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Superior Trunk Block versus Interscalene Block for Postoperative Analgesia and Diaphragmatic Function in Patients Undergoing Shoulder Arthroscopy under General Anaesthesia: A Prospective Observational Study

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Abstract

Background: Shoulder arthroscopy, although minimally invasive, is associated with intense early postoperative pain. The interscalene brachial plexus block (ISB) is the traditional gold standard for analgesia but carries a high incidence of ipsilateral hemidiaphragmatic paresis owing to phrenic nerve involvement. The superior trunk block (STB) targets the brachial plexus at a more distal, lateral level and may spare the phrenic nerve, yet direct real-world comparative data on functional analgesic duration and rescue-analgesic burden remain limited.

Aim: To compare the analgesic efficacy, rescue-analgesic requirement, diaphragmatic function and safety profile of STB and ISB in patients undergoing shoulder arthroscopy under general anaesthesia.

Methods: A prospective observational cohort study was conducted over 18 months at the Bone and Joint Hospital, an associated hospital of Government Medical College, Srinagar. Sixty adults (ASA I–II, 21–50 years) undergoing elective shoulder arthroscopy were allocated to ultrasound-guided STB (n = 30) or ISB (n = 30) according to the attending anaesthesiologist's clinical judgement. The primary outcome was the duration of analgesia (time to first pain requiring rescue, visual analogue scale [VAS] > 5). Secondary outcomes were 24-hour rescue-analgesic consumption, diaphragmatic excursion on ultrasonography, VAS/NRS pain scores, block characteristics, complications and patient satisfaction. Data were analysed using the chi-square test, independent t-test and Mann–Whitney U test, with $p < 0.05$ considered significant.

Results: The groups were comparable in age, sex, height, ASA status and surgical diagnosis, although the STB group had a higher mean weight and body mass index ($p = 0.032$ and $p = 0.021$, respectively). Early pain scores (up to 6 hours) were comparable, but from 9 hours onward the STB group reported significantly lower VAS scores (9 hours, $p = 0.015$; 12, 24 and 48 hours, $p < 0.0001$). The mean time to first pain was significantly longer with STB (12.88 ± 1.30 vs 10.38 ± 1.19 hours; $p < 0.001$), and escalation to triple-drug rescue analgesia was far less frequent (3.3% vs 33.3%; $p = 0.003$). Although ISB produced a longer sensory (12.07 ± 1.79 vs 10.14 ± 1.55 hours) and motor (15.24 ± 2.29 vs 12.98 ± 1.88 hours) block ($p < 0.001$), this did not translate into superior late analgesia. Diaphragmatic excursion was significantly better preserved with STB at 30 minutes and 6 hours ($p < 0.001$), and complete hemidiaphragmatic paresis occurred in 63.3% of ISB versus 13.3% of STB patients ($p < 0.001$). Patient satisfaction was significantly higher in the STB group ($p < 0.001$); haemodynamic parameters were comparable.

Conclusion: In this cohort, STB provided early analgesia equivalent to ISB and superior late analgesia with a lower rescue-analgesic burden, while markedly preserving diaphragmatic function and improving patient satisfaction. Despite producing a longer measured block, ISB conferred no late analgesic advantage. STB represents a clinically valuable phrenic-sparing alternative for shoulder arthroscopy under general anaesthesia..

Keywords: superior trunk block; interscalene block; shoulder arthroscopy; hemidiaphragmatic paresis; postoperative analgesia; regional anaesthesia.

1. Introduction

Shoulder arthroscopy is one of the most frequently performed minimally invasive orthopaedic procedures, undertaken for a range of pathologies including rotator cuff tears, labral injuries, glenohumeral instability and subacromial impingement. Despite its minimally invasive nature, it is associated with severe postoperative pain, particularly during the first 24 hours, arising from extensive capsular manipulation, periarticular soft-tissue handling, bursal distension and intra-operative traction. Inadequately controlled pain delays mobilisation, increases analgesic consumption, prolongs hospital stay and reduces patient satisfaction, so that effective perioperative analgesia, delivered wherever possible through opioid-sparing regional techniques, is a central component of anaesthetic management for these patients [1].

