# The Clavicle Chronicles: Combined Interscalene Targeting C5, C6 and Intermediate Cervical Plexus Block for Clavicle Surgery. A Case Series

Case Report

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## **ABSTRACT**

**Introduction:** Due to the complex innervation of the clavicle, sole regional anesthesia (RA) for clavicle fractures surgeries was considered difficult or incomplete and had limitations. This case series demonstrates the efficacy of combined interscalene targeting C5, C6 and intermediate cervical plexus block under dual guidance as the exclusive anaesthetic technique for the patients undergoing surgical repair of clavicle fracture.

**Cases:** We report the successful anaesthetic management of 15 patients posted for clavicle surgery under RA. Patients were given ultrasound and peripheral nerve stimulator guided interscalene block targeting C5 and C6 with 8-10ml and intermediate cervical plexus block with 5ml of 1% lignocaine +0.25% bupivacaine. We observed effective surgical anaesthesia for open reduction, internal fixation and plating of clavicle, no complications and postoperative analgesia up to 12 hours.

**Conclusions:** Combined interscalene targeting C5 and C6 and intermediate cervical plexus block using dual guidance, low concentration local anaesthetic solution was effective and safe for clavicle surgery. It provided optimum, site-specific surgical anaesthesia, without any complications, preserving the motor function of the upper limb, ensured adequate postoperative analgesia, contributing to enhanced patient recovery.

Key Words: Cervical and brachial plexus block, clavicle, nerve block, regional anaesthesia, ultrasonography.

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#### **INTRODUCTION**

Clavicle fractures account for 35% of all shoulder fractures<sup>[1]</sup>. Over the last few years, there has been an increasing trend of surgical correction in displaced clavicle fractures; initially, these surgeries were performed under general anaesthesia (GA), with or without regional anaesthesia (RA). The complex and disputed innervation of the clavicle has hindered anaesthesiologists from providing effective regional anaesthesia for surgical intervention. However, in current times, multiple techniques have been developed which make it possible to perform clavicle surgery under RA and also provide adequate postoperative analgesia<sup>[2,3]</sup>. This case series demonstrates the efficacy of low concentration local anaesthetic solution in dual guidance combined interscalene targeting C5, C6 and intermediate cervical plexus block as the exclusive anaesthetic technique for the patients undergoing surgical repair of clavicle fracture.

## CASES

We report the anaesthetic management of 15 patients, of which 13 were male and 2 were female, with mean age of 35.9±6.36 years (mean±SD), with unilateral clavicle fracture, posted for open reduction, internal fixation and plating. All patients included in our case series provided written informed consent for the procedure as well as for anonymous data recording, and sharing in educational publications. After confirming pre-anesthesia check, consent and nil by mouth status patients were wheeled inside the operation theatre, standard monitors such as electrocardiogram (ECG), non-invasive blood pressure (NIBP) and pulse oximeter (SPO<sub>2</sub>) were applied. Intravenous (IV) access was obtained with an 18G or 20G cannula, and maintenance IV fluid started. Procedural sedation was administered using intravenous bolus of midazolam 0.02mg/kg, along with dexmedetomidine infusion at 0.25micrograms/kg/hour; low flow (4L/min) oxygen supplementation was applied.

Patients were given supine position with their head turned to the opposite side, shoulder bolster placed below the ipsilateral shoulder in some patients for neck extension, and, head end of the table elevated by 20 degrees. Under aseptic precautions, ultrasound (Samsung HS30, South Korea) and peripheral nerve stimulator (PNS) (B. Braun Stimuplex HNS 12, Germany) guided combined interscalene targeting C5, C6 and intermediate cervical plexus block was given. It was a single-insertion, double-injection technique using in-plane approach. The 22-gauge, 50-millimetre Stimuplex block needle was inserted and advanced towards the interscalene groove under ultrasound guidance, with the target point being the upper trunk roots (C5 and C6). We accepted motor response, noted as deltoid and pectoralis major contractions, at the current intensity of 0.4-0.6m A using PNS. Within safe limits of toxicity, 8 to 10mL of local anaesthetic (LA) solution containing 1% lignocaine, 0.25% bupivacaine and 8mg dexamethasone was injected into the interscalene groove after negative aspiration for blood. Distribution of local anaesthetic drug was also visualised under ultrasound. After injecting into the interscalene groove, the needle was withdrawn, and positioned deep to the sternocleidomastoid muscle, along its tapering end, superficial to the prevertebral fascia and 5mL of LA solution was infiltrated as a plane block (Figure 1).





Fig. 1:Ultrasonographic image showing in-plane injection of local anaesthetic solution; **1a**- Needle in the interscalene groove, targeting the upper trunk roots (C5, C6). (ASM - anterior scalene muscle; MSM - middle scalene muscle; SCM - sternocleidomastoid muscle); **1b**- Needle between prevertebral fascia and investing layer of cervical fascia with drug spread (shown in green).

