Original Article

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Anaesthesia Section

Comparison of Analgesic Efficacy of Superficial Cervical Plexus Block versus Clavipectoral Fascia Block for Perioperative Pain Management in Clavicular Surgery: A Double-blinded Randomised Clinical Study

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ABSTRACT

Introduction: Analgesia during clavicle surgery is complicated due to intricate innervation and percutaneous anatomical placement. Regional anaesthesia methods, such as the Superficial Cervical Plexus Block (SCPB) and the Clavipectoral Fascia Block (CPFB), have proven beneficial, but direct comparative evidence of their analgesic potency is lacking.

Aim: To compare the analgesic efficacy of SCPB and CPFB for patients undergoing clavicular surgery.

Materials and Methods: A randomised double-blinded clinical study was conducted in the anaesthesiology department of Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pune, Maharashtra, India. The study took place from October 2024 to April 2025. A total of 40 American Society of Anesthesiologists (ASA) I-II patients, aged 18-65 years, who underwent clavicle surgery under General Anaesthesia (GA), were included. Under ultrasound supervision, each group of patients—Group A (SCPB) and Group B (CPFB)—received 15 millilitres of 0.25% bupivacaine. The outcome measures were postoperative Visual Analogue Scale (VAS) ratings, time to initial rescue analgesia, the number of analgesic doses in the first 24 hours, haemodynamic parameters and side-effects. Data were entered into an Excel sheet and analysed using Statistical Package for the Social Sciences (SPSS) version 21.0. Results were presented in tabular and graphical forms. An Independent t-test and Chi-square test were used to analyse continuous and categorical variables, respectively.

Results: The mean age of patients was comparable between Group A (35.3±6.2 years) and Group B (35.2±6.2 years). The gender distribution and ASA grading were also comparable between the groups, with p-values of 0.74 and 0.75, respectively. There were no notable adverse effects in either group. The time to first rescue analgesia was similar between both groups (Group A: 9.4±5.5 hours vs Group B: 10.3±6.6 hours, p-value =0.664). The total number of rescue analgesic doses required in 24 hours was also similar between the groups, with most patients requiring one or two doses: one dose (Group A: 20% vs Group B: 25%), two doses (Group A: 45% vs Group B: 35%) and three doses (Group A: 35% vs Group B: 40%).

Conclusion: This randomised clinical trial found that both SCPB and CPFB offer similar and effective pain control for clavicular surgery. Both blocks provide adequate perioperative analgesia, demonstrating similar pain control and safety profiles. The safety profile of both blocks was favourable, with only mild side-effects, such as nausea and no serious complications. Either block can be effectively used, with the choice guided by clinical judgment and patient needs.

Keywords: Anaesthesia, Analgesia, Postoperative pain, Ultrasound-guided block

INTRODUCTION

Pain management in orthopaedic surgery is a fundamental aspect of perioperative care, directly influencing recovery, rehabilitation and overall patient satisfaction. This is particularly challenging in clavicular surgeries due to the unique anatomical and neurovascular characteristics of the clavicle and its surrounding tissues. The clavicle's superficial location, thin soft-tissue coverage and complex innervation—primarily from the supraclavicular nerves, subclavian nerve branches and the brachial plexus—render conventional analgesic strategies often insufficient or overly invasive [1]. With the increasing prevalence of clavicular fractures, especially among young adults and athletes, optimising perioperative pain control has become paramount for enhancing recovery and patient satisfaction [2].

Regional anaesthesia methods, including the SCPB and Clavipectoral Fascia Block (CPFB), provide pain relief and potentially decrease opioid consumption and related complications [3]. The SCPB targets the superficial branches of the cervical plexus, primarily the supraclavicular nerves, which provide cutaneous innervation over the clavicle. It is relatively simple to perform under ultrasound guidance and has a low risk of complications. However, its limitation lies in the fact that it may not effectively block the deeper afferent fibers associated with the periosteum and muscular attachments of the clavicle. This limitation can lead to suboptimal analgesia during and after surgical manipulation, particularly in procedures involving open reduction and internal fixation.

