# Comparative Evaluation of Efficacy of Interscalene Block vs. Interscalene Block and Superficial Cervical Plexus Block for Fixation of Clavicular Fractures

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## ABSTRACT

**Introduction:** Regional anaesthesia is seldom used for clavicle fractures considering the anatomical location of the bone. We aim to compare the efficacy of two techniques of regional anaesthesia as sole anaesthesia technique for fixations of clavicular fractures.

**Material and methods**: 60 Adult patients with clavicle fractures were divided randomly in two groups (1 and 2) and were administered interscalene block (ISB) only or interscalene block and superficial cervical plexus block(ISB+SCPB) as sole anaesthetic, respectively. Patients were monitored for efficacy of block and adequacy of anaesthesia and analgesia at the surgical site. Side effects and hemodynamic parameters were also monitored.

**Results:**. ISB+SCPB provides excellent anaesthesia for clavicle fixation. Only 1 patient in group 2 required General Anaesthesia(GA) whereas in Group 1, 8 patients required some form of supplemental anaesthesia. There was no statistically significant difference in side-effects and hemodynamic profile in both the groups.

**Conclusion:** ISB+SCPB is significantly better than ISB only for anaesthesia for fixation of clavicular surgeries.


**Keywords:** Regional Anaesthesia for Clavicle Surgeries, Anaesthesia for Clavicle Fractures, Interscalene Block, Superficial Cervical Plexus Block

## INTRODUCTION

Regional anaesthesia is routinely not used for fixation of clavicle surgeries due to anatomical location of the bone and lack of knowledge about innervation of clavicle. The suprascapular, subclavian, supraclavicular and long-thoracic nerves, alone or in combination may be responsible for cutaneous pain transmission as well as from clavicle fractures.[1] Various regional blocks alone or in combination are hypothesised to achieve the desired anaesthesia for clavicle surgeries. These blocks are supraclavicular (SCB), interscalene block (ISB), superficial cervical plexus block (SCPB) or isolated C5 root block or suprascapular nerve block. The purpose of this study was to find out the optimum regional anaesthesia technique for surgical fixation of clavicular fractures. It was also intended to find out the role of superficial cervical plexus in the innervation of clavicle.

## MATERIAL AND METHODS

The study was conducted on 60 adult patients of either sex in age group of 20-60 years, belonging to ASA I and ASA II, who were posted for elective fixation of clavicle fractures. The patients with systemic illnesses, with associated ribs fractures, with associated neurovascular injuries and with history of drug allergy were excluded from the study. Informed consent was taken from the patients. Routine investigations were done and selected patients were fasted for 8 hours.

On arrival in Operating room, pulse oximetry ($SpO_2$), non-invasive blood pressure (NIBP) and electrocardiograph (ECG) with heart rate (HR)were attached and monitored. The patients received Inj. Midazolam 1.5 mg and Inj. Fentanyl 0.5 µg/kg and were randomly divided in two groups, Group 1 and Group 2. Patients in Group 1 received Interscalene block (ISB) using nerve stimulator with 1 mg/kg Bupivacaine and 3 mg/kg Lignocaine with adrenaline and made up to a volume of at least 20 ml with normal saline(NS), if total volume was less than 20 ml. Patients in Group 2 received Interscalene block (ISB) using nerve stimulator with 1 mg/kg Bupivacaine and 3 mg/kg Lignocaine with adrenaline and made up to a volume of at least 20 ml with NS if total volume was less than 20 ml and Superficial cervical plexus block (SCPB) with 0.5 mg/kg Bupivacaine and 1 mg/kg Lignocaine with adrenaline and made up to a volume of at least10 ml with NS, if total volume was less than 10 ml.

Primary outcome measure for the study was to determine adequacy of anaesthesia and analgesia at the surgical site. Secondary outcome measures included determining incidence and severity of side-effects like hemodynamic instability, respiratory difficulty, Horner's syndrome and hoarseness.

