



Thoracic Paravertebral Block and Extubation in the Operating Room in Robotic Atrial Septal Defect Closure

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ABSTRACT

Robotic-assisted cardiac surgery offers benefits such as reduced blood loss, shorter hospital stays, and improved recovery. Enhanced Recovery After Surgery (ERAS) protocols further optimize outcomes by promoting early mobilization, minimizing opioid use, and improving patient satisfaction. This case report highlights the successful implementation of a thoracic paravertebral block (PVB) as part of an ERAS strategy in robotic atrial septal defect (ASD) closure surgery.

Keywords: Atrial septal defect, ERAS, extubation, paravertebral block, robotic-assisted surgery

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Introduction

Robotic-assisted cardiac surgery techniques have been demonstrated to offer a number of benefits, including reduced blood loss and transfusion, a shorter duration of mechanical ventilation, intensive care unit (ICU) and hospital stay, and improved cosmetic outcomes.

[1] Robotic-assisted cardiac surgery is a method that facilitates the effective implementation of enhanced recovery after surgery (ERAS) protocols.[2] These protocols include the objective of improving quality of care and reducing costs in cardiac surgery.[3]

The thoracic paravertebral block (PVB) is a method of analgesia that has been shown to enhance hemodynamic stability, reduce opioid consumption, and decrease analgesic-related complications, including nausea, vomiting, dizziness, and pruritus. PVB has been demonstrated to promote postoperative recovery and has been associated with a reduced risk of postoperative complications.[4]

This case report mentions the benefits of using a paravertebral block in robotic atrial septal defect (ASD) closure surgery, particularly in terms of facilitating operating room extubation and enhancing recovery.

Case Report

Written informed consent was obtained from the patient for publication. A 35-year-old female patient (height, 173 cm; weight, 82 kg) was scheduled to undergo robotic ASD closure surgery. She had normal preoperative blood test results. Echocardiography showed a left ventricular ejection fraction of 60%, with normal size and function of the right and left ventricles and normal pulmonary artery pressure values.

Prior to the surgical procedure, the patient was informed about the surgery, regional analgesia, general anaesthesia, and the extubation procedure. The patient was administered 0.5 mg of oral alprazolam as premedication the night before surgery. In the operating room, standard monitoring

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procedures were initiated, including electrocardiography, non-invasive blood pressure, and pulse oximetry monitoring, along with an intravenous saline infusion at a rate of 8 mL/kg/h. The patient received oxygen via a face mask, and sedation was achieved in the sitting position using a combination of iv 2 mg midazolam and 50 µg fentanyl. The patient's heart rate was recorded as 67 beats/min, while blood pressure was 130/70 mmHg and SpO₂ was 99%.

Subsequent to marking the needle entry sites 2.5 cm lateral to the Th3 spinous process, the skin was cleansed with chlorhexidine, and the injection site was infiltrated with 2 mL of 2% lidocaine with 1:200,000 epinephrine. The 18 G Touhy needle was inserted at the marked Th3 level in the cephalad direction. The tip of the needle was advanced deeply to contact the transverse process at the T3 level, and the paravertebral space was identified via loss of resistance and confirmed with an USG 11 Hz linear probe. A total of 20 mL of 0.5% bupivacaine was injected, and the block was successfully achieved. After the block, anaesthesia was induced with propofol (2 mg/kg) and fentanyl (1 mcg/kg). Rocuronium was administered at a dose of 0.6 mg/kg to facilitate endobronchial intubation with a left-sided double-lumen tube. The patient was also monitored with an invasive blood pressure catheter, central venous catheter, bispectral index, cerebral oximeter, and transoesophageal echocardiography. Anaesthesia was maintained using a mixture of sevoflurane (0.5%–2%) and 50% oxygen with intermittent doses of fentanyl and rocuronium. The ventilation strategy was adjusted to either one-lung or bipulmonary ventilation, depending on the surgical requirements.

