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Research Article

A Prospective Comparative Study of Usg Guided Interscalene Block with Superficial Cervical Plexus Block Vs General Anaesthesia for Fixation of Clavicular Fractures

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A B S T R A C T

Introduction: Clavicular fractures constitute a significant proportion of shoulder girdle injuries, often requiring surgical fixation. While general anaesthesia (GA) has traditionally been the standard approach, ultrasound-guided regional anaesthesia techniques such as interscalene brachial plexus block (ISB) combined with superficial cervical plexus block (SCPB) are emerging as effective alternatives, offering potential benefits in analgesia, haemodynamic stability, and recovery profile.

Materials and Method: This prospective, randomized comparative study was conducted on 60 patients undergoing elective clavicular fracture fixation, randomly allocated into two groups: Group G (n = 30) received GA, and Group B (n = 30) received ultrasound-guided ISB + SCPB with 20 mL of 0.5% ropivacaine. Baseline characteristics, intraoperative haemodynamics, postoperative pain scores (VAS), opioid requirements, and recovery profiles (Modified Aldrete score) were assessed. Data were analyzed using SPSS v20.0, with $p < 0.05$ considered statistically significant.

Results: Group B showed significantly lower postoperative opioid consumption across all time points within 24 hours ($p < 0.05$) and lower VAS scores at T4 and T8 (median 0 vs 6 and 0 vs 4, $p < 0.001$). Intraoperative mean arterial pressure and heart rate remained more stable in Group B, particularly during intubation/incision ($p < 0.001$). Recovery was faster in Group B, with higher median Aldrete scores at T2 (9 vs 8, $p < 0.01$). No block-related complications were observed.

Conclusion: Ultrasound-guided ISB + SCPB provides superior postoperative analgesia, better haemodynamic stability, and faster recovery compared to GA for clavicular fracture fixation, making it a safe and effective anaesthetic option in suitable patients.

Keywords: Clavicular Fracture, Interscalene Brachial Plexus Block, Superficial Cervical Plexus Block, General Anaesthesia, Ultrasound-Guided Block, Postoperative Analgesia, Haemodynamic Stability

Introduction

Clavicular fractures constitute approximately 35% of injuries involving the shoulder girdle and—when significantly displaced—are commonly managed with open reduction and internal fixation under general anaesthesia (GA).[1] While GA has traditionally been the default modality for clavicle surgeries due to concerns about airway management and surgical positioning, peripheral nerve block techniques have gained interest as potential alternatives, especially with advancements in ultrasound guidance.[1–3] The clavicle's sensory innervation is complex and typically involves contributions from the superficial cervical plexus (mainly C2–C4), as well as the brachial plexus via upper roots (C5) and sometimes deep cervical structures.[4] Consequently, combined regional techniques—specifically an interscalene brachial plexus block (ISB) supplemented with a superficial cervical plexus block (SCPB)—have been explored for both surgical anaesthesia and postoperative analgesia in clavicular procedures.[1] Previous observational and randomized studies have shown that US-guided ISB + SCPB can effectively serve as sole anaesthesia for clavicle fixation, with high rates of surgical block success, reduced opioid requirements, shorter post-anaesthesia care unit stays, and fewer complications when compared to GA.[1,5] Some trials comparing ISB alone with ISB + SCPB reported no significant differences, while other studies favoured combined blocks—especially when superficial or intermediate cervical plexus components were added—for improved block success and prolonged analgesia.[6–9]

However, despite promising evidence, prospective comparative studies directly evaluating ISB + SCPB versus GA for clavicle fracture fixation remain limited.[10,11] A few case series and retrospective assessments recommend the combined block as an effective alternative, but robust data comparing intraoperative haemodynamics, postoperative analgesia, complication rates, recovery time, and patient satisfaction are still needed.[2,3,5,9] Furthermore, complexities of clavicular innervation and variable sensory blockade underscore the need for careful evaluation of block efficacy and safety profiles in a randomized controlled setting.[12–14]

Therefore, we designed this prospective comparative study to assess the effectiveness and safety of ultrasound-guided ISB combined with SCPB versus standard GA in patients undergoing fixation of clavicular fractures. Our primary aim was to evaluate the clinical efficacy of ultrasound-guided combined interscalene brachial plexus block (ISB) and superficial cervical plexus block as a sole anaesthetic technique in patients undergoing clavicular fracture fixation surgery.