In contrast, the CPFB is an anatomically targeted technique that involves the deposition of local anaesthetic within the fascial plane between the clavipectoral fascia and the clavicle. This approach allows for the diffusion of the anaesthetic to deeper nerves, including the lateral pectoral and subclavian nerves, thereby potentially offering more comprehensive analgesia. CPFB is also ultrasound-guided and can be performed with minimal risk when proper technique is used [4]. Though both blocks are effective and safe, formal comparisons during clavicular surgery are rare. Most existing literature focuses on individual efficacy or describes case series without head-to-head comparisons.

Understanding the relative advantages and limitations of each technique is crucial for developing evidence-based protocols for perioperative pain management. Successful regional anaesthesia can have far-reaching impacts, affecting not only pain relief but also patient satisfaction, length of stay, rehabilitation and reduced opioid utilisation [4-7].

This study aimed to comprehensively compare the analgesic efficacy of SCPB versus CPFB in patients undergoing clavicular surgery. The study assessed postoperative pain scores using a standardised VAS and evaluated important secondary outcomes, including intraoperative haemodynamic stability, opioid requirements within the first 24 hours, time to first rescue analgesia and block-related complications. By analysing both efficacy and safety parameters, the study aimed to provide a more nuanced understanding of the clinical utility of each block. The findings are intended to guide anaesthesiologists and surgical teams in selecting the most appropriate regional anaesthesia technique for clavicular procedures, ultimately improving recovery, reducing opioid use and enhancing overall patient satisfaction.

MATERIALS AND METHODS

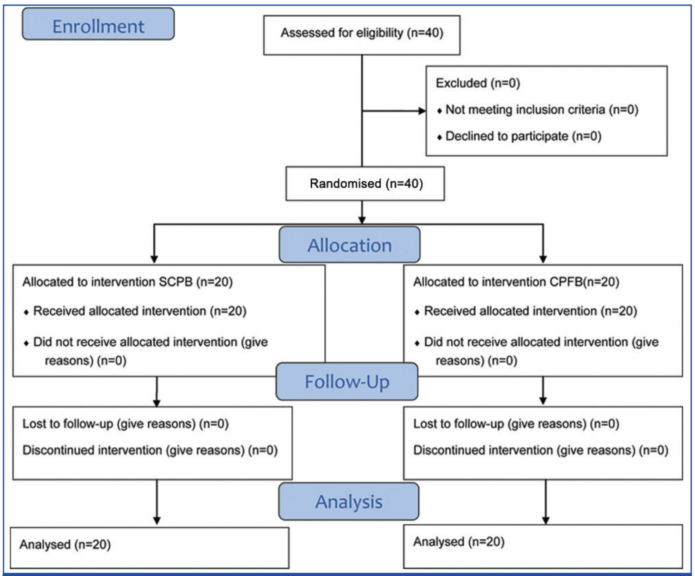
This double-blinded randomised clinical study was conducted in the anaesthesiology department of Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pune Maharashtra, India, from October 2024 to April 2025. The Institutional Ethics Committee (IESC/PGS/2023/156) and the Clinical Trials Registry of India (CTRI/2024/10/075118) approved the trial prior to its commencement. The study enrolled 40 patients scheduled for clavicular surgery under GA. Written informed consent was obtained from all participants after providing detailed information about the study procedures and potential risks.

Inclusion criteria: Patients classified as ASA physical status I or II, indicating individuals who were either healthy or had mild systemic disease. Adults aged between 18 and 65 years who were scheduled to undergo clavicle surgeries. All patients were required to be haemodynamically stable, with normal findings in routine preoperative investigations and no associated co-morbidities. Additionally, written informed consent was obtained from all participants prior to enrollment in the study.