Among regional techniques, the interscalene brachial plexus block has long been regarded as the gold standard for shoulder surgery because it reliably anaesthetises the upper roots and trunks of the brachial plexus that supply the joint [2]. Its efficacy, however, is accompanied by clinically important adverse effects. The most notable is ipsilateral phrenic nerve blockade producing hemidiaphragmatic paresis, which in conventional descriptions approaches near-universal incidence; other recognised effects include Horner's syndrome, hoarseness from recurrent laryngeal nerve involvement, upper-limb motor weakness and rebound pain as the block regresses. While diaphragmatic dysfunction may be well tolerated by healthy individuals, it can precipitate respiratory compromise in the elderly and in those with limited pulmonary reserve, constraining the use of the interscalene block in these populations [3,4].

The bulk of nociceptive input from the shoulder is carried by the C5 and C6 roots, whose sensory contributions to the suprascapular, axillary and lateral pectoral nerves are already grouped within the superior trunk of the brachial plexus; the suprascapular nerve alone conveys an estimated 60–70% of glenohumeral sensory supply [5]. This anatomical convergence makes the superior trunk a logical, focused target for analgesia. Performed at a more distal and lateral level than the interscalene approach, where the C5 and C6 roots have already united, the superior trunk block lies farther from the phrenic nerve and from neuraxial structures, limiting cephalad spread of local anaesthetic and thereby conferring a diaphragm-sparing advantage [6].

Randomised controlled trials have shown that the superior trunk block provides postoperative analgesia non-inferior to the interscalene block while dramatically reducing hemidiaphragmatic paresis (from over 70% to under 5% in some series) and preserving pulmonary function [7,8]. A systematic review and meta-analysis has similarly reported an approximately 93% relative reduction in the risk of total hemidiaphragmatic paralysis with the superior trunk block, together with comparable analgesic duration [9]. Despite this accumulating evidence, direct comparisons remain concentrated in tightly controlled trial settings, and real-world observational data addressing the functional duration of analgesia, the pattern of rescue-analgesic escalation and diaphragmatic outcomes in routine practice are comparatively scarce.

The present prospective observational study was therefore undertaken to compare the superior trunk block and the interscalene block for postoperative analgesic efficacy, 24-hour rescue-analgesic requirement, diaphragmatic function and block-related complications in patients undergoing shoulder arthroscopy under general anaesthesia in a tertiary-care orthopaedic setting.

METHODOLOGY

Study design and setting

This was a prospective observational cohort study conducted over an 18-month period at the Bone and Joint Hospital, an associated tertiary-care hospital of Government Medical College, Srinagar, selected for its high volume of elective shoulder arthroscopy and for the routine availability of high-resolution ultrasonography for both block guidance and diaphragmatic assessment. The observational design was chosen to compare the two techniques as administered in routine clinical practice; no randomisation was performed, and the choice of block was made by the attending anaesthesiologist on the basis of clinical judgement and standard institutional practice. Data were collected prospectively for every enrolled participant from the pre-operative period through postoperative follow-up.

Study population and eligibility

The study population comprised adult patients scheduled for elective shoulder arthroscopy under general anaesthesia. Patients were included if they were classified as American Society of Anesthesiologists (ASA) physical status I or II, were aged between 21 and 50 years, and had a normal coagulation profile. Patients were excluded if they had an ASA physical status of III or IV, declined written informed consent, had a history of severe respiratory disease or acute

respiratory distress, had a known allergy to local anaesthetics or study analgesics (paracetamol, tramadol or diclofenac), had any evidence of coagulopathy, or had local infection at the proposed block site.

Sampling and sample size

A consecutive (convenience) sampling method was used, whereby all eligible patients presenting during the study period who met the criteria and provided consent were enrolled. A formal sample-size calculation was not performed; the study was conceived as a preliminary observational comparison intended to inform the design of future adequately powered randomised trials. Sixty patients were enrolled and formed two groups of thirty.

