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Original Article

Anaesthesia Section

# Efficacy of Combined Interscalene Block and Superficial Cervical Plexus Block for Surgeries of the Clavicle: A Prospective Observational Study

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## ABSTRACT

**Introduction:** Although there are regional anaesthetic techniques used to provide analgesia in fractures of clavicle, their routine use as a sole anaesthetic technique for surgical fixation of the same has not been well established.

**Aim:** To assess the clinical efficacy of combined Interscalene Block (ISB) and Superficial Cervical Plexus Block (SCPB) as a sole anaesthetic technique in patients posted for routine clavicular surgeries.

**Materials and Methods:** This was an observational prospective study of adult patients (n=12, 18-65 years of age) posted for routine clavicular studies, who opted for Regional Anaesthesia (RA) over General Anaesthesia (GA). Preoperative Visual Analogue Scale (VAS) scores were recorded for comparison. The regional anaesthetic technique performed was USG-guided combined ISB and SCPB using 30 mL of a local anaesthetic mixture (Bupivacaine 0.5% and lignocaine 1% in 1:1 ratio). Volumes used were 20 mL for ISB and 10 mL for SCPB. The onset of sensory anaesthesia was determined by loss of pain to pin prick along the area of incision to be made at the intervals of 5, 10, 15, 20, 25 and 30 minutes after the block. Intraoperative pain of VAS ≥4 was managed by rescue local anaesthetic infiltration. Perioperatively, patients were assessed for pain and other complications at 30 minutes,1 hour, 2 hours, 4 hours, 6 hours, 8 hours and 24 hours after the block.

**Results:** All patients completed the study successfully under RA. Average duration for onset of anaesthesia was 15.41 minutes. Two patients required additional local anaesthetics of 2-3 mL each intraoperatively. Average duration of analgesia for all patients was 4.54 hours. No unwanted complications were observed.

**Conclusion:** Combined ISB and SCPB as a sole anaesthetic technique is effective for clavicular surgeries.


**Keywords:** Clavicular surgeries, General anaesthesia, Regional anaesthesia, Visual analogue scale

## INTRODUCTION

Fractures of the clavicle comprises 2.6 to 4% of all adult fractures usually following trauma and it accounts for 35% of injuries to the shoulder girdle [1,2]. Surgical fixation of clavicular fractures has been traditionally performed under General Anaesthesia (GA) due to difficulty in blocking all the nerves supplying the area of surgery concerned [3-5]. Although GA has the benefit of rendering all the patients completely relaxed and unaware during the surgery, it carries the usual risks of increased haemodynamic stress response, increased usage of drugs and increased Post-operative Nausea And Vomiting (PONV) apart from the risks of airway complications [6,7]. The risk is further increased in patients with co-morbid illness.

Regional anaesthesia (RA) on the other hand avoids the unwanted side effects of GA, produces superior analgesia and early ambulation [6]. Decreased cost of RA is another advantage [8,9]. RA for clavicular surgery has, however, been reserved mainly for analgesia purposes and infrequently used for total anaesthesia, because of its wide nerve supply namely the supraclavicular nerves, the subclavian nerve, and the suprascapular nerve, thereby causing difficulty in anaesthetising all of them. For RA to be effective in clavicular surgery, the concerned area to be anaesthetised will include the skin above the clavicle, the top of the shoulder and the clavicle bone itself (i.e., C3, C4 and C5 dermatomes). There are few case reports where RA was used successfully in patients who are not suitable for GA [4,10,11].

Different techniques of giving RA have been tried for clavicular surgery. They include: 1) USG–guided placement of combined superficial cervical plexus and selective C5 nerve root catheters [3,4]; 2) Selective supraclavicular nerve block using a subclavian approach [10]; and 3) Combined Interscalene Block (ISB) and Superficial Cervical Plexus Block (SCPB) [11]. RA for clavicular surgery are not without side effects. ISB may cause ipsilateral phrenic nerve paralysis; Horner's syndrome and recurrent laryngeal nerve palsy temporarily [12-14]. But, the use of USG in ISB has decreased the incidence of complications by depositing more accurately a reduced volume of the local anaesthetics [15-17]. However, there is a lack of studies regarding the use of RA as a sole anaesthetic technique in routine clavicular surgeries.

Therefore, the purpose of our study was to evaluate the efficacy of combined SCPB and ISB as the sole RA technique in patients coming for routine clavicular surgeries.

## MATERIALS AND METHODS

This was a prospective, observational pilot study conducted in a tertiary hospital, approved by the institutional ethics committee of the hospital (Ac/04/IEC/JNIMS/2017(36-R)). Informed consents were taken from 12 patients of ASA I and II between the age group of 18-65 years, who came for elective clavicular surgery and who opted for RA over GA during the study period of June 2017 to May 2018.

The exclusion criteria were: patients with neurological deficits of the brachial plexus, local site infections, phrenic nerve paralysis, coagulopathy, polytrauma with multiple fractures and hypersensitivity to local anaesthetics viz., bupivacaine and lignocaine.