Exclusion criteria: Patients unwilling to participate or if they had an ASA physical status of III or higher, indicating more severe systemic disease. Individuals below 18 years or above 65 years of age were also excluded. Additional exclusion criteria included the presence of uncontrolled systemic disorders such as neurological, cardiac, metabolic, renal, or pulmonary diseases, hepatic dysfunction with coagulation abnormalities, or any known bleeding or coagulation disorders. Patients with local infections at the intended site of needle insertion for the block, or those with known allergies to any of the drugs used in the study, were also excluded from the study.

Sample size: The duration of analgesia varied across the two block approaches. According to a previous study by Xu G et al., the duration of analgesia in the superficial cervical plexus with clavipectoral block was 20±5.8 hours, while in the other group (superficial cervical plexus with interscalene brachial plexus block), it was 13±4.3 hours. Considering this difference in mean duration of analgesia, Open Epi version 3 software was used to calculate the necessary sample size, which had an 80% power and a 95% confidence range [7]. A minimum sample size of 18 was established and 40 patients were enlisted to increase the validity of the results.

Randomisation and allocation concealment were carried out using a computer-generated random number [Table/Fig-1]. To ensure blinding and prevent selection bias, assignments were placed in sequentially numbered, opaque, sealed envelopes, which were opened only at the time of intervention. Patients were randomly divided into two groups. Both the data collector and the patients assigned were blinded. Group A and Group B were administered 15 millilitres of 0.25% bupivacaine for ultrasound-guided SCPB and CPFB, respectively.



[Table/Fig-1]: CONSORT flow diagram.

Study Procedure

Before surgery, a preanaesthesia check-up that included a comprehensive history, physical examination and laboratory testing was performed on each patient. Prior to surgery, patients were required to fast for the entire night.

In the operating room, baseline vital signs were recorded and standard ASA monitors for electrocardiography, Oxygen Saturation (SpO_2), End-Tidal Carbon Dioxide ($EtCO_2$), and non invasive blood pressure were attached. Fluid therapy was initiated after securing an intravenous catheter. Propofol (2 mg/kg), fentanyl (2 μg/kg), vecuronium (0.1 mg/kg) and midazolam (0.02 mg/kg) were used to induce GA. A suitably sized cuffed endotracheal tube was used to intubate the patients. Isoflurane (0.7-1.2 MAC) in a 50:50 nitrous oxide and oxygen combination was administered to maintain anaesthesia, with vecuronium dosages supplemented as needed.

Following GA induction, the prescribed block was administered under ultrasonographic guidance. In group A, the block was performed with the patient in a supine position, with the head turned to the contralateral side. Using a linear high-frequency ultrasound probe (6-13 MHz, Aloka Arietta S70), the superficial cervical plexus was identified at the lateral border of the sternocleidomastoid muscle at the level of the cricoid cartilage. A 22 G 1.5-inch hypodermic needle was introduced using a posterior in-plane technique and 15 mL of 0.25% bupivacaine was administered after negative aspiration. Patients in group B were positioned similarly, with the shoulder supported by a small pillow. Using a 6-13 MHz linear array probe, the space between the clavicular periosteum and clavipectoral fascia was identified. A 22 G 1.5-inch hypodermic needle was inserted using an in-plane technique and 15 mL of 0.25% bupivacaine was administered equally to the medial and lateral aspects of the clavicular fracture site. Following surgery, patients were extubated after the neuromuscular blockade was reversed with neostigmine (0.05 mg/kg) and glycopyrrolate (0.008 mg/kg).

After being moved to the recovery area, patients were monitored for adverse effects and haemodynamic stability. Using the Visual VAS, pain was measured at different time points (30 minutes, 60 minutes, 120 minutes, 180 minutes, 240 minutes, 8 hours, 12 hours, 16 hours, 20 hours and 24 hours postoperation). The time was measured until the first rescue analgesia was required (VAS >5). As needed, 50 mg of intravenous tramadol was given as rescue analgesia.