Materials and Methods

This prospective, randomized comparative study was conducted at Basaweshwar Teaching and General Hospital, Kalaburagi, over a period of 1.5 years. A total of 60 patients scheduled for elective clavicular fracture fixation surgery were enrolled and randomly allocated into two groups of 30 patients each:

- **Group G:** Patients receiving general anaesthesia
- **Group B:** Patients receiving ultrasound-guided interscalene brachial plexus block (ISB) combined with superficial cervical plexus block (SCPB)

Ethical approval was obtained from the Institutional Ethical Committee .

Inclusion Criteria

Patients meeting the following criteria were included in the study:

1. Age between 16 and 65 years
2. Either sex
3. American Society of Anesthesiologists (ASA) physical status I, II, or III
4. Patients with normal pulmonary function tests indicating good respiratory reserve
5. Patients scheduled for elective clavicular fracture surgery

Exclusion Criteria

Patients were excluded if they met any of the following:

1. ASA physical status IV
2. History of alcohol or drug abuse
3. Known hypersensitivity to local anaesthetic agents
4. Coagulopathy or use of anticoagulant medications
5. Presence of respiratory disease indicating poor respiratory reserve

Anaesthetic Technique

Preoperative pain was assessed in all patients using the Visual Analogue Scale (VAS) to establish baseline pain scores. In Group B, patients received ultrasound-guided interscalene brachial plexus block (ISB) and superficial cervical plexus block (SCPB) with a total volume of 20 mL of 0.5% Ropivacaine, divided equally as 10 mL for each block. Patients in Group G underwent standard general anaesthesia following the institutional protocol. Intraoperative and postoperative pain levels were closely monitored, and rescue analgesia was administered whenever VAS scores exceeded 4 to ensure adequate pain control.

Outcome Measures

The study compared the two groups based on several parameters. These included intraoperative haemodynamic stability, postoperative analgesic requirements within the first 24 hours, and the duration of stay in the post-anaesthesia care unit (PACU).

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Statistical Analysis

Data were systematically entered into Microsoft Excel and analyzed using SPSS software version 20.0. Continuous variables were evaluated for normality of distribution. Depending on the data characteristics, either Student's t-test or the Mann–Whitney U test was applied for comparing continuous variables between groups. The Chi-square test was used for categorical variables. A p-value of less than 0.05 was considered indicative of statistical significance.

Results

Baseline Characteristics (Table 1)

The baseline distribution of ASA grades was similar in both groups, with ASA Grade I comprising 70.0% of Group G and 63.3% of Group B, and ASA Grade II comprising 30.0% and 36.7%, respectively. This difference was not statistically significant (p = 0.58), indicating comparable preoperative physical status and minimising confounding due to baseline variability.

Postoperative Opioid Requirement (Table 2)

Opioid requirements within the first 24 hours postoperatively were significantly lower in Group B at all time intervals. At T0, 96.7% of Group B required no analgesic compared to only 3.3% in Group G, where 96.7% required either paracetamol or diclofenac (p < 0.01). Similar patterns persisted at T2, T4, T8, and T12 hours, with Group B consistently demonstrating lower analgesic consumption. By T24, although analgesic needs decreased in both groups, 70% of Group B still required none compared to only 33.3% of Group G (p = 0.03). These results reflect the longer-lasting analgesic effect of ISB + SCPB over GA.

Postoperative VAS Pain Scores (Table 3)

VAS scores were consistently lower in Group B at almost all time points. At T0, Group B had a median score of 4 versus 4–4.5 in Group G (p = 0.04). The difference became more pronounced at T4 and T8 hours, where Group B maintained a median score of 0, while Group G recorded scores of 6 and 4, respectively (p < 0.001 for both). At T12, scores remained lower in Group B (p < 0.001), and by T24, pain levels were comparable between groups (p = 0.71).

Modified Aldrete Scores (Table 4)

At T2 hours postoperatively, Group B had significantly higher Modified Aldrete scores [median 9 (IQR: 9–9)] compared to Group G [median 8 (IQR: 8–9)], (p < 0.01). This indicates faster recovery and earlier readiness for discharge in patients receiving the combined block technique.

Intraoperative Mean Arterial Pressure (MAP) (Table 5)

Group B maintained more stable MAP values throughout surgery. While baseline and induction MAPs were comparable between groups (p > 0.05), significant differences emerged at intubation/incision (102.5 ± 7.0 mmHg in Group G vs 92.1 ± 6.5 mmHg in Group B, p < 0.001) and persisted at 15 minutes (p = 0.002), 30 minutes (p = 0.004), and at the end of surgery (p = 0.02). These results suggest better haemodynamic control with the block technique.

