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## Case Report

# Bilateral continuous serratus anterior plane block: An effective alternative for bilateral multiple rib fracture analgesia

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### Abstract:

Pain due to rib fracture leads to respiratory impairment and bilateral fractures impact respiratory mechanics in the worst manner. Thoracic epidural analgesia is the gold standard for bilateral rib fractures but is technically difficult, entails potentially serious complications, and necessitates patient repositioning. Ultrasound-guided serratus anterior plane block (SAPB) has recently gained favor for alleviating thoracic pain and can be performed in patients lying supine, rendering it particularly useful in polytrauma patients who are unable to sit up or turn lateral for regional blocks on the back. Use of continuous bilateral SAPB for rib fractures has been underutilized. We report a case of a polytrauma patient who had bilateral multiple rib fracture along with vertebral and pelvic fractures due to which she was in severe pain and was unable to move to provide any kind of positioning for the blocks. Bilateral SAPB provided effective pain relief and facilitated early recovery and pulmonary rehabilitation of the patient.

### Keywords:

Multiple trauma, nerve block, pain management, pulmonary atelectasis, rib fractures, ultrasonography

## Introduction

In thoracic trauma patients, the ability to cough and clear secretions is impaired by pain, leading to an increased risk of atelectasis, retention of secretions, and chest infections. Hence, aggressive pain management is a vital component of rib fracture management for the healing of rib fractures, improvement of pulmonary functions, and pulmonary rehabilitation.<sup>[1]</sup> Thoracic epidural block (TEB) and lately paravertebral block have been considered the gold standard for treatment of pain due to rib fractures. More recently, interfascial plane blocks such as erector spinae plane block (ESPB), pectoral nerves block (PECS-II), and serratus anterior plane block (SAPB) are in vogue for thoracic

trauma and postoperative analgesia. SAPB has yielded encouraging results in the perioperative management of pain in the thoracic region. Use of unilateral SAPB has recently been described for pain management in patients with rib fractures, but bilateral continuous SAPB has sparsely been reported in this relation.<sup>[2]</sup> We present a case of bilateral multiple rib fractures along with multiple other fractures due to which positioning was impossible and we chose bilateral continuous SAPB as a component of multimodal analgesia. The patient consent was duly obtained (from the husband) for sharing the case details and ultrasound images for academic purposes.

## Case Report

A 32-year-old moderately built female patient presented to our trauma center

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after suffering blunt trauma from a road traffic accident. There was no history of loss of consciousness, seizure, or bleeding from the ear, nose, or mouth. After clinical examination and imaging studies, she was diagnosed to have multiple fractures (manubrium sterni, vertebrae: C5 cervical spinous process, L1-L3 transverse process; left 1-3 ribs with hemopneumothorax managed with intercostal drain (ICD) insertion, right 1-5 and 9<sup>th</sup> ribs, pelvic fractures [bilateral sacro-pubic and iliopubic rami, left sacral zone, mild pelvic hematoma with hemoperitoneum]). She was started on paracetamol 1 g 6 h, diclofenac 75 mg 8 h, and fentanyl infusion 25 µg/h for 1 day, but her pain was not controlled, and a call was sent to the acute pain services for insertion of the thoracic epidural catheter.

When seen during the pain rounds, she had complaints of difficulty in breathing due to severe pain on deep breathing. Her visual analog scale (VAS) score was 8/10 at rest and 10/10 on deep breathing or any movement. Her blood investigations including complete blood count and coagulation profile were unremarkable. When the patient was assessed, she was unable to turn to a lateral position or sit up even with support and assistance because of the rib, vertebral, and pelvic fractures. Hence, epidural, paravertebral, and erector spinae blocks were ruled out. Therefore, it was decided to perform bilateral SAPB. After ensuring full asepsis and local anesthetic infiltration, under ultrasound guidance (Sonosite S nerve portable ultrasound machine, Bothell, WA) using a linear probe (8-13 MHz), the nerve block needle was positioned between latissimus dorsi and serratus anterior muscle [Figure 1] and after confirmation with saline hydrodissection, 15 ml of 0.2% ropivacaine with dexamethasone 4 mg was injected on both sides. Following this, an 18 G epidural catheter was inserted, which was tunneled to a short distance and carefully secured in place. Within 15–20 min of the