Study groups and block technique

Patients were allocated to Group STB, who received an ultrasound-guided superior trunk block, or Group ISB, who received an ultrasound-guided interscalene block. After written informed consent, standard monitoring (non-invasive blood pressure, electrocardiography and pulse oximetry) was established and baseline haemodynamic parameters and diaphragmatic excursion were recorded. With the patient supine and the head turned away from the side to be blocked, the lateral neck was prepared under strict aseptic precautions and a high-frequency linear ultrasound transducer was used to identify the target, namely the superior trunk for STB or the roots and proximal trunks within the interscalene groove for ISB. A predetermined volume and concentration of local anaesthetic was deposited around the target under real-time visualisation with intermittent aspiration to exclude intravascular placement. Block onset was then assessed before induction of general anaesthesia, which was conducted and maintained according to a standardised institutional protocol.

Outcome measures

The primary outcome was the duration of analgesia, defined as the interval from block administration to the first complaint of pain with a VAS score greater than 5 requiring rescue analgesia. Secondary outcomes were the total rescue-analgesic consumption within the first 24 hours; diaphragmatic functionality, assessed by ultrasonographic diaphragmatic excursion pre-block, at 30 minutes post-block and at 6 hours postoperatively (normal deep-breathing excursion 3–7 cm; complete paresis defined as a reduction exceeding 75% or paradoxical inspiratory motion, and partial paresis as a 25–75% reduction with preserved inspiratory movement); postoperative pain at rest and on movement using the VAS and Numerical Rating Scale at 30 minutes and 1, 3, 6, 9, 12, 24 and 48 hours; block characteristics comprising sensory and motor onset and duration and sensory/motor block intensity graded 0–2; haemodynamic parameters (systolic, diastolic and mean arterial pressures and heart rate); and block-related complications, including phrenic nerve palsy, Horner's syndrome, intravascular injection, pneumothorax, intrathecal spread and local anaesthetic systemic toxicity. Rescue analgesia followed a stepwise protocol: intravenous paracetamol 1 g for VAS > 5, followed by intravenous tramadol 50 mg and then intravenous diclofenac 75 mg if pain persisted.

Statistical analysis

Data were entered in Microsoft Excel and analysed using statistical software. Categorical variables were expressed as frequencies and percentages and compared using the chi-square test or Fisher's exact test. Continuous variables were presented as mean ± standard deviation or as median with interquartile range according to distribution, with normality assessed by the Shapiro–Wilk test; between-group comparisons used the independent-samples t-test for parametric data and the Mann–Whitney U test for non-parametric data. Repeated-measures analysis of variance was used to examine changes in pain scores and haemodynamic parameters over time. A p-value below 0.05 was considered statistically significant.

Ethical considerations

The study was initiated only after approval from the Institutional Ethical Committee of Government Medical College and associated hospitals, Srinagar, and was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from every participant after explanation of the study in a language they understood, participation was voluntary, and patient data were anonymised. The study posed minimal additional risk, as the blocks and monitoring were part of established clinical practice, and the stepwise rescue-analgesia protocol ensured that no participant remained in significant pain.

RESULTS

Sixty adult patients undergoing shoulder arthroscopy were enrolled, thirty in each group.

Baseline demographic and clinical characteristics

The two groups were comparable in mean age (38.77 ± 8.70 years in the ISB group versus 36.30 ± 9.03 years in the STB group; p = 0.285), height (p = 0.716), gender distribution (males 53.3% versus 60.0%; p = 0.794) and ASA physical status (ASA I 70.0% versus 60.0%; p = 0.429). The distribution of surgical diagnoses, including rotator cuff

tear, SLAP lesion, subacromial impingement, Bankart lesion, impingement syndrome and labral injury, did not differ significantly between groups (p = 0.27). A statistically significant difference was, however, observed in body habitus: patients in the STB group had a higher mean weight (77.50 ± 14.33 versus 70.13 ± 11.43 kg; p = 0.032) and body mass index (27.16 ± 5.28 versus 24.34 ± 3.78 kg/m²; p = 0.021). Table 1 summarises these characteristics.

