

Abdominal packing in postpartum hemorrhage: A forgotten life-saving technique

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ABSTRACT

BACKGROUND: Postpartum hemorrhage is a major cause of maternal morbidity and mortality. Abdominal packing is a technique used to control bleeding when other methods fail. This study aimed to evaluate the outcomes of patients who underwent abdominal packing for postpartum hemorrhage.

METHODS: This retrospective study included 11 patients who underwent abdominal packing for severe obstetric hemorrhage (10 cases of postpartum hemorrhage and one case of second-trimester pregnancy termination complicated by severe hemorrhage) at Mersin University Faculty of Medicine Hospital between 2005 and 2023. Data were collected from medical records. The primary outcome was the successful immediate control of refractory hemorrhage and temporary stabilization of the patient's hemodynamic status. Secondary outcomes included transfusion requirements, complications, and length of hospital stay.

RESULTS: All 11 patients underwent hysterectomy for postpartum hemorrhage and subsequently required abdominal packing due to persistent bleeding. The median age was 33 years, and the median gravidity was 3. The primary causes of postpartum hemorrhage were uterine atony (54.5%), placenta previa (36.4%), and disseminated intravascular coagulation (9.1%). The median number of packs used was 3, and packs were removed after 24 hours in all cases. Abdominal packing successfully controlled persistent bleeding in all patients following hysterectomy. The median length of hospital stay was 6 days. All patients required blood transfusions. The most common complication was pulmonary edema (90.9%). All patients survived.

CONCLUSION: Abdominal packing may serve as a valuable temporary rescue measure for severe, refractory obstetric hemorrhage in selected cases where conventional methods are insufficient. Careful patient selection and close postoperative monitoring are essential.

Keywords: Abdominal packing; hysterectomy; maternal morbidity; mortality; postpartum hemorrhage.

INTRODUCTION

Postpartum hemorrhage (PPH) remains a leading cause of maternal mortality worldwide, accounting for an estimated 27.1% of all maternal deaths globally.^[1] Despite advances in obstetric care and medical management, PPH continues to

pose a significant challenge to healthcare providers. Severe cases require prompt and effective intervention to prevent potentially catastrophic outcomes. The time-critical nature of these emergencies often necessitates the implementation of rapid and reliable hemostatic strategies.

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Abdominal packing is a well-recognized procedure in trauma and general surgery, employed as a "damage control technique" in unstable patients with coagulopathy and widespread hemorrhage.^[2] This technique was once a mainstay of obstetric and gynecologic surgery prior to the development of modern alternatives. The traditional method involves strategically placing gauze packs to exert pressure on bleeding surfaces, thereby achieving temporary hemostasis until definitive treatment can be undertaken or coagulopathy corrected.^[3] However, with the advent of pharmacologic interventions such as uterotonics and hemostatic agents, as well as interventional procedures including arterial embolization and compression sutures, the use of abdominal packing has declined in contemporary obstetric practice.^[4-7]

Abdominal packing offers several distinct advantages in emergency situations. It does not require specialized equipment, can be performed in any surgical setting, and provides immediate tamponade of diffuse bleeding surfaces that may be challenging to manage with sutures or focal pressure.^[8] Moreover, in resource-limited settings or in cases of catastrophic hemorrhage, packing can serve as a life-saving temporizing measure until definitive treatment becomes available. However, these benefits must be considered alongside potential complications, including infection, adhesion formation, tissue necrosis, and the need for relaparotomy.^[9] Furthermore, the pressure exerted by the packs may compromise perfusion to adjacent structures if not carefully monitored.

The aim of this study was to evaluate the characteristics, complications, and outcomes of patients who underwent abdominal packing for severe obstetric hemorrhage at our institution. By analyzing these cases, we sought to determine the contemporary role and efficacy of this technique within the context of modern obstetric hemorrhage management protocols. Although newer techniques have largely replaced abdominal packing in routine practice, we hypothesized that this method remains valuable in specific clinical scenarios where conventional measures are inadequate or unavailable.

MATERIALS AND METHODS

Between January 1, 2005 and December 31, 2023, abdominopelvic packing was successfully performed in 11 patients with persistent postpartum hemorrhage after hysterectomy at Mersin University Medical Faculty Hospital. Ethical approval for the study was obtained from the University Ethics Committee on September 18, 2024 (decision number: 2024/872). The study was conducted in accordance with the principles of the Declaration of Helsinki. Data were collected retrospectively from the hospital's electronic information system and patient records. The indications for abdominopelvic packing included secondary disseminated intravascular coagulation following peripartum hysterectomy, with intact surgical pedicles, and persistent non-arterial hemorrhage originating from venous plexuses, exposed pelvic sidewalls, or other inaccessible regions where traditional suturing or ligation had

proven ineffective. For this indication, vascular sources of hemorrhage were excluded.

