

# Ultrasound guided selective cervical nerve root block and superficial cervical plexus block for surgeries on the clavicle

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## ABSTRACT

We report the anaesthetic management of two cases involving surgeries on the clavicle, performed under superficial cervical plexus block and selective C5 nerve root block under ultrasound (US) guidance, along with general anaesthesia. Regional analgesia for clavicular surgeries is challenging. Our patients also had significant comorbidities necessitating individualised approach. The first patient had a history of emphysema, obesity, and was allergic to morphine and hydromorphone. The second patient had clavicular arthritis and pain due to previous surgeries. He had a history of smoking, Stevens-Johnson syndrome, along with daily marijuana and prescription opioid use. Both patients had an effective regional block and required minimal supplementation of analgesia, both being discharged on the same day. Interscalene block with its associated risks and complications may not be suitable for every patient. This report highlights the importance of selective regional blockade and also the use of US guidance for an effective and safe block.

**Key words:** Nerve block, regional analgesia, ultrasound

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## INTRODUCTION

Surgeries on the upper limb are amenable to regional analgesia through brachial plexus blockade. Consideration for a successful block involves interscalene block (ISB) for surgeries on the shoulders and arms; supraclavicular block for surgeries on the elbows and forearms; and axillary block for surgeries on the hands and peripheries. Such a preference is considered based upon the segmental nerve supply and the possibility of effective blockade of the involved region.<sup>[1]</sup> Surgeries on the clavicle are not as common. In fact, most descriptions of regional analgesia for upper limb include techniques for shoulder and below. For an effective blockade of nociceptive input, for surgeries on the clavicle, one has to consider the variability in its nerve supply when compared to other upper limb structures. Previous reports suggest that the predominant nerve supply for distal clavicle is possibly from superficial cervical plexus (SCP) and

C5 nerve root, through suprascapular nerve and its branches.<sup>[2]</sup> In view of this, one can aim for a selective regional block to avoid the side-effects and hazards of an ISB. Our literature search revealed only one such existing report. We would like to report two cases of open clavicular surgeries, which were managed with a selective C5 nerve root block and SCP block, along with general anaesthesia (GA).

## CASE REPORTS

### Case 1

A 50-year-old obese woman had sustained a fall resulting in fracture of the left clavicle 6 months ago and was being treated conservatively. She had developed a malunion resulting in an acute inward angulation of the clavicle. This was resulting in significant pain and difficulty in deep breathing. Weighing 96 kgs, she had a history of pulmonary emphysema resulting from smoking. She also stated allergies to morphine and

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hydromorphone. Considering her comorbidities, we opted for a selective regional analgesia, along with GA. SCP block and a selective C5 nerve root block were performed. For the actual surgery, without any other premedication, patient was induced with 100 mcg of intravenous (IV) fentanyl, 200 mg of propofol and 60 mg of rocuronium. Patient was kept intubated throughout the surgery. Since the surgical dissection was in close proximity to the pleura, respiratory pressures were closely monitored. Patient required no analgesic supplementation during the surgery, apart from the 100 mcg of IV fentanyl given before the intubation. The surgery lasted approximately 110 min in duration.

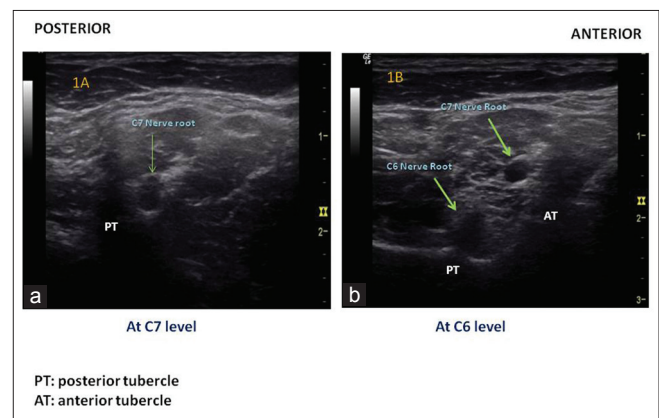
### Case 2

A 37-year-old man had a long history of right clavicular pain resulting from multiple injuries. He continued to have pain despite two previous surgeries on his clavicle, complicated with a history of recent injury. Weighing 78 kg, he had a history of smoking, daily marijuana use, known Stevens-Johnson syndrome with skin sloughing, and a daily morphine intake of 45 mg, 3 times daily. He was asked to continue with his regular dose of morphine even on the day of surgery. SCP block and a selective C5 nerve root block on the right side were performed. The patient was administered GA for the surgery. Patient was induced with 150 mg of propofol, 75 mcg of fentanyl and intubated using 50 mg of rocuronium. The surgery lasted for approximately 100 min. There were no signs indicative of inadequate analgesia and hence required no supplementation of intraoperative analgesics.