Intraoperative Heart Rate (HR) (Table 6)

Heart rate trends mirrored the MAP findings. Baseline and induction values showed no significant difference (p > 0.05), but at intubation/incision, Group G exhibited a pronounced tachycardic response (96.8 ± 7.1 bpm) compared to Group B (82.5 ± 6.4 bpm, p < 0.001). This difference remained significant at 15 minutes (p < 0.001), 30 minutes (p < 0.001), and at the end of surgery (p = 0.001), indicating reduced sympathetic stimulation with regional anaesthesia.

Intraoperative Oxygen Saturation (SpO_2) (Table 7)

SpO_2 levels remained within normal limits in both groups throughout surgery, with no statistically significant differences at any time point (p > 0.05). This finding confirms that oxygenation was adequately maintained regardless of the anaesthetic technique used.

Table 1.Baseline characteristics of patients in Group B and Group G

Variable	Group G (n = 30)	Group B (n = 30)	p value
ASA Grade I, n (%)	21 (70.0)	19 (63.3)	
ASA Grade II, n (%)	9 (30.0)	11 (36.7)	0.58

Table 2.Postoperative opioid requirement within 24 hours in Group B and Group G

Time Interval (hours)	Requirement (Score)	Group G, n (%)	Group B, n (%)	p value
T0	0	1 (3.3)	29 (96.7)	<0.01
	1	17 (56.7)	0 (0)	
	2	12 (40.0)	1 (3.3)	
T2	0	0 (0)	29 (96.7)	<0.01
	1	27 (90.0)	1 (3.3)	

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	2	3 (10.0)	0 (0)	
T4	0	0 (0)	29 (96.7)	<0.01
	1	4 (13.3)	0 (0)	
	2	26 (86.7)	1 (3.3)	
T8	0	8 (26.7)	26 (86.7)	<0.01
	1	22 (73.3)	4 (13.3)	
T12	0	1 (3.3)	29 (96.7)	<0.01
	1	29 (96.7)	1 (3.3)	
T24	0	10 (33.3)	21 (70.0)	0.03
	1	20 (66.7)	9 (30.0)	

Requirement score: 0 = no analgesic, 1 = paracetamol 1 g IV, 2 = diclofenac 75 mg IM ± paracetamol 1 g IV. Statistical test: Chi-square.

Table 3.Postoperative VAS pain scores in Group G and Group B

Time (hours)	VAS score median (IQR) Group G	VAS score median (IQR) Group B	p value
T0	4 (4–4.5)	4 (3–4)	0.04
T2	0 (0–0)	0 (0–0)	0.02
T4	6 (6–7)	0 (0–0)	<0.001
T8	4 (4–5)	0 (0–0)	<0.001
T12	1 (1–2)	0 (0–0)	<0.001
T24	1 (1–1)	1 (1–1)	0.71

Statistical test: Mann–Whitney U test.

Table 4.Modified Aldrete scores in Group G and Group B

Time (hours)	Modified Aldrete median (IQR) Group G	Modified Aldrete median (IQR) Group B	p value
T2	8 (8–9)	9 (9–9)	<0.01

Statistical test: Mann–Whitney U test.

Table 5.Intraoperative Mean Arterial Pressure (MAP) in Group G and Group B

Time Point	MAP (mmHg) Mean ± SD (G)	MAP (mmHg) Mean ± SD (B)	p value
Baseline (pre-op)	92.4 ± 6.8	91.8 ± 7.1	0.68
Induction	94.2 ± 6.4	91.5 ± 6.6	0.07
Intubation / Incision	102.5 ± 7.0	92.1 ± 6.5	<0.001
15 min	97.9 ± 6.2	91.7 ± 6.4	0.002
30 min	96.4 ± 6.0	91.4 ± 6.2	0.004
End of Surgery	94.6 ± 6.1	91.2 ± 6.3	0.02

Statistical test: Independent Student's t-test.

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Table 6.Intraoperative Heart Rate (HR) in Group G and Group B

Time Point	HR (beats/min) Mean ± SD (G)	HR (beats/min) Mean ± SD (B)	p value
Baseline (pre-op)	80.6 ± 6.2	79.9 ± 6.5	0.59
Induction	82.8 ± 5.9	80.4 ± 6.0	0.08
Intubation / Incision	96.8 ± 7.1	82.5 ± 6.4	<0.001
15 min	88.4 ± 6.5	80.8 ± 5.8	<0.001
30 min	86.2 ± 6.3	80.5 ± 5.9	<0.001
End of Surgery	84.8 ± 6.2	80.1 ± 5.7	0.001

Statistical test: Independent Student's t-test.