Patients were included if they experienced refractory PPH that could not be controlled by peripartum hysterectomy and conventional hemostatic measures, or if they developed secondary disseminated intravascular coagulation (DIC) with persistent diffuse oozing. Cases in which bleeding was primarily arterial and required specific ligation, or in which conservative measures (e.g., Bakri balloon) successfully achieved hemostasis, were excluded.

The primary outcome was the effectiveness of abdominopelvic packing in achieving hemostasis without the need for additional interventions. Preoperative and postoperative complete blood counts, transfusion requirements, duration of intensive care unit stay, duration of mechanical ventilation, length of hospitalization, and complications were evaluated. All patients were managed by a multidisciplinary team consisting of experienced obstetricians, anesthesiologists, transfusion medicine specialists, and intensive care physicians.

To prevent potential infectious complications associated with intra-abdominal foreign material, all patients received prophylactic intravenous antibiotic therapy consisting of clindamycin and gentamicin. This regimen was initiated at the time of tamponade and continued throughout the hospital stay.

In cases where conventional methods (uterotonics, compression sutures, or arterial ligation) proved insufficient to stop bleeding, abdominopelvic packing was used as a last-resort (rescue) measure to achieve hemostasis. The aim was to control persistent venous bleeding despite secured surgical pedicles, to gain time for correction of coagulopathy, and to achieve hemodynamic stabilization of the patient.

In cases of vaginal delivery included in the study, when bleeding could not be controlled using routine methods, a hysterectomy was performed first. However, as widespread intra-abdominal bleeding continued after the hysterectomy, transabdominal packing was subsequently applied.

The essential aspect of this technique is to primarily pack the true pelvis (below the pelvic brim) rather than the false pelvis, thereby creating a physical tamponade within the bony structures of the pelvis itself (above the pelvic brim). Packing above the pelvic brim provides minimal tamponade effect, as the primary source of bleeding typically arises from the internal pelvic vessels.

Only X-ray-detectable gauze of larger dimensions (minimum 45 × 45 cm) should be used, and it should be folded in half or into quarters to form rolls. The packs must be positioned securely and uniformly across the exposed bleeding areas of the pelvis and pedicles. In post-hysterectomy hemorrhage, it is crucial to verify that the surgical pedicles are adequately secured. The tamponade effect of abdominopelvic packing provides time for correction of coagulopathy and restoration of hemodynamic stability with blood transfusion.

The patient's blood pressure is stabilized to ensure adequate control of venous hemorrhage. Drains are typically omitted, and primary closure of the rectus sheath is avoided to prevent abdominal compartment syndrome; the skin is approximated only with sutures or staples. Patients are subsequently transferred to the intensive care unit (ICU) for stabilization and correction of any coagulopathy or anemia, and intra-abdominal pack removal is recommended within 24-48 hours.^[10] All patients underwent reoperation after 24 hours, during which the packs were removed (Fig. 1).

Statistical Analysis

Statistical analyses were performed using SPSS software (version 22.0; IBM Corp., Armonk, NY, USA). Continuous variables were expressed as median and interquartile range (IQR) due to the small sample size, while categorical variables were presented as numbers and percentages.

RESULTS

During the study period, 10,654 deliveries (3,042 normal vaginal deliveries and 7,612 cesarean deliveries) took place in our hospital, and the prevalence of peripartum hysterectomy was 7.04 per 1,000 deliveries. Eleven women who underwent hysterectomy for postpartum hemorrhage and required abdominal packing due to continued bleeding were included in the study. Patient demographics and clinical characteristics are presented in Table 1. The median age of the patients was 33.0 years (interquartile range [IQR]: 8.0), with a median gravidity of 3.0 (IQR: 1.0) and parity of 2.0 (IQR: 2.0). The me-

dian gestational age was 38.0 weeks (IQR: 5.0).

