Cilt/Volume 31 **Ek Sayı**/Number 1 **Yıl**/Year 2023

E-ISSN 2687-2242

JARSS
Anestezi Dergisi

Journal of Anesthesiology and Reanimation Specialists' Society

Anesteziyoloji ve Reanimasyon Uzmanları Derneği Yayın Organı
Official Journal of Anesthesiology and Reanimation Specialists' Society

www.anestezidergisi.com • www.jarss.org

Cilt/Volume 31 **Ek Sayı**/Number 1 **Yıl**/Year 2023 E-ISSN 2687-2242

JARSS Anestezi Dergisi

Journal of Anesthesiology and Reanimation Specialists' Society
Anesteziyoloji ve Reanimasyon Uzmanları Derneği Yayın Organı
Official Journal of Anesthesiology and Reanimation Specialists' Society

Yayın tarihi/*Publishing Date*
24.04.2023

*The manuscripts included in this supplement have not gone through the journal's standard review processes.

Anesteziyoloji ve Reanimasyon Uzmanları Derneği Dergisi, Anesteziyoloji ve Reanimasyon Uzmanları Derneği'nin (ARUD) resmi bilimsel yayın organıdır.
Dergi üç ayda bir yılda 4 sayı (Ocak, Nisan, Temmuz, Ekim) olarak yayımlanan açık erişim, ücretsiz ve hakemli bir dergidir.
TÜBİTAK ULAKBİM TR Dizin, EMBASE, EBSCO ve Scopus tarafından indekslenmektedir.
Yayın politikaları ve yazım rehberine www.anestezidergisi.com adreslerinden ulaşılabilir

Journal of Anesthesiology and Reanimation Specialists' Society (JARSS), is an official scientific journal of Anesthesiology and Reanimation Specialists' Society (ARSS).
It is published quarterly as 4 issues every year (January, April, July, October).
JARSS is an open Access, free and peer-reviewed journal and indexed in EMBASE, Scopus, EBSCO and ULAKBİM TR Dizin.
You can reach publication policies and writing guide from www.jarss.org

JARSS
Anestezi Dergisi
Journal of Anesthesiology and Reanimation Specialists' Society
Anesteziyoloji ve Reanimasyon Uzmanları Derneği Yayın Organı
Official Journal of Anesthesiology and Reanimation Specialists' Society

Danışma Kurulu / *Advisory Board*

Danışma Kurulu / *Advisory Board*

Emine Arık	*SBÜ Dışkapı Yıldırım Beyazıt EAH, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Emine Zeynep Eti	*Emekli Öğretim Üyesi*
Ender Gedik	*Başkent Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Yoğun Bakım Bilim Dalı*
Esra Özayar	*SBÜ Keçiören EAH, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Fatiş Altındaş	*İstanbul Üniversitesi Cerrahpaşa Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İstanbul*
Feyhan Ökten	*Ankara Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Filiz Üzümcügil	*Hacettepe Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Funda Gök	*Necmettin Erbakan Üniversitesi Meram Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Konya*
Gönül Tezcan Keleş	*Celal Bayar Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Manisa*
Gülay Ok	*Celal Bayar Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Manisa*
Hakkı Ünlügenç	*Çukurova Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Adana*
Handan Birbiçer	*Mersin Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Mersin*
Hatice Türe	*Yeditepe Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İstanbul*
Hija Yazıcıoğlu	*SBÜ Şehir Hastanesi SUAM, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Hilal Ayoğlu	*Zonguldak Bülent Ecevit Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Zonguldak*
Hülya Bilgin	*Uludağ Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Bursa*
Işıl Özkoçak Turan	*SBÜ Gülhane Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
İlkay Baran Akkuş	*SBÜ Dışkapı Yıldırım Beyazıt EAH, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
İrfan Güngör	*Gazi Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Jasmina Smajic	*University Clinical Center Tuzla, Clinic for Anesthesiology and Resuscitation, Tuzla, Bosnia and Herzegovina*
Jülide Ergil Hallıoğlu	*SBÜ Dışkapı Yıldırım Beyazıt EAH, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Kamil Toker	*İstinye Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İstanbul*
Karamehmet Yıldız	*Erciyes Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Kayseri*
Kemal Tolga Saraçoğlu	*SBÜ Dr. Lütfi Kırdar Şehir Hastanesi, Anesteziyoloji ve Reanimasyon Kliniği, İstanbul*
Keziban Sanem Çakar Turhan	*Ankara Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Lale Karabıyık	*Gazi Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Yoğun Bakım Bilim Dalı, Ankara*
Leyla İyilikçi Karaoğlan	*Dokuz Eylül Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İzmir*
Maja Sostaric	*Clinical Department of Anesthesiology and Intensive Care, Zaloska 7, Ljubljana, 1000 Slovenia*
Mehmet Emin İnce	*Gülhane Eğitim ve Araştırma Hastanesi, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Mehmet Murat Sayın	*SBÜ Dışkapı Yıldırım Beyazıt EAH, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Menekşe Özçelik	*Ankara Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Mukadder Orhan Sungur	*İstanbul Üniversitesi İstanbul Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İstanbul*
Mustafa Aksoy	*Ankara Yıldırım Beyazıt Üniversitesi, Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Nazım Doğan	*Atatürk Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Erzurum*
Nedim Çekmen	*Başkent Üniversitesi Tıp Fakültesi Hastanesi, Yoğun Bakım AD*
Nesrin Bozdogan Ozyilkan	*Başkent Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Adana*
Nezih Sertöz	*Ege Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İzmir*
Nurten Bakan	*SBÜ Sancaktepe Şehit Prof. Dr. İlhan Varank Hastanesi, Anesteziyoloji ve Reanimasyon Kliniği, İstanbul*
Nurten İnan	*Gazi Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Onat Bermede	*Ankara Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Onur Özlü	*TOBB ETÜ Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Orhan Kanbak	*T.C. Sağlık Bakanlığı Ankara Şehir Hastanesi, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Osman Ekinci	*SBÜ Haydarpaşa Numune EAH, Anesteziyoloji ve Reanimasyon Kliniği, İstanbul*
Oya Yalçın Çok	*Başkent Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Adana*
Ömür Erçelen	*Koç Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İstanbul*
Özgür Canbay	*Hacettepe Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Özlem Kocatürk	*Aydın Adnan Menderes Üniversitesi, Diş Hekimliği Fakültesi, Aydın*

Danışma Kurulu / *Advisory Board*

Özlem Korkmaz Dilmen	*İstanbul Üniversitesi Cerrahpaşa Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İstanbul*
Özlem Sağır	*Balıkesir Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Balıkesir*
Özlem Selvi Can	*Ankara Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Pakize Kırdemir	*Süleyman Demirel Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Isparta*
Paraskevi Matsota	*University Hospital "Attileoç", 9nd Department of Anesthesiology, Athens, Greece*
Perihan Ekmekçi	*Ufuk Üniversitesi Tıp Fakültesi, Dr. Rıdvan Ege Hastanesi Anesteziyoloji ve Reanimasyon AD, Ankara*
Pınar Kendigelen	*İstanbul Üniversitesi Cerrahpaşa Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İstanbul*
Pınar Zeyneloğlu	*Başkent Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Yoğun Bakım Bilim Dalı, Ankara*
Remzi İşçimen	*Bursa Uludağ Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Bursa*
Reyhan Polat	*SBÜ Dışkapı Yıldırım Beyazıt EAH, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Rudin Domi	*University of Medicine, Faculty of Medicine, Tirana, Albania, Anesthesiologist-Intensivist Department of Anesthesiology and Intensive Care, American Hospital 3, Tirana, Albania*
Savaş Altınsoy	*SBÜ Dışkapı Yıldırım Beyazıt EAH, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Seda Banu Akıncı	*Hacettepe Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Sema Şanal Baş	*Eskişehir Osmangazi Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Eskişehir*
Semra Karaman	*Ege Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İzmir*
Serap Karacalar	*SBÜ Prof. Dr. Cemil Taşcıoğlu Şehir Hastanesi SUAM, Anesteziyoloji ve Reanimasyon Kliniği, İstanbul*
Seval İzdeş	*Ankara Yıldırım Beyazıt Üniversitesi, Şehir Hastanesi Yoğun Bakım Kliniği, Ankara*
Sevtap Hekimoğlu Şahin	*Trakya Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Edirne*
Seyhan Yağar	*SBÜ Ankara Şehir Hastanesi SUAM, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Sibel Barış	*Ondokuz Mayıs Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Samsun*
Suna Akın Takmaz	*T.C. Sağlık Bakanlığı Ankara EAH, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Süheyla Ünver	*SBÜ Dr. Abdurrahman Yurtaslan Onkoloji EAH, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Süleyman Ganidağlı	*Gaziantep Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Gaziantep*
Şule Akın	*Girne Amerikan Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Girne, KKTC*
Taylan Akkaya	*SBÜ Dışkapı Yıldırım Beyazıt Eğitim Araştırma Hastanesi, Algoloji Kliniği, Ankara*
Tuğhan Utku	*Yeditepe Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İstanbul*
Tülay Şahin	*Kocaeli Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Kocaeli*
Ülkü Aygen Türkmen	*İstanbul İl Sağlık Müdürlüğü Gaziosmanpaşa EAH, Anesteziyoloji ve Reanimasyon Kliniği, İstanbul*
Ünase Büyükkoçak	*Yüksek İhtisas Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Vojislava Neskovic	*Military Medical Academy, Anesthesiology and Intensive Care, Belgrade, Serbia*
Vuslat Muslu Erdem	*Albert Einstein College of Medicine, Montefiore Medical Center, Internal Medicine, New Rochelle, NY, USA*
Yasemin Güneş Kocaoğlu	*Çukurova Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Adana*
Yavuz Gürkan	*Koç Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, İstanbul*
Yunus Gürkan Türker	*Uludağ Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Bursa*
Yusuf Ünal	*Gazi Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon AD, Ankara*
Yüksel Erkin	*Dokuz Eylül Üniversitesi Tıp Fakültesi, Algoloji Blim Dalı, İzmir*
Zeki Tuncel Tekgül	*SBÜ Izmir Bozyaka SUAM, Anesteziyoloji ve Reanimasyon Kliniği, İzmir*
Zeliha Aslı Demir	*SBÜ Ankara Şehir Hastanesi SUAM, Anesteziyoloji ve Reanimasyon Kliniği, Ankara*
Züleyha Kazak Bengisun	*Ufuk Üniversitesi Tıp Fakültesi, Rıdvan Ege Hastanesi, Anesteziyoloji ve Reanimasyon AD, Ankara*

Cilt/Volume 31 **Ek Sayı**/Number 1 **Yıl**/Year 2023 E-ISSN 2687-2242

JARSS
Anestezi Dergisi
Journal of Anesthesiology and Reanimation Specialists' Society
Anesteziyoloji ve Reanimasyon Uzmanları Derneği Yayın Organı
Official Journal of Anesthesiology and Reanimation Specialists' Society

Contents / *İçindekiler*

Oral Presentation / Sözlü Sunumlar

Poster Presentation / Poster Sunumlar

Specialist Section / Uzman Bölümü

100th Anniversary of The Republic

Anesthesiology and Reanimation Specialists' Society Congress

BALKAN STATES ANESTHESIA DAYS - VIII

Anesthesia and Intensive Care
In The Light of
The 100th Anniversary of Our Republic

28-30 April 2023

Ankara University, School of Medicine
Abdulkadir Noyan Conference Hall
Ankara, Türkiye

www.arud2023.org

organization secretariat
hakan@diamed98.com
+90 533 247 6627
DiAMED CONGRESS & ORGANIZATION

Committees / Komiteler

Congress President

Prof. F. Feyhan Ökten, MD

General Secretary

Prof. Onur Özlü, MD

Organizing Committee

Prof. Zekeriya Alanoğlu, MD (USA)
Eda Balcı, MD (Türkiye)
Prof. Ivana Budic, MD (Serbia)
Prof. Rudin Domi, MD (Albania)
Prof. Ali Fuat Erdem (Türkiye)
Assoc. Prof. Ezgi Erkılıç, MD (Türkiye)
Asst. Prof. Antigona Hasani, MD, PhD (Kosovo)
Doc. Dr. Sc. Višnja Ivančan, MD (Crotia)
Prof. Meral Kanbak, MD (Türkiye)
Prof. Marijana Karišik, MD (Montenegro)
Doc. Andrijan Kartalov, MD, PhD (Macedonia)
Prof. Ömer Kurtipek (Türkiye)
Assoc. Prof. Biljana Kuzmanovska, MD (Macedonia)
Prof. Feyhan Ökten, MD (Türkiye)
Prof. Onur Özlü, MD (Türkiye)
Prof. Dusica Simic, MD PhD (Serbia)
Asst. Prof. Jasmina Smajic, MD, PhD (BiH)
Prof. Sumru Şekerci, MD (Türkiye)
Assoc. Prof. Dilek Ünal, MD (Türkiye)
Assoc. Prof. Gülten Ütebey, MD (Türkiye)

Scientific Committee

Prof. Hülya Başar, MD (Türkiye)
Prof. Ahmet Coşar, MD (Türkiye)
Prof. Ivana Budic, MD (Serbia)
Prof. Rudin Domi, MD (Albania)
Asst. Prof. Antigona Hasani, MD, PhD (Kosovo)
Prof. Dusanka Janjevic, MD, PhD (Serbia)
Prof. Meral Kanbak, MD (Türkiye)
Doc. Andrijan Kartalov, MD, PhD (Macedonia)
Asst. Prof. Fatos Katanolli, MD (Kosovo)
Prof. Asc. Saimir Kuci (Albania)
Prof. Asc Krenar Lilaj (Albania)
Dr. Hasib Lukac, MD (Montenegro)
Assoc. Prof. Biljana Kuzmanovska, MD (Macedonia)
Asst Prof. Meldijana Omerbegovic, MD (BiH)
Prof. Feyhan Ökten, MD (Türkiye)
Prof. Dilek Özcengiz, MD (Türkiye)
Prof. Ayşegül Özkök, MD (Türkiye)
Prof. Zerrin Özköse Şatırlar (Türkiye)
Prof. Onur Özlü, MD (Türkiye)
Assoc. Prof. Sengül Özmert, MD (Türkiye)
Prof. Sumru Şekerci, MD (Türkiye)
Assoc. Prof. Dilek Ünal, MD (Türkiye)

Invitation / Davet

Dear Colleagues

The Anesthesiology and Reanimation Specialists' Society (ARUD) Balkan Countries Anesthesia Days, which started in 2014 in Pristina, the capital of Kosovo, with the participation of our colleagues from the Balkan countries, took place in the past in the form of 7 meetings, the last one being online, in 6 different cities in 5 different countries. In this unique international congress initiated by our esteemed colleague and former ARUD president Prof Dr Meral Kanbak, our society will embrace you for the 8th time with our colleagues and friends from all Balkan countries in Ankara, the symbol of the power of democracy in Turkey and where the foundations of the republic were laid, on the 100th anniversary of the proclamation of our republic. In our congress, where we invited our colleagues from the Balkan countries as well as from other countries;in addition to the exchange of information, friendly relations that will contribute to the promotion of the participating countries will continue as usual.

As it coincides with a very special and meaningful period for our country, our theme in our eighth congress will be "Anesthesia and Intensive Care in the Light of the 100th Anniversary of our Republic".

After the pandemic, we continue our work with the joy of getting healthy and bright days again. We are already excited by the desire to see you together with our valuable speakers and guests on 28-30 April 2023 in the meeting halls of Ankara University Faculty of Medicine, one of the most established universities of our country.

Our esteemed colleagues, we will be honored and happy to welcome you together with our congress secretary Prof Onur ÖZLÜ, MD, vice president Prof Sumru ŞEKERCI, MD, Prof Dilek ÜNAL, MD, Assoc Prof Ezgi ERKILIÇ, MD, Assoc Prof Gülten ÜTEBEY, MD and Eda BALCI, MD.

Best regards.

Prof. Feyhan ÖKTEN, MD

Invited Speakers / Davetli Konuşmacılar

- Doc. Andrijan Kartalov, MD, PhD (Macedonia)
- Assoc. Prof. Biljana Kuzmanovska, MD (Macedonia)
- Prof. Ass. Dr. Fatos Sada MSC (Kosovo)
- Prof. Dusica Simic, MD PhD (Serbia)
- Asst.Prof. Jasmina Smajic, MD, PhD (BiH)
- Prof. Marijana Karısık, MD, (Montenegro)
- Prof. Mirjana Shosholcheva, MD (Macedonia)
- Prof. Asc. Krenar Lilaj MD (Albenia)
- Prof. Asc Saimir Kuci, MD (Albania)
- Asst Prof. Meldijana Omerbegovıc, MD (BiH)
- Assoc. Prof. Vesna Durnev MD, PhD
- Joana Berger-Estilita, PD, Dr. Med (Switzerland)
- Assist. Prof. Ivana Budić, MD, PhD (Serbia)

Scientific Programme / Bilimsel Program

28 April 2023, Friday (Main Hall)

9:00-10:00	**OPENING CEREMONY**	
9:00-9:20	Opening Speech	Onur Özlü
9:20-9:40	President's welcome speech; Anesthesia is an art	Feyhan Ökten
9:40-10:00	Dean and Rector speeches	
10:00-10:35	*Coffee Break*	
10:35-11:55	**OPENING SESSION**	**Ömer Kurtipek, Meral Kanbak, Zeynep Kayhan**
10:35-10:50	Education in anesthesia during and after the pandemic: lessons for the coming years	Joana Berger Estilita
10:50-11:05	The neurophysiopathology of chronic stress and management strategies	Pelin Arıbal Ayral
11:05-11:20	Chronic stress and the neuroendocrine system	Özgür Demir
11:20-11:35	A new horizon in anesthesiology intensive care and pain medicine: Is the gut microbiome a new player?	Suna Akın Takmaz
11:35-11:55	Discussion	
11:55-13:15	**PANEL I: SHOCK**	**Oktay Demirkıran, Sema Turan, Oya Özatamer**
11:55-12:10	Traumatic shock and microcirculation	Zekeriya Alanoğlu
12:10-12:25	Blood gas analysis interpretation during shock	Tuğhan Utku
12:25-12:40	Hemodynamic monitoring	Mustafa Kemal Bayar
12:40-12:55	Pathophysiology of sepsis	Jasmina Smajic
12:55-13:15	Discussion	
13:15-14:15	*Lunch Break*	
14:15-15:35	**PANEL II: ANESTHESIA IN SPECIAL CIRCUMSTANCES – 1**	**Ayşegül Özgök, Hasan Koçoğlu, Saimir Kuci**
14:15-14:30	Benefits and risks of opiod free anesthesia techniques	Gözde İnan
14:30-14:45	Anesthetic management and current considerations in minimal invasive cardiac surgery	Kazım Karaaslan
14:45-15:00	Respiratory mechanics and lung protection in the obese patient	Aycan Özdemirkan
15:00-15:15	Artificial intelligence and anesthesia	Mirjana Shosholcheva
15:15-15:35	Discussion	
15:35-15:50	*Coffee Break*	

15:50-17:10	PANEL III: PEDIATRICS	Berrin Işık, Mehmet Emin Orhan, Meldijana Omerbegovic
15:50-16:05	Pediatric post resusitation care	Tanıl Kendirli
16:05-16:20	Current applications of peripheral nerve blockade in pediatric patient, where are we?	Filiz Üzümcügil
16:20-16:35	Recent trends in pediatric perioperative fluid management	Volkan Şıvgın
16:35-16:50	Perioperative blood transfusion in pediatrics	Marijana Karišik
16:50-17:10	Discussion	

17:10-18:30	PANEL IV: OBSTETRICS	Hülya Başar, Dilek Ünal, Filiz Tüzüner
17:10-17:25	Anesthetic management of pregnant patients with hypertensive disorders	Ayşe Özcan
17:25-17:40	The critical bleeding obstetric patient	İlkay Baran Akkuş
17:40-17:55	Obstetric anesthesia for cardiac high-risk patients	Namık Özcan
17:55-18:10	Overview of obstetric analgesia	Ayşenur Dostbil
18:10-18:30	Discussion	

29 April 2023, Saturday (Main Hall)

8:30-10:05	PANEL V: BLEEDING AND COAGULATION	Ümit Karadeniz, Lale Karabıyık, Vesna Durnev
8:30-8:45	Protocols for novel anticoagulant drugs	Sumru Şekerci
8:45-9:00	Perioperative Blood Pressure	Asutay Göktuğ
9:00-9:15	Prevention of respiratory complications after major abdominal surgery	Krenar Lilaj
9:15-9:30	Clinical use of tranexamic acid: effectiveness and controversies	Aslı Demir
9:30-9:45	Coagulation disorders in intensive care	Necla Dereli
9:45-10:05	Discussion	

10:05-10:25	CONFERENCE 1	Onur Özlü
10:05-10:25	Stem cell therapy and areas of usage	Haktan Karaman
10:25-10:40	*Coffee Break*	

10:40-12:00	PANEL VI: NUTRITION	Ali Alagöz, Dilek Kazancı, Ünase Büyükkoçak
10:40-10:55	Metabolic stress and starvation	Deniz Erdem
10:55-11:10	Management of the patient with dysphagia	Onur Özlü
11:10-11:25	Protein and energy targets in critical ill patients	Çetin Kaymak
11:25-11:40	Micronutrients	Birgül Yelken
11:40-12:00	Discussion	
12:00-13:00	*Lunch Break*	
13:00-13:20	About bread	Mine Ataman

13:20-14:40	PANEL VII: NEUROANESTHESIA	Nermin Göğüş, Ivana Budić, Ülkü Aypar
13:20-13:35	Perioperative temperature management	Biljana Kuzmanovska
13:35-13:50	Perioperative cognitive dysfunction in pediatric patients	Ayça Dumanlı Özcan
13:50-14:05	New guidelines in pediatric neurotrauma	Dusica Simic
14:05-14:20	Neuroprotective anesthesia and safe brain initiative	Nevriye Salman
14:20-14:40	Discussion	
14:40-14:55	*Coffee Break*	

14:55-16:15	PANEL VIII: ANESTHESIA IN SPECIAL CIRCUMSTANCES – 2	Işıl Özkoçak Turan, Süheyla Ünver
14:55-15:10	Cardiopulmonary resuscitation in the operating room	Bahar Kuvaki
15:10-15:25	Preoperative Carbohydrate-Rich Drink and ERAS protocol	Fatos Sada
15:25-15:40	Anesthetic management of the severe COVID-19 disease survived patient	Azize Beştaş
15:40-15:55	Vasopressin in sepsis	Andrijan Kartalov
15:55-16:15	Discussion	

16:15-17:35	PANEL IX: LAW	Jülide Ergil, Levent Öztürk, Raziye Ünal
16:15-16:30	Malpractice and recent changes in the "law of violence"	Dilek Özcengiz
16:30-16:45	Protection of patient data and law policy	Mete Salih Aker
16:45-17:00	Plagiarism and legal policies	Neval Yılmaz
17:00-17:15	Palliative Care and Ethics	Kadriye Kahveci
17:15-17:35	Discussion	

30 April 2023, Sunday (Main Hall)

9:00-10:35	PANEL X: ORTHOPEDIC ANESTHESIA	Mahmut Kalem, Fatma Sarıcaoğlu, Mustafa Aksoy
9:00-9:15	Choosing the anesthesia technique for high risk orthopedic surgery; Can we define pathways?	Menekşe Özçelik
9:15-9:30	Acute and chronic pain management after arthroscopic shoulder surgery	Sanem Çakar
9:30-9:45	Motor function preserving anesthetic and analgesic methods for hip arthroplasty	Derya Arslan Yurtlu
9:45-10:00	The role of the surgical team in the prevention of chronic pain after arthroplasty	Hakan Kocaoğlu
10:00-10:15	Postoperative cognitive dysfunction and perioperative facts; How to protect our patients based on cellular and clinical level	Başak Ceyda Meço
10:15-10:35	Discussion	
10:35-10:50	*Coffee Break*	

10:50-12:10	PANEL XI: REGIONAL ANESTHESIA	Semih Başkan, Abdülkadir But, Ahmet Coşar
10:50-11:05	Plane block throughout the body	Derya Özkan
11:05-11:20	Factors affecting block characterisitcs in peripheral nerve blockade	Perihan Ekmekci
11:20-11:35	Neurotoxicity of peripheral nerve block adjuants	M. Burak Eşkin
11:35-11:50	Long-term effects of anesthetic drugs in oncological patients	Güldeniz Argun
11:50-12:10	Discussion	

SUMMARIES

100th Anniversary of The Republic

Anesthesiology and Reanimation Specialists' Society Congress

BALKAN STATES ANESTHESIA DAYS - VIII

Anesthesia and Intensive Care In The Light of The 100th Anniversary of Our Republic

28-30 April 2023

Ankara University, School of Medicine
Abdulkadir Noyan Conference Hall
Ankara, Türkiye

www.arud2023.org

PANELIST

10:35-10:50 (Opening Session)

10:35-11:55	OPENING SESSION	Ömer Kurtipek, Meral Kanbak, Zeynep Kayhan
10:35-10:50	Education in anesthesia during and after the pandemic: lessons for the coming years	Joana Berger Estilita
10:50-11:05	The neurophysiopathology of chronic stress and management strategies	Pelin Arıbal Ayral
11:05-11:20	Chronic stress and the neuroendocrine system	Özgür Demir
11:20-11:35	A new horizon in anesthesiology intensive care and pain medicine: Is the gut microbiome a new player?	Suna Akın Takmaz
11:35-11:55	Discussion	

Education in Anaesthesia During and After the Pandemic: Lessons for Upcoming Years

Joana Berger-Estilita

Institute of Anaesthesiology and Intensive Care, Salemspital, Hirslanden Medical Group, Bern, Switzerland

The COVID-19 pandemic has brought significant changes to the field of anesthesia education and training. In response to the pandemic, many anesthesia programs had to quickly adapt to virtual learning platforms and modified clinical training protocols to ensure the safety of trainees, patients, and healthcare providers.

In the coming years, it is likely that the impact of the pandemic on anesthesia education will continue to be felt. Here are some lessons that could be learned from the experience:

- Importance of technology in medical education: The sudden shift to online learning during the pandemic highlighted the importance of technology in medical education. Online platforms have become crucial for delivering lectures, simulations, and other learning resources to students.
- Need for flexibility in training programs: The pandemic demonstrated the need for flexibility in training programs, as traditional methods of education and clinical training were disrupted. Anesthesia programs will need to be able to adapt to changing circumstances and adjust their training programs accordingly.
- Importance of safety protocols in clinical training: The pandemic has emphasized the importance of having robust safety protocols in place during clinical training. This includes ensuring that trainees are properly equipped with personal protective equipment, implementing measures to minimize the risk of exposure to the virus, and regularly updating protocols as the situation evolves.
- Emphasis on emergency preparedness: The pandemic has underscored the importance of emergency preparedness in anesthesia education and training. Trainees need to be prepared for sudden changes in clinical practice and have the knowledge and skills to respond to unexpected events, such as a pandemic.
- Importance of interprofessional collaboration: The pandemic has shown the importance of interprofessional collaboration in the delivery of patient care. Anesthesia programs will need to continue to foster interprofessional relationships and provide opportunities for trainees to work with other healthcare providers.

REFERENCES

1. Chu LF, Kurup V. Graduate medical education in anaesthesiology and COVID-19: lessons learned from a global pandemic. Curr Opin Anaesthesiol 2021;34(6):726-734.
2. Hughes L, Murphy O, Lenihan M, Mhuircheartaigh RN, Wall TP. Impact of the COVID-19 pandemic on anaesthesia specialty training: a single-centre quantitative analysis. BJA Open 2023;5:100117.

11:20-11:35 (Opening Session)

10:35-11:55	OPENING SESSION	Ömer Kurtipek, Meral Kanbak, Zeynep Kayhan
10:35-10:50	Education in anesthesia during and after the pandemic: lessons for the coming years	Joana Berger Estilita
10:50-11:05	The neurophysiopathology of chronic stress and management strategies	Pelin Arıbal Ayral
11:05-11:20	Chronic stress and the neuroendocrine system	Özgür Demir
11:20-11:35	A new horizon in anesthesiology intensive care and pain medicine: Is the gut microbiome a new player?	Suna Akın Takmaz
11:35-11:55	Discussion	

A New Horizon in Anesthesiology Intensive Care and Pain Medicine: Is the Gut Microbiome a New Player?

Suna Akın Takmaz

University of Health Sciences, Ankara Training and Research Hospital, Department of Anesthesiology and Reanimation/Algology, Ankara, Türkiye

Intestinal microbiota and microbiome are among the most interesting topics in the medical world recently. We can define the microbiota as the community of microorganisms (bacteria, fungi, viruses and protozoa families) that live in our body. It is defined as the community of the microorganisms and also their "theatre of activity (1). In this regard, microbiome encompasses a broader spectrum than that of microbiota. The total population of this living community is more than 100 trillion, and their total weight constitutes about 2-3 percent of our body weight . The number of cells in our microbiota is 10 times greater than the number of our own cells. The human microbiota, also known as "the hidden organ," contribute over 150 times more genetic information than that of the entire human genome. Recent studies, both clinical and experimental, have established beyond question that the gut microbiome plays an important role in human health and disease (2). Evidence suggests that the gut microbiome is a crucial modulator of human health and body homeostasis, undoubtedly playing an important role in regulating systemic inflammation, immunity, circadian rhythm and hormone levels. Our microbiome is involved in essential functions within the body such as protection from pathogens, host nutrient metabolism, production of vitamins, drug metabolism, maintenance of structural integrity of the gut mucosal barrier and modulation of the immune system (3). New research suggests that the gut microbiome may also have an important role in anesthesiology, intensive care and pain medicine (4-6). In animal models, the composition of the gut microbiome has been shown to change after general anesthesia. In humans, the gut microbiome is associated with the development of postoperative pain and neurocognitive disorders. The composition of the gut microbiome has been associated with visceral pain, inflammatory pain, headache, neuropathic pain, chronic pain, and opioid tolerance (7-9). Studies show gut microbiome changes in humans that are associated with some postoperative outcomes (3). Microbiome variability seems to be an important point in explaining why pain becomes chronic in some patients or why the analgesic response is different in each patient. Studies demonstrate the critical role of the gut microbiome in neuropathic pain through immunomodulatory mechanisms. Microbiota is considered as one of the important factors that can worsen the clinical condition of fragile intensive care patients. Intestinal dysbiosis occurs a few hours after admission to the intensive care unit (10). It appears that the microbiota plays a very important role in the prevention of complications associated with intensive care. .

Investigations are needed to determine the specific role of the gut microbiome in the development of strategies to prevent and improve patient outcome in anaesthesia, intensive care, and pain management.In this presentation, it is aimed to provide a comprehensive overview of the evidence linking the gut microbiome with anesthesiology, intensive care and pain medicine.

Keywords: Gut microbiome, pain, analgesia, intensive care, anesthesiology, anesthesia

REFERENCES

1. Berg, G., Rybakova, D., Fischer, D. et al. Microbiome definition re-visited: old concepts and new challenges. Microbiome.2020: 20;8(1):119
2. Tonelli Enrico V, Vo N, Methe B, Morris A, Sowa G. An unexpected connection: A narrative review of the associations between Gut Microbiome and Musculoskeletal Pain. Eur Spine J. 2022;31(12):3603-3615.
3. Valdes A.M., Walter J., Segal E., Spector T.D. Role of the gut microbiota in nutrition and health. BMJ. 2018;13(361)
4. Minerbi A, Shen S. Gut Microbiome in Anesthesiology and Pain Medicine. Anesthesiology. 2022 Jul 1;137(1):93-108.
5. Zanza C, Romenskaya T, Thangathurai D, Ojetti V, Saviano A, Abenavoli L, Robba C, Cammarota G, Franceschi F, Piccioni A, Longhitano Y. Microbiome in Critical Care: An Unconventional and Unknown Ally. Curr Med Chem. 2022;29(18):3179-3188.

6. Guo R, Chen LH, Xing C, Liu T. Pain regulation by gut microbiota: molecular mechanisms and therapeutic potential. Br J Anaesth. 2019 Nov;123(5):637-654.
7. Moloney RD, Johnson AC, O'Mahony SM, et al. Stress and the microbiota-gut-brain axis in visceral pain: relevance to irritable bowel syndrome. CNS Neurosci Ther. 2016;22:102–117.
8. Guo R, Chen LH, Xing C, Liu T. Pain regulation by gut microbiota: molecular mechanisms and therapeutic potential. Br J Anaesth. 2019;123:637–654.
9. Ding W, You Z, Chen Q, et al. Gut Microbiota Influences Neuropathic Pain Through Modulating Proinflammatory and Anti-inflammatory T Cells. Anesth Analg. 2021 Apr 1;132(4):1146-1155.
10. Zanza C, Romenskaya T, Thangathurai D, et al. Microbiome in Critical Care: An Unconventional and Unknown Ally. Curr Med Chem. 2022;29(18):3179-3188.

14:15-14:30 (Panel II)

14:15-15:35	PANEL II: ANESTHESIA IN SPECIAL CIRCUMSTANCES – 1	Ayşegül Özgök, Hasan Koçoğlu, Saimir Kuci
14:15-14:30	Benefits and risks of opiod free anesthesia techniques	Gözde İnan
14:30-14:45	Anesthetic management and current considerations in minimal invasive cardiac surgery	Kazım Karaaslan
14:45-15:00	Respiratory mechanics and lung protection in the obese patient	Aycan Özdemirkan
15:00-15:15	Artificial intelligence and anesthesia	Mirjana Shosholcheva
15:15-15:35	Discussion	
15:35-15:50	*Coffee Break*	

Benefits and Risks of Opiod Free Anesthesia Techniques

Gozde Inan, MD, DESAIC

Gazi University School of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

INTRODUCTION

As we continue to comprehend the natural history of pain, the various types of pain, and the effectiveness of various treatment techniques, the definition of pain as well as the way it is treated have changed over time. Worldwide, poor management of post-operative pain remains an ongoing concern.

In order to control the sympathetic response to surgical stimuli and for postoperative analgesia, opioids are administered intraoperatively. Postoperative pain can have detrimental impacts on patients' recovery processes, including less mobility to promote healing, respiratory issues, an increased stress response, patient dissatisfaction, and an elevated risk of delirium. Chronic pain is a long-term consequence of acute post-surgical pain, and it can negatively impact patients' quality of life.

Synthetic opioids have been employed to achieve both hemodynamic stability and peroperative analgesia during anesthesia. They enable the sympathetic system to be inhibited without causing a cardiac collapse or histamine release. However, opioid administration is also not without risk and is associated with a variety of side effects, including constipation, urinary retention, respiratory depression, sedation, ileus, confusion/delirium, immunodepression, hyperalgesia and postoperative nausea and vomiting. These side effects are associated with a significant morbidity, can increase the length of stay and slow postoperative rehabilitation, all of which raise the cost of healthcare services. It is also recognized that perioperative opioid delivery increases the risk of long-term opioid usage, which has contributed to the present global opioid epidemic.

Given their effectiveness, opiates are currently commonly used for surgical pain, but many healthcare providers are attempting to use the least amount of opiates necessary due to their significant side effect profile; the opioid abuse epidemic, and an aging population in which opiates' side effects are amplified. Since then, multimodal anesthesia with lower hypnotic concentrations has replaced inhalation anesthesia in the practice of anesthesia. It has been suggested that opioids are not necessary to fulfill the intraoperative goals of hypnosis, hemodynamic stability, immobility, and anticipation of postoperative analgesia. Our focus has shifted from using an opiate-heavy approach for post-surgical pain to using an opiate-sparing multimodal approach, where sometimes no opioids are used.

Opioid-free anesthesia (OFA), also known as intraoperative anesthesia without opiates, is frequently a practical option that spares patients from the adverse effects of opiates without impairing postoperative pain management (1). However, uncertainty exists in the balance between OFA benefits and risks (2).

I want to discuss about the advantages and disadvantages of OFA. I would like to present some important OFA-related questions as a pro/con discussion because the subject is still up for debate.

DISCUSSION

The term "opioid-free anesthesia" refers to intraoperative anesthesia without the use of opiates. Patients who are under general anesthesia (GA) are unconscious, and since the psychological effects of pain are not present, they only experience nociception instead of pain. Hemodynamic alterations, an increase in respiratory rate, and movement in nonparalyzed patients are just a few of the inadequate surrogates used to predict nociception in the anesthetized patient and its successful treatment. With the use of electroencephalography and the infratentorial balance of the autonomic nervous system, where nociception causes an

increase in sympathetic tone and a decrease in vagal tone, attempts have been made to develop objective measurements of nociception for the anesthetized patient (3).

Commercially available devices have been used to infer nociception through an increase in heart rate and heart rate variability, increased sweating (thus skin conductance), and pupillary dilation, which correlate with an increase in sympathetic activity; however, it is still unknown whether any of these devices truly measures nociception, and their clinical application is unproven. In order to reduce the exposure of patients to opiates and their negative side effects, it is possible to manage intraoperative surrogates for nociception, such as tachycardia and hypertension, using nonopiate alternatives. Yet, many people question whether this strategy for treating nociception intraoperatively is effective or whether skipping intraoperative opiates actually causes more pain following surgery.

Opioid-free anesthesia, a multimodal anesthesia combining hypnotics, N-methyl-D-aspartate (NMDA) antagonists, local anesthetics, anti-inflammatory medicines, and alpha-2 agonists, is based on the same principle of opioid sparing techniques. The early investigations on OFA were on bariatric surgery, which frequently results in respiratory complications. In obese patients, OFA with dexmedetomidine dramatically reduced postoperative pain and opioid needs without leading in respiratory depression (4,5).

The major argument for using intraoperative opioids is to prevent hemodynamic abnormalities, to let patients wake up comfortably, and to prevent pain in advance to avoid the occurrence of persistent postsurgical pain. The existence of other medications, such as beta-blockers, that can successfully prevent hemodynamic abnormalities without having opioid side effects is an argument in favor of OFA's practicality.

We may be overtreating patients' presumed pain or transient pain by administering opioids for any tachycardia and hypertension we notice, given that hemodynamic changes are imprecise markers of pain. Furthermore, there is little evidence that preemptive versus preventive opiates reduce acute postoperative pain (6).

In a review by Frauenknecht and colleagues (7), they demonstrated that the use of intraoperative opiates compared to opioid-free anesthesia increased the risk of nausea and vomiting postoperatively without providing any benefit for patients' pain management. Opioids have many known side effects that can negatively affect patients' recovery. PONV causes the patient distress and raises medical costs (8).

One established risk factor for the development of persistent pain following surgery is severe pain (9). There are convincing evidence that intraoperative opioids, including remifentanil, may be associated with greater postoperative pain and worse outcomes, raising concerns about their safety. Moreover, remifentanil utilized intraoperatively had unanticipated negative effects and was related to a deterioration of pain levels and an increased need for postoperative analgesics (10). Remifentanil may provide advantages, but these appear to be overshadowed by possible drawbacks, particularly in surgical operations when high postoperative pain scores are anticipated. Moreover, higher intraoperative opioid doses can induce opioid-induced hyperalgesia, which is associated with increased morphine consumption and higher postoperative pain scores (11-13).

As "con" perspective; first of all, a systematic review and meta-analysis demonstrates that there are no significant differences in postoperative pain between opioid-free and opioid-inclusive anesthesia. Further research is required to evaluate whether the severity of the pain would change if longer-acting opiates with a lower prevalence of hyperalgesia were administered. There is also no discussion of intraoperative hemodynamic alterations, which, if considerable, can have negative effects on patients with cardiovascular disease or advanced age (7).

The evidence is limited to particular surgical procedures (such as hysterectomies) and low-risk individuals (ASA 1-2) without chronic pain or opioid use, despite the fact that current research reveals no benefit on the use of prophylactic opiates. However, there are risks associated with using non-opiate analgesics intraoperatively. For example, non-steroidal anti-inflammatory medicines (NSAIDs) raise the risk of acute kidney injury (AKI), ketamine increases sympathetic response, and dexmedetomidine causes hypotension and bradycardia. Opiates are generally safe in small dosages and may help avoid polypharmacy, which has a number of undesirable side effects.

According to Beloeil et al., compared to balanced anesthesia with remifentanil, opioid-free anesthesia balanced with dexmedetomidine reduces postoperative opioid-related side effects. However, the dexmedetomidine group had a higher frequency of significant side events, particularly hypoxemia and bradycardia, according to the trial's findings (14).

Multimodal analgesia (MMA) is effective in decreasing or eliminating any multimodal agent's side effects, especially opiates, while improving perioperative pain management. Because to its enhanced pain management and reduced analgesic side effects,

MMA has grown to be a crucial part of enhanced recovery after surgery (ERAS) pathways. Although many medications appear to have some benefit in pain management and opiate-sparing properties, there are few studies that identify the best combination of non-opiate adjuncts and each one's individual contribution to analgesia, which raises the question of what combination and number of non-opiate analgesics is safe and effective to achieve OFA (15).

Although regional techniques have the capacity to provide adequate intraoperative analgesia, they come with risks, higher costs, and are not recommended for many minor procedures. Because MMA with low doses of opiates may offer a nearly equally effective, and more widely available analgesic at lower costs and risks, it appears ridiculous to rely on invasive analgesic procedures to enable OFA. Also, because to a lack of expertise and high costs, many institutions might not have recourse for regional techniques (3).

CONCLUSION

In order to improve recovery and patient satisfaction, it is crucial to control postoperative pain effectively. This enables early mobility and discharge. Opiate-sparing multi-modal analgesia enhances pain management and reduces adverse effects, especially from opiates. The standard of treatment should be opiate-free pain control during the perioperative period, with opiate-sparing intra-operative and post-operative analgesia as the ultimate objective. Unfortunately, opiate-free postoperative pain management may be all but impossible for some patients and procedures.

Even in the face of overwhelming proof of the effectiveness of OFA with minimal risks, it is challenging to modify clinical practice, which is one of the major problems of applying OFA. Another significant challenge is, there are numerous pharmacologic, nonpharmacologic, and regional approaches that can be utilized to achieve the goal of OFA, but it is unknown what the best combination of these is for each given treatment without introducing extra risks. Additionally, while there are multi-modal analgesia standards for certain procedures, there aren't any for individual patients, and the evidence for these guidelines isn't sufficient. Furthermore, not all surgeries or patients are the same.

Implementing opioid-free anesthesia may be facilitated by proper teaching on how to perform OFA and how new methods of antinociception monitoring works. Also, future well-designed trials that examine the function of opioid-free methods in multimodal anesthesia are only beneficial if they are a part of a continuum that emphasizes the importance of patient-centered approaches (16).

Enhancing recovery, reducing complications, and improving outcomes are the main objectives of perioperative medicine. We might therefore broaden our focus in this area and give research and the development of opioid-free anesthesia strategies as a component of multimodal anesthesia approaches due consideration. Although OFA is feasible, it shouldn't be the standard because many patients would benefit from the intraoperative use of properly titrated opiates. The standard of care could be personalised opiate sparing anesthesia technique, not the extreme of OFA.

REFERENCES

1. Beloeil H, Laviolle B, Menard C, et al. SFAR research network. POFA trial study protocol: a multicentre, double-blind, randomised, controlled clinical trial comparing opioid-free versus opioid anaesthesia on postoperative opioid-related adverse events after major or intermediate non-cardiac surgery. BMJ Open. 2018 Jun 30;8(6):e020873.
2. Veyckemans F. Opioid-free anaesthesia: Still a debate? Eur J Anaesthesiol. 2019 Apr;36(4):245-246.
3. Carcamo-Cavazos V, Cannesson M. Opioid-Free Anesthesia: The Pros and Cons. Adv Anesth. 2022 Dec;40(1):149-166.
4. Feld JM, Hoffman WE, Stechert MM, et al. Fentanyl or dexmedetomidine combined with desflurane for bariatric surgery. J Clin Anesth. 2006;18:24–8.
5. Hofer RE, Sprung J, Sarr MG, et al. Anesthesia for a patient with morbid obesity using dexmedetomidine without narcotics. Can J Anaesth. 2005;52:176–80.
6. Doleman B, Leonardi-Bee J, Heinink TP, et al. Pre-emptive and preventive opioids for postoperative pain in adults undergoing all types of surgery. Cochrane Database Syst Rev. 2018;12(12):CD012624
7. Frauenknecht J, Kirkham KR, Jacot-Guillarmod A, et al. Analgesic impact of intra-operative opioids vs. opioid-free anaesthesia: a systematic review and meta-analysis. Anaesthesia. 2019;74(5):651–62.
8. Elvir-Lazo OL, White PF, Yumul R, et al. Management strategies for the treatment and prevention of postoperative/postdischarge nausea and vomiting: an updated review. F1000Res 2020;9:F1000.
9. Richebe´ P, Capdevila X, Rivat C. Persistent postsurgical pain: pathophysiology and preventative pharmacologic considerations. Anesthesiology. 2018;129(3):590–607.

10. Forget P, Mulier J, Lavand'homme P, De Baerdemaeker L, Pelosi P, de Boer HD. Opioid-free Anesthesia: Comment. Anesthesiology. 2021 Oct 1;135(4):751-753
11. Niedermayer S, Heyn J, Guenther F, Küchenhoff H, Luchting B: Remifentanil for abdominal surgery is associated with unexpectedly unfavorable outcomes. Pain.2020; 161:266–73.
12. Grape S, Kirkham KR, Frauenknecht J, Albrecht E:Intra-operative analgesia with remifentanil vs. dexmedetomidine: A systematic review and meta-analysis with trial sequential analysis. Anaesthesia. 2019; 74:793–800.
13. Fletcher D, Martinez V: Opioid-induced hyperalgesia in patients after surgery: A systematic review and a meta-analysis. Br J Anaesth. 2014; 112:991–1004
14. Beloeil H, Garot M, Lebuffe G et al. SFAR Research Network: Balanced opioid-free anesthesia with dexmedetomidine versus balanced anesthesia with remifentanil for major or intermediate noncardiac surgery. Anesthesiology. 2021; 134:541–51.
15. Chia PA, Cannesson M, Bui CCM. Opioid free anesthesia: feasible? Curr Opin Anaesthesiol. 2020 Aug;33(4):512-517.
16. Lavand'homme P. Opioid-free anaesthesia: Pro: damned if you don't use opioids during surgery. Eur J Anaesthesiol. 2019 Apr;36(4):247-249.

15:00-15:15 (Panel II)

14:15-15:35	PANEL II: ANESTHESIA IN SPECIAL CIRCUMSTANCES – 1	Ayşegül Özgök, Hasan Koçoğlu, Saimir Kuci
14:15-14:30	Benefits and risks of opiod free anesthesia techniques	Gözde İnan
14:30-14:45	Anesthetic management and current considerations in minimal invasive cardiac surgery	Kazım Karaaslan
14:45-15:00	Respiratory mechanics and lung protection in the obese patient	Aycan Özdemirkan
15:00-15:15	Artificial intelligence and anesthesia	Mirjana Shosholcheva
15:15-15:35	Discussion	
15:35-15:50	*Coffee Break*	

Artificial Intelligence and Anesthesia

Mirjana Shosholcheva, MD, PhD

SS Cyril and Methodius University Faculty of Medicine, Skopje, Macedonia

Technological developments including computer power have changed the way we work in many fields including medicine. Artificial intelligence (AI) is a branch of computer science that makes intelligent machines that behave intelligently like humans. AI uses a set of theories, algorithms, and computing powers to perform intelligent tasks such as decision-making, reasoning, language understanding, speech recognition, and visual perception.

AI has the potential to change the landscape of our conventional practice patterns in anesthesia becoming a core component in our daily clinical practice. Potential applications of AI in anesthesiology include depth of anesthesia monitoring, control of anesthesia delivery, event and risk prediction, ultrasound guidance, pain management, and operating room logistics. The superiority of AI in understanding the depth of anesthesia monitoring is in the application of machine learning to analyze complex data streams such as EEG signals. Same control systems are used to automate the delivery of anesthetics in order to achieved anesthetic control of neuromuscular blockade, as well as mechanical ventilation. Different AI approaches are widely used to predict risks and events that can happen during perioperative care.

AI algorithms seem effective in outcomes prediction more accurately than validated prognostic scores and traditional statistics. Neural networks are the most commonly employed method of achieving ultrasound image classification. Furthermore recognizing, assessing, understanding, and treating pain using AI approaches may improve patient outcomes and healthcare resource utilization. As regards logistics in the operating rooms, AI analyzes different factors, such as scheduling of operating room time or tracking movements and actions of anesthesiologists, to optimize the operating room logistics.

It can be conlcuded that AI allow anaesthesiologists to maintain more careful, near-continuous vigilance over the patient during all three phases, preoperatively, intraoperatively, and postoperatively. AI provides this using the concept that allow computers to find patterns in a complex environment of multi domain and multidimensional data, with the prerequisite that such patterns would not be recognized otherwise. So, more and more clinical investigations are being performed using AI-driven models to leverage the data in anesthesia. Looking back in the history, the neural network system unlike McSleepy and other closed loop control systems which are rule based, used large data sets to train AI system. Nowdays, the relationship between AI, machine learning and deep learning became the basis for the successful application of a more sophisticated system. Any technique that enables computers to mimic human intelligence (e.g., logic, decision trees and machine learning), includes subset of AI statistical algorithmas that enable mascines to improve at tasks with experience. As a subcategory of machine learning, so-called deep learning is a computational structure that attempts to mimic the architecture of the human brain and so, to perform tasks on vast amounts of data.

AI in anesthesia is a reality and brings many benefits, but there are still challenges to overcome. Still in many countries there are no conditions for its development, there is no possibility of integration with other systems such as closed-loop feedback control systems, as well there is no common legal framework for its application. Another important problem faced by AI tools is skepticism, especially given by the lack of understanding of the methodology of the algorithms. Examples of “black box” algorithms are neural networks, random forests, and gradient boosting models, while, at the opposite end, “white box” algorithms can be found, such as logistic regression and decision trees. However, despite all doubts and difficulties, the application of AI is the future in biomedicine and the health system in general.

REFERENCES

1. Yubo Liu, Liangzhen Cheng. Ultrasound Images Guided under Deep Learning in the Anesthesia Effect of the Regional Nerve Block on Scapular Fracture Surgery. Journal of Healthcare Engineering 2021;6231116.

16:05-16:20 (Panel III)

15:50-17:10	PANEL III: PEDIATRICS	Berrin Işık, Mehmet Emin Orhan, Meldijana Omerbegovic
15:50-16:05	Pediatric post resusitation care	Tanıl Kendirli
16:05-16:20	Current applications of peripheral nerve blockade in pediatric patient, where are we?	Filiz Üzümcügil
16:20-16:35	Recent trends in pediatric perioperative fluid management	Volkan Şıvgın
16:35-16:50	Perioperative blood transfusion in pediatrics	Marijana Karišik
16:50-17:10	Discussion	

Current Applications of Peripheral Nerve Blockade in Paediatric Patient, Where Are We?

Filiz Uzumcugil, MD, DESAIC, FESAIC1

Hacettepe University School of Medicine, Department of Anaesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Considering the proven acute physiological and directly related consequences of exposure to pain at early stages of development, regional anaesthesia should be a part of pain management at every stage of childhood. Peripheral nerve blocks have gained wide use in the management of paediatric anaesthesia and analgesia, as they have been reported to have lower complication rates than central blocks especially for reduced morbidity and increased safety both at rest and on movement. The use of ultrasound for real-time visualization of the anatomical structures, advancement of needle and placement of the local anaesthetic into the correct anatomical site improved both the safety and efficacy profile of these block performances. Despite the technological improvements giving rise to safety issues and efficacy of these blocks, training on the use of this improving technology and studying the different physiology and anatomy of children at different stages of development still remain crucial. Although there is still need for standardized approaches described for peripheral nerve blocks in children at different age groups, the advantages such as decreasing exposure to opioids, suppressing the stress response, decreasing the doses of general anaesthetics, providing better hemodynamic stability cannot be denied. This review aims to highlight the peripheral nerve blocks which can be implemented as regional anaesthetic and analgesic techniques in infants and children undergoing general paediatric surgical procedures, excluding the orthopaedic surgeries and trauma.

Keywords: Children, infant, local anaesthetics, peripheral nerve block, ultrasound

INTRODUCTION

The use of regional anaesthetic and analgesic techniques as a component of pain management protocols in paediatric age group offers many advantages to this vulnerable population (1-3). It provides a superior analgesia ensuring a calmer patient and caregiver, a decrease in the dose of general anaesthetics and systemic analgesic agents, a better hemodynamic stability, a reduced requirement for mechanical ventilation postoperatively, reduced blood loss intraoperatively, decrease in hormonal stress response, an improved gastrointestinal function and may even avoid the need for general anaesthesia (3).

The nociceptive pathways are mainly the same in children as they are in adults. However, larger functional cutaneous receptor fields causing poor localization and immature descending inhibitory pathways allowing unmodulated nociceptive inputs delivered to ascending pathways may result in exaggerated response to painful stimulus in children (1-3). These early responses to pain have been shown to result in long-term behavioural changes in human infants, while causing neuroanatomical changes in rostroventral medulla (RVM) where modulation and inhibition of painful stimulus occur in infant animal models (2). It is an important finding that infants who had undergone a prior surgery without analgesic management presented a stronger pain response to routine vaccination or lower intraoperative pain thresholds compared to the ones without any prior surgical intervention demonstrating the impact of early exposure to pain on developing neural pathways (4-6).

Despite the evidence demonstrating the advantages of regional anaesthesia in children, it has only recently been more commonly employed as adjunct to other pain management protocols (3). The reluctancy which mainly constitutes the performance of blocks under deep sedation or general anaesthesia has been overcome by the reports of large prospective studies demonstrating no increased risk to children receiving blocks under general anaesthesia (7). However, the risk of complications was reported to be higher in children <6 months of age compared to older ones. Considering the different complication rates correlated with different age groups, although the use of advanced blocks has gained interest for all age groups in paediatric population, it

was reported that there is currently a tendency to shift to peripheral nerve blocks from central neuraxial blocks, as they have revealed less complication rates (3).

The use of real-time ultrasound guidance for peripheral nerve blocks increased the safety and efficacy of these procedures (1,2). Although the guidance provides visualization of anatomical structures, the advancement of the needle and the application of local anaesthetic into the targeted zone, it is still crucial to know especially the cross-sectional anatomy of the block sites (8). Most commonly, the knowledge obtained from adult anatomy studies are used to perform blocks in children, as well. However, a 'downscaling' of anatomical structures in adults for performances in children has been suggested to be inappropriate, that anatomy gradually changes during the developmental period throughout childhood (8). Since there is a lack of data to define standardized anatomical landmarks for specific age groups, it is important to gain familiarity to ultrasonographic view of certain block sites in children in our everyday practice.

The Selection of Block

As previously mentioned, this review aims to overview some basic peripheral nerve blocks which can be employed for pain management during the perioperative period of general paediatric surgical procedures, excluding the orthopaedics and trauma. The author most commonly attends to procedures including the neck, thorax, abdomen, inguinal and perianal sites, thus has gained experience on peripheral nerve blocks for these certain body parts, which are going to be discussed below.

If we construct the discussion of the block selection in a manner of 'head to toe' we can start with the procedures in the neck. The most commonly performed procedures in the neck region by the paediatric surgeons in our hospital are thyroid surgeries, thyroglossal duct cyst excision, lymph node excision and port-a-cath placements, which may benefit from *superficial cervical plexus block* (8). When upper thorax and breast tissue are included in the surgical procedure or an intercostal drain insertion is indicated *PECS 1 and 2 and serratus anterior plane block* may become useful (1). A thoracotomy which is required for lung resection, metastasis resection and/or fistula repair; and an upper abdominal procedure may benefit from unilateral *paravertebral or erector spine plane blocks*, ensuring that it would also cover the chest tube insertion site (9,10). The abdominal wall may expose to incisions of various size and number, where a *rectus sheath block* may be useful for midline incisions required for epigastric or umbilical hernias or laparoscopic surgeries (9,10). Besides the midline incisions on the abdominal wall, anterolateral regions may benefit from *transversus abdominis plane (TAP) block* at different levels (1,9,10). The *ilioinguinal and iliohypogastric nerve block (IL/IH)* can be used for surgical procedures in the inguinal region (9,10). In our hospital, for perineal surgeries including circumcision and hypospadias, caudal block is used successfully, however, *dorsal penile block or pudendal block* can be used efficiently, as well (1,9).

The absolute contraindications include allergic reactions to local anaesthetics (LA), parental/legal guardian refusal, systemic infection or infection on the injection site. Coagulopathy and bacteraemia remain contraindications for neuraxial blocks, while do not constitute absolute contraindications for peripheral nerve blocks. However, risks and benefits should be considered individually (2).

The Local Anaesthetic Agents

The ultrasound guidance provides an effective block with less concentrations and less volumes of local anaesthetics (1,2,11). If the needle directly targets a discrete nerve or nerve plexus, a volume of 0.1-0.2 ml/kg is generally effective initially, whereas a volume of 0.25-0.5 ml/kg is often necessary to cover branching end of nerves within an anatomical plane (2). The commonly used local anaesthetic agents are bupivacaine (0.25%), ropivacaine (0.2%) and levobupivacaine (0.25%) at a volume of 0.5 ml/kg bolus, as well as, lignocaine (2%) with adrenalin at a volume of 0.25 ml/kg bolus for peripheral and truncal blocks (1). The maximum allowable dose of local anaesthetics must be strictly adhered to, whereas, ultrasound use, test dosing and incremental injections should be considered, as well (1). The use of clonidine at a dose of 0.5-2 µg/kg as adjuvant to local anaesthetic agents for peripheral nerve blocks has been recommended to prolong the duration of analgesia, considering its side effects of sedation, bradycardia and hypotension, as well (1). The equipment and drugs for resuscitative measures should be available and easily accessible for side effects of agents, as well as, local anaesthetic systemic toxicity (LAST).

The amide type local anaesthetics are the most commonly used agents in infants and children, as well as, adults (12). The pharmacokinetic properties of neonates, infants and children differ from that of the adults, and also according to different stages of their development, which makes responses to local anaesthetics mainly depend on age (1,12). The free/unbound fraction of LA in plasma determines the clearance and toxicity. The low levels of alpha-1-acid glycoprotein in infants cause

higher free fraction of LA in plasma, however, it also constitutes an acute phase protein that rises with inflammation and stress, which decreases the risk of toxicity by decreasing the free form of the LA in the postoperative period (1,12). It should also be kept in mind that infants and especially neonates have high volume of distribution for amide LA maintaining a reduced peak plasma concentration after single bolus dose (1). Immaturity of hepatic enzymes makes the clearance highly depend on age for amide LA. The activity of P450 enzyme system reaches adult level at 1st year, preceded by an 0-10% at birth and 30-40% at 1st month of age (1). The clinical relevance of this immaturity of hepatic enzymes has a limited extent, and does not preclude the use of LA in neonates and infants (12).

The Ultrasound Guidance

The use of ultrasonographic guidance for peripheral nerve blocks in infants and children is advantageous due to smaller anatomical structures and shorter distances in between. Real-time visualization of the needle and deposit of the local anaesthetic agent within the correct targeted area improve the safety issues. It should be kept in mind that the cartilaginous bone structure of infants may lead to different images and the view may become difficult to recognize (2).

The Complications

A low incidence of serious complications was reported and no deaths or permanent nerve injuries was reported, as well (7,13). Serious complications were defined as LAST, infection, haematoma or vascular puncture (may cause compartment syndrome), dural puncture, respiratory distress and displacement of block catheter, which actually were more common at smaller ages, however still remaining extremely rare (13). The rate of catheter related infections was correlated with duration. The risk profile was reported to be more favourable in peripheral nerve blocks compared to central neuraxial blocks (7).

CONCLUSION

Peripheral nerve blocks in children have proven to be beneficial in the perioperative period when used as adjunct to general anaesthesia. The use of ultrasound increases its safety and efficacy. The selection of the block type should be according to individual patient and the surgical procedure itself. The presence of ultrasonographic guidance is not an alternative to the thorough knowledge of anatomical structures and the changes in them throughout the growth and development in childhood. Similarly, physiological differences and developments should also be kept in mind to decide for concentrations and volumes of the local anaesthetic agents. As standardized approaches regarding the anatomical landmarks at different stages of development are identified, the peripheral nerve blocks seem to be more commonly employed in children.

REFERENCES

1. Ponde V. Recent trends in paediatric regional anaesthesia. Indian J Anaesth. 2019 Sep;63(9):746-753.
2. Boretsky KR. A Review of Regional Anesthesia in Infants. Paediatr Drugs. 2019 Dec;21(6):439-449.
3. Roberts S. Regional Anesthesia in Pediatric Patients. https://www.nysora.com/topics/sub-specialities/pediatric-anesthesia/regional-anesthesia-pediatric-patients-general-considerations/
4. Taddio A, Katz J, Ilersich AL, Koren G. Effect of neonatal circumcision on pain response during subsequent routine vaccination. Lancet. 1997 Mar 1;349(9052):599-603.
5. Peters JW, Koot HM, de Boer JB, et al. Major surgery within the first 3 months of life and subsequent biobehavioral pain responses to immunization at later age: a case comparison study. Pediatrics. 2003 Jan;111(1):129-35.
6. Peters JWB, Schouw R, Anand KJS, van Dijk M, Duivenvoorden HJ, Tibboel D. Does neonatal surgery lead to increased pain sensitivity in later childhood? Pain. 2005 Apr;114(3):444-454.
7. Ecoffey C, Lacroix F, Giaufré E, Orliaguet G, Courrèges P; Association des Anesthésistes Réanimateurs Pédiatriques d'Expression Française (ADARPEF). Epidemiology and morbidity of regional anesthesia in children: a follow-up one-year prospective survey of the French-Language Society of Paediatric Anaesthesiologists (ADARPEF). Paediatr Anaesth. 2010 Dec;20(12):1061-9.
8. Byun S, Pather N. Pediatric regional anesthesia: A review of the relevance of surface anatomy and landmarks used for peripheral nerve blockades in infants and children. Clin Anat. 2019 Sep;32(6):803-823.
9. Pinto N, Sawardekar A, Suresh S. Regional Anesthesia: Options for the Pediatric Patient. Anesthesiol Clin. 2020 Sep;38(3):559-575.
10. Kaye AD, Green JB, Davidson KS, et al. Newer nerve blocks in pediatric surgery. Best Pract Res Clin Anaesthesiol. 2019 Dec;33(4):447-463.
11. Ip VHY, Tsui BCH. Regional Block Area Setup, Equipment, and Monitoring. In; Pediatric Atlas of Ultrasound-and Nerve Stimulation-Guided Regional Anesthesia-Ed. Tsui Ban CH., Suresh S. Springer, 2016

12. Dillane D. Pediatric Pharmacological Considerations. In; Pediatric Atlas of Ultrasound-and Nerve Stimulation-Guided Regional Anesthesia-Ed. Tsui Ban CH., Suresh S. Springer, 2016
13. Walker BJ, Long JB, Sathyamoorthy M, et al. Pediatric Regional Anesthesia Network Investigators. Complications in Pediatric Regional Anesthesia: An Analysis of More than 100,000 Blocks from the Pediatric Regional Anesthesia Network. Anesthesiology. 2018 Oct;129(4):721-732.

16:35-16:50 (Panel III)

15:50-17:10	PANEL III: PEDIATRICS	Berrin Işık, Mehmet Emin Orhan, Meldijana Omerbegovic
15:50-16:05	Pediatric post resusitation care	Tanıl Kendirli
16:05-16:20	Current applications of peripheral nerve blockade in pediatric patient, where are we?	Filiz Üzümcügil
16:20-16:35	Recent trends in pediatric perioperative fluid management	Volkan Şıvgın
16:35-16:50	Perioperative blood transfusion in pediatrics	Marijana Karišik
16:50-17:10	Discussion	

Perioperative Blood Transfusion in Pediatrics

Marijana Karišik MD, PhD

University of Montenegro Faculty of Medicine, Department of Anesthesiology and Intensive Care, Institute for Children Disease, Clinical Center of Montenegro, Montenegro

ABSTRACT

Objective: Perioperataive blood transfusion management in pediatric patients must be individualized for each child's clinical condition and type of surgery. Potential risks and benefites of transfusion should always be considered but the primary goal is always the same, to maintain hemodynamic stability, support oxygen delivery, maintain adequate organ perfusion, avoid over-transfusion and reduce harm and side effects associated with transfusion.

Methods: A literature review using Pubmed, Medline and Cohrane databases was completed on articles using key terms: "perioperative blood transfusion in pediatric surgery", "blood management in pediatrics", "perioperative massive hemorhage in pediatric patients, "periopeartive bleeding".

Results: The variation in blood management perioperatively might come from: the operation type (significant perioprative hemorrage is expected in trauma, cardiac surgery, neurosurgery, liver transplant, major abdominal operations), age of the child (neonates who received a preoperative blood transfusion had a higer rate of preoperative comorbidity and worse postoperative outcomes compared to those who did not receive a blood transfusion), transfusion triggers and lack of common guidance.

Conclusion: Making a multidisciplinary blood management for pediatric patients is substantual to create effective and safe system in case of expected or unexpected massive hemorrhage as well as institutional protocols of indications, prevention, management of transfusion, and the use of perioprative hemostatic agents.

Keywords: Hemorrage, pediatrics, transfusions, guidelines

INTRODUCTION

Perioperative blood management in children depends on their age, physiological and pathophysiological state. A child is not a small adult, and unlike the established guidelines for perioperative blood management in adults, research done up until know on pediatric patients, cannot give us precise guidelines for them. Pediatric patients blood management is the timely and safely application of evidence-based medical strategies designed to maintain hemoglobin concentrations, to manage massive hemorrhage and transfusion to improve patients outcomes and to help decrease preventable morbidity and mortality (1-4). Potential risks and benefites of transfusion should always be considered but the primary goal is always the same, to maintain hemodynamic stability, support oxygen delivery, maintain adequate organ perfusion, avoid over-transfusion and reduce harm and side effects associated with transfusion (5-10).

DISCUSSION

Pediatric transfusion is a complex field of medicine which covers a vide age spectrum, from life in utero until teenage years. Blood volumes change during early development into adolescence and adulthood (4,9) (Table 1). Hemoglobin levels change too, with special accent on the hemoglobin levels in pre-term babys which have a high risk for clinically significant anemia (4,9) (Tables 2 and 3).

The reasons for blood loss in neonates are: hemorrhage, hemolysys and phlebotomy (jatrogenic blood loss) (4,9). And indications for red cell transfusion in neonates are: acute blood loss of >10% blood volume, hemoglobin (Hgb) less than 80 g/L in a stable newborn with symptoms of anemia and Hgb less than 120 g/L in an infant with respiratory distress syndrome (RDS) or

congenital heart disease (4,9). But the literature data shows that triggers for neonatal transfusion are controversial and mostly based on professional opinion of the clinician (11-15). And, much more research is required to vouch for the outcome of neural development and advantages of either (liberal versus restrictive red blood cell transfusion) method of transfusion (11-15).

Small volume transfusion ("top-up" transfusion) 10-20 ml/kg is the most common type of transfusion for pre-term babies, neonates and pediatrics, replace blood losses or increase Hgb (a dose of 10 ml/kg increases Hgb by ~ 10g/L) (1,2,4,9). Top-up transfusions, are often given to premature newborns, mostly just to make up for the loss of blood for analyses, which can lead to anemia in those patients. Which is why with avoiding routine analysis, and instead using test tubes and machines which give necessary information from a very small amount of blood, i.e. micro-techniques, in laboratories and using noninvasive monitoring whenever possible, you can avoid already mentioned anemia.

Massive transfusion (large volume transfusion) which is equal to the circulatory volume of the neonate is used mostly in neonatal cardiosurgery and exchange transfusion (1,2,4,9). The both "top-up" and massive transfusion have the same specifics: transfusion should not have been taken from the donor more than 5 days before, which is important because we want to reduce the risk of hyperkalemia (2). Irradiated blood is indicated in neonates with suspected or existing T-cell immunodeficiency, and it must be used in 24 hour window from the moment of radiation (3).

In first 4 months of life ABO antigens can be poorly exposed on red blood cells and thus the reaction of ABO antibodies is not developed enough (2). ABO IgG antibodies of the mother can be present in the baby's plasma (2). That's why it is necessary, whenever possible, to test the blood of both mother and the child for ABO RhD group: antibody assay on mother's sample and direct antiglobulin test on baby's sample. Mistakes in blood type determination are common so the test should be done from 2 samples out of which one is from the umbilical cord. If the newborn does not have atypical mother's antibodies and direct antiglobulin test is negative, top-up transfusions can be given to newborns and infants without further tests, in the first 4 months (2).

Indications for red cell transfusion in older children are: acute blood loss of >15% blood volume, Hgb < 70 g/L with symptoms of anemia, significant preoprative anemia when other corrective therapy is not available, Hgb < 130 g/L on extracorporal membrane oxygenation and chronic transfusion programs for disorders of red blood cell production (11,12,13).

The most common indication for intrauterine transfusion (IUT) are concentrated red blood cells for prevention and treatment of fetal anemia caused by hemolitic desease of fetuses and newborns or because of Parvovirus infection (2). Just as common are platelet transfusions, for neonatal alloimune trombocytopaenia (2). This is a highly specialised area of medical practice, requiring excelent cooperation between experts in fetal medicine, hematology and transfusion, as well as availability of products of blood. Even in the hands of greatest experts, IUT still carries 1-3% risk of fatal outcome per procedure, and bleeding of mom and fetus can cause further worsening of the disease fetus has (1-4).

Guidelines for IUT vary between specialists but indications that are published include hematocrit below 0,25 between 18 and 26 weeks of gestation, and below 0,3 after 26th week of gestation (1-4). Target hematocrit after IUT is 0,45 (2). Babies receiving IUT should get transfusions with irradiated cellular blood components in first 6 months of life, if needed (3).

The person who decides on transfusion must balance out its costs and benefits in every age group and be aware of the indication for giving different blood components. Compared to adult practise, blood transfusion in children lacks high quality research for us to have evidence-based guidelines. UK National showed that 74% of patients who had a transfusion, actually get a dosage of red blood cells as blood component during hospitalisation (2,3,9). They also claim that many of those could have been avoided.

Special safety measures must be taken when blood components are to be transplanted to fetuses, neonates, and infants, including increased supervision in donor selection, and screening for clinically important blood type antibodies (pediatric antibody test or PAnTs) (2).

Volume and rate of components in blood while giving a child transfusion must be carefully and accurately determined in ml/kg/h and not in units, so that mistakes in dosage, and circulatory overload are reduced to the minimum (1-10).

Serious consequences of transfusions have been described more in pediatric patients then in adults, including mistakes in identifying blood types which are usully a consequence of confusing mother's blood with the newborn's, also, the issues could arise when there are two or more newborns (twins, triplets, and more) so mistakes derive from inadequately marked identification or mistakes in noting down details for each child (1-4).

Serious thrombocytopenia (< 50 x 10^9/l) is common in neonates who are treated in NICs (Neonatal Intensive Care Units), especially at prematurely born who demand intensive approach with therapy (5,7,8). There is no clear connection between thrombocytopenia and intravascular haemorrhage, literature confirms that most transfusions of platelets are given for prophylactic purposes, when there is no bleeding (2,5,7,8). Until ongoing research shows for certain if threshold for transfusion is the number of platelets 50 x 10^9/l or less, guidelines which could help are given in table 4 (2,5,7,8). Dosage for platelet transfusion is 10-20 ml/kg.

Values of coagulation factors which are tested the most, differ amongst newborns, older children and adults (2). At birth, vitamin K dependant coagulation factors are at 50% of adults' value, and that number is even lower in premature newborns (1-4). Thus, higher PT, TT, APTT keep hemostasis normal (1-4). Hemorrhagic diseases of a newborns are caused by vitamin K deficiency in children who did not get adequate dosage of the vitamin at birth, they can lead to extensive bleeding and DIC (which is relatively common for them) (2). Literature data showed that 42% of FFP transfusions are given to infants without signs of bleeding, as prophylaxis, because coagulation factors deviated from physiological values, as prophylaxis in treatment for peri/intravascular haemorrhage and to improve circulatory volume (2). BCSH (British Committee for Standards in Haematology) guidelines recommend that FFP should be used for (2,3,9):

- Vitamin K deficiency with bleeding;
- DIC with bleeding;
- Congenital coagulation factor deficiencies where no factor concentrate is available (Factor V deficiency);

The dose of FFP is usually 12–15 mL/kg. The degree of correction is unpredictable and clotting tests should be repeated after administration (2).

Indication for giving crioprecipitate is fibrin levels below 0.8 - 1.0 g/l, in bleeding caused by hereditary or acquired hypofibrinogenaemia (2). The usual dose is 5-10 ml/kg.

In infants and older children, as mentioned before, transfusions are used less in therapy than in neonates. They are indicated mostly in cardiosurgery and neurosurgery, trauma, major abdominal operations, certain hereditary states connected to bleedings, at oncological patients and in (Pediatric Intensive Care Units) PICUs (11,14). For older children guidelines for blood management are similar to those adults have (2). There is also a rule that blood components need to be carefully calculated and prescribed in ml/kg and not units, in order to prevent mistakes and circulatory overload (2).

Recomendations for transfusions in older children are (1-4):

1. Red cells are transfused at up to 5 ml/kg/h (unless there is active major bleeding) and the transfusion should be completed faster. Restrictive mode for transfusion trigger Hb of 70 g/l is safe, just like the liberal mode for transfusion Hb trigger of 95 g/l in stable patients who are being healed in PICUs, and it is connected with the decrease of transfusion.
2. Apheresis platelets should be used for all children <16 years old to reduce donor exposure. The typical dose for children weighing less than 15 kg is 10–20 mL/kg. Children above 15 kg may receive a single apheresis donation (approximately 300 mL). The recommended rate of administration is 10– 20 mL/kg/h.
3. FFP just like in neonates, must not be given for prophylactic purposes to correct small deviations of PT or APTT. When indicated, a dose of 12–15 mL /kg should be administered at a rate of 10–20 mL/kg/h with careful monitoring for acute transfusion reactions or circulatory overload.
4. A red cell transfusion trigger in children undergoing treatment for maliganncy is 70 g/L, for platelets 10x10^9/L. and is appropriate for clinically stable patients without active bleeding. A platelets threshold of 20-40x10^9/L is recomended in the presence of severe mucositis, DIC or anticoagulant therapy and for performance of lumbar puncture or insertion of a central venous line.

Well functional local protocols, excellent comunication with the transfusion laboratory, and senior staff with pediatric expertise are important elements of successful blood management in children with major haemorrhage (11-13). Emergency group O RhD negative red cells should be rapidly available, with the option of moving to group- specific blood when the identity of the patient and the blood group have been verified (11-13). The transfusion laboratory should be informed of the age and estimated weight of the patient because the age-specific componenets should be used if available, if not, used the best avaluable adult components (2,11-13). Once the patient has been stabilised and transfusion based on clinical signs, appropriate therapeutic

targets are: Hb 80 g/L; fibrinogen >1.0 g/L; PT ratio <1.5; platelet count >75x10^9/L (2,11-13). Based on the CRASH-2 study in adults, the Royal College of Paediatrics and Child Health now recommends the use of tranexamic acid in children after major trauma in a dose of 15 mg/kg (up to 1000 mg) infused intravenously over 10 minutes followed by 2 mg/kg/h (up to 125 mg/h) until bleeding is controlled (2,15).

CONCLUSION

This paper has highlighted the complexity of blood menagement in pediatric patients. Making a multidisciplinary approach for pediatric patients is substantual to create effective and safe system in case of expected and unexpected massive hemorrhage as well as an institutional protocols of indications, prevention, management of transfusion and the use of perioprative hemostatic agents. I hope that the ongoing prospective studies will clarify remaining questions in this area.

REFERENCES

1. Nemergut ME, Haile DT, Mauermann WJ, et al. Chapter 20: Blood Conservation and Transfusion Medicine. In: Davis PJ, Cladis FP, eds. Smith's Anesthesia for Infants and Children. 9th ed. St. Louis, Missouri: Elsevier; 2017: 399–422.
2. Joint United Kingdom Blood Trasfusion and Tissue Transplantation Services Professional Advisory Committee. Transfusion Hahdbook. https://www.transfusionguidelines.org/transfusion-handbook/10-effective-transfusion-in-paediatric-practice
3. British Committee for Standards in Hematology. Guidelines on the use of Irradiated Blood components. British Journal of Hematology 2011:152(1):35-51.
4. Canadian Society for Transfusion Medicine; Standards for Hospital Blood Transfusion Services. Version 4, April 2017.
5. Kaufman RM, Djulbegovic B, Gernsheimer T, et al. Platelet Transfusion: A Clinical Practice Guideline From the AABB. Ann Int Med 2015;162(3):205-213.
6. Callum JL, Pinkerton PH, Lima A, et al; Canadian Blood Services; Bloody Easy 4; Blood Transfusions, Blood Alternatives and Transfusion Reactions; A Guide to Transfusion Medicine 4th Edition; 2016.
7. Kumar A, Mhaskar R, Grossman BJ, et al. platelet transfusion: a systematic review of the clinical evidence. Transfusion 2015;55:1116-1127.
8. Nahirniak S, Slicher SJ, Tanael S, et al. Guidance on Platelet Transfusion for Patients With HypoproliferativeThrombocytopenia. Trans Med Rev 2015;29(1):4-13.
9. British Journal of Haematology Guidelines. Guidelines for Transfusion of Fetuses, Neonates and Older Children. 2016; 175: 784-828.
10. CBS Clinical Guide to Transfusion. Ch 13: Neonatal and Paediatric Transfusion. 2016. https://professionaleducation.blood.ca/en/transfusion/clinical-guide/neonatal-and- Paediatric-transfusion
11. Spilka J, Goobie SM. Perioperative Blood Management in the Pediatric Patient. Pediatric Anesthesia. 2020.
12. Goobie SM, Haas T. Perioperative bleeding management in pediatric patients. Curr Opin Anaesthesiol. 2016; 29(3): 352-8.
13. Goobie SM, Gallager T, Gross I, et al. Sosiety for the advancedment of blood management administrative and clinical standards for patient blood management programs. 4th edition (pediatric version). Paediatr Anaesth. 2019; 29(3): 231- 236 .
14. Valentine SL, Bembea MM, Muszynski JA, et al. Consensus Recommendations for RBC Transfusion Practice in Critically Ill Children from the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. Pediatr Crit Care Med. 2018; 19(9): 884-898.
15. Goobie SM, Faraoni D. Tranexamic acid and perioperative bleeding in children: What do we still need to know? Curr Opin Anesthesiol. 2019;32(3):343-352.

Table 1. Circulating blood volumes- birth to adolescence/adult

Age	Circulating blood volumes (ml/kg)
Pre-term	~ 100
Term Newborn	~ 85-90
Infant (>3months)	~ 75-80
Child	~ 70-75
Adolescent/Adult	~ 65-70

Table 2. Hemoglobin levels- birth to adolescent

Age	Hemoglobin levels (g/L)
Newborn	~ 165
3 months	~ 115
6mth-2 yrs	~ 125
6-12 yrs	~ 135
12-18yrs	F ~ 140; M~ 145

Table 3. Hemoglobin levels in pre-term babies

Age	Pre-Term	
	1.0-1.5 kg	1.5-2.0 kg
2 weeks	163 g/L	148 g/L
1 month	109 g/L	115 g/L
2 months	88 g/L	94 g/L
3 months	98 g/L	102 g/L

Table 4. Neonatal prophylactic platelet transfusion

Platelets < 20-30 $x10^9$/L	In the absence of bleeding
Platelets < 50 $x10^9$/L	Bleeding, current coagulopathy, planned surgery or exchange transfussion
Platelets < 100 $x10^9$/L	Major bleeding, major surgery

8:30-10:05	PANEL V: BLEEDING AND COAGULATION	Ümit Karadeniz, Lale Karabıyık, Vesna Durnev
8:30-8:45	Protocols for novel anticoagulant drugs	Sumru Şekerci
8:45-9:00	Perioperative Blood Pressure	Asutay Göktuğ
9:00-9:15	Prevention of respiratory complications after major abdominal surgery	Krenar Lilaj
9:15-9:30	Clinical use of tranexamic acid: effectiveness and controversies	Aslı Demir
9:30-9:45	Coagulation disorders in intensive care	Necla Dereli
9:45-10:05	Discussion	

Perioperative Management of Receving Direct Oral Anticoagulants (DOACS)

Sumru Şekerci, MD

University of Health Sciences, Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

Direct oral anticoagulants (DOACs; also called non-vitamin K oral anticoagulants [NOACs]) are oral medications that directly inhibit a specific enzyme in the coagulation cascade (Figure 1).

Available agents include those that directly inhibit thrombin (factor IIa) or factor Xa.

Dabigatran (Pradaxa) is the only oral direct thrombin inhibitor available for clinical use.

Rivaroxaban (Xarelto), apixaban (Eliquis), and edoxaban (Lixiana, Savaysa) are oral direct factor Xa (“ten-a”) inhibitors.

Interruption of anticoagulation temporarily increases thromboembolic risk, continuing anticoagulation increases the risk of bleeding associated with invasive procedures both of these outcomes can increase mortality rates. A balance between reducing the risk of thromboembolism and preventing excessive bleeding must be reached for each patient. Thrombotic and bleeding risks may vary depending on individual circumstances.

The direct oral anticoagulants (DOACs; dabigatran and factor Xa inhibitors) have shorter half-lives, easier to discontinue and resume rapidly.

Estimate thromboembolic risk: The higher the thromboembolic risk, the greater the importance of minimizing the interval without anticoagulation.The major factors that increase thromboembolic risk are atrial fibrillation, prosthetic heart valves, and recent venous or arterial thromboembolism (eg, within the preceding three months). For patients with a recent (within the previous one to three months) stroke, pulmonary embolism (PE) or deep vein thrombozis (DVT), in whom the risk of recurrent thromboembolism is markedly increased, we should be made to delay elective surgery when possible until the thromboembolic risk has returned to baseline.

Estimate bleeding risk: The risk of bleeding is dominated by the type of surgery or procedure. As a general guideline, we divide procedures into high and low bleeding risk examples of high bleeding risk procedures include coronary artery bypass surgery, kidney biopsy, and any procedure lasting >45 minutes; low bleeding risk procedures include cholecystectomy, carpal tunnel repair, and abdominal hysterectomy. Comorbidities (eg, older age, reduced kidney function) and medications that affect hemostasis (eg, aspirin) may also contribute.

Deciding whether to interrupt anticoagulation and determine the timing: Once the thromboembolic and bleeding risks have been estimated, a decision can be made about whether the anticoagulant should be interrupted or continued. In general, the anticoagulant must be discontinued if the surgical bleeding risk is high. Those at very high or high thromboembolic risk should limit the period without anticoagulation to the shortest possible interval; in some cases, this involves the use of a bridging agent. Procedures with a low bleeding risk (eg, dental extractions, minor skin surgery) often can be performed without interruption of anticoagulation. Additional considerations may be required in individuals with reduced kidney and/or liver function.

Many studies have been done on this subject. The PAUSE study provides very revealing information on when to discontinue the drug before surgery and when to start after surgery in patients using DOAC.

The PAUSE (Perioperative Anticoagulation Use for Surgery Evaluation) study, which prospectively evaluated outcomes in 3007 individuals who were taking a DOAC for atrial fibrillation and underwent an elective surgery or procedure and followed a simple,

standardized management approach for interruption of their anticoagulant. There was no preoperative coagulation testing and no heparin bridging.

Rates of thromboembolic and hemorrhagic complications associated with this management were low (major bleeding in <2 percent; ischemic stroke in <0.5 percent), thereby supporting the safety of this approach.

The PAUSE approach is illustrated in the figure 2 and can be summarized as follows:

Low/moderate bleed risk: For low/moderate bleeding risk surgery, omit the DOAC one day before and resume one day (approximately 24 hours) after the procedure, provided hemostasis is secure. The total duration of interruption is two days.

High bleed risk: For high bleeding risk surgery, omit the DOAC two days before and resume two days (approximately 48 hours) after the procedure, provided hemostasis is secure.

The total duration of interruption is four days. Waiting an additional one day before resumption may be appropriate in some cases.

Impaired kidney function: For individuals with impaired kidney function (creatinine clearance [CrCl] <30 to 50 mL/min) who are taking dabigatran, there is an additional one day interruption before low/moderate bleeding risk procedures and an additional two days interruption before high bleeding risk procedures. Direct factor Xa inhibitors (apixaban, edoxaban, rivaroxaban) do not require adjustments for kidney function

This strategy (figure 2) applies to all DOACs in individuals with normal kidney function (eg, CrCl>50 mL/min) and individuals taking apixaban, edoxaban or rivoraxaban with CrCl 30 to 50 mL/min.

For individuals taking dabigatran who have CrCl of 30 to 50 mL/min, omit an additional dose before the procedure.

For any DOAC and a high bleeding risk procedure, it may be reasonable to omit the DOAC for an additional postoperative day (5 days total interruption).

DETERMINE WHETHER TO USE BRIDGING ANTICOAGULATION

Accumulating evidence suggests that in the vast majority of patients, bridging does not provide a benefit in lowering thromboembolic risk, whereas most data show a consistent increase in bleeding risk. In general, the rapid offset and onset of DOACs activity makes bridging anticoagulation unnecessary. In rare cases bridging may be required, such as the use of postoperative bridging in individuals who have a very high thromboembolic risk and are unable to take oral medications postoperatively due to intestinal ileus from gastrointestinal surgery.

In the Dresden NOAC registry, over 800 patients who were receiving dabigatran, rivaroxaban, or apixaban for any indication and underwent an invasive procedure had similar rates of major cardiovascular events if they received bridging, no bridging, or no anticoagulant discontinuation (2).

MANAGEMENT OF BLEEDING IN PATIENTS RECEIVING DIRECT ORAL ANTICOAGULANTS

Management of bleeding in patients receiving direct oral anticoagulants can be challenging because routine coagulation tests cannot generally be used to determine the degree of anticoagulation, and some of the reversal agents are difficult to access and may be prothrombotic.

Assessment of anticoagulation status

The anticoagulation status depends on the specific agent, dose, time, since the last dose, and renal (and to a lesser extent hepatic) function.

Interval since last dose: We consider anticoagulation to have resolved fully after five half-lives have elapsed since the last dose. We use the following half-lives for patients with normal renal function (3)

- Dabigatran – 12 to 17 hours; five half-lives will have elapsed by day 2.5 to 3.5 after the last dose.
- Rivaroxaban – 5 to 9 hours; five half-lives will have elapsed by day 1 to 2 after the last dose.
- Apixaban – 8 to 15 hours; five half-lives will have elapsed by day 1.5 to 3 after the last dose.
- Edoxaban – 6 to 11 hours; five half-lives will have elapsed by day 1.3 to 2 after the last dose.

Renal and hepatic function: The half-lives of the DOACs are dependent on renal (and to a lesser extent hepatic) function; thus, patients with renal and/or severe hepatic impairment may have a greater degree and/or duration of anticoagulation than patients with normal renal and hepatic function for a given dose and/or schedule.

- Dabigatran – Excretion is approximately 80 to 85 percent renal.
- Rivaroxaban – Excretion is approximately 35 percent renal; severe hepatic impairment could result in bio-accumulation.
- Apixaban – Excretion is approximately 25 percent renal; severe hepatic impairment could result in bio-accumulation.
- Edoxaban – Excretion is approximately 35 percent renal; severe hepatic impairment could result in bio-accumulation.

Coagulation tests: Coagulation testing is not used for determining the anticoagulation status of a patient receiving a DOAC (Table 1)(4). Abnormal coagulation testing is consistent with the presence of continued DOAC effect, but normal testing does not necessarily eliminate the possibility of clinically important concentrations of these agents.

Therefore, with the exception of the thrombin time (TT) in patients with suspected dabigatran-associated bleeding, the results of coagulation tests, or their trends over time, do not meaningfully inform reversal of DOAC associated bleeding. We generally treat patients with normal coagulation testing and persistent bleeding as if they are still anticoagulated.

Risk of bleeding: The risk of major bleeding with DOACs is low and generally similar to or lower than other anticoagulants, but life-threatening hemorrhages have occurred.

Evaluation: We assess the severity of bleeding and the degree of anticoagulation through the patient history and physical examination. In some cases coagulation testing may be helpful in determining residual anticoagulant effect, but normal coagulation testing does not necessarily eliminate the need for aggressive interventions. Other limited laboratory testing includes a complete blood count (CBC) and tests of renal and hepatic function.

Initial treatment: In most cases of DOAC-associated bleeding, including major bleeding, We discontinue the drug, transfuse blood products, if necessary; address the hemorrhage anatomically (eg, surgery, endoscopy, local measures), and administer pro-hemostatic therapies such as antifibrinolytic agents.

1. MAJOR BLEEDING

For patients with major bleeding, including life-threatening bleeding (eg, intracranial, severe gastrointestinal)

a. DABIGATRAN REVERSAL (Table 2)

- **IDARUCIZUMAB**: Can be used for emergency reversal of the anticoagulant effect of dabigatran. We would only administer idarucizumab to patients with convincing evidence of significant dabigatran levels based on clinical history of ingestion or laboratory testing. Idarucizumab should not be administered to patients with a normal thrombin time (TT).
- Along with the antifibrinolytic agent (eg, tranexamic acid, epsilon-aminocaproic acid) (Grade 2C).
- We also suggest administration of oral activated charcoal if the last anticoagulant dose was within the previous two hours and the patient can tolerate the oral charcoal administration (ie, not vomiting, adequate mental status) (Grade 2C).
- Hemodialysis may be used in selected patients if the potential for significant drug removal is high (5).
- For patients at an imminent risk of death from bleeding for whom idarucizumab is not available, we suggest using an activated prothrombin complex concentrate (aPCC; eg, factor eight inhibitor bypassing agent [FEIBA] (Grade 2C) .
- We would not give idarucizumab and an aPCC (activated prothrombin complex concentrate) together.
- We suggest not giving an aPCC for major bleeding that is not life-threatening (Grade 2C). This is because treatment with aPCCs carries a real and substantial prothrombotic risk, so we avoid these agents except in extreme clinical circumstances.

b. FACTOR Xa INHIBITORS: (RIVAROXABAN, APIXABAN, EDOXABAN) (Table 3)

- We suggest an antifibrinolytic agent (eg, tranexamic acid, epsilon-aminocaproic acid) (Grade 2C).
- We also suggest administration of oral activated charcoal if the last dose of the anticoagulant was recent enough (rivaroxaban within eight hours; apixaban within six hours; edoxaban within two hours) (Grade 2C).

- The direct factor Xa inhibitors cannot be dialyzed because they are highly protein-bound.
- We suggest administering andexanet alfa (table 3) or an unactivated 4-factor PCC (Grade 2C).
- Importantly, andexanet carries a Boxed Warning regarding arterial and venous thrombosis, treatment with PCCs carries a real prothrombotic risk, and the quality of the available evidence regarding the safety and efficacy of PCCs in factor Xa inhibitor-associated major bleeding is low. Therefore, we suggest not using these agents except in extreme clinical circumstances (Grade 2C).

2. MINOR BLEEDING (Table 4)

- Many patients presenting with minor bleeding, slow blood loss, or simple anemia without evidence of bleeding may not require DOAC reversal. Given the short half-lives of these drugs, even short-term but unneeded interruption of therapy could result in avoidable thrombosis.
- Minor bleeding can usually be managed conservatively using local hemostatic measures (ie, without anticoagulant reversal).

DIRECT ORAL ANTICOAGULANT REVERSAL AGENTS FOR LIFE-THREATING BLEEDING (Table 5)

Our practice attempts to balance the risk of life-threatening bleeding with the risk of thrombosis.

ANDEXANET ALFA

Andexanet alfa (AndexXa) is a reversal agent for factor Xa inhibitors.

The US FDA approved Andexanet in May of 2018 for the reversal of anticoagulation by rivaroxaban and apixaban in individuals with life-threatening or uncontrolled bleeding associated with these drugs. We would not co-administer andexanet with a PCC product (ie, we would give one or the other, but not both).

There are two dose levels: (Table 6)

- Low dose – A bolus of 400 mg given at 30 mg/minute, followed by an infusion of 480 mg given at 4 mg/minute for up to 120 minutes
- High dose – A bolus of 800 mg given at 30 mg/minute, followed by an infusion at 960 mg given at 8 mg/minute for up to 120 minutes

The low dose is used in patients who received a lower dose of factor Xa inhibitor (eg, rivaroxaban ≤10 mg, apixaban ≤5 mg) OR if ≥8 hours have elapsed since the last dose of factor Xa inhibitor;

The higher dose is used for those who received a higher dose of factor Xa inhibitor (eg, rivaroxaban >10 mg, apixaban >5 mg, or dose unknown) within the previous 8 hours.

Reduction in anti-factor Xa activity was 92 percent for apixaban and rivaroxaban, and 75 percent for enoxaparin.

The package insert for andexanet includes a Boxed Warning regarding risks of arterial and venous thromboembolic and ischemic events including myocardial infarction, ischemic stroke, cardiac arrest, and sudden death.

CLOTTING FACTOR PRODUCTS

PCCs and aPCCs (Table 7)

Unactivated prothrombin complex concentrates (PCCs) and activated PCCs (aPCCs) both contain clotting factors purified from human plasma. They differ in their composition (eg, 3-factor PCCs contain factors II, IX, and X; 4-factor PCCs contain factors II, IX, X, and VII)

Unactivated prothrombin complex concentrates (PCCs)

A systematic review of case series published in 2019 identified 340 patients who received an unactivated PCC for direct factor Xa inhibitor-associated major bleeding (mostly rivaroxaban and apixaban) (6).

This systematic review found that the proportion of patients with overall successful bleeding management with PCC was 0.69 or 0.77, depending on the criteria used. The mortality rate was 0.16 and the rate of thrombosis was 0.04.

There has been a general trend towards the use of fixed doses rather than weight-based dosing. We would prescribe a fixed dose of 2000 units or a weight-based dose of 50 units/kg of actual body weight.

If the therapy appears ineffective, we typically would not re-administer the product, because it is unlikely that the risk-benefit ratio of doing so would be favorable.

If hemostasis were improved after PCC administration, we also would not re-administer the medication unless a patient's renal function is impaired and the expected clearance of the DOAC will be significantly delayed. In such cases, a repeat dose of the PCC may be appropriate 12 to 24 hours after the first dose.

Activated PCCs (aPCCs; factor VIII inhibitor activity bypassing agent [FEIBA])

In FEIBA, factor VII is mostly activated. When we use FEIBA, we start at a dose of 50 units/kg. If the therapy appears ineffective, we typically would not re-administer the product, because it is unlikely that the risk-benefit ratio of doing so would be favorable.

There are no high-quality data to support the use of aPCC in DOAC-associated bleeding.

Unactivated PCCs and aPCCs are potentially prothrombotic, and clinical judgment is required in determining the individual bleeding and thrombotic risks of each patient on a case-by-case basis.

Recombinant activated factor VII (rFVIIa)

We generally avoid the use of recombinant activated factor VII (rFVIIa) to treat DOAC-associated bleeding.

Plasma products

We do not use plasma products such as Fresh Frozen Plasma (FFP), Plasma Frozen Within 24 Hours After Phlebotomy (PF24), or cryoprecipitate to reverse the anticoagulant effect of DOACs.

Antifibrinolytics and other pro-hemostatic therapies

Antifibrinolytic agents including tranexamic acid and epsilon-aminocaproic acid can be used for severe bleeding.

- **Tranexamic acids:** The usual oral dose of tranexamic acid is 1 to 1.5 grams every 8 to 12 hours for the duration of bleeding. Intravenous doses are less well characterized; doses of 10 to 20 mg/kg as an intravenous bolus followed by 10 mg per kg intravenously every six to eight hours have been used in patients.
- **Epsilon-aminocaproic acid:** The dose of epsilon-aminocaproic acid depends on the urgency with which the bleeding needs to be reversed. A typical starting dose is 2 grams intravenously every six hours; as much as 1 gram intravenously every hour can be given. Epsilon-aminocaproic acid can also be administered orally at a dose of 3 grams three to four times per day.
- **Desmopressin** (DDAVP)**:** Desmopressin can be used for impaired platelet function such as occurs in the setting of uremia or antiplatelet agents. Typical dosing is 0.3 mcg/kg given subcutaneously or intravenously (in 50 mL of normal saline over 15 to 30 minutes if given intravenously), which may improve platelet function for several hours.

High-quality data are lacking regarding the efficacy of these agents in the setting of DOAC-related bleeding. However, given their low risk of thrombosis, low cost, and widespread availability, these agents may be appropriate in patients with major or life-threatening DOAC-associated bleeding.

Transfusions if needed: Transfusions are a component of supportive care for severe bleeding.

Platelets: Platelet transfusion is not used to reverse the anticoagulant effect of DOACs in a patient with a normal platelet count;

Plasma products: there is no evidence to support the use of FFP as a reversal strategy in DOAC-associated bleeding.

NEURAXIAL ANESTHESIA/ANALGESIA TECHNIQUES IN THE PATIENT RECEIVING DIRECT ORAL ANTICOAGULANTS (DOACs)

Patients receiving an anticoagulant during the periprocedural period require attention to the timing of drug administration and drug dosing when a spinal or epidural catheter is used.

Recommendations from the European Society of Anaesthesiology and Intensive Care and the European Society of Regional Anaesthesia (ESAIC/ESRA) are summarized in Table 8.

DIRECT ORAL ANTICOAGULANTS (DOACS)

Direct oral factor Xa inhibitors

There is limited experience with direct oral factor Xa inhibitors and neuraxial anesthesia. Spinal epidural hematoma (SEH) has been reported with the use of these agents (7), but the risk factors and incidence have not been determined, nor has the exact timing after a dose to reach a level of anticoagulant effect safe for neuraxial anesthesia.

The European Society of Anesthesiology and Intensive Care/European Society of Regional Anesthesia (ESAIC/ESRA) guidelines make recommendations for patients who receive low versus high dose rivaroxaban or apixaban, as described in the sections below (Table 8).

Routine laboratory testing is not used for determining anticoagulation status in patients receiving direct factor Xa inhibitors. Prolonged coagulation tests can be helpful in determining residual anticoagulant effect, but a normal prothrombin time/ international normalized ratio (PT/INR) cannot be used as evidence that the anticoagulant effect has resolved.

Specific assays for anti-factor Xa activity that are calibrated to the individual anticoagulant may be used if available in a timely fashion; if this testing is normal, then the result The US Food and Drug Administration (FDA) has issued black box warnings on the risk of SEH with neuraxial anesthesia in patients treated with the direct oral factor Xa inhibitors can be presumed to show that there is no residual anticoagulant effect.

Rivaroxaban (Xarelto): Rivaroxaban has a half-life of five to nine hours, which may be prolonged to 11 to 13 hours in older patients. Dose adjustments at required for patients with renal or hepatic insufficiency. The guideline recommends waiting at least 24 hours after low dose, and at least 72 hours after high dose rivaroxaban before a neuraxial procedure. However, for individuals receiving the 20 mg once daily dose, it may be prudent to observe an interval of 72 hours, regardless of indication, based on the pharmacokinetics of the drug. The first postoperative dose should be administered at least six hours after the procedure or catheter removal, longer after a traumatic procedure.

Apixaban (Eliquis): The half-life of apixaban is approximately 12 hours (range, 8 to 15 hours), and may be prolonged in patients with renal dysfunction and in older patients.

The FDA warning on apixaban stimulates that if a traumatic neuraxial procedure occurs, apixaban should be withheld for at least 48 hours (8).

The guideline recommends waiting at least 36 hours after low dose apixaban, and at least 72 hours after high dose apixaban, before performing a neuraxial procedure.

The ESAIC/ESRA guidelines define low dose apixaban as 2.5 mg twice daily (as long as certain criteria are absent, such as age ≥80 years, body weight <60 kg, or chronic kidney impairment), and high dose as 5 or 10 mg twice daily [22]. The guideline recommends waiting at least 36 hours after low dose apixaban, and at least 72 hours after high dose apixaban, before performing a neuraxial procedure. The first postoperative dose should be administered at least 6 hours after the procedure or catheter removal, longer after a traumatic procedure.

Edoxaban (Savaysa, Lixiana): The half-life of edoxaban is approximately 6 to 11 hours. The kidneys primarily excrete it, and dose adjustment is recommended for patients with renal insufficiency.

ESAIC/ESRA guidelines suggest that neuraxial anesthesia should occur no sooner than 72 hours after the last dose of edoxaban [7,9].

Dabigatran (Pradaxa):

There are no reported cases of SEH related to neuraxial anesthesia, but there are reports of a spontaneous SEH (10) and one related to a fall (11) in patients taking dabigatran.

The FDA has issued a black box warning for SEH with neuraxial anesthesia or lumbar puncture, without recommendation for optimal timing.

The ESAIC/ESRA guidelines make a distinction between low and high dose dabigatran [22], as follows:

- For patients who receive low dose dabigatran (220 mg once daily, or 150 mg once daily if CrCl is 30 to 50 mL/minute or age ≥75), perform neuraxial anesthesia at least 48 hours after the last dose.
- For patients who receive high dose dabigatran (150 mg twice daily, or 110 or 150 mg twice daily if CrCl is < 50 mL/min or age 75 to 80, or 110 mg twice daily if age ≥ 80), perform neuraxial procedure at least 72 hours after the last dose. For patients with CrCl <50 mL/min, perform neuraxial anesthesia after direct thrombin inhibitor level <30 ng/mL or thrombin time is normal. ESAIC/ESRA recommends administering the first postoperative dose at least 24 hours after a neuraxial procedure.

All content of the article has been prepared from the contents of the following headings **Up To Date.**

1. Perioperative management of patients receiving anticoagulants.

   Authors: James D Douketis, MD, FRCPC, FACP, FCCP, Gregory YH Lip, MD, FRCPE, FESC, FACC. Section Editor: Lawrence LK Leung, MD. Deputy Editor: Jennifer S Tirnauer, MD.

   Literature review current through: Feb 2023. | This topic last updated: Nov 18, 2022.

2. Management of bleeding in patients receiving direct oral anticoagulants.

   Authors: David A Garcia, MD, Mark Crowther, MD, MSc. Section Editors: Lawrence LK Leung, MD, Maria E Moreira, MD Deputy Editor: Jennifer S Tirnauer, MD

   Literature review current through: Dec 2022. | This topic last updated: Oct 01, 2021.

3. Neuraxial anesthesia/analgesia techniques in the patient receiving anticoagulant or antiplatelet medication.

   Author: Richard Rosenquist, MD, Section Editors: Lawrence LK Leung, MD, Robert Maniker, MD, Deputy Editors: Marianna Crowley, MD, Jennifer S Tirnauer, MD

   Literature review current through: Feb 2023. | This topic last updated: Jun 15, 2022.

REFERENCES

1. Shaw JR, Li N, Vanassche T, et al. Predictors of preprocedural direct oral anticoagulant levels in patients having an elective surgery or procedure. Blood Adv 2020; 4:3520.
2. Beyer-Westendorf J, Gelbricht V, Förster K, et al. Peri-interventional management of novel oral anticoagulants in daily care: results from the prospective Dresden NOAC registry. Eur Heart J 2014; 35:1888.
3. Scaglione F. New oral anticoagulants: comparative pharmacology with vitamin K antagonists. Clin Pharmacokinet 2013; 52:69.
4. Samuelson BT, Cuker A, Siegal DM, et al. Laboratory Assessment of the Anticoagulant Activity of Direct Oral Anticoagulants: A Systematic Review. Chest 2017; 151:127.
5. Getta B, Muller N, Motum P, et al. Intermittent haemodialysis and continuous veno-venous dialysis are effective in mitigating major bleeding due to dabigatran. Br J Haematol 2015; 169:603.
6. Piran S, Khatib R, Schulman S, et al. Management of direct factor Xa inhibitor-related major bleeding with prothrombin complex concentrate: a meta-analysis. Blood Adv 2019; 3:158.
7. Horlocker TT, Vandermeuelen E, Kopp SL, et al. Regional Anesthesia in the Patient Receiving Antithrombotic or Thrombolytic Therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Fourth Edition). Reg Anesth Pain Med 2018; 43:263.
8. https://www.accessdata.fda.gov/drugsatfda_docs/label/2018/202155s018lbl.pdf (Accessed on April 16, 2018).
9. Kietaibl S, Ferrandis R, Godier A, et al. Regional anaesthesia in patients on antithrombotic drugs: Joint ESAIC/ESRA guidelines. Eur J Anaesthesiol 2022; 39:100.
10. Bamps S, Decramer T, Vandenbussche N, et al. Dabigatran-associated spontaneous acute cervical epidural hematoma. World Neurosurg 2015; 83:257.
11. Truumees E, Gaudu T, Dieterichs C, et al. Epidural hematoma and intraoperative hemorrhage in a spine trauma patient on Pradaxa (dabigatran). Spine (Phila Pa 1976) 2012; 37:E863.

Table 1. Expected Effects of Anticoagulant Drugs on Commonly Used Coagulation Tests

Drug class	Drug	Brand name(s)	PT	aPTT	Anti-factor Xa activity
Direct thrombin inhibitors	Dabigatran	Pradaxa	↑/-	↑	-
Direct factor Xa inhibitors	Rivaroxaban	Xarelto	↑/-	↑/-	↑*
	Apixaban	Eliquis	↑/-	↑/-	↑*
	Edoxaban	Lixiana, Savaysa			↑*

Table 2. Life-Threating Bleeding Reversal Strategies for Dabigatran (Pradaxa)

Direct oral anticoagulant-associated bleeding reversal strategies

Type of bleeding	Agent	Possible intervention
Life-threating or imminently fatal bleeding(eg. Intracranial, retroperitoneal, compartment syndrome, massive gastrointestinal)	Dabigatran (Pradaxa)	• Idarucizumab • Activated PCC* (eg. FEIBA) • Antifibrinolitic agent (eg. Tranexamic acid, epsilon aminocarpoic acid) • Anticoagulant discontinuation • Oral activated charcol (if last dose within prior two hours) • Hemodialysis • RBC transfusions if needed for anemia • Platelet transfusions if needed for thrombocytopenia • Surgical/endoscopic intervention if appropriate

PCC:protrombin complex concentration, FEIBA: factor eighth inhibitor bypassing activity

* Use activated PCC if idarucizumab is unavaible or if continued bleeding is reasonably likely to be fatal within hours.

Table 3. Life-Threating Bleeding Reversal Strategies for Factor Xa Inhibitors

Direct oral anticoagulant-associated bleeding reversal strategies

Type of bleeding	Agent	Possible intervention
Life-threating or imminently fatal bleeding(eg. Intracranial, retroperitoneal, compartment syndrome, massive gastrointestinal)	Rivaroxaban (Xarelto) Apixaban (Eliquis) Edoxaban (Lixiana)	• Andexanet alfa (Andexxa) or a 4-factor unactivated PCC (eg. Kcentra) • Antifibrinolitic agent (eg. Tranexamic acid, epsilon aminocarpoic acid) • Anticoagulant discontinuation • Oral activated charcol (if last dose within prior two hours) • RBC transfusions if needed for anemia • Platelet transfusions if needed for thrombocytopenia • Surgical/endoscopic intervention if appropriate

Table 4. Minor Bleeding Reversal Strategies for Direct Oral Anticoagulants

Type of bleeding	Agent	Possible intervention
Minor bleeding (eg. epistaxis, uncomplicated soft tissue bleeding, minor (slow) gastrointestinal bleeding)	Dabigatran (Pradaxa)	• Local hemostatic measures • Possible anticoagulant discontinuation • Half life (normal renal function*) 12 to 17 hours) • Possible antifibrinolitic agent (eg. Tranexamic acid, epsilon aminocarpoic acid)
	Rivaroxaban (Xarelto) Apixaban (Eliquis) Edoxaban (Lixiana)	• Local hemostatic measures • Possible anticoagulant discontinuation • Half life (normal renal function *) Rivaroxaban 5 to 9 hours Apixaban 8 to 15 hours Edoxaban 6 to 11 hours • Possible antifibrinolitic agent (eg. Tranexamic acid, epsilon aminocarpoic acid)
*The anticoagulant effect of these agents (especially dabigatran)will dissipate more slowly as renal function declines. Severe hepatic failure may also prolong the half-life for apixaban, edoxaban and rivaroxaban.		

Table 5. Direct Oral Anticoagulant Reversal Agents for Life-Thereating Bleeding (Imminent Risk of Death From Bleeding)

Reversal agents carry a risk of life-threatening thrombosis

Anticoagulant	Reversal agent (all are given intravenously)
Oral thrombin inhibitor: Dabigatran (Pradaxa)	• Idarucizumab (Praxbind. Dose: 5 grams*
Oral factor Xa inhibitors: Rivaroxaban (Xarelto) Apixaban (Eliquis) Edoxaban (Lixiana)	• Andexanet alfa (AndexXA). Dosing for the initial bolus and subsequent infusion depend on the dose level of the factor Xa inhibitor and the interval since it was last taken –OR- • 4- factor PCC (Kcentra, Beriplex P/N, Octaplex). Dosing can be done with a fix dose of 2000 units OR a weight-based dose of 25 to 50 units per kg.
	* If idarucizumab is unavailable, an activated PCC (FEIBA, 50 to 80 units per kg intravenously) may be a reasonable alternative.

Table 6. Adexanet Alfa Dosing

If the patient took rivaroxaban >10 mg, apixaban >5 mg, or dose unknown within the previous 8 hours: Adexanet 800 mg bolus at 30 mg/minute followed by 960 mg infusion at 8 mg /minute for up to 120 minutes. **OR**
If the patient took rivaroxaban ≤10 mg or apixaban ≤5 mg, or if ≥ 8 hours have elapsed since the last dose of a factor Xa inhibitor: Adexanet 400 mg bolus at 30 mg/minute followed by 480 mg infusion at 4 mg /minute for up to 120 minutes.

Table 7. Unactivated Prothrombin Complex Concentrations (PCCs) and Activated Prothrombin Complex Concentrations (aPCCs)

Clotting factor products PCCs and a PCCs		
Unactivated prothrombin complex concentrations (PCCs)		
	4 factor • Kcentra	Contains inactive forms of 4 factors: Factor II, VII, IX and X Also contain heparin
	3 factor • Profilnine	Contains inactive forms of 3 factors: Factor II, IX and X Does not contain heparin
Activated prothrombin complex concentrate (aPCCs)		
	4 factor • FEIBA	Contains inactive 4 factors: Factor II, VII, IX and X. Of these only factor VII is mostly the activated form. Does not contain heparin

Table 8. ESAIC/ESRA Guidelines for Management Related to Anticoagulation for High Bleeding Risk Block (Neuraxial and Deep Nerve Blocks)

Drug and dose	Time from last drug intake to intervention	Target laboratory value at intervention	Time from intervention to next drug dose
DXA low	24 hours rivaroxaban, edoxaban (30 hours if CrCl<30 mL/minute), 36 hours apixaban	No testing	
DXA high	72 hours or until target laboratory value (until target laboratory value if CrCl<30 mL/minute)	DXA level <30 ng/mL (alternative:≤ 0.1 anti-Xa international units/mL)	6 hours postoperative Consider prolonged time interval after bloody tap
Dabigatran low	48 hours	No testing	
Dabigatran high	72 hours or until target laboratory value (until target laboratory value if CrCl<50 mL/ minute)	Direct Thrombin ınhibitor (DTI) level <30 ng/mL (alternative: thrombin time in normal range of local laboratory)	24 hours postoperative

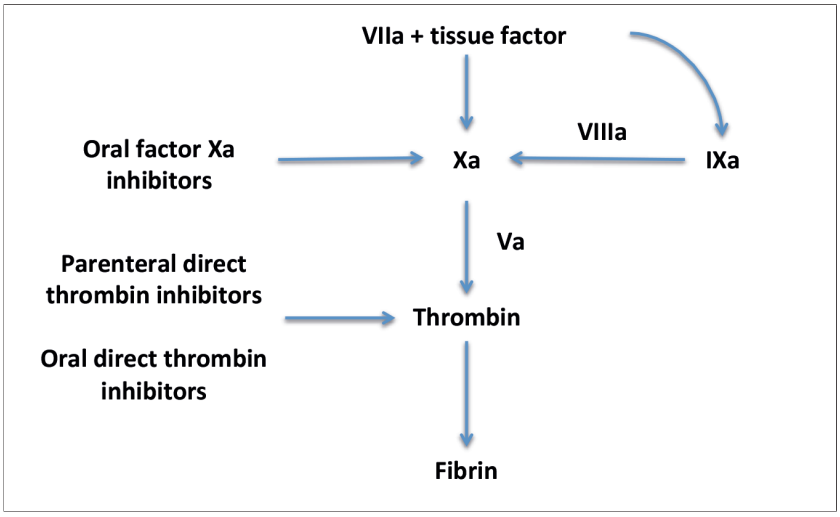


Figure 1. Coagulation cascade and anticoagulant effects.

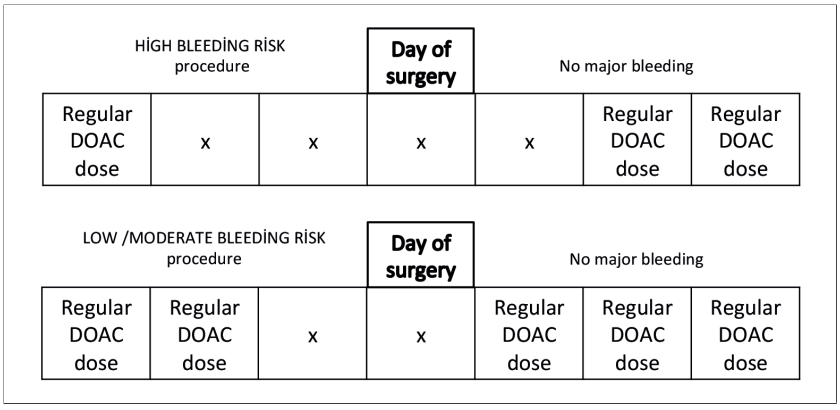


Figure 2. Timing for interruption of a DOAC before and after elective surgery.

8:45-09:00 (Panel V)

8:30-10:05	PANEL V: BLEEDING AND COAGULATION	Ümit Karadeniz, Lale Karabıyık, Vesna Durnev
8:30-8:45	Protocols for novel anticoagulant drugs	Sumru Şekerci
8:45-9:00	Perioperative Blood Pressure	Asutay Göktuğ
9:00-9:15	Prevention of respiratory complications after major abdominal surgery	Krenar Lilaj
9:15-9:30	Clinical use of tranexamic acid: effectiveness and controversies	Aslı Demir
9:30-9:45	Coagulation disorders in intensive care	Necla Dereli
9:45-10:05	Discussion	

Perioperative Blood Pressure Management

Asutay Goktug

University of Health Sciences, Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

Blood pressure (BP) is the key determinant of organ blood flow. Lack of blood flow causes tissue hypoxia which triggers cellular oxidative stress, leading to organ damage. In the perioperative period, BP is dynamic and intraoperative hypotension is common. Although the relationship between intraoperative hypotension and organ damage cannot be clearly established, hypotension has been shown to cause perfusion disorder. The information about which levels of hypotension cause damage to which organ is unclear. Randomized controlled trials suggest that mean arterial pressure (OAB) values below 65 mmHg lasting longer than 15 minutes are associated with myocardial and kidney damage (1).

BP is the interaction between cardiac output and systemic vascular resistance. Changes in cardiac compliance, myocardial contractility, heart rate, intravascular volume, hormonal and emotional changes, and circadian rhythm also affect BP. The presence of insufficient blood flow due to changes in BP causes tissue hypoxia and triggers cellular oxidative stress leading to organ dysfunction. The levels of BP that trigger tissue damage vary by organ and vary individually. Therefore, the effects of hypotension or hypertension on organ perfusion may be different. When there is an upward or downward movement in BP, pressure autoregulation is activated to maintain the perfusion in the organs stably. With these fluctuations in BP, hypoperfusion or hyperperfusion can be seen in the organs. Although the autoregulation capacity is not the same in all organs, the brain, heart, kidneys, and spinal cord have stronger autoregulation ability (2). The perfusion pressure and organ-specific resistance regulate organ perfusion. The aim of perioperative BP management is not only to concentrate on BP values numerically but to optimize adequate blood flow.

BP management guidelines were updated by the American College of Cardiology/American Heart Association (ACC/AHA) (3) in 2017 and by the European Society of Cardiology/European Society of Hypertension (4) in 2018. However, these guidelines are difficult to apply to perioperative patients due to increased stress and immune response, inflammation, possible problems in bleeding, clotting, and postoperative pain due to surgery (5). The common emphasis in these guidelines is the need for routine and regular monitoring of BP in the perioperative period (2).

Turkish Hypertension Prevalence Study (PatenT2 Prevalence, awareness and treatment of hypertension in Türkiye) (6) reported that hypertension is a common problem in epidemic dimensions in our country and that awareness of this problem is low with insufficient treatment. For this reason, they emphasized that hypertension awareness should be increased by creating social awareness.

PatentT2 made the following recommendations:

1. Blood pressure measurements should be expanded to identify the problem early on.
2. Hypertension is a preventable problem and should be prevented from childhood before it occurs with lifestyle changes.
3. When hypertension develops, the diagnosis should be made early and the treatment should be completed effectively.

Apart from this, kidney damage associated with hypertension, reduction of cardiovascular and cerebrovascular risks, and the problems that need to be emphasized in terms of the burden that hypertension will bring to society are key issues that Skate T2 emphasizes.

Regardless of the guideline applied, the appropriate technique must be used when measuring BP. The patient should sit quietly with his arm supported at the level of the heart. During the measurement, the patient should not speak and the appropriate size cuff should be used. If an automatic device is used, it must comply with national standards. If the patient is in an irregular rhythm such as atrial fibrillation, the pulse should be palpated before manual measurements are made. If BP is measured as high, a second measurement should be taken at least one minute after the first measurement. If there is a significant difference between these two BP measurements, a third reading should be done after an appropriate break (4). The UK National Institute for Health and Care Excellence (NICE) recommends averaging at least 14 blood pressure values measured after waking up in the morning for the diagnosis of hypertension. NICE also recommends monitoring blood pressure measurements at home and emphasizes that BP should be checked from both arms at the time of diagnosis, as the difference between the arms is an important marker of vascular disease and can lead to inadequate treatment (7).

According to the Hypertension Consensus report, in the first evaluation, the diagnosis of hypertension is immediately made in patients with systolic blood pressure above 180 mmHg or diastolic blood pressure above 110 mmHg as a result of repeated measurements. Patients with blood pressure between 140/90 mmHg and 179/109 mmHg are called for a second examination to confirm the diagnosis of hypertension.

Severe hypertensive conditions in which systolic blood pressure is higher than 180 mmHg are rare but carry significant risks for the patient. Lower hypertension values, such as systolic blood pressure of 140-150 mmHg, are much more common and are responsible for a significant proportion of cardiovascular diseases, although they carry less risk. This definition and classification of hypertension are important for the prevention of cardiovascular diseases accompanying hypertension (2). The NICE guideline defines normal blood pressure as blood pressure below 140/90 mmHg when measurements are made in a clinical setting (Table-1).

While multiple measurements should be performed in different cases for the diagnosis of stage I or stage II hypertension, treatment should be started immediately in patients with severe hypertension.

As a treatment, lifestyle recommendations are offered to patients with Stage 1 hypertension and pharmacological treatment can be added according to their existing cardiovascular disease risk. In patients with stage 2 hypertension, pharmacological treatment is offered as well as lifestyle recommendations. The 2019 NICE guidance describes the emphasis on consistently keeping BP below target levels. Target blood pressures in patients under 80 years of age are below 140/90 mmHg as clinical measurements, 135/85 mmHg in out-of-home measured values, below 150/90 mmHg in patients over 80 years of age, and 145/85 mmHg in out-of-home measured values.

While the goal of chronic BP management is to reduce cardiovascular risk throughout life, the goals of perioperative BP management are to focus on preventing perioperative morbidity and mortality.

BP is often measured high in hospitalized patients for elective surgery. “White coat” hypertension occurs in 55% of people with grade 1 hypertension, but only about 10% of people with severe hypertension (1). The two most commonly used methods for perioperative BP monitoring are intermittent oscillometric manometry with a non-invasive cuff and continuous intra-arterial invasive catheterization. With advances in technology in recent years, the popularity of sleeveless non-invasive BP measuring devices is increasing (8). Perioperative BP is usually measured non-invasively by oscillometric manometry with intervals of 3-5 minutes. Measurement accuracy depends on the choice of a sleeve that is compatible with the patient’s arm circumference, the patient’s posture, and ambient temperature. BP values measured invasively by intra-arterial cannulation are considered to be more accurate than non-invasive blood pressure measurements (9). In invasive measurements on hypertensive patients, non-invasive measurements are usually higher than systolic BP values. This is especially prevalent in chronic hypertensive patients because the pulse pressure difference increases as the pulse wave spreads from the aorta to the peripheral arteries.

The Importance of Preoperative BP Optimization

Approximately 280 million surgical operations are performed worldwide every year (1) and hypertension is one of the most common problems during operations. Hypertension is usually asymptomatic and can be diagnosed during routine physical examinations and examinations in the preoperative period. Damage caused by high BP to the heart can be left ventricular hypertrophy, diastolic dysfunction, microvascular disease, and atherosclerotic coronary artery disease, while in the cerebral system infarctions can be hypertensive encephalopathy due to reduced cerebral blood flow (2). The main cause of stroke is hypertension. It occurs in the form of severe hypertension, vascular damage due to hypertension, and hypertensive retinopathy. Kidney damage may be glomerular damage, glomerulosclerosis, renal tubular ischemia, and end-stage renal failure. Peripheral

artery disease can also be a result of hypertension. These complications increase in direct proportion to the high level of BP and can be reduced with effective, successful blood pressure management. However, it is not clear which level of blood pressure causes these complications or what level of blood pressure will be useful in preventing complications.

Laboratory techniques that should be performed in the preoperative period to examine a wide range of target organ dysfunctions caused by hypertension are summarized in the table below:

Since people with type 2 diabetes are about two and a half times more likely to develop hypertension, the glycosylated hemoglobin level will indicate long-term glucose control. The NICE guideline recommends fundoscopy to evaluate hypertensive retinopathy, but it will not be easy to implement this recommendation in the preoperative period. Echocardiographic evaluation should be performed in the preoperative period according to the clinical status of the patient and the surgical risk.

Over the years, high BP was the most common preventable medical indication for delaying anesthesia and surgery. According to previous guidelines, uncontrolled hypertensive patients would have elective surgeries postponed due to increased perioperative cardiovascular risks. Although BP measurement is a basic principle of perioperative practice, since there is no consensus on the appropriate BP to guide clinical management, the BP values that would cause anesthesia and surgery to be postponed were also unclear. Studies conducted in the last 20 years show that mild to moderate preoperative hypertension is not a major risk factor for complications (10). Although some studies have shown an association between increased BP and perioperative cardiac complications, these complications tend to decrease or disappear when BP management is performed appropriately. The ACC/AHA guideline recommends that if blood pressure is above 180/110 mmHg, surgery should be postponed and antihypertensive therapy should be started immediately. It was concluded that patients with stage 1 or 2 hypertension without target organ damage did not need to postpone surgical intervention due to the lack of evidence that it increases perioperative morbidity and mortality (3, 4).

Rapid control of BP with medications increases the risk of postoperative complications, especially in patients with very high BP. Falaschetti et al. (11) found no relationship between BP values above 180/110 mmHg and perioperative side effects. Also, there is no clear evidence that postponing surgery will improve perioperative outcomes. In patients with significantly elevated preoperative BP, rapid regulation increases the risk of postoperative complications. Howell (12) reported that surgery should not be delayed due to high preoperative high blood pressure values in a healthy patient.

Preoperative Management of Antihypertensive Drugs

Antihypertensive drugs frequently used in the treatment of hypertension are angiotensin converting enzyme inhibitors, angiotensin receptor blockers, β blockers, calcium channel blockers, and diuretics.

Most patients who take antihypertensive medication continue to take the drugs on the morning of surgery and during the perioperative period. However, increasing evidence suggests that this practice may contribute to perioperative hypotension and a higher risk of complications.

β blockers are not the first-line treatment for hypertension, but pre-existing β blocker therapy should generally be continued perioperatively, especially in patients with congestive heart failure, atrial fibrillation, or who have recently had a myocardial infarction. A fixed-dose of β Blockers started before the operation may be associated with an increased risk of perioperative death (13-14). β blockers in the perioperative period may cause hypotension and end organ hypoperfusion. In a Perioperative Ischemic Assessment (POISE) study published in 2008, it was reported that although β blocker initiated in the preoperative period reduces the risk of myocardial infarction, it has cardiovascular effects including bradycardia, stroke, and hypotension in the perioperative period and increases the risk of mortality (15). Since the current information about the limitation, suspension, or continuation of blocker therapy in the perioperative period is the subject of debate in β, comprehensive studies are needed in this regard.

Information on the route to be applied in patients receiving ACEIs or angiotensin receptor blockers (ARBs) in the perioperative period is also controversial. Hypotension can be deeper, especially when in combination with diuretics (16). Angiotensin converting enzyme inhibitors and angiotensin receptor blockers may increase the incidence of acute kidney injury, stroke, myocardial damage, and mortality by deepening intraoperative hypotension (16). For this reason, the Canadian Cardiovascular Association, the European Cardiovascular Association, and the European Society of Anesthesiologists recommend discontinuing these drugs on the day of operation (17). In 14,687 patients in a 2017 VISION study investigating patients undergoing non-cardiac surgery, discontinuation of preoperative ACEIs and ARBs was shown to be associated with a lower risk of death and

postoperative vascular events (17). Continuing these drugs in the preoperative period results in hypotension and organ hypoperfusion that occur in the perioperative period. The POQI study recommends discontinuing ACEI and ARBs 24 hours before surgery (18).

The American College of Cardiology and the American Heart Association recommends the perioperative continuation of ACEI medications and ARBs. The 2014 European Society of Cardiology and European Society of Anesthesiology guidelines for non-cardiac surgery warn of the relationship between ACEIs and ARBs and perioperative hypotension.

Patients with left ventricular dysfunction are recommended to continue ACEI and ARBs throughout the perioperative period (19). If patients have accidentally removed their ACEI on the morning of surgery, their surgery is not postponed. In this case, since deep hypotension is expected, a management plan should be made accordingly.

A Perioperative Ischemic Evaluation-3 (POISE-3) study is being conducted to respond to controversy about optimal perioperative BP goals and whether antihypertensive drugs should be interrupted in the perioperative period and restarted in the postoperative period (20).

Information on the application of calcium channel blockers and diuretics in the perioperative period is limited. The POQI Group recommends that decisions about these drugs be made on a patient-by-patient basis (18)

Intraoperative Management of Blood Pressure

Although BP is monitored compulsorily and regularly in the perioperative period, there is no consensus on the blood pressure goal in patients undergoing different surgical procedures. During the operation, the target of basal BP should be ±20%, intraoperative measures should be taken to ensure a stable cardiovascular system and targets for blood pressure values should be determined (Table-4).

In hypertensive patients, cardiovascular lability is expected with increases of 20 to 30 mmHg in BP and 15 to 20 beats/min in heart rate during anesthesia induction. General anesthetic agents cause hypotension by causing vasodilation and reducing cardiac output. Hypertensive patients may show greater cardiovascular lability during surgery with increased BP and heart rate in the induction of anesthesia and hypotension risks in the intraoperative period. As a result, both hypotension and hypertension are associated with higher morbidity and mortality. From the same blood pressure, the hypertensive and normotensive patient do not benefit equally. Therefore, a one-size-fits-all practice is controversial (21). Since preoperative, intraoperative, and postoperative hypotension is independently associated with all-cause mortality and an increased risk of cardiovascular complications 30 days after noncardiac surgery, it is important to manage hypertension well during these periods. The unanswered question is whether avoiding hypotension or hypertension in the perioperative environment can prevent major cardiovascular complications. It seems that individualized blood pressure control according to the initial blood pressure level of the patient may be useful (21, 22).

BP is measured throughout surgery, usually using automated oscillometric manometry (8) at 3-5 minute intervals. The accuracy of the measurement depends on the selection of the appropriate cuff. The accuracy of blood pressure values measured invasively intra-arterial is higher than that measured by the headline (21). In hypotensive patients, especially patients with arterial systolic blood pressure below 111 mmHg, blood pressure values measured by cuff are higher than invasive arterial pressure (22). In chronic hypertensive patients, invasive measurements, especially systolic blood pressure measurements, are higher than non-invasive measurements because the pulse pressure difference increases as the pulse wave spreads from the aorta to the peripheral arteries (2).

The Perioperative Quality Initiative expressed the opinion that intraoperative OAB < 60-70 mmHg in non-cardiac surgery is associated with myocardial injury, acute kidney injury, and death (7). Systolic artery pressures below 100 mmHg are associated with myocardial damage and death, and organ damage is associated with the severity and duration of hypotension. When reporting intraoperative hypotension, both SBP and MAP values should be used. The number of hypotensive periods that occur and the total time that patients spend below the hypotensive threshold values should also be reported. Despite all these studies, more studies are needed to confirm the optimal blood pressure goal and how to achieve it.

All drugs used during the induction of anesthesia are equally safe for hypertensive patients. Ketamine, one of the intravenous anesthetic agents, is contraindicated in elective surgeries in hypertensive patients. Ensuring hemodynamic stability is important in the induction and maintenance of anesthesia. Considering that hypotension may develop during the maintenance of anesthesia, the doses of inhalation agents should be well titrated. Fluid overload should be avoided to prevent postoperative hypertension in patients.

The definitive treatment of perioperative hypotension should be based on the patient's initial BP, cardiac output, beat volume, and heart rate. The treatment approach is done as in Table-5.

Increases in blood pressure and heart rate at the end of anesthesia and during extubation are common, and may cause dangerous increases in myocardial oxygen demand in patients. Therefore, necessary precautions should be taken during the extubation and recovery period, and care should be taken to reduce the risk of a hyperdynamic condition and myocardial ischemia. To reduce this risk different agents were tried during the extubation period. In a study where the effects of diltiazem, metoprolol, and verapamil on hemodynamic response during the extubation period were evaluated, it was concluded that verapamil was more effective (24).

Postoperative BP Management

Postoperative BP is one of the main elements of the perioperative period, and proper management of BP in the postoperative period will help prevent many problems. (23). BP can be fragile postoperatively. Orthostatic hypotension is common after general anesthesia.

Since the occurrence of POH is multifactorial, the incidence varies in a wide range of 8%-48% (25). In the POISE-2 study (26), the incidence of POH in the first four postoperative days was reported to be 7.6%. There are very few studies investigating the relationship between postoperative blood pressure and organ failure.

In the POISE 2 study, it was reported that POH caused myocardial damage and infarction formation and that the duration of POH longer than 10 minutes was associated with an increased risk of postoperative myocardial infarction and 30-day mortality in elderly patients. However, information on which values of BP cause this damage is insufficient.

It is also known that in the early postoperative period, especially in the first 72 hours, the incidence of hypertension increases due to the triggering of factors such as extubation, pain, hypercarbia, hypervolemia, hypothermia-tremor, hypoxia, preoperative hypertension, bladder dandruff, and POH. Since hypertension (especially with tachycardia) may lead to myocardial ischemia, antihypertensive treatment should be started in this period if the underlying cause is continued after treatment (27).

As a result, adequate preoperative evaluation and laboratory tests should be performed in the perioperative management of all operative patients and the degree and treatment efficacy in the presence of hypertension, the drugs used, and the target organ damage should be evaluated. In the intraoperative period, measures should be taken to reduce the stress response, and in the postoperative period, effective pain treatment should be performed to prevent situations that may cause fluctuations in BP.

Since perioperative individualized BP management has been studied in recent years, personalized intraoperative BP is targeted by addressing the patient's current physiopathological condition (28, 29).

As a result, the most important consideration in BP management is to avoid hypotension. Perioperative BP management is a dynamic process and with the available data, it is widely accepted to keep patients' MAP at ≥65 mmHg perioperatively. It should be considered that hypotension in the intraoperative and postoperative periods will have negative consequences.

Advances in machine learning and artificial intelligence could facilitate the management of hemodynamics globally, including fluid management instead of BP alone.

REFERENCES

1. Ahuja S, Mascha EJ, Yang D et al. Associations of Intraoperative Radial Arterial Systolic, Diastolic, Mean, and Pulse Pressures with Myocardial and Acute Kidney Injury after Noncardiac Surgery. Anesthesiology 2022; 32(2): 291-306.
2. Meng L, Yu W, Wang T et al. Blood Pressure Targets in Perioperative Care Provisional Considerations Based on a Comprehensive Literature Review. Hypertension 2018; 72(4):806-817.
3. R.D. Brook and S. Rajagopalan, "2017 ACC/ AHA/ AAPA/ ABC/ ACPM/ AGS/ APhA/ ASH/ ASPC/ NMA/ PCNA Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. A report of the American College of Cardiology/American Heart Association Task Force on clinical practice guidelines," Journal of the American Society of Hypertension 2018; 12: 238
4. 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology and the European Society of Hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology and the European Society of Hypertension. J Hypertens 2018;36:1953-2041.
5. Song Q, Li J, Jiang Z. Provisional Decision-Making for Perioperative Blood Pressure Management: A Narrative Review. Hindawi Oxidative Medicine and Cellular Longevity 2022;1-17.

6. Sengul S, Akpolat T, Erdem Y: Changes in hypertension prevalence, awareness, treatment, and control rates in Türkiye from 2003 to 2012. J of Hypertension 2016; 34:1208–1217.
7. Jones RN, McCormack T, Constanti M, McManus RJ. Diagnosis and management of hypertension in adults: NICE guideline update 2019; British Journal of General Practice 2020; 90-91.
8. Mukkamala R, Stergiou GS, Avolio AP. "Cuffless blood pressure measurement," Annual Review of Biomedical Engineering 2022; 24:203–230.
9. T. Kaufmann, E. G. M. Cox, R. Wiersema et al., "Non-invasive oscillometric versus invasive arterial blood pressure measurements in critically ill patients: a post hoc analysis of a prospective observational study," Journal of Critical Care 2020;57:118–123.
10. Howell SJ, Sear YM, Sear JW, Yeates D, Goldacre M, Foex P. Nested case-control study of risk factors for cardiovascular death after anaesthesia and surgery. Br J Anaesth 1997;78:466.
11. Falaschetti E, Chaudhury M, Mindell J, Poulter N. Continued improvement in hypertension management in England: results from the health survey for England. Hypertension 2009; 53:480–486.
12. Howell SJ: Preoperative Hypertension Current Anesthesiology Reports 2018; 8:25–31.
13. Andersson C, Shilane D, Go A S et al. Beta-Blocker Therapy and Cardiac Events Among Patients With Newly Diagnosed Coronary Heart Disease. J of the American College of Cardiology 2014; 64: 247–252.
14. Fleisher LA, Fleischmann KE, Auerbach A Det al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/ American Heart Association Task Force on practice guidelines. J of the American College of Cardiology 2014; 64: 77–137.
15. Devereaux PJ, Yang H, Yusuf S et al. Effects of extendedrelease metoprolol succinate in patients undergoing non- cardiac surgery (POISE trial): a randomised controlled trial. Lancet 2008; 371: 1839–1847.
16. Roshanov PS, Rochwerg B, Patel A et al. WithholdingversusContinuing angiotensin-converting enzyme inhibitors or angiotensin ii receptor blockers before noncardiac surgery. Anesthesiology 2017; 126: 16–27.
17. Sanders RD, Hughes F, Shaw A et al. Perioperative Quality Initiative consensus statement on preoperative blood pressure, risk and outcomes for elective surgery. British Journal of Anaesthesia 2019; 122: 552–562.
18. Sessler DI, Bloomstone JA, Aronson S, Berry C, Gan TJ, Kellum JA, et al. Perioperative quality initiative consensus statement on intraoperative blood pressure, risk and outcomes for elective surgery. Br J Anaesth 2019;122(5):563–74.
19. Auron M, Harte B, Kumar A, Michota F. Renin-angiotensin system antagonists in the perioperative setting: clinical consequences and recommendations for practice. Postgrad Med J 2011; 87:472–81.
20. Marcucci M, Painter TW, Conen D et al. Rationale and design of the PeriOperative ISchemic Evaluation-3 (POISE-3): a randomized controlled trial evaluating tranexamic acid and a strategy to minimize hypotension in noncardiac surgery. Randomized Controlled Trial 2022; 31 23(1):101.
21. Wax DB, Lin HM, Leibowitz AB. Invasive and concomitant noninvasive intraoperative blood pressure monitoring: observed differences in measurements and associated therapeutic interventions. Anesthesiology 2011; 115: 973–978.
22. Kihara S, Brimacombe J, Yaguchi Y, Watanabe S, Taguchi N, Komatsuzaki T. Hemodynamic responses among three tracheal intubation devices in normotensive and hypertensive patients. Anesth Analg. 2003; 96:890–5.
23. Briesenick L, Flick M, Saugel B. Postoperative blood pressure management in patients treated in the ICU after noncardiac surgery. Current Opinion in Critical Care 2021; 27, 694–700.
24. Yörükoğlu D, Göktuğ A, Alanoğ}u Z, Tulunay M. Comparison of intravenous metoprolol, verapamil and diltiazem on the attenuation of haemodynamic changes associated with tracheal extubation. EJA 1999; 462-467.
25. Liem VGB, Hoeks SE, Mol K et al. Postoperative hypotension after noncardiac surgery and the association with myocardial injury. Anesthesiology 2020; 133: 510–522.
26. Sessler DI, Meyhoff C S, Zimmerman N M et al. Perioddependent associations between hypotension during and for four days after noncardiac surgery and a composite of myocardial infarction and death: a substudy of the POISE-2 trial. Anesthesiology 2018; 128: 317–327.
27. Zhao D, LI J, Yang R , Xu GH. Effects of stage I hypertension on the recovery of early postoperative attention network function in elderly patients undergoing elective hip or knee arthroplasty surgery. Turk J Med Sci 2020; 50: 37-43.
28. Futier E, Lefrant YJ, Guinot PG et al. Effect of individualized vs standard blood pressure management strategies on postoperative organ dysfunction among high-risk patients undergoing major surgery: a randomized clinical trial. JAMA 2017; 318: 1346–1357.
29. Godet T, Grobost R, Futier E. Personalization of arterial pressure in the perioperative period. Current Opinion in Critical Care 2018; 24: 554–559.

Table 1. Categories of BP in Adults

BP Category	SBP		DBP
NORMAL	< 120 mmHg	and	<80 mmHg
ELEVATED	120-129 mmHg	and	<80 mmHg
HYPERTENSİON			
Stage 1	130-139 mmHg	or	80-89 mmHg
Stage 2	> 140	or	>90 mmHg

SBP= Systolic blood pressure measurement, DBP= Diastolic blood pressure measurement.

Table 2. CVD Risk Factors Common in Patients With Hypertension (3)

Modifiable Risk Factors	Relatively Fixed Risk Factors
Current cigarette smoking, secondhand smoking	CKD
Diabetes mellitus	Family history
Dyslipidemia/hypercholesterolemia	Increased age
Overweight/obesity	Low socioeconomic/ educational status Male sex
Physical inactivity/low fitness	Obstructive sleep apnea
Unhealthy diet	Psychosocial stress

CKD= indicates chronic kidney disease, CVD= cardiovascular disease.

Table 3. Laboratory Investigations in Hypertensive Patients

Recommended for each patient	According to the clinical situation
Complete blood count	Rate of excretion of albumin in urine
Full urine analysis	ALT/AST
Fasting blood glucose	Calcium
Sodium, potassium, and uric acid in the blood	TSH
Lipid profile	OGTT
Creatinine and glomerular filtration rate (eGFR) Electrocardiography	Echocardiography
Urine albumin excretion rate in DM patients (annual follow-up)	

Table 4. Intraoperative Blood Pressure Goals

HIGH SBP≥ 130 mmHg DBP≥80 mmHg	TARGETS BP 80-110% Baseline Allowable BP decrease ≤ 20 Allowable BP increase ≤ 10 SBP<160 mmHg
NORMAL SBP-90-129 DBP-50-79	BP 90-110 % Baseline Allowable BP change ≤ 10 MAP=65-95 mmHg
LOW SBP<90 mmHg or DBP<50 mmHg	BP 100-120% Baseline Allowable BP decrease = 0 Allowable BP increase ≤ 10 MAP ≥60 mmHg

Table 5. Factors Predictive of Perioperative Hypotension and Treatment

Patient Related	Surgery Related	Treatment
Advanced age	High risk surgery	Fluid management
Hypovolemia	Long procedure	Blood transfusion
ASA status		Vasopressors-inotrops
Antihypertensive drugs		Prevent depth of anesthesia

09:00-9:15 (Panel V)

8:30-10:05	PANEL V: BLEEDING AND COAGULATION	Ümit Karadeniz, Lale Karabıyık, Vesna Durnev
8:30-8:45	Protocols for novel anticoagulant drugs	Sumru Şekerci
8:45-9:00	Perioperative Blood Pressure	Asutay Göktuğ
9:00-9:15	Prevention of respiratory complications after major abdominal surgery	Krenar Lilaj
9:15-9:30	Clinical use of tranexamic acid: effectiveness and controversies	Aslı Demir
9:30-9:45	Coagulation disorders in intensive care	Necla Dereli
9:45-10:05	Discussion	

Prevention of Respiratory Complications After Major Abdominal Surgery

Krenar Lilaj

University of Medicine, Faculty of Medicine, Tirana, Albania

ABSTRACT

Objective: Postoperative pulmonary complications (PPCs) are often faced, increasing patient mortality, hospital length of stay, and costs as well. Several changes can immediately occur after general anesthesia. These changes include altered respiratory drive and muscle function, reduced lung volumes, and atelectasis may develop in majority of patients receiving muscle relaxants. It is recently reported that baseline pulmonary functions need to time to be normal after general anesthesia for major surgery. We checked on recent literature to determine the actual trend on prevention of postoperative pulmonary complications.

Methods: PPCs included pneumonia, pulmonary edema, pulmonary thromboembolism, atelectasis, and acute exacerbation of COPD. There are several risk factors for PPC, but the physicians must differentiate non-modifiable to modifiable factors to optimize the patient further preoperatively. Several scores are certified to predict PPCs but there is no adequate consensus for them due to lack of evidence.

Results: Preoperative optimization consists of controlling comorbidities and smoking cessation. Intraoperative protective ventilation strategies and appropriate management of neuromuscular blocking drugs are hot points as well. Ventilation with low tidal volumes, lowest acceptable FiO2, driving pressure up to 15, and using PEEP no more than 10 cmH2O are of great importance. PEEP is helpful to implement recruitment maneuver if atelectasis is suspected. For high-risk patients, surgical time and use of muscle relaxants should be minimized. Multimodal analgesia is strongly recommended. Early postoperative mobilization, chest physiotherapy, and oral hygiene ca reduce PPCs.

Conclusion: Identifying the patients risk factors for PPCs, using predicting score systems, and a detailed anesthetic and surgical plan can guarantee the success. Preoperative optimization, avoiding dehydration and hypotension, lung protective ventilation strategies implementation, minimizing surgery time and muscle relaxants use, early mobilization and chest physiotherapy are hallmarks of PPCs prevention.

Keywords: Postoperative pulmonary complications, major abdominal surgery, atelectasis, hypoxia

REFERENCES

1. Kim T, et al. Pulmonary complications after abdominal surgery in patients with mild-to-moderate chronic obstructive pulmonary disease. International Journal of COPD. 2016; 11:2785–2796
2. SabateS, MazoV,CanetJ. Predicting postoperative pulmonary complications: implications for outcomes and costs. Curr Opin Anaesthesiol. 2014; 27(2):201–209.
3. Yang CK, Teng A, Lee DY, Rose K. Pulmonary complications after major abdominal surgery: National Surgical Quality Improvement Program analysis. J Surg Res. 2015;198(2):441–449.

09:15-9:30 (Panel V)

8:30-10:05	PANEL V: BLEEDING AND COAGULATION	Ümit Karadeniz, Lale Karabıyık, Vesna Durnev
8:30-8:45	Protocols for novel anticoagulant drugs	Sumru Şekerci
8:45-9:00	Perioperative Blood Pressure	Asutay Göktuğ
9:00-9:15	Prevention of respiratory complications after major abdominal surgery	Krenar Lilaj
9:15-9:30	Clinical use of tranexamic acid: effectiveness and controversies	Aslı Demir
9:30-9:45	Coagulation disorders in intensive care	Necla Dereli
9:45-10:05	Discussion	

Traneksamik Asidin Klinik Kullanımı: Etkinlik ve Tartışmalar

Clinical Use of Tranexamic Acid: Effectiveness and Controversies

Z. Aslı Demir, MD

Sağlık Bilimleri Üniversitesi Bilkent Ankara Şehir Hastanesi, Anesteziyoji ve Reanimasyon Anabilim Dalı, Ankara, Türkiye

Dr. Utako & Okamoto tarafından 1962 yılında keşfedilen traneksamik asit (TXA), lizinin moleküler analoğudur ve Epsilon amino kaproik asitten 27 kat daha potenttir. Plazminojenden plazmine dönüşümü engelleyerek fibrinolizisi inhibe eder, immün sistem ve inflamasyon sistemine de etki eder (1). Kanamalı birçok ameliyatta kullanılan TXA etkinliğine dair birçok köşe taşı çalışmalar yapılmıştır (2). Travmatik kanamalarda CRASH-2 ve STAAMP öne çıkarken, postpartum kanama için WOMAN TRIAL, travmatik beyin hasarı (TBI) ile ilgili Rowel ve CRASH-3 çalışmaları göze çarpmaktadır. CRASH-2 çalışması 20211 hasta üzerinde yapıldı ve 2010'da yayınlandı. Buna göre tüm nedenli mortalite (%14,5 ve %16) ve kanama nedenli mortalite (%4,9 & %5,7) TXA grubunda anlamlı olarak azalmış bulundu. Ancak kan transfüzyon oranlarında fark olmaması, uygulama süresi gecikince etkinliğin yok olması çalışmanın eleştiri noktaları oldu. STAAMP 903 travma hastasında yapıldı ve 2020'de yayınlandı. TXA uygulamasının hastaneden önce yapılmasıyla plasebonun kıyaslandığı çalışmanın sonuçlarında 30 günlük mortalite azalmış bulundu (%8,1 ve %9,9 p=0,17). Rowell çalışması 1063 TBI hastası içeriyordu ve 2020'de yayınlandı. 6 aylık nörolojik fonksiyonun değerlendirildiği çalışmada gruplar arasında fark bulunmadı. 12737 TBI hastasında yapılan ve 2019'da yayınlanan CRASH-3 çalışmasında TXA'in ilk 3 saatte yapılmasının 28 günlük kafa travması ilişikili mortalitede bir avantaj sağlamadığı ortaya çıktı. WOMAN çalışması 20060 kadında yapıldı ve 2017'de yayınlandı. Buna göre kanama nedenli mortalite TXA grubunda anlamlı olarak daha azdı (%1,5 ve %1,9, p=0,045). Kalp cerrahisinde TXA uygulaması uluslararası kılavuzlara girmiş olmakla birlikte protrombotik etki kuşkusu uzun süre endişe yaratmıştı. Güncel bilgilerimize göre herhangi bir etyolojik protromboz faktörünün olmadığı durumlarda TXA koroner arter hastasında bile güvenle uygulanabilmektedir (3). Gündemi meşgul eden bir diğer konu ise optimum doz belirsizliğidir. Bu konu her merkezin kendi uygulamalarında farklılık göstermektedir, ideal doz araştırmaları devam etmektedir ancak kalp cerrahisiiçin 20 mg/kg'lık dozun kanamayı efektif azalttığı ve komplikasyona yol açmadan güvenle uygulanabileceği vurgulanmaktadır (4). Topikal uygulamanan TXA'in de etkin olduğuna dair çalışmalar da mevcuttur (5). TXA'in renal yetmezlik durumunda doz azaltma gerekliliği ve yatkın hastalarda nöbet benzeri aktivite yapabildiği akılda tutulmalıdır.