Table 1: Baseline demographic and clinical characteristics of the two groups (n = 60)

Variable	ISB (n = 30)	STB (n = 30)	Test	p-value
Age (years), mean ± SD	38.77 ± 8.70	36.30 ± 9.03	t = 1.08	0.285
Height (cm), mean ± SD	169.80 ± 6.68	169.10 ± 8.09	t = 0.37	0.716
Weight (kg), mean ± SD	70.13 ± 11.43	77.50 ± 14.33	t = 2.20	0.032*
BMI (kg/m²), mean ± SD	24.34 ± 3.78	27.16 ± 5.28	t = 2.38	0.021*
Male, n (%)	16 (53.3)	18 (60.0)	$\chi^2 = 0.07$	0.794
Female, n (%)	14 (46.7)	12 (40.0)		
ASA I, n (%)	21 (70.0)	18 (60.0)	$\chi^2 = 0.63$	0.429
ASA II, n (%)	9 (30.0)	12 (40.0)		

*ASA, American Society of Anesthesiologists; BMI, body mass index; ISB, interscalene block; SD, standard deviation; STB, superior trunk block. * denotes p < 0.05.*

Block characteristics

Sensory and motor block onset times were comparable between groups (sensory onset 18.47 ± 7.08 versus 16.30 ± 8.33 minutes, p = 0.282; motor onset 17.40 ± 7.17 versus 16.03 ± 8.23 minutes, p = 0.495), as was block intensity, with complete sensory block (Grade 0) achieved in 86.7% and 90.0% of ISB and STB patients respectively (p = 0.680) and no significant difference in motor block grade (p = 0.600). The duration of blockade, however, was significantly longer in the ISB group for both the sensory component (12.07 ± 1.79 versus 10.14 ± 1.55 hours; p < 0.001) and the motor component (15.24 ± 2.29 versus 12.98 ± 1.88 hours; p < 0.001). Table 2 details these findings.

Table 2: Block onset, duration and intensity characteristics

Parameter	ISB (n = 30)	STB (n = 30)	p-value
Sensory block onset (min), mean ± SD	18.47 ± 7.08	16.30 ± 8.33	0.282
Motor block onset (min), mean ± SD	17.40 ± 7.17	16.03 ± 8.23	0.495
Duration of sensory block (h), mean ± SD	12.07 ± 1.79	10.14 ± 1.55	<0.001*
Duration of motor block (h), mean ± SD	15.24 ± 2.29	12.98 ± 1.88	<0.001*
Complete sensory block (Grade 0), n (%)	26 (86.7)	27 (90.0)	0.680
No motor block (Grade 2), n (%)	20 (66.7)	22 (73.3)	0.600

*ISB, interscalene block; SD, standard deviation; STB, superior trunk block. * denotes p < 0.05.*

Postoperative pain scores and time to first pain

Postoperative VAS scores were comparable between groups throughout the early period up to 6 hours, with no significant differences. From 9 hours onward the analgesic profiles diverged: the STB group reported significantly lower scores at 9 hours (2.15 ± 1.57 versus 1.10 ± 1.68; p = 0.015), and the difference widened at 12, 24 and 48 hours, with the STB group maintaining significantly lower VAS values at all three time points (p < 0.0001). Correspondingly, the mean time to first pain requiring rescue analgesia was significantly longer in the STB group (12.88 ± 1.30 versus 10.38 ± 1.19 hours; p < 0.001), indicating a longer functional analgesic duration despite the shorter measured sensory block. Table 3 presents the pain trajectory and time to first pain.

