IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 25, Issue 6 Ser. 2 (June. 2026), PP 48-53
www.iosrjournals.org

Two Different Doses of Inj. Bupivacaine 0.5% Using Ultrasound-Guided Clavipectoral Fascia Block in Clavicular Surgeries – A Case Series

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Abstract
Background*:*
Clavicle fractures are among the most common injuries of the shoulder girdle, with mid-shaft fractures accounting for the majority of cases. Surgical fixation often requires effective peri-operative analgesia. The clavipectoral fascia block (CPB) is a relatively new regional anesthesia technique that provides targeted analgesia for clavicular surgeries while avoiding complications associated with interscalene brachial plexus block. This case series evaluates the anesthetic and analgesic efficacy of two different doses of 0.5% bupivacaine administered using ultrasound-guided clavipectoral fascia block combined with superficial cervical plexus block.
Materials and Methods*:*
Six adult patients undergoing open reduction and internal fixation of mid-shaft clavicle fractures were included. After ethical committee approval and informed consent, ultrasound-guided clavipectoral fascia block was performed. An initial dose of 5 ml of 0.5% bupivacaine with adrenaline (1:200000) and dexamethasone 8 mg was injected on either side of the fracture site. If the block was inadequate, the volume was increased to 7.5 ml and subsequently to 10 ml. A superficial cervical plexus block was additionally performed. Pain was assessed using Visual Analog Scale (VAS), and duration of postoperative analgesia was recorded.
Results*:*
All six patients achieved adequate surgical anesthesia with the combined block technique. The duration of postoperative analgesia ranged from 18 to 24 hours. The time to first rescue analgesia was between 18 and 24 hours. Only one patient required a single dose of diclofenac within the first 24 hours and only One patient required conversion to general anesthesia.
Conclusion*:*
Ultrasound-guided clavipectoral fascia block combined with superficial cervical plexus block provides effective anesthesia and prolonged postoperative analgesia for clavicle fracture surgery. Lower volumes (5–7.5 ml) of 0.5% bupivacaine per injection site were sufficient in most patients, suggesting that smaller doses may provide adequate analgesia while minimizing the risk of local anesthetic toxicity.
Keywords*: Clavipectoral fascia block, clavicle fracture, regional anesthesia, bupivacaine, ultrasound-guided block*

Date of Submission: 29-05-2026 Date of Acceptance: 08-06-2026

I. INTRODUCTION:

Clavicle fractures are among the most common injuries of the shoulder girdle, accounting for approximately 35–45% of such injuries, with mid-shaft fractures being the most frequent subtype [1,2]. These fractures usually result from high-energy trauma such as sports injuries or road traffic accidents [3]. Displaced mid-shaft fractures often require open reduction and internal fixation (ORIF) with plates and screws to restore anatomical alignment and ensure optimal functional recovery [4].

Effective perioperative pain management is essential in clavicle surgeries to improve patient comfort and facilitate early mobilization and rehabilitation. Traditionally, general anesthesia (GA) has been the most commonly used technique for clavicular fracture fixation. However, GA may be associated with complications such as airway manipulation, postoperative nausea and vomiting, and cognitive dysfunction in susceptible

individuals [5]. Regional anesthesia techniques have therefore gained increasing popularity due to their ability to provide better postoperative analgesia, reduced opioid consumption, and fewer systemic side effects [6].

The sensory innervation of the clavicle is complex, involving contributions from multiple nerves. The supraclavicular branches of the cervical plexus provide cutaneous innervation to the skin overlying the clavicle, while deeper structures receive sensory supply from nerves such as the suprascapular, subclavian, and long thoracic nerves [7,8]. Because of this complex innervation pattern, single nerve block techniques may sometimes result in incomplete analgesia.