STATISTICAL ANALYSIS

The data were analysed using SPSS software, version 21. Quantitative variables were summarised using mean, standard deviation (SD), median and range, while qualitative variables were represented using frequency and percentages. An Independent t-test was used to compare continuous variables and the chi-square test was used for categorical variables. A p-value <0.05 was considered statistically significant.

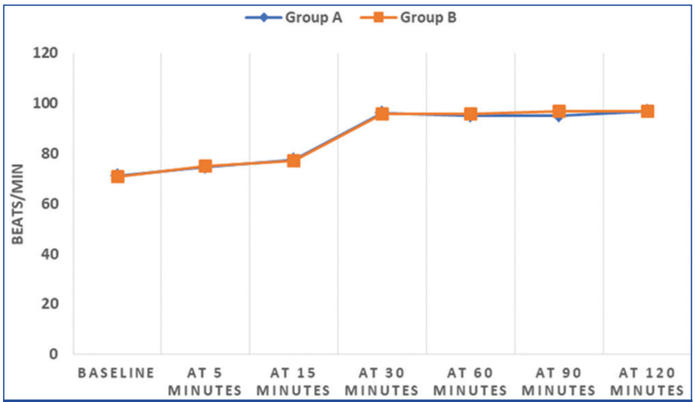
RESULTS

[Table/Fig-2] shows that the baseline characteristics and demographics of both the groups. Age (35.3±6.2 vs. 35.2±6.2 years, p-value =0.92) and weight (65.7±9.4 vs. 63.3±7.6 kg, p-value=0.38) did not differ significantly between Group A and Group B. Both the gender distribution and the ASA physical status were similar across the groups (p-value=0.75 and p-value=0.74, respectively).

Parameter	Group A (mean±SD) / n (%)	Group B (mean±SD) / n (%)	p-value*
Age (years)	35.3±6.2	35.2±6.2	t=0.23, p=0.92
Weight (kg)	65.7±9.4	63.3±7.6	t=0.891, p=0.38
Gender			
Female	9 (45)	8 (40)	χ^2=0.107, p=0.74
Male	11 (55)	12 (60)	
ASA Grade			
I	10 (50%)	11 (55%)	χ^2=0.100, p=0.75
II	10 (50%)	9 (45%)	

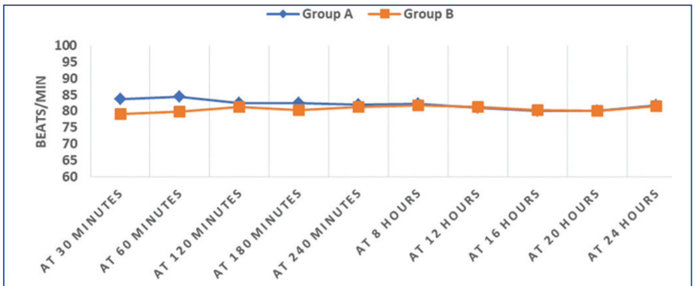
[Table/Fig-2]: Comparison of demographic characteristics.
*Independent t-test for continuous variables; Chi-square test for categorical variables

[Table/Fig-3] reveals that the intraoperative heart rate was comparable between both groups at most time points, with a significant difference noted only at 90 minutes (Group A: 95.1±2.3 beats/min, Group B: 96.8±1.5 beats/min, p-value=0.008), suggesting similar haemodynamic responses during surgery.



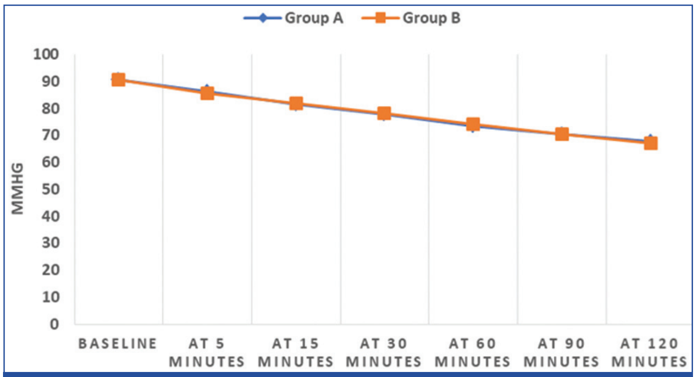
[Table/Fig-3]: Comparison of intraoperative heart rate.