Standard anaesthesia monitors were applied to all patients on the operating table and the baseline parameters were noted. Premedication with IV midazolam 0.02 mg/kg were given. With the patient in supine position and head turned to the other side, SCPB was given with 10 mL of local anaesthetics (1% lignocaine 5 mL+0.5% bupivacaine 5 mL) using surface landmark technique [Table/Fig-1]. The posterior border of the sternocleidomastoid muscle is identified and marked by asking the patients to lift their heads to make it prominent. We did not find it necessary to use ultrasonography for SCPB as we gave the block subcutaneously. At the midpoint along the posterior border of the muscle, a 23 G needle is inserted perpendicularly upto a depth of 0.5 cm-1 cm and 2-3 mL of local anaesthetic is injected followed by 3-4 mL caudad and cephalad to the point of insertion subcutaneously along the border. Thereafter, ultrasonography was used to identify the brachial plexus in the interscalene groove and using in-plane technique and a 25 G spinal needle, ISB was given with 20 mL of local anaesthetics (1% lignocaine 10 mL+0.5% bupivacaine 10 mL) after anaesthetising the skin at the point of entry with 1-2 mL of 2% lignocaine. No adjuvants were added to the local anaesthetics. The $SpO_2$, BP and HR were recorded at five minutes interval.


**[Table/Fig-1]:** Point of needle entry (arrow) for SCPB using surface landmark.

The onset of anaesthesia which was indicated by loss of pain sensation to pin prick over the C3, C4, and C5 dermatome and loss of motor power (inability to abduct or raise the arm) was recorded. The side effects or complications that can arise from the block such as Horner's syndrome (stellate ganglion block), dypnoea (ipsilateral phrenic nerve palsy), and hoarseness (recurrent laryngeal nerve palsy) were assessed by clinical examination and X-Ray chest AP view.

Intraoperative requirement of analgesics or local anaesthetic infiltration were also recorded. RA was considered successful if the surgery was completed without conversion to GA. Perioperatively, all patients were evaluated for pain with VAS- on a horizontal 10 cm scale rated by the patients that ranges from 0 (no pain) to 10 (worst pain possible) at interval of 30 minutes,1 hour, 2 hours, 4 hours, 6 hours, 8 hours, 24 hours after the block. VAS score of ≥4 were considered as inadequate analgesia and were treated with local infiltration or IV analgesics. The time for first analgesic requirement and total amount of analgesics used in the first 24 hours were also recorded. Post-operative sedation score of the patient were evaluated with modified Observer's Assessment of Alertness/Sedation Scale (OAAS) ranging from 0 (no response to noxious stimuli) to 5 (responds readily to name spoken in normal tone) at intervals of 30 minutes,1 hour, 2 hours, 4 hours, 6 hours, 8 hours, 24 hours after the block.

## RESULTS

The characteristics of the patients are given in [Table/Fig-2]. Outcome of the anaesthesia and surgery are given in [Table/Fig-3,4].

| | |
|---|---|
| Age (years) (Mean±SD) | 40.66±14.51 |
| Height (cm) (Mean±SD) | 169.68±5.79 |
| Weight (Kg) (Mean±SD) | 67.41±11.31 |
| Male/Female | 10/2 |
| ORIF/Implant removal | 8/4 |

**[Table/Fig-2]:** Patients' characteristics.

| Parameters | Mean±SD |
|---|---|
| Onset of anaesthesia (min) | 15.41±2.57 |
| Duration of surgery (min) | 72.9±19.4 |
| Duration of analgesia (hr) | 4.54±1.58 |
| Complications | Nil |
| Conversion to GA | Nil |

**[Table/Fig-3]:** Primary outcome of the anaesthesia and surgery.

| Patient No. | Maximum VAS over 24 hours post-op period | OASS at different time intervals in 24 hours Post-op period | Post op IV analgesics requirement in 24 hours (when VAS ≥4) |
|---|---|---|---|
| 1 | 4 | 5 | IV Diclofenac 75 mg+IV Paracetamol 1 gm |
| 2 | 4 | 5 | IV Diclofenac 75 mg |
| 3 | 4 | 5 | IV Diclofenac 75 mg+IV Paracetamol 1 gm |
| 4 | 4 | 5 | IV Diclofenac 75 mg+IV Paracetamol 1gm |
| 5 | 4 | 5 | IV Diclofenac 75 mg |
| 6 | 4 | 5 | IV Diclofenac 75mg+IV Paracetamol 1 gm |
| 7 | 4 | 5 | IV Diclofenac 75 mg+IV Paracetamol 1 gm |
| 8 | 4 | 5 | IV Diclofenac 75 mg+IV Paracetamol 1 gm |
| 9 | 4 | 5 | IV Diclofenac 75 mg |
| 10 | 2 | 5 | Nil |
| 11 | 4 | 5 | IV Diclofenac 75 mg+IV Paracetamol 1gm |
| 12 | 4 | 5 | IV Diclofenac 75 mg |

**[Table/Fig-4]:** Post-operative outcome in 24 hours.

All 12 patients who underwent the surgery completed the procedure under RA without conversion to GA. Eight patients came for ORIF (Open Reduction and Internal Fixation) of the clavicle and four patients came for implant removal. Two patients complained of pain intraoperatively (VAS ≥4) on handling of the clavicle for which an additional 2-3 mL of local anaesthetic infiltration was given in the periosteum of the clavicle at the site of surgery, and there was no further complaint. Average duration of onset of anaesthesia was 15.41 minutes. Average duration of analgesia for all patients was 4.54 hours. Perioperative haemodynamics were stable in all patients. No unwanted complications such as local anaesthetic toxicity, pneumothorax, Horner's syndrome, hoarseness of voice etc., were observed.

