TURKISH JOURNAL OF EMERGENCY MEDICINE

Case Report/Case Series

Access this article online

Quick Response Code:

Website: https://turkjemergmed.com/

DOI: 10.4103/tjem.tjem_151_25

Ultrasonography-guided serratus anterior plane block for intercostal drain tube insertion pain

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Abstract:

Intercostal drainage (ICD) tube insertion is a life-saving procedure through which blood, fluid, or air is drained out of the pleural space surrounding the lungs. This treatment is essential to manage conditions such as hemothorax, pleural effusion, and pneumothorax. In addressing the severe pain accompanying these conditions and pain caused by ICD tube insertion, emergency physicians are increasingly turning to newer techniques for pain management. We are presenting one such technique, which is the serratus anterior plane block (SAPB) guided by ultrasonography. This emerging approach holds promise in improving pain management and patient comfort, making it a crucial consideration in individuals requiring an ICD. In this case series, we present cases that required an ICD tube insertion for which SAPB was administered to manage the pain caused by the ICD tube. The pain reduced significantly in all patients following SAPB administration, and they did not require any additional analgesics for an average of 6–8 h after the block. This case series shows a more efficient way of managing pain in patients requiring ICD tube insertion.

Keywords:

Emergency medicine, nerve block, pain management, regional anesthesia

Introduction

The serratus anterior plane block (SAPB) is a relatively new type of compartment block described in recent literature for managing pain of the thoracic wall.[1] Various studies have shown the usefulness of SAPB for postthoracotomy and postmastectomy pain management.[2,3] But it is of great value for an emergency physician due to its benefits for patients presenting severe thoracic wall pain caused by rib fractures or for patients who require intercostal drainage (ICD) tube insertion. Studies show that mortality ranges from 4% to 20% in patients with rib fractures due to an increased risk of developing pneumonia, respiratory failure, and death.[4] Such pain, when treated with opioids, especially in the elderly population, could lead to delirium and respiratory depression.[5] This makes SAPB block a better option for pain management. Dilute anaesthetic, generally 25–30mL, is injected in the serratus anterior plane with the guidance of an ultrasound. Usually, in the emergency department (ED), the indication for SAPB is for the treatment of rib fracture pain. However, we are reporting SAPB as an indication for pre- and/or postprocedural pain from ICD tube insertion. We are presenting 6 cases where we have used the SAPB for ICD tube insertion pain and found that it has promising results and is a safer, reliable way for managing ICD tube insertion-related pain.

Submitted: 03-05-2025
Revised: 28-07-2025
Accepted: 07-08-2025
Published: 01-01-2026

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How to cite this article: Birru JD, Shinde V. Ultrasonography-guided serratus anterior plane block for intercostal drain tube insertion pain. Turk J Emerg Med 2026;26:78-81.

Case Reports

Case 1

A 21-year-old male patient, was brought to the ED with an alleged history of a road traffic accident. The patient had complaints of severe pain and swelling over the left side of the chest, and had multiple abrasions on the face and chest. Furthermore, the patient was conscious and oriented with a Glasgow Coma Scale (GCS) of 15/15 and otherwise normal vitals. On auscultation, there was a significant reduction of air entry on the left side. Chest X-ray was suggestive of left-sided pneumothorax with multiple rib fractures. A 26F ICD was inserted under local anesthesia. Post ICD insertion, 0.5% bupivacaine and normal saline (15 ml each) were injected into the fascial plane overlying the left serratus anterior muscle under the guidance of ultrasound. We noted a significant reduction in pain on the numerical rating scale from 10/10 to 2/10 for the next 8 h, requiring no additional analgesia for that period.

Case 2

A 52-year-old male patient, a known case of pulmonary tuberculosis, presented to the ED with complaints of breathlessness for 5–6 days. The patient required 6 l of oxygen via face mask and had a respiratory rate of 30 breaths/min. He was conscious, oriented, and his vitals were otherwise stable. Chest X-ray was suggestive of gross left-sided pleural effusion, which was confirmed using point-of-care lung ultrasound. A decision to insert an intercostal drain tube was made. Prior to ICD tube insertion, 0.5% bupivacaine and normal saline (15 ml each) were injected into the fascial plane overlying the left serratus anterior muscle under the guidance of ultrasound. Post which a 24F ICD was inserted with local anesthesia given at the sight of incision. The patient's report noted pain on a numerical rating scale of 1/10 for the next 10 h and did not require any additional analgesia for that period.

Case 3

A 55-year-old female patient presented to the ED complaining of breathlessness and cough for 10–12 days. High-resolution computed tomography of the thorax was suggestive of left gross hydro-pneumothorax. Patient required 4 l of oxygen via nasal prongs, had a respiratory rate of 26 breaths/min and was conscious and oriented with otherwise stable vitals. A decision to insert an ICD tube was made. Prior to ICD tube insertion, 0.5% bupivacaine and normal saline (15 ml each) were injected into the fascial plane overlying the left serratus anterior muscle under the guidance of ultrasound. Local anesthesia was given at the site of incision, and a 24F ICD was inserted. Seven hundred milliliter of pyothorax was drained. The patient reported pain on a numerical rating scale of 3/10 for the next 8 h and did not require any additional analgesia for that period.