The primary causes of hemorrhage were uterine atony (n=6; 54.5%), placenta previa (n=4; 36.4%), and disseminated intravascular coagulation (n=1; 9.1%). Cesarean section was the predominant mode of delivery (n=10; 90.9%), while only one patient (9.1%) delivered vaginally. Additional procedures performed included hypogastric artery ligation in seven cases (63.6%) and Bakri balloon tamponade in one case (9.1%).

Management strategies and clinical outcomes are summarized in Table 2. The median shock index at the time of the decision to pack was 1.16 (IQR: 0.17). The median number of packs used for abdominal packing was 3 (IQR: 3), with a uniform pack duration of one day for all patients. The median length of hospitalization was 6 days (IQR: 2). Intensive care was required in 10 patients (90.9%), with a median ICU stay of 1.0 day (IQR: 0.5) and a median duration of mechanical ventilation of 30.0 hours (IQR: 8.5). Pulmonary edema was the most common complication, occurring in 10 patients (90.9%).

Table 3 details the hematological parameters and blood product requirements. The median preoperative hemoglobin level was 9.3 g/dL (IQR: 3.1), and the median postoperative hemoglobin level was 8.2 g/dL (IQR: 1.6). The median preoperative hematocrit was 27.1% (IQR: 10%), and the median postoperative hematocrit was 23% (IQR: 6%). The median preoperative platelet count was $101 \times 10^9/L$ (IQR: $162 \times 10^9/L$), and the median postoperative platelet count was $85 \times 10^9/L$ (IQR: $63 \times 10^9/L$).

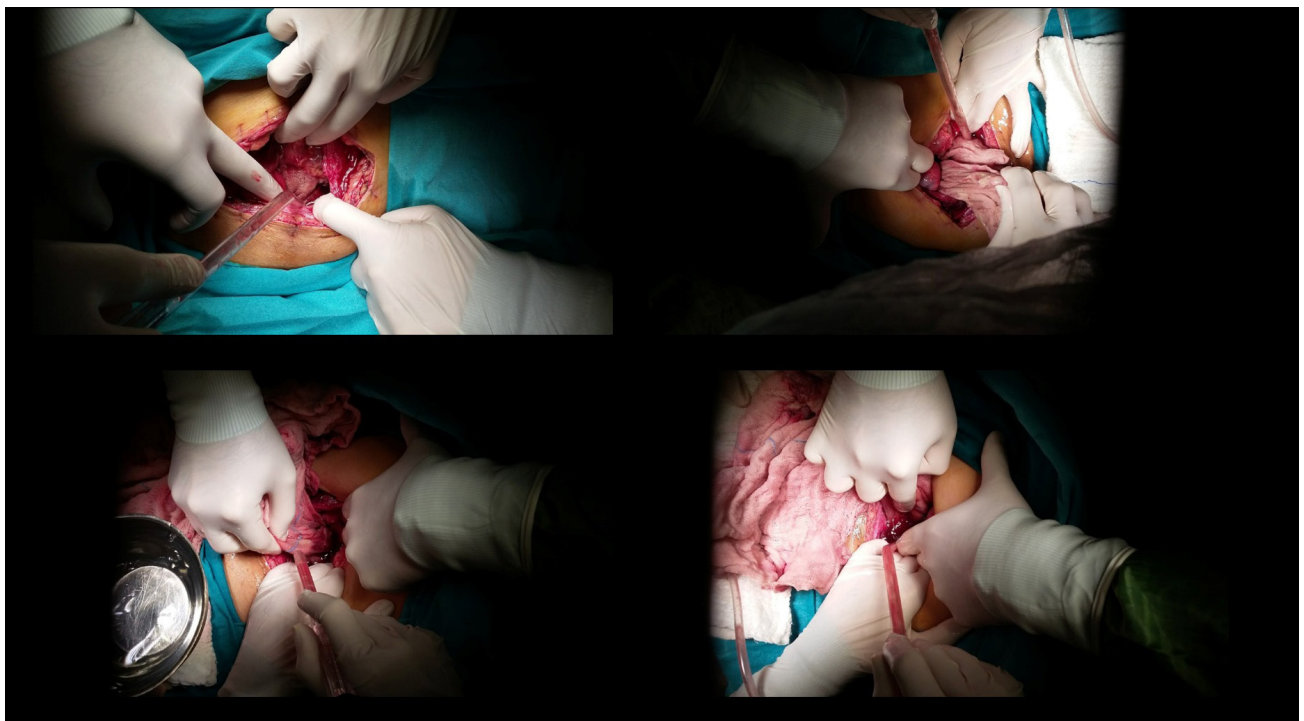


Figure 1. Removed the packs after abdominopelvic packing.