Post-operatively, pain scores of VAS ≥4 were managed with IV diclofenac 75 mg or IV paracetamol 1 g. Except for one patient who did not ask for any analgesic in the post-operative period, all the other 11 patients required atleast one IV analgesic in the post-operative period. Out of the eleven, seven patients required two injections of IV analgesics and four patients required only one IV

analgesic. OAAS scores measured at 30 minutes, 1 hour, 2 hours, 4 hours, 6 hours, 8 hours and 24 hours were maximum i.e., 5 in all patients in the perioperative period indicating little or no sedation at all [Table/Fig-4]. This allowed early ambulation of the patient and early oral intake of the patient postoperatively.

## DISCUSSION

This study revealed that combined SCPB and ISB is adequate as a sole anaesthetic technique for surgeries of the clavicle. It has the advantage of avoiding the side effects and complications of GA. All the patients were able to start oral intake right after the surgery reducing the period of fasting, bringing much relief to them.

Different regional anaesthetic techniques have been described in the literature, for providing analgesia or anaesthesia of the clavicle. Herring AA et al., reported a first case of ultrasound-guided SCPB for anaesthesia and analgesia in emergency care settings [5]. Ueshima H and Otake H, successfully performed selective supraclavicular nerve block using a subclavian approach along with USG guided C5 and C6 nerve blocks for a clavicle fracture surgery [10]. Vandepitte C et al., performed a combined superficial cervical plexus and interscalene blocks for a clavicular fracture surgery in a 15 week pregnant woman [11]. However, these are all single case reports and suggested the need for proper prospective studies for use of the nerve blocks in routine clavicular surgeries. A retrospective observational study conducted by Balaban O et al., suggested that it was possible to use ultrasound guided combined interscalene-cervical plexus block for surgery of the clavicle [18]. In their study, they blocked the cervical plexus deep to the SCM. In our study, we chose to block the superficial cervical plexus subcutaneously along the posterior border of SCM to decrease the risk of extension of the local anaesthetic into deeper structures and produce complications. The identification of the posterior border of SCM was possible in all the patients, by turning their heads to the opposite side and asking them lift their heads. Subcutaneous injection was confirmed by the formation of a linear skin wheal along the posterior border of the SCM muscle. For the interscalene block, we have used ultrasonography as it allows accurate identification of the brachial plexus in the ISB. We used a smaller 25 gauge spinal needle to decrease injury and pain during needling. No unwanted complications were observed in our study.

A recent prospective observational study by Contractor HU et al., showed that ultrasound guided superficial cervical plexus and interscalene brachial plexus block was effective for clavicular surgeries, although they have used dexmedetomidine boluses of 1 µg/kg on all the patients after the block was given which could confound the pain evaluation [19]. They reported Horner's syndrome of 26.7% and hoarseness of voice in 16.7% of the patients. In our study, no additional analgesics were used and no intravenous rescue analgesics was required intraoperatively except for two patients who complained of pain on handling of the clavicle by the surgeon. It was managed by subperiosteal injection of 2-3 mL of additional local anaesthetic at the site of the clavicular pain. The average time of onset of anaesthesia was 15.41 minutes and the duration of analgesia (time for first analgesic demand) was 4.54 hours in our study which were comparable with other studies. The duration of analgesia offered was well beyond the time required for completion of the surgery [Table/Fig-3].

Perhaps, further studies with the addition of adjuvants such as clonidine or dexamethasone to the local anaesthetics will be interesting to see its effect on the duration of analgesia.

Reverdy F reported that patients who underwent clavicle surgery under combined interscalene-superficial cervical plexus block for clavicle surgery also had high satisfaction scores post-operatively [20].

Use of ultrasonography has drastically decreased the serious side effects of interscalene brachial plexus blocks such as intrathecal or epidural injections and pneumothorax [21]. Other side effects such as Horner's syndrome, ipsilateral phrenic nerve palsy and hoarseness of voice can still occur infrequently but are usually transient and recovers spontaneously as the action of the drugs weans off. Use of a smaller volume of local anaesthetic and accurate deposition of the drug in the hands of an expert may further decrease these side effects [21].

## LIMITATION

The study is limited by the small number of cases as hospital admissions for clavicular surgeries are usually low. For a stronger implication of this study, a proper clinical trial comparing a GA group and a RA group will be necessary.

## CONCLUSION

We conclude that combined ISB and SCPB is efficacious as a sole anaesthetic technique for surgeries of the clavicle.

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