Surgical anaesthesia was assessed by pin prick along the incision site, as well as above and below the clavicle, and upper aspect of shoulder. There was minimal motor blockade noted as heaviness of ipsilateral shoulder without any distal muscle involvement. There was no evidence of phrenic nerve blockade or any other block related complication.

Thus, the surgery open reduction, internal fixation and plating was performed only under the above-mentioned block with minimal sedation, while requiring no additional infiltration, and providing optimum anaesthesia during the surgery. (Figure 2) Mean duration of surgery was  $133\pm10$  minutes (mean±SD). Patients were monitored in the post operative period and all the patients had adequate postoperative analgesia up to 10-12 hours. Visual Analogue score (VAS) was 3-4 at 12 hrs.



Fig. 2: Fracture clavicle: open reduction, internal fixation and plating; 2a- Intraoperative manipulation of the clavicle fracture segments; 2b-Internal fixation with plating performed on the clavicle.

# DISCUSSION

Clavicle surgery is usually performed for open and displaced fractures. Due to the complex and uncertain innervation of the clavicle RA was considered difficult or incomplete. However, with better understanding of clavicular innervation and better technology available, currently multiple RA techniques are being used to perform clavicle. RA definitely has several advantages over GA, including hemodynamic stability, better intraoperative and postoperative analgesia, less postoperative nausea and vomiting, improved patient satisfaction, and shorter hospital stay thus contributing to enhanced recovery<sup>[4]</sup>.

To establish a regional anaesthesia for clavicle surgery, understanding the complex innervation of the clavicle and the skin over the surgical site is imperative. (Figure 3)<sup>[3]</sup>. The terminal branches of the cervical plexus, mainly supraclavicular (C3-C4; medial, intermediate and lateral branches to the clavicle) and transverse cervical nerves provide sensory innervation to the skin and superficial structures of the anterolateral neck, clavicle and shoulder. The brachial plexus provides innervation for the entire upper extremity, both sensory and motor, specifically the skin over the deltoid muscle. The supraclavicular, subclavian, and long thoracic/suprascapular nerves, alone or together, may be responsible for pain transmission after clavicle fracture and surgery<sup>[3]</sup>. Hence, peripheral nerve blocks used to anaesthetise the clavicle need to include both the cervical plexus block and brachial plexus block mainly targeting C5, C6.



**Fig. 3:** Innervation of Clavicle (Source: Sonawane K, Dixit H, Balavenkatasubramanian J, Gurumoorthi P. (2021). Uncovering secrets of the beauty bone. A comprehensive review of anatomy and regional anesthesia techniques of clavicle surgeries. Open J Orthop Rheumatol 6(1): 019-029)<sup>[3]</sup>.

Considering this, in our case series, we gave an intermediate cervical plexus block combined with an interscalene block targeting the upper trunk roots (C5 and C6), under ultrasound and PNS guidance. We used low concentration of LA solution so as to avoid complete motor blockade as it is redundant for clavicle surgeries and facilitate enhanced patient recovery. In addition, with use of dual guidance, target specific LA deposition was possible with low volume and without any complications specifically avoiding phrenic nerve. The blocks were considered successful for all of our patients as they did not require conversion to GA, provided optimum operating conditions throughout the procedure, and duration of postoperative analgesia was up to 12 hours.

Various techniques described are interscalene with cervical plexus block, supraclavicular with cervical plexus block, selective blockade of supraclavicular nerves and upper trunk of brachial plexus (SCUT), clavipectoral fascial plane block, costoclavicular block<sup>[2-9]</sup>. A systematic review concluded that RA techniques for clavicle surgery are diverse, with different approaches used to overcome the overlapping sensory innervation and further comparative studies are required<sup>[10]</sup>. The cervical plexus block and brachial plexus block have some potential complications<sup>[4]</sup>. In our case series none of the patient had phrenic nerve blockade or any other complication. In this series we observed, 100% block success rate with dual guidance combined interscalene targeting C5 and C6 and intermediate cervical plexus block for optimum anaesthesia in clavicle surgery, without any complications. Patients showed lower postoperative VAS scores, and spent a shorter time in post-anesthesia care unit. However, larger prospective comparative studies are required to further elaborate on the efficacy of newer techniques, variable local anaesthetic drugs and their concentrations, and consequently help formulate a standard protocol for RA in clavicle surgery.

#### CONCLUSION

In conclusion, our experience with case series shows that Combined interscalene targeting C5 and C6 and intermediate cervical plexus block using dual guidance, low concentration local anaesthetics was effective and safe for clavicle surgery. It provided optimum, site- specific surgical anaesthesia, without any complications, preserving the motor function of the upper limb, ensured adequate postoperative analgesia, contributing to enhanced patient recovery. It can be used as an effective RA technique as a sole anaesthetic modality for clavicle surgeries.

## **CONFLICT OF INTERESTS**

There are no conflicts of interest.

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