Table 1. Patient characteristics

Case	Age	Gravidity	Parity	BMI (kg/m ²)	Gestational Age (weeks)	Previous Surgery	Delivery Route	Cause of Hemorrhage	Additional Procedures Before Packing
1	22	2	1	23.44	19	CS	CS	Second-trimester hemorrhage	Hysterectomy
2	33	3	3	30.44	38	None	CS	Second-trimester hemorrhage	Hysterectomy
3	36	2	2	27.48	38	CS	CS	Placenta previa	Hypogastric artery ligation + hysterectomy
4	31	3	2	22.23	36	CS	CS	Placenta previa	Hysterectomy
5	33	3	2	31.20	38	None	CS	Second-trimester hemorrhage	Hypogastric artery ligation + hysterectomy
6	39	2	1	27.68	37	CS	CS	Second-trimester hemorrhage	Hypogastric artery ligation + hysterectomy
7	43	3	3	25.10	40	Appendectomy	NVD	Second-trimester hemorrhage	Bakri balloon tamponade + hysterectomy
8	33	3	3	35.63	40	None	CS	Second-trimester hemorrhage	Hypogastric artery ligation + hysterectomy
9	39	4	3	Not available	27	None	CS	Placenta previa	Hypogastric artery ligation + hysterectomy
10	38	2	1	Not available	33	None	CS	Placenta previa	Hypogastric artery ligation + hysterectomy
11	30	4	3	29.38	38	CS	CS	DIC	Hypogastric artery ligation + hysterectomy

BMI: Body mass index; CS: Cesarean section; El: Elective; Em: Emergency; NVD: Normal vaginal delivery.

Table 2. Management and outcomes of patients

Case	Shock Index (HR/SBP)	Number of Packs	Pack Duration (days)	Hospital Stay (days)	ICU stay (days)	Duration of Mechanical Ventilation (hours)	Complications
1	1.17	3	1	6	4	48	Pulmonary edema
2	1.29	1	1	10	1	20	Pulmonary edema
3	1.08	2	1	4	2	25	Pulmonary edema
4	1.02	3	1	10	2	30	Pulmonary edema
5	1.30	2	1	5	1	19	Pulmonary edema
6	1.14	6	1	7	2	30	Pulmonary edema
7	1.04	3	1	5	2	36	Pulmonary edema
8	1.16	3	1	5	3	1	None
9	1.26	6	1	6	2	30	Pulmonary edema
10	1.04	5	1	5	3	24	Pulmonary edema
11	1.16	5	1	6	2	30	Pulmonary edema

BP: Blood pressure.

Table 3. Blood product transfusions

Case	Preoperative Hemoglobin	Preoperative Hematocrit	Preoperative Platelets	Postoperative Hemoglobin	Postoperative Hematocrit	Postoperative Platelets	Erythrocyte Suspension Transfusion	Fresh Frozen Plasma Transfusion	Cryoprecipitate Transfusion	Platelet Suspension	Fibrinogen Transfusion (patient level mg/dL)
1	12.9	35.8	101	3.0	9.5	98	10	8	0	2	1 (104)
2	4.9	14.6	40	7.2	21.0	44	8	10	10	5	1 (86)
3	10.9	32.0	121	4.3	12.9	35	5	10	1	1	1 (132)
4	9.3	27.1	105	8.3	23.6	120	5	4	1	4	1 (108)
5	8.4	23.0	76	8.1	23.0	81	4	4	0	1	1 (129)
6	7.9	23.0	77	7.4	22.0	74	5	1	1	2	1 (117)
7	7.8	22.0	60	8.3	23.0	60	6	3	1	0	1 (128)
8	9.7	30.0	231	8.8	27.0	165	4	2	0	0	1 (133)
9	9.4	29.0	236	9.5	29.0	191	8	4	1	0	1 (138)
10	6.5	20.0	28	10.2	29.0	85	5	4	1	1	1 (141)
11	11.1	35.0	222	8.2	24.0	123	8	6	1	1	2 (135)

Blood product transfusions were required in all cases. The median number of erythrocyte suspension transfusions was 5 (IQR: 3), and the median number of fresh frozen plasma transfusions was 4 (IQR: 5). The median number of cryoprecipitate transfusions was 1 (IQR: 0), and the median number of platelet suspension transfusions was 1.5 (IQR: 2.5). The median number of fibrinogen transfusions was 1 (IQR: 0). All patients survived following management with abdominal packing and associated interventions.