KAYNAKLAR

1. Relke N, Chornenki NLJ, Sholzberg M. Tranexamic acid evidence and controversies: An illustrated review. Res Pract Thromb Haemost. 2021 Jul 14;5(5):e12546.
2. https://www.rattibha.com
3. Domenico Pagano, Milan Milojevic, Michael I Meesters, et al. 2017 EACTS/EACTA Guidelines on patient blood management for adult cardiac surgery, European Journal of Cardio-Thoracic Surgery, Volume 53, Issue 1, January 2018, Pages 79–111.
4. Faraoni D, Levy JH. Optimal Tranexamic Acid Dosing Regimen in Cardiac Surgery: What Are the Missing Pieces? Anesthesiology. 2021 Feb 1;134(2):143-146.
5. Ausen K, Pleym H, Spigset O. Topical tranexamic acid for prophylaxis of bleeding. Tidsskr Nor Laegeforen. 2023 Jan 2;143(1).

10:05-10:25	CONFERENCE 1	Onur Özlü
10:05-10:25	Stem cell therapy and areas of usage	Haktan Karaman
10:25-10:40	*Coffee Break*	

Stem Cell Therapy and Areas of Usage

Haktan Karaman, MD

Dicle University Faculty of Medicine, Department of Anesthesiology and Reanimation, Diyarbakır, Türkiye

Purpose of Presentation

- In this presentation, information about the application of stem cell therapy, which is becoming increasingly popular today, will be presented. In modern medicine, we see that stem cell, which has started to show promise in many diseases, and in which serious preclinical and clinical studies are carried out in diseases that cannot be treated yet, shows promise in the treatment of many diseases. What stem cells are, how they are used to treat disease and injury, and why they are the subject of such fierce debate will be covered in this presentation.

What is Regenerative Medicine?

- This name; it takes it because it enables the regeneration of damaged tissues and organs, and thus the recovery of body functions.
- Regenerative medicine is an exciting and growing field of medicine that studies the development of new living tissues to replace and repair diseased tissues, often through Stem Cell and Cellular therapies.
- Some serious injuries or chronic diseases can cause significant damage to the functional tissues of the body. In such cases, the body may fail to renew itself.
- Regenerative medicine is an important newly developed field of medicine for such patients 'to restore organ and/or tissue functions'.
- Traditional treatment methods used in the treatment of a disease usually affect all tissues in the body (Unfortunately!). In cellular treatments, only the areas of the body that need it can be treated
- The greatest aim of regenerative medicine is to use cell-based therapies, which are likely to restore the patient's health with one or two applications, in diseases whose treatment is life-long. In this way, it can improve people's quality of life and require less intervention.
- In addition, great hopes and expectations have begun that diseases that cannot be treated today will be treatable with regenerative medicine (1-8).

Prometheus

- The idea of wound repair and organ regeneration is as old as humanity and appears in the ancient Greek myth of Prometheus. Zeus, king of the Olympian gods, punishes Prometheus for his disobedience in introducing fire and knowledge to humans.
- In this legend, Prometheus is tied to a rock and eats a portion of an eagle's liver every day, only to be regenerated overnight (in a loop) (9).

IMMORTALITY

Immortality is eternal life, freedom from death, endless existence. Some modern species have biological immortalityit could be. Immortal jellyfish-like creatures have biological immortality, that isthey can (theoretically) live forever if the necessary conditions are created.

Some scientists, futurists, and philosophers have theorized about the immortality of the human body, and some have suggested that human immortality could be achieved in the first few decades of the 21st century. Others believed that extending lifespan was a more achievable goal in the short term (10).

AB-I HAYAT

In Islamic sources, aynü'l-hayât, nehrü'l-hayât, âb-ı câvidânî, âb-ı zindegî, source of life, spring of life, bengi su, water of vitality, etc., and sometimes âb-ı Hızır or âb-ı İskender (Alexander the Great) are also given, This legendary water, which is known by various names, is actually a concept that exists in all world mythologies.

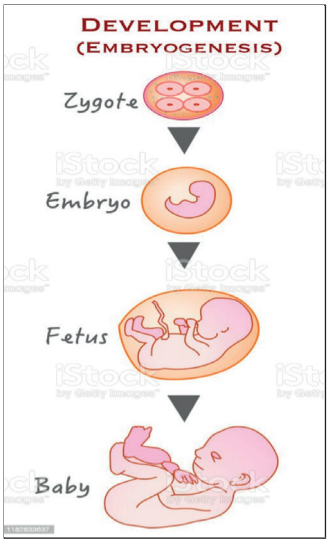
Since the appearance of man on earth, the shortness of life in almost every society, on the other hand, the strong desire to live has always inspired the idea of an eternal life. It is seen that this tendency has given birth to some mythological products in various societies and gives truly masterpieces such as the epic of Gilgamesh and the legend of Alexander, which tells about the struggles of people to seek eternal life.

The importance of water is immediately apparent in these examples. Because the importance of water in real life for all living things has a great role in the birth of the belief in the existence of water (âb-ı life) that provides such an eternal life. Its life-giving, revitalizing, constructive and invigorating feature manifested itself in various belief systems and laid the groundwork for the birth of the legend of âb-ı life, which gives immortality (11).

ALCHEMISTS

For 2500 years, alchemists had some basic goals. Their aims:

- Transforming worthless materials into gold and silver
- Finding the cure for all diseases in the universe (Panacea)
- Finding the elixir of immortality (13)



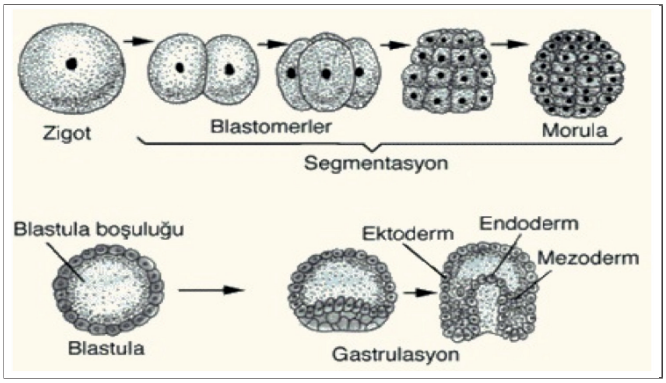
Histology-Embryology!

- Germinal period (0-2 weeks)
- Embryonic period (2nd-8th week)
- Fetal period (8th week-birth)

Germinal period (0-2 weeks)

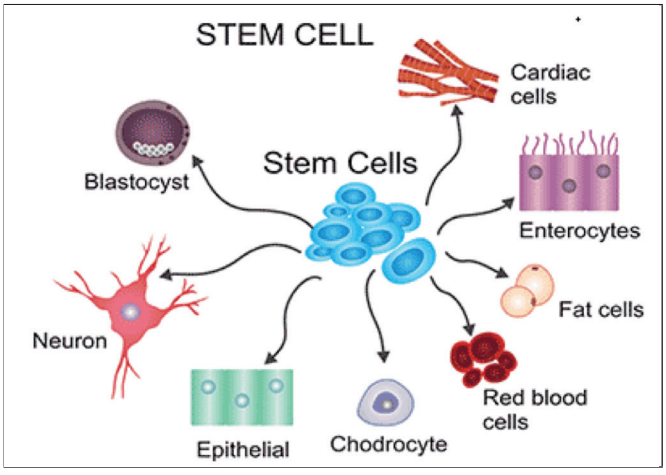
- **Morula:** It is a compacted mass consisting of 12-32 blastomeres as a result of division of the zygote. This tightening process is created by cell adhesion molecules. This stage occurs 3-4 days after fertilization as the embryo reaches the uterus.
- **Blastocyst:** After about 2-3 days, the morula enters the uterus from the tuba uterina (fallopian tube). When it enters the uterus, it transforms into a fluid-filled sac called blastocyst.
- **Implantation:** It is the process of embedding the blastocyst into the endometrium (mucous layer of the uterus). It takes an average of 6 days.

- **Gastrula:** During gastrulation, a 3-layered embryonic disc is formed (3rd week). The 3 germ layers of the gastrula (ectoderm, mesoderm, endoderm) form the tissues and organs of the embryo.
- **Neurula:** It corresponds to the 3rd and 4th weeks of early embryo development and covers the period when the neural tube develops from the neural plate (12).



WHAT IS A STEM CELL?

Stem Cells are the main cells that make up all the tissues and organs in our body. There are many different cells in an organ. When stem cells are damaged from cells in tissues or organs; It transforms into a cell and treats organs and tissues. They have unlimited divisibility abilities.



- Stem Cells are the main cells that make up all the tissues and organs in our body. There are many different cells in an organ.
- When stem cells are damaged from cells in tissues or organs; It transforms into a cell and treats organs and tissues. They have unlimited divisibility abilities.
- In fact, stem cells are constantly active and provide the regeneration of our entire body or the treatment of the necessary areas (Attention to Hibernation!). If it is directed to a certain area collectively, it provides the healing of that area.

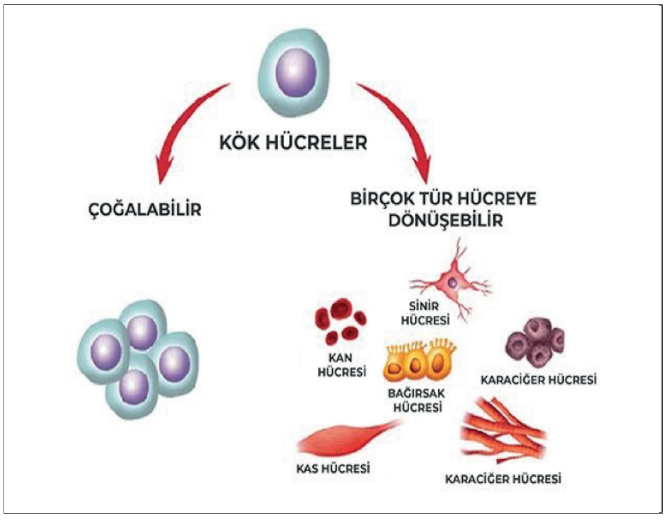
Stem Cells Must Have These Criteria

The main features of stem cells are:

a) self-renewal

b) clonality (usually originating from a single cell)

c) potency (plasticity-differentiation) (ability to differentiate into different cell types) .



These properties may differ between various stem cells. For example, blastocyst-derived embryonic stem cells (ESCs) have a greater ability for self-renewal and potency (Pluripotent), whereas stem cells found in adult tissue (Multipotent) have limited self-renewal as they do not proliferate extensively and can only differentiate into tissue-specific cells. It has a self-renewal feature.

The human body develops from the zygote and blastocyst, from which ESCs are derived into the endoderm, mesoderm and ectoderm germ layers. Specific organs arise from the germ layers. Some progenitor cells that contribute to organ formation do not differentiate terminally but remain as tissue stem cells and can be found in bone marrow, bone, blood, muscle, liver, brain, adipose tissue, skin, and gastrointestinal tract.

Tissue stem cells can be termed as progenitor cells as they give rise to terminally differentiated and specialized cells of the tissue or organ. These cells may be dormant within the tissue but proliferate under conditions of injury and repair.

The dynamics of tissue stem cells or progenitor cells vary from tissue to tissue; for example, in the bone marrow, liver, lung, and intestine, stem cells replicate regularly to support cells during normal transformation or injury, while in the pancreas, heart or nervous system, they multiply to replace damaged cells after injury.

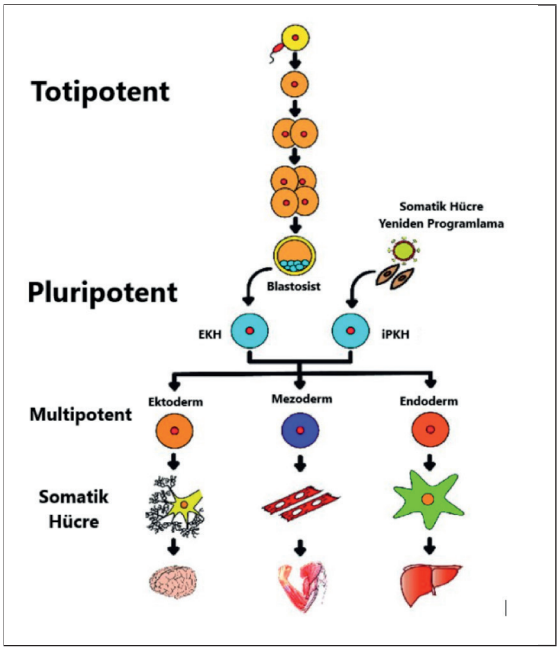
Studies involving stem cell and organ regeneration in today's medicine began with the first attempts at bone marrow transplantation in animal models in the 1950s. These pioneering studies paved the way for human bone marrow transplantation, a treatment now widely used for a variety of blood disorders. This new therapeutic strategy revealed the existence of stem cells that regenerate adult tissue.

Currently, the main focus of regenerative medicine is not only to find treatments for diseases, but also to understand the underlying biology and pathogenesis of disease. While a number of ethical issues have arisen in stem cell research, recent advances in stem cell isolation and development have allowed scientists to identify specific cell types for tissue regeneration in various diseases (such as Parkinson's, Alzheimer's, heart, muscles, lung, liver, and other organ diseases) and contributed to its cultivation (14-37).

Stem Cell Classification According to Differentiation Potential

All stem cells can be divided into 5 groups according to their differentiation potential:

- Totipotent veya Omnipotent,
- Pluripotent,
- Multipotent,
- Oligopotent
- Unipotent



TOTIPOTENT (OMNIPOTENT) CELLS

Stem cells are diverse in their ability to differentiate. The cell type with the highest differentiation ability is the zygote, which is the first state of the egg in a woman when it is fertilized with sperm. Totipotent or omnipotent cells are the most undifferentiated cells and are found in early development. A fertilized oocyte and cells of the first two divisions are totipotent cells as they differentiate into both embryonic and extraembryonic tissues to form the embryo and placenta.

In this way, a human being is born from a single cell. Within 5 days after fertilization, a hollow sphere called “blastocyst” with approximately 150 cells is formed. These cells can regenerate a human and clone a human. For this reason, studies on embryonic stem cells are prohibited by all countries.

PLURIPOTENT STEM CELLS

Pluripotent stem cells can differentiate into cells that arise from the 3 germ layers (ectoderm, endoderm and mesoderm) from which all tissues and organs develop. Pluripotent stem cells, called ESC, were first obtained from the inner cell mass of the blastocyst. Recently, Takahashi and Yamanaka reprogrammed somatic cells to produce pluripotent cells. These cells are called induced pluripotent stem cells (iPSCs) and share similar properties with ESCs. Notably, there has been no isolated population of pluripotent cells from the lung.

MULTIPOTENT CELLS

Multipotent stem cells are found in most tissues and differentiate into cells from a single germ layer. Mesenchymal stem cells (MSCs) are the most recognized multipotent cells. They can be obtained from various tissues such as bone marrow, adipose tissue, bone, Wharton’s jelly, umbilical cord blood and peripheral blood. MSCs adhere to cell culture dishes and are characterized by specific surface cell markers.

These cells can differentiate into mesoderm-derived tissues such as adipose tissue, bone, cartilage, and muscle. Recently, MSCs have been differentiated into neuronal tissue derived from ectoderm. This is an example of transdifferentiation, i.e. when a cell differentiates from a germ layer (mesoderm) into neuronal tissue (ectoderm). Tissue-resident MSCs were isolated from the lungs. however, no other multipotent cells have been isolated to date.

OLIGOPOTENT CELLS

Oligopotent stem cells can self-renew and form 2 or more lineages within a given tissue; For example, the ocular surface of pig, including the cornea, has been reported to contain oligopotent stem cells that form individual corneal and conjunctival cell

colonies. Hematopoietic stem cells are typical of oligopotent stem cells, as they can differentiate into both myeloid and lymphoid lineages. In the lung, studies suggest that bronchoalveolar duct connecting cells may give rise to bronchiolar epithelium and alveolar epithelium.

UNIPOTENT CELLS

Unipotent stem cells are self-renewing and can only differentiate into a particular cell type, forming a single lineage like muscle stem cells, giving rise to mature muscle cells and not other cells. In the lung, type II pneumocytes of the alveoli give rise to type I pneumocytes.

STEM CELL RESOURCES

1-EMBRYONIC STEM CELLS

These stem cells come from embryos three to five days old. An embryo at this stage is called a blastocyst and has about 150 cells. These are pluripotent stem cells, meaning they can divide into more stem cells or become any cell type in the body. This versatility allows embryonic stem cells to be used to regenerate or repair diseased tissues and organs.

2-ADULT STEM CELLS (=SOMATIC STEM CELLS)

These stem cells are found in most adult tissues, such as bone marrow or fat. Compared to embryonic stem cells, adult stem cells have a more limited ability to generate various cells of the body (ie they are multipotent). Until recently, researchers thought that adult stem cells could only generate similar cell types. For example, researchers thought that stem cells found in the bone marrow could only produce blood cells.

However, emerging new evidence suggests that adult stem cells can form a variety of cell types. For example, bone marrow stem cells can form bone or heart muscle cells. This research has led to early-stage clinical trials to test efficacy and safety in humans. For example, adult stem cells are currently being tested in people with neurological or heart disease.

INDUCED PLURIPOTENT STEM CELLS (iPSCs)

Using genetic reprogramming, scientists have successfully transformed normal adult cells into stem cells. By changing the genes in adult cells, researchers can reprogram the cells to act similarly to embryonic stem cells.

With this new technique, first produced by Shinya Yamanaka's working group at the University of Kyoto in 2006, researchers were able to allow researchers to use reprogrammed cells instead of embryonic stem cells and prevent new stem cells from being rejected by the immune system.

However, scientists do not yet know whether using modified adult cells will cause adverse effects in humans. The researchers were able to take ordinary connective tissue (fibroblast) cells and reprogram them to become functional heart cells. In studies, animals with heart failure who were injected with new heart cells showed improvement in heart function and survival.

PERINATAL STEM CELLS

The researchers discovered stem cells in the amniotic fluid (the fluid in which the fetus floats in the womb) as well as in the umbilical cord. It has been understood that these stem cells also have the ability to transform into certain specific cells. Amniotic fluid fills the sac that surrounds and protects a developing fetus in the mother's womb.

To test for prenatal abnormalities, the researchers determined that stem cells were present in amniotic fluid samples taken from pregnant women (a procedure called amniocentesis). However, more studies on amniotic fluid stem cells are needed to understand the potential of these cells.

MESENCHIMAL STEM CELLS

Mesenchymal stem cell is an adult multipotent stem cell type found in the connective tissues of cells. They also form the basis of the "Stroma cell", which is the support part of the tissues. Fat, bone, cartilage, muscle, tendon etc. they can differ. Mesenchymal stem cells can migrate from the tissue they are in to a damaged tissue. In this way, they provide tissue repair in damaged tissue (38-52).

OBJECTIVES IN STEM CELL RESEARCH

1-Increased knowledge of how diseases occur

By watching stem cells mature and transform into cells in bone, heart muscle, nerves, and other organs and tissues, researchers can better understand how diseases develop.

2- Testing new drugs for their safety and efficacy

Before using research drugs in humans, researchers can use certain types of stem cells to test drugs for safety and quality. Such testing will likely have a direct impact on drug development first for cardiac toxicity testing.

New areas of study include the effectiveness of using human stem cells programmed into tissue-specific cells to test new drugs. For testing new drugs to be accurate, cells must be programmed to acquire the characteristics of the cell type the drug is targeting.

Techniques for programming cells into specific cells continue to be studied. For example, nerve cells could be created to test a new drug for a neurodegenerative disease. Tests can show whether the new drug has had any effect on cells and whether cells have been damaged (53-54).

FOR WHICH DISEASES IS STEM CELL TREATMENT EXPECTED TO BE USED?
(Note: Which we already use for some of these diseases!)

Neurological Diseases

- Multiple Sclerosis (MS)
- Parkinson's disease
- Alzheimer's disease-Dementia
- ALS
- StrokeBrain and nerve damage (Paraplegia-Quadriplegia)
- Lyme disease

ALZHEIMER'S DISEASE

As of 2017, there are approximately 50 million dementia patients in the world and it has been reported that the estimated global care cost is 818 billion USD. Therefore, it can be said that dementia is one of the most important social, economic and medical problems of our age. Since age is the most important risk factor and the demographic structure is aging rapidly, this figure is expected to increase to 132 million people by 2050

Although described by Alzheimer's in 1906, the molecular identities of the two defining pathologies of the disease, the beta amyloid (Aβ) peptide found in plaques and the hyperphosphorylated tau protein found in neurofibrillary tangles (NFTs), were not identified until the mid-1980s

Stem cell therapy may be a good solution for the treatment of AD. In addition to advances in the molecular pathogenesis of this disease and in animal models, "neural stem cells (NSCs)", "embryonic stem cells (ESCs)" to be used in the treatment of AD, and "derived from bone marrow, umbilical cord, umbilical cord blood" mesenchymal stem cells (MSCs)" can be potential sources of stem cells.

Stem cell therapy for AD shows great promise. There is now substantial preclinical literature, with new studies continuing to uncover potential therapeutic mechanisms. Currently, MSC-based therapeutics are the most consistent and have reached human clinical trials (55-59)

PARKINSON DISEASE

Parkinson's disease (PD) is one of the most common of a group of progressive neurodegenerative movement disorders, with a prevalence of approximately 100-300 per 100,000. It is the second most common neurodegenerative disease.

In general, oral medications begin to lose their effect after five years. Moreover, such treatments cannot repair damaged areas; For this reason, restorative approaches should be prioritized to increase the effectiveness of treatment.

Studies

- In 2010, DA neurons differentiated from iPSCs of PD patients were transplanted into PD transgenic mice, where these neurons survived for several months and relieved PD symptoms
- ESCs are an important resource used in the laboratory to differentiate into DA neurons. DA neurons derived from rodent and human ESCs have been shown to survive and function after transplantation into the striatum of mice with PD
- MSCs were grafted into PD models without differentiation in vitro in most studies; however, the ability of bone marrow MSCs (BMSCs) to spontaneously differentiate after transplantation is low. Li et al. They injected BMSC bilaterally into the striatum of mice with MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) lesions, and these cells showed low TH (tyrosine hydroxylase) immunoreactivity, which promoted motor recovery
- MSCs isolated from umbilical cords also showed beneficial effects in 6-OHDA PD models (60-69)

AMYOTROPHIC LATERAL SCLEROSIS

Amyotrophic lateral sclerosis (ALS - also known as Lou Gehrig's disease) is a progressive, incurable neurodegenerative disease characterized by the death of both upper and lower region motor neurons in the ventral horn of the spinal cord and motor cortex. As the disease progresses, symptoms such as motor weakness, twitching, stiffness, and loss of voluntary movement control become evident. This eventually leads to paralysis.

The researchers also generated iPSCs from patients carrying the VAPB mutation as well as their healthy siblings. The finding suggested that decreased levels of VAPB protein in MNs may play a role in the pathogenesis of ALS. Testing for chemical compounds on differentiated MNs showed that the abnormal ALS MN phenotype could be rescued by anacardic acid; this suggested that specific MNs could be a new approach to elucidate ALS disease mechanisms and to screen for candidate drugs

As a result, although stem cell therapy for the treatment of ALS is still in its infancy, researchers around the world hope that treatments like this will halt the progression of the disease and increase the effectiveness of existing drug therapies (70-75)

MULTIPLE SCLEROSIS

Multiple sclerosis (MS) is a potentially progressive, autoimmune neurological disorder of the central nervous system that results from an autoimmune attack on the white matter of the central nervous system.

The few drugs approved for the treatment of MS are typically limited in their effectiveness to active forms of the disease, have little effect on slowing degeneration, and fail to promote repair. In this context, the multifactorial therapeutic benefits of stem cell therapies may be particularly convincing. Stem cell transplantation, which apparently provides neurotrophic support, immunomodulation, and cell replacement, holds great promise in tackling the complex pathology of chronic neuroinflammation

Mesenchymal stem cells are a suitable source of stem cells derived from a variety of autologous or allogeneic tissues, including bone marrow (BM-MSCs), adipose tissue (AD-MSCs), and umbilical cord (UC-MSCs). Although MSCs have been reported to be able to differentiate into non-mesodermal cells, including neurons, astrocytes, and oligodendrocytes, both in vitro and in vivo, their in vivo neural differentiation propensity is limited. MSCs from different sources or even fractions of the same cell population are highly heterogeneous, making it difficult to accurately determine their therapeutic efficacy

It has been reported that MSCs exhibit immunosuppressive properties, raising concerns that patients are potentially at risk of developing cancer. Somatic NSCs have several advantages for CNS applications over other stem cell sources; they have a low tumorigenic risk due to their neural origin, patient specificity and lack of pluripotency, and limited proliferation rates. In addition, removal of NSCs from neurogenic regions of the brain is difficult, invasive and therefore risky

Indeed, human adult neurogenesis and the existence of NSC niches in the adult human brain have been a source of controversy in the scientific community . Instead, NSCs are derived almost entirely from fetal tissues, which limits their accessibility and raises ethical concerns. These issues have led to the search and identification of alternative sources of NSCs, such as those derived from iNSCs as well as ESCs or iPSCs.

These derived NSCs mimic the properties, potency, and therapeutic potential of real NSCs, making them ideal candidates for sustaining CNS regeneration. iNSCs offer a number of potential therapeutic advantages over pluripotent sources in that they are

readily available, apparently easier, faster and more cost-effective than iPSCs, and bypass a problematic phase of pluripotency associated with tumorigenic risks (76-80).

Endocrine Diseases (81-83)

- Diabetes type 1
- Diabetic foot
- Erection problems
- Obesity

Musculoskeletal Diseases (84,85)

- Osteoarthritis
- Joint inflammation
- Sports-related injuries
- Non-union fractures
- Ligament injuries, including sprains
- Avascular necroses

Digestive System Diseases (86-89)

- Crohn's disease
- Liver Cirrhosis
- Peptic ulcer disease
- Chronic pancreatitis

Respiratory System Diseases (90-92)

- COPD
- Asthma
- Allergic rhinitis
- Sarcoidosis

Rheumatic Diseases (93-97)

- Scleroderma
- Dermatomyositis
- Rheumatoid arthritis
- SLE
- Vasculitis

Stem Cell Therapy in Cardiology (98)

- Myocardial infarction-intracoronary reperfusion
- Heart failure
- Ischemic heart disease (in intramyocardial injections)

In Women (99)

- Genital area shaping (instead of filling)
- Treatment of postmenopausal vaginal dryness and atrophy
- To induce the ovaries

Skin Rejuvenation (100)

Stem cell-assisted fat injection is a method currently used for the repair and regeneration of damaged tissue. Stem cell-assisted fat injection is used more and more every day to repair aesthetic defects such as acne scars, wrinkles for rejuvenation and aging.

With the application of adipose tissue stem cells into the skin, an improvement in skin tissue, wrinkles and skin thickness can be achieved. It can be used in aesthetic procedures such as skin aging, wrinkles, sun damage, loss of fat tissue on the skin.

HOW TO OBTAIN ADIPOSED STEM CELLS FROM ADIPOSIS TISSUE

Adult stem cells; It can be obtained from adult tissues such as adipose tissue and bone marrow by point-of-care application. Obtaining stem cells from adipose tissue has advantages such as the fact that adipose tissue contains plenty of stem cells compared to bone marrow and is very easy to obtain. As it can be understood, harvesting stem cells from the bone marrow is a laborious task.

Stem cells in the bone marrow contain less in number and at the same time stem cells with less differentiation ability. Stem cells derived from adipose tissue have a strong structure, the capacity to differentiate into various cells and structures, including vascular cells.

Therefore, they cause minimal distress to the patient due to their lack of easy accessibility and immune system stimulating substances that support vascular formation. In this case, it is considered ideal for use in regenerative medicine (101).

CONCLUSION

- After decades of research, stem cell therapy is becoming a great “GAME CHANGER” for medicine. Although there are many hurdles to be overcome, the capabilities of stem cells are increasing (or being discovered!) with each study. Regardless, the impact of stem cells in Regenerative Medicine and Transplantology is huge and will continue to grow.
- Today, there is a strong possibility that incurable neurodegenerative diseases will become treatable with stem cell therapy.
- With stem cell therapy (and all its regenerative ability), we will be able to extend human lifespan more than ‘any time in history’ (Crowded World Population, Food and Energy Access issues and many more will also be our “spoiled” issues!)

REFERENCES

1. Naranjo JD, Scarritt ME, Huleihel L, Ravindra A, Torres CM, Badylak SF Regenerative medicine: lessons from mother nature . Regen Med. 2016; 11: 767 – 775.
2. Paul K . Regenerative medicine looking backwards 10 years further on . Regen. Med 2016;11:787 – 800.
3. Fairchild PJ, Horton C, Lahiri P, Shanmugarajah K, Davies TJ . Beneath the Sword of Damocles: regenerative medicine and the shadow of immunogenicity . Regen Med 2016;11:817 – 829.
4. Alarçin E, Guan X, Kashaf SS et al. Recreating composition, structure, functionalities of tissues at nanoscale for regenerative medicine. Regen Med 2016;11:849 – 858.
5. Mengsteab PY, Nair LS, Laurencin CT . The past, present, and future of ligament regenerative engineering . Regen Med 2016;11:871 – 881.
6. Williams K, Andersson KE . Regenerative pharmacology: recent developments and future perspectives . Regen Med 2016;11:859 – 870.
7. McCormack K . Regen Med California Institute for Regenerative Medicine Profile CIRM 2.0. Regen Med 2016;11:759 – 762.
8. Evans A, Johnson S . CCRM: cultivating a culture of cooperation to advance the global regenerative medicine industry . Regen Med 2016:11:763 – 766.
9. https://en.wikipedia.org/wiki/Prometheus
10. https://en.wikipedia.org/wiki/Immortality
11. https://islamansiklopedisi.org.tr/ab-i-hayat
12. https://www.khanacademy.org/test-prep/mcat/cells/embryology/v/early-embryogenesis-cleavage-blastulation-gastrulation-and-neurulation
13. https://en.wikipedia.org/wiki/Alchemy
14. Kolios G, Moodley Y. Introduction to Stem Cells and Regenerative Medicine. Respiration 2013;85:3–10.
15. Lajtha LG: Stem cells and their properties. Proc Can Cancer Conf 1967; 7: 31–39.
16. He S, Nakada D, Morrison SJ: Mechanisms of stem cell self-renewal. Annu Rev Cell Dev Biol 2009; 25: 377–406.

17. Falanga V. Stem cells in tissue repair and regeneration. J Invest Dermatol 2012; 132:1538–1541.
18. Lane S, Rippon HJ, Bishop AE. Stem cells in lung repair and regeneration. Regen Med 2007; 2: 407–415.
19. Fausto N. Liver regeneration and repair: hepatocytes, progenitor cells, and stem cells. Hepatology 2004; 39: 1477–1487.
20. Shaker A, Rubin DC. Stem cells: one step closer to gut repair. Nature 2012; 485: 181–182.
21. Angelini A, Castellani C, Vescovo G, Thiene G. Pathological evidence of stem cell regeneration in the heart. Int J Cardiol 2004; 96: 499–504.
22. Mirotsou M, Jayawardena TM, Schmeckpeper J, Gnecchi M, Dzau VJ. Paracrine mechanisms of stem cell reparative and regenerative actions in the heart. J Mol Cell Cardiol 2011; 50: 280–289.
23. Mansergh FC, Wride MA, Rancourt DE. Neurons from stem cells: implications for understanding nervous system development and repair. Biochem Cell Biol 2000; 78: 613– 628.
24. Bouwens L. Transdifferentiation versus stem cell hypothesis for the regeneration of işlet beta-cells in the pancreas. Microsc Res Tech 1998; 43: 332–336.
25. Lodi D, Iannitti T, Palmieri B. Stem cells in clinical practice: applications and warnings. J Exp Clin Cancer Res 2011; 30: 9.
26. Dameshek W. Bone marrow transplantation; a present-day challenge. Blood 1957; 12: 321– 323.
27. de la Morena MT, Gatti RA. A history of bone marrow transplantation. Immunol Allergy Clin North Am 2010; 30: 1–15.
28. Le BK, Ringden O. Mesenchymal stem cells: properties and role in clinical bone marrow transplantation. Curr Opin Immunol 2006; 18: 586–591.
29. Chien KR. Regenerative medicine and human models of human disease. Nature 2008; 453: 302–305.
30. Inoue H, Yamanaka S. The use of induced pluripotent stem cells in drug development. Clin Pharmacol Ther 2011; 89: 655–661.
31. Fahey MC, Wallace EM. Stem cells: research tools and clinical treatments. J Paediatr Child Health 2011; 47: 672–675.
32. McCormick JB, Huso HA. Stem cells and ethics: current issues. J Cardiovasc Transl Res 2010; 3: 122–127.
33. Xi J, Zhang SC. Stem cells in development of therapeutics for Parkinson's disease: a perspective. J Cell Biochem 2008; 105: 1153–1160.
34. Perin EC, Silva GV, Zheng Y, Gahremanpour A, Canales J, Patel D, Fernandes MR, Keller LH, Quan X, Coulter SA, Moore WH, Herlihy JP, Willerson JT. Randomized, double-blind pilot study of transendocardial injection of autologous aldehyde dehydrogenase-bright stem cells in patients with ischemic heart failure. Am Heart J 2012; 163: 415–421, 421.e1.
35. Cerletti M, Jurga S, Witczak CA, Hirshman MF, Shadrach JL, Goodyear LJ, Wagers AJ. Highly efficient, functional engraftment of skeletal muscle stem cells in dystrophic muscles. Cell 2008; 134: 37–47.
36. Weiss DJ, Bertoncello I, Borok Z, Kim C, Panoskaltsis-Mortari A, Reynolds S, Rojas M, Stripp B, Warburton D, Prockop DJ. Stem cells and cell therapies in lung biology and lung diseases. Proc Am Thorac Soc 2011; 8: 223–272.
37. Rashid ST, Corbineau S, Hannan N, Marciniak SJ, Miranda E, Alexander G, Huang- Doran I, Griffin J, Ahrlund-Richter L, Skepper J, Semple R, Weber A, Lomas DA, Vallier L. Modeling inherited metabolic disorders of the liver using human induced pluripotent stem cells. J Clin Invest 2010; 120: 3127–3136.
38. Smith A. A glossary for stem-cell biology. Nature 2006; 441: 1060.
39. Rossant J. Stem cells from the mammalian blastocyst. Stem Cells 2001; 19: 477–482.
40. De Miguel MP, Fuentes-Julian S, Alcaina Y. Pluripotent stem cells: origin, maintenance and induction. Stem Cell Rev 2010; 6: 633–649.
41. Evans MJ, Kaufman MH. Establishment in culture of pluripotential cells from Mouse embryos. Nature 1981; 292: 154–156.
42. Takahashi K, Yamanaka S. Induction of pluripotent stem cells from mouse embryonic and adult fibroblast cultures by defined factors. Cell 2006; 126: 663–676.
43. Ratajczak MZ, Zuba-Surma E, Kucia M, Poniewierska A, Suszynska M, Ratajczak J. Pluripotent and multipotent stem cells in adult tissues. Adv Med Sci 2012; 57: 1–17.
44. Augello A, Kurth TB, De BC. Mesenchymal stem cells: a perspective from in vitro cultures to in vivo migration and niches. Eur Cell Mater 2010; 20: 121–133.
45. Bruder SP, Jaiswal N, Haynesworth SE. Growth kinetics, self-renewal, and the osteogenic potential of purified human mesenchymal stem cells during extensive subcultivation and following cryopreservation. J Cell Biochem 1997; 64: 278–294.
46. Prockop DJ. Marrow stromal cells as stem cells for nonhematopoietic tissues. Science 1997; 276: 71–74.
47. Friedenstein AJ, Chailakhjan RK, Lalykina KS. The development of fibroblast colonies in monolayer cultures of guinea-pig bone marrow and spleen cells. Cell Tissue Kinet 1970; 3: 393–403.
48. Barzilay R, Melamed E, Offen D. Introducing transcription factors to multipotent mesenchymal stem cells: making transdifferentiation possible. Stem Cells 2009; 27: 2509– 2515.
49. Jarvinen L, Badri L, Wettlaufer S, Ohtsuka T, Standiford TJ, Toews GB, Pinsky DJ, Peters- Golden M, Lama VN. Lung resident mesenchymal stem cells isolated from human lung allografts inhibit T cell proliferation via a soluble mediator. J Immunol 2008; 181: 4389– 4396.

50. Majo F, Rochat A, Nicolas M, Jaoude GA, Barrandon Y. Oligopotent stem cells are distributed throughout the mammalian ocular surface. Nature 2008; 456: 250–254.
51. Marone M, De RD, Bonanno G, Mozzetti S, Rutella S, Scambia G, Pierelli L. Cell cycle regulation in human hematopoietic stem cells: from isolation to activation. Leuk Lymphoma 2002; 43: 493–501.
52. Kim CF, Jackson EL, Woolfenden AE, Lawrence S, Babar I, Vogel S, Crowley D, Bronson RT, Jacks T. Identification of bronchioalveolar stem cells in normal lung and lung cancer. Cell 2005; 121: 823–835.
53. Alzheimers Association. 2015 Alzheimer's disease facts and figures. Alzheimers Dement. 2015;11:332.
54. Briggs R, Kennelly SP, O'Neill D. Clin Med (Lond). 2016 Jun;16(3):247-53. doi: 10.7861/clinmedicine.16-3-247.
55. Möller HJ, Graeber MB. The case described by Alois Alzheimer in 1911. Historical and conceptual perspectives based on the clinical record and neurohistological sections. Eur Arch Psychiatry Clin Neurosci. 1998;248(3):111-22
56. Montine TJ, Phelps CH, Beach TG, Bigio EH, Cairns NJ, Dickson DW, Duyckaerts C, Frosch MP, Masliah E, Mirra SS, Nelson PT, Schneider JA, Thal DR, Trojanowski JQ, Vinters HV, Hyman BT. National Institute on Aging-Alzheimer's Association guidelines for the neuropathologic assessment of Alzheimer's disease: a practical approach. National Institute on Aging; Alzheimer's Association.Acta Neuropathol. 2012;123:1-11
57. Fabin Han 1 2, Jianzhong Bi 3, Liyan Qiao 4, Ottavio Arancio. Stem Cell Therapy for Alzheimer's Disease Adv Exp Med Biol 2020;1266:39-55.
58. Israel MA, Yuan SH, Bardy C et al (2012) Probing sporadic and familial Alzheimer's disease using induced pluripotent stem cells. Nature 482:216–220
59. Duncan T, Valenzuela M. Alzheimer's disease, dementia, and stem cell therapy. Stem Cell Research & Therapy 2017; 8:111.
60. Lees AJ, Hardy J, Revesz T (2009) Parkinson's disease. Lancet 373:2055–2066
61. Tanner CM, Goldman SM. Epidemiology of Parkinson's disease. Neurol Clin 1996;14:317–335
62. Badger JL, Cordero-Llana O, Hartfield EM, Wade-Martins R Parkinson's disease in a dish—using stem cells as a molecular tool. Neuropharma cology 2014; 76(Pt A):88–96
63. Schondorf DC, Aureli M, McAllister FE et al. iPSCderived neurons from GBA1-associated Parkinson's disease patients show autophagic defects and impaired calcium homeostasis. Nat Commun 2014; 5:4028
64. Kim JH, Auerbach JM, Rodriguez-Gomez JA et al. Dopamine neurons derived from embryonic stem cells function in an animal model of Parkinson's disease. Nature 2002;418:50–56
65. Yang D, Zhang ZJ, Oldenburg M, Ayala M, Zhang SC. Human embryonic stem cell-derived dopaminergic neurons reverse functional deficit in parkinsonian rats. Stem Cells 2008; 26:55–63
66. Mezey E, Chandross KJ, Harta G, Maki RA, McKercher SR. Turning blood into brain: cells bearing neuronal antigens generated in vivo from bone marrow. Science 2000; 290:1779–1782
67. Li Y, Chen J, Wang L, Zhang L, Lu M, Chopp M. Intracerebral transplan tation of bone marrow stromal cells in a 1-methyl-4-phenyl-1,2,3,6tetrahydropyridine mouse model of Parkinson's disease. Neurosci Lett 2001; 316:67–70
68. Dezawa M, Kanno H, Hoshino M et al. Specific induction of neuronal cells from bone marrow stromal cells and application for autologous transplantation. J Clin Investig 2004; 113:1701–1710
69. Mathieu P, Roca V, Gamba C, Del Pozo A, Pitossi F. Neuroprotective effects of human umbilical cord mesenchymal stromal cells in an immunocompetent animal model of Parkinson's disease. J Neuroim munol 2012; 246:43–50
70. Hardiman O, Al-Chalabi A, Chio A, Corr EM, Logroscino G, Robberecht W, Shaw PJ, Simmons Z, van den Berg LH. Amyotrophic lateral sclerosis. Nat Rev Dis Primers 2017; 5;3:17071.
71. Lunn J.S, Sakowski S.A, Hur J. Feldman, E.L. Stem cell technology for neurodegenerative diseases. Ann. Neurol. 2011, 70, 353–361.
72. Raore B, Federici T, Taub J, Wu MC, Riley J, Franz CK, Kliem MA, Snyder B, Feldman E.L, Johe, K. Cervical multilevel intraspinal stem cell therapy: Assessment of surgical risks in Gottingen minipigs. Spine 2011, 36, E164–E171.
73. Dimos JT, Rodolfa KT, Niakan KK et al. Induced pluripotent stem cells generated from patients with ALS can be differentiated into motor neurons. Science 2008;321:1218–1221
74. Chen H, Qian K, Du Z et al. Modeling ALS with iPSCs reveals that mutant SOD1 misregulates neurofilament balance in motor neurons. Cell Stem Cell 2014; 14:796–809
75. Egawa N, Kitaoka S, Tsukita K et al. Drug screening for ALS using patient-specific induced pluripotent stem cells. Sci Trans Med 2012; 4:145ra104
76. Kobelt G, Thompson A, Berg J, et al. New insights into the burden and costs of multiple sclerosis in Europe. Mult Scler 2017; 23: 1123–36.
77. Smith JA, Nicaise AM, Ionescu RB, Hamel R, Peruzzotti-Jametti L, Pluchino S. Stem Cell Therapies for Progressive Multiple Sclerosis. Front Cell Dev Biol. 2021; 9;9:696434.
78. Squillaro, T, Peluso, G, Galderisi, U. Clinical trials with mesenchymal stem cells: an update. Cell Transplant 2016; 25, 829–848

79. Bortolotti F, Ukovich, L Razban V, Martinelli V, Ruozi G, Pelos B, et al. In vivo therapeutic potential of mesenchymal stromal cells depends on the source and the isolation procedure. Stem Cell Rep 2015; 4:332–339.
80. Nam H, Lee, KH, Nam DH, Joo KM. Adult human neural stem cell therapeutics: current developmental status and prospect. World J. Stem Cells 2015;7, 126–136.
81. Cao Y, Gang X, Sun C, Wang G. Mesenchymal Stem Cells Improve Healing of Diabetic Foot Ulcer. J Diabetes Res. 2017;2017:9328347.
82. Aguayo-Mazzucato C, Bonner-Weir S. Pancreatic β Cell Regeneration as a Possible Therapy for Diabetes. Cell Metab. 2018:9;27:57-67.
83. Yafi FA, Jenkins L, Albersen M, Corona G, Isidori AM, Goldfarb S, Maggi M, Nelson CJ, Parish S, Salonia A, Tan R, Mulhall JP, Hellstrom WJ. Erectile dysfunction. Nat Rev Dis Primers. 2016:4;2:16003.
84. Primorac D, Molnar V, Rod E, Jeleč Ž, Čukelj F, Matišić V, Vrdoljak T, Hudetz D, Hajsok H, Borić I. Knee Osteoarthritis: A Review of Pathogenesis and State-Of-The-Art Non-Operative Therapeutic Considerations. Genes (Basel). 2020:26;11:854.
85. Xu Y, Jiang Y, Xia C, Wang Y, Zhao Z, Li T. Stem cell therapy for osteonecrosis of femoral head: Opportunities and challenges. Regen Ther. 2020: 28;15:295-304.
86. Carvello M, Lightner A, Yamamoto T, Kotze PG, Spinelli A. Mesenchymal Stem Cells for Perianal Crohn's Disease. Cells. 2019:23;8:764.
87. Wang J, Sun M, Liu W, Li Y, Li M. Stem Cell-Based Therapies for Liver Diseases: An Overview and Update. Tissue Eng Regen Med. 2019: 21;16:107-118.
88. Ahmed SM, Morsi M, Ghoneim NI, Abdel-Daim MM, El-Badri N. Mesenchymal Stromal Cell Therapy for Pancreatitis: A Systematic Review. Oxid Med Cell Longev. 2018:18;2018:3250864.
89. Saleh M, Sohrabpour AA, Mehrabi MR, Seyhoun I, Vaezi AA. Therapeutic approach of adipose-derived mesenchymal stem cells in refractory peptic ulcer. Stem Cell Res Ther. 2021:26;12:515.
90. Trounson A, Courtney McDonald C. Stem Cell Therapies in Clinical Trials: Progress and Challenges. Cell Stem Cell. 2015: 2;17:11-22
91. Qin H, Zhao A. Mesenchymal stem cell therapy for acute respiratory distress syndrome: from basic to clinics. Protein Cell. 2020:11:707-722
92. Kim R, Meyer KC. Therapies for interstitial lung disease: past, present and future. Ther Adv Respir Dis. 2008:2:319-38.
93. Hayward K, Wallace CA: Recent developments in anti-rheumatic drugs in pediatrics: treatment of juvenile idiopathic arthritis. Arthritis Res Ther 2009: 11:216.
94. Snowden JA, Passweg J, Moore JJ, Milliken S, Cannell P, Van Laar J, Verburg R Szer J, Taylor K, Joske D. Autologous hemopoietic stem cell transplantation in severe rheumatoid arthritis: a report from the EBMT and ABMTR. J Rheumatol 2004:31:482-488.
95. Jallouli M, Frigui M, Hmida MB, Marzouk S, Kaddour N, Bahloul Z. Clinical and immunological manifestations of systemic lupus erythematosus: study on 146 south Tunisian patients. Saudi J Kidney Dis Transpl 2008:19:1001-1008.
96. Katsara M, Matsoukas J, Deraos G, Apostolopoulos V: Towards immunotherapeutic drugs and vaccines against multiple sclerosis. Acta Biochim Biophys Sin (Shanghai) 2008: 40:636-642.
97. Mezey E, Chandross KJ, Harta G, Maki RA, McKercher SR. Turning blood into brain: cells bearing neuronal antigens generated in vivo from bone marrow. Science 2000:290:1779-1782.
98. Guo R, Morimatsu M, Feng T, Lan F, Chang D, Wan F, Ling Y. Stem cell-derived cell sheet transplantation for heart tissue repair in myocardial infarction. Stem Cell Res Ther. 2020:8;11:19.
99. Takahashi A, Yousif A, Hong L, Chefetz I. Premature ovarian insufficiency: pathogenesis and therapeutic potential of mesenchymal stem cell. J Mol Med (Berl). 2021:99:637-650.
100. Gaur M, Dobke M, Lunyak VV. Mesenchymal Stem Cells from Adipose Tissue in Clinical Applications for Dermatological Indications and Skin Aging. Int J Mol Sci 2017: 20;18:208.
101. Kunze KN, Burnett RA, Wright-Chisem J, Frank RM, Chahla J. Adipose-Derived Mesenchymal Stem Cell Treatments and Available Formulations. Current Reviews in Musculoskeletal Medicine 2020; 13:264–280.

10:40-10:55 (Panel VI)

10:40-12:00	PANEL VI: NUTRITION	Ali Alagöz, Dilek Kazancı, Ünase Büyükkoçak
10:40-10:55	Metabolic stress and starvation	Deniz Erdem
10:55-11:10	Management of the patient with dysphagia	Onur Özlü
11:10-11:25	Protein and energy targets in critical ill patients	Çetin Kaymak
11:25-11:40	Micronutrients	Birgül Yelken
11:40-12:00	Discussion	
12:00-13:00	*Lunch Break*	
13:00-13:20	About bread	Mine Ataman

Metabolic Stress and Starvation

Deniz Erdem, MD

University of Health Sciences, Ankara City Hospital, Department of Intensive Care Unit, Ankara, Türkiye

Introduction: Our body's response to metabolic stress depends on the magnitude and duration of the stress. Metabolic changes occur in the body, whether stress is simple due to altered food intake or activity level, or multifaceted due to trauma or illness. Therefore, nutritional therapy in stress-related hunger is also important.

Metabolism: It includes the conversion of metabolites to each other, the biochemical pathways in which this conversion takes place, and the mechanisms that regulate the metabolite flow in the pathways. When the human body is under stress, some changes occur in its metabolism.

Metabolic stress is the catabolic response to acute injury or illness caused by trauma, burns, severe inflammation, cancer, sepsis, and hypoxic events. metabolic responses; They cause fluid shift as well as hormone release, synthesis of acute phase proteins, hypermetabolism, increase in gluconeogenesis and glucose production.

There are 3 phases of metabolic stress:

1. Ebb phase: Occurs within 2-48 hours after injury. It is characterized by reduced oxygen delivery to tissues and shock.

2. Flow phase: Metabolism increase, catabolism and changes in immune response are observed.

3. Recovery phase: An increase in anabolism and a decrease in stress occur. (1,2)

Starvation (an adaptive process): Starvation is a pathological process in which there is insufficient food intake to meet the demands. If prolonged, starvation leads to malnutrition. A normal person can adapt to inadequate intake by re-adjusting their food use. Therefore, harmful effects on metabolism, recovery and organ function may not be apparent for several weeks. The most important protective response of the host is 'protein sparing'. Most of the energy (90 to 95 percent) comes from fat and only five percent comes from protein.

Food intake in humans is an intermittent process, but energy is constantly expended. Therefore, humans adapt well to short-term or long-term starvation by utilizing their reserve stores of carbohydrates, fats, and protein and by mechanisms that reduce energy expenditure as well as conserve protein. (3)

Simple starvation: Fasting that is shorter than 72 hours is simple starvation. The body uses its stores when food intake is lost. With short fasting periods, insulin decreases and glucagon and catecholamine secretion increases, leading to glycogenolysis and lipolysis. The glucose requirement of the brain and erythrocytes is met initially from glycogenolysis (24 hours), then from gluconeogenesis. The metabolic rate initially increases, but begins to decrease after 2 days. During simple fasting, albumin concentration does not change, but plasma proteins with shorter half-lives may decrease. (3)

Prolonged fasting: After 72 hours, insulin levels drop further. Glycogen levels drop and essential glucose is derived from gluconeogenesis. Since fatty acids cannot be converted to glucose, this process in the liver and kidney depends on the continuation of precursor amino acids in muscle, glycerol from adipose tissue, and lactate (Cori cycle) from anaerobic glycolysis in muscle. The brain uses ketone bodies, which are released as energy in the absence of glucose. Due to decreased muscle activity, increased sleep and decreased core body temperature, the energy requirement also decreases gradually.(3)

Stress starvations: It occurs when the individual is not only starved but also exposed to a metabolic response to trauma, sepsis, and critical illness. The metabolic rate rises instead of falling, ketosis is minimal, protein catabolism is accelerated to meet the demands of tissue repair and gluconeogenesis, and there is hyperglycemia and glucose intolerance. Salt and water retention is exacerbated and this can cause a kwashiorkor-like condition with edema and hypoalbuminemia.

The body's metabolic responses depend on the level of stress. Glucogon, cortisol, epinephrine, and norepinephrine trigger the 'fight or flight' response. The degree of hypermetabolism and catabolism depends on both the degree of injury and the host response to injury. The hormonally induced metabolic response produces a marked increase in energy demands and changes in nutrient use, with 50 percent from fat, 30 percent from carbohydrates and 20 percent (or more) from protein. An energy deficit is common. The increased use of protein for fuel goes against normal nutrient-partitioning principles and rapidly depletes body lean mass.(4)

Assessment of Nutritional Needs: An accurate assessment of nutritional demands is essential to optimally address protein and energy deficits.

1. energy or calorie requirements;
2. protein requirements;
3. Micronutrient requirements must be determined correctly.(5)

Nutritional therapy: Enteral nutrition (EN) and parenteral nutrition (PN) can be safely administered to patients experiencing high metabolic stress. Indirect calorimetry is very useful in these patients. While EN is performed earlier and more widely, PN is applied to malnourished patients who are not fed for more than 7 days and to major surgery patients who cannot undergo EN. In these patients, overfeeding should be avoided in order not to cause an increase in CO2 production and hyperglycemia.

Energy recommendations:

a. BMI> 30 →22-25 kcal/kg ideal body weight (IBW)

b. Normal BMI → 22-25 kcal/kg actual body weight (BW)

In stress starvation, the body's nutritional requirements increase:

1. Glutamine: 0.3-0.4 g/kg/day
2. Branched-chain amino acids (BCAA): isoleucine, leucine, valine metabolized in skeletal muscle
3. Antioxidants: vitamin C and E, selenium, copper and zinc added intravenously
4. Fiber: added to prevent diarrhea and protect bacteria in the gastrointestinal tract.(5)

Evaluation of nutrition: Evaluation of protein metabolism is important, especially in the treatment of stress starvation. Accordingly, the half-lives and concentrations of serum proteins are accepted as criteria in the case of nutrition. In addition, ion concentrations, trace elements and vitamins should be closely monitored.

REFERENCES

1. L.Tappy, M M Berger, R L Chiolero. Nutrition and stres. Ann Med Interne. 2000 Nov;151(7):584-593
2. Wu G. Metabolic response to surgical stress and therapeutic perspectives. Honghua Wei Chang Wai Ke Za Zhi. 2016 Mar;19(3):253-5Z
3. Barendregt K, Soeters P, Allison S, Sobotka L. Basics in clinical nutrition: Simple and Stress starvation. e-SPEN 2008;3: e267-e271
4. Buono R,Longo V D. Starvation, Stress Resistance, and Cancer. Trends Endocrinol Metab.2018 Apr;29(4):271-280
5. Singer P, Blaser A R Berger M M, Alhazzani W, Calder P C, Casaer M P. ESPEN guideline on clinical nutrition in the intensive care unit. Clinical Nutrition.38 (2019) 48e79

10:55-11:10 (Panel VI)

10:40-12:00	PANEL VI: NUTRITION	Ali Alagöz, Dilek Kazancı, Ünase Büyükkoçak
10:40-10:55	Metabolic stress and starvation	Deniz Erdem
10:55-11:10	Management of the patient with dysphagia	Onur Özlü
11:10-11:25	Protein and energy targets in critical ill patients	Çetin Kaymak
11:25-11:40	Micronutrients	Birgül Yelken
11:40-12:00	Discussion	
12:00-13:00	*Lunch Break*	
13:00-13:20	About bread	Mine Ataman

Yoğun Bakımda Disfaji

Onur Özlü, MD

TOBB-ETÜ Üniversitesi, Tıp Fakültesi, Anesteziyoloji ve Reanimasyon Anabilim Dalı, Ankara, Türkiye

GİRİŞ

Disfaji, gıdaların ağız boşluğundan yemek borusu aracılığı ile mideye geçiş sürecinde yaşanan güçlüktür. Yutulmak istenen materyalin normal geçişinde zorluk hisssedilir. Yutmanın başlangıç dönemindeki zorluk orofaringeal disfaji, mideye geçişteki zorluk özofageal disfaji olarak adlandırılır (1,2).

Genel populasyonda % 11 sıklıkta gözlenir. Sıklık yaş ile beraber artar ve yaşlılarda sıklığı % 30-40 kadardır ve bakım evinde kalanlarda % 60'a kadar yükselir (2). İnme hastalarının %40-70'inde nörodejeneratif hastalıklarda %60-80, baş-boyun kanseri nedeni ile radyoterapi uygulanan hastalarda % 65-70 sıklıkta gelişir (1,2).

YUTMA FİZYOLOJİSİ

Yutma eylemi oral faz (hazırlık dönemi ve transport dönemi), faringeal faz ve özofageal fazlardan olur. Oral faz motor korteks tarafından kontrol edilen istemli hareketlerden olurken diğer fazlar refleks olarak gerçekleşir. Yutma merkezi beyin sapında yutma refleksini yöneten retiküler sistemdedir; yutma refleksinin aferent yolağı V, IX ve X. kafa çiftlerinin ağız, farinks ve özofagusdan kalkan duyu dalları, eferent yolağı ise farinks ve özofagus kaslarını inerve eden V, VII, IX, X ve XII. kafa çiftleri ile C1-C3 spinal sinirlerdi (2-4).

DİSFAJİ NEDENLERİ (3,4)

Orofaringeal disfaji: Nörolojik hastalıklar (%80), neoplastik lezyonlar, diş bozuklukları, güçsüzleşmiş kaslar ve ağız kuruluğuna bağlı çiğneme bozuklukları ile yiyeceklerin transportunun azalması, öksürük refleksinin zayıflaması, larinksin hava yolunu koruyan fonksiyonunun bozulması.

Özofageal disfaji: Sindirim sistemi hastalıkları (%85), özofagusun organik darlıkları (neoplazmalar, divertikül, koroziv madde yanıklarından sonra stenoz, özofageal ring, özofageal web, inflamasyon sonrası ve ilaçlara bağlı ülseratif darlıklar.

Motor bozukluklar: kardiya spazmı, diffüz özofagus spazmı, gastroözofageal reflü.

Diabetes mellitus, hipotiroidizm ve kronik bağ dokusu hastalıkları gibi sistemik hastalıklar da özofageal disfaji nedenleridir**.**

NÖROJENİK DİSFAJİ

Santral sinir sisteminde; akut serebral iskemi, beyin tümörü, beyin hasarı, bulber ve psödobulber sendrom, nörodejeneratif hastalıklara bağlı çeşitli seviyelerdeki hasarlar, ayrıca

miyastenia gravis, miyastenik sendrom. nöromusküler kavşak patolojileri ve Guillain-Barré sendromu, botulizm, jögren sendromu, amiloidozis, difteri, sarkoidoz, polimiyelitin yol açtığı periferik nöropatiler nörojenik disfaji nedenlerindendir (1).

KLİNİK BELİRTİLER

Ağız ve boğazda gıda kalıntısı, yutma başlangıcında zorlanma, yemek süresinin uzaması, yemek sırasında boğulma ve öksürük, artmış öğürme refleksi, kilo kaybı, tat ve koku kaybı, retrosternal ağrı, göğüste yanma, tükrüğün akması klinik belirtilerdir. Solunum, yutma ve fonasyon aynı kas guruplarını ilgilendirdiği için dizartri sık gelişir (1, 4).

KLİNİK SONUÇLARI

En önemli klinik sonuç kolonize sekresyonların, mide içeriğinin ve beslenme sırasında yiyeceklerin aspirasyonu ile gelişen aspirasyon pnömonisidir. Malnütrisyon ve dehidratasyon diğer önemli sonuçlardır. Malnütrisyona bağlı immunitenin zayıflaması ile infeksiyonlara yatkınlık gelişir. Aspirasyon pnömonisi, malnütrisyon ve dehidratasyon morbidite ve mortaliteyi arttırır (5-7).

YOĞUN BAKIM

Yoğun bakım ünitelerinde yatan hastalarda; endotrakeal entübasyon varlığı ve entübasyon süresi, hastanın yaşı, düşük kardiyak output, postoperatif dönemde akciğer komplikasyonları, sonda ile beslenme, sepsis, transözofageal ekokardiyografi, sigara kullanımı, eşlik eden sistemik hastalıklar (hipertansiyon, KOAH, kalp yetmezliğ vb), endotrakeal tüp boyutu gibi faktörlerin disfaji riskini arttırdığı çeşitli çalışmalarda bildirilmiştir (2,6). Bu risk faktörleri için çelişkili sonuçlar olmakla beraber, Zuercher P ve arkadaşlarının (6) prospektif gözlemsel çalışma verilerinin Post-hoc analizi; nörolojik hastalık, yoğun bakıma acil yatış ve mekanik ventilasyon süresinin, mekanik ventilasyon sonrası disfaji gelişmesi için bağımsız risk faftörleri olduğu sonucunu vermiştir. Beslenme amaçlı mide sondası varlığı ile uzamış renal replasman tedavi sürelerinin ekstübasyon sonrası disfaji gelişmesi için risk olmasını, hastalığın şiddetine ve mekanik ventilatör desteğinin uzamış olmasına bağlı olduğu bununla beraber vücud kitle indeksinin, uygulanan propofol ve midazolam gibi sedatif hipnotiklerin toplam dozları ile cinsiyetin risk faktörü olmadığı bildirilmiştir (6).

GERİYATRİK DİSFAJİ

Avrupa Geriatrik Tıp Derneği (The European Society of Geriatric Medicine) disfajiyi geriyatrik semptom olarak tanımlar. Ağız ve boğazdaki duyu reseptörlerinin hassasiyetlerinde azalma, yutma fonksiyonu ile ilgili kasların zayıflaması, boyun konnektif dokusunun elastikiyetinde azalma, tükürük üretiminde azalma, koku ve tat duyusunun bozulması, hiyoid kıkırdak ve larinks mobilitesindeki bozulmalar geriyatrik populasyonda disfaji nedenleridir (7).

Disfaji 80 yaşın üzerindeki bütün yaşlılarda belirti, bulgu ve risk faktörleri olmasa da akılda bulundurulmalıdır. 65 Yaş üzerinde ise risk varlığında veya herhangi bir belirti veya bulgu varlığında disfaji akla gelmelidir. Polifarmasi, kognitif disfonksiyon, uzamış hospitalizasyon, sarkopeni ve frajilite geriatrik yaş grubunda risk faktörleridir. Uzamış yutma zamanı, faringeal fazın gecikmesi, beslenme sırasında baş ve postür değişiklikleri, alt solunum yolu enfeksiyonu bulguları, yılda 3 defadan fazla pnömoni hikayesi, beslenme sırasında ve sonrasında puls oksimetre ile oksijen saturasyonunun azalması disfaji ve aspirasyonun önemli belirti ve bulgularıdır (7).

KLİNİK TANI

Sıvı gıdaların disfajisi orofaringeal faz için, katı gıdaların disfajisi özofageal faz için tipik belirtilerdir. Disfaji için klinik değerlendirme risk faktörleri ile ilgili belirtileri de sorgulayan ayrıntılı anamnez, disfaji bulgularının değerlendirilmesi ve yatak başında yutma testi, nörolojik, kardiyopulmoner, gastrointestinal, diş, kas iskelet sistemini kapsayan genel sistemik muayene yapılmalıdır(7,8).

TARAMA TESTLERİ

Yatak başı yutma testleri; su yutma testi, hacim viskozite yutma testi (5, 10, 15 ml ve üç farklı viskozitede, VVST), katı, yarı katı ve sıvı gıdalarla yutkunma- yutma tarama testi (GUSS) sırasında puls oksimetre ile aspirasyon belirtileri gözlenir. GUSS ve VVST günlük hayatta tüketilen gıdalarla olan gerçek yutma fonksiyonuna benzediği için tercih edilen yatak başı yutma testleridir. GUSS ve VVST ile değerlendirme sırasında aspirasyon riskini azaltır (4,5).

CİHAZLARLA YAPILAN TESTLER

Yapılacak olan incelemeye farklı uzmanlık alanlarının ortak değerlendirmesi ile karar verilir. Altta yatan patoloji, disfajinin tipi, hastanın özellikleri, ve kurumun teknik olanakları dikkate alınır. Yutmanın videofloroskopi (VF) ve flesibl fiberoptik endoskopi (FFES) ile değerlendirilmesi orofaringeal disfajinin değerlendirilmesi için altın standarttır.

Özofageal disfajinin incelenmesi için baryumlu faringoözafagoskopi/özafagoskopi, üst gastrointestinal sistem endoskopisi ve manometri (mümkünse rezolüsyon manometrisi) önerilen metodlardır. İlk olarak baryumlu radyografi ile yapısal ve inflamatuvar nedenler dışlandıktan sonra manometri ile motilite değerlendirilir. Özellikle dirençli disfaji vakalarında endoskopi önerilir. Manyetik rezonans görüntüleme (MRI), bigisayarlı tomografi (BT), sintigrafi de tanıda yol gösterir(4).

DİSFAJİNİN TEDAVİSİ

Disfaji tedavisinde hedef aspirasyonu ve komplikasyonlarını önlemektir. Adaptif, kompansatuvar ve rehabilitasyon ile ilgili uygulamalar vardır. Diyetisyen ile görüşerek gıdaların gıdaların özellikleri yutmayı kolaylaştırması sağlanır. Sıvı gıdalar daha konsantre duruma getirilir veya katı gıdalar parçalanarak yutma kolaylaştırılır. Yiyecekler ağızdaki reseptörleri aracılığı ile yutmarefleksini uyarır. Ağız kuruluğu varsa mukozanın nemlenmesini sağlamak, buz küplerinin emdirilmesi, sakız çiğnetilmesi, soğuk içecekler adaptif işlemlerdendir. Kompansasyon uygulamaları fizyoterapistin yaklaşımını gerektirir. Vücudun yutmayı kolaylaştıracak pozisyonu alması, yiyeceklerin ağız boşluğunun arkasına alınmasını sağlanarak, termal ve taktil uyarılar verilir. Havayolunu sindirim yolundan ayırmak için trakeal fistül açılması, beslenme amacı ile gastrostomi yapılması radikal uygulamalardır (4,8).

Gastroözofageal reflü, özofagusun motilite bozukluklarında farmakolojik tedavi uygulanır. Nitratlar, kalsiyum kanal blokörleri, kas gevşeticiler, trisiklik atidepresanlar alt özofagus sfinkterini gevşetir. Metoklopramid ise alt özofagus sfinkter tonusunu arttırır (4).

SONUÇ

Disfaji yoğun bakım hastalarında sık görülmekte ve komplikasyonları nedeni ile hastanede yatış süresini ve mortaliteyi attırmaktadır. Disfaji taraması kurumların kaynaklarındaki kısıtlılıklar nedeni ile yoğun bakımlardaki standart bakımlar arasında değildir. Belirlenmiş disfaji risklerinin varlığının disfaji taraması olarak uygulandığı ve entübasyon sonrası gelişen disfajinin yeterince tanınamayan bir problem olarak devam ettiği ileri sürülmektedir. Disfajinin yoğun bakımlarda farkındalığının artması ve sistematik tarama protokollerinin uygulanması disfajinin neden olduğu morbidite ve mortalite sıklığını azaltabilir görüşündeyiz.

KAYNAKLAR

1. Sommer AD. Dysphagia. Part 1: General issues. Anaesthesiol Intensive Ther 2020; 52(3): 226–32.
2. Zuercher P, Moret CS, Dziewas R, Schefold JC. Dysphagia in the intensive care unit: epidemiology, mechanisms, and clinical management. Critical Care 2019; (23):103-14.
3. Dysphagia Global Guidelines & Cascades. www.worldgastroenterology.org/UserFiles/file/guidelines/dysphagia.
4. Ambrosı DM, Lee YT. Rehabilitation of Swallowing Disorders. In: Cifu DX, editor, Braddom's Physical Medicine and Rehabilitation 6. Edition, Philadelphia: Elsevier, 2021;(3)53-67.
5. Brodsky MB, Pandian V, Needham DM. Post-extubation Dysphagia: A Problem needing multidisciplinary efforts. Intensive Care Med. 2020 J; 46(1): 93–96.
6. Zuercher P, Schenk NV, Moret C, Berger D, Abegglen R, Schefold JC. Risk factors for dysphagia in ICU patients following invasive mechanical ventilation. Chest 2020; 158(5):1983-91.
7. Umay E, Eyigor S, Bahat G ve ark. Best Practice Recommendations for Geriatric Dysphagia Management with 5 Ws and 1H. Ann Geriatr Med Res 2022;26(2):94-124.
8. Sommer AD. Dysphagia.Part 2: Dysphagia in intensive care patient. Anaesthesiol Intensive Ther 2020; 52, 3: 233–36 .

13:20-13:35 (Panel VII)

13:20-14:40	PANEL VII: NEUROANESTHESIA	Nermin Göğüş, Ivana Budić, Ülkü Aypar
13:20-13:35	Perioperative temperature management	Biljana Kuzmanovska
13:35-13:50	Perioperative cognitive dysfunction in pediatric patients	Ayça Dumanlı Özcan
13:50-14:05	New guidelines in pediatric neurotrauma	Dusica Simic
14:05-14:20	Neuroprotective anesthesia and safe brain initiative	Nevriye Salman
14:20-14:40	Discussion	
14:40-14:55	*Coffee Break*	

Perioperative Temperature Management

Biljana Kuzmanovska, MD

University SS Cyril and Methodius, Skopje, Macedonia

The prevention and treatment of perioperative hypothermia is an important part of anesthesia care. Understanding the principles of human body thermoregulation, mechanisms that lead to perioperative hypothermia, and adverse effects of hypothermia is of essential importance for anesthesia providers. As stated by American Society of Anesthesiologist (ASA), every patient subjected to anesthesia should have temperature monitoring due to suspected, intended or anticipated changes in body temperature (1). Hypothermia is defined as patient's core temperature below 36.0°C, and preoperatively it is assumed that approximately 20% of the patients acquired inadvertent hypothermia (2). Normal temperature range is between 36.5°C to 37.5°C, but during anesthesia it can decline below 35.0°C. On one hand, hypothermia is generated by the cold operation theater environment, and on the other hand, by anesthesia modified thermoregulation mechanisms, anesthesia generated peripheral vasodilatation, intravenous fluids temperature and the field of operation (3). Hypothermia leads to increased perioperative morbidity, expanded surgical site infections, and increased surgical bleeding. Hypothermia shifts the oxyhemoglobin dissociation curve to the left, thus decreasing the available oxygen to the tissues, and along with shivering which occurs as a result of heat production and goes along with oxygen consumption that promote anaerobic metabolism, leads to increased lactates and lactic acidosis respectively. Lactic acidosis promotes coagulopathy. Furthermore, hypothermia decreases the drug metabolism and alters the drug effects. Additionally, with all these probable complications, hypothermia might increase the length of hospital stay and might lead to lower patient's satisfaction (4-7). Due to everything above mentioned it is essential to prevent inadvertent perioperative hypothermia, moreover this inadvertent hypothermia should differ from the intentional induction in hypothermia for medical reasons. Despite this knowledge, application of warming strategies remains not consistent.

Keywords: Thermoregulation, perioperative hypothermia

REFERENCES

1. American Society of Anesthesiologists. 2010. Standards for basic anesthetic monitoring. http://www.asahq.org/For-Healthcare-Professionals/
2. Kurz A. Physiology of thermoregulation.Best Pract Res Clin Anaesthesiol.2008;22(4):627–644.
3. Frank SM, Fleisher LA, Breslow MJ, et al. Perioperative maintenance of normothermia reduces the incidence of morbid cardiac events. A randomized clinical trial. JAMA. 1997;277(14):1127–1134.
4. Hart S, Bordes B, Hart J, et al. Unintended Perioperative Hypothermia. Ochsner J. 2011 Fall; 11(3): 259–270. 5. Schmied H, Kurz A, Sessler DI, et al. Mild hypothermia increases blood loss and transfusion requirements during total hip arthroplasty. Lancet. 1996;347 (8997):289–292.
5. Peng RY, Bongard FS. Hypothermia in trauma patients.J Am Coll Surg. 1999;188(6):685–696.
6. Perioperative hypothermia (inadvertent): the management of inadvertent perioperative hypothermia in adults, NICE Clinical Guideline 29, 2008 London National Institute for Health and Clinical Excellence. http://www.nice.org.uk/CG065

13:35-13:50 (Panel VII)

13:20-14:40	PANEL VII: NEUROANESTHESIA	Nermin Göğüş, Ivana Budić, Ülkü Aypar
13:20-13:35	Perioperative temperature management	Biljana Kuzmanovska
13:35-13:50	Perioperative cognitive dysfunction in pediatric patients	Ayça Dumanlı Özcan
13:50-14:05	New guidelines in pediatric neurotrauma	Dusica Simic
14:05-14:20	Neuroprotective anesthesia and safe brain initiative	Nevriye Salman
14:20-14:40	Discussion	
14:40-14:55	*Coffee Break*	

Perioperative Cognitive Dysfunction in Pediatric Patients

Ayça Dumanlı Özcan

Ministry of Health, Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

Paracelsus's statement is self-explanatory for anesthetic agent exposure. 'All things are poisonous, and noting is without poison only the dose makes a thing not poisonous.' It was clear that not only the dose but also the exposure time can be effective in toxication.

Multiple, but not single, exposures to procedures requiring general anesthesia before age 3 year are associated with a specific pattern of deficits in some neuropsychological tests (1). To provide more definitive evidence to address the clinical relevance of anesthetic neurotoxicity in children, an interdisciplinary team of investigators designed and developed the Pediatric Anesthesia Neuro Development Assessment (PANDA) project (2). In another study, general anesthesia compared to spinal anesthesia (GAS) concluded that GA less than 1 hour in early infancy would not alter neurodevelopmental outcome at age 5 years compered to awake-regional anesthesia. Data from animal experiments have provided ample evidence that general anesthetics can cause neurotoxic changes of developing brain (3).

The recent PANDA, GAS and MASK studies explained that a single exposure to general anesthesia lasting less than 1-hour early infancy is not associated with an increased risk in neurodevelopmental deficits in later childhood.

For the USA, the Food and Drug Administration (FDA) recently recommended cautious indications for anaesthesia and surgery in children aged less than 3 years (4).

In Europe, the ESA launched an initiative, the EUROpean Safe Tots Anaesthesia Research (Eurostar) Initiative Task Force to promote translational research on anaesthesia neurotoxicity and long-term outcomes after pediatric anaesthesia and surgery (4).

Recent findings suggested that anesthetic neurotoxicity is not a major contributor to adverse neurodevelopmental outcomes for most healthy children who require surgery. Biological, environmental, and social factors are of far greater import. The mother's education had an impact on the neurocognitive outcome in children. It was not finded that premature, the duration of sevoflurane exposure, and the age of children had a significant effect on the neurocognitive outcome (5).

Postoperative Cognitive Dysfunction

Postoperative cognitive dysfunction (POCD) has been defined as a subtle impairment of memory, concentration, and speed of information processing after surgery. Postoperative delirium (POD) is an adverse postoperative complication that can occur in patients of any age, from children to the elderly (4).

In the adult population, geriatric patients are especially vulnerable to delirium due to the neuron loss in the neocortex and hippocampus during aging. İn the developing brain, the opposite process takes place over the first 3 years. During that period, the development of cholinergic function and the hippocampus might put young children at a significantly greater risk for PD (4).

Fifty-eight children aged 5-14 years were randomized to propofol (total intravenous anesthesia) or isoflurane for day-case dental procedures. Propofol and isoflurane have similar adverse effects on reaction time, psychomotor coordination, and visual memory. Delayed verbal recall was significantly impaired only after propofol (6).

In school age children, it was compared with sevoflurane, children given propofol had visual memory deficits at 1 week, but recovered at 3 months, after elective hernia surgery (7).

179 children aged 5-10 years were randomly assigned to receive buccal midazolam and the results showed that significant short-term impairment of children's cognitive function and amnesia enduring for 48 h after low-dose midazolam premedication (8). For future studies, we need carefully designed and adequately powered clinical trials testing reasonable intervention in suitable patient populations.

Emergence Delirium

Very early onset of POD in the immediate post anaesthesia period before or on arrival at the recovery room is referred to as 'emergence delirium'. In children, pediatric emergence delirium (paedED) may present with purposeless agitation with kicking, absence of eye contact with caregivers or parents (with eyes staring or averting), inconsolability and absence of awareness of the surroundings. It is reported that the incidence of ED in children anesthetized with sevoflurane is up to 80%, much higher than that in adults (4).

PaedED was defined as a disturbance in a child's awareness of and attention to his or her environment with disorientation and perceptual alterations including hypersensitivity to stimuli and hyperactive motor behavior in the immediate postanesthetic period.

Risk Factors of Emergence Delirium

Younger age, no previous surgery, ophthalmology procedures, otorhinolaryngology procedures, volatile anesthetics such as sevoflurane, and preoperative anxiety, male sex, preoperative anxiety are risk factors of emergence delirium.

Emergence Delirium reduced by intraoperative opioids, benzodiazepine, and alpha 2 adrenergic agonists.

Emergence Agitation

Emergence agitation is an umbrella term, and is affected by emergence delirium, pain, and several other factors. The term 'emergence agitation' should not be used interchangeably with paedED because agitation is excessive motor activity, is more common than paedED in the postoperative period and is associated with discomfort, pain or anxiety (4).

Delirium

Delirium is an acute and fluctuating alteration of mental state of reduced awareness and disturbance of attention. POD often starts in there coveryroom and occurs upto 5 days after surgery. One investigation found that many patients with POD on the peripheral ward already had POD in the recovery room.

Hypoactive (decreased alertness, motor activity and anhedonia), Hyperactive (agitated and combative) Mixed forms. Increased age seems to be a predisposing factor for the hypoactive form. The prognosis may be worse with hypoactive delirium, possibly due to relative under-detection by staff and consequently delayed treatment (4).

Rating Scales

POD screening is recommended by using standardized rating scales validated for the postoperative setting. The scales usually take less than 1 min to complete.

For emergence delirium immediately after surgery, agitation scales such as the RASS were used in all studies whereas the Pediatric Anesthesia Emergence Delirium (PAED) scale was used in children.

PaedED is based on the theoretical framework of delirium defined by DSM (4). PAED used in perioperative settings to access agitation and delirium and it's also the basis of CAPD. PAED focuses on patients with hyperactive symptoms which may underestimate the incidence of hypoactive delirium (9).

Delirium Risk Factors

For pediatric patients, risk factors for development of paedED should be considered, monitoring for paedED should be established and preventive and treatment measures should be taken to decrease the incidence of paedED.

According to ESA the risk factors of paedED are pre-school age, ENT surgery and pain and the sex is not considering as a risk factor. In addition, POD is more common in all age groups if precipitating risk factors such as major surgery or emergency surgery are present.

The incidence increases with a high burden of comorbidities:

- Multiorgan dysfunction before surgery,
- Low haemoglobin concentration,
- Low ejection fraction,
- Carotid artery stenosis,
- High serum creatinine concentration (4).

Predisposing factors:

- Children with low adaptability
- Temperament of the child
- The anxiety of parents/guardians
- PaedED after repetitive procedures is unclear.
- Research should be undertaken psychological, social and medical risk factors (4).

POD is associated with several negative clinical consequences, including major postoperative complications, cognitive decline, distress, longer hospitalization with increased costs and higher mortality.

Anticholinergic medication, benzodiazepines, cardiac bypass surgery, immobilization, prolonged ICU length of stay, restraints, sleep rhythm disruption, suboptimal pain management are the modifiable risk factors (10).

Non-modifiable risk factors:

- Age under 2
- Male gender
- Preschool children
- Development delay
- Low albumin
- Prolonged mechanical ventilation
- Pre-existing medical condition
- Status epilepticus as primary diagnosis (10).

The incidence of ED tended to be higher in younger age and poorer preoperative sleep quality in pediatric patients. In particular, the poorer sleep quality score was associated with higher incidence of ED in the preschool-age (11).

Prolonged fasting time, solid food fasting time and thirst time are risk factors for developing postoperative ED in children undergoing MRI under sedation (12).

Premedication

Midazolam reduces paedED after sevoflurane anaesthesia. Melatonin might be superior to midazolam to decrease the risk of paedED, but it does not reduce anxiety. Alfa2-agonists (dexmedetomidine or clonidine) decreases the incidence of paedED. Premedication with gabapentin, ketamine, intraoperative dexamethasone or magnesium were also found to decrease paedED (4).

Neuromonitoring

A meta-analysis included 26 RCTs with 10,743 patients to demonstrate the effects of deep vs. light anesthesia on postoperative pain, cognitive function, postoperative recovery, complications, and mortality. The deep anesthesia led to lower postoperative pain but a higher incidence of POD when compared with light anesthesia (13).

In children neuronal hyperexcitability – as seen by occurrence of interictal, epileptiform discharges during anaesthesia induction or increased frontal connectivity during emergence of general anaesthesia has been related to ED. Intraoperative Burst Suppression activity in the EEG is not associated with ED in young children.

Anaesthesia

For short-term procedures, propofol is well tolerated in children. In literature the use of either total intravenous anesthesia with propofol and remifentanil or sevoflurane inhalational anesthesia with dexmedetomidine resulted in a lower incidence of emergence delirium (14).

Postoperative Pain

Acute perioperative pain in infants and children is still often undertreated. Tonsillectomy, appendicectomy and orchidopexy are more painful than usually expected. Up to 44% of children still suffer from severe pain until day 3, and up to 30% until day 7 after surgery (4).

Several analgesic techniques, such as regional anaesthesia (caudal block and fascia iliaca compartment block) or pharmacological interventions (fentanyl or nalbuphine) are available and seem to reduce the incidence of paedED (4).

Prevention and Treatment

ESA suggest using the ADVANCE strategy of cognitive preparation for surgery, midazolam to reduce preoperative anxiety in children, using a2-agonists (clonidine and dexmedetomidine) intravenously, intranasally or epidurally, propofol as a bolus on emergence to decrease PaedED, preventive analgesia, e.g. caudal, fascia iliaca block, to reduce paedED and implementing nonpharmacological strategies include in the treatment of paedED to calm the patient and limit harm, balancing the use of short acting volatile anesthetics (Sevoflurane/Desflurane > Isoflurane) against their risk for PaedED (4). The family-centered preoperative ADVANCE preparation program is effective in the reduction of preoperative anxiety and improvement in postoperative outcomes. That is, children in the ADVANCE group were least likely to exhibit severe emergence delirium symptoms when compared with children in the control, midazolam, and parental presence groups (15).

Driscoll et al have revealed that the use of desflurane for maintenance of anesthesia did not significantly affect the incidence or duration of ED when compared to sevoflurane, at their study (16). At another clinical trial, it was reported that the dexmedetomidine 0.5 μg/kg reduced the incidence of ED after sevoflurane anesthesia (17). The use of 1 $\mu g.kg^{-1}$ intravenous clonidine during anesthesia induction can effectively reduce the incidence of ED in children undergoing elective tonsillectomy/adenotonsillectomy under general inhalation anesthesia with sevoflurane (18). In a prospective randomized controlled study, it was reported that the magnesium supplementation during anaesthesia had no significant effects on the incidence of emergence delirium (19).

In conclusion POD is a common complication and requires prompt and adequate treatment as well as preventive measures.

REFERENCES

1. Zaccariello MJ, Frank RD, Lee M, et al. Patterns of neuropsychological changes after general anaesthesia in young children: secondary analysis of the Mayo Anesthesia Safety in Kids study. Br J Anaesth. 2019;122(5):671-681.doi:10.1016/j.bja.2019.01.022
2. Sun LS, Li G, DiMaggio CJ, et al. Feasibility and pilot study of the Pediatric Anesthesia NeuroDevelopment Assessment (PANDA) project. J Neurosurg Anesthesiol. 2012;24(4):382-388. doi:10.1097/ANA.0b013e31826a0371
3. McCann ME, de Graaff JC, Dorris L, et al. Neurodevelopmental outcome at 5 years of age after general anaesthesia or awake-regional anaesthesia in infancy (GAS): an international, multicentre, randomised, controlled equivalence trial [published correction appears in Lancet. 2019 Aug 24;394(10199):638]. Lancet. 2019;393(10172):664-677. doi:10.1016/S0140-6736(18)32485-1.
4. Aldecoa C, Bettelli G, Bilotta F, et al. European Society of Anaesthesiology evidence-based and consensus-based guideline on postoperative delirium [published correction appears in Eur J Anaesthesiol. 2018 Sep;35(9):718-719]. Eur J Anaesthesiol. 2017;34(4):192-214. doi:10.1097/EJA.0000000000000594.
5. Zhou P, Zhang C, Huang G, Hu Y, Ma W, Yu C. The effect of sevoflurane anesthesia for dental procedure on neurocognition in children: a prospective, equivalence, controlled trial. BMC Pediatr. 2021;21(1):177. Published 2021 Apr 16. doi:10.1186/s12887-021-02649-5.
6. Millar K, Bowman AW, Burns D, et al. Children's cognitive recovery after day-case general anesthesia: a randomized trial of propofol or isoflurane for dental procedures. Paediatr Anaesth. 2014;24(2):201-207. doi:10.1111/pan.12316
7. Yin J, Wang SL, Liu XB. The effects of general anaesthesia on memory in children: a comparison between propofol and sevoflurane. Anaesthesia. 2014;69(2):118-123. doi:10.1111/anae.12504
8. Millar K, Asbury AJ, Bowman AW, et al. A randomised placebo-controlled trial of the effects of midazolam premedication on children's postoperative cognition. Anaesthesia. 2007;62(9):923-930. doi:10.1111/j.1365-2044.2007.05148.x

9. Bajwa SA, Costi D, Cyna AM. A comparison of emergence delirium scales following general anesthesia in children. Paediatr Anaesth. 2010;20(8):704–11.
10. Nair S, Wolf A. Emergence delirium after paediatric anaesthesia: new strategies in avoidance and treatment. BJA Educ. 2018;18(1):30-33. doi:10.1016/j.bjae.2017.07.001.
11. Do W, Kim HS, Kim SH, et al. Sleep quality and emergence delirium in children undergoing strabismus surgery: a comparison between preschool- and school-age patients. BMC Anesthesiol. 2021;21(1):290. Published 2021 Nov 22. doi:10.1186/s12871-021-01507-2.
12. Balkaya AN, Yılmaz C, Baytar Ç, et al. Relationship between Fasting Times and Emergence Delirium in Children Undergoing Magnetic Resonance Imaging under Sedation. Medicina (Kaunas). 2022;58(12):1861. Published 2022 Dec 16. doi:10.3390/medicina58121861.
13. Long Y, Feng X, Liu H, Shan X, Ji F, Peng K. Effects of anesthetic depth on postoperative pain and delirium: a meta-analysis of randomized controlled trials with trial sequential analysis. Chin Med J (Engl). 2022;135(23):2805-2814. Published 2022 Dec 5. doi:10.1097/CM9.0000000000002449
14. Oriby ME, Elrashidy A. Comparative Effects of Total Intravenous Anesthesia with Propofol and Remifentanil Versus Inhalational Sevoflurane with Dexmedetomidine on Emergence Delirium in Children Undergoing Strabismus Surgery. Anesth Pain Med. 2020;11(1):e109048. Published 2020 Dec 20. doi:10.5812/aapm.109048
15. Kain ZN, Caldwell-Andrews AA, Mayes LC, et al. Family-centered preparation for surgery improves perioperative outcomes in children: a randomized controlled trial. Anesthesiology. 2007;106(1):65-74. doi:10.1097/00000542-200701000-00013
16. Driscoll JN, Bender BM, Archilla CA, et al. Comparing incidence of emergence delirium between sevoflurane and desflurane in children following routine otolaryngology procedures. Minerva Anestesiol. 2017;83(4):383-391. doi:10.23736/S0375-9393.16.11362-8
17. Shi M, Miao S, Gu T, Wang D, Zhang H, Liu J. Dexmedetomidine for the prevention of emergence delirium and postoperative behavioral changes in pediatric patients with sevoflurane anesthesia: a double-blind, randomized trial. Drug Des Devel Ther. 2019;13:897-905. Published 2019 Mar 15. doi:10.2147/DDDT.S196075
18. Sousa-Júnior FA, Souza ASR, Lima LC, et al. Intraoperative clonidine to prevent postoperative emergence delirium following sevoflurane anesthesia in pediatric patients: a randomized clinical trial. Braz J Anesthesiol. 2021;71(1):5-10. doi:10.1016/j.bjane.2020.12.003
19. Lee JH, Choi S, Lee M, et al. Effect of magnesium supplementation on emergence delirium and postoperative pain in children undergoing strabismus surgery: a prospective randomised controlled study. BMC Anesthesiol. 2020;20(1):289. Published 2020 Nov 18. doi:10.1186/s12871-020-01192-7

14:05-14:20 (Panel VII)

13:20-14:40	PANEL VII: NEUROANESTHESIA	Nermin Göğüş, Ivana Budić, Ülkü Aypar
13:20-13:35	Perioperative temperature management	Biljana Kuzmanovska
13:35-13:50	Perioperative cognitive dysfunction in pediatric patients	Ayça Dumanlı Özcan
13:50-14:05	New guidelines in pediatric neurotrauma	Dusica Simic
14:05-14:20	Neuroprotective anesthesia and safe brain initiative	Nevriye Salman
14:20-14:40	Discussion	
14:40-14:55	*Coffee Break*	

Neuroprotective Anesthesia and 'Safe Brain Initiative'

Nevriye Salman

University of Health Sciences, Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

Since the human brain needs oxygen 10 times its weight and has low energy storage, it is a cerebral blood flow dependent organ (1,2). Any disease, trauma or iatrogenic cause, including anesthetic agents that may impair cerebral blood flow, can damage the brain (3). With ischemia/hypoxia, apoptosis and inflammation increase, protein synthesis is inhibited, and it causes continuation of oxidative stress and neurogenesis (4). This in turn causes neuroinflammation and neurodegeneration and ultimately 'perioperative neurocognitive disease'.

Neurocognitive disease (NCD); aphasia and/or apraxia is defined as a state of confusion accompanied by agnosia and deterioration in memory, learning and evaluation speed, and social and cognitive functions (5). Neurocognitive disease can be seen from postoperative day 0 to 7.5 years (Figure 1).

'**Neuroprotective anesthesia**' to prevent this situation; It covers all treatments that will increase the tolerance of the tissue to ischemia and change the intracellular response to energy source deprivation before intraischemic cellular and vascular biological responses due to ischemia/hypoxia or lack of energy supply (4,6).

Neurocognitive disease that increases the need for postoperative care, dependence on mechanical ventilators, complications, hospital stay, and mortality (7) can be diagnosed perioperatively with DSM-5, MMSE, Mini-Cog, Clock drawing test, etc. (8).

Preoperative predisposing factors:

- Advanced age (>85 years old)
- Poor functional status: preoperative NCD, frailty
- Metabolic imbalance, hyponatremia
- Polypharmacy
- Malnutrition, anemia, hypoalbuminemia, dehydration, Vit D deficiency
- History of depression, delirium
- Alcohol addiction
- Sleeping disorder
- Low education level
- Atherosclerosis, high cholesterol
- Sensory impairment (hearing, vision)

Preoperative precipitating factors:

- Long fasting, thirsty
- Pain
- Premedication (anticholinergic, benzodiazepine, opioid, pethidine, gabapentinoid)

Intraoperative factors:

- Long, emergency, invasive surgery

- Deep anesthesia or deep sedation
- Major surgery (cardiac, orthopedic etc.)
- Blood loss and transfusion
- Hypo/hypertension
- Hypothermia
- Cerebral desaturation
- General > regional/neuroaxial anesthesia
- Inhalan >iv anesthetic agents
- Benzodiazepines, opioids, gabapentinoid, ketamine, diphenhydramine, metoclopramide, anticholinergic drug

Postoperative factors:

- Poor pain control
- Long stay at ICU
- Long mechanical ventilation
- Hearing/visual impairment
- Immobilization,
- Dehydration
- Electrolyte anomaly
- Sleeping disorder
- Excessive medication
- Unnecessary drains, lines etc.
- Hypoxia
- Insufficient cognitive stimulation (lack of hours, daylight, etc.)

I. Preoperative Actions

1. Prehabilitation

2. Preoperative preparation

The goal of **SBI (=Safe Braın Inıtıative**) is to change and improve the clinical routine and outcomes for staff and patients; this requires time and perseverance during the implementation process and the support of the Department and Hospital administrators.

II. Intraoperative Actions

1. Type of anesthesia
2. Monitoring
3. Anesthetic agent
4. Other

III. Postoperative Procedures

1. Analgesia
2. Optimization of the physical environment,
3. Ensuring vision/hearing
4. Removal of Catheters
5. Discontinuation of unnecessary drugs
6. Early mobilization

7. Prevention of the risk of falling
8. Ensuring adequate nutrition
9. Prevention of urinary enfection
10. Prevention of functional decline etc.

After all; anesthetic management as well as the prevention of predisposing and accelerating factors;

- Anesthesia by age
- How much will I give more than what I will give
- Monitoring
- Patient-specific anesthesia
- Care should be taken to ensure that it is balanced and with short-acting agents.

Keywords: Neurocognitive disease (NCD), anesthesia, neuroprotection

REFERENCES

1. Quastel JH and Wheatley AH. Oxidations by the brain. Biochem J 1932; 26: 725–744.
2. Be´langer M, Allaman I and Magistretti PJ. Brain energy metabolism: focus on astrocyte-neuron metabolic cooperation. Cell Metab 2011; 14: 724–738.
3. Andrew M Slupe, Jeffrey R Kirsch. Effects of anesthesia on cerebral blood flow, metabolism, and neuroprotection. Cereb Blood Flow Metab. 2018 Dec;38(12):2192-2208.
4. S. Fukuda and D. S. Warner. Cerebral protection. Br J Anaesth 2007 Jul;99(1):10-7.
5. Evered L, Silbert B, Knopman DS, et al. Recommendations for the nomenclature of cognitive change associated with anaesthesia and surgery-2018. Br J Anaesth. 2018 Nov;121(5):1005-1012.
6. Zwerus R, Absalom A. Update on anesthetic neuroprotection. Curr Opin Anaesthesiol. 2015 Aug;28(4):424-30.
7. E Wang, Lu Wang, Chunyan Ye et al. Effect of Electroencephalography Spectral Edge Frequency (SEF) and Patient State Index (PSI)-Guided Propofol-Remifentanil Anesthesia on Delirium After Laparoscopic Surgery: The eMODIPOD Randomized Controlled Trial. J Neurosurg Anesthesiol. 2022 Apr 1;34(2):183-192.
8. Olotu C, Ascone L, Wiede J, et al. The effect of delirium preventive measures on the occurrence of postoperative cognitive dysfunction in older adults undergoing cardiovascular surgery. The DelPOCD randomised controlled trial. Clin Anesth. 2022 Jun;78:110686.

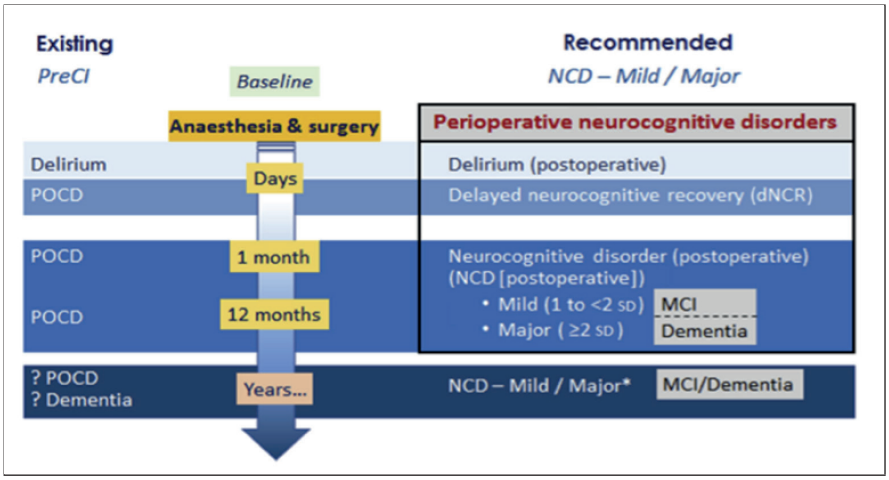


Figure 1. Postoperative cognitive dysfunction and neurocognitive disorders, a crosswalk.

MCI: mild cognitive impairment, POCD: postoperative cognitive dysfunction.

** State of the clinical science of perioperative brain health: report from the American Society of Anesthesiologists Brain Health Initiative Summit 2018. Mahanna-Gabrielli E, Schenning KJ, Eriksson LI, et al .Br J Anaesth. 2019 Oct;123(4):464-478.*

14:55-15:10 (Panel VIII)

14:55-16:15	PANEL VIII: ANESTHESIA IN SPECIAL CIRCUMSTANCES – 2	Işıl Özkoçak Turan, Süheyla Ünver
14:55-15:10	Cardiopulmonary resuscitation in the operating room	Bahar Kuvaki
15:10-15:25	Preoperative Carbohydrate-Rich Drink and ERAS protocol	Fatos Sada
15:25-15:40	Anesthetic management of the severe COVID-19 disease survived patient	Azize Beştaş
15:40-15:55	Vasopressin in sepsis	Andrijan Kartalov
15:55-16:15	Discussion	

Cardiopulmonary Resuscitation in the Operating Room

Bahar Kuvaki Balkan

Dokuz Eylül University School of Medicine, Department of Anesthesiology and Reanimation, İzmir, Türkiye

Intraoperative cardiac arrest (IOCA) is commonly defined as the loss of circulation that prompts resuscitation with chest compressions and/or defibrillation in the operating room. It is a rare but one of the worst event during anaesthesia and surgery with high mortality (1,2). Guidelines for treatment of intraoperative cardiac arrest are lacking and there is an increasing effort to close this gap of knowledge.

Cardiac arrests in the operating room are almost always witnessed and involve rescuer providers with knowledge of the patient and their procedure. In many cases physiological deterioration is gradual and the cause of the cardiac arrest is known and hence the arrest anticipated. Anesthesiologists should be prepared to provide appropriate and timely care. They should be able to recognise cardiac arrest by continuous monitoring (3,4).

There is a different spectrum of causes and rapid and appropriate evaluation and management of these causes require modification of traditional cardiac arrest algorithms. The ALS algorithm should be followed with a strong focus on reversible causes, especially hypovolaemia (anaphylaxis, bleeding), hypoxia, tension-pneumothorax and thrombosis (pulmonary embolism) (3,4).

When cardiac arrest is diagnosed these actions should be started generally (5,6):

- Call for help and the defibrillator and initiate high-quality chest compressions and effective ventilation.
- Check the airway and review the $EtCO_2$ tracing,
- Administer oxygen with a FiO_2 1.0
- Adjust the height of the OR table to enable high-quality CPR
- Open cardiac compressions should be considered as an effective alternative to closed chest compressions
- Use ultrasound to guide resuscitation
- Consider ECPR as a rescue therapy for selected patients with cardiac arrest when conventional CPR is failing.

Keywords: Operating room, CPR

REFERENCES

1. Chalkias A, Mongardon N, Boboshko V et al. Clinical practice recommendations on the management of perioperative cardiac arrest: A report from the PERIOPCA Consortium. Crit Care (2021) 25:265
2. Hinkelbein J, Andres J, thies KCh, Derobertis E. Perioperative cardiac arrest in the operating room environment: a review of the literature. Minerva Anestesiologica 2017 November;83(11):1190-8
3. McEvoy MD, Thies KCh, Einav S et al. Cardiac Arrest in the Operating Room: Part Special Situations in the Perioperative Period. Anesth Analg 2018;126:889–903
4. Moitra VK, Einav S, Thies KCh et al. Cardiac Arrest in the Operating Room: Resuscitation and Management for the Anesthesiologist: Part 1. Anesth Analg 2018;126:876–8
5. Truhla A, Deakin Ch, Soar J et al. European Resuscitation Council Guidelines for Resuscitation 2015Section 4. Cardiac arrest in special circumstances. Resuscitation 95 (2015) 148-201
6. Lott C, Truhla A, Alfonzo A et al. European Resuscitation Council Guidelines 2021: Cardiac arrest in special circumstances. Resuscitation 161 (2021) 152-2019

15:40-15:55 (Panel VIII)

14:55-16:15	PANEL VIII: ANESTHESIA IN SPECIAL CIRCUMSTANCES – 2	Işıl Özkoçak Turan, Süheyla Ünver
14:55-15:10	Cardiopulmonary resuscitation in the operating room	Bahar Kuvaki
15:10-15:25	Preoperative Carbohydrate-Rich Drink and ERAS protocol	Fatos Sada
15:25-15:40	Anesthetic management of the severe COVID-19 disease survived patient	Azize Beştaş
15:40-15:55	Vasopressin in sepsis	Andrijan Kartalov
15:55-16:15	Discussion	

Vasopressin in Sepsis

Andrijan Kartalov

Clinical Center Skopje, Macedonia

Vasopressin, also called antidiuretic hormone (ADH), arginine vasopressin (AVP) or argipressin, is a hormone synthesized as a peptide prohormone in neurons in the hypothalamus, and is converted to AVP. It then travels down the axon of that cell, which terminates in the posterior pituitary, and is released from vesicles into the circulation in response to extracellular fluid hypertonicity (hyperosmolality). AVP has two primary functions. First, it increases the amount of solute-free water reabsorbed back into the circulation from the filtrate in the kidney tubules of the nephrons. Second, AVP constricts arterioles, which increases peripheral vascular resistance and raises arterial blood pressure. Some AVP may be released directly into the brain from the hypothalamus, and may play an important role in social behavior, sexual motivation and pair bonding, and maternal responses to stress. It has a very short half-life, between 16–24 minutes. Vasopressin is used to treat diabetes insipidus related to low levels of antidiuretic hormone. Fluid, vasoconstrictors, and inotropes are usually used to maintain arterial pressure. Norepinephrine is the most commonly used vasoconstrictor. Vasopressin infusions are also used as second line therapy for septic shock patients not responding to fluid resuscitation or infusions of catecholamines (e.g., dopamine or norepinephrine) to increase the blood pressure while sparing the use of catecholamines. Unfortunately, cardiac and vascular smooth muscle can become resistant, requiring increasing doses of norepinephrine. This produces adverse effects which include increasing tissue oxygen demand, reducing renal and mesenteric blood flow, pulmonary hypertension, and arrhythmias. Why level of vasopressin is low in septic shock is open to conjecture. Initially, vasopressin levels are elevated but 6 h after the onset of hypotension levels may be inappropriately low for the degree of hypotension. Possible explanations include exhaustion of stores and autonomic nervous system dysfunction. Large doses of norepinephrine are inhibitory to vasopressin release. Nitric oxide, an inflammatory mediator, may also act on the pituitary to prevent release. In sepsis, there is an increased sensitivity to vasopressin. Vasopressin and norepinephrine is believed to have a synergistic action when used together.

Vasopressin increases intracellular calcium, maintaining vascular tone when norepinephrine receptor sensitivity is reduced. In endotoxic shock, excessive activation of potassium-sensitive ATP channels causes increased potassium conductance leading to the closure of voltage-gated calcium channels and the reduction in vascular tone. The use of vasopressin is not without side-effects. Myocardial ischemia may occur, but this effect is limited by avoiding high doses. A varied effect on splanchnic blood flow has been found. At lower doses, a minimal response occurs provided the patients are adequately intravascularly filled. Both the dosage and timing of the use of vasopressin in sepsis is currently under investigation. However, in the literature, a dose range of 0.01–0.04 IU/ min −1 is commonly used to replace falling vasopressin levels. It is usually started when increasing norepinephrine doses are being used to maintain arterial pressure. It is best administered through central access as extravasations can cause skin necrosis. The most common side effects during treatment with vasopressin is dizziness, angina, chest pain, abdominal cramps, nausea, vomiting, fever, water intoxication, pounding sensation in the head, diarrhea, sweating, paleness, and flatulence. The most severe adverse reactions are myocardial infarction and hypersensitivity.

Summary: There is growing evidence that vasopressin infusion in septic shock is safe and effective. Several studies published this year support the hypothesis that vasopressin should be used as a continuous low-dose infusion (between 0.01 and 0.04 U/min in adults) and not titrated as a single vasopressor agent.

16:45-17:00 (Panel IX)

16:15-17:35	PANEL IX: LAW	Jülide Ergil, Levent Öztürk, Raziye Ünal
16:15-16:30	Malpractice and recent changes in the "law of violence"	Dilek Özcengiz
16:30-16:45	Protection of patient data and law policy	Mete Salih Aker
16:45-17:00	Plagiarism and legal policies	Neval Yılmaz
17:00-17:15	Palliative Care and Ethics	Kadriye Kahveci
17:15-17:35	Discussion	

Etik İhlaller ve Yasal Düzenlemeler

Plagiarism and Legal Policies

Av. Dr. E. Neval YILMAZ, MD, PhD, LLM[1]

Ankara

Bilimsel araştırma, çalışma, yayın ve etkinliklerde uyulması gereken bilim etiği kuralları bulunmaktadır. Türkiye'de YÖK Başkanlığı bünyesinde bilimsel yayın etiği soruşturmaları YÖK Başkanına bağlı, Başkan tarafından görevlendirilip onun adına soruşturma yürüten ve her biri 9 üye profesörden oluşan 3 adet Etik Kurul tarafından yürütülmektedir. Sağlık Bilimleri, Sosyal Bilimler ve Mühendislik Bilimleri alanında oluşturulmuş 3 adet etik kurul, yayın etiği açısından disipline aykırı fiillerin tespiti ve cezalandırılması süreçlerinden sorumludur. Bilimsel araştırma ve yayın etiğine aykırı eylemler intihal (başkalarının özgün fikirlerini, metotlarını, verilerini veya eserlerini bilimsel kurallara uygun biçimde atıf yapmadan kısmen veya tamamen kendi eseri gibi göstermek), sahtecilik (bilimsel araştırmalarda gerçekte var olmayan veya tahrif edilmiş verileri kullanmak), çarpıtma (araştırma kayıtları veya elde edilen verileri tahrif etmek, araştırmada kullanılmayan cihaz veya materyalleri kullanılmış gibi göstermek, destek alınan kişi ve kuruluşların çıkarları doğrultusunda araştırma sonuçlarını tahrif etmek veya şekillendirmek), tekrar yayım (mükerrer yayınlarını akademik atama ve yükselmelerde ayrı yayınlar olarak sunmak), dilimleme (bir araştırmanın sonuçlarını, araştırmanın bütünlüğünü bozacak şekilde ve uygun olmayan biçimde parçalara ayırıp birden fazla sayıda yayımlayarak bu yayınları akademik atama ve yükselmelerde ayrı yayınlar olarak sunmak), haksız yazarlık (aktif katkısı olmayan kişileri yazarlar arasına dâhil etmek veya olan kişileri dâhil etmemek, yazar sıralamasını gerekçesiz ve uygun olmayan bir biçimde değiştirmek, aktif katkısı olanların isimlerini sonraki baskılarda eserden çıkartmak, aktif katkısı olmadığı hâlde nüfuzunu kullanarak ismini yazarlar arasına dâhil ettirmek) olarak sayılabilir. Diğer etik ihlal türleri arasında destek alınarak yürütülen araştırmalar sonucu yapılan yayınlarda destek veren kişi, kurum veya kuruluşlar ile bunların katkılarını belirtmemek, henüz sunulmamış veya savunularak kabul edilmemiş tez veya çalışmaları, sahibinin izni olmadan kaynak olarak kullanmak, yayınlarında hasta haklarına riayet etmemek, insanlarla ilgili biyomedikal araştırmalarda veya diğer klinik araştırmalarda ilgili mevzuat hükümlerine aykırı davranmak, incelemek üzere görevlendirildiği bir eserde yer alan bilgileri eser sahibinin açık izni olmaksızın yayımlanmadan önce başkalarıyla paylaşmak, bilimsel araştırma için sağlanan veya ayrılan kaynakları, mekânları, imkânları ve cihazları amaç dışı kullanmak, bilimsel bir çalışma kapsamında yapılan anket ve tutum araştırmalarında katılımcıların açık rızasını almadan ya da araştırma bir kurumda yapılacaksa ayrıca kurumun iznini almadan elde edilen verileri yayımlamak, araştırma ve deneylerde; hayvanlara ve ekolojik dengeye zarar vermek, çalışmalara başlamadan önce alınması gereken izinleri yetkili birimlerden yazılı olarak almamak, mevzuatın veya Türkiye'nin taraf olduğu uluslararası sözleşmelerin ilgili araştırma ve deneylere dair hükümlerine aykırı çalışmalarda bulunmak, araştırmacılar veya yetkililerce, yapılan bilimsel araştırma ile ilgili olarak muhtemel zararlı uygulamalar konusunda ilgilileri bilgilendirme ve uyarma yükümlülüğüne uymamak, bilimsel çalışmalarda, diğer kişi ve kurumlardan temin edilen veri ve bilgileri, izin verildiği ölçüde ve şekilde kullanmamak, bu bilgilerin gizliliğine riayet etmemek ve korunmasını sağlamamak, akademik atama ve yükseltmelere ilişkin başvurularda bilimsel araştırma ve yayınlara ilişkin yanlış veya yanıltıcı beyanda bulunmak, akademik teamüllere aykırı olarak bir doçent adayında etik açıdan beklenmeyen tutum ve davranışlarda bulunmak, başvuru dosyasında mevcut olmayan bir dergiyi mevcut, yahut indekslerde taranmayan bir dergiyi taranıyor gibi göstererek, ya da hakemli olmayan bir dergiyi hakemli olarak belirterek yayın yapmak sayılabilir.

1 Ankara Barosu, ORCHID: 0000-0003-2310-0269, avdrnevalyilmaz@gmail.com, +90 535 7267626

There are scientific ethics rules that must be followed in scientific research, study, publication and activities. In Türkiye, scientific publication ethics investigations are carried out by three Ethics Committees, each consisting of nine professors, affiliated to the President of the Higher Education Institution, who are appointed by the President and conduct investigations on his behalf. Three ethics committees established in the field of Health Sciences, Social Sciences and Engineering Sciences are responsible for the detection and punishment of acts against the discipline in terms of publication ethics. Acts contrary to scientific research and publication ethics, plagiarism (to present the original ideas, methods, data or works of others as one's own work without attribution in accordance with scientific rules), forgery (using non-existent or distorted data in scientific research), distortion (research falsifying the records or data obtained, making the devices or materials not used in the research appear to have been used, falsifying or shaping the research results in line with the interests of the people and institutions from which support is received), republishing (presenting the duplicate publications as separate publications in academic appointments and promotions), slicing (disrupting the integrity of the research and inappropriately disaggregating the results of the research and publishing them in more than one number, presenting these publications as separate publications in academic appointments and promotions), unfair authorship (including people who do not have an active contribution among the authors, or not including the people who are a part of the work, changing the order of authors in an unjustified and inappropriate way, removing the names of those who contributed actively from the work in later editions, using his influence to include his name among the authors even though he did not have an active contribution). Among other types of ethical violations, not stating the support people, institutions or organizations and their contributions in the publications made as a result of research carried out with support, using the thesis or studies that have not yet been presented or defended and accepted as a source without the permission of the owner, not complying with the rights of patients in their publications, to act against the provisions of the relevant legislation in research or other clinical research, to share the information contained in a work that he has been assigned to examine with others before it is published without the express permission of the author, to use the resources, places, facilities and devices provided or allocated for scientific research for purposes other than within the scope of a scientific study, to publish the data obtained without the explicit consent of the participants in the surveys and attitude researches, or if the research is to be conducted in an institution, without the permission of the institution, in research and experiments; to harm animals and the ecological balance, not to obtain written permissions from the authorized units before starting the studies, to carry out studies contrary to the provisions of the legislation or the international conventions to which Türkiye is a party, regarding the relevant research and experiments, not complying with the obligation to inform and warn the relevant people about the applications, not using the data and information obtained from other individuals and institutions in scientific studies, to the extent and manner allowed, not complying with the confidentiality of this information and not ensuring its protection, errors in scientific research and publications in applications for academic appointments and promotions. or making a misleading statement, behaving in an ethically unexpected manner in an associate professor candidate contrary to academic practices, scanning a journal that is not included in the application file, or that is not indexed in the indexes can be mentioned.

KAYNAKLAR

Demircioğlu MY, İdari Yargı Kararları Çerçevesinde Bilimsel Yayın Etiği Soruşturmaları, Ankara Barosu Dergisi 2014(1): 147-217

Demiral Bakırman B, İntihal Suçları, CHKD (2015), Cilt: 3, Sayı: 2: 57-77

Kolaylı ZC, Türk Özel Hukuk Sisteminde İntihal, YL Tezi, Hacettepe Üniversitesi, 2019.

Yasal Düzenlemeler

İnsan Hakları Evrensel Bildirgesi

Edebiyat Ve Sanat Eserlerinin Korunmasına İlişkin Bern Sözleşmesi

Anayasa

5846 sayılı Fikir ve Sanat Eserleri Kanunu

2547 sayılı YÖK Kanunu

5237 sayılı Türk Ceza Kanunu

Yükseköğretim Kurumları Bilimsel Araştırma Ve Yayın Etiği Yönergesi

Üniversitelerarası Kurul Bilimsel Araştırma Ve Yayın Etiği Yönergesi

17:00-17:15 (Panel IX)

16:15-17:35	PANEL IX: LAW	Jülide Ergil, Levent Öztürk, Raziye Ünal
16:15-16:30	Malpractice and recent changes in the "law of violence"	Dilek Özcengiz
16:30-16:45	Protection of patient data and law policy	Mete Salih Aker
16:45-17:00	Plagiarism and legal policies	Neval Yılmaz
17:00-17:15	Palliative Care and Ethics	Kadriye Kahveci
17:15-17:35	Discussion	

Palyatif Bakım ve Etik

Kadriye Kahveci

Bilkent Şehir Hastanesi, Anesteziyoloji ve Reanimasyon Bölümü, Ankara, Türkiye

Palyatif bakım (PB), teşhis ve prognozdan bağımsız olarak, kritik hastalığı olan hasta ve hasta yakınlarının başta ağrı olmak üzere tüm fiziksel ve psikososyal problemlerini azaltarak yaşam kalitelerini artırmaya odaklanan tıbbi uzmanlık ve bakım felsefesidir. Günümüzde kronik yaşamı sınırlayan hastalıklar giderek artmaktadır bu nedenle PB, sağlık hizmetlerinin yeni bir bileşeni olsa da tüm sağlık sistemlerinin önemli bir parçası olarak giderek daha fazla önem kazanmaktadır. Tıp teknolojisindeki yenilikler, yaşam süresinin uzamasına ve yaşam beklentisinin artmasına neden olmuştur. Akut ve hızlı gelişen birçok rahatsızlığın, kronik ve ağır seyreden hastalıklara dönüşmesi, hastalıkları eskisine nazaran daha karmaşık hale getirmiştir. Yaşamın son döneminde karşılaşılan tıbbi sorunlar hakkında karar vermede kullanılan ölçütlerin çerçevesi daha fazla tartışılır hale gelmiştir. Doktorların çoğu sadece yaşam sonu dönemde PB'i düşünmekte ve hastalarının öleceğini kabul etme de zorluk yaşamakta ve PB için geç kalınmaktadır.

PB'de amaç ölümü hızlandırmak ya da ertelemek değil, ölümü yaşamın doğal süreçlerinden biri olarak kabul edebilmesidir. Son yıllarda "İyi ölüm" ve "iyi ölmek" kavramı tartışılmakta Dünya Sağlık Örgütü (DSÖ) herkesin onurlu ölümü hak ettiğini ve PB insanlık hakkı olduğunu bildirmektedir. Ölüm kasvetli ve korkutucudur. Hasta ve yakınları terk edilme hissindedir ve çaresizdir. Terminal dönemde semptom yönetimi yapılamadığında, ölüm hasta ve aile için zorlu bir süreç haline gelir. Ölen kişinin ailesi ve sevenleri uzun süre bu acının anıları ile yaşarlar. Hastaların onurlu bir şekilde ölmesine izin vermek önemlidir. İyi bir ölüm, ‹hastaların ve ailelerin isteklerine uygun olarak önlenebilir acılardan uzak olandır.

- Hastanın fiziksel ve psiko-ruhsal bütünlüğünü korumak;
- Hastanın acı ve ıstırabını ele almak;
- Hastanın tercihlerine saygı duymak;
- Hastanın yaşamının son evresine değer vermek.

PB veya yaşamın sonundaki hastalar için yaşamı sürdürme tedavisine ilişkin kararlar yasasına göre: Hastaların ölümünü erteleme potansiyeline sahip tüm tedaviler yaşamı sürdüren tedavilerdir.

1. Kalp pilleri
2. Vazopresörler
3. Antibiyotikler
4. Yapay beslenme ve hidrasyon
5. Kardiyopulmoner resüsitasyon
6. Mekanik ventilasyon,
7. Hemodiyaliz
8. Kemoterapi
9. Kan ürünleri

Etik, doğruları ve yanlışları, ne yapılması veya yapılmaması gerektiğini inceleyen bir felsefe dalıdır. Klinik etik, tıp ve sağlık bilimleri alanında bilimin uygulanması ve ahlak anlayışı anlamına gelir. Klinik etiğin amacı, hastaların refahına olan bağlılığı vurgulayarak hasta bakımının kalitesini iyileştirmektir. Hastalar ve hekimleri, ilerlemiş kanserli yaşlı bir hastanın yaşamının sonunda bir dizi

zorlu etik sorunla karşı karşıya kalmaktadır. Bu nedenle, doktorun birincil önceliği hastanın refahı ve çıkarları olmalıdır. Buradaki kilit beceri, kötü haberin iletilmesi ve hasta, aile ve sağlık ekibi için kabul edilebilir bir tedavi planı üzerinde müzakere etmektir.

PB, ileri evre tedavi edilemeyen kanser ve diğer ölümcül kronik hastalıklarda zorunludur. Ağrı ve semptom kontrolü, psikososyal bakım ve yaşam sonu sorunları gibi palyatif bakımın farklı yönleri etik bir şekilde yönetilmelidir. İzlenecek temel etik ilkeler özerklik, yararlılık, zarar vermeme ve adalettir. Dindirilemeyen acılar ve morfinin bulunmaması nedeniyle yaşanan ıstırap, insan haklarının ihmali olarak kabul edilmektedir. Çözülmesi gereken etik zorluklar vardır. Gerçeği söyleme, bakım yeri, etkin PB yaşamın son günlerine kadar sürdürülmesi, gizlilik, antibiyotik kullanımı ve kan transfüzyonu, beslenme ve ileri yönergeler PB ekibinin karşılaştığı kilit noktalar olabilir.

Etik ilkeler:

1. Yararlı olma,
2. Zarar vermeme,
3. Özerkliğe saygı
4. Adalet

Bu dört etik ilke klinik karar vermenin temel ilkeleridir. PB' de en çok dikkate alınan etik ilkeler; fayda ve zarar vermeme ilkeleridir. Bu temel ilkeler dışında onur, doğruluk ve dürüstlük ilkelerini de göz ardı etmemek gerekmektedir. Hastalar için konforlu bir yaşam sonu dönemi sağlamak için karar vermede etik ilkelerin uygulanması gerekmektedir.

1. Yararlı olma

PB'nin birincil amacı, acıyı hafifletmek ve hastanın yaşam kalitesini iyileştirmektir. Hastanın çıkarları en iyi şekilde gözetilmeli ve onların esenliğini destekleyen bakım sağlamalıdır.

2. Zarar vermeme

Sağlık profesyonelleri hastaya zarar vermekten kaçınmalı ve gereksiz acıya neden olmayan bakım sağlamalıdır.

Sadece uygun tedavi verme yükümlülüğü: Hekimler, hastanın yararı ile hasta için oluşabilecek risk ve zarar ihtimalini muhakeme ederek; yararı olmayan ya da gereksiz tedavi uygulanmamalıdır.

Sınırlanması/geri çekilmesi olası, gereksiz veya uygun olmayan tedavi kavramı: Tedavinin sınırlanması, hastada ortaya çıkabilecek yan etkileri kısıtlamak ve hasta üzerindeki yararını arttırmak için hem aşamalı olarak tedavinin geri çekilmesi hem de hastaya verilen dozların azaltılması anlamına gelir.

Hastanın yapay yoldan gıda ve sıvı alması (TPN, PEG) tıbbi endikasyon kararıyla uygulanır. Hastayı yapay yoldan beslemek çoğu ülkede tedavi biçimi olarak kabul edilir. Bir başka görüşe göre, PB araştırmaları göz önüne alındığında, terminal evredeki hastaya yapay yoldan sıvı ve gıda verilmesi, sorunlu bir durumdur.

3. Özerkliğe saygı

PB, hastanın kendi bakımı hakkında karar verme hakkına saygı duyar ve sağlık profesyonelleri, hastanın istek ve tercihlerine saygı gösterilmesini sağlamalıdır. Yaşamın son döneminde özellikle zihinsel yetilerinin gerilediği, sınırlandığı durumlarda, hastanın, sağlıklı iken nasıl düşündüğünü, istek ve görüşlerinin ne olduğunu sorgulamak, önceden, ileriye dönük olarak verilmiş bir beyanı olup olmadığını araştırmalı. Tıbbi kararlar, mesleki yükümlülükleri ışığında, hastanın tıbbi durumunu değerlendiren bir hekim ile hastanın isteği arasında sağlanan bir uzlaşı niteliğinde olup özellikle yararlı olma, zarar vermeme ve bir o kadar da adil olma ilkelerinin dengelenmesi ile alınır.

4. Adalet ilkesi (Sağlık hizmetlerine hakkaniyete uygun erişim)

Adalet ilkesine göre sosyoekonomik durumları, etnik kökenleri veya diğer faktörler ne olursa olsun ihtiyacı olan tüm hastalara PB sağlanmalıdır.

İnsan Hakları ve Biyotıp Sözleşmesi'nin 3. Maddesi: Hastanın nitelikli sağlık hizmetine adil biçimde ve hakkaniyetle erişebilmesi hakkı.

Hakkaniyet ilkesi, mevcut kaynakların, eldeki olanaklar ölçüsünde, mümkün olduğunca adil biçimde dağıtılması anlamına gelir.

Bakım Hedeflerinin Belirlenmesi

Bakım planlaması ve bakım hedeflerinin belirlenmesi, hastaların bakımları üzerinde sahip oldukları kontrolü arttırır. Hastalar sağlık hizmetlerinde söz sahibi olmak, tedavileri ve gelecekleri için nasıl plan yapacaklarını bilmek isterler. Ölmekte olan hastaları "tedavi etmeye" odaklanan müdahalelerin, hastaya çok az fayda sağlayarak veya hiç fayda sağlamadığı bilinmektedir. Hasta yakınlarının %20'nde, sevdiklerinin sağlık sorunlarıyla başa çıkma stresine tepki olarak fiziksel bir hastalık gelişmektedir.

Etik ikilemler: PB, sağlık hizmetlerinin karmaşık ve hassas bir alanıdır ve ciddi şekilde hasta olan veya yaşamının sonuna gelmiş hastalara bakım verirken etik ikilemler ortaya çıkabilir. PB'deki bazı yaygın etik ikilemler şunları içerir:

1. **İletişim:** PB'nin önemli bir bileşenidir ve hastalar, aileler ve sağlık hizmeti sağlayıcılarının farklı beklentileri veya hedefleri olduğunda etik zorluklar ortaya çıkabilir. Etkili iletişim, hastaların değerleri ve tercihleri ile tutarlı bakım almalarını sağlamak için gereklidir. İletişim, iş birliği ve hasta merkezli bir yaklaşım, bu zorlukların üstesinden gelmek ve hastaların değerleri ve tercihleri ile tutarlı bir bakım almalarını sağlamak için gereklidir.
2. **Yaşam sonu karar verme:** hastalar, aileler ve sağlık hizmeti sağlayıcıları için zor olabilir ve en iyi eylem şekli hakkında anlaşmazlık olduğunda etik zorluklar ortaya çıkabilir. Sağlayıcılar, hastanın kendi bakımı hakkında karar verme konusundaki özerkliği ile hastanın çıkarlarına en uygun şekilde hareket etme görevlerini dengelemelidir.
3. **Ağrı yönetimi:** PB'nin çok önemli bir yönüdür, ancak hastalar opioidlere ve diğer ağrı kesici ilaçlara bağımlılık riski nedeniyle etik zorluklar ortaya çıkabilir. Acı çekmenin hafifletilmesi ile bağımlılık riskini dengelemeli ve hastaların uygun eğitim ve destek almasını sağlamalıdır.
4. **Kültürel ve dini hususlar:** Hastaların veya ailelerin kültürel ve dini inançları sağlık hizmeti sağlayıcılarının uygulamalarıyla çeliştiğinde etik zorluklar ortaya çıkabilir. Mesleki yükümlülüklerini yerine getirirken hastalarının inançlarına ve değerlerine saygı göstermelidir.
5. **Kaynakların tahsisi:** PB maliyetli olabilir ve sınırlı kaynakların ihtiyacı olan hastalara nasıl tahsis edileceğine karar verirken etik zorluklar ortaya çıkabilir. Hastaların bireysel ihtiyaçlarını daha geniş bir toplumun ihtiyaçları ile dengelemeli ve kaynakları etkili ve verimli bir şekilde kullanmalıdır.
6. **Tedaviyi durdurma veya geri çekme:** hastalar, aileler ve sağlık profesyonelleri için zor olabilir. Hastanın kendi bakımı hakkında karar verme konusundaki özerkliği ile hastanın çıkarlarına en uygun şekilde hareket etmek gerekir.

Bu zorlukların ve etik sorunların farkında olan PB sağlayıcıları, İletişim, iş birliği ve hasta merkezli bir yaklaşım, bu zorlukların üstesinden gelmek ve hastaların değerleri ve tercihleri ile tutarlı bir bakım almalarını etkili ve etik olan yüksek kaliteli bakım sağlamak için gereklidir

Aynı Olguda İki Farklı Yaklaşım

S.K. 71 yaş/K diyabeti olan ve üç hafta önce pnömoni tanısı ile hastaneye yatış öyküsü olan hasta KOAH alevlenmesi ve pnömoni tanısı ile yeniden hastaneye yatırılır. Öksürük, ateş, baş ağrısı ve dispne şikayeti olan hasta genel durumu kötüleşmesi ve septik şok gelişmesi nedeniyle yoğun bakıma transfer edilir. Yoğun bakımda baş ağrısı ve nefes darlığından şikayet etmeye devam eder ve hemşireler onun giderek daha fazla sinirlendiğini ve zar zor uyuduğunu kaydeder. S.K. bu arada akut bir burun kanaması geçirir, akciğere kan aspire eder, solunum sıkıntısı nedeniyle entübe edilir.

İlk olarak, hasta, ağrı ve semptom yönetimi alamamıştır, baş ağrısı ve uykusuzluğu tamamen gözden kaçırılırken nefes darlığı çekmeye devam etmiştir. İkincisi, hasta, aile ve sağlık ekibi arasında yetersiz iletişim bulunmaktadır. S.K. ile iletişim kurabilirken bakım hedeflerinin tartışılmadığı ve ailenin hastalığın ciddiyetini anlayamadığı belirlenmiştir. Hastaya yaşam kalitesini ve özerkliğini göz önüne almayan koordinasyonsuz bir bakım sunulmuştur. Sonuç olarak fiziksel, psikososyal ve ruhsal ihtiyaçlarını karşılamayan yetersiz bakım verilmiştir.

S. K. anneniz olsaydı?

Mümkün olan en iyi yaşam kalitesine sahip olmasını, ağrısının dinmesini, dispnesinin rahatlamasını, kaygılarının fark edilmesini ve tedavi edilmesini, solunum cihazından çıkmasını ve eve geri döndüğünü görmek isterdiniz. Eski sağlığına kavuşması mümkün değilse bile annenizin kişisel değerlerine uygun bir bakım aldığından emin olmak isterdiniz.

İkinci Yaklaşım Modeli

Hekimler, S.K. bir süredir KOAH ve diyabet hastası olduğunu, önemli ağrı ve semptom endişeleri olduğunu gözlemlediler. Hastanın ikinci kez aynı nedenle hastaneye yatışı olduğundan, geçmişi ve teşhisi göz önüne alındığında, pnömoni nöbetleri ve solunum sıkıntısı muhtemelen devam edeceğinden, bakım hedefleri ve ileri bakım planlaması için PB ekibinden yardım talep ettiler. Nefes almasına yardımcı olması için oksijen, baş ağrılarını dindirmek ve uyumasına yardımcı olmak için ağrı kesici verilir. Tedaviyi üstlenen doktoru, hemşiresi, psikolog ve sosyal hizmet uzmanından oluşan PB ekibi ve S.K., oğlu ve gelini ile bir aile toplantısı yapılır. Bu toplantıda S.K., hala iletişim kurabilirken ve yaşam kalitesinin onun için özel olarak ne anlama geldiğini, onun kişisel değerlerini ve bakım hedeflerini tartışırlar. S.K. kabul edilebilir bir yaşam kalitesiyle eve dönemezse, kardiyopulmoner canlandırma istemeyeceğini beyan eder ve "Hayatta kalmak" istemediğini açıklar. S.K. pnömoni antibiyotiklere yanıt vermez ve septik şok gelişir. PB Ekibi, konuyu S.K. ailesine aktarır, S.K. nın dileklerine uygun olarak, yoğun bakım nakline karşı çıkarlar. Hastalığının ciddiyeti ile başa çıkmak ve agresif tedaviden kaçınmak onlar için zor olsada, semptomatik rahatlama sağlanabileceğini bilmek onları rahatlatır. S. K. burun kanamasından dolayı solunum sıkıntısına girdiğinde, ağrısı ve semptomları entübasyon olmaksızın iyi bir şekilde kontrol altına alınır ve sonraki birkaç saat içinde ailesi ile birlikte iken huzur içinde yaşama veda eder.

Kalp yetmezliği ve son dönem solunum yolu hastalığı, hastanede yatan hastalarda en yaygın ölüm nedenleri arasındadır. Bu tür Kr. hastalıklar son evrelerinde, ağrı ve semptom kontrolüne ihtiyaç duyar. PB hizmetlerine genellikle hastalıklarının çok geç dönemlerinde ulaşmakta veya hiç ulaşamamaktadırlar. S.K. da ki gibi Kr. hastalığı olan çoğu hasta, uygun fiziksel, psikolojik, sosyal ve ruhsal destek olmadan yaşamın son aşamasına ulaşır. S.K gibi diğer hastalara kaliteli bakım sağlamanın etik açıdan çözümü, disiplinler arası özel bir sağlık ekibi aracılığıyla PB hizmetlerinin sunumudur.

SONUÇ ve ÖNERİLER

Ölüm, genellikle yaşamın doğal bir yönü değil sağlık sisteminin başarısızlığı olarak görülür. Yaşam sonu dönemde, hala yaşamı uzatan tedaviyi sürdürürken hastaları ölümlerine nasıl hazırlayacağımızı öğrenmemiz gerekmektedir. Bunu başarmak için sağlık hizmeti sağlayıcıları, hastalarla bakımın hedefleri hakkında açıkça tartışmalı ve agresif, hayat kurtaran tedavilerin kullanımını sınırlamak için aşamalı olarak geçişler yapmalıdır. Tüm sağlık çalışanlarının her hastanın çekmekte olduğu ağrı ve acıyı dindirmek üzere ayrım gözetmeden, ihtiyacı olan PB'e erişebilmesini sağlamak üzere örgütlenmiş olmaları önemlidir. İnsan haklarını gözeten, özellikle hastanın yaşamının sonunda ölürken bulunmayı tercih ettiği yer ve koşulları seçme hakkına saygı duyulacak biçimde bu bakım verilmelidir. Yaşamı uzatan tedaviler etkili değilse aileye yaşamı uzatan tedaviyi durdurmanın veya geri çekmenin hastanın terk edilmesi anlamına gelmeyeceği anlatılmalı ve artık aktif semptom yönetimine odaklanılacağına dair güvence vermek önemlidir.

Hastaların özerkliklerine saygı duyan, iyilik hallerini destekleyen ve acılarını hafifleten şefkatli ve hasta merkezli bakım almalarını sağlamak için PB'de etik hususlar çok önemlidir.

KAYNAKLAR

1. World Health Organization definition of palliative care. https://www.who.int/news-room/fact-sheets/detail/palliative-care.
2. Reid, V.L., et al., A systematically structured review of biomarkers of dying in cancer patients in the last months of life; An exploration of the biology of dying. PLoS One, 2017. 12(4): p. e0175123.
3. O'Brien, C.P., Withdrawing medication: managing medical comorbidities near the end of life. Can Fam Physician, 2011. 57(3): p. 304-7, e89-92.
4. Working Group on Clinical Ethics of the HospitalAuthority Clinical Ethics Committee. Hospital Authority Guidelines on Life-sustainingTreatment in the Terminally Ill. (Hong Kong) First Edition, .
5. Daher, M., Ethical issues in the geriatric patient with advanced cancer 'living to the end'. Annals of oncology, 2013. 24: p. vii55-vii58.
6. De Panfilis, L., et al., "I go into crisis when …": ethics of care and moral dilemmas in palliative care. BMC Palliat Care, 2019. 18(1): p. 70.
7. Konseyi, A., Yaşamın son döneminde tıbbi tedavide karar verme sürecine ilişkin kılavuz. Ekim, 2015. 18: p. 2018.
8. Shreves, A. and E. Marcolini, End of life/palliative care/ethics. Emerg Med Clin North Am, 2014. 32(4): p. 955-74.
9. Mohanti, B.K., Ethics in palliative care. Indian J Palliat Care, 2009. 15(2): p. 89-92.
10. Roscoe, L.A. and D.P. Schenck, Communication and Bioethics at the End of Life. 2017: Springer.
11. Sreenivasan, V. and C.O.S. Nobleza, Challenges and ethical issues in the course of palliative care management for people living with advanced neurologic diseases. Ann Palliat Med, 2018. 7(3): p. 304-319.

12. Wilkie, D.J. and M.O. Ezenwa, Pain and symptom management in palliative care and at end of life. Nurs Outlook, 2012. 60(6): p. 357-64.
13. Shreves, A. and E. Marcolini, End of life/palliative care/ethics. Emerg Med Clin North Am, 2014. 32(4): p. 955-74.
14. Schuyler, D. and S. Fowler, Palliative Care at the End of Life. Prim Care Companion CNS Disord, 2016. 18(3).
15. Mohanti, B.K., Ethics in palliative care. Indian J Palliat Care, 2009. 15(2): p. 89-92.
16. Hui, D. and E. Bruera, Models of Palliative Care Delivery for Patients With Cancer. J Clin Oncol, 2020. 38(9): p. 852-865.
17. Senderovich, H. and S. Wignarajah, Overcoming the challenges associated with symptom management in palliative care. Ann Palliat Med, 2017. 6(2): p. 187-194.
18. Kass, L.R., Ethical Dilemmas in the Care of the III: II. What Is the Patient's Good? Jama, 1980. 244(17): p. 1946-1949.

09:15-09:30 (Panel X)

9:00-10:35	PANEL X: ORTHOPEDIC ANESTHESIA	Mahmut Kalem, Fatma Sarıcaoğlu, Mustafa Aksoy
9:00-9:15	Choosing the anesthesia technique for high risk orthopedic surgery; Can we define pathways?	Menekşe Özçelik
9:15-9:30	Acute and chronic pain management after arthroscopic shoulder surgery	Sanem Çakar
9:30-9:45	Motor function preserving anesthetic and analgesic methods for hip arthroplasty	Derya Arslan Yurtlu
9:45-10:00	The role of the surgical team in the prevention of chronic pain after arthroplasty	Hakan Kocaoğlu
10:00-10:15	Postoperative cognitive dysfunction and perioperative facts; How to protect our patients based on cellular and clinical level	Başak Ceyda Meço
10:15-10:35	Discussion	
10:35-10:50	*Coffee Break*	

Acute and Chronic Pain Management After Arthroscopic Shoulder Surgery

K. Sanem Cakar Turhan

Ankara University School of Medicine, Department of Anesthesiology and ICU, Ankara, Türkiye

Pain according to IASP (International Association for the study of pain) is defined as unpleasant emotional and sensorial experience associated with a tissue injury. Pain is a multidimensional situation consisting of neurophysiological, biochemical, psychological, ethnocultural, religious, cognitive, mental and environmental factors. Pain is always a personal experience that is influenced to varying degrees by biological, psychological, and social factors (1).

Acute postoperative pain is defined as pain developing immediately following surgery and lasting up to 7 days whereas chronic postsurgical pain (CPSP) is a clinical picture persisting for at least three months following a surgical intervention, where additional particular neuropathic symptoms are observed. Acute pain treatment focuses on treating the underlying cause and interrupting the nociceptive signals whereas chronic pain treatment should depend on a multidisciplinary approach and involve more than one therapeutic modality (2).

Shoulder arthroscopy is a minimally invasive surgery which is useful to treat several shoulder pathologies and improve long-term pain and quality of life in patients with shoulder problems. But it is associated with severe post-operative pain and the incidence of postoperative pain is reported to be 30-70%. Effective post-operative pain management is an important modality in such cases, not only to prevent chronic pain development but also for early recovery and rehabilitation following surgery. There are several risk factors for chronic pain development such as female gender, young age, genetic predisposition, psychological vulnerability, presence of moderate-severe preoperative pain and anxiety, depression, inadequate control of postoperative pain. A preoperative history of opioid use before shoulder arthroscopy is associated with significantly higher postoperative opioid consumption and visual analog scale scores. Peroperative interventions to decrease the postoperative pain are using paracetamol, cyclooxygenase-2 inhibitors, intravenous dexamethasone, peripheral nerve blocks such as interscalene block or suprascapular nerve block (with or without axillary nerve block) and choosing arthroscopic surgical technique. There are limited evidence related to preoperative use of gabapentin, perineural adjuncts such as opioids, glucocorticoids, or α-2-adrenoceptor agonists added to the local anaesthetic solution or postoperative transcutaneous electrical nerve stimulation (3).

Keywords: Postoperative pain, shoulder arthroscopy, interscalene block

REFERENCES

1. Raja, SN, Carr, DB, Cohen M, Finnerup NB et al. The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises. Pain 2020; 161 (9): 1976-1982.
2. Glare P, Aubrey KR, Myles PS. Transition from acute to chronic pain after surgery. The Lancet 2019; 393 (13): 1537-1546.
3. Toma O, Persoons B, Pogatski-Zahn E, Van de Velde M, Joshi GP. Prospect guideline for rotator cuff repair surgery: systematic review and procedure-specific postoperative pain management recommendations. Anesthesia 2019; 74: 1320-1331.

09:30-09:45 (Panel X)

9:00-10:35	PANEL X: ORTHOPEDIC ANESTHESIA	Mahmut Kalem, Fatma Sarıcaoğlu, Mustafa Aksoy
9:00-9:15	Choosing the anesthesia technique for high risk orthopedic surgery; Can we define pathways?	Menekşe Özçelik
9:15-9:30	Acute and chronic pain management after arthroscopic shoulder surgery	Sanem Çakar
9:30-9:45	Motor function preserving anesthetic and analgesic methods for hip arthroplasty	Derya Arslan Yurtlu
9:45-10:00	The role of the surgical team in the prevention of chronic pain after arthroplasty	Hakan Kocaoğlu
10:00-10:15	Postoperative cognitive dysfunction and perioperative facts; How to protect our patients based on cellular and clinical level	Başak Ceyda Meço
10:15-10:35	Discussion	
10:35-10:50	*Coffee Break*	

Motor Function Preserving Anesthetic and Analgesic Methods for Hip Arthroplasty

Derya Arslan Yurtlu

Izmir Atatürk Training and Research Hospital, Department of Anesthesiology and Reanimation, İzmir, Türkiye

Effective anesthesia and analgesia for hip surgery are very important in terms of reducing morbidity and mortality, functional well-being and long-term surgical results. The inclusion of peripheral nerve blocks as part of a multimodal analgesia strategy in the treatment of these patients provides significant benefits supported by evidence (1). However, the search for an ideal method that will contribute to early functional recovery while providing effective analgesia for peripheral nerve blocks continues. There is a wide variety of peripheral nerve block options for hip surgery, from deep plexus blocks such as perioperative lumbar and sacral plexus to individual nerve blocks for analgesia.

Femoral nerve block (FNB) and fascia iliaca compartment block (FICB), which are frequently used among peripheral blocks, are easy and safe techniques, and they provide the patient with a pain-free positioning with a decrease in pain scores and opioid use. In addition, they cause a decrease in delirium, hospital stay, and pneumonia incidence (2). It has been demonstrated that the suprainguinal approach to the fascia iliaca block extends more consistently to all nerves and provides better pain control (3). However, since they target the femoral nerve and possibly the obturator nerve in both blocks, they inevitably cause motor block of the lower extremity (4). This situation has been associated with the risk of falling in patients.

Although there are recent studies on the use of quadratus lumborum and erector spina plane blocks for analgesia in hip surgery, Pericapsular Nerve Group (PENG) block stands out due to its potential motor block sparing feature. PENG block targets the higher articular branches of the femoral, accessory obturator and obturator nerves in the plane between the iliopsoas muscle and the pubic ramus in the iliopubic eminence. Thus, the sensory innervation of the anterior hip capsule, which is largely responsible for pain, is provided. PENG block has advantages such as reduction in preoperative position pain, potential motor protective effect, and analgesic effectiveness (5). However, an important limitation is that cutaneous sensory block cannot be achieved with PENG block. For this, combinations of local anesthetic skin infiltration or lateral femoral cutaneous nerve block (LFCN) can be used.

The iliopsoas (IP) block is a PENG-like interfascial plane block that targets IP for analgesia of the anterior hip capsule. It differs from PENG block in terms of final needle position and injection volume, which play an important role in determining motor sparing properties. Currently available clinical data support IPB, though limited, as a motor-sparing hip block.

As a conclusion in line with current knowledge, PENG block and similarly IP block may offer a motor-sparing approach for hip surgery, but more research is required to determine analgesic efficacy, feasibility, and safety profile.

Keywords: Femoral nerve, fascia iliaca, quadratus lumborum, erector spina, iliopsoas, peripheric block

REFERENCES

1. Guay J, Kopp S. Peripheral nerve blocks for hip fractures in adults. Cochrane Database Syst Rev. 2020;11:CD001159.
2. Dangle, J, Kukreja, P. & Kalagara, H. Review of Current Practices of Peripheral Nerve Blocks for Hip Fracture and Surgery. Curr Anesthesiol Rep 10, 259–266 (2020).
3. Amin NH, West JA, Farmer T, Basmajian HG. Nerve Blocks in the Geriatric Patient With Hip Fracture: A Review of the Current Literature and Relevant Neuroanatomy. Geriatr Orthop Surg Rehabil. 2017; 8: 268-275.
4. Tran DQ, Salinas FV, Benzon HT, et al. Lower extremity regional anesthesia: essentials of our current understanding. Reg Anesth Pain Med 2019;44:143-180.
5. Ueshima H, Otake H, et al. Clinical experiences of pericapsular nerve group (PENG) block for hip surgery. J Clin Anesth. 2018; 51:60-61.

10:50-11:05 (Panel XI)

10:50-12:10	PANEL XI: REGIONAL ANESTHESIA	Semih Başkan, Abdülkadir But, Ahmet Coşar
10:50-11:05	Plane block throughout the body	Derya Özkan
11:05-11:20	Factors affecting block characterisitcs in peripheral nerve blockade	Perihan Ekmekci
11:20-11:35	Neurotoxicity of peripheral nerve block adjuants	M. Burak Eşkin
11:35-11:50	Long-term effects of anesthetic drugs in oncological patients	Güldeniz Argun
11:50-12:10	Discussion	

Plane Block Throughout the Body

Derya Özkan

Health Sciences University, Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

In recent years, new approaches have emerged in modern regional anesthesia practice, with the introduction of local anesthetics from the specific nerve sheath to a different localization, interfacial plane or compartment under ultrasound guidance. The aim of these new approaches is to block the sensorial nerve fibers as much as possible without affecting the motor nerve fibers, unlike the nerve plexus blocks, as much as possible. Thus, in recent years, it is aimed to recover quickly, which is in accordance with Enhanced Recovery After Surgery (ERAS) protocols and does not require the use of opioids.

There are three basic layers of fascial ligaments in the human body: the superfascial fascia, the deep fascia, and the fascia within the muscle (epimysium-perimysium-endomysium). The one that concerns the interfacial plane blocks is the deep fascia. Deep fascia extends throughout the body, does not contain fat layers, and forms sheaths that surround vessels, nerves, and some organs. Unlike peripheral nerve and plexus blocks, interfacial plane blocks can be applied to the interfacial area or compartment in various parts of the body (1).

Fascial Plane Blocks for Abdominal and Thorasic Surgery

The fascial plane blocks have found particular application in truncal analgesia as simpler and safer alternatives to thoracic epidural and paravertebral blockade. Although paravertebral or epidural blocks applied in abdominal, thoracic and breast surgeries are considered the gold standard in perioperative analgesia, they are advanced techniques also they pose risks such as pneumothorax in practice. Recently, effective and safe perioperative analgesia has been provided with the application of transversus abdominis plane (TAP), quadratus lumborum block (QLB), interpectoral (PECS1, PECS2, serratus anterior plane block) and parasternal facial blocks (2,3).

Transversus Abdominis Plane (TAP) Block

This interfascial plane contains the intercostal, subcostal, iliohypogastric, and ilioinguinal nerves. These nerves give sensation to the anterior and lateral abdominal wall as well as the parietal peritoneum, providing only somatic and not visceral analgesia (2).

Quadratus Lumborum Block (QLB)

It is a deep interfacial block applied to the region between the posterior abdominal muscles. When applied unilaterally, sensorial branches of the spinal nerve can be blocked from T12 level to L2 level on that side (abdominal surgery). It is also reported to provide effective postoperative analgesia in hip surgeries (4).

PECS (Interpectoral) Blocks

The Pecs I and Pecs II blocks are superficial thoracic wall blocks which through blockade of the pectoral and intercostal nerves can be used to provide analgesia for breast surgery and other procedures / surgery involving the anterior chest wall (3).

Fascial Plane Blocks for Upper and Lower Extremity

Shoulder (such as arthroplasty, rotator cuff repair), knee (such as arthroplasty, arcuate ligament repair) and hip (such as arthroplasty, arthroscopy) surgeries are the most commonly performed orthopedic procedures. These procedures cause moderate to severe pain that requires a multimodal analgesic approach in the perioperative period. Although peripheral nerve blocks provide very effective analgesia in extremity surgeries, they have the potential to create motor block. Therefore, in recent years, interfacial and compartment blocks have gained popularity in shoulder, hip and knee surgeries to create more sensory blocks (5).

Shoulder Surgeries

Pericapsular nerve group (PENG) Block

It has been reported that deep pericapsular local anesthetic infiltration along the subscapular muscle under ultrasound guidance can block the axillary and subscapular nerve branches that innervate the glenohumeral joint. In cadaver studies, it was determined that the axillary and subscapular nerve branches were stained with methylene blue in the pericapsular area with PENG block. Studies on block efficacy are mostly in the form of case reports, and randomized controlled studies are not sufficient yet.

Erector spinae plane (ESP) Block

The ESP block is an interfacial block that targets the ventral and dorsal rami of the spinal nerves passing between the transverse process and the erector spina muscle at the level of the thoracic, abdominal vertebrae. It is frequently used in abdominal and thoracic surgeries. Recently, it has been reported that applications at the thoracic (T) 2 vertebrae level, which target the block of nerves that provide shoulder innervation in shoulder surgeries, provide effective postoperative analgesia in arthroscopic shoulder surgery (3).

Hip and Knee Surgeries

PENG block

The largest area responsible for pain in hip surgeries is the anterior hip joint. Innervation of this area is provided by the femoral nerve, obturator nerve, and accessory obturator nerve. Ultrasound-guided PENG is the plane between the psoas muscle tendon and the iliopubic prominence that is targeted in the block. Both anatomical and clinical studies support that PENG block provides perioperative analgesia without causing motor block in hip surgery (4).

Fascia iliaca block

The fascia iliaca compartment is a potential area located between the fascia iliaca anteriorly and the iliacus and psoas muscles posteriorly. This area is the transition area of the lumbar plexus. It has been reported that the suprainguinal approach, accompanied by ultrasonography, provides more effective analgesia (5)

Lumbar ESP block

It has been reported that ESP block applied from the lumbar 4 (L4) vertebra level provides effective analgesia at T12-L4 levels, which includes the dermatomes required for hip surgeries (6,7).

Adductor channel block

The adductor canal, also known as the Hunter's canal, is an aponeurotic space extending between the femoral triangle and the adductor magnus. The saphenous nerve, the obturator nerve, and the vastus mediali branch pass through this canal. Thus, the branches that innervate the anterior capsule of the knee joint are blocked.

Infiltration between the popliteal artery and the capsule of the posterior knee block (IPACK) block: It is a technique in which local anesthetic is applied between the posterior capsule of the knee and the popliteal artery (6,8). Effective analgesia can be achieved in knee surgeries with both adductor canal block and IPAC block.