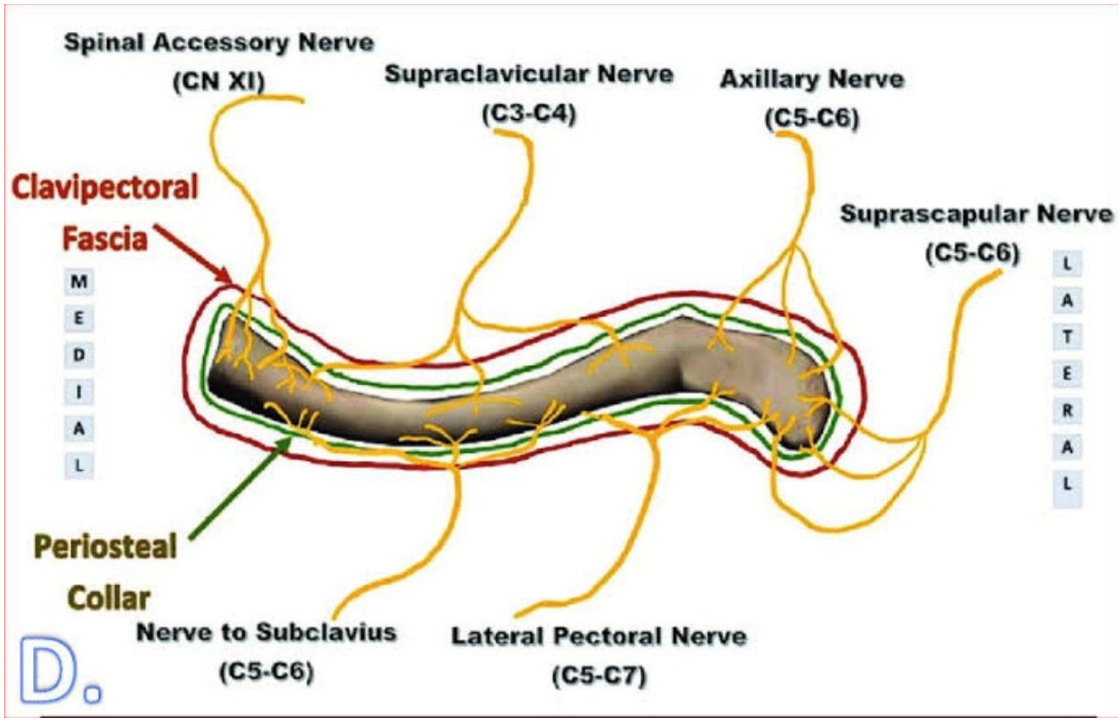


Figure 1: Diagram showing the sensory innervation of the clavicle and the clavipectoral fascial plane through which terminal nerve branches pass.

Regional anesthesia techniques commonly used for clavicle surgery include the superficial cervical plexus block (SCPB) alone or in combination with the interscalene brachial plexus block (ISB). Although effective, interscalene block is associated with complications such as phrenic nerve palsy, diaphragmatic paralysis, Horner's syndrome, vascular puncture, nerve injury, and pneumothorax, which may limit its use, particularly in patients with compromised respiratory function [9–11].