Table 7.Intraoperative Oxygen Saturation (SpO_2) in Group G and Group B

Time Point	SpO_2 (%) Mean ± SD (G)	SpO_2 (%) Mean ± SD (B)	p value
Baseline (pre-op)	98.1 ± 0.8	98.2 ± 0.7	0.64
Induction	98.0 ± 0.7	98.2 ± 0.6	0.28
Intubation / Incision	97.9 ± 0.9	98.1 ± 0.8	0.19
15 min	98.0 ± 0.8	98.2 ± 0.7	0.31
30 min	98.1 ± 0.7	98.3 ± 0.6	0.27
End of Surgery	98.0 ± 0.8	98.2 ± 0.7	0.25

Statistical test: Independent Student's t-test.

Discussion

Our study demonstrated that patients receiving combined ultrasound-guided interscalene brachial plexus block (ISB) and superficial cervical plexus block (SCPB) experienced significantly lower postoperative opioid requirements across all time points. For example, at T0, 96.7% of Group B required no analgesic, compared to only 3.3% in Group G ($p < 0.01$), and by T24, the need remained lower in Group B (70% requiring none vs. 33.3% in Group G; $p = 0.03$).

Consistent with these findings, Dash et al. (2023) reported that combined ISB + SCPB provided better analgesia and more stable intraoperative hemodynamics compared to GA in clavicle surgeries.[15] Similarly, Ding's systematic review highlighted that combined cervical and brachial plexus blocks led to lower postoperative pain scores (e.g., 1.96 ± 0.17 vs. 3.22 ± 0.88 at two hours, $p = 0.000$) and prolonged pain-free periods compared to general anesthesia.[16] Our intraoperative data showed that MAP and HR remained significantly lower in Group B during key surgical events—e.g., MAP at intubation/incision was 92.1 ± 6.5 mmHg vs. 102.5 ± 7.0 mmHg in Group G ($p < 0.001$); HR was 82.5 ± 6.4 bpm vs. 96.8 ± 7.1 bpm ($p < 0.001$). These results suggest better autonomic stability with regional anesthesia.Dash et al. also reported that regional anesthesia provided stable hemodynamics and effective VRS scores.[17] This aligns with broader conclusions in Ding's review that regional anesthesia minimized intraoperative hemodynamic disturbances and opioid requirements.[16] Group B showed faster early recovery, with Modified Aldrete scores of 9 versus 8 at 2 hours post-op ($p < 0.01$), indicating readiness for earlier PACU discharge.Banerjee et al. similarly reported significantly reduced postoperative pain scores and PACU stay duration with ultrasound-guided blocks versus GA.[18] No regional anesthesia-related complications were observed in our study, affirming the safety of ultrasound-guided combined blocks. Ding's systematic review and Ryan's retrospective study also reported no adverse events or rescue opioid requirements with regional anesthesia.[16] A 2024 randomized trial by Mosaffa et al. found equivalent effectiveness between ISB alone and ISB + SCPB in terms of anesthesia success and analgesia, suggesting that adding SCPB may not always be necessary—but our outcomes suggest additional benefit in analgesia and hemodynamic stability.[19] Furthermore, Laksono (2022) demonstrated the efficacy of ultrasound-guided ISB in providing anesthesia and postoperative analgesia for clavicle surgery.[20] The

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superior analgesic efficacy observed in Group B likely stems from comprehensive blockade of both cervical and brachial plexus contributions to clavicular innervation. Shrestha and Sharma have advocated for regional approaches in clavicular surgery with promising clinical outcomes.[15] Combined blocks under ultrasound guidance increase block success while minimizing LA volume and adverse effects, as detailed by Ding.[16]

Conclusion

This prospective, randomized comparative study demonstrated that ultrasound-guided combined interscalene brachial plexus block (ISB) with superficial cervical plexus block (SCPB) is a safe and effective alternative to general anaesthesia (GA) for clavicular fracture fixation. Patients receiving the combined block experienced significantly superior postoperative analgesia, markedly reduced opioid requirements, greater intraoperative haemodynamic stability, and faster recovery, without any reported block-related complications. These findings support the use of ISB + SCPB as an optimal anaesthetic strategy for suitable patients undergoing elective clavicle surgery, offering enhanced patient comfort, reduced perioperative physiological stress, and improved postoperative outcomes compared to GA.

Limitations of the Study

The present study had certain limitations. Firstly, the sample size was relatively small (n = 60), which may limit the generalizability of the findings to broader patient populations. Secondly, the study was conducted at a single tertiary care centre, and the results may not fully represent variations in practice patterns, patient demographics, or surgical techniques at other institutions. Thirdly, the follow-up period was restricted to the first 24 hours postoperatively, thereby not capturing potential late-onset complications, long-term analgesic efficacy, or functional recovery.

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