Case 4

A 54-year-old male patient, was brought to the ED with an alleged history of a road traffic accident. The patient had complaints of severe pain and swelling over the right side of the chest and multiple abrasions over the face and chest. The patient was conscious and oriented with a GCS of 15/15. On auscultation, air entry was significantly reduced on both sides. Chest X-ray was suggestive of bilateral pneumothorax with multiple rib fractures. The decision to place bilateral ICDs was made, and a 26F ICD was inserted under local anesthesia. Post ICD tube insertion, with the guidance of ultrasound, 0.5% bupivacaine and normal saline (15 ml each) were injected into the fascial plane overlying the left and right Serratus anterior muscle. The patient report noted that pain had significantly reduced from a numerical rating scale of 8/10 to 2/10 (thoracic pain) for the next 4 h post which the patient's condition deteriorated and the pain could not be adequately assessed due to a drop in consciousness.

Case 5

A 45-year-old male patient, a known case of pulmonary tuberculosis, presented to the ED with complaints of breathlessness and fever for 5–6 days. Patient required 4 l of oxygen via nasal prongs and had a respiratory rate of 24 breaths/min. The patient was conscious, oriented and had otherwise stable vitals. Chest X-ray was suggestive of gross left-sided pleural effusion. A decision to insert an intercostal drain tube was made. Prior to ICD tube insertion, under the guidance of ultrasound, 0.5% bupivacaine and normal saline (15 ml each) were injected into the fascial plane overlying the left serratus anterior muscle. Local anesthesia was given at the site of incision and a 24F ICD was inserted. The patient reported pain on a numerical rating scale of 1/10 for the next 8 h and did not require any additional analgesia for that period.

Case 6

A 56-year-old female patient, a known case of ovarian cancer, presented to the ED complaining of breathlessness with fever for 20 days. The patient had a respiratory rate of 38 breaths/min, was conscious and oriented, with otherwise stable vitals. Chest X-ray was suggestive of gross right-sided pleural effusion. A decision to insert an intercostal drain tube was made. Prior to ICD insertion, 0.5% bupivacaine and normal saline (15 ml each) were injected into the fascial plane overlying the right serratus anterior muscle under the guidance of ultrasound. Local anesthesia was given at the site of incision, and a 24F ICD was inserted. The patient reported pain on a numerical

rating scale of 2/10 for the next 8 h and did not require any additional analgesia for that period.

Discussion

The SAPB has emerged as a successful upcoming regional anaesthesia technique. It has been successfully utilized in cases of anterolateral and lateral rib fractures, rib contusions, thoracoscopic surgeries, thoracotomies, breast surgeries, and post-mastectomy pain syndromes. The SAPB targets the lateral cutaneous branches of the intercostal nerves, giving hemithoracic analgesia.[6,7]

The ultrasound-guided SAPB is typically performed on a patient, with the affected side up in a supine or lateral decubitus position. A high-frequency linear ultrasound probe of 10–12 MHz is placed in the coronal plane and then taken posteriorly until key muscular landmarks (including the serratus anterior, latissimus dorsi, and teres major) are visualized [Figure 1]. A 22G, Tuohy needle is inserted in-plane (parallel) to the ultrasound probe, targeting the fascial plane superficial to the serratus anterior muscle. A mixture of 0.5% bupivacaine and normal saline (15 ml each) is then injected under real-time ultrasound guidance, with the needle always under visualization. The spread of injectate and fascia splitting is observed in real-time to confirm anesthetic placement [Figure 2].

Comparative studies have found SAPB to be a feasible option in place of thoracic epidural analgesia for managing thoracotomy pain. Notably, SAPB was associated with stable hemodynamics, lower pain scores, reduced total morphine consumption, and no significant complications in the early postoperative period.[8]

Introducing regional techniques like SAPB into emergency medicine practice can offer substantial opioid sparing benefits, particularly for opioid naive patients.[9] ICD tube insertion is associated with severe pain requiring multiple analgesics and often requiring opioids. In our case series, we have successfully achieved a significant reduction of pain for an average 6–8 h in all six cases [Table 1] who underwent ICD tube placement. None of the patients required any additional analgesics for the entire duration of action of the SAPB. We also found that none of the patients had any adverse events because of the SAPB procedure. We also found the SAPB block to be much easier, less time-consuming, and safer to perform by emergency physicians. An attending consultant of the ED, with substantial expertise in ultrasound-guided nerve blocks, supervised every nerve block performed by the 2nd and 3rd year residents. Only those residents who were deemed competent after undergoing a systematic and comprehensive training program were allowed to perform this procedure.