REFERENCES

1. Chin KJ, Versyck B, Elsharkawy H, Rojas Gomez MF, Sala-Blanch X, Reina MA. Anatomical basis of fascial plane blocks. Reg Anesth Pain Med. 2021;46:581-599.
2. Blanco R, Ansari T, Riad W, Shetty N. Quadratus Lumborum block versus transversus abdominis plane block for postoperative pain after cesarean delivery: a randomized controlled trial. Regional Anesthesia and Pain Medicine 2016; 41: 757– 62.
3. Chin KJ. Thoracic wall blocks: from paravertebral to retrolaminar to serratus to erector spinae and back again - a review of evidence. Best Practice and Research: Clinical Anaesthesiology 2019; 33: 67– 77.
4. Korgvee A, Junttila E, Koskinen H, Huhtala H, Kalliomaki ML. Ultrasound-guided quadratus lumborum block for postoperative analgesia: A systematic review and meta-analysis. Eur J Anaesthesiol. 2021 Feb 1;38(2):115-129.
5. Li J, Tang S, Lam D, Hergrueter A, Dennis J, Liu H. Novel utilization of fascial layer blocks in hip and knee procedures. Best Pract Res Clin Anaesthesiol. 2019;33:539-551.
6. Tran DQ, Salinas FV, Benzon HT, Neal JM. Lower extremity regional anesthesia: essentials of our current understanding. Reg Anesth Pain Med. 2019 Jan 11:rapm-2018-000019.
7. Ciftci B, Ekinci M, Gölboyu BE et al. High Thoracic Erector Spinae Plane Block for Arthroscopic Shoulder Surgery: A Randomized Prospective Double-Blind Study. Pain Med. 2021 20;22:776-783.
8. Layera S, Saadawi M, Tran Q, Salinas FV. Motor-Sparing Peripheral Nerve Blocks for Shoulder, Knee, and Hip Surgery. Adv Anesth. 2020 ;38:189-207.

10:50-12:10	PANEL XI: REGIONAL ANESTHESIA	Semih Başkan, Abdülkadir But, Ahmet Coşar
10:50-11:05	Plane block throughout the body	Derya Özkan
11:05-11:20	Factors affecting block characterisitcs in peripheral nerve blockade	Perihan Ekmekci
11:20-11:35	Neurotoxicity of peripheral nerve block adjuants	M. Burak Eşkin
11:35-11:50	Long-term effects of anesthetic drugs in oncological patients	Güldeniz Argun
11:50-12:10	Discussion	

Neurotoxicity of Peripheral Nerve Block Adjuvants

Mehmet Burak Eşkin

Health Sciences University, Gülhane Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Peripheral nerve blocks (PNBs) are frequently applied to provide anesthesia and analgesia during surgery. Due to the development of technology, the number and success rate of PNBs have increased considerably. Many adjuvant drugs were used to increase the effects of local anesthetics in PNBs. The aim is to increase the speed of onset and prolong the block duration without toxicity. However, these perineural adjuvants, which are mostly used off-label, are associated with neurotoxicity. In this article, we aimed to investigate the neurotoxicity of adjuvants used in PNBs.

Keywords: Peripheral nerve blocks, local anesthetics, adjuvants, neurotoxicity

INTRODUCTION

As a result of the technological developments in both ultrasonographic imaging and block needles, the success of peripheral nerve block (PNB) has increased and accordingly, PNBs are being applied more frequently. Therefore, PNB has become an integral part of modern anesthesia and analgesia applications (1). Adjuvants used for PNB are drugs that help to increase the quality and effectiveness of the blocks by increasing the effects of local anesthetics, although they have little or no local anesthetic effects (2).The main purpose of adjuvant use is to minimize the dose of local anesthetics, accelerate the onset of action, prolong the duration of analgesia, increase the quality of analgesia, and limit possible drug-related side effects (3). Adjuvants can be administered using different routes, including systemic, perineural, and topical administration. The adjuvants used PNBs are given in *Table I*. The most important and undesirable side effect of perineural adjuvants is neurotoxicity (4). This article aims to provide information about the neurotoxicity of perineural adjuvants used in PNBs.

Buprenorphine

Buprenorphine is an adjuvant that acts as a partial agonist on opioid receptors. Buprenorphine has an opioid receptor affinity which is 24 times greater than fentanyl and 50 times greater than morphine (5-6). It is a lipophilic agent. Buprenorphine shows its effect by blocking voltage-gated Na^+ channels. Buprenorphine is metabolized to norbuprenorphine. Buprenorphine blocks Mu, kappa, and delta opioid receptors (5). In a recent study, perineural dexamethasone and buprenorphine were compared as adjuvants to femoral block and saphenous (adductor canal) nerve block in patients undergoing knee arthroplasty. The effect of buprenorphine was found to be lower than that of dexamethasone. Therefore, it has been suggested as an alternative adjuvant to dexamethasone in patients in whom dexamethasone is contraindicated, such as in diabetics (6). Viel et al. used interscalene block with a mixture of levobupivacaine and buprenorphine in patients undergoing shoulder arthroscopy, and they found a two-fold increase in the duration of analgesia (7). In another study, buprenorphine, fentanyl, and morphine were used as adjuvant in patients undergoing supraclavicular block and a six-hour prolongation in the duration of analgesia was reported (8). Candido et al. found that buprenorphine increased the duration of analgesia 1.5-3 times in infragluteal sciatic block (9). In all these studies, no neurotoxicity or increased side effects were reported. However, nausea and vomiting were observed after administration in several studies (10). In an animal study, it was reported that cell death was high in sensory neurons exposed to higher concentrations of buprenorphine. Invitro studies have also shown that buprenorphine increases apoptosis in nerve cells. However, the concentrations used in these studies (100 µM) were much higher than the doses used in normal clinical practice (≤25 µg/mL) (11). In another study in an in vivo animal safety model by Williams et al., only neurotoxicity and no other adverse events were encountered (12).

Tramadol

Tramadol is a weak opioid μ-receptor agonist and serotonin norepinephrine reuptake inhibitor. Tramadol inhibits norepinephrine/serotonin reuptake and blocks Na^+ and K^+ channels. Tramadol increases analgesia (13). In axillary block studies where tramadol was used as an adjuvant, 100 mg and 200 mg of tramadol were added to mepivacaine. There was an increase in the duration of motor and sensory block, without any increase in side effects (14-16)**.** The group that received perineural tramadol with an adjuvant dose of tramadol for interscalene block was compared with the group receiving systemic tramadol, and analgesia was found to be longer in the first group (17). However, the use of perineural tramadol for PNB is not recommended, as little is known about its potential neurotoxicity and its effect of prolonging analgesia is also controversial. It is recommended for use only as a postoperative epidural infusion.

Morphine

Morphine is a non-selective μ-receptor agonist. Conflicting results have been found in studies on the use of perineural morphine. Some showed prolongation of analgesia, while others reported no benefit. No advantage has been demonstrated with the use of perineural morphine in PNB over intravenous and intramuscular morphine. Studies have not shown any advantage of using perineural morphine over intravenous (IV) and intramuscular (IM) routes. Perineural use of morphine is not recommended because there is no difference from systemic use and there is little evidence that perineural use is beneficial. Therefore, studies on perineural toxicity are limited (8, 18,19).

Fentanyl

Fentanyl is a synthetic lipophilic opioid. It shows strong activity on opiate receptors such as mu (μ) and kappa (ƙ). In studies examining fentanyl as a perineural adjuvant, it was added as an adjuvant to ropivacaine and mepivacaine together with epinephrine in supraclavicular block and sciatic/femoral block, but it was not shown to provide any advantage (20,21). On the contrary, administration of fentanyl with 0.25% bupivacaine and epinephrine in paravertebral block prolonged the anesthesia duration by 18 hours, and with bupivacaine + lidocaine mixture increased the effectiveness of cervical plexus block (22). In a review of 26 randomized studies, no neurotoxicity was detected due to the application path of opioids. In many studies where perineural opioids were used, systemic side effects, including itching, nausea, and vomiting, were reported (23) In another study, it was found that there was no histological neurotoxicity after daily exposure to intrathecal sufentanyl, fentanyl, and morphine in dogs (24). In vitro studies have shown that opioids are neurotoxic. Sufentanyl and morphine do not increase cell death caused by lidocaine in human nerve cells. In animal studies, morphine increased apoptosis caused by lidocaine in astrocytes, but sufentanyl did not have the same effect (24-26).

Clonidine

The imidazole derivative is an α2-selective adrenergic agonist. It has been used as an adjuvant in PNB for about 30 years (27). It has analgesic, sedative, and hemodynamic effects (28). In vivo, the nerve blockade prolonging effect occurs through hyperpolarization of nucleotide-gated ion channels (29). It shows higher efficacy with long-acting anesthetics. The use of 30-300 mg of clonidine prolongs the time of initial analgesic request by 2 to 2.5 hours. In 70% of studies, 150 mg was found to be the effective dose. It has been shown that it can increase the effect of all other anesthetics except mepivacaine (29,30). In animal models, it has been demonstrated that clonidine facilitates PNB (31). Although various systemic side effects, including hypotension and bradycardia, have been demonstrated with high-dose (over 150 mg) clonidine, no neurotoxicity has been reported. Intrathecal and epidural uses of clonidine are approved by the US Food and Drug Administration (FDA). The safety of clonidine use in PNB can be categorized as “grandfathered.” It is generally accepted in textbooks (20).

Dexmedetomidine

Dexmedetomidine is a selective α2 agonist. It has analgesic and hypnotic effects. Dexmedetomidine is used for short-term sedation and analgesia in the intensive care unit (ICU). It also causes hypotension and bradycardia. An intrathecal dose of 3 μg bupivacaine has been shown to prolong the motor and sensory blockade. Dexmedetomidine can prolong PNB by 200 minutes at a dose of 1 μg/kg (32,33). Stimulation of the α2-receptor can cause hypotension, bradycardia, and sedation at high doses. These effects may outweigh its benefit as an analgesic. When used as an adjuvant in PNB, it has been reported to prolong the motor block by 4.4 hours, first analgesic request time by 5.7 hours, and sensory block by 4.5 hours (32,33). Interestingly, despite initial concerns that dexmedetomidine might have greater hemodynamic effects than clonidine, the incidence of

reversible bradycardia was found to be less than 10% (33). The potential neurotoxicity of dexmedetomidine has not been extensively studied. However, no neurotoxicity of dexmedetomidine has been reported in animal models of spinal anesthesia. Moreover, in animal models of peripheral and central regional nerve block, dexmedetomidine did not show neurotoxicity. It is potentially neuroprotective when combined with lidocaine and bupivacaine. Human studies have not revealed the occurrence of neurotoxicity with dexmedetomidine use (34). Before Brummet's study, there was no safety data on the perineural use of dexmedetomidine. Dexmedetomidine was found to reduce perineural inflammation when added to bupivacaine in sciatic nerve block in rats. Studies using these safety data have confirmed the efficacy of perineural dexmedetomidine. Further studies investigating the effects of dexmedetomidine in combination with other adjuvants have not yet been performed (35). Dexmedetomidine is used off-label. Although it is widely used internationally and has been investigated in many scientific studies, the FDA does not approve dexmedetomidine for peripheral administration (35-36).

Ketamine

Ketamine is an N-methyl D-aspartate receptor (NMDA) receptor antagonist. Ketamine also has a local anesthetic effect. Few studies have evaluated it as an adjuvant to PNB, despite some studies demonstrating its neuraxial effect (37). Lee et al. found that the use of ropivacaine + 30 mg of ketamine had no effect on peripheral nerve blockade (38). High rates of side effects such as hallucinations, nausea, and drowsiness were observed with ketamine. In animal studies, no neurotoxicity was observed following intrathecal administration of ketamine (37,39). However, studies investigating neurotoxicity resulting from the use of ketamine in PNB are not sufficient. Due to the lack of high-quality clinical data to support the perineural use of ketamine and concerns regarding the high incidence of side effects, its use as an adjuvant in PNB is not recommended (39).

Magnesium

Magnesium is an NMDA receptor antagonist. It regulates the calcium flow in the cell. Addition of magnesium to bupivacaine, prilocaine, and levobupivacaine has been shown to prolong PNB (40). No side effects have been reported. In experimental rat models, magnesium has also been demonstrated to increase the activity of lidocaine by raising the threshold of A-beta fibers (41). In one study, when high doses (200 µg) of perineural magnesium were used in brachial plexus block, nausea was reported in the first 12 hours (42). In an animal study by Saeki et al., severe neurotoxicity was caused by the intrathecal administration of magnesium (43). These studies have shown that although perineural magnesium prolongs the nerve block without any side effects, its administration is not recommended due to the small number of clinical studies performed.

Dexamethasone

Dexamethasone is a synthetic corticosteroid. It has a postoperative antiemetic effect (4 to 10 mg intravenously) as well as a systemic anti-inflammatory effect. It is widely used as an adjuvant to local anesthetics in regional anesthesia. The adjuvant mechanism is uncertain. It has been shown to act on the K+ channels in the nociceptive C fibers through the glucocorticoid receptor (32). In a meta-analysis investigating brachial plexus nerve block, it was found that when 4-10 mg of dexamethasone was added to the local anesthetic, the effect of the long-acting local anesthetic was reduced from 730 minutes to 1.306 minutes, while this difference was 175 minutes for moderate-acting local anesthetics. Motor blockade increased from 664 minutes to 1102 minutes with a mean difference of 438 minutes. (44). Another study compared the addition of dexamethasone phosphate to a 1.5% mepivacaine hydrochloride solution with placebo in supraclavicular PNB. It was found that there was a slight increase in the onset time of pain (45). However, in vitro studies have shown an increased risk of perineural neurotoxicity with dexamethasone (46). In an in vivo study in an animal model, neural toxicity of dexamethasone was reported. No potential neuroprotection or antihyperalgesic effects have been shown with the clinical dose. In another animal study, perineural dexamethasone was shown to have a protective effect against neural inflammation caused by bupivacaine (47). Dexamethasone is also used off-label like dexmedetomidine. Although it is widely used internationally and has been investigated in many scientific studies, the FDA does not approve the perineural administration of dexamethasone (36).

Metilprednisolone

Metilprednisolone is a synthetic systemic corticosteroid. It has long been used in analgesia. Few articles support its use as a perineural adjuvant in PNB (48). In neuropathic pain caused by nerve damage, application of 0.5% lidocaine + adjuvant depot methylprednisolone to the proximal region of the injury through PNB has achieved very good results.

Anti-Inflammatory Agents

Prostaglandins sensitize the peripheral nerve endings to the effects of endogenous chemical mediators released with the initiation of surgery. Non-steroidal anti-inflammatory drugs (NSAIDs) inhibit the production of prostaglandins through their well-known cyclooxygenase (COX) inhibitory effects. Therefore, direct perineural administration of NSAIDs appears to be a meaningful way to reduce pain by a peripheral mechanism. No neurotoxicity was found in an animal study in which epidural parecoxib was administered (49). In another animal study in which lornoxicam was administered epidurally, dose-related neurotoxic findings were demonstrated (49).

Neostigmine

Neostigmine is a parasympathomimetic drug. It is a reversible acetylcholine esterase inhibitor. There are very few studies investigating the use of neostigmine in PNB. It produces gastrointestinal side effects. In animal studies, neurotoxicity due to perineural neostigmine has been reported (50). Given the high incidence of gastrointestinal adverse events, risk of neurotoxicity, and minimal data to support prolongation of the block, perineural use of neostigmine is not recommended.

Epinephrine

Epinephrine has been used for a very long time as an adjuvant. It is usually used in a concentration of 5-10 µg/mL. Thanks to the vasoconstrictive effect, it systematically prevents the absorption of the local anesthetic (LA), prolonging the effect of the LA, reducing local anesthetic systemic toxicity (LAST), and allowing higher doses of the LA to be administered. It exerts an alpha 2 adrenoreceptor-mediated antinociceptive effect (2). Adverse hemodynamic side effects of epinephrine are rare. Lower doses of epinephrine may be effective in patients who have the possibility of developing hypertension or tachycardia (3).

Epinephrine has been shown to significantly reduce the nerve blood flow. Kroin et al. showed that perineural epinephrine increases neurotoxicity in a diabetic animal study (51). As a result, its use in patients with diabetes has become controversial. Some investigators have suggested that perineural epinephrine should be avoided in PNB as minimal efficacy has been reported. Despite its long-term use as a perineural adjuvant in PNB, epinephrine has been shown to compromise the endoneural blood flow. It has also been reported to increase neurotoxicity in diabetic animal models. It should not be used in patients with diabetic peripheral neuropathy. Epinephrine has been shown to have little efficacy in prolonging PNB and its use for this purpose is not recommended (3-51).

Verapamil

It is a calcium channel blocker. It prolongs the sensory block by decreasing the permeability to calcium. When verapamil is added as an adjuvant to PNB with lignocaine/bupivacaine, faster action and prolonged analgesia have been demonstrated (52). There are no neurotoxicity studies on the use of verapamil as an adjuvant in PNBs.

Adenosine

Adenosine produces an analgesic effect through spinal adenosine receptors. Minimal neurotoxicity has been observed in laboratory animals. In a study where adenosine was used with local anesthetics for brachial plexus block, it had no effect on prolonging the duration of analgesia (53). There are no studies on the neurotoxicity of perineural adenosine.

Midazolam

It is a gamma-aminobutyric acid (GABA) receptor agonist. Intrathecal use of midazolam in animal models has shown neurotoxicity. It is not recommended as an adjuvant in PNB (54).

Dextran

Some studies have shown that macromolecules exert a local anesthetic effect. At the same time, some studies have shown that dextran prolongs the duration of local anesthetic action. However, studies proving the efficacy of dextran as an adjuvant in PNB are limited (51-54-55).

CONCLUSION

PNBs provide significant anesthetic and analgesic benefits to patients. The adjuvants mentioned above are added to local anesthetics in PNB to both facilitate and prolong the onset of anesthetic and analgesic effects. Although the effect of each adjuvant is variable, dexamethasone seems to be the most effective adjuvant. The evolving knowledge of the nociceptive mechanisms underlying PNB will enable the development of new techniques to further improve pain management in the future. Numerous adjuvants have been investigated for prolonging PNB, but none have been approved by the FDA for this purpose, and since most are off-label, it is unlikely that they will receive FDA approval in the absence of a sponsor with a commercial interest. In addition, few agents have been extensively investigated for potential neurotoxicity, and only a few published clinical studies have appropriate Investigational New Drug (IND) application or equivalent status. However, several commonly used and widely studied adjuvants have been shown to be effective in prolonging PNB for postoperative analgesia with no evidence of clinical neurotoxicity.

In conclusion, use of adjuvants in PNB is an evolving field in anesthesiology where new agents and techniques are added to improve the efficacy and safety of sustained analgesia. Among the different classes of drugs, opioids remain the most widely used adjuvants. With the increase in the number of adjuvants in PNB, their use has become more common. It is important to understand the side-effect profile, associated life-threatening complications, and raise awareness among the users. Future efforts need to be directed to reduce the perineural doses of local anesthetics, increase the analgesic effect, and nullify any adverse effect of adjuvants, mainly neurotoxicity.

REFERENCES

1. Edinoff AN, Fitz-Gerald JS, Holland KAA et al. Adjuvant Drugs for Peripheral Nerve Blocks: The Role of NMDA Antagonists, Neostigmine, Epinephrine, and Sodium Bicarbonate. Anesth Pain Med. 2021 Jul 5;11(3):e117146; 1-10
2. Kirksey MA, Haskins SC, Cheng J, Liu SS. Local Anesthetic Peripheral Nerve Block Adjuvants for Prolongation of Analgesia: A Systematic Qualitative Review. PLoS One. 2015 Sep 10;10(9):e0137312; 1-23
3. Bailard NS, Ortiz J, Flores RA. Additives to local anesthetics for peripheral nerve blocks: Evidence, limitations, and recommendations. Am J Health Syst Pharm. 2014 Mar 1;71(5):373-85.
4. Knight JB, Schott NJ, Kentor ML, Williams BA. Neurotoxicity of common peripheral nerve block adjuvants. Curr Opin Anaesthesiol. 2015 Oct;28(5):598-604.
5. Leffler A, Frank G, Kistner K. et al. Local anesthetic-like inhibition of voltage-gated Na(+) channels by the partial -opioid receptor agonist buprenorphine. Anesthesiology 2012; 116:1335-46
6. Ortiz-Gómez JR, Perepérez-Candel M, Martínez-García Ó et al. Buprenorphine versus dexamethasone as perineural adjuvants in femoral and adductor canal nerve blocks for total knee arthroplasty: a randomized, non-inferiority clinical trial. Minerva Anestesiol. 2022 Jul-Aug;88(7-8):544-553
7. Viel EJ, Eledjam JJ, De La Coussaye JE, D'Athis F. Brachial plexus block with opioids for postoperative pain relief: comparison between buprenorphine and morphine. Reg Anesth 1989; 14: 274-8
8. Bazin JE, Massoni C, Bruelle P et al. The addition of opioids to local anaesthetics in brachial plexus block: The comparative effects of morphine, buprenorphine and sufentanil. Anaesthesia 1997;52:858-62
9. Candido KD, Hennes J, Gonzalez S, et al. Buprenorphine enhances and prolongs the postoperative analgesic effect of bupivacaine in patients receiving infra- gluteal sciatic nerve block. Anesthesiology 2010;113(6):1419e26.
10. An K, Elkassabany NM, Liu J. Dexamethasone as adjuvant to bupivacaine prolongs the duration of thermal antinociception and prevents bupivacaine-induced rebound hyperalgesia via regional mechanism in a mouse sciatic nerve block model. PLoS One. 2015; 10(4):e0123459.
11. Williams BA, Hough KA, Tsui BY et al. Neurotoxicity of adjuvants used in perineural anesthesia and analgesia in comparison with ropivacaine. Reg Anesth Pain Med. 2011; 36(3):225–30.
12. Williams BA, Butt MT, Zeller JR, Coffee S, Pippi MA. Multimodal perineural analgesia with combined bupivacaine-clonidine-buprenorphine-dexamethasone: safe in vivo and chemically compatible in solution. Pain Med. 2015; 16(1):186–98.
13. Shin HW, Ju BJ, Jang YK et al. Effect of tramadol as an adjuvant to local anesthetics for brachial plexus block: A systematic review and meta-analysis. PLoS One. 2017 Sep 27;12(9):e0184649.
14. Kapral S, Gollmann G, Waltl B et al. Tramadol added to mepivacaine prolongs the duration of an axillary brachial plexus blockade. Anesth Analg. 1999 Apr;88(4):853-6.
15. Soulioti E, Tsaroucha A, Makris A et al. Addition of 100 mg of Tramadol to 40 mL of 0.5% Ropivacaine for Interscalene Brachial Plexus Block Improves Postoperative Analgesia in Patients Undergoing Shoulder Surgeries as Compared to Ropivacaine Alone-A Randomized Controlled Study. Medicina (Kaunas). 2019 Jul 23;55(7):399.

16. Kilinc L, Cinar S, Turk HS. Prolonged Analgesic Efficacy of Articaine with the Addition of Tramadol in Axillary Brachial Plexus Block. Sisli Etfal Hastan Tip Bul. 2019 Mar 22;53(1):21-6.
17. Alemanno F, Ghisi D, Fanelli A et al. Tramadol and 0.5% levobupivacaine for single-shot interscalene block: effects on postoperative analgesia in patients undergoing shoulder arthroplasty. Minerva Anestesiol. 2012 Mar;78(3):291-6.
18. Karaman S, Kocabas S, Uyar M, Hayzaran S, Firat V. The effects of sufentanil or morphine added to hyperbaric bupivacaine in spinal anaesthesia for Caesarean section. Eur J Anaesthesiol 2006; 23: 285-91.
19. Flory N, Van-Gessel E, Donald F, Hoffmeyer P, Gamulin Z. Does the addition of morphine to brachial plexus block improve analgesia after shoulder surgery? Br J Anaesth 1995; 75:23-6.
20. Xuan C, Yan W, Wang D, et al. The Facilitatory Effects of Adjuvant Pharmaceutics to Prolong the Duration of Local Anesthetic for Peripheral Nerve Block: A Systematic Review and Network Meta-analysis. Anesth Analg. 2021 Sep 1;133(3):620-9.
21. Moharari R, Sadeghi J, Khajavi M, Davari M, Mojtahedzadeh M. Fentanyl supplement expedites the onset time of sensory and motor blocking in interscalene lidocaine anesthesia. Daru J Fac Pharm Tehran Univ Med Sci 2010; 18:298-302.
22. Bhuvaneswari V, Wig J, Mathew PJ, Singh G. Post-operative pain and analgesic requirements after paravertebral block for mastectomy: A randomized controlled trial of different concentrations of bupivacaine and fentanyl. Indian J Anaesth 2012; 56:34-9.
23. Picard PR, Tramer MR, McQuay HJ, Moore RA. Analgesic efficacy of peripheral opioids (all except intra-articular): a qualitative systematic review of randomised controlled trials. Pain. 1997; 72(3):309–18.
24. Sabbe MB, Grafe MR, Mjanger E et al. Spinal delivery of sufentanil, alfentanil, and morphine in dogs. Physiologic and toxicologic investigations. Anesthesiology. 1994; 81(4):899– 920.
25. Koyyalamudi V, Sen S, Patil S et al. Adjuvant Agents in Regional Anesthesia in the Ambulatory Setting. Curr Pain Headache Rep. 2017 Jan;21(1):6.
26. Werdehausen R, Braun S, Hermanns H et al. The influence of adjuvants used in regional anesthesia on lidocaine-induced neurotoxicity in vitro. Reg Anesth Pain Med. 2011; 36(5):436–43.
27. Eisenach JC, Kock MD, Klimscha W. Alpha 2-Adrenergic Agonists for Regional AnesthesiaA Clinical Review of Clonidine (1984 - 1995). Anesthesiol J Am Soc Anesthesiol 1996;85:655-74.
28. McCartney CJL, Duggan E, Apatu E. Should we add clonidine to local anesthetic for peripheral nerve blockade? A qualitative systematic review of the literature. Reg Anesth Pain Med 2007;32:330-8
29. Kroin JS, Buvanendran A, Beck DR et al. Clonidine prolongation of lidocaine analgesia after sciatic nerve block in rats Is mediated via the hyperpolarization-activated cation current, not by alpha-adrenoreceptors. Anesthesiology 2004;101:488-94.
30. Fournier R, Faust A, Chassot O, Gamulin Z. Perineural clonidine does not prolong levobupivacaine 0.5% after sciatic nerve block using the Labat approach in foot and ankle surgery. Reg Anesth Pain Med 2012;37:521-4
31. Romero-Sandoval A, Eisenach JC. Perineural clonidine reduces mechanical hypersensitivity and cytokine production in established nerve injury. Anesthesiology. 2006 Feb;104(2):351-5.
32. Sehmbi H, Brull R, Ceballos KR et al. Perineural and intravenous dexamethasone and dexmedetomidine: network meta-analysis of adjunctive effects on supraclavicular brachial plexus block. Anaesthesia. 2021 Jul;76(7):974-90.
33. Abdallah FW, Brull R. Facilitatory effects of perineural dexmedetomidine on neuraxial and peripheral nerve block: A systematic review and metaanalysis. Br J Anaesth 2013;110:915-25.
34. Zhang H, Zhou F, Li C et al. Molecular mechanisms underlying the analgesic property of intrathecal dexmedetomidine and its neurotoxicity evaluation: An in vivo and in vitro experimental study. PLoS One 2013;8:e55556.
35. Brummett CM, Norat MA, Palmisano JM et al. Perineural administration of dexmedetomidine in combination with bupivacaine enhances sensory and motor blockade in sciatic nerve block without inducing neurotoxicity in rat. Anesthesiology. 2008 Sep; 109(3):502–511.
36. Neal JM, Rathmell JP, Rowlingson JC. Publishing studies that involve “off-label” use of drugs: formalizing Regional Anesthesia and Pain Medicine’s policy. Reg Anesth Pain Med. 2009;34(5):391–2
37. Zhu T, Gao Y, Xu X et al. Effect of Ketamine Added to Ropivacaine in Nerve Block for Postoperative Pain Management in Patients Undergoing Anterior Cruciate Ligament Reconstruction: A Randomized Trial. Clin Ther. 2020 May;42(5):882-91.
38. Lee IO, Kim WK, Kong MH et al. No enhancement of sensory and motor blockade by ketamine added to ropivacaine interscalene brachial plexus blockade. Acta Anaesthesiol Scand 2002; 46:821-6
39. Nestor CC, Ng C, Sepulveda P, Irwin MG. Pharmacological and clinical implications of local anaesthetic mixtures: a narrative review. Anaesthesia. 2022 Mar;77(3):339-350.
40. Li M, Jin S, Zhao X et al. Does Magnesium Sulfate as an Adjuvant of Local Anesthetics Facilitate Better Effect of Perineural Nerve Blocks?: A Meta-analysis of Randomized Controlled Trials. Clin J Pain. 2016 Dec;32(12):1053-61.
41. Vastani N, Seifert B, Spahn DR, Maurer K. Sensitivities of rat primary sensory afferent nerves to magnesium: Implications for differential nerve blocks. Eur J Anaesthesiol 2013; 30:21-8
42. Lee AR, Yi HW, Chung IS et al. Magnesium nerve block. Can J Anaesth J Can Anesth 2012; 59:21-7.

43. Saeki H, Matsumoto M, Kaneko S et al. Is intrathecal magnesium sulfate safe and protective against ischemic spinal cord injury in rabbits? Anesth Analg 2004;99:1805-12.
44. Choi S, Rodseth R, McCartney CJL. Effects of dexamethasone as a local anaesthetic adjuvant for brachial plexus block: A systematic review and meta-analysis of randomized trials. Br J Anaesth 2014;112:427-39
45. Parrington SJ, O'Donnell D, Chan VW, et al. Dexamethasone added to mepivacaine prolongs the duration of analgesia after supraclavicular brachial plexus blockade. Reg Anesth Pain Med 2010;35:422-6.
46. Dani C, Vestri V, Bertini G, Pratesi S, Rubaltelli FF. Toxicity of corticosteroids and catecholamines for mice neuronal cell cultures: Role of preservatives. J Matern Fetal Neonatal Med 2007; 20:325-33
47. Ferré F, Krin A, Sanchez M, et al. Perineural dexamethasone attenuates liposomal bupivacaine-induced delayed neural inflammation in mice in vivo. Br J Anaesth. 2020;125(2):175–83.
48. Del Toro-Pagán NM, Dai F, Banack T, et al. Perineural Methylprednisolone Depot Formulation Decreases Opioid Consumption After Total Knee Arthroplasty. J Pain Res. 2022 Aug 27; 15:2537-2546.
49. Kim YH, Lee PB, Park J et al. The neurological safety of epidural parecoxib in rats. Neurotoxicology. 2011; 32(6):864–70.
50. Demirel E, Ugur HC, Dolgun H, et al. The neurotoxic effects of intrathecal midazolam and neostigmine in rabbits. Anaesth Intensive Care 2006; 34:218-23.
51. Kroin JS, Buvanendran A, Williams DK et al. Local anesthetic sciatic nerve block and nerve fiber damage in diabetic rats. Reg Anesth Pain Med 2010;35:343-50
52. Routray SS, Mishra D, Routray D, Nanda K. Effect of verapamil as an adjuvant to levobupivacaine in supraclavicular brachial plexus block. Anesth Essays Res 2017;11:656-60.
53. Apan A, Basar H, Ozcan S, Buyukkocak U. Combination of adenosine with prilocaine and lignocaine for brachial plexus block does not prolong postoperative analgesia. Anaesth Intensive Care 2003;31:648-52.
54. Tsuchiya M, Mizutani K, Ueda W. Adding dextran to local anesthetic enhances analgesia. J Anesth 2019;33:163.
55. Wiles MD, Nathanson MH. Local anaesthetics and adjuvants – Future developments. Anaesthesia 2010;65:22-37

Table I. Adjuvants Used in PNBs

Opioids	Buprenorphine Tramadol Morphine Fentanyl
α2 Agonists	Clonidine Dexmedetomidine
NMDA	Ketamine Magnesium
Steroids	Dexamethasone Methylprednisolone
NSAID	Cyclooxygenase Inhibitors Ketorolac Celocoxib
Acetylcholinesterase Inhibitors	Neostigmine
Others	Verapamil, Adenosine, Epinephrine, Midazolam, Dextran

NMDA: N-Methyl D-Aspartate Receptor Agonists, **NSAID:** Non-steroidal Anti Inflammatory Drugs

11:35-11:50 (Panel XI)

10:50-12:10	PANEL XI: REGIONAL ANESTHESIA	Semih Başkan, Abdülkadir But, Ahmet Coşar
10:50-11:05	Plane block throughout the body	Derya Özkan
11:05-11:20	Factors affecting block characterisitcs in peripheral nerve blockade	Perihan Ekmekci
11:20-11:35	Neurotoxicity of peripheral nerve block adjuants	M. Burak Eşkin
11:35-11:50	Long-term effects of anesthetic drugs in oncological patients	Güldeniz Argun
11:50-12:10	Discussion	

Long-Term Effects of Anesthetic Drugs in Oncological Patients

Guldeniz Argun

Health Sciences University, Ankara Oncology Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

Cancer remains the leading cause of death worldwide. Due to the increase in the elderly population in the world, it is estimated that the number of new cancer cases diagnosed from today to 2035 will reach 24 million people (1).

For the treatment of many solid tumors, surgical resection combined with chemotherapy is the best available approach. Patients are exposed to one or more surgical interventions during the treatment process. Surgery can also have negative effects in this process. In the perioperative period, proinflammatory mediator release and high immunomodulation occur with stimulation in the neuroendocrine system (2). In addition, surgical resection of solid tumors leads to increased sympathetic stimulation and initiates a proinflammatory response to tissue damage. This proinflammatory state exerts numerous effects on the body's own cell-mediated immune response. There is a complex interaction between the release of cortisol and catecholamines and the function of immune cells, including but not limited to natural killer (NK) cells and CD8+ T cells; both of these have antitumor activities. In addition, pro-oncogenic cell lines, regulatory T cells and type 2 helper T cells are activated and their proliferation is encouraged (2). This biological response to surgical stress may cause tumor cells to survive and possibly migrate. Metastatic disease is the most common cause of death in cancer patients and can be a source of great financial burden and emotional distress for patients and their families (3).

During surgery, exposure to general anesthesia raises the question that anesthesia may also play a role in primary relapse or metastatic transformation. Agents used in the induction and maintenance of general anesthesia have variable interactions with the immune and neuroendocrine systems and may affect the stress response during surgery. Therefore, discussion of the best type of anesthesia to help attenuate sympathetic and/or proinflammatory responses while modulating cytokine release and transcription factors/oncogenes is at the forefront. This may affect inducible cancer cell survival and metastasis ability, not only during surgery but also in the immediate post-operative recovery phase. Therefore, it is reasonable for anesthesiologists to try to exploit the sympatholytic, anti-inflammatory and immunomodulatory effects of anesthetic drugs in order to change this process and improve patient outcomes. Ideal anesthetic for cancer patients:

1. Attenuate the sympathetic response while maintaining adequate tissue perfusion to prevent tissue hypoxia
2. Attenuate the proinflammatory environment while maintaining an adequate healing response
3. Modulate cytokine release and cellular function to promote NK and CD8+ T cell activity
4. Modulate transcription factors and oncogenes to prevent inducible cell survival and migration

Here, we will discuss the latest information on the role that anesthesia can play during cancer surgery, focusing on the effects of regional and general anesthesia and the various hypnotics, analgesics, and sympatholytic commonly used in primary recurrence and metastasis.

I- General Anesthesia and Regional Anesthesia

Volatile anesthetics and other hypnotics used in the induction and maintenance of general anesthesia have various anti-inflammatory and immunomodulatory effects (4–7). Regional anesthesia techniques such as peripheral nerve blocks and neuraxial blocks are used in many primary tumor resections to reduce both anesthesia and postoperative pain and opioid consumption (8-9). In addition to avoiding the potential immunosuppressive effects of volatile anesthetics and opioids, regional anesthesia may provide an improvement in relapse or conversion outcomes due to its potent sympatholytic effects.

Ketamine, one of the general anesthetics, inhibits NK activity. Thiopental reduces the number of circulating NK. Propofol prevents tumor spread by inhibition of MMP (metalloproteinase). Benzodiazepines have a controversial role. Inhalational agents promote apoptosis of NK cells and human T lymphocytes and promote tumor metastasis. Nitrous oxide interferes with DNA, purine and thymidylate synthesis and inhibits neutrophil function, promotes tumor metastasis. Muscle relaxants no effect on tumor progression. Opioids promotes angiogenesis and immunosuppression. NSAIDS have antiangiogenetic effect and inhibit tumor spread (10).

A randomized controlled trial compared the use of propofol-infused TIVA with combined paravertebral nerve blocks (PNB) with volatile anesthesia and conventional opioid analgesia in women undergoing primary mastectomy for breast cancer (11). Recurrence occurred in 102 (9.8%) and 111 (10.4%) women in the regional anesthesia and volatile general anesthesia groups, which was statistically significant and crossed the study ineffectiveness threshold. The study was stopped at that time and no further data were collected. In this study, it was concluded that the use of regional propofol anesthesia did not affect breast cancer recurrence. One should not forget about the extreme heterogeneity of oncological disease. Although more operations can be performed under regional anesthesia with the latest developments in surgical technique, it should be noted that almost all oncological surgeries require general anesthesia in order to be feasible and safe.

II- TIVA and Volatile Anesthetics

In vitro and in vivo studies have shown that when breast, ovarian and renal cell carcinoma cells are exposed to volatile anesthetics, cytokine release (IL-1/6/8 and TNF), NK and T-cell modulation, as well as growth, angiogenic and migration factors increase (12,13). However, for other types of cancer, such as non-small cell lung cancer, exposure to volatile anesthetics has been shown to suppress growth and metastasis (14). The Cancer and Anesthesia Study (CAN NCT01975064), one of the largest randomized controlled trials (RCTs) examining recurrence and survival in breast cancer patients undergoing general anesthesia, recently published an analysis of first-year survival data for 1705 patients with breast cancer (15). No difference in one-year survival was observed between patients receiving volatile anesthetic or TIVA with propofol, but the study was expanded. An RCT has been performed showing that propofol reduces local recurrence of breast intraductal carcinoma (16). This study included 2036 Asian women randomized to receive propofol TIVA and PVB versus volatile anesthesia and PVB. There was a significant reduction in the risk of local recurrence in women taking propofol, but no difference in the risk of metastatic transformation. In short, more data is needed to say with certainty whether one type of anesthesia is beneficial or harmful to the survival of cancer patients.

III- Opioids

Opioids are potent immunomodulators known to affect innate cell immunity by reducing NK cell activity and cytokine production (8, 17). In a study, it was proven that survival time increased in colorectal and breast cancer patients receiving mu-opioid receptor antagonists such as naloxone, and this effect was thought to be related to mu-opioid receptor activity (18, 19). Other cell and animal studies have shown that opioids have a direct effect on tumor growth through activation of transcription factors (20). In addition, opioids have been shown to be pro-angiogenic through activation of VEGF receptors (19,21). Recent data suggest that different opioids exert different effects on the immune system. For example, morphine and fentanyl have been shown to have similar effects on NK cell activity and lymphocyte proliferation, while oxycodone has been shown to have minimal immunosuppressive properties (22). Despite these data, opioids are the most commonly used analgesic drugs in the postoperative period and are indispensable in the treatment of pain in cancer patients.

IV- Alpha 2 Agonists

Clonidine and dexmedetomidine are potent α2-adrenoceptor agonists used in general anesthesia and ICU care for their analgesic effects, opioid-sparing properties, as well as strong sedative and anxiolytic effects. Some studies have found that dexmedetomidine is neuroprotective and improves postoperative cognitive dysfunction by reducing serum TNF-α, IL-6, PI3K, and AKT, suggesting that dexmedetomidine is anti-inflammatory (23). With its analgesic properties and a sympatholytic action, dexmedetomidine may seem ideal for use in general anesthesia in cancer patients. Compared to clonidine, dexmedetomidine is more effective and has fewer side effects. However, harmful effects have also been demonstrated.

Numerous in vivo and in vitro studies have shown that dexmedetomidine may increase the risk of relapse by modulating cell survival through the activation of Hypoxia-induced factor 1 alpha (HIF-1 alpha) and also by increasing the secretion of metalloproteinases (MMPs), which play a role in cell migration and metastasis (24,25). It was found that alfa 2-adrenoceptors have a positive effect on in vitro proliferation in a mouse mammary tumor cell culture (26). Dexmedetomidine increases

VEGF production, promotes tumor metastasis, induces proliferation of important proangiogenic myeloid-derived suppressor cells (9). In addition, dexmedetomidine increases the expression of survivin, MMP-2, MMP-9, all of which are involved in the metastatic transformation of lung adenocarcinoma (25). A recent retrospective study for patients with non-small cell lung tumors showed that the use of dexmedetomidine had no benefit on recurrence-free survival and significantly reduced overall survival in patients undergoing primary surgical resection (25). These effects have also been noted in other cancer types such as esophageal, colorectal, and hepatocellular carcinoma (27). However, given the number of studies suggesting the potential harm of dexmedetomidine, it makes sense to use "safer" alternatives.

V- Local Anesthetics

Amide local anesthetics, particularly lidocaine, have long been a useful tool in pain management during general anesthesia, used both during systemic intravenous infusions and during neuraxial and peripheral nerve blocks. Lidocaine is a short-acting, minimally toxic sodium channel blocker that reduces nerve conduction and results in a decrease in pain scores in patients receiving intraoperative and postoperative intravenous infusions (28). In addition to its analgesic properties, lidocaine exhibits anti-oncogenic and anti-inflammatory effects through various pathways. There are numerous biological pathways responsible for the observed effects of lidocaine. There is a study reporting the clinical effects of lidocaine on pancreatic cancer recurrence, and this study does not identify a difference in disease-free survival at 1 and 3 years of patients treated with intravenous infusions of lidocaine (29). Intraperitoneal ropivacaine wash was applied to patients who underwent ovarian tumor resection, and it was observed that chemotherapy administration times were shorter compared to patients in the placebo group (30). The Volatile Anesthesia and Cancer Perioperative Outcomes (VAPOR-C, NCT04316013) study, scheduled for completion in 2025, will examine the effects of lidocaine in patients with lung or colorectal adenocarcinoma (31). To date, no studies have shown that lidocaine infusions are harmful to cancer patients unless they are used judiciously and there are no contraindications to increase toxicity such as severe liver disease or low protein conditions.

Consequently, the perioperative period has been defined as the intersection of treatment and the potential harm to the patient due to this treatment. Anesthesiologists and surgeons are in a position to influence a patient's postoperative course and survival outcome. Anesthesia applied during surgical intervention has the potential to benefit or harm these patients. Considering the prevalence of oncological diseases, a large number of studies are needed in this area to improve patients.

REFERENCES

1. Montejano J, Todorovic JV. Anesthesia and Cancer, Friend or Foe? A Narrative Review. MINI REVIEW article Front. Oncol.2021;11
2. Coussens LM, Werb Z. Inflammation and Cancer. Nature 2002; 420(6917):860–7. doi: 10.1038/nature01322
3. Weingart SN, Nelson J, Koethe B, Yaghi O, Dunning S, Feldman A. Association Between Cancer-Specific Adverse Event Triggers and Mortality: A Validation Study. Cancer Med (2020) 9(12):4447–59
4. Weingart SN, Nelson J, Koethe B, Yaghi O, Dunning S, Feldman A. Association Between Cancer-Specific Adverse Event Triggers and Mortality: A Validation Study. Cancer Med (2020) 9(12):4447–59
5. Hong B, Lee S, Kim Y, Lee M, Youn AM, Rhim H. Anesthetics and Long-Term Survival After Cancer Surgery-Total Intravenous Versus Volatile Anesthesia: A Retrospective Study. BMC Anesthesiol (2019) 19(1):233.
6. Sessler DI, Pei L, Huang Y, Fleischmann E, Marhofer P, Kurz A, et al. Recurrence of Breast Cancer After Regional or General Anesthesia: A Randomized Controlled Trial. Lancet 2019; 394(10211):1807–15.
7. Wigmore TJ, Mohammed K, Jhanji S. Long-Term Survival for Patients Undergoing Volatile Versus IV Anesthesia for Cancer Surgery: A Retrospective Analysis. Anesthesiology (2016) 124(1):69–79. doi: 10.1097/ALN.0000000000000936
8. Bugada D, Lorini LF, Lavand'homme P. Opioid Free Anesthesia: Evidence for Short and Long-Term Outcome. Minerva Anestesiol (2021) 87(2):230–7.
9. Chong PH, Yeo ZZ. Parenteral Lidocaine for Complex Cancer Pain in the Home or Inpatient Hospice Setting: A Review and Synthesis of the Evidence. J Palliat Med (2021) 24(8):1154–60.
10. Bajwa SJS, Anand S, Kaur G. Anesthesia and cancer recurrences: The current knowledge and evidence. J Cancer Res Ther. 2015;11(3):528-34.
11. Sessler DI, Pei L, Huang Y, Fleischmann E, Marhofer P, Kurz A, et al. Recurrence of Breast Cancer After Regional or General Anaesthesia: A Randomised Controlled Trial. Lancet (2019) 394(10211):1807–15.
12. Deng X, Vipani M, Liang G, Gouda D, Wang B, Wei H. Sevoflurane Modulates Breast Cancer Cell Survival via Modulation of Intracellular Calcium Homeostasis. BMC Anesthesiol (2020) 20(1):253.

13. Liu Y, Sun J, Wu T, Lu X, Du Y, Duan H. Effects of Serum from Breast Cancer Surgery Patients Receiving Perioperative Dexmedetomidine on Breast Cancer Cell Malignancy: A Prospective Randomized Controlled Trial. Cancer Med (2019) 8(18):7603–12.
14. Wang L, Wang T, Gu J-Q, Su H-B. Volatile Anesthetic Sevoflurane Suppresses Lung Cancer Cells and miRNA Interference in Lung Cancer Cells. Oncol Targets Ther (2018) 11:5689–93.
15. Enlund M, Enlund A, Berglund A, Bergkvist L. Rationale and Design of the CAN Study: An RCT of Survival After Propofol- or Sevoflurane-Based Anesthesia for Cancer Surgery. Curr Pharm Des (2019) 25(28):3028–33.
16. Zhang J, Chang C-L, Lu C-Y, Chen H-M, Wu S-Y. Paravertebral Block in Regional Anesthesia with Propofol Sedation Reduces Locoregional Recurrence in Patients with Breast Cancer Receiving Breast Conservative Surgery Compared with Volatile Inhalational Without Propofol in General Anesthesia. BioMed Pharmacother 2021; 142:111991.
17. Chen J, Luo F, Lei M, Chen Z. A Study on Cellular Immune Function of Patients Treated with Radical Resection of Pulmonary Carcinoma with Two Different Methods of Anesthesia and Analgesia. J buon (2017) 22(6):1416–21.
18. Bimonte S, Barbieri A, Cascella M, Rea D, Palma G, Del Vecchio V, et al. The Effects of Naloxone on Human Breast Cancer Progression: In Vitro and In Vivo Studies on MDA.MB231 Cells. Onco Targets Ther (2018) 11:185–91.
19. Ma M, Wang X, Liu N, Shan F, Feng Y. Low-Dose Naltrexone Inhibits Colorectal Cancer Progression and Promotes Apoptosis by Increasing M1-Type Macrophages and Activating the Bax/Bcl-2/Caspase-3/PARP Pathway. Int Immunopharmacol 2020; 83:106388.
20. Wu Q, Chen X, Wang J, Sun P, Weng M, Chen W. Nalmefene Attenuates Malignant Potential in Colorectal Cancer Cell via Inhibition of Opioid Receptor. Acta Biochim Biophys Sin (Shanghai) 2018; 50(2):156–63.
21. Yan T, Zhang GH, Wang BN, Sun L, Hui Zheng H. Effects of Propofol/Remifentanil-Based Total Intravenous Anesthesia Versus Sevoflurane-Based Inhalational Anesthesia on the Release of VEGF-C and TGF-β and Prognosis After Breast Cancer Surgery: A Prospective, Randomized and Controlled Study. BMC Anesthesiol 2018);8(1):131
22. Franchi S, Moschetti G, Amodeo G, Sacerdote P. Do All Opioid Drugs Share the Same Immunomodulatory Properties? A Review from Animal and Human Studies. Front Immunol (2019) 10(2914).
23. Zhang J, Liu G, Zhang F, Fang H, Zhang D, Liu S, et al. Analysis of Postoperative Cognitive Dysfunction and Influencing Factors of Dexmedetomidine Anesthesia in Elderly Patients with Colorectal Cancer. Oncol Lett (2019) 18(3):3058–64.
24. Chen HY, Li GH, Tan GC, Liang H, Lai XH, Huang Q, et al. Dexmedetomidine Enhances Hypoxia-Induced Cancer Cell Progression. Exp Ther Med (2019) 18(6):4820–8.
25. Cata JP, Singh V, Lee BM, Villarreal J, Mehran JR, Yu J, et al. Intraoperative Use of Dexmedetomidine is Associated with Decreased Overall Survival After Lung Cancer Surgery. J Anaesthesiol Clin Pharmacol (2017) 33(3):317–23.
26. Lavon H, Matzner P, Benbenishty A, Sorski L, Rossene E, Haldar R, et al. Dexmedetomidine Promotes Metastasis in Rodent Models of Breast, Lung, and Colon Cancers. Br J Anaesth (2018) 120(1):188–96.
27. Chen P, Luo X, Dai G, Jiang Y, Luo Y, Peng S. Dexmedetomidine Promotes the Progression of Hepatocellular Carcinoma Through Hepatic Stellate Cell Activation. Exp Mol Med (2020) 52(7):1062–74.
28. Kutay Yazici K, Menşure K, Büşra A, Süheyla U. The Effect of Perioperative Lidocaine Infusion on Postoperative Pain and Postsurgical Recovery Parameters in Gynecologic Cancer Surgery. Clin J Pain (2021).
29. Zhang H, Yang L, Zhu X, Zhu M, Sun Z, Cata JP, et al. Association Between Intraoperative Intravenous Lidocaine Infusion and Survival in Patients Undergoing Pancreatectomy for Pancreatic Cancer: A Retrospective Study. Br J Anaesth (2020) 125(2):141–8.
30. Hayden JM, Oras J, Block L, Thörn S-E, Palmqvist C, Salehi S, et al. Intraperitoneal Ropivacaine Reduces Time Interval to Initiation of Chemotherapy After Surgery for Advanced Ovarian Cancer: Randomised Controlled Double-Blind Pilot Study. Br J Anaesth (2020) 124(5):562–70.
31. Wall TP, Buggy DJ. Perioperative Intravenous Lidocaine and Metastatic Cancer Recurrence - A Narrative Review. Front Oncol (2021) 11:688896.

100th Anniversary of The Republic

Anesthesiology and Reanimation Specialists' Society Congress

BALKAN STATES ANESTHESIA DAYS - VIII

Anesthesia and Intensive Care In The Light of The 100th Anniversary of Our Republic

28-30 April 2023

Ankara University, School of Medicine
Abdulkadir Noyan Conference Hall
Ankara, Türkiye

www.arud2023.org

ORAL PRESENTATION

Is It an Obstacle or a Guide For Hematoma Femoral Block in Coronary Bypass Graft Surgery?

Nevriye Salman[1], Zeynep Cemre Celebi[1], Levent Mavilioglu[2], Sumru Sekerci[1]

[1] University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2]University of Health Sciences Ankara Bilkent City Hospital, Department of Cardiovascular Surgery, Ankara, Türkiye

ABSTRACT

Background: Pain management is becoming more important with the preference for minimally invasive surgery. Besides, analgesia strategies is based on multimodal approaches, including less aggressive regional techniques that reduce morbidity and mortality. In addition to regional anesthesia/plane blocks, femoral block can also be used as in coronary artery bypass grafting.

We would like to tell that, in this case, although the patient had a hematoma after femoral anjiography, a femoral block is applied in addition to the transthoracic block (TTB) before coronary artery bypass grafting (CABG).

Case: The patient, a 78 year-old, 175 cm and ASA 3 male, prepared for CABG after ASA monitoring and BIS,NIRS monitoring anesthesia induction was performed with propofol 2 mg/kg, fentanyl 2 mcg/kg, rocuronium 0.6 mg/kg. After arterial, central and urinary catheterization and temperature monitoring, TTB and right femoral block were applied to the patient under ultrasound guidance (with 10 ml %0,25 bupivakain) (Figure 1). However, the patient who underwent angiography, had a superficial and deep hematoma in the femoral region of the right leg (Figure 2,3). After the case with a cross-clemp time of 74 minutes, a CPB time of 104 minutes and an anesthesia time of 240 minutes, the patient was taken to the intensive care unit with mechanical ventilator support. On postoperative day 0, the VAS score was 3, when there was no pain in the right leg. After the patient was hospitalized in the intensive care unit for 1 day and in the cardiovascular surgery service for 7 days was discharged without complications.

Conclusion: Femoral and radial hematomas are frequently seen in CABG due to preoperative angiography. In the literature, there are cases that hematoma in wrist fractures is a landmark for radius block (4). In this case, we used hematoma as a landmark for the USG-guided femoral block, this method made it easier to inject local anesthetic around the femoral nerve.

Even though hematoma after angiography is a common undesirable situation, we believe that it can be used it as a landmark in determining the place where the local anesthetic in femoral nerve blocks is applied.

Keywords: Hematoma, femoral block, coronary artery bypass grafting

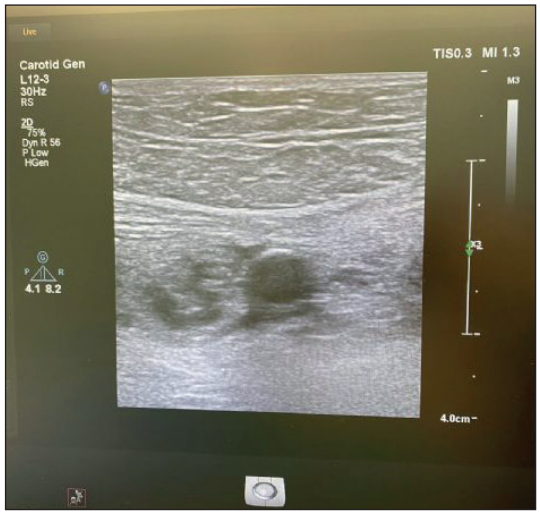


Figure 1. USG-guided femoral block

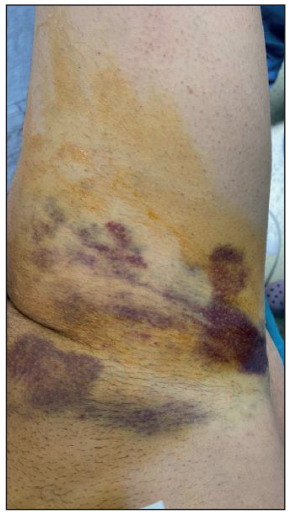


Figure 2. Superficial hematoma in the femoral region of the right leg

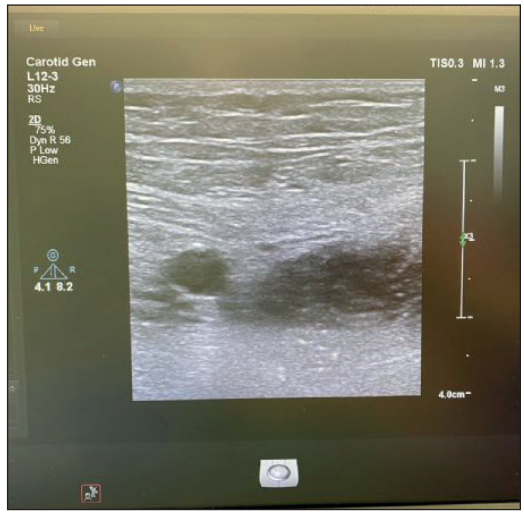


Figure 3. Hematoma in the femoral sheath

The Effect of Using Smart Glasses Integrated Ultrasonography on the Success of the Procedure and Comfort of the Anesthesiologist in Radial Artery Catheterization

Merve Gözen, Bengi Şafak, Ayşegül Güven, Ahmet Onat Bermede

Ankara University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: In vascular interventions performed with ultrasonography (USG), the comfort of the practitioner and hand-eye coordination become very important, especially in interventions applied to small structures such as the radial artery. In this context, it is aimed that radial artery catheterization with the use of smart glasses integrated USG increases the hand-eye coordination in practitioners with different experiences, increasing the success of the intervention compared to the intervention with standard USG, shortening the time, and increasing satisfaction by providing a more comfortable USG use experience.

Material and Methods: Patients over the age of 18 who will be operated on electively in the operating room of Ankara University Faculty of Medicine were divided into two groups. The first group underwent standard USG imaging, and the second group performed radial artery catheterization with smart glasses integrated USG imaging by two anesthesiologists with different interventional experience. In both groups, the success rate of the intervention was checked and the duration of the intervention was measured. Anesthesiologist satisfaction after the procedure was evaluated with a 5-point Likert scale.

Results: Sixty patients were included in radial artery catheterization using standard USG and 59 patients were included in catheterization with smart glasses integrated USG. There was no significant difference between the two groups in terms of demographic data of the patients. The intervention time of the less experienced practitioner with smart glasses integrated USG was found to be shorter than the intervention time using standard USG (99.73±75.18, 49.07±29.9; $p<0.001$). Interventions with smart glasses in the same practitioner were evaluated as an increased level of satisfaction compared to standard use ($p=0.001$). There was no significant difference between the two applications in terms of the intervention time (59.13±41.98, 44.66±32.24; $p>0.001$) and the level of satisfaction ($p>0.001$) in the practitioner with more experience.

Conclusion: Radial artery catheterization with the use of smart glasses integrated USG shortens the intervention time compared to the standard use in practitioners with less experience. Increasing hand-eye coordination shortens the procedure time and increases satisfaction compared to the intervention with standard USG imaging.

Keywords: Radial artery catheterization, USG, smart glasses

Neurogenic Pulmonary Edema Patient Management in Intensive Care

Yusuf Özgüner

Diskapi Yıldırım Beyazit Training and Research Hospital, Department of Anesthesiology and Reanimation, University of Health Sciences, Ankara, Türkiye

ABSTRACT

Background: Neurogenic pulmonary edema (NPE) is a condition with acute onset caused by damage to the central nervous system, characterized by accumulation of interstitial fluid in the lung, with a mortality rate of over 60%. It can be seen in many neurological diseases such as subarachnoid hemorrhage, intracranial hemorrhage, traumatic brain injury, status epilepticus, meningitis, multiple sclerosis. We aimed to present a case report who was diagnosed with NPE in the intensive care unit after being operated for subarachnoid hemorrhage.

Case: A 43-year-old male patient with known hypertension and diabetes mellitus was operated for subarachnoid hemorrhage. At the induction of anesthesia, the patient's blood pressure was 173/98, heart rate was 83, and oxygen saturation was 96%. At the end of the surgery, it was observed that the patient's oxygen saturation dropped suddenly and was in the range of 80-84. After the patient came to the intensive care unit intubated, chest X-ray, echocardiography, CT-angiography were taken to find the etiology of respiratory pathology. Echocardiography of the patient was normal, no embolism was observed in CT-angiography. NPE was considered in the patient. There was no increase in intracranial pressure. The patient was started on diuretic drug infusion. Metabolic acidosis and hypotension were observed at the 4th postoperative hour. The patient was started on noradrenaline as a vasopressor drug. Hemodialysis was applied to the patient who had no urine output at the 6th hour postoperatively. Extracorporeal membrane oxygenation (ECMO) was considered for the patient whose oxygen saturation did not improve after dialysis, but he died after cardiac arrest at the 11th hour postoperatively.

Discussion: The pathogenesis of NPE is not well known. It is thought that pulmonary hypertension and increased pulmonary capillary permeability are caused by systemic vasoconstriction due to sympathetic overstimulation. Correction of oxygenation with supportive therapies, vasoactive drugs and diuretic therapy are used in treatment. If there is no response with conventional treatments, extracorporeal membrane oxygenation (ECMO) can also be used in treatment.

Conclusion: NPE is a condition with a poor prognosis that can be seen after many neurological diseases. Therefore, early diagnosis and treatment is important.

Keywords: Critical care, neurogenic, pulmonary edema

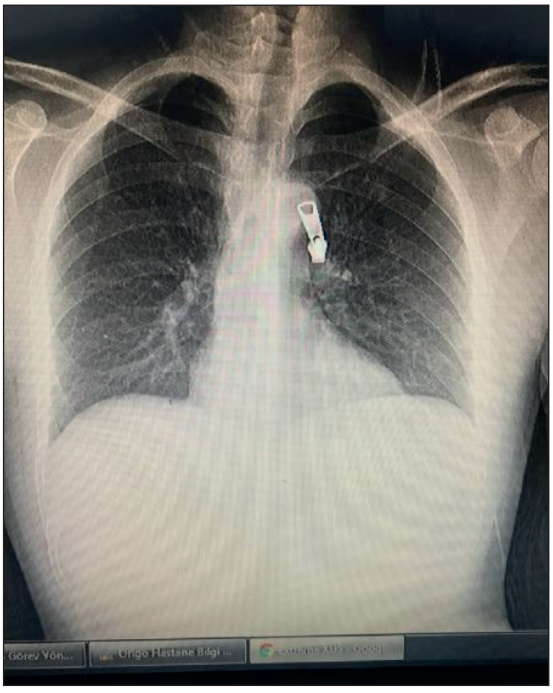


Figure 1. Preoperative lung imaging

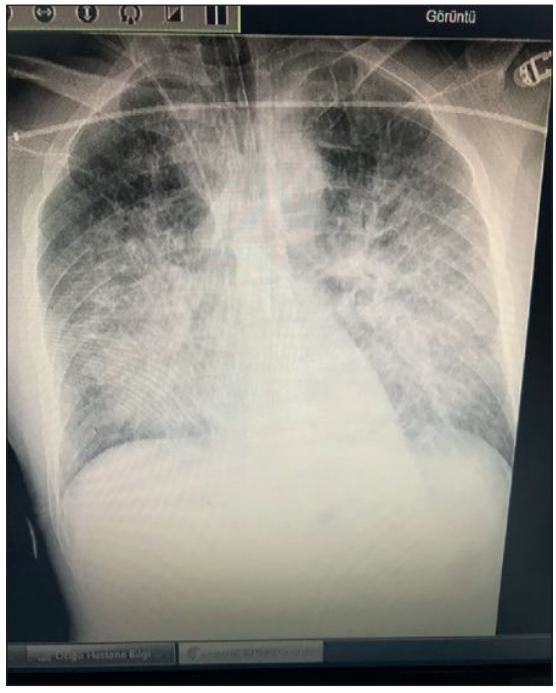


Figure 2. Postoperative lung imaging

Stereotype Threat Effect on CPR Performance in COVID-19 Intensive Care Units: A Randomized Controlled Mannequin Study

Murat Tümer[1], Leman Korkmaz[2], Filiz Üzümcügil[3], Aysun Ankay Yılbaş[3], Banu Kılıçaslan[3], Seda Banu Akıncı[3]

[1]VKV Amerikan Hospital, Department of Anesthesiology and Reanimation, Istanbul, Türkiye
[2]Middle East Technical University, Faculty of Administrative and Social Sciences, Department of Psychology, Ankara, Türkiye
[3]Hacettepe University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Stereotype threat (ST), which causes a decrease in performance, is experienced when there is a possibility for a person to confirm a negative stereotype about the group he/she belongs to. Non-Intensive Care Unit physicians (non-ICUp) were assigned to the ICUs during the COVID-19 pandemic. However, the inadequacy of knowledge and skills of these physicians was emphasized in social media. Considering the negative judgments, we aimed to evaluate the CPR performances of these physicians and the effect of ST.

Material and Methods: Sixty-three non-ICUp and 53 ICUp worked in COVID -19 ICU were randomly assigned to control and experimental groups. In the experimental group, to manipulate ST, the aim of the study was presented as measuring the difference in CPR performances between ICUp and non-ICUp. Control group received no information. Participants were videotaped while performing a standard CPR scenario and evaluated by independent instructors and mannequin scores (Figure 1).

Results: Overall CPR scores were higher in ICUp. ICUp had lower scores on the correct place of chest compression in the ST condition (p=.03) (Figure 2). Non-ICUp performed better in the ST condition on effective chest compression (p=.02) (Figure 3) and correct compression rates per minute (p=0.02) than in the control (Figure 4).

Conclusion: The higher CPR performance of ICUp was an expected finding. However, the hypothesis suggesting the lower performance of non-ICUp in the ST condition was not supported. Inconsistent results with the ST effect might be related to moderating factors such as the difficulty level of tasks, knowledge about the existing stereotype, and motivation to perform well on the task.

Keywords: Stereotype threat, intensive care unit, cardiopulmonary resuscitation, COVID-19

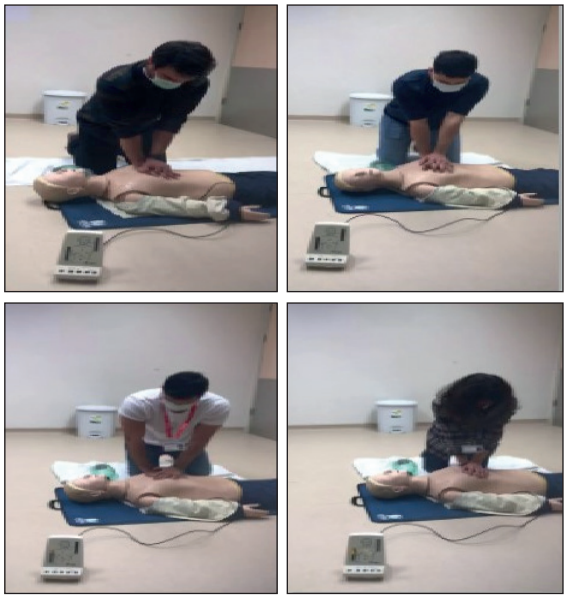


Figure 1. CPR simulation scenario

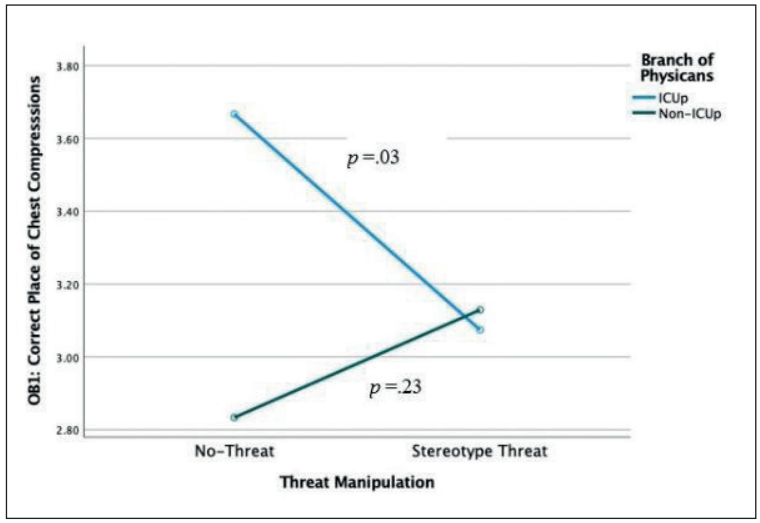


Figure 2. The interaction of branch of physicians and ST manipulation in predicting the correct place of chest compression scores

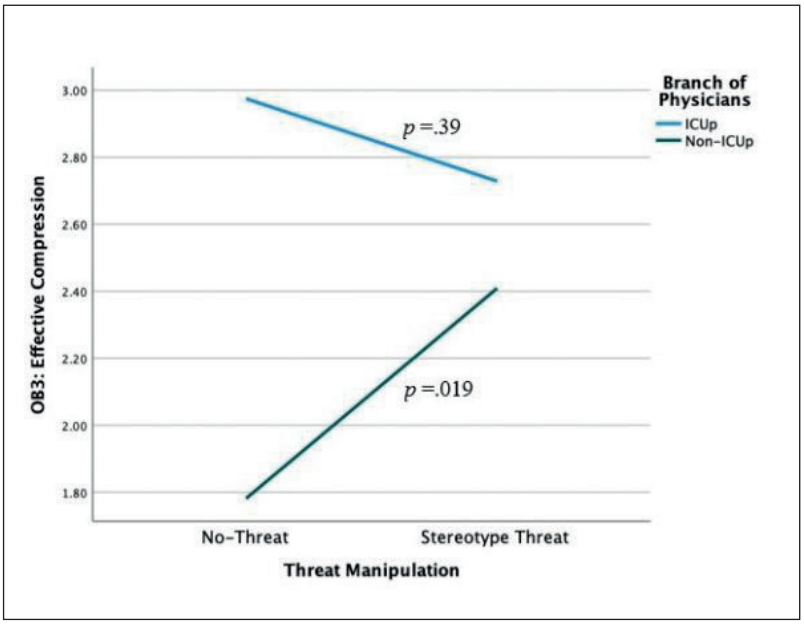


Figure 3. The interaction of branch of physicians and ST manipulation in predicting the effective compression scores (OB3)

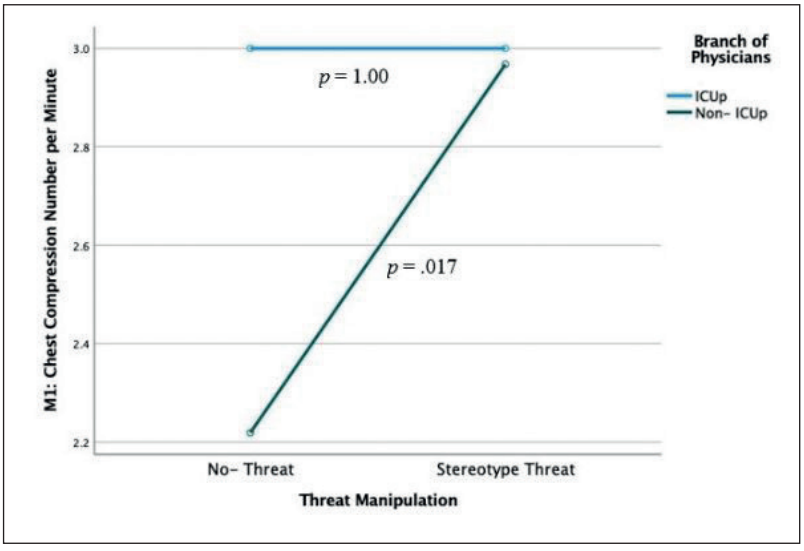


Figure 4. The interaction of branch of physicians and ST manipulation in predicting the chest compression number scores (M1 and OB4)

Accuracy of Burn Score Indexes in Prediction of Outcome

Monika Belba[1,2]

[1]University of Medicine, Pharmacology Subject at the Faculty of Medicine, Department of Biomedical and Experimental Subjects, Tirana, Albania
[2]University Hospital Center "Mother Tereza", Anesthesiologist-Intensivist in the Department of Anesthesia and Intensive Care, Tirana, Albania

ABSTRACT

Background: Treatment of severely burned patients in the Service of Burns and Plastic Surgery of the University Hospital Center "Mother Teresa" in Tirana, Albania is improved but despite advances burns remain a frequent cause of traumatic injury, resulting in considerable morbidity and mortality.

The objective of the present study was to evaluate the outcomes of severe burn patients with burn indexes.

Material and Methods: We retrospectively analyzed the data of all burned patients admitted to our burn unit over two decades 1998 to 2008 and 2009-2019.The ROC Curve was used to test the sensitivity and specificity of different score indexes against each other. The ABSI(Abbreviated Burn Score Index) originally published in 1982 ranges between 2 and 18 points, resulting in six risk categories, with a probability of survival ranging from more than 99% to less than 10%. The ABSI considers the following risk factors: female gender (1 point), increasing age (1–5 points), increasing BSA (%) burned (1–10 points), presence of inhalation injury (1 point), and presence of full-thickness burns (1 point) (1).The Baux-index, originally published in 1961 as Baux Score and R Baux (Revised Baux), revised by Osler et al., is a continuous score based on age, BSA (%) burned, and presence of inhalation injury, with a probability of death ranging between 0 and 100% (2).

Results: While comparing the decade (2009-2019) with the previous one (1998-2008) there is a progressive decrease in mortality (6.89% versus 10.5%) of our burn patient population although mean BSA (%) burned increased to 25.6±19.1 % (versus 22.8±14.7%). In figure 1, we noticed that all three scores were excellent in predicting outcomes (AUC of more than 0.9) but the ABSI score showed superiority in accuracy (AUC of 0.966) for predicting the outcome.

Conclusions: Our data indicate that the ABSI, Baux, and R Baux scoring systems are still accurate and valuable tools in the prediction of burn patient mortality.The use of prediction models(ABSI,Baux, and Revised Baux score) should serve as guidance for the clinical decision because many other factors are associated with an increased mortality risk of burned patients.

Keywords: Outcome, burn prediction indexes, mortality

INTRODUCTION

Treatment of severely burned patient in the Service of Burns and Plastic Surgery of the University Hospital Center (UHC) "Mother Teresa" in Tirana, Albania is improved but despite advances burns remains a frequent cause of traumatic injury, resulting in considerable morbidity and mortality. Management of burn injuries in the UHC differs in comparison to the previous decade in the increase in the application of standardized protocols and optimization of resources. During the last century, over 40 new or modified mortality prediction models have been presented and validated to assess mortality risks in populations with severe burns (1-10). The objective of the present study was to evaluate outcomes in severe burn patients admitted to our unit between 1998 and 2019 and to assess trends in risk profile and survival. The aim of this study is to compare outcomes in severe burn patients in two periods 1998-2008 and 2009-2019 applying the ABSI score, BAUX score, and Rbaux score.

MATERIAL and METHODS

The study is performed in the Service of Burns and Plastic Surgery in Tirana which is the only burn center in Albania, serving the congregation of burn patients from the whole geographic area of Albania. We retrospectively analyzed the data of all burned patients admitted to our burn unit over two decades 1998 to 2009 and 2009-2019. Patients with Steven-Johnson, Toxic Epidermal necrolysis, as well as degloving injuries, were excluded from the study. Information collected included: Year of admission, Month of admission, Age, Gender (Male, Female), Etiology of burns (Scalds; Flame; Electrical; Chemical; Others), Body Surface Area (tBSA) (%) burned: (0-10%;11-20%;21-40%; 41-60%; 61-80%;81-100%), Degree (Partial-thickness; Full-thickness), Presence of Inhalation injury (Yes; No).

We have applied some prediction models for the outcome:

- Abbreviated Burn Score Index (ABSI). The ABSI originally published in 1982 ranges between 2 and 18 points, resulting in six risk categories, with a probability of survival ranging from more than 99% to less than 10%. The ABSI considers the following risk factors: female gender (1 point), increasing age (1–5 points), increasing BSA (%) burned (1–10 points), presence of inhalation injury (1 point), and presence of full-thickness burns (1 point) (8).

- Baux Score and Score R Baux (Revised Baux). The Baux-index, originally published in 1961, revised by Osler et al., is a continuous score based on age, BSA (%) burned and presence of inhalation injury, with a probability of death ranging between 0 and 100% (9).

Statistical Analysis

SPSS 23 software was used for the conduction of the statistical analysis. Descriptive Statistics were conducted to summarize data for the central tendency (Mean) and variability (Standard Deviation). T-test was used for comparing two means and the Chi-squared test for comparing two proportions. Receiver Operator Characteristic (ROC) Curve was used to test the sensitivity and specificity of different score indexes against each other. Statistical significance was defined as $p<0.05$.

RESULTS

A total of 4362 patients had a burn-related primary admission in the Service of Burns and Plastic Surgery of the UHC in Tirana, Albania from 1998 to 2008, from which 2337 were admissions to the Intensive Care Unit. The mean annual number of ICU-admitted patients was 210, which decreased from 224 in 1998 to 202 in 2008. On the other side, a total of 3355 patients had a burn-related primary admission in the Service of Burns and Plastic Surgery of the UHC in Tirana, Albania from 2009 to 2019, from which 1684 were admissions to the Intensive Care Unit. The mean annual number of ICU-admitted patients was 153, which decreased from 169 in 2009 to 139 in 2019.

Mortality is reduced from 10.5% in the first decade to 6.8% in the second decade. There is a marked reduction in children from 8.9% to 1.05% with statistical significance while mortality in adults and elderly although reduced has no statistical significance. The length of hospital stay was the same in the two periods without statistical difference. Severity scoring systems have been developed to evaluate changes in the outcome following burns. We used ABSI, Baux score, and Revised Baux score to calculate our patients' probability of death. The predicted mortality was compared with observed mortality. For all patients mean ABSI score was 5.4±2.87in the second decade vs.7.2±2.8 in the first, the mean Baux score was 50.6±36.28 vs.40.1±28.5 and the mean Revised Baux score was 53.2±39.8 vs.42.1±31.4 respectively. The mean ABSI score in deaths was 11.9±2.74, the mean Baux score was 120.6±29.34, mean Revised Baux score was 134.5±31.87.

We used the ROC curves for the three diagnostic tests to predict the outcome against each other ABSI, Baux, and Revised Baux scores as models for predicting outcome. In Figure 1, we noticed that all three scores were excellent in predicting outcomes (AUC of more than 0.9) but the ABSI score showed superiority in accuracy (AUC of 0.966) for predicting the outcome.

DISCUSSION

The magnitude of the public health problem represented by burns is indicated by fire and burn deaths. According to the Global Burden of the Disease (GBD) which estimates the number of deaths by cause, the death rate from fire and burns in Albania has experienced a notable decline from 1.07 in 1990 to 0.52 per 100000 people in 2017 (11).

While comparing the decade (2009-2019) with the previous one (1998-2008) there is a progressive decrease in mortality (6.89% versus 10.5%) of our burn patient population although mean BSA (%) burned increased to 25.6±19.1 % (versus 22.8±14.7%). There were improvements in mortality despite more patients being affected by flame burns (39.5% versus 23%), more patients had inhalation burns (15.5% versus 10.6%) as well as there is evidence of an increase in the number of adults with burns and more than double of the number of elderly with burns with greater burn size and full thickness burns

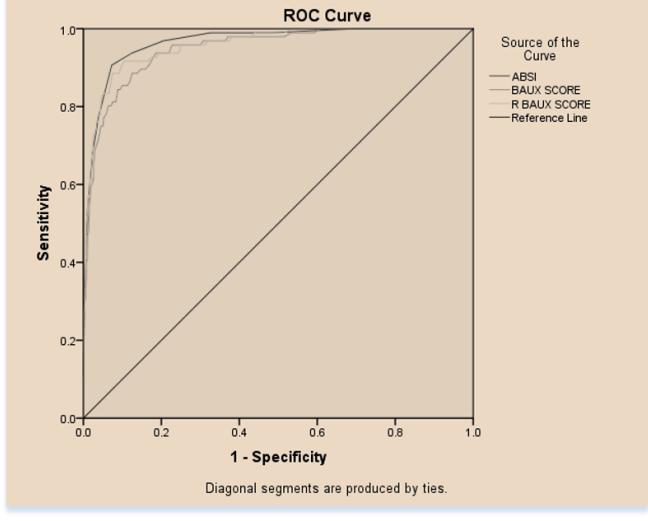
Our data indicate that the ABSI Baux and R Baux scoring systems are still accurate and valuable tools in the prediction of burn patient mortality. In the present study, the three specific burn outcome models were validated, with the ABSI scoring system showing the best performance in predicting mortality. As an area under the curve (AUC) of more than 0.9 indicates high accuracy, all the scoring systems were accurate and the AUC of the ABSI model was higher than the other models (AUC of 0.966). This is in accordance with other studies (12-15).

CONCLUSION

There is a decline in severe burn admissions in the Service of Burns UHC" Mother Teresa" in Tirana of children and adults but there is an increase in admissions in the elderly group. The etiology of burns has changed towards an increase in flame burns, especially in adults and the elderly population. The use of prediction models(ABSI, Baux, and Revised Baux score) should serve as guidance for the clinical decision because many other factors are associated with an increased mortality risk of burned patients.

REFERENCES

1. Sheppard NN, Hemington-Gorse S, Shelley OP, Philp B, Dziewulski P. Prognostic scoring systems in burns: a review. Burns 2011;37:1288–95.
2. Wiedenfield S. Uber den verbennungstod:I. Abhanggigkeit des verbrennungstods von der grosse der verbrannter hautflache. Arch Dermatol Syph 1902;61:33.
3. Rittenbury MS, Maddox RW, Schmidt FH, Ham Jr WT, Haynes Jr BW. Probit analysis of burn mortality in 1831 patients: comparison with other large series. Ann Surg 1966;164:123–38.
4. Sachs A, Watson J. Four years' experience at a specialised burns centre. The McIndoe Burns Centre 1965–68. Lancet 1969;1:718–21.
5. Brusselaers N, Juhasz I, Erdei I, Monstrey S, Blot S. Evaluation of mortality following severe burns injury in Hungary: external validation of a prediction model developed on Belgian burn data. Burns 2009; 35:1009–14.
6. McCoy JA, Micks DW, Lynch JB. Discriminant function probability model for predicting survival in burned patients. JAMA 1968;203:644–6.
7. Curreri PW, Luterman A, Braun Jr DW, Shires GT. Burn injury. Analysis of survival and hospitalization time for 937 patients. Ann Surg 1980;192:472–8.
8. Tobiasen J, Hiebert JM, Edlich RF. The abbreviated burn severity index. Ann Emerg Med 1982; 11:260–2.
9. Osler T, Glance LG, Hosmer DW. Simplified estimates of the probability of death after burn injuries: extending and updating the Baux score. J Trauma. 2010;68(3):690–7.
10. Ryan CM, Schoenfeld DA, Thorpe WP, Sheridan RL. Objective estimates of the probability of death from burn injuries. N Engl J Med. 1998;38(6):362–366.
11. Hannah Ritchie and Max Roser (2020) - "Causes of Death". Published online at OurWorldInData.org.
12. Salehi SH, As'adi K, Abbaszadeh-Kasbi A, Isfeedvajani MS, Khodaei N. Comparison of six outcome prediction models in an adult burn population in a developing country. Annals of Burns and Fire Disasters. 2017 Mar;30(1):13-17.
13. Forster NA, Zingg M, Haile SR, Künzi W. 30 years later - does the ABSI need revision? Burns.2011;37(6): 958-963.
14. Dokter J, Meijs J, Oen IM, van Baar ME. External validation of the revised Baux score for the prediction of mortality in patients with acute burn injury. J Trauma Acute Care Surg. 2014;76(3):840–845.
15. Roberts G, Lloyd M, Parker M, et al. The Baux score is dead. Long live the Baux score: a 27-year retrospective cohort study of mortality at a regional burns service. J Trauma Acute Care Surg. 2012; 72 (1): 251–6



Area Under the Curve

Test Result Variable(s)	Area
ABSI	.966
BAUX SCORE	.948
R BAUX SCORE	.958

Figure 1. The Area Under the Curve of variable(s): ABSI, BAUX SCORE, R BAUX SCORE by Outcome

COVID-19 Mortality: Does Age and Gender Really Matter?

Feyza Özkan, Süleyman Sarı, Akif Demirel

Yozgat City Hospital, Department of Anesthesiology and Reanimation, Yozgat, Türkiye

ABSTRACT

Background: Identifying the risk factors that increase mortality in Covid-19 patients and taking the necessary precautions can significantly improve the management against this disease. In this study, it was aimed to examine the factors affecting mortality and the ratios of age and gender on mortality in 500 patients diagnosed with Covid-19 in our hospital.

Material and Methods: This study was carried out in 500 patients hospitalized in the intensive care unit with the diagnosis of covid-19. The inclusion criteria were to be over 18 years old and diagnosed with covid-19. The patients' age, gender, body mass index, date of admission to the intensive care unit, the length of stay in the intensive care unit, levels of creatinine, CRP, neutrophil-lymphocyte ratio, procalcitonin, D-Dimer, Pt-PTT-INR and fibrinogen in the blood samples taken on the first day in the intensive care unit were recorded and analyzed. Effects on mortality were investigated retrospectively with data from patient records.

Result: Of 500 patients included in the study, 34.6% (n=173) survived; 65.4% (n=327) died. Of those who died, 200 were male patients and 18 were under 55 years of age. There was no significant difference in mortality percentages in terms of gender, but mortality was higher in patients over 55 years of age. The length of stay in the intensive care unit, PCT, D-Dimer and PTT values of those who died under the age of 55 were statistically significantly higher than those who survived (p=0.006; p=0.021; p=0.030; p=0.010). The length of stay in the intensive care unit, mechanical ventilation requirement, creatinine, CRP, NEU and PCT values were statistically significantly higher than those who died in the 55 years and older age group (p=0.001; p=0.007; p=0.001; p=0.001; p= 0.010; p=0.001).BMI and lymphocyte levels of male subjects were found to be statistically significantly higher than females(p=0.001). The creatinine, CRP, PCT, PTT and fibrinogen values of women were found to be statistically significantly higher than men (p=0.003; p=0.001; p=0.001; p=0.011; p=0.001). There was no statistically significant difference in mortality status, length of stay in the intensive care unit, mechanical ventilation requirement, neutrophil, D-Dimer, PT and INR values of the participants according to genders (p>0.05).

Conclusion: Although the prevalance was higher in men,no gender difference was observed on mortality. Age factor was found to be significantly effective on covid-19.

Keywords: Age, COVID-19 mortality, gender, predict

INTRODUCTION

The coronavirus disease (covid-19), which emerged as pneumonia of unknown origin and was understood to be caused by severe acute respiratory syndrome coronavirus 2(SARS-CoV-2), spread rapidly all over the world and led to increasing deaths (1). SARS-CoV-2 virus infects people of both sexes, all ages, races and ethnic groups(2). The clinical manifestations of Covid-19 vary from mild symptoms to acute respiratory distress syndrome (ARDS) and require hospitalization in intensive care units in the presence of ARDS. Defined risk factors for severe disease in hospitalized patients include advanced age, male gender, and comorbidities such as hypertension, cardiovascular disease, diabetes, or COPD (3).

In the studies so far, the inadequacy of treatment for the Covid-19 disease has been mentioned and studies have been carried out on it. However, for this rapidly progressing pandemic disease, the disease dynamics have not been fully elucidated and much is not known about the risk factors. The scarcity of available studies makes it difficult to draw conclusions about the typical sociodemographic and clinical features of COVID-19, as well as the risk factors for severe disease.

Older people are more susceptible to SARS-CoV-2 and are more likely to be admitted to the intensive care unit with a high risk of death. Age-related muscle atrophy and changes in lung anatomy in the elderly lead to changes in the physiological function of the respiratory system. Progression of mitochondrial dysfunction with age leads to immune system disorders and thus contributes to higher susceptibility to viral infections (4). Nevertheless, mortality rates due to Covid-19 in young people show that age is not the only risk factor for the disease.

It has been documented that coronavirus infection causes higher mortality rates in men than in women (5). This may be due to higher levels of interferon-1 production of female gender, which is important for the early response to COVID-19 (6). It is also known that the transmission of SARS-CoV-2 is mediated by the angiotensin-converting enzyme 2 (ACE2) receptor, and this receptor is protected by estradiol, the main sex hormone in women (7).

In the light of all this information, it is possible to say that people of all ages and genders are at risk for this serious or even fatal disease. In this study, it was aimed to compare the effects of demographic differences such as age and gender on mortality and morbidity of patients in the intensive care unit infected with Covid-19.

MATERIAL and METHODS

The study had 500 patients who were treated in the Intensive Care Department of Yozgat City Hospital, had ground glass densities in thorax CT and clinical symptoms with Covid-19 pcr test positive between August 1, 2020 and January 1, 2022. After the ethical approval of the study was obtained from the Bozok University Clinical Research Ethics Committee(no. 2017-KAEK-189_2022.02.10_01), the data were analyzed retrospectively. Those who were transferred or died within 24 hours from the start of treatment, those younger than 18 years of age and pregnant patients were excluded from the study. Age, gender and body mass indexes of all patients and the date of admission to the intensive care unit (ICU), length of stay in the ICU, comorbidity status and mechanical ventilator requirement were noted. On the first day of admission to the ICU, creatinine, CRP, neutrophil-lymphocyte ratio, procalcitonin, D-Dimer, Pt-PTT-INR and fibrinogen values were analyzed from blood samples.

The age range of 18-55 was evaluated as young patients and those over 55 years of age were evaluated and grouped as elderly patients. This grouping was made with reference to the age ranges at which European countries observed marginal changes during the pandemic. Relationships between demographic-clinical characteristics (ie, age, gender, and body mass), survival and laboratory values were analyzed by Mann Whitney-u Test. P< 0.05 values indicated statistical significance.

Our primary aim is to observe the effects of gender and age on mortality in Covid-19. Our secondary aim is to monitor the impacts of comorbidities or variables in blood values on these risk factors that may be effective in mortality.

Statistical Analysis

NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) program was used for statistical analysis. Descriptive statistical methods (mean, standard deviation, median, frequency, percentage, minimum, maximum) were used while evaluating the study data. The conformity of the quantitative data to the normal distribution was tested with the Shapiro-Wilk test and graphical examinations. Independent groups t-test was used for the comparison of normally distributed quantitative variables between two groups, and the Mann-Whitney U test was used for comparisons between two groups of non-normally distributed quantitative variables. Pearson chi-square test was used to compare qualitative data. Statistical significance was accepted as $p<0.05$.

RESULTS

A total of 500 cases, 59.4% (n=297) male and 40.6% (n=203) female, in Yozgat City Hospital between August 1, 2020 and January 1, 2022, were included in this randomized and retrospective study (figüre 1). The ages of the cases ranged from 23 to 96; the mean is 70.85±13.74. While 12.2% (n=61) of the cases were under 55 years of age; 87.8% (n=439) were 55 years old and over(figüre 1).

The BMI values of the subjects participating in the study ranged from 16 to 58; the mean value is 28.67±5.92. Comorbidity was observed in 84.4% of the cases. The cases were hospitalized in the intensive care unit after an average of 2.73±2.78 days from the onset of the disease. The duration of stay in the intensive care unit of the participants ranged from 1 to 83 days; mean hospital stay was 12.02±11.4 days.

34.6% (n=173) of the patients survived; It was observed that 65.4%(n=327) of them died. Of those who died, 200 were male and 127 were female. The creatinine, CRP, PCT, PT and PTT values of the patients who died were found to be statistically significantly higher than those who survived (respectively; p=0.001; p=0.002; p=0.001; p=0.039; p=0.002; p<0.05). Other laboratory results of the cases according to the mortality status did not show a statistically significant difference (p>0.05).

BMI values of survivors under 55 years of age were statistically significantly higher than those who died(p=0.024; p<0.05). The length of stay in the intensive care unit, PCT, D-Dimer and PTT values of the patients who died were found to be statistically significantly higher than those who survived(respectively; p=0.006; p=0.021; p=0.030; p=0.010; p<0.05). The other measurement values of the cases according to the mortality status did not show a statistically significant difference (p=0.05) (table 1).

The duration of stay in the intensive care unit, duration of mechanical ventilation, creatinine, CRP, NEU, and PCT values of the patients aged 55 and over who died were found to be statistically significantly higher than those who survived (respectively;

p=0.001; p=0.007; p=0.001; p=0.001; p=0.010; p=0.001; p>0.05). The other measurement values of the cases according to the mortality status did not show a statistically significant difference (p=0.05) (table 2).

The duration of stay in the intensive care unit, creatinine, CRP, PCT, PT, PTT values were found to be statistically significantly higher in the male patients who died than in those who survived (respectively; p=0.001; p=0.001; p=0.027; p=0.001; p= 0.005; p=0.001; p<0.05). The other measurement values of the cases according to the mortality status did not show a statistically significant difference (p=0.05) (table 3).

In female cases, the length of stay in the intensive care unit, intubation, creatinine and PCT values were found to be statistically significantly higher than those who survived(respectively; p=0.001; p=0.032; p=0.001; p=0.002; p<0.05). The other measurement values of the cases according to the mortality status did not show a statistically significant difference(p=0.05) (table 4).

BMI and LYNPH values of male subjects were found to be statistically significantly higher than females (p=0.001; p<0.01). Creatinine, CRP, PCT and fibrinogen values of women were found to be statistically significantly higher than men (p=0.003; p=0.001; p=0.001; p=0.001; p<0.01). According to the genders, the mortality status of the participants, length of hospital stay, length of stay in the ICU, intubation, NEU, D Dimer, PT and INR values do not show any statistically significant difference (p>0.05) (table 5).

DISCUSSION

Identifying risk factors in advance of patients who may experience severe illness will allow focus on Covid-19 surveillance and intervention at an early stage for the treatment of this disease (8). Therefore, based on previous studies, we identified age and gender as potential risk factors for this disease (9,10). Studies on Covid-19 mortality and survival have found a relationship between old age and the risk of mortality (11,12,13). The fact that there are gender differences on mortality has also led to an increase in studies in this field and it has been reported that gender has an effect on mortality (14,15). In this retrospective randomized study, we observed that age has an important role in the mortality of Covid-19 patients. Analysis by gender and age category shows that age groups over 55 have a higher mortality rate than those aged 18-55. We also observed that male gender is a poor prognostic factor, the incidence and mortality percentage is higher than females, but it is not statistically significant.

In animal experiments, it has been shown that the elderly are more susceptible host to SARS-CoV infections (16). It has been found that excessive proinflammatory responses caused by uncontrolled proliferation of viral replication and diseases that occur with increasing age lead to a significant decrease in cell-mediated and humoral immune responses (17,18). In our study, a strong correlation was found between age and mortality. We believe that comorbidities in elderly patients play an important role in this increasing mortality.

In a study conducted with more than 59,000 patients, it was concluded that male gender and advanced age were the main determinants of mortality for all diseases (19). In another study to investigate the reason for the difference between genders, the spike (S) protein of coronaviruses facilitates viral entry into target cells, the surface unit of the S protein S1 must bind to a cellular receptor that facilitates viral attachment to the surface of target cells, and for this binding angiotensin-converting enzyme (ACE2) is used and it is more common in men (20). In another study with similar findings, it was observed that ACE2 was associated with adipose tissue, and it was predicted that ACE2 would be higher in excess adipose tissue, and therefore, Covid-19 disease may progress more aggressively in obese patients (21). Although the body mass index (BMI) is higher in men, there was no difference in mortality between male and female genders in this study. It is possible that creatine, CRP, PCT and fibrinogen, which were found to be significantly higher in women than in men, increased mortality.

High fibrinogen is the characteristic feature of Covid-associated coagulopathy (22). Elevated creatine level is an indicator of kidney damage caused by systemic inflammatory response caused by cytokine storm (22). It has been reported in a study that thrombosis formation is facilitated by high fibrinogen, and inflammatory markers such as CRP contribute to this thrombosis (23). In a study by Jordana B Cohen et al., it was found that mortality was higher in Covid-19 patients with high creatine levels (24). There can be several causes of liver and kidney dysfunction in Covid-19. The hepatotoxic and renal toxic effects of the drugs given in the treatment of the disease cannot be ignored, as can be the result of direct damage to hepatocytes and nephrons or a cytokine storm by the SARS-CoV-2 virus. The high rate of both in our female cases may be due to comorbid liver or kidney diseases. However, we do not have sufficient data for this and further research is required for the relationship between fibrinogen, creatinine elevations and comorbidity correlation. However, we believe that higher levels of CRP and procalcitonin, which are acute phase reactants, in women may have exacerbated kidney and liver damage. Previous studies have revealed the critical role of BUN, creatine, CRP, fibrinogen and lymphocyte biomarkers in COVID-19 (25,26).

In the study, no significant difference was found between the length of stay in the intensive care unit, intubation period, neutrophil, PT-INR, D-Dimer levels in both genders.

There are several limitations in our study. First, reliable data could not be collected because comorbidity data were obtained from patients or their relatives. We believe that comorbidities, regardless of age group, especially between genders, have an effect on mortality, but this could not be compared due to insufficient data. Second, due to the study was conducted retrospectively, equal participants could not be obtained between both genders or age groups. This limits our demographic generalization of the study. Third, certain biochemical markers were studied in our hospital. We expect more comprehensive blood tests to yield more accurate results.

CONCLUSION

This study shows the absolute effect of the age factor on Covid-19 mortality. Although men were found to have a higher incidence of disease than women, there was no difference in mortality. Cohort studies with larger biomarkers will increase the contribution in this area.

REFERENCES

1. World Health Organisation. WHO Coronavirus Disease (COVID-19) Dashboard 2021.
2. Sze S., Pan D., Nevill C.R., Gray L.J., Martin C.A., et all., Pareek M. Ethnicity and clinical outcomes in COVID-19: a systematic review and metaanalysis. EClinicalMedicine. 2020;29:100630.
3. Chen R, Liang W, Jiang M, Guan W, Zhan C, Wang T, et all. Risk factors of fatal outcome in hospitalized subjects with coronavirus disease 2019 from a nationwide analysis in China. Chest. 2020.
4. E S Nekaeva , A E Bolshakova , E S Malysheva et all., Gender Characteristics of the Novel Coronavirus Infection (COVID-19) in Middle-Aged Adults, Sovrem Tekhnologii Med. 2021;13(4):16-24.
5. Meng Y., Wu P., Lu W, et all., Sex-specific clinical characteristics and prognosis of Coronavirus Disease-19 infection in Wuhan, China: a retrospective study of 168 severe patients. PLoS Pathog. 2020;16(4):e1008520.
6. Webb K., Peckham H., Radziszewska A., Menon M., Oliveri P., et all., Sex and pubertal differences in the type 1 interferon pathway associate with both X chromosome number and serum sex hormone concentration. Front Immunol. 2019;9:3167.
7. Culebras E., Hernández F. ACE2 is on the X chromosome: could this explain COVID-19 gender differences? Eur Heart J. 2020;41(32):3095.
8. Li X, Xu S, Yu M, et al. Risk factors for severity and mortality in adult COVID-19 inpatients in Wuhan. J Allergy Clin Immunol. 2020.
9. Williamson EJ, Walker AJ, Bhaskaran K, et al. OpenSAFELY: factors associated with COVID-19 death in 17 million patients. Nature. 2020.
10. Guan WJ, Liang WH, Zhao Y et al. Comorbidity and its impact on 1590 patients with Covid-19 in China: A Nationwide Analysis. Eur Respir J. 2020.
11. Jean Y Ko , Melissa L Danielson , Machell Town et. all.Risk Factors for Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization: COVID-19-Associated Hospitalization Surveillance Network and Behavioral Risk Factor Surveillance System, Clin Infect Dis. 2021 Jun 1;72(11):e695-e703.
12. Lara Jehi , Xinge Ji , Alex Milinovich et all. Development and validation of a model for individualized prediction of hospitalization risk in 4,536 patients with COVID-19, PLoS One. 2020 Aug 11;15(8):e0237419.
13. Adam Booth , Angus Bruno Reed , Sonia Ponzo et all. Population risk factors for severe disease and mortality in COVID-19: A global systematic review and meta-analysis, PLoS One. 2021 Mar 4;16(3):e0247461..
14. Williamson EJ, Walker AJ, Bhaskaran K, et all. Factors associated with COVID-19-related death using OpenSAFELY, 2020 Aug;584(7821):430-436.
15. Docherty AB, Harrison EM, Green CA et all. Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study, BMJ. 2020 May 22;369:m1985.
16. Smits S.L., de Lang A., van den Brand J.M., Leijten L.M., van IJcken W.F., Eijkemans M.J.C. Exacerbated innate host response to SARS-CoV in aged non-human primates. PLoS Pathog. 2010;6
17. Zhou F., Yu T., Du R., Fan G., Liu Y. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. 2020;395:1054–1062
18. Opal S.M., Girard T.D., Ely E.W. The immunopathogenesis of sepsis in elderly patients. Clin Infect Dis. 2005 Nov 15;41 Suppl 7:S504-12
19. Meng Y, Wu P, Lu W et al. Sex-specific clinical characteristics and prognosis of coronavirus disease-19 infection in Wuhan, China: A retrospective study of 168 severe patients. PLoS Pathog. 2020;16(4):e1008520 10.1371/journal.ppat.1008520,
20. Hoffmann M., Kleine-Weber H., Schroeder S., Kruger N., Herrler T., Erichsen S. SARS-CoV-2 cell entry depends on ACE2 and TMPRSS2 and is blocked by a clinically proven protease inhibitor. Cell. 2020;181(2):271–280

21. Linna Li , Leonard Spranger , Dominik Soll et al. Metabolic impact of weight loss induced reduction of adipose ACE-2 – Potential implication in COVID-19 infections?, Metabolism Clinical and Experimental, 2020;113:154401
22. Nekaeva ES, Bolshakova AE, Malysheva ES, et al. Gender Characteristics of the Novel Coronavirus Infection (COVID-19) in Middle-Aged Adults. *Sovrem Tekhnologii Med*. 2021;13(4):16-24
23. Al-Samkari H, Karp Leaf RS, Dzik WH et al. COVID-19 and coagulation: bleeding and thrombotic manifestations of SARS-CoV-2 infection. Blood. 2020;136(4):489-500.
24. Cohen JB, Hanff TC, William P et al. Continuation versus discontinuation of renin-angiotensin system inhibitors in patients admitted to hospital with COVID-19: a prospective, randomised, open-label trial. Lancet Respir Med. 2021;9(3):275-284
25. Ruan Q, Yang K, Wang W, Jiang L, Song J. Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. Intensive Care Medicine. 2020. pp. 846–848. 10.1007/s00134-020-05991-x
26. Chen R, Liang W, Jiang M et al. Risk factors of fatal outcome in hospitalized subjects with coronavirus disease 2019 from a nationwide analysis in China. Chest. 2020; 1–9.

Table 1. Association of Laboratory Results with Mortality of Patients Under 55 Years of Age

N=61		Mortality		*p*
		Alive (n=43)	Exitus (n=18)	
BMI	*Mean±SD*	29.91±6.21	27.44±7.43	[a]***0.024****
	Median (Min-Max)	29 (20-55)	26.5 (21-54)	
Stay in I.C.U	*Mean±SD*	8.05±5.87	14.11±10.07	[b]***0.006****
	Median (Min-Max)	7 (3-36)	13 (1-40)	
in mechanic vent.(day)	*Mean±SD*	4.50±5.07	4.28±3.83	[a]***0.897***
	Median (Min-Max)	2.5 (1-12)	3 (1-14)	
Creatine	*Mean±SD*	1.03±1.57	2.09±3.58	[a]***0.150***
	Median (Min-Max)	0.7 (0.4-10.6)	0.8 (0.3-14.9)	
CRP	*Mean±SD*	13.51±9.60	17.31±12.26	[a]***0.289***
	Median (Min-Max)	12.3 (0.4-45)	14.3 (0.3-43.9)	
Neutrophil	*Mean±SD*	12.07±5.97	10.97±8.32	[a]***0.211***
	Median (Min-Max)	11.4 (2.4-26.2)	8.2 (2-36)	
Lynphocyte	*Mean±SD*	0.85±0.48	1.12±1.74	[a]***0.611***
	Median (Min-Max)	0.7 (0.2-3.1)	0.8 (0.1-7.9)	
Procalcitonin	*Mean±SD*	0.93±2.84	1.46±2.51	[a]***0.021****
	Median (Min-Max)	0.2 (0-16.6)	0.3 (0.1-9.6)	
D-Dimmer	*Mean±SD*	1905.49±1817.76	2702.50±1883.49	[a]***0.030****
	Median (Min-Max)	1400 (300-9760)	1965 (945-7920)	
PT	*Mean±SD*	12.33±1.54	12.50±1.47	[a]***0.517***
	Median (Min-Max)	12 (11-18)	12.5 (10-15)	
İNR	*Mean±SD*	1.03±0.15	1.07±0.14	[a]***0.225***
	Median (Min-Max)	1 (0.9-1.5)	1.1 (0.9-1.3)	
PTT	*Mean±SD*	22.09±3.14	25.67±5.62	[a]***0.010****
	Median (Min-Max)	21 (17-30)	24.5 (19-41)	
Fibrinogen	*Mean±SD*	578.77±181.59	613.11±183.17	[a]***0.564***
	Median (Min-Max)	574 (241-900)	586.5 (286-900)	

[a]Mann Whitney-u Test, [b]Student-t Test, *p<0,05, **p<0,01

Table 2. Association of Laboratory Results with Mortality of Patients Over 55 Years of Age

N=439		Mortality		*p*
		Alive (n=130)	Exitus (n=309)	
BMI	*Mean±SD*	28.25±6.13	28.75±5.69	[a]***0.350***
	Median (Min-Max)	27 (17-48)	28 (16-58)	
Stay in I.C.U	*Mean±SD*	7.78±5.32	14.23±13.17	[b]***0.001****
	Median (Min-Max)	7 (1-26)	10 (1-83)	
İn mechanichal vent.	*Mean±SD*	1.92±1.50	4.70±5.33	[a]***0.007****
	Median (Min-Max)	1 (1-5)	3 (1-48)	
Creatine	*Mean±SD*	1.27±1.21	1.87±1.66	[a]***0.001****
	Median (Min-Max)	0.9 (0.4-8.6)	1.2 (0.3-9.4)	
CRP	*Mean±SD*	11.32±8.62	15.10±10.93	[a]***0.001****
	Median (Min-Max)	9.8 (0.2-42.3)	12.6 (0.3-57)	
Neutrophil	*Mean±SD*	9.72±5.01	11.21±5.83	[a]***0.010****
	Median (Min-Max)	8.8 (1.5-30)	10.2 (1.6-39)	
Lynphocyte	*Mean±SD*	0.75±0.61	0.78±0.80	[a]***0.773***
	Median (Min-Max)	0.5 (0.1-3.7)	0.6 (0.1-5.8)	
Procalcitonin	*Mean±SD*	1.24±3.76	3.31±9.27	[a]***0.001****
	Median (Min-Max)	0.3 (0-30.3)	0.5 (0-84)	
D-Dimmer	*Mean±SD*	2180.41±1804.74	2262.02±2041.6	[a]***0.730***
	Median (Min-Max)	1645 (290-9230)	1420 (200-10000)	
PT	*Mean±SD*	13.81±6.16	14.18±7.71	[a]***0.353***
	Median (Min-Max)	12.3 (10-73)	13 (10-119)	
INR	*Mean±SD*	1.17±0.33	1.20±0.58	[a]***0.584***
	Median (Min-Max)	1.1 (0.8-3.2)	1.1 (0.8-6.9)	
PTT	*Mean±SD*	24.35±6.15	25.72±8.63	[a]***0.059***
	Median (Min-Max)	23 (17-50)	24 (16-99)	
Fibrinogen	*Mean±SD*	537.33±195.76	555.45±198.29	[a]***0.272***
	Median (Min-Max)	504 (122-900)	552 (95-971)	

[a]Mann Whitney-u Test, [b]Student-t Test, *p<0,05, **p<0,01

Table 3. Association of Laboratory Results with Mortality of Male Patients

N=297		Mortality		*p*
		Alive (n=97)	Exitus (n=200)	
BMI	*Mean±SD*	26.92±4.65	27.44±4.26	***[a]0.276***
	Median (Min-Max)	27 (17-44)	27 (16-52)	
Stay in I.C.U	*Mean±SD*	8.19±6.02	13.00±11.57	***[b]0.001***
	Median (Min-Max)	7 (2-36)	10 (1-69)	
in mechanichal vent.	*Mean±SD*	2.91±3.27	4.45±4.77	***[a]0.166***
	Median (Min-Max)	2 (1-12)	3 (1-32)	
Creatine	*Mean±SD*	1.35±1.59	1.89±1.64	***[a]0.001***
	Median (Min-Max)	0.9 (0.4-10.6)	1.2 (0.3-8.5)	
CRP	*Mean±SD*	13.26±9.48	16.54±11.44	***[a]0.027****
	Median (Min-Max)	10.8 (0.2-45)	13.9 (0.3-57)	
Neutrophil	*Mean±SD*	10.98±5.39	11.35±5.94	***[a]0.690***
	Median (Min-Max)	9.8 (2.3-30)	10.3 (1.6-36)	
Lynphocyte	*Mean±SD*	0.68±0.54	0.75±0.91	***[a]0.316***
	Median (Min-Max)	0.5 (0.1-3.7)	0.5 (0.1-7.9)	
Procalcitonin	*Mean±SD*	1.15±3.67	3.65±9.54	***[a]0.001***
	Median (Min-Max)	0.3 (0-30.3)	0.5 (0-84)	
D-Dimmer	*Mean±SD*	1986.43±1624.76	2292.98±2049.11	***[a]0.364***
	Median (Min-Max)	1520 (290-9760)	1415 (200-10000)	
PT	*Mean±SD*	13.02±3.02	14.55±9.18	***[a]0.005***
	Median (Min-Max)	12 (11-33)	13 (10-119)	
INR	*Mean±SD*	1.13±0.30	1.23±0.67	***[a]0.169***
	Median (Min-Max)	1 (0.8-3.1)	1.1 (0.8-6.9)	
PTT	*Mean±SD*	23.58±4.85	26.28±7.80	***[a]0.001***
	Median (Min-Max)	23 (17-42)	24 (17-71)	
Fibrinogen	*Mean±SD*	586.32±195.90	574.81±208.09	***[a]0.697***
	Median (Min-Max)	576 (122-900)	566 (95-971)	

*[a]Mann Whitney-u Test, [b]Student-t Test, *p<0,05, **p<0,01*

Table 4. Association of Laboratory Results with Mortality of Female Patients

N=203		Mortality		*p*
		Alive (n=76)	Exitus (n=127)	
BMI	*Mean±SD*	30.88±7.13	30.63±7.20	[a]***0.571***
	Median (Min-Max)	30 (17-55)	30 (16-58)	
Stay in I.C.U	*Mean±SD*	7.41±4.60	16.15±14.84	[b]***0.001****
	Median (Min-Max)	6 (1-25)	12 (1-83)	
İn mechanichal vent.	*Mean±SD*	1.83±1.60	5.05±5.94	[a]***0.032****
	Median (Min-Max)	1 (1-5)	3 (1-48)	
Creatine	*Mean±SD*	1.03±0.77	1.86±2.06	[a]***0.001****
	Median (Min-Max)	0.8 (0.4-4.4)	1.1 (0.3-14.9)	
CRP	*Mean±SD*	10.08±7.78	13.14±9.95	[a]***0.054***
	Median (Min-Max)	9.2 (0.4-37.8)	10.6 (0.3-46.5)	
Neutrophil	*Mean±SD*	9.44±5.19	10.97±6.05	[a]***0.068***
	Median (Min-Max)	7.9 (1.5-26.8)	9.8 (1.6-39)	
Lynphocyte	*Mean±SD*	0.90±0.61	0.88±0.81	[a]***0.321***
	Median (Min-Max)	0.8 (0.1-3.1)	0.7 (0.1-5.3)	
Procalcitonin	*Mean±SD*	1.19±3.41	2.52±8.17	[a]***0.002****
	Median (Min-Max)	0.2 (0-17.9)	0.4 (0-64.6)	
D-Dimmer	*Mean±SD*	2272.43±2014.86	2275.69±2015.40	[a]***0.574***
	Median (Min-Max)	1525 (296-9230)	1490 (240-8270)	
PT	*Mean±SD*	13.98±7.44	13.36±3.43	[a]***0.854***
	Median (Min-Max)	12 (10-73)	12 (10-33)	
INR	*Mean±SD*	1.14±0.31	1.14±0.34	[a]***0.793***
	Median (Min-Max)	1.1 (0.9-3.2)	1.1 (0.8-3)	
PTT	*Mean±SD*	24.05±6.52	24.84±9.42	[a]***0.544***
	Median (Min-Max)	23 (17-50)	23 (16-99)	
Fibrinogen	*Mean±SD*	498.25±177.75	533.15±177.85	[a]***0.132***
	Median (Min-Max)	466.5 (192-900)	516 (121-900)	

[a]Mann Whitney-u Test, [b]Student-t Test, *p<0,05, **p<0,01

Table 5. Comparison of Mortality and Laboratory Results by Gender

		Female	Male	*p*
Mortality	**Alive**	97 (32.7)	76 (37.4)	[c]***0.293***
	Exitus	200 (67.3)	127 (62.6)	
BMI	*Mean±SD*	27.27±4.39	30.72±7.16	[a]***0.001****
	Median (Min-Max)	27 (16-52)	30 (16-58)	
Stay in I.C.U	*Mean±SD*	11.43±10.34	12.88±12.77	[b]***0.163***
	Median (Min-Max)	8 (1-69)	9 (1-83)	
İn mechanichal vent.	*Mean±SD*	4.36±4.71	4.90±5.85	[a]***0.414***
	Median (Min-Max)	3 (1-32)	3 (1-48)	
Creatine	*Mean±SD*	1.72±1.64	1.55±1.74	[a]***0.003****
	Median (Min-Max)	1.1 (0.3-10.6)	0.9 (0.3-14.9)	
CRP	*Mean±SD*	15.47±10.93	12.00±9.30	[a]***0.001****
	Median (Min-Max)	13.1 (0.2-57)	10.1 (0.3-46.5)	
Neutrophil	*Mean±SD*	11.23±5.76	10.40±5.77	[a]***0.073***
	Median (Min-Max)	10.1 (1.6-36)	9.3 (1.5-39)	
Lynphocyte	*Mean±SD*	0.73±0.81	0.89±0.74	[a]***0.001****
	Median (Min-Max)	0.5 (0.1-7.9)	0.7 (0.1-5.3)	
Procalcitonin	*Mean±SD*	2.83±8.18	2.02±6.81	[a]***0.001****
	Median (Min-Max)	0.4 (0-84)	0.3 (0-64.6)	
D-Dimmer	*Mean±SD*	2192.86±1923.48	2274.47±2010.20	[a]***0.754***
	Median (Min-Max)	1420 (200-10000)	1490 (240-9230)	
PT	*Mean±SD*	14.05±7.76	13.59±5.29	[a]***0.366***
	Median (Min-Max)	13 (10-119)	12 (10-73)	
INR	*Mean±SD*	1.20±0.58	1.14±0.33	[a]***0.385***
	Median (Min-Max)	1.1 (0.8-6.9)	1.1 (0.8-3.2)	
PTT	*Mean±SD*	25.39±7.08	24.55±8.44	[a]***0.011****
	Median (Min-Max)	24 (17-71)	23 (16-99)	
Fibrinogen	*Mean±SD*	578.57±203.93	520.08±178.18	[a]***0.001****
	Median (Min-Max)	574 (95-971)	501 (121-900)	

[a]Mann Whitney-u Test, [b]Student-t Test, *p<0,05, **p<0,01

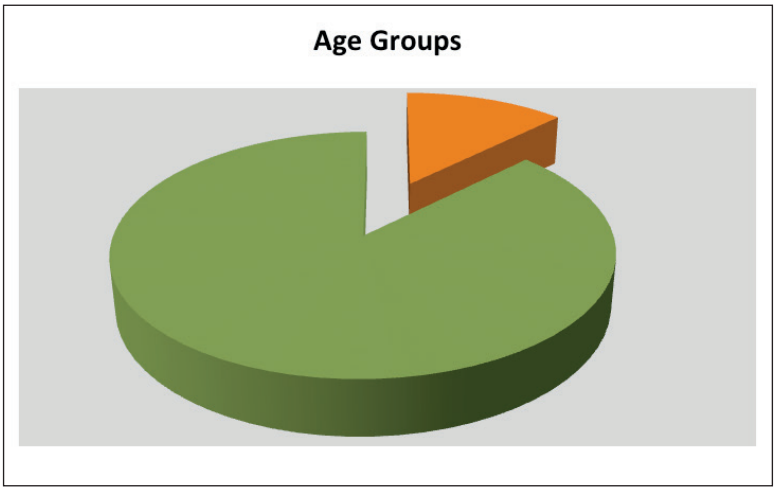


Figure 1. Distribution of age groups
Age≤55 %13 Age>55 %87

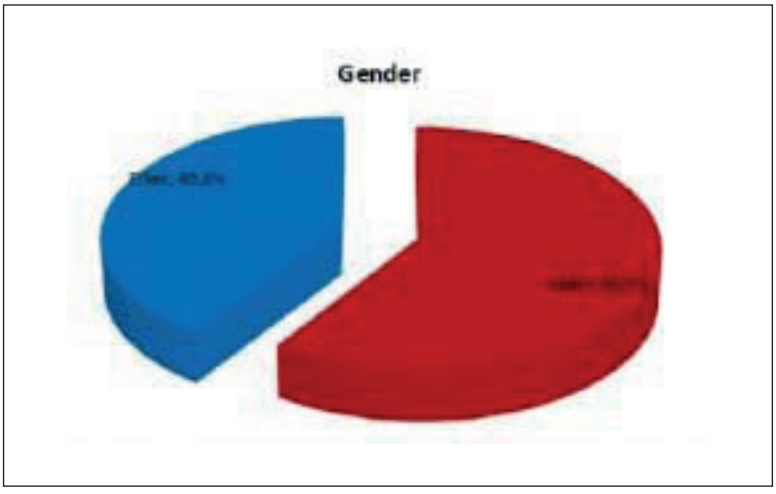


Figure 2. Distribution of gender

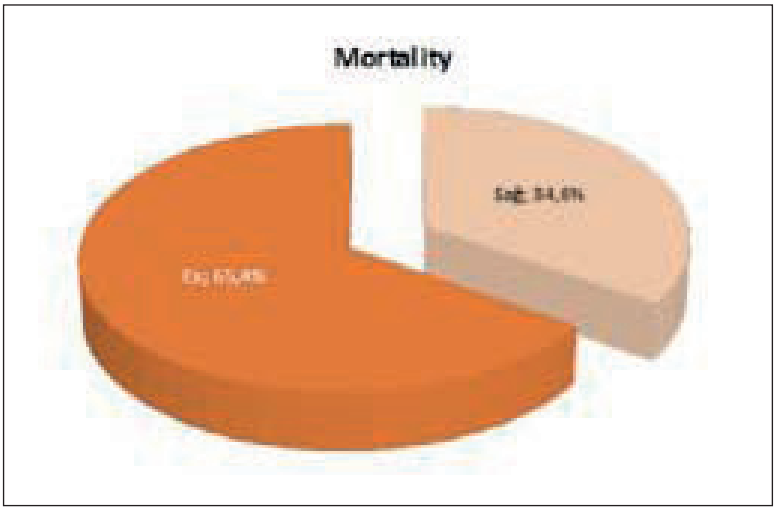


Figure 3. Distribution of mortality

Pneumoscrotum Due to Mechanical Ventilation in COVID-19 Patient in Intensive Care: A Case Report

Selin Erel

Gazi University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Pneumoscrotum is a rare and unique complication that is rarely discussed by intensivists and urologists. The term is used to describe the presence of air within the scrotum. The incidence is unknown, and the true frequency is likely to be underestimated because the condition is frequently unreported. This case report will discuss pneumoscrotum in COVID-19 patient with mechanical ventilation and pneumothorax.

Case report: A 71-year-old male COVID-19 patient was admitted to the intensive care unit (ICU) with the need for non-invasive mechanical ventilation. He was intubated the next day due to Glasgow Coma Scale regression. Mechanical ventilation settings were set up as tidal volume (TV) 6mL kg^{-1} and positive-end expiratory pressure (PEEP) of 8 cm H_2O^{-1}, respiratory rate (RR) 14 min^{-1}, and sedation was initiated. The mechanical ventilator settings were chosen based on the daily blood gas monitoring. On the 19th day, physical examination revealed crepitations in scrotum. Thorax and abdomen CT was performed and widespread air was observed along the scrotum walls. The next day he became hemodynamically unstable and urine output decreased. On the physical examination, he had widespread subcutaneous emphysema in the chest wall. Pneumothorax was suspected and chest X-ray was performed. To manage the pneumothorax and widespread subcutaneous emphysema through the thorax to scrotum; mechanical ventilator settings have been set up as tidal volume 4mL kg^{-1}, PEEP 5 mmHg, RR 20, and a chest tube was inserted. After 3 days the emphysema regressed and crepitations disappeared. Unfortunately, on the 25th day of ICU admission patient dead as a consequence of COVID-19.

Discussion: The most common etiology of pneumoscrotum is infection and it is not a common symptom in ICU. Pneumoscrotum our patient was thought to be due to mechanical ventilator treatment. The difficulties of this case study include the limits of the published literature. This is due to the scarcity of case reports on the pneumoscrotum, particularly those involving pneumoscrotum produced by a pneumothorax.

Conclusion: Our case demonstrated that subcutaneous emphysema and pneumoscrotum are uncommon disorders encountered in COVID-19 patients, but they should not be overlooked because they can be a subsequent symptom of a more serious, life-threatening condition.

Keywords: Pneumoscrotum, long term ventilation, COVID 19, intensive care, pneumothorax

INTRODUCTION

Pneumoscrotum, also known as scrotal emphysema, is a rare medical condition that occurs when air accumulates within the scrotum. This condition can be caused by a variety of factors, including trauma, infection, and medical procedures. Pneumoscrotum is a unique complication that is rarely discussed by intensivists and urologists, the incidence is unknown, and the true frequency is likely to be underestimated because the condition is frequently unreported which is why it remains an underreported condition (1).

In this case report, a COVID-19 patient who was on mechanical ventilation and also had a pneumothorax and developed a pneumoscrotum was discussed. Etiology and potential risk factors related to pneumoscrotum in COVID-19 patients will be summarized before describing the patient's clinical presentation, diagnosis, and treatment. We hope that by raising awareness and understanding of this uncommon and special complication, clinicians will be more likely to include pneumoscrotum in their differential diagnosis when assessing COVID-19 patients who are experiencing scrotal swelling or pain, especially those who are receiving mechanical ventilation.

CASE

A 71-year-old male patient arrived at the emergency room complaining of shortness of breath and cough. He had no fever and was hemodynamically stable, but his respiration rate and SPO_2 were 32 and % 78 respectively. Chest tomography revealed, subpleural and parenchymal focal ground-glass areas in both lung parenchyma, and mild covid infection was evaluated in favor of lung involvement. On admission, his viral polymerized chain reaction test for SARS-CoV-2 was positive. The medical history includes coronary artery disease, insulin-dependent diabetes, cerebrovascular disease, transient ischemic attack, and temporal arteritis. He received antiviral therapy (favipiravir 1600 mg twice daily for 2 days, 600 mg for 8 days), methylprednisolone (80 mg intravenously for 10 days), and moxifloxacin (400 mg once daily for ten days).

On hospital day 10, the patient was moved to the intensive care unit (ICU) due to worsening hypoxic respiratory failure and the need for non-invasive mechanical ventilation. Upon the ICU admission absolute lymphocyte count was 490 mcL; ferritin, 627 ng mL^{-1}; C-reactive protein, 13.8 mg dL^{-1}; and procalcitonin, 0.50 ng mL^{-1}, albumin 18.4 gr L^{-1}, serum creatine 0.45 mg dL^{-1}. He was intubated the next day due to Glasgow Coma Scale regression. Mechanical ventilation settings were set up as tidal volume (TV) 6 mL kg^{-1} and positive-end expiratory pressure (PEEP) of 8 cm H_2O^{-1}, respiratory rate (RR) 14, and sedation was initiated with midazolam. To manage the patient's respiratory distress, mechanical ventilation settings were carefully chosen based on daily blood gas monitoring. Piperacillin–tazobactam (4.5 g $8h^{-1}$), prophylactic anticoagulation, and methylprednisolone (250 mg daily for 3 days) was added to his therapy.

On the 19th day of ICU admission, he became hemodynamically unstable, and urine output decreased. Noradrenaline administration was initiated. physical examination revealed crepitations in the scrotum. This finding was confirmed by abdominal, thoracal, pelvic computer tomography and scrotal ultrasound imaging, which showed widespread air along the scrotum walls, indicating pneumoscrotum (Figure 1).

The patient's condition deteriorated further the next day, with hemodynamic instability and decreased urine output. On physical examination, widespread subcutaneous emphysema was observed in the chest wall, and pneumothorax was suspected. A chest X-ray was performed, confirming the diagnosis.

To manage the pneumothorax and widespread subcutaneous emphysema from the thorax to the scrotum, the mechanical ventilator settings were modified, with a TV of 4 mL kg^{-1}, PEEP of 5 mmHg, and RR of 20. In addition, a chest tube was inserted. After three days of treatment, the emphysema regressed, and the crepitations disappeared.

Despite the best efforts of the medical team, the patient passed away on the 25th day of ICU admission due to the severe and unpredictable nature of COVID-19.

DISCUSSION

Although COVID 19 patients are most frequently followed up with respiratory failure in ICU, clinical manifestations vary from asymptomatic to other organ dysfunctions. Management of these patients challenges in the ICU with not only respiratory failure but also other organ dysfunctions.

Urological manifestations are neither seen as the first symptom of COVID-19 nor as the main symptom during hospitalization in ICU. Since COVID-19 was unlikely to cause any urinary symptoms, the simple presence of these symptoms should not be a cause for concern. However, it might also be a symptom that comes along with other conditions (2, 3).

Pneumoscrotum is an uncommon medical condition that should not be overlooked, as it may indicate an underlying serious condition that could be life-threatening. The accumulation of air or gas in the scrotum can occur due to various reasons. Gas-producing bacteria like Clostridia or Fournier's gangrene or emphysematous epididymorchits can result in the production and accumulation of gas in the affected area. The spread of air from the thoracic cavity is another mechanism that can lead to pneumoscrotum. This usually happens in cases of pneumomediastinum and pneumothorax, where the air travels from the lungs to the scrotum through the body tissues. The occurrence of these thoracic conditions can have different causes, such as blunt trauma to the chest, prolonged ventilation or jet ventilation, cardiopulmonary resuscitation, and chest drainage (1, 4, 5).

The treatment strategy should be based on the underlying cause and the patient's physical condition, even though pneumoscrotum is typically not regarded as a serious medical condition. Therefore, it is crucial to carefully carry out the diagnosis and treatment of the primary and secondary diseases that cause pneumoscrotum. Usually antibiotics and close observation are sufficient for the management of pneumoscrotum without the need for surgery. In this case report, the main cause of the pneumoscrotum is the patient's pathological condition, pneumothorax with the mechanism for the presence of air in the scrotum via intrathoracic.

The relationship between pneumoscrotum and COVID-19 is not known exactly. But patients with COVID-19 infections with invasive mechanical ventilation have a high chance of the barotrauma. The development of barotrauma in the lungs may lead to pneumothorax and surgical emphysema in the head, neck, and chest region. Pneumothorax and pneumomediastinum occur frequently in COVID-19 patients with ARDS requiring mechanical ventilation is associated with increased mortality. Development of pneumothorax and indirectly pneumoscrotum seems to occur despite the use of protective mechanical ventilation and has a radiologic predictor sign (6).

CONCLUSION

Our patient's case indicated that although subcutaneous emphysema and pneumoscrotum are uncommon conditions that can occur in COVID-19 patients, they must not be neglected as they might be secondary to more serious conditions that pose a serious risk to the patient's life. To choose the best course of action, the primary cause of the pneumoscrotum must be identified. This is because there are not many case reports about the pneumoscrotum that can be found, especially regarding the pneumoscrotum caused by a pneumothorax.

REFERENCES

1. Firman R, Heiselman D, Lloyd T, Mardesich P. Pneumoscrotum. Ann of Emerg Med 1993;22(8):1353-6.
2. Edirappuli S, Venkatesh A. Atypical symptoms in COVID-19: the many guises of a common culprit. Rapid response to: Covid-19: four fifths of cases are asymptomatic, China figures indicate. Br Med J 2020;369:1375.
3. Chan VW-S, Chiu PK-F, Yee C-H, Yuan Y, Ng C-F, Teoh JY-C. A systematic review on COVID-19: urological manifestations, viral RNA detection and special considerations in urological conditions. World J Urol 2021:39(9):3127-38.
4. Lostoridis E, Tourountzi P, Pouggouras K, Koutsouki S, Lampiri K, Nagy E-O. Pneumoscrotum after tracheal intubation. Acta Anaesthesiol Taiwan 2015;53(1):44-6.
5. Klimach O, Defriend D, Foster D. Pneumoscrotum following endoscopic sphincterotomy. Surg Endosc 1990;4(4):230-1.
6. Belletti A, Palumbo D, Zangrillo A, Fominskiy EV, Franchini S, Dell'Acqua A, et al. Predictors of pneumothorax/pneumomediastinum in mechanically ventilated COVID-19 patients. J Cardiothorac Vasc Anesth 2021:35(12):3642-51

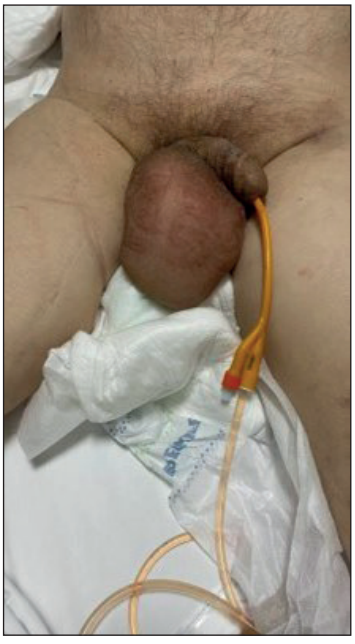


Figure 1. Pneumoscrotum

Frequency of Thromboembolic Events and Predictive Value of ISTH DIC Score in COVID-19 Intensive Care Patients: Retrospective analysis

Fatma Ozkan Sipahioglu, Eda Macit Aydin, Julide Ergil

University of Health Sciences Ankara Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Deep vein thrombosis, pulmonary embolism, disseminated intravascular coagulation (DIC), myocardial infarction, and cerebrovascular events are among the most common thromboembolic complications in COVID-19 patients. Clinical scoring systems such as the Sepsis-Associated Coagulopathy, Sequential Organ Failure Score, and International Society for Thrombosis and Hemostasis (ISTH) DIC score can be used to assist in determining the severity of the disease and predicting outcomes in patients with COVID-19. In this study, we aimed to assess the risk of thromboembolic events in patients with COVID-19 in the intensive care unit (ICU) and the usefulness of the ISTH DIC scoring system in this regard.

Material and Methods: After hospital ethics committee approval, all patient data in the 3rd-level COVID-19 Anesthesia ICUs between 01.07.2020 and 01.01.2022 were extracted. Patients' demographic, clinical, laboratory, and outcome data with length of stay in the hospital and ICU were recorded. Patients with a thromboembolic event were divided into the thrombosis group. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results and Discussion: A total of 1172 patients were enrolled in this study. One hundred thirty-six patients had thromboembolic events. The clinical characteristics of patients with thromboembolic event are given in Table 1. The most common thromboembolic event was acute coronary syndrome (Figure 1). The mortality rate was higher in the thrombosis group (p=0.012) and gender, advanced age (>=65), smoking, and COVID-19 vaccine status had no effect on mortality (p>0.05). The ISTH DIC score was between 2-5 points in most patients, and there was no difference between the groups (p=0.160) (Table 2). Only five patients in the thrombosis group and two patients in the control group matched the DIC criteria (>=5 points).

Conclusion: The incidence of thromboembolic events in patients with COVID-19 in the ICU is high and effective in mortality. The ISTH DIC score was thought to be utility in predicting the critical COVID-19 patient in need of ICU but was insufficient to predict the development of thromboembolic events.

Keywords: COVID-19, disseminated intravascular coagulation, thromboembolism, thrombosis

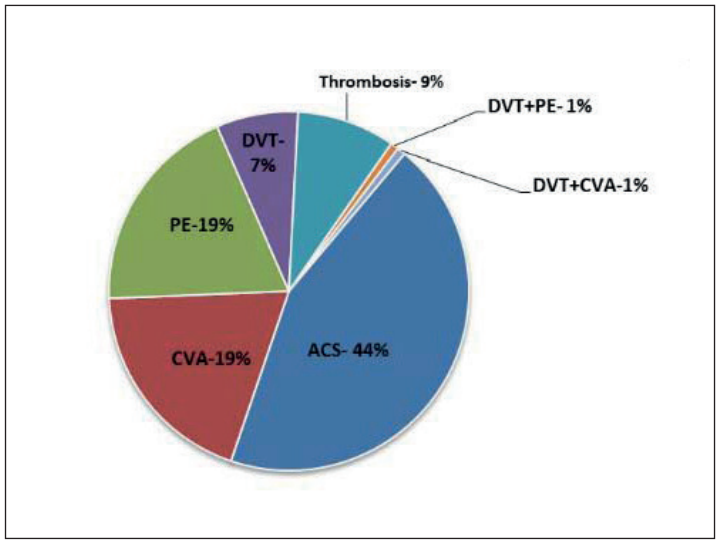


Figure 1. Thromboembolic events
DVT: Deep Vein Thrombosis, PE: Pulmonary Embolism, CVA: Cerebrovascular Accident, ACS: Acute Coronary Syndrome

Table 1. The Clinical Characteristics of Patients with Thromboembolic Events

Age [year. median (min-max)]	72 (42-96)
Male gender (n.%)	68 (50)
Comorbidity (n.%) · Hypertension · Diabetes mellitus · Coronary artery disease · Heart failure · COPD · Chronic kidney disease · CVA · Malignancy · Atrial fibrillation · Chronic renal failure	124 (91.2) 97(71.3) 70 (51.5) 48 (35.3) 33(24.3) 30 (22.1) 25 (18.4) 20 (14.7) 16 (11.8) 15 (11) 7 (5.1)
APACHE II [median (min-max)]	19 (7-36)
Multiple organ failure (n.%)	46 (33.8)
COVID-19 vaccine* (n.%)	47 (34.6)
Smoking (n.%) · Smokes · Non-smoker · Exsmoker	 21 (15.4) 87 (64) 28 (20.6)
Oxygen support (n.%) · Simple oxygen mask · NIMV · IMV	 45 (33.1) 79 (58.1) 12 (8.8)
Length of stay in intensive care (day. median. min-max)	10 (1-57)
Length of stay in hospital (day. median. min-max)	14 (2-90)

NIMV: Non-invasive mechanical ventilator. IMV: Invasive mechanical ventilator. COPD: Chronic obstructive pulmonary disease. CVA: Cerebrovascular accident. *At least one COVID-19 vaccination

Table 2: Comparison Between Groups

Group	Thrombosis (n:136)	Control (n:1036)	P value
Age [year. median (min-max)]	72 (42-96)	69 (27-96)	0.212
Male gender (n.%)	68 (50)	498 (48)	0.455
APACHE II [median (min-max)]	19 (7-36)	16 (6-38)	0.320
Coagulation parameters (median – IQR) · PT (second) · APTT (second) · INR · Platelet (x10^3/ml) · D-dimer (mcg/ml) · Fibrinogen (mg/dl)	 10.20 (1.69) 33.90 (10.10) 1.12 (0.18) 224.50 (116) 1.57 (2.11) 566.50 (216)	 9.87 (1.73) 36.10 (10.15) 1.10 (0.18) 200.50 (118) 1.86 (2.59) 519 (272.8)	 0.253 0.083 0.256 0.070 0.072 0.064
ISTH DIC score group (n.%) · <2 · 2-5 · ≥5	 5 (3.7) 126 (92.6) 5 (3.7)	 45 (4.3) 976 (94.2) 15 (1.4)	0.160
Mortality (n.%)	82 (60.3)	506 (48.8)	**0.012***
Length of stay in intensive care (day. median. min-max)	10 (1-57)	9 (1-49)	0.196
Length of stay in hospital (day. median. min-max)	14 (2-90)	15 (2-120)	0.504

ISTH-DIC: International Society of Thrombosis and Hemostasis-Disseminated Intravascular Coagulation. PT: Prothrombin Time. APTT: Active Partial Thromboplastin Time. INR: International Normalized Ratio

Case Report: An Emergency Percutaneous Dilatation Tracheostomy for Tracheal Stenosis

Melis Sumak Hazir, Nevzat Özfırat

Bilecik Research and Training Hospital, Bilecik, Türkiye

ABSTRACT

Background: Endotracheal intubation is one of the important parts of airway management. There are several early and late complications of intubation. Laryngeal injury, inflammation, oedema, granulomas, and laryngotracheal stenosis are late complications. Laryngotracheal stenosis usually becomes symptomatic after extubation and could be progressively increased. In this case report, we would like to share our experience with difficult airway management for a patient with tracheal stenosis.

Case: An 80-year-old male patient with chronic obstructive pulmonary disease and cardiovascular disease was followed up in the intensive care unit after successful cardiopulmonary resuscitation. After one month of intubated period, the patient was extubated and hospitalised in the palliative care unit. After the two-and-a-half-month stable spontan respiration period, we decided to intubate the patient electively because of the increased respiratory distress. Although adequate visualization of the airway with the direct and video laryngoscopy, we couldn't intubate the patient due to the increased resistance to the tube. We decided to open an emergency percutaneous dilatational tracheostomy (PDT). All hemodynamics and respiratory parameters remained stable during the PDT. After the securing airway with PDT, we examined the patient with a flexible fiberoptic bronchoscope (FFB) from the nasal route to diagnose the narrowed part. Under the vocal cord, there was a stiff mass was observed.

Conclusion: Traumatic intubation, mucosal injury, high cuff pressure and prolonged or repetitive intubation are causes of laryngotracheal stenosis. Airway management in patients with laryngeal stenosis is complex. Although we couldn't able to intubate the patient, ventilation and oxygenation were adequate with mask ventilation all the time in our case. Due to our familiarity with PDT and the predicted level of tracheal stenosis, we preferred the emergency PDT over cricothyroidotomy (CT) to secure the airway. After the FFB examination, we realized that CT may not cross the narrow part of the airway and it may be complicated by bleeding from the hypertrophic tissue. In conclusion, laryngeal stenosis must be kept in the mind for patient who has a prior intubation period and anaesthetists must be able to perform different difficult airway management methods in an emergency setting.

Keywords: Difficult airway management, tracheostomy, tracheal stenosis

INTRODUCTION

Endotracheal intubation is performed for several reasons in patients who are followed up in the intensive care unit (ICU). Although endotracheal intubation is necessary to secure the airway and ventilate the patient, there are several early and late complications of intubation. Late complications include laryngeal injury, inflammation, oedema, granulomas, and laryngotracheal stenosis (LTS)(1). LTS incidence was reported up to 21% after intubation in literature (2).

Patients with laryngotracheal stenosis, depending on the level and area of stenosis, may present in a wide spectrum from asymptomatic to severe respiratory distress. In general, patients become symptomatic after extubation and could be progressively increased. The most common presentations are dyspnea, stridor and failure to wean from mechanical ventilation (1).

Anesthesiologists may encounter patients with previously undiagnosed laryngotracheal stenosis under emergency conditions in ICU. In this case report, we would like to share our experience with difficult airway management for a patient with tracheal stenosis.

CASE

An 80-year-old male patient with chronic obstructive pulmonary disease and cardiovascular disease was followed up in the intensive care unit after successful cardiopulmonary resuscitation. After one month of intubated period, the patient was extubated and hospitalised in the palliative care unit.

After the two-and-a-half-month stable spontan respiration period, the patient developed dyspnea and respiratory distress. Due to the patient's comorbidities and prolonged hospitalization, we diagnosed pneumonia. The patient's laboratory results and portable lung X-RAY confirmed our diagnosis. The patient did not respond to non-invasive mechanical ventilation and deteriorated. We decided to intubate the patient electively because of the increased respiratory distress.

An experienced anaesthetist tried to intubate the patient with a 7.5 mm-sized intubation tube by direct laryngoscopy after the sedation with midazolam and rocuronium. Although adequate visualization of the airway with the direct laryngoscope, the patient was not intubated due to the increased resistance to the tube. The patient's vital parameters and oxygen saturation were normal and we provided adequate ventilation via a face mask with 10 litres per minute oxygen flow. After the first attempt at direct laryngoscopy, we used the video laryngoscope and a 6.5 mm-sized tube. Although normal glottic visualization with Cormack-Lehane grade 1, the same resistance to the tube was detected with videolarnygocopy.

We decided to open an emergency invasive airway for the patient. Due to our familiarity with percutaneous dilatational tracheostomy (PDT) and the level of predicted resistance, we preferred the emergency PDT over cricothyroidotomy (CT) to secure the airway. After the sterilization and draping, PDT was performed under the narrowed part without complication. Mechanical ventilation was initiated via tracheostomy cannula. In ventilator and arterial blood gas, all the respiratory parameters were within normal range.

All hemodynamics and respiratory parameters remained stable during all the intubation attempts and the PDT administration period. After the securing airway with PDT, we examined the patient with a flexible fiberoptic bronchoscope (FFB) from the nasal route to diagnose the narrowed part. Under the vocal cord, there was a stiff mass which reduced the lumen by over 50 % was observed (Figure 1). We diagnosed post-intubation tracheal stenosis.

DISCUSSION

Laryngotracheal stenosis is a narrowing of the airway with fibrotic tissue (3). LTS can be congenital and acquired. Acquired LTS is caused by traumatic intubation, mucosal injury, high cuff pressure and prolonged or repetitive intubation (1).

LTS severity is not associated with laryngotracheal injury and may appear weeks after the initial injury (3). The clinic of the patient depends on the LTS severity. Patients with LTS may be asymptomatic after the initial injury or present to the doctor with mild dyspnea or serious respiratory distress which is required intubation or tracheostomy (4). In the young patient group who has dyspnea due to LTS, patients can be treated for asthma mistakenly (5).

LTS severity can be classified according to the percentage of reduced lumen area in Cotton-Myer Classification which is included four grades (Grade I: 0 to 50% decrease in the area; Grade II−51 to 70% decrease; Grade III−71 to 99% decrease, and Grade IV– no detectable lumen area) (6). After the anaesthesia induction, due to loss of muscle tone and auto-compensation mechanism, the patient's LTS grade can be increased and resulting in increased oxygen demand. If we can not overcome the oxygen demand, the patient's situation can be worsened more rapidly (7).

In this case, the patient's LTS was Cotton-Myer Grade II and oxygen demand was increased not only for the LTS but also pneumonia. The patient had a known diagnosis of COPD and had previously been intubated in the intensive care unit. After invasive mechanical ventilation, weaning was successful and the patient was able to wean from invasive mechanical ventilation. However, he continued to stay in the hospital because he needed oxygen support. With the development of lung infection, the oxygen demand increased and the patient's condition worsened.

Airway management in patients with laryngeal stenosis is complex. The most important part of airway management is continuing adequate ventilation. In our case, although we couldn't able to intubate the patient, ventilation and oxygenation were adequate with mask ventilation all the time in our case. In the literature about difficult airway management, intubation attempts are restricted 3+1 times (8). Due to guidelines and our previous experiment, we stayed strict with this rule and limited our intubation attempts 3 times.

Anaesthetists have to deal with difficult airways in both of the ICU and operating rooms. In operating rooms, supraglottic airway devices such as different generations of laryngeal masks might be helpful to overcome this situation. Also, patients could be awakened and non-emergent operations can be delayed for the comprehensive airway examination and treatment of the LTS. In the literature, there are several reports which are suggested the supraglottic airway device usage or awakening of the patients (7, 9, 10). However, in ICU settings, both of these scenarios are not useful. Patients who have LTS and severe respiratory distress might be needed an invasive airway in ICU. In our case, we had to secure the airway with invasive methods.

Emergency front-neck access (e-FONA) is recommended for "can not intubate" patients by difficult airway guidelines. There are three types of e-FONA which are scalpel cricothyroidotomy, cannula cricothyroidotomy and tracheostomy. Cricothyroidotomies are the first lines of e-FONA and tracheostomy can be useful for selected cases and experienced administrators (11). In LTS patients, the level of narrowed part of the airway is important to make a decision on which e-FONA type is useful.

In our case, we preferred the emergency PDT over CT because of the restricted part was located below the cricothyroid membrane. After securing the airway with PDT, we made an FFB examination to diagnose the narrowed part. In this examination, we noticed that CT could not pass through the narrow part of the airway and could be complicated by increased airway oedema or bleeding from hypertrophic tissue.

In conclusion, laryngeal stenosis must be kept in the mind for a patient who has a prior intubation period. In difficult airway management, reducing the attempts and staying strict with the flow of DAS guidelines can be a life-saving route. Besides that, anaesthetists should be familiar with invasive airway devices and able to perform different invasive airway methods for the emergency setting.

REFERENCES

1. Hyzy R. C.. Complications-Of-The-Endotracheal-Tube-Following-İnitial-Placement-Prevention-And-Management-İn-Adult-İntensive-Care-Unit-Patients. In: UpToDate; 2023 /Feb. www.uptodate.com. Accessed 07/03/2023
2. Farzanegan, R., Farzanegan, B., Zangi, M et al. Incidence Rate of Post-Intubation Tracheal Stenosis in Patients Admitted to Five Intensive Care Units in Iran. Iranian Red Crescent medical journal 2016; 18(9), e37574.
3. Dorris, ER, Russel, J, Murphy, M. Post-intubation subglottic stenosis: aetiology at the cellular and molecular level. European respiratory review: an official journal of the European Respiratory Society 2021; 30(159), 200218.
4. Sze Yee Lui, Karniza Khalid, Jee Jian Yew, Ida Zaliza Zainol Abidin. Emergency airway management in a patient with acquired subglottic stenosi . Indian Journal of Medical Specialities 2018;9:2, 94-96,
5. Ellis, H., Iliff, H. A., Lahloub, F. M. F., Smith, D. R. K.,Rees, G. J. Unexpected difficult tracheal intubation secondary to subglottic stenosis leading to emergency front-of-neck airway. Anaesthesia reports 2021; 9(1), 90–94.
6. Filauro, M., Mazzola, F., Missale, F., Canevari, F. R., Peretti, G. Endoscopic Preoperative Assessment, Classification of Stenosis, Decision-Making. Frontiers in pediatrics 2020;, 7, 532.
7. Anwar-ul-huda, Qamar-ul-Hoda, M., Awan, S. Emergency airway management of a patient with tracheal stenosis. JPMA. The Journal of the Pakistan Medical Association 2010; 60(9), 775–777.
8. Jeffrey L. Apfelbaum, Carin A. et al. 2022 American Society of Anesthesiologists Practice Guidelines for Management of the Difficult Airway. Anesthesiology 2022; 136:31–81
9. Nouraei, S. A., Giussani, D. A., Howard, D. J., Sandhu, G. S., Ferguson, C.,Patel, A. Physiological comparison of spontaneous and positive-pressure ventilation in laryngotracheal stenosis. British journal of Anaesthesia 2008; 101(3), 419–423.
10. Youn, A. M., Yoon, S. H.,Park, S. Y. Failed intubation of an unanticipated postintubation tracheal stenosis: a case report. Korean journal of anesthesiology 2016; 69(2), 167–170.
11. Price, T. M., & McCoy, EP Emergency front of neck access in airway management. BJA education,2019; 19(8), 246–253.

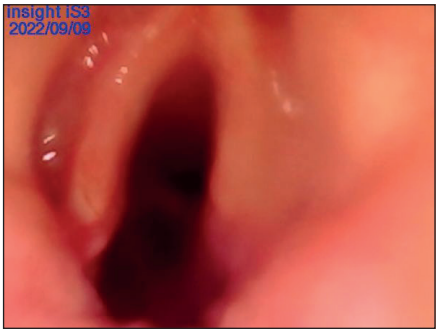


Figure 1. Vocal Cords from flexible fiberoptic bronchoscope

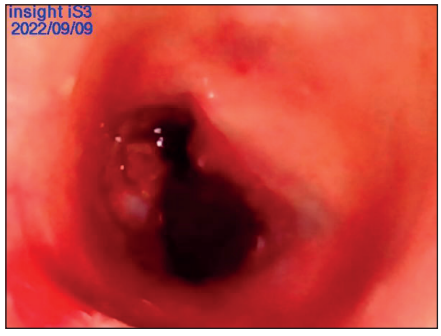


Figure 2. Tracheal stenosis photo from flexible fiberoptic bronchoscope

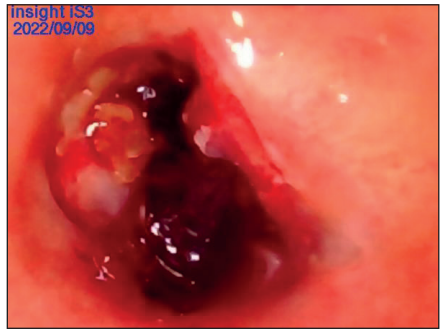


Figure 3. Tracheal stenosis photo from flexible fiberoptic bronchoscope

Case Report: A Rare Detachment Complication of Tracheostomy Cuff

Kevser Dilek Andic, Serkan Yücepur

Bilecik Research and Training Hospital, Bilecik, Türkiye

ABSTRACT

Background: Tracheostomy is an invasive procedure which could be complicated with minor or major complications. Bleeding, local infection, subcutaneous emphysema, posterior wall injury, and tracheoesophageal fistula are the most common complications of tracheostomy. Although cuff-related complications like deflation or blow-up are common, cuff detachment from the cannula is rare. In this report, we would like to share our experience with the cuff detachment.