[Table/Fig-4] demonstrates that postoperative heart rate was comparable between both groups at all time points from 30 minutes to 24 hours post-surgery, with no statistically significant differences (all p-values >0.05), indicating comparable cardiovascular stability during recovery.



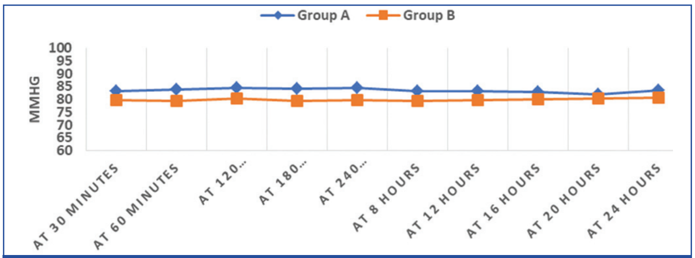
[Table/Fig-4]: Comparison of postoperative heart rate.

[Table/Fig-5] shows that intraoperative Mean Arterial Pressure (MAP) measurements were similar between both groups at all time points, with no statistically significant differences (all p-values >0.05), supporting the notion that both block techniques provided comparable haemodynamic stability.



[Table/Fig-5]: Comparison of intraoperative MAP.

[Table/Fig-6] illustrates that postoperative MAP measurements were comparable between both groups at all time points from 30 minutes to 24 hours post-surgery, with no statistically significant differences (all p-values >0.05), indicating similar cardiovascular stability during recovery.



[Table/Fig-6]: Comparison of postoperative MAP.

Comparisons of $ETCO_2$ and SpO_2 demonstrated no statistically significant variations.

[Table/Fig-7] indicates that although group A's average intraoperative fentanyl demand was marginally higher (123±11.7 μg) than Group B's (117±7.3 μg), the difference was not statistically significant (p-value=0.06). Similarly, group B had a higher average vecuronium demand (8.05±0.94 mg) than Group A (7.45±1.09 mg), but the difference was not statistically significant (p-value=0.07). These findings suggest that the two groups used intraoperative opioids and neuromuscular blockers similarly.

	Group A	Group B	t value	p-value*
Fentanyl (μg)	123±11.7	117±7.3	1.924	0.06
Vecuronium (mg)	7.45±1.09	8.05±0.94	-1.85	0.07

[Table/Fig-7]: Comparison of total dose of fentanyl and vecuronium.
*Independent t-test

[Table/Fig-8] shows that VAS scores were similar between both groups at all time points from baseline to 24 hours, with no statistically significant differences, suggesting comparable analgesic efficacy for both block techniques.

[Table/Fig-9] demonstrates that the time to first rescue analgesia was similar between both groups (Group A: 9.4±5.5 hours vs. Group B: 10.3±6.6 hours, p-value =0.664), indicating a comparable duration of adequate analgesia with both block techniques.

[Table/Fig-10] shows that there was no statistically significant difference between the two groups in the total rescue doses of analgesia required in the first 24 postoperative hours (p-value=0.849). Nine patients in group A received two doses, seven patients received three doses and four patients received one rescue dose. In Group B, five patients received one dose, seven received two doses