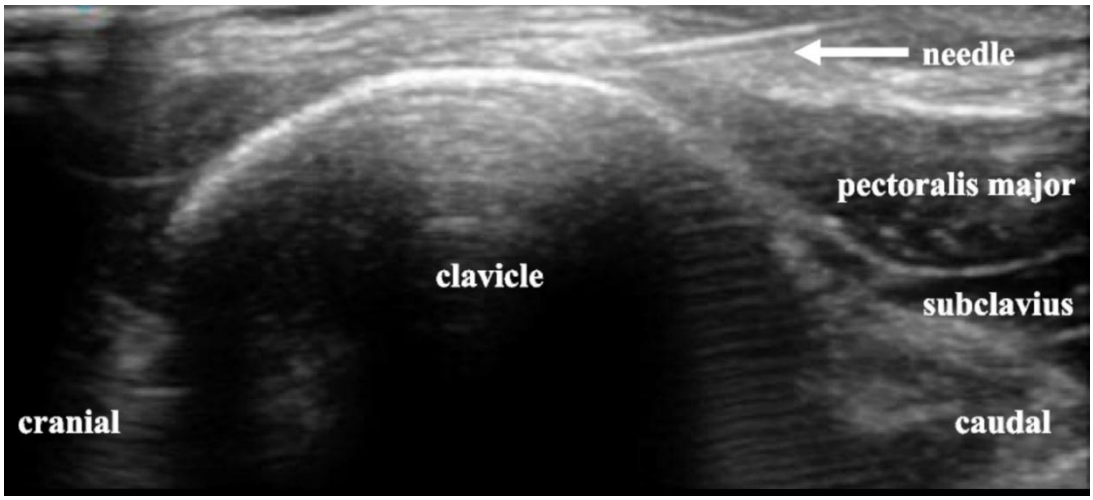


Figure 2 : Ultrasound image showing the clavicle, pectoralis major, and subclavius muscles with the needle approaching the clavipectoral fascial plane for local anesthetic injection.

In 2017, Valdés introduced the clavipectoral fascia plane block (CPB) as a novel regional anesthesia technique for clavicle surgery [12]. Anatomical studies have shown that the clavipectoral fascia envelops the clavicle, and sensory nerve branches traverse the plane between the fascia and the clavicle before innervating the bone [13]. Injection of local anesthetic in this fascial plane under ultrasound guidance allows blockade of these terminal sensory branches.When combined with a superficial cervical plexus block, CPB can provide effective anesthesia for clavicular fracture surgery without causing motor blockade or phrenic nerve involvement [14,15]. However, most studies have used relatively large volumes of local anesthetic, and limited evidence exists regarding the minimum effective volume required for adequate anesthesia and postoperative analgesia.

Therefore, this case series was conducted to evaluate the anesthetic and analgesic efficacy of two different volumes of 0.5% bupivacaine administered using ultrasound-guided clavipectoral fascia block in patients undergoing clavicle fracture fixation.

II. MATERIALS AND METHODS

After obtaining institutional ethical committee clearance (SIMS&RC/EC-15/PG-06/2024-25) ,written informed consent was obtained from the patients recruited in the study .6 adult
patients scheduled for open reduction and internal fixation (ORIF) of the clavicle were
enrolled Aged >18 years , Fracture <7 days old , no neurological abnormality and Ability to
cooperate.

Study Design: Prospective interventional study

Study Location: This was a tertiary care teaching hospital based study done in Department of Anesthesiology, SIMS&RC, Bangalore, Karnataka

Study Duration: December 2023 to June 2024.

Sample size: 10 patients

Patient selection : Six adult patients scheduled for open reduction and internal fixation (ORIF) of the clavicle

Inclusion criteria:

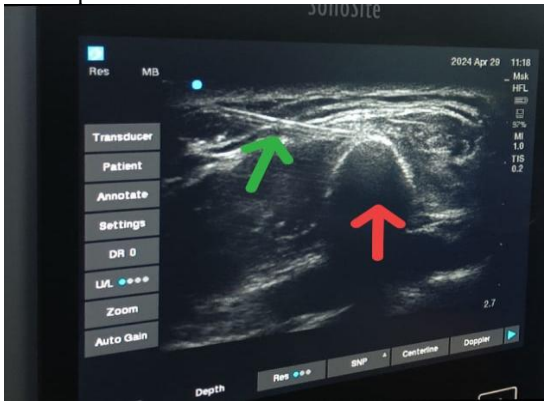
Patient consent
Age >18 years
Fracture <7 days old
No neurological abnormality
Ability to cooperate during awake regional Anesthesia

Exclusion criteria:

Patient unwilling for procedure.
Patient on anti coagulants
Morbid obesity .

