

# Ultrasound-Guided Serratus Plane Block Combined with Intercostal Block for a High-Risk Patient with Pericardial Tamponade: A Case Report

## Abstract

Anesthetic management of patients with pericardial tamponade is challenging. A 65-year-old man diagnosed with small-cell lung carcinoma and bilateral malignant pleural effusion in the lungs and pericardial effusion was scheduled for pericardial-window-opening surgery. The severely compromised lung function of the patient led to an anesthetic plan of ultrasound-guided serratus anterior plane block combined with an intercostal block. Although serratus plane block was initially developed for postoperative analgesia, we have shown here that it can be used under deep sedation in combination with an intercostal block for anesthesia for surgeries involving the hemithorax; the block may be promising in high-risk cases.

**Keywords:** High risk, pericardial tamponade, serratus plane block

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## Introduction

Anesthetic management of patients with pericardial tamponade is challenging because of the associated cardiovascular problems inherent to this condition, with its associated comorbidities. The etiology of pericardial tamponade is highly varied, with trauma, malignancy, end-stage renal disease, iatrogenic, and idiopathic as the most common causes.<sup>[1-3]</sup>

Surgical drainage can be achieved by the creation of a subxiphoid pericardial window, or a small anterior thoracotomy using either an open or a thoracoscopic approach, or by the creation of a pericardial–peritoneal window.<sup>[1-3]</sup>

The serratus anterior plane block is a new ultrasound-guided regional anesthesia technique of the thorax, using injections of local anesthetics between the serratus anterior and the latissimus dorsi muscles. Although the serratus plane block was initially described for analgesia after breast surgery, it has considerable utility for analgesia following thoracotomy and rib fractures.<sup>[4]</sup>

Here, we report the use of this technique for a case that was too risky for general anesthesia because of pericardial effusion and possible tamponade.

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## Case Report

A 65-year-old male diagnosed with small-cell lung carcinoma 6 months previously was scheduled for pericardial-window-opening surgery (lateral thoracotomy approach) by our Department of Cardiovascular Surgery. An emergency preoperative evaluation led to the patient's assessment by the Department of Chest Disease as a case of "severe chronic obstructive chest disease, bilateral malignant pleural effusion in the lungs and pericardial effusion, and too risky for general anesthesia."

The patient's vital signs were as follows: heart rate 126 bpm, blood pressure 75/35 mmHg, and SpO<sub>2</sub> 75%. He had no comorbidities and no history of surgery or allergy, but a smoking history of 100 pack years. His complete blood count, coagulation functions, and biochemical parameters were normal.

The severely compromised lung function of the patient led to an anesthetic plan of ultrasound-guided serratus anterior plane block combined with an intercostal block. Written consent was obtained from the patient for the procedure. Once the patient entered the operating theater, vital signs were monitored using three-lead electrocardiography and noninvasive blood pressure and SpO<sub>2</sub> monitors. Peripheral

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venous access was provided and a 30-cm<sup>3</sup>/h saline infusion was started. An oxygen mask was used to deliver oxygen at 4 l/min. The patient was placed in the semi-Fowler position with the arm brought forward. Following sterile preparation and coverage, an Esaote MyLab Six ultrasound system (Esaote, Genoa, Italy) with a 6–18-MHz linear probe was used. Once the fourth and fifth rib had been identified, the probe was moved laterally and distally until the latissimus dorsi and serratus anterior muscles were identified, whereupon the transducer was tilted posteriorly. The needle puncture point was anesthetized with 2% lidocaine, and then a 21-ga, 10-cm stimulating needle (Vygon, Ecouen, France) was introduced under ultrasound guidance. After negative aspiration, the plane between the latissimus dorsi and serratus anterior muscles was filled with 15 cm<sup>3</sup> of 0.5% bupivacaine plus 5 cm<sup>3</sup> saline in 5 cm<sup>3</sup> aliquots. After the serratus anterior plane block, 4 cm<sup>3</sup> of 0.5% bupivacaine was injected in the fifth and sixth intercostal region for additional analgesia.