Conclusion

Ultrasound-guided SAPB has proven to be a safe, effective, and practical method for managing acute thoracic pain. In this case series, we have utilized SAPB specifically for the management of ICD tube insertion pain, an application not widely reported in the literature. We found that it provided consistent, prolonged analgesia lasting 6–8 h, without the need for additional intravenous opioids. In addition, patients remained conscious, allowing better GCS monitoring, and potentially stabilizing pain-induced vital sign changes such as tachycardia or hypertension. The

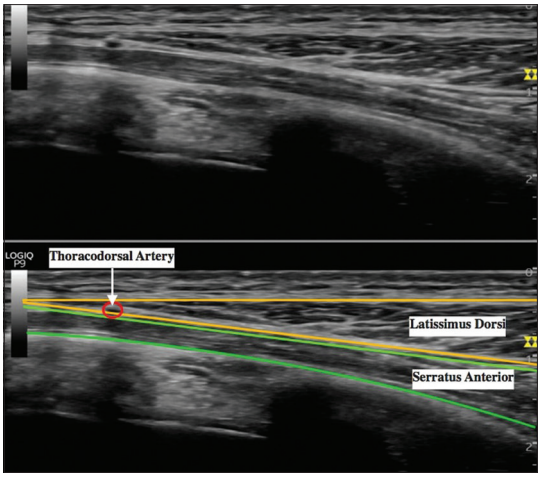

Figure 1: Sonoanatomy of the serratus anterior plane block

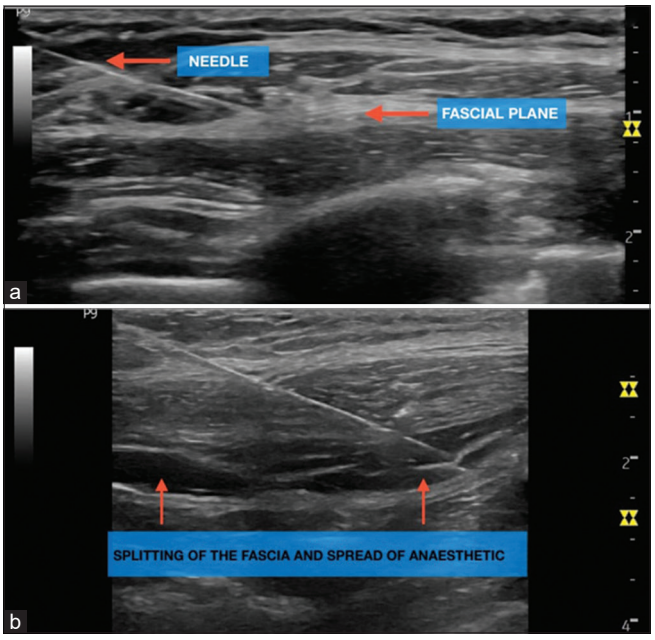

Figure 2: (a) Needle approaching the fascial plane, (b) Splitting of fascia indicating correct placement of anesthetic

Table 1: Summary of cases

Case	Age/sex	Diagnosis	Side	ICD size	Analgesia given	Pain score (NRS)	Duration of pain relief (h)	Additional IV analgesia
1	21/male	Pneumothorax with multiple rib fractures post-RTA	Left	26 female	Serratus anterior block with 0.5% bupivacaine + NS (15 ml each)	10/10 → 2/10	8	Not required
2	52/male	Left pleural effusion (pulmonary tuberculosis)	Left	24 female	Serratus anterior block with 0.5% bupivacaine + NS (15 ml each)	1/10	10	Not required
3	55/female	Left hydropneumothorax (pyothorax)	Left	24 female	Serratus anterior block with 0.5% bupivacaine + NS (15 ml each)	3/10	8	Not required
4	54/male	Bilateral pneumothorax with rib fractures (post-RTA) + femur and tibia/fibula fracture	Bilateral	26 female	Bilateral Serratus anterior block with 0.5% bupivacaine + NS (15 ml each)	8/10 → 2/10	4	Not assessed
5	45/male	Left pleural effusion (pulmonary tuberculosis)	Left	24 female	Serratus anterior block with 0.5% bupivacaine + NS (15 ml each)	1/10	8	Not required
6	56/female	Right pleural effusion (CA ovary)	Right	24 female	Serratus anterior block with 0.5% bupivacaine + NS (15 ml each)	2/10	8	Not required

RTA: Road traffic accident, NRS: Numerical Rating Scale, ICD: Intercostal drainage, IV: Intravenous, CA: Carcinoma, NS: 0.9% normal saline

block's ease of administration, minimal hemodynamic impact, and opioid-sparing benefits make it invaluable to emergency physicians. We strongly advocate the use of SAPB for patients requiring ICD tube insertions in the ED.

Author contributions statement

JDB: Conception and design of the study; data analysis and curation; drafting of the preliminary manuscript; responsibility for data integrity and accuracy; data collection; manuscript editing and final review. VS: Manuscript editing and review; responsibility for data integrity; final approval of the manuscript for submission.

Conflicts of interest

None Declared.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for 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.

Acknowledgment(s)

The author(s) confirm that everyone who contributed to this manuscript is listed as an author.

Funding

None.

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