Following standard NPO guidelines , after shifting the patient to operating room , Baseline vitals (heart rate, mean arterial pressure, SpO_2, ECG, temperature) were recorded.Intravenous access was secured with 18G cannula, and crystalloid fluids (Ringer lactate) were administered at10 mL/kg.Pre-medication was given with intravenous midazolam (2–5 mg) and fentanyl(50–100 µg).

The patient was placed in the supine position with the head turned contralaterally.The
clavicle was palpated to locate the fracture site.Under asterile precautions ,2% lignocaine
was infiltrated into the skin and subcutaneous tissues at the fracture site.Under strict asepsis, a high-frequency linear ultrasound probe was placed 2–3 cm proximal and 2–3 cm distal to the fracture line and the injection site was marked .The clavicle,periosteum, and overlying clavipectoral fascia were identified.An in-plane approach was used, advancing the needle in a caudad-to-cephalad direction
until the clavipectoral fascial plane was reached. After negative aspiration, local anesthetic
was deposited.



Green arrow:needle inserted into clavipectoral fascia

Red arrow:clavicle

An Initial volume of 5 mL of 0.5% inj.bupivacaine with inj.adrenaline (1:200,000) and inj.dexamethasone 8 mg injected on either side of the fracture.
If inadequate block was noted, the volume was titrated stepwise to 7.5 mL and then 10 mL.
Two injections were performed: one medial and one lateral to the fracture site.
A superficial cervical plexus block (SCPB) was also performed with 5 mL of 0.5% bupivacaine to provide cutaneous coverage. Block success was defined as absence of pain or discomfort on surgical incision and clavicle manipulation within 20 minutes of injection.Continuous monitoring of heart rate, blood pressure, and oxygen saturation was performed.Any patient reporting pain received incremental doses of intravenous fentanyl (25–50 mcg). If pain and discomfort persisted, the case was converted to general anesthesia.
Patients were observed in the post-anesthesia care unit (PACU) for 24 hours. Pain was assessed using the Visual Analog Scale (VAS) every 2 hours for the first 24 hours. Rescue analgesia with intravenous diclofenac 75 mg in 100 mL normal saline was administered if VAS > 4/10

PATIENT DEMOGRAPHICS:

Patient No.	Age (years)	Gender	ASA Physical Status
1	34	Male	II
2	47	Male	I
3	39	Male	III
4	31	Male	I
5	44	Male	II
6	36	Male	I

Table 1: Demographic characteristics of patients undergoing clavicle fracture fixation under ultrasound-guided clavipectoral fascial plane block.

Block Characteristics, Post-operative Analgesia, and Conversion to General Anesthesia

Patient No.	Volume of 0.5% Bupivacaine Used on either side (ml)	Duration of Analgesia (hours)	Time to First Rescue Analgesia (hours)	Diclofenac Requirement (24 h)	Conversion to General Anesthesia
1	5	20	20	No	No
2	5	21	21	No	No
3	7.5	18	18	Yes (1 dose)	No
4	5	24	24	No	No
5	7.5	20	20	No	No
6	10	—	—	—	Yes

Table 2: Block characteristics, postoperative analgesia parameters, and requirement for conversion to general anesthesia in patients undergoing clavicle fracture fixation using ultrasound-guided clavipectoral fascial plane block.

III. RESULTS

A total of six patients undergoing open reduction and internal fixation (ORIF) for mid-shaft clavicle fractures were included in this case series. All patients were male, with a mean age of 38.5 ± 6.1 years. The distribution of ASA physical status included ASA I (n = 3), ASA II (n = 2), and ASA III (n = 1).

Ultrasound-guided clavipectoral fascial plane block (CPB) combined with superficial cervical plexus block (SCPB) was performed in all patients before surgery. The initial volume of 0.5% bupivacaine administered was 5 mL on either side of the fracture, with incremental escalation to 7.5 mL and 10 mL if adequate anesthesia was not achieved.

Successful surgical anesthesia was achieved in five out of six patients (83.3%) using CPB with SCPB. In one patient, the block was inadequate despite escalation of local anesthetic volume, and the procedure was converted to general anesthesia.