Case: A 52-year-old female patient with tracheostomy cannula for respiratory insufficiency caused by amyotrophic lateral sclerosis was followed up in the intensive care unit. Because of the increased respiratory distress, we aimed to examine the patient with a flexible fiberoptic bronchoscope (FFB) to visualise the tracheobronchial structure and to make a bronchoalveolar lavage. Due to the tracheostomy cannula being blocked with dense pulmonary secretions, we decided to exchange the cannula. After the removal of the cannula, there was no cuff can be seen on the cannula.

After the patient's airway was quickly secured with orotracheal intubation, it was observed that the cuff balloon remained above the carina with FFB. Using FFB-guided endoscopic forceps, the intact cuff piece was removed with the endotracheal tube. The procedure was terminated by inserting a new tracheostomy cannula and the place of the cannula and the secured airway confirming with the FFB. There was no tracheal damage or bleeding and all hemodynamics and respiratory parameters remained stable during the intervention.

Conclusion: In literature, there are only a few case reports about fractured tracheostomy cannulas. In one of the cases, the cannula piece broke off on the 7th day after the tracheostomy. Also, Atwood et al. shared a case where they removed the ruptured part of the cannula with FFB. In general, cannula rupture is caused by the junction of the neck plate and tube. However, in our case, the separation between the cuff and the cannula was observed from the main part. FFB examination is a useful skill for airway devices related problems. In conclusion, cannula-cuff detachment is a rare complication of tracheostomy. Recognition of the broken cannula and management of the airway is vital to reduce morbidity and mortality.

Keywords: Tracheostomy cannula, detachment, bronchoscopy

INTRODUCTION

Tracheostomy is one of the oldest surgical procedures which is defined as opening of the anterior tracheal wall and the placing of a tracheostomy tube to provide ventilation. It is commonly being performed for bypassing an obstructed upper airway in emergent cases or in mechanically- ventilated, critically ill patients for prolonged intubation in intensive care units (ICU). Although the procedure is safe with a mortality rare of <5%, some early and rare complications can occur in 3-15% of the patients (1). Early complications are hemorrhage, subcutaneous emphysema or pneumothorax, decannulation, wrong placement of the cannula, obstruction of the tracheostomy tube and wound infections. Late complications are tracheal stenosis, tracheomalacia, pneumonia, aspiration, granuloma formation, tracheoesophagial fistula (2,3). Fracture of the tracheostomy cannula is a rare occurance, but it can be a life-threating condition that requires emergency management. The detachment generally occurs at the junction between the tube and the neck plate and usually in metallic tubes. Herein we present an aytpical case with a flexible spiral type of plastic tracheostomy tube seperation between the cuff and the cannula.

CASE

A 52-year-old female patient with a tracheostomy tube for respiratory insufficiency caused by ALS was followed up for about 2 years in ICU. She was first admitted to the hospital due to bilateral pneumothorax and respiratory distress. A percutaneous tracheostomy was performed on the patient on the 4th day of the hospitalisation and she was followed on the mechanical ventilator. Because of the increased respiratory distress for last few days, we aimed to examine the patient with a flexible fiberoptic bronchoscope (FFB) to visualise the tracheobronchial structure and to make a bronchoalveolar lavage if needed. After intravenous sedation done with 1 mg/kg propofol and 0,6 mg/kg rocuronium, we performed bronchoscopy by entering through the tracheostomy cannula (a flexible spiral type of plastic tube with an internal diameter of 8.0 mm). Tracheobronchial structures and the tracheostomy cannula appeared intact. The last change of her tracheostomy tube was about 4 months ago. Due to the tracheostomy cannula being blocked with dense pulmonary secretions, we decided to exchange the cannula with the newer one. After the cannula is gently removed from the tracheal ostium, there was no cuff can be seen on the cannula.

The patient's airway was quickly secured with orotracheal intubation with a number 7 endotracheal tube to improve oxygenation and ventilation. After intubation, the bronchoscope was advanced into the airway through the endotracheal tube. It was observed that the cuff balloon remained above the carina with FFB. Using a FFB-guided endoscopic forceps, the cuff piece was grasped and intactly removed with the endotracheal tube transorally. The procedure was terminated by inserting a new size 7,5 cuffed tracheostomy cannula into the tracheostomy site and the secured airway confirming with the FFB. There was no tracheal damage or bleeding. The patient's all hemodynamics and respiratory parameters remained stable during the intervention. After the procedure, a chest X-ray was obtained and it did not reveal any abnormal findings.

DISCUSSION

Tracheostomy is an essential and common part of modern airway management for caregivers. Tracheostomy tubes are used as an airway adjunct to provide appropriate ventilation in mechanically-ventilated patients in ICUs. They provide a safe airway, reduce larygeal damages, facilitate airway aspiration, increase patients' mobilization, help return to nutrition and speech and they totally improve comfort. It also benefits such as reducing airway resistance and dead space, also aids the weaning period from the mechanical ventilator (4).

Although tracheostomy-related complications like dislodgement, inability to reinsert the tube, cuff deflation or blow-up are common, cuff detachment from the cannula is rare and we believe it is worthwhile to discuss. Tracheostomy tube fracture is an infrequent complication. The first case in the literature was reported in 1960 in an adult with a broken piece of metallic tracheostomy cannula (5) and since published reports of fractured tracheostomy tube presenting as foreign body are few in every 1-2 years (6-9).

Tracheostomy tubes are made from metal, plastic (polyvinil chloride=PVC) and silicone. Metallic tubes are suitable and preferred for prolonged use. Most portex cannulas are disposible and cannot be reused. Fractures occur less frequently in polymeric tubes (PVC, silicone, polyurethane) than metallic tubes because plastic ones are pliable and snugly fitting to the shape of the trachea. Despite this, a majority of the cases reported in the literature have been metallic and generally in children (1,8).

The components of the tracheostomy tube are the connector, neck plate, cannula, cuff, and pilot balloon. The most common fragile points of the tubes are the junction between the cannula and the neck plate, the distal end of the tube and the fenestration site (10). However, in our case, the separation between the cuff and the tube was observed from the main part. During the FFB, the tube appeared intact and the patient was not in respiratory distress on presentation and the chest auscultation was unremarkable.

The possible causes and some various risk factors for the fracture of tracheostomy tubes are corosions due to alkaline nature of the tracheobronchial secretions, tissue reactions to the chemicals leached from the plastic tubes, infections, repeated boiling of the metal tubes, repeated mechanical stresses and movements, aging due to prolonged usage of the same tube and some manufacturing defects in minority of cases (8,11,12). Prolonged use of tracheostomy tubes is a major factor in the causation of their failure. This is most likely due to the economic cost of replacing tubes and restricted or irregular follow-up. Most specialists recommend that tracheostomy tubes be changed at least twice yearly, so in line with this, our patient's tracheostomy tube was last changed about 4 months ago with FFB. The other suggestions for reducing the risk of damage are regular inspection and scheduled replacement of tubes in long-term tracheostomised patients, frequent daily cleaning of the cannula and stoma site depending upon the nature and amount of the patient's secretions and detailed daily examination of patient. Also, caregivers and patients should be educated about possible complications and appropriate care of tracheostomy.

Dislodgement of a fractured tracheostomy tube causes airway obstruction with the potential for catastrophic outcome. The fractured piece of the tube is a foreign body and it can lead to partial or complete tracheobronchial obstruction. Clinical presentation of symptomatic patients includes cough, respiratory distress, tachypnea, tachycardia and cyanosis. Deaths secondary to acute airway obstruction have been reported in mostly in the paediatric patients, possibly due to the smaller tracheobronchial structure (13). Most patients present with little or no symptoms because tracheostomy tubes usually have a large lumen that enables airflow.

After the diagnosis of a fractured tube, removal should be recommended with using a FFB. In some cases with a compromised airway due to subglottic and tracheal stenosis, ridig bronchoscopy or surgical procedures like wound exploration or stomal incision may be necessary. The interventions should be performed in a controlled environment like the operating room and when removal of the foreign body is prolonged and traumatic, high-dependency care may be necessary. In our patient, we were able to remove the fractured tracheostomy cuff transorally with the aid of a FFB-guided endoscopic forceps with no

complications. FFB examination is a useful skill for airway devices related problems and may help clinicians at bedside in making appropriate clinical desicions.

CONCLUSIONS

Fracture of the tracheoatomy tube is rare but it can lead to several conditions. A patient may present minimal symptoms like cough or severe clinical condition ranging from respiratory distress to death. Good tracheostomy care can avoid this complication. Prompt recognition and management of a fractured tracheostomy tube are critical to prevent morbidity and mortality.

REFERENCES

1. Wilson W,Nagajara DM, Dias Ayesha, Murty Shakuntala. Fracture and aspiration of tracheostomy tube: a case report. Hong Kong J of Emerg Med 2018;25(6):371-373
2. Zouk AN, Batra H. Managing complications of percutaneous tracheostomy and gastrostomy. J Thorac Dis. 2021;13(8):5314-5330.
3. Afzal M, Mutairi HA and Chaudhary I. Fractured tracheostomy tube obturator: a rare cause of respiratory distress in a tracheostomized patient. World J Anesthesiol 2013; 2(3): 30–32
4. Yıldırım F, Güllü YT, Demirel CB. Yoğun Bakımda Perkütan Trakeostomi. Eurasian J Pulmonol 2015; DOI: 10.5152
5. Bassoe HH, Boe J. Broken tracheotomy tube as a foreign body. Lancet 1960; 275(7132): 1006–1007
6. Antwi-Kusi A, Osei-Ampofo M, Mohammed DI, Addison W. Fractured tracheostomy tube – A case report of a 3-year old Ghanaian child. African Journal of Emergency Medicine 2012; 2, 114–116
7. Atwood C, Ulualp S, Ungar G. A Fractured Tracheostomy Tube Causing Airway Compromise. Am J Case Rep, 2022; 23: e936072
8. Parida PK, Kalaiarasi R, Alexander A, Saxena SK. Factors Associated with Fracture and Migration of Tracheostomy Tube into Trachea in Children: A Case Series. Iranian J of Otorh,2020;Vol 32(6), 113
9. Gupta SC and Ahluwalia H. Fractured tracheostomy tube: an overlooked foreign body. J Laryngol Otol 1996; 110(11):1069–1071
10. Lynrah ZA, Goyal S, Goyal A, et al. Fractured tracheostomy tube as foreign body bronchus: Our experience with three cases. Int J Pediatr Otorhinolaryngol. 2012;76:1691-95
11. Majid AA. Fractured silver tracheostomy tube: a case report and literature review. Singapore Med J. 1989;30(6):602-604.
12. Loh TL,Chin R,Flyinn P,Jayachandra S. Fracture and aspiration of a tracheostomy tube. BMJ Case Rep. 2014; 2014: bcr2013203232
13. Brockhurst PJ, Feltoe CK. Corrosion and fracture of a silver tracheostomy tube. J Laryngol Otol 1991;105:48–9

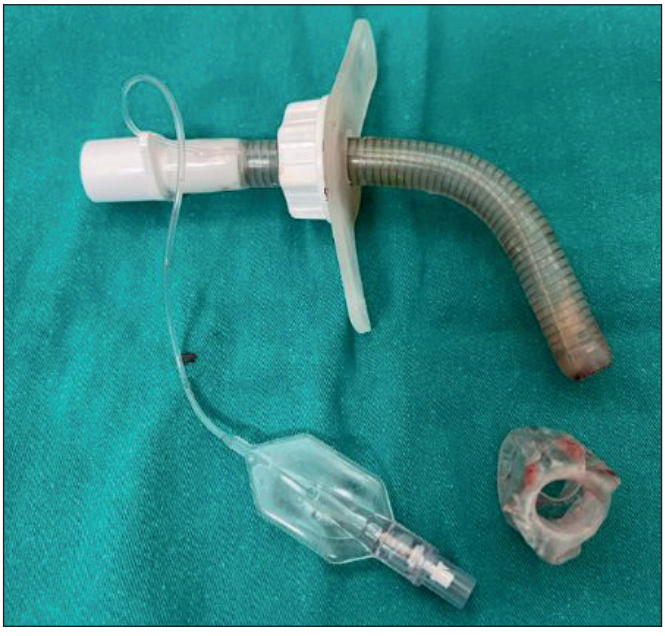


Figure 1. Ruptured tracheostomy cannula cuff

Our Data on Renal Failure in Patients Hospitalized in the Intensive Care Unit due to Crush Injury in the 2023 Kahramanmaras Earthquake

Gülçin Hilal Alay, Derya Tatlısuluoğlu, Feyzullah Kolay, Güldem Turan

Başakşehir Çam and Sakura City Hospital, Istanbul, Türkiye

ABSTRACT

Background: Crush Syndrome (CS); Compression injury occurs as a result of prolonged compression and immobility. There is marked tissue injury and muscle necrosis. Excessive crushing of the muscles can progress to a process that can result in death if fast and effective treatment isn't applied. In this report, we aimed to present the data of the patients hospitalized in our intensive care units in terms of kidney failure after the earthquake disaster.

Material and Methods: Patients with CS hospitalized in the ICU of Basaksehir Cam and Sakura City Hospital were retrospectively analyzed. Demographic data and APACHE II scores of the patients were recorded. Intubation status, mechanical ventilation days, and need for renal replacement therapy (RRT) were recorded. In addition to whether the RRT was performed as an intermittent(IHD) or continuous (CRRT) renal replacement, also laboratory values at the time of admission of the patients were recorded.

Results and Discussion: 51 patients were followed up in our intensive care units. The mean age of the patients was 42.36±20.01 and APACHE II score was 13.44±6.49. The mean mechanical ventilation days were 2.42±4.00 (15 patients were intubated). The duration spent under the wreckage was 41.4 ± 27.2 hours. Admission CK was found to be 33691.52±46876.55 and creatinine was 3.16±5.75. Renal replacement therapy need was present in 15 patients (30%). CRRT was performed in 12 patients, and half of these patients continued with intermittent HD. IHD was performed in 3 patients from the beginning. The duration of RRT treatment of the patients was 7,8 ±3,45 days. Three of the patients who underwent RRT for Crush syndrome continued to receive RRT after 28 days of ICU follow-up. No ARF-related mortality was observed in patients followed up in our intensive care units. However, a significant portion of the patients needed renal replacement therapy despite fluid resuscitation.

Conclusion: Renal Disaster Relief Task Force has responded to many disasters, the most important being the Marmara, Bam, Kashmir, and Haiti earthquakes. This unit emphasized early fluid resuscitation in crush syndrome and prepared algorithms. The 2023 Kahramanmaras earthquakes will provide new data that will contribute to the literature.

Keywords: Acute renal failure, crush injury, renal replacement theraphy

Sepsis Multi Organ Damage Due To Secondary Immune Failure After Spondylodiscitis

Gizem Demir Şenoğlu, Yavuz Demiraran, Zeliha Yazar

Düzce Univercity Medicine Faculty, Department of Anesthesiology and Reanimation, Düzce, Türkiye

ABSTRACT

Background: Surgical trauma may affect immunity and pave the way for septic complications. In our case, the intensive care follow-up of a patient who developed spondylodiscitis and diagnosed with immunodeficiency and ARDS-Sepsis was presented, and the literature was reviewed.

Case: A 36-year-old male patient became immobile with severe pain after a lumbar disc hernia repair twenty-eight days ago. Antibiotherapy was started after the diagnosis of Spondylodiscitis by MRI (Figure 1). Due to his clinical deterioration, he was transferred to our intensive care unit with the preliminary diagnosis of ARDS-sepsis and acute renal failure.

There were tachycardia, hypotension, hypoxia, anuria, with no infective findings in the operation area. Continuous venovenous hemodialysis and cytokine filter were applied to the patient. The cytokine filter was terminated on the third day with the regression of ARDS and infective parameters (Table 1), and the patient was followed up with high flow (fiO_2:100 flow:60L/min). Hypoxia became evident on the seventh day, and the patient had to be intubated on the tenth day.

Antibiotherapy was expanded due to acinetobacter and hyphae in deep tracheal aspirate. Deepening of thrombocytopenia was thought to be related to antibiotics. IgG level was 569 mg/dL (700-1600 mg/dL). Intravenous Ig (IVIG) was administered. As the cytopenia continued, it was thought that infection-related immune thrombocytopenia might have been added, and IVIG was planned again, the treatment was completed with clinical response. After sixty days of intensive care follow-up, the patient was removed from the intensive care unit by closing the tracheotomy.

Conclusion: Spondylodiscitis is usually bacterial and occurs after surgery. Complications, constant source of infection, and prolonged antibiotic therapy may lead to multiple organ dysfunction syndrome (MODS) due to uncompensated excessive and prolonged proinflammatory responses in patients. Long-term hospitalization after surgery, immobility, malnutrition are predisposing factors to sepsis; it also reveals the imbalance of inflammatory and anti- inflammatory processes. Thus, prolonged immunodeficiency findings can be observed.

The patient, who developed MODS and secondary immunodeficiency, was discharged after meticulous multidisciplinary follow-up.

In conclusion, it should be kept in mind that the immune system may be suppressed in young and low-risk patients and the resulting sepsis may cause multi-organ damage.

Keywords: Spondylodiscitis, sepsis, secondary immune failure

INTRODUCTION

Sepsis is among the leading causes of death in intensive care units. Surgical patients make up one-third of all septic patients (1,2). Surgical trauma affects both innate and acquired immunity. Changes in the immune system following surgical trauma may predispose to septic complications, which can be fatal. Although systemic inflammatory response syndrome (SIRS) may develop in most patients undergoing surgery, only a tiny proportion develop sepsis, severe sepsis, and septic shock (4). However, these patients have increased morbidity and mortality.

Surgical site infections after posterior spinal surgery can lead to spondylodiscitis, pseudarthrosis, neurologic sequelae, sepsis, and other adverse outcomes if not treated promptly. Infection rates vary depending on the type and extent of operative procedures, instrumentation used, and patients; risk factors.

In our case, a 36-year-old male patient who developed spondylodiscitis after Lumbar Discectomy and sepsis due to secondary immunodeficiency and whose clinical, laboratory, and imaging findings improved with medical treatment was presented, and the literatüre

CASE

A 36-year-old male patient was transferred to our intensive care unit with the preliminary diagnosis of ARDS-sepsis, acute renal failure, and spondylodiscitis after L4-5 discectomy. In his anamnesis, it was learned that he had been operated on for a lumbar disc herniation in an external center 28 days ago. He became immobile with severe pain shortly after the operation and was

followed up in the hospital. The patient, who had no known comorbidity in his history, had a history of alcohol use three days a week.

The examination findings showed that the patient was tachypneic, tachycardic, hypotensive, desaturated, and anuric. The operation area had no discharge, redness, or temperature increase.

In laboratory tests, thrombocytopenia, CRP, and procalcitonin increased, renal function tests were impaired, and anuria, ALT, and AST elevation were present.

In magnetic resonance imaging (MRI), an increase in signal was noted in the lumbar 5- Sacral1 intervertebral disc in T2AG and STIR sequences. Irregularity was observed in the vertebral end plateaus adjacent to the disc at this level. Signal increase in the disc and abnormality; in the end, plateaus were primarily observed as spondylodiscitis. (PICTURE 1) Considering MRI, the patient was started on tazosin and teicoplanin. Meropenem, moxifloxacin, and teicoplanin were administered to the patient in the septic state, whose intensive care follow-up was started. Anidulafungin was added as an antifungal due to growth in urine culture. Afterward, the anuric, hypotensive patient was placed on continuous venovenous hemodialysis and cytokine filter.

The patient, who was followed up with high flow (fio2:100 flow:60), had ARDS and infective parameters regressed (table 1), and the respiratory pattern improved according to the patient's chest X-ray. The cytokine filter was terminated on the 3rd day. The patient, whose tachypnea and hypoxia increased as of the 7th day, was intubated on the 10th day due to the inability to wean from the noninvasive mechanical ventilator (FIO2:100 CPAP/PSV: 12) and the deterioration of oxygenation and increased hypercapnia.

On the 15th day of his hospitalization, the patient, whose hypercapnia and hypoxia had increased, was placed in the prone position, and a neuromuscular blocker and sedation were applied. Due to prolonged intubation (on the 21st day), a tracheostomy was performed under operating room conditions. Acinetobacter in deep tracheal aspirate culture taken during intensive care follow-up and hyphae in sputum microscopic examination were observed. The patient's anti-biotherapy was optimized as teicoplanin, micafungin, cefoperazone sulbactam, and colistin. In addition, there was coagulase-negative staphylococcus growth in the blood catheter culture; no growth in the bone marrow culture was taken. In addition, leishmania, hantavirus, coxiella, brucella, and Crimea-Congo were negative among the zoonoses examined for further investigation.

The cytopenia of the patient whose thrombocytopenia deepened was thought to be primarily related to antibiotics in terms of hematology. In the peripheral smear, there was increased granulation and left shift in neutrophils, no schistocyte was observed, and no finding suggestive of malignancy was detected. Due to the continuation of cytopenia and lack of clinical response, Ig levels were observed regarding immunodeficiency. The first immunoglobulin G level was 569(700-1600), and the Ig G level (1504) in the latest tests was found to be relatively low, as it was expected to increase, especially with the current clinic.

Therefore, IVIG was planned (600 mg kg at intervals of 4-6 weeks), and when the cytopenia continued (20 days later), it was thought that infection-related immune thrombocytopenia might have been added. Therefore, it was accepted as a secondary ITP. 400mg/kg/day was planned for five days. Clinical response was obtained on the 3rd day, and the treatment was completed. During this process, blood product replacements were applied to the patient with hemoptysis and hematuria. Monoclonal gammopathy was not detected in the patient's serum immunofixation and protein electrophoresis, and the free kappa lambda ratio was evaluated within the normal range of 0.86.

As a result of the bone marrow biopsy performed on the patient ;increase in myeloid series precursors whose bone is hypercellular, left shift hyper granulation, cytoplasmic narrowing in erythroid series, localized cytoplasmic narrowing, but aggregation tendency was noted, and it was found to be compatible with the current infective clinic. The patient received optimized anti-biotherapy and antifungal treatment and was discharged to the ward after 60 days of intensive care follow-up, with his tracheotomy closed.

DISCUSSION

Spondylodiscitis is osteomyelitis involving the vertebra and is an infection of the vertebral body, intervertebral disc, and posterior vertebral arch. It can frequently develop due to bacterial agents and rarely due to fungal and parasitic agents. Spondylodiscitis; can be grouped as pyogenic, granulomatous (tuberculosis, brucellosis, or fungal agents), and infections caused by parasitic agents (5-8). Microorganisms that cause spondylodiscitis can often reach the bone by hematogenous route or directly during diagnostic or surgical procedures and cause infection (9). The predisposing factor for spondylodiscitis in our patient was that the patient had a lumbar disc herniation operation due to pain two weeks ago.

Among bacterial agents, S.aureus is the most common cause of spondylodiscitis and is responsible for most pyogenic spondylodiscitis. Spondylodiscitis caused by Gram-negative bacilli and Candida species are frequently seen in immunosuppressive patients, intravenous drug abusers, and postoperative patients (10).

In the initial period after trauma or local infection, the inflammatory response is considered physiological, but persistent infection of the wound, increased malnutrition, or reoperation increases the systemic inflammatory response and can also lead to multiple organ failure (MOF).

The intense production of proinflammatory cytokines characterizes the postoperative inflammatory reaction. Some conditions, such as postoperative complications, persistent source of infection, and prolonged antibiotic therapy, may lead to uncompensated excessive and prolonged proinflammatory response multiple organ dysfunction syndrome (MODS) in patients (3).

The fact that our patient had pancytopenia, elevated creatinine, anuria, elevated liver enzymes, tachypneic hypoxic, and hypotensive with prolonged infection after the operation suggests multiple organ failure. We think the CRP and Procalcitonin levels were very high in the examinations; the immune globulin levels were low, and the increased expiration of anti-inflammatory mediators compensated for the inflammatory response secondary to surgery. Therefore, long-term, widespread bone marrow suppression and increased opportunistic infections are due to this. Thrombocytopenia of the patient was administered IVIG (600 mg/kg single dose for 20 days and 400mg/kg for three days) as a secondary immunodeficiency treatment improved.

While long-term hospitalization after surgery, immobility, and malnutrition are predisposing factors to sepsis, it also reveals an imbalance of inflammatory and anti-inflammatory processes. This situation causes the patient to show prolonged immunodeficiency findings (11). Our patient developed sepsis, MOF, and secondary immunodeficiency due to acute malnutrition, immobility, prolonged hospitalization, and multiple drug use after surgery. After meticulous multidisciplinary follow-up, he was discharged after 60 days of recovery.

CONCLUSION

As a result, it should not be overlooked that sepsis may result in multi-organ damage in patients who have undergone surgery due to long-term antibiotic therapy, immobilization, hospitalization, and malnutrition suppressing the immune system.

REFERENCES

1. Postoperative sepsis Elchanan Frieda, Charles Weissman and Charles Sprung
2. Anderson RN, Smith BL. Deaths: leading causes for 2002. Natl Vital Stat Rep 2005; 53:1–89.
3. (Dąbrowska, A. M., & Słotwiński, R. (2014). The immune response to surgery and infection. Central-European journal of immunology, 39(4), 532–537.
4. Pittet D, Rangel-Frausto S, Li N, et al. Systemic inflammatory response syndrome, sepsis, severe sepsis, and septic shock: incidence, morbidities and outcomes in surgical ICU patients. Intensive Care Med 1995; 21:302– 309.
5. Brown EM, Pople IK, de Louvois J. Spine update: prevention of postoperative infection in patients undergoing spinal surgery. Spine. 2004;29:938–945.
6. Guerado E, Cerván AM. Surgical treatment of spondylodiscitis. An update. Int Orthop 2012; 36: 413-420
7. Özgüler M, Özden M. Tüberküloza Bağlı Spondilodiskit Olgularının İrdelenmesi.Van Tıp Derg 2016; 23: 154-158.
8. Berbari EF, Steckelberg JM, Osmon DR. Osteomyelitis. In: Mandell GL, Bennett JE, Dolin R (eds). Mandell, Douglas, and Bennett's Principles and Practice of InfectiousDiseases. 7th ed. Philadelphia: Churchill Livingstone, 2010: 1457-67
9. Hatipoğlu ÇA, Arslan K, Bulut C, Tufan ZK, Gül YK, Kınıklı S, Demiröz AP. Spondilodiskitli hastaların epidemiyolojik, klinik ve laboratuvar özelliklerinin değerlendirilmesi. Flora 2013;
10. Spondylodiscitis case due to methicilline-resistant staphylococcus aureus after neurosurgery International Journal of Contemporary Health Sciences Sorumlu Yazar*: Salih Cesur, Sağlık Bilimleri Üniversitesi, Ankara Egitim ve Arastırma Hastanesi, Enfeksiyon Hastalıkları ve Klinik Mikrobiyoloji Kliniği, Ankara,
11. Abdul-jabbar A, Takemoto S, Weber MH, et al. Surgical site infection in spinal surgery: description of surgical and patient-based risk factors for postoperative infection using administrative claims data. Spine. 2012;37:1340–1345.

Table 1. Biochemical Values

	0.Day	Cytokine Filter 1.Day	Cytokine Filter 2.Day	Cytokine Filter 3.Day
CRP (mg/dl)	23.9	18.3	6.3	4.1
Procalcitonin (ng/ml)	32.2	22.5	10.9	5.2
Trombocyte ($10^3/mm^3$)	30	36	28	50
ALT (u/ml)	208	148	109	88
AST (IU/L)	302	146	91	68
Creatinine (mg/dl)	4.92	3.88	3.20	2.5
PaO^2 (mmHg)	56.6	83	224	185

Change of Biochemical Values in the first three days; In this process, the patient was taken to hi flow oxygenation (FiO^2 100%; Flow 60L/min), continuous venovenous dialysis and cytokine filter. On the third day, oxygen support was reduced.

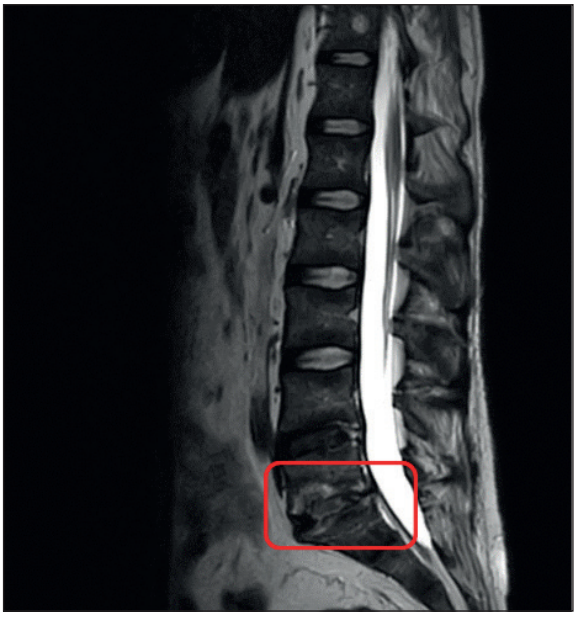


Figure 1. Magnetic resonance imaging (MRI) showed increased signal in T2AG and STIR sequences in Lumbar 5 - Sacral 1 intervertebral disc

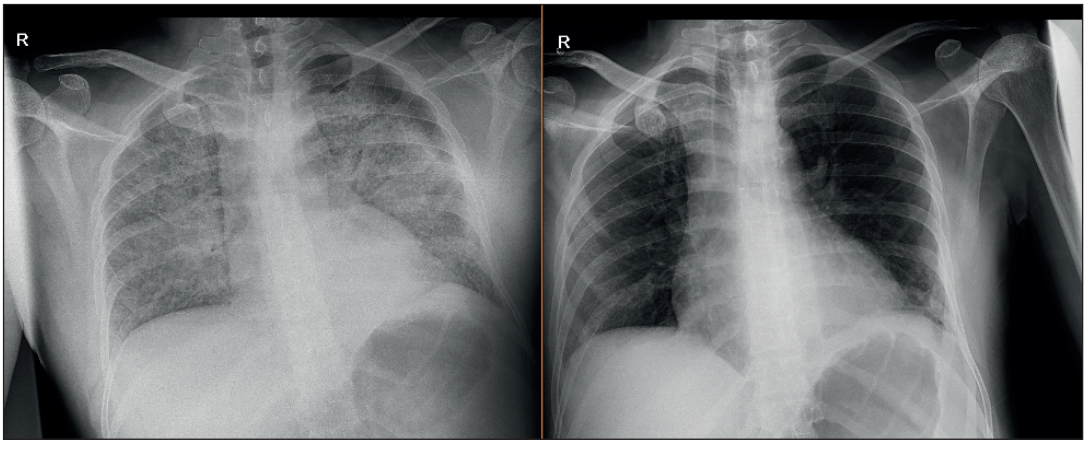


Figure 2. X-ray

Refractory Bradycardia Caused by Paracetamol Overdose: A Case Report

Eda Macit Aydın

University of Health Sciences Ankara Etlik City Hospital, Department of Anesthesiology and Reanimation, Intensive Care, Ankara, Türkiye

ABSTRACT

Background: Paracetamol is considered a safe and effective analgesic, antipyretic drug that is widely used in the world. It causes significant hepatic injury and less commonly renal failure when used in excess amounts. Cardiac abnormalities is predicted to be a serious complication of paracetamol poisoning.

Case: A 20-year-old female with Reynoud syndrome presented to the hospital approximately 20 hours after ingestion of 15 g of paracetamol. On admission, her respiratory rate was 8 per-minute, oxygen saturation 99% on room air, blood pressure of 147/84 mmHg, and Glasgow coma score of 13. Electrocardiograph showed 2:1 atrioventricular block and bradycardia (42 bpm). Initial bloods chemistry revealed AST 586 IU/L, ALT 516 IU/L, INR 1.27, and lactate 2.19 mmol/L. Acetaminophen level was 94.4 µg/mL (RR:10-30 µg/mL). N-acetylcysteine infusion (150 mg/kg over 20 minutes,and next 50 mg/kg every 4 hour) and fluid support treatment was started immediately after admission to the intensive care unit(ICU). Acetaminophen level was repeated after 36 h and was 17.2 µg/mL. She remained hemodynamically stable but the electrocardiograph still showed 2:1 av block (min 36 bpm). 48 hours post-ingestion subsequently developed acute liver injury with a peak ALT of 7573 U/L, peak AST of 5926 U/L, and peak INR of 2.15. Kidney function did not deteriorate at all during stay in the ICU. Hepatic functions improved from day 3, whereas AV block didn't recover. Bedside echocardiogram showed normal systolic function. Electrocardiograph abnormality was associated with excess paracetamol overdose by the cardiology. She was discharged to the ward 7 days after admission. Cardiac and hepatic function returned to baseline, and she was discharged to hospital after 15 days.

Conclusion: Paracetamol overdose and its side effects are common in clinical practice. Cardiac abnormalities such as myocarditis, ST/T wave changes, subendocardial haemorrhages and myocardial necrosis have been reported in the literature following paracetamol overdose. Our case was presented with 2:1 av block and refractory bradycardia. It is claimed that cardiotoxicity is due to metabolic disorders that can lead to arrhythmias. Although cardiotoxicity is rare following paracetamol overdose, physicians should be aware of it, and electrocardiography should be a part of daily routine.

Keywords: Paracetamol, cardiotoxicity, AV block, bradycardia

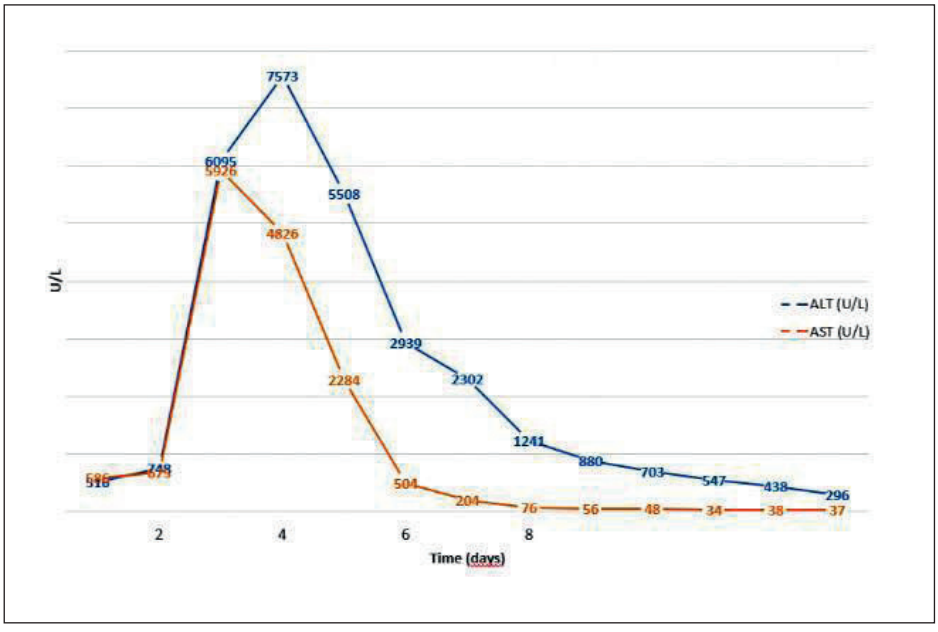


Figure. ALT, and AST levels vs. time post-ingestion

Eleven Years of Experience in Colchicine Poisoning, A New Treatment Method: Rapid Sequence Apheresis

Kıvanç Terzi[1], Selman Kesici[1], Özlem Tekşam[2], Benan Bayrakci[1]

[1] Hacettepe University Faculty of Medicine, Department of Pediatric Critical Care Medicine and Life Support Center, Ankara, Türkiye
[2] Hacettepe University Faculty of Medicine, Department of Pediatrics, Division of Pediatric Emergency Medicine, Ankara, Türkiye

ABSTRACT

Background: Colchicine has a wide range of uses and is frequently used. Its therapeutic range is narrow and its poisoning is life-threatening. Its treatment is symptomatic. Deaths are due to cardiovascular collapse in the early period.

Materials and Methods: Medical records of children aged 0-18 years admitted to Hacettepe University İhsan Doğramacı Children's Hospital Pediatric Intensive Care Unit between April 2011 and August 2022 due to colchicine poisoning were retrospectively reviewed. Demographic data (age, gender, weight), amount taken, purpose of taking colchicine, duration of admission to hospital, decontamination method applied, signs of poisoning (gastrointestinal, cardiovascular, neurological, hematological), extracorporeal treatments applied, and final status of the patients were recorded from the files.

Results and Discussion: 77 patients were included in our study. 79.2% of the patients were male, and the median age was 180 months. The median time to hospital admission was 5 hours (IR, 1.5-16). The median length of stay in the intensive care unit was 3 days (IR, 2-4). There was toxic drug intake in 16.9% (n= 13) and lethal dose in 9.1% (n=7) of the patients. Findings in the patients, in order of frequency; gastrointestinal system findings in 48.8% (n=59), cardiovascular system findings in 19% (n=23), hematological system findings in 19% (n=23) and central nervous system findings in 13.2% (n=16). Extracorporeal treatments applied to patients for drug removal, in order of frequency; 22.1% (n=17) were therapeutic plasma exchange, 19.5% (n=15) erythrophoresis, 6.5% (n=5) whole blood exchange, and 3.9% (n=3) leukophoresis. Extracorporeal membrane oxygenation were initiated to four patients. Five of the patients died.

Conclusion: The deadliest drug poison in our center's series is colchicine. With rapid sequence apheresis (therapeutic plasma exchange, erythrophoresis and leukophoresis) method, it is possible to treat this deadly poison.

Keywords: Rapid sequence apheresis, colchicine, poisoning

Can We Predict Insulin Pharmacotherapy in Burn Patients?

Leonard Deda, Monika Belba

University of Medicine, Pharmacology Subject at the Faculty of Medicine, Department of Biomedical and Experimental Subjects, Tirana, Albania

ABSTRACT

Background: The authors of Surviving Sepsis Campaign in 2012 recommend a protocolled approach to blood glucose management commencing insulin dosing when two consecutive blood glucose levels are >= 180 mg/dL.The purpose of this study is to evaluate whether testing for critical hyperglycemia in the first 24 hours of admission could help in predicting a probable critical hyperglycemic event in the disease course.

Methods: Patients were categorized as follows: Patients with euglycemia [mean BG values vary in the range 80-120 mg/dL], moderate hyperglycemia [mean BG values <180 mg/dL] and critical hyperglycemia [mean BG values >=180 mg/dL].

Results: Using 180 mg/dL as cut off for critical hyperglycemia, we found that this test had a sensitivity of 66.67 % (95% CI: =44.68 % to 84.33 %) and Specificity of 88.20 % (95% CI: 84.16 % to 91.51 %). Accuracy of the test is 0.86.ROC curve is presented in Figure 1 with AUC equal to 0.878.

Conclusions:In our model the value of AUC is 0.878 with a significance level of p<0.0001, which indicates very good discrimination for a diagnostic test. The value of this test is in its negative predicted value, which means that a patient showing no critical hyperglycemia on admission will by most chances not develop it during the disease.The small positive predicted value of our test indicates that many of the positive results from this testing procedure are false positives. Most of the hyperglycemic values on admission are as a result of the stress syndrome but it would be however necessary to follow up these positive results with a more rigorous monitoring in ICU to evidence on times the presence of critical hyperglycemia during the disease which needs treatment with Insulin.

Keywords: Hyperglycemia, Insulin, accuracy test

INTRODUCTION

Burn trauma patient disease follows a two stages situation: a hypometabolic ebb and a subsequent hypermetabolic flow phase. After a starting hypometabolism (ebb stage) which is characterized by diminished metabolic rate and intravascular volume, impaired tissue perfusion, and a low cardiac output a hypermetabolic state is ordinarily observed after the first days in patients with serious burns (flow stage) (1,2,3).

Stress-Induced Hyperglycemia (SIH) develops rapidly and is a frequent finding among burn patients. It may persist during all critical illnesses regardless of the type of injury (4,5). Hyperglycemia as a component of the hypermetabolic stress syndrome results from both an increase of gluconeogenesis as well as from a decrease in peripheral glucose uptake. Many studies have observed that hyperglycemia can impair immune function by causing an alteration in cytokine production and decreasing the intracellular bactericidal activity of white blood cells. Also, values of glucose concentrations more than 220 mg/dL have been shown to cause a significant reduction in opsonic activity (6). On the other side, there is evidence for impairment of wound healing in patients with diabetes mellitus (7). The authors of Surviving Sepsis Campaign in 2021 recommend a protocolled approach to blood glucose management commencing insulin dosing when two consecutive blood glucose levels are ≥ 180 mg/dL (8).

The purpose of this study is to evaluate whether testing for critical hyperglycemia in the first 24 hours of admission could help in predicting a probable critical hyperglycemic event in the disease course.

MATERIAL and METHODS

This is a retrospective cohort study of adult and elderly patients with severe burns during the past 5 years. The study population is composed of adult burn patients (≥ 20 years old) hospitalized in the Intensive Care Unit (ICU) of the Burn Service near the University Hospital Center" Mother Teresa" in Tirana, Albania. This study was approved by the institutional board. In the ICU are admitted patients with major burns according to American Burn Association referral criteria and also patients with moderate burns only for the period of fluid resuscitation (9,10).

Hyperglycemia is defined as blood glucose values above normal. Concretely we have categorized patients into the following groups: Patients with euglycemia (values 80-120 mg/dL), moderate hyperglycemia (values <180 mg/dL), and critical hyperglycemia (values ≥180 mg/dL). The patients are classified according to blood glucose values on admission and during the

disease. The patients with critical hyperglycemia are treated with an insulin regimen (basal-bolus therapy with a correctional insulin scale) with a total daily dose calculated at 0.3-0.5 IU/kg/day taking into consideration values of blood glucose and creatinine clearance rate.

Statistical Analysis

Patients with hyperglycemia (critical and moderate) were compared with those with euglycemia. The normally distributed continuous data are reported as the mean ± standard deviation and analyzed using one-way ANOVA. The categorical data are expressed as frequency distributions and the Chi-square test was used to determine whether differences existed between groups. To answer the clinical question: What is the accuracy of testing hyperglycemia in the first 24 hours for diagnosing the probability of critical hyperglycemia during the disease we have calculated the sensitivity and specificity of this test and likelihood ratios, ROC curve, Positive Predicted Value (PPV) and Pretest, Post-test probability.

Binary Logistic Regression and univariate analysis were performed to observe if there is a statistically significant relationship between critical hyperglycemia and blood glucose values at admission. SPSS 22 was used for statistical analysis.

RESULTS

A total of 346 or 44 % of the total patients were adults and aged patients. Of 346 patients, 50 died. The overall mortality was 14.5%. The mean length of stay (LOS) of patients was 14.1±17.1 days. Mean blood glucose (BG) values on admission were 149±57.9 mg/dl; patients with euglycemia were 144 (41.6%), patients with moderate hyperglycemia were 148 (42.8%) and patients with critical hyperglycemia were 54 (15.6%). The prevalence of critical hyperglycemia in the study population is estimated to be 15.6% on admission and 7% (24 patients) during the course of the burn disease.

Having proven previously that BG values on admission are predictors of BG during the disease, we investigate if our test for predicting critical hyperglycemia during the disease based on critical hyperglycemia on admission would be of clinical use. For this, we present the test performance and the ROC curve analysis (Figure 1).

Using 180 mg/dL as cut off for critical hyperglycemia, we found that this test had a sensitivity of 66.67% (95% CI: 44.68% to 84.3 %) and specificity of 88.20% (95% CI: 84.16% to 91.51%) as demonstrated in the ROC curve. Concretely we have a PPV (positive predicted value) of 29.63 % (95% CI: 17.99 % to 43.61 %) and an NPV (negative predicted value) of 97.26 % (95% CI: 94.67 % to 98.81 %). The accuracy of the test is 0.86. The ROC curve is presented with AUC equal to 0.878.

In binary logistic regression, univariate analysis, it is seen that there is a statistically significant relationship between critical hyperglycemia and blood glucose values at admission ($p<0.001$); for each increase in glucose values by one unit, the likelihood of developing critical hyperglycemia increases by 1%.

DISCUSSION

Clinical outcomes of a critical illness can be estimated from different perspectives (patients, medical staff, health managers, and society). Staff-oriented outcomes differ from patient-oriented in the fact that in the first, short and long-term outcomes are to be influenced by medical interventions as well as by directing medical attention and resources to those patients who are most likely to benefit from the decisions. On the other side, society-oriented outcomes require making rational decisions using cost-effectiveness and benefit.

There is an association between hyperglycemia and an increased rate of muscle protein catabolism in severely burned patients. This suggests a possible link between the resistance of muscle to the action of insulin for both glucose clearance and muscle protein catabolism (11,12).

Data indicate that high doses of insulin and glucose can be safely administered to massively burned patients to improve wound matrix formation (13). Some authors have observed that conventional factors of disease severity, but not the highest glucose value during the first 24 hrs after ICU admission, predict hospital mortality in medical ICU (14). Others concluded that hyperglycemia is an independent risk factor only in patients without diabetic history concretely in cardiac, cardiothoracic, and neurosurgical intensive care units (15).

The clinical question we raised in this article was concerned with the possible relationship between critical hyperglycemia on admission and during the disease in burn patients. In 12 of 54 patients experiencing hyperglycemia on admission (22.3%), this was a pure expression of the shock phase after burns, since blood glucose values during the disease were normal. In part of

the patients, concretely in 16 patients or 29.6%, there might have been a trigger for glucose homeostasis impairment which could advance and result in hyperglycemia needing insulin treatment. It is important to emphasize that both patients with moderate and critical hyperglycemia during the disease mount up to 42 patients or approximately 78% of all patients with critical hyperglycemia on admission (n=54).

Based on our test results, we calculated a sensitivity of 66.67%, a specificity of 88.2%, a PPV of 29.63%, and a NPV of 97.2%. A PPV of 29.63% means that 1 in 3 patients presenting critical hyperglycemia on admission will manifest critical hyperglycemia during the disease. A NPV of 97.2% means that 9 in 10 patients with glucose values < 180 mg/dL in the first 24 hours will not have critical hyperglycemia during the disease. The value of this test stays in its negative predicted value, which means that a patient showing no critical hyperglycemia on admission will by most chance not develop it during the disease. AUC evaluates discrimination or the ability of the model to distinguish those with and without critical hyperglycemia during the disease. In our model, the value of AUC is 0.878 with a significance level of $p<0.0001$, which indicates very good discrimination for a diagnostic test.

The small positive predicted value (PPV=29.63%) of our test indicates that many of the positive results from this testing procedure are false positives. Most of the hyperglycemic values on admission are a result of the stress syndrome but it would be however necessary to follow up these positive results with more rigorous monitoring in ICU to evidence on times the presence of critical hyperglycemia during the disease.

CONCLUSION

In our model, the value of AUC is 0.878 with a significance level of $p<0.0001$, which indicates very good discrimination for a diagnostic test. The value of this test is in its negative predicted value, which means that a patient showing no critical hyperglycemia on admission will by most chance not develop it during the disease. The small positive predicted value of our test indicates that many of the positive results from this testing procedure are false positives. Most of the hyperglycemic values on admission are a result of the stress syndrome but it would be however necessary to follow up these positive results with more rigorous monitoring in ICU to evidence on times the presence of critical hyperglycemia during the disease which needs treatment with insulin.

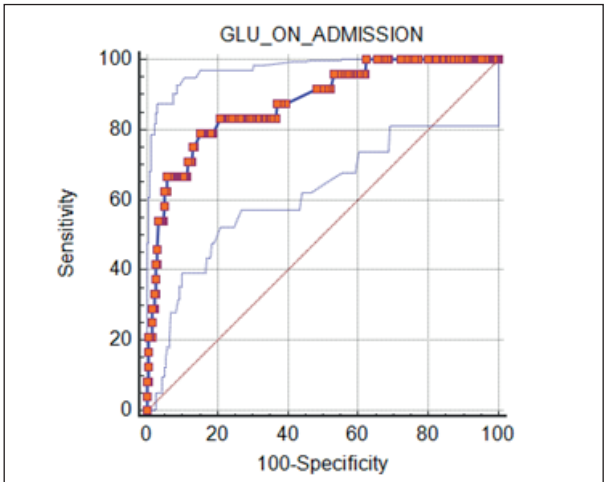
By paying more attention to adults and specially aged patients with hyperglycemic values on admission and by frequently monitoring BG, we can find the appropriate time to start insulin therapy taking into consideration the benefits and risks (hypoglycemia) of this treatment.

REFERENCES

1. Jeschke MG, Gauglitz GG, Song J, Kulp GA, Finnerty CC, Cox RA, Barral JM, Herndon DN, Boehning D. Calcium, and ER stress mediate hepatic apoptosis after burn injury. J Cell Mol Med. 2009;13(8B):1857-65
2. Jeschke MG. The hepatic response to thermal injury: is the liver important for postburn outcomes? Mol Med. 2009;15(9-10):337-51
3. Jeschke MG. Postburn Hypermetabolism: Past, Present, and Future. J Burn Care Res. 2016;37(2):86-96.
4. Jeschke MG, van Baar ME, Choudhry MA, Chung KK, Gibran NS, Logsetty S. Burn injury. Nat Rev Dis Primers. 2020;6(1):11
5. Brooks NC, Marshall AH, Qa'aty N, Hiyama Y, Boehning D, Jeschke MG. XBP-1s is linked to suppressed gluconeogenesis in the Ebb phase of burn injury. Mol Med. 2013;19(1):72-8.
6. Hsu CW. Glycemic control in critically ill patients. World J Crit Care Med. 2012;1(1):31-9.
7. Spampinato SF, Caruso GI, De Pasquale R, Sortino MA, Merlo S. The Treatment of Impaired Wound Healing in Diabetes: Looking among Old Drugs. Pharmaceuticals (Basel). 2020;13(4):60
8. Evans L, Rhodes A, Alhazzani W. et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021. Critical Care Medicine 2021;49(11):p e1063-e1143
9. Burn Center Referral Criteria. Available at: https://ameriburn.org/wp-content/uploads/2017/05/burncenterreferralcriteria.pdf
10. Greenhalgh, David G et al. American Burn Association consensus conference to define sepsis and infection in burns. J Burn Care Res 2007;28:776–790
11. Gauglitz GG, et al. Post-burn hepatic insulin resistance is associated with the endoplasmic reticulum (ER) stress. Shock. 2010;33:299–305
12. Jeschke MG, et al. Insulin protects against hepatic damage postburn. Mol Med 2011;17:516–22
13. Badoiu SC, Miricescu D, Stanescu-Spinu I-I, Ripszky Totan A, Badoiu SE, Costagliola M, Greabu M. Glucose Metabolism in Burns—What Happens? *International Journal of Molecular Sciences*. 2021;22(10):5159

14. Barmanray RD, Cheuk N, Fourlanos S, et al. In-hospital hyperglycemia but not diabetes mellitus alone is associated with increased in-hospital mortality in community-acquired pneumonia (CAP): a systematic review and meta-analysis of observational studies prior to COVID-19.BMJ Open Diabetes Research and Care. 2022;10:e002880.

15. Guillermo E. Umpierrez, Scott D. Isaacs, Niloofar Bazargan, Xiangdong You, Leonard M. Thaler, Abbas E. Kitabchi, Hyperglycemia: An Independent Marker of In-Hospital Mortality in Patients with Undiagnosed Diabetes, *The Journal of Clinical Endocrinology & Metabolism* 2002;87(3):978-982



Area under the ROC curve (AUC)

Area under the ROC curve (AUC)	0.878
Standard Error [a]	0.0378
95% Confidence interval [b]	0.839 to 0.910
z statistic	10.006
Significance level P (Area=0.5)	<0.0001

[a] DeLong et al., 1988

[b] Binomial exact

Figure 1. Glucose values on admission versus glucose values during the disease (mg/dL)

Retrospective Evaluation of Intoxication Cases Followed in Intensive Care Unit

Ayşe Ayyıldız[1], Fatih Alper Ayyıldız[2]

[1]Eskisehir City Hospital, Intensive Care Department, Eskisehir, Türkiye
[2]Eskisehir City Hospital, Emergency Department, Eskisehir, Türkiye

ABSTRACT

Background: Intoxication with medical drugs is a serious public health problem that is frequently followed in intensive care units (ICU). Intoxications account for approximately 0.91% of the cases admitted to the emergency department and 5.11% of all cases treated in ICU in Türkiye (1). In our study, we aimed to retrospectively evaluate intoxication cases followed in ICU in terms of demographic characteristics, cause of intoxication and prognosis.

Materials and Methods: In our study, patients who applied to Eskişehir City Hospital Emergency Service and were treated in ICU for a period of 6 months between September 2022 and February 2023 were examined retrospectively. Demographic data of the patients, Glasgow coma scores, poisoning drug, days of hospitalization in ICU, number of mechanical ventilation support, and mortality were evaluated.

Results and Discussion: The mean age of the 61 patients included in the study was 27.16 ± 8.92 years, and 60.6% of the patients were male (n=37). The mean GCS was 14.81 ±1.23. The mean number of intensive care unit stay was 2.4±1.2. When we look at the distribution of intoxications, we saw that antidepressant drugs 55.7%, analgesic drugs 16.3%, multiple drug intakes 13.1% and antidiabetic drugs 6.55% respectively. Conventional plasmapheresis was used in the treatment of 2 patients. Only 3 patients were followed on mechanical ventilator and 1 patient died. The mortality rate is 0.16% (n=1). The most commonly used drug group in intoxications is antidepressants. Suicide attempts are high in depressed patients and it has been determined that these patients generally attempt suicide with their own medication (2,3). In our study, antidepressant drug intoxications constituted the highest group in parallel with the literature.

Conclusion: With this retrospective evaluation, we believe that we have a general point of view by revealing the patient profile in intoxication cases that we frequently encounter in our ICU.

Keywords: Intoxication, intensive care unit, antidepressant

REFERENCES

1. Göktaş U,Isik Y,Cegin MB et al.Retrospective analysis of the poisoning cases who were followed in our intensive care unit.J Anesthesia.2011;19(2):114-6
2. Beskow J.Depression and suicide.Pharmacopsychiatry. 1990 Jan;23Suppl1:3-8.doi: 10.1055/s-2007-1014522.
3. Akkas M, Coşkun F, Ulu N et al.An epidemiological evaluation of 1098 acute poisoning cases from Türkiye.Vet Hum Toxicol 2004;46:213-5

Congenital Hypofibrinogenemia in a Patient with Ischemic Stroke: a Case Report

Demet Bölükbaşı[1], Şerife Bektaş[1], Duygu Çalılı[2], Seval İzdeş[2]

[1]University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2]Ankara Yıldırım Beyazit University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Fibrinogen plays an important role in hemostasis. Although acquired fibrinogen deficiency is relatively common, congenital afibrinogenemia/hypofibrinogenemia is extremely rare. Depending on the fibrinogen levels, some patients with congenital hypofibrinogenemia may be overlooked. Although severe bleeding is mainly seen in hypofibrinogenemia, here we report a patient with an ischemic stroke associated with congenital hypofibrinogenemia.

Case: A 42-year-old, 75-kg male patient presented with the complaint of confusion. In the examinations, it was detected that the patient had infarction in his right pons. The patient had no known disease. There was no lesion in the bilateral carotid and bacillary arteries in the radiologic investigations, the ECG was in sinus rhythm and the echocardiography was normal. A treatment dose of low-molecular-weight heparin (LMWH) was administered to the patient. Serum fibrinogen levels detected as 0.65 g/L(normal value 1.7-4.2). When his previous lab results were examined, it was founded that his result ranged between 0.6-1g/L. In his personal history, it was learned that in his visits for dental procedures, his bleeding lasted longer than normal. After stabilizing in the intensive care unit, the patient was discharged to the physical therapy and rehabilitation service.

Discussion: Critical depletion of iatrogenic fibrinogen may develop after IV thrombolysis in acute stroke patients, and it has been reported that it is clinically safe to administer IV fibrinogen concentrate to increase plasma fibrinogen levels(2). Mild to severe bleeding is usually seen with afibrinogenemia/hypofibrinogenemia, although some cases may progress with thrombosis. Fibrinogen levels should also be monitored before and after ischemic stroke.

Spontaneous bleeding can usually be seen in patients with a fibrinogen level <0.5 g/L(3). In our case, the previous and follow-up plasma fibrinogen values were between 0.6-1g/L, and therefore there was a tendency to thrombosis, and we did not replace fibrinogen in the treatment.

Conclusion: Our aim in presenting this case is to remind clinicians to consider whether there is congenital hypofibrinogenemia before giving fibrinogen in ischemic stroke and to plan treatment according to previous plasma fibrinogen levels in patients with congenital hypofibrinogenemia.

Keywords: Congenital hypofibrinogenemia, acute ischemic stroke, serum fibrinogen levels

Veno-Arterial Extracorporeal Membrane Oxygenation in a Case of Posttraumatic Acute Respiratory Distress Syndrome

Miray Gözde Özdemir, Zeliha Aycan Özdemirkan, Aydan İremnur Ergörün, Nur Köksal, Ömer Kurtipek, Hasan Kutluk Pampal

Gazi University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Extracorporeal membrane oxygenation (ECMO) is used when conventional methods for acute respiratory distress syndrome (ARDS) and circulatory shock treatment fail. In this case report, we present our successful management with ECMO in a patient with post-traumatic ARDS, in line with the written informed consent obtained from the patient.

Case: A 46-year-old female with a history of systemic lupus erythematosus and allergic asthma evaluated in emergency department due to non-vehicle traffic accident. Computerized tomography (CT) scan revealed mosaic pattern in the lungs and L3 corpus burst fracture. The patient, underwent lumbar stabilization and was transferred to the neurosurgery ward in the postoperative period without any problems. On the first postoperative day she developed respiratory distress and transferred to intensive care unit. Thorax CT scan revealed areas of bilateral pneumonic consolidation and diffuse ground glass opacity. She developed circulatory failure, acute kidney injury and acidosis. Noradrenaline at a dose of 0.7 mcg/kg/min and dobutamin at a dose of 10 mcg/kg/min was started. It was decided to perform ECMO in venoarterial configuration. The cannulas were inserted percutaneously via femoral artery and vein. A distal perfusion cannula was inserted for lower limb perfusion. Ultraprotective MV settings were initiated upon initiation of ECMO flow. During the follow-up, the need for vasopressor support decreased and the ECMO flow of the patient with P/F > 300 was gradually decreased. On the 4th day following ECMO support, ECMO weaning was successfully performed. The patient was extubated after meeting the criteria for weaning from mechanical ventilation.

Discussion: It is stated in the ELSO guidelines that there is a definite ECMO indication when P/F < 80 in a patient on mechanical ventilation. In addition, in patients undergoing MV, $PaCO_2$ >80 mmHg or end-inspiratory plateau pressure >30 cmH_2O is also considered an indication for ECMO. We preferred the venoarterial method as the ECMO configuration in the management of ARDS and shock in our patient.

Conclusion: We think that V-A ECMO applied in the early period in the management of our patient with trauma-related ARDS is effective in preventing mortality and morbidity and shortens the length of intensive care stay.

Keywords: ARDS, ECMO, trauma

INTRODUCTION

ARDS is a clinical syndrome characterized by diffuse alveolar damage, inflammation and edema causing acute respiratory failure with impaired gas exchange. It is seen in 10% of patients in intensive care units and has a mortality rate of 40% (1, 2). ARDS can be caused by direct or indirect damage to the lungs, such as pneumonia, aspiration, severe sepsis, or trauma.

The incidence of ARDS is significantly higher in patients with severe trauma and is linked to increased morbidity and mortality, regardless of the severity of the underlying condition (3). In patients with pulmonary contusion, the lung injury may initially appear mild but can worsen rapidly within hours or days following admission (4).

The cornerstone of ARDS treatment is lung protective mechanical ventilation. The current guidelines for mechanical ventilation in ARDS suggest low tidal volume (4-6 mL/kg estimated body weight), low plateau pressure (Pplat < 30 cmH2O), and low driving pressure (ΔP< 14 cmH_2O) (5). Positive end-expiratory pressure (PEEP) is also recommended based on individual patient characteristics. For patients with severe ARDS, rescue therapies such as prone positioning, ECMO and extracorporeal carbon dioxide removal are also recommended.

ECMO is a type of circulatory support used in patients with respiratory or heart failure when conventional treatments have failed. In cases of respiratory failure, the aim of ECMO is to provide a period of rest and recuperation for the lungs, while reducing potential damage caused by mechanical ventilation (6). ECMO can be administered through two distinct methods. The first is known as veno-venous ECMO (V-V ECMO). Venous blood is decarboxylated, oxygenated, heated and returned to the venous circulation. The second method is veno-arterial ECMO (V-A ECMO). The difference from V-V ECMO is the delivery of blood to the arterial circulation (7).

In this case, we aimed to present the successful V-A ECMO treatment in a patient with trauma-related ARDS.

CASE

A 46-year-old woman with a history of systemic lupus erythematosus and allergic asthma presented to the emergency department after a non-vehicle traffic accident. The patient was taking plaquenil and acetylsalicylic acid. At the initial evaluation, the patient had a Glasgow Coma Score of 15 and was alert and cooperative. Her SpO2 was 94% with 3 lt/min nasal oxygen, hemodynamics were stable and chest X-ray was normal (Figure 1). On physical examination, tenderness was observed in the T_{2-4} and L_{1-4} spinous processes, as well as in the anterior thorax and midline of the sternum. CT revealed a mosaic pattern in the lungs, a displaced fracture in the right 1-4 metatarsals, and a burst fracture in the L_3 vertebral body.

After undergoing lumbar stabilization, the patient was transferred to the neurosurgery ward with no complications. The patient began experiencing respiratory distress at the post-operative 24th hour and an increased demand for oxygen. The medical team treated the patient with bronchodilators, antibiotics, and pulmonary rehabilitation, initially suspecting an asthma attack. Despite these interventions, the patient's oxygen requirement continued to increase, eventually reaching a level of 10 lt/min with a reservoir mask and SpO_2 was 65%. As a result, the decision was made to transfer the patient to the neurosurgery intensive care unit and intubated. Patient was transferred to the post-anesthesia care unit because there were areas of pneumonic consolidation on a ground-glass background in both lung parenchyma on thorax CT and noradrenaline infusion was initiated due to hemodynamic instability. (Figure 2)

The patient developed circulatory failure, deterioration of renal function and acidosis. Norepinephrine infusion at 0.7 mcg/kg/min and dobutamine infusion at 10 mcg/kg/min was started. However, the patient's condition worsened with hypoxemia (PaO_2/FiO_2:78.7) , high plateau pressure (Ppl>30cmH_2O, SIMV-Autoflow PEEP:15, FiO_2:1.0, VT:320ml), hemodynamic instability (MAP<65mmHg), and acidosis (pH:7.261nmol/mg, pCO_2:56.8 mmHg, HCO_3:24.7 mmol/L). It was decided to perform ECMO in venoarterial configuration.

The cannulas were inserted using the percutaneous Seldinger technique under ultrasound guidance. A 21 Fr drainage cannula was inserted through the right femoral vein, and a 17 Fr return cannula was inserted through the left femoral artery. Additionally, a 5 Fr catheter was placed in the femoral artery as a distal perfusion cannula to ensure lower limb perfusion. Leg perfusion was monitored by instantaneous near infrared spectroscopy during ECMO follow-up. Ultraprotective MV settings were initiated upon initiation of ECMO flow.

As the patient's condition improved, the need for vasopressor support decreased and the ECMO flow was gradually decreased while maintaining an adequate oxygen level (PaO_2/FiO_2>300). On the 4th day following ECMO support, the patient underwent successful ECMO weaning. After meeting the criteria for weaning from mechanical ventilation, the patient was extubated. (Figure 3)

The patient was discharged from the hospital 5 days after undergoing surgery for a metatarsal fracture, which occurred 6 days after successfully weaning from ECMO.

DISCUSSION

The occurrence of ARDS in patients with lung injury caused by trauma adds complexity to the already challenging management of these patients. In recent years, the use of ECMO has become more prevalent in managing hypoxemia associated with ARDS.

The positive outcomes reported in case studies and research studies have made ECMO an increasingly used treatment option for patients with trauma-related ARDS (8). Blunt chest trauma can result in pulmonary contusion and severe respiratory failure. According to the guidelines of ELSO, a definite indication for ECMO treatment is when PaO_2/FiO_2<80 in a patient on mechanical ventilation. Moreover, ECMO is also considered appropriate for patients undergoing mechanical ventilation with $PaCO_2$>80 mmHg or end-inspiratory plateau pressure>30cmH_2O (9).

ECMO can be administered in two different methods: V-V and V-A ECMO. V-V ECMO acts as an "artificial lung" that supplies oxygen and removes carbon dioxide in severe respiratory failure cases. However, it does not offer any cardiac support and necessitates a functional heart (10). On the other hand, V-A ECMO provides cardiac support and bypasses the pulmonary circulation. This method allows for organ perfusion while the heart and lungs rest and eliminates carbon dioxide by supplying oxygenation.

We opted to utilize the V-A ECMO in the management of ARDS and shock in our patient who developed ARDS after emergency surgery due to trauma and presented with hypoxemia, hemodynamic instability, vasopressor support need and deterioration of renal function. Our approach resulted in a successful outcome, with the patient being discharged without any complications.

To conclude, we believe that timely application of V-A ECMO in the management of trauma-induced ARDS can effectively prevent mortality and morbidity, as well as shorten the length of ICU stay for patients.

REFERENCES

1. Bellani G., Laffey J.G., Pham T., Fan E., Brochard L., Esteban A., Gattinoni L., van Haren F., Larsson A., McAuley D.F., et al. Epidemiology, Patterns of Care, and Mortality for Patients with Acute Respiratory Distress Syndrome in Intensive Care Units in 50 Countries. JAMA. 2016;315:788.
2. Rubenfeld G.D., Caldwell E., Peabody E., Weaver J., Martin D.P., Neff M., Stern E.J., Hudson L.D. Incidence and Outcomes of Acute Lung Injury. N. Engl. J. Med. 2005;353:1685–1693
3. Shah, Chirag V. MD, MS; Localio, A R. PhD; Lanken, Paul N. MD; Kahn, Jeremy M. MD, MS; Bellamy, Scarlett ScD; Gallop, Robert PhD; Finkel, Barbara MSN; Gracias, Vicente H. MD; Fuchs, Barry D. MD; Christie, Jason D. MD, MS. The impact of development of acute lung injury on hospital mortality in critically ill trauma patients. Critical Care Medicine 36(8):p 2309-2315, August 2008
4. Moore, Frederick A. MD; Sauaia, Angela MD; Moore, Ernest E. MD; Haenel, James B. RRT; Burch, Jon M. MD; Lezotte, Dennis C. PhD. Postinjury Multiple Organ Failure: A Bimodal Phenomenon. The Journal of Trauma: Injury, Infection, and Critical Care 40(4):p 501-512
5. Brower R., Matthay M., Morris A., Schoenfeld D., Thompson B., Wheeler A. Ventilation with Lower Tidal Volumes as Compared with Traditional Tidal Volumes for Acute Lung Injury and the Acute Respiratory Distress Syndrome. N. Engl. J. Med. 2000;342:1301–1308.
6. Extracorporeal membrane oxygenation use has increased by 433% in adults in the United States from 2006 to 2011. Sauer CM, Yuh DD, Bonde P. ASAIO J. 2015;61:31–36.
7. Rabah H, Rabah A. Extracorporeal Membrane Oxygenation (ECMO): What We Need to Know. Cureus. 2022 Jul 11;14(7):e26735.
8. Swol, Justyna MD; Brodie, Daniel MD; Napolitano, Lena MD; Park, Pauline K. MD; Thiagarajan, Ravi MD; Barbaro, Ryan P. MD; Lorusso, Roberto MD, PhD; McMullan, David MD; Cavarocchi, Nicholas MD; Hssain, Ali Ait MD; Rycus, Peter MPH; Zonies, David MD, MPH; for the Extracorporeal Life Support Organization (ELSO). Indications and outcomes of extracorporeal life support in trauma patients. Journal of Trauma and Acute Care Surgery: June 2018 - Volume 84 - Issue 6 - p 831-837
9. Swol J LW. Trauma and Extracorporeal Life Support In: Brogan TV LL, Lorusso R, MacLaren G, Peek G, ed. Extracorporeal Life Support: The ELSO Red Book 5th ed. 5th Ed, 2017:593-97.
10. Extracorporeal membrane oxygenation for 2009 influenza A(H1N1) acute respiratory distress syndrome. Davies A, Jones D, Bailey M, et al. JAMA. 2009;302:1888–1895.

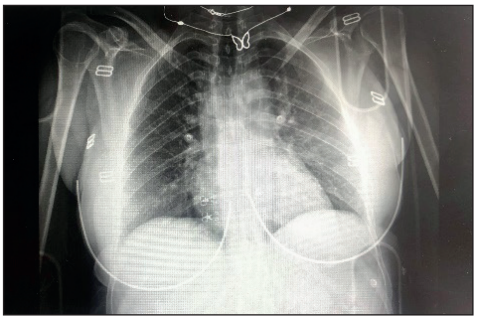


Figure 1. PA Lung X-ray in patient guidelines for emergency care

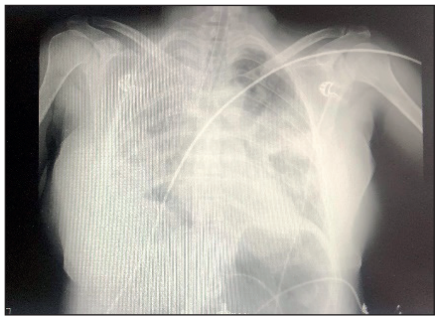


Figure 2. PA Chest X-ray of the patient before ECMO taken in the intensive care unit

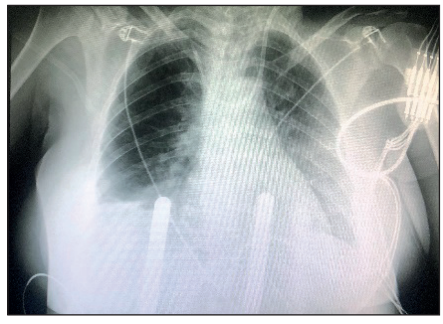


Figure 3. PA Lung X-ray taken on the 3rd day after ECMO

Critical Care Management of Patient with Dimethylformamide Induced Severe Hepatotoxicity after Occupational Exposure

Ümmügülsüm Gaygısız, Lale Karabıyık

Gazi University Faculty of Medicine, Department of Anesthesiology and Intensive Care, Ankara, Türkiye

ABSTRACT

Background: N,N-dimethylformamide (DMF) is a colorless, odorless and volatile liquid that is miscible with water and most organic liquids and is used in various industrial applications. Exposure to DMF is mainly through the dermal and respiratory systems. After exposure to DMF, it is mainly metabolized in the liver and the metabolites are excreted by the kidneys. Acute or chronic occupational exposure to this solvent is hepatotoxic and may cause poisoning.(1) We aimed to present the intensive care management of a patient who developed acute hepatitis after serious occupational dimethylformamide exposure.

Case: A 22-year-old male patient applied to the emergency department with complaints of nausea, vomiting, diarrhea and fever after exposure to dimethylformamide at work. The patient was admitted to the intensive care unit with the diagnosis of acute toxic hepatitis. The patient had no history of additional disease or previous hepatitis. Hepatobiliary ultrasound was performed in the patient with high liver function tests, and hepatitis markers were negative. Viral infection-associated and alcoholic hepatitis were ruled out. In the intensive care unit, hepatotoxic agents were avoided and n acetyl cysteine and symptomatic supportive treatment were given. At the end of the 6-day follow-up, the patient was discharged, whose symptoms improved and liver function tests decreased.

Discussion: Occupational exposure limits for dimethylformamide is 10 ppm or 30 mg/m3 as an 8-hour time-weighted average (TWA) according to Occupational Safety and Health Administration (OSHA) and American Conference of Governmental Industrial Hygienists (ACGIH).(2,3) In recent years, poisoning cases associated with occupational exposure to DMF have been reported. Findings of this toxic solvent exposure are nonspecific, they can be confused with many diseases in terms of differential diagnosis. There is no specific antidote to DMF, treatment is supportive.

Conclusion: The use of DMF in the industrial field is increasing day by day and cases of acute and chronic poisoning related to occupational exposure are reported. The target organ is the liver, and especially severe hepatotoxicity should be monitored in the intensive care unit.

Keywords: Intensive care; Hepatotoxicity; N,N-dimethylformamide; Occupational exposure; Toxic Hepatitis

INTRODUCTION

N, N-dimethylformamide (DMF) is a colorless, odorless and volatile liquid that is miscible with water and most organic liquids and is used in various industrial applications. Exposure to DMF is mainly through the dermal and respiratory systems. After exposure to DMF, it is mainly metabolized in the liver and the metabolites are excreted by the kidneys. Acute or chronic occupational exposure to this solvent is hepatotoxic and may cause poisoning (1). We aimed to present the intensive care management of a patient who developed acute hepatitis after serious occupational dimethylformamide exposure.

N, N-dimethylformamide (DMF) is a colorless to slightly yellow liquid with a faint amine-like odor. DMF has low volatility and can be miscible with water and the majority of organic liquids, and thus is globally used in a wide variety of industrial applications (2) Human exposure to DMF is mainly through the dermal and respiratory systems. Accumulating evidences from occupational poisoning cases and animal studies have demonstrated that both acute and chronic DMF exposure can lead to damage to various organs, among which the liver is the primary target. Exposure to DMF at lower levels than we expected might also cause serious liver injury in sensitive populations. Unfortunately, the underlying mechanisms by which DMF induces liver injury remain largely unknown, despite considerable attention has been drawn to the hepatotoxic effects of DMF.

Metabolism of DMF

After absorption by mouth, skin and respiratory tract, DMF is mainly metabolized in liver and is excreted in the form of metabolites through the urine. In liver, DMF is hydroxylated to N-hydroxymethyl-N-methylformamide (HMMF), which then decomposes to N methylformamide (NMF) chemically with concomitant elimination of formaldehyde at a rate depending on the pH value and the temperature of the environment. Hepatic cytochrome P4502E1 (CYP2E1), the CYP450 isozyme responsible for the metabolism of many small chemicals including ethanol, carbon tetrachloride (CCl_4) and acetaminophen (APAP), also accounts for the biotransformation of DMF to HMMF, and from N-methylformamide (NMF) to S-(N-methylcarbamoyl) glutathione (SMG) in rats, mice, and also human beings.(3)

Although DMF has been reported to induce gastric irritation, embryotoxicity, developmental toxicity, carcinogenesis, heart toxicity, and nephrotoxicity, both animal studies and occupational poisoning cases have demonstrated that liver is the most sensitive target of DMF. This is theoretically rational because the biotransformation of DMF is catalyzed mainly by hepatic CYP2E1. It has been clearly documented that DMF-induced hepatotoxicity is associated with the metabolism of DMF catalyzed by CYP2E1. This could be demonstrated by the potentiation of acetone (a CYP2E1 inducer) on DMF-elicited toxicity in mice/rats and the higher susceptibility to DMF hepatotoxicity in mice compared with that in rats, which might be at least in part related to the higher metabolic capacity of mice.(4)

CASE

A 22-year-old male patient applied to the emergency department with complaints of nausea, vomiting, diarrhea and fever after exposure to dimethylformamide at work. The patient was admitted to the intensive care unit with the diagnosis of acute toxic hepatitis. The patient had no history of additional disease or previous hepatitis. Hepatobiliary ultrasound was performed in the patient with high liver function tests, and hepatitis markers were negative. Viral infection-associated and alcoholic hepatitis were ruled out. In the intensive care unit, hepatotoxic agents were avoided and n-acetyl cysteine and symptomatic supportive treatment were given. At the end of the 6-day follow-up, the patient was discharged, whose symptoms improved and liver function tests decreased.

DISCUSSION

As a versatile solvent, the global consumption of DMF will still increase, and the reports on occupational DMF poisoning cases are on the rise. A growing number of studies have demonstrated that both acute and chronic DMF exposure could result in liver damage. Occupational DMF poisoning cases are frequently reported in recent years especially in China. In addition, the wide fluctuation of DMF concentrations indicates the possibility of occasional overexposure, although the average concentration of DMF in workplaces might be below the threshold limit value.(5) Furthermore, special attention should be payed to the synergistic hepatotoxicity of DMF with other liver toxicants and the increased sensitivity in some subgroup populations such as overweight populations and hepatitis virus-infected populations.

Underlying mechanisms for DMF-induced hepatotoxicity remain largely unknown. Future studies regarding the DMF hepatotoxicity may focus on the following several aspects. First, the sharp decline of hepatic glutathione (GSH) levels, the elevation of oxidative markers such as malondialdehyde (MDA), and the beneficial effects of NAC in the treatment of DMF posing provide convincing evidences that oxidative stress plays critical roles in DMF-induced hepatotoxicity. It would be interesting to investigate the protective roles of nuclear factor erythroid-derived 2-like 2 (NRF-2), the key transcription factor controlling the induction of endogenous antioxidant enzymes such as heme oxygenase 1 (HO-1) and glutamate-cysteine ligase (GCL, the rate-limiting enzyme in the synthesis of glutathione (GSH)) in response to oxidative stress.

Occupational exposure limits for dimethylformamide is 10 ppm or 30 mg/m^3 as an 8-hour time-weighted average (TWA) according to Occupational Safety and Health Administration (OSHA) and American Conference of Governmental Industrial Hygienists (ACGIH). In recent years, poisoning cases associated with occupational exposure to DMF have been reported. Findings of this toxic solvent exposure are nonspecific, they can be confused with many diseases in terms of differential diagnosis. There is no specific antidote to DMF, treatment is supportive.

CONCLUSION

The use of DMF in the industrial field is increasing day by day and cases of acute and chronic poisoning related to occupational exposure are reported. The target organ is the liver, and especially severe hepatotoxicity should be monitored in the intensive care unit.

REFERENCES

1. Li MJ, T. Zeng. The deleterious effects of N, N-dimethylformamide on liver: A mini-review. Chemico-biological interactions. 2019;298:29.
2. Kim TH, Kim SG. Clinical outcomes of occupational exposure to n, n-dimethylformamide: perspectives from experimental toxicology. Safety and health at work. 2011;2(2):97.
3. Mraz J, et al. Investigation of the mechanistic basis of N, N-dimethylformamide toxicity. Metabolism of N, N-dimethylformamide and its deuterated isotopomers by cytochrome P450 2E1. Chemical research in toxicology, 1993;6(2):197.
4. Imazu K, Fujishiro K, Inoue N. Liver injury and alterations of hepatic microsomal monooxygenase system due to dimethylformamide (DMF) in rats. Fukuoka igaku zasshi= Hukuoka acta medica. 1994;85(5):147-153.
5. He J, et al. Serum activities of liver enzymes in workers exposed to sub-TLV levels of dimethylformamide. International Journal of Occupational Medicine and Environmental Health. 2015;28(2):395.

Intensive Care Management of Phenytoin Intoxication in a Patient with Iatrogenic Overdose Combined with Glycol

Aysel Mercan, Lale Karabıyık

Gazi University Faculty of Medicine, Department of Anesthesiology and Intensive Care, Ankara, Türkiye

ABSTRACT

Background: Phenytoin is a commonly prescribed antiepileptic drug. The narrow therapeutic index, the wide individual variability in the rate of phenytoin metabolism and clearance are responsible from the observed dose-related toxicity. Parenteral form of phenytoin contains propylene glycol as an excipient. In case of acute intoxication; agitation and restlessness, drowsiness, lethargy, increased reflexes, stupor and coma, respiratory arrest, hypotension, bradycardia and delusions are observed. In this case, we aimed to present the prolonged phenytoin fluctuation in drug level after iatrogenic phenytoin intoxication in a patient who received propylene glycol from phenytoin ampule and polyethylene glycol for colonoscopy preparation.

Case: A 72-year-old male patient applied to the emergency service after having multiple seizures. He had a seizure after applying polyethylene glycol for colonoscopic preparation. Phenytoin was loaded to stop the seizures. After phenytoin, the patient developed confusion, hyperactivity and agitation. The patient with a blood phenytoin level of 50 microgram/mL was admitted to the intensive care unit with the diagnosis of phenytoin intoxication. Since there was no specific antidote for phenytoin toxicity, symptomatic treatment was applied. The patient with high troponin level was followed-up in terms of cardiac side effects. Liver enzymes were elevated. Daily blood phenytoin level was monitored. After the first four days, neurological examination did not regress and seizure did not develop. The patient, whose blood phenytoin level was fluctuating and did not fall to the normal therapeutic value, was applied to hemodialysis on the 7th day. The patient was transferred to the geriatric service on the 9th day of hospitalization, as his cardiac status remained stable and the drug level fell below the normal value.

Discussion: The serum level at which the toxic effect of phenytoin begins is >20 microgram/mL. Phenytoin can also cause myocardial damage by rapid administration of parenteral forms containing propylene glycol as a solvent. In addition, the patient's age, comorbidities and polypharmacy increase the risk of side effects and the tendency to intoxication.

Conclusion: In addition, propylene glycol in ampoules as excipients and polyethylene glycol taken in preparation for colonoscopy may have contributed to the intoxication clinic.

Keywords: Intensive care, phenytoin, glycol, intoxication, iatrogenic

INTRODUCTION

Phenytoin is a commonly prescribed antiepileptic drug. It is also used for the treatment of paroxysmal kinesigenic dyskinesia, myotonia, and neuropathic pain.(1, 4) Serum phenytoin concentration rises in a curvilinear manner. Consequently, the small increments in dose can cause a large increase in the serum phenytoin level in many patients. Phenytoin intoxication is one reason why patients with epilepsy visit the emergency department. The narrow therapeutic index, the wide inter-individual variability in the rate of phenytoin metabolism and clearance of phenytoin are responsible for the observed dose-related toxicity.(5) Clinical findings related to serum drug level are listed in Table 1.

Phenytoin is highly protein-bound (90%), mostly to albumin. The unbound (free) phenytoin is pharmacologically active. Phenytoin exhibits non-linear or zero-order pharmacokinetics which makes it difficult to achieve and manage therapeutic concentrations. Optimum steady-state concentrations are those without adverse effects and often fall within the range of 10-20 µg/ml in adults. The factors such as drugs or underlying disease that may alter protein binding can affect phenytoin plasma levels, potentially resulting in concentration-related toxicity. In patients with decreased albumin levels, for example, those with significant renal and/or hepatic impairment, the free phenytoin level is often a useful clinical indicator for dosage adjustment. Although phenytoin, in general, is effective and well tolerated, given its non-linear kinetics characteristic and narrow therapeutic window, therapeutic drug monitoring of phenytoin is usually necessary to aid dosage adjustment and prevent concentration-dependent adverse effects.

Phenytoin is primarily metabolized by the hepatic cytochrome P450 (CYP) enzymes CYP2C9 and CYP2C19. Approximate 80% of phenytoin is eliminated by the hydroxylation pathway to form 5-(4'- hydroxyphenyl)-5-phenylhydantoin (p-HPPH). This inactive metabolite, p-HPPH, is renally excreted. A reactive arene oxide intermediate is also formed through the hydroxylation pathway. Several studies have proposed that the arene oxide intermediates might stimulate immune reactions, cause cellular destruction,

and thus lead to either toxicity or hypersensitivity. However, due to its unstable structure, the functional role of the arene oxide intermediate remains uncertain.(6)

Polyethylene glycol (PEG) is a polymer of choice in drug delivery systems. This FDA approved polymer is popular due to its tunable properties and well-established safety profile.(7) Adequacy of bowel preparation before colonoscopy is important. Studies have shown that reduced volume of polyethylene glycol (PEG) with bisacodyl may improve visualization and tolerability for bowel preparation prior to colonoscopy.(8)

CASE

A 72-year-old male patient applied to the emergency service after having multiple seizures. When the patient's history was questioned, it was learned that colonoscopy would be planned same day and he had a seizure after applying polyethylene glycol for colonoscopic preparation. Phenytoin was loaded to stop the seizures in the emergency department. After phenytoin, the patient developed confusion, hyperactivity and agitation. The patient with a blood phenytoin level of 50 µg/ml was admitted to the intensive care unit with the diagnosis of phenytoin intoxication. The patient has a history of hypertension and hypothyroidism. Since there was no specific antidote for phenytoin toxicity, symptomatic treatment was applied. The patient with high troponin level was followed-up in terms of cardiac side effects. Liver enzymes were elevated. Daily blood Phenytoin level was monitored.(Table 2) His seizures were controlled with levetiracetam. From the 4th day of hospitalization, seizure did not develop and neurological examination did not regress. The patient, whose blood phenytoin level was fluctuating and did not fall to the normal therapeutic value, was taken to hemodialysis on the 7th day of his intensive care unit admission. The patient was transferred to the geriatric service on the 9th day of hospitalization, as his cardiac status remained stable and the drug level fell below the normal value (19 µg/ml <normal).

DISCUSSION

Phenytoin is metabolized in the liver by CYP450 enzymes and has a rather narrow therapeutic index. The serum level at which the toxic effect of phenytoin begins is >20 µg /mL. Phenytoin can also cause myocardial damage by rapid administration of parenteral forms containing propylene glycol as a solvent. In addition, the patient's age, comorbidities and polypharmacy increase the risk of side effects and the tendency to intoxication. In addition, propylene glycol in ampoules as excipients and polyethylene glycol taken in preparation for colonoscopy may have contributed to the intoxication clinic. In addition, we think that dehydration and hypoalbuminemia that may occur during colonoscopy preparation may have increased phenytoin intoxication.

CONCLUSION

We thought that fluctuations in serum drug level in our case might be related to the accompanying glycol amount.

REFERENCES

1. Hwang W., Lu CS, and Tsai JJ, Clinical manifestations of 20 Taiwanese patients with paroxysmal kinesigenic dyskinesia. Acta neurologica scandinavica;1998:98(5):340.
2. Patocka J, Wu Q, Nepovimova E, Kuca K. Phenytoin - An anti-seizure drug: Overview of its chemistry, pharmacology and toxicology. Food Chem Toxicol. 2020;142:111393.
3. Anseeuw K et al. Extracorporeal Treatment in Phenytoin Poisoning. Am J Kidney Dis. 2016;67:187.
4. McQuay H, et al. Anticonvulsant drugs for management of pain: a systematic review. BMJ.1995;311(7012):1047.
5. Eadie MJ. Anticonvulsant therapy: Pharmacological basis and practice. Edinburgh, 1989:137.
6. Chang WC, et al. An update on CYP2C9 polymorphisms and phenytoin metabolism: implications for adverse effects. Expert Opinion on Drug Metabolism & Toxicology. 2020;16(8):723.
7. D'souza, A.A. and R. Shegokar, Polyethylene glycol (PEG): a versatile polymer for pharmaceutical applications. Expert opinion on drug delivery. 2016;13(9):1257-1275.
8. Clark RE, et al. Low-volume polyethylene glycol and bisacodyl for bowel preparation prior to colonoscopy: a meta-analysis. Annals of Gastroenterology: Quarterly Publication of the Hellenic Society of Gastroenterology. 2013;26(4):319.

Tablo 1. Serum Phenytoin Level and Clinical Effects

Serum phenytoin level (µg/ml)	Clinical Effects
<10	Non effects
10-20	Horizontal nistagmus
20-30	Spontan nistagmus
30-40	Tremor, diplopia, vertical nystagmus, ataxia, hyperreflexia
40-50	Lethargy, disorientation, confusion, hyperactivity
>50	Coma, seizures

Table 2. Daily Blood Phenytoin Level (µg/ml)

Days*	1. Day	2. Day	3. Day	4. Day	5. Day	6. Day	7-8. Day	9. Day
Phenitoin level	50	48	36	37	22	27	21	18
Clinical Observation	Nausea, vomiting, confusion, agitation	confusion, agitation	confusion, agitation	clear consciousness	clear consciousness	clear consciousness	clear consciousness	clear consciousness

*Days of the current case with phenytoin blood level

Anesthesia for Awake Craniotomy; a Case Report

Halide Hande Şahinkaya[1], Fehamet Nazlı Saruhan[1], Alper Tabanlı[2]

[1] University of Health Sciences, Bozyaka Education and Research Hospital, Department of Anesthesiology and Reanimation, Izmir, Türkiye
[2] University of Health Sciences, Bozyaka Education and Research Hospital, Department of Neurosurgery, Izmir, Türkiye

ABSTRACT

Background: Awake craniotomy is a neurosurgical intervention used for identifying and preserving the functional brain areas during resection of tumors, epilepsy and functional neurosurgery located near the cortical and subcortical language centers, sensory and motor pathways. Commonly used sedation techniques for an awake craniotomy include monitored anesthesia care and asleep-awake-asleep technique. We aim to present our experince of awake craniotomy under monitored anesthesia care.

Case: 54 years old male patient with a parietal subcortical tumour was scheduled for surgical treatment. After a detailed preoperative evaluation, a written consent was taken for awake craniotomy. The patient was conscious, full cooperated and oriented without any motor deficits. The patient was monitored for electrocardiography, periferal oxygen saturation, invasive arterial blood pressure, end-tidal carbon dioxide and bispectral index in the operating room. Oxygen was delivered via a face mask. Intravenous infusions of propofol and remifentanil were used for monitored anesthesia care. Bispectral index was maintained between 60 and 80. Bilateral scalp block was performed with epinephrine added 0.25 % bupivacaine and 1 % prilocain combination 15 minutes before skull pinning. The surgical procedure was performed in supine position under intraoperative navigation and neurophysiological monitoring. Bupivacaine was also administered before dural incision. The patient was awakened intraoperatively during the manuplation of motor cortex. He was able to move the left upper and lower extremities with verbal commands. After the resection, the patient was sedated until the end of the surgery. The surgical procedure proceeded without any complications. The patient was transferred to the intensive care unit after the surgery and monitored for postoperative complications. The patient was discharged on the fifth day of hospitalization.

Conclusion: A careful and adequate selection and preparation of patient are mandatory. Several anesthetic tecniques are available for awake craniotomy. The choice of tecnique depends on the patient's characteristics, location and duration of the surgery and the experience of the anesthesiologist. Monitored anesthesia care presents an unprotected airway where asleep-awake-asleep technique provides a partially or totally protected airway. A propofol and remifentanil combination with bilateral scalp block provided adequate analgesia and effective monitored anaesthesia care for our patient.

Keywords: Awake craniotomy, bispectral index, monitored anesthesia care, neurosurgery, scalp block

INTRODUCTION

Awake craniotomy (AC) is a neurosurgical intervention used for identifying and preserving the functional brain areas during resection of tumours, epilepsy and functional neurosurgery located near the cortical and subcortical language centers, sensory and motor pathways (1). AC enables the neurosurgeon to perform the maximum extent of resection safely. The advantages of AC include shortened hospital stays, better neurologic outcomes, and decreased expenditure compared with brain tumor surgery under general anesthesia (GA).

Preoperative patient selection is critical to a successful AC because patients must be physically and psychologically capable of being safely kept awake for intraoperative cortical mapping, continuous language monitoring and resection. The patient's ability to participate and cooperate with commands is a prerequisite to a successful operation. This procedure can be a frightining experience for the patient. It is much safer with the development in anesthesiology. Commonly used anesthesia techniques for an AC include monitored anesthesia care (MAC) and asleep-awake-asleep (AAA) technique (2). We aim to present our experince of awake craniotomy under MAC of a patient with a tumour located in the parietal lob.

CASE PRESENTATION

The patient was 54 years old male with a history of lisping during speech. He was taken to the hospital for detailed examination and a parietal subcortical tumour was detected in computed tomography (CT). So he was scheduled for surgical treatment. The neurosurgeon decided an AC operation would be the best neurosurgical option for the patient. A detailed preoperative evaluation was held. The patient was conscious, full cooperated and oriented without any motor deficits. He was told about every details about the awake procedure and all his questions were answered. A written consent was taken from the patient for AC.

On the operation day, the patient was monitored for electrocardiography (ECG), peripheral oxygen saturation, invasive arterial blood pressure, end-tidal carbon dioxide and bispectral index (BIS) in the operating room. Oxygen with a flow of 2L/min was delivered via a face mask. A warm blanket was placed on top of the patient to keep him comfortable. All pressure points were carefully padded. Intravenous infusions of propofol and remifentanil were used for MAC. BIS was used for the depth of anesthesia. So the infusion doses of agents changed according to the BIS values. It was maintained between 60 and 80 depending to the phases of the surgical procedure. Bilateral scalp block was performed with epinephrine 1:200.000 added 0.25% bupivacaine and 1% prilocain combination 15 minutes before skull pinning. Supraorbital and supratrochlear nerves, zygomaticotemporal and auriculotemporal nerves, greater occipital and lesser occipital nerves were blocked with a total of 20 mL local anesthetic solution for appropriate analgesia. A sterile sharp needle was used to test the effectiveness of the regional nerve block. The patient was noted to have no pain or any change in vital signs. The patient tolerated both the nerve block and pinning without any movement. The surgical procedure was performed in supine position under intraoperative navigation system (StealthStation S7, Medtronic, USA). Neddle electrodes were placed in the appropriate sites of the patient for neurophysiological monitoring (Cadwell Cascade IONM System, Sierra Garcia, MFI Medical, San Diego, California, USA). The insicion was re-marked. A drape was placed on the forehead of the patient. A standart bone flap was turned to expose the dura. An injection of 0.25% bupivacaine was also administered before dural incision by the surgeon. The surgical microscope was brought into the surgical field. The location of the mass was visualized. The patient was awakened intraoperatively during the manuplation of motor cortex by weaning down the intravenous anesthetics. BIS values were above 80 in this period. The patient was asked to move his left upper and lower extremities and to count the numbers with verbal commands. Cortical stimulation was performed using a probe. Than the patient was sedated for a target of BIS value 60 until the end of the resection. The mass was totally resected. Than the patient was awakened once again for speech and motor exam. No deficits were detected. The patient was sedated deeply until the skull pins were removed. Intravenous 0.5 mg kg^{-1} mannitol for oedema treatment and 500 mg levetiracetam for seizure prophylaxis were administered. Nimodipin infusion with a dose of 2 mg hr^{-1} were used for hypertension. 6 mg dexamethasone and 3 mg granisetron were given intravenously for prevention of nausea and vomiting. Balanced electrolyte solution was used for goal directed fluid theraphy The surgical procedure proceeded without any surgical and anesthetic complications. The patient was transferred to the intensive care unit (ICU) after the surgery and monitored in the ICU for 24 hours. He was admitted to the ward on the first day of surgery. No postoperative complications were occured. The patient was discharged on the third day of hospitalization.

DISCUSSION

AC is a safe and effective method for achieving a high rate of resection of lesions located in cortex with a low degree of postoperative neurological deficit. We performed a successful anesthesia management for AC without any anesthetic complications.

Anesthesiologists play a crutial role in the patient's experience of AC. The main concern during the procedure is the patient's anxiety. Preoperative evaluation is important for the selection of the appropriate patient and anesthesia method for AC. The procedure should be discussed with the patient. Every step of the procedure should be explained. Contraindications to surgery include mental confusion, poor compliance and inability to concentrate (3). Claustrophobia, movement disorders may complicate positioning and motionless surgical field. Size of tumor, hemorrhagic risk, type and frequency of seizures and hemodynamic instability may limit candidacy. Patients with severe preoperative aphasias are also excluded as they can not participate in intraoperative language mapping (4). These factors should be considered with the surgeon before the procedure.

The airway must be carefully considered. Ease of mask airway, Mallampati score, intubation history, predictors of difficulty with laringoscopy should be assessed. Obesity, gastroesophageal reflux, chronic cough or wheezing may be contraindications of AC. Airway factors affect the management of intracranial pressure control because of the difficulty for providing hyperventilation in a spontaneously breathing patient (5). Our patient had a small size of tumour without any risk of bleeding. There were no predictors of difficulty in airway management. Body mass index of our patient was 33.8. Although obesity is a factor influencing the management of AC, the patient had no snoring and obstructive sleep apnea. AC was thought to be appropriate for the patient after consulting with the surgeon.

AC can be performed under MAC and AAA technique (2). AAA technique may provide better results with respect to agitation and seizure. The most critical phases of AAA technique are removal and insertion of laringeal mask airway (LMA). Respiratory insufficiency, hypercapnia and coughing may cause hypoxemia and increased intracranial pressure. On the other hand controlled ventilation provides control of PaCO2 levels and facilitates brain relaxation. We prefered MAC, provided by propofol and remifentanil infusions in our patient. Dexmedetomidine can also be used with better respiratory preservation, whereas

propofol is associated with a decreased incidence of nausea, vomiting and intraoperative seizures (6). Remifentanil is a short acting agent that is useful for intraoperative pain control. However it increases the risk of nausea, vomiting and respiratory depression (7). We prefered propofol and remifentanil infusion as we are more accustomed in the operating room. Respiratory depression and seizure did not occur during the procedure. The patient stayed calm without any movement.

The use of local anesthesia is the cornerstone of AC and has been established as the reference standart for patients undergoing AC (8). We performed a successful scalp block where six nerves were blocked bilaterally. Since the patient was comfortable during the skull pinning and the rest of the procedure.

BIS monitoring during AC is useful for obtaining adequate depth of hypnosis while using the minimum anesthetic dose possible. This provides a limitation of potential prolonged sedation and hypoventilation. The use of BIS is a valuable contribution to anesthetic tecnique for AC, allowing a smooth transition from deep sedation to awake condition (9). We also used BIS monitoring. We changed the infusion doses of propofol and remifentanil according to the BIS values when an awake and cooperated patient was expected.

In conclusion, detailed preoperative evaluation and appropriate selection of the patients for AC are essential for successful intraoperative management. Preference of anesthesia technique depends on the patients' characteristics, place of the pathology in the cranium, surgeon's and anesthesiologist's experience.

REFERENCES

1. Kobyakov GL, Lubnin AY, Kulikov AS, Gavrilov AG, Goryaynov SA, Poddubskiy AA, Lodygina KS. Awake craniotomy. Zh Vopr Neirokhir Im N N Burdenko. 2016;80:107-116.
2. Lobo FA, Wagemakers M, Absalom AR. Anesthesia for awake craniotomy. Br J Anaesth 2016;116:740-744.
3. Manchella S, Khurana VG, Duke D, Brussel T, French J, Zuccherelli L. The experience of patients undergoing awake craniotomy for intracranial masses: expectations, recall, satisfaction and functional outcome. Br J Neurosurg. 2011;
4. 25:391-400.
5. Nossek E, Matot I, Shahar T, Barzilai O, Rapoport Y, Gonen T. Failed awake craniotomy: a retrospective analysis in 424 patients undergoing craniotomy for brain tumor. J Neurosurg. 2013;118:243-249.
6. Erickson KM, Cole DJ. Anesthetic considerations for awake craniotomy for epilepsy and functional neurosurgery. Anesthesiology Clin. 2012;30:241-268.
7. Stevanovic A, Rossaint R, Veldeman M, Bilotta F, Coburn M.Anaesthesia managemant for awake craniotomy: systematic review and meta-analysis. PLoS One. 2016;11:e0156448.
8. Kim SH, Choi SH: Anesthetic considerations for awake craniotomy. Anest. Pain Med (Seoul). 2020;15:269-274.
9. Chaki T, Sugino S, Janicki PK et al.Efficacy and safety of a lidocaine and ropivacaine mixture for scalp nerve block and local infiltration anesthesia in patients undergoing awake craniotomy. J Neurosurg Anesthesiol. 2016;28:1-5.
10. De Sloovere V, De Deyne C, Wuyts J, Heylen R. Bispectral index monitoring during asleep-awake technique for craniotomy. Eur J Anaesthesiol. 2009;26:443-444.

Dexmedetomidine Infusion for Post-ECT Delirium: Case Report

Nigar Kangarlı

Bezmialem Vakıf University Dragos Hospital, Department of Anesthesiology and Reanimation, Istanbul, Türkiye

ABSTRACT

Background: Among the most common complications, evidenced after the ECT session, agitation takes the dominant place. Distinct etiologies, such as medications, patient's neurologic state and electroconvulsive therapy may be responsible for severe agitation after the session.In this report, we consider a case of post-ECT delirium, that successfully responded to a-2 agonist dexmedetomidine in contrast to very poor response to combinations of classic anti-agitation medications. Assuming few number of case reports and researches, supporting the dexmedetomidine premedication, in our case, we aimed to confirm the effectivity of dexmedetomidine in post-ECT delirium, by using delirium scales, to be precise, using bCAM scale. On the other hand, this case report includes stepwise description of distinct combinations of approaches to delirium, all failed to manage this resistant state.

Case: In this report we consider a case of a patient, male, 39 years old. As medical treatment failed to take his manic behaviour under control, 10 sessions of ECT were planned. Five sessions of ECT culminated with postictal agitation, inspite of numerous combinations of sedative medications. The rest five sessions were conducted under dexmedetomidine premedication prior to the session. The patient was decided to be premedicated with 1 mcg/kg dexmedetomidine intravenously in 10 minutes before the session. No negative influence on seizure duration and efficacy was observed. After the session, the patient showed absence of any kind of agitation in the postoperative unit. İn our clinic we practice Brief Confusion Assesment Scale (bCAM) to measure the severity of delirium. This scale is preferred as the simplest and fastest way to diagnose the condition.

Conclusion: In our case, a patient whose ECT sessions continually ended up with severe delirium, showed absence of any agitation after dexmedetomidine premedication. Very significant reduce in Brief Confusion Assesment Scale (bCAM) was observed during all sessions, premedicated with dexmedetomidine. The benefits of this method, as concluded from our case, should be taken into account to prevent complications. At the other side, multidisciplinary research on this topic is necessary to support this concept.

Keywords: Electroconvulsive therapy, agitation, dexmedetomidine

Hemodynamic Collapse During Craniotomy; Can Anaphylaxis Be the Cause in a Patient With No Known Allergy?

Esin Tekin[1], İpek Yeniçeri[1], Yunus Emre Ses[1], Gözde İnan[1], Özlem Gülbahar[2], Zerrin Özköse Şatırlar[1]

[1] Gazi University School of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2] Gazi University School of Medicine, Department of Biochemistry, Ankara, Türkiye

ABSTRACT

Background: Anaphylaxis is a rare but fatal condition with intraoperative diagnosis and treatment difficulties. Incidence of intraoperative anaphylaxis is 1/1500-5000. Triggering agents commonly include latex, neuromuscular blockers, intravenous anesthetics, antibiotics, and protamine. However, in approximately 16% of these cases, no etiology has been identified1. In the present case, we aimed to describe our approach and differential diagnostic management of intraoperative hemodynamic collapse in a patient with no known allergy.

Case: A 60-year-old patient with contact dermatitis, no known allergy was scheduled for occipital mass operation. The patient was intubated and put in the prone position with a skull clamp. Acute sinus hemorrhage developed in the 40th minute of the operation during removal of occipital bone. The surgeons were able to stop bleeding, but the patient's blood pressure kept dropping. Noradrenaline was administered when there was no response to fluid resuscitation, however hypotension persisted. Arterial blood gas revealed hemoglobin 13mg/dL, PCO2 39mmHg. Following adequate fluid replacement, prednol and pheniramine maleate were administered. Considering a potential anaphylactic scenario, a blood sample was sent to the lab for analysis of serum tryptase and latex-specific IgE, and latex-containing substances were removed away. Hemodynamically stabilized patient was transferred to the ICU following surgery. The patient was admitted to ward on the 2nd postoperative day and the results showed positive latex-specific IgE.

Conclusion: There are many causes of intraoperative hypotension in neuroanesthesia. Failure to achieve hemodynamic stabilization with bleeding control and adequate fluid-blood replacement, besides no clinical improvement despite normal ventilation and blood gas parameters led us away from surgical bleeding and air embolism diagnoses, and persistent hypotension suggested potential anaphylaxis. Latex allergy is one of the most common causes of anaphylaxis in the operating room3. Its confusion with contact dermatitis is documented in the literature. For this reason, latex allergy was considered in the patient and all agents were removed and treatment was. However, the development of anaphylaxis after bleeding at 40 minutes in the case presented here suggests that the hemostasis material containing oxidized regenerated cellulose used by the surgical team during bleeding control may also have triggered anaphylaxis.

Keywords: Intraoperative anaphylaxis, contact dermatitis, latex allergy

INTRODUCTION

Anaphylaxis is a rare but fatal condition with intraoperative diagnosis and treatment difficulties. Incidence of intraoperative anaphylaxis is 1/1500-5000. Triggering agents commonly include latex, neuromuscular blockers, intravenous anesthetics, antibiotics, and protamine. However, in approximately 16% of these cases, no etiology has been identified (1). In the present case, we aimed to describe our approach and differential diagnostic management of intraoperative hemodynamic collapse in a patient with no known allergy.

CASE

An occipital mass procedure was planned for a 60-year-old patient with contact dermatitis and no known allergies. The patient underwent bispectral index (BIS), BIS-density spectral array and train of four monitoring in addition to standard ASA monitoring. The patient was induced with 1 mg kg^{-1}lidocaine, 5 mg kg^{-1}thiopental, and 0.6 mg kg^{-1}rocuronium and intubated with a size 8 endotracheal tube after receiving venous access via a 20 G iv cannula. He was positioned in the prone position with a skull clamp after a 20 G intravenous cannula was inserted into the left radial artery for invasive arterial pressure measurement. Acute sinus hemorrhage developed in the 40th minute of the operation during removal of occipital bone. The patient's blood pressure decreased after bleeding 1000 cc, but the mechanical ventilator's settings remained unchanged until the surgical team was able to control the bleeding (Figure 1). As the anesthetic infusions were stopped, the patient was placed in the Trendelenburg position. The surgeons were able to stop the bleeding, but the patient's blood pressure continued to drop. Noradrenaline was administered when there was no response to fluid resuscitation, however hypotension persisted. Arterial blood gas revealed hemoglobin 13 mg dL^{-1}, PCO_2 43 mmHg (Figure 2). Following adequate fluid replacement, prednol and pheniramine maleate were administered. Considering a potential anaphylactic scenario, a blood sample was sent to the lab for analysis of serum

tryptase and latex-specific IgE, and latex-containing substances were removed away. Hemodynamically stabilized patient was transferred to the ICU following surgery. The patient was admitted to ward on the 2nd postoperative day and the results showed positive latex-specific IgE.

DISCUSSION

Intraoperative hypotension in neuroanesthesia has a variety of causes. Acute surgical bleeding, anaphylaxis, air embolism, and pulmonary embolism are a few of them.

Vascular air embolism refers to the introduction of gases into the vascular system. (VAE). Cardiocirculatory arrest and severe right-sided heart failure may result from VAE's blockage of the pulmonary circulation. If the surgical field is above the level of the heart, this situation can occur during ear, nose, and throat surgery, hip surgery, surgery of the lesser pelvis, or breast surgery. However, a VAE can also happen during routine tasks, such as inserting or removing a central venous catheter or performing endoscopic procedures with the insufflation of gas. Since the anesthetists and surgeons are not primarily concerned with VAE during these procedures, it can have severe consequences when it occurs suddenly and unexpectedly. In contrast, the risk of intraoperative VAE is considerably better understood in cardiac surgery and neurosurgery (2). The cardiovascular, pulmonary, and central nervous systems are the key systems that are impacted by VAE. The cardiac symptoms include bradyarrhythmias or tachyarrhythmias, and alterations in the S-T segment or right ventricular strain patterns may be observed on an electrocardiogram (3).

Patient may have reduced lung compliance, increased dead space and acute shunting leading to hypoxemia and hypercarbia (4). The pulmonary over inflation syndrome ranges from minor parenchymal lung injury causing local bleed, pneumothorax and less commonly but potentially dangerous, over expansion of alveoli leading to rapture and entry of air into the pulmonary venules and arterioles causing systemic air embolism, clinically these can present as cerebrovascular accidents, paralysis, convulsion, coma, and may be associated with cardiovascular instability (5). Failure to achieve hemodynamic stabilization with bleeding control and adequate fluid-blood replacement, besides no clinical improvement despite normal ventilation and blood gas parameters led us away from surgical bleeding and air embolism diagnoses, and persistent hypotension suggested potential anaphylaxis.

CONCLUSION

The word "latex," which refers to a liquid dispersed in a water emulsion or other liquid, is derived from the rubber tree Hevea Brasiliense (6). Dr. William Halsted, an American surgeon, first used latex gloves in surgery in 1890 to stop the spread of infectious diseases. There is a lot of data in the literature concerning the confusion between contact dermatitis and latex allergy, which is one of the most frequent causes of anaphylaxis in the operating room (7).

Due to the patient's possible latex sensitivity, all potential agents were removed, and therapy was initiated. However, the development of anaphylaxis following bleeding at 40 minutes in the case reported here raises the possibility that the surgical team's use of hemostasis material containing oxidized regenerated cellulose during bleeding control potentially contributed to the development of anaphylaxis.

REFERENCES

1. Siegel, Judy Fried MD; Rich, Mark MD; Brock, William A. MD. Latex Allergy and Anaphylaxis. International Anesthesiology Clinics. 1993;31(1):141-6.
2. Michels P, Meyer EC, Brandes IF, Bräuer A. Intraoperative vaskuläre Luftembolie : Evidenz bei Risiko, Diagnostik und Therapie (Intraoperative vascular air embolism : Evidence for risks, diagnostics and treatment]. Anaesthesist. 2021 May;70(5):361-75.
3. Orebough SL. Venous air embolism. Clinical and experimental considerations. Crit care Med. 1992;20:1169–7.
4. Siviri S, woods WPD, Van Heerden. Air embolism; A case series and review. Critical Care and Resuscitation. 2004;6:271–6
5. Tom S Neumann. Arterial gas embolism and decompression sickness. News physiolo Sci. 2002;17:77–81.
6. Kumar RP. Latex allergy in clinical practice. Indian J Dermatol. 2012 Jan;57(1):66- 70.
7. Parisi CA, Petriz NA, Busaniche JN, Cortines MC, Frangi FA, Portillo SA, de Badiola FI. Prevalence of latex allergy in a population of patients diagnosed with myelomeningocele. Arch Argent Pediatr. 2016 Feb;114(1):30-5.

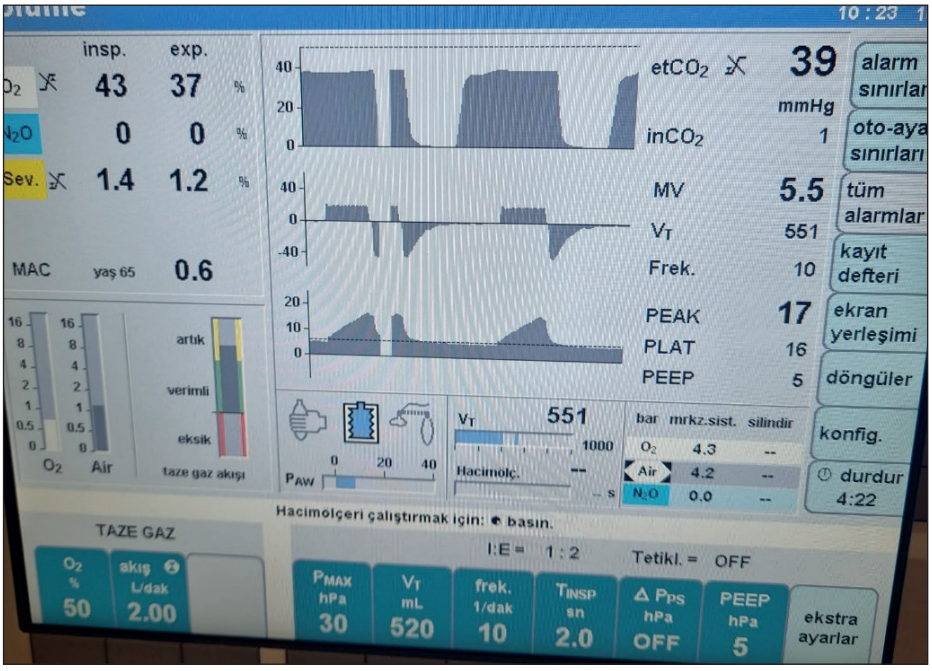


Figure 1. Mechanical ventilatory parameters during acute hypotension

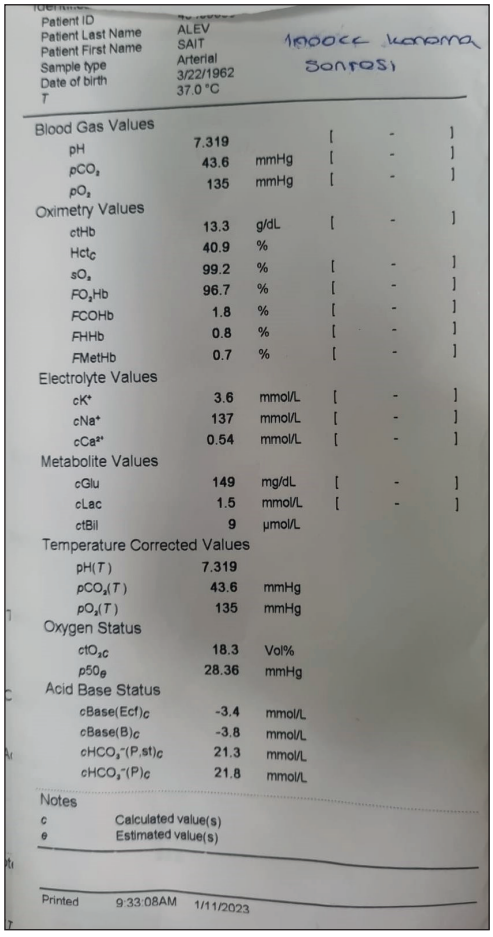


Figure 2. Blood gas parameters during acute hypotension

Effects of Prone Position on Intracranial Pressure During Spine Surgery: Evaluation by Ultrasonographic Measurement of Optic Nerve Sheath Diameter

Sevil Kalbiyeva, Gözde İnan, Zerrin Özköse Şatırlar

Gazi University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Prone positioning is common during spine procedures. Because the optic nerve sheath is an extension of dura mater, optic nerve sheath diameter (ONSD) reflects changes in intracranial pressure (ICP). Measurement of ONSD is recommended as a rapid, reliable, reproducible and non-invasive technique for the evaluation of ICP. In this study, our primary objective was to determine prone position effect on ICP in patients undergoing lumbar surgery using ultrasonographic measurements of ONSD, and secondly to evaluate factors that might have impact on ONSD.

Material and Methods: Our study is a single centered prospective study. Written informed consent was obtained from all patients, and study protocol was approved by institutional committee, ensuring ethical guidelines of Declaration of Helsinki. Patients in ASA I-III risk group, aged between 18-80 years, who would undergo lumbar surgery under elective conditions were included. Standard anesthesia was administered with bispectral index monitoring. Optic ultrasonography was assessed in B mode via linear probe in both transverse and sagittal planes. Control measurements (T0) were taken before intubation, and second measurements in supine position after intubation (T1). At the end of the surgery, last measurements were taken in prone position (T2) and then in supine position (T3) before patient was awakened. The percentage of change in ONSDs were calculated. In the comparison of two independent groups for continuous variables, Student's t-test was used, correlation coefficients and statistical significance between normally distributed variables were calculated using Pearson's test.

Results: Of the 84 patients, 49 (58.3%) were female and 35 (41.7%) were male. The mean age of the patients was 52.4±14.3 years, height was 168.6±8.6 cm and body weight was 79.4±12.7 kg. A total of 39 (46.4%) patients had comorbid disease. Mean ONSD at T1, T2, and T3 were similar and were found to be significantly higher than T0 measurements ($p<0.001$). There was no statistically significant correlation between ONSD in the prone position with age, obesity, presence of comorbid disease, hemodynamic variables, duration of anesthesia and amount of fluid administered during the operation.

Conclusion: Ocular ultrasonography, a non-invasive, bedside technique, plays a significant role in the identification of elevated intracranial pressure in prone positioning.

Keywords: Intracranial pressure, optic ultrasonography, optic nerve sheath diameter

INTRODUCTION

The amount of brain tissue, cerebrospinal fluid, and blood in the skull is constant because the craniospinal space is virtually entirely non-expandable. The rise in any of these components must be counterbalanced by a reduction in the other structures for the intracranial pressure (ICP) to remain constant. Increased ICP, which is defined as cerebrospinal pressure that is higher than 20 mmHg may occur because of brain injury (1).

The most precise, economical, and reliable way to monitor ICP is to measure ventricular fluid pressure with ventricular catheters, which is the current gold standard. Although the ability to drain cerebrospinal fluid in patients with elevated ICP is a therapeutic benefit of this invasive monitoring technique, its active use and application are challenging due to frequent calibration, changing the catheter's location, a lack of an experienced physician, risk of infection and bleeding, and most importantly, the fact that it is invasive.

The diameter of the optic nerve sheath (ONSD) can be measured using ultrasonography, which is a noninvasive, inexpensive, and incredibly quick technique that can be used at the patient's bedside. The sheath of the optic nerve, which is a component of the central nervous system, continues into the cerebral subarachnoid area. As a result, the nerve and sheath are used to convey intracranial pressure. As ICP rises, the volume of the retrobulbar section of the optic nerve sheath tends to expand because it is more elastic than its posterior portion (2). Ultrasound, magnetic resonance imaging, and computed tomography can all detect this increase of the diameter (3). In comparison to other noninvasive imaging modalities, increased ONSC levels are believed to be an earlier indicator of high ICP.

Prone posture, which is typical during spine surgeries, increases ICP. Optic nerve sheath diameter has been proposed as a quick, dependable, repeatable, and non-invasive approach for the assessment of ICP in recent investigations. Ultrasonographic

measurements of ONSD were used in this study to establish the effects of the prone position on ICP in patients undergoing spine surgery. In this study, our primary objective was to establish the effects of the prone position on ICP in patients undergoing spinal surgery using ultrasonographic measurements of ONSD. A secondary goal was to evaluate demographic and clinical characteristics that might have an impact on ONSD.

MATERIAL and METHODS

The present study was planned as a single center and prospective study. Written informed consent was obtained from all patients, and the study protocol was approved by the institutional committee, ensuring that it conformed to the ethical guidelines of the Declaration of Helsinki.

Patients in the ASA I-III risk group, aged between 18-80 years, who would undergo lumbar surgery under elective conditions were included in the study. Patients who were admitted to emergency surgery, refused to participate in the study, were <18 and >80 years old, had a previous eye and cranial operation, had a history of glaucoma, had CRPS findings, had cranial anomalies, were expected to have excessive intraoperative bleeding, and could not measure ONSD.

Standard anesthesia was applied to the patients with bispectral index monitoring. Optic ultrasonography was assessed in B mode via linear probe. The ONSD was assessed 3 mm below the eyeball. The mean of measurements in transverse and sagittal planes for each optic nerve was evaluated. In prone position, measurements were obtained with the head turned 30 degrees to the right and left by assistance of a second person. Control measurements (T0) were taken from both eyes before the patients were intubated, and the second measurements were taken in the supine position after intubation (T1). At the end of the surgery, the last measurements were taken in the prone position (T2) and then in the supine position (T3) before the patient was awakened.

The patients' demographic and hemodynamic data, duration of anesthesia and surgery, and time spent in the prone position were all recorded. The percentages of delta change in ONSDs at the measurement times (T1, T2, and T3) during the operation differed from the control (T0) ONSD values were calculated. Statistical correlations were investigated between ONSD measured in the prone position, and age, obesity, presence of comorbid disease, hemodynamic variables, duration of anesthesia, and amount of fluid administered during the operation.

In the comparison of two independent groups for continuous variables, Student's t-test was calculated, and correlation coefficients and statistical significance between normally distributed variables were calculated using Pearson's test. Analysis of variation of repeated measures over time was analyzed using Repeated Measures ANOVA.

RESULTS

Patients who will undergo elective lumbar surgery were included in our study. Of the 84 patients, 49 (58.3%) were female and 35 (41.7%) were male. The mean age of the patients was 52.4±14.3 years, mean height was 168.6±8.6 cm, mean body weight was 79.4±12.7 kg, and mean BMI was 27.9±4.1 kg/m^2. According to the American Society of Anesthesiology's (ASA) classification of physical condition, 12 (14.3%) patients were classified as having ASA class I physical conditions, 66 (78.6%) as having ASA class II physical conditions, and 6 (7.1%) as having ASA class III physical conditions before surgery. A total of 39 (46.4%) patients had comorbid disease. These were hypertension in 31 (36.9%) patients, coronary artery disease in 10 (11.9%) patients, diabetes mellitus in 10 (11.9%) patients, and lung disease in 8 (9.5%) patients.

In the transverse and sagittal plane measurements of both eyes, the mean ONSD at the prone position (T2) was found to be statistically significantly higher than induction (T0) and post-intubation (T1) measurements ($p<0.001$). However, prone position (T2) measurements and pre-extubation (T3) measurements were similar in both transverse and sagittal evaluations (Table 1).

When the percentages of change between the ONSD values at the measurement times (T1, T2, T3) and the control (T0) are examined; the changes between T0-T2 and T0-T3 were statistically significantly higher when compared to the change between T0-T1 ($p<0.001$). Compared to the control value (T0), the highest difference was observed in the T2 measurement (12.6%, $p<0.001$) (Table 2).

There was no statistically significant correlation between ONSD in the prone position with age, obesity, presence of comorbid disease, hemodynamic variables, duration of anesthesia and amount of fluid administered during the operation.

DISCUSSION

In this prospective randomized controlled trial, the ultrasonographic ONSD measurement was used to assess the impact of the prone position on ICP during lumbar operations. At the end of the time spent in the prone position, all patients' ONSD levels were found to have increased significantly, and this rise was statistically greater than the control value compared to the previous measurement intervals. Secondly, demographic and clinical factors that might impact changes in ONSD in the prone position were investigated, but no statistically significant correlation could be found between the increase in ONSD and any of these factors: age, obesity, the presence of comorbid diseases, hemodynamic variables, anesthesia duration, or the volume of fluid administered during the procedure.

Although being the gold standard for ICP measurement, intraventricular catheterization is invasive and prone to complications. Because the optic nerve sheath is an extension of dura mater, ONSD reflects changes in ICP. Among the various brain ultrasonography techniques proposed as noninvasive monitoring of increased ICP, increasing attention is now devoted to the measurement of ONSD.

In recent studies, ONSD measurements are recommended as a rapid, reliable, reproducible, and non-invasive technique for the evaluation of ICP (2). Fundoscopy and transcranial Doppler are among the non-invasive methods that can be applied at the bedside. Although a bedside fundoscopy examination is also possible, it is not sufficiently sensitive or specific and may result in delayed findings. Transcranial doppler is another technique, although its application is constrained by the need for qualified personnel and advanced technology. Once more, noninvasive techniques such as ONSD assessment and automatic infrared pupillometry have been found to be helpful in monitoring acute brain injury, particularly in patients at high ICP risk and for early neuroprognostic diagnosis after cardiac arrest (5).

Because of the hemodynamic changes that body posture causes, intracranial and intraocular pressure are affected by positioning. For ICP monitoring in the operation room, measuring ONSD via ultrasonography is helpful (6). It offers advantages such simpler evaluation at bedside, reduced radiation exposure, the ability for the clinician to monitor the patient's clinical findings with ONSD measures, and repeatability, all of which improve diagnosis accuracy. The use of ONSD has been documented in the literature in healthy individuals undergoing surgery in the Trendelenburg position, or with pneumoperitoneum (7). Increased ICP was more frequently investigated in laparoscopic surgery cases using the Trendelenburg position.

Today, the prone position has become a frequently used technique, especially in the treatment of ARDS patients, as it improves oxygenation as a result of regular distribution of ventilation and perfusion. Unfortunately, this approach does not include patients with increased ICP. In fact, therapeutic prone positioning is generally not performed in patients with acute brain injury and there are studies that consider increased ICP as a contraindication for prone positioning. Roth et al. conducted a study evaluating the supine and prone ICP values, cerebral perfusion pressures and oxygenation of patients treated in the prone position in neurointensive care patients. They found that the prone position increased intracranial and intraocular pressure compared to the supine position in these patients who underwent invasive ICP monitoring. Therefore, they recommended ICP monitoring for early detection of severe ICP elevation in patients with both acute brain injury and acute respiratory failure who will be placed in a prone position (8).

Kermorgant et al., with 12 healthy male volunteers, tried to determine whether the increase in ICP during the head-down tilt maneuver affects sympathetic nervous system activity and cerebral blood flow velocity. Flow in the cerebral blood vessels was evaluated by transcranial Doppler, and the increase in ICP was evaluated by ultrasound with ONST measurement. In the study, neither heart rate nor heart pressure changed significantly during the head-down tilt, while the ONSD increased significantly (9).

In patients who could experience deleterious effects from an increase in intracranial pressure, monitoring ICP changes with ultrasonographic ONSD is crucial. Despite the fact that we could not find a correlation between the length of anesthesia and the change in ONSD, the fact that the highest ONSD values were found in the measurements taken at the end of the prone position seems to be a warning sign that should be taken into consideration, especially in patients who need to remain in the prone position for a longer period of time.

To conclude, we believe that patients with cerebral disease who are scheduled for prone surgery should be closely monitored and non-invasively measured for ONSD using ultrasonography. Ocular ultrasonography, a non-invasive technique that is simple to use at the bedside, may be helpful in identifying elevated ICP in patients undergoing surgery in the prone position.

REFERENCES

1. Hawryluk GWJ, Citerio G, Hutchinson P, Kolias A, Meyfroidt G, Robba C, Stocchetti N, Chesnut R. Intracranial pressure: current perspectives on physiology and monitoring. Intensive Care Med. 2022 Oct;48(10):1471-1481.
2. Robba C, Goffi A, Geeraerts T, et al. Brain ultrasonography: methodology, basic and advanced principles and clinical applications. A narrative review. Intensive Care Med 2019; 45:913–927.
3. Patterson DF, Ho M-L, Leavitt JA, et al. Comparison of ocular ultrasonography and magnetic resonance imaging for detection of increased intracranial pressure. Front Neurol 2018; 9:278.
4. Lochner, P., et al., Optic nerve sheath diameter: present and future perspectives for neurologists and critical care physicians. Neurological Sciences, 2019. 40(12): p. 2447-2457.
5. Romagnosi F, Bongiovanni F, Oddo M. Eyeing up the injured brain: automated pupillometry and optic nerve sheath diameter. Curr Opin Crit Care. 2020 Apr;26(2):115-121.
6. Rasulo FA, Bertuetti R. Transcranial Doppler and Optic Nerve Sonography. J Cardiothorac Vasc Anesth. 2019 Aug;33 Suppl 1:S38-S52.
7. Robba, C., et al., Effects of pneumoperitoneum and Trendelenburg position on intracranial pressure assessed using different non-invasive methods. 2016. 117(6): p. 783-791.
8. Roth, C., et al., Does prone positioning increase intracranial pressure? A retrospective analysis of patients with acute brain injury and acute respiratory failure. Neurocritical care, 2014. 21(2): p. 186-191.
9. Kermorgant M, Labrunée M, Despas F, Hélissen O, Geeraerts T, Lambert E, et al. How does head position induced intracranial pressure changes impact sympathetic activity and cerebral blood flow? Autonomic Neuroscience. 2022:103036.

Table 1. Optic Nerve Sheath Diameter of Both Eyes at Measurement Times (mean±SD)

ONSD, mm	T0	T1	T2	T3	p*
Right-transverse	0.508±0.065[a]	0.552±0.071[b]	0.584±0.06[c]	0.577±0.066[c]	<0.001
Right- sagittal	0.515±0.06[a]	0.551±0.064[b]	0.586±0.064[c]	0.579±0.065[c]	<0.001
Left-transverse	0.522±0.06[a]	0.553±0.07[b]	0.576±0.07[c]	0.576±0.06[c]	<0.001
Left-sagittal	0.523±0.06[a]	0.553±0.072[b]	0.579±0.068[c]	0.576±0.06[c]	<0.001

*p value is based on Repeated Measures ANOVA test results
The difference between a and b is statistically significant (p<0.001)
The difference between b and c is statistically significant (p<0.001)
The difference between a and c is statistically significant (p<0.001)
SD: Standard deviation

Table 2. Percentage of Change in ONSD for Both Eyes (mean±SD)

ONSD*, mm	Change (%)			p[£]
	T0-T1	T0-T2	T0-T3	
Right	6.7[a]	12.6[b]	11.5[b]	*<0.001*
Left	5[a]	9.2[b]	9[b]	*<0.001*

*The arithmetic mean of transverse and sagittal measurements was taken for each optic nerve sheath diameter (ONSD)
[£]p is based on Repeated Measures ANOVA test results
The difference between a and b is statistically significant (p<0.05)
SD: Standard deviation

Anesthetic Management for Cesarean Section In a Patient With Factor XI Deficiency: Case Report

Ferda Yaman, Irem Eraslan

Osmangazi University Faculty of Medicine, Department of Anesthesiology and Reanimation, Eskişehir, Türkiye

ABSTRACT

Background: Hemophilia C, which develops as a result of deficiency of Factor XI, is a rare coagulation disorder and was first described by Rosenthal in 1953. Spontaneous bleeding is rare in patients, severe bleeding may occur as a result of surgery and trauma. Hemorrhage is seen mostly in the oral and nasal mucosa and urogenital system, where fibrinolytic activity is high.

Case: In this case, we aimed to present the management of cesarean section anesthesia in a patient with Factor XI deficiency in the light of the literature. 31 years old, 85 kg, 36 weeks pregnant, gravida 2, para 1, was planned for elective cesarean section. In the preoperative evaluation, the patient with hypothyroidism was medicated levothyroxine 75 mcg day-1 and diagnosed hemophilia C. The American Society of Anesthesiologists' score was 2, and the Mallampati score was 2. No spontaneous bleeding, but menorrhagia also heavy bleeding during dental treatment were been in her history. The patient had been operated for cholecystectomy and cesarean section with fresh frozen plasma before these operations and no exessive bleeding was encountered. The preoperative laboratory parameters of the patient were aPTT 75.3 sec, INR 0.98, platelet count 150.000 ul-1, hemoglobin 11.9 g dl-1. In consultation with the Hematology department before the operation, 1 unit of fresh frozen plasma (FFP) was replaced. After the replacement, aPTT value was seen as 40.8 seconds, the patient was taken to the operation. Tranexamic acid 1 gr IV and 1 unit of FFP were administered intraoperatively. On the 3rd postoperative day, the aPTT value increased to 60.4 seconds, re-replacement was not planned with the recommendation of the Hematology department. The patient was discharged on the 4th postoperative day.

Conclusion: Clinically, spontaneous bleeding is rare and routinary treatment is not necessary, but the risk of bleeding may always be assessed according to the characteristics of the surgery. There are cases in the literature who underwent neuraxial anesthesia, and an increase in postpartum bleeding rates was reported in the cohort study. Bleeding management should be performed in the patient with hemophilia C with a multidisciplinary approach consisting of an anesthesiologist, hematologist and obstetrician.

Keywords: Factor XI Deficiency, anesthesia management, cesarian section

INTRODUCTION

Hemophilia C, which develops as a result of deficiency of Factor XI, is a rare coagulation disorder and was first described by Rosenthal in 1953(1). Spontaneous bleeding is rare in patients, severe bleeding may occur as a result of surgery and trauma. Hemorrhage is seen mostly in the oral and nasal mucosa and urogenital system, where fibrinolytic activity is high (2). In this case, we aimed to present the management of cesarean section anesthesia in a patient with Factor XI deficiency in the light of the literature.

CASE

31 years old, 85 kg, 36 weeks pregnant, gravida 2, para 1, was planned for elective cesarean section. In the preoperative evaluation, the patient with hypothyroidism was medicated levothyroxine 75 mcg day^{-1} and diagnosed hemophilia C. The American Society of Anesthesiologists' score was 2, and the Mallampati score was 2. No spontaneous bleeding, but menorrhagia also heavy bleeding during dental treatment were been in her history. The patient had been operated for cholecystectomy and cesarean section with fresh frozen plasma before these operations and no exessive bleeding was encountered. The preoperative laboratory parameters of the patient were aPTT 75.3 sec, INR 0.98, platelet count 150.000 ul^{-1}, hemoglobin 11.9 g dl^{-1}. In consultation with the Hematology department before the operation, 1 unit of fresh frozen plasma (FFP) was replaced. After the replacement, aPTT value was seen as 40.8 seconds, the patient was taken to the operation. Noninvasive blood pressure, peripheral oxygen saturation, and 3-channel electrocardiography were monitored. Tranexamic acid 1 gr IV and 1 unit of TDP were started to administer throughout the operation. In the first minute after induction with Propofol 200 mg and Rocuronium 80 mg, the patient was intubated with a 6.5 size intubation tube with videoryngoscope. Sevoflurane was started as a maintenance. Midazolam 2 mg and Fentanyl 75 mg were added at the 3rd minute after the baby came out. Cefazolin 1 g IV was administered as antibiotic prophylaxis, ondansetron 4 mg IV for antiemetic prophylaxis, and Parol 1 g IV for postoperative analgesia. Oxytocin, which we routinely apply for postpartum hemorrhage (PPH) prophylaxis, was started as a 20 IU slow

infusion after 10 IU IV push was applied. Methylergonovine 0.2 mg was administered intramuscularly. Tranexamic acid 1 gr IV and 1 unit of FFP were administered intraoperatively. The patient's hemodynamic parameters remained stable throughout the operation. Total bleeding was 500cc, 2000cc crystalloid was replaced. After the operation that lasted for 1 hour, the patient was reversed with Sugammadex 200 mg and extubated without any problem.On the 3rd postoperative day, the aPTT value increased to 60.4 seconds, re-replacement was not planned with the recommendation of the Hematology department. The patient was discharged on the 4th postoperative day.

DISCUSSION

It is a rare genetic disease and the incidence has been reported as 1/1,000,000. (3) The coding gene is located on the 4th chromosome. Although it was initially thought to be inherited as autosomal dominant, it has been shown to be an autosomal recessive disease with homozygous and heterozygous forms. With this feature, it is distinguished from X-linked recessive inherited Factor VIII deficiency (Hamophilia A) and Factor IX deficiency (Hamophilia B). In individuals with homozygous mutation, Factor XI level is below 15-20 U/dl and it is defined as severe deficiency. In individuals with heterozygous mutations, Factor XI level is above 15-20 U/dl and below 50-70 U/dl, which is normal for the laboratory, and is defined as partial deficiency. Patients with severe Factor XI deficiency have excessive bleeding after surgery and trauma, especially in the oral and nasal mucosa and urogenital system, where fibrinolytic activity is high (4). Spontaneous bleeding, unlike Hemophilia A and B, is not a part of Hemophilia C, but it has been reported that spontaneous hemarthrosis is very rare. Differently some patients with severe Factor XI deficiency did not appear to have bleeding disorders. Factor XI level is considered to have low correlation with the degree of bleeding disorder. While some patients with severe factor deficiency do not have increased bleeding after trauma, some patients with partial factor deficiency may experience excessive bleeding after trauma. (5)

Clinically, spontaneous bleeding is rare and routinary treatment is not necessary, but the risk of bleeding may always be assessed according to the characteristics of the surgery (6,7) There are cases in the literature who underwent neuraxial anesthesia, and an increase in postpartum bleeding rates was reported in the cohort study (8)

CONCLUSION

Bleeding management should be performed in the patient with hemophilia C with a multidisciplinary approach consisting of an anesthesiologist, hematologist and obstetrician.

REFERENCES

1. Rosenthal RL, Dreskin OH, Rosenthal N. New hemophilia-like disease caused bydeficiency of a third plasma thromboplastin factor. Proceedings of the Society for Experimental Biology and Medicine Society for Experimental Biology and Medicine (New-York, NY).1953;82(1):171-4.
2. Emmanuelle de R, Frédéric B, Brigitte P-P, Jenny G. Déficiten facteur XI.Hématologie. 2010;16(4):284-92.
3. Saunders RE, O'Connell NM, Lee CA, Perry DJ, Perkins SJ. Factor XI deficiency database: an interactive web database of mutations, phenotypes, and structural analysis tools. Hum Mutat. 2005 Sep;26(3):192-8.
4. Salomon O, Steinberg DM, Seligshon U. Variable bleeding manifestations characterize different types of surgery in patients with severe factor XI deficiency enabling parsimonious use of replacement therapy. Haemophilia. 2006 Sep;12(5):490-3.
5. Módolo NS, de Azevedo VL, Santos PS, Rosa ML, Corvino DR, Alves LJ. Anesthetic strategy for cesarean section in a patient with factor XI deficiency. Case report. *Rev Bras Anestesiol*. 2010;60(2):176-10
6. Gerber GF, Klute KA, Chapin J, Bussel J, DeSancho MT. Peri- and Postpartum Management of Patients With Factor XI Deficiency. Clin Appl Thromb Hemost. 2019 Jan-Dec;25:1076029619880262.
7. Martín-Salces M, Jimenez-Yuste V, Alvarez MT, Quintana M, Hernández-Navarro F. Review: Factor XI deficiency: review and management in pregnant women. Clin Appl Thromb Hemost. 2010 Apr;16(2):209-13.
8. Stoeckle JH, Bogue T, Zwicker JI. Postpartum haemorrhage in women with mild factor XI deficiency. Haemophilia. 2020 Jul;26(4):663-666.

OP-26 (Obstetric Anesthesia)
Full Manuscript

Anesthetic Approach in Case of Placenta Percreata: Case Series

Hafize Yasemin Dayican[1], İlkay Baran Akkuş[2]

[1] University of Health Sciences Ankara Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2] University of Health Sciences, Yıldırım Beyazıt Dışkapı Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Placenta percreata is common in line with the increase in cesarean delivery.Diagnosis during pregnancy has vital importance.We present the anesthetic management of eight placenta percreata cases.

Case: Eight patients who delivered by cesarean section were operated with the diagnosis of PAS (placenta accreta spectrum disorders). Standard monitoring was applied.Three peripheral venous accesses were placed.Patients are subjected to invasive arterial blood pressure and blood gas monitoring.Central venous catheterization was inserted in two patients. İntraoperative bleeding was monitored. The patients were multiparous between the ages of 26-42.Gestational weeks were between 27-35.Average operative time lasted for 3-4 hours. Two patients had the administration of general anethesia while seven had spinal anesthesia.Diagnosis of placenta percreata were establihed by intraoperative observation.Preoperative haemoglobin(Hb) values were between 9.8-12g/dl. Intraoperative bleeding amount was between 1200-3000cc. Two patients with 2500-3000cc intraoperative bleeding admitted to intensive care unit received 4U packed red blood cell (PRBC), 4U fresh frozen plasma (FFP), fibrinogen, 3000cc fluid.Patient operated under emergency conditios with an Hb value of 7.5g/dl received 2U 0RH(-) PRBC.Two patients received steradine infusion. 2U PRBC, 2U FFP, 3500cc fluid were given to two of the patients who bled 1500cc.A patient with 2000cc bleeding received 3U PRBC, 3U FFP, 3500cc fluid.Two patients who received 2000cc fluid had no bleeding into the aspirator.One patient had no blood product transfusion.The other patient received 1U PRBC.All patients received 500cc colloid. After the breech delivery of the baby, 1g transamine was administered to the patients.The hysterectomy was performed leaving the placenta in situ.In 3 cases, the uterus was densely adhered to the bladder, and the surgical plan was lost. Muscular defects occurred in the bladder which was repaired by the urology. In two cases, the intestines were adhered to the posterior surface of the uterus and no problem was encountered.

Conclusion: The effect of PAS on pregnancy outcomes is well defined. A multidisciplinary team should discuss potential intraoperative complications and interventions (eg, severe bleeding, blood transfusion, injury or partial resection of bladder and bowel, hysterectomy, risk of postoperative vesicovaginal fistula).Management and delivery in a tertiary care hospital improves outcomes and reduces complication rates.

Keywords: Hemorrhage, placenta percreta, hysterectomy, transfusion

INTRODUCTION

Placenta accreta spectrum disorder (PAS) is a condition in which implantation of the placenta occurs abnormally, including placenta accreta, placenta increta and placenta percreta. : Placenta percreta is a form of placenta accreta spectrum disorder (PAS) where the placenta deeply implants into the uterine wall, often seen in women with a history of caesarean section or placenta previa (1). This severe form of PAS can result in the placenta penetrating the entire uterine wall and attaching to another organ such as the bladder and bowel, leading to major obstetric haemorrhage, peripartum hysterectomy, and maternal and fetal morbidity and mortality (1).

The timely diagnosis of this condition during pregnancy is of utmost importance. In this study, we present the anaesthetic management of eight cases of placenta percreta.

MATERIAL AND METHODS

Eight multiparous patients between the ages of 26-42 who were diagnosed with placenta accreta spectrum disorders underwent caesarean section. The files and anaesthesia records of 8 patients were reviewed. Standard monitoring was applied, and three peripheral venous accesses were placed. Invasive arterial blood pressure and blood gas monitoring were conducted, and central venous catheterization was performed in two patients. In the intraoperative period, the amount of bleeding at the surgical site is monitored by the number of sponges, the amount of bleeding in the drapes, the amount of blood in the aspirator and a Hb and HTC follow-up and the hourly urine output is routinely monitored. The patients were given either general or spinal anaesthesia. The two of them who were taken to the operating room to undergo caesarean section underwent rapid induction with IV propofol, rocuronium as a muscle relaxant and sevoflurane as an inhalation agent in 50%O2 / 50% air in the administration of general anaesthesia. Six patients had spinal anaesthesia with 15 mg bupivacaine The diagnosis of placenta percreta was established through intraoperative observation. Preoperative haemoglobin values ranged from 9.8-12g/dl, and the gestational age ranged from 27-35 weeks. The average operative time was 3-4 hours.

RESULTS

The amount of intraoperative bleeding ranged from 1200-3000cc. Three patients had 2500-3000 cc intraoperative bleeding. Two of the three with 2500-3000cc intraoperative bleeding were admitted to the intensive care unit and received 4 units of packed red blood cells (PRBCs), 4 units of fresh frozen plasma (FFP), fibrinogen, and 3000cc of fluid. One patient who underwent surgery under emergency conditions with an Hb value of 7.5g/dl received 2 units of 0RH (-) PRBCs. The other patient bled 2500 cc. 2 units PRBCs, fibrinogen and 2500cc of fluid. 3 patients received steradine infusion. Two patients who bled 1500cc received 2 units of PRBCs, 2 units of FFP, and 3500cc of fluid. One patient who bled 2000cc received 3 units of PRBCs, 3 units of FFP, and 3500cc of fluid. Two patients who received 2000cc of fluid had no bleeding into the aspirator. "In one of the patients, the sponges showed 500 cc of bleeding, and she received 1 unit of PRBCs. The other patient did not require any blood product transfusion. All patients received 500cc of colloid. After the delivery of the baby, 1g of transamine was administered to the patients. The hysterectomy was performed, leaving the placenta in situ. In three cases, the uterus was densely adhered to the bladder, and the surgical plan was lost. Muscular defects occurred in the bladder, which was repaired by the urology team. In two cases, the intestines were adhered to the posterior surface of the uterus, but no problems were encountered.

DISCUSSION

Optimum management of placenta percreta requires early detection and a planned caesarean hysterectomy, ideally at about 34–36 weeks. Antenatal supplementation with oral iron can maximize iron stores and improving the oxygen-carrying capacity of blood. In a selected group of patients, erythropoietin injections and/or simultaneous parenteral iron infusions may be needed preoperatively.(2) A multidisciplinary approach by a team of experienced obstetricians, anaesthesiologists, nurses, interventional radiologists, neonatologists, and urologists, as well as a blood bank, ensures the best outcomes.(3)

Anaesthetic management requires meticulous preoperative planning. Important management factors include the following: optimization of haemoglobin, adequate intravenous access, availability of rapid infusers, hemodynamic monitoring (including central venous and peripheral arterial access), use of a cell saver, rapid availability of blood products, compression stockings, padding and positioning to prevent nerve compression, and avoidance and treatment of hypothermia.

Compared with general anaesthesia, regional anaesthesia for caesarean delivery is associated with a 17-fold decrease in the overall rate of complications, including failed endotracheal intubation, aspiration of gastric contents, hypoxia (4), intraoperative recall (5), and a 1.7-fold decreased risk of maternal death(6) Neuraxial anaesthesia for peripartum intervention is now considered a standard of practice in developed countries. Hypotension due to sympathectomy and an inability to quickly titrate down the level of anaesthesia after establishment of neuraxial block make spinal and epidural anaesthesia a less favourable choice in cases in which hemodynamic instability is likely. Coagulation abnormalities, which frequently follow haemorrhage and transfusion, substantially increase the risk of spinal or epidural hematoma formation, especially during manipulation of the catheter (7). Due to the significant risk of massive bleeding complicated by profound hypotension and coagulopathy and a high likelihood of hysterectomy during caesarean delivery, general anaesthesia is generally regarded as the anaesthetic of choice for patients with placenta accreta. Lately, some authors have suggested that regional anaesthesia may be an acceptable alternative for otherwise healthy patients with a minimal degree of invasion of placenta accreta (8). Patients selected for conservative management would also benefit from avoidance of general anaesthesia. For such patients, epidural (8) or combined spinal–epidural (9) anaesthesia would be preferable. Some authors have advocated a combination of regional and general anaesthesia. In this way, delivery of the baby can be performed under regional anaesthesia which would allow the mother to be awake during that critical time, followed by conversion to general anaesthesia for performance of the hysterectomy (10).The use of caesarean section (CS) for placenta previa (PP) is a controversial issue in terms of anaesthesia management. While most anaesthesiologists believe that general anaesthesia (GA) is mandatory for this indication, there are also studies in the literature that claim the opposite (11-13). It has also been noted in various studies that regional anaesthesia (RA) may be prioritized depending on the position of the placenta, the urgency of the situation, and the presence of bleeding (12-13). Arcario et al. reported in their retrospective study involving 180 patients that RA is not a definite contraindication in this patient group, and sympathetic blockade reduces blood loss (14). In another study, it was reported that RA was applied to 25% of 147 patients who underwent CS due to PP, and there was no maternal or fetal mortality and morbidity (15). Additionally, it has been reported that RA may be preferred in CS for pregnant women diagnosed with PP because the inhalation agents used in GA relax the uterus, increasing the need for bleeding and transfusion (14,15). In Parekh et al.'s retrospective study involving 350 patients, RA was applied to 60% of the patients, and 5 patients underwent CS hysterectomy due to placenta accreta, of which 4 started with RA but had to switch to GA during the surgery in 2 patients. It was noted that the hypotension caused by RA reduces blood loss and

the need for transfusion (16). In a large retrospective study in Canada on the anaesthesia approach in placenta accreta, it was reported that uterine artery embolization was performed in 23 out of 56,892 births due to placenta accreta. It was reported that epidural catheterization was performed in all these cases, and regional anaesthesia was applied in 17 patients with more than 2 L of blood loss, GA was used in 6 patients, and hysterectomy was performed in a total of 11 cases (17).