Table 3: Postoperative VAS pain scores over time and time to first pain

Time interval	ISB, mean ± SD	STB, mean ± SD	p-value
30 minutes	1.71 ± 0.87	1.42 ± 0.84	0.192
1 hour	1.07 ± 0.71	1.09 ± 0.70	0.913
3 hours	1.13 ± 0.57	1.20 ± 0.68	0.675
6 hours	1.03 ± 0.72	1.12 ± 0.56	0.592
9 hours	2.15 ± 1.57	1.10 ± 1.68	0.015*
12 hours	6.27 ± 0.78	4.43 ± 0.97	<0.0001*
24 hours	7.46 ± 0.96	5.54 ± 0.97	<0.0001*
48 hours	8.01 ± 1.03	6.76 ± 1.02	<0.0001*
Time to first pain (h)	**10.38 ± 1.19**	**12.88 ± 1.30**	**<0.001***

*ISB, interscalene block; SD, standard deviation; STB, superior trunk block; VAS, visual analogue scale. * denotes p < 0.05.*

Rescue-analgesic requirement

The pattern of rescue analgesia within the first 24 hours differed significantly between groups ($\chi^2 = 13.9$; $p = 0.003$). In the STB group a much greater proportion of patients were managed with paracetamol alone (46.7% versus 20.0%), whereas escalation to a triple-drug regimen of paracetamol, tramadol and diclofenac was required by only 3.3% of STB patients compared with 33.3% of ISB patients, reflecting both better pain control and a reduced multimodal analgesic burden. Table 4 summarises these data.

Table 4: Rescue-analgesic requirement within the first 24 hours

Analgesic regimen	ISB, n (%)	STB, n (%)	p-value
Paracetamol only	6 (20.0)	14 (46.7)	
Paracetamol + tramadol	14 (46.7)	15 (50.0)	0.003*
Paracetamol + tramadol + diclofenac	10 (33.3)	1 (3.3)	

*ISB, interscalene block; STB, superior trunk block. Chi-square $\chi^2 = 13.9$. * denotes p < 0.05.*

Diaphragmatic function and hemidiaphragmatic paresis

Baseline diaphragmatic excursion was comparable between groups ($p = 0.316$). At 30 minutes post-block, excursion was markedly reduced in the ISB group relative to the STB group (0.83 ± 0.59 versus 2.26 ± 0.98 cm; $p < 0.001$), a difference that persisted at 6 hours (1.46 ± 0.86 versus 3.17 ± 1.22 cm; $p < 0.001$). The percentage reduction in excursion at 30 minutes was also significantly greater following ISB (78.14 ± 16.41% versus 42.46 ± 26.79%; $p < 0.001$). Consistent with this, complete hemidiaphragmatic paresis at 30 minutes was observed in 63.3% of ISB patients versus 13.3% of STB patients, and no ISB patient retained fully preserved diaphragmatic function, whereas 26.7% of STB patients did ($\chi^2 = 22.9$; $p < 0.001$). Respiratory symptoms of diaphragmatic dysfunction, namely dyspnoea, orthopnoea, tachypnoea and oxygen desaturation, were consistently more frequent in the ISB group, and a greater proportion of STB patients remained asymptomatic (60.0% versus 26.7%). Table 5 presents the diaphragmatic outcomes.

Table 5: Diaphragmatic excursion and hemidiaphragmatic paresis

Parameter	ISB (n = 30)	STB (n = 30)	p-value
Excursion, baseline (cm)	3.97 ± 0.94	4.26 ± 1.25	0.316
Excursion, 30 min (cm)	0.83 ± 0.59	2.26 ± 0.98	<0.001*
Excursion, 6 h (cm)	1.46 ± 0.86	3.17 ± 1.22	<0.001*
Decrease at 30 min (%)	78.14 ± 16.41	42.46 ± 26.79	<0.001*
Paresis – absent, n (%)	0 (0.0)	8 (26.7)	

Parameter	ISB (n = 30)	STB (n = 30)	p-value
Paresis – partial, n (%)	11 (36.7)	18 (60.0)	<0.001*
Paresis – complete, n (%)	19 (63.3)	4 (13.3)	

*ISB, interscalene block; STB, superior trunk block. Excursion values compared by t-test; paresis distribution by chi-square ($\chi^2 = 22.9$). * denotes $p < 0.05$.*