Patients in both the groups were checked for adequacy of anaesthesia and analgesia under motor and sensory divisions. For motor response, patients were asked to lift the shoulder and flex the elbow every 5 min after the administration of the block for 30 min. Motor response was graded in terms of

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power grading as below:

| Grade | Description |
|---|---|
| 5 | Patient can hold a position against maximum resistance and through complete range of motion |
| 4 | Patient can hold a position against moderate resistance and through complete range of motion |
| 3 | Patient can tolerate no resistance but can perform action through full range of motion |
| 2 | Patient has all or partial range of motion in gravity free position |
| 1 | Muscles can be palpated while performing action in gravity free position |
| 0 | No contractile activity in gravity free position |

A power grade of less than 2/5 was considered adequate for surgery to proceed.

For sensory response, patients were checked for deep touch/ pressure at medial end, mid-point and lateral end of the clavicle, every 5 min after administration of the block for 30 min. Patients' response was recorded in Verbal Response Scale (VRS) on a scale of 0-10, with 0 being no sensation and 10 being no anaesthesia or sensation similar to prior of anaesthesia. A VRS of <3 at all three points was considered adequate for surgical procedure.

In case of inadequate sensory and/or motor response after 30 min of administration of block, patients were administered General Anaesthesia using LMA or ETT. If there is inadequate sensory response only at the medial end of the clavicle, medial end of clavicle was infiltrated with 5 ml if 1% Lignocaine subcutaneously. Number of patients with inadequate effect and requiring general anaesthesia were recorded in both the groups. Number of patients requiring only medial end infiltration was also recorded.

Pulse oximetry ($SpO_2$) and non-invasive blood pressure (NIBP: SBP and DBP) were recorded every 10 min. The patient was observed for any discomfort or pain or change in vital parameters or any other side effect like hoarseness, difficulty in breathing, nausea/vomiting, etc. A rise/fall of >20% in hemodynamic parameters was considered as significant. Surgeon was asked to rate the surgical conditions subjectively as excellent, good, satisfactory and poor.

## STATISTICAL ANALYSIS

The statistical analysis of the data was performed using SSPS Statistics for Windows, Version 17.0, Chicago, SSPS Inc. The normally distributed continuous data were described as mean and 95% confidence interval for mean (95% CI), as median with interquartile range (IQR) when the distribution was not normal. Categorical data are expressed as number with percentage. The continuous variables were compared between the groups using independent sample t-test for data distributed normally and non-parametric Mann-Whitney U-test when skewed, and categorical data were compared using Chi-square test. The changes in the hemodynamics from baseline within groups were analysed using ANOVA. A p value of <0.05 was considered as statistically significant for all tests.

| Type of supplementation | Group 1 (n=30) | Group 2 (n=30) | p |
|---|---|---|---|
| Medial end infiltration | 16.66 | 0 | <0.05 |
| General anaesthesia | 10 | 3.33 | <0.05 |

**Table-1:** Percentage of patients with supplemental anaesthesia

| Mean time to (min) | Group 1 (n=30) | Group 2 (n=30) | p |
|---|---|---|---|
| VRS<3 at lateral end | 9±4.18 | 8±4.82 | >0.05 |
| VRS<3 at mid-point | 10±3.42 | 9±4.24 | >0.05 |
| VRS<3 at medial end | 14±2.13 | 10±2.14 | <0.05 |
| Power <2/5 at shoulder | 10±1.14 | 8±3.82 | >0.05 |
| Power <2/5 at elbow | 9±2.45 | 9±2.92 | >0.05 |

**Table-2:** Block Characteristics

| | Group 1 | Group 2 | p |
|---|---|---|---|
| Tachycardia | - | - | >0.05 |
| Bradycardia | - | - | >0.05 |
| Hypotension | - | - | >0.05 |
| Hypertension | - | - | >0.05 |
| SpO2 < 95% | - | - | >0.05 |
| Hoarseness | 5 | 6 | <0.05 |
| Difficulty in breathing | - | - | >0.05 |
| Nausea /Vomiting | - | - | >0.05 |
| Horner's syndrome | - | - | >0.05 |

**Table-3:** Side-effects

## RESULTS

The mean age, height, body weight, sex distribution and duration of surgery was comparable in both the groups. All the patients in both groups underwent intramedullary TENS nailing of the clavicle.