Massive haemorrhage during delivery and total hysterectomy makes it critical to know how to respond to massive haemorrhage and DIC in a timely and suitable manner. It is necessary to plan for an adequate number of health care providers, role division, access to the venous system, blood transfusion, haemostatic technique, and data collection must all be coordinated in parallel. In critical massive haemorrhage cases, Takeda S et al. recommended, the blood of the same ABO group be used, even omitting the cross-matching test. In case of insufficient availability of the same ABO group, noncrossmatched compatible RBC and fresh frozen plasma (FFP) can be used. Transfusions of RBC and FFP should be done to achieve haemoglobin levels of 7 to 8 g/dl, fibrinogen levels of 150 mg/dl or higher, and total protein levels of 4.0 g/dl or higher. The platelet concentration should be kept at or above 100000/cubic millimetres. (18)

The management of massive obstetric hemorrhage requires careful consideration of fluid and blood product resuscitation. To avoid dilutional coagulopathy and exacerbation of the discrepancy in activity of coagulation factors, the use of crystalloids and colloids should be minimized. A higher ratio of FFP and platelets to RBCs significantly decreases the risk of coagulation abnormalities, and the appropriate use of cryoprecipitate and antifibrinolytic agents is recommended. Monitoring of coagulation factors, electrolytes, and hemostasis should be performed regularly, and point-of-care devices such as thromboelastography and thromboelastometry may improve assessment of overall hemostasis. Factor VII may be considered in cases of failure to respond to other treatments.(19,20,21,22)

CONCLUSION

The impact of placenta accreta spectrum disorders on pregnancy outcomes is well established. A multidisciplinary team should discuss potential intraoperative complications and interventions such as severe bleeding, blood transfusion, injury or partial resection of bladder and bowel, hysterectomy, and the risk of postoperative vesicovaginal fistula. The management and delivery of these cases in a tertiary care hospital improve outcomes and reduce complication rates.

REFERENCES

1. Morlando M, Collins S. Placenta accreta spectrum disorders: Challenges, risks, and management strategies. Int J Womens Health. 2020; 12:1033-45
2. Publications Committee, Society for Maternal-Fetal Medicine, Belfort MA. Placenta accreta. Am J Obstet Gynecol. 2010;203(5):430–439.
3. Parva M, Chamchad D, Keegan J, Gerson A, Horrow J. Placenta percreta with invasion of the bladder wall: management with a multidisciplinary approach. J Clin Anesth. 2010;22(3):209–212.
4. Lynch J, Scholz S. Anaesthetic-related complications of caesarean section. Zentralbl Gynakol 2005; 127:91–95.
5. Paech M, Scott K, Clavisi O, et al. A prospective study of awareness and recall associated with general anaesthesia for caesarean section. Obstetric Anesthesia Digest 2009; 29:155–156.
6. Hawkins JL. Anesthesia-related maternal mortality. Clin Obstet Gynecol 2003; 46:679–687.
7. Horlocker TT, Wedel DJ, Rowlingson JC, et al. Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Third Edition). Reg Anesth Pain Med 2010; 35:64–101.
8. Chestnut DH, Dewan DM, Redick LF, et al. Anesthetic management for obstetric hysterectomy: a multiinstitutional study. Anesthesiology 1989; 70:607–610.
9. Wise A, Clark V. Strategies to manage major obstetric haemorrhage. Curr Opin Anesthesiol 2008; 21:281–287.
10. Murata H, Hara T, Sumikawa K. Anesthesia for cesarean hysterectomy in a parturient with placenta accreta. Masui 2009; 58:903–906.
11. Tunstall ME. Section I. Discussion. In Reynolds F, ed. Epidural and spinal Blockade in Obstetrics. London: Bailiere Tindall, 1990; 35-37. 8
12. Bonner SM, Haynes SR, Ryall D. The anaesthetic management of Anestezi Dergisi 2018; 26 (1): 15 - 19 Özlem Özmete : Plasentasyon anomalileri ve anestezi 19 Caesarean section for placenta previa: a questionnaire survey. Anaesthesia 1995; 50: 992-994.
13. Plummer MH, Rottman R. How anaesthesiologists practice obstetric anesthesia. Responses of practicing obtetric anesthesiologists at the meeting of the Society for Obstetric Anaesthesia and Perinatology. Reg Anesth 1996; 21: 49-60.
14. Arcario T, Greene M, Ostheimer GW, Datta S, Naulty JS. Risks of placenta praevia/accreta in patients with previous Caesarean deliveries. Anesthesiology 1988; 69: 659.
15. McShane PM, Heyl PS, Epstein MF. Maternal and perinatal morbidity resulting from placenta praevia. Obstet Gynecol 1985; 65: 176-182.

16. Parekh N, Husaini SWU, Russell IF. Caesarean section for placenta previa: a retrospective study of anaesthetic management. British Journal of Anesthesia 200: 84; 725-730.
17. Lilker SJ, Meyer RA, Downey KN, Macarthur AJ. Anesthetic considerations for placenta accreta. Int J Obstet Anesth 2011; 20: 288-292.
18. Takeda S, Takeda J, Makino S. Cesarean section for placenta previa and placenta previa accreta spectrum. Surg J. 2020; 6(Suppl 2):S110-21.
19. Watts DD, Trask A, Soeken K, et al. Hypothermic coagulopathy in trauma: effect of varying levels of hypothermia on enzyme speed, platelet function, and fibrinolytic activity. J Trauma 1998; 44:846–854
20. Mittermayr M, Streif W, Haas T, et al. Effects of colloid and crystalloid solutions on endogenous activation of fibrinolysis and resistance of polymerized fibrin to recombinant tissue plasminogen activator added ex vivo. Br J Anaesth 2008; 100:307–314.
21. Charbit B, Mandelbrot L, Samain E, et al. The decrease of fibrinogen is an early predictor of the severity of postpartum hemorrhage. J Thromb Haemostasis 2007; 5:266–273.
22. Shakur H, Elbourne D, Gulmezoglu M, et al. The WOMAN Trial (World Maternal Antifibrinolytic Trial): tranexamic acid for the treatment of postpartum haemorrhage: an international randomised, double blind placebo controlled trial. Trials 2010; 16:40.

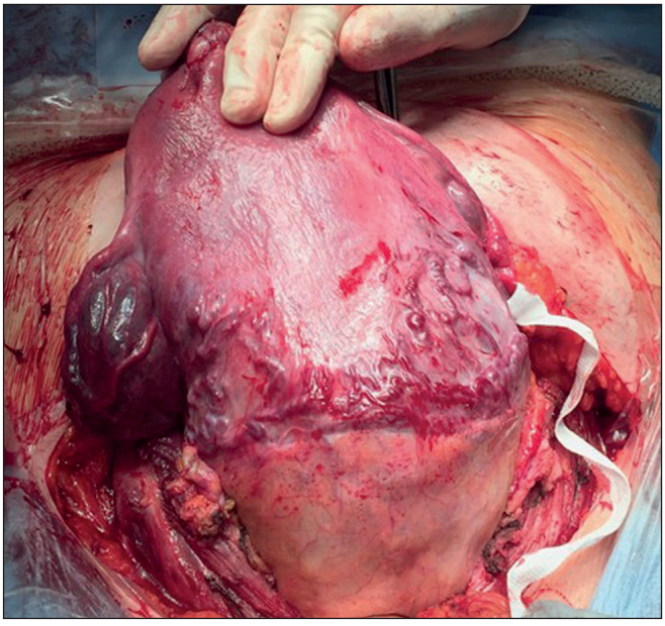


Figure 1. Placenta percreta, showing aberrant neovascularization of the lower uterine segment. This extends down behind the urinary bladder (this can just be seen at the top of the bladder).

ROTEM Guided Multidisciplinary Management of Massive Perioperative Bleeding in Abdominal Myomectomy Operation

Nuray Camgoz Eryilmaz, Selin Erel, Berrin Gunaydin

Gazi University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Myomectomy remains the most popular methods for those who have myomas and desire further childbearing. Substantial perioperative blood loss has been associated with myomectomy and sometimes comprehensive management needs to be performed to control bleeding which results in increased morbidity and mortality. In this case, we aimed to share the management of massive perioperative bleeding in abdominal myomectomy.

Case: A 24-year-old ASA 1 patient was scheduled for myomectomy under general anesthesia. Anesthesia was induced with intravenous (IV) propofol, lidocaine, and rocuronium, followed by sevoflurane and remifentanil while ECG, SpO2, and noninvasive arterial blood pressure were monitored. Intraoperatively, due to increased bleeding, invasive arterial monitoring was performed and another vascular access was established. Thoughout the procedure there was a total of 2000 mL of bleeding. Intraoperatively, 3 units of packed red blood cell (RBC) and 3 units of fresh frozen plasma (FFP) were administered to the patient, whose hemoglobin value dropped to 2.8 g/dL. One gram (g) of tranexamic acid was given intravenously. The patient was transferred to the post-anesthesia care unit (PACU) after extubation. Postoperatively 1 g of IV tranexamic acid was repeated , IV infusion of 20 IU oxytocin in 1 L Ringer's lactate solution, and intramuscular 0.2 mg methylergonovine were administered. After the hemoglobin level reached 5.3 g dL^{-1}, 2 units of RBC were administered, and ROTEM analysis was performed. The patient was given 5 g of IV fibrinogen since FIBTEM A5 was 3 mm and EXTEM A5 was 15 mm. Since the drain was oozing 850 mL of blood and the patient was hypotensive and tachycardic, she was transported to interventional radiology unit, where uterine artery embolization was performed under monitored anesthesia care anesthesia. Following the surgery, the patient was taken to the PACU.

Discussion: Myomectomy is often associated with intraoperative bleeding, leading to significant blood loss and consequently resulting in anemia, hypovolemia, and coagulation abnormalities, necessitating blood transfusions thus lengthening hospital stay. Treatment options for hemorrhage due to uterine atony include administration of pharmacologic agents, tamponade of the uterus, surgical techniques or endovascular embolization.

Conclusion: Since ROTEM-guided bleeding management has an important role in improved patients' outcomes including perioperative morbidity and mortality, effective coagulopathy management by using ROTEM together with interventional radiologic techniques if available would be the best practice in bleeding abdominal myomectomy patients.

Keywords: ROTEM, perioperative bleeding, massive hemorrhage, obstetric hemorrhage

INTRODUCTION

Leiomyomas, are benign tumors that arise from the smooth muscle tissue of the uterus. They are the most common type of benign tumor affecting the female reproductive system, with a prevalence of 20% to 40% in women at reproductive age. For women who wish to preserve their fertility and have symptomatic leiomyomas, myomectomy is the preferred treatment option. Myomectomy involves the surgical removal of tumour while preserving the uterus. However, one of the main challenges of myomectomy is the risk of excessive bleeding during or after the procedure, which can lead to the need for a hysterectomy or other interventions to control bleeding. This can increase the risk of morbidity and mortality and can also compromise future fertility (1). To address this challenge, a multidisciplinary surgical and interventional radiological approach under general anesthesia and monitored anesthesia care, respectively for myomectomy along with management of perioperative bleeding has been proposed. The team approach involves a coordinated effort among gynecologists, anesthesiologists, interventional radiologists, and blood bank personnel to optimize patient outcomes.

In this case report, we present a successful management of massive perioperative bleeding in a patient undergoing abdominal myomectomy. The approach involved preoperative planning, intraoperative hemodynamic monitoring, the use of tranexamic acid and other hemostatic agents, and the timely intervention of selective uterine artery embolization. With this approach, the patient was able to avoid a total hysterectomy and achieve a favorable outcome with minimal morbidity and preserved fertility.

CASE

A 24-year-old ASA I patient, was scheduled to undergo myomectomy under general anesthesia. The induction of anesthesia

was achieved with IV propofol, lidocaine, and rocuronium, and then maintained with sevoflurane and remifentanil while continuously monitoring the patient's vital signs such as electrocardiogram, peripheral oxygen saturation and noninvasive arterial blood pressure.

During the procedure, due to the increased blood loss, the patient necessitated invasive arterial monitoring and an additional vascular access. The total amount of bleeding during the operation was 2000 mL, which prompted the administration of 3 units of red blood cell (RBC) and 3 units of fresh frozen plasma, as the patient's Hb value dropped to a critical 2.8 g dL^{-1} (Figure 1). To counteract this, 1 g of tranexamic acid was administered intravenously.

Upon the completion of the myomectomy, the patient was transferred to the post-anesthesia care unit (PACU) after extubation. However, the patient experienced postoperative bleeding, which was treated with 1 g of IV tranexamic acid, 20 IU oxytocin in 1 L of Ringer's lactate solution, and intramuscular 0.2 mg methylergonovine. To address the low Hb levels, 2 units of RBC were administered, and ROTEM analysis was conducted, which revealed that the patient's FIBTEM A5 was only 3 mm and her EXTEM A5 was 15 mm (Figure 2). Consequently, the patient was given a total of 5 g of fibrinogen.

Unfortunately, the patient continued to bleed and oozing from the drain, which led to the loss of 850 mL of blood. This, coupled with the patient's hypotension and tachycardia, the patient transfered to interventional radiology unit. Under monitored anesthesia care, the patient underwent uterine artery embolization to stop the bleeding (Figure 3). Following the embolization, the patient was sent back to the PACU for further follow up.

DISCUSSION

Myomectomy is commonly associated with intraoperative bleeding, which can result in significant blood loss. This can lead to various complications such as anemia, hypovolemia, and coagulation abnormalities. As a consequence, patients may require blood transfusions, which can prolong hospital stay and increase healthcare costs (1).

Fortunately, there are several pharmacological/non-pharmacological and surgical/non-surgical treatment options available to manage perioperative hemorrhage for myomectomy. These include the administration of tranexamic acid, fibrinogen, uterotonics, blood/blood products transfusion, tamponade of the uterus, surgical sutures or interventional uterine artery embolization (2). By employing these strategies, physicians can effectively control bleeding and minimize the risk of complications. Previously effect fo uterine artery embolisation on size and symptomatology of leiomyoma under patient controlled IV analgesia with meperidine was evaluated in our institution (3). Additionally, we managed postpartum bleeding due to uterine atony/rupture in a parturient after vaginal delivery by using interventional therapy in the ongoing bleeding during intensive care unit follow-up (4). Therefore, availability of interventional radiology facility might be very helpful in life-threatening bleeding situations.

One promising approach is the use of ROTEM-guided algorithms in bleeding patients. This innovative technique involves monitoring blood coagulation and clot formation in real-time using a point of care device called ROTEM analyzer (5). By continuously assessing clotting parameters, physicians can quickly identify and correct any abnormalities, controlling of intraoperative bleeding and improving patient outcomes.

Overall, by employing a range of treatment options, including ROTEM-guided algorithms, clinicians can effectively manage hemorrhage during myomectomy, ultimately improving patient safety, reducing morbidity and mortality, and promoting faster recovery.

In our case, the timely administration of medications and close monitoring allowed for the successful treatment of the patient's bleeding and the safe completion of the surgery.

CONCLUSION

To sum up, our case report highlights the importance of considering the possibility of massive bleeding in abdominal myomectomies. As we have seen, even in the absence of risk factors such as coagulation disorders or large myomas, bleeding can still occur and lead to life-threatening complications. Therefore, we recommend to keep this possibility in mind and take the necessary precautions to prevent and manage bleeding during and after surgery. Based on the growing evidence the use of a rotem-guided bleeding management strategy for severely bleeding myomectomy during the perioperative period in addition to surgical and endovascular interventions would be a promising approach.

REFERENCES

1. Ye M, Zhou J, Chen J, Yan L, Zhu X. Analysis of hidden blood loss and its influential factors in myomectomy. J Int Med Res 2020;48(5):1-11.
2. Seracchioli R, Esposti ED, Arena A. Perioperative blood loss after abdominal myomectomies: new solutions to an old problem. Fertil Steril 2021;115(3):609-10.
3. Bayram B, Turgut IE, Altan B, Günaydın DB, Önal AB, Akkan MK et al. Evaluation of Uterine Artery Embolisation on Size and Symptomatology of Leiomyoma Under Patient Controlled Analgesia with Meperidine. International Journal of Gynecological and Obstetrical Research 2014;(2):14-9
4. Gunaydin B, Inan G, Turgut E et al. Perioperative Management of Bleeding due to Uterine Atony/Rupture in a Parturient after Vaginal Delivery and Intensive Care Unit Follow-up: Pharmacological, Surgical and Interventional Therapies. Turk J Intensive Care 2020;18:39-45
5. Kietaibl S, Ahmed A, Afshari A et al. Management of severe peri-operative bleeding: Guidelines from the European Society of Anaesthesiology and Intensive Care: Second update 2022. EJA 2023;40(4):226-304.

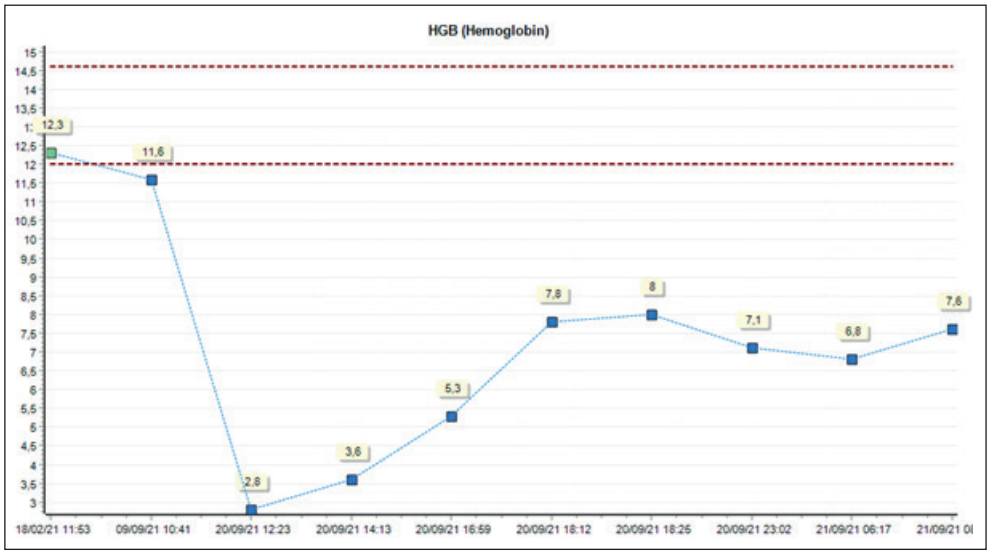


Figure 1. Hemoglobin levels and the critical drop.

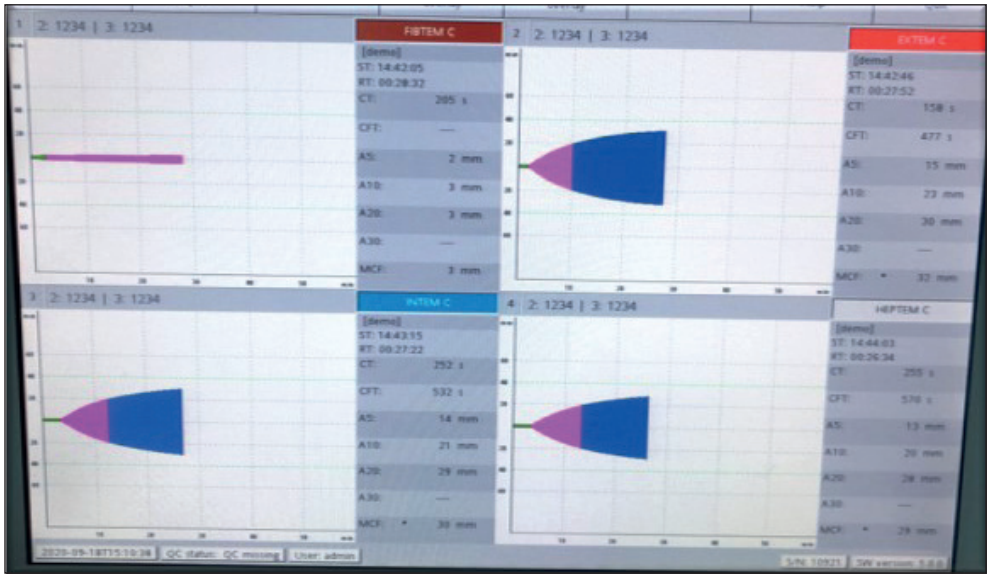


Figure 2. ROTEM analysis.

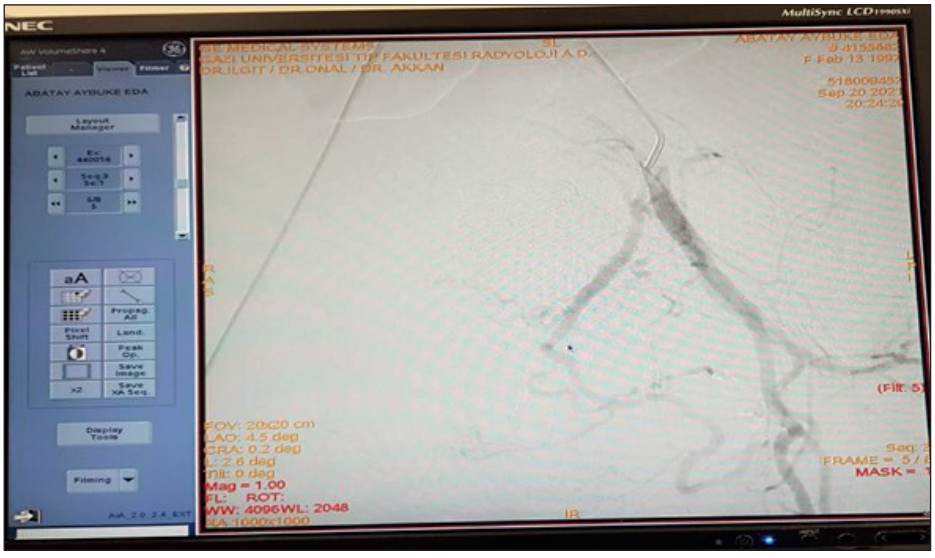


Figure 3. Uterine artery embolization.

Our Anesthesia Management in a Pediatric Patient with Moyamoya Disease

Yeliz Kılıç, Mehmet Sacit Güleç

Osmangazi University Faculty of Medicine, Department of Anesthesiology and Reanimation, Eskişehir, Türkiye

ABSTRACT

Background: Moyamoya disease (MMD) is a chronic cerebrovascular disease characterized by progressive stenosis or occlusion of the main intracranial cerebral arteries, usually bilateral, and the development of compensatory collateral vessels (1). Unspecified systemic processes may accompany this progressive vasculopathy. It is a rare disease that is more common in women than in men, occurs most frequently in the first and fourth decades of life, and includes familial predisposition findings.

Loss of focal motor and sensory functions due to transient ischemic attacks in children. While it can be followed, intracranial hemorrhage and cerebrovascular insufficiency are seen in the adult form. During the surgery, for prevention of ischemic complications, hypocapnia, hypercapnia, hypotension, and hypovolemia during surgery should be avoided.

Case: An 11-year-old girl with a weight of 35 kg was evaluated for right achillesectomy operation. The patient with MMD in ASA2 physical condition had never received anesthesia before. After routine monitoring, a laingeal mask airway (LMA) was inserted with 150 mg propofol, 10 µg remifentanil, 10 mg rocuronium. Since total intravenous anesthesia was planned for the maintenance of anesthesia, the patient was followed up with additional bispectral index (BIS) monitoring. TIVA was applied with propofol 25-100 µg/kg/min and remifentanil 03-0.5 µg/kg/min remifentanil together with 50%-50% oxygen-air mixture. After two hours, 350 mg of parol was administered for postoperative analgesia, and the patient awakened without any problem.

Conclusion: In surgery for MMD, anesthesia management is a specific topic and there are many different opinions. While it is suggested that inhalation anesthetics may be a good choice due to their cerebral vasodilator effects, there are publications recommending intravenous anesthesia with propofol due to the risk of stealing some inhalation anesthetics. Additionally balanced and total intravenous anesthesia is recomended for the revascularization procedure in MMD patients. Although cerebral oxygenation monitoring (NIRS) may be helpful for guiding hemodynamic targets in long-term revascularization surgeries, the effect of neuromonitorization on neurological outcomes is concussive. We did not use NIRS because of the type and duration of surgery. We wanted to present our anesthesia experience with using TİVA under BIS monitoring in our patient.

Keywords: Bispectral index, cerebral oxygenation monitoring, moyamoya, total intravenous anesthesia

REFERENCES

1. Keleş GT, Topçu İ, Canan S., Ağdanlı D., Duransoy Y. Moyamoya hastalığı ve anestezi: tiva & vima. *Göztepe tıp Dergisi 2013; 28*(2), 95-100.
2. Parray T, Martin TW, Siddiqui S. Moyamoya disease: a review of the disease and anesthetic management. J Neurosurg Anesthesiol. 2011 Apr;23(2):100-9.
3. Giustini AJ, Stone SA, Ramamoorthy C. Moyamoya disease in children and its anesthetic implications: A review. Paediatr Anaesth. 2020 Nov;30(11):1191-1198.

The Effect of Blood Pressure Value on Intraoperative Imaging in Biportal Endoscopic Spine Surgery

Mehmet Can Gezer[1], Menekşe Özçelik[2], Abdullah Merter[1]

[1]Ankara University Faculty of Medicine, Department of Orthopedics and Traumatology, Ankara, Türkiye
[2]Ankara University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Spinal stenosis is a common cause of low back pain in the elderly population. The aim of our study is to investigate the relationship between vision and blood pressure during tube decompression in patients with lumbar spinal stenosis and to clarify the optimal blood pressure to maintain good visualization during surgery.

Material and Methods: At the beginning of UBE, during laminectomy and during formaninotomy, 3 consecutive blood pressure measurements were taken with 2-minute intervals, and the patient's systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) were recorded. The mean of these consecutive measurements was taken to determine the SBP, DBP, MAP of these surgical stages. Simultaneously, the first surgeon and the assistant surgeon were asked to evaluate the image quality. Surgeons evaluated the image quality independent of blood pressure values and each other, as 4 best and 1 worst. Stages 4 and 3 were evaluated as good images for surgery, and Stages 2 and 1 were evaluated as bad images for surgery.

Results: Forty-five patients (25 F, 20 M) with a mean age of 66.88. who were scheduled for UBE surgery due to lumbar stenosis were included. The mean blood pressure values of the good (stage 4-3) and bad (stage 2-1) image groups at the surgical stages were compared. When the mean SBP, DBP and MAP values of the good image group were compared with the mean values of the bad image group at the beginning of UBE and at the foraminotomy stage, no statistical difference was observed (p=0.29/0.10/0.26), (p=0.96/0.07/0.22).When the mean SBP and MAP values of the good image group were compared with the mean values of the poor image group at the laminectomy stage, no statistical difference was observed (p=0.42/0.05). However, there was a statistically significant difference between the mean DBP between the groups (p=0.02). ROC analysis was performed and the cut-off value was found to be 106.34 mm Hg for SBP.

Conclusion: UBE decompression monitoring clarity is correlated with patient blood pressure. Keeping the systolic blood pressure below 106 mmHg ensures good monitoring clarity, without posing a risk to the patient during the surgery

Keywords: Blood pressure, monitoring, UBE

Anesthesia Management in a Patient With Amyotropic Lateral Sclerosis

Meltem Bektaş, Salih Birkan Arı, Eda Nur Köksal

[1] Ankara Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Amyotrophic Lateral Sclerosis (ALS) is a progressive disease characterized by degeneration of motor neurons. Anesthesia management is difficult due to hypersensitivity to neuromuscular blocking agents, muscle weakness, respiratory dysfunction, and regional anesthesia increasing neurological symptoms in ALS patients. In this case, we present a patient with ALS who was operated for left femoral fracture. In our case, we used propofol and remifentanyl infusion without using neuromuscular blockers.

Case: An operation was planned for a 57-year-old female ALS patient due to a fracture of the left distal femur. Verbal and written consent was obtained from the patient.She had been operated under general anesthesia for a right hip fracture 7 months ago, neuromuscular blockade was applied and recovery from anesthesia was delayed. Neurological examination revealed weakness in both upper and lower extremities. The patient was evaluated as ASA 3. Total intravenous anesthesia(TIVA) is planned as the method of anesthesia. Bispectral index (BIS) was used to detect the depth of anesthesia. Induction was performed with 3.5 mg/kg propofol and 1,5 mcg/kg remifentanyl. After measuring BIS as 40,the patient was intubated using video laryngoscopy. In maintanence,we used 12mg/kg/h of propofol and 0,2-0,5 mcg/kg/dk remifentanyl. After 120 minutes of operation, TIVA was terminated, and the patient was extubated when the tidal volume was sufficient and the BIS value was above 90. 15 mg/kg paracetamol and 1,5mg/kg tramadol was administered for analgesia. The patient was discharged to the ward from intensive care unit after 2 hours of follow up. Neurological examination of the patient was the same as preoperative period after 3 weeks of surgery.

Conclusion: The use of neuromuscular blockers in ALS patients may cause prolonged paralysis, therefore it is recommended to use neuromuscular blockers in small doses or not at all. Regional anesthesia, on the other hand, may exacerbate pre-existing neurological symptoms and the level of block may not be predicted TIVA can be safely applied in anesthesia. Avoiding the use of muscle relaxants, postoperative respiratory problems and muscle weakness are not experienced.

Keywords: Amyotrophic lateral sclerosis, total intravenous anesthesia, without neuromuscular blockade

INTRODUCTION

ALS is a chronic progressive degenerative disease of the motor system due to both upper and lower motor neuron involvement. It usually starts with the symptoms such as focal muscle weakness, difficulty in speaking and swallowing and progresses to respiratory failure in 2-3 years. (1) Themost common cause of death in ALS patients is respiratory failure. (2) Regional anesthesia is relatively contraindicated as it may worsen existing neurological deficits. ALS patients are at high risk for complications associated with general anesthesia due to increased sensitivity of neuromuscular blocking agents. Inhalation agents are also avoided because of their muscle relaxant effect. In this study, we aimed to present our anesthesia management in a patient with ALS without using neuromuscular blocking agents and inhalation agents.

CASE

An operation was planned for a 57-year-old, 57kg, female patient who was diagnosed with ALS 1.5 years ago and was walking with a walker because of a fracture of the left distal femur. She had no known disease other than ALS .Riluzole was available for ALS. In the anamnesis taken during the preoperative anesthesia examination, it was learned that she had been operated for a right hip fracture 7 months ago, general anesthesia was applied and recovery from anesthesia was delayed. According to the preoperative neurological examination performed by the neurology clinic; 4/5 muscle strength in the right upper extremity, 4/5 muscle strength in the left upper extremity, and 1/5 muscle strength in the right lower extremity were observed. The left lower extremity could not be evaluated due to fracture. Riluzole treatment was continued according to neurology recommendations. The patient had dysarthric speech. Cardiac and pulmonary examinations were evaluated naturally as a result of the Cardiology and Chest Diseases consultation. No pathological value was observed in the preoperative laboratory examinations. The patient was evaluated as ASA 3.

TIVA (Total Intravenous Anesthesia) was planned as the anesthesia method for the patient. Electrocardiogram (ECG), non-invasive blood pressure, oxygen saturation (spO2), heart rate, end tidal CO2, body temperature monitoring were provided for the patient who was taken to the operating table. Bispectral Index (BIS) was used for anesthesia depth monitoring. IV access was achieved with a 20 G cannula. The patient's pre-induction vitals were blood pressure: 147/100 mmHg, pulse: 98/

min, spO2: 96%. The patient was preoxygenated for 3 minutes with 100% oxygen from 7lt/min. For induction, intravenous 3.5mg/kg Propofol and 80mcg Remifentanyl were administered. Vital signs 10 minutes after induction were blood pressure: 104/75mmHg, pulse: 81/min, spO2: 97%. After applying mask ventilation and measuring the Bispectral Index (BIS) as 40, the patient was intubated with a 7 mm o.d. spiral endotracheal tube using a video laryngoscope. In maintenance, 12mg/kg/hour propofol and 0.02 mcg/kg/min remifentanyliv infusion were administered. Propofol infusion was decreased to 9mg/kg/h at 60th minute and to 8mg/kg/h at 90th minute. Remifentanyl infusion was increased up to 0.1mcg/kg/min. BIS values were kept in the range of 40-60 during the operation. Propofol and remifentanyl infusions were stopped at 150 minutes. The patient was extubated when the patient regularly created sufficient tidal volume and the BIS value rose above 90. For postoperative analgesia, 1gr paracetamol, 50mg dexketoprofen trometamol, 50mg tramadol were administered, IV PCA was prepared. As an antiemetic, 4mg ondansetron was administered. The patient was sent to the ward without complications after 2 hours of intensive care unit follow-up. The neurological examination of the patient 3 weeks after the operation was the same as the preoperative examination.

DISCUSSION

ALS is a progressive neurodegenerative disease of unknown etiology that affects both upper and lower motor neurons, and affects motor neurons in the cerebral cortex, brain stem and spinal cord. There is no specific treatment for ALS. Riluzole is the only FDA-approved drug, but has a minimal effect on mortality. (3) Regional anesthesia may exacerbate pre-existing neurological symptoms and the level of block may not be predicted in these patients. (4) Complications of general anesthesia include aspiration pneumonia, failure to reverse neuromuscular blockade with sugammadex, and hyperkalemia after succinylcholine administration. (5) Depolarizing muscular blockers may causehyperkalemiaHyperkalemia may cause cardiac arrest in ALS patients. Therefore depolarizing neuromuscular blockers are contraindicated in ALS patients. On the other hand, the duration of action of nondepolarizing muscular blockers is prolonged in ALS patients, higher doses of sugammadex may be required to reverse the muscular blockade, the muscular blockade may not be reversed and it may be difficult to wean the patient from the mechanic ventilation. There is no universal consensus on the ideal anesthetic approach to ALS patients. The choice of anesthesia method should be made according to the risk analysis of the patient.

In our case, general anesthesia was administered with TIVA (total intravenous anesthesia) without the use of inhalation agents with neuromuscular blocker and muscle relaxant effects, and no complications were experienced. We think that choosing the right anesthesia method in ALS patients will significantly reduce morbidity and mortality.

REFERENCES

1. Brown RH, Al-Chalabi A. Amyotrophic Lateral Sclerosis. N Engl J Med 2017; 377, 162–172.
2. Park KB, Son B, Hwang DY, Jeon Y. Spinal anesthetic management for discectomy in a patient with amyotrophic lateral sclerosis -A case report. *Korean J Anesthesiol.* 2012; 63 :547–9.
3. Winderbank A . Adult Motor neuron diseases. In: Munsat TL, Engel AG, Banker BQ (eds) Myology. McGrawHill, New York, 1994;pp. 1854–1864
4. Lee D, Lee KC, Kim JY, Park YS, Chang YJ. Total intravenous anesthesia without muscle relaxant in a patient with amyotrophic lateral sclerosis. J Anesth. 2008; 22(4): 443-5.
5. Turner M, Lawrence H, Arnold I, Ansorge O, Talbot K. Catastrophic hyperkalaemia following administration of suxamethonium chloride to a patient with undiagnosed amyotrophic lateral sclerosis .Clin Med (Northfield Province 2011; 11 (3):292–293.

The Importance of Preoperative Arterial Stiffness Measurement in Predicting Hemodynamic Improvements in Hypertensive and Normotensive Patients Undergoing Spinal Anesthesia

Emre Balta, Sinan Yılmaz

Adnan Menderes University Faculty of Medicine, Department of Anesthesiology and Reanimation, Aydin, Türkiye

ABSTRACT

Background: Spinal anesthesia is a temporary, central type of regional anesthesia that is created as a result of injection of local anesthetics alone or with additional drugs into the subarachnoid space. The most common and serious complication of spinal anesthesia is hypotension. Arterial stiffness (AS) measurement is an increasingly used method in the diagnosis of cardiovascular diseases. We aimed to investigate the relationship between AS measurement and hypotension in hypertensive and normotensive patients undergoing spinal anesthesia.

Material and Methods: 124 patients, with an age range of 31-81 (mean 57.9±10.3) years, who underwent lower extremity surgery with spinal anesthesia were included. The patients were divided into 2 groups as hypertensive (HT=54) and normotensive (N=70). Pulse wave velocity (PWV) measurement was performed with Mobil-O-Graph device. When the patients came to the preoperative operating room, routine ASA monitoring was applied. Systolic blood pressure (SBP), diastolic blood pressure, mean arterial blood pressure and heart rate values were recorded in the case follow-up form at the 1st, 3rd, 5th, 10th, 20th and 30th minutes after spinal anesthesia. A decrease of 20% or more in SBP was recorded as hypotension. In analysis,p values below 0,05 were considered statistically significant.

Results and Discussion: Spinal anesthesia-related hypotension (SARH) was significantly higher in the HT group (58.5%) than the control group (16.6%) ($p<0.001$). In the HT group, PWV (9.51±1.58 m/sec) was higher than the control group (7.21±1.4 m/sec). In addition, PWV and AUI@75 measurements were found significantly higher in the SARH (+) group when compared with SARH (-) group values ($p<0.001$). In logistic regression analysis, the risk of SARH was found to be increased by 6.4 times when the patient has HT diagnosis. Furthermore, advanced age increased the risk by 1.059 times. When the effectiveness of preoperative PWV measurement in predicting the development of SARH with ROC analysis was investigated, the sensitivity was 82% and the specificity was 60.8%.

Conclusion: Preoperative AS-PWV is very effective in detecting the frequency of hypotension after spinal anesthesia; however, we think that it does not have sufficient sensitivity and specificity to be a diagnostic test.

Keywords: Arterial Stiffness, pulse wave velocity, spinal anesthesia related hypotension

Severe Airway Edema Due to Tranexamic Acid and Albumin Transfusion

Baturay Kansu Kazbek[1], Ülkü Ceren Köksoy[2], Perihan Ekmekçi[2], Filiz Tüzüner[2]

[1]Nallıhan State Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2]Ufuk University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: The incidence of life threatening anaphylactic reactions is between 1:353 and 1:18,600. Although tranexamic acid and albumin have a high margin of safety, allergic reactions to both agents have been reported. We describe a severe and life threatening upper airway edema in a patient in whom tranexamic acid and albumin infusions were given simultaneously.

Case: A 79 years-old ASA-II male patient who underwent debridement due to periprosthetic infection following hip arthroplasty was given albumin and tranexamic acid infusions in the surgical ward. The patient complained of dyspnea and physical examination revealed severe edema of the tongue, perioral area and chin (Figure 1,2). The infusions were stopped and the patient was given nebulization therapy, diphenhydramine (45.5 mg iv), methylprednisolone (total 240 mg iv) and pantoprazole (40 mg iv). Rapid intubation in the operating room was planned as the patient deteriorated. Videolaryngoscopy for a possible difficult ventilation failed. Inotrope infusions were initiated due to hemodynamic instability. The patient was intubated with a 6.0 endotracheal tube using Fastrach LMA, which was exchanged with a 7.5 endotracheal tube using a gum elastic bougie. Bilateral pneumpothorax was detected and chest tubes were placed. Emergent tracheotomy was performed due to hypoxia and difficult ventilation. Bronchoscopy revealed edema of the tracheal rings and main bronchi. Hemodynamic status and oxygenation improved and the patient was transformed to the intensive care unit. Upper airway ultrasound revealed a tongue thickness of 8.79cm (Figure 3). Inotrope infusions were gradually stopped and tracheostomy was removed on the third day. The patient was discharged on the seventh day.

Conclusion: We believe that the simultaneous administration of two drugs with a low risk of allergic reactions could have contributed to the clinical situation via a cross reaction in this case. A detailed patient history and skin tests in the preoperative period and the measurement of serum IgE and tryptase levels in the postoperative period are very important in such patients. Anesthesiologists should be aware of the fact that life threatening drug reactions can happen in both intraoperative and postoperative periods in addition to the potential dangers of simultaneous multidrug administration.

Keywords: Tranexamic acid, albumin, airway edema

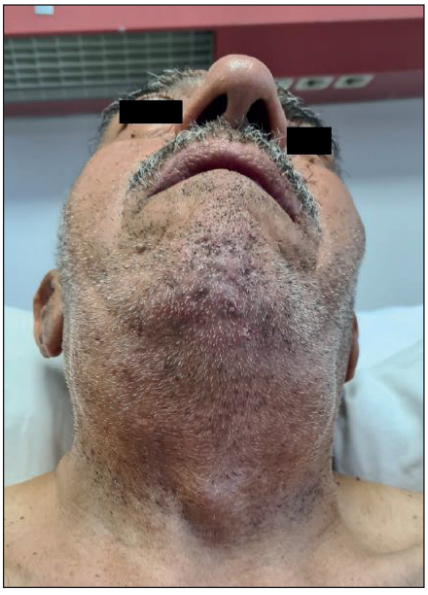


Figure 1. Severe edema under the chin

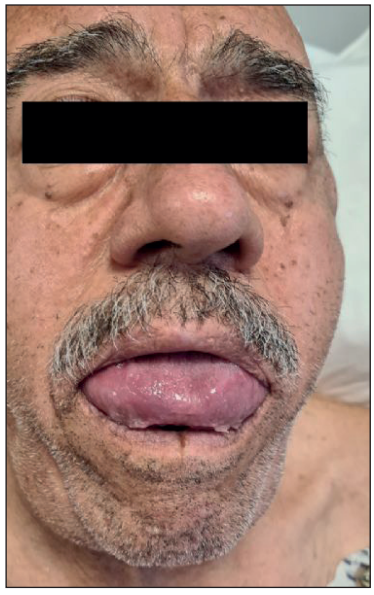


Figure 2. Severe lingual and perioral edema

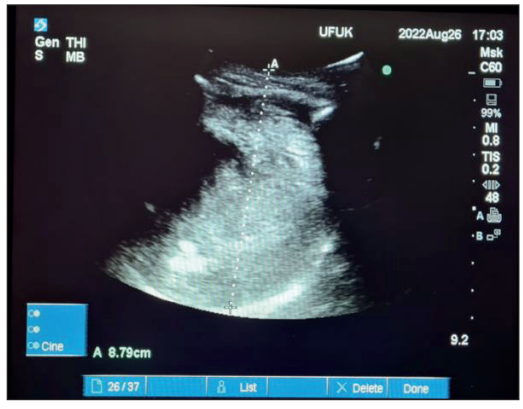


Figure 3. Tongue thickness as measured by ultrasound

Perioperative Anesthetic Management in Patients with Spinal Muscular Atrophy Undergoing Scoliosis Surgery

Mehmet Anıl Süzer

Cankaya Hospital, Ankara, Türkiye

ABSTRACT

Background: Spinal muscular atrophy (SMA) is a severe neuromuscular disease manifested by progressive muscle weakness. This study aimed to evaluate anesthetic management in SMA patients who underwent spinal surgery for scoliosis restricting pulmonary capacity. Primary outcome measure were perioperative variables. Secondary outcome was to determine predictive factors for postoperative ICU admission.

Material and Methods: After obtaining hospital's ethic committee approval, retrospective data between 2020-2023 were collected. All patients were received propofol and remifentanyl based TIVA without neuromuscular blocking agent under somatosensory evoked potentials monitorization. Controlled hypotensive anesthesia combined with tranexamic acid was used to reduce blood loss. Packed red blood cell (PRBC) was given when estimated blood loss (EBL) exceeded 30% of total blood volume (TBV). Multimodal analgesic regimen was used for postoperative pain relief. ICU admission was decided according to respiratory and hemodynamic parameters, arterial blood gas analysis, and EBL. p value< 0.05 was considered statistically significant.

Results and Discussion: Of 37 (25 female/12 male) ASA II-III patients who were included into study, 15 were SMA type II and 7 were type III (11.38±1.1 (5-28) years). Twenty-six patients had mild and seven patients had moderate restrictive lung disease, and one patient was mechanical ventilation dependent. Thirty patients underwent posterior instrumentation and fusion and seven patients underwent magnetic rod stabilization (12.5±0.4 (7-14) levels). Two difficult intubation cases were managed successfully using fiberoptic bronchoscope. EBL was 750±57 ml (310-1800 ml) and EBL/TBV was 40.1%. Thirty-two (86.5%) patients were given 1.47±0.13 (1-4) units PRBC. Eleven (29.7%) patients were admitted to ICU for 20.2±4.8 (18-47) hours. Two patients were required postoperative mechanical ventilation. One patient was admitted from service to ICU due to respiratory distress at second day. Receiver operation characteristics analysis revealed that preoperative poor respiratory function, prolonged surgery (>6 hours), multiple vertebral fusion (>6 levels), intra-operative EBL >34% of TBV, and massive transfusion are predictive for ICU admission ($p<0.01$)

Conclusion: Preoperative risk analysis and preventive measures should be taken into consideration to enhance the success of the procedure which is one of the most challenging orthopedic surgeries due to respiratory compromise with complicated and prolonged surgery.

Keywords: Anesthesia, spine, congenital disease

OP-34 (Others)

Abstract Only

Our Airway Management in a Case with Anterior Mediastinal Mass

Emine Emen, Hülya Yiğit, Sumru Şekerci

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Large anterior mediastinal masses can cause serious cardiorespiratory problems due to their proximity to the main airway and cardiovascular structures. Any compression effect may be exacerbated under general anesthesia. Here, the airway management of a case with a large mediastinal mass is presented.

Case: A 32-year-old, 51 kg, 155 cm tall, ASA I female patient, who was scheduled for mediastinoscopy due to a mediastinal mass, was found to have a mass compressing the left main pulmonary artery and superior vena cava in the thorax and expanding the mediastinum on CT angiography. In premedication, 1 mg of midazolam iv was given. Routine monitoring was performed for the surgery. Blood pressure:125/80 mmHg, pulse: 126 min. sinus tachycardia, SO2:97%. Induction was achieved with midazolam 0.02mg/kg, fentanyl 1mcg/kg, propofol 2mg/kg, rocuronium bromide 0.6 mg/kg and the patient was intubated with a portex 7.0 cuffed endotracheal tube. Maintenance anesthesia was provided with propofol and ultiva infusion. Surgery started while the patient was in the supine position.After entering the mediastinum, the patient desaturated and SO2:decreased to 88%. Sufficient tidal volume was not formed in the mechanical ventilator.The patient was ventilated manually and with high pressures. Peripheral SO_2 of the patient was maintained around 92-94%. At the end of the surgery, which lasted approximately 1.5 hours, the patient was taken to the postoperative intensive care unit intubated.In fiberoptic bronchoscopy (FOB), it was observed that the mediastinal mass made full compression distal to the trachea. The endotracheal tube was advanced distal to the mass with FOB guidance. Extubation was attempted 3 days after the operation, but the patient was re-intubated because she could not tolerate it. Chemotherapy was planned after the pathologic diagnosis of lymphoblastic lymphoma. The patient, who received 1 cure of chemotherapy in the intensive care unit, was extubated 48 hours later and taken to the ward.

Conclusion: Careful evaluation of the relationship between the mediastinal mass and vital structures in the preoperative period, close communication with the surgeon, careful planning and preparation for perioperative complications that may develop due to compression on the main airways and vascular structures will ensure successful management.

Keywords: Anterior mediastinal mass, airway management, tracheal pressure

OP-35 (Others)

Abstract Only

Anesthesia Management in a Case Undergoing Carina Resection and Tracheobronchial Reconstruction through Left Video-assisted Thoracoscopic Surgery and Right Thoracotomy

Nur Sena Çakar[1], Ali Alagöz[1], Dilara Arıcan[1], Mehtap Tunç[1], Göktürk Fındık[2], Hilal Sazak[1]

[1] University of Health Sciences, Gülhane Faculty of Medicine, Ankara Atatürk Sanatorium Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2] University of Health Sciences, Gülhane Faculty of Medicine, Ankara Atatürk Sanatorium Training and Research Hospital, Department of Thoracic Surgery, Ankara, Türkiye

ABSTRACT

Background: Tracheal and carinal procedures are special operations requiring communication between anesthesia and surgical teams to ensure the safety of airways.Here,we wanted to emphasize anesthesia management on our patient who is undergoing bilateral thoracic surgery and carina resection.

Case: A 61-year-old male patient who was planned for carina resection/reconstruction through left video-assisted thoracoscopic surgery (VATS) and right thoracotomy was evaluated as ASA 3. Mechanical tumor resection was performed by interventional pulmonology clinic and partial airway patency was achieved.In thorax computed-tomography,there was a 30x24 mm carinal lesion obstructing both main bronchi. After monitorization,thoracic epidural,radial artery and subclavian vein catheterizations were performed.Total intravenous anesthesia was applied.The patient was intubated with an Univent® tube. Bronchial blocker (BB) was inserted into the left main bronchus using a bronchoscope(Figure1). After left VATS was completed,the BB was placed in the right main bronchus (Figure 2) and right thoracotomy was started.During incision on the right bronchus,BB and Univent® were pulled proximally in the trachea and ventilation was interrupted (Figure 2). An endotracheal tube (ETT) was placed in the right intermediate bronchus from surgical field,"cross-field ventilation"was started with a sterile connection. Then the trachea and the left main bronchus incisions was made and carina resected (Figure3). ETT was placed in distal part of incision in the left bronchus,a catheter for high frequency jet ventilation(HFJV) was placed in the right intermediate bronchus. Right/left lungs were ventilated alternately with ETT/HFJV during suturing(Figure 4).Arterial blood gas values were stable.The patient was transferred to Intensive Care Unit after electively intubated. At postoperative 48th hour, extubation was achieved.We do not have any conflict of interest. This report has not been published before.Written informed consent was obtained from the patient.

Conclusion: Studies on tracheobronchial surgeries and specific anesthesia applications are limited and quite complicated."Cross-field" ventilation and/or HFJV are frequently used techniques. We have used these methods successfully.In recent years,flow-controlled ventilation has started to be accepted in such cases.In ideal conditions,extracorporeal membrane oxygenation should be available for crisis moments. Carinal resections and reconstructions are challenging procedures in terms of airway managements.Close follow-up,preparation and interdisciplinary cooperation in perioperative period is a key point in terms of patient safety.

Keywords: Airway, anesthesia, carina

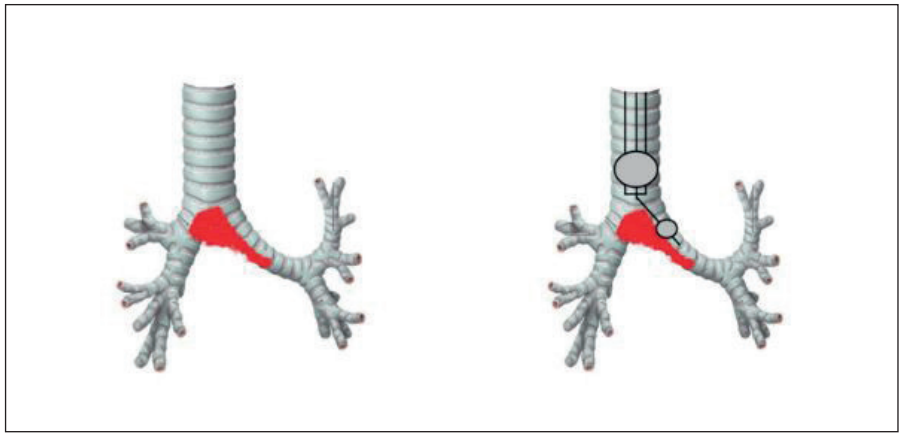


Figure 1. The location of the mass and the appearance of the BB in the left main bronchus

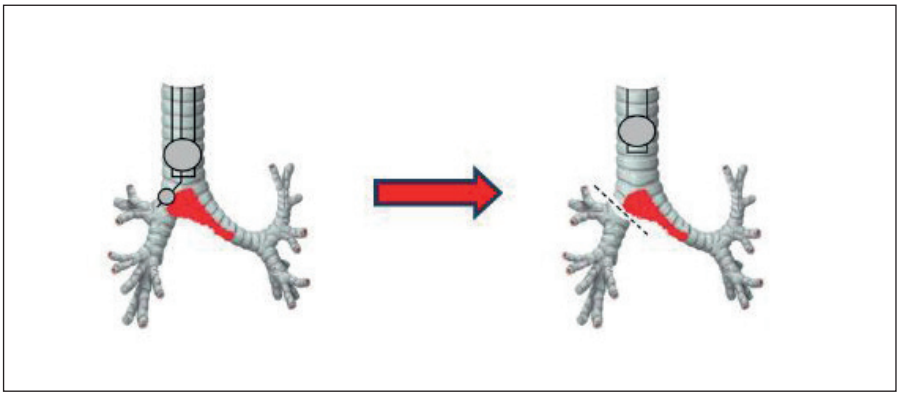


Figure 2. View of Univent®,BB and incision of the right main bronchus

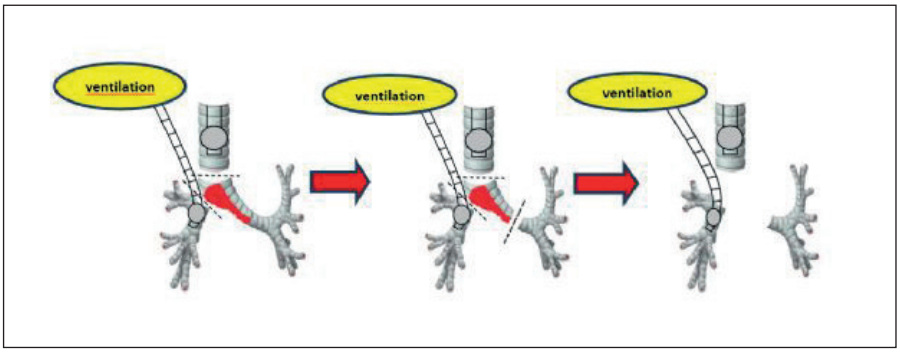


Figure 3. Incisions for carina resection

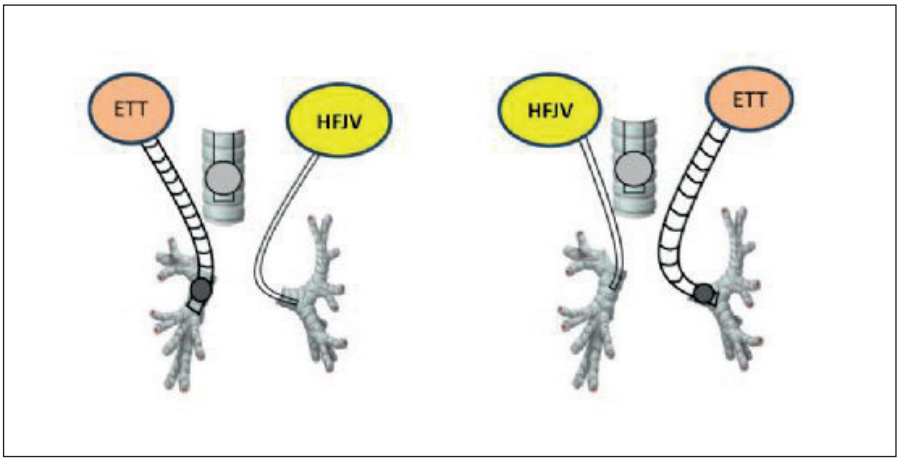


Figure 4. Ventilation with ETT/HFJV

Our Anesthesia Experience in Two Patients with Robotic Laparoscopic Radical Prostatectomy

Yusuf Özgüner, Savas Altınsoy, Cem Koray Çataroğlu
University of Health Sciences Diskapi Yıldırım Beyazit Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Robotic laparoscopic radical prostatectomy is a surgical technique performed in the trendelenburg position, which is an upside-down position, with intraperitoneal carbon dioxide (CO_2) insufflation. These situations can cause some difficulties in anesthesia management. In this case report, we aimed to present our anesthesia experiences in two patients who underwent robotic laparoscopic radical prostatectomy.

Case: Our first patient was American Society of Anesthesiologists (ASA) physical class II (coronary artery disease), 62 years old, BMI (Body Mass Index) was 22.7. The patient's heart rate was 67, blood pressure was 154/76, and oxygen saturation was 96%. Our second patient was ASA II(smoking), 58 years old, BMI (Body Mass Index) was 24.7. The patient's heart rate was 71, blood pressure was 122/68, and oxygen saturation was 92%. Anesthesia induction and intubation were performed using propofol, fentanyl and rocuronium. Anesthesia was maintained with sevoflurane, oxygen/air mixture, remifentanil infusion and intermittent rocuronium administration. After the induction of anesthesia, bilateral transversus abdominis plane (TAP) block was applied to the patients for postoperative analgesia. In the intraoperative follow-up, pulse oximetry, capnograph, electrocardiography, temperature, urine, invasive artery, BIS (Bispectral Index) monitoring were used. In addition, optic nerve diameters were measured intermittently to evaluate intraocular pressures intraoperatively. Tramadol, paracetamol and ondansetron were also administered as analgesics and antiemetics. Sugammadex was used to reverse neuromuscular block. Postoperative patient-controlled analgesia (PCA) was used. Pain, nausea and cognitive functions of the patients were monitored for 24 hours at regular intervals.

Discussion: In addition to the increase in intra-abdominal pressure, there is also an increase in intracranial and intraocular pressure in these patients. In the preoperative evaluation, comorbidities such as intracranial mass, hydrocephalus and glaucoma should also be questioned. During Trendelenburg position and pneumoperitoneum (12-15 mm Hg), severe hemodynamic changes can be seen in the patient. Increased intracranial pressure may increase the risk of delirium in the postoperative period. In addition, pain that is not treated effectively increases the risk of postoperative delirium. A multimodal approach is recommended for postoperative pain management.

Conclusion: Detailed preoperative evaluation, intraoperative and postoperative close follow-up of robotic laparoscopic radical prostatectomy patients is important.

Keywords: Anesthesia, robotic surgery, trendelenburg position

Table 1. Intraoperative Monitor Data of Patients

	Beginning	Beginning	Hour 1	Hour 1	Hour 2	Hour 2	Hour 3	Hour 3	Hour 4	Hour 4
Patient	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Optic nerve diameter (mm)	6.4	5.5	6.9	6.4	7	6.2	7.2	6	7.4	6.7
$ETCO_2$	30	31	34	33	32	35	35	34	36	35
BIS	44	43	43	46	42	45	44	44	41	42
P peak	21	24	26	29	28	33	27	35	27	33
P plateau	19	21	24	28	26	30	25	32	25	29

P1: Patient 1, P2: Patient 2 ETCO2: End tidal carbon dioxide, BIS: Bispectral Index, P peak: Peak inspiratory pressure, P plateau: inspiratory plateau pressure

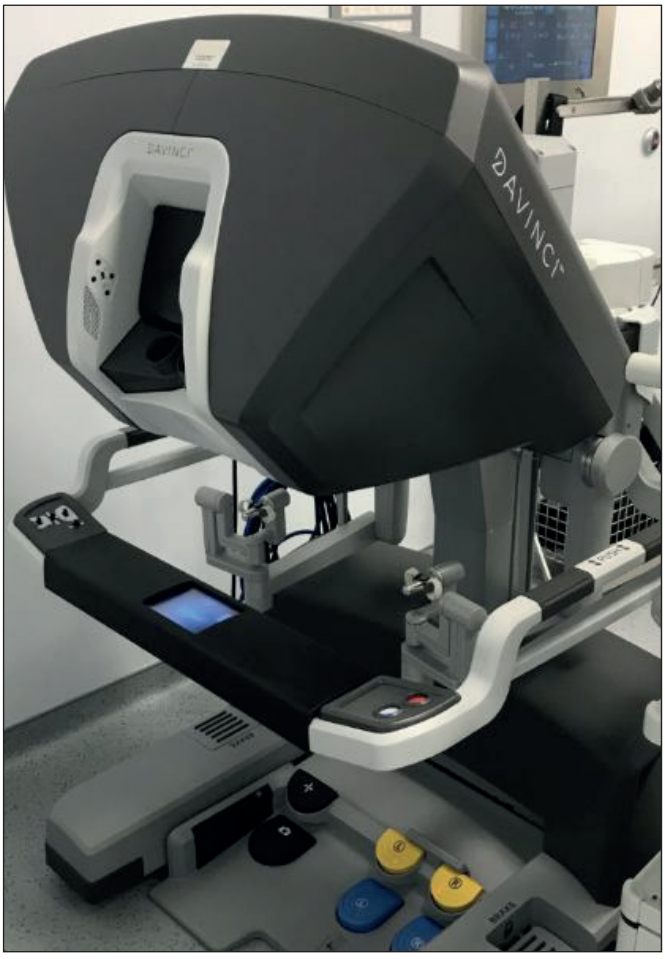


Figure 1.

Figure 2.

OP-37 (Others)
Full Manuscript

Our Anesthesia Management in Laparoscopic Cholecystectomy of a Patient With a Left Ventricular Assist Device

Selvinaz Durantaş, Ayça Tuba Dumanlı Özcan, Handan Güleç

Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Our aim is to present the precautions and applications that can be taken to perform a laparoscopic operation safely in LVAD patients through a case study.

Case: A forty-year-old 72 kg male patient was evaluated for laparoscopic cholecystectomy for acute cholecystitis. In preoperative echocardiographic evaluation, ejection fraction is 10%, right atrium and ventricle are slightly enlarged, right ventricular functions are severely depressed, 1-2 degrees tricuspid insufficiency, 1-2 degrees mitral insufficiency, aortic valve opens every 6-7 beats, mild and continuous aortic insufficiency, Small thrombus on the aortic noncoronary valve, pulmonary valve opening with each beat, interventricular septum in midline, inlet and outlet cannulas were reported as normal. Before induction, left radial artery cannulation was performed under ultrasound guidance. 2 mg midazolam, 80 mg lidocaine, 100 mg ketamine, 50 mcg fentanyl, 20 mg propofol, 30 mg rocuronium were administered intravenously to the patient who underwent preoxygenation for two minutes. Two minutes later, she was intubated in one go with a size 8 cuffed tube. Ephedrine was administered to the patient who became hypotensive with carbon dioxide insufflation, and when the response was insufficient, norepinephrine infusion was started at a dose of 0.1 mcg/kg/min. Intra-abdominal pressure was reduced to a level that would allow surgery. At the end of the operation, subcutaneous emphysema was noticed, and due to the risk of hypercarbia and hypoxia, he was transferred to the cardiovascular surgery intensive care unit to be intubated in order to make extubation more controlled. The patient was extubated on the same day and discharged on the 4th postoperative day.

Conclusion: In direct proportion to the increasing number of patients with mechanical assist devices, the number of patients with LVAD implanted in anesthesia practice is also increasing. In the surgical plans of these patients, it is necessary to master the effects of anesthesia and surgery on LVAD physiology. When these patients are encountered, a safe surgery and anesthesia plan can be provided with adequate preliminary preparation, equipment and planning.

Keywords: LVAD, Laporoscopic surgery, anesthesia

INTRODUCTION

Ventricular assist devices (VADs) are mechanical support implanted in the ventricle to bridge the waiting period for transplantation in patients with acute or chronic end-stage heart failure, to ensure survival in case of acute heart failure, and to contribute to myocardial and patient recovery by reducing the ventricular load in this process are devices. The working principle of the device is to provide intercannula flow connecting the left ventricle to the ascending aorta.

First generation mechanical assist devices were devices that took all the blood from the left ventricle with pulsatility and acted as a pump. These pulsatile VADs have been avoided due to their size, excess thromboembolic events and noisy operation. The new generation continuous flow VADs, on the other hand, work with a more miniature, very fast rotating impeller system(1). Although they are smaller, they can provide higher flow and work silently. The lack of pulsatility of the new generation continuous flow devices can be considered as one of the issues that challenge the anesthesiologist.

Mechanical assist devices have positive effects on cardiac reverse remodeling, increasing left ventricular compliance, positive effects on myocytes, increasing cardiac output, neurohumoral effects, and perfusion of other organs such as liver and kidney. Data obtained in a clinical study showed that LVAD prolongs survival and improves quality of life in patients with end-stage heart failure(2). Due to these benefits, it is expected that the number of patients with LVAD support and therefore the number of non-cardiac surgeries of these patients will increase in the coming years. Therefore, anesthesiologists should be familiar with the issues related to these patients and their devices.

Laparoscopic cholecystectomy is a frequently preferred method in acute cholecystitis, and it is a feasible procedure in patients with LVAD implants if it is managed by a team that has a good grasp of LVAD physiology. In the study published by Vingeswaran et al. in 2019, the retrospective data of 17 LVAD patients were examined and laparoscopic procedures were found to be safe in these patients (3).

Anesthesia management of these patients becomes difficult due to both the effects of laparoscopic procedures on hemodynamics and the complex physiopathology of LVAD patients. Our aim is to present the precautions and applications that can be taken to perform a laparoscopic operation safely in LVAD patients through a case study.

CASE

A forty-year-old 72 kg male patient was evaluated for laparoscopic cholecystectomy for acute cholecystitis. The patient, who was implanted with LVAD due to congestive heart failure due to hypertrophic cardiomyopathy, and who was waiting for heart transplantation, had a history of transient ischemic attack that had healed without any sequelae, and hepatitis C positivity. He was taking warfarin and antidepressant treatments. In the laboratory evaluations, INR: 3.6, hemoglobin 10.2, platelet 147.000, anticoagulant regulation and blood preparation were requested. In preoperative echocardiographic evaluation, ejection fraction is 10%, right atrium and ventricle are slightly enlarged, right ventricular functions are severely depressed, 1-2 degrees tricuspid insufficiency, 1-2 degrees mitral insufficiency, aortic valve opens every 6-7 beats, mild and continuous aortic insufficiency, Small thrombus on the aortic noncoronary valve, pulmonary valve opening with each beat, interventricular septum in midline, inlet and outlet cannulas were reported as normal. In the evaluation of preoperative cardiovascular surgery, mapping of the LVAD device and control of flow rates were made and it was stated that laparoscopic operation and carbon dioxide insufflation would not be a problem. After preoperative discontinuation of warfarin, INR control was 2.1, aPTT:35.8 after 1 unit of plasma with the suggestion of cardiovascular surgery. The patient, whose preparation was completed, was taken to the operating room. Routine monitoring was done. A 20G intravenous cannula was inserted from the dorsal aspect of the right hand. Before induction, left radial artery cannulation was performed under ultrasound guidance. The patient's vital values; blood pressure: 134/65 mmHg, saturation: 95%, pulse: 99/min. Before induction, the preparation of ephedrine, atropine, adrenaline, noradrenaline was checked. 2 mg midazolam, 80 mg lidocaine, 100 mg ketamine, 50 mcg fentanyl, 20 mg propofol, 30 mg rocuronium were administered intravenously to the patient who underwent preoxygenation for two minutes. Two minutes later, she was intubated in one go with a size 8 cuffed tube. Maintenance was provided with 2% sevoflurane and intermittent ketamine administration. A nasogastric tube was placed. Fluid resuscitation and 10 mg ephedrine were administered to the patient whose mean arterial pressure fell below 60 minutes after induction. He was placed in the Tredelenburg position. When normotension was achieved, the position was corrected and surgery was allowed to begin. Ephedrine was administered to the patient who became hypotensive again with carbon dioxide insufflation. When the response was insufficient, norepinephrine infusion was started at a dose of 0.1 mcg/kg/minute. Intra-abdominal pressure was reduced to a level that would allow surgery. In order to avoid fluid load, crystalloid solutions were switched to HES solution. Ventilator settings of the patient whose intraoperative end tidal carbon dioxide levels were around 40 mmHg were adjusted. Respiratory rate increased. Paracetamol 1000 milligram was administered near the end of the operation, and the operation, which lasted 125 minutes, was terminated. At the end of the operation, subcutaneous emphysema was noticed in the patient, and he was transferred to the cardiovascular surgery intensive care unit intubated in order to make extubation more controlled due to the risk of hypercarbia and hypoxia. The patient was extubated on the same day and discharged on the 4th postoperative day.

DISCUSSION

When a patient with mechanical assist device has a noncardiac surgery plan, besides the routine preoperative evaluation of the patient, the type of surgery, placement of the device, anticoagulation status and bridging treatment planning, echocardiographic evaluation of cardiac status and hemodynamic status should be reviewed.

Due to the predisposition of LVAD patients to device-induced thrombosis, patients have antithrombotic and anticoagulant use. However, there is also the possibility of bleeding due to acquired von Willebrand factor deficiency, platelet dysfunction and pharmacological reasons. In order to maintain the balance between bleeding and thrombosis, it is necessary to consider the type and duration of the operation and the preference of the surgeon. It is generally preferred to discontinue the anticoagulant and switch to heparin infusion a few days before surgery, but there is no definitive guideline recommendation. It is recommended that anticoagulation not fall below the therapeutic lower limit. Reversing with fresh frozen plasma and prothrombin complexes is not recommended except in emergency, neurosurgery and eye operations. In our case, although the use of warfarin was discontinued 2 days before the operation and heparin infusion was started with the recommendation of cardiovascular surgery for coagulation control, fresh frozen plasma replacement was performed because the control INR was above the desired level on the day of operation. Care was taken to ensure that the anticoagulation did not fall below the lower limit.Preoperative determination of the location of the device and cables is recommended.

Considering that the device may show preperitoneal, pericardial, and intra-abdominal location, the surgical incision site, retraction tools and the patient's position should be determined accordingly. Considering the placement of the device, the laparoscopic approach may come to the fore compared to laparotomy. In this case, the surgical procedure was determined by using both imaging methods and showing the line of the device by cardiovascular surgery.

Current status and battery level of the device should be evaluated preoperatively. Ideally, an officer who will control the device during the entire intraoperative process should be on standby and the LVAD team should be determined. In our case, preoperative device control was performed and people who could be reached in case of problems were determined.

Ventricular arrhythmias are common in mechanically assisted patients, and these patients usually have an implantable cardioverter defibrillator (ICD). If the patient has an ICD, it should be preoperatively checked and inactivated due to the use of electrocautery. In patients with ICD inactivated, external defibrillator preparation should be performed preoperatively. Due to the high risk of arrhythmia in our patient, preoperative defibrillator control was performed and kept ready.

Invasive blood pressure monitoring is recommended for more accurate results in addition to routine monitoring in patients with a continuous flow non-pulsatile mechanical assist device. Since non-pulsatile flow is dominant in these patients, doppler ultrasound guided cannulation will be safer due to the difficulty of cannulation and the risk of hematoma due to anticoagulant use. In our patient, left radial artery cannulation was performed with ultrasound before induction. For the same reason, the accuracy of pulse oximetry is also limited, and there are sources that recommend serial blood gas analysis or measurement of cerebral tissue oxygenation instead.(4)

As in all heart failure patients, hemodynamic stability is very important in LVAD patients. Therefore, preoperative supportive drugs and pulmonary vasodilator agents should be available. The optimal functioning of the LVAD is entirely dependent on the right ventricle's ability to deliver volume to the left ventricle (5). It is necessary to idealize the volume that will come to the left ventricle, that is, the preload, and to avoid sudden and excessive increases in the left ventricular afterload. It is important that the right ventricular function is adequate and that right ventricular afterload and pulmonary vascular resistance are not increased. We should make choices in accordance with LVAD physiology in anesthetic agent, fluid and vasoactive agent, ventilator settings and patient positioning.

First, pre-induction volume optimization should be achieved. Fluid resuscitation should be performed for the patient who is hypovolemic or hemorrhagic. However, even if he is a normovolemic patient, it should be kept in mind that fluid load may accelerate isolated right ventricular failure. (6) This can be evaluated by transesophageal echocardiography, pulmonary artery catheter or central venous pressure monitoring. Since our patient was given fluid therapy during the fasting period, we did not load.

Although it is not the recommended agent for induction, agents that will increase serious venous capacitance such as propofol and pentothal may negatively affect organ perfusion even if they increase the pump flow due to hypotension and it is recommended to be used by titration. We tried to limit systemic vasodilation by adding ketamine to our induction so that there would be no significant change in afterload.

Laryngoscopy, intubation, painful stimulus, or surgical stimulation increase arterial pressure, thereby increasing left ventricular afterload, thereby restricting LVAD flow(7). It also increases the risk of thromboembolic events by causing device stasis. For this reason, care should be taken to ensure a good depth of anesthesia and to avoid attacks of hypertension. At this stage, the use of bispectral index for the depth of anesthesia may be recommended.

Etiology-oriented treatment plan is important in intraoperative hypotension. It would be helpful to use TEE for this decision. In TEE, right ventricular status, volume status, and if the pump flow is greater than the incoming volume, aspiration can be evaluated. In case of hypovolemia and bleeding, it is the first choice to replace fluid loss and perform maneuvers to increase venous return. In cases of increased PVR, the use of nitric oxide and prostaglandin is recommended. Milrinone, dobutamine and epinephrine can be preferred as inotropic agents(5). Small bolus doses of inotropic agents can be given, especially in hypotension due to vasodilation, which may be triggered by the use of anesthetic agents. When using these agents, it should be considered that they can increase left ventricular afterload and their negative effects. Since hypotension was observed after induction in our patient management, fluid replacement and a single bolus of 10 mg ephedrine were preferred and the patient was placed in a head-down position. Thus, we increased the venous return and tried to reduce the venous capacitance, which increased with induction, to the initial level. We think that the hypotension experienced despite the absence of intraoperative hypovolemia and bleeding is due to vasodilation, reverse trendelenburg position given for surgery and increased intra-abdominal pressure.

Due to the restriction of venous return to the right ventricle, gradual increase of intra-abdominal pressure and gradual introduction of reverse trendelenburg position in laparoscopic cases are very important in LVAD patients. Fluid therapy is important to stabilize venous return in head-up positions. Again, a tidal volume and positive end-expiratory pressure should be selected that will not cause atelectasis, but will not increase intrathoracic pressure and restrict venous return. Increasing right ventricular afterload due to hypoxia and hypercarbia increasing pulmonary vascular resistance may trigger hemodynamic deterioration in LVAD patients(8). Therefore, it is important to prevent hypercarbia, especially in laparoscopic cases. In our patient, ventilation was started with a tidal volume of 7 ml/kg and a low PEEP. Due to the increase in endtidal carbon dioxide pressures and PaCO2 in blood gas analysis due to laparoscopic operation, the respiratory rate was increased and the inspiratory expiration rate was shifted in favor of the expiration. At the end of the case, it was decided to transfer the patient, who was observed to have subcutaneous emphysema, to the intensive care unit in a controlled and intubated manner in order to prevent hemodynamic deterioration due to hypercarbia. The patient was transferred to the ward after controlled extubation and restoration of anticoagulation by the intensive care team. He was discharged home on the fourth postoperative day.

The limitations of the case report include the lack of use of technological devices to provide targeted fluid therapy and the use of TEE to assess LVAD status.

CONCLUSION

In direct proportion to the increasing number of patients with mechanical assist devices, the number of patients with LVAD implanted in anesthesia practice is also increasing. In the surgical plans of these patients, it is necessary to master the effects of anesthesia and surgery on LVAD physiology. When these patients are encountered, a safe surgery and anesthesia plan can be provided with adequate preliminary preparation, equipment and planning.

Acknowledgements

There was no assistance state. There is no financial support or sponsor. There is no conflict of interest. Preliminary data not previously presented. No support was received from a pharmaceutical company or manufacturer.

Informed consent was obtained from the patient for the case presentation and publication.

REFERENCES

1. Agarwal S, High KM. Newer-generation ventricular assist devices. Best Pract Res Clin Anaesthesiol. 2012 Jun;26(2):117-30.
2. Rose EA, Gelijns AC, Moskowitz AJ, Heitjan DF, Stevenson LW, Dembitsky W, Long JW, Ascheim DD, Tierney AR, Levitan RG, Watson JT, Meier P: Long-term use of a left ventricular assist device for end-stage heart failure. N Engl J Med 2001; 345: 1435–43
3. Vigneswaran Y, Wang V, Krezalek M, Prachand V, Wyers S, Juricek C, Uriel N, Jeevanandam V, Hussain M. Laparoscopic procedures in patients with cardiac ventricular assist devices. Surg Endosc. 2019 Jul;33(7):2181-2186.
4. Oleyar M, Stone M, Neustein SM. Perioperative management of a patient with a nonpulsatile left ventricular-assist device presenting for noncardiac surgery. J Cardiothorac Vasc Anesth. 2010 Oct;24(5):820-3
5. Chung M. Perioperative Management of the Patient with a Left Ventricular Assist Device for Noncardiac Surgery. Anesth Analg. 2018 Jun;126(6):1839-1850.
6. El-Magharbel I. Ventricular assist devices and anesthesia. Semin Cardiothorac Vasc Anesth. 2005 Sep;9(3):241-9.
7. Nicolosi AC, Pagel PS. Perioperative considerations in the patient with a left ventricular assist device. Anesthesiology. 2003 Feb;98(2):565-70.
8. Kartha V, Gomez W, Wu B, Tremper K. Laparoscopic cholecystectomy in a patient with an implantable left ventricular assist device. Br J Anaesth. 2008 May;100(5):652-5.

OP-38 (Others)

Abstract Only

The Effect of Virtual Reality Headset on Anxiety, Sedation Need and Patient Satisfaction in Oncologic Patients Scheduled for Port Catheter Implantation

Hilal Yavuzel, Mesut Aslan, Tülin Satılmış

University of Health Sciences, Doctor Siyami Ersek Chest Heart and Vascular Surgery Training and Research Hospital, Department of Anesthesiology and Reanimation, Istanbul, Türkiye

ABSTRACT

Background: Virtual reality (VR) technology has made significant advances in recent years and its use has expanded into the health care. Our aim is to evaluate the effects of VR on pain, anxiety, and additional anesthesic needs in oncologic patients undergoing port catheter implantation.

Material and Methods: After ethics committee approval was obtained (HNEAH-KAEK 2022/86-3588), our study was planned prospective, randomized, controlled, single-center study involving patients who are scheduled for port catheter implantation procedure. The patients randomly divided into 2 groups and one group was shown relaxing videos (nature scenes) by wearing a VR headset in addition to the routine anesthesia procedure, while the control group underwent the routine anesthesia procedure. Preoperative and postoperative anxiety levels evaluated with the STAI (state-transit anxiety inventory) questionnaire. SPSS 22 program was used in the analysis of the data.

Results: The data of 60 patients were evaluated in the preliminary findings of our study. The use of propofol in the VR group was statistically significantly less than in the control group (p=0.043). When patient satisfaction was compared, it was found that the rate of very satisfied patients was higher in the VR group, and the rate of those who were satisfied was higher in the control group (p=0.012).

Discussion: Since studies on the use of VR technology in anesthesia are limited in a small number of cases, more studies are needed on this subject. In the study of Pandya et al., in which they used VR technology in addition to sedation, sedative doses and pain scores were found to be lower in the VR group. Although a decrease in the need for additional sedation and an increase in patient satisfaction were observed in our study, we think that we will achieve more valuable results when our study target of 200 patients is reached.

Conclusion: As a result of the analysis of the preliminary findings of our study, it is seen that VR can reduce the need for sedation and increase patient satisfaction, but it does not change the postoperative anxiety levels.

Keywords: Anxiety, port catheter, sedation, virtual reality

OP-39 (Others)
Full Manuscript

Management of Anesthesia in a Patient With Birt-Hogg-Dubé Syndrome: A Rare Hereditary Syndrome Characterized by Pneumothoraces and Neoplasms

Mehmet Alper Salman[1], Ünase Büyükkoçak[2], Aykut Buğra Şentürk[3], Tevfik Sinan Sözen[4]

[1]Lösante Hospital, Department of Anesthesiology and Reanimation, Algology, Ankara, Türkiye
[2]Yüksek İhtisas University, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[3]Lösante Hospital, Department of Urology, Ankara, Türkiye
[4]Gazi University Faculty of Medicine, Department of Urology, Ankara, Türkiye

ABSTRACT

Background: Birt-Hogg-Dubé syndrome (BHDS) is a rare autosomal dominant syndrome, characterized by hair follicle hamartomas, basal lung cysts, which can lead to recurrent spontaneous pneumothorax and 12–34% lifetime risk of developing renal tumours (1). Besides renal tumours, there is an increased incidence of other tumours, such as lung cancer, thyroid cancer, parathyroid adenoma, breast cancer, lipoma, melanoma, parotid oncocytoma and probably colon cancer. We could not find any report of a patient with BDHS and prostate cancer. We present a patient with BHDS, who was diagnosed prostate cancer, and underwent radical prostatectomy.

Case: A 65 year old patient with a previous history of BHDS who had a spontaneous pneumothorax 15 years ago. Family history of pneumothorax and lung cancer led to genetic screening and a pathogenic mutation in the FLCN gene was identified. The patient was smoking 15 cigarettes a day and had pulmonary cysts and fibrous bands on chest X-Ray. The patient was using formoterol fumarate dihydrate, budesonide, ipratropium, albuterol, and glycopyrronium for chronic obstructive pulmonary disease (COPD). The patient had lower urinary tract symptoms, and prostate biopsy revealed prostatic cancer. Spirometry results were poor and combined spinal and epidural anaesthesia with moderate sedation was preferred for radical prostatectomy in order to avoid possible pulmonary complications.

Discussion: BHDS is a rare hereditary syndrome which exhibits autosomal dominant inheritance. There are 663 families described in literature with BHDS (2). There is variability in the clinical presentation of this disorder thus, it can be under diagnosed. Diagnosis has significant implications for the patient and the extended family.

Conclusion: BHDS usually presents pulmonary cysts/pneumothoraces, and renal tumours. Appropriate anaesthetic management is crucial in preventing pulmonary complications. The identification of BHDS is of importance in recognition and follow-up of malignancies consistent with the syndrome in the family.

Keywords: Anesthesia, Birt-Hogg-Dubé Syndrome, pneumothorax, regional anesthesia

INTRODUCTION

Birt-Hogg-Dubé syndrome (BHD) is a rare autosomal dominant syndrome, characterized by hair follicle hamartomas, skin tumors named “fibrofolliculomas”, basal lung cysts, which can lead to spontaneous pneumothoraces and 12–34% lifetime risk of developing renal tumors (1). BHD originates from mutations in the gene that encodes folliculin (FLCN) on chromosome 17. There are 663 families described in literature with BDH (2). Besides renal tumors, there is an increased occurrence of various other tumors, such as thyroid cancer, lung cancer, breast cancer, parathyroid adenoma, parotid oncocytoma, lipoma, melanoma and, possibly colon cancer. Multiple fibrofolliculomas, colorectal polyps, and thyroid nodules are frequently observed manifestations of BDH. Over 80% of BHD patients have pulmonary cysts. In a study by Kluger et al. (3) 22 individuals from unrelated families with BDH were examined. 82% were diagnosed with five or more fibrofolliculomas. Cystic lesions were detected in 70% of patients. Thyroid nodules and/or cysts were disclosed in 65%. Renal cysts were found in 45%, oral papules were noted in 43% of patients, severe facial hyperseborrhoea was found in 41% multiple epidermal cysts were found in 14% of studied patients. Spontaneous pneumothorax was reported in 32% of affected patients. Primary clear cell carcinoma of the thyroid was reported in a BHD patient and molecular evidence supporting an association between BDH syndrome and thyroid clear cell carcinoma was provided (5).

We found only one patient in the literature with BDH and with prostate cancer (6). We present a patient with BDH, who was diagnosed prostate cancer and underwent a radical prostatectomy.

FLCN produces folliculin, a protein that operates as a tumor suppressor and is found in various organs, tissues and specific cells such as type I pneumocytes, distal nephrons, the skin, breast, pancreas, brain, prostate, parotid glands and ovaries (7-10). BHD diagnosis is usually based on clinical findings but it is definitively diagnosed by genetic testing to detect mutations in the FLCN

gene. There is no causative therapy for BHD. Skin lesions are usually resected for cosmetic reasons; on the other hand, tumors and pneumothorax usually necessitate surgical treatment.

CASE

A 65-year-old patient with a previous history of BDH, who had a spontaneous pneumothorax 15 years ago, had a family history of pneumothorax and lung cancer was led to genetic screening, and a pathogenic mutation in the FLCN gene was identified. Even though the patient had chronic obstructive pulmonary disease (COPD) he was a chronic smoker, smoking 15 cigarettes a day. Pulmonary cysts and fibrous bands were identified on chest X-Ray. On auscultation, breath sounds were found to be decreased bilaterally with wheezing. The patient was using formoterol fumarate dihydrate, budesonide, ipratropium, albuterol, and glycopyrronium for the treatment of COPD. The patient had lower urinary tract symptoms, and a prostate biopsy revealed prostatic cancer. Spirometry results were poor. Combined spinal and epidural anesthesia with moderate sedation was preferred for radical prostatectomy to avoid possible pulmonary complications. The patient was considered to be in ASA Physical Status class III. In the operating room, standard ASA monitoring was obtained and intravenous access was secured. Lumbar spinal anesthesia was achieved with 12.5 mg of heavy bupivacaine 0.5% and an epidural catheter was placed at the lumbar 3-4 level. A nasal oxygen cannula was placed and the patient breathed spontaneously. The patient was sedated with 50 mcg of fentanyl and total 3.5 mg of sedozolam administered intermittantly. Operation time was 135 minutes. An epidural PCA device was used using bupivacaine and fentanyl for acute postoperative pain management. Intensive care unit admission was not necessary. The patient was discharged from the hospital after postoperative 48th hour without any complications.

DISCUSSION

BDH is a rare hereditary syndrome that exhibits autosomal dominant inheritance. There is variability in the clinical presentation of this disorder thus, it can be underdiagnosed. Diagnosis has significant implications for the patient and the extended family. Exposure of BHD patients to significant alterations in atmospheric pressure related to flying and diving may lead to an increase in the possibility of pneumothorax. Furthermore, the patients and family members should be screened for renal and various other tumors.

In the case of surgical treatment of a diagnosed tumor anesthetic management and surgical manipulation can be challenging and life-threatening (12). Spontaneous ventilation, whenever possible, is considered the safest approach for anesthetizing patients with pulmonary cysts (13). Pressure in the bulla may increase and there is a risk of rupture if positive pressure is used. Bulla rupture may lead to grave outcomes owing to tension pneumothorax or inadequate ventilation attributable to a consequential bronchopleural fistula (14, 15). Meticulous anesthetic management and pain management in patients with BHD undergoing surgery is essential in preventing perioperative complications (16).

CONCLUSION

BDH usually presents pulmonary cysts/pneumothoraces, and renal tumors. Appropriate anesthetic management is crucial in preventing perioperative pulmonary complications. The identification of BDH is of importance in the recognition and follow-up of malignancies consistent with the syndrome both for the patient and for members of the family.

REFERENCES

1. Birt AR, Hogg GR, Dubé WJ. Hereditary multiple fibrofolliculomas with trichodiscomas and acrochordons. Arch Dermatol 1977; 113: 1674–7.
2. Published BHD Families by the BHD foundation. (cited 2023 Mar 30]. Available from: https://bhdsyndrome.org/for-researchers/bhd-literature/introduction/published-bhd-families/
3. Kluger N, Giraud S, Coupier I et al. Birt-Hogg-Dubé syndrome: clinical and genetic studies of 10 French families. Br J Dermatol. 2010 Mar;162(3):527-37
4. Benusiglio PR, Gad S, Massard C, et al. Case Report: Expanding the tumour spectrum associated with the Birt-Hogg-Dubé cancer susceptibility syndrome. F1000Res. 2014;3:159.
5. Johannesma PC, van de Beek I, van der Wel JW et al. Risk of spontaneous pneumothorax due to air travel and diving in patients with Birt-Hogg-Dubé syndrome. Springerplus. 2016 Sep 7;5(1):1506.
6. Toro JR, Wei MH, Glenn GM et al.BHD mutations, clinical and molecular genetic investigations of Birt-Hogg-Dubé syndrome: a new series of 50 families and a review of published reports. J Med Genet. 2008 Jun;45(6):321-31.

7. Reese, Erin; Sluzevich, Jason; Kluijt, Irma; Teertstra, H. Jelle; De Jong, Daphne; Horenblas, Simon; Ryu, Jay (5 October 2009), "Birt-Hogg-Dubé Syndrome", in Riegert-Johnson, Douglas L; Boardman, Lisa A; Hefferon, Timothy; Roberts, Maegan (eds.), Cancer Syndromes, Bethesda, MD: National Center for Biotechnology Information
8. Toro, Jorge R. (9 September 2008), "Birt-Hogg-Dubé Syndrome", in Pagon, Roberta A; Adam, Margaret P; Bird, Thomas D; Dolan, Cynthia R; Fong, Chin-To; Smith, Richard JH; Stephens, Karen (eds.), GeneReviews, University of Washington
9. Coleman, Jonathan A; Russo, Paul. Hereditary and familial kidney cancer. Current Opinion in Urology 2009;19 (5): 478–85
10. Palmirotta, Raffaele; Savonarola, Annalisa; Ludovici, Giorgia et al. Association between Birt Hogg Dubé syndrome and cancer predisposition, Anticancer Res 2010; 30 (3): 751–7
11. Catarino Ferro AR, Ferreira Campos AM. When it starts in the skin and goes to the lungs, where does it stop? Respirology Case Reports. 2022;10:e01043.
12. Miranda, Carmel. Birt-Hogg-Dubé syndrome: a rare cause of pneumothorax complicating general anaesthesia. Anaesthesia Cases 4.1 2016: 123-125.
13. Mottaghi, K., Asadi, S., Safari, F., Nashibi, M. Anesthesia management of bullous emphysema in patient candidate for craniotomy. Annals of Anesthesiology and Critical Care, 2016; 1(1), 1-3.
14. Saini V, Assu SM, Bhatia N, Sethi S. Abdominal surgery in a patient with bullous emphysema: Anesthetic concerns. J Anaesthesiol Clin Pharmacol. 2019 Jul-Sep;35(3):414-415.
15. Hau AT, Jones BA, Olutoye OA. Apical bullae and spontaneous pneumothorax. Anesthesiology. 2013;119(1):201.
16. Lee C, Lee C, Jang H, Lee J . Anesthetic Management in BirtHogg-Dubé Syndrome with Spontaneous and Recurrent Pneumothorax during Recovery after Laparoscopic-Assisted Partial Nephrectomy. J Anesth Clin Care 2019; 6: 35.

OP-40 (Others)

Abstract Only

A Beginning with an Surprising Ending: To Be Diagnosed with Reverse Takotsubo Cardiomyopathy Within 24 Hours

Gurkan Ilhan, Ezgi Erkılıç, Emine Sönmez, Tülin Gümüş, Hasan Öztürk, Orhan Kanbak

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: The reverse variant of Takotsubo cardiomyopathy (rTTC) characterized with basal akinesia/hypokinesia associated with spontaneously recovering apical hyperkinesia has been reported. In this case report, we aimed to evaluate the perioperative management of a patient with extremely rare and previously unknown rTTC.

Case: The 35-year-old physician-patient without history of a known chronic disease was taken under operation for the planned elective septoplasty. The patient was administered anesthesia induction following routine monitoring in the operating theatre. After intraoperative local anaesthetic injection to the nasal mucosa; tachycardia, hypertension and diffuse ST changes on ECG developed in the patient. The patient detected with diffuse and deep ST depression. Chest pain, dyspnea, blurred vision and headache were present in the patient who was taken to post-anesthesia intensive care unit. According to the verbal information from the patient, hypertension and tachycardia had developed after local anaesthetic injection for hair transplantation procedure approximately 6 months before, however, no ECG finding was detected since he was not monitored. Coronary arteries were normal in CAG performed emergently. Control ECG turned to normal approximately 6 hours later. Ophthalmological examination was interpreted as bilateral posterior ischemic optic neuropathy. Hyperbaric oxygen therapy was initiated for retinal edema. Control ECG performed one day later was normal and troponin level was reduced.

Conclusion: rTTC is a condition which mimics acute myocardial infarction without coronary stenosis. It occurs due to sudden emotional stress and results in reversible left ventricular dysfunction. Although, its pathophysiology is not clear, it suggests neurovegetative system activation leading to exaggerated sympathetic activation. The occurrence of rTTC surprisingly and its rapid diagnosis as in our patient are the unexpected conditions. In this critical circumstance; the postponement of the surgery and management of the patients requires a team approach involving anaesthetists, surgeons, intensive care specialists and cardiologists. The optimal conditions should be provided for replanning of the surgery.

Keywords: Reverse Takotsubo cardiomyopathy, anesthesia, diagnosis

OP-41 (Others)
Full Manuscript

A Rare Case: Multiple Mandibular Arteriovenous Malformation With High Output: May A Tooth Extraction Alone Turn To A Catastrophic Condition?

Aziz Aysel, Eda Aysan, Bilge Tuncer, Mustafa Turan, Ezgi Erkılıç

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Arteriovenous malformations (AVM) in the mandibular and neck are the potentially life-threatening conditions because of rare and possible massive hemorrhage. They are often first diagnosed by the specialist dentists as hemorrhage and unfavorable condition. In this case report, we aimed to review in the light of related literature how a tooth extraction turned to a catastrophic condition in a patient with multiple AVMs in the mandibular, submandibular and hyoid regions in the light of related literature.

Case: The 19-year-old male patient who was diagnosed with AVM in the mandibular and submandibular regions according to the test results performed because of serious hemorrhage after the first tooth extraction at 6 years of age as stated in the anamnesis, has admitted to our hospital with the complaint of leaky hemorrhage around the lower left 3rd molar tooth. The Department of Interventional Radiology performed embolization procedure twice. Tooth extraction was planned after embolization procedure because hemorrhage was triggered due to the movement of the tooth. The patient intubated without a complication using videolaryngoscope. PA projectile hemorrhage from the tooth root started at the moment of insertion of mouth gag in the beginning of the surgical procedure. An acute hemorrhage occurred in one minute. It was attempted to reduce the high output of the AVM embolizing some more branches in interventional Radiology. The tooth was extracted under less hemorrhage since venous pressure was reduced. The patient with hemodynamic stability was admitted in the PACU to be monitored as intubated. The patient with stable night hemodynamics and without hemorrhage was extubated 12 hours later and referred to the service. The approval for the presentation was taken from the patient.

Conclusion: AVMs are the extremely rare formations that may cause abundant blood loss during tooth extraction or biopsy and may be life-threatening unless treated. In these cases, the trauma should be minimized during the induction of general anaesthesia and laryngoscopy, if possible, intubation should be performed gently accompanied with fiberoptic bronchoscopy and videolaryngoscopy. We conclude that multidisciplinary intervention approach (anaesthesiology, ENT, interventional radiology, maxillofacial surgery) as applied in our patient would be valuable in such cases.

Keywords: Arteriovenous malformations (AVM), tooth extraction, anesthesia management

INTRODUCTION

Arteriovenous malformations (AVM) are usually congenital abnormal connections between arteries and veins. AVM in the mandible and neck region is a rare and potentially life-threatening condition because of possible massive bleeding. Due to it's uncertain clinical and radiographic presentations, it is often first diagnosed by dentistry specialists as a bleeding and unlucky condition. Endovascular embolization can effectively treat most lesions with limited tissue involvement. However, in selected cases, surgery (mandible resection) can be used together as part of the treatment in the component. In this presentation, we wanted to review how a simple tooth extraction turned into a catastrophic situation in a 19-year-old male patient with multiple AVMs in the mandible, submandible and hyoid region, in the light of the relevant literature.

CASE

A 19-year-old, 73-kg male patient, who was diagnosed with AVM in the mandibular and submandibular region as a result of the tests performed at the age of 6 due to severe bleeding after the first tooth extraction in his anamnesis, applied to our hospital with the complaint of bleeding around the left lower third molar tooth. Previously, 4 sessions of embolization in an external center process has been applied. As a result of imaging and blood tests, the patient's hemoglobin value was 6.2 and 2 units of erythrocyte suspension were given. In CT Angiography, it was determined that the cause of the bleeding was the AVM located just below the tooth. Embolization was performed twice by interventional radiology. Tooth extraction was planned after embolization because the movement of the tooth caused the bleeding to stall. It was observed that the patient, who was taken to the operating table, continued to bleed slightly from the root of the tooth. Routine ASA monitoring was performed. The patient was intubated with 1 mg/kg lidocaine, 2.5 mg/kg propofol and 1 mg/kg rocuronium using rapid serial intubation method, with a videolaringoscope, protecting the bleeding area and using an appropriate sized tube. Before starting the procedure, in case of bleeding, a wide vascular access was obtained from two different regions with left radial artery cannulation. At the beginning of

the surgical procedure, bleeding started from the root of the tooth while the Brown Davis mouth opener was placed. More than 1600 cc of acute bleeding occurred within 1 minute. Right femoral catheter and urinary catheter were inserted immediately. Hemodynamic parameters was tried to be maintained with 1000 ml of colloid and crystalloid fluids until the blood products came. 2 units of erythrocyte suspension and 1 unit of FFP were given. When the bleeding area was brought under control and stable hemodynamics was achieved, assistance was requested from the interventional radiology unit. It was observed that the patient's AVM was not fed from a single site, but also from the ophthalmic and lingual arteries, therefore the bleeding area could not be fully embolized beforehand. A few more branches were embolized and the flow rate of the high flow AVM was tried to be reduced. During the interventional procedure, 2 more units of erythrocytes and 1 FFP were given. The patient was brought back to the operating room, as the tooth was buried in the mandible while the bleeding was being controlled, so it had to be removed. The tooth was removed under less bleeding as the pressure was lowered. Liquid embolizing agent was applied to the bleeding area and primary sutured. The total amount of bleeding was 2200 cc at the end of the case. The patient, whose hemodynamics was stable and urine output was sufficient, was taken to the PACU. The patient, who had stable hemodynamics at night and had no bleeding, was extubated 12 hours later and transferred to the service. Informed consent was obtained from the patient for the presentation and images.

DISCUSSION

AVMs are extremely rare formations that can cause major blood loss during tooth extraction or biopsy and can be life-threatening if not treated. Symptoms can range from maxillofacial asymmetry to severe bleeding. Very few cases of submandibular AVM are reported in the literature. Generally, superselective angiographic embolization is considered first-line therapy, alone or in combination with a surgical approach, to reduce intraoperative bleeding.

CONCLUSION

It is important to prepare blood products, keeping in mind that sudden and severe bleeding may occur during the treatment. Trauma should be minimized during general anesthesia induction and laryngoscopy, and if possible, intubation should be done softly with a fiberoptic bronchoscope and video laryngoscopy. Without forgetting the presence of fatal complications, a PACU or intensive care unit can be planned for postoperative follow-up. We think that the multidisciplinary (anesthesiology, ENT (ear, nose and throat surgeons), interventional radiology, maxillofacial surgery) approach is valuable in such cases, as we did in our patient.

REFERENCES

1. Chaurasia V, Tiwari R, Singh V, et al. A Rare Case of Arteriovenous Malformation of Mandible: A Case Report. J Mahatma Gandhi Univ Med Sci Tech 2019;4(1):14–17.
2. Mallory Laframboise, Audrey Lacombe. Presentation of a Mandibular Arteriovenous Malformation: A Case Study Report. https://www.oralhealthgroup.com/features/presentation-of-a-mandibular-arteriovenous-malformation-a-case-study-report/
3. R. Spreafico, L. Sordo, R. Bellotto, M. Schipano, A. Rescaldani, and F. Parmigiani. Acta Otorhinolaryngol Ital. 2016 Aug; 36(4): 333–336.

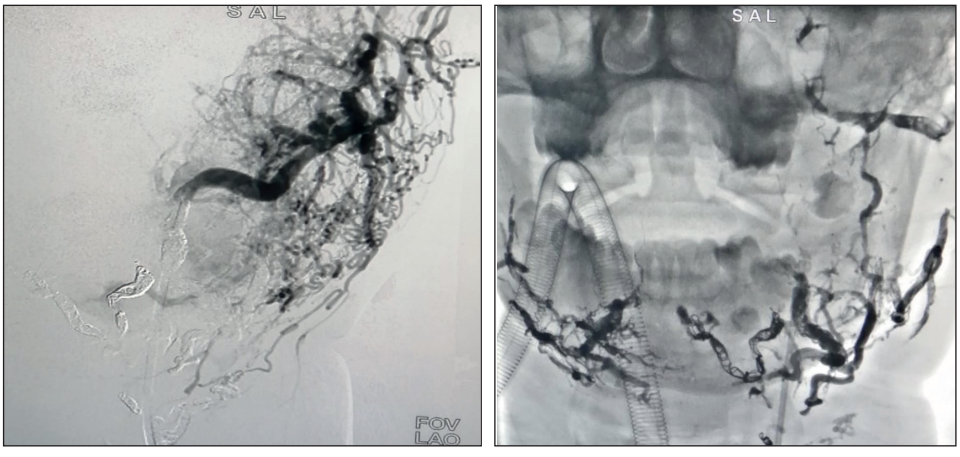


Figure 1.

OP-42 (Others)

Abstract Only

Our Anesthetic Experience in a Patient Diagnosed with Nieman Pick Type C

Yasemin Akcaalan, Muhammed Köse, Ezgi Erkılıç

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Niemann Pick Syndrome is an autosomal recessive disease due to sphingomyelin and cholesterol storage in liposomes due to sphingomyelin metabolism disorder. Clinical signs and symptoms include dysphagia, loss of motor function, hepatosplenomegaly, recurrent respiratory tract infections, seizures, mental retardation, spasticity, myoclonic seizures, and ataxia. In these patients, one of the issues that require attention for anesthetists is ventilation due to hepatosplenomegaly, and the other is the difficulty of intubation. We aimed to present our anesthesia experience in a patient with Niemann Pick Syndrome, which is a rare disease, and to review the points to be considered.

Case: A 20-year-old female patient diagnosed with Nieman Pick Type C also has cerebral palsy and epilepsy. Tracheotomy was planned for the patient who had been intubated for 13 days in the intensive care unit with the diagnosis of aspiration pneumonia, due to prolonged intubation. In the preoperative evaluation, unconscious, not cooperative (sedated), intubated with a size 7 cuffed ETT. The drugs she uses are valproic acid, levetiracetam and miglustat. No pathological value was detected in laboratory findings. After IV induction, the patient underwent tracheotomy under general anesthesia by the otolaryngology surgery, and the patient was transferred to the intensive care unit without any problems.

Conclusion: Although there are restrictive problems in the lungs in these patients, the main cause of ventilation difficulty is; It is a decrease in lung volumes by pushing the diaphragm up due to increased intra-abdominal pressure for reasons such as ascites, hepatosplenomegaly(1). In this case, attention should be paid to ventilation with low tidal volume and high frequency. It is necessary to be careful with anesthetic agents, as they can cause liver damage. Liver function tests may be high and platelet count may be low. In addition, chronic use of anticonvulsant drugs may affect the metabolism of some anesthetic drugs. It should be kept in mind that special techniques and difficulties may be encountered in the anesthetic approach to Nieman Pick patients, and it should not be forgotten that these difficulties can be successfully managed by knowing the specific pathology that causes them.

Keywords: Anesthetic management, Niemann Pick syndrome, tracheotomy

Anesthetic Management of 2 Cases with Mucopolysaccaridosis Type VI (Maroteaux-Lamy Syndrome) and Mucoopolisacharidosis Type II (Hunter Syndrome)

Meltem Bektaş, Hale Yarkan Uysal, Tuğçe Merve Büyükyıldız

University of Health Sciences, Ankara Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Mucopolysaccharidosis (MPS) are a group of lysosomal storage diseases caused by a deficiency of enzymes in glycosaminoglycan (GAG) metabolism, resulting in GAG accumulation in tissues and organs. Anesthetic management of these patients can be challenging due to difficult airway and cardiopulmonary problems. In this case we aim to emphasize the anesthetic consideration of two different MPS syndrome patients undergoing different surgeries.

Case 1: A 5-year-old boy weighting 21 kg with MPS type II (Hunter syndrome) was scheduled for adenoidectomy operation. His physical examination showed macrocephaly, short neck and coarse facial features (Fig.1). His mallampati grade was III. Oral and written consent was obtained from the patient's family. For the potential risk for difficult airway; LMA, videolaryngoscope, and fiberoptic bronchoscope was kept ready. After preoxygenation, anesthesia induction was performed with sevoflurane via face mask avoiding hyperextension of the neck. After insertion of an intravenous access, anesthesia induction was maintained with lidocaine, fentanyl and rocuronium. Using direct laryngoscope; Cormack-Lehane grade IV was visualized at the first attempt. Immediately afterwards videolaryngoscopy has initiated (Fig.2). Intubation was unsuccessful despite using several size of endotracheal tubes with styles. Eventually, the patient was intubated with the tube angled 90° using a rigid stile. The child was extubated while awake and transferred to the recovery unit without any complications.

Case 2: A 21-year-old, 155 cm, 86 kg male patient with MPS type VI (Maroteaux-Lamy syndrome) was scheduled for a right inguinal hernia operation. Preoperative evaluation revealed coarse facial features, short neck, flattened nose, macroglossia, and kyphoscoliosis (Fig 3). His Mallampati grade was IV. Oral and written consent was obtained from the patient. Although spinal anesthesia was planned, preparation for difficult airway management was performed (Fig 4). A single subarachnoid block was administered with 12.5 mg of heavy bupivacaine, and the operation was completed under spinal anesthesia without complications. The patient was then transferred to the service.

Conclusion: MPS syndrome patients often have a difficult airway due to mucopolysaccharide accumulation, short neck, ankylosis, and dislocation risks. Regional anesthesia is preferable for suitable patients and surgeries even so preoperative airway evaluation and difficult intubation preparation are essential.

Keywords: Mucopolysaccharidosis type 2, Mucopolysaccharidosis type 6, difficult airway, videolaryngoscope

INTRODUCTION

Mucopolysaccharidoses (MPS) are a group of inherited metabolic disorders characterized by the accumulation of glycosaminoglycans (GAGs) due to specific enzyme deficiencies within lysosomes, resulting in chronic, progressive, and multisystem involvement (1). MPSs are classified into seven types (I, II, III, IV, VI, VII, and IX) based on the missing enzyme, with symptom severity and progression rates varying depending on the type (2). However, some clinical features, such as short stature, cognitive impairment, skeletal abnormalities, coarse facial features, hearing loss, and cardiovascular disease, are common among different MPS types.

Clinical symptoms in patients with MPS vary widely in onset, severity, and diversity depending on the organs where GAGs accumulate, with symptoms potentially appearing during childhood, adolescence, or adulthood (3). Patients with MPS may undergo surgical operations at any point in their lives due to a range of conditions, including ear-nose-throat problems, spinal cord compression syndromes, joint contractures, organomegaly, visual and hearing impairments, and cardiovascular and respiratory issues. During surgery, patients with MPS may encounter airway management difficulties, such as short neck, macroglossia, gingival hyperplasia, mandibular abnormalities, cervical instability, and airway obstruction, which may occur at different levels.

Consequently, specialized perioperative anesthesia care is necessary to manage their current cardiac and pulmonary problems. In this case we aim to emphasize the anesthetic consideration of two different MPS syndrome patients undergoing different surgeries.

CASES

Case 1

A 5-year-old boy weighting 21 kg with MPS type II (Hunter syndrome) was scheduled for adenoidectomy operation. In the preoperative evaluation of the patient, it was observed that he was using idursulfase as a specific enzyme therapy after being diagnosed with MPS type II and did not take any other medication.

His physical examination showed macrocephaly, short neck and coarse facial features. His mallampati grade was III. Laboratory values were normal, and the patient, who had normal chest X-ray and echocardiograpy, was evaluated by pediatric metabolic specialist under elective conditions. Oral and written consent was obtained from the patient's family. For the potential risk for difficult airway; LMA, videolaryngoscope, and fiberoptic bronchoscope was kept ready.

The patient, who was taken to the operating room, underwent standard monitoring with electrocardiography, peripheral oxygen saturation probe, and non-invasive blood pressure. After preoxygenation, anesthesia induction was performed with sevoflurane in 50% O_2-N_2O mixture via face mask avoiding hyperextension of the neck. After insertion of an intravenous access, anesthesia induction was performed with 10 mg lidocaine, 1mg/kg fentanyl and 0,6 mg/kg rocuronium. Using direct laryngoscope; Cormack-Lehane grade IV was visualized at the first attempt. Immediately afterwards videolaryngoscopy has initiated. Intubation was unsuccessful despite using several size of endotracheal tubes with styles. Eventually, the patient was intubated with the tube angled 90° using a rigid stile. Endotracheal intubation was confirmed by capnography. Anesthesia maintenance was provided with 2.5% sevoflurane in a 50% O_2-N_2O mixture. At the end of the one-hour operation, 2 mg/kg sugammadex was administered to reverse the neuromuscular blockade. The child was extubated while awake and transferred to the recovery unit without any complications.

Case 2

A 21-year-old, 155 cm, 86 kg male patient with MPS type VI (Maroteaux-Lamy syndrome) was scheduled for a right inguinal hernia operation. During the preoperative evaluation, it was discovered that the patient was being monitored with a diagnosis of Maroteaux-Lamy syndrome and receiving treatment with recombinant N-acetylgalactosamine-4-sulfatase enzyme (Naglazyme®), which is a specific enzyme. The patient's medical history indicated that he had no history of general anesthesia except for adenoidectomy surgery performed at the age of 5, which was uneventful.

His physical evaluation revealed coarse facial features, short neck, flattened nose, macroglossia, and kyphoscoliosis. His Mallampati grade was IV. Laboratory tests and chest X-ray were normal. Oral and written consent was obtained from the patient. In the operating room peripheral venous access was secured and routine monitoring with electrocardiography, oxygen saturation, and non-invasive blood pressure were started in the sitting position. Although spinal anesthesia was planned, preparation for difficult airway management was performed. A single subarachnoid block was administered with 12.5 mg of heavy bupivacaine, and the operation was completed under spinal anesthesia without complications. The patient was then transferred to the service.

DISCUSSION

Mucopolysaccharidosis type 2 (MPS II), also known as Hunter syndrome, is caused by a deficiency in the enzyme iduronate-2-sulfatase (I2S) leading to the accumulation of GAGs such as dermatan and heparan sulfate in various tissues and organs. Mucopolysaccharidosis type 2 is a rare disorder, with an estimated incidence of 1 in 100,000 to 1 in 170,000 male births (1,3). With the exception of MPS II which is inherited as an X-linked recessive disorder, all other MPS disorders are inherited in an autosomal recessive pattern; therefore, affecting males and females equally.

Mucopolysaccharidosis type 6 (MPS VI), also known as Maroteaux-Lamy syndrome, is another rare genetic disorder caused by the deficiency of the enzyme N-acetylgalactosamine-4-sulfatase. It is characterized by the accumulation of chondroitin sulfate and dermatan sulfate in various tissues and organs. The incidence of MPS VI varies across different populations, with an estimated prevalence of 1 in 200,000 to 1 in 300,000 individuals worldwide. Unlike other MPS types, MPS type VI patients do not exhibit mental retardation (4).

The severity and specific clinical problems associated with MPS can vary depending on the type of MPS, the age of onset, and the degree of enzyme deficiency but typically include the following: skeletal abnormalities (short stature, thickened bones, and joint stiffness, spinal cord compression and neurological symptoms.), respiratory problems (airway obstruction and breathing

difficulties, recurrent infections and pneumonia.), cardiovascular problems (heart valve abnormalities, which can lead to heart failure), neurological problems (developmental delays, cognitive impairment, and behavioral problems, seizures and hearing loss), vision problems (vision impairment due to clouding of the cornea and retina), enlarged liver and spleen (abdominal pain and digestive problems), hernias (due to the weakness of their connective tissue) (5,6).

In addition, many patients with MPS require surgery or other invasive procedures, which can pose significant challenges for the anesthesiologist. The high anesthetic risk for MPS patients consists primarily in the predicted difficult airway and in the presence of comorbidity. Airway difficulties associated with MPS are generally caused by the accumulation of mucopolysaccharides in the tissues of the upper and middle airways, macroglossia, and frequent recurring respiratory infections (7). This underlines the critical role of an appropriate anesthesiological plan.

In this report, the first case was a child scheduled for adenoidectomy with a diagnosis of MPS II. In this case; to minimize the risk of airway obstruction and desaturation, we preoxygenated the patient with 100% oxygen for 3 minutes prior to induction of anesthesia. The induction with sevoflurane via mask was carried out while maintaining spontaneous ventilation until the intravenous access was established. During airway management, extension of the head and neck was avoided. Although the patient had easy mask ventilation, a conventional laryngoscope did not provide an optimal view of the larynx, so a videolaryngoscope was used. While the epiglottis and glottic opening were clearly visualized with the videolaryngoscope, the endotracheal tube had to be directed between the vocal cords with the use of several different tube sizes and maneuvers during intubation. Throughout the procedure, the patient's vital signs remained stable, and no significant complications were observed.

Regional anesthesia has been reported to be a viable option for surgical anesthesia and perioperative analgesia in patients with MPS, as it avoids the risks associated with general anesthesia, such as airway compromise and postoperative respiratory depression (8).

In this report, the second case was an adult patient scheduled for an inguinal hernia repair operation wit a diagnosis of MPS VI. At the preoperative period, we examined the airway, cardiac, vertebral, and colonic anatomy as well as symptoms of spinal cord compression. We planned a subarachnoid block for surgical anesthesia. In preparation for the possibility of switching to general anesthesia, difficult airway management was conducted in the operating room. The patient underwent successful surgery under spinal anesthesia and was discharged without any complications.

CONCLUSION

In conclusion, surgery is often necessary for patients with MPS to improve their quality of life and prevent further complications. However, surgery in these patients can be challenging due to the increased risk of complications related to anesthesia and the underlying disease. MPS syndrome patients often have a difficult airway due to mucopolysaccharide accumulation, short neck, ankylosis, and dislocation risks. Regional anesthesia is preferable for suitable patients and surgeries even so preoperative airway evaluation and difficult intubation preparation are essential for ensuring optimal outcomes in this challenging patient population.

REFERENCES

1. Neufeld EF, Muenzer J. The mucopolysaccharidoses. In: Scriver CR, Beaudet AL, Sly WS, Valle D, editors. *The Metabolic and Molecular Bases of Inherited Disease.* Vol. 8. New York: The McGraw-Hill Companies, Inc; 2001. pp. 3421–52
2. Stapleton M, Arunkumar N, Kubaski F, Mason RW, Tadao O, Tomatsu S. Clinical presentation and diagnosis of mucopolysaccharidoses. *Mol Genet Metab*. 2018;125(1-2):4-17.
3. Muenzer J. Overview of the mucopolysaccharidoses. Rheumatology 2011; 5: 4-12.
4. Harmatz, P.R.; Shediac, R. Mucopolysaccharidosis VI: Pathophysiology, diagnosis and treatment. Front. Biosci. Landmark 2017, 22, 385–406
5. Montaño, A. M., Tomatsu, S., & Gottesman, G. S. (2014). Mucopolysaccharidosis VI. GeneReviews®.
6. Martin, R., Beck, M., Eng, C., Giugliani, R., Harmatz, P., Muñoz, V. Recognition and diagnosis of mucopolysaccharidosis II (Hunter syndrome). Pediatrics, 2018; 141(Suppl 5), S455-S468. doi:10.1542/peds.2017-2853G
7. Clark BM, Sprung J, Weingarten TN, Warner ME. Anesthesia for patients with mucopolysaccharidoses: Comprehensive review of the literature with emphasis on airway management. *Bosn J Basic Med Sci*. 2018;18(1):1-7.
8. Driessen, C., Hollak, C. E., Vanderveldt, M. A., Pain, M. C. Safety and efficacy of regional anesthesia in patients with mucopolysaccharidoses. Acta Anaesthesiologica Scandinavica, 2018; 62(4), 477-483.

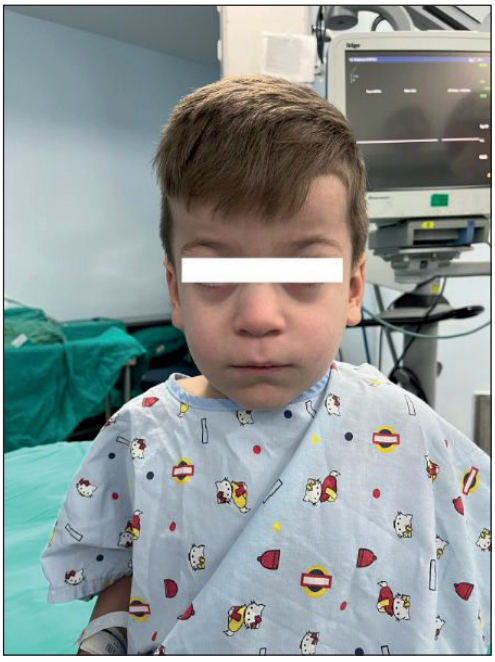


Figure 1.

Figure 2.

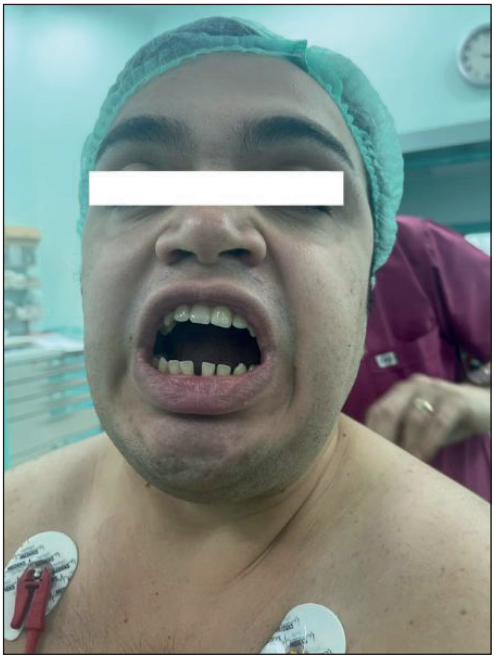


Figure 3.

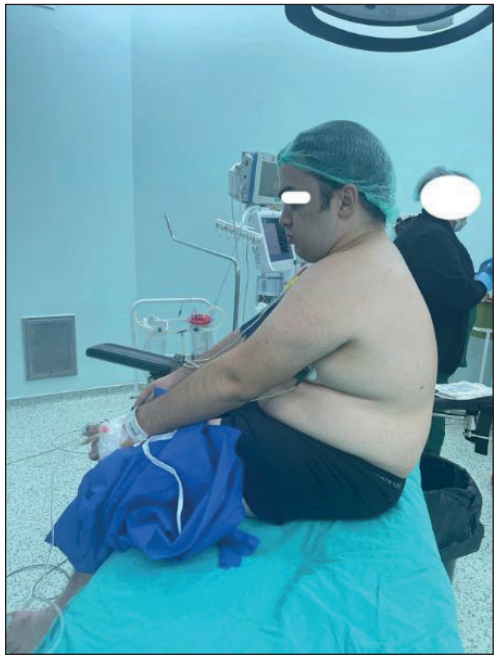


Figure 4.

Comparative Assessment of The Relationship Between Preoperatively Measured Pulse Wave Velocity and the Hemodynamic Changes Observed During Anesthesia Induction in Hypertensive nd Normotensive Patients

Sinan Yilmaz[1], Imran Kurt Omurlu[2]

[1] Adnan Menderes University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Aydin, Türkiye
[2] Adnan Menderes University, Faculty of Medicine, Department of Biostatistics, Aydin, Türkiye

ABSTRACT

Background: During the induction of general anesthesia, hemodynamic instability is a common occurrence in elderly hypertensive patients with increased arterial stiffness, and it can cause undesirable complications. To investigate if preoperatively measured pulse wave velocity (PWV) is related to hemodynamic changes during general anesthesia induction in hypertensive (HT) and normotensive (non-HT) patients.

Material and Methods: The study was carried out with 139 patients who met the study inclusion criteria, between December 2018 and December 2019. Prospective, cohort, observational, single-center study and was conducted university hospital. The participants were patients aged 50 years or older, and who were planned to have elective otolaryngology with endotracheal intubation. Patients with a diagnosis of hypertension or patients who have been receiving treatment for hypertension or with systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg were included in the hypertension group (HT group), whereas the remaining patients were included in the normotensive group (non-HT group). Arterial stiffness measurements were performed preoperatively using an oscillometric device (Mobil-O-Graph PWA).

Results and Discussion: PWV, an important indicator of arterial stiffness, was found to be significantly higher in the HT group than in the non-HT group ($p<0.001$). Hypotension was higher in the HT group than in the non-HT group on all occasions, only hypotension observed 30th second of intubation in the HT group was significantly higher than in the non-HT group ($p<0.025$).

Conclusions: The easily and non-invasively measurable preoperative PWV values can be a good predictor of hypotension after intraoperative general anesthesia.

Keywords: Arterial stiffness, hypotension, hypertension

OP-45 (Others)

Abstract Only

Anesthetic Management for Functional Endoscopic Sinus Surgery of a Lung-Transplanted Patient

Bilge Tuncer, Eda Uysal Aydın, Aziz Aysel, Eda Aysan, Ezgi Erkılıç

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Over the past decades there has been an increase in lung transplantation surgeries. The improvement in patient outcomes and increased survival rates (85% at 1 year, 59% at 5 years) has brought along a rise in other surgical interventions. Common important challenges are immunosuppressive therapy related infections, diabetes, renal injury, malignancies and abdominal surgeries. Since anesthetic management has become an important issue in these patients, we aimed to discuss and share our experience in a lung transplanted patient scheduled for functional endoscopic sinus surgery.

Case: A 61-year-old, 68 kg, ASA 3 male patient with a history of diabetes, hypertension and chronic renal disease, was admitted to our hospital because of severe headache and nasal congestion. He had a lung transplantation 11 months ago. The patient's preoperative laboratory values were Hb 10.3 g/dL, Htc 31.9%, urea 44 mg/dL, creatinine 1.48 mg/dL, HbA1C 7.1%, tacrolimus level 8.69 ng/ml. In the preoperative echocardiography minimal tricuspid insufficiency, EF: 67%, PAP 25 mmHg were detected. Pulmonary function test revealed FVC 64%, FEV1 75%, FEV1/FVC 93,6%. His SpO2 was 92 in room air. Following preoxygenation, anesthesia was induced with propofol 2,5 mg/kg, fentanyl 1 mcg/kg, rocuronium 0,6 mg/kg. Videolaryngoscope was used for endothracheal intubation. TIVA was applied for maintenance, with infusions of propofol 8 mg/kg/hr and remifentanil 0.1 mcg/kg/min. Mechanical ventilator settings were adjusted as 5 ml/kg tidal volume, 13/min respiratory rate, 5 mmHg PEEP and PIP was kept below 30 cm H_2O. The procedure lasted 68 min and 200 ml of saline was given intravenously. Urinary output was 50 ml. Sugammadex 2 mg/kg was applied to reverse neuromuscular block.

Discussion: Aseptic conditions should be provided in all interventional procedures in patients who will undergo surgery after lung transplantation. Lung protective ventilation can be ensured with low tidal volume, PEEP and PIP. Restrictive fluid management should be considered. Total intravenous anesthesia should be preferred for maintenance of anesthesia and lung protective measures should be taken by using sugammadex to reverse neuromuscular block.

Conclusion: Due to immunosuppressive conditions and altered respiratory physiology, lung protective measures should be considered for lung-transplanted patients.

Keywords: Lung transplantation, functional endoscopic sinus surgery, anesthetic management, lung protection

Anesthetic Approach in a Patient Undergoing Tracheal Resection Due to Tracheal Stenosis: Intraoperative Retrograd Intubation

Mehtap Tunç

Atatürk Sanatoryum Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Tracheal stenosis is one of the worst complications associated with endotracheal intubation and tracheostomy. In this study, we presented our case in which we applied tracheal resection by intubating from the tracheostomy line for upper tracheal stenosis due to long-term intubation and tracheostomy in the intensive care unit.

Case: Tracheostomy was performed to a 29-year-old male patient after 3 weeks of intubation due to multitrauma. He was discharged to the ward with a tracheostomy cannula on the 70th day of his admission to the intensive care unit. Tracheal resection was planned for upper tracheal stenosis. After anesthesia induction of the patient, the tracheostomy cannula was removed, a sterile spiral tube was inserted through the same line, and cross-field ventilation was applied. A tube changer catheter was given to the surgical team before the last sutures were placed. The catheter was guided retrogradely from the surgical field from the trachea to the glottis by the surgical team. The endotracheal tube was inserted into the trachea by sliding it over the changer catheter taken from the mouth by the anesthesist. The catheter was removed from the tubing and connected to the ventilator circuit. In the postoperative period, the patient was extubated and admitted to the intensive care unit without any problem.This report has not been published before. Written informed consent was obtained from the patient.

Discussion: Different methods such as jet ventilation, distal tracheal intubation, spontaneous ventilation, LMA and ECMO have been reported in the literature for ventilation during upper tracheal resections. Our case is a rare case in which airway maintenance was achieved with retrograde intubation after intubation through the tracheostomy opening. With retrograde intubation, safe intubation was performed in the neck flexion position without forcing the suture lines, and at the level desired by the surgery.

Conclusion: Tracheal resection and reconstruction are very difficult surgeries for the anesthesiologist. The anesthesiologist should be proficient in different methods of securing the airway and maintaining gas exchange. The most optimal approach should be decided within the available possibilities and experience and cooperation during the surgery.

Keywords: Anesthetic management, postintubation, posttracheostomy, tracheal stenosis, tracheal resection

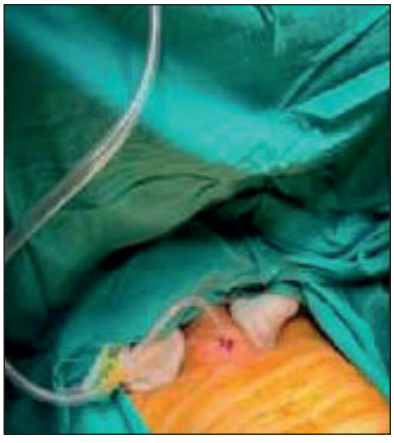


Figure 1. Spiral endotracheal tube insertion through the tracheostomy line and cross field ventilation

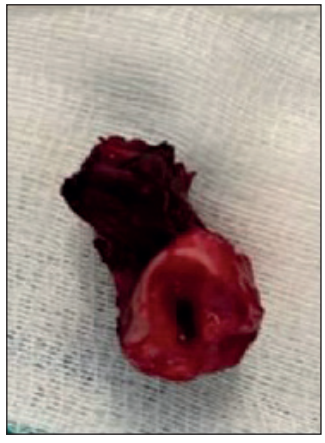


Figure 2. Resected stenotic tracheal rings

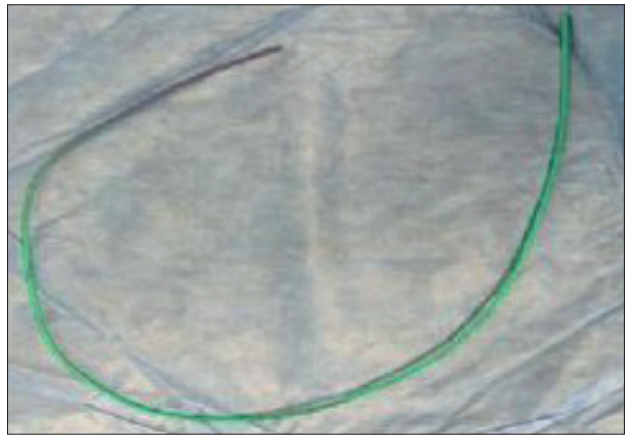


Figure 3. Airway exchange catheter

OP-47 (Others)

Abstract Only

Evaluation of the Relationships Between 2 Different Frailty Indices and Short- and Mid-term Outcomes in EVAR-TEVAR Cases Received in the DSA Unit

Eda Uysal Aydın, Ezgi Erkılıç, Cahide Çağlayan, Ayşegül Özel Erdem

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: It is known that comprehensive pre-anesthesia evaluation plays an important role in predicting morbidity and mortality of patients in the perioperative and postoperative periods. Frailty is a state of reduced physiological reserve and resistance to stressors. Frailty is the accumulation of deficiencies in multiple organ systems leading to physiological decline and subsequent changes in pharmacodynamics and pharmacokinetics. In this study, we aimed to examine the frailty scores of EVAR-TEVAR patients.

Material and Methods: The retrospective study included patients who underwent EVAR-TEVAR in the Digital Angiography Unit of Ankara City Hospital within a 2-year period. MFI-5 (Modified 5-item frailty scale) and EK-5 (clinical frailty scale) scales were used for assessment measurement. Forty-two patients, including 14 TEVAR patients, were included in the study. The average age was calculated as 65.5/year.

Results: There was a moderate correlation between the length of hospital stay and MFI-5 and EK-5 scores. Similarly, those who developed postoperative complications and were readmitted to the hospital within 30 days had higher MFI-5 and EK-5 scores. In the same pattern, it was learned that 6 patients with high MFI-5 and EK-5 scores died. The mean MFI-5 and EK-5 scores of the patients were calculated as 2.5 and 3.94, respectively.

Conclusion: Frailty is characterized by increased sensitivity or reduced physiological reserves. Identification as frail or high-risk can directly influence the treatment decision. MFI-5 and CFS may be a simple and useful assessment to predict early and mid-term EVAR-TEVAR perioperative outcomes.

Keywords: Frailty, pre-anesthesia, EVAR-TEVAR

OP-48 (Others)

Abstract Only

Anaphylaxis due to Intraoperative Hydatic Cyst Rupturing

Rıdvan Durgut, Aslı Kevser Aydilek, Handan Güleç, Ezgi Erkılıç, Ayça Tuba Dumanlı Özcan, Mehmet Hanifi Çanakçı

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Hydatid cyst is an infection of echinococcus granulosus. The incidence of the disease is 50-400 per 100,000 people and its incidence is 3.4 per 100,000 people in Türkiye. We aimed to discuss the anesthesia management of liver cold ischemia period and anaphylaxis due to rupture of hydatid cyst during excision of giant cyst invading liver and main vascular structures.

Case: A 42-year-old female patient was admitted with the complaints of right upper quadrant pain and fullness. She was diagnosed with VCI in the 7th and 8th segments of the liver, right hepatic vein and alveolar hydatid cyst invading the diaphragm, and right hepatectomy and vena cava resection surgery was planned with in situ hypothermic perfusion without venovenous bypass.. Preoperative preparation was made. The patient was taken to the operating table and routinely monitored. ESP block was performed at the bilateral T8 level. The patient was intubated and connected to the MV after general anesthesia. Hemodynamic monitoring was provided with mostcare monitoring. Since vena cava resection was planned for the patient, left IJV central catheterization was performed. Fluid responsiveness and maintenance were adjusted according to mostcare hemodynamic data. Pheniramine maleate, methyl prednisolone and pantoprazole were administered prophylactically. Before the anhepatic phase was passed, NAC, vitamin c, and magnesium were administered. Anaphylaxis developed after the rupture of the diaphragmatic cyst during resection at approximately 40 minutes. At this stage, the anhepatic phase was exited by placing a graft in the inferior vena cava. A decrease in SV and SVR was observed in Mostcare, and an increase in SVV and PPV was observed. The patient, who did not respond to crystalloid colloid and blood products and fluid resuscitation, was taken to the intensive care unit with noradrenaline, dopamine dobutamine, adrenaline support and chest tube. The patient, whose supports were stopped on the 3rd postoperative day, was extubated on the 5th day, and his vital parameters were stable in the service follow-ups, and he was discharged with recovery on the 16th postoperative day.

Conclusion: Our patient developed anaphylaxis due to cyst rupture. Avoiding excessive swelling of the cyst and gentle manipulation can prevent anaphylactic reactions.

Keywords: Hydatid cyst, anaphylaxis, adrenaline, cardiovascular collapse

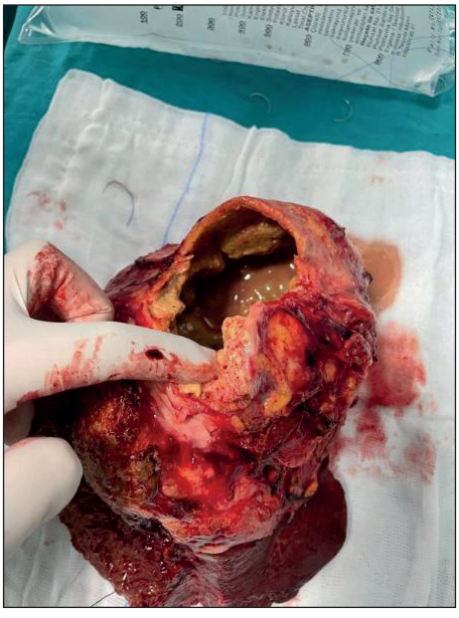


Figure 1. Removed hydatid cyst

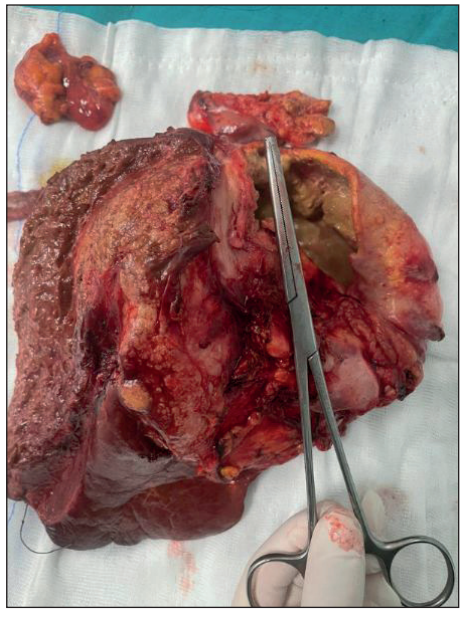


Figure 2. Cyst hydatic exploration

OP-49 (Others)

Abstract Only

Effect of Epidural Analgesia on Goal-Directed Fluid Therapy With PVI in Patients Who Underwent Laparoscopic Colorectal Surgery

Ayşe Ceren Doğanözü[1], Onat Bermede[1], Cihangir Akyol[2], Necmettin Ünal[1]

[1] Ankara University Faculty of Medicine, Department of Anaesthesiology and Reanimation, Ankara, Türkiye
[2] Ankara University Faculty of Medicine, Department of General Surgery, Ankara, Türkiye

ABSTRACT

Background: One of the most critical parameters of the ERAS protocol is perioperative fluid management. Goal-directed fluid therapy has advantages in this respect. We aimed to observe whether the epidural analgesia has an effect on intraoperative fluid replacement and postoperative recovery in patients who underwent major abdominal surgery in this study.

Material and Methods: Forty-six patients who underwent elective laparoscopic colon surgery under general anesthesia, aged 18-75, ASA I-III, were included in the study. The patients were randomized into epidural and intravenous analgesia groups. In the epidural analgesia group, 0.25% bupivacaine infusion was initiated at a rate of 5 ml/h, and it was adjusted according to the hemodynamic response intraoperatively. In the IV analgesia group, fentanyl was administered at a rate of 0.5 mcg/kg per hour intraoperatively.

Goal-directed fluid therapy was arranged with PVI monitoring in both groups.

Intraoperative vital signs, body temperature, the intraoperative volume replacement, PVI values were recorded. Postoperative oral intake, mobilization, time to first flatus, hospital length of stay, and the complications were noted.

Results: The demographic data of both groups were the same except older the ages of the IV analgesia group. There was no difference in the amount of the fluid administered and the hemodynamic parameters between the groups.

Intraoperative PVI trend significantly decreased in the epidural group while it was stable in the IV analgesia group. ($p=0.03$). Body temperature was significantly lower at the end of the surgery compared to the beginning of the epidural analgesia group ($p<0.001$). But this was not the case in the IV analgesia group ($p=0.182$). There was no difference between groups in terms of hospital length of stay, postoperative complications, and clinical recovery time.

Conclusions: The administration of epidural analgesia does not have an advantage in comparison to the iv-analgesia group in terms of targeted fluid therapy and the postoperative process and recovery time in laparoscopic colorectal surgery performed under general anesthesia. In contrast, it increases body heat loss. More detailed evaluations are needed for the effectiveness of PVI in intraoperative fluid therapy optimization.

Keywords: ERAS, goal-directed fluid therapy, epidural analgesia

Non-Intubated Video-Assisted Thoracic Surgery With Erector Spina Plane Block and Sedation in a Patient with Limited Lung Capacity: A Case Report

Mehtap Tunç, Merve Sarıyıldız Pehlivan

Ankara Atatürk Sanatoryum Training and Research Hospital, Department of Anaesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: The Risk of hypoxemia is increased in patients with limited respiratory capacity due to one-lung ventilation in video-assisted thoracoscopic surgery (VATS). We aimed to present a case with interstitial lung disease (ILD) and pleural effusion that underwent non-intubated VATS (NIVATS) with erector spina plan block (ESPB) and sedation.

Case: A 57-year-old male patient with a diagnosis of ILD and gastric cancer, who was planned for VATS and pleural biopsy, was evaluated as ASA III. The patient with FEV1: 29%, FVC: 43%, FEV1/FVC: 77% in pulmonary function tests (PFT) was decided to be treated with NIVATS by combining peripheral block and sedation. She was premedicated with midazolam after preoxygenation. Oxygen was given to the patient by nasal cannula. Sedation was applied using propofol, ketamine and remifentanil. After fiberoptic bronchoscope (FOB), the patient was placed in the lateral decubitus position. Before the surgical procedure, imaging was performed at the T5 level with USG (SonoHealth D2CL) and in-plane technique. ESPB was performed using prilocaine and bupivacaine. After the sensory block was controlled with the pinprick test, the surgical procedure was started. Local anesthetic was applied to the incision area by the surgical team. 2500 cc of pleural effusion was drained and multiple biopsies were taken from the pleura. Intraoperative hypoxemia and hypercarbia did not develop. The procedure lasted 35 minutes and the patient, whose vitals were stable, was taken to the intensive care unit for postoperative follow-up. This report has not been published before. Written informed consent was obtained from the patient.

Conclusion: We can reduce the risks of intubation by choosing NIVATS in patients with limited PFT. By avoiding muscle relaxants, a physiological advantage in terms of intraoperative stability can be achieved and postoperative pulmonary complications can be avoided. ESPB, which we apply to provide adequate analgesia, can be preferred in terms of side effects compared to other blocks (such as paravertebral,thoracic epidural,intercostal) because it causes fewer complications and is easier to visualize.Deciding on NIVATS by considering the advantages and disadvantages in patients with pulmonary comorbidity with a good evaluation in the preoperative period will reduce the risk of possible complications.

Keywords: Erector spinae plane block, non intubated video assisted thoracoscopic surgery, interstitial lung disease

OP-51 (Others)

Abstract Only

Post-Thoracotomy Patient-Controlled Epidural Analgesia Using Bupivacaine and Morphine Combination: High Volume-Low Concentration Or Low volume-High Concentration?

Mehtap Tunç

Atatürk Sanatoryum Training and Research Hospital, Department of Anaesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: The dosage, volume, and concentration effects of local anesthetic and opioid combinations for the epidural analgesia after thoracotomy are still not fully understood. This prospective randomized controlled study compared the influences of two concentrations (High volume-Low concentration; HV-LC or Low volume-High concentration;LV-HC) of bupivacaine and morphine(BM) mixture for patient-controlled epidural analgesia (PCEA). Drugs consumption, the quality of analgesia, sensory block,hemodynamic effects,and side effect s were evaluated.

Material and Methods: The ethics committee's approval and written informed consent were obtained before the study. Sixty-four patients who underwent posterolateral thoracotomy were randomized into two groups. In Group1(HV-LC), a solution prepared with 0.12% bupivacaine and 0.05 mg/cc morphine was administered with a basal infusion rate of 4 cc/h, bolus dose of 2 cc, and a lockout time of 30 min. In Group 2 (LV-HC), a solution prepared with 0.48% bupivacaine and 0.2 mg/cc morphine was administered with a basal infusion rate of 1 cc/h, bolus dose of 0.5 cc, and a lockout time of 30 min. During the postoperative period VAS pain scores, sensory block spread, hemodynamic parameters, peripheral oxygen saturation, sedation, drugs consumption, the PCEA bolus amounts were compared. Additionally, patients were evaluated for side effects, additional medication requirements, and patient satisfaction.

Results and Discussion: The resting VAS score was statistically significantly higher mainly on the second postoperative day in Group 2 ($p<0.05$). In Group 2, there were increases in coughing VAS scores and the amount of drugs consumed on the first postoperative day ($p<0.05$). The cephalic spread of the sensory block was more extensive in Group 1 than Group 2 ($p<0.05$). There were no significant differences between the groups regarding the side effects and patient satisfaction ($p>0.05$).

Conclusion The administration of the BM combination for PCEA at HV-LC after thoracotomy in the same total dose provided better analgesia and less drug consumption. It was observed that the cephalic spread of sensory block was higher in this group. Both applications were effective and safe in terms of analgesia and side effects. Patients in both groups were similarly satisfied with the analgesic treatment.

Keywords: Patient controlled epidural analgesia, anesthetic techniques, thoracic surgery, local anesthetic and opioid combination, dose and concentration

Postoperative AKI in Geriatric Patients Undergoing Major Open Abdominal Gynecologic Oncologic Surgery: Single-Center, Retrospective, Cohort Study

Nadide Aysun Postaci

University of Health Sciences Ankara City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Postoperative acute kidney injury (PO-AKI) is an independent risk factor for both in-hospital and long-term mortality, as well as an increased risk of chronic kidney disease and progression to cardiovascular events. PO-AKI can occur in 6.7% to 39.3% of patients undergoing noncardiac surgery.The etiologies and mechanisms of AKI are multifactorial, and it is stated that it is a common postoperative complication, especially in elderly patients, due to decreases in preoperative renal reserve, multiple comorbidities, and polypharmacy.

The aim of the study was to retrospectively examine the incidence of AKI, risk factors, 90th-day outcome and kidney functions in the geriatric patient population undergoing major open abdominal gynecologic-oncologic surgery (GOS).

Material and Methods: Retroceptive, cohort study, Ethics Committee approval (E1-22-2381), evaluated 113 geriatric patients undergoing major open abdominal surgery in GOS between January 2021 and March 2022 (Figure 1).The following clinical data were collected; preoperative disease states: hypertension, diabetes mellitus, ischemic heart disease, congestive heart failure and additional diseases, patients demogprafic data, preoperative;hemoglobin, sCr, eGFR, serum albumin, serum chloride consentration,pre-intra-postoperative drugs; use of preoperative chemotherapy, ACEIs, ARBs, beta blocker, diuretic, acetylsalicylic acid, NSAIDs, vassoactive drugs, furosemide, surgical diagnosis and time, amount of acid discharge, blood loss, blood transfusion, total amount of crystalloid / colloid infused, amount of fluid infused throughout the operation, need for ileo-colostomy, ASA score, General Surgery AKI Risk İndex were calculated and recorded.

Results: The mean age of the patients was 72.15±5.75 years, the mean BMI was 32.30±6.50, patient data are shown in the Table 1,2 and 3. The incidence of PO-AKI is shown in Figure 1. There was a significant difference between the two groups in terms of surgical time, intraoperative bleeding amount, intraoperative hypotension, intraoperative vasopressor use, postoperative hypoalbuminemia, postoperative diuretic use, and factors related to PO-AKI. PO-AKI caused prolongation of PACU and discharge time.

Discussion and Conclusion: The etiology of PO-ABI is multifactorial, and it was found in 22% of the gyno-oncological geriatric patient group in our clinic. Renal function of 78% of these patients recovered within 48 hours. Surgery time is an independent risk factor, especially in geriatric major open abdominal gynecologic oncologic surgery.

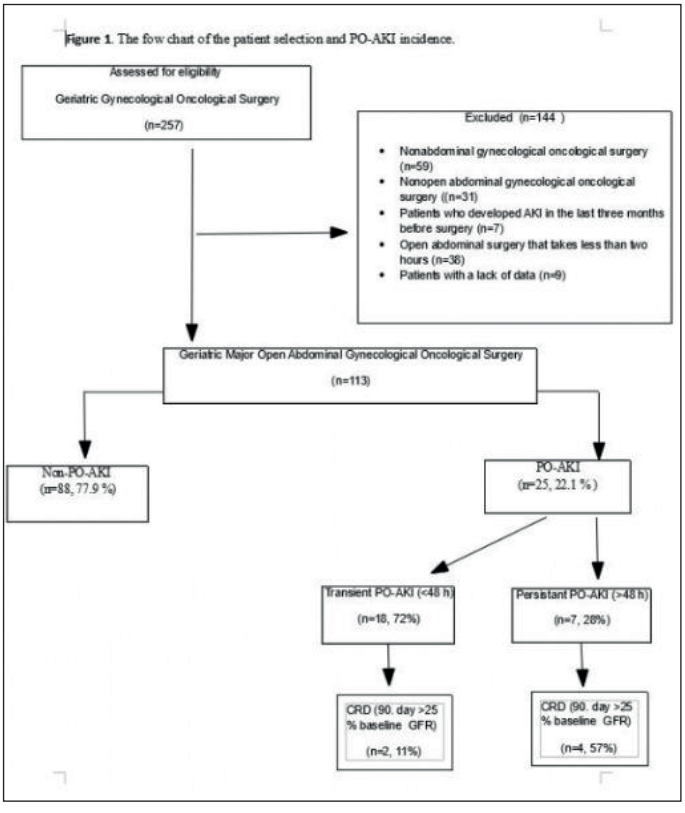
Keywords: Acute kidney injury, postoperative AKI, abdominal surgery, elderly patients

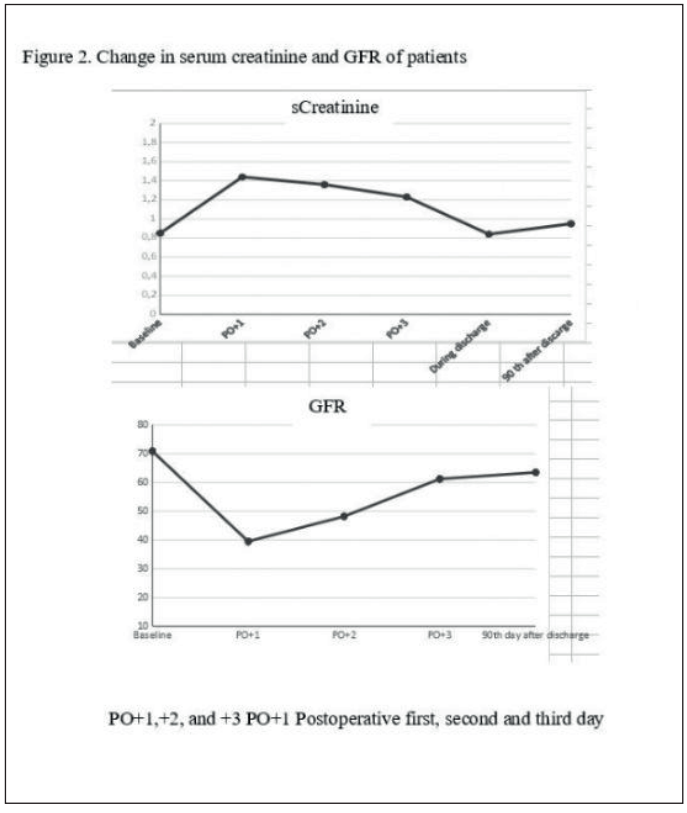
Table 1. AKI Stage Distribution of Patients

		n	%
KDIGO stage	0 1 2 3	88 17 6 2	77.9 15 5.3 1.8
PO-AKI	No Yes	88 25	77.9 22.1
PO-AKI time	<48 hour >48 hour	18 7	72.0 28.0
Surgery Time (min) Mean ± SD Median (Min-Maks)	Non AKI 258.98±79.1 247.5 (135-490)	AKI 308.00±84.53 315 (180-480)	P 0.014 a

Table 2. Comparisons of Postoperative Data of Patients with No-AKI and AKI

		No-AKI Mean ± SD Median (Min-Max)		AKI Mean ± SD Median (Min-Max)	p
Amount of fluid used (mL/h)		882.25±257.12 845 (400-1741)		817.12±232.42 825 (338-1299)	0.329 a
PACU time (day)		1.50±0.85 1 (1-5)		2.88±2.61 2 (1-13)	0.001 a
Discharge time (day)		7.06±3.28 6 (4-22)		11.08±6.17 9 (5-27)	<0.001 a
	n	%	n	%	
PO diuretic use No Yes	72 16	81.8 18.2	11 14	44.0 56.0	<0.001 b
PO Blood trasfusion No Yes	77 9	89.5 10.5	22 2	91.7 8.3	1.000 b
PO +1 Albumin decreased No change	31 57	35.2 64.8	17 8	68.0 32.0	0.003 b
PO+ 2 Albumin decreased No change	37 50	42.5 57.5	18 7	72.0 28.0	0.009 b





The Influence of Different Sugammadex Doses on Neural Tube Development in Early-Stage Chick Embryos

Asude Ayhan[1], Ekin Efe[2], Pinar Ayran Fidan[2], Oguzhan Ekin Efe[3], Eylem Gul[4], Fikret Sahinturk[5], Selim Ayhan[5]

[1]Baskent University, School of Medicine, Department of Anaesthesiology and Reanimation, Ankara, Türkiye
[2]Baskent University, School of Medicine, Department of Histology and Embryology, Ankara, Türkiye
[3]Baskent University, School of Medicine, Department of Pharmacology, Ankara, Türkiye
[4]Baskent University, School of Medicine, Department of Biostatistics, Ankara, Türkiye
[5]Baskent University, School of Medicine, Department of Neurological Surgery, Ankara, Türkiye

ABSTRACT

Background: Sugammadex is a modified gamma-cyclodextrin that has been developed with the goal of reversing the neuromuscular blockade brought on by steroidal neuromuscular blocking agents. The literature is insufficient to evaluate the safety of sugammadex during early gestation and fetal development. The aim of the present study is to invesitgate the effects of different sugammadex doses on neural tube development in an early-stage chick embryo model.