Other complications, haemodynamics and patient satisfaction

Apart from the diaphragmatic paresis detailed in Table 5, block-related complications were infrequent and minor. Transient numbness of the fingers was the only additional complication, occurring in 1 ISB patient (3.3%) and 2 STB patients (6.7%), and no case of pneumothorax, intravascular injection, local anaesthetic systemic toxicity or Horner's syndrome was recorded in either group. The overall complication burden was thus substantially lower with STB, in which 26.7% of patients were free of any diaphragmatic paresis compared with none in the ISB group. Haemodynamic parameters were comparable throughout, with no significant differences in systolic ($p = 0.537$), diastolic ($p = 0.564$) or mean arterial pressure ($p = 0.473$) or heart rate ($p = 0.531$). Patient satisfaction, however, was significantly higher in the STB group ($\chi^2 = 31.6$; $p < 0.001$): whereas 33.3% of ISB patients reported dissatisfaction and none reported being very or extremely satisfied, no STB patient was dissatisfied and 43.3% and 13.3% reported being very and extremely satisfied respectively. Table 6 presents the satisfaction distribution.

Table 6: Patient satisfaction (5-point scale)

Satisfaction level	ISB, n (%)	STB, n (%)	p-value
Dissatisfied	10 (33.3)	0 (0.0)	
Satisfied	20 (66.7)	13 (43.3)	
Very satisfied	0 (0.0)	13 (43.3)	<0.001*
Extremely satisfied	0 (0.0)	4 (13.3)	

*ISB, interscalene block; STB, superior trunk block. Satisfaction compared by chi-square ($\chi^2 = 31.6$). No patient in either group reported being very dissatisfied. * denotes $p < 0.05$.*

DISCUSSION

This prospective observational comparison of the superior trunk block and the interscalene block in shoulder arthroscopy demonstrated three principal findings: both techniques provided comparable early analgesia, the superior trunk block conferred superior late analgesia with a longer time to first pain and a substantially lower rescue-analgesic burden despite a shorter measured block, and diaphragmatic function was markedly better preserved with the superior trunk block, translating into fewer complications and higher patient satisfaction.

The comparable pain scores during the first 6 hours confirm that both blocks adequately interrupt the major afferent nociceptive pathways from the shoulder in the early postoperative phase, when pain related to capsular distension and arthroscopic instrumentation is most intense. This early equivalence is consistent with the randomised trials of Kim and colleagues and Kang and colleagues, both of which reported non-inferior early analgesia with the superior trunk block despite its more distal and focused target [7,8]. The clinically important divergence emerged later: from 9 hours onward the interscalene group experienced a sharper rise in pain, and by 12 to 48 hours their scores were significantly higher, even though the interscalene block had produced longer measurable sensory and motor blockade. This apparent paradox is best explained by rebound pain, an increasingly recognised limitation of the single-shot interscalene block. Trompeter and colleagues documented that a subset of patients experience severe pain as the interscalene block regresses in the days after surgery [10], and DeMarco and colleagues demonstrated that the analgesic advantage of the block is largely confined to the early hours and may be followed by a rebound increase once its effect wanes [11]. The abrupt transition from dense blockade to unopposed nociception seen with the interscalene block in the present cohort mirrors this pattern, whereas the smoother regression associated with the superior trunk block appears to have yielded a more favourable functional analgesic duration from the patient's perspective.

The longer measured block produced by the interscalene approach is itself expected, given its more proximal targeting of the nerve roots, and accords with earlier comparative work such as that of Kumara and colleagues [12]. The present findings, however, reinforce that measured block duration and clinically meaningful analgesia are not equivalent: the superior trunk group reached first pain later and required markedly less analgesic escalation, with nearly half managed

on paracetamol alone and only one patient requiring triple-drug rescue, against a third of interscalene patients requiring the full escalation. Because tramadol and diclofenac carry their own adverse-effect profiles, this reduction in escalation aligns the superior trunk block with contemporary multimodal, opioid-sparing pathways; a continuous superior trunk catheter has moreover been shown to reduce rebound pain and opioid consumption relative to a single-shot block, indicating that the technique can be tailored further where more prolonged analgesia is required [18]. It should be noted that Lee and colleagues reported inferior anaesthetic quality with the superior trunk block in a rotator-cuff population, underlining that the technique is operator- and technique-dependent [13]; refinements such as low-volume injection, subparaneural deposition and consistent ultrasound guidance have since addressed several of these concerns [14,15].