procedure, the VAS score was found to be down to 2/10 on deep breathing. The patient was followed up for pain control by our acute pain services team 8 hourly with instruction to contact us earlier if VAS was  $\geq 4/10$  with deep breathing at any time. Injection paracetamol 1 g 8 hourly and injection diclofenac 75 mg 12 hourly were regularly prescribed. Patient-controlled analgesia using fentanyl 15 µg bolus on patient demand with lockout period of 20 min without any background infusion was advised, but only one bolus was used over the first 24 h, and it was stopped after that. After 24 h, her VAS score was 3/10 at rest and dynamic score was 5/10, so another bolus of the same local anesthetic drug was given. Following this, she remained pain-free with a VAS score of 2–3 only and second bolus of the combination of ropivacaine and dexamethasone in the same dose and concentration was given after almost 36 h of the second dose on the 3<sup>rd</sup> day. After that, she remained pain-free with no further requirement of analgesics other than the routinely scheduled doses of paracetamol and diclofenac. Incentive spirometry and movements were being tolerated well and at the end of the 4<sup>th</sup> day, the catheter was removed in view of no further requirements of analgesics through the catheters. Her pulmonary functions improved, hemopneumothorax resolved and ICD was removed. The patient was discharged home after 1 week on oral analgesics.

## Discussion

Effective analgesia ameliorates the pulmonary complications in patients with rib fractures and abbreviates the hospital stay.<sup>[3]</sup> Although multiple therapeutic options are available, pain management can be difficult.<sup>[4]</sup>

TEB is considered the gold standard for providing analgesia for thoracic region, especially for bilateral pathology.<sup>[3]</sup> Paravertebral or ESPB has emerged as an effective alternative, but our patient had multiple injuries due to which she was unable to sit or lie in lateral decubitus position, and we decided to go for ultrasound-guided bilateral continuous SAPB which requires minimal patient cooperation for positioning and is feasible in patients who cannot be positioned for the former blocks.

Ultrasound-guided SAPB block is a relatively recent technique that provides almost complete analgesia of the hemithorax. It is safe, simple to perform with no significant contraindications or side effects.<sup>[5]</sup> It can be safely given to polytrauma patients who may be having hemodynamic instability or coagulopathy, unlike epidural and paravertebral. There is a theoretical possibility of local anesthetic toxicity and hematoma such as other interfacial plane blocks.<sup>[6]</sup> Pneumothorax



Figure 1: Showing Latissimus dorsi (A), Serratus anterior muscle (B), Catheter in Serratus anterior plane (C), and fifth rib (D)

is a potential complication, but under ultrasound guidance, it would be a remote possibility as the injection is far from the pleura between two muscles or above the rib.<sup>[5,6]</sup> Literature review attests to the safety of the technique.<sup>[5,6]</sup> The target area for injection can be either superficial to serratus muscle or one deep underneath it.<sup>[5]</sup> We chose the superficial plane as it is reported to provide a wider dermatomal coverage (T2–T9).<sup>[7]</sup> The use of 0.4 ml/kg of LA provides T2–T9 level of analgesia.<sup>[5,6]</sup> Bupivacaine (0.25%), levobupivacaine (0.25%), ropivacaine (0.2%–0.75%) are the local anesthetics which have been used for SAPB in varying dose and concentrations depending on the indication, extent of surgery, and use of a continuous technique.<sup>[5,6]</sup> Most authors have used 20 ml volume for the block.<sup>[6]</sup> We used 15 ml LA as we had to perform bilateral block and had to be careful about LA toxicity. Furthermore, the presence of the catheter gave us the flexibility of titration of analgesia. PECS-II block can be an alternative technique but requires two needle punctures and it has been found to have a limited dermatomal coverage (up to T6).<sup>[8]</sup> Similarly, intercostal nerve block has the drawback of the need for multiple injections and a potential risk of pneumothorax. Hence, SAPB would strike a better option in polytrauma patients.

Use of continuous techniques using catheters has the benefit of providing prolonged analgesia titrated to patient response. Addition of an adjuvant in the form of dexamethasone also prolonged the duration of analgesia. The use of dexmedetomidine and morphine has been previously found to prolong the block duration.<sup>[6]</sup> The onset of analgesia was also very fast as has been reported previously by Kunhabdulla *et al.*<sup>[9]</sup> Anderson *et al.*<sup>[10]</sup> reported the use of continuous SAPB for postoperative analgesia after double lung transplant as part of a multimodal analgesic regimen. The SAPB helped in optimizing the patient's pulmonary status similar to that seen in our case. They documented a VAS score of up to 5/10 after 24 h, despite using continuous local anesthetic infusion and multimodal analgesic regime (acetaminophen, lidocaine patches, and a fentanyl patient-controlled analgesia). The excellent pain relief obtained in the index case might be explained by the use of bolus doses of LA which have recently been proposed to provide superior dermatomal coverage compared to infusions.<sup>[11]</sup>

## Conclusion

Considering the simple procedural technique of SAPB,

minimal contraindications or complications, fast and effective analgesia, and comfortable patient positioning, we believe that it can be considered a promising regional anesthesia option even in thoracic trauma victims with bilateral trauma. Use of continuous technique provides flexibility of titrating the dose and duration of the block and should be used whenever feasible.

### 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.

### Conflicts of interest

None Declared.

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