Materials and Methods: A total of 100 specific pathogen-free, fertilized domestic chicken eggs were randomly divided into five groups (n=20), and were placed in an automatic cycle incubator. The eggs in the "Control" (C) group were incubated without administration of any drug till the end of the experiment. Subblastodermic administration of 0.9% NaCl and different doses of sugammadex solutions prepared with the latter [2mg/ml (LD), 4mg/ml (MD), 16mg/ml (HD)] were performed at 30 hours of incubation [Hamburger-Hamilton (HH) stage 9] for the rest. All embryos were removed from the eggs at 72 hours, when the anterior and posterior neuropores are expected to close (HH stage 19-20), and evaluated histo-morphologically.

Results and Discussion: There was no embryonic development in ten of the total eggs (Figure 1, 2), and an open neural tube was detected in one embryo in the HD group (Figure 1-3). No statistically significant differences was found between the experimental groups (Figure 1).

Conclusion(s): Sugammadex may be given to surgical patients in early pregnancy for rapid neuromuscular reversal. This avian experimental model showed a dose-dependent developmental and neural tube closure defects in early-stage chick embryos. Such information may be important in patient and physician counseling, however, further clinical studies will be required to extrapolate these results to humans.

Keywords: Anesthesia, chick embryo, neural tube defects, pregnancy, sugammadex

Experimental Groups	Unfertile n (%)	Alive n (%)	Undeveloped n (%)	Open Neural Tube n (%)	p-value
Control (n=20)	1_a (5.0)	18_a (90.0)	1_a (5.0)	0_a (0.0)	0.577
%0.9 NaCl (n=20)	1_a (5.0)	18_a (90.0)	1_a (5.0)	0_a (0.0)	
Low Dose (n=20)	0_a (0.0)	17_a (85.0)	3_a (15.0)	0_a (0.0)	
Medium Dose (n=20)	3_a (15.0)	14_a (70.0)	3_a (15.0)	0_a (0.0)	
High Dose (n=20)	2_a (10.0)	14_a (70.0)	3_a (15.0)	1_a (5.0)	

a: p>0.05

Figure 1. Development of control and experimental groups (72-hr embryos).

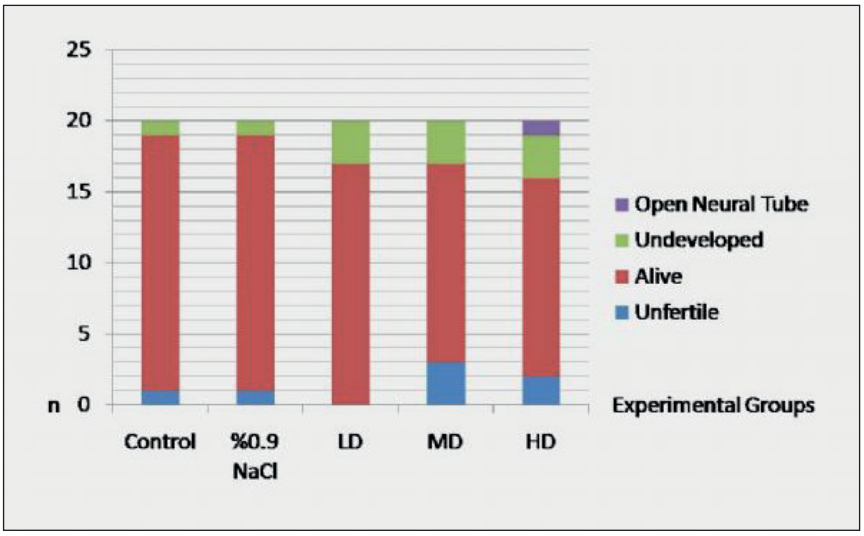


Figure 2. Graphical illustration for the development of control and experimental groups.

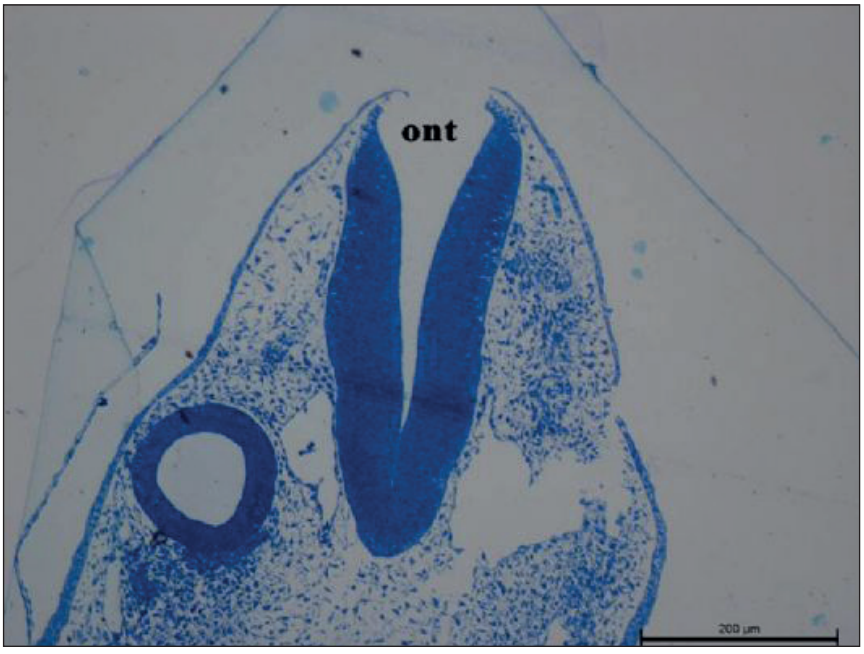


Figure 3. Embryo with neural tube defect in HD group (ont) (Semi-thin section, light microscopy, Toluidin blue staining, x100).

The Effect of Preoperative Fasting Period on Renal Ischemia Reperfusion Injury in Rats

Mustafa Cem Yılmaz[1], Ezgi Erkılıç[2], Nursen Karakelle[2], Yasemin Akçaalan[2], Nermin Göğüş[2], Ebru Menekşe[5], Gürkan Dumlu[5], Betül Öğüt[3], Aylin Sepici Dinçel[4]

[1]Kahramankazan State Hospital, Clinic of Anesthesiology and Reanimation, Türkiye
[2]University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[3]Gazi University, Faculty of Medicine, Department of Pathology, Ankara, Türkiye
[4]Gazi University, Faculty of Medicine, Department of Biochemistry, Ankara, Türkiye
[5]University of Health Sciences Ankara Bilkent City Hospital, Department of General Surgery, Ankara, Türkiye

ABSTRACT

Background: Preoperative fasting is a traditional method used to avoid pulmonary aspiration and related complications. However, with the introduction of enhanced recover after surgery (ERAS) protocols in recent years, preoperative fasting periods have started to decrease. Short periods of fasting have been shown to reduce insulin resistance, acute phase response and oxidative stress in the perioperative period. Ischemia reperfusion injury has an important place in the etiology of acute kidney injury. In our study, we aimed to observe the effect of preoperative short fasting periods on renal ischemia reperfusion injury.

Materials and Methods: 21 wistar albino rats in 3 groups were included in the study. Rats were randomized as sham A group fasted for 12 hours preoperatively, group B fasted for 12 hours preoperatively, group C for 2 hours preoperatively. Blood samples were taken for preoperative baseline biochemical values. After abdominal laparotomy, rats in groups B and C, renal ischemia applied by clamping left renal pedicle 20 min. Then 20 minutes reperfusion was allowed. After laparotomy in group A, after reperfusion in groups B and C, left and right nephrectomy was performed, and samples were stored for histopathological examination. After blood samples were taken to measure postoperative biochemical values, the rats were sacrificed.

Results: In the histopathological examination, proximal tubular epithelium brush-border loss, apoptosis and tubular cast formation were examined. In terms of apoptosis, the score was significantly higher in the left kidney with ischemia in group B compared to the right kidney ($p = 0.008$). A similar increase was not observed in other groups. In terms of tubular cast formation, statistically significant increases were observed for both right and left kidneys in group B ($p = 0.015$, $p = 0.017$). There wasn't statistically significant difference between and within the groups in the evaluations made with interleukin-6 and neutrophil gelatinase-associated lipocalin (NGAL) biochemically.

Conclusion: In our study, we found that the preoperative short fasting period in rats has a positive effect in the case of mild renal ischemia reperfusion injury. However, we think that many more studies should be done on this subject.

Keywords: Neutrophil gelatinase-associated lipocalin (NGAL), preoperative nutrition, renal ischemia reperfusion injury

INTRODUCTION

Preoperative fasting is a traditional method used by surgeons and anesthesiologists for years, especially to avoid pulmonary aspiration and related complications (1). However, studies have shown that long preoperative fasting periods increase insulin resistance, inflammatory response to surgery, and oxidative stress (2–5). With the implementation of enhanced recovery after surgery (ERAS) protocols, which have been put into clinical practice in the last 20 years, complication and morbidity rates have decreased in the perioperative period and hospitalization times have been shortened. An important step of ERAS protocols is shortening the preoperative fasting period. Oral fluids with carbohydrate content are given to the patients 2-3 hours before the operation. This procedure reduces insulin resistance and acute phase response (C-reactive protein and interleukin -6) in the perioperative period, and also reduces oxidative stress in patients undergoing surgery (1,6–8).

Acute kidney injury (AKI) can be observed at a high rate of 18-47% during and after surgery in the perioperative period (9). When the etiology of AKI is examined, it is seen that ischemia-reperfusion (IR) injury has an important place (10). Apoptosis occurs in cells in the nephron structure as a result of insufficiency in oxygen and glucose delivery to the tissue due to ischemia. During reperfusion, both free radical levels increase and the inflammatory process begins. The result is devastating damage to the nephron structure (11,12). In some experimental studies, it has been shown that preoperative fasting for a shorter time protects cardiac functions and reduces oxidative damage in rats which exposed intraoperative mesenteric ischemia (3). However, the effects of the length of the preoperative fasting period on renal ischemia-reperfusion injury are unclear in the literature.

In this study, it was aimed to investigate the effects of preoperative fasting times in ERAS protocols, which are mostly applied in abdominal surgery procedures, on modeling of renal ischemia-reperfusion injury. In order to evaluate the effects of different preoperative fasting periods, interleukin-6 (IL-6) and neutrophil gelatinase-associated lipocaine (NGAL), which is one of the important biomarkers for acute kidney injury in recent years, were used as biochemical parameters. At the same time, histopathologically, tissue pathologies were evaluated objectively.

MATERIALS and METHODS

Ethics committee approval was obtained from the Animal Experiments Local Ethics Committee of Health Sciences University Ankara Training and Research Hospital with the date of 26.11.2020 and number 0063. After the planned study was completed in Health Sciences University Ankara Training and Research Hospital Experimental and Clinical Research Laboratories, the evaluation of blood and tissues was carried out in Gazi University Faculty of Medicine, Department of Medical Biochemistry and Pathology Laboratories.

In the study, 21 male Wistar albino rats with an average weight of 250 ± 25 grams were used. The room temperature was 22-25 °C and the environment including 12 hours light / 12 hours dark cycles was provided before the experiment. Rats were fed ad libitum (23% protein, 5% fat, 15% fiber, 50% carbohydrate) standard rat chow and drank tap water. Before the study, 3 experimental groups were formed, 7 in each group (n=7).

At the beginning of the study, all rats were anesthetized with Ketamine 90 mg/kg intraperitoneally (Ketalar Vial, 50 mg/ml Pfizer, Istanbul, Türkiye) and Xylazine 10mg/kg intraperitoneally (Rompun 2% Vial Bayer, Istanbul, Türkiye) (Figure 1). First blood samples were taken from all rats in order to determine the preoperative biochemical basal value. All rats underwent laparotomy with an incision of approximately 3 cm from the midline (Figure 2).

1. Group (Group A): Sham group: After 12 hours of fasting and thirst preoperatively, after abdominal laparotomy, bilateral nephrectomy was performed without creating renal ischemia.

2. Group (Group B): After 12 hours of preoperative fasting and thirst, abdominal laparotomy was performed. The left kidney pedicle was clamped (Figure 3). Ischemia was created for 20 minutes. Afterwards, the clamp was opened and reperfusion was allowed for 20 minutes. Bilateral nephrectomy was performed after reperfusion.

3. Group (Group C): Abdominal laparotomy was performed after 2 hours of preoperative fasting and thirst. The left renal pedicle was clamped. Ischemia was created for 20 minutes. Afterwards, the clamp was opened and reperfusion was allowed for 20 minutes. Bilateral nephrectomy was performed after reperfusion.

Renal samples were taken into containers containing 10% formaldehyde solution, which were previously labeled for histopathological examination during the experiment. After bilateral nephrectomy was performed for each subject, second blood samples were taken from the inferior vena cava for biochemical analysis of postoperative values. Afterwards, the rats were sacrificed.

Histopathological Examination of the Kidneys

All tissues were fixed in 10% formaldehyde for 12-36 hours, routinely deparaffinized with xylene and graded alcohol solutions, and 4 µm sections were obtained by embedding in paraffin. Hematoxylin and eosin staining protocol and histochemical PAS staining protocol were applied to these sections. At least 10 areas in each kidney at x200 magnification were evaluated and scored in terms of loss of proximal tubule epithelium brush border, apoptotic cells and tubular cast formations. Scoring was made as 0= 0, 1= 0-10%, 2= 11-25%, 3= 26-45%, 4=46-75%, 5= 76-100%.

Biochemical Analysis

Enzyme-Linked Immunosorbent Analysis Measurement Method (ELISA): It is based on the antigen-antibody relationship, it is a method that measures the amount of antigen according to the amount of enzyme that binds to the antibody and the intensity of the color change that occurs. NGAL, IL-6 levels in serum samples were measured by solid-phase sandwich ELISA using the NGAL Elisa Kit (USCN, Lot: L201013972), Human IL-6 Elisa Kit (USCN, Lot: L201013952) according to the manufacturer's instructions.

Statistical Analysis

The Shapiro-Wilk test was used to determine whether continuous numerical variables were distributed close to normal, and

whether the assumption of homogeneity of variances was provided was investigated by Levene's test. Descriptive statistics; For continuous numerical variables, the median (25th-75th) percentile was expressed. Sortable variables; displayed as both the median (25th-75th) percentile and the number of subjects and (%).

Wilcoxon sign test was used to determine whether there was a statistically significant difference in biochemical measurements after surgery compared to pre-operatively, and whether there was a histopathologically significant difference between the right and left kidneys. The significance of the differences between the groups in terms of biochemical measurements and histopathology scores was evaluated with the Kruskal Wallis test. If the Kruskal Wallis test statistic results were found to be significant, the group(s) causing the difference were determined using the Dunn-Bonferroni test. Whether there was a statistically significant correlation between biochemical measurements and histopathological indicators was investigated using Spearman's rank-order correlation test.

Data analysis was done in IBM SPSS Statistics 17.0 (IBM Corporation, Armonk, NY, USA) package program. Unless otherwise stated, results for $p<0.05$ were considered statistically significant. However, Bonferroni Correction was performed to control for Type I error in all possible multiple comparisons.

RESULTS

In this study we performed in rats, biochemical NGAL and IL-6 values and histopathologically morphological findings of ATN, proximal tubule brush border loss, apoptosis and tubular cast formation were examined. It was observed that the groups were homogeneous in terms of basal biochemical values characteristics. No rats were lost during the study.

Biochemical Results

There was no statistically significant difference between the groups in terms of preoperative NGAL levels (p=0.489). When the results within the groups were compared, there was no statistically significant difference between preoperative and postoperative NGAL levels according to Bonferroni correction (p>0.0167). There was no statistically significant difference between the groups in terms of NGAL levels after surgery (p=0.297). The amount of change in NGAL levels after surgery compared to preoperative values was similar between the groups (p=0.437) (Table 1) (Figure 5).

There was no statistically significant difference between the groups in terms of preoperative IL-6 levels (p=0.385). When the results within the groups are compared, There was no statistically significant difference between preoperative and postoperative IL-6 levels according to Bonferroni correction (p>0.0167). There was no statistically significant difference between the groups in terms of IL-6 levels after surgery (p=0.320). The amount of change in IL-6 levels after surgery compared to pre-surgery was similar between the groups (p=0.409) (Table 1) (Figure 6).

Histopathological Results

In order to examine the histopathological changes, pathological examination was performed in terms of ATN, where the effects of renal ischemia-reperfusion can be seen most clearly. For this purpose, the brush border of the proximal tubule epithelium (Figure 7), apoptotic cells and tubular cast formations were examined. For quantitative evaluation, scoring was done as 0= none, 1= 0-10%, 2=11-25%, 3=26-45%, 4=46-75%, 5=76-100%. A score of 4 and above was not observed in any sample. No score of 2 or more was observed in any of the subjects in group A. In group B, especially in the left kidney, the scores were generally 2 (Table 2). In the pathological examinations of the subjects, it was observed that the formation of apoptotic cells and cast formation was higher in group B than in group C (Figure 8).

There was no statistically significant difference between the right and left kidneys within the groups in terms of proximal tubule epithelium brush border loss scores according to Bonferroni correction (p>0.0167). There was a statistically significant difference between the groups in terms of the loss of the right proximal tubule epithelium brush border scores (p<0.001). The situation that caused the said difference; The scores of groups B and C were higher than group A (p<0.001 and p=0.019). There was a statistically significant difference between the groups in terms of left proximal tubule epithelial brush border loss scores (p<0.001), and the reason for this difference; The scores of groups B and C were higher than group A (p<0.001 and p=0.006) (Table 3).

There was no statistically significant difference between the right and left kidneys within the groups (except group B) in terms of apoptotic cell scores according to Bonferroni correction (p>0.0167). In Group B, the apoptotic cell score in the left kidney was

statistically significantly higher than in the right kidney (p=0.008). There was a statistically significant difference between the groups in terms of right apoptotic cell scores (p<0.001). The situation that caused the said difference; The scores of groups B and C were higher than those of group A (p<0.001). There was a statistically significant difference between the groups in terms of left apoptotic cell scores too (p<0.001). The reason for this difference; the scores of groups B and C were higher than those of group A (p<0.001 and p=0.008) (Table 3).

There was no statistically significant difference within the groups in terms of tubular cast formation scores between the right and left kidneys according to Bonferroni correction (p>0.0167). There was a statistically significant difference between the groups in terms of right tubular cast formation scores (p=0.011); The scores of group B were higher than group A (p=0.015). There was a statistically significant difference between the groups in terms of left tubular cast formation scores too (p<0.001). The situation that causes this difference; The scores of groups A and C were lower than those of group B (p<0.001 and p=0.017) (Table 3).

Correlation Analysis

As a result of the existing correlation analyzes, no statistically significant correlation was found between histopathological indicators and both preoperative biochemical measurements and postoperative measurements, according to Bonferroni Correction (p>0.025). Likewise, no statistically significant correlation was found between the change in biochemical measurements after surgery compared to pre-surgery and histopathological indicators according to Bonferroni Correction (p>0.025). There was no statistically significant correlation between the biochemical measurements according to Bonferroni Correction (p>0.025). (Tables 4, 5, 6,7)

DISCUSSION

In our experimental study, in which we evaluated the effects of preoperative fasting duration in rats, we found that short fasting duration had more protective effects in ischemia-reperfusion injury cases. Although the biochemical parameter data evaluated in the study did not statistically differ between the groups, the pathological data were effective in determining the outcome of the study. ATN findings due to ischemia-reperfusion injury were statistically significantly higher in rats with a longer preoperative fasting period than in shorter ones.

Acute kidney injury (AKI) is a common condition in hospitalized patients and is associated with increased medical costs, prolonged hospital stay, and increased morbidity and mortality. Ischemia-reperfusion injury is one of the most common causes of AKI in clinics (13). Knowing that it can be delayed in the diagnosis of AKI by measuring serum creatinine and glomerular filtration rate (GFR), which are traditional methods, led to the search for new biochemical markers (14). NGAL has been used as an early biochemical marker of AKI in many experiments with renal IR injury in the literatüre (15-20). Compared to serum creatinine, NGAL is more prominent in the diagnosis of AKI due to its more significant increase, especially in the early period. Similarly, serum and urine NGAL measurements show parallelism (21,22). Similar to animal experiments, in clinical studies (patients undergoing cardiac surgery, acute decompensated heart failure), NGAL is considered an early sensitive and specific marker of AKI. It was concluded that NGAL is an important marker in monitoring short-term graft function after kidney transplant surgeries (23–25). Akpinar et al. reported that urinary NGAL measurements may be more significant than GFR measurement in the early diagnosis of AKI in patients who underwent partial nephrectomy for renal tumor, but they did not find a correlation between urinary NGAL elevation and clinical severity of AKI (20).

Arakawa et al. They found that the amount of NGAL protein increased in the renal tissue by using immunohistochemical staining method in their study in which they used 20 min ischemia to subjects. According to their experiments; the amount of urine NGAL increasing is observed by 20 min. and longer ischemia, but serum NGAL increasing observed by 30 min. and longer ischemias (15). Dong et al.; investigated the relationship between tubular biomarkers and ischemia duration and frequency in IR injury. As a result They found that both serum and urine NGAL levels increased significantly after 10-15 min ischemia (18). Similarly in the literature, Woodson et al. in their studies in which they caused renal IR damage in rats; They proved that NGAL is effective in demonstrating renal damage. Although they observed an effect with 15 minutes of ischemia and then 30 minutes of reperfusion, they reported that the maximum effect was seen with 30 minutes of ischemia and 45-60 minutes of reperfusion, and that longer ischemia times resulted in a decrease in NGAL values (26). We did not observe a statistically significant difference in serum NGAL values of our subjects, in which we applied 20 minutes of reperfusion after 20 minutes of ischemia, in groups with sham and different fasting periods, within themselves and also between groups. This may be related to both our ischemia and reperfusion time. Since we could not find any study in the literature on the relationship between preoperative fasting and serum NGAL, we unfortunately interpreted this issue only on our own data.

IL-6 is a pleiotropic cytokine, primarily involved in the immune and inflammatory response. It is produced not only from T and B lymphocytes, but also from fibroblasts, vascular smooth muscle cells, endothelial, mesangial cells and renal tubule epithelial cells (27). This pleitropism complicates the role of IL-6 in ischemia-reperfusion injury. For example; IL-6 levels increase in cerebral IR injury. This increase turns into a positive protective picture (28).

Nimesh et al. In an experimental study consisting of 3 groups: normal rats, IL-6 deficient rats and IL-6 antibody administered; When reperfusion is applied for 24 hours after 30 minutes of bilateral renal ischemia; determined that renal damage, inflammation and loss of function were seen minimum in IL-6 deficient rats (29). De Vries et al. reported that the amount of IL-6 increased from the 5th minute in the samples they took from the greft veins after renal transplantation, but they also showed that survival decreased when IL-6 antibody was given to the rats who underwent renal transplantation in the same study (30). Chen et al. In their study based on the anti-inflammatory activity of IL-6 when bound to membrane receptors and pro-inflammatory properties when bound to the receptor dissolved in serum; reported that less fibrosis was observed in rats given antibodies against gp-130, a IL-6 receptor dissolved in serum, on the 14th day after 45 minutes of renal ischemia compared to rats that were not given antibodies (31). When seeking an answer to the question of whether the reason for the increase in IL-6 in renal IR damage is the decrease in renal filtration or the increase in local or systemic inflammation; It has been reported that after 45 minutes of renal ischemia, IL-6 expression increases in both the kidney and liver at both the 1st and 6th hours, and that renal ischemia reperfusion causes a systemic response (32). In our study, we wanted to evaluate the effect of preoperative fasting time on IL-6, a biochemical marker of renal ischemia-reperfusion injury. Similar to serum NGAL values, we did not detect any difference between and within groups.

When the relationship between IL-6 and NGAL in renal ischemia-reperfusion injury was examined, it was shown that the major factor in the increase in NGAL was caused by liver NGAL production and the IL-6 cytokine was the active stimulator in this situation (33). We did not observe a statistically significant association between IL-6 and NGAL correlation in our study. This may be related to the relatively short duration of ischemia. Because the studies in the literature; It shows that IL-6 is increased especially in cases where severe damage is caused by prolonged ischemia. The rise of IL-6 is especially associated with fibrosis formation and progression to chronic kidney damage (31,32).

While acute kidney injury is a 5% mortal condition when faced in isolation without any additional pathology in patients, it is an important problem with a mortality rate of 50% or more, especially in intensive care patients, if there is an accompanying organ failure. The most common cause appears to be ATN due to ischemia. Proximal tubule cells are also the most susceptible to ischemia, as they are the most energy-demanding part with high mitochondria (34). Renal ischemia reperfusion animal models in the literature; warm ischemia reperfusion, cold ischemia-warm reperfusion, and isolated renal reperfusion. Heyman et al. warm ischemia reperfusion model among these models; They stated that it is the most preferred model because of simple, functional damage and pathology being correlated with humans, and the inflammatory response being compatible with humans (35) Hesketh et al. In their study examining the effect of renal ischemia time on IR damage in rats, they proved histopathologically that 20 min ischemia with mild injury, 22 min ischemia with moderate damage, 24 min ischemia with severe tubular necrotic injury (36). In our study, we used the warm ischemia reperfusion model in accordance with the literature, instead of applying a drug or substance, we applied ischemia for 20 minutes to allow mild damage instead of severe necrotic damage in order to compare the effects of a condition on ischemia reperfusion damage. Due to the technical inadequacies of the laboratory where the experiment was conducted, we ended the experiment after 20 minutes of reperfusion.

It has been shown in studies that shortening the preoperative fasting period reduces insulin resistance and acute inflammatory response (4,5,37). Preoperative nutrition has an important place in ERAS protocols. Rege et al. retrospectively examining the effects of ERAS protocols on kidney donors; preoperative carbohydrate-containing fluid consumption; argued that it contributes to early postoperative recovery due to the ability to keep blood glucose under control and muscle preservation mechanisms (38). Fleming et al. when they examined the effects of ERAS protocols in cardiac surgery; with many postoperative complications, including acute kidney injury, atrial fibrillation, cardiac tamponade; They found that they encountered less in patients who applied the ERAS protocol (39). Although the positive effects of ERAS protocols in renal ischemia-reperfusion situations were observed in these studies, the role of preoperative nutrition in this effect has not been fully explained. van Hoorn et al. examined the relationship between preoperative fasting time and ischemia-reperfusion injury. In their study, ischemia was created by clamping the superior mesenteric artery for 60 minutes in rats that were fasted for 13 hours and 2 hours preoperatively, and then reperfusion was allowed for 180 minutes. They showed that cardiac functions were better preserved and oxidative stress-related damage was less observed in rats with a short preoperative fasting period. The results of their studies, when preoperative shorter fasting periods in rats are compared with long periods of fasting; They reported that

it reduces IR damage and preserves organ function (3). When we examined the histopathological effects of renal IR injury in our study, we observed negative high scores in terms of all histopathological evaluations in rats exposed to a long preoperative fasting period. This result was consistent with the targeted level of mild ischemic injury. In terms of brush border loss, we found statistically significant higher scores in both left and right kidneys in the other groups compared to the sham group. In terms of apoptosis, a statistically significant increase was observed in the left kidney compared to the right kidney in rats with a long preoperative fasting period, while this increase was not observed in the other groups. In terms of tubular cast formation, a statistically significant increase was observed in rats that were fasted longer preoperatively in both the left and right kidneys (without ischemia), compared to the other groups. This made us think that a short preoperative fasting period may have protective effects in cases of renal ischemia-reperfusion injury.

CONCLUSION

General practices during the preoperative fasting period have begun to change in recent years, unlike the traditional protocol. In the formation of this result, the decrease in insulin resistance and inflammatory response due to surgical stress due to the consumption of preoperative carbohydrate-containing fluids 2-3 hours before the operation, which is an important step of ERAS protocols, has an important role. In our study, we concluded that the short preoperative fasting period has a protective effect on renal ischemia perfusion injury.

In our study, we observed the effects on renal ischemia-reperfusion injury by fasting a group of rats for 12 hours and a group for 2 hours. In rats with shorter preoperative fasting periods, histopathological damage is seen less in the case of mild renal ischemia reperfusion. We did not observe significant changes in IL-6 and NGAL parameters, which may be because we aimed to cause mild ischemic damage in our study. In this respect, it does not contradict other studies in the literature which longer ischemia reperfusion times and severe ischemic injury. We believe that future studies that will use histopathological criteria and different biochemical markers on moderate and severe renal ischemia-reperfusion injury will be even more useful to fully explain the effects of preoperative fasting time on renal ischemia-reperfusion injury.

REFERENCES

1. Pimenta GP, de Aguilar-Nascimento JE. Prolonged preoperative fasting in elective surgical patients: Why should we reduce it? *Nutrition in Clinical Practice*. 2014;29(1):22-28.
2. Awad S, Varadhan KK, Ljungqvist O, Lobo DN. A meta-analysis of randomised controlled trials on preoperative oral carbohydrate treatment in elective surgery. *Clinical Nutrition*. 2013;32(1):34-44.
3. van Hoorn DEC, Boelens PG, van Middelaar-Voskuilen MC, et al. Preoperative feeding preserves heart function and decreases oxidative injury in rats. *Nutrition*. 2005;21(7-8):859-866
4. Viganò J, Cereda E, Caccialanza R, et al. Effects of preoperative oral carbohydrate supplementation on postoperative metabolic stress response of patients undergoing elective abdominal surgery. *World J Surg*. 2012;36(8):1738-1743.
5. Zelić M, Štimac D, Mendrila D, et al. Influence of preoperative oral feeding on stress response after resection for colon cancer. *Hepatogastroenterology*. 2012;59(117):1385-1389
6. Ackerman RS, Tufts CW, DePinto DG, et al. How Sweet Is This? A Review and Evaluation of Preoperative Carbohydrate Loading in the Enhanced Recovery After Surgery Model. *Nutrition in Clinical Practice*. 2020;35(2):246-253
7. Pogatschnik C, Steiger E. Review of Preoperative Carbohydrate Loading. *Nutrition in Clinical Practice*. 2015;30(5):660-664
8. Steenhagen E. Enhanced recovery after surgery: It's time to change practice! *Nutrition in Clinical Practice*. 2016;31(1):18-29
9. Küllmar M, Meersch M. Perioperative acute kidney injury. *Anaesthesist*. 2019;68(4):194-201.
10. Basile DP, Anderson MD, Sutton TA. Pathophysiology of acute kidney injury. *Compr Physiol*. 2012;2(2):1303-1353
11. Cowled P, Fitridge R. Pathophysiology of Reperfusion Injury. *Mechanisms of Vascular Disease*. 2020;(1):415-440
12. Tögel F, Westenfelder C. Recent advances in the understanding of acute kidney injury. *F1000Prime Rep*. 2014;6
13. Uchino S, Kellum JA, Bellomo R, et al. Acute renal failure in critically ill patients: A multinational, multicenter study. *J Am Med Assoc*. 2005;294(7):813-818.
14. Devarajan P. Emerging Biomarkers of Acute Kidney Injury. In: *Acute Kidney Injury*. Vol 156. KARGER; 2007:203-212
15. Arakawa Y, Ushijima K, Tsuchiya H, et al. Influence of renal ischaemia-reperfusion injury on renal neutrophil gelatinase-associated lipocalin receptor (24p3R) in rats. *Clin Exp Pharmacol Physiol*. 2019;46(12):1166-1173
16. Arantes VM, Bueno RT, Módolo RP, et al. Effects of Ischemic Preconditioning and Postconditioning in a Renal Ischemia-Reperfusion Injury Model: A Comparative Experimental Study in Rats. *Transplant Proc*. 2018;50(10):3811-3815.

17. de Carvalho ALR, Vital RB, Kakuda CM, et al. Dexmedetomidine on renal ischemia-reperfusion injury in rats: Assessment by means of NGAL and histology. *Ren Fail*. 2015;37(3):526-530
18. Dong Y, Zhang Q, Wen J, et al. Ischemic duration and frequency determines AKI-to-CKD progression monitored by dynamic changes of tubular biomarkers in IRI mice. *Front Physiol*. 2019;10(FEB):1-15
19. Si YN, Bao HG, Xu L, et al. Dexmedetomidine protects against ischemia/reperfusion injury in rat kidney. *Eur Rev Med Pharmacol Sci*. 2014;18(13):1843-1851.
20. Akpinar C, Dogan O, Kubilay E, et al. The evaluation of acute kidney injury due to ischemia by urinary neutrophil gelatinase-induced lipocalin (uNGAL) measurement in patients who underwent partial nephrectomy. *Int Urol Nephrol*. 2021;53(3):393-400.
21. Singer E, Markó L, Paragas N, et al. Neutrophil gelatinase-associated lipocalin: Pathophysiology and clinical applications. *Acta Physiologica*. 2013;207(4):663-672.
22. Haase M, Bellomo R, Devarajan P, et al. Accuracy of Neutrophil Gelatinase-Associated Lipocalin (NGAL) in Diagnosis and Prognosis in Acute Kidney Injury: A Systematic Review and Meta-analysis. *American Journal of Kidney Diseases*. 2009;54(6):1012-1024.
23. Aghel A, Shrestha K, Mullens W, Borowski A, Tang WHW. Serum Neutrophil Gelatinase-Associated Lipocalin (NGAL) in Predicting Worsening Renal Function in Acute Decompensated Heart Failure. *J Card Fail*. 2010;16(1):49-54.
24. Mishra J, Dent C, Tarabishi R, et al. Neutrophil gelatinase-associated lipocalin (NGAL) as a biomarker for acute renal injury after cardiac surgery. *Lancet*. 2005;365(9466):1231-1238.
25. Rahimzadeh N, Otukesh H, Hoseini R, et al. Are serum and urine neutrophil gelatinase-associated lipocalin predictive of renal graft function in short term? *Pediatr Transplant*. 2012;16(7):796-802
26. Woodson BW, Wang L, Mandava S, Lee BR. Urinary cystatin C and NGAL as early biomarkers for assessment of renal ischemia-reperfusion injury: A serum marker to replace creatinine? *J Endourol*. 2013;27(12):1510-1515
27. Fukatsu A, Matsuo S, Yuzawa Y, Miyai H, Futenma A, Kato K. Expression of interleukin 6 and major histocompatibility complex molecules in tubular epithelial cells of diseased human kidneys. *Laboratory Investigation*. 1993;69(1):58-67. Accessed January 8, 2021.
28. Herrmann O, Tarabin V, Suzuki S, et al. Regulation of body temperature and neuroprotection by endogenous interleukin-6 in cerebral ischemia. *Journal of Cerebral Blood Flow and Metabolism*. 2003;23(4):406-415.
29. Patel NSA, Chatterjee PK, di Paola R, et al. Endogenous interleukin-6 enhances the renal injury, dysfunction, and inflammation caused by ischemia/reperfusion. *Journal of Pharmacology and Experimental Therapeutics*. 2005;312(3):1170-1178.
30. de Vries DK, Lindeman JHN, Tsikas D, et al. Early renal ischemia-reperfusion injury in humans is dominated by IL-6 release from the allograft. *American Journal of Transplantation*. 2009;9(7):1574-1584.
31. Chen W, Yuan H, Cao W, et al. Blocking interleukin-6 trans-signaling protects against renal fibrosis by suppressing STAT3 activation. *Theranostics*. 2019;9(14):3980-3991.
32. Shang Y, Madduma Hewage S, Wijerathne CUB, Siow YL, Isaak CK, Karmin O. Kidney Ischemia-Reperfusion Elicits Acute Liver Injury and Inflammatory Response. *Front Med (Lausanne)*. 2020;7(June):1-9
33. Skrypnyk NI, Gist KM, Okamura K, et al. IL-6-mediated hepatocyte production is the primary source of plasma and urine neutrophil gelatinase–associated lipocalin during acute kidney injury. *Kidney Int*. 2020;97(5):966-979
34. Kellerman PS, Blichfeldt TC. Acute Kidney Injury. In: *Pathophysiology of Kidney Disease and Hypertension*. Elsevier Inc.; 2008:131-143
35. Heyman SN, Lieberthal W, Rogiers P, Bonventre J v. Animal models of acute tubular necrosis. *Curr Opin Crit Care*. 2002;8(6):526-534
36. Hesketh EE, Czopek A, Clay M, et al. Renal ischaemia reperfusion injury: A mouse model of injury and regeneration. *Journal of Visualized Experiments*. 2014;(88):1-8
37. Ljungqvist O. Jonathan E. Rhoads lecture 2011: Insulin resistance and enhanced recovery after surgery. *Journal of Parenteral and Enteral Nutrition*. 2012;36(4):389-398.
38. Rege A, Leraas H, Vikraman D, et al. Could the Use of an Enhanced Recovery Protocol in Laparoscopic Donor Nephrectomy Be an Incentive for Live Kidney Donation? *Cureus*. 2016;8(11):2-13
39. Fleming IO, Garratt C, Guha R, et al. Aggregation of Marginal Gains in Cardiac Surgery: Feasibility of a Perioperative Care Bundle for Enhanced Recovery in Cardiac Surgical Patients. *J Cardiothorac Vasc Anesth*. 2016;30(3):665-670

Table 1. Correlation Coefficient and Significance Levels Between Preoperative Biochemical Measurements and Histopathological Indicators Among All Subjects

	NGAL	IL-6
Right proximal tubule epithelium brush border loss		
Correlation coefficient	0.122	0.314
p-value †	0.598	0.166
Left proximal tubule epithelium brush border loss		
Correlation coefficient	0.139	0.306
p-value †	0.549	0.178
Right apoptotic cells		
Correlation coefficient	0.150	0.234
p-value †	0.516	0.308
Left apoptotic cell		
Correlation coefficient	0.145	0.271
p-value †	0.531	0.234
Right tubular cast formation		
Correlation coefficient	0.314	0.419
p-value †	0.166	0.059
Left tubular cast formation		
Correlation coefficient	0.065	0.223
p-value †	0.781	0.331

† Spearman's rank correlation test; According to Bonferroni correction, the results were considered statistically significant for p<0.0125.

Table 2. Frequency Distribution of the Subjects According to the Scores of the Histopathological Indicators of the Right and Left Kidneys within the Groups

Group	A Right Kidney	B Right Kidney	C Right Kidney	A Left Kidney	B Left Kidney	C Left Kidney
Loss of brush border of proximal tubule epithelium						
0	7 (100.0%)			7 (100.0%)		
1		2 (28.6%)	6 (85.7%)		1 (14.3%)	3 (42.9%)
2		5 (71.4%)	1 (14.3%)		6 (85.7%)	4 (57.1%)
Apoptotic cell						
0	7 (100.0%)			7 (100.0%)		
1		7 (100.0%)	7 (100.0%)			3 (42.9%)
2					7 (100.0%)	4 (57.1%)
Tubular cast formation						
0	4 (57.1%)			2 (28.6%)		
1	3 (42.9%)	6 (85.7%)	7 (100.0%)	5 (71.4%)		6 (85.7%)
2		1 (14.3%)			6 (85.7%)	1 (14.3%)
3					1 (14.3%)	

*0= 0, 1= 0-%10, 2= %11-25, 3= %26-45

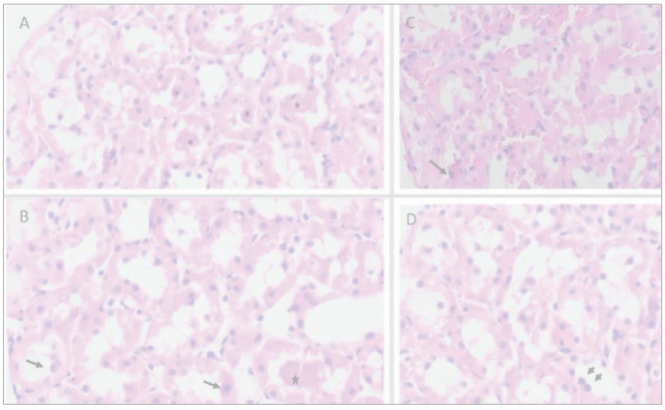


Figure 1. Apoptotic cells and tubular cast formation. Pictures A and B show group B left kidney, pictures C and D show group C left kidney. Apoptotic cells in the proximal tubules are shown with an arrow, and tubular castes with an asterisk (*). H&E x400.

Figure 2. Experiment Study Plan

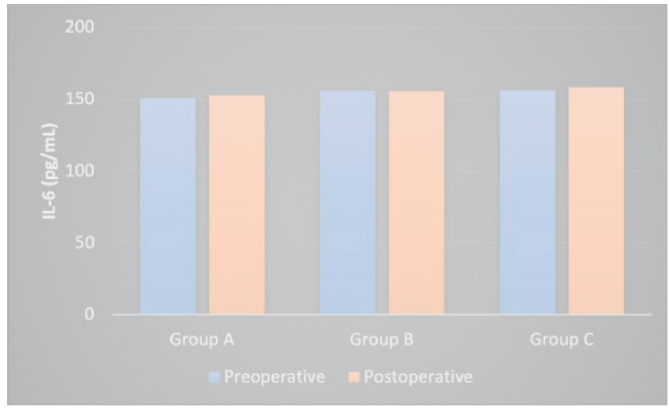


Figure 3. Preoperative and Postoperative Comparison of Serum IL-6 Values Between Groups

Figure 4. Preoperative and postoperative comparison of serum NGAL values between groups

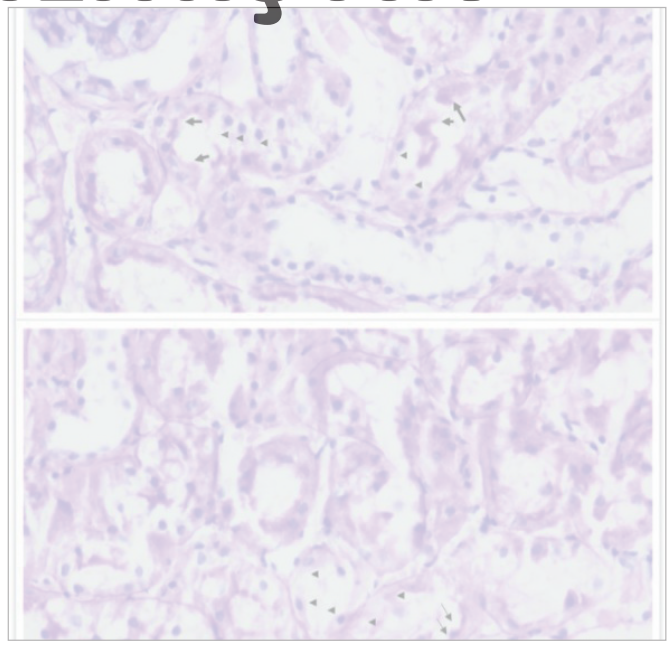


Figure 5. Proximal tubule brush border and loss of proximal tubule brush border In the proximal tubules, the brush border is shown with an arrow, and the loss of the brush border is shown as a triangular arrowhead. PAS dye x400.

OP-55 (Others)
Full Manuscript

The Effect of Switching from the Supine Position to the Prone Position on Endotracheal Tube Cuff Pressure in Patients Undergoing Lumbar Spine Surgery

Filiz Banu Çetinkaya Ethemoğlu

Yenimahalle Education and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: We aimed to investigate the effect of switching from the supine to the prone position (PP) on the endotracheal tube (ETT) cuff pressure (CP) of patients undergoing lumbar spine surgery, and to assess various factors associated with ETT-CP values.

Materials and Methods: 121 ASA I-II patients were included the study. Endotracheal intubation was performed with low-pressure, high-volume cuffed, different type ETT. Cuff inflated with air. CP was set at an inflation pressure of 25 cmH2O.

The ETT-CPs were measured before, immediately after, and every 15 minutes after turning to PP. After each measurement, values were adjusted to 25 cmH2O. Appropriate statistical tests were performed.

Results: 121participants were included in our study, the mean age was 51.92 ± 12.02 years. Postoperative median NRS score for sore throat was significantly higher compared to the measurement performed at the 24th hour ($p < 0.001$).

ETT-CP at the 15th minute was inversely correlated with weight ($r = -0.182$, $p = 0.046$) and positively correlated with postoperative NRS score ($r = 0.274$, $p = 0.002$). There was a significant inverse correlation between ETT-CP at the 45th minute and postoperative NRS score ($r = 0.281$, $p = 0.003$). While ETT-CP at 60 minutes was inversely correlated with age ($p = -0.445$, $p = 0.001$), it was positively correlated with male sex ($r = 0.285$, $p = 0.045$) and ETT size ($r = 0.285$, $p = 0.045$)

While 16.7% of patients with abnormal ETT-CP at 60 minutes were in Mallampati class 3, none of those with normal ETT-CP were in Mallampati class 3, and this difference was statistically significant ($p = 0.041$).

Conclusion: In order to minimize the negative effects of the PP on the ETT-CP, before moving to the position, the ETT should be fixed very well and the ETT-CP should be set to 25 cm H2O. In addition, during and after the transition to the PP, the ETT should immobilized and head flexion or extension should be restricted.

Keywords: Prone position, endotracheal tubes cuff pressure, lumbar spine surgery

INTRODUCTION

Adjusting and monitoring the cuff pressure (CP) of endotracheal tubes (ETT) is a very important factor in preventing various complications, some of which can be severe or life-threatening (1, 2). In order to minimize the risk of these complications, current evidence shows that high-volume and low-pressure ETTs should be used while maintaining CP in the safe pressure range of 20-30 cm H_2O (1, 3, 4). Very low ETT-CP may cause microaspiration of secretions or gastric content, ventilator-associated pneumonia, accidental extubation and inadequate ventilation; whereas, exceedingly high values may lead to mucosal damage, laryngeal nerve palsy, tracheal necrosis, ulceration, stenosis, rupture, tracheoesophageal fistula and hoarseness (2, 5, 6).

Maintaining the ETT-CP value within the safe range is not easy because various patient, environmental, and surgical factors can cause the ETT-CP value to change from the initial setting (4). One of the most important of these factors is ETT dislocation, most often due to changing the patient's head / neck or lying position (4, 7, 8). Studies have shown that frequent positional changes, even when minor, can be detrimental on ETT-CP (5, 9, 10). In the supine position (SP), the location of the ETT may change with flexion and extension of the head and neck (3, 10). Also, the prone position (PP), a common position in spinal surgery, increases risks regarding adverse changes in the depth of ETT, and thus, could alter ETT-CP. These risks exist when switching from the SP to the PP and also when head and neck movements specific to the PP occur. The PP flexes and rotates the patient's head and neck; therefore, the ETT movement becomes more complex (7, 8, 11). In a study conducted on intensive care patients with trauma, the effect of positional changes on ETT-CP was investigated, revealing that the PP was the first to increase ETT-CP in a significant percentage of patients (2). There are several studies investigating the effects of switching from the SP to the PP on ETT-CP during general anesthesia; however, these studies are often limited by sample size and inconsistencies in results (7, 12-14). Additionally, there are very few studies (13, 15) investigating the effects of maintaining PP on ETT-CP values.

In this study, we aimed to investigate the effect of transitioning from SP to PP on ETT-CP values, and to assess the relationships between ETT-CP values and the clinicodemographic characteristics of patients who underwent lumbar spine surgery.

MATERIAL and METHODS

Study design and participants

This was a prospective cohort study conducted between May 2019 and January 2020 at the Department of Anesthesiology of Yıldırım Beyazıt University, Yenimahalle Training and Research Hospital, Ankara, Türkiye. Ethics committee approval was obtained from Yıldırım Beyazıt University Clinical Research Ethics Committee, dated 30/04/2019 and numbered 2019/50. Written informed consent was acquired from each of the patients included in the study.

We included a total of 121 patients older than 18 years of age who underwent lumbar spine surgery under general anesthesia with oral endotracheal intubation and were classified as ASA 1 or 2 according to the American Society of Anesthesiologists (ASA) physical status classification. Patients with difficult intubation, nasal intubation, ASA 3 or 4 physical status, body mass index (BMI) greater than 30 kg/m^2, cervical spine pathology and limited neck motion were excluded. Also, patients who were scheduled to receive nitrous oxide anesthesia or emergency surgery, and subjects with mental retardation, pregnancy and puerperal status were not included in the study.

Data Collection and Study Protocol

Demographic characteristics such as age, sex, weight (kg) and comorbidities of the patients were recorded. The ASA score (16) and Mallampati classification (17) were determined in accordance with guidelines. Standard monitoring, including electrocardiogram (ECG), non-invasive blood pressure and pulse oximetry monitoring, was applied to all patients who were taken to the operating room. All patients were started on intravenous (IV) paracetamol (15 mg/kg) for preemptive analgesia. In the induction of anesthesia, IV propofol (2 mg/kg), fentanyl citrate (1 µg/kg) and rocuronium bromide (0.6 mg/kg) were administered. After induction, endotracheal intubation was performed with a 7.5F (in female) or 8.5F (in male) diameter, low-pressure, high-volume cuffed ETT (Bıçakçılar®, Istanbul, Türkiye) with direct laryngoscopy. Type of ETT (spiral or normal) was recorded. Cuff inflation was performed with air. The insertion depth of the ETT was set at the upper incisors as 23 cm in males and 21 cm in females. To prevent dislocation (or displacement) of the ETT and oral secretion flow during and after transition to PP, the ETT was fixed to the left side of the mouth with a bite block by placing a sponge in the mouth and fixing a sponge in front of the ostium nasale.

Cuff pressure adjustments and measurements were made using an automated CP controller (Mallinckrodt Pressure Controls®, COVIDIEN, Dublin, Ireland). CP was set without air leakage at an inflation pressure of 25 cmH_2O and cuff pressure was recorded at the end of expiration. The equivalence of bilateral breath sounds was checked with lung auscultation. During the maintenance of anesthesia, 50% oxygen was applied at 2 L/min minimal alveolar concentration (MAC). Nitrous oxide was not used. Remifentanil infusion of 0.05-0.25 µg/kg/min was used throughout the surgery (with dosage alteration according to vital signs). During the perioperative period, 15 mg/kg/hour of magnesium sulfate (in 100 ml isotonic solution) was administered to reduce postoperative pain and analgesic requirement. After the patient's vital signs were stabilized and the operating room table was prepared with silicone supports in accordance with the PP, the patient was moved from the SP to the PP by holding the fixed tube with the left hand and supporting the back of the patient's head with the right hand so that the flexion angle between the patient's head and neck would not be impaired. In transition, a standard position was used with the patient's face against the prone pillow and head turned to the right. The cuff was quickly checked and adjusted with the cuff pressure controller to 25 cm H_2O. The depth of the ETT was checked and confirmed. The equivalence of breath sounds was again checked via auscultation. The ETT-CP values of patients were measured every 15 minutes during the surgery and corrections were performed to maintain the 25 cmH_2O level. Those with CP values outside of the 20-30 cm H_2O range (measured at the 15th, 30th, 45th and 60th minutes) were defined to have abnormal CP (1). Tramadol (1-2 mg/kg) slow bolus was administered as an analgesic to all patients before extubation.

All patients were also questioned with the Numerical Rating Scale (NRS) in terms of sore throat in the postoperative period and at the 24th hour. The NRS is a verbal scale rating (ranging from 0 to 10) that assesses the severity of postoperative sore throat at rest and during swallowing. Zero represents the lowest and 10 the most severe sore throat (18).

Statistical Analysis

All analyses were performed on IBM SPSS Statistics for Windows, Version 25.0 (IBM, Armonk, NY, USA) with the classical acceptance that $p<0.05$ values were statistically significant. For the normality check concerning continuous variables, histogram and Q-Q plots were evaluated. Continuous data are given as mean ± standard deviation or as median (minimum - maximum) for according to normality of distribution (normal and non-normal, respectively). For the description of categorical variables, absolute and relative frequencies (n, %) were used. Repeated measurements of the ETT-CP were analyzed with the Friedman's

analysis of variance by ranks. Repeated measurements of NRS scores were analyzed with the Wilcoxon signed ranks test. Spearman or point-biserial correlation coefficients were calculated to evaluate directional relationships between ETT-CP and other variables. Between-group analysis of continuous variables were performed with the Mann-Whitney *U* test. Between-group analysis of categorical variables were performed with chi-square tests with continuity correction, whereas the Fisher's exact test or the Fisher-Freeman-Halton test were used when necessary.

RESULTS

88 female and 33 male participants were included in our study, and the mean age was 51.92 ± 12.02 (range 20- 85) years. The patients' weight, comorbidity, ASA score, Mallampati classification, ETT size and type, ETT-CP values and NRS scores are summarized in **Table 1**. Postoperative median NRS score for sore throat was significantly higher compared to the measurement performed at the 24th hour after surgery ($p < 0.001$).

ETT-CP at the 15th minute was inversely correlated with weight ($r = -0.182$, $p = 0.046$) and positively correlated with postoperative NRS score ($r = 0.274$, $p = 0.002$). There was a significant inverse correlation between ETT-CP at the 45th minute and postoperative NRS score ($r = 0.281$, $p = 0.003$). While ETT-CP at 60 minutes was inversely correlated with age ($p = -0.445$, $p = 0.001$), it was positively correlated with male sex ($r = 0.285$, $p = 0.045$) and ETT size ($r = 0.285$, $p = 0.045$) (**Table 2**).

While 16.7% of patients with abnormal ETT-CP at 60 minutes were in Mallampati class 3, none of those with normal ETT-CP were in Mallampati class 3, and this difference was statistically significant ($p = 0.041$). Other characteristics were similar in the comparison of patients with normal and abnormal ETT-CP values at each time-point of measurement (15th, 30th, 45th and 60th minutes) (**Table 3**).

DISCUSSION

The PP is an operating position that is used especially in spinal surgeries. It requires the patient to be intubated first in the SP and then displace 180 degrees. Therefore, it is an important potential risk factor for the change of the depth of ETT and thus of ETT-CP (7, 11). In the present study, we sought to evaluate whether transition to the PP (where the head is turned to the right side without flexion or extension) caused abnormalities in ETT-CP values. There was no change in ETT depth and ETT-CP in any of the patients when transitioning to the PP. The median ETT-CP values did not change significantly in the 15th, 30th, 45th and 60th minutes, and there were relatively few patients whose ETT-CP values were defined to be abnormal. ETT-CP after 60 minutes was inversely correlated with age.

Although endotracheal intubation is unavoidable for some patients in the intensive care unit and during general anesthesia, it can cause serious and sometimes irreversible complications. Many of these complications are due to inappropriate CP (6, 19). Therefore, ETT-CP should be adjusted appropriately, followed regularly, and factors that may affect ETT-CP should be clarified. Changing the patient's position from the SP to the PP and/or repositioning the head may displace the ETT, thus causing detrimental effects of ETT-CP (3, 8, 10, 20). The effect of position change on ETT-CP has been demonstrated in the studies by Kako et al. and Alcan et al. (5, 21). In our study, there was no change in ETT depth and ETT-CP in any of our patients during the transition to the PP. The number of patients whose ETT-CP was outside the normal values was not remarkable in the 4 different time periods in which the measurements were repeated. In study conducted in Egypt, the effect of 6 different position changes on ETT-CP was investigated and it was revealed that PP change was the position that caused the most ETT-CP change, increasing ETT-CP in 78.6% of the patients (2). In a prospective and interventional study conducted in Korea, the effect of transitioning to PP without moving the head and neck (right or left) on ETT-CP was examined. The results of this study showed that position change from SP to PP increased the ETT-CP (26 cm H_2O to 31.5 ± 5.9 cm H_2O) (11). Yet another study showed that ETT-CP increased significantly after switching from the SP to the PP during general anesthesia (12). When SP and PP were compared in patients undergoing general anesthesia, no significant differences were found between SP and PP in neutral, flexed and extended posture in terms of ETT-CP values (3). Contrary to the majority of studies, Kinoshita et al. found that ETT movement accompanied by PP decreased ETT-CP in surgical patients (14). A study similar to ours, by Minonishi et al., also suggested that the transition from SP to PP caused a significant reduction in ETT-CP. In addition, in 7 of the 132 patients included in the study, CP had to be adjusted due to air leakage at 25 cm H_2O inflation pressure (8). We think that the most important factors in obtaining the results in the present study are to fix the ETT very well and to set the ETT-CP to 25 cm H_2O with a CP controller before moving to the PP. Also, preventing the patient's head-neck angle from changing (restricting flexion or extension) during and after the transition to the PP may be critical to maintain ETT-CP in the safe range. Finally, considering previous studies and our results, it may be feasible to suggest that the rotation movement of the head causes less significant changes in ETT-CP compared to flexion and extension movements; however, this possibility must be confirmed with further studies.

Although the ETT-CP is mostly checked initially after intubation, it is often not controlled intermittently or continuously during the operation. There are many perioperative factors that can change ETT-CP, such as anesthetic agents (for example the use of nitrous oxide), insufficient muscle relaxation, surgical interventions, body temperature, tracheal tube placement, head and neck position, and patient position (3, 4). It is known that ETT-CP may also decrease with time (2). In the present study, measuring ETT-CP every 15 minutes and performing necessary corrections after each measurement, could have yielded better outcomes regarding the frequency of patients with abnormal ETT-CP. Indeed, although the percentage of patients with abnormal ETT-CP was higher on the 30th and 45th minutes compared to the 15th and 60th minutes, these differences were not significant. One study compared changes in ETT-CP over 4, 8, and 12 hours and reported a decrease in ETT-CP as time passed (22). Similarly, in another study, the mean ETT-CP after 20 minutes in all positions investigated was significantly higher in all patients compared to values after 2 hours (2). Jalali et al. tested whether the ETT-CP changed over time in intubated intensive care patients who were rotated to the left lateral, right lateral and semi-fowler positions. They measured ETT-CP after 0, 15, 45, and 90 minutes for each position and demonstrated that ETT-CP values were similar in the three positions, but time was found to have a modifier effect on ETT-CP, most pronounced in the first 15 minutes (4). Conversely, in another prospective observational study, changes in ETT-CP were investigated in patients who were placed in the PP for spinal surgery. After the patients were placed in the PP with right head rotation, ETT-CP was measured every 5 minutes. The time at which ETT-CP exceeded 30 cm H_2O was recorded. It was observed that ETT-CP exceeded 30 cm H_2O in the first 5 minutes in half of the patients, and ETT-CP gradually increased above 30 cm H_2O in the other half in the following 5 minutes (13). In their study of 100 patients, Kroll et al. did not observe a significant relationship between the length of the operation and changes in ETT-CPs during the surgeries which lasted for an average of 171 minutes in the PP (15). As can be seen, the results of the studies regarding the course of ETT-CP in the PP over time are highly inconsistent. This may suggest that there are many other factors that may affect ETT-CP, showing the need for prospectively designed studies in which patients are stratified according to baseline characteristics, anesthesia type, and surgery-related factors.

Various studies have claimed that factors such as the ETT size, age, and positive pressure ventilation may alter ETT-CP (23, 24). In this study, we found a negative correlation between age and ETT-CP at the 60th minute. The correlations between ETT-CPs measured at 4 different times and other variables including sex, weight, ASA score, Mallampati classification, ETT size, NRS score in both postoperative and after 24 hours were weak. In the study by Alcan et al., ETT-CP was not associated with comorbidities, age, sex, BMI, ETT size, ETT fixation area and positive end-expiratory pressure, but it was emphasized that this might be due to the low patient count (5). Multiple regression analysis of a similar study noted no association between ETT displacement and age, sex or BMI (8). ETT-CP is likely to be affected by many different factors, but more comprehensive studies are needed to determine the degree of effect of these factors on ETT-CP in the PP.

Tracheal intubation is related with a great risk of postoperative sore throat. High ETT-CP may also increase the risk of postoperative sore throat (25). In the present study, postoperative NRS score was significantly higher than scores measured at 24 hours. In a randomized double-blind controlled study, control of ETT-CP with a gauge at the beginning of the operation and adjustment of the pressure during operation were found to reduce postoperative throat pain (26). Conversely, in a study similar to ours, postoperative sore throat and hoarseness was not found to be associated with ETT displacement or reduction in CP (8). Although data is again inconsistent, it is not unreasonable to expect abnormal ETT-CP to increase the severity of sore throat.

The limitations of our study can be listed as follows: The fact that this was a single-centered study limits the generalization of the results. The lack of a control group in our study is another limitation. As a matter of fact, these time-dependent changes are also likely to occur in SP or in another position. Since the study targeted this particular assessment, extra care may have been taken not to shift the position of the tube during the position change of the patients, and this may have affected the results due to unintentional bias. Only patients who underwent elective spinal surgery in the PP were included in our study; therefore, caution should be exercised when interpreting our results for patients intubated in the PP for other indications, as various other factors may also affect ETT-CP.

In conclusion, ETT depth and ETT-CP did not change in any of the patients during the transition to the PP. There was no significant change in ETT-CP over time, but this was likely a result of meticulous follow-up. We showed that age, weight, ETT size, and Mallampati classification were weakly associated with ETT-CP at various time-points of measurement. With respect to our findings, we believe that in order to minimize the negative effects of the PP on the ETT-CP, the ETT should be fixed very well and the ETT-CP should be set to 25 cm H_2O before positional switch. In addition, during and after the transition to the PP, the ETT should be immobilized and head flexion or extension should be restricted as much as possible. However, more comprehensive, multicenter studies with greater sample size are required to accurately assess the effects of PP (or other factors) on ETT-CP values.

REFERENCES

1. Alshawadfy A, Alyeddin WF, Elsadany MA. Endotracheal tube cuff inflation pressure varieties and response to education among anesthetists. Egyptian Journal of Anaesthesia. 2022;38(1):174-178
2. Abd Elbaky MM. Effect of various body positions for intensive care patients on the measurement of endotracheal tube cuff pressure. Journal of Health Sciences. 2019;9(2).
3. Ahamed AM, Kumar KS, Balasubramanian S, Lazarus SP, Vikram V. A Comparative Study on the Endotracheal Tube Cuff Pressure Changes between Supine and Prone in Patients Undergoing Prone Position Surgeries. Indian Journal of Anesthesia and Analgesia 2019; 6(5) (Part - I): 1599-1603
4. Jalali A, Maleki Z, Dinmohammadi M. The Effect of Different Body Positions on Endotracheal Tube Cuff Pressure in Patients under Mechanical Ventilation. Journal of Caring Sciences. 2022;11(1):15-20
5. Alcan AO, van Giersbergen MY, Dincarslan G, Hepcivici Z, Kaya E, Uyar M. Effect of patient position on endotracheal cuff pressure in mechanically ventilated critically ill patients. Australian Critical Care. 2017;30(5):267-72.
6. Hosseinzadeh Maleki M, Younessi Heravi MA, Ghasemi R, Gharaee R, Yaghubi M. Effect of Body Position Change and Vital Signals on Endotracheal Tube Cuff Pressure Variations. Evidence Based Care. 2022;12(1):14-22.
7. Athiraman U, Gupta R, Singh G. Endotracheal cuff pressure changes with change in position in neurosurgical patients. International Journal of Critical Illness and Injury Science. 2015;5(4):237.
8. Minonishi T, Kinoshita H, Hirayama M, Kawahito S, Azma T, Hatakeyama N, et al. The supine-to-prone position change induces modification of endotracheal tube cuff pressure accompanied by tube displacement. Journal of clinical anesthesia. 2013;25(1):28-31.
9. Lizy C, Swinnen W, Labeau S, Poelaert J, Vogelaers D, Vandewoude K, et al. Cuff pressure of endotracheal tubes after changes in body position in critically ill patients treated with mechanical ventilation. American Journal of Critical Care. 2014;23(1):e1-e8.
10. Ziyaeifard M, Ferasatkish R, Alizadehasl A, Faritous Z, Alavi SM, Pouraliakbar H, et al. Effect of various patient positions on endotracheal tube cuff pressure after adult cardiac surgery. Research in Cardiovascular Medicine. 2017;6(4):34.
11. Kim D, Jeon B, Son J-S, Lee J-R, Ko S, Lim H. The changes of endotracheal tube cuff pressure by the position changes from supine to prone and the flexion and extension of head. Korean journal of anesthesiology. 2015;68(1):27.
12. Mahoori A, Karami N, Jabbarzade S. The effect of change in position on intratracheal cuff pressure in patients undergoing surgery wıth general anesthesia: a prospective analytical study. Studies in Medical Sciences. 2019;30(8):590-6.
13. Phanpaisan C. Effect of Prone Position with Right-sided Head Rotation to Endotracheal Cuff Pressure: A Prospective Observational Study. Thai Journal of Anesthesiology. 2021;47(4):299-304.
14. Kinoshita H, Hirayama M, Minonishi T, Hatakeyama N, Matsuda N, Yamazaki M. The Prone Positioning Decreases Endotracheal Tube Cuff Pressure Accompanied by the Tube Movement. The Anesthesiology Annual Meeting 2011 Abstracts ; A1033.
15. Kroll H, Fitzgerald J. The Effect of Patient Positioning and Surgical Duration on Endotracheal Cuff Pressures. The Anesthesiology Annual Meeting 2006 Abstracts ; 105: A1265.
16. Doyle DJ, Garmon EH. American Society of Anesthesiologists classification (ASA class). 2017.
17. Mallampati SR, Gatt SP, Gugino LD, Desai SP, Waraksa B, Freiberger D, et al. A clinical sign to predict difficult tracheal intubation; a prospective study. Canadian Anaesthetists' Society Journal. 1985;32(4):429-34.
18. Ghaleb MA, Falatah S, Al-Amoudi FA. The efficacy of licorice gargle for attenuating postoperative sore throat. Am J Res Commun. 2013;1(11):379-94.
19. AR SM, Malekzade J, Mesbahi Z, Esmaeli H. Relationship between temperature and cuff pressure in mechanically ventilated patients with endotracheal tube. The Horizon of Medical Sciences. 2013;19(2):105-9.
20. Nazari R, Omran MS, Nia HS, Yaghoobzadeh A. Effect of head position change on endotracheal cuff pressure in mechanically ventilated patients: a quasi-experimental study. Tanaffos. 2020;19(2):129.
21. Kako H, Krishna SG, Ramesh AS, Merz MN, Elmaraghy C, Grischkan J, et al. The relationship between head and neck position and endotracheal tube intracuff pressure in the pediatric population. Pediatric Anesthesia. 2014;24(3):316-21.
22. Sole ML. Changes in endotracheal cuff pressures over time: 575. Critical Care Medicine. 2002;30(12):A144.
23. Sole ML, Su X, Talbert S, Penoyer DA, Kalita S, Jimenez E, et al. Evaluation of an intervention to maintain endotracheal tube cuff pressure within therapeutic range. American Journal of Critical Care. 2011;20(2):109-18.
24. Lorente L, Blot S, Rello J. Evidence on measures for the prevention of ventilator-associated pneumonia. European Respiratory Journal. 2007;30(6):1193-207.
25. El-Boghdadly K, Bailey C, Wiles M. Postoperative sore throat: a systematic review. Anaesthesia. 2016;71(6):706-17.
26. Ansari L, Bohluli B, Mahaseni H, Valaei N, Sadr-Eshkevari P, Rashad A. The effect of endotracheal tube cuff pressure control on postextubation throat pain in orthognathic surgeries: a randomized double-blind controlled clinical trial. British Journal of Oral and Maxillofacial Surgery. 2014;52(2):140-3.

Table 1. Summary of Variables

Age (n=121)	**51.92 ± 12.02**
Sex (n=121)	
Female	88 (72.7%)
Male	33 (27.3%)
Weight, kg (n=121)	69.45 ± 11.36
1	77 (63.6%)
2	44 (36.4%)
Mallampati classification (n=119)	
Class 1	77 (64.7%)
Class 2	39 (32.8%)
Class 3	3 (2.5%)
ETT size (n=121)	
7.5 (female)	88 (72.7%)
8.5 (male)	33 (27.3%)
Type of ETT (n=121)	
Spiral	121 (100.0%)
Normal	0 (0.0%)
ETT cuff pressure	
Baseline (n=121)	25 (25 - 25)
15th minute (n=121)	25 (18 - 35)
30th minute (n=121)	25 (18 - 35)
45th minute (n=108)	25 (18 - 50)
60th minute (n=50)	25 (18 - 35)
ETT cuff pressure, 15th minute (n=121)	
<20	1 (0.8%)
20-30	115 (95.0%)
>30	5 (4.1%)
ETT cuff pressure, 30th minute (n=121)	
<20	2 (1.7%)
20-30	104 (86.0%)
>30	15 (12.4%)
ETT cuff pressure, 45th minute (n=108)	
<20	2 (1.9%)
20-30	90 (83.3%)
>30	16 (14.8%)
ETT cuff pressure, 60th minute (n=50)	
<20	1 (2.0%)
20-30	44 (88.0%)
>30	5 (10.0%)
Sore throat, NRS (n=121)	
Postoperative	3 (1 - 7)
24 hour	1 (0 - 1)

Data are given as mean ± standard deviation or median (minimum - maximum) for continuous variables according to normality of distribution and as frequency (percentage) for categorical variables. Abbreviations: ASA: The American Society of Anesthesiologists, ETT: Endotracheal tube, NRS: Numerical Rating Scale

Table 2. Correlations between Variables and ETT Cuff Pressure

		15th minute	30th minute	45th minute	60th minute
Age	r	0.009	0.038	-0.037	-0.445
	p	0.924	0.682	0.701	0.001
Sex, male	r	-0.005	-0.130	0.146	0.285
	p	0.960	0.155	0.131	0.045
Weight	r	-0.182	-0.171	-0.036	-0.130
	p	0.046	0.060	0.715	0.367
ASA score	r	0.034	0.029	0.061	-0.047
	p	0.712	0.752	0.534	0.744
Mallampati classification	r	-0.032	-0.151	-0.017	-0.068
	p	0.726	0.100	0.864	0.643
ETT size	r	-0.005	-0.130	0.146	0.285
	p	0.960	0.155	0.131	0.045
Sore throat, NRS, Postoperative	r	0.274	0.101	0.281	0.190
	p	0.002	0.270	0.003	0.187
Sore throat, NRS, 24th hour	r	0.072	0.159	0.187	0.033
	p	0.433	0.081	0.053	0.821

r: Correlation coefficient, Abbreviations: ASA: The American Society of Anesthesiologists, ETT: Endotracheal tube, NRS: Numerical Rating Scale

Table 3. Summary of Patients Characteristics with Regard to ETT Cuff Pressure

	ETT cuff pressure, 15th minute			ETT cuff pressure, 30th minute			ETT cuff pressure, 45th minute			ETT cuff pressure, 60th minute		
	20-30 (n=115)	Abnormal (n=6)	p	20-30 (n=104)	Abnormal (n=17)	p	20-30 (n=90)	Abnormal (n=18)	p	20-30 (n=44)	Abnormal (n=6)	p
Age	52 (20 - 81)	49.5 (46 - 85)	0.802	52 (20 85)	53 (32 - 74)	0.808	51.5 (20 - 81)	53.5 (36 - 85)	0.488	49 (32 -77)	43 (30 -52)	0.091
Sex												
Female	84 (73.0%)	4 (66.7%)	0.664	74(71.2%)	14 (82.4%)	0.397	66 (73.3%)	13 (72.2%)	1.000	33 (75.0%)	4 (66.7%)	0.643
Male	31 (27.0%)	2 (33.3%)		30(28.8%)	3 (17.6%)		24 (26.7%)	5 (27.8%)		11 (25.0%)	2 (33.3%)	
Weight, kg	68 (44 -98)	62 (50 - 88)	0.321	68 (50 98)	65 (44 -88)	0.195	69 (44 -98)	64.5 (50 - 89)	0.223	73 (54 -94)	57 (44 -85)	0.066
ASA score												
1	75 (65.2%)	2 (33.3%)	0.189	65(62.5%)	12 (70.6%)	0.711	61 (67.8%)	11 (61.1%)	0.784	32 (72.7%)	3 (50.0%)	0.348
2	40 (34.8%)	4 (66.7%)		39 (37.5%)	5 (29.4%)		29 (32.2%)	7 (38.9%)		12 (27.3%)	3 (50.0%)	
Mallampati												
Class 1	72 (63.7%)	5 (83.3%)	0.711	65 (63.1%)	12 (75.0%)	0.218	56 (62.9%)	13 (72.2%)	0.215	30 (69.8%)	5 (83.3%)	**0.041**
Class 2	38 (33.6%)	1 (16.7%)		36 (35.0%)	3 (18.8%)		32 (36.0%)	4 (22.2%)		13 (30.2%)	0 (0.0%)	
Class 3	3 (2.7%)	0 (0.0%)		2 (1.9%)	1 (6.3%)		1 (1.1%)	1 (5.6%)		0 (0.0%)	1 (16.7%)	
ETT size												
7.5	84 (73.0%)	4 (66.7%)	0.664	74(71.2%)	14 (82.4%)	0.397	66 (73.3%)	13 (72.2%)	1.000	33 (75.0%)	4 (66.7%)	0.643
8.5	31 (27.0%)	2 (33.3%)		30 (28.8%)	3 (17.6%)		24 (26.7%)	5 (27.8%)		11 (25.0%)	2 (33.3%)	

Data are given as median (minimum - maximum) for continuous variables according to normality of distribution and as frequency (percentage) for categorical variables, Abbreviations: ASA: The American Society of Anesthesiologists, ETT: Endotracheal tube

OP-56 (Others)

Abstract Only

Bibliometric Analysis of the Most Cited Studies on Anaesthesiology and Ultrasonography: Preliminary Study

Sinan Yılmaz

Aydin Adnan Menderes University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Aydin, Türkiye

ABSTRACT

Background: In recent years, ultrasound has been widely used in the field of anesthesiology. Nerve blocks, vascular interventions and perioperative hemodynamic changes can be performed quickly and successfully with ultrasonography (USG). Parallel to the widespread use of USG, the number of publications in this field has increased. In this bibliometric analysis, the publications on ultrasonography in the last 10 years in anesthesiology were evaluated.

Materials and Methods: Publications published from 2013 to 2022 and their information were retrieved using "ultrasonography and anesthesiology" as search terms in the Scopus citation database. Articles focusing on the use of USG in anaesthesiology were included in the study.

Results and Discussion: In total, 707 original articles were reviewed. Using source details from the Scopus, the journals in which the articles were published were classified as (1) anesthesiology and pain medicine, (2) radiological and ultrasound technology, (3) general medicine, (4) emergency medicine, (5) surgery, (6) other. Paper published by Davinder Ramsingh in 2015 had the highest citation score. Canadian Journal of Anesthesia and Regional Anesthesia and Pain Medicine were the journals with the highest number of scientific publications. Most of the published articles were on nerve blocks. In studies conducted from 23 countries, the USA (n=31) and Canada (n=19) were in the first place. The most cited articles on ultrasonography in anaesthesiology were published in the "Canadian Journal of Anaesthesia" (n=9).

Most of the work done in the last decade has centered on basic research. Although, in recent publications, increasing the success of vascular and nerve interventions seems to have become the focus of attention. It is seen that the annual number of publications on peripheral nerve blocks has increased in the last 10 years.

Conclusion: The most cited articles on ultrasonography are related to nerve block. Although many doctors from different specialties have worked in the field of USG, it is noteworthy that most of the first authors of the most cited studies were anesthesiologists. This bibliometric analysis is thought to provide useful information to researchers and editorial staff in the field of anesthesiology and USG.

Keywords: Ultrasonography, anesthesiology, article, cite

OP-57 (Others)
Full Manuscript

Cerebrospinal Fluid – Cutaneous Fistula After Combined Spinal Epidural Anesthesia in a Non-Obstetric Patient Treated With an Epidural Blood Patch: A Case Report

Özlem Ersoy Karka, Yavuz Demiraran, Güner Sobcalı

Duzce University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Duzce, Türkiye

ABSTRACT

Background: We aimed to discuss the successful treatment of cerebrospinal fluid (CSF)-cutaneous fistula which is caused by combined spinal epidural anesthesia (CSE), with an autologous epidural blood patch (EBP), further investigation and antibiotherapy.

Case: CSE was applied for a total hip replacement. Since CSF was seen in the first attempt, CSE was achieved in the second attempt using the same Tuohy needle. Postoperatively epidural catheter was used for analgesic purposes for 2 days. After the catheter removal, anesthesia consultation was requested due to the patient's wet back. A clear fluid leak at the needle insertion point was observed. A sample was taken and the differential diagnosis of CSF-skin fistula was made biochemically with the presence of glucose and chloride. The patient denied headaches. Neurological examination was normal. With patient's consent, EBP was performed. During the injection CSF leak was slowed down, the last drops were macroscopically hemorrhagic and eventually the leak stopped. Headache, dizziness, and nausea occurred on the 2nd day after EBP. Neurological examination was normal. No dural defect or CSF collection was observed in brain CT, brain diffusion MR and contrast-enhanced MR myelography. Ceftriaxone, metronidazole and a pneumococcal vaccine were added for meningitis prophylaxis in consensus with infection and neurology consultants. 1-month follow-up was performed telephonically and the patient was completely cured.

Conclusion: Cerebrospinal fluid (CSF)-cutaneous fistula is a rare complication of neuraxial anesthesia techniques. Since there are no sufficient guidelines for management, the decision on the treatment method depends on the clinician's aspect. We consider that it would be advantageous to prefer EBP primarily in cases with CSF-skin fistula and that the benefit/harm ratio is higher than the complications to be caused by a subarachnoid space that is fistulized to skin and opened out to cutaneous flora. In the literature, the development of meningitis has been reported in some cases followed up under conservative treatment or skin sutures. Although prophylactic use should be avoided as possible due to increasing antibiotic resistance, our opinion is that clinicians should decide for each case, taking into account the conditions such as hospital infection surveillance and the flora of inpatient service.

Keywords: Cerebrospinal fluid-cutaneous fistula, epidural blood patch, combined spinal-epidural anesthesia, prophylactic antibiotherapy

INTRODUCTION

Cerebrospinal fluid (CSF)-cutaneous fistula is a rare complication of neuraxial anesthesia techniques. Although it is known that CSF-cutaneous fistula and cerebrospinal fluid leakage and the resulting post-dural puncture headache (PDPH) occur more frequently in obstetric anesthesia, CSF leakage is possible after all surgeries performed under neuraxial anesthesia. Because PDPH is more common, resources on its treatment are extensive but the literature on CSF-cutaneous fistula is limited to case reports. In treating this rare clinical condition, an autologous epidural blood patch, an invasive procedure, can be applied successfully as well as conservative and medical treatment methods (1-8).

In the current case report the authors aimed to discuss the successful treatment of CSF-cutaneous fistula which is caused by combined spinal epidural anesthesia (CSE), with an autologous epidural blood patch (EBP), further investigation and antibiotherapy.

CASE

Combined spinal-epidural anesthesia was planned for a 52-year-old female patient with ASA I characteristics for a total hip replacement surgery for coxarthrosis. During the first attempt applied through the L4-5 intervertebral space under sterile conditions by an anesthesia assistant in 3rd-year seniority, with a 16 Gauge 90 mm Tuohy needle, CSF was seen and the needle was removed and a pressure dressing was applied. In the second procedure performed from the upper intervertebral space (L3-4) using the same Tuohy needle, the epidural space was found to be 5 cm with saline and loss of resistance technique. Then by using the needle-through-needle technique spinal anesthesia was achieved with a 27 G pencil point spinal needle by injecting 2 ml of 0.5% heavy bupivacaine into the subarachnoid space after observing the clear flow of CSF. The procedure was terminated by placing a 20 G standard epidural catheter. After the operation, which lasted 2 hours and 35 minutes, the patient was transferred to the orthopedics ward without any complications. After being used for analgesic purposes for the

next 2 days without complications, the epidural catheter was removed on the 3rd postoperative day. Anesthesia consultation was requested 2 hours after catheter removal because of wetness on the patient's back. Clear fluid flow was observed from the skin on inspection, and biochemical evaluation was performed by taking a sample from the fluid for differential diagnosis. CSF was determined by the presence of glucose and chloride, and a diagnosis of CSF-cutaneous fistula was made. The patient did not have any additional symptoms, including headaches, and her neurological examination was normal. An epidural blood patch was recommended by explaining the treatment options to the patient, and written informed consent was obtained. The epidural space was localized with a 16 Gauge 90 mm Tuohy needle from the L3-4 intervertebral space under sterile conditions in the operating room and a slow injection of 20 ml of autologous blood taken sterile from the antecubital vein was started. Meanwhile, the CSF flow decelerated, the last drops of CSF were macroscopically hemorrhagic, and the injection was terminated when the CSF flow completely stopped. The patch was applied with a total of 18 ml of autologous blood. Since the patient, who was followed up in the supine position for 1 hour, did not have any complaints, conservative treatment was recommended and it was decided to be consulted daily. On the 5th postoperative day (2nd day after EBP), the patient started to suffer from headaches, dizziness, and nausea. Physical and neurological examinations were normal, and there was no nuchal rigidity or neurological deficit. After the consultation of infectious diseases and neurology, brain CT, brain diffusion MR, and contrast-enhanced MR myelography were requested. Any other pathology but chronic partial empty sella was not observed in radiological imaging, and no dural defect or CSF collection existed. Ceftriaxone and metronidazole were added to the treatment for meningitis prophylaxis with a consensus, and the patient was vaccinated against pneumococcus. The patient, whose complaints completely regressed, was discharged on the 8th postoperative day with recommendations of completion of antibiotherapy to 7 days in addition to conservative therapy. When follow-up was performed telephonically in 1 month, the patient had no leakage on her back, any headache, low back pain, or any neurological deficit.

DISCUSSION

CSF leakage is one of the most disturbing and daily life-limiting complications of neuraxial anesthesia techniques, which are widely used in the operating room routine. CSF leakage can be defined as the loss of CSF from a defect in the dura mater, resulting in the development of symptoms such as intracranial hypotension, headache, and nausea. A rare, advanced form of this complication is CSF leakage at the needle insertion site as a result of the development of a CSF-cutaneous fistula. Several basic mechanisms have been suggested for the development of the fistula tract in rare CSF-cutaneous fistula cases reported in the literature. One is the induction of a tract by the use of epidural steroids and the other is the transport of foreign bodies into the epidural space, such as fibrin deposits or blood clots from tissue inside the needle (6, 9-13). The mechanism we consider in the case discussed is the last one. A fistula probably developed due to the intervention from a different intervertebral space with the same needle after the CSF flow was observed during the epidural intervention.

When clear fluid leaking from the patient's back is seen, it should be considered in the differential diagnosis that it may be interstitial fluid from the epidural space, saline or local anesthetic drug injected through the catheter, and CSF. Although the biochemical test with the highest sensitivity is beta 2 transferrin, rapid biochemical measurements such as glucose, protein, and pH can be used because this test requires time and cost (6,9-11).

Treatment options are conservative treatments such as hydration, consumption of beverages containing caffeine and theophylline and bed rest, medical treatment with aminophylline, theophylline, and caffeine, and leaving the fistula tract to heal spontaneously by placing sutures on the fistula opening. Furthermore, invasive treatments like a neurochirurgical repair of the dural defect and an epidural blood patch can be successfully performed (1-8). Since there are no adequate studies and guidelines for the management of this rare complication, the decision on the treatment method is attached to the clinician. However, in a small number of reported cases, a tendency to avoid epidural blood patch due to the risks that may arise from invasive procedures can be recognized (4, 5, 9-11, 13).

In our case, since CSF flow from the skin could be seen macroscopically, we took a sample from the discharge in the first examination, and we preferred to analyze glucose, protein, and chloride from the sample due to technical impossibilities regarding beta2 transferrin. We used biochemical analysis to rule out possibilities other than CSF. Thus, we could make a rapid decision with the consent of our patient and apply the epidural blood patch. We evaluate that it would be advantageous to prefer EBP primarily in cases with CSF-skin fistula and that the benefit/harm ratio is higher than the complications to be caused by a central nervous system that is fistulized to the skin and open to all external factors.

One of the points we want to discuss in our case is that we started prophylactic antibiotic treatment for meningitis. In the literature, the development of meningitis has been reported in some of the cases followed up by conservative treatment or

skin sutures (9, 14). Our patient's complaints of headache, dizziness, and nausea that started on the 2nd day after EBP may have been caused by a possible central nervous system infection or could be due to the recurrence of intracranial hypotension, which is often seen after an epidural blood patch. So it was conceivable that our patient could benefit from conservative treatment and bed rest. However, two important facts that the patient's complaints did not occur even during the period of active CSF discharge from the fistula, and that the fistula tract opens the subarachnoid space to the skin microbiologic flora, could not be put at risk by us. Therefore we found it appropriate to initiate prophylaxis as a result of our consultations with infectious diseases and neurology physicians. Although prophylactic antibiotics use should be avoided as much as possible due to increasing antibiotic resistance, our opinion is that clinicians have to decide for each case individually, taking the conditions such as hospital infection surveillance and the flora of the hospitalization service into account.

CONCLUSION

CSF-cutaneous fistula is a rare complication of neuraxial anesthesia techniques. In treating this rare clinical condition, an autologous epidural blood patch, an invasive procedure, can be successfully applied as well as conservative and medical treatment methods. We evaluate that it would be advantageous to prefer EBP primarily in cases with CSF-skin fistula and that the benefit/harm ratio is higher than the complications that may be caused by a central nervous system that is fistulized to the skin. Although prophylactic use should be avoided as much as possible due to increasing antibiotic resistance, our opinion is that clinicians decide for each case individually, taking the conditions such as hospital infection surveillance and the flora of the hospitalization service into account.

REFERENCES

1. Nas, O. F., Oztepe, M. F., Kandemirli, S. G., Demir, A. B., Bilgin, C., Inecikli, M. F., & Hakyemez, B. The Efficacy and Safety of Lumbar Accessed Catheter-Assisted Epidural Blood Patch in Cervical and Thoracic Cerebrospinal Fluid Leakage. World neurosurgery 2022; 168, e233–e239
2. West, J. L., De Biase, G., Abode-Iyamah, K et al. Initial Results of Precision Treatment of Postoperative Cerebrospinal Fluid Leak with Ultrasound-Guided Epidural Blood Patch. World neurosurgery, 2021;153, e204–e212.
3. Gupta, A., von Heymann, C., Magnuson, et al. Management practices for postdural puncture headache in obstetrics: a prospective, international, cohort study. British journal of anaesthesia,2020; 125(6), 1045–1055.
4. Russell, R., Laxton, C., Lucas, D. N., Niewiarowski, J., Scrutton, M., Stocks, G. Treatment of obstetric post-dural puncture headache. Part 2: epidural blood patch. International journal of obstetric anesthesia, 2019;38, 104–118.
5. Katz, D., & Beilin, Y. Review of the Alternatives to Epidural Blood Patch for Treatment of Postdural Puncture Headache in the Parturient. Anesthesia and analgesia 2017; 124(4), 1219–1228.
6. Lenart, M. J., & Carness, J. M. Cerebrospinal Fluid-Cutaneous Fistula After Continuous Spinal Catheter in an Obstetric Patient. A & A case reports, 2016; 7(5), 103–107.
7. Abouleish, E., Vega, S., Blendinger, I., & Tio, T. O. Long-term follow-up of epidural blood patch. Anesthesia and analgesia, 1975;54(4), 459–463.
8. van Kooten, F., Oedit, R., Bakker, S. L., & Dippel, D. W. Epidural blood patch in post dural puncture headache: a randomised, observer-blind, controlled clinical trial. Journal of neurology, neurosurgery, and psychiatry, 2008; 79(5), 553–558.
9. Gordon, C., Fry, C., Salman, M., & Desai, N. Meningitis following cerebrospinal fluid-cutaneous fistula secondary to combined spinal-epidural anaesthesia for elective caesarean delivery. International journal of obstetric Anesthesia, 2022; 49, 103241.
10. Shields, N., Innes, E., & Goodman, J. A rare complication of accidental dural puncture during epidural insertion for labour analgesia. Anaesthesia reports 2019; 7(1), 18–21.
11. Sanha, M., Vaz, I., Barbosa, H., Alves, S., & Paiva, M. Cerebrospinal Fluid Cutaneous Fistula Following Neuraxial Anesthesia for Cesarean Delivery. Cureus, 2022; 14(12), e32895.
12. Howes, J., & Lenz, R. Cerebrospinal fluid cutaneous fistula. An unusual complication of epidural anaesthesia. Anaesthesia,1994; 49(3), 221–222.
13. Jawalekar, S. R., & Marx, G. F. Cutaneous cerebrospinal fluid leakage following attempted extradural block. Anesthesiology, 1981; 54(4), 348–349.
14. Abaza, K. T., & Bogod, D. G. Cerebrospinal fluid-cutaneous fistula and pseudomonas meningitis complicating thoracic epidural analgesia. British journal of anaesthesia, 2004; 92(3), 429–431.

Figure 1. Clear fluid leak at the needle insertion point. A sample was taken for biochemical analysis.

High-Frequency Jet Ventilation in Tracheal Surgery

Murat Izgi, Seda Ozkan, Gizem Daghan, Emre Onur Bal, Ozge Ozen, Meral Kanbak

Hacettepe University Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Methods of airway management depend on the location and growth pattern of the obstructive mass, as well as the degree of airway obstruction and surgical approach. The advantages of high-frequency jet ventilation (HFJV) include preserved gas exchange, decreased ventilation/perfusion mismatch and risk of atelectasis due to reduced auto-positive end-expiratory pressure, and minimal hemodynamic changes (1-2). Our aim is to share our ventilation strategy during an emergency surgery for repairing tracheal laceration.

Case: A 54-years-old female patient who was diagnosed with esophageal squamous cell carcinoma. She had total esophagectomy, total gastrectomy, and transverse colon interposition surgery. She developed shortness of breath and low saturation levels on the sixth postoperative day. After CT scan revealed a defect located right posterolateral part of trachea 8 mm superior to carina the patient was admitted for emergency surgery for repair.

She was intubated with a double lumen tube for one-lung ventilation. But the patient's airway pressures increased and saturation decreased to 60% and she was re-intubated with a single lumen tube. At this time, it was observed that the laceration reached 2-3 cm diameter. Despite our ventilation efforts, the saturation decreased to 25%, and vasopressor infusion was started. We decided to use cardiopulmonary bypass (CPB) to proceed with the surgery. When the patient's blood gas analysis show PaCO2 was 109 mmHg and PaO2 pressure was 23 mmHg we decided to apply high-frequency jet ventilation until cardiopulmonary bypass therapy was established. HFJV was applied by inserting the catheter to the left main bronchus through the endotracheal tube while simultaneously ventilating. With jet ventilation, the patient's PaO2 value increased to 60.4 mmHg and PaCO2 values began to decrease gradually. After switching to CPB the primary tracheal repair was completed, the patient was transported to the intensive care unit.

Conclusion: HFJV has been used as an auxiliary ventilation technique to conventional ventilation in endolaryngeal surgeries and can be considered as a good option. However, the team should keep in mind that the procedure itself may have complications. If adequate oxygenation cannot be achieved, jet ventilation should be considered in tracheal surgery.

Keywords: Adequate oxygenation, jet ventilation, tracheal surgery

INTRODUCTION

Methods for airway management in airway obstruction depend mainly on the nature, location, and growth pattern of the obstructive mass, as well as the degree of airway obstruction and the surgical approach. During upper airway surgery, various airway management techniques can be applied, including oxygenation with intubation, high-frequency jet ventilation (HFJV), non-intubated techniques, and veno-venous extracorporeal membrane oxygenation (VV-ECMO). The advantages of high-frequency jet ventilation include good gas exchange, reduced ventilation/perfusion mismatch, decreased atelectasis due to automatic positive end-expiratory pressure, and minimal hemodynamic changes (1, 2). The aim of this study is to share our ventilation strategy and anesthesia approach in a patient who underwent total esophagectomy due to esophageal squamous cell carcinoma (SCC) for emergency tracheal laceration repair surgery in our clinic.

CASE

The patient is a 54-year-old woman who was diagnosed with esophageal squamous cell carcinoma in 2017, with thoracic esophageal involvement, and received taxol and carboplatin chemotherapy treatment and 28 days of esophageal radiotherapy. She underwent transthoracic esophagectomy surgery in 2018. During follow-up, the patient had a recurrence in 2021 and underwent total esophagectomy + total gastrectomy + transverse colon interposition surgery in August 2022.

During the postoperative intensive care follow-up, the patient was extubated on the second day but was closely monitored with high-flow nasal oxygen therapy. However, on the third day, due to intolerance, the patient had to be re-intubated. A chest CT scan was performed, which revealed a 26mm hole on the right posterolateral side of the trachea, above the superior part of the carina. A consultation with a thoracic surgeon was requested, and a bronchoscopy was scheduled for the next day. However, due to a drop in the patient's oxygen saturation, emergency surgery was performed at 7:30 pm on the sixth day of intensive care to repair the hole.

During the administration of general anesthesia, a rigid bronchoscopy revealed an air leak in the trachea above the carina. A primary repair was planned with thoracotomy to address the air leak. After completion of the rigid bronchoscopy, the

patient was intubated with a left double-lumen tube of size 33. During one-lung ventilation with high airway pressures, the patient's oxygen saturation dropped to 60%, leading to intolerance. The patient was then extubated and re-intubated with a 7.5 endotracheal tube while placed in the left lateral decubitus position. At 8:30 pm, thoracotomy was initiated, and the defect was identified where the transverse colon mesentery was adhered to the trachea. During separation of the colon mesentery, the size of the tracheal laceration was found to be approximately 2-3 cm.

During surgical repair, it was observed that the laceration was progressively increasing. The surgical team attempted to manually close the defect and provide ventilation. Attempts were made to repair the defect with intermittent apneic ventilation and surgical suturing. During suturing, the SaO2 dropped to as low as 60%. Despite efforts to provide ventilation, the patient's overall condition deteriorated due to the difficulty in surgical repair, the enlargement of the defect, and the prolonged process. The saturation dropped to 25%, and the patient became bradycardic and hypotensive, leading to the initiation of vasopressor infusion. At around 9:45 pm, even with dopamine 10 mcg/kg/min and adrenaline 1 mcg/kg/min infusions and intermittent adrenaline boluses, the patient could not reach the target blood pressure levels. Therefore, it was decided to continue the surgery with cardiopulmonary bypass (CPB). Although the tracheal laceration was attempted to be manually closed and the patient was ventilated, adequate ventilation could not be provided. The endotracheal tube was attempted to be advanced into the left main bronchus under the guidance of the surgical team but was unsuccessful. The patient's arterial blood gas values showed a partial pressure of arterial carbon dioxide (PaCO2) increasing up to 109 mmHg and a partial pressure of arterial oxygen (PaO2) decreasing to 23.2 mmHg. Therefore, it was decided to apply high-frequency jet ventilation while waiting for the necessary team for CPB. While ventilation continued, a catheter was advanced through the endotracheal tube into the left main bronchus, and high-frequency jet ventilation was applied. After jet ventilation, the patient's PaO2 value increased to 60.4 mmHg, and PaCO2 values gradually began to decrease. At around 10:45 pm, the patient in the left lateral position was smoothly transitioned to CPB with femoral artery and vein cannulation. After the primary tracheal repair and pericardial fat tissue flap were performed, CPB was terminated at around 11:55 pm. No air leakage was observed, and the patient was transferred to the car diac surgery intensive care unit while intubated and receiving dopamine and adrenaline infusions.

DISCUSSION

Indications for high-frequency ventilation in adults include preventing ventilation-associated lung injury in severe ARDS, large air leak syndromes such as bronchopleural fistula, pneumothorax, and pulmonary interstitial emphysema, as well as failure of conventional mechanical ventilation and rescue therapy for refractory hypoxemia (3).

In the literature, HFJV has been used as a respiratory technique to assist conventional ventilation during supraglottic, infraglottic, and endolaryngeal surgeries, as well as during bronchoscopy, and can be considered a good alternative. However, the team should bear in mind that there may be complications within the procedure itself (2,4).

The effectiveness of high-frequency jet ventilation in patients with high airway resistance is questionable and can lead to air trapping and barotrauma, such as pneumothorax, pneumomediastinum, pneumopericardium, and pulmonary interstitial emphysema. It can also cause a decrease in venous return and cardiac output by leading to high intrathoracic pressures (3).

CONCLUSION

In our case, the area being surgically corrected was of critical importance for the patient's ventilation. The use of jet ventilation was lifesaving in preventing hypoxia and providing ventilation for the patient when positive pressure mechanical ventilation was insufficient and the patient was heading towards the option of cardiopulmonary bypass. Since it did not cause hypoxia and provided us with time, we used it as a life-saving option, as we were experienced with its use and it was available in our clinic.

REFERENCES

1. Hatipoglu, Z., Turktan, M., & Avci, A. (2016). The anesthesia of trachea and bronchus surgery. *Journal of thoracic disease*,2016; *8*(11) 3442–3451.
2. Liu, X., Jiang, R., Xiao, J., Lu, T., Gan, J., Cheng, J., Liao, J., & Li, PAnesthesia airway management for tracheal resection and reconstruction: a single-center case series. *Annals of palliative medicine*, 2021; *10*(3), 3354–3363.
3. Murthy PR, AK AK. High Frequency Ventilation. 2022 Sep 29. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 33085298.
4. Altun D, Çamcı E, Orhan-Sungur M, Sivrikoz N, Başaran B, Özkan-Seyhan T. High frequency jet ventilation during endolaryngeal surgery: Risk factors for complications [published correction appears in Auris Nasus Larynx. 2019 Dec;46(6):962]. *Auris Nasus Larynx*. 2018;45(5):1047-1052.
5. Dai L, Jiang L, Gu Y, Vannucci J, Lv X, Song J. Modified double lumen tube for a unique bronchial and carinal resection in a patient undergoing uniportal VATS for tumour: A case report. *Transl Cancer Res*. 2020;9(3):2077-2081

OP-59 (Others)

Abstract Only

Preceding Diabetes Mellitus: No Impact on The Changes of Blood Glucose Level During Whipple Surgery

Semiha Cagatay Gokdere, Almıla Gülsün Pamuk, Filiz Üzümcügil

Hacettepe University Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Whipple surgery with manipulation and resection of pancreas causes blood glucose changes, some of which develop into Type 3 DM. Our aim was to determine the difference, if any, between blood glucose changes that develop in patients with and without preceding DM while still in surgery.

Materials and Methods: We retrospectively studied files of 86 patients (> 18 years, ASA I-III) who had Whipple surgery between Jan 1st -Mar 1st 2021. All patients had at least 4 blood glucose levels measured and recorded (start of operation, during pancreatic manipulation and resection, end of surgery). There were 32 patients with preceding diagnosis of DM and 54 without. Any surges or dips in blood glucose and relating interventions were studied.

Results and Discussion: All patients with preceding DM were coded as Type 2, onset times and relation to pancreatic disease was unavailable. Regardless of DM, blood glucose measurement at the beginning of the operation (1st measurement) was significantly lower than the 2nd, 3rd, and 4th measurements in all patients; there was no difference between the 2nd and 3rd measurements, and the 4th measurement was significantly higher. Blood glucose changes during the operation were much steeper in patients without DM (P=0.012), The effect of DM diagnosis alone on blood glucose measurement values was not found significant (p=0.139), but diabetic patients were treated more promptly with Insulin if over a Glucose threshold of >=180 mg/dl (p=0.01). Previous studies showed a correlation with 'early' postoperative blood glucose changes and onset of new Type 3b DM, but intraoperative surges were never studied or correlated.

Conclusions: The observed intraoperative blood glucose increase was steep and significant. This finding should be confirmed by prospective studies and investigated as a likely early indicator for the subsequent development of Type 3c DM.

Keywords: Whipple, DM, blood glucose, Type 3c DM

REFERENCES

1. Eshuis WJ, Hermanides J, van Dalen JW, et al. Ann Surg. 2011 Apr;253(4):739-44.
2. Lim PW, Dinh KH, Sullivan M, et al. Epub 2016 Feb 17. PMID: 27037206; PMCID: PMC4814621.
3. Scholten L, Mungroop TH, Haijtink SAL, et al. Surgery. 2018 May 17

OP-60 (Others)

Abstract Only

Comparison of the Effect of Erector Spina and Subcostal Transversus Abdominis Plane Block on Diaphragm Movement in Laparoscopic Cholecystectomies

Ülkü Ceren Köksoy[1], Hakan Yılmaz[1], Baturay Kansu Kazbek[1], Perihan Ekmekçi[1], Hasan Turgut Aydın[2], Filiz Tüzüner[1]

[1]Ufuk University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2]Ufuk University Faculty of Medicine, Department of General Surgery, Ankara, Türkiye

ABSTRACT

Background: Thoracic erector spina plane block (ESPB) and subcostal transversus abdominis plane block (STAPB) performed with ultrasonography are plane blocks with low side-effect profile that provide effective analgesia in laparoscopic cholecystectomies (LC) but studies on their effects on diaphragmatic movement are limited. In this study, we aimed to evaluate the effects of TESPB and STAPB on diaphragm movement, postoperative pain levels and opioid consumption.

Material and Methods: In this retrospective study, with ethics committee approval, 66 patient's files, 18-65 years, ASA I-II, who underwent LC under general anesthesia, and bilateral TESPB at T8 level or STAPB with 40 ml of 0.375% bupivacaine were scanned and grouped as group T (STAPB) and group E (TESPB). Diaphragm excursion measurements of all patients taken before premedication and at the postoperative 30th minute were evaluated. Additionally, visual analog scale (VAS), numerical scale (NRS) values, opioid consumption (OC) and additional analgesic needs (AAN) recorded at 1st, 6th and 12th hours postoperatively in patients with patient-controlled analgesia device with tramadol were obtained and compared with t-test and repeated measures anova tests.

Results and Discussion: While demographic data (Table I, Table II), intraoperative heart rate, mean arterial pressure, oxygen saturation, remifentanil consumptions were similar between groups, the duration of surgery and anesthesia was longer in group T ($p<0.05$). A postoperative decrease in diaphragmatic excursion was observed in both groups ($p=0.014$, $p=0.001$) with more significance in group T (Table III). In group E, NRS 1-6-12; VAS 1-6; OC 6 and AAN 1-12 values were higher ($p<0.05$) (Table IV). Postoperative diaphragmatic dysfunction in LC results not only from irritation of the visceral afferent nerves due to the surgical procedure, but also from the mechanical reflex suppression of respiratory motility to reduce incisional pain. Although STAPB effecting between T6-L1 dermatomes, provides more effective analgesia in the first 12 hours than TESPB which can effect between T4-L2 dermatomes, it causes more deterioration in diaphragm excursion in the early postoperative period.

Conclusion: Therefore, we believe that TESPB may be a safer analgesia method for postoperative diaphragm movement in patients with impaired respiratory function, although it is less effective in pain control than STAPB.

Keywords: Erector spina plane block, subcostal transversus abdominis plane block, diaphragm excursion

Table 1: Demographic Data

DEMOGRAPHIC DATA							
	Group E			Group T			
	n	MEAN ±SD	Median (Min-Max)	n	MEAN ±SD	Median (Min-Max)	p-value
Age	33	51.73±13.27	55 (26-65)	33	54.09±10.91	57 (18-65)	0.528
Body weight (kg)	33	75.06±13.23	74 (55-107)	33	76.88±14.72	76 (48-110)	0.600
Height (cm)	33	167.00±7.89	166 (154-183)	33	166.88±8.96	165 (154-185)	0.954
BMI	33	26.83±3.85	26.2 (21.8-35.4)	33	27.63±5.18	26.0 (20-39.5)	0.479
Duration of anesthesia(min)	33	84.48±30.15	81 (46-228)	33	113.58±24.14	108 (70-170)	<0.001
Duration of surgery (min)	33	68.33±29.99	65 (31-212)	33	88.30±21.84	86 (42-130)	0.003

BMI: Body Mass Index, cm: Centimeter, kg:Kilogram, Max: Maximum, Min:Minimum, min: Minutes, n: number, SD: Standart Deviation

Table 2. Gender and ASA Score Frequencies

GENDER AND ASA SCORE FREQUENCIES			
	Group E	Group T	
	Number of patients (%)	Number of patients (%)	p-value
Gender			0,629
Female	19 (%28.8)	17 (%25.8)	
Male	14 (%21.2)	16 (%24.2)	
ASA score			0,108
I	1 (%1.5)	32 (%48.5)	
II	3 (%4.5)	30 (%45.5)	
ASA: American Society of Anesthesiologists			

Table 3. Diaphragm Excursion Measurements in Subcostal Transversus Abdominal Plane Block (stapb) and Thoracic Erector Spina Plane Block (tespb) Groups

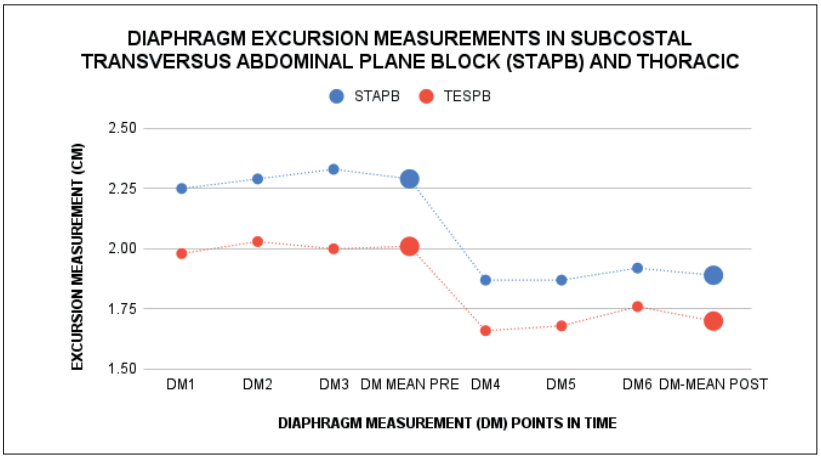


Table 4. Postoperative Pain Scores, Opioid and Analgesic Consumptions

POSTOPERATIVE PAIN SCORES, OPIOID AND ANALGESIC CONSUMPTIONS							
	Group E			Group T			
	n	MEAN ±SD	Median (Min-Max)	n	MEAN ±SD	Median (Min-Max)	p-value
NRS-1	33	4.67±2.65	5.00	33	3.00±2.32	3.00	**0.010**
NRS-6	33	3.88±2.42	4.00	33	1.82±1.85	1.00	**<.001**
NRS-12	33	2.42±2.00	2.00	33	1.36±1.52	1.00	**0.005**
VAS-1	33	3.64±2.40	3.00	33	2.12±2.06	2.00	**0.008**
VAS-6	33	2.58±2.06	2.00	33	1.18±1.13	1.00	**0.001**
VAS-12	33	1.70±1.65	1.00	33	1.12±1.11	1.00	0.139
OC-1	33	12.79±8.57	7.50	33	11.59±9.90	9.40	0.687
OC-6	33	20.75±11.76	15.00	33	30.66±20.68	28.00	**0.083**
OC-12	33	41.14±18.57	37.50	33	42.36±18.57	30.00	0.729
AAN-1	33	42.36±29.04	30.00	33	0.09±25.09	0.00	**<.001**
AAN-6	33	6.06±0.29	0.00	33	0.06±16.57	0.00	0.348
AAN-12	33	22.73±0.24	0.00	33	0.03±25.28	0.00	**<.001**
AAN: Additional Analgesic Need (dexketoprofen in miligrams), NRS: Numerical Rating Scale, OC: Opioid Consumption (Tramadol %0.2, in mililiters), VAS: Visual Analog Scale							

OP-61 (Others)

Abstract Only

Anesthesiological Management of Gynecologic-Oncology Patients Undergoing Cytoreductive Surgery with Hyperthermic Intraperitoneal Chemotherapy: A Single-Center Retrospective Study

Asude Ayhan[1], Gamze Haras[1], Meric Yavuz Colak[2], Elvin Kesimci[1], Ali Ayhan[3]

[1]Baskent University School of Medicine, Department of Anaesthesiology and Reanimation, Ankara, Türkiye
[2]Baskent University School of Medicine, Department of Biostatistics, Ankara, Türkiye
[3]Baskent University School of Medicine, Department of Gynecological Oncology, Ankara, Türkiye

ABSTRACT

Background: Heated intraperitoneal chemotherapy (HIPEC) with cytoreductive surgery (CRS) is a technique for treating isolated peritoneal dissemination of intraabdominal and pelvic malignancies. The process entails major abdominal-pelvic surgery, thermal stress, and the harmful effects of chemotherapeutic agents, with significant electrolyte and fluid disturbances. The purpose of this study was to evaluate the perioperative variables and anesthesiological outcomes of using HIPEC after CRS at an academic tertiary care center.

Material and Methods: The patient records were retrospectively examined for demographic characteristics, interventions, peri-operative care, post-operative course, and complications following ethics committee approval.

Results and Discussion: Between 2017 and 2022, a total of 122 consecutive patients underwent 125 interventions. The mean age of the patients was 55 ± 11.58 years. ASA Physical Status Classification was noted as ' >= 3' in 25 patients. The most common comorbid condition was hypertension. The diagnosis of ascites and acute kidney injury (AKI) was made in 19 and 5 of the patients, respectively, at the pre-operative period. The mean anesthesia time was 227 ± 65 minutes. HIPEC induced hyperthermia with an overall median peak temperature of 36.7 (min-max: 35.2-38.2)°C with active cooling. Metabolic acidosis occurred in 4% of the patients, and hypotension occurred in 20% of the patients during HIPEC. The bleeding, expressed as median blood loss, was 0.3 (0 to 2.7) liters. Only 12 of the patients required intensive care unit management. Total length of hospital stay was 12.97 ± 11.75 days. AKI developed in 20.8% of the patients after the treatment. Respiratory problems were observed in 12% of patients. Postoperative fever, nausea and vomiting, diuretics need, arrhythmias, and thromboembolic events were observed more frequently in the long period of HIPEC (90 vs. 60 minutes). No statistically significant differences between postoperative AKI and HIPEC duration were found (p = 0.323). The one-year mortality rate was noted as 4.8%.

Conclusion: CRS with HIPEC is linked to significant hemodynamic and metabolic alterations. Considering the complexity of the primary disease and surgical intervention, it requires well-organized and patient-tailored anesthetic management, including meticulous monitoring of the relevant parts of the many physiological systems throughout the entire body.

Keywords: Anesthesia, hyperthermic intraperitoneal chemotherapy (HIPEC), cytoreductive surgery, complications, gynecologic oncology

Can Intravascular Foreign Body be a Fractured Fragment of an Intravenous Cannula?

Esin Tekin[1], Utku Güngörür[1], Sinem Küçük[1], Yusuf Ünal[1], Sercan Tak[2], Mustafa Arslan[1]

[1]Gazi University School of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2]Gazi University School of Medicine, Department of Cardiovascular Surgery, Ankara, Türkiye

ABSTRACT

Background: Although peripheral intravenous cannulation is a safe procedure when performed properly, it can lead to rare but fatal complications. Among these complications, fracture of the peripheral cannula is an extremely underreported complication. In this case report, we aimed to present iatrogenic fracture of a cannula in the cephalic vein and its intraoperative management.

Case: Sixty-eight-year-old patient was scheduled for radical prostatectomy+inguinal hernia operation. Second venous line was accessed from the left arm cephalic vein with a 16G intracath for venous access. The intracath was removed when the intracath could not advance in the vein due to the thrombosed vasculature of the patient. When the intracath checked at the entrance was removed, it was found that the plastic part was broken. A tourniquet was immediately applied to the proximal part of the arm where the intracath was to be inserted. When the venous structure was checked by ultrasonography, a fractured piece of the intracut in the vein was seen in the in plane image(Figure1). The entry site was marked by ultrasonography and the cardiovascular surgery team was informed. The plastic part of the intracath was seen in the vein and removed(Figure2a-2b).

Conclusion: Peripheral cannulation is an invasive procedure used for the infusion of intravenous fluids, drugs and blood sampling. Complications such as thrombophlebitis, infection, hematoma and catheter fracture leading to intravenous foreign body retention can occur during this procedure1. Reports of fractured intravenous cannula in the literature are mostly related to central venous catheterization. Some of the reasons for cannula fracture are repeated attempts with the same cannula leading to structural failure, poor quality of the cannula, lack of expertise, frequent movement of the cannula site, repeated touching by the patient due to pain and irritation, and reinsertion of the guide2. Diagnosis of a broken cannula in a peripheral vein requires a careful history and examination for a possible mechanism of the broken cannula. Before removal, imaging examinations for localization and tourniquet use are crucial to prevent distal migration with serious consequences. Given the variable but potentially fatal consequences of intravascular migration, early recognition is paramount.

Keywords: Intravascular foreign body, foreign body embolization, broken intravascular cannula

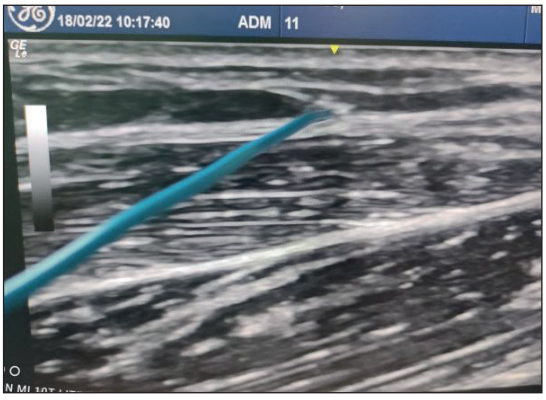


Figure 1. Ultrasonography image of the broken cannula fragment

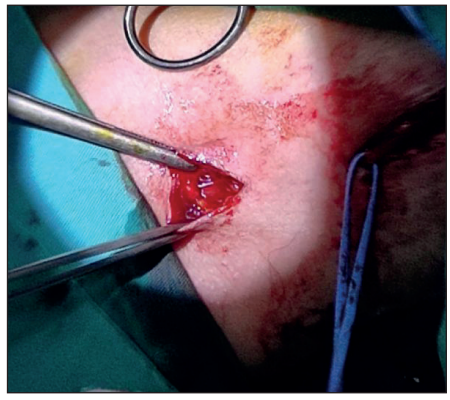


Figure 2a. Intravenous localization of intravascular foreign body

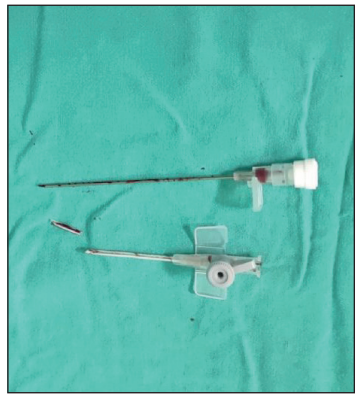


Figure 2b. Removed portion of intravascular foreign body

OP-63 (Others)

Abstract Only

Use of Sugammadex After TIVA with Low-Dose Rocuronium in Amyotrophic Lateral Sclerosis

Ülkü Ceren Köksoy, Züleyha Kazak Bengisun, Hakan Yılmaz, Baturay Kansu Kazbek, Filiz Tüzüner

Ufuk University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: We are presenting the perioperative management of a patient with amyotrophic lateral sclerosis (ALS), who underwent laparoscopic cholecystectomy with low-dose muscle relaxant and total intravenous anesthesia(TIVA) reversed by sugammadex.

Case: A 47 years-old, 176 cm/90 kg male patient who could not walk without support due to weakness in the lower extremities was diagnosed with ALS and started treatment with riluzole and corticosteroids. He was admitted to general surgery department with complaints of nausea, dyspnea and abdominal pain. In his neurological examination, chin reflex was inactive, plantar response was present, patellar reflex was hyperactive, the Achilles reflex was hyperactive. Electromyelogram showed active diffuse anterior horn cell involvement. Carotid and vertebral artery Doppler ultrasonography was normal. Following informed consent the patient was monitored for heart rate, oxygen saturation, invasive arterial blood pressure, body temperature (BT), train-of-four (TOF) and bispectral index (BIS). With basal TOF:100, BIS:98, BT:36.5 intubation was performed with 40mg 20% lidocaine, 300mg propofol and 0.2mg/kg rocuronium (TOF:40, BIS:26). TIVA was administered with 2% propofol and remifentanil. Total anesthesia time was 133 minutes. At the end of the surgery (TOF:100, BIS:76) 2 mg/kg sugammadex was administered. Extubation was performed at the fifth minute with TOF:100, BIS:95, BT:35.5. The patient, who had no postoperative respiratory distress and pain, was discharged on the second postoperative day without complications.

Conclusion: ALS is a rapidly progressive, neurodegenerative motor neuron disease seen in 5th-6th decades with muscle weakness, atrophy, fasciculation and spasticity. It starts asymmetrically and becomes generalized, with skeletal and bulbar muscle involvement. Patients have a high sensitivity to nondepolarizing muscle relaxants. Since aspiration risks and mechanical ventilator needs may increase with respiratory muscle involvement, intubation of patients with little or no neuromuscular blockers and extubation following reversal of breathing with full alertness is recommended. Although TOF response is 100% in ALS patients, respiratory effort and tidal volume may be insufficient. Since the half-lives of nondepolarizing agents are longer than cholinesterase inhibitors, there is a risk of recurarization. In order to avoid these risks, we decided to use sugammadex. In conclusion, 0.2mg/kg rocuronium and sugammadex provides reliable anesthesia and a smooth discharge in ALS patients.

Keywords: Amyotrophic lateral sclerosis, sugammadex, total intravenous anesthesia

Comparison of Ultrasound-Guided Combined Deep and Superficial Serratus Anterior Block and Thoracic Paravertebral Block in Video-Assisted Tracoscopic Surgery Patients; Preliminary Study

Gülay Ülger[1], Oya Kaybal[1], Musa Zengin[2], Ali Alagöz[1]

[1]University of Health Sciences, Ankara Atatürk Sanatorium Training and Research Hospital, Anesthesiology and Reanimation Department, Ankara, Türkiye
[2]University of Health Sciences, Ankara Etlik City Hospital, Anesthesiology and Reanimation Department, Ankara, Türkiye

ABSTRACT

Background: Video-assisted thoracoscopic surgery (VATS) has become the standard procedure in thoracic surgery. Blocks such as thoracic paravertebral block (TPVB) and serratus anterior plane block (SAPB) are frequently preferred. In this preliminary study, it was aimed to evaluate the analgesic efficacy of ultrasound (US) guided combined deep and superficial SAPB and TPVB application.

Material and Methods: In this prospective randomized study, in which we evaluated the preliminary results, patients who will undergo VATS, ASA I-III, and between the ages of 18-65 years were included in the study. The patients were divided into two groups as combined deep / superficial SAPB (Group 1) and TPVB (Group 2). Under the US guidance 30 ml of 0.25% bupivacaine was injected into both groups. Multimodal analgesia was applied in both groups postoperatively. Demographic characteristics of the patients, complications rates, postoperative visual analog scale (VAS) scores, and postoperative additional analgesic use were recorded.

Results and Discussion: Demographic data of Groups 1 and 2, VAS values, morphine consumption, additional analgesic requirements, and complication rates are indicated in the tables. US-guided TPVB is a preferred method for analgesia in VATS. However, due to the proximity of the area to be blocked to the pleura and its deep location, interfascial block applications such as SAPB, which can be applied more easily, have been applied with increasing frequency in recent years. Considering the preliminary results of our ongoing study, pain scores, complication rates, additional analgesic requirements, and morphine consumption were within acceptable limits.

Conclusion: When evaluated in terms of ease of implementation, SAPB may be a suitable alternative to VATS. In addition, we think that combination of blocks may limit block failure in block applications, which is an important component of multimodal analgesia.

Keywords: Postoperative pain, serratus anterior plane block, thoracic paravertebral block

Table 1: Demographic data of patients, ASA scores, surgery performed on patients, duration of anesthesia

	SAPB	TPVB
Gender		
Female	1	2
Male	5	4
Age, years	56,12 ± 3,11	39,33 ± 8,90
BMI, kg/m²	25,70±1,48	24,38 ± 2,87
ASA		
ASA II	5	3
ASA III	1	3
Operation		
Lobektomy	3	3
Wedge, segmentectomy	2	3
Biopsy	1	0
Duration of anesthesia, min	172,50 ± 44,34	140 ± 29,50

ASA: American Society of Anesthesiologist, SAPB: Serratus Anterior Plane Block, TPVB: Thoracic Paravertebral Block, BMI: Body Mass Index

Table 2: VAS scores at 1, 2, 4, 8, 6, 16, 24 and 48 hours at rest in patients who underwent SAPB and TPVB

	SAPB	TPVB
	Mean±SD	Mean±SD
VAS 1st hour	4.00±0,37	3,83±0,70
VAS 2st hour	3,16±0,75	3,33±0,67
VAS 4st hour	2,33±0,56	2,17±0,31
VAS 8st hour	1,83±0,48	1,50±0,43
VAS 16st hour	2,83±0,48	1,83±0,70
VAS 24st hour	2,17±0,65	1,67±0,42
VAS 48st hour	1,33±0,42	1,17±0,17

VAS: Visual analogue scale, SAPB: Serratus Anterior Plane Block, TPVB: Thoracic Paravertebral Block

Table 3: Morphine consumption, Additional analgesic requirements, and Complications rates in groups

	SAPB	TPVB
Morphine consumption, ml*	38,67±9,97	44,00±14,72
Additional analgesic requirements		
No	0 (0 %)	2 (33,3%)
Yes	6 (100%)	4 (66,67%)
Complication		
Nause/Vmiting	1(16.67%)	1(16.67%)

SAPB: Serratus Anterior Plane Block, TPVB: Thoracic Paravertebral Block

Another Nightmare After the Earthquake – Phantom Pain in Children

Serkan Solak, Ahmet Murat Gül, Aslı Ayaz, Hisar Can Kutan, Gülsen Keskin, Aslı Zoroğlu Dönmez

University of Health Sciences Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Phantom pain is a common condition that occurs after both upper and lower extremity amputations. The most common causes of amputation in the pediatric population are trauma, cancer, and congenital amputations. For trauma-related amputations, recorded prevalence of phantom pain is 12% and 83%. We aimed to present the frequency of phantom pain in patients hospitalized in our hospital after Pazarcık earthquake due to amputation.

Material and Methods: Children aged 0-18 years with extremity amputations due to trauma followed in Ankara Etlik City Hospital after Pazarcık earthquake were included in the study. Data were obtained from the patient files and hospital records. All patients were evaluated daily for Phantom sensation or Phantom pain in a standardized fashion. The severity, time and character of the pain were questioned in patients with Phantom pain.

Results and Discussion: Nineteen patients with traumatic amputation were included in the study. Demographic values and amputation sites are shown in Table I and II. In the follow-up of the patients at the end of one month; Phantom sensation and Phantom pain was detected in 16 (88.9%) and 11 (61.1%) patients respectively (Table III). The lower extremity rate in traumatic amputations has been reported to be 80-85% in the literature, as in our results. Wilkins et al found the incidence of Phantom pain to be 48.5% in children aged 8-18 who underwent traumatic amputation. However, we found a higher incidence (61.1%) in our patients. This high incidence may be due to the fact that we started to follow patients immediately after they were admitted to the hospital.

Conclusion: Phantom sensation and Phantom pain are seen with considerable frequency after traumatic amputation in children. It may be valuable to evaluate the treatment plan in the early period and to improve the quality of life.

Keywords: Amputation, child, phantom pain

Table 1. Data on Demographic Characteristics and General Status of the Patients

Gender n (%)	**Female Male**	**9 (47.37) 10 (52.63)**
Age (year)	Average ± SD Median (Min.-Max.)	9.42±5.49 9 (1-17)
Weight (kg)	Average ± SD Median (Min.-Max.)	36.74±22.10 36 (9-90)
Intubation, n (%)	- +	15 (78.9) 4 (21.1)
Consciousness, n (%)	Conscious Unconscious	18 (94.7) 1 (5.3)

SD: Standard Deviation, Min.:Minimum, Max.:Maximum

Table 2. Distribution of Amputation Areas of the Patients

	Amputation Level	**Unilateral, n**	**Bilateral, n**	**Total, n %**
Upper Extremity	Arm	2	-	2 (10.5)
Lower Extremity	Above Knee Under Knee Foot Toe	6 4 2 2	1 2 - -	17 (89.5)

Table 3. Phantom Sensation, Phantom Pain and Phantom Pain Onset, FLACC Pain Scale

Phantom Sensation, n (%)	None Yes	2 (11.1) 16 (88.9)
Phantom Pain, n (%)	None Yes	7 (38.9) 11 (61.1)
Phantom Pain Onset, n (%)	Immediately After Amputation After one week	9 (81.8) 2 (18.2)
FLACC Pain Scale	Average ± SD Median (Min.-Max.)	6.45±1.51 6 (38)

SD: Standard Deviation, Min.:Minimum, Max.:Maximum

Bilateral Pectoral Block for Post-sternotomy Pain Relief: Case Series

Nilgün Şahin, Engin Zafer Terzi, Hacer Serdaroğlu, Özge Yamankılıç Mumcu, Umut Can Ağar, Dilek Ünal

Ministry of Health, Etlik City Hospital, department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Adequate postoperative analgesia is very important for early recovery and early extubation in patients undergoing open-heart surgery (OHS). For this reason, the use of regional anesthesia techniques, which reduce the need for systemic opioids, is becoming more common day by day. The purpose of this case series is to present our experience with Pectoralis (PECS) I-II block in patients undergoing OHS.

Case: Bilateral PECS I/ II blocks were applied after induction of anesthesia to ASAII-IV group patients who underwent OHS between 10/2022-2/2023 with 0.25% bupivacaine (10mL each, for a total of 40mL) using a 100mm(Pajunk Sonoblok 2)needle under the guidance of (GE Logiq P9) ultrasound device. Patients' extubation times, pain onset-times, pain scores (visual analog scale: VAS), hypertensive responses during awakening, nurses' post-procedural satisfaction questionnaires (0-3: not at all satisfied - very satisfied) were retrospectively investigated. Of 76 patients who applied PECS block during the study period; coronary artery bypass grafting was performed in 66 and valve replacement was performed in 10. 50 (65%) of the patients were male and 26 (35%) were female. The mean age of the patients was 66.3 years (the smallest-the biggest value was 26-84). It was observed that the patients did not have pain in the first 12-16 hours in the postoperative period. It was observed that the VAS scores of the patients were below 6 in the first 24 hours and they did not need spioid analgesics. It was determined that the first analgesic requirement of most of the patients appeared at the 16th hour, their pain was relieved with paracetamol or dexketoprofen, their first opioid requirement appeared after the 24th hour. 100% of the intensive care nurses scored their satisfaction with analgesia management as 3.

Conclusion: Open-heart surgery patients are generally elderly, have comorbidities and have limited cardiac reserve. It is desirable that the analgesia method used in these patients should not affect the hemodynamic status of the patient. Thanks to the postoperative analgesia provided by regional anesthesia methods, protection from the undesirable systemic effects of analgesics can be achieved. The results of our study showed that PECS blocks were effective in reducing post-sternotomy pain.

Keywords: Open hearth surgery, PECS block, postoperative pain

Our Experience with Erector Spinae Plane Block for Postoperative Analgesia in Patients Undergoing Videoassisted Thoracoscopic Surgery

Nilgün Şahin[1], Engin Zafer Terzi[2], Umut Can Ağar[3], Hacer Serdaroğlu[4], Ahmet Canıtez[5], Özge Yamankılıç Mumcu[6], Dilek Ünal[7]

Ministry of Health, Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Video-assisted thoracoscopic surgeries (VATS) are more preferred because they facilitate lung operations through a smaller incision and are not as painful as thoracotomy. Anesthesiologists are turning to methods such as Erector spinae plane (ESP) block, which is less invasive than thoracic epidural analgesia and can provide effective analgesia, for postoperative pain in these patients. The purpose of this case report is to share our experience of ESP block in patients undergoing VATS.

Case: ESP block were applied at two thoracic vertebra levels after induction of anesthesia to ASA II-IV group patients who underwent VATS between October 2022 and February 2023 with 0.25% bupivacaine (10 mL each block, for a total of 20 mL) using a 100 mm Pajunk Sonoblok 2 needle under the guidance of GE Logiq P9 ultrasound device. Patients' extubation times, postoperative pain onset times, pain scores (visual analog scale: VAS), hypertensive responses during awakening, and nurses' post-procedural satisfaction questionnaires (0-3: not at all satisfied - very satisfied) were retrospectively investigated. During the study period, 3(50%) of the 6 patients who received ESP block were male and 3(50%) were female. The mean age of the patients was 59 years (the smallest and the biggest values: 20-69), and the mean weight was 70 kg (Table 1). It was observed that the patients did not have pain immediately after their extubation and in the first 12-16 hours of the postoperative period. VAS scores were lower than 6 in the first 24 hours and they did not need opioid analgesics. The first analgesic requirement of most of the patients appeared after the 16th hour and it was relieved with paracetamol or dexketoprofen. 100% of the intensive care nurses scored their satisfaction with analgesia management as 3.

Conclusion: Peripheral plane blocks applied under ultrasound devices guidance in thoracic surgery can be considered as an alternative to central blocks. It is necessary to expand the practice and studies on this subject.

Keywords: VATS, ESP block, postoperative analgesia

Anesthetic Management In Patient With Williams Syndrome

Yasemin Akcaalan[1], Eda Aysan[1], Aziz Aysel[1], Ezgi Erkılıç[1], Tülin Gümüş[1], Orhan Kanbak[1], Levent Öztürk[2]

[1]University of Health Sciences Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2]Yıldırım Beyazıt University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Williams syndrome is a microdeletion syndrome characterized by special facial appearance, mental-growth retardation, idiopathic hypercalcemia, vascular occlusions, neurological, endocrinological and renal pathologies, eye, hearing, tooth, connective tissue and skeletal system anomalies. The majority of mortality and morbidity develops due to concomitant cardiac pathologies.

Case: An operation was planned for a 16-year-old female patient due to a mobile, rigid, painful swelling under the left ear by otorhinolaryngology surgery. She has known hypertension, superior mesenteric artery compression, hypothyroidism and OSAS disease. Coronary angiography was performed 3 years ago and medical treatment was started. She uses enapril and levotron. Preoperative cardiology and endocrine diseases were consulted, recommendations were received. No pathological value was detected in laboratory tests. Mallampati score was 2.

General anesthesia was planned for the patient, mask ventilation was comfortable after iv induction. After 3 unsuccessful attempts with direct laryngoscopy, she was intubated with a video laryngoscope and a 6.5 size spiral endotracheal tube. At the end of the case, which lasted for 50 minutes, the patient was extubated without any problems, and he was taken to the recovery room consciously and cooperatively.

Conclusion: Intraoperative cardiac arrest and sudden death cases have been reported in patients with Williams syndrome in the literatüre(1). Careful preoperative preparation of the patient with Williams syndrome should be undertaken before every elective procedure. As cardiovascular abnormalities are the leading cause of morbidity and mortality in these patients, and the degree of severity can evolve rapidly, an evaluation by a cardiologist within one month of the procedure should be considered. Preprocedural anxiety is very common in patients with Williams syndrome. This anxiety may be compounded by hyperacusis. Loud noises may be very distressing and the perioperative environment should be quiet, especially for induction and during recovery.

These patients are at increased risk of adverse perioperative outcomes, but with appropriate risk stratification, clear physiologic and anesthetic goals, and attention to detail, these risks can be successfully managed in most tertiary care settings. Clear, accurate communication amongst a multidisciplinary team including anesthesiologists, surgeons and cardiologists is key to successful planning and preparation.

Keywords: Anesthesia, cardiovascular abnormalities, Williams syndrome

Superficial Cervical Plexus Block for Lymph Node Excision in a Child with Mediastinal Area Full of Lymph Nodes

Filiz Uzumcugil[1], Bengisu Koc[1], Mehmet Kirikoz[1], I.Rana User[2]

[1]Hacettepe University, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2]Hacettepe University, Department of Pediatric Surgery, Ankara, Türkiye

ABSTRACT

Background: Mediastinal masses with a risk of compromise to airway during anaesthetic management mainly requires preserving spontaneous ventilation. We aimed to present a child with numerous lymph nodes in the mediastinum surrounding the trachea, to highlight the main considerations of anaesthetic management for lymph node excision in the neck.

Case: A 4.5-year-old female child of 14.5 kg was scheduled for diagnostic lymph node excision in the neck. On computed tomography, airway was patent with several nodes surrounding and on clinical examination there was no respiratory problems (Figure 1). The patient had an intravenous line and received 0.1 mg/kg midazolam for anxiolysis on arrival to the operating room with precautions for airway management. Preserving spontaneous ventilation with close monitoring, midazolam was administered incrementally up to 0.3 mg/kg in combination with 1 mg/kg intravenous ketamine given incrementally, as well. Oxygen supplement was provided by nasal cannula. After positioning the patient for excision of the node on the right side of the neck, US-guided superficial cervical plexus block (SCPB) was performed using bupivacaine (1 mg/kg) and prilocaine (2 mg/kg) at a total volume of 0.5 ml/kg when diluted with saline. During traction of muscles in the neck 0.1 mg/kg propofol was added without any need for further medication for a total of approximately 40-45 minutes of procedure. No complication occurred.

Conclusion: Preserving spontaneous ventilation is a major concern during anaesthetic management of patients with mediastinal masses surrounding trachea. Procedures including thoracotomy, mediastinoscopy or video-assisted thoracoscopy may require general anaesthesia and endotracheal intubation, however, a diagnostic lymph node excision in the neck in such patients may be considered for regional anaesthetic techniques. Considering small age of our patient, a regional anaesthetic technique was not possible without sedation. Ensuring that the airway is patent and spontaneous ventilation is maintained under sedation, SCPB provided a safe and effective method for lymph node excision in a child with mediastinal mass

Keywords: Superficial cervical plexus block, pediatric, lymph node excision, mediastinal mass

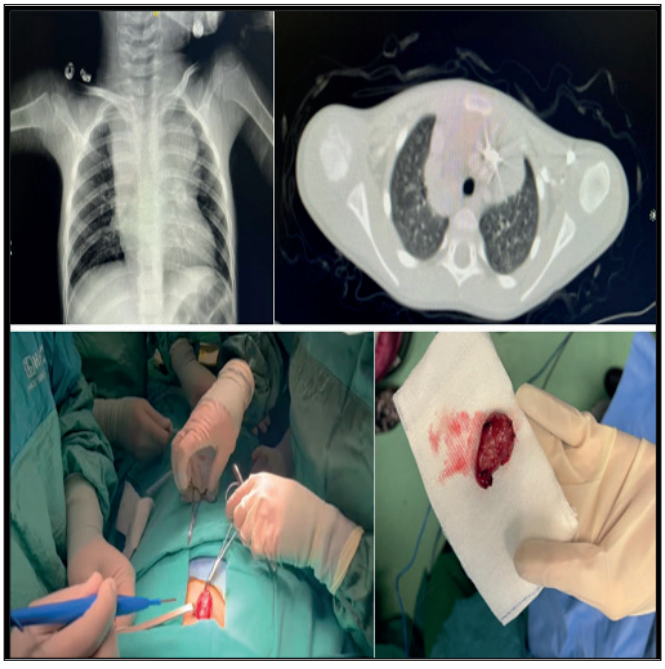


Figure 1. Above, Chest X-ray and CT scan showing the mediastinal masses; below, the lymph node excised

OP-70 (Pediatric Anesthesia)
Full Manuscript

Anesthesia Management of a Child Who is Scheduled for Biopsy From a Suspected Mass of Thymic Hyperplasia

Murat Izgi, Rabia Aliosmanoglu, Simge Cefer Ibodirik, Filiz Uzumcugil

Hacettepe University, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Half of the mediastinal masses occur in the anterior compartment and may present with symptoms regarding compression on intrathoracic structures, type B symptoms or paraneoplastic syndrome, as well as, a mediastinal enlargement on chest X-ray. We aimed to report the anesthetic management of a pediatric patient undergoing tru-cut biopsy.

Case: A 15-month-old, 8600 gr male with a preliminary diagnosis of thymic hyperplasia was scheduled for tru-cut biopsy. On computed tomography (CT), the mass was in the thymus locus, surrounding the vascular structures and compressing the trachea above carina. Immediately before the procedure, superior vena cava (SVC) syndrome developed and CT revealed a narrowed trachea with progression in the mass. Gradually increasing respiratory distress and oxygen demand within a week prior to operation, worsened the day of the procedure. Respiratory rate was 36 breaths/min and since sedation was not appropriate due to tracheal compression, his agitation on arrival to the operating room caused a decrease in the SpO2 to 70%. In order to provide airway patency, midazolam and ketamine was used to decrease the agitation and anxiety while maintaining spontaneous ventilation. Balloon-mask ventilation was used successfully to support ventilation. In the presence of sugammadex at hand, rocuronium was used for tracheal intubation. A 4.0 mm ID ETT was not suitable for subglottic area, that a 3.5 mm ID ETT was placed. Due to the SVC syndrome, the vascular access on the upper extremity was replaced with femoral venous access. The femoral artery was used for real-time hemodynamic monitoring, as well. Left 4th intercostal space was used for biopsy without any complication. The patient was transferred to PICU intubated.

Discussion: Anterior mediastinal masses constitute major risk for cardiovascular compromise during anesthetic management with a high incidence of death due to airway collapse on induction. Biopsy of deep tissues for mediastinal masses require general anesthesia. Maintenance of airway patency and preserving spontaneous ventilation during use of hypnotic agents, whereas, a fast and safe endotracheal intubation achieved with the use of rapid-onset, short-acting and rapidly reversable NMBA should be considered crucial in the presence of an experienced and adequately prepared team, as recommended.

Keywords: Difficult airway, difficult intubation, pediatric anesthesia

INTRODUCTION

The mediastinum is an anatomical space in the thoracic cavity, and contains the heart, great vessels, lymph nodes, and nerve structures. Half of mediastinal masses occur in the anterior compartment (1). Patients may have symptoms of compression on intrathoracic structures, type B symptoms, signs of paraneoplastic syndrome or they may present with mediastinal enlargement on chest X-ray (2).

CASE

A procedure was planned in the operating room for a 15-month-old male patient, weighing 8600 g, to take a tru-cut biopsy from the mass defined in the anterior mediastinum In the physical examination, it was observed that there were significant intercostal, suprasternal and subcostal retractions. Significant wheezing was detected on bilateral auscultation. According to the computed torax tomography, a mass was observed in the anterior mediastinum in the thymus locus, surrounding the vascular structures all around, extending to the retrocaval area, and pressing on the trachea proximal to the carina. The patient, who was monitored in the room air during his admission to the hospital, had increased respiratory distress and oxygen need within 1 week, but responded to the adrenaline nebule application. In the CT images obtained before the procedure, it was determined that the mass causing the symptoms of superior vena cava syndrome narrowed the trachea with an anterior-posterior diameter of 3 mm at its narrowest point in the proximal carina, and progressed compared to previous CT images. It was decided to perform the procedure, by the Department of Interventional Radiology, in the central operating room due to respiratory distress and priori complications of the anesthesia management. On the day of procedure, respiratory distress occured, respiratory rate (respiratory rate 36/min) and oxygen demand increased, responded to adrenaline nebule. The patient was not sedated because of the mass pressing on the trachea in the anterior mediastinum, but when he was taken to the operating room, it was observed that she could not maintain her spontaneous ventilation during the increasing agitation and crying process, and SpO2 decreased to 70%. In these circumstances, it was decided to use anesthetic drugs with rapid onset of

action, short duration of action and reversible effect, although anesthesia induction cannot be performed by inhalation. Difficult intubation preparation was made due to upper airway edema due to the presence of superior vena cava syndrome, however, normal and spiral endotracheal tubes with an outer diameter of ≥3 mm were prepared due to the mass causing stenosis in the proximal carina. Midazolam and fentanyl were administered to the patient, along with the administration of 100% oxygen with a face mask. During spontaneous ventilation, the effectiveness of mask application was confirmed, sugammadex was available, and muscle relaxation was achieved with rocuronium. Intubation was attempted by a senior anesthesiologist using a 4.0 mm cuffless endotracheal tube (ETT) with videolaryngoscope, and intubation was provided with a 3.5 ETT, since the tube could not be advanced in the subglottic region. Sevoflurane was used in an oxygen-air mixture for maintenance of anesthesia. Since the patient also had superior vena cava syndrome, femoral artery and vein catheterization was performed and the femoral artery was monitored. In the patient's arterial blood gas analysis, pH:7.26 pCO2:36.4 HCO3:16.8 was detected. Intraoperative vital signs remained stable. A tru-cut biopsy was taken through left midclavicular line, from the 4th intercostal space under USG guidance. The patient, who did not develop any complications, was transferred to the pediatric intensive care unit intubated after biopsy. Prednisolone, vincristine and daunourabicin treatments were started in the patient, whose biopsy result was reported as precursor T-Acute lymphoblastic leukemia. On the chest X-ray taken on the 5th day of intensive care hospitalization, the volume mass decreased.

DISCUSSION

Patients diagnosed with an anterior mediastinal mass are at risk for serious complications ranging from temporary and mild suppression to collapse in the cardiorespiratory system during general anesthesia due to the anatomical proximity of this mass to the main vascular structures, heart and airway. Therefore, the severity of preoperative symptoms and pressure on cardiovascular structures should be carefully evaluated with detailed imaging methods in the preoperative period. Especially, hematological malignancies are very common in children and they have a rapid growth feature (3). The patient's stridor may be a warning finding in terms of possible anesthesia complications. The degree of sedation or anesthesia required for the patient should be decided depending on the surgical procedure and the patient, and one should be prepared for all possible complications (2). Contrary to adults, the most common cause of death in children with anterior mediastinal masses is closure of the airway during induction (2). Therefore, it was emphasized that general anesthesia should be avoided if possible and superficial tissue biopsy should be performed under sedation in cooperative children, and the importance of maintaining spontaneous ventilation throughout the procedure was emphasized. Because positive pressure ventilation increases intrathoracic pressure, vessels already narrowed by the tumor mass cause further reduction of pulmonary blood flow and acute right heart failure may occur. Increased right ventricular end-diastolic volume decreases left ventricular filling and cardiac index decreases. Agents such as dexmedetomidine and ketamine are less likely to cause respiratory depression and have been used successfully in the past (4). Procedures such as mediastinoscopy, video-assisted thoracoscopy, thoracotomy, sternotomy, or biopsy of deep tissue regions far from the mediastinal mass require general anesthesia (5). In our patient, difficult intubation preparation was made before the procedure because of the increased respiratory distress and oxygen demand. However, general anesthesia was planned for the patient because the patient was old enough to be uncooperative, spontaneous breathing could not be preserved with crying, and the depth of biopsy during the procedure could not be predicted. A fast and safe endotracheal intubation was also achieved in our patient with the use of a muscle relaxant whose effect can be rapidly reversed with the rapid-onset, short-acting anesthetics recommended for such conditions (5). Interventions for anterior mediastinal masses require an anesthetic approach planned with a special and multidisciplinary preparation due to the vital anatomical structures that these masses are close to. Although the most recommended approach for the anesthesia approach is to preserve spontaneous breathing, it should not be forgotten that the type of intervention and the approach of the team that will perform the intervention should also be considered during the application of anesthesia, therefore the importance of the multidisciplinary approach should be taken into account.

REFERENCES

1. Almeida PT., Heller D. Anterior Mediastinal Mass, StatPearls Publishing, Treasure Island 2019 PMID:31536215
2. Chutei A., Zestos M. Anesthetic Considerations In A Child With Malignant Thymoma Invading The Superior Vena Cava
3. Hack HA, Wright NB, Wynn RF. The anaesthetic management of children with anterior mediastinal masses. Anaesthesia 2008; 63: 837–846
4. Mahmoud M,Tyler T, Sadhasivam S. Dexmedetomidine and ketamine for large anterior mediastinal mass biopsy. Pediatric Aneshtesia 2008; 10: 1011-1013
5. Tan A.,Nolan J. A. Anesthesia for children with anterior mediastinal masses. Pediatric Anesthesia 2022; 32: 4-9

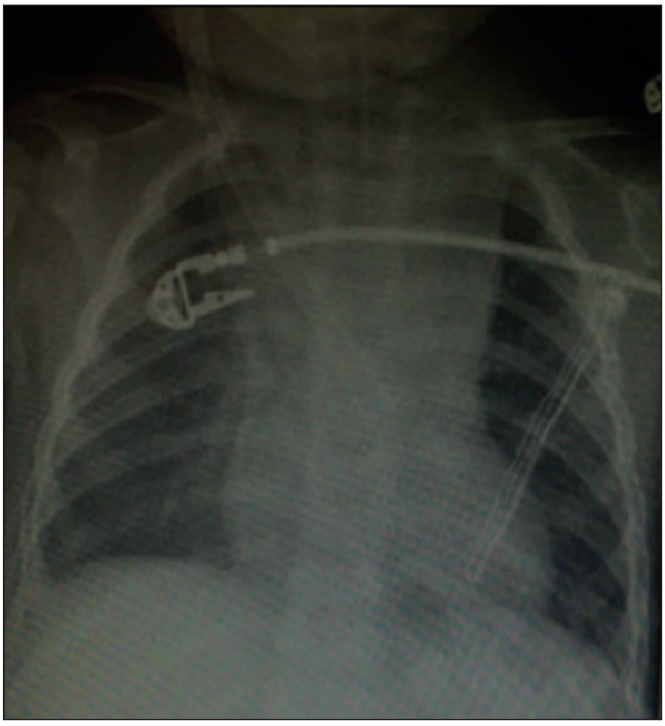


Figure 1. Chest X-ra image shows expented anteior mediastinum

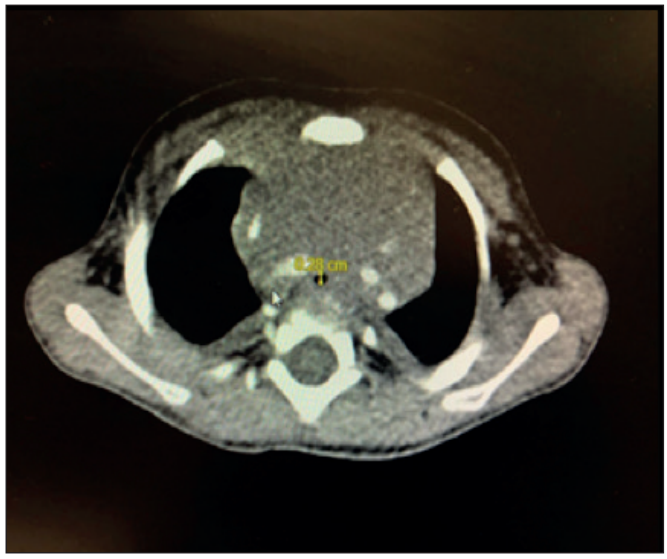


Figure 2. Computed Tomography of the patient, CT scan shows the narrowest part of the trachea

Our Pediatric Anesthesia and Analgesia Practice After Two Following Devastating Earthquakes in Turkey

Asli Ayaz, Serkan Solak, Ahmet Murat Gül, Hisar Can Kutan, Gülsen Keskin, Aslı Dönmez

University of Health Sciences Ankara Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: In 2023, due to two earthquakes with high destructive power, over 46000 people died and a very high number of injured people admitted to the hospitals in Türkiye. Especially child victims were mostly transferred to our hospital from the disaster regions.Thus hours after the two earthquakes, we performed anesthesia.

The purpose of this study is to represent our anesthetic and analgesic managements of children victims of the earthquake aged between 10 days- and 18- years old children who underwent several consecutive surgeries.

Material and Method: This current study was analyzed retrospectively using the medical data of all pediatric patients operated in the pediatric anesthesia department's operating rooms of our hospital. Demographic data, surgical procedures, anesthesia and analgesia methods, consecutive surgical practices, intensive care needs, presence of crush syndrome and acute renal failure, applied hemodialysis, mortality and morbidity of pediatric patients were reviewed.