DISCUSSION

Postpartum hemorrhage remains a leading cause of maternal morbidity and mortality worldwide. This case series provides valuable insights into the role of abdominal packing in the contemporary management of severe, refractory PPH when conventional methods prove unsuccessful.

Our results demonstrate a 100% survival rate among patients managed with pelvic pressure packing, which compares favorably with the findings of Franchini et al.,^[11] who reported mortality rates of 2–4% in severe PPH cases requiring second-line interventions. However, 10 of our 11 patients (90.9%) developed pulmonary edema, a complication rate considerably higher than the 28.6% (2 of 7 patients) reported by Yoong et al.^[12] in their study on abdominopelvic packing. This discrepancy underscores the importance of meticulous fluid management protocols when employing this method.

In our study, the median blood product requirements were 5.0 units of packed red blood cells and 4.0 units of fresh frozen plasma. Touhami et al.,^[8] in their study on pelvic packing after emergency peripartum hysterectomy, reported a mean transfusion requirement of 19.5 units of packed red blood cells (standard deviation: 7.7). Our median ICU stay of 1.0 day was notably shorter than the 3 days (IQR: 2-6.5) reported by Deffieux et al.^[13] in their study on maternal outcomes after abdominal packing for uncontrolled postpartum hemorrhage. This shorter ICU stay, together with the median mechanical ventilation duration of 24 hours (IQR: 24-48) reported by Deffieux et al., suggests potential benefits of our postoperative care approach. Specifically, the shorter ICU stay in our series may be attributed to our practice of reoperating 24 hours after the initial packing procedure.

There are limited data on the use of the shock index in obstetric patients. In a study by Nathan et al., a shock index >0.9 in patients with postpartum hemorrhage was associated with an increased risk of maternal adverse events.^[14] Le Bas et al. found that a shock index of 0.7-0.9 in patients with postpartum hemorrhage was associated with a significant increase in blood loss.^[15] The median shock index of 1.16 in patients who underwent abdominal packing in this study suggests that these patients were at high risk of hemodynamic instability. The shock index may be a useful tool for assessing hemodynamic status and guiding treatment strategies in patients undergoing abdominal packing.

Based on our findings and a review of the literature, abdominal packing appears most appropriate in specific clinical scenarios: cases of severe PPH refractory to first-line medical management;^[9,16] situations in which arterial embolization is unavailable or impractical;^[17] when compression sutures have failed;^[9] and in resource-limited settings lacking advanced surgical expertise.^[9] Specifically, our data suggest that patients with uterine atony or placenta previa who continue to hemorrhage despite conventional measures may derive the greatest benefit from this approach.

This technique is particularly valuable in patients with coagulopathy, such as our patient with DIC, in whom definitive surgical procedures may be complicated by persistent bleeding. As highlighted by Zhou et al.,^[18] packing provides temporary hemostasis, allowing correction of coagulopathy before definitive surgery.

Compared to other second-line interventions, abdominal packing offers several distinct advantages. Unlike arterial embolization, which Sentilhes et al.^[19] reported to have a technical success rate of 85–95% but requires specialized radiological expertise and facilities, packing can be performed in any surgical setting using readily available materials. The simplicity of the technique contrasts with more complex compression sutures, such as the B-Lynch or Hayman sutures, which Matsubara et al.^[20] noted require specific surgical skills and may be challenging to implement in emergency situations.

However, our findings must be considered alongside the advantages of balloon tamponade techniques, which Germano et al.^[21] reported to be successful in 99% of cases with ultrasound guidance and 86% without ultrasound guidance. Compared to packing, balloon tamponade techniques are associated with lower complication rates. Therefore, the choice between these methods should take into account institutional resources, provider expertise, and patient-specific factors, such as the source and severity of bleeding.

A notable finding in our study was the high incidence of pulmonary edema, observed in 90.9% of cases. This rate is significantly higher than that reported in standard obstetric cohorts and warrants careful interpretation.^[22] It is important to emphasize that all patients in our series experienced massive hemorrhage requiring aggressive fluid resuscitation and multiple blood product transfusions under a massive transfusion protocol. Therefore, we believe that the high rate of pulmonary edema was primarily a manifestation of transfusion-associated circulatory overload and/or transfusion-related acute lung injury, rather than a direct complication of the packing technique itself. Furthermore, abdominal packing is typically reserved for patients in profound shock with coagulopathy; thus, the associated systemic inflammatory response and increased capillary permeability likely contributed to the development of pulmonary edema. Despite this high complication rate, the primary goals of hemorrhage control and hemodynamic stabilization were achieved in all patients, and

all cases of pulmonary edema were successfully managed in the intensive care unit without long-term sequelae.