The most clinically consequential advantage of the superior trunk block in this study was preservation of diaphragmatic function. The interscalene injection site lies close to the phrenic nerve, which descends on the anterior scalene muscle from the C3–C5 roots, so that local anaesthetic readily spreads medially to block it; accordingly, complete or partial hemidiaphragmatic paresis affected every interscalene patient, with none retaining fully preserved function. In contrast, the more distal and lateral superior trunk target, farther from the phrenic nerve, was associated with preserved excursion in a substantial minority and complete paresis in only a small fraction. These results closely parallel the landmark trial of Kim and colleagues, who reported hemidiaphragmatic paralysis in 4.8% of superior trunk versus 71.4% of interscalene patients [7], and the findings of Kang and colleagues, who documented both lower paresis rates and better-preserved pulmonary function with the superior trunk block [8]. The systematic review and meta-analysis of Amaral and colleagues quantified an approximately 93% relative reduction in the risk of hemidiaphragmatic paralysis with no loss of analgesic efficacy [9], and further trials by Zhang and colleagues and by Sinha and colleagues confirmed the diaphragm-sparing advantage in arthroscopic and humeral-fracture surgery respectively while maintaining comparable pain control [15,17]. Evidence that reducing local-anaesthetic volume or dose further lowers phrenic involvement without compromising analgesia [14,16], and reports of the superior trunk block enabling awake surgery in patients with severe respiratory disease [19], underscore the relevance of this property for high-risk populations.

The integration of equivalent early analgesia, superior late analgesia, reduced rescue requirement and preserved respiratory mechanics plausibly explains the significantly higher patient satisfaction observed in the superior trunk group, an association also reported by Kim and colleagues and attributed to preserved respiratory function and reduced discomfort [7]. Although the interscalene block remains an effective and widely used technique, its rebound pain, phrenic involvement and associated discomfort have prompted continued interest in alternatives [20], and comparative approaches such as the anterior suprascapular block have likewise been shown to preserve pulmonary function while delivering non-inferior analgesia [21]. The present real-world data add observational support to this literature and suggest that the superior trunk block is not merely a phrenic-sparing substitute but may offer a more clinically useful overall analgesic profile for shoulder arthroscopy.

Study limitations

Several limitations warrant consideration. The observational design without randomisation introduces the possibility of selection bias arising from anaesthesiologist preference, and this is reflected in the significantly higher weight and body mass index of the superior trunk group, which could in principle influence block spread and outcomes. The sample size was modest and no formal power calculation was performed, limiting generalisability and the ability to detect less common effects. Only ASA I–II patients aged 21–50 years were studied, so the findings cannot be extrapolated to patients with significant systemic or respiratory comorbidity, in whom the diaphragm-sparing advantage may be most valuable. Outcomes were assessed only over the short term, and continuous-catheter and low-volume block strategies, which may further optimise efficacy and safety, were not evaluated. Larger randomised controlled trials are needed to confirm these observations.

CONCLUSION

In patients undergoing shoulder arthroscopy under general anaesthesia, the superior trunk block provided early analgesia equivalent to the interscalene block and superior analgesia in the later postoperative period, with a longer time to first pain and a substantially reduced rescue-analgesic requirement, despite producing a shorter measured block. It also markedly preserved diaphragmatic function, with a far lower incidence of hemidiaphragmatic paresis and block-related complications, and was associated with significantly higher patient satisfaction. The superior trunk block thus offers an effective balance of analgesic efficacy and respiratory safety and represents a clinically valuable phrenic-sparing alternative to the interscalene block, particularly where preservation of respiratory function is a priority. Larger randomised controlled trials are warranted to validate these findings and to refine optimal block

technique..

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