Results and Discussion: It was determined that a total of 216 surgical procedures were performed in 78 children. Anesthesia and clinical follow-ups of a total of 78 pediatric patients who were operated in our hospital due to two earthquakes were analyzed. Surgeries of the children started on the 2nd day of the earthquakes and continued until the first month with gradually decreasing number. The most commonly performed surgeries are orthopedic surgeries such as fasciotomy for compartment syndrome, multiple fractures and limb amputations at different levels. In this process, patients who were included in the hemodialysis program also underwent consecutive surgical procedures. Demographical data, operations performed, analgesic managements, laboratory results and presence of crush syndrome are shown in the table.

Conclusion: In such massive disasters, anesthesia and analgesia practices are challenging especially in children, who are the most affected group. It would be appropriate to follow-up and treat these children who need repetitive surgery and anesthesia in fully equipped and multidisciplinary hospitals as soon as possible.

Keywords: Anesthesia, analgesia, earthquake, pediatric

Table 1. Descriptive Table of Pediatric Earthquake Victims

	Total, n (%)	Male, n (%)	Female, n (%)
Total admissions	78 (100)	48 (61.5)	30 (38.5)
Age group (years)			
0-2	5 (6.4)	2 (4.1)	3 (10.0)
2-5	11 (14.1)	9 (18.79	2 (6.6)
5-10	23 (29.4)	10 (20.8)	13 (43.3)
10-15	26 (33.39	12 (25.0)	14 (46.6)
15-18	12 (15.3)	9 (18.7)	3 (10.0)
Location of injury			
Head and neck	5 (6.4)	3 (6.2)	2 (6.6)
Upper limb	28 (35.8)	16 (33.3)	12 (40.0)
Lower limb	42 (53.8)	22 (45.8)	20 (66.6)
Trunk	3 (3.8)	1 (2.0)	2 (6.6)
Primary surgery			
Orthopedic	65 (83.3)	37 (77.0)	28 (93.3)
Plastic	4 (5.1)	2 (4.1)	2 (6.6)
Neurosurgery	6 (7.6)	2 (4.1)	4 (13.3)
Other	3 (3.8)	2 (4.1)	1 (3.3)
Amputation	16 (20.5)	11 (22.9)	5 (16.6)
Hemodialysis	28 (35.8)	18 (37.5)	10 (33.3)
Crush syndrome	24 (30.7)	20 (41.6)	4 (13.3)
Analgesia	78 (100.0)	48 (100.0)	30 (100.0)

Our Anesthesia Experience in Very Low Birth Weight Prematures with Necrotizing Enterocolitis Perforation

Ahmet Murat Gül, Gülsen Keskin

University of Health Sciences Ankara Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Necrotizing enterocolitis (NEC) is a serious, life-threatening pathology seen especially in the neonatal period. It is characterized by inflammation of the intestinal mucosa and ischemic necrosis. When it progresses, intestinal perforation can lead to peritonitis, sepsis, and even to death (50%). We present our anesthesia practices in 5 premature patients with very low birth weight (VLBW) (<=1500 g) who underwent surgery for intestinal perforation after NEC.

Case report: All patients were ASA V E and in need of invasive respiratory support with cardiac and respiratory co-morbidities. The demographic and peroperative data of the patients are shown in the table. Gas distention and dilated bowel loops were observed in the abdomen on radiological imaging. Transfers to the operating room were provided in a heated incubator with a transport ventilator and monitor. Inotropic support was continued during transport. The operating room and operating table were preheated. ECG, SpO2, non-invasive blood pressure and body temperature monitoring was achieved. Inotropic support was continued. Fluid management was provided with 3.33% dextrose-0.3% sodium chloride. Four extremities and head circumferences were wrapped with cotton to reduce heat loss. Since the patients were hemodynamically labile, ketamine was generally preferred for anesthesia induction and maintenance. Pressure-controlled mechanical ventilation was administered with neonatal breathing circuits. No patient needed muscle relaxants. After surgery, all patients were successfully transferred to the intensive care unit.

Discussion: Many factors may be responsible for the etiology of NEC, but the strongest risk factor is prematurity. The morbidity and mortality rates are higher in patients requiring surgical intervention. Interventions to prevent NEC development are the most effective way to avoid negative consequences. Preventive interventions should start from the maternal period and include the intensive care hospitalization and the arrival to the operating room. The transfers of VLBW prematures between the intensive care and the operating room, operating room preparation and anesthesia applications require more caution.

Conclusion: Detailed and careful preparation, communication between teams and a multidisciplinary approach are required to achieve success in these babies with high mortality and morbidity rates.

Keywords: Anesthesia, necrotizing enterocolitis, premature

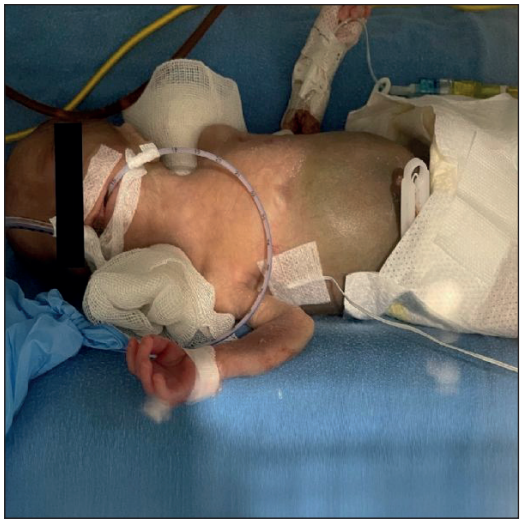


Figure 1. Preoperative period

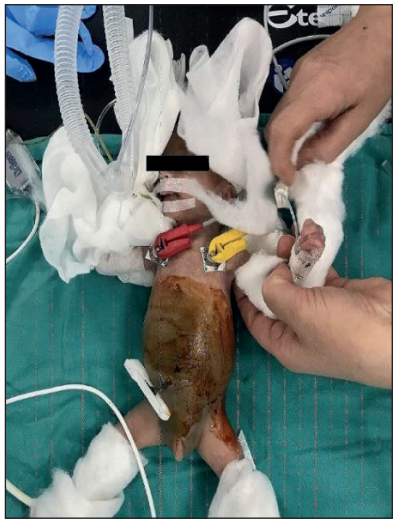


Figure 2. Preoperative period

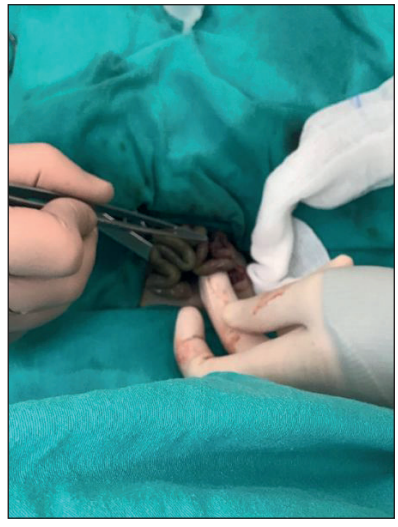


Figure 3. Intraoperative period

Table 1. Demographic and Peroperative Data of the Patients

Patient no	1	2	3	4	5
Postnatal surgery day	17th day	5th day	21st day	25th day	11st day
Gestational week	31	29	27	27	26
Body weight (gram)	1337	1500	925	940	780
Cardiac disease	PFO	ASD	PFO	ASD	PFO
Respiratory disease	RDS	RDS	RDS	RDS	RDS
Anesthesia duration (min)	140	130	105	110	120
Surgery duration (min)	120	110	75	90	90
Transfusion need	Ø	Ø	RBC + PLT	RBC + PLT	Ø
Preop Hemoglobin (g/dl)/ Hct (%)	13.5/40.5	13.2/40	10.3/31.5	11/32	12/36
Preop Platelet (10^3/ml)	124	217	31	95	106
Blood glucose (g/dl)	125	59	79	130	78
Preop Na++/K+ (mEq/L)	136/4.4	135/4.6	141/3	134/2.9	134/5.5
Preop creatinine (mg/dL)	0.2	0.4	0.3	1.3	0.5
Benzodiazepine (mg)	0.2	0.2	Ø	Ø	Ø
Propofol (mg)	5	2	Ø	Ø	Ø
Ketamin (mg)	1	Ø	2	2	0.5
Inhalation agent	Sevofluran	Sevofluran	Sevofluran	Ø	Sevofluran
Inotrops	Dopamine	Ø	Dopamine	Dopamine+Dobutamine	Dopamine
Maintenance fluid rate (ml/h)	10	10	5	10	10
Post-op mortality	Ø	Ø	On15th day	Ø	Ø

PFO: Patent foramen ovale, ASD: Atrial septal defect, RDS: Respiratory distress syndrome RBC:Red Blood Cell PLT: Platelet

Technical Difficulties in Two Pediatric Cases who Underwent Right and Left One-Lung Ventilation With Fogarty Catheter

Sengül Özmert, Mustafa Atak, Tuğba Nur Taygurt

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Single-lung ventilation is performed in order to provide optimal surgical exposure by causing collapse of the operative lung and minimize the risk for contamination of the nonoperative lung with blood and infected material from the surgical site.This report aims to present the difficulties, applications and results of right and left lung blockers placed in two children who were planned to have one lung ventilation for the videothoracoscopy procedure.

Case: Two pediatric patients, one of whom developed empyema in the right, the other in the left lung after bronchopneumonia were planned for videothoracoscopy.The patients were evaluated preoperatively,written consent was obtained from families. Standard monitoring, general anesthesia induction and endotracheal intubation was performed. In the first case in which we blocked the right lung we failed because the bronchial blocker was broken. In order to reduce dead space and prevent the blocker from breaking, we cut the endotracheal tube and insert a 4Fr Fogarty embolectomy catheter using the multiport spacer of the bronchial blocker(Figure1/2). In the second case in which the left lung was to be blocked we also used a 4 Fr Fogarty embolectomy catheter.Due to the anatomical difficulty in guiding the catheter to the left, we were able to place the catheter by turning the patient's head to the right lateral and deviating the trachea manually to the left. For both cases we inflated the Fogarty catheter balloon with 1.5ml of air(Picture3) and used fiberoptic guidance to confirm its position.While advancing the fiberoptic by applying lubricating gel we fixed the occlusion caused by the patient's teeth by using an airway. Although we did not encountered symptoms of hypoxia in the first case, the smaller ETT and more severe empyema in the second case caused lowO_2 saturation and high $ETCO_2$. In both cases the passive lung was deflated by using an aspirator probe. The patients were in the lateral decubitis position with the passive lung on top. Data on patients, anesthesia and surgery are in Table 1.

Conclusion: We suggest that, if there is no available adequate equipment, this method can be effectively used as an alternative for one-lung ventilation in children.

Keywords: Anesthesia, fogarty embolectomy catheter, one-lung ventilation, pediatrics

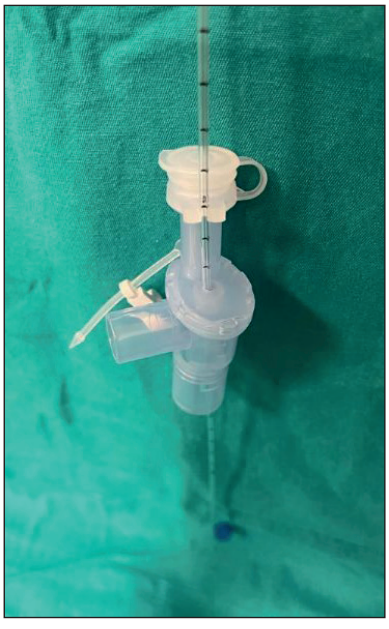


Figure 1. Multiport spacer

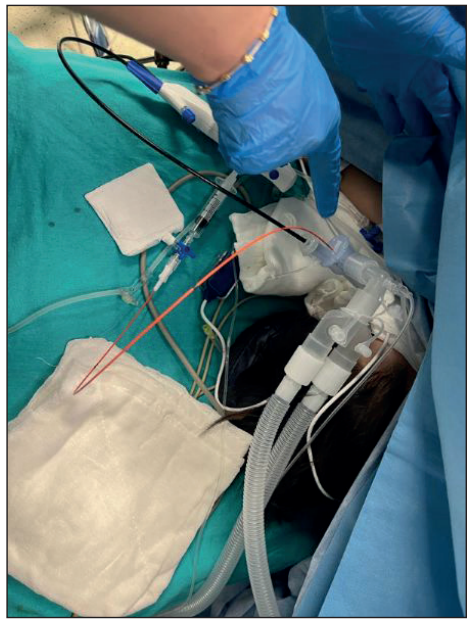


Figure 2. 4Fr Fogarty embolectomy catheter and multiport spacer of the bronchial blocker

Figure 3. Inflated Fogarty catheter balloon with 1.5 ml of air

Table 1. Data of Patients, Anesthesia and Surgery

	CASE 1	CASE 2
Complaint	Respiratory Distress, Fever, Cough	Respiratory Distress, Fever, Cough
Gender	Male	Male
Age	2 year 7 month	2 year 7 month
Weight	13 kg	13 kg
Preoperative-Postoperative Hb	11.1-10.3 mg/dl	9.8-6.9 mg/dl
Additional İllness	-	-
Surgery	Vats (Debridement/Postpneumonia)	Vats (Debridement/Postpneumonıa)
Endotracheal Tube Size	5,5mm cuffless endotracheal tube	5mm cuffless endotracheal tube
Patient Position	Left Lateral Dekubitus	Right Lateral Dekubitus
Induction	10 mg LIDOCAINE IV, 10 mcg FENTANYL IV, 30 mg PROPOFOL IV, 10 mg ROCURONIUM IV	12 mg LIDOCAINE IV, 15 mcg FENTANYL IV, 50 mg PROPOFOL IV, 10 mg ROCURONIUM IV
Anesthesia Maintenance	%50-50 O_2-Air, %2-3 Sevoflurane, Remifentanil inf. (0.1 mcg/kg/min)	%50-80 O_2-%20-50 Air,%2-3 Sevoflurane, Remifentanil inf. (0.1 mcg/kg/min)
FiO_2	50	50-80
Tidal Volume	7 ml/kg	7 ml/kg
Frequency	18	25-40
İ/E Rate	1/2	1/2
Saturation	94-98	MİNİMUM SpO_2:78, AVERAGE SpO_2:90-98
Postoperative Analgesia	150 mg Paracetamol, 1.5 mg Morphine	200 mg Paracetamol, 1.5 mg Morphine
Icu	-	1 DAY(CPAP+)
Chest Tube	Right Chest Tube +	Removed Preoperatively(Left)
Case Time	2.5 hour	2 hour
Single Lung Ventilation Time	60 min.	70 min.

OP-74 (Pediatric Anesthesia)
Full Manuscript

Catalase Activity During Total Intravenous Propofol Anesthesia in Children - Influence Of Ugt1a9, Cyp2b6 And Cyp2c9 Gene Polymorphisms

Ivana Budic[1], Vesna Marjanovic[1], Ivana Mitic[2], Jelena Lilic[2], Marija Stevic[3], Emil Bosinci[4], Dusica Simic[3]

[1] University of Nis, Faculty of Medicine, Department of Surgery and Anesthesiology, Serbia
[2] University Clinical Center Nis, Clinic for Anesthesiology and Intensive Therapy, Serbia
[3] University of Belgrade, Faculty of Medicine, Department of Surgery and Anesthesiology, Serbia
[4]University Children's Hospital, Belgrade, Serbia

ABSTRACT

Background: Propofol can inhibit lipid peroxidation in various experimental models in order to protect the cell against oxidative stress and increase the antioxidant capacity of plasma. The aim of this study was to determine the influence of gene polymorphisms CYP2C9 430C> T, CYP2B6 516G> T and UGT1A9 98T> C on the catalase activity in ninety children of different sexes and ages undergoing total intravenous anesthesia.

Material and Method: Anesthesia was induced by a bolus dose of propofol from 2.5 to 3.5 mg/kg body weight, after which it was maintained by continuous infusion of propofol via an infusion syringe pump (3 - 15 mg/kg/h). Five blood samples were taken from each patient included in the study: before propofol administration to determine the presence of gene mutations in propofol degrading enzymes, 10 minutes after induction of anesthesia, immediately before the end of the propofol infusion, and 10 and 20 minutes after the end of the infusion. HPLC analytical technique was used to measure plasma propofol concentration. Genomic DNA was isolated from whole blood using the commercial QIAamp DNA Blood Mini kit. The presence of polymorphisms was analyzed using polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP). Plasma catalase (CAT) activity was determined by spectrophotometric method.

Results: The highest CAT values were measured immediately before the exclusion of continuous infusion of propofol, when there was a significant increase in activity relative to first sample ($p < 0.01$), followed by a gradual decrease in concentration in each subsequent sample (Table 1). Compared to the examined polymorphisms, lower activity of CAT ten minutes after induction of anesthesia was found in carriers of GG genotype for CYP2B6 (Table 2), compared to the group of patients with GT and TT genotype ($p < 0.05$).

Discussion: The influence of gene polymorphisms on the expression of antioxidant activity of propofol requires further research.

Keywords: Propofol, catalase, gene polymorphisms

INTRODUCTION

Propofol (2,6-diisopropylphenol) is the first representative of intravenous anesthetic agents from the group of alkylphenols. It is characterized by a phenolic structure that is identical to the structure of α-tocopherol and has antioxidant properties that have been proven in vitro and in vivo (1-3). Propofol can inhibit lipid peroxidation in various experimental models (4,5) in order to protect cells against oxidative stress and increase the antioxidant capacity of plasma (6). Alternatively, polyphenols can increase the capacity of endogenous antioxidant defenses and modulate the cellular redox state. Changes in the cellular redox state, during the transmission of physiological stimuli through the regulation of signaling pathways, can have a wide range of consequences for cellular development and differentiation (7). In addition to the above, polyphenols have been reliably documented to modulate protein kinase activity (8), serve as ligands for transcription factors (9), and modulate protease activities (10). Propofol is mainly metabolized by hepatic and extrahepatic cytochromes P450 2B6 (CYP2B6) and cytochromes P450 2C9 (CYP2C9) (11), as well as by UDP-glucuronosulfotransferase 1A9 (UGT1A9). UDP-glucuronosulfotransferase 1A9 (UGT1A9) catalyzes the formation of propofol glucuronide (12). Cytochrome P450 enzymes (CYP2B6 and CYP2C9) are responsible for the formation of the hydroxyl derivative of propofol - 4-hydroxypropofol, which can be further transformed into 4-hydroxypropofol-1-O-b-D-glucuronide (Q1G) and 4-hydroxypropofol-4-O-b-D-3 glucuronide (Q4G) (13,14). About 70 to 90% of propofol is eliminated in the urine in the form of glucuronide metabolites (12,13).

The role of catalase (CAT) in adaptation to oxidative stress is insufficiently elucidated compared to the role of low molecular weight antioxidants (15,16). This phenomenon could be explained by adaptation specificity, depending on the type of tissue, which is probably related to the function and character of tissue metabolism.

The aim of this study was to determine the influence of gene polymorphisms CYP2C9 430C> T, CYP2B6 516G> T and UGT1A9 98T> C on the catalase activity in ninety children of different sexes and ages undergoing total intravenous anesthesia.

MATERIAL and METHODS

The research was carried out in the Laboratory for Functional Genomics and Proteomics of the Scientific Research Center for Biomedicine, Faculty of Medicine, University of Niš. The material used for the research was collected at the Anesthesia and Resuscitation Department of the Anesthesia and Resuscitation Clinic at the Children's Surgery and Orthopedics Clinic of the Clinical Center in Niš and at the University Children's Clinic, Faculty of Medicine, University of Belgrade. As the patients were children, their parents were previously informed about the objectives of the research and gave their consent for the use of the collected material and data by signing the informed consent. The entire study was approved by the Ethics Committee of the Faculty of Medicine in Nis no. 12-8765/9 as well as by the Ethics Committee of the University Children's Clinic in Belgrade no. 26/340 and Ethics Committee of the Clinical Center in Niš no. 27771/11. The clinical study was conducted in accordance with the ethical principles of Good Clinical and Laboratory Practice and the Declaration of Helsinki (17,18).

Anesthesia was induced by a bolus dose of propofol from 2.5 to 3.5 mg/kg body weight, after which it was maintained by continuous infusion of propofol via an infusion syringe pump (3 - 15 mg/kg/h). For analgesia, fentanyl was used in a dose of 1 - 2 mcg/kg during induction of anesthesia, and as needed it was added in a dose of 0.5 to 1 mcg/kg. Muscle relaxation was provided by rocuronium bromide in a bolus dose of 0.6 - 1 mg/kg, after which 0.2 - 0.3 mg/kg was added every 20 minutes during the operation. Atropine 0.02 mg/kg and prostigmine 0.05 mg/kg were administered to reverse the neuromuscular block. Patients were ventilated with oxygen and air (35:65%; 50:50%) or oxygen and nitrous oxide (35:65%). Vital parameters were monitored during anesthesia (systolic and diastolic pressure, heart rate, hemoglobin oxygen saturation, partial pressure of carbon dioxide at the end of expiration) and in individual patients monitoring of the depth of sedation and anesthesia by analyzing the bispectral index (BIS) value.

Five blood samples were taken from each patient included in the study: before propofol administration to determine the presence of gene mutations in propofol degrading enzymes, 10 minutes after induction of anesthesia, immediately before the end of the propofol infusion, and 10and 20 minutes after the end of the infusion. HPLC analytical technique was used to measure plasma propofol concentration (11,19). Genomic DNA was isolated from whole blood using the commercial QIAamp DNA Blood Mini kit. The presence of polymorphisms was analyzed using polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP). Catalase activity in plasma was determined by the spectrophotometric method according to Goth (20), which is based on the ability of catalase to decompose the substrate (H2O2), whereby the enzymatic reaction is stopped by the addition of ammonium molybdate, and the resulting yellow complex of H2O2 and molybdate is measured at 405 nm according to the blank give it a try. Enzyme activity is expressed in catalytic units per liter of serum (kU/L).

RESULTS

The research included a total of 94 children aged 1 to 17 years (average age 9.13±5.32 years), of which 53 were male (56.4%), and 41 were female (43.6%). The largest number of patients had normal nutrition (47.9%). 33 (35.1%) had anatomical malformations, and 20 (21.3%) had comorbidities, the most common of which were respiratory tract diseases (45.0%) and epilepsy (30.0%). The most common type of intervention was in the field of plastic surgery (54.3%). The average duration of anesthesia was 58 minutes. The average total dose of propofol was 278 mg, the initial dose was 85 mg, and the maintenance dose was 160 mg.

The highest CAT values were measured immediately before turning off the continuous infusion of propofol, when there was a significant increase in concentration compared to the 1st sample ($p<0.01$), and then there was a gradual decrease in concentration in each subsequent sample, with the values were similar to the concentration in the 1st sample (**Table 1**).

By multivariate linear regression analysis of CAT1 (CAT measured ten minutes after induction of anesthesia) predictors, in a model with two independent variables ($F=7.926$, $p<0.001$) which explains 13.0% of CAT1 variance, in our study independent predictors of higher CAT1 values are male gender ($p<0.01$) and polymorphic GT and TT CYP2B6 genotype ($p<0.01$) (**Table 2**).

DISCUSSION

Free oxygen radicals (reactive oxygen species - ROS) such as superoxide anion (O2•), hydrogen peroxide (H2O2), hydroxyl radical (OH•) as well as reactive nitrogen oxide species (RNOS) are involved in the formation tissue damage. All these molecules have an unpaired electron in the last electron orbital. This characteristic makes them aggressive and highly reactive towards different cellular components. The massive production of ROS soon exceeds the capacity of cellular defence systems (catalase, superoxide dismutase, glutathione peroxidase, and vitamins C and E) and thus brings the cell into a state of oxidative stress. NADPH oxidase, xanthine oxidase, termination of the respiratory chain and activation of the arachidonic acid cascade are the

main sources of ROS (21-23). Most of the in vitro and in vivo studies conducted so far have confirmed the protective effects of bioactive polyphenols, explaining this property by their chemical reaction with free radicals and the ability to prevent the oxidation of important intracellular components (24,25). Another significant property of propofol is its antiapoptotic effect (26). Since surgical intervention intensifies oxidative stress by creating ROS but also by weakening biological defense systems according to their effect, it is of great importance to determine the antioxidant activity of drugs used in the perioperative period. Application of an adequate combination of drugs could normalize the weakened redox status of the patient, which would have clinical significance (27). Aarts et al. (28) demonstrated that plasma concentrations of propofol, which can lead to inhibition of lipid peroxidation, are in the range of 3-5 µgml-1, which is the range of clinically achievable concentrations. On the other hand, other authors believe that only higher concentrations of propofol can show scavenger activity (29). The results of our research confirmed that propofol has a significant antioxidant activity in the tested concentrations that are in the range of concentrations that are achieved in the plasma of patients.

The role of catalase (CAT) in adaptation to oxidative stress is insufficiently elucidated compared to the role of low molecular weight antioxidants (30,31). This phenomenon could be explained by adaptation specificity, depending on the type of tissue, which is probably related to the function and character of tissue metabolism. It is also possible that changes in CAT activity are due to post-translational modification of the enzyme. CAT is a dual function enzyme; catalyses the decomposition of hydrogen peroxide (H2O2) with the formation of water and oxygen (catalytic activity) or oxidizes H donors (peroxidase activity). Under normal conditions, ratio of these functions is 30:70. Therefore, another mechanism of alteration of enzyme specific activity after exposure to oxidative stress would be a change in the ratio of these two reactions (32). Al-Abrash et al. (33) observed an increase in catalase activity in all examined patients in whom oxidative stress was established (cardiovascular diseases, diabetes, tumor processes, inflammation, dermatological diseases, anemia and Wilson's disease). Compared to the examined polymorphisms, lower activity of CAT ten minutes after induction of anesthesia was found in carriers of GG genotype for CYP2B6, compared to the group of patients with GT and TT genotype ($p < 0.01$).

CONCLUSION

There is a small number of papers related to the examination of gene polymorphisms of enzymes involved in the metabolism of anesthetics in children. The highest CAT values were measured immediately before the exclusion of continuous infusion of propofol, when there was a significant increase in activity relative to first sample. Lower activity of CAT ten minutes after induction of anesthesia was found only in carriers of GG genotype for CYP2B6, compared to the group of patients with GT and TT genotype. No association was observed between the other investigated polymorphisms of enzymes involved in propofol metabolism and CAT activity. The influence of gene polymorphisms on the expression of antioxidant activity of propofol requires further research.

REFERENCES

1. Erbas M, Demiraran Y, Yildirim HA, Sezen G, Iskender A, Karagoz I, et al. Comparison of effects on the oxidant/antioxidant system of sevoflurane, desflurane and propofol infusion during general anesthesia. Rev Bras Anestesiol. 2015;65(1):68-72.
2. Zhong H, Song R, Pang Q, Liu Y, Zhuang J, Chen Y, et al. Propofol inhibits parthanatos via ROS-ER-calcium-mitochondria signal pathway in vivo and vitro. Cell Death Dis. 2018; 9(10):932.
3. Ulbrich F, Eisert L, Buerkle H, Goebel U, Schallner N. Propofol, but not ketamine or midazolam, exerts neuroprotection after ischaemic injury by inhibition of Toll-like receptor 4 and nuclear factor kappa-light-chain-enhancer of activated B-cell signalling: A combined in vitro and animal study. Eur J Anaesthesiol. 2016; 33(9):670-80.
4. Wu GJ, Lin YW, Tsai HC, Lee YW, Chen JT, Chen RM. Sepsis-induced liver dysfunction was ameliorated by propofol via suppressing hepatic lipid peroxidation, inflammation, and drug interactions. Life Sci. 2018; 213:279-286.
5. Gan X, Xing D, Su G, Li S, Luo C, Irwin MG, et al. Propofol Attenuates Small Intestinal Ischemia Reperfusion Injury through Inhibiting NADPH Oxidase Mediated Mast Cell Activation. Oxid Med Cell Longev. 2015; 2015:167014.
6. Braz MG, Braz LG, Freire CMM, Lucio LMC, Braz JRC, Tang G, et al. Isoflurane and Propofol Contribute to Increasing the Antioxidant Status of Patients During Minor Elective Surgery: A Randomized Clinical Study. Medicine (Baltimore). 2015; 94(31):e1266.
7. Li Volti G, Murabito P, Attaguile G, Rodella LF, Astuto M, Di Giacomo C, Gullo A. Antioxidant properties of propofol: when oxidative stress sleeps with patients. EXCLI J 2006; 5:25-32.
8. Agarwal R. Cell signaling and regulators of cell cycle as molecular targets for prostate cancer prevention by dietary agents. Biochem Pharmacol 2000; 60:1051-1059.

9. Amakura Y, Tsutsumi T, Nakamura M, Kitagawa H, Fujino J et al. Activation of the aryl hydrocarbon receptor by some vegetable constituents determined using in vitro reporter gene assay. Biol Pharm Bull 2003; 26:532-539.
10. Moon SK, Cho GO, Jung SY, Gal SW, Kwon TK et al. Quercetin exerts multiple inhibitory effects on vascular smooth muscle cells: role of ERK1/2, cell-cycle regulation, and martrix metalloproteinase-9. Biochem Biophys Res Commun 2003; 301:1069-1078.
11. Mikstacki A, Zakerska-Banaszak O, Skrzypczak-Zielinska M, Tamowicz B, Prendeckim, Dorszewska J, et al. The effect of UGT1A9, CYP2B6 and CYP2C9 genes polymorphism on individual differences in propofol pharmacokinetics among Polish patients undergoing general anaesthesia. J Appl Genetics 2017; 58:213-220.
12. Mukai M, Tanaka S, Yamamoto K, Murata M, Okada K, Isobe T, et al. In vitro glucuronidation of propofol in microsomal fractions from human liver, intestine and kidney: tissue distribution and physiological role of UGT1A9. Pharmazie 2014; 69(11):829-832.
13. Court MH, Duan SX, Hesse LM, Venkatakrishnan K, Greenblatt DJ. Cytochrome P-450 2B6 is responsible for interindividual variability of propofol hydroxylation by human liver microsomes. Anesthesiology 2001; 94:110-119.
14. Restrepo JG, Garcia-Martin E, Martinez C, Agundez JA. Polymorphic drug metabolism in anaesthesia. Curr Drug Metab 2009; 10:236-46.
15. Ransy C, Vaz C, Lombès A, Bouillaud F. Use of H_2O_2 to Cause Oxidative Stress, the Catalase Issue. Int J Mol Sci. 2020; 21(23):9149.
16. Ruottinen M, Kaaronen V, Saimanen I, Kuosmanen V, KÄrkkÄinen J, Selander T, et al. The Induction of Antioxidant Catalase Enzyme With Decrease of Plasma Malonidialdehyde: An Important Reactive Oxidative Species Inhibiting Mechanism. Anticancer Res. 2020; 40(10):5701-5706.
17. Mellin-Olsen J, Staender S. The Helsinki Declaration on Patient Safety in Anaesthesiology: the past, present and future. Curr Opin Anaesthesiol 2014; 27(6): 630-634.
18. Robert V, Carlson RV, Kenneth M, Boyd KM, Webb DJ. The revision of the Declaration of Helsinki: past, present and future. Br J Clin Pharmacol 2004; 57(6): 695-713.
19. Moghaddam PT, Pipelzadeh MR, Nesioonpour S, Saki N, Rezaee S. High-Performance Liquid Chromatographic Determination of Propofol in Human Plasma: Comparison of Different Heteroscedastic Calibration Curve Models. Adv Pharm Bull 2014; 4(4), 351-358.
20. Goth L. Serum catalase: reversibly formed charge isoform of erythrocyte catalase. Clin Chem 1991;37 (2):2043-2047.
21. Abramov AY, Scorziello A, Duchen MR. Three distinct mechanisms generate oxygen free radicals in neurons and contribute to cell death during anoxia and reoxygenation. J Neurosci 2007; 27:1129-1138.
22. Kang SM, Lim S, Song H, et el. Allopurinol modulates reactive oxygen species generation and Ca^{2+} overload in ischemia-reperfused heart and hypoxia-reoxygenated cardiomyocytes. Eur J Pharmacol 2006; 535:212-219.
23. Szocs K. Endothelial dysfunction and reactive oxygen species production in ischemia/reperfusion and nitrate tolerance. Gen Physiol Biophys 2004; 23:265-295.
24. Gebicki JM, Nauser T. Fast Antioxidant Reaction of Polyphenols and Their Metabolites. Antioxidants (Basel). 2021; 10(8):1297.
25. Di Meo F, Lemaur V, Cornil J, Lazzaroni R, Duroux JL, Olivier Y, et al. Free radical scavenging by natural polyphenols: atom versus electron transfer. J Phys Chem A. 2013 Mar 14;117(10):2082-92.
26. Chen J, Chen W, Zhu M, Zhu Y, Yin H, Tan Z. Propofol attenuates angiotensin II-induced apoptosis in human coronary artery endothelial cells. Br J Anaesth. 2011; 107(4):525-32.
27. Kang MY, Tsuchiya M, Packer L, Manabe M. In vitro study on antioxidant potential of various drugs used in the perioperative period. Acta Anaesthesiol Scand 1998; 42:4-12.
28. Aarts L, van der Hee R, Dekker I et al. The widely used anesthetic agent propofol can replace alpha-tocopherol as an antioxidant.FEBS Lett 1995; 357:83-85.
29. Green TR, Bennett SR, Nelson VM. Specificity and properties of propofol as an antioxidant free radical scavenger. Toxicol Appl Pharmacol 1994; 129:163-169.
30. Ransy C, Vaz C, Lombès A, Bouillaud F. Use of H_2O_2 to Cause Oxidative Stress, the Catalase Issue. Int J Mol Sci. 2020; 21(23):9149.
31. Ruottinen M, Kaaronen V, Saimanen I, Kuosmanen V, KÄrkkÄinen J, Selander T, et al. The Induction of Antioxidant Catalase Enzyme With Decrease of Plasma Malonidialdehyde: An Important Reactive Oxidative Species Inhibiting Mechanism. Anticancer Res. 2020; 40(10):5701-5706.
32. Latyshko N, Gudkova L, Gudkova O, Mykhailovsky V. Molecular mechanisms of catalase action under cold stress conditions. Annals UMCS Sect DDD 2006; 19(1):159-162.
33. Al-Abrash AS, Al-Quobaili FA, Al-Akhras GN. Catalase evaluation in different human diseases associated with oxidative stress. Saudi Medical Journal 2000; 21(9):826-830.

Table 1. Average Catalase Values

	Time 1	Time 2	Time 3	Time 4
CAT	22.3 (18.9-27.8)	24.83±6.53**	23.63±6.54###	23.36±6.34###,$$$

vs. Time 1: *p<0.05; **p<0.01; ***p<0.001
vs. Time 2: #p<0.05; ##p<0.01; ###p<0.001
vs. Time 3: $p<0.05; $$p<0.01; $$$p<0.001

Table 2. Catalase Values in Relation to the CYP2B6 Polymorphism

	CYP2B6 (GG)	CYP2B6 (GT+TT)	t* ili Z** (p)
CAT1	20.9 (16.1-25.9)	23.4 (19.1-29.5)	**2.052 (0.040)****
CAT2	24.00±6.62	25.22±6.50	0.840 (0.403)*
CAT3	22.93±6.10	23.96±6.76	0.709 (0.480)*
CAT4	22.54±7.28	23.75±5.87	0.859 (0.393)*

*p<0.05; **p<0.01

(YAZAR ONAYI İLE GERİ ÇEKİLMİŞTİR)

Our Anesthesia Experiences in Pediatric Thoracic Surgery Cases

Ahmet Kaya[1], Nurseda Erez[2]

[1]University of Health Science, Mehmet Akif Inan Training and Research Hospital, Departmant of Anesthesiology and Reanimation, Sanliurfa, Türkiye
[2] Sanliurfa Training and Research Hospital, Departmant of Anesthesiology and Reanimation, Sanliurfa, Türkiye

Evaluation of Phantom Sensation in a Child with Traumatic Amputation: A Case Report

Serkan Solak

University of Health Sciences Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Phantom pain is any pain sensation associated with an absent limb. Phantom sensation is any sensation other than pain associated with a non-existing limb1. Phantom sensation can be subdivided into kinetic, kinesthetic and external perceptions2. Although the incidence of phantom sensation or phantom pain in children varies depending on age, it is stated that the incidence is low in children under 2 years of age3. In our case, we aimed to present the phantom sensation seen after traumatic amputation in a 15-month-old patient.

Case: After Pazarcık earthquake, a 15-month-old girl who was removed from the wreckage 36 hours later, underwent a below-knee amputation in the earthquake area. As she had necrotic areas on the stump line in follow-ups, she was referred to our hospital on the 11th day of amputation to evaluate the level of amputation. Consecutive surgeries were performed to debride necrotic tissues on the amputation site. She received hyperbaric oxygen therapy to accelerate wound healing in the meantime.

It was learned from her mother that she was able to walk and run before the incident. Although she scored 0 on her pain evaluation with Face, Legs, Activity, Cry, Consolability (FLACC) score, she urged to move and walk, and pointed to her leg intermittently. As she had no pain and no need for analgesics since the hospitalization and wanted to walk as if she had never had an amputation from the first day, it was thought that the child had phantom sensation.

Conclusion: It is stated that children with congenital limb amputation or exposed to limb amputation at an early age do not have position, movement, and temporal sensations related to their amputated limbs4. However, it has been reported that 20% of children with limb amputation develop phantom sensation5. Although our patient did not describe any pain, she showed symptoms that she could feel the area where his amputated leg was. Since phantom sensation carries the risk of developing phantom pain in the next period, it should be carefully evaluated and necessary precautions should be taken.

Keywords: Phantom limb, amputation, child, sensation

Comparison of Propofol Alone and Midazolam-Propofol Combination in Pediatric ERCP Procedure

Nihal Gokbulut Ozaslan

University of Health Sciences Ankara City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Introduction: There are many publications in the literature about sedation in adult patients during the ERCP procedure. Scientific data on almost all anesthetic agents in these publications presented. However, studies in the pediatric patient group are limited. Our aim is to compare only with propofol or midazolam-propofol combination used in the ERCP procedure in children; in terms of duration of the procedure, its success, hemodynamic efficiency, changes in parameters and complications.

Material and Method: After receiving the ethics committee approval (decision E1-22-2713), in the ERCP unitASA I-III, younger than 18 years of age patients were divided into two groups; Group I (n=30) Midazolam-Propofol; Group II (n=30) only propofol.Demographic datas, duration of anesthesia and ERCP, midazolam and propofol doses, vital signs (mean arterial pressure, O2 saturation, heart rate), Bispectral index value, Ramsey sedation score, complications were evaluated.

Results: 66.7% of the patients were female and 33.3% were male. The mean propofol infusion dose was 106.7 ± 59.3 mg in group I, while it was 135.7±51.1 mg in group II. There was a significant difference between the groups according to the amount of propofol infusion given during the procedure ($p<0.05$).Recovery time was 20.0±9.5 minutes in group I and 25.0±3.4 in group II. Major complication developed in any patient, minor complications were observed in 9 patients in Group I and 8 patients in Group II. There was no significant difference between the two groups in terms of demographics and vital signs. In group comparisons; In terms of OAB values; It was found that there was a statistically significant difference ($p<0.05$) between the beginning and end of the procedure values in Group I patients, and the entry values were higher. In terms of pulse, SpO2 values; It was observed that there was a statistically significant difference between the entry and end-of-procedure values in both Group I and Group II.

Conclusion: It was observed that the addition of midazolam in the ERCP procedure in pediatric patients decreased the dose of propofol and procedural success, patient recovery were also better.

Keywords: ERCP, pediatric, propofol-midazolam

Anesthesia Management and Use of Recombinant Factor VIIa in a Pediatric Patient with Refractory Immune Thrombocytopenia, Scheduled for Emergency Splenectomy

Sengül Özmert, Yusuf Aynıgül, Muhsin Selçuk Yavuz

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Acute immune thrombocytopenic purpura (ITP) in children is a rare disease that usually follows a viral disease. Data about the use of recombinant factor VIIa (rFVIIa) is limited in children. In this case, following written consent obtained from the family, we present the perioperative use of rFVIIa and anesthesia management in a pediatric patient with a diagnosis of refractory ITP that lead to subarachnoid hemorrhage and will now undergo to an emergency splenectomy.

Case: Emergency splenectomy was planned for an 8 kg and 13-month-old girl diagnosed with ITP. She was followed up for sinus vein thrombosis and subarachnoid hemorrhage that developed 2 months ago. Her general condition was moderate, she was conscious and agitated. There were widespread petechiae and ecchymoses. Laboratory values were normal except 5.7 gr/dl hemoglobin and platelet count as 11000. Novosevenâ® (rFVIIa) 90mcg/kg was administered to the patient preoperatively with the suggestion of pediatric haemotology consultation. Following standard monitoring and induction of general anesthesia, she was intubated with a 3.5 cuffed tube size. Arterial and central vascular access was withhold because of the haemotologic condition. Same amount of rFVIIa was given 2 hours after the first dose, just before the surgical incision. Co-morbitiy, medications as well as perioperatively used anesthetic drugs were summurized in Table1. During the eighty minute operation, there was no major bleeding and she was hemodynamicly stable. Intraoperatively, a total of 20 ml/kg 0.9% NaCl, 30 cc platelets and 60 cc erythrocyte suspension were given. She was extubated uneventfully and delivered to the pediatric intensive care unit. Postoperatively she get a diagnosis of SPENCD syndrome with ACP5 mutation positive laboratory test. The patient was started on tofacitinib and discharged 18 days later, with an Hb of 11.3gr/dl and a plt of 457 000. No thrombotic and thromboembolic complications related to the use of rFVIIa was recorded.

Conclusion: In summary, rFVIIa offers a rapid and safe stabilization for children presenting with acute ITP and severe bleeding refractory to standard therapy. Limited data exist for the routine use of rFVIIa in this pediatric patient population. Therefore, this case will contribute to the literature.

Keywords: İmmune thrombocytopenic purpura, pediatrics, recombinant factor VIIa, splenectomy

Table 1. Co-morbitiy, Medications as well as Perioperatively Used Anesthetic Drugs were Summurized

Co-morbidities	Drugs	Anesthesia induction and maintenance and extubation
1) Immunodeficiency 2) Refractory ITP 3) CMV PCR + 4) Sinus vein thrombosis	1) 200 mg sülfametoksazol ve 40 mg trimetoprim (prophylactic Bactrim®) and Intravenous Immunoglobulin (IVIG) 2) Sirolimus and steroid 3) Gansiklovir 4) LMWH stopped 24 hr before operation (Clexan)	Induction: IV 1 µcg/kg fentanyl, IV 0.6mg/kg rocuronyum, IV 3 mg/kg propofol Maintenance: Sevoflurane (MAC 1), %50 O2/%50 Air and IV 0,1- 0,07 µg/kg remifentanil infusion Extubation: IV 2mg/kg sugammadex

(YAZAR ONAYI İLE GERİ ÇEKİLMİŞTİR)

Clinical and Immunological Aspects of Viral Hepatitis “C” in Children

Abzal S. Yusupov., Yakupdjan N. Fayziev

Tashkent Pediatric Medical Institute, Pediatric of Infectious Diseases with Children’s Infectious Diseases, Tashkent, Uzbekistan

(YAZAR ONAYI İLE GERİ ÇEKİLMİŞTİR)

Evaluation of the Effectiveness and Safety of Pain Relief in the Postoperative Period in Children Under Urological Interventions

Otabek. Ya. Fayziev, Elmira. A. Satvaldieva, Anvar. S. Yusupov

Tashkent Pediatric Medical Institute, Department of Pediatric Anesthesiology and Intensive Care, Tashkent, Uzbekistan

Anesthetic Management of a Child with Arthrogryposis Multiplex Congenita

Gizem Avci[1], Fatma Alkan Bayburt[2], Murat Danişman[3]

[1]Dışkapı Education and Research Hospital, Departmant of Anesthesiology and Reanimation, Ankara, Türkiye
[2]Giresun Education and Research Hospital, Departmant of Anesthesiology and Reanimation, Giresun, Türkiye
[3]Giresun Education and Research Hospital, Departmant of Orthopedics and Traumatology, Giresun, Türkiye

ABSTRACT

Background: Arthrogryposis multiplex congenita (AMC) is recognized at birth by multiple and usually symmetric joint abnormalities with muscular and soft tissue hypoplasia. These patients require frequent surgery for joint contractures. It is an important disease for anesthesiologists because limitations in mandibular movements, torticollis, scoliosis that can cause difficulty in intubation and malignant hyperthermia risk . In this report, we aimed to present the anesthetic management of a patient diagnosed AMC who was operated for right hip external rotation contracture and subluxation.

Case: Eight year-old boy patient was diagnosed with AMC at birth and underwent to several extremity surgery in a university hospital. The patient was motor-mentally normal, walking with support and there was no sign for difficult intubation. In the history, the patient required intensive care treatment twice because he had bronchospasm. However, there was no malignant hyperthermia history or any other serious complication. The surgery was estimated to take 3 hours and we planned total intravenous anesthesia (TIVA). Postoperative intensive care unit was arranged. In addition to standard monitorization esophageal temperature was planned. 0.03 mg/kg midazolam was administered for premedication. For anesthesia induction, 2 mcg/kg fentanyl, 1.5 mg/kg propofol and 0.5 mg/kg rocuronium were administered and intubated easily. Anesthesia was maintained with propofol (50 mg/kg/hour) and remifentanil (0.08 mcg/kg/min) infusion. The patient was ventilated with oxygen-air mixture. At the end of the surgery sugammadex (2 mg/kg) was administered and extubated without any complication. He was taken to the recovery unit. Because his follow-up was normal, we transferred him to the ward.

Conclusion: In terms of anesthesia, there is difficulty in intubation, intravenous interventions and risk of malignant hyperthermia. It is thought that there will be no problems in general anesthesia with the knowledge of the effects of the drugs and good preparation for necessary equipment. It is advised that the depth of anesthesia should be monitored by bispectral index (BIS) during general anesthesia with TIVA. Unfortunately, we couldn't use BIS, because we didn't have electrote.

Analgesic Efficacy of Combined Serratus Anterior Plane Block in Acute Pain After Video-Assisted Thoracoscopic Surgery

Emine Nilgün Zengin

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: With video-assisted thoracoscopic surgery (VATS), procedures such as lobectomy, bullectomy, and wedge resection are performed successfully. Although VATS causes less pain than thoracotomy, pain control should be done carefully. Ultrasound-guided serratus anterior plane block (SAPB) is a new method characterized by long block time, wide block range, and low risk of serious procedure-related complications. Local anesthetic solution for SAPB can be given under, over, or both below and above the serratus anterior muscle. Multisite injection of local anesthetic for SAPB may provide more effective analgesia, with a spread in different areas in patients undergoing VATS

Case: The files of 4 patients who underwent VATS and combined SAPB (CSAPB) for postoperative analgesia were reviewed retrospectively for the study. All patients had written informed consent. Deep SAPB (15 mL 0.25% bupivacaine) and superficial SAPB (15 mL 0.25% bupivacaine) were applied to the patients with ultrasound-guided single-needle insertion. Demographic data of the patients, postoperative procedure-related side effects (pneumothorax, hematoma, bleeding, allergy, nausea, vomiting, etc.), postoperative pain levels (visual analog scale: VAS), and additional analgesia used were recorded. The mean age of the patients was 69 years. While 3 patients were female, 1 patient was male. The mean body mass index of the patients was 30.7. All patients were ASA 3. The mean surgical time was 225 minutes. Wedge resection was performed in 3 patients due to nodules, while lobectomy was performed in one patient due to cancer. The mean VAS scores of the patients at the postoperative 1st hour, 2nd hour, 4th hour, 12th hour, and 24th hour were recorded as 1.75, 1.75, 1.5, 1, 1, respectively. The mean arterial pressures, heart rates and peripheral oxygen saturations of the patients were within the normal range. None of the procedure-related side effects were observed in the patients. No patient used additional analgesics.

Conclusion: CSAPB application was found to provide sufficient analgesic efficacy in acute pain after VATS. Because it is very superficial, CSAPB can be easily seen and applied by ultrasound. It can be applied safely due to its distance from the pleura.

Keywords: Acute pain, postoperative analgesia, combined serratus anterior plane block, video-assisted thoracoscopic surgery

Table 1: Demographic/Surgical Characteristics of Patients and Side Effects

	Age (year)	Gender	BMI	ASA	Diagnosis	Surgery	Duration of Anesthesia (min)	Side Effects
Case 1	72	Female	29.3	3	Nodule	Wedge Resection	120	No
Case 2	66	Female	36.7	3	Nodule	Wedge Resection	180	No
Case 3	80	Male	26.2	3	Ca/Mass	Lobectomy	360	No
Case 4	58	Female	30.8	3	Nodule	Wedge Resection	240	No

ASA: American Society of Anesthesiologists; BMI: Body mass index.

Table 2: MAP, HR, SpO2, VAS rest, VAS Cough Values, and Additional Analgesic Use of the Patients

	1st hour (mean)	2nd hour (mean)	4th hour (mean)	12th hour (mean)	24th hour (mean)
MAP	78.25	76	75.25	73.5	74.25
HR	68.7	69	66.7	66	67.7
SpO_2	97.5	97.25	97.25	97.75	97.75
VAS Resting	1.75	1.75	1.5	1	1
VAS Coughing	3	3	2.75	2.5	2.25
Additional Analgesic Use	0	0	0	0	0

MAP: Mean arterial pressure; HR: Heart rate; SpO_2: Peripheral oxygen saturation; VAS: Visual analog scale

Stellate Ganglion Block as Salvage Therapy in Refractory Vasospasm After Upper Extremity Surgery

Funda Atar, Derya Özkan

University of Health Sciences, Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: These two case reports describe the successful use of early stellate ganglion block (SGB) to save acute ischemic extremities in patients undergoing upper extremity fasciotomy secondary to the earthquake.

Case: A 20 and 15years old American Society of Anesthesiologists (ASA) II patients who underwent emergency surgery for upper extremity fasciotomy was taken to the operating room without premedication, and routine monitoring was performed. Before surgery, under ultrasound guidance, SGB was performed with 10 mL of 0.25% bupivacaine in fractionated doses. After induction of standard general anesthesia, anesthesia was maintained with sevoflurane-air (50%-50%) and remifentanil intravenous infusion according to hemodynamic parameters. Multimodal analgesia (Paracetamol, dexketoprofen iv) was administered to the patients in the perioperative period. The patients, whose surgery was completed without complications, was reverted with sugammadex, extubated, and sent to the service. It was observed that the upper extremity perfusions were better in the 3 weeks follow-up of the patients and no reoperation was considered by the orthopedist.

Discussion: Ultrasound-guided SGB allows anesthesiologists to directly visualize the surrounding structures, such as nerve roots, esophagus, thyroid, and vessels, which minimizes the risk of harm to them. Brachial artery blood flow has been shown in studies as an index of sympathetic function. There is a positive correlation between blood flow and sympatholysis. It has been reported that SGB reduces the resistance index of radial and digital arteries in diseases with circulatory problems, such as progressive systemic sclerosis and Raynaud's phenomenon. Animal studies have shown that arterial blood flow on the blocked side is increased significantly after SGB. Such increases in blood flow are believed to be due to vasodilatation mediated by sympathetic blockade of the α1-adrenergic receptor. Alternatively, increased expression of vascular endothelial growth factor and inducible nitric oxide synthase and activation of adenosine A2B receptors after sympathetic blockade increase nitric oxide expression, resulting in increased blood flow has been suggested.

Conclusion: SGB is known to increase upper extremity blood flow. We think SGB may be beneficial in treating upper extremity ischemia in patients undergoing ultrasound-guided fasciotomy.

Keywords: Fasciotomy, regional anesthesia, stellate ganglion block

Pericapsular Nerve Group Block (PENG) in Positional Pain in Hip Fractures: Case Series

Ela Erten

Gulhane Research and Education Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Hip fractures are one of the most common reasons for the elderly to apply to the emergency department due to osteoporotic changes. While most hip fracture operations are performed under regional anesthesia, the most applied technique is spinal anesthesia. Spinal anesthesia is often performed in a sitting or side position. Hip fractures are extremely painful fractures and positioning for regional anesthesia is very difficult due to this pain. We would like to present our observation on the effects of Pericapsular nerve group block (PENG) that we applied in 5 patients who will be operated for hip fracture, on their pain while positioning for spinal anesthesia and at rest.

Case: Patients with hip fractures were evaluated preoperatively, and written consent was obtained from all patients after giving information about PENG block. Pain scores were noted at rest and during active 15-degree lateral movement of the fractured limb (dynamic pain) before blocking. The block was performed with 20 ml of 0.025% Bupivacaine under the guidance of a convex ultrasound probe. Twenty minutes after the block was applied, the pain in sitting position was re-evaluated for resting, dynamic and spinal after PENG block, all of our patients had a reduction in resting and dynamic pain. In our patients, the highest VAS value was measured as 4 while they were placed in a semi-sitting position for spinal anesthesia.

Conclusion: In this case series, we observed that PENG block reduces pain in the perioperative period in hip fractures, increases patient comfort and facilitates positioning for spinal anesthesia. We think it would be beneficial to conduct more studies on this subject.

Keywords: PENG block, hip fracture, spinal anaesthesia

Table 1. Pain Scores

Patient	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
The Place of Break	Femur Neck	Femur Neck	Femur Neck	Femur Neck	Femur Neck
Pre-Block Rest Pain	7	8	6	7	6
Pre-Block Dynamic Pain	10	10	9	9	8
Post-Block Rest Pain	4	5	4	5	3
Post-Block Dynamic Pain	5	6	5	4	4
Pain in Sitting Position	3	3	4	3	4

Our First Experiences of Incisionless Sub-Tenon's Block for Cataract and Vitroretinal Surgery

Yeliz Kılıç[1], Haluk Hüseyin Gürsoy[2], Mustafa Değer Bilgeç[2], Hikmet Başmak[2], Ayten Bilir[1], Mehmet Sacit Güleç[1]

[1]Osmangazi University School of Medicine, Department of Anesthesiology and Reanimation, Eskişehir, Türkiye
[2]Osmangazi University School of Medicine, Department of Ophthalmology, Eskişehir, Türkiye

ABSTRACT

Background: Sub-Tenon's block (STB) is a technique of ophthalmic regional anesthesia. It has a good risk profile, in that sight- and life-threatening complications are extremely rare. STB has gained popularity in the last three decades, with refinements including different types of blunt metal cannula, plastic cannulae and 'incisionless' approaches (1). The incisionless type of STB has lower rate of regional ophthalmic anesthesia complications (2,3). In Türkiye, sub-Tenon's block anesthesia is employed by a few anesthesiologists. In this study, the clinical outcomes of our first STB experiences.

Material and Methods: Eighteen adult patients who underwent cataract and vitroretinal surgery under incisionless STB were included. In the anestetic management, the patients were sedatizated with dextmetodomidine, midazolam and fentanyl. The conjunctiva was anesthetized with topical proparacaine (0,5%). The conjunctiva was then grasped 5 mm from the limbus using toothed forceps. For incisionless STB, an intravenous cannula was used to administer a mixture of bupivacaine (0.5%) and lidocaine (2%). The RAMSEY sedation scores, visual analogue pain score, need of painkiller, the presence of vomitting, and FAST-TRACK recovery scores of the patients were recorded before block, at 15th minute of block, just after the operation, postoperative 3rd hour and 1st day. Movement of eyelid and eye globe, the presence of chemosis, petechiae, and subconjunctival hemorrhage were noted.

Results: There were 12 females and 6 males with a mean age of 68 years old. Almost all patients were ASA 1-2 physical status. Cataract and vitroretinal surgery were performed in 10 and 8 patients, respectively. No major complication was observed. Of the 18 patients, 14 were very satified, 3 were satified and 1 was unsure for the procedure. On the other hand, the surgeons were very satisfied for the block in 17 operations.

Conclusions: This method seeks to avoid the risks of retrobulbar haemorrhage, perforation of the globe, damage to the optic nerve, and injection into the subarachnoid space, whilst providing prolonged and reliable anaesthesia. Thanks to this block, providing a high akinesia rate is one of the most important gains of this technique. Similarly, this new technique, minimally invasive and incisionless sub-Tenon's block, was highly successfull and safe in our case series.

Keywords: Opthtalmic regional anesthesia, sub-tenon's block, outcome

REFERENCES

1. Chua MJ, Lersch F, Chua AWY, Kumar CM, Eke T. Sub-Tenon's anaesthesia formodern eye surgery-clinicians' perspective, 30 years after reintroduction. Eye(Lond). 2021 May;35(5):1295-1304.
2. Amin S, Minihan M, Lesnik-Oberstein S, et al. A new technique for deliveringsub-Tenon's anaesthesia in ophthalmic surgery. British Journal of Ophthalmology2002;86:119-120.
3. Palte HD, Gayer S. Novel Technique for minimally invasive sub-Tenon'sanaesthesiaReg Anesth Pain Med 2019;44:131–132.

Comparison of the Effects of Bilateral Transversus Abdominis Plane Block and Bilateral Quadratus Lumborum Block on Postoperative Analgesia in Patients Undergoing Midline Laparotomy

Esma Aşık, Süheyla Karadağ Erkoç, Yeşim Batislam

Ankara University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: The aim of this study is compare the effect of ultrasound-guided bilateral oblique subcostal TAPB and bilateral QLB2 and QLB3 in terms of early postoperative pain scores (VAS), first rescue analgesic requirement times, total opioid requirements and side effects in the first postoperative 24 hours in laparotomy performed with midline incision.

Material and Methods: A total of 120 ASA I-III patients aged between 18-70 undergoing midline incision laparotomy in Ankara University Medical Faculty Hospital were included to the current study. Bilateral QLB2-QLB3 or bilateral oblique subcostal TAPB with 0.3ml/kg of 0.25%bupivacaine was applied to patients who underwent laparotomy under general anesthesia at the end of the surgery. After awakening the patients, iv PCA device containing morphine was administered as 1mg bolus with 10-minute lock-time. Postoperative VAS scores, nausea/vomiting scores, pruritus scores at the postoperative 15th min,2,4,8,12,16, 24th hours, the time of first rescue analgesic requirement, lower extremity motor evaluation, total opioid consumption during postoperative 24 hours and total additional analgesic requirements were recorded.

Results: There were 62 patients in the QLB group and 60 patients in the TAPB group. 2 patients in the QLB group were not included in the statistical analysis due to lack of data. There was no significant difference between patients' demographic data(except ASA score), surgery types, amount of local anesthetic drug used, presence of postoperative nausea-vomiting, itching, need for antiemetic medication, ICU stay, postoperative complications, and the times of first postoperative additional analgesic requirement. Considering the ASA scores, there was a significant difference between the two groups($p<0.001$). The total amount of morphine used in the QLB group in the first 24 hours was found to be significantly lower($p<0.001$). VAS scores at rest and during movement and additional analgesic use were significantly lower in the QLB group at time periods($p<0.05$). When the use of additional analgesics was examined in terms of time trend between the groups, a significant difference was found($p<0.001$).

Conclusion: QLB is also effective for control of postoperative acute visceral pain in patients undergoing midline laparotomy; It provides more effective pain control than TAPB, significantly reduces postoperative opioid use compared to TAPB, and increases patient satisfaction.

Keywords: Quadratus lumborum block, transversus abdominis plane block, postoperative pain

Combined Paravertebral and Erector Spinae Plane Block in Video-Assisted Thoracoscopic Wedge Resection: A Case Report

Mesher Ensarioglu, Ali Alagöz

University of Health Sciences, Ankara Atatürk Sanatorium Training and Research Hospital, Department of Anaesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Regional anaesthesia is an alternative approach of anaesthesia for different situations (1). In thoracic surgery, thoracic paravertebral block (TPVB) and erector spinae plane (ESP) blocks have been shown to provide analgesia and, it can provide adequate anaesthesia as the sole (2-4). In this case, we will discuss a patient who underwent video-assisted thoracoscopy under paravertebral and ESP block as the main anaesthesia approach.

Case: 28 years old male patient with no known comorbidity had been admitted to the thoracic surgery ward due to right pneumothorax requiring chest tube. The medical history revealed that, he had repeated right pneumothorax.In the requested computed chest tomography, bullous lung formation was observed in the bilateral lungs.During follow-up, right lung was deemed non-expanding and wedge resection for right lower lobe by video-assisted thoracic surgery (VATS) was planned.Received in surgery with ASA 2 score. As the patient's left lung was bullous as well, avoidance of invasive ventilation was considered and regional approach with sedo-analgesia was preferred, and patient's written, and verbal approval was received. After standard ASA monitorization, real time ultrasound guided TPVB and ESP block, was utilized for visualization of fifth and sixth thoracic vertebral transverse processes. Midazolam 2 mg and fentanyl 50 mcg was adminestered intravenously prior to block application to prevent pain and anxiety.Paravertebral block was then performed by injection of local anaesthetic in the paravertebral space at T5 level (10 mL %0.5 bupivacaine, 5 mL %2 lidocaine), followed by ESP block performed between erector spinae muscle and thoracic transverse process at the same level (10 mL %0.5 bupivacaine, 5 mL %2 lidocaine). For maintenance sedation, a total of 2 mg midazolam,50 mg ketamine,50 mcg fentanyl and 150 mg propofol was used within 90 minutes. After VATS was performed, the patient was admitted to the surgical intensive care unit uneventhfully.

Conclusion: Bilateral bullous lungs can cause serious comprimises in positive pressure ventilation. Adequate anesthesia can be provided in selected patients within the framework of the accelerated recovery after surgery(ERAS) protocol(5). The minimally invasive nature of VATS also contributes to overall safety and allows regional anesthesia with sedation to be used as the sole method of anesthesia (5-6).

Keywords: Awake thoracic surgery, erector spinae plane block, paravertebral block, video-assisted thoracic surgery

Ultrasound-Guided Bilateral Rectus Sheath Block for Surgical Gastrostomy in an End-Stage Cancer Patient

Hasan Kamburoğlu[1], Mehmet Anıl Süzer[2]

[1]Acıbadem Ataşehir Hospital, Anesthesiology and Intensive Care, Istanbul, Türkiye
[2]Private Çankaya Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Palliative care aims to improve quality of life in patients facing problems associated with life threatening illness. End stage anaplastic tyroid cancer lead to distressing symptoms vomiting problems,bleeding, challenges in maintaining adequate nutrition. Most of patient suffers from dysphagia, and this is largely due to mechanical and functional obstruction. Placement of gastrostomy tubes is the most common approach to ensuring safe delivery of adequate nutrition. There are three tecnics; percutaneous endoscopic gastrostomy,surgically inserted open gastrostomy, and radiologically inserted gastrostomy. Sometimes,the obstructing nature of tumor, limited mouth opening or head and neck mobility because of radiotherapy, renders only the open surgical approach.

Case: A 71year-old male, weighing 62kg,end-stage anaplastic tyroid cancer was hospitalized for vomiting and swallowing problems. We planned nutritional support in palliative care unit. His mass was very tough because of radiotherapy. The neck ekstantion was very limited. Mouth opening 2,5 cm,thyromental distance 5cm measured. Cancer was locally invazed all deep neck tissues and esophagus.He had a severe disphagia. In this situation we started parenteral nutrition but decided that the patient required gastrostomy for nutritional support. We discussed with patient, family, and surgical team about an alternative technique for procedure that does not require airway handling. A regional technique in the form of ultrasound-guided bilateral rectus sheath block was planned. All preparations for general anesthesia, resuscitation drugs, and equipment were kept ready along with a team for emergency tracheostomy. After applying the standard monitoring (noninvasive blood pressure, electrocardiography SpO2), area between xiphisternum and umbilicus (block site) was prepared with aseptic measures. After identifying the layers of anterior abdominal wall with transducer lokal lidocain%2 infiltrated. We use Stimuplex needle exclusively for peripheral nerve blocks,so a 80mm needle was inserted. Bupivacain0.5%20 ml is administreated to the sheath compartment. The same procedure is repeated on the contralateral side. The patient tolerated surgery well. After surgery we started enteral nutrition next day and look after 5 day more in palliative care unit. He was discharged home with enteral nutrition support and lived 8 month more with his family.

Conclusion: This case goals the utility of ultrasound guided rectus sheath block as a very useful regional technique alternative to general anesthesia for short abdominal procedures, especially where airway risk is high.

Keywords: Block, gastrostomy, rectus, ultrasonography

Submental Intubation in Maxillofacial Trauma Surgery: A Case Report

Murat Tümer[1], Alper Tunga Doğan[1], Mehmet Ali Yükselen[1], Selahattin Özmen[2], Ömür Erçelen[2]

[1]VKV American Hospital, Department of Anesthesiology and Reanimation, Istanbul, Türkiye
[2]VKV American Hospital, Department of Plastic, Reconstructive and Aesthetic Surgery, Istanbul, Türkiye

ABSTRACT

Background: Submental intubation is an alternative to nasal intubation and tracheostomy in maxillofacial trauma. In this case report, we present our middle submental intubation experience in a maxillofacial trauma patient.

Case: A 29-year-old ASA-1 female patient who had an in-vehicle traffic accident was admitted to the operating room with internal fixation and close reduction plan of the zymotic bone, multiple nasal bones, and LeForte fractures. She had bilateral femur fractures and a right elbow fracture. Her mouth opening was limited to 2 cm due to temporomandibular joint pain. After standard monitoring and anesthesia induction, orotracheal intubation with a 7.5 mm spiral endotracheal tube was performed by video laryngoscope. After intubation, a 1.5 cm midline submental incision was made and a foley catheter was inserted into the oropharynx through this incision by the help of the surgeon. Intubation tube was attached to foley catheter and pulled out from incision (Figure). At the end of surgery, the endotracheal tube was pushed back into the oropharynx and incision was sutured. Extubation was performed after reversing muscle relaxation with sugammadex. After a 4-day follow-up, patient was discharged. Incision was healed with a cosmetic minimal scarring and without any infection.

Discussion: Nasal intubation is contraindicated during maxillofacial injuries that involves Leforte fracture and nasal area when occlusion should be supplied during fracture reduction and fixation. Although tracheotomy is an alternative in this patient group, submental intubation is a better way to supply the airway with minimal trauma and scarring. Submental intubation, described by Altemir in 1986, is a fast and simple technique with minimal morbidity and complication rate that can be used as an alternative to nasal intubation and tracheostomy. There are limited numbers of case series and reviews about submental intubation in the literature. We chose midline incision because it is anatomically safer and less scarring than lateral. Furthermore, we used a Foley catheter as a guide to endotracheal tube to reduce tissue damage.

Conclusion: Submental intubation is a good, safe, less invasive and easy alternative in maxillofacial surgeries when oral or nasal intubation is not possible or tracheotomy is required.

Keywords: Submental intubation, trauma, airway management

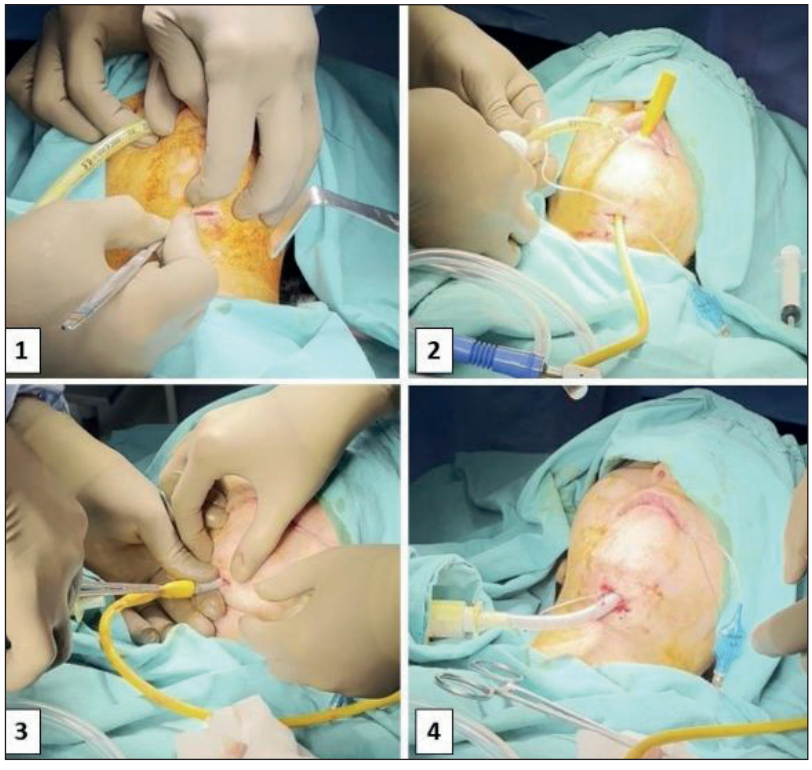


Figure 1. Submental intubation

Tracheal Rupture After Endotracheal Intubation: A Case Report

Zeynep Ergin, Hülya Yiğit, Nilgün Zengin, Tamer Direk

University of Health Sciences, Ankara City Hospital, Department of Anesthesiology and Reanimation Ankara, Türkiye

ABSTRACT

Background: Tracheal rupture is a life-threatening complication that most commonly occurs after blunt trauma to the neck and chest. Here, a case with tracheal rupture after endotracheal intubation is presented.

Case: A 68 years old, 155 cm and 90 kg female patient with known hypertension and stage 1 sarcoidosis was referred to us with complaints of hemoptysis and dyspnea that developed after left shoulder arthroscopy performed under general anesthesia in an external center. The patient's GCS: 15, SpO_2: 93%, blood pressure: 130/70 mmHg, pulse: 92/min and there was bilateral subcutaneous emphysema on her neck. Pulmonary CT angiography revealed diffuse subcutaneous emphysema and pneumomediastinum. Fiberoptic bronchoscopy was planned for the patient with the preliminary diagnosis of tracheal rupture. Midazolam 0.01mg/kg, fentanyl 1 mcg/kg and propofol 2 mg/kg iv were given for anesthesia induction. When sufficient depth of anesthesia was provided, an airway was established with the number 4 laryngeal mask. Open surgery was planned after the FOB revealed a 6-7 cm long defect in the membranous wall of the trachea posterior to the vocal cords, approximately 5 cm below the vocal cords, in which the esophagus protrudes into the lumen. Rocuronium 50 mg IV was administered to the patient and the patient was intubated with a 7.5 size spiral endotracheal tube (ETT). ETT was advanced to the right bronchus. The patient was placed in the left lateral decubitus position. Right thoracotomy was performed. Intraoperative intermittent apnea was performed because the rupture extended to the right main bronchus. After reaching the bronchus, the number 6 spiral tube was placed in the left main bronchus from the surgical field, and the trachea was primarily repaired by providing one-lung ventilation. The patient's hemodynamics remained stable throughout the operation, which lasted approximately 3 hours. The patient was extubated at the 10th hour postoperatively.

Conclusion: Trauma during intubation, overinflation of the tube cuff, or patient-related anatomical factors may contribute to the development of tracheal rupture. Therefore, placing the ETT with gentle movements, avoiding unnecessary sudden movements, and monitoring the cuff pressure with a manometer will be effective in preventing undesirable events.

Keywords: Postintubation, tracheal rupture, trauma

OP-91 (Trauma)
Abstract Only

New Guidelines in Pediatric Neurotrauma

Dusica Simic[1], Ana Vlajkovic[1], Marija Stevic[2]

[1]University Children's Hospital, Belgrade, Serbia
[2]University of Belgrade, Medical Faculty, Belgrade, Serbia

ABSTRACT

Pediatric neurotrauma is the leading cause of death in children older than 1 year. The incidence of head trauma in the pediatric population is approximately 180 - 300 per 100,000. About 80-90 % children have minor head traumas (which includes both minimal and mild head trauma), while 10 % have moderate to severe head. Throughout infancy, childhood and adolescence, traumatic brain injury (TBI) is in the top 10 causes of years lost to disability. Children younger than two years were not specifically addressed, although they can be distinguished as a separate group within the pediatric population with TBI.

The optimal management of severe TBI in the pediatric population has not been well studied. In recent years, reduced mortality and better outcomes from TBI has been the result of the use of evidence-based protocols which aim to minimize secondary brain injury. Like in previous, in new recommendations about the treatment of severe TBI, high-quality randomized controlled trials that could support level I recommendations are absent. In the present review, the current state of the literature for initial management, triage and treatment TBI in the intensive care unit, are summarized.

Keywords: Traumatic head injury, children, injury, trauma, neurotrauma

Can Resuscitative Thoracotomy Always Resuscitate?

Nur Sena Çakar[1], Özlem İlhan[1], Erbil Türksal[1], Onur Küçük[1], Hakan Nomenoğlu[2], Hilal Sazak[1]

[1] University of Health Sciences, Gülhane Faculty of Medicine, Ankara Atatürk Sanatorium Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye
[2] University of Health Sciences, Gülhane Faculty of Medicine, Ankara Atatürk Sanatorium Training and Research Hospital, Department of Thoracic Surgery, Ankara, Türkiye

ABSTRACT

Background: Resuscitative thoracotomy is a method applied for control of tamponade,intrathoracic bleeding and open cardiac massage. We aimed to present an emergent case with hemopneumothorax and massive bleeding due to trauma.

Case: A 77-year-old male was brought to emergency department due to multiple organ injuries after a gun shot wound. Patient had large thoracic injuries due to bullet/scatter and flail chest. Cardiopulmonary resuscitation(CPR) was started in patient who was unconscious and had filiform pulse while chest tube was placed. ES's and noradrenaline were given. Resuscitative thoracotomy and intrathoracic cardiac massage was performed by thoracic surgeon (Figure 1). The patient was transferred to the operating room urgently. CPR was terminated after hemodynamics improvement with additional iv crystalloid, colloid, ES's and dopamine.The patient was monitored,mechanical ventilation was started,right lateral decubitus position was provided. Central vein and right radial artery catheterizations were performed. The patient with hemoglobin level 6.3 g/dl had metabolic acidosis. Sodium bicarbonate,Cefazolin,prednol, ES's and FFP's were given. Defect in the left lung, extensive bleeding and air leakage were observed by thoracic surgeon.Bleeding control was applied, arteries were clamped but bleeding not completely stopped. Hemorrhagic pericardial fluid was aspirated by cardiovascular surgeon. Myocardial laceration was repaired.S ince there were bronchial and arterial injuries in the left lung, lower lobectomy was decided,but the patient required open CPR again. CPR was terminated after defibrillation. During the case, hemoglobin level has dropped as low as 3 g/dl. ES's, FFP's and cryoprecipitate were given. Ketamine, sevoflurane, transamine, calcium, magnesium were administered. There was no urine output during operation lasting 2 hours. Again open CPR was needed, but there was no response, patient was accepted as exitus. We do not have any conflict of interest. This report has not been published before. Written informed consent was obtained from the patient's relative.

Conclusion: Rapid and accurate interventions are important in patients with hemorrhagic shock and arrest after multiple injury, but CPR is often not sufficient and internal cardiac massage is needed. Resuscitative thoracotomy may be important for survival. However, it can't be enough either.

Keywords: Resuscitation, thoracotomy, trauma

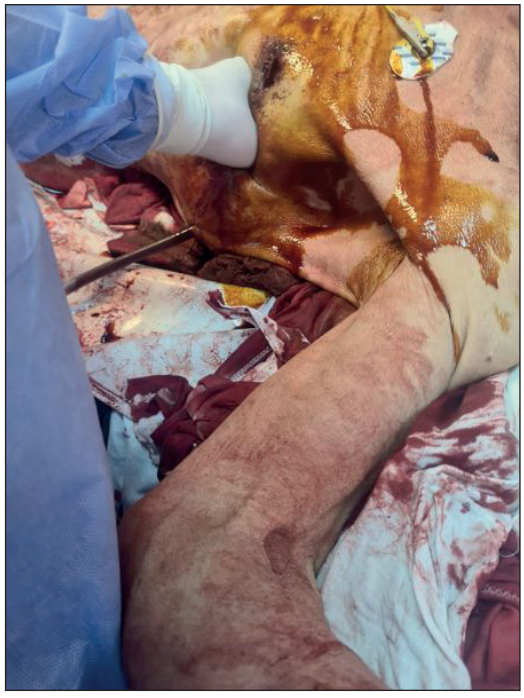


Figure 1. Resuscitative thoracotomy

100th Anniversary of The Republic

Anesthesiology and Reanimation Specialists' Society Congress

BALKAN STATES ANESTHESIA DAYS - VIII

Anesthesia and Intensive Care In The Light of The 100th Anniversary of Our Republic

28-30 April 2023

Ankara University, School of Medicine
Abdulkadir Noyan Conference Hall
Ankara, Türkiye

www.arud2023.org

POSTER PRESENTATION

The Effect of Esmolol Cardioplegia on Reducing Perioperative Myocardial Ischemia in Patients with Coronary Artery Disease

Beti Kostadinovska Jordanoska, Aleksandar Nikolic, Ivica Stefanovski, Fadilj Bedzeti, Darko Bislimovski

Acibadem Sistina Hospital, Department of Cardiac Surgery, Skopje, North Macedonia

ABSTRACT

Introduction: Patients with coronary artery disease undergoing coronary artery bypass surgery (CABG) are susceptible to perioperative ischemia and numerous complications due to inadequate myocardial protection. Administration of esmolol, a cardioselective beta-1 blocker with ultra-short action, is a pharmacological cardioprotective method for protecting the myocardium. Determination of serum troponin T and lactate concentrations are frequently used markers of myocardial injury.

Objective: The aim of this study was to determine whether the administration of a fast-acting beta-1 selective adrenergic blocker - esmolol immediately before CABG and as an adjunct to cardioplegia itself would provide additional myocardial protection and reduce serum troponin T and lactate levels. in the postoperative period.

Methods: 100 patients aged 40-80 years with coronary artery disease were included in this prospective, randomized, controlled study. Patients were grouped into two randomized groups according to whether they received esmolol beta1-selective adrenergic blocker according to a well-defined protocol or placebo. A computer-generated list of random numbers was used to randomize patients. In all patients, the serum troponin T level was measured according to the protocol, the highest troponin T value and the highest serum lactate level were determined in the first three hours postoperatively.

Results: All troponin T measurements according to the well-defined protocol, including the peak value, showed lower values in patients in the esmolol group compared to others. The serum troponin T value measured at time zero was statistically significantly lower (p=0.042) in patients receiving esmolol compared to others. We also obtained statistical significance in the serum troponin T value at 4 hours (p=0.040) as well as its peak serum value (p=0.020) in patients given esmolol. Lactate levels in the first three hours were statistically significantly lower (p=0.020) in patients in the esmolol group compared to others.

Conclusion: A pharmacological cardioprotective method for the protection of the myocardium with a beta-1 selective adrenergic blocker - esmolol given as an adjunct before and during cardioplegia in patients with coronary artery disease has a positive effect on reducing the level of troponin T and lactates in the postoperative period.

Keywords: Esmolol, coronary artery disease, cardiac surgery, cardioanesthesia, troponin T

INTRODUCTION

Coronary artery disease (CAD) is a narrowing of the coronary arteries as a result of an atherosclerotic process and loss of elasticity of the blood vessel wall, which reduces blood flow to the myocardium. For more than two decades CAD has been the leading cause of death worldwide (1,2).

Coronary artery bypass surgery (CABG) is one of the revascularization techniques that has seen great progress in the last 10 years with low perioperative morbidity and mortality, with excellent long-term results despite an increase in the number of high-risk patients (3). It is associated with complications due to perioperative ischemia and myocardial injury despite the use of numerous cardioplegic solutions to protect the myocardium.

The mechanisms underlying perioperative ischemia and myocardial infarction (PMI) are multifactorial including acute global ischemia-reperfusion injury (IRI) induced by aortic clamping and declamping, systemic inflammatory injury from cardiopulmonary bypass, distal coronary microembolization, genetic susceptibility to acute myocardial IRI (3,4,8).

The protection of the myocardium during the cardiac surgery itself represents the application of numerous strategies and methods that are used to reduce or prevent perioperative ischemia of the myocardium. In the last 20 years, great progress has been made in the myocardial protection strategy, which reduces the operative risk of CAD (3,4,7).

The use of beta-blockers (BBs) represents pharmacological cardioprotective methods of protecting the myocardium that include administering the cardioprotective agent before aortic clamping, adding a pharmacological agent to the cardioplegic solution, or administering the cardioprotective agent at the time of removing the aortic clamp, or a combination of these various approaches (3-8,16).

Esmolol is a cardioselective, ultra-short-acting BB with a half-life of about 9 minutes due to esterase hydrolysis, which allows its negative inotropic effect to be rapidly terminated after the infusion is reduced or stopped (11,12). Because of these properties, this beta-1 selective adrenergic blocker is the drug of first choice for use as an adjuvant to cardioplegia in patients in whom the possible side effects (hypotension, bradycardia, heart failure) (18) of the longer-acting BBs given would be avoided.

Perioperative myocardial injury and infarction can be detected by measuring serum biomarkers of myocardial necrosis such as cardiac troponin T (standard and high sensitivity), and troponin I and determination of serum lactate levels.

The aim of this study was to determine whether the application of a fast-acting beta-1 selective adrenergic blocker-esmolol immediately before CABG and as an adjunct to cardioplegia itself would provide additional myocardial protection and reduce serum troponin T and lactate levels in the postoperative period.

MATERIAL and METHODS

This prospective, randomized, controlled study enrolled 100 patients aged 40-80 years with coronary artery disease over a two-year period (2021-2023). The patients met the criteria for inclusion in the study and had signed the informed written consent for their participation in the study, which was previously explained to them in detail. A computer-generated list of random numbers was used to randomize patients. In all patients, the serum troponin T level was measured according to the protocol, the highest troponin T value and the highest serum lactate level were determined in the first three hours postoperatively.

According to a precisely defined protocol for the inclusion of esmolol:

The initial dosage of esmolol (1 mg/kg in 10 mg/ml solution) was administered by a central venous catheter after cannulating the aorta and soon before clamping the aorta.

Esmolol was given a second time at a dose of 2 mg/kg in a 10 mg/ml solution, along with antegrade cold blood cardioplegia. Esmolol was only ever given at a dose of 200 mg while cardioplegia was present, and a maximum dose of 100 mg before aortic clamping.

The people in the control group received an identical volume of a placebo (saline solution).

In all patients who were included in the study, the following parameters were monitored: (1) the level of troponin T in serum, immediately after the arrival of the patient in intensive care unit (ICU); (2) serum troponin T level at 4 hours; (3) serum troponin T level at 12 hours; (4) the level of troponin T in serum on the first and second postoperative day (5) the highest value of troponin T marked as peak - postoperative concentration.

Also, in all patients were monitored: (6) serum lactate concentration during the first 3 hours in ICU.

Statistical Analysis

Categorical parameters were summarized as percentages and continuous parameters as mean ± standard deviation. Differences between groups were tested using Pearson's Chi-square test for categorical variables and Mann-Whitney non-parametric tests for continuous variables. Correlation was done using Pearson's or Spearman's analysis. All data analyzes were performed using SPSS version 25.0 (IBM SPSS, Inc., Chicago, Illinois, USA), and $p \leq 0.05$ was considered statistically significant.

RESULTS

A total of 100 patients who met the study entry criteria were the subject of our investigation.

The comparison of the basal values of the patients divided into two groups of 50 patients each: those who received the fast-acting beta-1 selective adrenergic blocker - esmolol and those without it, are given in tables 1 and 2.

Patients in both groups were almost identical in age (p=0.471) with a slightly higher representation of females (30%) in the esmolol group, patients in both groups were almost identical in weight gain (p=0.398).

Regarding the clinical classifications (NYHA and CCS class), the NYHA classification was statistically insignificantly higher in the placebo group, 3.16±0.68 compared to the esmolol group, 2.96±0.57, (p= 0.105). The CCS classification was statistically marginally higher in the placebo group, 3.18±0.69, compared to the esmolol group, 2.94±0.58, (p=0.059).

EuroSCORE in patients in the esmolol group was 4.99±3.99, while in patients in the placebo group it was 5.35±4.34, (p= 0.850). The STS score was 1.91±1.81 in the esmolol group and 2.28±2.50 in the placebo group (p=0.491). The values of both surgical

scores were statistically insignificantly lower in the study group compared to the control group of patients, that is, they had more favorable clinical and pre-surgical performance (table 1, figure 1).

Regarding the risk factors for atherosclerosis (table 2), there was no statistically significant difference in their representation among subjects with and without given esmolol.

From the measured echocardiographic parameters (table 3), the patients who received esmolol had statistically significantly smaller left ventricular internal dimensions and with borderline significance smaller end volumes (p=0.080) in diastole, as well as smaller left atrial volume (p=0.071). Other measurements were almost identical in both groups of patients.

RV=right ventricle; RA=right atrium; PW=posterior wall; LVIDd=left ventricular internal dimension in diastole; LVIDs=left ventricular internal dimension in systole; LVEF= left ventricular ejection fraction; LVEDVI = left ventricular end-diastolic volume indexed for body surface area; LVESVI=left ventricular end-systolic volume indexed for body surface area; LVMI=left ventricular mass indexed for body surface area; LA=left atrium; LAVI=left atrium volume indexed for body surface area; MAPSE=mitral annulus systolic motion; IVS=interventricular septum; TAPSE=systolic movement of tricuspid annulus.

Postoperative serum troponin T was measured at ICU entry (time zero), at 4 and 12 hours, then on the first and second day postoperatively. The measured troponin T value at entry to ICU (zero time) was statistically significantly lower 0.77±0.97 in the esmolol group, compared to the value in the placebo group 1.39±2.67, (p=0.042). Also, the troponin T value after 4 hours was statistically significantly lower 1.05±0.77 in the esmolol group, compared to the value in the placebo group 2.03±3.26, (p=0.040). Troponin T values measured on the first and second postoperative days were lower in patients in the esmolol group, but without statistical significance. Whereas, the measured peak troponin T value in serum was statistically significantly lower 1.08±0.92 in the esmolol group compared to the measured value in the placebo group 2.05±3.71, (p=0.02) (table 4, figure 2).

Serum lactate level in the first 3 hours was significantly lower 2.29±1.15 in patients receiving esmolol compared to others 3.41±3.69, (p=0.020). (table 5, figure 3).

DISCUSSION

Coronary artery bypass surgery (CABG) is one of the revascularization techniques that has seen great progress in the last 10 years with low perioperative morbidity and mortality, with excellent long-term results despite an increase in the number of high-risk patients (3). It is associated with complications due to perioperative ischemia and myocardial injury despite the use of numerous cardioplegic solutions to protect the myocardium.

In our study, 100 individuals with coronary artery disease between the ages of 40 and 80 were included. According on whether they got an esmolol-beta1-selective adrenergic blocker or a placebo, patients were randomly divided into two groups.

Patients in both groups had ages that were almost equal, average around 65 years, with somewhat more women (30%) in the esmolol group than in the control group of patients (16%).

Patients in the esmolol group showed marginally lower values for clinical classifications (NYHA and CCS class), as well as surgical scores (EuroSCORE and STS score), indicating better clinical and pre-surgical performance.

Regarding risk factors for atherosclerosis, there was no statistically significant difference in their representation in patients with and without given esmolol.

Of the measured echocardiographic parameters, patients who received esmolol had statistically significantly smaller left ventricular internal dimensions and with borderline significance smaller end volumes (p=0.080) in diastole, as well as smaller left atrial volume (p=0.071). The other measurements were almost identical in both groups.

In our study, a comparison was made of the measured values of troponin T in the serum in both groups of patients, that is, the value of troponin T was compared at the entrance to ICU (zero time), after 4 and 12 hours, then on the first and second day postoperatively. In doing so, we identified that the measured value of troponin T at entry to ICU (zero time) was statistically significantly lower in the esmolol group, compared to the value in the placebo group (p=0.042). Also, the troponin T value after 4 hours was statistically significantly lower in the esmolol group, compared to the value in the placebo group (p=0.040). Troponin T values measured on the first and second postoperative days were lower in patients in the esmolol group, but without statistical significance. Whereas, the measured peak value of troponin T in serum was statistically significantly lower in the esmolol group (p=0.02).

Patients in the esmolol group had lactate levels that were statistically substantially lower than those in the other groups over the first three hours (p=0.020).

Despite significant progress in the last 20 years, patients at high risk of cardiac surgery, including those with poorer ventricular function, diabetes, and advanced age, continue to manifest postoperative complications such as perioperative myocardial infarction, heart failure, and low cardiac output, which requires prolonged intensive care. In most cases, the complications are due to ischemic-reperfusion injury and inadequate protection of the myocardium.

Ischemic-reperfusion injury manifests as postischemic stunning, which is reversible, and apoptosis and/or necrosis, which are irreversible. Myocardial stunning is an injury that lasts hours to days despite restoration of normal blood flow. Stunned cardiomyocytes show minimal ultrastructural damage that resolves within hours to days after recovery from ischemia. Apoptosis, or programmed cell death, on the other hand, is a pattern of cell death that affects single cells. Prolonged ischemia results in necrotic cell death. Dying cells may show features of both apoptosis and necrosis, that is, nuclear condensation and/or plasma membrane damage (3,4,8).

The use of beta-blockers (BBs) represents pharmacological cardioprotective methods of protecting the myocardium that include administering the cardioprotective agent before aortic clamping, adding a pharmacological agent to the cardioplegic solution, or administering the cardioprotective agent at the time of removing the aortic clamp, or a combination of these various approaches (3-6,16).

Most BBs given in the perioperative period reduce myocardial injury during ischemia and reperfusion, but since most of them have a prolonged (hours) negative inotropic and chronotropic effect, their use during cardiac surgery is limited. (9,10,11).

Esmolol is a cardioselective, ultra-short-acting BB with a half-life of about 9 minutes due to esterase hydrolysis, which allows its negative inotropic effect to be rapidly terminated after the infusion is reduced or stopped (12,13). Esmolol reduces myocardial metabolic demands before and during cardioplegic arrest, reducing ischemia-reperfusion injury. Esmolol penetrates the coronary microcirculation when administered prior to aortic clamping and offers cardioprotection before the actual delivery of cardioplegia (14). In addition, if added to the cardioplegic solution, esmolol may provide additional protection by reducing myocardial activity (15,16,17).

Because of these properties, esmolol remains the drug of first choice for use as an adjuvant to cardioplegia in patients in whom the possible side effects would be avoided (hypotension, bradycardia, heart failure)(18) of the given longer-acting BBs administered in the intraoperative period.

The use of BBs in the perioperative period has been widely investigated in cardiac surgery and in non-cardiac surgery with relatively controversial findings (26). It comes from the fact that myocardial oxygen consumption can protect myocytes from necrosis, but on the other hand, the reduction of inotropism in the postoperative period can be harmful (11). THE POISE study confirms that the use of long-acting beta-adrenergic blocker metoprolol reduces myocardial ischemia in non-cardiac surgery, but on the other hand the mortality rate is much higher (27). It is also confirmed that negative inotropism in cardiac surgery in patients with reduced left ventricular ejection fraction (LVEF) could lead to difficulties in weaning from extracorporeal circulation (ECC) and increased need for inotropic support in the postoperative period (28,29,30).

In 2003, Scorsin et al. (20), investigated the protective effect of esmolol during continuous retrograde cardioplegia. The result of the study is a reduced consumption and demand of the myocardium for oxygen, and thus a reduced IRI.

In 2011, Sun et al. (23), investigated the effect of esmolol as an adjuvant to cardioplegia on cardiac recovery after CABG. There were results of reduced occurrence of ventricular arrhythmias, shortened time to automatic heart rhythm establishment, reduced occurrence of ventricular fibrillation after establishment of heart rhythm and shortened reperfusion time.

In a study by Bignami et al. from 2016 (31), investigated the effect of esmolol as an adjuvant in cardioplegia in 46 patients with a result of a significant reduction of peak postoperative troponin of 46%.

In 2016, Liu et al. (24), investigated esmolol as an adjuvant in cardioplegia and found a significant reduction of up to 61% in serum troponin T. In one group, 12 patients received a normal cardioplegic solution, and in the second group, 12 patients received a cardioplegic solution with esmolol before starting the cardiopulmonary bypass.

Also, the detection of perioperative myocardial injury and infarction by measuring serum cardiac biomarkers has been extensively investigated in recent years. .In a meta-analysis (15), it was reported that for patients undergoing CABG, an elevation of CK-MB

or troponin I in the first 24 hours was associated with an increased intermediate (1 year) and long-term (3 year) mortality risk. Kinetic studies (25,32) have revealed a biphasic pattern of troponin release during CABG with a small troponin peak 8-10 hours after surgery suggesting nonspecific perioperative myocardial injury and a second larger peak at 20 hours after surgery suggesting PMI due to true myocardial necrosis.

Because of the wide variability in definitions used, the incidence of reported perioperative myocardial infarction (serum cardiac enzymes five times normal) is highly variable and study dependent, ranging from 10–40%. However, in the majority of patients undergoing CABG, perioperative myocardial injury may occur in the absence of classic infarction (4).

CONCLUSION

A pharmacological cardioprotective method to protect the myocardium with a beta-1 selective adrenergic blocker - esmolol given as an adjunct before and during cardioplegia in patients with coronary artery disease has a positive effect of reducing the level of troponin T and lactates in the postoperative period.

REFERENCES

1. Khan MA, Hashim MJ, Mustafa H et al. Global Epidemiology of Ischemic Heart Disease: Results from the Global Burden of Disease Study. *Cureus.* 2020;12(7):e9349.
2. Nowbar AN, Gitto M, Howard JP, Francis DP, Al-Lamee R. Mortality from ischemic heart disease: analysis of data from the World Health Organization and coronary artery disease risk factors from NCD Risk Factor Collaboration. *Circ Cardiovasc Qual Outcomes*. 2019;12:005375.
3. Sousa-Uva M, Head SJ, Milojevic M et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. *Eur J Cardiothorac Surg.* 2018;53(1):5-33.
4. Hausenloy DJ, Boston-Griffiths E, Yellon DM. Cardioprotection during cardiac surgery. *Cardiovasc Res.* 2012;94(2):253-65.
5. Devereaux PJ, Yang H, Yusuf S et al. Effects of extended-release metoprolol succinate in patients undergoing non-cardiac surgery (POISE trial): a randomised controlled trial. *Lancet.* 2008; 371: 1839–1847.
6. Bojar, Robert M, editors. Manual of Perioperative Care in Adult Cardiac Surgery. Chichester, UK: Wiley-Blackwell; 2011.
7. Allen BS. Myocardial protection: a forgotten modality. *Eur J Cardiothorac Surg*. 2020;57:263–70.
8. Costa MA, Carere RG, Lichtenstein SV et al. Incidence, predictors, and significance of abnormal cardiac enzyme rise in patients treated with bypass surgery in the arterial revascularization therapies study (ARTS). *Circulation.* 2001;104(22):2689-93.
9. Hans J. Geissler, Karen L. Davis, Glen A. Laine et al. Myocardial protection with high-dose b-blockade in acute myocardial ischemia. *European Journal of Cardio-Thoracic Surgery*. 2000;63–70.
10. Brinkman W, Herbert MA, O'Brien S et al. Preoperative β-blocker use in coronary artery bypass grafting surgery: national database analysis. *JAMA Intern Med.* 2014;174(8):1320-7.
11. Blessberger H, Lewis SR, Pritchard MW, Fawcett LJ, Domanovits H et al. Perioperative beta-blockers for preventing surgery-related mortality and morbidity in adults undergoing non-cardiac surgery. *Cochrane Database Syst Rev*. 2019;9(9):CD013438.
12. Oliver E, Mayor F Jr, D'Ocon P. Beta-blockers: Historical Perspective and Mechanisms of Action. *Rev Esp Cardiol (Engl Ed).* 2019;72(10):853-862.
13. Loscalzo J, editors. Harrison's Cardiovascular Medicine, 3e. McGraw Hill; 2016.
14. Fujii M, Chambers DJ. Cardioprotection with esmolol cardioplegia: efficacy as a blood-based solution. *Eur J Cardiothorac Surg.* 2013;43(3):619-27.
15. Neustein SM, Bronheim DS, Lasker S. Esmolol and intraoperative myocardial ischemia: a double-blind study. *J Cardiothorac Vasc Anesth*. 1994; 8: 273–277.
16. Rinne T, Harmoinen A, Kaukinen S. Esmolol cardioplegia in unstable coronary revascularisation patients. A randomised clinical trial. *Acta Anaesthesiol Scand*. 2000; 44: 727–232.
17. Cork RC, Kramer TH, Dreischmeier B et al. The effect of esmolol given during cardiopulmonary bypass. *Anesth Analg*. 1995; 80: 28–40.
18. Zangrillo A, Bignami E, Noè B et al. Esmolol in Cardiac Surgery: A Randomized Controlled Trial. *J Cardiothorac Vasc Anesth.* 2021;35(4):1106-1114.
19. Eltzschig HK, Bonney SK, Eckle T. Attenuating myocardial ischemia by targeting a2b adenosine receptors. *Trends Mol Med.* 2013; 19:345-354
20. Scorsin M, Mebazaa A, Al Attar N et al. Efficacy of esmolol as a myocardial protective agent during continuous retrograde blood cardioplegia. *J Thorac Cardiovasc Surg.* 2003;125(5):1022-9.
21. Fannelop T, Dahle GO, Matre K et al. Esmolol before 80 min of cardiac arrest with oxygenated cold blood cardioplegia alleviates systolic dysfunction. An experimental study in pigs. *Eur J Cardiothorac Surg.* 2008;33(1):9-17.

22. Dahle GO, Salminen PR, Moen CA et al. Esmolol added in repeated, cold, oxygenated blood cardioplegia improves myocardial function after cardiopulmonary bypass. *J Cardiothorac Vasc Anesth.* 2015;29(3):684-93.
23. Sun J, Ding Z, Qian Y. Effect of short-acting beta blocker on the cardiac recovery after cardiopulmonary bypass. *J Cardiothorac Surg.* 2011;6:99.
24. Liu X, Shao F, Yang L, Jia Y. A pilot study of perioperative esmolol for myocardial protection during on-pump cardiac surgery. *Exp Ther Med.* 2016;12(5):2990-2996.
25. Carrier M, Pellerin M, Perrault LP, Solymoss BC, Pelletier LC. Troponin levels in patients with myocardial infarction after coronary artery bypass grafting. *Ann Thorac Surg.* 2000;69(2):435-40.
26. Zangrillo, A, Turi, S, Crescenzi, G. Esmolol reduces perioperative ischemia in cardiac surgery: a meta-analysis of randomized controlled studies. J Cardiothorac Vasc Anesth 2009; 23: 625–632.
27. Devereaux PJ, Yang H, Yusuf S et al. Effects of extended-release metoprolol succinate in patients undergoing non-cardiac surgery (POISE trial): a randomised controlled trial. *Lancet.* 2008; 371: 1839–1847.
28. Nishina D, Chambers DJ. Efficacy of esmolol cardioplegia during hypothermic ischaemia. *Eur J Cardiothorac Surg.* 2018;53:392–9.
29. Kuhn-Régnier F, Natour E, Dhein S et al. Beta-blockade versus Buckberg blood-cardioplegia in coronary bypass operation. *Eur J Cardiothorac Surg.* 1999; 15: 67–74.
30. Mehlhorn U, Sauer H, Kuhn-Régnier F. Myocardial beta-blockade as an alternative to cardioplegic arrest during coronary artery surgery. *Cardiovasc Surg.* 1999; 7: 549–557.
31. Bignami E, Guarnieri M, Franco A et al. Esmolol before cardioplegia and as cardioplegia adjuvant reduces cardiac troponin release after cardiac surgery. A randomized trial. *Perfusion.* 2017;32(4):313-320.
32. Alyanakian MA, Dehoux M, Chatel D et al. Cardiac troponin I in diagnosis of perioperative myocardial infarction after cardiac surgery. *J Cardiothorac Vasc Anesth.* 1998;12(3):288-94.

Table 1. Comparison of Anthropometric Measurements and Magnitude of Clinical Scores for Pre-Surgical Performance of Patients Divided Into Those with and Without Esmolol Given

Parameters	With esmolol n=50	Without esmolol n=50	p
Age (y)	65.18±7.83	65.96±9.30	0.471
Sex Men/Women (%)	70/30	84/16	0.077
BMI (kg/m2)	27.45±4.58	28.06±4.34	0.398
NYHA classification	2.96±0.57	3.16±0.68	0.105
CCS classification	2.94±0.58	3.18±0.69	0.059
EuroSCORE	4.99±3.99	5.35±4.34	0.850
STS score	1.91±1.81	2.28±2.50	0.491

CCS= Canadian Cardiovascular Society; NYHA=New York Heart Association; EuroSCORE=European sustem for cardiac operative risk evaluation; STS score= Society of Thoracic Surgeons score.

Table 2. Comparison of Risk Factors in Patients Divided into Those with and without Given Esmolol

Parameters	With esmolol n=50	Without esmolol n=50	p
Smoking (%)	70	68	0.500
Hypertension (%)	90	88	0.500
Dyslipidemia (%)	84	86	0.500
Diabetes mellitus (%)	56	58	0.500
COPD (%)	16	10	0.277
Previous PCI (%)	22	16	0.306
Heart failure (%)	-	2.0	0.500
PAD (%)	12	20	0.207
CVI (%)	6	10	0.357

Table 3. Comparison of Echocardiographic Measurements in Patients Divided into Those with and without Esmolol Given

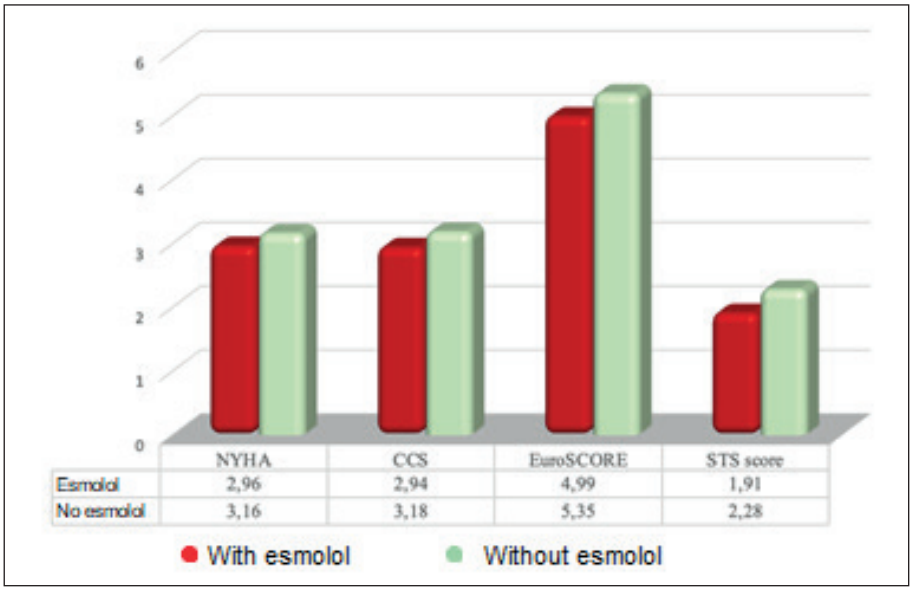
Parameters	With esmolol n=50	Without esmolol n=50	p
LVIDd (mm)	50.70±6.67	53.54±5.54	0.034
LVIDs (mm)	38.38±4.30	40.38±4.59	0.014
LVEDVI (ml/m2)	55.56±14.65	59.40±14.06	0.080
LVESVI (ml/m2)	31.09±9.21	33.68±9.62	0.101
LVEF (%)	45.04±2.75	45.56±3.66	0.155
IVSd (mm)	12.98±1.75	12.68±1.36	0.686
PWd (mm)	12.12±1.22	12.08±1.19	0.960
LVMI (g/m2)	84.38±8.68	85.22±6.47	0.860
MAPSE (mm)	7.40±0.98	7.28±0.76	0.771
LA (mm)	39.64±4.55	38.94±4.24	0.798
LAVI (ml/m2)	24.84±4.70	28.24±11.29	0.071
RA (mm)	30.38±3.57	30.56±4.40	0.983
RV (mm)	29.70±1.90	28.24±3.18	0.641
TAPSE (mm)	22.22±2.26	21.72±3.07	0.379

Table 4. Measured Serum Troponin T Values in Patients Divided into Those with and without Esmolol Given

Troponin value (ng/mL)	With esmolol n=50	Without esmolol n=50	p
Zero time	0.77±0.97	1.39±2.67	**0.042**
At 4th hour	1.05±0.77	2.03±3.26	**0.040**
At 12th hour	0.76±0.53	1.63±3.75	0.160
First postoperative day	0.56±0.46	1.02±1.83	0.260
Second postoperative day	0.45±0.47	0.74±1.18	0.391
Peak Troponin T value	1.08±0.92	2.05±3.71	**0.020**

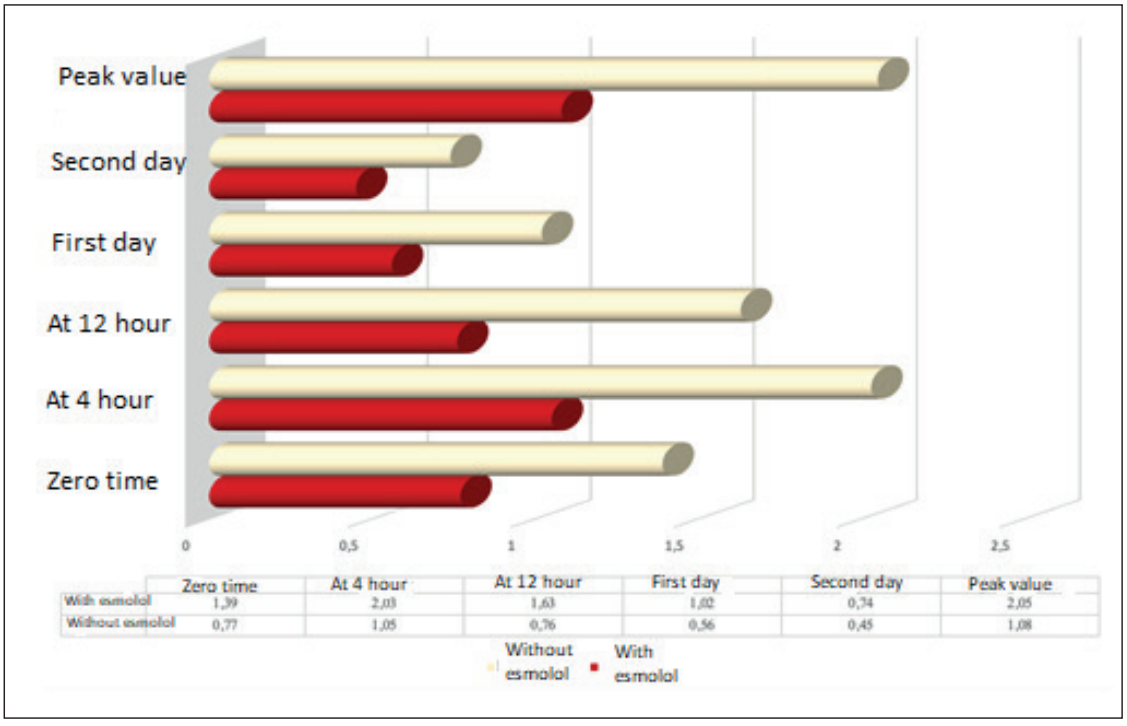
Table 5. Measured Serum Lactate Values in Patients Divided into Those with and without Esmolol Given

Parameters	With esmolol n=50	Without esmolol n=50	p
Serum lactate level in the first 3 hours (mmol/L)	2.29±1.15	3.41±3.69	0.020



	NYHA	CCS	EuroSCORE	STS score
Esmolol	2,96	2,94	4,99	1,91
No esmolol	3,16	3,18	5,35	2,28

Figure 1. Graphical representation of the comparison of score size in patients with and without esmolol.



	Zero time	At 4 hour	At 12 hour	First day	Second day	Peak value
With esmolol	1,39	2,03	1,63	1,02	0,74	2,05
Without esmolol	0,77	1,05	0,76	0,56	0,45	1,08

Figure 2. Graphical representation of troponin T level (ng/mL) measured in serum at 4 times, as well as its peak value in patients divided into those with and without esmolol given.

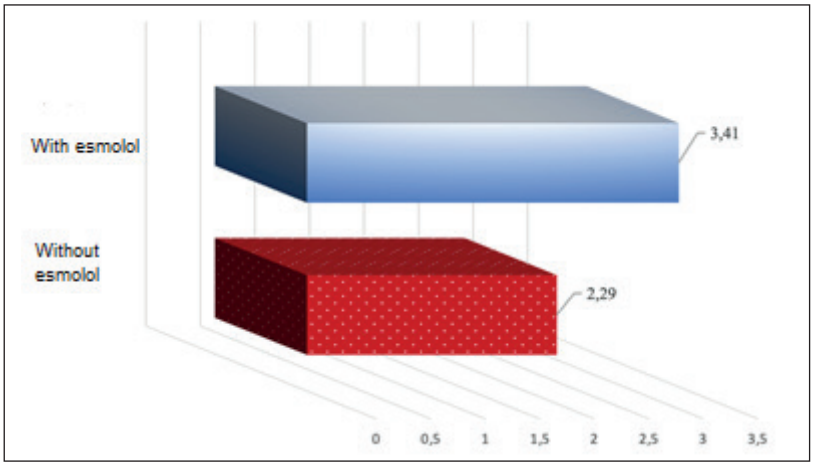


Figure 3. Graphic representation of serum lactate level in the first 3 hours in patients divided into those with and without esmolol given.

Perioperative Considerations in a Sickle Cell Anemia Patient Undergoing Cardiopulmonary Bypass are Critical in Order to Prevent Fatal Vaso-Occlusive Crises

Bilge Çelebioğlu, Nur Banu Büker Zorlu, Celal Avan

Hacettepe University, School of Medicine, Department of Anaesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Introduction: Sickle cell anemia is a form of haemoglobinopathy. A inherited point mutation in β-globin gene causes abnormal haemoglobin production(HbS). HbS when deoxygenated is poorly soluble and this leads to haemoglobin polymerisation and sickle haemoglobin. During CPB, there are a lot of predisposing factors such as hypoxia, hypothermia, hypoperfusion and acidemia which can trigger a profound sickle cell crisis.

Case: Patient is a 61 year old woman with chronic kidney disease, but never needed hemodialysis,homozygote sickle cell anemia and mitral and tricuspid valve regurgitation. The calculated ejection fraction was 45% and pulmonary arterial pressure was measured as 50 mmHg by transthoracic echocardiography. Also grade 3 mitral valve regurgitation and grade 3/4 tricuspid valve regurgitation were present in ECHO.Two days before the surgery, the patient who used hydroxyurea 500 mg twice a day was planned to be treated with therapeutic eritrositoferesis. Patient's Hb was 9 g/dL and hemoglobin electrophoresis revealed HbS of 40.3%, adult hemoglobin (HbA)of 44.7%.After the treatment,Hb was 9.9 g/dl, HbS: 14.5%, HbA:81.2%.On surgery day, temperature of the operating room was adjusted to 21°C and warm heat blanket was used to avoid hypothermia.The patient was monitorized with ECG, spO2, blood pressure,cerebral near infrared spectroscopy (NIRS). Also,right radial artery was cannulated.For induction, midazolam, fentanyl and rocuronium were used.Sevoflurane and remifentanyl were used for maintenance.After systemic heparinization,aortic and bicaval cannulation were performed. CPB was initiated at mild hypothermia(30°C). Activated clotting times (ACTs) were obtained every 30 minutes and greater than 400 seconds.First administration of normothermic crystalloid cardioplegia 20 ml/kg was antegrade.After that every 30 minutes, normothermic cardioplegia 10 ml/kg was administered retrogradely. During CPB, venous reservoir level was maintained by adding 2 packed red cell transfusions, to keep hematocrit level close to 20%.The patient was rewarmed and weaned from bypass by inotropic support of dopamine 5 µg/kg/min. The patient was transported to ICU while intubated.There was no episode of venoocclusive complications postoperatively. Postoperative Hb was 9.8 g/dl and HbS:6.8%.

Conclusion: Preoperative therapeutic erythrocytopheresis, avoidance of intraooperative hypoxia/hypothermia, and normothermic cardioplegia enable CPB to be conducted safely in sickle cell patients.

Keywords: Cardiopulmonary bypass, sickle cell anemia, therapeutic eritrositoferesis

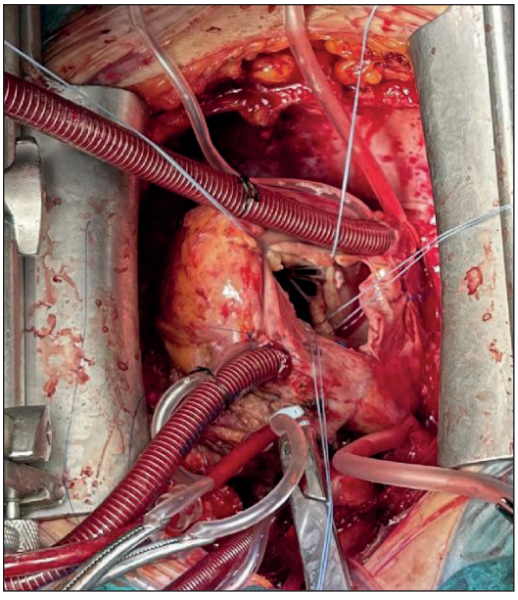


Figure 1.

PP-03 (Cardiac Anesthesia)
Full Manuscript

Perioperative Excessive Blood Loss and Acute Mesenteric Ischemia During Re-cardiac Surgery: A Hapless Patient

Muhammed Talha Daşgın, Mert Can Uğurcan, Zeliha Aslı Demir

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Introduction: Acute mesenteric ischemia (AMI) is a rare disease entity associated with high morbidity and mortality. After cardiac surgery, non-occlusive mesenteric ischemia may develop due to arterial vasoconstriction or arterial hypoperfusion due to low cardiac output syndrome.

Case: 47-year-old woman with known Marfan disease; The patient, who was operated for Aortic Valve Replacement in 2012, TEVAR in 2019, and for ascending aortic aneurysm in 2020, applied to the emergency department in 2023 because of hemoptysis. Pulmonary thromboembolism (PTE) was detected, an operation was planned as a result of the development of dissected aortic aneurysm in the follow-up.

After blood product preparation, the patient was neuromonitored with NIRS and BIS the case was operated under general anesthesia. After the sternotomy, the patient lost a significant amount of blood due to adhesions from previous operations. CPB was performed after right axillary artery cannulation and femoral artery-vein cannulation. Antegrade selective cerebral perfusion (ASCP) lasted 83 minutes. Despite the massive intraoperative blood transfusion, hematocrit could not be increased above 25 in the case. 1 lt ultrafiltration done due to dilutional anemia during CPB. She was transferred to the intensive care unit(ICU) as Hb:8 Htc:23 under multiple inotropic support. During the ICU follow-up, the patient with ileus was operated by the general surgery. Fogarty procedure done due to AMI. The patient, who was followed under high-dose inotrope at the post-operative 80th hour after cardiac surgery, died secondary to hypotensive shock.

Discussion: Long CPB times, global ischemia during ASCP, atheromatous debris or thrombus-related embolic events may be causes of complications. Avoiding femoral artery cannulation may reduce the risk of retrograde thromboembolism. Peripheral artery and vein cannulations may be required in patients undergoing recurrent aortic surgery.

The genetic and clinical predisposition to thrombosis of our patient, who was diagnosed with Marfan disease and PTE, is obvious. AMI may be encountered as a complication of both existing predispositions, atheromatous plaques that can be dislodged during peripheral cannulations or massive transfusion complication.

Conclusion: AMI after cardiac surgery is a challenging clinical condition that is often diagnosed late and carries a high mortality rate.

Keywords: Antegrade selective cerebral perfusion, mesenteric ischemia, marfan syndrome, aortic repair surgery

INTRODUCTION

Acute mesenteric ischemia is a serious complication with an incidence of 0.1% to 0.5% and is associated with high mortality rates ranging from 24% to 94%. This rare complication falls into four categories: arterial embolism, arterial thrombosis,mesenteric venous thrombosis, and non-occlusive mesenteric ischemia (NOMI). NOMI results from arterial hypoperfusion due to arterial vasoconstriction or low cardiac output syndrome.Ischemic injury can range from reversible ischemia to severe inflammatory injury with necrosis and/or perforation (1).

Although advances in knowledge and technology in recent years have improved outcomes in cardiac surgery patients, some postoperative complications still remain potentially fatal. Gastrointestinal complications, in particular, have high reoperation and death rates following cardiac surgery. In etiology, ischemia and bleeding are two of the most blamed causes (2).

In this case report, postoperative mesenteric ischemia and the problems encountered in a patient with Marfan syndrome, who underwent re-re-aortic surgery and were at high risk for thrombosis and bleeding, were described.

CASE

47-year-old woman with known Marfan disease; The patient, who used warfarin regularly after Aortic Valve Replacement in 2012, was operated on for TEVAR in 2019 and for ascending aortic aneurysm in 2020, applied to the emergency department in March 2023 for hemoptysis. In pulmonary CT angiography, hypodense thrombus material consistent with PTE, extending from the left main pulmonary artery distal to the lower lobe lobar pulmonary artery branch and proximal to the lingular segmental pulmonary artery branch, causing partial filling defect in the lumen was observed. In Transthoracic Echocardiography: “Min Aortic regurtation, SBAP: 30 mmHg, Min 1-Mitral regurtation, 2-3 Tricuspit regurtation, Ejection Fraction was 55%.

After the recommendation of 2x0.4cc enoxaparin by the Chest Diseases, the operation was planned by Cardiovascular Surgery because of the development of dissected aortic aneurysm in the hospital follow-up. Cardiac monitoring and NIRS-BIS monitoring were performed. Since the right axillary artery will be cannulated by the surgery, catheterization was performed from the left brachial artery under USG guidance, although the blood flow was good, the artery trace was dumping. The patient's entry NIRS values were measured as L/R 38/58. Input was Hb: 9.3 htc: 29.9. After induction with propofol, ketamine, lidocaine and rocuronium, the patient was intubated. BIS-guided maintenance was provided with desflurane and ultiva. A catheter was placed in the right internal jugular vein under USG guidance. Right axillary artery, right femoral artery-vein cannulation was performed by the surgery. After sternotomy, adhesions from previous operations were removed and CBP was entered. During adhesion dehiscence, the patient lost significant blood, and blood product replacement was required even though the bleeding was removed to the CPB pump reservoir with a coronary aspirator. The patient was cooled to 24 °C and a cross-clamp (XCL) was placed.

Cardiac arrest was achieved with antegrade custodiol cardioplegia. During the case, after it was observed that the old TEVAR graft caused stenosis at the entrance of the left subclavian artery, the short segment proximal to the TEVAR graft was removed. It was observed that low left NIRS and dumping image in the left brachial artery were related to this stenosis. The old debranching was separated by clamping and the right ASSP was immediately passed, after the elephant trunk was made with a dacron graft, the XCL was removed by removing air from the heart cavities and the CPB was exited. One right thorax and two mediastinal drains were placed, the operation was terminated by closing the sternotomy after bleeding control.

The patient's XCL time was 87 min. CBP time was 177 min. ASSP duration was 83 min. During the patient's NIRS follow-up, the lowest L/R was measured as 29/42. Although NIRS lateralization improved after CPB, it generally remained at 45/45 values. During the case, htc could not be exceeded 25. Intraoperatively; 10 RBCs, 10 FFP, 3 PLTs, 10 gr fibrinogen concentrate, 750 iU Cofact and balanced isolate-s solution were given. Intrapoerative cell-saver was used. The patient underwent 1000cc ultrafiltration by the perfusionist during the ASSP.

Despite all these interventions, Htc could not be increased. It was discussed with the surgical team that there may be bleeding from a place other than the field. Although all the intervention sites were checked many times, the bleeding focus could not be found. The patient was intubated as hb:8, htc:23, plt:84 K, and transferred to the intensive care unit under the support of 10 mcg/kg/min dopamine, 0.2 mcg/kg/min noradrenaline, 5 mcg/kg/min dobutamine. Despite the massive blood and blood product transfusion under high-dose inotropic support at the post-operative 21st hour, the patient underwent a bedside sternotomy with the suspicion of bleeding, as the hypotension and anemia persisted. The patient, whose air-fluid levels were seen in the abdominal X-ray taken during the follow-up, was operated with a preliminary diagnosis of ileus. Diffuse intraperitoneal hematoma was seen after laparotomy, no active bleeding focus was found, the hematoma was cleared. During this time, the patient who was found to have mesenteric artery ischemia underwent the fogarty procedure.During the follow-up, the patient died due to hypotensive shock.

DISCUSSION

Clinicians face the challenge of navigating the delicate balance between bleeding and clotting. Bleeding disorders or inadequate hemostasis during surgery may cause serious bleeding. However, if serious bleeding and superimposed thrombotic complications occur during surgery, these can be much more difficult to treat. Complications associated with many organs may occur after proximal aortic surgery. Long CPB times, global ischemia during ASSP, atheromatous load, or embolic events related to thrombus may be the causes of complications (3,4).

The optimal method of arterial cannulation and perfusion in re-aortic surgery remains controversial, and there are few reports documenting the safety and efficacy of various approaches (5-12). Avoiding femoral artery cannulation may reduce the risk of retrograde thromboembolism resulting from atheromatous loads on the thoracic and abdominal aortic arteries (13). However, this is not always possible. Peripheral artery and vein cannulations were obligatory in our case who underwent aortic surgery for the third time. Our patient, who was diagnosed with Marfan disease and pulmonary embolism in the preoperative period, had a clear genetic and clinical predisposition to thrombosis. Mesenteric artery ischemia may be encountered due to existing predispositions, the possibility of atheromatous plaques that may be dislodged during peripheral cannulations, or as a complication of massive transfusion.

Removal of existing adhesions in patients undergoing cardiac surgery is mandatory to provide a field of view for the operation. In the meantime, bleeding from each dissected area is inevitable. In cardiac surgeries performed under the influence of heparin and in hypothermia, the functions of both coagulation factors and platelets are impaired (14).

Although all of these causes can be kept under control in routine cases, it is common for cases to cause severe bleeding (15).

Blood-preserving strategies such as cell saver, ultrafiltration, and tranexamic acid were used in our patient, for whom a large amount of blood and blood product preparation was made. However, no observable bleeding focus was detected in the field. No dissection or problem was encountered in the peripheral cannulation areas of the patient, who later turned out to bleed into the abdomen. Hematomas due to vascular injury from these areas are already located retroperitoneally.

Bleeding and related hemodynamic disorders and possible thrombosis made the case more difficult, gradually increasing lactate, and required massive transfusion and inotropic-vasopressor support.

CONCLUSION

Acute mesenteric ischemia after cardiac surgery is a challenging clinical problem that is often diagnosed late and carries a high mortality rate (16).

Mesenteric ischemia may be caused by a thrombus in the thoracic aorta due to occlusive reasons, or it may develop as a retrograde embolism secondary to intraoperative femoral artery cannulation. At the same time, mesenteric ischemia may be caused by hypoperfusion due to hemodynamic fluctuations or intra-postoperative vasopressor use. Long perfusion time and hemodynamic changes due to this, anemia secondary to postoperative hemorrhage, and massive transfusion also predispose to this ischemic condition.

REFERENCES

1. Krasivskyi I, Djordjevic I, Tayeh M et al. Short-Term Outcomes and Risk Factors of In-Hospital Mortality in Patients Suffering Acute Mesenteric Ischemia after Cardiac Surgery: Role of Opioids and Lactic Acid. J. Clin. Med. 2023, 12, 857.
2. Nilsson J, Hansson E, Andersson B. Intestinal ischemia after cardiac surgery: analysis of a large registry. J Cardiothorac Surg. 2013 Jun 18;8:156
3. Ergin MA, Griepp EB, Lansman SL, Galla JD, Levy M, Griepp RB. Hypothermic circulatory arrest and other methods of cerebral protection during operations on the thoracic aorta. J Card Surg. 1994;9:525-37
4. Hagl C, Ergin MA, Galla JD, et al. Neurologic outcome after ascending aorta-aortic arch operations: effect of brain protection technique in high-risk patients. J Thorac Cardiovasc Surg. 2001; 121:1107-21.
5. Reece TB, Tribble CG, Smith RLet al. Central cannulation is safe in acute aortic dissection repair. J Thorac Cardiovasc Surg. 2007;133:428-34.
6. Fusco DS, Shaw RK, Tranquilli M, Kopf GS, Elefteriades JA. Femoral cannulation is safe for type A dissection repair. Ann Thorac Surg. 2004;78:1285-9.
7. Di Eusanio M, Schepens MAAM, Morshuis WJ, Di Bartolomeo R, Pierangeli A, Dossche KM. Antegrade selective cerebral perfusion during operations on the thoracic aorta: factors influencing survival and neurologic outcome in 413 patients. J Thorac Cardiovasc Surg. 2002;124:1080-6
8. Staunch JT, Spielvogel D, Lauten A, et al. Axillary artery cannulation: routine use in ascending aorta and aortic arch replacement. Ann Thorac Surg. 2004;78:103-8.
9. Di Eusanio M, Wesselink RMJ, Morshuis WJ, Dossche KM, Schepens MAAM. Deep hypothermic circulatory arrest and antegrade selective cerebral perfusion during ascending aorta-hemiarch replacement: a retrospective comparative study. J Thorac Cardiovasc Surg. 2003;125:849-54.
10. Bavaria JE, Brinster DR, Gorman RC, Woo YJ, Gleason T, Pochettino A. Advances in the treatment of acute type A dissection: an integrated approach. Ann Thorac Surg. 2002;74:S1848-52.
11. Bavaria JE, Pochettino A, Brinster DR et al. New paradigms and improved results for the surgical treatment of acute type A dissection. Ann Surg. 2001;234:336-43.
12. Khaladj N, Shrestha M, Meck S et al. Hypothermic circulatory arrest with selective antegrade cerebral perfusion in ascending aortic and aortic arch surgery: a risk factor analysis for adverse outcome in 501 patients. J Thorac Cardiovasc Surg. 2008;135:908-14.
13. Westaby S, Katsumata T, Vaccari G. Arch and descending aortic aneurysms: influence of perfusion technique on neurologic outcome. Eur J Cardiothorac Surg. 1999;15:180-5.
14. Delaney M, Stark PC, Suh M et al. Massive Transfusion in Cardiac Surgery: The Impact of Blood Component Ratios on Clinical Outcomes and Survival. Anesth Analg. 2017 Jun;124(6):1777-1782.
15. Ghadimi K, Levy JH, Welsby IJ. Perioperative management of the bleeding patient. Br J Anaesth. 2016 Dec;117(suppl 3):iii18-iii30
16. Papadimas E, Kang GS. Acute mesenteric ischaemia after cardiac surgery: Clinical suspicion is key to survival. Singapore Med J. 2020;61(11):613.

Is Smoking a Predictive Negative Factor For COVID-19 Severity? A Discussion Through Clinical Cases

Jolanda Nikolla[1], Gentian Huti[2], Rudin Domi[2]

[1]American Hospital Tirana, Albania
[2]University of Tirana, Faculty of Medicine, Tirana, Albania

ABSTRACT

Background: There were such different and unexpected clinical cases of patients we have faced during the pandemic of Covid-19. We are not still able yet to explain completely the clear mechanism why mostly of patients with severe bilateral pneumonia due to Covid 19 infection who were current smokers did survived comparing with nonsmokers who unfortunately did not, even they were intubated on time.

Material and Methods: We have analyzed retrospectively five specific cases of Covid 19 infection with severe bilateral pneumonia who were hospitalized in ICU in mechanical ventilation in prone position. Their predictive risk factors that they had were compared. Among them three were smokers and two nonsmokers relatively in young age, two females (one of them in third trimester of pregnancy ex smoker) and three males. Around the fourth-five days in three of them (the pregnant patient and two nonsmokers males) the pulmonary function was worsened as acute respiratory distress syndrome (ARDS) and as a result they were intubated. A PaO_2:FiO_2 of less than 300 mm Hg indicated acute respiratory distress syndrome.

Results and Discussion: The patients in mechanical ventilation received low tidal volume ventilation (LTVV) targeting <=6 mL/kg predicted body weight (PBW; range 4 to 8 mL/kg) Unfortunately the male intubated patients did not survived. They were in young age and with no comorbidities as the others. Smoking and the time of hospitalization were the only factors that distinguished them. Theoretically we know that it may be significantly associated with an enhanced risk of COVID-19 progression towards severe disease. However, additional prospective studies are needed to clarify the complex relationship between smoking and COVID-19 severity.

Keywords: COVID-19, disease severity, smoking

INTRODUCTION

Smoking compromises lung function and impairs also the immune system. On the other hand infection from COVID-19 primarily affects the lungs. Smoking tobacco is also a known risk factor for severe disease from many respiratory infections, including coronaviruses SARS in 2003 and MERS-CoV in 2012.

COVID-19 has several clinical manifestations. The main presenting symptoms are fever and respiratory symptoms, such as cough, sputum production, and shortness of breath. Some patients with severe disease may present with acute respiratory distress syndrome, multiple organ dysfunction syndromes, and even death.

The pandemic has identified several factors associated with COVID-19 severity, including older age, male sex, ethnicity cardiac and metabolic comorbidities (such as hypertension and diabetes) and non-white. However, the evidence on whether smoking is associated with a greater likelihood of more severe COVID-19 infection has been inconsistent, note the researchers (1-3).

Several studies conducted early in the pandemic reported a lower prevalence of active smokers among COVID-19 patients relative to the general population, and a large population-based study conducted in the UK found that smoking was associated with lower risks of COVID-19 mortality 10 on adjustment for multiple prognostic factors. In contrast, current smoking was associated with higher risks of COVID-related death, adjusted for age and sex, in another large population-based study (4-5).

In our experience there were such different and unexpected clinical cases of patients we have faced during the pandemic of Covid-19. We are not still able yet to explain completely the clear mechanism why mostly of patients with severe bilateral pneumonia due to Covid 19 infection who were current smokers did survived comparing with nonsmokers who unfortunately did not, even they were intubated on time.

MATERIAL and METHODS

We have analyzed retrospectively five specific cases of Covid 19 infection (with RT/PCR positive) with severe bilateral pneumonia who were hospitalized in ICU in mechanical ventilation in prone position. Their predictive risk factors that they had were compared. Among them three were smokers and two nonsmokers relatively in young age, two females (one of them in third

trimester of pregnancy ex-smoker) and three males. Around the fourth-five days in three of them (the pregnant patient and two nonsmoker males) the pulmonary function was worsened as acute respiratory distress syndrome (ARDS) and as a result they were intubated. A Pao2:Fio2 of less than 300 mm Hg indicated acute respiratory distress syndrome.

In table 1 we have registered some demographic data of the patients such as: age, gender, smoking status, comorbidities, the number of days that the ARDS has happened, if they were intubated and the mortality. They were all relatively in young age (median age was 41 years). The patients were classed as never-smokers, ex-smokers and current smokers. As it can be seen from the table one and figure one males were mostly smokers and just one pregnant female also.

In Figure 2 we have compared the relationship of smoking status with intubation of the patients. It is evident that two smoker patients has a severe acute lung injury which deteriorates in ARDS and as a result they were intubated. Chakladar et al found that smoking-mediated upregulation of the androgen pathway leads to increased SARS-CoV-2 susceptibility (11). Umnuaypornlert et al conducted a meta-analysis and found that smoking, whether current smoking or former smoking, significantly increases the risk of COVID-19 severity and death (7). A low prevalence of current smokers among hospitalised patients with COVID-19 has been reported in several studies. Farsalinos at al in a systematic review and meta-analyses found an unexpectedly low prevalence of current smoking among hospitalised patients with COVID-19 (6).

In Figure 3 from our patients unfortunately only two has died (one non-smoker and one smoker, males both) as a result of their severe conditions. A French clinical observational study reported that current smokers had a lower susceptibility to SARS-CoV-2 infection, although the disease was severe once they got infected (8).

Figure 4 and 5 show chest scan images of one intubated patient (the female pregnant-ex smoker). It is evident the endotracheal tube of intubation, the atypical pneumonia of Covid 19 with bacterial superposition (SARS –C0V-2 RT/PCR positive, bilateral lung involvement) with consolidation and predilection of posterior and basal lobes which continues to deteriorate with time, pneumomediastinum and subcutaneous emphysema. The patient has been intubated for 5 days. After weaning from intubation she has been under nHFO-therapy in the ward for two weeks.

The patient and her baby survived and they are healthy without pulmonary or other consequences.

DISCUSSION

Smoking seriously damages human health and is the main risk factor for respiratory and cardiovascular diseases. ACE and ACE2 are important components of the renin-angiotensin system. ACE is an enzyme that catalyzes the conversion of angiotensin (Ang) I to Ang II, which exerts a strong vasoconstrictive effect. Ang II favours vasoconstriction, cellular proliferation, inflammation, and fibrilization when it binds to the Ang II Type 1 receptor. Chronic smoke exposure triggers an increase in the population of these cells and a concomitant increase in ACE2 expression. ACE2 expression is responsive to inflammatory signaling and can be up regulated by viral infections or interferon treatment. SARS-CoV-2 infections could create positive feedback loops that increase ACE2 levels and facilitate viral dissemination. These mechanisms may partially explain why smokers are particularly susceptible to severe SARS-CoV-2 infections (8,9).

In our observation of these cases and all that we have experienced in pandemic we have unanswered questions such as : Why in young patients with no comorbidities and non-smokers we have seen more severe cases and more fatal deaths ? Why chronic lung patients (COPD) with bilateral pneumonia due to Covid 19 mostly of them did survive?

Findings from Leung et al suggested that quitting smoking can reduce the probability of COVID-19 progression to severe disease. In the study, patients who were smokers or who had chronic obstructive pulmonary disease had higher ACE2 levels, increasing the probability of viral entry into the host cells and infection. They also found that ex-smokers and never-smokers had similar ACE2 levels. These findings support the fact that immediate quitting of smoking is optimal (10).

However due to the study's retrospective nature and the very limited number of patients, our conclusions need to be further verified in prospective studies with large sample sizes to clarify the complex relationship between smoking and COVID-19.

REFERENCES

1. de Lusignan S, Dorward J, Correa A, et al. Risk factors for SARS-CoV-2 among patients in the Oxford Royal College of General Practitioners Research and Surveillance Centre primary care network: a cross-sectional study. Lancet Infect Dis 2020;20:1034–42.
2. Williamson EJ, Walker AJ, Bhaskaran K. OpenSAFELY: factors associated with COVID-19 death in 17 million patients. Nature 2020;584:430–6.

3. Yang X, Yu Y, Xu J, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Lancet Respir Med 2020;8:475–81.
4. Jackson SE, Brown J, Shahab L, et al. COVID-19, smoking and inequalities: a study of 53 002 adults in the UK. Tob Control 2020.
5. U.S. National Library of Medicine. Evaluation of the efficacy of nicotine patches in SARS-CoV2 (COVID-19) infection in intensive care unit patients (NICOVID-REA). NCT04598594, 2020.
6. Farsalinos K, Barbouni A, Niaura R. Systematic review of the prevalence of current smoking among hospitalized COVID-19 patients in China: could nicotine be a therapeutic option? Intern Emerg Med 2020;15:845–52.
7. Umnuaypornlert A, Kanchanasurakit S, Lucero-Prisno DEI, Saokaew S. Smoking and risk of negative outcomes among COVID-19 patients: a systematic review and meta-analysis. Tob Induc Dis 2021;19:9.
8. Changeux JP, Amoura Z, Rey FA, Miyara M. A nicotinic hypothesis for Covid-19 with preventive and therapeutic implications. C R Biol 2020;343:33–9.
9. Smith JC, Sausville EL, Girish V, et al. Cigarette smoke exposure and inflammatory signaling increase the expression of the SARS-CoV-2 receptor ACE2 in the respiratory tract. Dev Cell 2020;53:514–29.e3.
10. Leung JM, Yang CX, Tam A, et al. ACE-2 expression in the small airway epithelia of smokers and COPD patients: implications for COVID-19. Eur Respir J 2020;55.

Table 1. Demographic and Clinical Characteristics of the Patients

Nr of pts	Age/y	Gender F/M	Smoking status	Comorbidities	pregnant/non pregnant	ARDS time/day	Intubation	Mortality
1	41	male	no	no	no	4	yes	yes
1	54	male	current smoker	HTA	no	5	yes	yes
1	47	male	current smoker	no	no	no ARDS	no	no
1	31	female	no	no	no	no ARDS	no	no
1	36	female	Ex-smoker	no	yes	3	yes	no

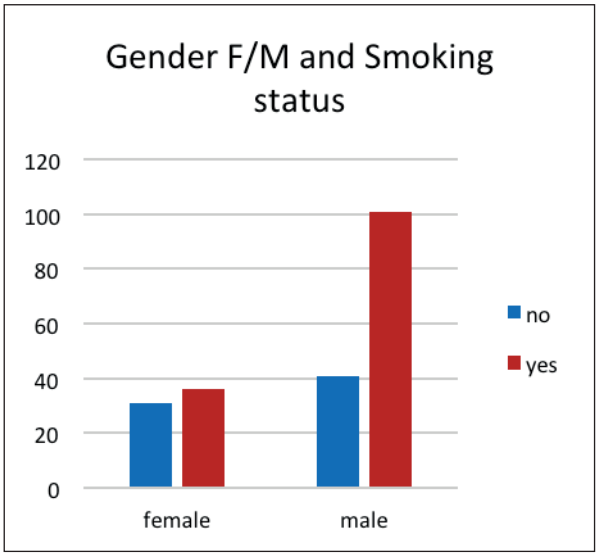


Figure 1. Smoking status and gender.

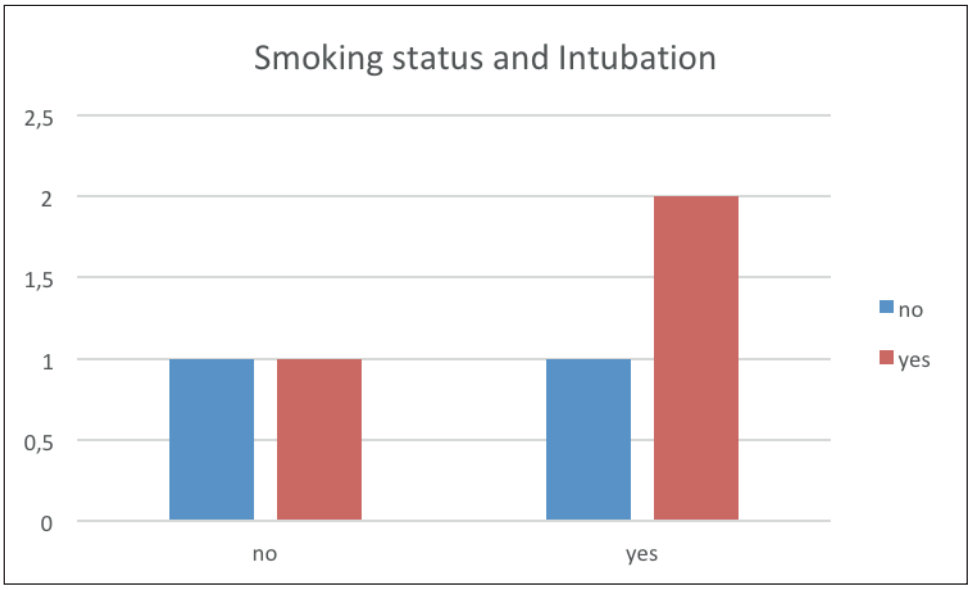


Figure 2. Smoking status and intubation.

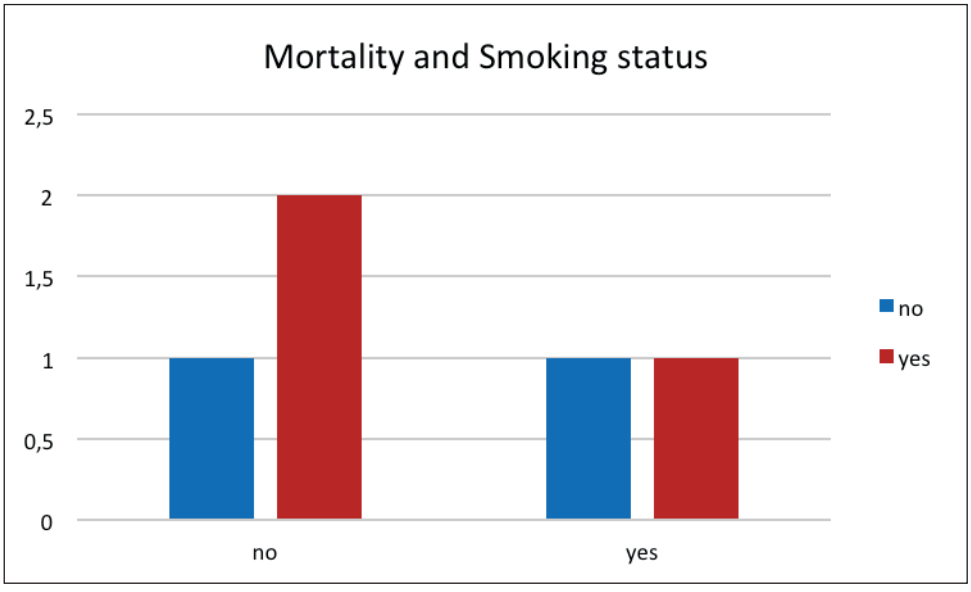


Figure 3. Mortality and smoking status.

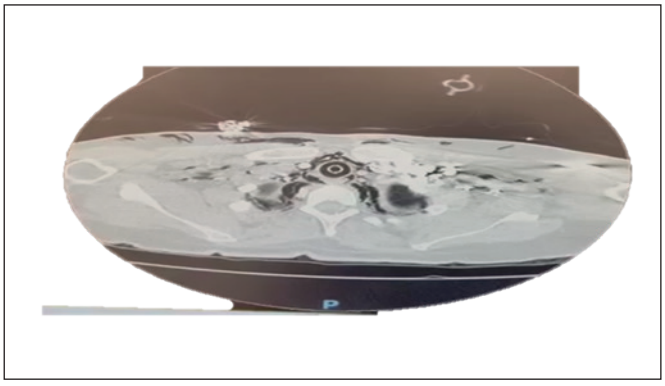


Figure 4. Pneumomediastinum and subcutaneous emphysema.

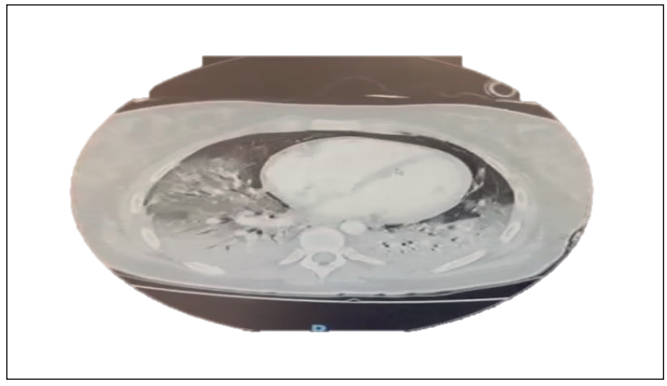


Figure 5: Bilateral pneumonia in inferior-posterior basal lobes.

Incidentally Detected Ascaris Lumbricoides Infection in Intensive Care Unit

Azime Bulut[1], Gizem Avcı[2], Fatma Alkan Bayburt[1]

[1]Giresun Training and Research Hospital, Giresun, Türkiye
[2]Dışkapı Training and Research Hospital, Ankara, Türkiye

ABSTRACT

Backround: Ascariasis is a common problem in certain areas of the world, usually in developing countries (1). The worms usually develop in the jejunum and cause bowel obstruction, volvulus, intussusceptions and even bowel perforation (2). In this report, we aimed to present the incidentally detected nematode infection in a patient hospitalized in the intensive care unit (ICU) with acute respiratory distress.

Case: We describe the case of a 65-year-old woman who had no underlying diseases. The patient had motor menthal retardation. She was admitted to the surgery clinic with mass in the right breast. The patient underwent biopsy guided with ultrasonography. Because she was incompatible, sedoanalgesia planned.The patient had no respiratory symptom and oxygen saturation was 93% in room air. She had sudden respiratory failure during procedure so we intubated the patient urgently. The patient admitted to the ICU. On the second day, after unsuccessful weaning, patient underwent thoracic computerized tomography which revealed pleural effusion in right lung (Figure 1). Pleural fluid was drained by inserting pleural catheter. Ten days later, the patient was stil intubated and vomited a 15 cm nematode (Figure 2). Therapy with albendazole 400 mg was started and repeated one week apart. Treatment was terminated when no worms were observed. No signs of Löffler's pneumonia was detected in thoracic CT. Pleural effusion was thought to be secondary to malignancy. Patient was died on 45th day of ICU care with septisemia.

Conclusion: Ascaris lumbricoides is one of the most common parasite and infestation is acquired through ingestion of eggs in raw vegetables and the human is the definitive host. Patients usually complained intestinal symptoms,but in this case there was no intestinal signs. Although we couldn't attribute respiratory complaints to nematode infection in this case, we should keep in mind that nematode infections may cause respiratory failure.

Keywords: Ascaris, respiratory failure, critical care

REFERENCES

1. Misra SP, Dwivedi M. Clinical features and management of biliary ascariasis in a non-endemic area. Postgraduate medical journal, 2000, 76:29–32.
2. Nagotkar L, Shanbag P,Shenoy P. Hypokalemic paralysis following severe vomiting in a child with intestinal obstruction due to round worms.J Trop Pediatr. 2010 Feb;56(1):63-4. doi: 10.1093/tropej/fmp044. Epub 2009 Jun 5.

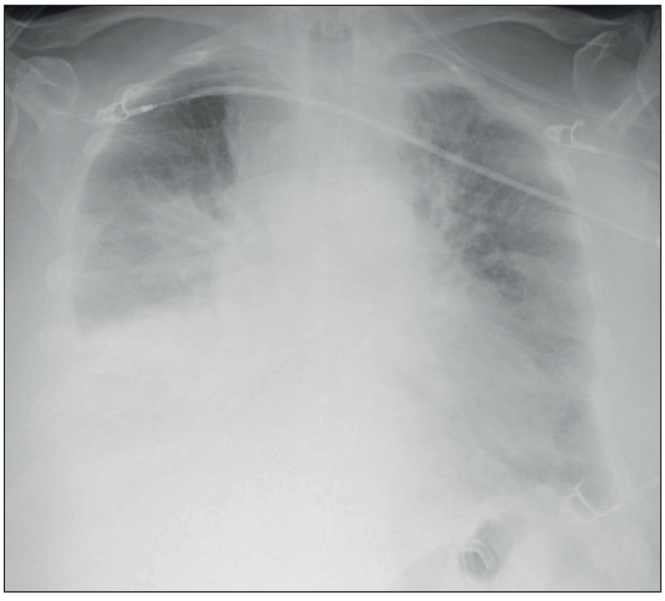


Figure 1. X-ray of the chest at the time of parasite extraction

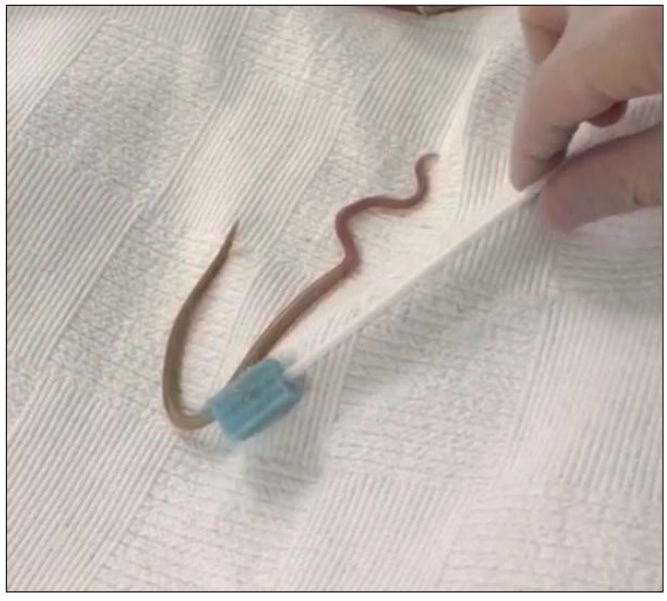


Figure 2. Ascaris extracted from the patients' mouth.