Peripheral cannulation was performed under the guidance of TEE, and the patient's haemodynamic status was also monitored using TEE. The working ports of the robot were inserted into the right thorax. The ASD was closed using a pericardial patch. Following the release of the aortic cross-clamp, TEE with color flow Doppler analysis revealed no residual defects. The patient was weaned from cardiopulmonary bypass. The cross-clamp, cardiopulmonary bypass, and operation times were 53, 86, and 270 minutes, respectively. A total of 750 micrograms of fentanyl was administered to the patient. At the end of the operation, sugammadex 200 mg was administered to facilitate extubation in the operating room. The patient was awake and cooperative and did not require respiratory support, opioids, or inotropic agents. The patient had 100 mL of blood loss and did not receive a blood transfusion. The patient was transferred to the ICU in a haemodynamically stable, conscious, and cooperative state.

In the ICU, the patient's heart rate was 75 beats/min, while blood pressure was 110/60 mmHg, SpO₂ was 99%, and body temperature was 36.5°C. The VAS values were recorded

as 0, 3, and 3 at the 1st, 6th, and 12th hours, respectively. There were no postoperative complications or pain in the ICU. Postoperatively, the patient did not require the administration of antispasmodic or analgesic medication and was discharged from the ICU at the 13th hour, with no reported adverse sequelae. The patient was discharged from the hospital on the 6th postoperative day.

Discussion

This case report highlights the implementation of ERAS protocols in robotic ASD closure surgery with a paravertebral block and extubation.

In recent years, the development and implementation of ERAS protocols have gained greater importance in the surgical care of patients.

Robotic techniques are inherently minimally invasive, generating small wounds, less surgical stress, and minimal scarring. Therefore, robotic techniques are particularly well-suited to the principles of an ERAS program. The ERAS approach takes advantage of robotic surgery's ability to reduce surgical stress while improving the quality of postoperative care. The ERAS protocol is a set of perioperative care protocols based on the best available evidence that improve recovery after surgery and are designed to help patients achieve the best possible outcomes.^[5] The ERAS protocol addresses the goals of minimizing opioid use and the side effects associated with their use.^[6]

Despite being less invasive, robotic-assisted cardiac surgery involves an approximately 3 cm incision in the thorax, which can cause postoperative pain due to intercostal nerve irritation, rib retraction, and tissue trauma. Inadequate pain control may lead to complications such as impaired pulmonary function, increased risk of atelectasis, delayed mobilization, and prolonged hospital stays.

The PVB has emerged as a regional anaesthesia technique in robotic cardiac surgery. It is effective in providing intraoperative and postoperative analgesia and has the potential to reduce opioid use and accelerate recovery with a single-dose injection that is as effective as multiple injections.^[4] It also improves postoperative pulmonary function and reduces the risk of atelectasis and hypoxic events postoperatively.^[4] The paravertebral block has also been shown to minimally block pain transmission, reducing the incidence of chronic pain after surgery.^[4]

ERAS protocols in cardiac surgery involve preoperative, intraoperative, and postoperative strategies. The ERAS strategies include fluid management, anaesthesia, multimodal analgesia, temperature control, control of nausea and vomiting, early mobilization, early nutrition, removal of invasive lines, medication, and education.^[5] In

this case, preoperatively the patient was informed about the procedure, sedated, and underwent a paravertebral block for analgesia prior to surgery. Intraoperatively, the patient's volume status and fluid replacement were managed with TEE guidance. In the operating room, extubation prevented postoperative complications associated with postoperative mechanical ventilation.

Conclusion

The paravertebral block constitutes a valuable adjunct to ERAS protocols in robotic cardiac surgery. It offers effective analgesia, reduces opioid use, supports early extubation, and contributes to enhanced recovery. PVB can be safely administered in robotic cardiac surgery, improving patient outcomes and satisfaction.

Disclosures

Ethics Committee Approval: This is a single case report, and therefore ethics committee approval was not required in accordance with institutional policies.

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report.

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