Our study has several limitations. The retrospective nature and small sample size ($n=11$) limit the generalizability of our findings, and the single-center experience may not reflect outcomes in other healthcare settings. The lack of a control group precludes direct comparison with other management strategies. Finally, the absence of long-term follow-up data, combined with the fact that all patients underwent hysterectomy, prevents evaluation of potential long-term complications such as adhesion formation or effects on subsequent fertility.

Despite these limitations, our study has several strengths. It is one of the few studies to investigate the use of abdominal packing in contemporary practice and provides valuable insights into the technique's potential role in managing severe PPH. Our findings suggest that abdominal packing can be a life-saving intervention for women with refractory PPH, particularly in settings where more advanced interventions may not be immediately available.

CONCLUSION

In conclusion, abdominal packing remains a valuable tool in the management of severe, refractory PPH. When implemented with appropriate patient selection and careful postoperative monitoring, it can serve as a life-saving intervention that bridges the gap between medical management and more invasive surgical procedures. Future research should address the limitations of our study through prospective, multicenter studies comparing modified packing techniques with contemporary interventions such as intrauterine balloon tamponade and endovascular approaches. The development of standardized protocols for patient selection, pack placement, and postoperative management would improve the quality of evidence. Additionally, investigation of modified packing materials that minimize tissue trauma while maintaining efficacy may help reduce complication rates. Long-term follow-up studies examining subsequent pregnancy outcomes and quality of life after abdominal packing for PPH would provide valuable insights into the broader impact of this intervention.

Ethics Committee Approval: This study was approved by the Mersin University Medical Faculty Hospital Ethics Committee (Date: 18.09.2024, Decision No: 2024/872).

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ORİJİNAL ÇALIŞMA - ÖZ

Doğum sonrası kanamada abdominal packing: Unutulmuş bir hayat kurtarma tekniği

AMAÇ: Postpartum kanama maternal morbidite ve mortalitenin önemli bir nedenidir. Abdominal packing, diğer yöntemler başarısız olduğunda kanamayı kontrol etmek için kullanılan bir tekniktir. Bu çalışmanın amacı postpartum kanama nedeniyle abdominal packing tekniği uygulanan hastaların sonuçlarını değerlendirmektir.

GEREÇ VE YÖNTEM: Bu retrospektif çalışmaya 2005-2023 yılları arasında Mersin Üniversitesi Tıp Fakültesi Hastanesi'nde postpartum kanama nedeniyle abdominal packing uygulanan 11 hasta dahil edildi. Veriler tıbbi kayıtlardan toplandı. Birincil sonuç, daha fazla operasyon gerektirmeden abdomino-pelvik packingin etkinliği idi. İkincil sonuçlar kanama, transfüzyonlar, komplikasyonlar ve hastanede yatış süresini kapsamaktadır.

BULGULAR: 11 hastanın hepsine postpartum kanama nedeniyle histerektomi yapıldı ve devam eden kanama nedeniyle abdominal packing uygulandı. Postpartum kanamanın ana nedenleri uterus atonisi (%54.5), plasenta previa (%36.4) ve dissemine intravasküler koagülasyon (%9.1) idi. Kullanılan ortalama kompres sayısı 3 idi ve tüm hastalara 1 gün süreyle yerleştirildi. Abdominal packing, histerektomi sonrası tüm vakalarda inatçı kanamayı etkili bir şekilde kontrol altına almıştır. Hastanede yatış süresi median 6 gündü. Tüm hastalara kan transfüzyonu gerekmiştir. En yaygın komplikasyon akciğer ödemi idi (%90.9). Tüm hastalar hayatta kaldı.

SONUÇ: Abdominal packing tekniği, özellikle diğer yöntemler başarısız olduğunda, şiddetli postpartum kanama için hayat kurtarıcı bir girişim olabilir. Dikkatli hasta seçimi ve ameliyat sonrası izlem şarttır.

Anahtar sözcükler: Abdominal packing; histerektomi; maternal morbidite; mortalite; postpartum kanama.