Pharmacotherapy for Glucose Control in the Burn Intensive Unit, Albania

Leonard Deda, Monika Belba

University of Medicine, Pharmacology Subject at the Faculty of Medicine, Department of Biomedical and Experimental Subjects, Tirana, Albania

ABSTRACT

Introduction: Control of glucose values with exogenous insulin has been beneficial in the treatment of critically ill as well as in burn patients although glucose targets have not been the same. Many professional organizations support tight glycemic control; others support conventional glucose control. The aim of this study is to examine the prevalence of critical hyperglycemia (≥180 mg/dL) which needs insulin treatment in adult patients with severe burns.

Material and Methods: The study population is composed of adult burn patients(≥20 years old) hospitalized in the Intensive Care Unit (ICU) of the Burn Service near University Hospital Center" Mother Teresa" in Tirana, Albania during 5 years. From the clinical charts of all the patient we have studied in particular the patients treated with insuline during the course of burn disease.

Results and Discussion: The prevalence of critical hyperglycemia in the burned adult and aged population in our center is estimated to be 15.6% on admission and 7% during the disease. Patients treated with Insulin (in the group of patients with critical hyperglycemia) had a better prognosis than patients with moderate hyperglycemia. For the patients with no previously diagnosed diabetes, the mean day of beginning with insulin was on the 7th day after burn which also corresponds with parenteral nutrition support. Treatment with Insulin has not only improved the prognosis of these patients but also made possible more surgical interventions on these patients because of their stabilized clinical situation. Insulin was discontinued after stabilization of glucose values with an average of 28 ±14.9 days of treatment.

Conclusion: Intravenous and subcutaneous insulin remain the treatment of choice for critically ill patients. Clinicians face many barriers to developing and implementing glucose control protocols into ICU clinical practice. Protocols and algorithms must be designed to adapt to individual patient responses, as well as work within the limitations of the institution.

Keywords: Pharmacotherapy, insuline, glucose control

INTRODUCTION

Patients with severe burns, experiencing some kind of trauma, undergo among others, disturbances in glucose homeostasis, possibly leading to Stress-Induced Hyperglycemia (SIH) (1). Every severe burn patient is unique regarding the magnitude and persistence of inflammatory situations. Catecholamines are the main drivers of the hypermetabolic response to burn injury, with levels rising nearly 10-fold after injury. Catecholamines increase cardiac work, drive lipolysis, enhance glycogenolysis, and impair glucose disposal by altering insulin signaling. Hyperglycemia has been associated with several adverse effects in burn patient populations. These include stimulation of a persistent inflammatory state, poor wound healing, protein catabolism, infection, and death. Hypermetabolism leads to protein–calorie malnutrition, muscle wasting, deconditioning, and delayed wound healing. These factors can prolong the length of hospital stay (LOS) and hospital costs.

Control of glucose values with exogenous insulin has been found to be beneficial in the treatment of critically ill burn patients despite a previous diagnosis of diabetes (glucose targets differ depending on the presence of diabetes). Many professional organizations support the conclusions of Van Den Berghe and colleagues for tight glycemic control; others support the NICE-SUGAR Study Investigators for conventional glucose control (2,3,4). Surviving Sepsis Campaign (SSC) International Guidelines (2021) recommend a protocolled approach to blood glucose management in Intensive Care Unit (ICU) patients commencing insulin dosing when two consecutive blood glucose levels are ≥ 180 mg/dL (5).

Other pharmacological interventions include recombinant human growth hormone (rhGH), the co-administration of oxandrolone and propranolol to diminish burn hypermetabolism, and metformin to improve glucose levels and muscle protein synthesis in burn patients. Modulation of postburn hypermetabolism with these drugs can potentially ameliorate the consequences [6,7].

The aim of this study is to give data for the prevalence of critical hyperglycemia (≥180 mg/dL) which needs insulin treatment in adult patients with severe burns and to discuss other treatments for supporting the burn patient.

MATERIAL and METHODS

This is a retrospective cohort study of adult and elderly patients with severe burns hospitalized in the Intensive Care Unit (ICU)of the Burn Service at the University Hospital Center" Mother Teresa" in Tirana, Albania during the last 5 years. The study population

is composed of adult burn patients (≥ 20 years old). This study was approved by the institutional board. Hyperglycemia is defined as blood glucose values above normal. Patients were categorized as follows: Patients with euglycemia (mean blood glucose (BG) values in the range of 80-120 mg/dL), moderate hyperglycemia (mean BG values >120 mg/dL but <180 mg/dL), and critical hyperglycemia (mean BG values ≥180 mg/dL).

Demographic and clinical variables: Age (years), Gender, Body Mass Index (BMI-kg/m^2) [based on BMI, patients were divided into underweight (BMI<18.5), normal (BMI 18.5-24.9), overweight (BMI 25.0-29.9), obesity class I (BMI 30-34), obesity class II (BMI 35-39.9) and obesity class III (BMI >40)], Co-morbidities: the presence of diabetes, cardiovascular, respiratory, gastrointestinal, renal diseases.

Burn-related variables: Total Burned Surface Area (TBSA) expressed as % of Total Body Surface and Predomination of Full-thickness burn.

Outcome variables: Blood glucose values (mg/dL) on admission and during the disease, LOS (days), and Mortality (%).

The patients with critical hyperglycemia were treated with an insulin regimen (Basal-Bolus therapy with a correctional Insulin scale) with a total daily dose calculated at 0.3-0.5 IU/kg/day taking into consideration the values of blood glucose and the rate of creatinine clearance.

Statistical Analysis

Patients with hyperglycemia (moderate and critical) were compared with those with euglycemia. The normally distributed continuous data are reported as the mean ± standard deviation and analyzed using one-way ANOVA. The categorical data are expressed as frequency distributions and the Chi-square test was used to determine whether differences existed between groups. The univariate association between demographic, burn-related, clinical characteristics, and critical hyperglycemia was examined using the Chi-square test. Significant univariate factors ($p<0.01$) were then entered into a multivariate logistic regression model to determine the independent predictors of critical hyperglycemia. SPSS 22 was used for statistical analysis.

RESULTS

On admission, of 346 patients hospitalized in the ICU for severe burns, 144 were patients with euglycemia (41.6%), 148 with moderate hyperglycemia (42.8%), and 54 with critical hyperglycemia (15.6%). During the hospitalization period, the patients with euglycemia were 204 (58.9%), with moderate hyperglycemia 118 (34.1%), and with critical hyperglycemia 24 (7%). The prevalence of critical hyperglycemia in the burned adult and aged population in our center is estimated to be 15.6% on admission and 7% during the course of the disease. Of 346 patients, 50 died; overall mortality was 14.5%.

In Table 1, are given the characteristics of adult and elderly patients with critical hyperglycemia treated with insulin (n=24). This subset of patients was divided into patients previously diagnosed with diabetes (n=13) and patients with stress-induced hyperglycemia (n=11). Patients treated with insulin (in the group of patients with critical hyperglycemia) had a better prognosis than patients with moderate hyperglycemia. For the patients with no previously diagnosed diabetes, insulin was initiated on average on the 7^{th} day after the burn, which also corresponds with the start of parenteral nutrition support. Treatment with insulin not only improved the prognosis of these patients but also made possible more surgical interventions for these patients because of their stabilized clinical condition. Insulin was discontinued after the stabilization of glucose values with an average of 28 ±14.9 days of treatment.

The clinical course of a patient with SIH treated with insulin is presented in Figure 1.

Demographic characteristics of the first subgroup of patients (previously diagnosed with diabetes mellitus) show that the mean age was 63.3 years (range: 39 - 85 years). Patients were classified as pre-obese in 46.1% of the total number of the subgroup and having obesity class I in 30.7%. HbA1c levels were 92.3% of the total considered as high. Sepsis was present in the majority of the patients while mortality was 30.7% with 4 deaths which constitute all the deaths in the study group. Prognostic factors (age, BSA %) as well as the presence of diabetes predispose these patients to a bad prognosis, also accompanied by renal deterioration. LOS was 11.1±10.7 with a maximum of 40 days and a minimum of 1 day. Patients needed a TDD of Insulin of 39.3±14.1 units with a maximum of 60 units/day and minimum of 20 units/day which is equal to the values of the second subgroup. The start of the insulin therapy varies from the 1^{st} to the 5^{th} day after the burn with an average of 11.3±10.6 treatment days which corresponds to the LOS of these patients.

Demographic characteristics of patients with SIH showed that the mean age was 47 years (range: 22 - 64 years). We noticed a younger population in this subgroup, a higher rate of obesity class I (54%) and obesity class II (36.3%). 2 patients (18.1%)were found to have elevated HbA1C levels, 4 patients (36.3 %) were found to have HbA1C levels associated with prediabetes or in risk for diabetes and 5 patients (45.6 %) had normal values. Sepsis was present in 72.7 % of the total, while there was no death in this group. LOS was higher with an average of 50±39.2 days with a maximum of 148 days and a minimum of 10 days. Patients needed a TDD of Insulin of 39.4±18.3 units, with a maximum of 70 units/day and a minimum of 8 units/day. Regarding the day of starting with Insulin, this usually corresponds to the 7th day after hospitalization (7.2±2.7 days) with the earliest on day 4 and the latest on day 10 after the burn. The duration of Insulin therapy is more than double for this group with an average of 28±14.9 days and a maximum of 48 days of treatment. The period of insulin therapy is half of the mean LOS.

In binary logistic regression, multivariate analysis, it is seen that there is a statistically significant relationship between critical hyperglycemia and: age (p=0.025): for every one-year increase in age, the likelihood of developing critical hyperglycemia increases by 3%; BMI (p=0.006): for each increase in BMI by one unit, the likelihood of developing critical hyperglycemia increases by 2.4 times; blood glucose values at admission (p<0.001): for each increase in glucose values by one unit, the likelihood of developing critical hyperglycemia increases by 1%; sepsis (p=0.042): patients with sepsis are 3.3 times more likely to develop critical hyperglycemia than those without sepsis. Data are presented in Table 2.

DISCUSSION

Homeostasis is the maintenance of a stable internal environment in an organism through careful regulation of many parameters, including maintaining blood glucose levels within the narrow range of 80–120 mg/dl.

Patients with severe burns experience one of the most severe disruptions of homeostasis. Clinical situations associated with disorders of glucose homeostasis consist of patients previously diagnosed with diabetes, patients with SIH, and patients who suffer from a relative deficiency of insulin in the preoperative period. Based on many studies, hyperglycemia might have different biological or clinical implications and has been associated with an increased risk of adverse outcomes (8,9,10).

Some authors have observed that conventional factors of disease severity, but not the highest glucose value during the first 24 hrs after ICU admission, predict hospital mortality in medical ICU (11). Others concluded that hyperglycemia is an independent risk factor only in patients without diabetic history concretely in cardiac, cardiothoracic, and neurosurgical intensive care units [12]. Correction of hyperglycemia may ameliorate the adverse effects while blocking the catecholamine surge could potentially improve multiple aspects of postburn hypermetabolism (13,14).

Making the so-called point prevalence which in our study is the prevalence with respect to two main periods of the burn disease, we have observed higher values of it on admission compared with those during the disease. Our classification of hyperglycemia is similar to the one of other authors which is based on American Diabetes Association recommendations (15). In the GLUCEMERG study, the prevalence of hyperglycemia on admission was 21% and their patients were divided into three groups: patients with normoglycemia, hyperglycemia with a need for follow-up, and hyperglycemia with the need for intervention where glucose values of the third group were at least 180mg/dl. (16). In our study, the prevalence of hyperglycemia on admission is 15.6 % while during the disease it is 7%, which corresponds with the patients who were treated with insulin therapy.

Emergency Department hyperglycemia has been observed to be a strong predictor of in-hospital outcomes. Many studies emphasized the fact that SIH happened secondary to an increase in the levels of counter-regulatory hormones and that the phenomenon occurs in individuals with and without a history of diabetes (15,16,17).

We have identified through logistic regression many factors associated with the presence of critical hyperglycemia during the disease. This is important because tells us of the need for treatment of the hypermetabolic response not only by Insulin but with other drugs from the armamentarium of pharmacology.

CONCLUSION

The prevalence of critical hyperglycemia in the burned adult and aged population in our center is estimated to be 15.6% on admission and 7% during the burn disease.

Insulin therapy to maintain normoglycemia in severely burned patients can be safely and effectively implemented in the burn unit. This therapy seems to lower infection rates and improve survival. Patients treated with Insulin (in the group of patients with critical hyperglycemia) had a better prognosis than patients with moderate hyperglycemia. For the patients with no

previously diagnosed diabetes, the mean day of beginning with insulin was on the 7th day after burn which also corresponds with parenteral nutrition support. Treatment with Insulin has not only improved the prognosis of these patients but also made possible more surgical interventions for these patients because of their stabilized clinical situation. Insulin was discontinued after the stabilization of glucose values with an average of 28 ±14.9 days of treatment. Intravenous and subcutaneous insulin remain the treatment of choice for critically ill patients. Clinicians face many barriers to developing and implementing glucose control protocols in ICU clinical practice. Protocols and algorithms must be designed to adapt to individual patient responses, as well as work within the limitations of the institution.

REFERENCES

1. Mizock BA. Alterations in fuel metabolism in critical illness: hyperglycemia. Best Pract Res ClinEndocrinolMetab. 2001;15(4):533-51.
2. van den Berghe G, Wouters P, Weekers F, et al. Intensive insulin therapy in critically ill patients. N Engl J Med. 2001;345(19):1359-67.
3. NICE-SUGAR Study Investigators; Finfer S, Chittock DR, Su SY, et al. Intensive versus conventional glucose control in critically ill patients. N Engl J Med. 2009;360(13):1283-97.
4. Jeschke MG, Kraft R, Emdad F, Kulp GA, Williams FN, Herndon DN. Glucose control in severely thermally injured pediatric patients: what glucose range should be the target? Ann Surg. 2010;252(3):521-7; discussion 527-8.
5. Evans, Laura; Rhodes, Andrew; Alhazzani, Waleedet al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021. Critical Care Medicine 49(11):p e1063-e1143, November 2021.
6. Eldaly AS, Avila FR, Torres R, Maita K, Garcia J, Serrano L, Ho O, Forte AJ. Modulation of Burn Hypermetabolism in Preclinical Models. Cureus. 2023;15(1):e33518.
7. Herndon DN, Voigt CD, Capek KD, Wurzer P, Guillory A, Kline A, Andersen CR, Klein GL, Tompkins RG, Suman OE, Finnerty CC, Meyer WJ, Sousse LE. Reversal of Growth Arrest With the Combined Administration of Oxandrolone and Propranolol in Severely Burned Children. Ann Surg. 2016;264(3):421-8.
8. Egi M, Bellomo R, Stachowski E, French CJ, Hart GK, Hegarty C, Bailey M. Blood glucose concentration and outcome of critical illness: the impact of diabetes. Crit Care Med. 2008;36(8):2249-55.
9. Duncan AE. Hyperglycemia and perioperative glucose management. Curr Pharm Des. 2012;18(38):6195-203.
10. Duncan AE, Abd-Elsayed A, Maheshwari A, Xu M, Soltesz E, Koch CG. Role of intraoperative and postoperative blood glucose concentrations in predicting outcomes after cardiac surgery. Anesthesiology. 2010;112(4):860-71.
11. Barmanray RD, Cheuk N, Fourlanos S, Greenberg PB, Colman PG, Worth LJ. In-hospital hyperglycemia but not diabetes mellitus alone is associated with increased in-hospital mortality in community-acquired pneumonia (CAP): a systematic review and meta-analysis of observational studies prior to COVID-19. BMJ Open Diabetes Res Care. 2022 Jul;10(4):e002880.
12. Guillermo E. Umpierrez, Scott D. Isaacs, NiloofarBazargan, Xiangdong You, Leonard M. Thaler, Abbas E. Kitabchi, Hyperglycemia: An Independent Marker of In-Hospital Mortality in Patients with Undiagnosed Diabetes, The Journal of Clinical Endocrinology & Metabolism.2002;87(3):978–982.
13. Vedantam D, Poman DS, Motwani L, Asif N, Patel A, Anne KK. Stress-Induced Hyperglycemia: Consequences and Management. Cureus. 2022 10;14(7):e26714
14. Sommerhalder C, Blears E, Murton AJ, Porter C, Finnerty C, Herndon DN. Current problems in burn hypermetabolism. CurrProbl Surg. 2020;57(1):100709.
15. Zelihic E, Poneleit B, Siegmund T, Haller B, Sayk F, Dodt C. Hyperglycemia in emergency patients--prevalence and consequences: results of the GLUCEMERGE analysis. Eur J Emerg Med. 2015;22(3):181-7.
16. Bochicchio GV, Salzano L, Joshi M, Bochicchio K, Scalea TM. Admission preoperative glucose is predictive of morbidity and mortality in trauma patients who require immediate operative intervention. Am Surg. 2005;71(2):171-4.
17. Sung J, Bochicchio GV, Joshi M, Bochicchio K, Tracy K, Scalea TM. Admission hyperglycemia is predictive of outcome in critically ill trauma patients. J Trauma. 2005;59(1):80-3.

Table 1. Characteristics of the Adults with Critical Hyperglycemia During the Disease Treated with Insulin

VARIABLES	Patients with Critical Hyperglycemia (n=24)		
	Patients Previously Diabetics (n=13)	Patients with Stress-Induced Hyperglycemia (n=11)	Significance level P
Age, years, mean (SD)	63.3 (14.9)	47 (12.8)	**0.0094**
Gender,male, % (n)	61.5 (8)	54.5 (6)	0.9451
TBSA %, mean (SD)	33 (26.1)	46.8 (16.9)	0.1467
The predomination of full-thickness % (n)	76.9 (10)	81.8 (9)	0.8338
LOS, days, mean(SD)	11.1 (10.7)	50 (39.2)	**0.002**
Presence of sepsis, % (n)	46.1 (6)	72.7 (8)	0.3674
Mortality, % (n)	30.7 (4)	0(0)	0
BMI class % (n)			
Underweight	0 (0)	0 (0)	-
Normal	23.2 (2)	9.2 (1)	0.7141
Overweight	46.1 (6)	0 (0)	**0.0335**
Obesity Class I	30.7 (4)	54.5 (6)	0.4454
Obesity Class II	0 (0)	36.3 (4)	**0**
HbA1c %			
<5.7 (Normal) % (n)	0 (0)	45.6 (5)	**0.0255**
5.7-6.4 (Pre-diabetes) % (n)	7.7 (1)	36.3 (4)	0.2243
>6.4 (Diabetes) % (n)	92.3 (12)	18.1 (2)	**0.0011**
Total daily dose(IU), mean(SD)	39.3 (14.1)	39.4 (18.3)	0.9881
Day of insulin initiation, mean (SD)	1.3 (1.1)	7.2 (2.7)	**< 0.0001**
Treatment period (days), mean (SD)	11.3 (10.6)	28 (14.9)	**0.0041**

Table 2. Multiple Regression for Factors Having an Impact in Critical Hyperglycemia

VARIABLES	GROUPS		P-VALUE	ODDS	CI 95%	
	Critical hyperglycemia (n=24)	Non-critical hyperglycemia (n=322)			Lower	Upper
Age (years), mean (SD)	55.8 (15.9)	48.1 (16.8)	**0.025**	1.03	1.01	2.95
BMI, class			**0.006**	2.42	1.22	4.77
Glicemia on admission mg/dL, mean (SD)	248.4 (100.4)	141.6 (45.6)	**<0.001**	1.01	1	3.99
TBSA%, mean (SD)	39.3 (23.05)	31.3 (23)	0.364	1	0.99	1.04
The predomination of full-thickness, % (n)	79.2 (19)	78.5 (253)	0.93	1.02	0.21	4.13
Partial-thickness, % (n)	20.8 (5)	21.5 (69)	Reference			
Presence of Sepsis, % (n)	58.3 (14)	23.6 (76)	**0.042**	3.26	1.04	7.16
Absence of Sepsis, % (n)	41.7 (10)	76.4 (246)	Reference			
Abbreviations						
BSA% (Burn Surface Area)						
BMI kg/m^2 (Body Mass Index)						
Non-critical hyperglycemia(n=322)=Euglycemia(n=204)+Moderate(n=118)						

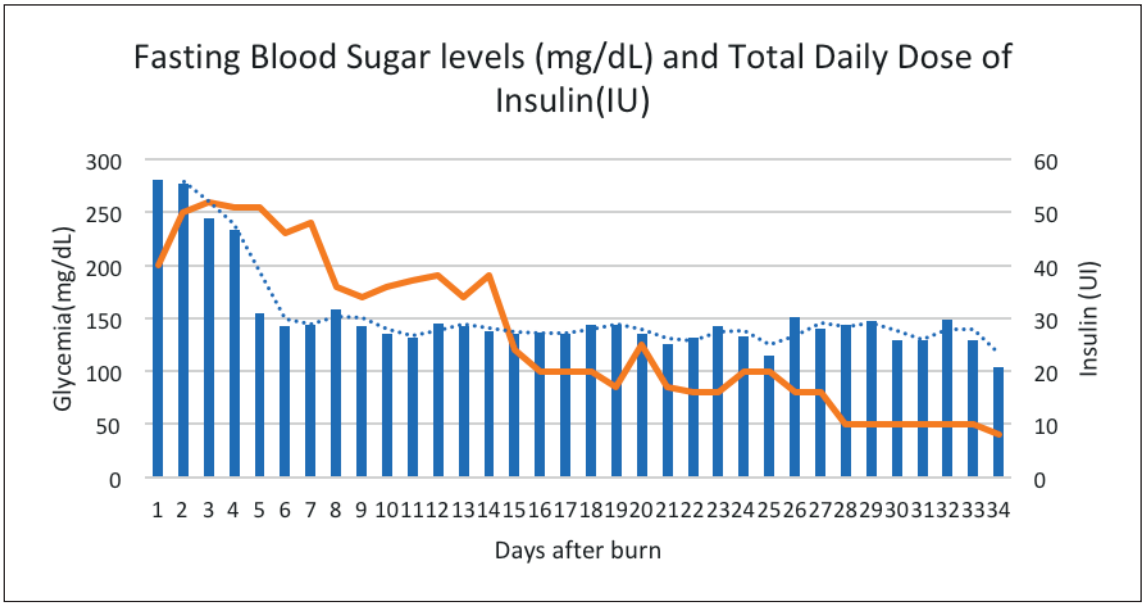


Figure 1. Fasting blood glucose levels and the total daily dose of Insulin (IU) in a patient with SIH.

Common Skin Manifestations in Intensive Care

Hüsne Bayrak Şahin

TOBB ETU, Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: The skin is one of the most affected organs of the patients in intensive care unit (ICU). Although skin lesions in ICU indicate serious life-threating disease such as infection, drug reaction, vasculitis, these are often ignored or delayed and the outcomes would be serious. We aimed to review the causes and differential diagnoses of the common skin lesions of other patients in ICU, not those who have a serious skin disease and need to be treated in ICU.

Material and Methods: While this article was being prepared, the literature was reviewed and publications on skin lesions frequently encountered in intensive care patients were reviewed.

Discussion: Although intensive care treatment is life-saving, it also brings with it a number of undesirable events. Skin rash is not uncommon in a patient whose condition is critical, but treatment should be evaluated quickly and planning should be made to prevent it. If a drug reaction is suspected, all medications that may be relevant should be reevaluated.

Our skin is the largest organ of the body with an area of 1.5 -2 m^2, which is about 8-10% of the body weight. Although the most important function of the skin is being a protection barrier against environmental factors (physical, chemical, microorganisms, etc.), it has important functions in thermoregulation, immune modulation, metabolism and fluid balance.During the follow-up of critically ill patients, immobilization, malnutrition, immunodeficiency, organ dysfunctions, multi drug therapy, inadequate hygiene and use of invazive monitoring techniques are the factors that facilitate the formation of the lesions by disrupting the skin barrier. Intensive care unit patients are patients with multiple organ dysfunction and complex follow-up treatments. Due to the nature of intensive care follow-up, lesions on the skin during daily routines can be ignored, which may lead to a delay in the diagnosis and treatment of life-threatening problems.

Conclusion: In the diagnosis and treatment of skin lesions in intensive care patients, the knowledge and support of dermatologists should be benefited and quick action should be taken.

Keywords: Skin, critical care, drug, rash, infection

PP-08 (Others)
Abstract Only

General Anesthesia in Torg Winchester Syndrome

Rıdvan Durgut, Oğuzhan Pinar, Ayça Tuba Dumanlı Özcan, Ezgi Erkılıç, Handan Güleç

University of Health Sciences Ankara Bilkent City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Torg winchester syndrome; Numerous, painless, subcutaneous nodules are seen, usually limited to the hands and feet. Radiographically, it is accompanied by characteristic enlargement of the osteolyzed metacarpal and metatarsal bones. The resulting bone loss causes pain, pathological fractures and limitation of movement. Bone and joint manifestations characteristically begin in the hands and feet, then spread to larger joints. It is accompanied by hypertrichosis. It can develop a white or transparent appearance in the eyes that covers the cornea. It is stated that Winchester syndrome is inherited by autosomal recessive inheritance. The protein inactivation mutation is found in the matrix metalloproteinase 2 gene (mmp2). MM2 is responsible for bone remodeling. This mutation causes a multicentric syndrome of osteolysis and arthritis. A complete skeletal radiographic examination is mandatory for the diagnosis of Winchester syndrome, along with a detailed musculoskeletal examination and assessment of craniofacial morphology. It is more common in women than men. There are only a few people worldwide who are reported to have this disorder.

Case: A 25-year-old male patient with Winchester syndrome was taken to the operating room for cholecystectomy. He had an ASD repair operation, motor dysfunction in his fingers and toes. His pulmonary, neurological and abdominal examinations were unremarkable. It was learned that his older brother also had the same genetic disorder.

On physical examination: height 90 cm, weight 45 kg, pulse rate 120/min, and blood pressure 120/76 mmHg On airway examination, temporomandibular (TM) joint mobility was normal, a Mallampati II with a distance between incisors of 4 cm and a thyromental distance of 6 cm. The patient was intubated by administering 1 mg midazolam 50 mcg fentanyl 40 mg lidocaine 100 mg propofol 30 mg rocuronium. Anesthesia was maintained with sevoflurane with a MAC of 1.3. There was no intraoperative or postoperative problem in our patient. 1000 cc of saline was administered intraoperatively and the procedure lasted for 2 hours.

Conclusion: When the literature is examined, the problems that may be encountered are as follows: Thick skin, vertebral anomalies, decreased lung capacities, cardiac disease, difficult airway, limitation of movement in the atlanto-axial joint.

Keywords: Torg winchester syndrome, general anesthesia, MMP2

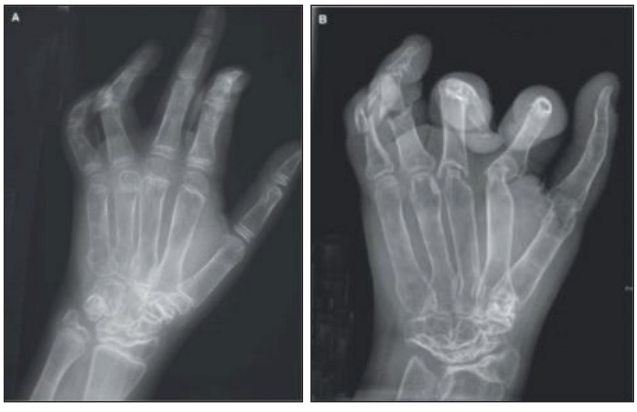


Figure 1. Hand X-ray.

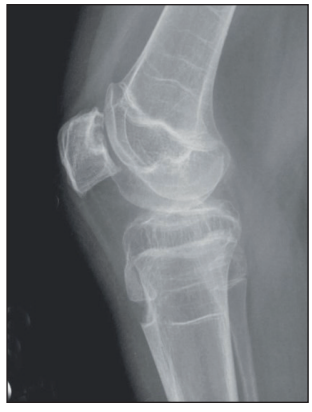


Figure 2. Knee X-ray in TORG.

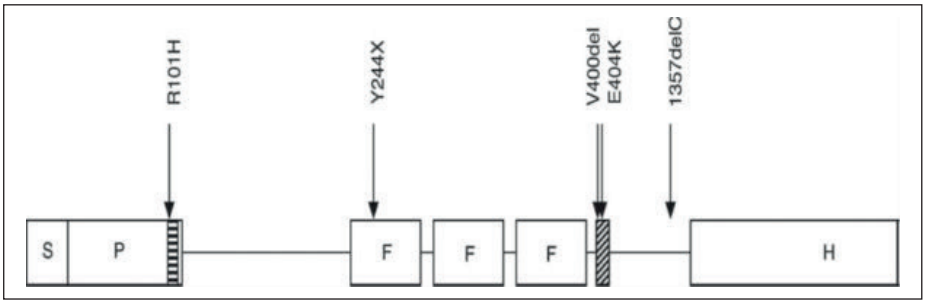


Figure 3. mmp2 gene mutation.

PP-09 (Others)

Abstract Only

Our Approach to Difficult Intubation with Double Lumen Tube Planned for Lung Resection: A Case Report

Merve Sarıyıldız Pehlivan, Mehtap Tunç, Ali Alagöz, Gülay Ülger

Ankara Atatürk Sanatoryum Training and Research Hospital, Ankara, Türkiye

ABSTRACT

Background: Double-lumen tube (DLT) intubation is more complicated due to its thicker diameter, rigid structure, and curve.We aimed to present our approach to intubation with DLT in a case of difficult intubation operated due to a lung nodule.

Case: Lung resection with video-assisted thoracic surgery (VATS) was planned for a 55-year-old male patient with an ASA II, BMI of 22.8 kg/m2, and Mallampati score of 3. Mask ventilation was not difficult. In the laryngoscopic evaluation with Macintosh, it was seen that the Cormack-Lehane score was 3b. Intubation was attempted with a size 39 left DLT, but it was found to be esophageal intubation. Intubation with McCoy laryngoscope failed for second time. In the third attempt, pediatric gum-bougie was tried to be directed to glottis with McGrath Mac video laryngoscope, but it couldn't be directed. Since the patient's mouth anatomy and larynx structure were not suitable for intubation fiberoptic bronchoscope (FOB)-guided DLT intubation, it was decided clinically to ventilate with LMA.The vocal cords were visualized by passing FOB through LMA. Another attempt was made to direct bougie to the trachea with FOB. Since the trachea was deviated to the left, bougie rested on the mucosa in the subglottic area and couldn't be advanced. It was decided to intubate with a single lumen tube with FOB.Intubation was performed with size 8.5 single lumen tube. After bougie was inserted through single lumen tube, tube was removed. DLT was inserted into the trachea by sliding it from the bronchial lumen over bougie. Intubation and tube placement were reconfirmed with auscultation and FOB. This report hasn't been published before. Written informed consent was obtained from the patient.

Conclusion: In difficult intubation in thoracic surgery, prolonged intubation time increases the risk of desaturation due to pulmonary comorbidities. Repetitive attempts and attempting to blindly advance bougie without FOB can result airway trauma. FOB will both facilitate intubation and reduce the possibility of trauma. Anesthesiologists should be familiar with alternative techniques for DLT placement. Creating a plan based on clinical experience and available equipment will increase the chances of success in difficult double lumen tube intubation.

Keywords: Difficult intubation, double lumen tube, fiberoptic bronchoscope

Investigation of the Attitudes and Behaviors of Anesthesiologists for the Prophylaxis and Treatment of Postoperative Nausea and Vomiting

Eskandar Abdullah Ali Ghallab[1], Ferda Yaman[2]

[1]Private Gürlife Hospital, Eskişehir, Türkiye
[2]Eskişehir Osmangazi University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Eskişehir, Türkiye

ABSTRACT

Background: Postoperative nausea and vomiting (PONV) is a patient-important outcome; patients often rate PONV as worse than postoperative pain (1). PONV usually resolves or is treated without sequelae, but may require unanticipated hospital admission and delay recovery room discharge (2). Also, vomiting can result in wound dehiscence, esophageal rupture, aspiration, dehydration, increased intracranial pressure, and pneumothorax. The aim of the study was to make an awareness on the attitude and knowledge of the anesthesiologists.

Material and Methods: The survey study is conducted via the web online between October 2021 and March 2022, after the approval of Eskişehir Osmangazi University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee (Ethics committee date/no: 28.09.2021/04). The study is an observational prospective survey study consists of 17 questions in total. The first 5 questions include demographic data, and the remaining 12 questions are about the attitudes and behaviors of anesthesiologists about prophylaxis and treatment of PONV. Physicians working actively in Anesthesiology and Reanimation clinics were included in the study. The data were obtained by filling out the survey questions via the web online.

Results: 200 physicians working actively in Anesthesiology and Reanimation clinics were included in the study. According to the analysis results of our study, when the rates of encountering PONV are examined; While the rate of those who have never encountered postoperative nausea and vomiting is as low as 4%, the rate of those who encounter frequently (1-2 per week) is 41.5%, which shows that PONV is still an important problem in anesthesia practice. The rate of raising awareness about postoperative nausea and vomiting (PONV) prophylaxis and treatment among anesthesiologists who participated in this survey was 90.0%.

Discussion: The risk assessment and prophylaxis have been determined to be a complication that is still being ignored in clinical practice, and more clinical studies are needed to determine the most appropriate prophylaxis and treatment according to the patient.Enhanced recovery after surgery suggests that it can be integrated into routine practice by arranging preoperative evaluation forms, which include the scoring system for PONV, among the preoperative anesthesia evaluation protocols (3).

Conclusion: Postoperative nausea and vomiting (PONV) still remains an important postanesthetic problem and should not be ignored.

Keywords: Nausea and Vomiting, Postoperative, prevention and control, general anesthesia, enhanced recovery after surgery

REFERENCES

1. Elvir-Lazo OL, White PF, Yumul R, Eng HC. Management strategies for the treatment and prevention of postoperative/postdischarge nausea and vomiting: an updated review. F1000Research. 2020;9.
2. Fortier J, Chung F, Su J. Unanticipated admission after ambulatory surgery--a prospective study. Can J Anaesth 1998; 45:612.
3. Gan TJ, Belani KG, Bergese S, et al. Fourth Consensus Guidelines for the Management of Postoperative Nausea and Vomiting. Anesth Analg 2020; 131:411.

Anesthesia Management of a Child with Noonan Syndrome Undergoing Craniotomy

Asli Ayaz

University of Health Sciences Ankara Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Noonan syndrome (NS) is a genetically transmitted autosomal dominant disorder characterized by clinical findings of facial dysmorphism, congenital heart disease, and short stature. The potential anesthetic issues presented by patients with NS relate to impairment of cardiopulmonary function, possibility of a difficult airway, bleeding abnormalities with factor XI deficiency and platelet abnormalities. In this case report, we present successful anesthesia management of a child with NS undergoing craniotomy, who had previous cardiac surgery.

Case: A 13-years old, 35 kg male with NS was scheduled to craniotomy due to glial tumor excision. It was learnt from his medical history that pulmonary reconstruction was performed at the age of 3 (Figure 1). Preoperative laboratory results and chest X-ray were within the normal limits and his physical capacity was normal. He had micrognatia, hypertelorism and short stature for age. His neck motion and mouth opening were not limited, and Mallampati score was II. After standard monitorization (SpO_2: 98 %, electrocardiogram, noninvasive blood pressure: 125/75 mmHg; pulse rate 95 beats/min), and confirming adequate ventilation with a face-mask ($ETCO_2$ detection) anesthesia was induced with ketamin, midazolam and rocuronium. Following successful endotracheal entubation, anesthesia was maintained with sevoflurane and remifentanil infusion. Pre-incision scalp block was administered for postoperative pain after craniotomy. Although he did not have any known bleeding disorder there was oozing on the surgical site. Blood pressure elevations during the intraoperative period were controlled with nitrogliserine infusion. At the end of the surgery, neuromuscular blockade was reversed with neostigmine and atropine. He was extubated and transferred to the pediatric intensive care unit.

Conclusion: Considering that patients with NS may have airway difficulties, caution should be exercised in terms of intubation and extubation. Bleeding disorder and cardiac defects may accompany in many of the patients with NS. Medical history of a NS patient should be well questioned and difficult airway management protocols should be applied with care by anesthesiologists. Preoperative evaluation must be done very carefully on a multidisciplinary approach.

Keywords: Pediatric, Noonan syndrome, anesthesia

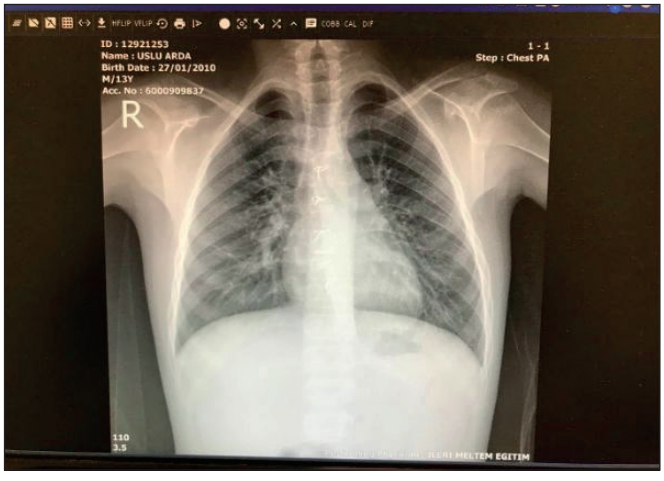


Figure 1. Chest X-ray showing the sternum closure wires.

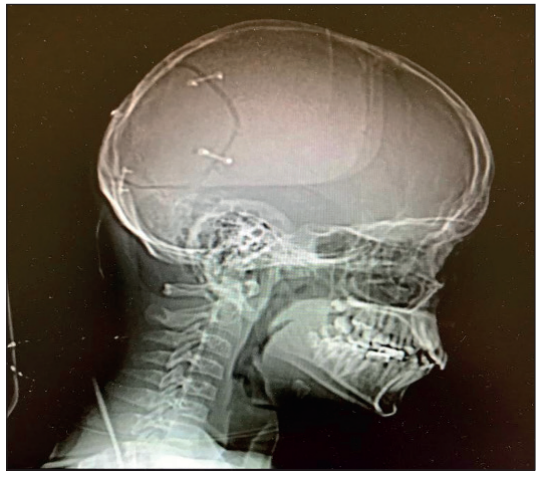


Figure 2. Lateral view showing face, cranium and cervical vertebra.

PP-12 (Regional Anesthesia)
Full Manuscript

Thoracal Epidural Anaesthesia for Emergency Laparotomies in the Elderly Patients

Seyma Akpinar, Halil Ergün

Bilecik Research and Training Hospital, Bilecik, Türkiye

ABSTRACT

Background: Epidural anaesthesia has lots of advantages in the perioperative period. Mechanical ventilation requirement, thromboembolic events, stress response, morbidity and mortality can be reduced with epidural blocks. In addition, it can also increase gastrointestinal motility and perfusion. When we take into account all of these, thoracal epidural anaesthesia (TEA) could be the preferred method for emergency laparotomy. In this case series, we would like to share our experience with TEA in 3 elderly patients who are scheduled for emergency laparotomy.

Case: Three patients who are over 65 and ASA status IIIE, are scheduled for emergency laparotomy due to intraperitoneal pathologies. After the standard ASA monitorization, premedication with 1 mg midazolam and 50mcq fentanyl was administered. An epidural catheter was inserted under local anaesthesia in a sitting position with sterile conditions. We preferred the “hanging drop” technique at the level of T7 for the catheter.

For medication, 10 ml 2% lidocaine, 2 ml sodium bicarbonate, 2 ml fentanyl and 6 ml 0.9 % sodium chloride were mixed in the 20 ml syringe. With the aim of T4-T12 level anaesthesia, the first 5 ml of the mixture was administered. The aimed level was checked with pin-prick test 15 minutes after the first dose and surgery were started. Maintenance dose were administered as 5 ml of the mixture after 30 minutes from the first dose. After the surgery, patients were followed-up at the intensive care unit.

Conclusion: General anaesthesia is the commonest method in emergency laparotomy. However, in the literature, general anaesthesia was found to be related to pulmonary side effects, thromboembolic events and increased length of stay in the hospital.

In this case series, the low dose of the lidocaine-bicarbonate mixture was used in TEA because of its rapid onset. We showed that T4-T12 level TEA can be preferred for emergency laparotomy in elderly patients who has cardiopulmonary comorbidities. With TEA, cardiovascular stability can be provided and pulmonary side effects can be reduced in the perioperative period.

Keywords: Epidural anesthesia, laparatomy, eldery

INTRODUCTION

Throracal epidural block(TEA) is widely applied for anaesthesia and postoperative analgesia in many abdominal, thoracic, and cardiovascular surgeries. The application of TEA may reduce mortality, morbidity, and hospitalization in patients, as they do not require mechanical ventilation and a decrease in thromboembolic events. Additionally, sympathetic blockade below the block level can increase gastrointestinal motility and perfusion, reduce postoperative nausea and vomiting, and contribute to reducing myocardial ischemia and systemic stress response (1-4). TEA has also been shown to significantly reduce postoperative pain incidence (5). Considering all of these factors, the use of TEA in advanced-age patients who need abdominal surgery procedures with high-risk additional comorbidities may be preferred due to its benefits for patient survival. These benefits include reduced postoperative ileus (6), improved pulmonary function (7), earlier mobilization (8), reduced hormonal stress response (9), and hemodynamic stability.

In this case series, we aimed to share our experience with TEA, which we applied to three elderly high-risk patients who needed abdominal surgery.

CASES

In this case series, we had three elderly patients who needed urgent laparotomy. 1 mg of Midazolam and 50 mcg of fentanyl were given as sedation in the preoperative room. In the operating room, routine monitoring (electrocardiography-ECG, oxygen saturation-SpO2, noninvasive arterial blood pressure-NIBP) was applied to the patients. Intravenous access was established for all patients, and arterial cannulation was applied to one patient. A nasogastric tube placement was inserted successfully after the topical anaesthesia for intraoperative gastric drainage. Then patients were given position and the area where the epidural catheter was to be inserted was cleaned with aseptic techniques. We used lidocaine (20 mg/mL) as a local anaesthetic in the skin and underlying soft tissue, and an 18-gauge Touhy needle (Combifix Standard,18G; Egemen International Medical Inc, İzmir, Türkiye) with a 20-gauge catheter (Combifix Standard,20G; Egemen International Medical Inc, İzmir, Türkiye) for the procedure. An epidural catheter was inserted at the T7 level in the thoracic region with the hanging drop technique. A total 20 ml solution

was prepared with 10 mL of 2% lidocaine (20 mg/mL), 2 mL of sodium bicarbonate (%8.4 10 mL), 2 mL of fentanyl (50 mcg/mL) and 6 mL of 0.9% NaCl. For the first dose, 5 mL of this solution was administered to all cases. Segmental epidural anaesthesia was successfully achieved in all three cases. Sensory block was verified using cold sensation. After the first dose, the surgical procedure was allowed for all patients 10-15 minutes later. Subsequent doses of 5 mL were repeated with the prepared solution at 25-30 minute intervals. Patients were followed up in the postoperative intensive care unit.

Case 1

An urgent laparotomy was planned for ileus which caused an obstruction in a 90-year-old male patient with a known diagnosis of Alzheimer's and immobility. The patient was evaluated as ASA (The American Society Anesthesiologist Physical Status Classification System) 3E in preoperative evaluation. The patient did not have any known cardiac disease or history of medication, but after routine monitoring, vital signs were: heart rate 182 (in atrial fibrillation rhythm), blood pressure (BP) 140/75 mmHg, and SpO2 83%. The patient was provided with 4 L/min of oxygen support via nasal cannula and the SpO2 was increased to above 90%. The patient became hypotensive after the first dose of epidural, but was stabilized with fluid support and 10 mg of Ephedrine. A cardiology consultation could not be performed due to the urgent case. No additional sedation was administered other than preoperative sedation. The operation ended in 42 minutes, A colostomy was performed. No additional doses were administered after the initial dose from the epidural catheter.

Case 2

A 69-year-old patient who had any known additional diseases underwent a distal gastrectomy 11 days prior due to stomach perforation. The patient was planned for another laparotomy operation because of the bile leakage and enterocutaneous fistula. The patient was evaluated for ASA 3E. After monitoring, the patient's BP was 90/62 mmHg, SpO2 was 95%, and heart rate was 110 bpm. The operation ended in 150 minutes and an additional 10 ml dose was administered via the epidural catheter, divided into 2 doses of 5 ml each. The patient became hypotensive 10 minutes after the initial dose, and was stabilized with fluid support and a total of 25 mg of Epinephrine. The patient was transferred to the intensive care unit postoperatively, Patient died on the 23rd day due to sepsis.

Case 3

An 88-year-old patient with non-cooperative consciousness and no known additional diseases was planned for an urgent laparotomy due to ileus. The patient also had cough and sputum complaints. In the respiratory system examination of the patient, his lung sounds were bilaterally coarse and rales were present. The patient was evaluated for ASA 3E in preoperative anaesthesia evaluation. The patient had acute hypovolemic hypernatremia and acute renal failure with laboratory values of Na: 159, K: 2.27, creatinine: 1.5, urea: 87, and CRP: 70. Internal medicine and chest disease consultations could not be performed due to the urgency of the case. After monitoring, the patient's BP was 130/85 mmHg, SpO2 was 90%, and heart rate was 85 bpm. The patient was provided with 3-4 L/min of oxygen support via nasal cannula and the SpO2 was increased to above 92%. During the 165-minute operation, an additional 10 ml dose was administered from the epidural catheter, divided into 2 doses of 5 ml each. The patient's hemodynamics parameters were stable. The patient was transferred to the intensive care unit postoperatively and died on the 8th day due to acute renal failure and sepsis.

DISCUSSION

In these cases, we achieved successful anaesthesia management with segmental thoracic epidural anaesthesia (T4-T12) in patients with high cardiac risk and reduced pulmonary function who were planned for emergency laparotomy. The local anaesthetic solution we used in the epidural anaesthesia was lidocaine solution with added bicarbonate. We preferred lidocaine because of its fast onset of action.

General anaesthesia is the commonest method in emergency laparotomy surgeries. General anaesthesia may cause intraoperative and postoperative respiratory complications because of the necessity of endotracheal intubation (10,11). General anaesthesia can result in decreased functional residual capacity (FRC), alveolar hypoventilation, and bronchospasm, and can also cause gastric regurgitation, which can cause aspiration of gastric contents (7). Although the exact mechanism of how thoracic epidural anaesthesia and analgesia improve postoperative lung function is not understood, it is known to improve diaphragmatic function and provide better postoperative analgesia than intravenous analgesic agents such as opioids (13). Polaner et al. (14) placed sonomicrometry crystals on different parts of the diaphragm and observed a significant improvement in diaphragmatic function under epidural anaesthesia. In the same year, the same authors were able to demonstrate an improvement in respiratory

patterns during the transition from rapid shallow breathing to slow deep breathing phase in patients undergoing abdominal aortic surgery. Later, Warner et al. (15) examined diaphragmatic movement and respiratory muscle activity in volunteers and found an increase in FRC and a decrease in intrathoracic blood volume. Overall, there seems to be a direct effect of thoracic epidural anaesthesia on diaphragmatic contractility and respiratory pattern. In addition, in 2000, a larger meta-analysis that analyzed the effects of regional anaesthesia on perioperative morbidity and mortality in 141 randomized studies and nearly 10,000 patients followed this analysis. Among other effects, these researchers found a 39% reduction in postoperative pneumonia and about a one-third reduction in mortality under epidural anaesthesia (16). Based on these studies, it can be said that epidural anaesthesia improves postoperative vital capacity and FRC, provides better analgesia than all other techniques, and reduces the incidence of postoperative pulmonary complications. One of our cases had a cough and sputum symptoms. In this case, the patient had not experienced intraoperative or postoperative pneumonia complications or any pulmonary function loss.

After a local anaesthetic solution injection is applied via epidural catheter more segmental blockade occurs in elderly patients compared to young patients (17). Another study showed that elderly patients require a lower dose of a local anaesthetic solution to achieve the same number of blocked segments. In our cases, we achieved high segmental blockade using a low dose of local anaesthetic solution. Additionally, there is a greater incidence of hemodynamic instability with increasing age in elderly patients (18). One of our patients is shown hypotension after drug administration, but low-dose epinephrine and saline administration were helpful to overcome the hypotension.

The potential benefits of the segmental blockade in thoracic epidural anaesthesia include effective mobilization. In the elderly patient population, mobilization results in a significant reduction in morbidity and mortality. Furthermore, animal studies have shown that segmental blockade leads to vasodilation in the blocked segments and reflex narrowing in the unblocked areas, as well as improved tissue oxygenation and improved myocardial blood flow distribution that has effects on wound healing. (19-21).

As a result, the elderly population continues to increase and the need for elective or emergency laparotomy surgeries will increase day by day in this large elderly group. Thus, small improvements in outcomes and reduction in the incidence of complications in this large group can have a dramatic impact on the burden of healthcare delivery.

REFERENCES

1. Basse L, Raskov HH, Jakobsen DH et al. Accelerated postoperative recovery programme after colonic resection improves physical performance, pulmonary function and body composition. Br J Surg 2002; 89:446–453
2. Loick HM, Schmidt C, van Aken H et al. High thoracic epidural anesthesia, but not clonidine, attenuates the perioperative stress response via sympatholysis and reduces the release of troponin T in patients undergoing coronary artery bypass grafting. Anesth Analg 1999;88:701–709
3. Olausson K, Magnusdottir H, Lurje L, Wennerblom B, Emanuelsson H, Ricksten S-E. Anti-ischemic and antianginal effects of thoracic epidural anesthesia versus those of conventional medical therapy in the treatment of severe refractory unstable angina pectoris. Circulation 1997; 96:2178–2182
4. Rutberg H, Hakanson E, Anderberg B, Jorfeldt L, Martensson J, Schildt B. Effects of the extradural administration of morphine or bupivacaine on the endocrine response to upper abdominal surgery. Br J Anaesth 1984; 56:233–238
5. Guay J, Nishimori M, Kopp S. Epidural local anaesthetics versus opioid-based analgesic regimens for postoperative gastrointestinal paralysis, vomiting and pain after abdominal surgery. Cochrane Database of Systematic Reviews. 2016
6 Basse L, Madsen JL, Kehlet H. Normal gastrointestinal transit after colonic resection using epidural analgesia, enforced oral nutrition and laxative. British Journal of Surgery 2001; 88: 1498–500.
7 Ballantyne JC, Carr DB, deFerranti S, et al. The comparative effects of postoperative analgesic therapies on pulmonary outcome: cumulative meta-analyses of randomized controlled trials. Anesthesia and Analgesia 1998; 86: 598– 612.
8 Hjort Jakobsen D, Sonne E, Basse L, Bisgaard T, Kehlet H. Convalescence after colonic resection with fast-track versus conventional care. Scandinavian Journal of Surgery 2004; 93: 24–8.
9 Holte K, Kehlet H. Epidural anaesthesia and analgesia – effects on surgical stress responses and implications for postoperative nutrition. Clinical Nutrition 2002; 21: 199–206.
10. Caplan RA, Posner KL, Ward RJ, Cheney FW. Adverse respiratory events in anesthesia: A closed claims analysis. Anesthesiology 1990; 72: 828-833
11. Warner DO, Warner MA, Offord KP, Schroeder DNR, Maxson P, Scanlon PD. Airway obstruction and perioperative complications in smokers undergoing abdominal surgery. Anesthesiology 1999; 90: 372-379.

12. Eikermann M, Blobner M, Groeben H et al. Postoperative upper airway obtruction after recovery of the train of four ratio of the adductor pollicis muscle from neuromuscular blockade. Anesth Analg 2006; 102: 937-942.
13. Groeben H. Epidural anesthesia and pulmonary function. *J Anesth*. 2006;20(4):290-299.
14. Polaner DM, Kimball WR, Fratacci MD, Wain JC, Zapol WM. Thoracic epidural anesthesia increases diaphragmatic shortening after thoracotomy in the awake lamb. Anesthesiology 1993; 79:808–816
15. Warner DO, Warner MA, Ritman EL. Human chest wall function during epidural anesthesia. Anesthesiology 1996; 85:761–773
16. Rodgers A, Walker N, Schug S et al. Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomised trials. Br Med J 2000; 321:1–12
17. Hirabayashi Y, Shimizu R. Effect of age on extradural dose requirement in thoracic extradural anaesthesia. Br J Anaesth 1993; 71: 445–46.
18. Holman SJ, Bosco RR, Kao T et al. What constitutes an effective but safe initial dose of lidocaine to test a thoracic epidural catheter? Anesth Analg 2001; 93: 749–54.
19. Taniguchi M, Kasaba T, Takasaki M. Epidural anaesthesia enhances sympathetic nerve activity in the unanesthetized segments in cats. Anesthesia and Analgesia 1997; 84: 391–7.
20. Buggy DJ, Doherty WL, Hart EM, Pallett EJ. Postoperative wound oxygen tension with epidural or intravenous analgesia: a prospective, randomized, single-blind clinical trial. Anesthesiology 2002; 97: 952–8
21. Kabon B, Fleischmann E, Treschan T, Taguchi A, Kapral S, Kurz A. Thoracic epidural anesthesia increases tissue oxygenation during major abdominal surgery. Anesth Analg 2003; 97: 1812–7.

Table 1. Summary of Patients' Data

Case No	Age	Gender	Comorbidities	Surgery Type	Surgery Time (Min)	Total Epidural Dose
1	90	male	alzheimer,atrial fibrillation	Laparatomy (ileus)	42	5 ml
2	79	male	postoperative gastric perforation	Laparatomy (enterocutaneous fistula)	150	5+5 ml
3	88	male	acute kidney failure,pneumonia	Laparatomy (ileus)	165	5+5 ml

PP-13 (Regional Anesthesia)
Full Manuscript

Neuraxial Anesthesia at Knee Amputation in Patient with Heart Failure

Mehlika Kuşvuran Kurtay, Eda Uysal Aydın, Handan Güleç

University of Health Sciences Ankara City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Background: Cardiovascular diseases are encountered very frequently in anesthesia practices and are a significant cause of perioperative morbidity and mortality.

This case report provides an anesthetic approach in the lower extremity amputation surgery of a patient with congestive cardiac failure besides insulin-dependent diabetes mellitus, hypertension and chronic renal failure.

Case: A male patient aged 61 years, scheduled for amputation below the right knee due to diabetic foot, had hypertension, chronic renal failure, diabetes mellitus, coronary artery disease and congestive cardiac failure and used furosemide, clopidogrel, insulin, proton pump inhibitor, and inhaler. The patient who had a history of cardiac arrest a month ago had ejection fraction of 25% on echocardiography, left bundle branch block on electrocardiogram, and pleural effusion image on chest radiography. The patient who was evaluated as ASA IV was applied a standard monitorization. Using a 22-gauge Quincke spinal needle under aseptic conditions from the L4-L5 interval, the spinal anesthesia with 5 mg bupivacaine heavy and 30 microgram fentanyl was administered on the basis of midline approach. The surgical operation was initiated when the sensory block level was T12. For sedation, intravenous 1 mg dormicum was administered. The blood pressure during the operation was stable and the initial blood pressure was 129/71 mmHg, heart rate was 81 beats/min, and oxygen saturation was 99% in the postoperative recovery room. The patient was transferred to the service without any problem.

Conclusion: General anesthesia causing vasodilation and loss of sympathetic tonus, results in reduction in blood pressure both in induction and maintenance by disruption of the normal heart-lung interaction induced by mechanical ventilation. According to a retrospective study analyzing intraoperative hemodynamic status in 57 ASA IV patients who underwent above-the-knee amputation by applying peripheral nerve block, the majority of patients were hemodynamically stable apart from 10 patients requiring vasopressor during surgery. A subarachnoid block was preferred to decrease the drugs used and to use less sedative agents in this case. We believe that neuraxial anesthesia performed using appropriate doses and drug combinations in comorbid patients with low ejection fraction can reduce perioperative morbidity and mortality by ensuring stable hemodynamics.

Keywords: Neuraxial anesthesia, heart failure, amputation, high risk procedure, perioperative risk

INTRODUCTION

Cardiovascular diseases are very common diseases in anesthesia practice and are a major cause of perioperative morbidity and mortality. (1) Lower extremity amputation was considered high risk for 30-day cardiovascular death and myocardial infarction, regardless of underlying cardiovascular disease, depending on the type of surgery or intervention. (2) Systolic heart failure occurs when the heart cannot pump enough blood to meet the body's metabolic needs. (1) Congestive heart failure is associated with high perioperative risk and contributes significantly to mortality. (1,8) Transthoracic echocardiography has a key role in the preoperative evaluation of patients with known or suspected heart failure. (2) The role of left ventricular ejection fraction has been investigated in non-cardiac surgery patients and it has been shown that an ejection fraction of less than 30% is associated with a significant increase in mortality and myocardial infarctions. (8) Clinical risk factors according to the adjusted cardiac risk index; ischemic heart disease, heart failure, stroke, renal dysfunction and insulin-requiring diabetes mellitus. (4) In this case report, anesthetic approach in lower extremity amputation surgery of a patient with congestive heart failure as well as insulin-regulated diabetes mellitus, hypertension and chronic renal failure is presented.

CASE

A 61-year-old male patient, who was scheduled for amputation below the right knee due to diabetic foot, was receiving hemodialysis 3 times a week due to chronic renal failure. The patient with the diagnosis of hypertension, coronary artery disease and congestive heart failure had coronary artery bypass grafting 11 years ago and was using proton pump inhibitor,furosemide, clopidogrel, insulin and inhaler. The patient was evaluated before anesthesia. The general condition of the patient, who was followed up with an oxygen cannula in the service, was moderate. The patient with a Mallampati score of 2 had bilateral basal rales on listening. The patient, who had a history of cardiac arrest one month ago, had an ejection fraction of 25% on echocardiography, pleural effusion on chest X-ray and incomplete left bundle branch block on electrocardiography. In the preoperative examinations of the patient, hemoglobin was 9.1 g/dl, creatinine was 3.04 mg/dl, and INR was 1.5. Standard

monitoring was applied to the patient who was evaluated as ASA4. Preoperative blood pressure was 122/75 mmHg, heart rate was 85 beats/min, and oxygen saturation was 98% with nasal cannula. It was decided to apply spinal anesthesia to the patient who had not used clopidogrel for a week. Spinal anesthesia was applied to the patient through the midline approach using a 22G Quincke spinal needle under aseptic conditions from the L4-L5 interval. 5 mg bupivacaine heavy and 30 microgram fentanyl were applied to the intrathecal space. Sensory block was evaluated with the help of a blunt-tipped needle, and the surgical procedure was started when the block level was T12. Intravenous 1 mg dormicum was administered for sedation. The initial blood pressure measured after spinal anesthesia was 130/74 mmHg, heart rate was 85 beats/min, and oxygen saturation was 99%. The blood pressure of the patient, whose operation lasted for 1 hour, was similar throughout the operation, and the initial blood pressure in the postoperative wake-up room was 129/71 mmHg, heart rate was 81 beats/min, and oxygen saturation was 99%. In the postoperativeexamination in the wake-up unit, the sensory block level was T12 and the motor block started to return. The patient, who was delivered to the service from the wake-up unit without any problem, continued to be followed in the service with a nasal oxygen cannula.

DISCUSSION

Amputation procedures are often painful and associated with a high perioperative cardiovascular risk. While 90% of these procedures can be preferred under regional anesthesia, they are still performed under general anesthesia. According to a study comparing the results of general and regional anesthesia in lower extremity amputation procedures between 2013 and 2018; Regional anesthesia was preferred in only 13% of the patients, and although these patients were older and had higher comorbidities (diabetes mellitus, end-stage renal disease, congestive heart failure, coronary artery disease) compared to the patients who preferred general anesthesia, there were 30 percent difference between the two groups. There was no statistically significant difference in terms of daily major cardiovascular events and mortality. (5)

In a study retrospectively examining the results of general and regional anesthesia in a total of 434 procedures of 323 patients who underwent below-knee or above-knee amputation, surgical complications, the need for surgical revision, and the need for an intensive care unit were found to be significantly higher in patients who received general anesthesia (6).

In a case report of a patient with ischemic dilated cardiomyopathy and congestive heart failure with an ejection fraction of 27% who underwent below-knee amputation, unilateral spinal anesthesia was applied and hemodynamic stability was preserved throughout the operation. In this case report, 75 mg heavy bupivacaine, 4 micrograms dexmedetomidine and 25 mg While spinal anesthesia was applied using microgram of fentanyl, spinal anesthesia was applied at L4-L5 level using 5 mg heavy bupivacaine and 30 µg fentanyl in our case report, and hemodynamic stability was preserved in both cases despite low ejection fraction. (7)

There is no consensus on the use of a specific anesthetic technique in patients with congestive heart failure. Therefore, the use of individual anesthetic drugs is usually based on expert opinion and pathophysiological considerations. (8) The gold standard in monitoring is intraoperative and postoperative monitoring of ventricular morphology and function by echocardiography. In this case, regional anesthesia using low-dose drugs and noninvasive blood pressure monitoring were preferred in order to maintain hemodynamic stability. General anesthesia causes vasodilation and loss of sympathetic tone; In addition, it causes a decrease in blood pressure both in induction and maintenance by disruption of the normal heart-lung interaction due to mechanical ventilation. (8) Regional anesthesia may also cause a decrease in blood pressure secondary to loss of sympathetic tone. (1) According to a retrospective study evaluating intraoperative hemodynamic status in 57 ASA4 patients who underwent above-knee amputation by applying peripheral nerve block, the majority of patients were hemodynamically stable during surgery, except for 10 patients who required vasopressors during surgery. (9) In this case, subarachnoid block was preferred in order to keep the volume of drug used less and to use less sedative agents. As a result, in comorbid patients with low ejection fraction, using neuraxial anesthesia and using appropriate drug combinations at low doses can provide perioperative hemodynamic stability. Providing perioperative hemodynamic stability will reduce perioperative morbidity and mortality.

REFERENCES

1. Butterworth IV, J. F., Mackey, D. C., & Wasnick, J. D. Morgan & Mikhail's. 2013
2. Anderson, J. L., Antman, E. M., Harold, J. G., et al .Clinical practice guidelines on perioperative cardiovascular evaluation:collaborative efforts among the ACC, AHA, and ESC. *Circulation* 2014; *130*(24), 2213-2214.
3. Glance, L. G., Lustik, S. J., Hannan, E. L et al. The Surgical Mortality Probability Model: derivation and validation of a simple risk prediction rule for noncardiac surgery. *Annals of Surgery* 2012; *255*(4), 696-702.

4. Lee TH, Marcantonio ER, Mangione CM et al.Derivation and prospective validation of a simple index for prediction of cardiac risk of majör noncardiac surgery. Circulation 1999;100:1043–1049.
5. Hall, M. R., Kalbaugh, C. A., Tsujimoto, T. H., McGinigle, K. L. Regional Anaesthesia Alone is Reasonable for Major Lower Extremity Amputation in High Risk Patients and May Initiate a More Efficacious Enhanced Recovery Programme. *European Journal of Vascular and Endovascular Surgery* 2020; *60*(5), 747-751.
6. Niskakangas, M., Dahlbacka, S., Liisanantti, J., Vakkala, M., Kaakinen, T. Spinal or general anaesthesia for lower-limb amputation in peripheral artery disease–a retrospective cohort study. *Acta Anaesthesiologica Scandinavica* 2018: *62*(2), 226-233.
7. Mulugeta, H., Zemedkun, A., Getachew, H .Selective Spinal Anesthesia in a Patient with Low Ejection Fraction Who Underwent Emergent Below-Knee Amputation in a Resource-Constrained Setting. *Local and Regional Anesthesia* 2020; *13*, 135.
8. Smit-Fun, V, Buhre, W. F. The patient with chronic heart failure undergoing surgery. *Current Opinion in Anaesthesiology* 2016; *29*(3), 391-396.
9. Chandran, R., Beh, Z. Y., Tsai, F. C., Kuruppu, S. D.,Lim, J. Y. Peripheral nerve blocks for above knee amputation in high-risk patients. Journal of Anaesthesiology, Clinical Pharmacology 2018; 34(4), 458–464.

Is Neuraxial Anesthesia Safe in Patients with Aortic Stenosis?

Enes Eskin, Arzu Karaveli

University of Health Sciences, Antalya Training and Research Hospital, Department of Anesthesiology and Reanimation, Antalya, Türkiye

ABSTRACT

Background: Aortic stenosis (AS) is the most common heart valve lesion, the incidence of which increases with age. Due to the high risk of perioperative morbidity and mortality in AS patients, anesthetic management is challenging. General anesthesia (GA) is preferred to neuraxial anesthesia (NA), which is traditionally considered to be contraindicated in patients with AS. In this case report, we aimed to describe the NA management in a patient with severe AS and to review the evidence on NA applications in the light of the literature.

Case: A 91-year-old-male patient with a history of severe AS, asthma, PHT, coronary artery and cerebrovascular disease was scheduled for elective revision-surgery due to hip fracture. The patient was admitted to the ICU one-month ago following a right total hip-arthroplasty under GA. On the third-day of the ICU, coronary angiography and TAVI were recommended with the diagnosis of NSTEMI. Because the procedure was rejected by the patients' relatives, he was discharged with antiplatelet medication. Due to the patient's significant comorbidity, bilateral ronchus and ASA-IV status, we decided to avoid GA and apply NA. Following invasive monitoring, combined spinal/epidural anesthesia was administered (0.5% isobaric bupivacaine), through the L3-4 interval. During the surgery, the sensorial block level was maintained at T12 by administering an intermittent bolus. After the surgery, the patient, was taken to the PACU.

Conclusion: The goal of anesthesia management in AS patients is to preserve cardiovascular stability to avoid hypotension and ischemia. In these patients, GA is usually preferred to NA. Because of its sympatholytic impact, NA may cause a rapid and significant decrease in SVR, resulting in hypotension and a reduction in coronary perfusion. GA, on the other hand, may have a more noticeable cardiovascular effect than NA due to induction-triggered hypotension with decreased venous return and vascular tone. Furthermore, the use of muscle relaxants and positive airway pressure could possibly result in an even higher haemodynamic shift, which is harmful to the AS patient. We believe that carefully managed NA, especially in advanced age patients with AS, could be reduce the patient's risk of perioperative morbidity and mortality and a feasible alternative to GA.

Keywords: Aortic stenosis, anesthesia management, neuraxial anesthesia, general anesthesia

100th Anniversary of The Republic

Anesthesiology and Reanimation Specialists' Society Congress

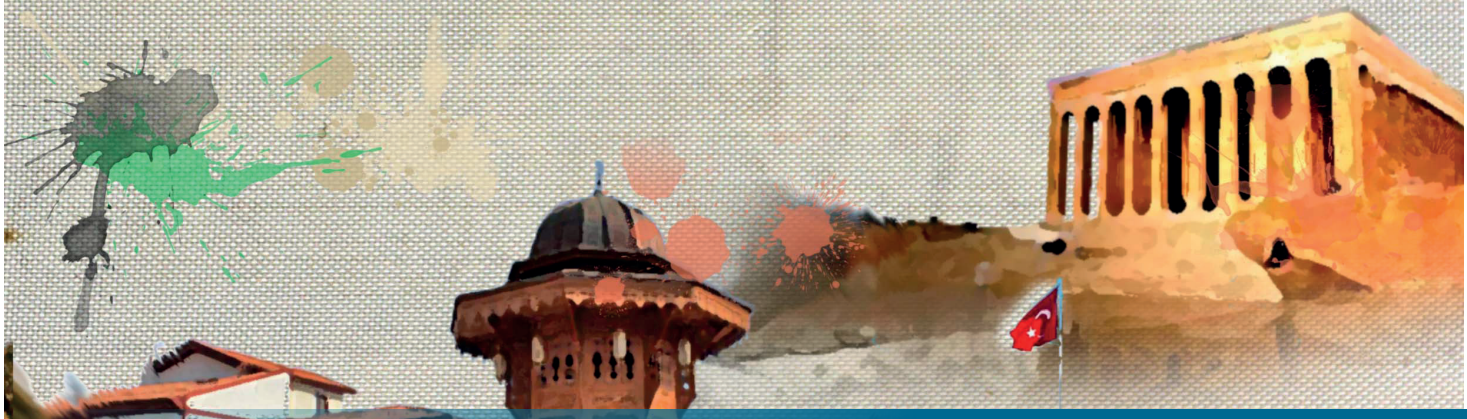
BALKAN STATES ANESTHESIA DAYS - VIII

Anesthesia and Intensive Care In The Light of The 100th Anniversary of Our Republic

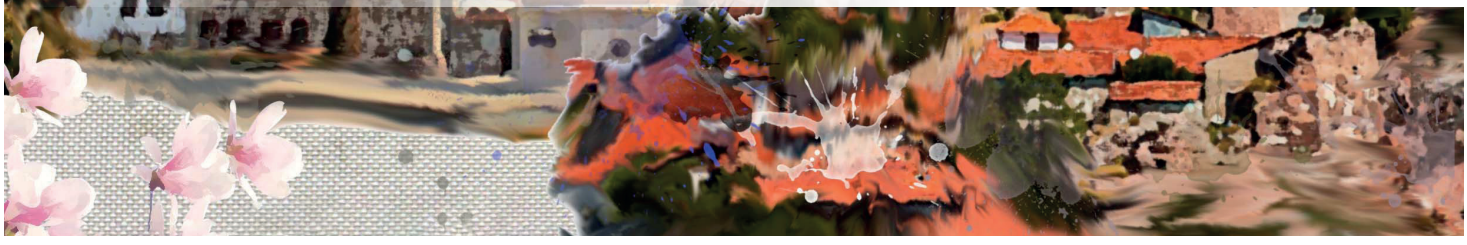
28-30 April 2023

Ankara University, School of Medicine
Abdulkadir Noyan Conference Hall
Ankara, Türkiye

www.arud2023.org



SPECIALIST SECTION



SS-01
Full Manuscript

Anesthesia Practice in Dentistry

Merve H. Kocaoğlu, M.D.

Ankara University Faculty of Dentistry, Department of Pediatric Dentistry, Ankara, Turkey

INTRODUCTION

There is an increasing need for various applications of anesthesia practice for different procedures and different patient groups in dentistry. In the practice of dentistry, anesthesia is applied on a wide scale, from office-based sedation procedures to general anesthesia for surgical procedures. At this point, the increase in the familiarity of dentists with anesthesia practice, the correct planning, the application of anesthesia in environments with the appropriate infrastructure and full team and equipment will also minimize the complications that may arise.

Anesthesia Concept in Dentistry

Since most procedures in dentistry are elective, patient safety should be considered in the first place. Being radical in treatment methods and reducing the duration of anesthesia and thus the cost in repetitive procedures will also reduce the risks associated with anesthesia.

Sedation is mostly indicated in young children with limited cooperation likewise children and adults with genetic disorders or mental retardation. Sharing the airway with the dentist can lead to various complications during sedation. Appropriate patient selection, avoidance of drug combinations, and planning the duration of anesthesia in advance are a rational approach. Minimizing water-logged processes, choosing deep sedation, placing oropharyngeal gauze for airway isolation from blood and secretions are ideal methods to suppress airway reflexes. General anesthesia (GA) should be preferred in patients with a more fragile medical history that makes it difficult to maintain spontaneous breathing or protect the airway from irritants.

Dental phobia is another topic that necessitates anesthesia in dentistry. Conscious sedation anesthesia, in which spontaneous breathing and cooperation is preserved, may be preferred for adult patients by informing them with a preliminary interview. Since all sedation procedures are mostly performed in operating room, out-of-office-based conditions, sufficient time should be planned for the patient's recovery and discharge conditions should be based on standardized recovery scales.

GA is applied to a wide range of patient populations that require nasotracheal intubation in maxillofacial and orthognathic surgery, ranging from reconstruction to impacted tooth extraction.

Anesthesia Approach in Maxillofacial and Orthognathic Surgery

Difficult airway is encountered in many cases such as cleft palate-lip, acquired or developmental jaw deformities, obstructive sleep apnea surgery, temporomandibular joint deformities. It is imperative that these patients be evaluated in detail before the operation, mouth-jaw opening examination, and appropriate preoperative consultations. Airway tools, especially the videolaryngoscope, should be available, and when a difficult airway is anticipated, awake intubation should be attempted with a flexible fiberoptic bronchoscope (FOB). (1) Nasotracheal intubation is preferred in the presence of indications to share the area to be worked in the mouth and to make the position of the tube safer. Placing an oropharyngeal gauze helps to fix the nasal tube, while preventing bleeding, aspiration of washing fluids and saliva from the surgical area. (2) An average of 200-800 mL blood loss is observed in orthognathic surgery. (3) Hypotensive anesthesia technique should be applied to control the amount of bleeding and reduce the need for transfusion. (4) A single dose of penicillin prophylaxis is recommended in orthognathic surgery, which is considered a clean-contaminated wound. (5) Postoperative nausea-vomiting and edema are common. Intraoperative dexamethasone administration is recommended for prophylaxis. (6) Local anesthetic infiltration into surgical areas reduces opioid use, bleeding and hospital stay. (7) Extubation should be performed gently with the head elevated, isolating the airway from blood and secretions as much as possible with sugammadex-mediated complete reversal. (8) Mask ventilation should be as smooth as possible to avoid disrupting osteotomies and intraoral sutures.

Anesthesia Approach in Pediatric Dentistry

In pedodontics, patients with disabilities and severe systemic diseases and poor oral care due to related medicosocial reasons are frequently encountered. In these patients, when cognitive-behavioral approaches are not effective, anesthesia with a pharmacological approach comes into play. Depending on the individual characteristics of the patients and the configuration of the clinic, sedation or GA is preferred.

According to the American Association of Pediatric Dentistry (AAPD) guideline for patients with sedation indication in pedodontics, patient preparation should be done just like day surgery. Due to the sharing of the airway with the pediatric dentist, the airway should be protected with a wet gauze, cotton rolls from dentin dust, blood, and saliva to prevent possible airway reactions. In terms of the risk of aspiration, water irrigation should not be used. Short-acting anesthetic agents such as propofol and remifentanil should be provided, and drug combinations should be avoided to avoid residual effects. It is known that the use of local anesthetics during sedation and GA reduces the need for anesthetic agents. (9) Recovery should be followed in a fully monitored environment and discharge should be made in accordance with gold standard recovery criteria such as Modified Aldrete Score and PADDS. (10,11)

If the number of teeth to be processed in the mouth increases, working with water and patient safety will be higher, a GA indication occurs. All routine evaluations should be done before GA application. In pediatric patients, consideration should be given to routine maintenance fluid management, use of heaters, prophylaxis of infective endocarditis, and use of analgesics if indicated. Patient discharge should be made according to the duration of anesthesia and the characteristics of the anesthetic agents applied. Patients who return to pre-anesthesia mental and physical levels according to standardized discharge scores after being observed for an appropriate time can be discharged with their parents.

Sedation and GA applications should be applied in full-fledged environments, including experienced and trained team, all emergency medicine and advanced life support equipment. Informed consent should be obtained from the patient and their parents for all procedures.

REFERENCES

1. American Society of Anesthesiologists Task Force on Management of the Difficult Airway. Practice Guidelines For Management of The Difficult Airway: An Updated Report by The American Society of Anesthesiologists Task Force on Management of the Difficult Airway. Anaesthesiology 2003;98(5):1269-77.
2. Schwartz, A. Airway Management for The Oral Surgery Patient. Oral and Maxillofacial Surgery Clinics 2018;30(2):207-226.
3. Blyth AS, Devic J. Orthognathic Surgery Principles, Planning and Practice. 1st Ed. Oxford, UK: John Wiley & Sons Ltd.; 2017. P.326-32.
4. Choi WS, Samman N. Risks and Benefits of Deliberate Hypotension in Anaesthesia: A Systematic Review. Int J Oral Maxillofac Surg 2008;37:687-703.
5. Tan SK, Lo J, Zwahlen RA. Perioperative Antibiotic Prophylaxis in Orthognathic Surgery: A Systematic Review and Meta-Analysis Of Clinical Trials. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011;112:19-27.
6. Lin HH, Kim SG, Kim HY, Niu LS, Lo LJ. Higher Dose of Dexamethasone Does Not Further Reduce Facial Swelling After Orthognathic Surgery: A Randomized Controlled Trial Using 3-Dimensional Photogrammetry. Ann Plast Surg 2017;78(3):S61-S69.
7. Carli F, Kehlet H, Baldini G, Steel A, Mcrae K, Slinger P, Et al. Evidence Basis for Regional Anesthesia in Multidisciplinary Fast-Track Surgical Care Pathways. Reg Anesth Pain Med 2011;36:63-72.
8. Schwer CI, Roth T, Gass M, Rothweiler R, Loop T, Metzger MC, Kalbhenn J. Risk Factors for Prolonged Mechanical Ventilation and Delayed Extubation Following Bimaxillary Orthognathic Surgery: A Single-Center Retrospective Cohort Study. J Clin Med 2022 Jul 1;11(13):3829.
9. Townsend Ja, Hagan Jl, Smiley M. Use of Local Anesthesia During Dental Rehabilitation with General Anesthesia: A Survey of Dentist Anesthesiologists. Anesth Prog 2014;61(1):11-7.
10. Aldrete J. The Post-Anesthesia Recovery Score Revisited. J Clin Anesth 1995;7(1):89-91.
11. Marshall SI, Chung F. Discharge Criteria and Complications After Ambulatory Surgery. Anesth Anal 1999;88(3):508-17.

SS-02

Abstract Only

Prehospital Coagulapathy Management in Trauma Patient

Ayşegül Güven

Iznik State Hospital, Department of Anesthesiology and Reanimation Bursa, Türkiye

ABSTRACT

Bleeding is the leading preventable cause of death in the globe, while trauma is a major cause of mortality worldwide. About one-fourth of patients with severe trauma develop trauma-induced coagulopathy (TIC), a coagulation disorder that is fatal in 30–50% of cases.TIC; tissue injury and shock induce endothelial, immune system, platelet, and clotting activation, which is amplified by the “lethal triad.” (coagulopathy, hypothermia and acidosis). Activates platelets, which adhere to the injury site to form the initial platelet clot, and the coagulation cascade, which is amplified by activated platelets and results in a thrombin explosion that cleaves fibrinogen into fibrin.Ibrin monomers covalently link to the aggregated platelets, thereby enhancing the stability of thrombus formation. To maintain vascular patency, anticoagulation and fibrinolytic processes limit excessive thrombus formation under normal conditions.In approximately fifty percent of TIC patients, adhesion and aggregation abilities of platelets are dysfunctional. The platelet count, which is typically normal, does not reveal this platelet dysfunction, also known as “platelet exhaustion.”Understanding the chronology of hemorrhagic deaths is essential for determining when haemostatic therapies are most effective and which outcomes they may influence (such as the need for massive transfusion, all-cause or hemorrhagic deaths, and early or late mortality).Damage control haemostatic interventions are necessary to stop the progression of TICs. The optimal coagulation test for determining early and late TIC has yet to be developed.Therefore, haemostatic interventions are more likely to prevent hemorrhagic trauma-related fatalities in the hours following injury.Included are permissive hypotension to minimize fluid infusion and dilution of coagulation factors, early administration of tranexamic acid to limit the production of plasmin and reduce fibrinolysis, and early activation of massive transfusion protocols using a balanced transfusion strategy of 1:1:1 red blood cells, plasma, and platelets. Pathophysiology dictates that fibrinogen and calcium must be replaced as indispensable components of the coagulation cascade. Even without direct support from clinical trials, correcting hypothermia and acidosis to facilitate enzymatic coagulation reactions is standard practice.Delivering the right product(s) at the right time to the right patient is the ultimate aim of personalized medicine for injured patients at risk of TIC. However, despite intense research efforts, our current understanding of the pathophysiology of TIC is incomplete, and diagnostic testing limitations make current clinical decisions imprecise; these decisions should be continuously refined by a comprehensive literature review on TIC.

Keywords: Trauma, Coagulation, Pre-hospital

SS-03
Full Manuscript

Geriatrik Hastalarda Lokal Anesteziklerin Farmakodinamiği ve Farmakokinetiği

Mehmet Can Gezer

Ankara Üniversitesi İbn-i Sina Hastanesi, Ortopedi ve Travmatoloji Anabilim Dalı, Ankara, Türkiye

Gelişen tıbbi teknoloji ve medikal endüstrininde etkisiyle insan ömrü uzamıştır. DSÖ verilerine göre 60 yaş üstü insanlar 2050 yılına kadar popülasyonun %20-25 'ini oluşturacaklardır (1). Bu da yaşlılıkta gördüğümüz hastalıklarla daha sık karşılaşacağımızı göstermektedir.

Yaşlılarda en sık görülen sistemik hastalıklar; diyabet, kardiyovasküler hastalıklar (hipertansiyon, aritmi, kalp yetmezliği) kronik obstrüktif akciğer hastalığı ve demanstır. Ayrıca kas iskelet sistemi hastalıkları; osteoartit, osteoporoz, düşük enerjili travma sonucu oluşan kırıklar da yaşla birlikte artış gösterecektir (2).

Yaşlı hasta, sistemik anestezik ilaçların etkilerine karşı benzersiz bir şekilde savunmasızdır. Yaşlanma, sedatif ilaçların ve lokal anesteziklerin hem farmakokinetiğini hemde farmakodinamiğini etkiler. Fizyolojik yaşlanma sürecinin yanı sıra, genellikle yaşla birlikte artan ve fizyolojik rezervde büyük bir değişikliğe yol açabilen sayısız patolojik komorbiditeler olayı karmaşık hale getirir (3).

İntravenöz ve genel anesteziklerin kardiyovasküler yan etkilerinin yaşlılarda çok fazla olması ayrıca entübasyonun pulmoner kötü etkileri yaşlılarda rejyonel anesteziyi popüler hale getirmiştir. Rejyonel anestezi teknikleri, operasyon sırasında daha iyi bir hemodinamik stabilite sağlamasının yanı sıra erlen derlenme ve erken yara iyileşmesi, erken mobilizasyon ve yeterli postoperatif analjezi sağlar. Gerçektende ultrasound eşliğinde rejyonel anestezi, yaşlı nüfusu için anestezi uygulamasının önemli bir parçasıdır (4).

Literatürde rejyonel anestezinin ameliyat sonrası oluşabilecek deliryum insidansını ve hatta mortaliteyi azaltığını gösteren çalışmalar vardır. Bazı ajan grupları için farmakokinetik ve farmakodinamikteki yaşa bağlı değişkenlere belirgin bir ayrım yapmak mümkünken, diğerleri için literatür yalnızca yaşlılardaki tepkilerin arttığını belirtmektedir (5).

Yaşlılardaki lokal anestezik ilaçların farmakodinamisi; medulla spinaslisteki nöron sayısındaki düşüşten ve periferik sinirlerin iletim hızının yavaşlamasından kaynaklanır. Bupivakain için epidural ve spinal absorpsiyon çalışmalarında nöronların duyarlılıklarında artış gözlenmiş olup vasküler emilimin bozulması ile ilgili kanıt gösterilememiştir. Bu nedenle yaşlılarda %10-20 lokal anestezi dozunu azaltmak gerekir (6,7).

Lokal anesteziğin uygulandığı bölgede birikimi ve emilimi uygulanan yerin damarlanmasına, ilaç miktarına, ilacın farmakkokinetik özelliklerine bağlıdır. Yaşlılarda emilimin büyüklüğü, doğrudan intravenöz uygulama ile başlayan ve daha sonra azalan büyüklük sırasına göre, interkostal, kompartman (kaudal>epidural>brakiyal), subkutan/insizyonel ve transdermal/topikal olarak sıralanabilir (8).

Sistemik absorpsiyonun kalp debisi ile ilişkisi indirek bir ilişkidir. Yaşlı poplasyonunda kalp atım hacmi ve kalbin fonksiyonel kapasitesinde azalma görülür. Ancak lokal anesteziklerin sistemik emilimi kalp atım hacmi ile ilişkili değildir. Ancak kalp atım hacmindeki azalma doku perfüzyonunda bir miktar azalmaya neden olur bu da bir aralıkta pik konsantrasyon dozuna kadar olan emilim süresinde uzamaya neden olur (3,8).

Yaşlandıkça vücut su oranı ve yağsız kitle oranı azalırken, vücut yağ oranı artmaktadır. Bu da ilacın dağılımına etki etmektedir. Bu durum bireyin karaciğer metabolizması, ilacın proteine bağlanma miktarı gibi farmakokinetik değişenler kadar etkili değildir (9).

Lokal anesteziklerin en önemli plazma bağlayıcı proteini α-1-asit (A1a glikoprotein)'tir. Karaciğer yetmezliği ve böbrek yetmezliğine neden olan hastalık durumlarda A1a glikoproteinin plazma seviyesi azalır bu lokal anesteziklerin toksisitesinde artışa neden olur. Geriatrik popülasyonda bu proteinin serumdaki düzeyi artar ayrıca stres, inflamasyon ve cerrahi işlemler sonrasında da bu proteininin düzeyi artmaktadır. Nihai olarak lokal anestezik sistemik toksisitesi, hastanın mevcut klinik durumu ve komorbid faktörleri ile ilişkilidir (10,11).

Amid lokal anestezikler öncelikle hepatik metabolizma yoluyla temizlenir. Yaşlanma ile karaciğer fonksiyonu azalır. Hepatik kan akımı azalması ve enzim aktivitesinin düşmesi ile amid lokal anesteziklerin ekstraksiyonu zayıflar bu nedenle lidokain ve bupivakain gibi amidlerin toksik seviyelere ulaşmasını engellemek için dikkatli olunmalıdır (9).

KAYNAKLAR

1. Kıvanç Öncü. Geriatrik Hastalarda Rejyonel Anestezi Yönetimi. In: Güncel Anesteziyoloji Ve Ağrı Çalışmaları VI. 1st Ed. 2022. P. 91–108.
2. Ferrerbrechner T. Spinal And Epidural-Anesthesia In The Elderly. Seminars in Anesthesia Perioperative Medicine And Pain. 1986;5:54–61.
3. Sorooshian SS, Stafford MA, Eastwood NB, Boyd AH, Hull CJ, Wright PMC. Pharmacokinetics And Pharmacodynamics Of Cisatracurium in Young And Elderly Adult patients. Anesthesiology 1996;84(5):1083–91.
4. Lin C, Darling C, Tsui BCH. Practical Regional Anesthesia Guide for Elderly Patients. Drugs Aging 2019;36(3):213–34.
5. Veering BT, Burm AGL, Vletter AA, van den Heuvel RPM, Onkenhout W, Spierdijk J. The effect of age on the systemic absorption, disposition and pharmacodynamics of bupivacaine after epidural administration. Clin Pharmacokinet 1992;22(1):75–84.
6. Jackson SHD. Pharmacodynamics in the elderly. J R Soc Med 1994; 87(23):5–7
7. Vuyk J. Pharmacodynamics in the elderly. Best Pract Res Clin Anaesthesiol [Internet]. 2003;17(2):207–18.
8. Sadean MR, Glass PSA. Pharmacokinetics in the elderly. Best Pract Res Clin Anaesthesiol 2003;17(2):191–205
9. Which local anaesthetic? Drug Ther Bull 1976;14(5):17–9.
10. Racle JP, Benkhadra A, Poy JY, Gleizal B. Spinal analgesia with hyperbaric bupivacaine: influence of age. Br J Anaesth 1988;60(5):508–14.
11. Veering Th. B, Burm AGL, Van Kleef JW, Hennis PJ, Spierdijk J. Spinal anesthesia with glucose-free bupivacaine: Effects of age on neural blockade and pharmacokinetics. Anesth Analg 1987;66(10):965–70.

Perioperative Management in Robotic Surgery

F. Nur Duruk Erkent

Ankara University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Türkiye

Robotic surgery can improve the ability of surgeons to visualize pathologies and perform complex procedures by creating three-dimensional views and allowing for more movement and precise movements of laparoscopic instruments in the patient's body (1). Robotic surgery has been successfully used in the care of patients in the fields of urology, gynecology, colorectal surgery, hepatobiliary surgery, ear, nose and throat surgery, cardiac and thoracic procedures. In clinical practice, the da Vinci system is used most frequently for prostatectomy and hysterectomy. In addition, the Kepler intubation system is also used for endotracheal intubation (2-4). In fact, robotic surgery helps in situations where microsurgery is necessary and reaching the target organ is difficult. Its ability to transform a traditionally open procedure into a minimally invasive one is especially valuable.

In addition to its various potential benefits, robotic surgery has also brought new challenges for anesthesia and surgical teams. During robotic surgery, many physiological changes occur. These changes are mainly due to CO_2 insufflation and the increase in intracompartmental pressure (abdominal, thoracic, oral) and positioning in order to obtain a better surgical view. During laparoscopic surgery, an increase in mean arterial pressure (MAP), systemic vascular resistance (SVR) and central venous pressure (CVP) is observed, while a decrease in cardiac output and stroke volume is observed (5-6). While healthy patients tolerate these changes more easily, more pharmacological intervention and intensive monitoring may be required if they have cardiac disease. CO2 pneumoperitoneum and surgical positioning may be associated with changes in pulmonary function and gas exchange. These changes may be due to increased MAP and CO2 absorption with pneumoperitoneum. Lung volumes and lung compliance decrease during robotic surgery, while PCO2 increases depending on ventilation (7). Pneumoperitoneum and Trendelenburg position may also cause displacement of the endotracheal tube due to the upward movement of the abdomen (8). Also robotic surgery can cause a decrease in splanchnic, renal, and intracranial blood flow and an increase in intraocular pressure (9-10). Thus, patients should be evaluated very well preoperatively.

Since the trendelenburg position is frequently used during robotic surgery, endotracheal intubation under general anesthesia provide safe airway management. Although there are various publications regarding the use of SGAs, endotracheal intubation provide safer airway management trendelenburg position (11-12). Standard American Society of Anesthesiologists (ASA) monitors (e.g., blood pressure [BP], electrocardiography, oxygen saturation, capnography, and temperature) are applied prior to laparoscopy. Further monitoring (e.g., continuous intra-arterial pressure) should be added as required by the patient's medical condition, the expected blood loss, and the duration of surgery. As many robotic surgery procedures are performed with the instrument arms closed on the side, access to the patient can be difficult. If venous catheterization and arterial catheterization are required before the procedure, they should be done carefully. Anesthetic concerns of robotic-assisted surgery include the length of surgical time, intravenous fluid management, and positioning. In patients undergoing robotic surgery in prolonged steep head-down position, excessive fluid administration may result in facial, pharyngeal, and laryngeal edema. Lung-protective mechanical ventilation strategies usage is recommended during surgery (13-14). After laparoscopic and robotic surgery, the degree of pain is usually low to moderate, and the pain is much less compared to open surgery. Multimodal analgesia is preferred in many centers, and in this direction, it is tried to reduce the use of less opioids by applying acetaminophen and nsai local / regional analgesia technics (fascial plane blocks (eg, transversus abdominis plane blocks) (15-16).

Preoperative, intraoperative and postoperative anesthesia manegement of robotic surgery and the experience of anesthesiologist are important issues during robotic surgery anesthesia.

REFERENCES

1. Gropper M, et all. Miller's anesthesia nineth edition.Elsevier.2019:2236-2250
2. Hemmerling TM, Wehbe M, Zaouter C, Taddei R, Morse J. The Kepler intubation system. Anesth Analg 2012;114(3):590-4.
3. Hemmerling TM, Taddei R, Wehbe M, Zaouter C, Cyr S, Morse J. First robotic tracheal intubations in humans using the Kepler intubation system. Br J Anaesth 2012;108(6):1011-6.
4. Hemmerling TM, Terrasini N. Robotic anesthesia: not the realm of science fiction any more. Curr Opin Anaesthesiol 2012;25(6):736-42.
5. O'Malley C, Cunningham AJ. Physiologic changes during laparoscopy. Anesthesiol Clin North America 2001; 19:1.

6. Hein HA, Joshi GP, Ramsay MA, et al. Hemodynamic changes during laparoscopic cholecystectomy in patients with severe cardiac disease. J Clin Anesth 1997; 9:261.
7. Kalmar AF, Foubert L, Hendrickx JF, et al. Influence of steep Trendelenburg position and CO(2) pneumoperitoneum on cardiovascular, cerebrovascular, and respiratory homeostasis during robotic prostatectomy. Br J Anaesth 2010; 104:433.
8. Chang CH, Lee HK, Nam SH. The displacement of the tracheal tube during robot-assisted radical prostatectomy. Eur J Anaesthesiol 2010; 27:478.
9. Nguyen NT, Perez RV, Fleming N, et al. Effect of prolonged pneumoperitoneum on intraoperative urine output during laparoscopic gastric bypass. J Am Coll Surg 2002; 195:476.
10. Awad H, Santilli S, Ohr M, et al. The effects of steep trendelenburg positioning on intraocular pressure during robotic radical prostatectomy. Anesth Analg 2009; 109:473.
11. Lim Y, Goel S, Brimacombe JR. The ProSeal laryngeal mask airway is an effective alternative to laryngoscope-guided tracheal intubation for gynaecological laparoscopy. Anaesth Intensive Care 2007; 35:52.
12. Yoon SW, Kang H, Choi GJ, et al. Comparison of supraglottic airway devices in laparoscopic surgeries: A network meta-analysis. J Clin Anesth 2019; 55:52.
13. Jun JH, Chung RK, Baik HJ, Chung MH, Hyeon JS, Lee YG, Park SH. The tidal volume challenge improves the reliability of dynamic preload indices during robot-assisted laparoscopic surgery in the Trendelenburg position with lung-protective ventilation. BMC Anesthesiol. 2019 Aug 7;19(1):142.
14. Assessment of Ventilation during general AnesThesia for Robotic surgery (AVATaR) Study Investigators; PROtective VEntilation (PROVE) Network; Writing Committee Members; Steering Committee Members; AVATaR Investigators. Ventilation and outcomes following robotic-assisted abdominal surgery: an international, multicentre observational study. Br J Anaesth. 2021 Feb;126(2):533-543.
15. Macfater H, Xia W, Srinivasa S, et al. Evidence-Based Management of Postoperative Pain in Adults Undergoing Laparoscopic Sleeve Gastrectomy. World J Surg 2019; 43:1571.
16. Barazanchi AWH, MacFater WS, Rahiri JL, et al. Evidence-based management of pain after laparoscopic cholecystectomy: a PROSPECT review update. Br J Anaesth 2018; 121:787.

SS-05
Full Manuscript

Common Skin Manifastations in Intensive Care

Hüsne Bayrak Sahin

TOBB ETU Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Although intensive care treatment is life-saving, it also brings with it a number of undesirable events. Skin rash is not uncommon in a patient whose condition is critical, but treatment should be evaluated quickly and planning should be made to prevent it. If a drug reaction is suspected, all medications that may be relevant should be reevaluated.

Keywords: Skin, critical care, drug,rash, infection

Our skin is the largest organ of the body with an area of 1.5 -2 m^2, which is about 8-10% of the body weight. Although the most important function of the skin is being a protection barrier against environmental factors (physical, chemical, microorganisms, etc.), it has important functions in thermoregulation, immune modulation, metabolism and fluid balance (1,2).

During the follow-up of critically ill patients, immobilization, malnutrition, immunodeficiency, organ dysfunctions, multi drug therapy, inadequate hygiene and use of invazive monitoring techniques are the factors that facilitate the formation of the lesions by disrupting the skin barrier (3).

The skin is one of the most affected organs of the patients in intensive care unit (ICU). Although skin lesions in ICU indicate serious life-threating disease such as infection, drug reaction, vasculitis, these are often ignored or delayed and the outcomes would be serious.

We aimed to review the causes and differential diagnoses of the common skin lesions of other patients in ICU, not those who have a serious skin disease and need to be treated in ICU.

Classification of Skin Manifestations in ICU

Skin lesions that develop in patients followed up in intensive care unit can be classified as shown in table 1 (4)

Infection-Induced Skin Lesions

Skin lesions are frequently caused by infectious diseases in ICU. Causes such as prolonged hospitalization, bed sheets, humidity, malnutrition, obesity, immun defficiency, inadequate hygiene, disrupt skin barrier and causing normal flora microorganizms to gain pathogenity (5).

Although it varies according to the degree and location of the infection, keeping the skin dry and clean is the most important step There is a wide range of treatments, from topical ,oral or parenteral antimicrobiyal treatment (6).

Fungal Lesions

Candida is the most comman cause of skin infections.

- Candida intertrigo (Fig. 1)/miliaria) (Fig.2)
- Paronychia (Fig.3)
- Oral, urogenital, esophageal mycosis
- Candida folliculiti
- siystemic mycosis

Bacterial Skin Infections

Although the main pathogens are pyogenic streptococci and staphylococs, many bacteria are responsible (5)

- Impetigo (staphylococs, pyogen streptocs)

- Folluculitis (most commonly staphylococs, gram(–)bacteria, pseudomonas) (Fig. 4)
- Phroncule
- Cellulitis-involvement in infection of subcutaneous tissue (pyogen streptococs, staph aureus) (fig. 5)
- Erysipelas(lymphatic vessels infection) (fig. 6)
- Erytrasma-axilla and flexor folds, darkening of the skin color (corynebcterium) (Fig.7)
- SSSS (characterized by peeling of the skin as a result of exfoliative toxins of staph aureus, and hypothermia requires urgent treatment, as it can cause dehydration (fig. 8).

It is the most common HSV (1-2) infection and should be treated with iv anti-viral according to oral, topical or enf severity due to the risk of returning to systemic infection.

Drug Reactions

Skin rashes due to drugs are encountered in 2-3% of hospitalized patients (7,8). Kara et all. In their study of 1532 intensive care patients, they found that 18% of patients with lesions on the skin were due to drug reactions (8). The fact that patients are under multi-drug treatment in ICU both increases the risk of drug reactions and complicates the detection of the responsible drug (9).

Although the mechanism of drug reactions is mixed, there is an acute or delayed immune response. It may occur in the form of a urticaria-like form or as morbiliform, eruption, pustules or bullous rashes.

Drug eruption is mostly mild morbiliform (measles-like) (fig 9), erythematous maculo-papular, symmetrical and diffuse. These rashes begin within 4-14 days of starting a new medication, often resolve spontaneously with the discontinuation of the drug, sometimes anti-histamine and steroid therapy is needed (10). Although almost all drugs have the potential to cause a rash, it is most commonly caused by penicillin and its derivatives, anticonvulsants, sulfonamides, NSAIDs (11).

Although drug reactions are often encountered in the form of mild rash, they may also occur with the rash as severe life-threatening conditions such as eosinophilia, systemic symptoms (DRESS), steven jhonson send (SJS) or toxic epidermal necrolysis (fig. 10) (12, 13).

Diffuse rash

Temparature >39 ^{o}C

Mucosal involvement

Abnormal liver and renal functions

Lymphadenopathy

Fatigue, arthralgia, sore throat

Eosinophilia

Positive nikolsky symptom(bullae formation and peeling of the skin by rubbing)

These symptoms indicate a severe drug reaction in the patient and require urgent treatment. Suspicious drug(s) should be discontinued immediately, dermatology specialist support should be obtained and supportive treatment for organ dysfunctions should be applied.

Pressure Ulcers

It is caused by the deterioration of capillary flow as a result of exposure of soft tissue to pressure between beds or treatment equipment, especially in areas where bony prominences are evident, such as sacrum, heel, elbow, scapula. It is a very important problem that starts with simple tissue damage and can progree to necrosisi and prolongs the stay in the intensive care unit (14).

After the pressure ulcer is formed, the treatment is quite difficult and it is the most important point to take the necessary precautions to prevent it from occurring. For patients at risk of pressure ulcer formation, the ulcer should be evaluated and the treatment plan should be determined by using the Waterlow and Braden risk scoring (tablo 3) with international scores and close follow-up and the ulcer classification of the European pressure ulcer advisory panel (fig.8) (15,16).

In the treatment of ulcer, the elimination of the pressure with continuous position change in the bed, keeping the skin dry and clean, using equipment such as air mattresses that reduce pressure, physiotherapy support, adequate protein energy support and preventing malnutrition are the first and most important stages. After the skin integrity is disturbed, the progression of the ulcer is rapid and may even become necessary to need surgical debridement (17,18).

Dermatological Problems Caused By Devices

Intensive care patients need invasive monitoring and treatment systems during their treatment. This situation can lead to contact dermatitis, infection, compression and iatrogenic injuries due to both devices. for example, ECG pallets (Fig 12), disinfectants and adhesive tapes can cause contact dermatitis and egzema, while antiembolic socks (fig.14), oxygen saturation probe (fig.13), catheter and cannulas can cause compression injuries (19).

During treatment in ICU, drug and fluid extravasation or iatrogenic accidents such as intra-arterial injection may occur. The fact that patients do not complain of pain because they are sedated or debilitated and they are taking multiple drug infusions facilitate the occurrence of such undesirable situations. Especially vasoconstrictor drugs, calcium, magnesium, parenteral nutrition solutions and hyperosmolar drugs such as potassium, acids and alkalis such as amiadoron, erythromycin, vancomycin are drugs that can cause significant problems in the skin if extravasted.

When there is pain and swelling at the place of application, extravasation should be suspected, drug infusion should be stopped quickly, the drug should be withdrawn if possible without removing the cannula, the limb should be raised to increase venous return, the lesion site should be washed with salt water, lesion contours should be marked, photographed and plastic surgery support should be taken (fig.15) (20,21).

Cuteneous Small Vessel Vasculitis (CSVV)(Fig.16)

Cutaneous small vessel vasculitis is a form of vasculitis that affects small blood vessels, mainly the post-capillary venules. It is characterized by palpable purpuric lesions that often settle on the lower extremities. CSMV can be idiopathic, as well as occur in association with infections, medications, inflammatory diseases and malignancies. Treatment is applied for the underlying factor (22).

Symmetrical Peripheral Gangrene And Purpura Fulminans

Symmetrical peripheral gangrene (SPG) is an extreme ischemia of two or more without large vein occlusion and is usually due to disseminated intravascular coagulation during severe sepsis, and the use of vasopressor agents (dopamin,noradrenalin)is also an important factor. vasodilators, anticogulant therapy and amputation and grafting treatment may be required (23,24). (Skin Necrosis İnduced By Vasopressor Drugs) (fig .17).

CONCLUSION

Intensive care unit patients are patients with multiple organ dysfunction and complex follow-up treatments. Due to the nature of intensive care follow-up, lesions on the skin during daily routines can be ignored, which may lead to a delay in the diagnosis and treatment of life-threatening problems.

The importance of dermatologists in the recognition and treatment of lesions is indispensable and their knowledge and support should be consulted (25).

REFERENCES

1. Kanitakis J. Anatomy, histology and immunohistochemistry of normal human skin. Eur J Dermatol. 2002 Jul-Aug;12(4):390-9.
2. Habif TP. Clinical Dermatology E-Book. 5th ed. Elsevier Health Sciences; 2009.
3. G. P. Prashanth and V. V. Pai, “A retrospective cohort study of dermatological problems observed in paediatric intensive care unit,” Journal of the European Academy of Dermatology and Venereology, vol. 26, no. 9, pp. 1105–1108, 2012.
4. M. G. Dunnill, S. E. Handfield-Jones, D. Treacher, and D. H. McGibbon, “Dermatology in the intensive care unit,” *e British Journal of Dermatology, vol. 132, no. 2, pp. 226– 235, 1995
5. Medically reviewed by Sarah Taylor, M.D., FAAD — By MaryAnn De Pietro, CRT — Updated on Feb 3, 2022
6. M. G. Kalra, K. E. Higgins, and B. S. Kinney, “Intertrigo and secondary skin infections,” American Family Physician, vol. 89, no. 7, pp. 569–573, 2014,
7. Roujeau JC, Stern RS. Severe adverse cutaneous reactions to drugs. N Engl J Med 1994; 331: 1272e85

8. A.Kara,E.Ortaç,A.Hapa,S.Öcal,A.Topeli, "Dermatological Problems and Dermatology Consultations in Intensive Care Units'' Journal of Medical and Surgical Intensive Care Medicine, Dermatological Problems and Dermatology Consultations in Intensive Care Units vol.6.nu.1 pp.1-3,2015
9. Trivalle C, Cartier T, Verny C, et al. Identifying and preventing adverse drug reactions in elderly hospitalised patients: A randomised trial of a program to reduce adverse drug effects. J Nutr Health Aging.2010;14: 7-61.
10. C. Bigham and A. Elsey, "Cutaneous drug reactions in intensive care," British Journal of Hospital Medicine, vol. 74, no. 6, pp. 340–346, 2013.
11. A.V. Marzano, A. Borghi, and M. Cugno, "Adverse drug reactions and organ damage: the skin," European Journal of Internal Medicine, vol. 28, pp. 17–24, 2016.
12. M.Bromley,S.Marsh,A.Layton " Dermatological complicationsof critical care" BJA Education,vol.21,No.11,pp.408-413,2021
13. Badia M, Trujillano J, Gasco E, Casanova JM, Alvarez M, Leon M. Skin lesions in the ICU. Intensive Care Med 1999; 25: 1271e6
14. L. E. Edsberg, D. Langemo, M. M. Baharestani, M. E. Posthauer, and M. Goldberg, "Unavoidable pressure injury," Journal of Wound, Ostomy and Continence Nursing, vol. 41, no. 4, pp. 313–334, 2014.
15. National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, Pan Pacific Pressure Injury Alliance. In: Haesler Emily, editor. Prevention and treatment of pressure ulcers: quick reference guide. Osborne Park, Australia: Cambridge Media; 2014
16. Black JM, Cuddigan JE, Walko MA, Didier A, Lander MJ, Kelpe MR. Medical device related pressure ulcers in hospitalized patients. Internat Wound J 2010; 7: 358e65
17. National Institute for health and care xcellence. Pressure ulcers: prevention and management: clinical Guideline cg179. NICE; 2014
18. N. Tayyib and F. Coyer, "Effectiveness of pressure ulcer prevention strategies for adult patients in intensive care units: a systematic review," Worldviews on Evidence-Based Nursing, vol. 13, no. 6, pp. 432–444, 2016.
19. J. M. Smit, R. Raadsen, M. J. Blans, M. Petjak, P. M. Van de Ven, and P. R. Tuinman, "Bedside ultrasound to detect central venous catheter misplacement and associated iatrogenic complications: a systematic review and metaanalysis," Critical Care, vol. 22, p. 65, 2018,
20. Nandhabalan P, Ioannou N, Meadows C, Wyncoll D. Refractory septic shock: our pragmatic approach. Crit Care 2018; 22: 215
21. Lake C, Beecroft C. Extravasation injuries and accidental intra-arterial injection. Cont Ed Anaes, Crit Care Pain 2010; 10: 109e13
22. James WD, Berger TG, Elston DM. Cutaneous vascular diseases. Andrews' Diseases of the Skin Clinical Dermatology. 10th ed. Phildelphia: Saunder Elsevier; 2006. p.833-6.
23. Sharma BD, Kabra SR, Gupta B. Symmetrical peripheral gangrene. Trop Doct 2004; 34: 2e4
24. N. Ruffin, C. V. Vasa, S. Breakstone, and W. Axman, "Symmetrical peripheral gangrene of bilateral feet and unilateral hand after administration of vasopressors during septic shock," BMJ Case Reports, vol. 2018, Article ID bcr2017223602, 2018
25. Lee KT, Lee DY. Analysis of dermatologic consultations in intensive care unit patients. Korean J Dermatol 2011;49:976-82.

Table 1. Skin Lesions

1. Skin lesions of infectious origin
2. Drug Reactions (mild, serious)
3. Pressure injuries
4. Lesions due to devices
5. Cuteneous small vessel vasculitis (CSVV)
6. Lesions caused by vasopressor drugs (Symetrical peripheral gangrene and purpura fulminans)
7. Other (cutaneous small vessel vasculitis, Symmetrical Peripheral Gangrene And Pupura Fulminans)

Table 2. The Classification of Drugs According to the Lesions (12)

Drug-induced exanthems (including symmetrical drug-related and flexural exanthema (SDRIFE))	Allopurinol Aminopenicillins Cephalosporins Antiepileptic agents Sulphonamides
Urticaria/angioedema	Non-steroidal anti-inflammatory drugs (NSAIDs) Angiotensin converting enzyme (ACE) inhibitors Antibiotics, especially penicillin and teicoplanin.
Cutaneous small vessel vasculitis	Antibiotics Diuretics NSAIDS Anticonvulsants Antipsychotics TNF-α inhibitors Rituximab IFN-β
Erythroderma/Exfoliative dermatitis	Sulphonamides Chloroquine Penicillin Phenytoin Carbamazepine Allopurinol Isoniazid
Stevens-Johnson syndrome and toxic epidermal necrolysis	Sulphonamides Anticonvulsants Oxicam-type NSAIDs Allopurinol Nevirapine
Drug reaction with eosinophilia and systemic symptoms (DRESS)	Anticonvulsants (mainly carbamazepine, phenobarbital, phenytoin, lamotrigine and sodium valproate) Allopurinol Sulphonamides and dapsone
Acute generalised exanthematous pustulosis (AGEP)	Aminopenicillins Hydroxychloroquine Sulphonamides Terbinafine Diltiazem

Table 3. Braden Risk Assessment Scale

Braden Risk Assessment Scale

Sensory/ Mental	Moisture	Activity	Mobility	Nutrition	Friction/ Shear
1. Totally limited	1. Constantly moist	1. Bedfast	1. 100% immobile	1. Very poor	1. Frequent sliding
2. Very limited	2. Very moist	2. Chairfast	2. Very limited	2. < ½ daily portion	2. Feeble corrections
3. Slightly limited	3. Occasionally moist	3. Walks w/ assistance	3. Slightly limited	3. Most of portion	3. Independent corrections
4. No impairment	4. Dry	4. Walks w/out assistance	4. Full mobility	4. Eats everything	

Total Braden Score _____

15-16 Mild Risk 12-14 Moderate Risk <12 High Risk
15-18 is considered Mild Risk for those > 75 years

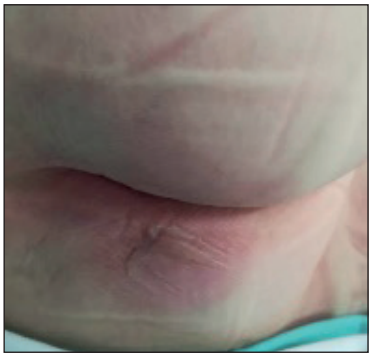


Figure 1

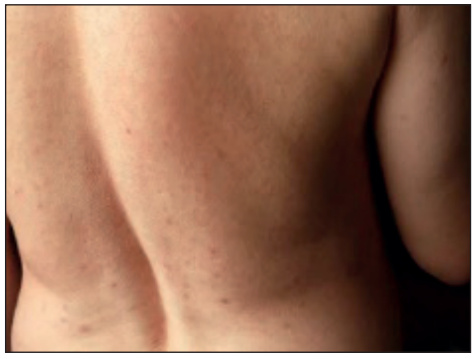


Figure 2

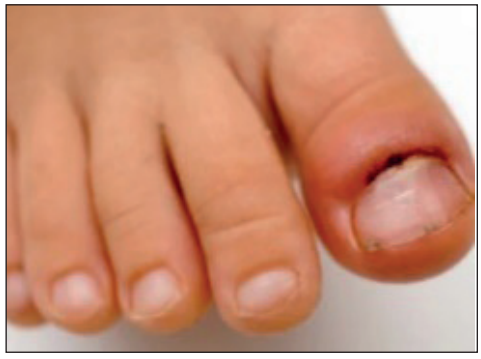


Figure 3

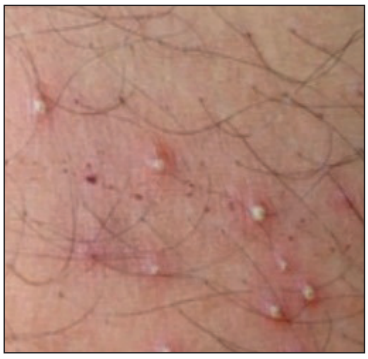


Figure 4

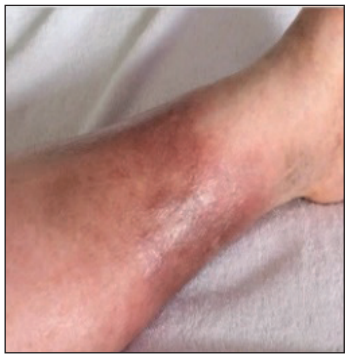


Figure 5

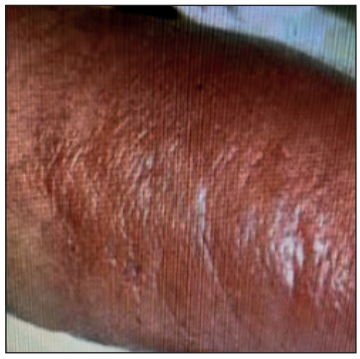


Figure 6

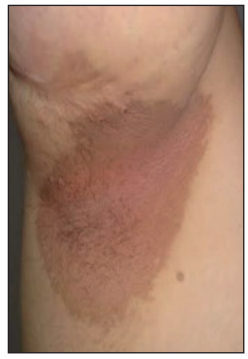


Figure 7

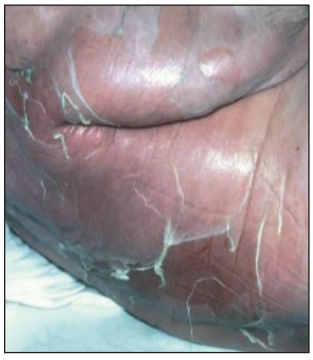


Figure 8

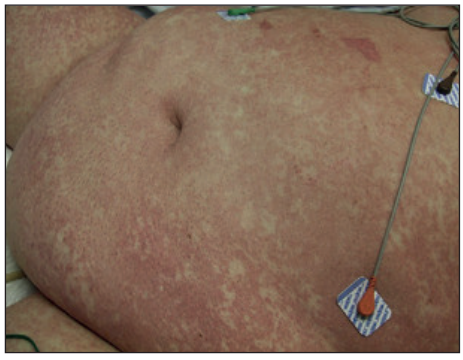


Figure 9

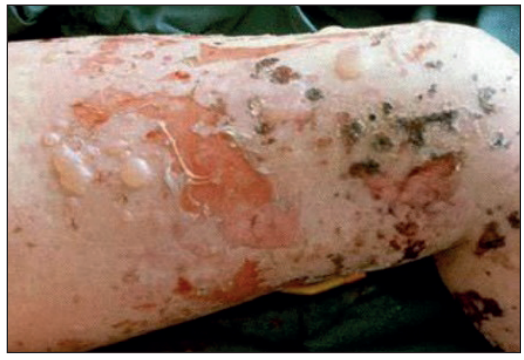


Figure 10

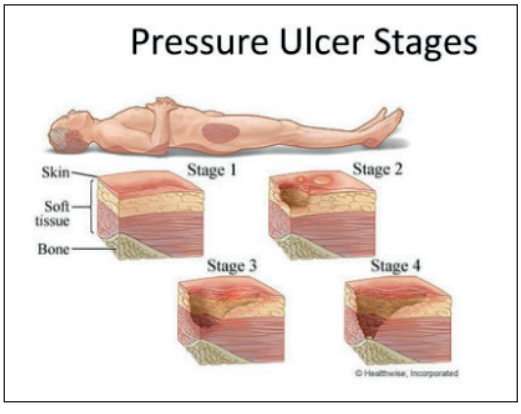


Figure 11

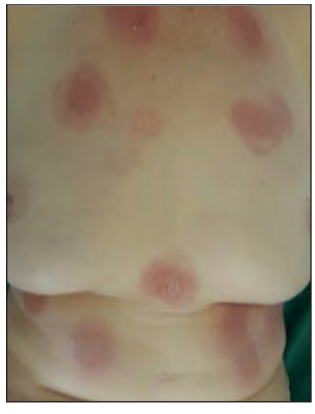


Figure 12

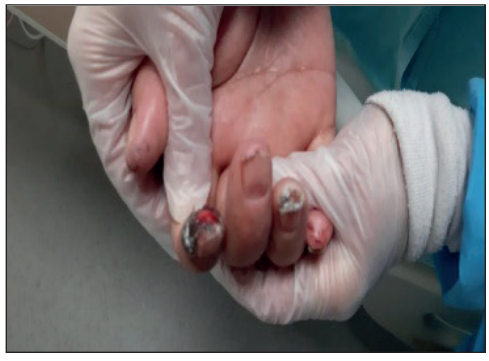


Figure 13

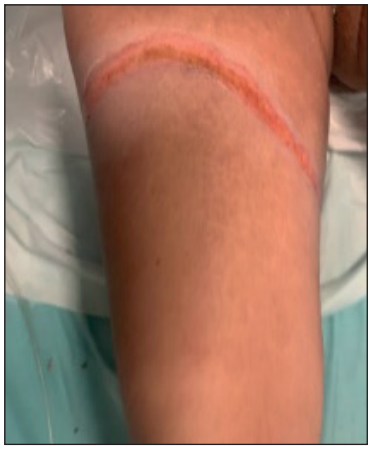


Figure 14

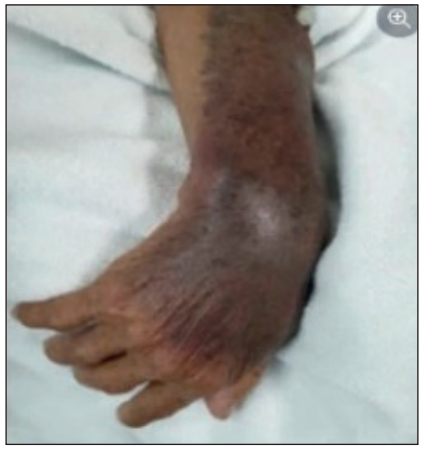


Figure 15

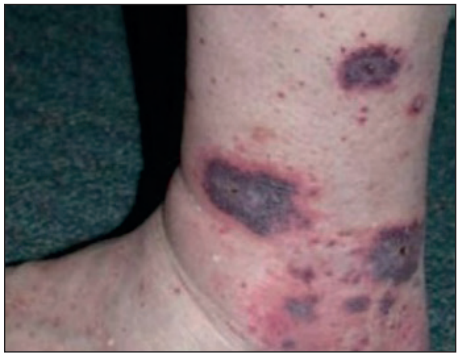


Figure 16

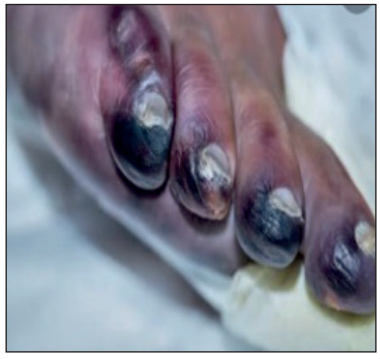


Figure 17

SS-06
Full Manuscript

Spinal Anesthesia Management in Laparoscopic Bilateral Tube Ligation

Kadir Teoman Etikcan

University of Health Sciences Ankara Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Laparoscopic methods, which are frequently used in gynecological surgeries, are mostly performed under general anesthesia. Spinal anesthesia can only be preferred in patients for whom general anesthesia is contraindicated. Currently, it is seen that laparoscopic interventions with spinal anesthesia in healthy people are used more in general surgery cases (eg laparoscopic cholecystectomy) than gynecological surgery. Patients operated with regional anesthesia have postoperative sore throat, pain control at the operation site, and less opioid need. Bilateral tubal ligation is one of the most frequently performed operations in gynecological surgeries. In laparoscopic tubal ligation surgeries; The fact that the operation time is short, the operated population is young, and the operated patients are in the ASA I-II group may be the reasons for preference in terms of regional anesthesia.

Keywords: regional anesthesia, general anesthesia, laparoscopic surgery, gynecological surgeries

INTRODUCTION

Laparoscopic procedures are generally performed as day surgery (1). General and regional anesthesia; It is used successfully and safely when the use of short-acting drugs, providing cardiovascular stability, rapid recovery and mobilization, postoperative nausea, vomiting and pain treatment are taken care of.

Although the common procedure in laparoscopic surgeries is operation under general anesthesia, it has been reported that regional anesthesia methods can be used safely within certain limits.

Regional anesthesia; it is advantageous because it provides rapid recovery, less nausea, vomiting and postoperative pain, shorter hospitalization, reduced cost, increased patient satisfaction, early diagnosis of complications and less hemodynamic changes. General anesthesia complications such as sore throat, myalgia, and airway trauma are also not observed (2).

There are some limitations when applying regional anesthesia methods in laparoscopic surgeries. Problems in the operating room cause the patient's anxiety, pain and discomfort to increase, resulting in the need for intravenous sedation support. The effect of pneumoperitoneum can cause sedation, hypoventilation and a decrease in arterial oxygen saturation.

One of the indications in which regional anesthesia can be applied is laparoscopic tubal ligation (3).

Procedures that require many puncture points, major organ manipulations, steep inclination of the operating table, development of pneumoperitoneum make it difficult for the patient to breathe spontaneously, and regional anesthesia should not be used in these cases.

MATERIAL and METHODS

Spinal anesthesia is one of the simplest and safest regional anesthesia technique. Spinal anesthesia, which is a primary technique for laparoscopic gynecology, has many advantages compared with general anesthesia.

The patient position depends on the place to be operated. Trendelenburg position is applied for pelvic organs in gynecological procedures. In order to apply spinal anesthesia in laparoscopic surgeries, the practitioner must be experienced. Trendelenburg position can cause spinal block to spread to the head, increase sympathetic block, bradycardia and hypotension. In rare cases, intubation material and general anesthesia devices should be readily available to ensure deep hypotension and respiratory continuity.

It is important for the patient's compliance that the pneumoperitoneum pressure applied to the patient is lower than 12 mmHg. Such low pressure does not affect the respiratory functions of the patients. In patients without contraindications, trendelenburg is well tolerated by patients and, unlike high-pressure pneumoperitoneum, has no adverse effects on patients' breathing. Regional anesthesia; It has advantages such as having minimal effect on the respiratory system and preventing the spread of intubation-related pathogens to the lower respiratory tract. By using regional anesthetic techniques, reduced thromboembolic complications and reduced surgical stress response, aerosol-generating procedures can be avoided with less risk to healthcare professionals.

RESULTS

Low-dose spinal anesthesia is a good alternative to general anesthesia with desflurane in outpatient gynecological surgeries (5). In spinal anesthesia, postoperative pain and cost are less and recovery is faster. When compared to general anesthesia administered with propofol total intravenous infusion, recovery time was found to be shorter in low-dose spinal anesthesia. With the development of gasless laparoscopy and microlaparoscopy techniques, the place of spinal anesthesia in laparoscopy will increase over time. The role of regional anesthesia in laparoscopic surgeries It has been suggested that it is a reliable method for operations during the COVID-19 pandemic (4). Regional anesthesia is a good alternative to laparoscopy and can be tolerated by patients if performed in good low-pressure pneumoperitoneum.

When considering neuraxial anesthesia and general anesthesia, the usual benefit/risk ratio should be stated.

Further studies and analyzes are needed to confirm the advantages of laparoscopic surgery in regional anesthesia.

REFERENCES

1. Collins, Linda M., and Himat Vaghadia. Regional anesthesia for laparoscopy. Anesthesiology Clinics of North America 2001: 43-55.
2. Martinello, Caroline, Matthew Williams, and Jill M. Mhyre. Regıonal Anesthesia and Analgesıa For Cesarean Delivery. Regional Anesthesia and Acute Pain Medicine: A Problem-Based Learning Approach 2023: 399.
3. Uğur, B. K., Pirbudak, L., Öztürk, et al. Spinal versus general anesthesia in gynecologic laparoscopy: a prospective, randomized study. Turkish Journal of Obstetrics and Gynecology 2020;17(3), 186.
4. Major, A. L., Jumaniyazov, K., Yusupova, S., Jabbarov, R., Saidmamatov, O., & Mayboroda-Major, I. Laparoscopy in gynecologic and abdominal surgery in regional (spinal, peridural) anesthesia, the utility of the technique during COVID-19 pandemic. Medicines 2021; 8(10), 60.
5. Lennox PH, Vaghadia H, Henderson C, Martin L, Mitchell GW. Small-dose selective spinal anesthesia for short-duration outpatient laparoscopy: recovery characteristics compared with desflurane anesthesia. Anesth Analg 2002;94(2):346-50

Uterotonics

Hafize Yasemin Dayıcan
University of Health Sciences Ankara Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

Drugs that induce uterine contraction as their primary action may be referred to as uterotonics. Uterotonics, which include oxytocin, ergot alkaloids, and prostaglandins, are used for both prevention and treatment of postpartum hemorrhage(PPH). The American College of Obstetricians and Gynecologists (ACOG) recommends using uterotonic agents as first-line treatment for PPH caused by uterine atony.

Several surveys of uterotonic administration by obstetricians and anesthetists show huge variation in practice, including mode of administration (bolus vs. continuous infusion), frequency (routine vs. selective use) and single vs. repeat bolus administration.

Oxytocin

Endogenous oxytocin is a nonapeptide hormone produced in the hypothalamus and secreted into circulation by posterior pituitary gland. Oxytocin was first discovered by Sir Henry Dale and was first synthesized synthetically by Du Vigneaud in 1953.

Oxytocin, or its analogue carbetocin, is the first-line for preventing and treating uterine atony and maintaining tone. Ergot derivatives and prostaglandins (E1, F2a, and E2) are second and third in line.

Oxytocin binds to G protein-coupled receptors found in various parts of the body, including the uterus, cardiovascular system, and central nervous system. During pregnancy, there is a significant increase in oxytocin receptors in the uterus. Oxytocin has two ways of exerting its effects on the uterus, by directly contracting the myometrium and stimulating the production of prostaglandin in the endometrium. Oxytocin receptors undergo rapid homologous desensitization, which can affect the uterine response to subsequent oxytocin administration. It is important to distinguish between oxytocin-naïve and oxytocin-exposed women, as there are significant differences in receptor sensitivity and hormone levels in these two clinical situations.

Elective caesarean section

In 1997, it was reported that a ceiling effect was observed with 5 IU of oxytocin in elective cesarean sections (in non-laboring pregnant women) (11). Subsequent studies have shown that the IV bolus loading dose of oxytocin for elective cesarean sections is ED90=0.35 in non-laboring pregnant women, while it is relatively higher in laboring pregnant women (ED90=2.99) (12, 13). Based on this, it became apparent that there was a need for a protocol regarding both prophylactic and therapeutic oxytocin doses for laboring and non-laboring pregnant women undergoing cesarean section. Therefore, Tsen and Balki (14) published an evidence-based and easy-to-remember protocol for cesarean delivery called the “Triple Rule,” which emphasizes the following points when administering oxytocin:

- Starting dose should be less than 5 IU
- Rapid IV bolus should not be given
- Rapid initial infusion should be followed by slow maintenance infusion
- Should be administered with saline or lactated Ringer’s solution
- Should not be given with hypotonic fluids, as this can result in dilutional hyponatremia
- If effective uterine contractions are not present, other effective uterotonics should be considered.

Oxytocin protocol for cesarean delivery: ‘‘Rule of threes”

- 3 IU oxytocin intravenous loading dose (administered no faster than 15 seconds)3 min assessment intervals. If inadequate uterine tone, give 3-IU oxytocin intravenous rescue dose
- 3 total doses of oxytocin (Initial Load + 2 Rescue Doses)
- 3 IU oxytocin intravenous maintenance dose (3 IU/L at 100mL/h)
- 3 Pharmacologic options (e.g. ergometrine, carboprost and misoprostol) if inadequate uterine tone persists

Carvalho et al. found that a dose of 0.35 IU of oxytocin was effective in obtaining adequate uterine tone in 90% of low-risk women undergoing elective caesarean section at three minutes after administration, and an infusion of 2.4 IU/h was given for maintenance for 6 hours.

Butwick et al. found that doses above 0.5 IU of oxytocin had limited benefit, and 73% of low-risk women in the 0 IU group achieved adequate uterine tone without additional medication. Adverse effects increased with doses above 1 IU/

George et al. and Lavoie et al. determined the optimal calibrated oxytocin infusion rates to initiate adequate uterine tone, which were found to be around 0.27-0.29 IU.min-1.A study also found that an oxytocin infusion rate of 40 IU.h-1 over 30 minutes was as effective as 60 or 80 IU.h-1 over the same time.

Duffield et al. found that low doses of oxytocin infusion after an initial bolus were required to improve uterine tone and reduce blood loss.

Kovacheva et al. found that a 3 IU oxytocin bolus followed by a maintenance infusion of 3 IU per hour was as effective as a 'wide open' infusion of 30 IU in 500 ml.

The use of oxytocin in intrapartum caesarean section varies depending on whether the woman received oxytocin infusion during labor, and higher doses may be required to achieve adequate uterine tone in these cases. The ones who had oxytocin infusion during labor require a higher dose of oxytocin to achieve adequate uterine tone during caesarean section, likely due to oxytocin receptor desensitization. Additionally, a postpartum oxytocin infusion may be needed, and additional uterotonic agents may be required.

Its haemodynamic effects are influenced by dose, rate of administration, comorbidities, volume status, and repeated dosing. Adverse cardiovascular effects such as hypotension, tachycardia, coronary vasoconstriction, and myocardial ischemia are dose-dependent. Slow administration can reduce these effects. Other adverse effects of oxytocin include water retention, hyponatremia, nausea, vomiting, palpitations, flushing, nasal congestion, xerostomia, metallic taste, headache, shivering, and pruritus. The use of oxytocin during labor may decrease breastfeeding rates due to down-regulation of oxytocin receptors in the mother and transplacental passage.

Carbetocin

Carbetocin is a synthetic analogue of oxytocin with similar pharmacodynamic properties but longer acting. It is an octapeptide while oxytocin is nonapeptide and due to its structural difference carbetocin is more stable and is more resistant to degradation by disulphidase, aminopeptidase and oxidoreductase enzymes. It has a half-life of about 40 minutes which is 10 times that of oxytocin. Side effects of carbetocin are like oxytocin including hypotension, flushing, headache and abdominal pain. A Cochrane database review in 2012 found lower incidence of PPH after caesarean deliveries with carbetocin compared with oxytocin. The ED90 dose of carbetocin during caesarean delivery to maintain uterine tone ranged from 14.8µg in non-laboring women to 121µg in laboring women. In studies comparing carbetocin with oxytocin, carbetocin was associated with a lower risk of severe postpartum hemorrhage and need for additional therapeutic uterotonics. Carbetocin has a lower likelihood of crossing into breast milk and causing clinical concern. Studies suggest that carbetocin can save costs and prevent postpartum hemorrhage compared to oxytocin.

The Society of Obstetricians and Gynecologists of Canada recommends carbetocin 100µg be given as an intravenous bolus over one minute to prevent PPH. The current evidence in use of carbetocin is quite encouraging and further large scale studies are needed to know the effective dose and side effect profile.

Other uterotonic agents

Second-line uterotonics include ergot alkaloids and prostaglandins.

Ergometrine (ergonovine) and methylergometrine (methylergonovine) are ergot alkaloids that increase the uterine muscle tone by sustained uterine contraction via nonspecific activation of adrenergic, dopaminergic and 5-HT receptors. They have a plasma half-life of 30– 120 min. The most frequent adverse effects include hypertension, nausea and vomiting . Ergot alkaloids may produce peripheral vasoconstriction that leads to elevated systemic arterial pressure and central venous pressure. It is relatively contra-indicated in women with pre-eclampsia and hypertension as exaggerated hypertensive effects may be seen. They have been associated with coronary artery spasm, causing chest pain and palpitations. Besides nausea and vomiting, other side-effects include diarrhea, headache, abdominal pain and dyspnea. The UK license for ergometrine is for doses up to 500 µ; however, in a number of countries lower doses of 200–250 µ are recommended.

Prostaglandins are bio-active lipids derived from arachidonic acid, which act as paracrine or autocrine agents that bind to different G protein-coupled receptors. Some prostaglandins stimulate myometrial contraction via activation of FP, EP1, EP3 and TP receptors.

Misoprostol is a prostaglandin-E1 analogue, which is licensed for the prevention and treatment of gastric ulcers. It is in unlicensed use worldwide as a uterotonic agent. It is absorbed 9– 15 min after sublingual, oral, vaginal or rectal use. The half-life is 20–40 min. The most prominent side-effect of misoprostol is hyperpyrexia.

Carboprost, a synthetic PGF2a analogue, and sulprostone, a synthetic PGE2 analogue, are also used during treatment of postpartum hemorrhage, but are not used for prophylactic treatment during caesarean section due to significant adverse effects. Carboprost can cause significant bronchospasm, even in patients without asthma. Other effects include hypertension, diarrhea, nausea, vomiting, flushing, hyperpyrexia and myalgia .

Sulprostone may cause fever, diarrhea and painful uterine contraction. There are reports of cardiac or respiratory side-effects, including cardiac arrest, when sulprostone was administered during hemorrhagic shock, combined with dinoprost, or off-license as a continuous i.v. infusion

A recent Cochrane network meta-analysis of 196 clinical trials with over 135,000 women studied prophylactic uterotonic drugs after both vaginal and caesarean deliveries. There were no trials investigating ergot alkaloids or prostaglandins as first-line prophylactic treatments for caesarean section. Prophylactic use of carbetocin alone during caesarean section did not decrease the rate of postpartum hemorrhage compared with placebo. Only the combination of an infusion of 20 IU oxytocin plus sublingual misoprostol 400 lg was superior to oxytocin alone in preventing blood loss ≥ 500 ml at caesarean section. For major postpartum hemorrhage (blood loss ≥ 1000 ml), there was no evidence for differences between any agent and oxytocin alone. In a registry data analysis, the use of carboprost for persistent uterine atony after failed oxytocin prophylaxis increased the risk of hemorrhage-related morbidity. An escalating strategy for managing increased bleeding after delivery may be useful in reducing postpartum hemorrhage rates.

REFERENCES

1. Guidelines International consensus statement on the use of uterotonic agents during caesarean section. Anaesthesia 2019, 74, 1305–1319
2. Gutkowska J, Jankowski M. Oxytocin revisited: its role in cardiovascular regulation. Journal of Neuroendocrinology 2012; 24: 599–608.
3. Lewis G, ed. Why mothers die 1997–99. The confidential enquiry into maternal deaths in the United Kingdom. London, UK: RCOG Press, 2001.
4. Mavrides E, Allard S, Chandraharan E, et al. on behalf of the Royal College of Obstetricians and Gynaecologists. Prevention and management of postpartum haemorrhage. British Journal of Obstetrics and Gynaecology 2016; 124: e106–49.
5. Practice Bulletin No. 183: Postpartum Hemorrhage. Obstetrics and Gynecology 2017; 130: e168–86. 6. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists. Management of Postpartum Haemorrhage (PPH) 2017.
6. WHO Recommendations: Uterotonics For The Prevention Of Postpartum Haemorrhage. Geneva: World Health Organization 2018.
7. Lalonde A. Prevention and treatment of postpartum hemorrhage in low-resource settings. International Journal of Gynaecology and Obstetrics 2012; 117: 108–18.
8. National Institute for Health and Care Excellence. Intrapartum care for healthy women and babies. NICE Clinical Guideline 190. London, UK: National Institute for Health and Care Excellence; 2014.
9. Guidelines for oxytocin administration after birth. AWHONN practice brief number 2. Journal of Obstetrics, Gynecology and Neonatal Nursing 2015; 44: 161–3.
10. Bolton TJ, Randall K, Yentis SM. Effect of the confidential enquiries into maternal deaths on the use of syntocinon at caesarean section in the UK. Anaesthesia 2003; 58: 277–9.
11. Wedisinghe L, Macleod M, Murphy DJ. Use of oxytocin to prevent haemorrhage at caesarean section–a survey of practice in the United Kingdom. European Journal of Obstetrics and Gynecology and Reproductive Biology 2008; 137: 27–30.
12. West R, West S, Simons R, McGlennan A. Impact of dosefinding studies on administration of oxytocin during caesarean section in the UK. Anaesthesia 2013; 68: 1021–5.
13. Orbach-Zinger S, Einav S, Yona A, et al. A survey of physicians' attitudes toward uterotonic administration in parturients undergoing Cesarean section. Journal of Maternal-Fetal and Neonatal Medicine 2018; 31: 3183–90.
14. Meher S, Cuthbert A, Kirkham JJ, et al. Core outcome sets for prevention and treatment of post-partum haemorrhage: an international Delphi consensus study. British Journal of Obstetrics and Gynaecology 2019; 126: 83–93.

15. Gimpl G, Fahrenholz F. The oxytocin receptor system: structure, function, and regulation. Physiological Reviews 2001; 81: 629–83.
16. Carvalho JC, Balki M, Kingdom J, Windrim R. Oxytocin requirements at elective Cesarean delivery: a dose-finding study. Obstetrics and Gynecology 2004; 104: 1005–10.
17. Butwick AJ, Coleman L, Cohen SE, Riley ET, Carvalho B. Minimum effective bolus dose of oxytocin during elective Caesarean delivery. British Journal of Anaesthesia 2010; 104: 338–43.
18. Kovacheva VP, Soens MA, Tsen LC. A randomized, doubleblinded trial of a "rule of threes" algorithm versus continuous infusion of oxytocin during elective Cesarean delivery. Anesthesiology 2015; 123: 92–100.
19. George RB, McKeen D, Chaplin AC, McLeod L. Up-down determination of the ED(90) of oxytocin infusions for the prevention of postpartum uterine atony in parturients undergoing Cesarean delivery. Canadian Journal of Anesthesia 2010; 57: 578–82.
20. Lavoie A, McCarthy RJ, Wong CA. The ED90 of prophylactic oxytocin infusion after delivery of the placenta during Cesarean delivery in laboring compared with nonlaboring women: an updown sequential allocation dose-response study. Anesthesia and Analgesia 2015; 121: 159–64.
21. Duffield A, McKenzie C, Carvalho B, et al. Effect of a high-rate versus a low-rate oxytocin infusion for maintaining uterine contractility during elective Cesarean delivery: a prospective randomized clinical trial. Anesthesia and Analgesia 2017; 124: 857–62.
22. Gung € ord € uk K, Asicioglu O, Celikkol O, Olgac Y, Ark C. Use of € additional oxytocin to reduce blood loss at elective caesarean section: a randomised control trial. Australian and New Zealand Journal of Obstetrics and Gynaecology 2010; 50: 36–9.
23. Sheehan SR, Montgomery AA, Carey M, et al. ECSSIT Study Group. Oxytocin bolus versus oxytocin bolus and infusion for control of blood loss at elective caesarean section: double blind, placebo controlled, randomised trial. British Medical Journal 2011; 343: d4661.
24. Balki M, Ronayne M, Davies S, et al. Minimum oxytocin dose requirement after Cesarean delivery for labor arrest. Obstetrics and Gynecology 2006; 107: 45–50.
25. Munn MB, Owen J, Vincent R, Wakefield M, Chestnut DH, Hauth JC. Comparison of two oxytocin regimens to prevent uterine atony at Cesarean delivery: a randomized controlled trial. Obstetrics and Gynecology 2001; 98: 386–90.
26. King KJ, Douglas MJ, Unger W, Wong A, King RA. Five unit bolus oxytocin at Cesarean delivery in women at risk of atony: a randomized, double-blind, controlled trial. Anesthesia and Analgesia 2010; 111: 1460–6.
27. Langesaeter E, Rosseland LA, Stubhaug A. Haemodynamic effects of repeated doses of oxytocin during Caesarean delivery in healthy parturients. British Journal of Anaesthesia 2009; 103: 260–2.
28. Secher NJ, Arnsbo P, Wallin L. Haemodynamic effects of oxytocin (syntocinon) and methyl ergometrine (methergin) on the systemic and pulmonary circulations of pregnant anaesthetized women. Acta Obstetrica Gynecologica Scandinavica 1978; 57: 97–103.
29. Thomas JS, Koh SH, Cooper GM. Haemodynamic effects of oxytocin given as i.v. bolus or infusion on women undergoing Caesarean section. British Journal of Anaesthesia 2007; 98: 116–19.
30. Langesaeter E, Rosseland LA, Stubhaug A. Haemodynamic effects of oxytocin in women with severe preeclampsia. International Journal of Obstetric Anesthesia 2011; 20: 26–9.
31. Langesaeter E, Dragsund M, Rosseland LA. Regional anaesthesia for a Caesarean section in women with cardiac disease: a prospective study. Acta Anaesthesiologica Scandinavica 2010; 54: 46–54.
32. Mathew JP, Fleisher LA, Rinehouse JA, et al. ST segment depression during labor and delivery. Anesthesiology 1992; 77: 635–41.
33. Palmer CM, Norris MC, Giudici MC, Leighton BL, DeSimone CA. Incidence of electrocardiographic changes during caesarean delivery under rgional anaesthesia. Anesthesia and Analgesia 1990; 70: 36–43.
34. Zakowski MI, Ramanathen S, Baratta JB, et al. Electrocardiographic changes during caesarean section: a cause for concern? Anesthesia and Analgesia 1993; 76: 162–7.
35. Moran C, Ni Bhuinneain M, Geary M, Cunningham S, McKenna P, Gardiner J. Myocardial ischaemia in normal patients undergoing elective Caesarean section: a peripartum assessment. Anaesthesia 2001; 56: 1051

International guidelines on uterotonic use during caesarean section are variable.

Box 1 Suggested dose regimens for uterotonic administration at low-risk elective caesarean section, and caesarean section in labouring women. N.B. take account of national drug license restrictions. See text for further information.

First-line drugs

Oxytocin

Elective caesarean section	Intrapartum caesarean section
Bolus 1 IU oxytocin; start oxytocin infusion at 2.5–7.5 $IU.h^{-1}$ (0.04–0.125 $IU.min^{-1}$).	3 IU oxytocin over ≥ 30 s; start oxytocin infusion at 7.5–15 $IU.h^{-1}$ (0.125–0.25 $IU.min^{-1}$).
If required after 2 min, give a further dose of 3 IU over ≥ 30 s.	
Consider second-line agent early in the event of failure of this regimen to produce sustained uterine tone.	
Review the patient's clinical condition before discontinuing the infusion; this will usually be between 2 h and 4 h after commencement.	

Alternative – carbetocin

Elective caesarean section	Intrapartum caesarean section
100 µg over ≥ 30 s.	100 µg over ≥ 30 s.
Smaller doses (as low as 20 µg) may be sufficient; in this case, doses can be repeated if required, up to 100 µg.	Do not exceed 100 µg – if required move to second-line drug.
Do not exceed 100 µg – if required move to second-line drug.	

Second-line drugs

These drugs should be considered for both prophylaxis and treatment of postpartum haemorrhage.
Consider early use in the event of failure of first-line drugs to produce sustained uterine tone.
Depending on local availability, the following drugs can be used:

1. Ergometrine (ergonovine) 200–500 µg/methylergometrine (methylergonovine) 200 µg: i.m., or slow i.v. in exceptional circumstances; may be repeated after 2 h.
2. Misoprostol 400–600 µg: sublingual, rectal, vaginal, oral; repeat after 15 min if required, maximum dose 800 µg.
3. Carboprost 250 µg: i.m. or intramyometrial (contraindicated i.v.); up to every 15 min if required, maximum eight doses.
4. Sulprostone 500 µg: i.v. at 100 $µg.h^{-1}$; maximum dose 1500 µg.

Consider early use of adjunctive medication to counter adverse effects, for example, antiemetics.
Further uterotonic administration (third-line drugs) should be considered within a multimodal postpartum haemorrhage regimen (pharmacology/haematology and antifibrinolysis/surgery/interventional radiology).

SS-08

Abstract Only

Labor Analgesia

Gazi Akkurt

University of Health Sciences Ankara Etlik City Hospital, Department of Anesthesiology and Reanimation, Ankara, Türkiye

ABSTRACT

Birth is a very special experience for a woman and her family. It is the duty of the entire healthcare team to make this experience unique, unique, perfect, happy and peaceful. Labor pain and stress increase sympathetic nervous system activation, cause a decrease in placental blood flow due to peripheral vasoconstriction. As a result of uteroplacental circulation, impaired oxygenation of the fetus, metabolic acidosis and fetal hypoxia occur in the fetus. As a result of intense catecholamine synthesis, inhibition occurs in oxytocin release. As a result, the vicious circle formed between fear, anxiety and pain negatively affects the progression of labor.Birth takes place in three stages. The first stage is divided into two as slow latent phase and faster active phase according to the cervical dilatation rate. Latent phase, progressive cervical effacement and minor dilatation (2-4 cm). Active phase, with more frequent contractions (30-60 seconds every 3-5 minutes) and progressive cervical dilation up to 10 cm. The first stage lasts 8-12 hours in nulliparous patients and 5-8 hours in multiparous patients. Pain in the first stage of labor is due to dilatation of the cervix, hypoxia during contraction, and stretching of the lower segment of the uterus.The second stage begins with full cervical dilatation and completes with the complete delivery of the fetus. Pain in the second stage of labor is due to hypoxia of the uterine muscles, enlargement of the vagina and perineum, pressure of the fetus on the perineum. The third stage covers the exit of the placenta after the birth of the baby. The painful stimulus that accompanies the descent of the fetus and the separation of the placenta continues.Ideal analgesia technique for childbirth; should provide consistent-sustained analgesia,the onset of effect must be rapid, long lasting effect, maternal and fetal effects should be minimal, should not affect the course of birth. There are pharmacological (inhalation, intravenous, neuraxial anesthesia) and non-pharmacological (TENS, hypnosis,acupuncture) techniques that can be used to prevent labor pain. Indications; mother's request, operative birth expectancy, obstetric disease, maternal conditions that complicate or contraindicate general anesthesia, comorbid diseases of the mother whose physiological consequences of pain severity should be avoided. Systemic analgesics, Meperidine.Intramuscular (im) dose range is 50-100 mg, Peak analgesic level is reached in 40-50 minutes. 25-50 mg intravenously (iv), optimal effect is achieved in 5-10 minutes. Analgesic effect ends after 3-4 hours. It produces maximum maternal fetal respiratory depression 10-20 minutes after intravenous administration and 1-3 hours after intramuscular administration.It may cause temporary changes in fetal heartbeat. Fentanyl, it is short-acting.Due to its high lipid solubility, it rapidly crosses the placenta and reaches the fetal circulation. The dose used in labor analgesia is 25-50 µg i.v. It reaches the peak effect in 3-5 minutes and the effect lasts for 30-60 minutes. Remifentanyl is an effective and safe drug for labor analgesia due to its rapid onset and termination of action. Crosses the placenta but is rapidly eliminated in the newborn. Neuraxial Technique; epidural analgesia (intermittent bolus, continuous epidural infusion,patient controlled epidural analgesia), spinal analgesia (single application, continuous), combined spinal-epidural analgesia,dural puncture epidural analgesia. Maternal effects of the neuraxial technique:sensory block,motor block,autonomous block,increase in maternal temperature, Fetal Effects of the neuraxial technique; neonatal depression due to high or repeated doses of opioids,fetal acidosis as a result of impaired placental gas exchange. Regional anesthesia improves intervillous blood flow when hydration and position prevent hypotension.When starting neuraxial analgesia, a good physical examination should be done and anamnesis should be taken. Oral and written informed consent should be obtained. In case of emergency, necessary materials for resuscitation should be available. The vital signs of the mother, uterine contractions and fetal heartbeats of the baby should be monitored. The main drugs used are local anesthetics and opioids. Local anesthetics produce sympathetic, sensory, and motor blocks. Opioids provide visceral analgesia without motor and sympathetic blockade. After administering neuraxial analgesia, aortocaval compression should be avoided. Close blood pressure monitoring should be performed for 20 minutes after the first dose of local anesthetic. In top-up doses, close blood pressure monitoring should be performed for 10 minutes. A 20% or more decrease in systolic blood pressure requires 5-10 mg of ephedrine or intravenous fluid loading. Anesthesiologists, obstetricians, midwives should be readily available and easily accessible. Because birth is a dynamic event, the treatment of labor pain should be flexible and individual.Analgesia plan should be arranged according to the expectations of the pregnant woman and existing medical/obstetric problems.