Surgery commenced only once adequate analgesia in the operation zone involving the dermatomes T3–T6 had been confirmed. During surgery, which included a semi-oblique incision in the fourth intercostal region, a total of 2 mg midazolam and 30 mg propofol were administered intravenously. No complications such as severe hypotension or arrhythmia occurred, and the patient did not report any pain, even the surgeon infiltrated no local anesthetics. Ventilation was supported manually when needed, but spontaneous breathing was never lost. After 45 min of surgery, the fully orientated and cooperative patient was transferred to the postanesthesia care unit for close postoperative follow-up. He experienced no pain for 10 h postoperatively. Written consent was obtained from the patient for the publication of this case report.

## Discussion

The most commonly used surgical approaches for creating a pericardial window are through either a subxiphoid, lateral, or anterior thoracotomy. The recently developed video-assisted thoracoscopic surgery (VATS) approach has opened new opportunities for drainage of the pericardium with minimal surgical trauma. However, all these methods have certain limitations. VATS requires specialized technology that is not always available and is limited by the need for free pleural space and one-lung ventilation with a double lumen endotracheal tube. The anterior or lateral approach is not convenient in morbidly obese patients or in women with large breasts (either natural or after breast augmentation surgery). The subxiphoid approach is less effective in patients with ascites or morbid obesity.<sup>[5]</sup>

The serratus plane block, described by Blanco *et al.* in 2013, was initially introduced for analgesia after breast cancer surgery. Four volunteers were injected with 0.4 ml/kg 0.125% levobupivacaine mixed with 0.1 mmol/kg gadolinium for visualizing the distribution of

the analgesic mixture using magnetic resonance imaging. Dermatomal paresthesia from T2 to T9 was demonstrated in all volunteers for a mean of 752 min.<sup>[6]</sup>

In 2015, Madabushi *et al.* reported a case in which they attempted to relieve pain after thoracotomy. A 21-year-old male patient underwent a transthoracic esophagectomy for corrosive stricture. A right thoracotomy was performed with an incision from below the nipple to the anterior axilla, similar to that in our case. Although the patient had a thoracic epidural catheter, due to poor postoperative vital signs, the authors did not start epidural infusion in the intensive care unit and the patient was kept intubated under sedation. A 19-French catheter was inserted via an 18-ga Touhy needle, and the authors performed a serratus plane block using 6 ml of 1% lidocaine followed by an infusion of 0.1% bupivacaine and 1 µg/ml of fentanyl at 7 ml/h. The patient's pain was reduced and his pulmonary function was improved. Therefore, he could be extubated after 2 days.<sup>[7]</sup>

Kunhabdulla *et al.* performed an ultrasound-guided serratus plane block on a 63-year-old male patient with severe chest pain of the left hemithorax following a motor vehicle accident. He had a body mass index of 44, diabetes mellitus, high blood pressure, and obstructive sleep apnea. He sustained broken fourth to seventh ribs without pneumothorax or hemothorax and was unable to lie supine; therefore, the authors used the block to insert a catheter with the patient in the sitting position. They performed the block in the posterior axillary line using an 18-ga Touhy needle to inject 20 cm<sup>3</sup> of 0.125% bupivacaine followed by a continuous infusion. The patient's pain began to diminish 15 min after the procedure and he was able to undergo respiratory physiotherapy. This case report is exceptional because of the patient's position during surgery, his morbid obesity, and the posterior approach.<sup>[8]</sup>

Similarly, Durant *et al.* performed ultrasound-guided serratus plane blocks for rib fracture pain control on two patients in the emergency department. One was an 82-year-old man who fell onto a table and fractured his fourth to ninth right ribs, and the other was a 65-year-old woman struck by a car with fractured fifth to seventh left ribs. The authors performed serratus plane blocks on both patients in the lateral decubitus position toward the posterior axillary line using 30 cm<sup>3</sup> of 0.5% ropivacaine.<sup>[9]</sup>

Serratus plane block is a recently described technique used for postoperative analgesia after breast surgery, thoracotomy, and rib fractures. Although serratus plane block was initially developed for postoperative analgesia, we have shown that it can be used under deep sedation in combination with an intercostal block for anesthesia for surgeries involving the hemithorax. The potential utility of this novel block for other thoracic procedures should be further investigated.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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