Time	Group A (mean±SD)	Group B (mean±SD)	t-value	p-value*
At 30 minutes	3.1±0.68	3.2±0.49	-0.98	0.35
At 60 minutes	2.1±0.59	2.5±0.66	-1.935	0.06
At 180 minutes	2.2±0.7	2.34±0.56	-0.502	0.62
At 2 hours	2.13±0.85	2.35±0.67	-0.921	0.36
At 4 hours	2.06±1.1	2.4±1.07	-1.025	0.31
At 6 hours	2.11±1.1	2.06±0.94	0.150	0.88
At 12 hours	1.9±1.2	2±0.91	-0.296	0.77
At 18 hours	1.5±1	2.04±1.3	-1.287	0.206
At 24 hours	0.75±0.44	0.9±0.5	-0.945	0.35

[Table/Fig-8]: Comparison of VAS.
*Independent t-test

	Group A	Group B	t value	p-value*
Time to first rescue analgesia (hours)	9.4±5.5	10.3±6.6	t=-0.439	0.664

[Table/Fig-9]: Comparison of time to first rescue analgesia.
*Independent t-test

Total rescue doses in 24 hours	Group A	Group B	p-value*
1	4 (20%)	5 (25%)	χ^2=0.326 df=2 p=0.849
2	9 (45%)	7 (35%)	
3	7 (35%)	8 (40%)	

[Table/Fig-10]: Comparison of total rescue doses in 24 hours.
*Chi-square test

and eight received three doses. According to these results, the two groups' postoperative desire for analgesia during the first 24 hours followed the same trend.

[Table/Fig-11] indicates that the incidence of side-effects was comparable between both groups, with low incidences of nausea and vomiting (Group A: 15% vs. Group B: 5% for nausea; Group A: 5% vs. Group B: 10% for vomiting), with no statistically significant difference (p-value=0.506).

Side-effects	Group A	Group B	p-value*
Nausea	3 (15%)	1 (5%)	0.506
Vomiting	1 (5%)	2 (10%)	
Total	20 (100%)	20 (100%)	

[Table/Fig-11]: Comparison of side-effects.

DISCUSSION

In present study, both groups were similar in age, gender and weight. The mean age was 35.3±6.2 years in Group A and 35.2±6.2 years in Group B (p-value=0.92). the demographic profile was consistent with that of Kukreja P et al., who studied 60 patients undergoing clavicular surgery with a mean age of 34.6 years and a male predominance (68.3%) and Ryan DJ et al., who reported a mean age of 36 years in their study of regional blocks for clavicular surgery, with 63% male patients. This supports the external validity of present study results. The ASA physical status classification in present study was also evenly distributed, with a p-value of 0.75. This was consistent with most studies on clavicular fractures, which typically involve otherwise healthy individuals without significant comorbidities, as observed by Tran DQH et al., [4,8,9].

Both SCPB and CPFB offered similar haemodynamic stability during the procedure. HR and MAP were stable in both groups with no clinically significant changes. A slight statistical difference in HR was observed at one time point, but it did not result in any adverse outcomes. These findings were consistent with those of Lee CCM et al., who compared supraclavicular brachial plexus block with CPFB for clavicular surgery and found no significant differences in intraoperative haemodynamic parameters [10]. Patel H et al., also observed stable haemodynamics with SCPB for head and neck surgeries [11]. Additionally, Ding X, al., reported slightly higher intraoperative heart rates and blood pressures in patients receiving GA alone compared to those receiving additional regional blocks for clavicular surgery, emphasising the beneficial effect of regional techniques in attenuating the stress response to surgical stimuli [12]. Present study findings of stable haemodynamics with both SCPB and CPFB support this observation and underscore the advantage of regional blocks as adjuncts to GA for clavicular surgeries.

Respiratory function was maintained with both SCPB and CPFB, as evidenced by stable intraoperative and postoperative SpO_2 and $EtCO_2$. This result corresponds to Yang TH et al., who noted no respiratory complications with SCPB [13]. In contrast to interscalene blocks, which, according to Urmey W and McDonald M, are responsible for phrenic nerve palsy, SCPB and CPFB did not influence diaphragmatic function and are, therefore, preferred for patients with respiratory issues [14].