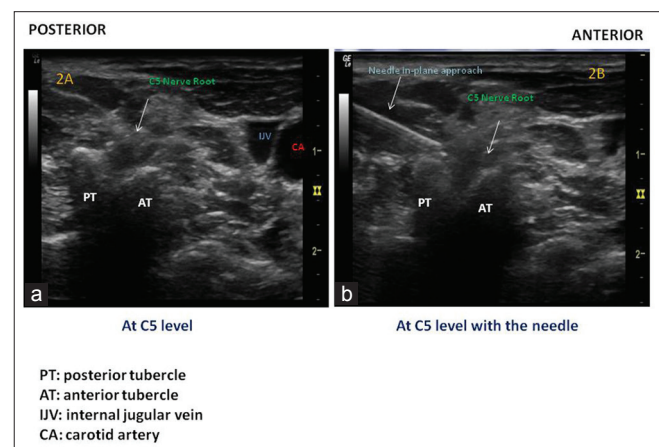
For both patients, an informed consent which included an explanation regarding the ultrasound (US) guided regional blocks, were obtained. They were sedated with 2 mg of midazolam before the blocks and were provided oxygen supplementation through nasal prongs. They were monitored with continuous noninvasive blood pressure (NIBP) and O<sub>2</sub> saturation in the block room. We used a high frequency linear probe (GE Ultrasound, LOGIQ-e<sup>®</sup> machine), with a 50 mm Echostim needle (Benlan, Ontario, Canada). SCP block was performed with patient's head turned to the opposite side. At the posterior border of sternocleidomastoid, around the midpoint between C6 and mastoid process, the needle was placed just underneath the muscle, in an in-plane approach, and 8 ml of 0.5% ropivacaine was injected with good visualisation-observed as a sausage under the posterior border of the sternocleidomastoid. The selective C5 nerve root block was performed in an in-plane approach

as described by Narouze *et al.*<sup>[3]</sup> Identification of C5 was done by comparing it with the anterior and posterior tubercles of C6 and C7 transverse processes. The C7 has a rudimentary anterior tubercle and a prominent posterior tubercle [Figure 1a]. The vertebral artery travels antero-posteriorly and enters the foramen transversarium at C6, to lie medial and anterior to the nerve root. The C6 transverse process has a prominent anterior tubercle, which is well-known as Chassaignac's tubercle [Figure 1b]. The C5 transverse process makes a "two humped camel sign", with the C5 nerve root in between them, casting a hypoechoic shadow [Figure 2a]. The needle was placed with an in-plane approach, just below the nerve root and 2 ml of 0.5% ropivacaine was injected [Figure 2b]. In both patients, sensory block involving the clavicular area was confirmed using a pin prick.

Both patients were monitored with 3-lead



**Figure 1:** (a) Identification of C7 level: Prominent posterior tubercle with almost no anterior tubercle. (b) Identification of C6 level: Prominent anterior tubercle (Chassaignac tubercle)



**Figure 2:** (a) Identification of C5 nerve root with important vascular structures visualised in the medial aspect. (b) C5 nerve root between the "camel humps" formed by anterior and posterior tubercles - with the needle approaching from posterior

electrocardiography, O<sub>2</sub> saturation and a continuous NIBP throughout the procedure; their vital signs were observed to be within normal ranges throughout. Both were observed to be comfortable in the postoperative period with minimal pain, <2/10 in numerical analogue scale, in recovery. In the first patient, a postoperative chest X-ray was ordered from the surgical team to rule out any pneumothorax due to the proximity of surgical site to the pleura. The X-ray demonstrated no evidence of diaphragmatic paralysis. Both patients were discharged home with no immediate complications.

## DISCUSSION

Our reports demonstrate that selective regional analgesia for surgeries involving clavicle is an acceptable technique and provides effective analgesia with limitation of side-effects. It does require considerable practice and skill in recognition of anatomical structures and placement of the needle.

The clavicle and its superficial structures possess a complex innervation. The nerve supply for clavicle is from C3 to C5 nerve roots. The skin and superficial fascia around the upper front of the chest is innervated from the SCP.<sup>[4]</sup> The plexus is formed by the anterior rami of C1-C4 nerve roots and gives rise to four terminal branches: greater auricular, lesser occipital, transverse cervical and suprascapular nerves. It has been shown that US guided SCP can work well for acute clavicular fractures, performed in the emergency room.<sup>[5]</sup> The shoulder joint complex (comprised of glenohumeral, acromioclavicular and sternoclavicular joints) itself is also innervated from the same nerve roots with predominant supply from suprascapular nerve arising from C5.<sup>[6,2]</sup> Cervical plexus block alone has been reported to be effective for clavicular fracture;<sup>[5]</sup> however, it may not be sufficient to effectively block the deeper fibres innervating the bone, during and after surgery. Kline *et al.* described the use of double catheters at cervical plexus and selective C5 nerve root for clavicle surgeries.<sup>[2]</sup> The disadvantages of the ISB include unwanted motor and sensory block of the upper extremity along with other recognised adverse effects.<sup>[1,7]</sup> Phrenic nerve originates predominantly from C4 nerve root and the incidence of phrenic nerve blockade could be nearly 100% when more than 20 ml of the solution is used.<sup>[8]</sup> ISB also has the highest incidence

of neurological complications, including transient neurological complications.<sup>[9]</sup> Up to 8% of neurological symptoms, reported on the 8<sup>th</sup> postoperative day after shoulder surgery are attributed to it. The guidelines by American Society of Regional Anaesthesia accord a clear recommendation regarding the use of ISB.<sup>[10]</sup> Among the various strategies proposed to limit the respiratory impact of analgesic strategies to shoulder surgeries include supraclavicular nerve block and reduced volume of local anaesthetics.<sup>[7]</sup>

## CONCLUSION

Our report attempts to highlight that selective regional analgesia could be considered for patient specific management. Blockade of C5 nerve root along with SCP block can provide efficient analgesia for surgeries involving clavicle. Use of US helps localisation and to avoid injury to important vascular structures.

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