Among the successful blocks, the duration of postoperative analgesia ranged from 18 to 24 hours. The time to first rescue analgesia was similar, occurring between 18 and 24 hours postoperatively. Only one patient required a single dose of intravenous diclofenac (75 mg) within the first 24 hours, while the remaining patients did not require additional analgesia. Postoperative Visual Analog Scale (VAS) scores remained low in the immediate postoperative period. VAS scores were 0 at 1 hour, increased to 1–2 at 3 and 6 hours, and reached 2–4 at 12 hours with maximum duration of 24 hours corresponding with the gradual waning of block effect.

No block-related complications such as vascular puncture, local anesthetic systemic toxicity (LAST), diaphragmatic paralysis, or pneumothorax were observed during the perioperative period.Overall, the results demonstrate that ultrasound-guided CPB combined with SCPB provides effective intraoperative anesthesia and prolonged postoperative analgesia for clavicular fracture surgery.

IV. DISCUSSION

Clavicle fractures, particularly mid-shaft fractures, are among the most common injuries of the shoulder girdle and frequently require surgical fixation when significantly displaced [1,2]. These injuries usually result from direct trauma, sports injuries, or road traffic accidents [3]. Although general anesthesia is commonly used for clavicle surgeries, regional anesthesia techniques are increasingly preferred due to improved postoperative analgesia and reduced opioid requirements [8,10].

The clavipectoral fascial plane block (CPB), first described by Valdés in 2017, involves deposition of local anesthetic between the clavipectoral fascia and the clavicular periosteum, thereby blocking terminal sensory branches supplying the clavicle [4]. Anatomical studies have demonstrated that several nerves contributing to clavicular innervation traverse this fascial plane, explaining the effectiveness of the block [5].

Traditionally, clavicle surgeries have been performed using a combination of superficial cervical plexus block (SCPB) and interscalene brachial plexus block (ISB). However, ISB is associated with a high incidence of phrenic nerve palsy and hemidiaphragmatic paralysis, as well as other complications such as vascular puncture and pneumothorax [9,10]. Because CPB targets terminal sensory branches without involving the brachial plexus directly, it may reduce the risk of these complications.

Previous studies have demonstrated the effectiveness of CPB for clavicle surgery. Rosales and Aypa reported successful use of CPB as a sole anesthetic technique with prolonged analgesia [6], while Ince et al. showed that ultrasound-guided CPB can provide adequate surgical anesthesia with minimal complications [7]. Other authors have also reported that combining CPB with SCPB improves intraoperative anesthesia and postoperative analgesia [11,12].

In our case series, CPB combined with SCPB provided successful surgical anesthesia in five of six patients, with only one patient requiring conversion to general anesthesia. The duration of postoperative analgesia ranged from 18 to 24 hours, and only one patient required rescue analgesia during the first 24 hours. These findings suggest that 5–7.5 mL of 0.5% bupivacaine per injection site may be sufficient to achieve effective analgesia.

No block-related complications such as diaphragmatic paralysis, vascular puncture, or local anesthetic systemic toxicity were observed. However, the small sample size and single-center design are limitations of this study. Larger studies are required to further evaluate the optimal dosing and effectiveness of CPB in clavicle fracture surgery.

LIMITATIONS

- Small sample size
- Single-center study
- Lack of control group
- Short follow-up

V. CONCLUSION

Ultrasound-guided clavipectoral fascial plane block combined with superficial cervical plexus block provided effective intraoperative anesthesia and prolonged postoperative analgesia for clavicle fracture fixation in the majority of patients. Adequate analgesia was achieved with lower volumes of 0.5% bupivacaine (5–7.5 mL) in most cases, with minimal requirement for rescue analgesia and no observed complications. This technique may represent a safe and reliable alternative to traditional regional blocks, particularly in patients where avoidance of phrenic nerve involvement is desirable. Larger studies are required to further validate these findings.

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