All the patients in Group 2, except one had adequate anaesthesia for surgery to proceed. The patient had inadequate sensory block at medial end of clavicle and at mid-point of clavicle with pain at the fracture site after 30 min of administering the block, and thus, was administered General Anaesthesia (GA). However in Group 1, 5 patients had inadequate medial end analgesia and thus, required medial end infiltration with LA, and 3 patients required GA. The difference in outcome was statistically significant.(Table 1)

Adequacy of sensory block at mid-point of the clavicle and at the lateral end of clavicle and of motor block was similar in both the groups. Onset at lateral end of the clavicle was fasterin Group 2 but not statistically significant. But, the sensory block at medial end of clavicle was significantly faster and adequate in Group 2 as compared to Group 1. All the patients who achieved VRS<3 at >30 min at a particular point, they were excluded from mean time calculation and were considered as inadequate effect (Table 2). The surgeons' rating was excellent to good in Group 2 and good to satisfactory in group 1.

The vital parameters remained stable with no significant change from the baseline and were comparable in both the groups. Five patients in group 1 and 6 patients in group 2 developed hoarseness of voice with no statistical difference.

There was no incidence of respiratory difficulty, nausea, vomiting, desaturation and Horner's syndrome in any patient in both the groups. (Table 3)

## DISCUSSION

SCPB has been used in emergency settings for pain relief not only after clavicular fractures but in ear lobe and lateral neck injuries as well.[2,3] Ultrasound guided SCPB alone has been used by Herring AA et al to treat pain following clavicle fracture using 8 ml of 0.5% Bupivacaine.[2]

Post-operative pain after clavicle surgeries in treated by various approaches to peripheral nerve blocks. Choi SD et al found cervical plexus block with 0.5% Bupivacaine to be successful in treating post-operative pain following open reduction internal fixation following clavicle fracture for as long as 14 hours.[4]

Selective supra-clavicular nerve or C5 root block is also being used along with brachial plexus block or SCPB by various approaches for treating surgical pain.[1,5,6] Valdes-Vilches et al reported successful low volume (1.5-2) ml selective supraclavicular nerve block with brachial plexus block using supraclavicular approach for surgical procedures on clavicle.[1]

Use of USG guided combined SCPB and selective C5 nerve root block with catheters have been used for pain management following distal clavicle fractures by Kline JP.[5] Shanthanna H used the same combination for surgical pain relief during clavicle surgeries.[6]

In a landmark observation by Tran DQ et al, it was noted that peripheral nerve blocks including ISB, SCPB and ISB+SCPB can be used to anaesthetise the clavicle. However, they called for future RCTs to determine the best option for Emergency department, in case of pain relief following clavicle fractures and in operating room for fixing the clavicle fractures and also to determine the innervation of clavicle.[7] Dillane D et al also used a USG guided combination of SCPB and supraclavicular brachial plexus block using a single needle technique to anaesthetise the clavicle for surgical fixation and found an appropriate satisfactory response.[8] Combined ISB and SCPB is also used successfully in a 15 weeks pregnant lady for surgical repair of clavicle fracture, and hence, avoiding general anaesthesia in a potential high risk patient for same.[9] In our study, we combined SCPB with ISB and found it adequate for relieving pain at the surgical site during intra-medullary nailing opf clavicle, as compared to ISB alone. ISB alone is insufficient as an anaesthetic technique for clavicle fractures. We recommend further randomised studies to find whether ISB is unnecessary in clavicle fixation surgeries.

## CONCLUSION

ISB+SCPB is superior to ISB alone as regional anaesthesia technique for surgical fixation of clavicular fractures.

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