Fentanyl and vecuronium needs were marginally lower in the CPFB group but not statistically significant. Sayed AG et al., made similar observations, noting that the SCPB group required rescue analgesia earlier and had greater postoperative opioid consumption [15]. The slightly lower fentanyl requirement in the CPFB group in present study, though not statistically significant, may be clinically relevant, as it could contribute to faster recovery, reduced postoperative nausea and vomiting and improved patient satisfaction.

Pain scores and time to first rescue analgesia were similar between groups, suggesting equivalent analgesic efficacy. Xu G et al., noted decreased pain scores with SCPB, while others, such as Sayed AG et al., observed decreased opioid consumption with CPFB. Overall, the evidence indicates that both methods are effective [7,15]. Arjun BK et al., stated that cervical plexus blocks in isolation may be insufficient and should be used in conjunction with other methods [16]. In present study, both SCPB and CPFB were adequate for achieving postoperative analgesia. The majority of patients required one to three rescue analgesic doses in the initial 24 hours, confirming their utility in multimodal pain management strategies.

Side-effects were minor and equivalent between groups. Nausea and vomiting were rare and no serious complications, including local anesthetic toxicity, pneumothorax, or nerve damage, were encountered. This observation was consistent with findings by Herring AA et al. and contrasts with the increased complication rates associated with interscalene blocks, as described by Neal J et al., [17,18].

SCPB targets the superficial cervical plexus, which innervates the skin over the clavicle but may fail to block deeper structures. CPFB is injected into the clavipectoral fascia, with the potential to block both superficial nerves and parts of the brachial plexus. Despite anatomical differences, both methods achieved adequate analgesia, potentially due to overlapping innervation. Tran DQH et al., illustrated this through cadaveric dissections, corroborating the clinical equivalence observed in present study [19].

Clavicle fractures account for about 2.6-4% of all adult fractures and nearly 35% of shoulder girdle injuries. With greater emphasis placed on surgical reduction of displaced and comminuted fractures for superior functional results, proper perioperative pain management is now of particular importance [20]. Regional anaesthetic techniques are increasingly used in conjunction with GA, providing advantages such as decreased need for opioids, better postoperative analgesia, early mobilisation and shorter hospital stays. Although the interscalene brachial plexus block has historically been the favoured method for shoulder and clavicular surgery, its complications—such as phrenic nerve palsy and Horner's syndrome—have sparked growing interest in safer alternatives [14].

Limitation(s)

Present study had several limitations that should be acknowledged. First, authors did not assess block success rates separately from analgesic outcomes, assuming that all blocks were technically successful. Future studies should include a formal assessment of sensory and motor blockade to confirm successful block placement before surgery. Second, the follow-up period was limited to 24 hours postoperatively. Longer follow-up would provide insights into the potential impact of these regional techniques on chronic pain development after clavicular surgery. Third, authors did not specifically assess patient satisfaction or functional outcomes, which are increasingly recognised as important endpoints in regional anaesthesia research. Future studies should incorporate these patient-centered outcomes to provide a more comprehensive evaluation of these techniques.

Finally, present study was conducted at a single institution with experienced anesthesiologists performing the blocks, which may limit the generalisability of present study findings to settings with different expertise levels or patient populations.

CONCLUSION(S)

Present study showed both methods to have equivalent analgesic effectiveness. Pain intensity, time to initial rescue analgesia and overall analgesic usage were similar between groups. Haemodynamic and respiratory monitoring parameters remained unchanged throughout, with few side-effects and no serious complications reported. Both SCPB and CPFB are safe and effective and the choice can be based on clinical preference or patient-specific considerations. SCPB and CPFB are both recognised as viable alternatives, with fewer complications targeting innervation unique to the clavicle. The decision to utilise one of these techniques should be made based on clinical preference or patient-specific considerations.

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- Manual Googling: Jul 01, 2025
- iThenticate Software: Jul 03, 2025 (15%)

ETYMOLOGY: Author Origin

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