

## Comparative Study of Analgesic Efficacy of Interscalene Brachial Plexus Block Versus Anterior Approach Suprascapular Nerve Block for Arthroscopic Shoulder Surgery

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Conflict of interest: Nil

### Abstract

**Background:** The interscalene block (ISB) is widely recognized for postoperative analgesia after shoulder surgery but carries risks of serious complications, while the anterior approach suprascapular nerve block (SSNB) offers a safer alternative with fewer adverse effects. This study aimed to compare the analgesic efficacy of ISB versus anterior approach SSNB in patients undergoing arthroscopic shoulder surgery.

**Methods:** A prospective randomized parallel group trial was conducted with 84 patients undergoing shoulder arthroscopy. Patients were equally randomized into two groups: Group A (ISB, n=42) and Group B (SSNB anterior approach, n=42). Primary outcome measures included pain scores assessed using the Visual Analog Scale (VAS) at multiple time points (immediate, 6, 12, and 24 hours postoperatively), patient satisfaction ratings, and incidence of adverse effects. Secondary outcomes included respiratory function monitoring through SpO<sub>2</sub> measurements and vital signs assessment.

**Results:** ISB demonstrated significantly lower VAS scores immediately postoperatively compared to SSNB (2.0 vs 2.5, p<0.001, moderate effect size r=0.36). However, no significant differences were observed at 6, 12, and 24 hours postoperatively. The SSNB group showed consistently higher SpO<sub>2</sub> values at multiple intraoperative and postoperative time points, indicating better preservation of respiratory function.

**Conclusion:** While ISB provides marginally superior immediate postoperative analgesia, SSNB offers a clinically acceptable alternative with significant safety advantages. The preservation of respiratory function, reduced complication rates, and comparable pain control at extended time points support the adoption of SSNB as the preferred technique for postoperative analgesia in arthroscopic shoulder surgery, particularly for patients with respiratory comorbidities.

**Keywords:** Interscalene Block, Suprascapular Nerve Block, Arthroscopic Shoulder Surgery, Postoperative Analgesia.

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### Introduction

Arthroscopic surgery of the shoulder joint induces moderate to severe pain. Interscalene brachial plexus block (ISB) has been shown to provide excellent analgesia for shoulder surgery as an adjunct to multimodal analgesia, and has been the regional anesthesia technique of choice for decades. However, some studies have quoted up to 100% incidence of phrenic nerve palsy, resulting approximately 20-25% reduction in pulmonary

function.[1,2] For patients with limited respiratory reserves this reduction can result in symptomatic dyspnea or desaturation. While the opioid-sparing effects of regional anesthesia are most valuable to these groups of patients, they are least likely to tolerate the reduction in lung function caused by ISB. In addition, ISB is also associated with other adverse effects such as Horner's syndrome, hoarseness of voice, and dense motor blockade.

Posterior approach supra scapular nerve block (SSNB) at the scapular notch emerged as an alternate option only with suboptimal pain relief, as supra scapular nerve innervates only 70% of the shoulder joint. A dual block including posterior approach SSNB and circumflex axillary nerve block have been reported to yield equianalgesic effect with ISB, though this requires performing two separate demanding procedures. [3] Recently a new novel approach of supra scapular nerve block has been reported at the subomohyoid supra clavicular fossa. [4] Another study reported non inferior analgesic efficacy of this new approach compared to ISB. [5] There is paucity of literature on this new technique of SSNB during shoulder arthroscopy. We intended to study the potential of this anterior approach SSNB and compare its analgesic efficacy with ISB in patients undergoing shoulder arthroscopic surgery.

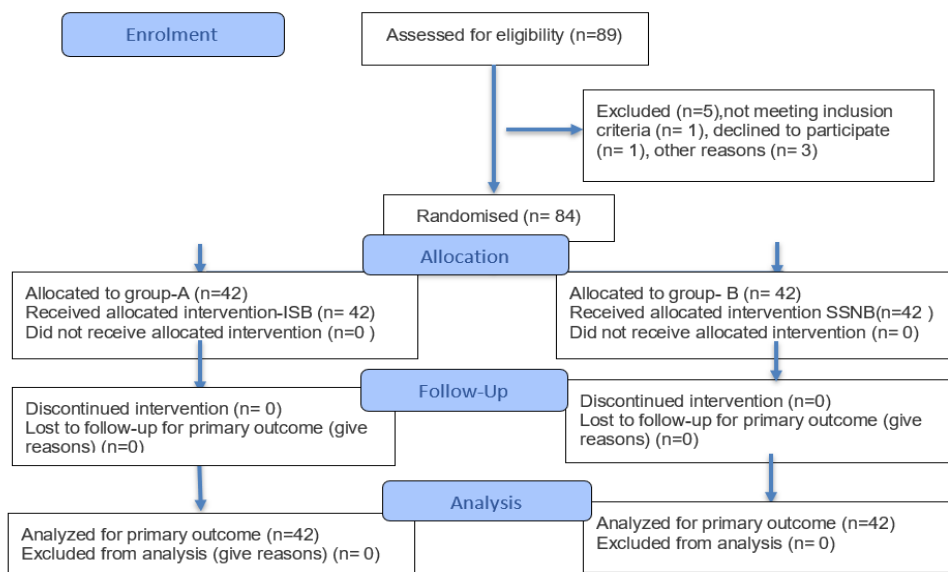
**Materials and Methods**

After Institutional Ethics Committee clearance and registration with the Clinical Trial Registry (CTRI/2023/02/049921) this prospective randomized parallel group trial was conducted at a city teaching hospital from March 2023 to February 2024. Sample size was calculated with reference to a previous study by David B. Auyong et al. and 84 patients scheduled to undergo elective arthroscopic shoulder surgery under general anaesthesia were recruited after obtaining informed consent and fulfilling inclusion and exclusion criteria. [5] Following pre anaesthetic examination the patients were distributed by computer generated randomization into two groups i.e GROUP –A and GROUP –B each comprising 42 patients. GROUP

A received Inter Scalene Block under USG and PNS guidance with Inj Ropivacaine ( 0.5 % ) 15ml and GROUP B received Anterior approach Supra Scapular Nerve Block under USG and PNS guidance with Inj Ropivacaine ( 0.5 % ) 10ml. After the nerve blocks were done, patients from both the group were operated under general anesthesia with standard technique and standard ASA Monitoring. All the patients vitals (Heart rate, Blood Pressure, MAP, SpO2) were recorded intra operatively every 15 min and post operatively with VAS Score after regaining consciousness from general anesthesia i.e., at 0 hours, at 6 hours, 12 hours and 24 hours. If any complications were noted, they were also recored. Post operatively all the patients received Analgesic Inj Paracetamol 1gm 8 hourly and Rescue analgesia Inj Pethidine 1.5 mg/kg upto100mg on demand. Data were analysed using Statistical Package for Social Sciences (SPSS) version 29 (International Business Machines SPSS Statistics Inc., Chicago, Illinois, USA) Mac software program. Descriptive analysis for patient demographics and intra-operative events was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Continuous variables analysed using Man-Whitney U test and categorical variables analysed using Chi- square/Fisher’s Exact test. A p- value of <0.05 was considered statistically significant.

**Results**

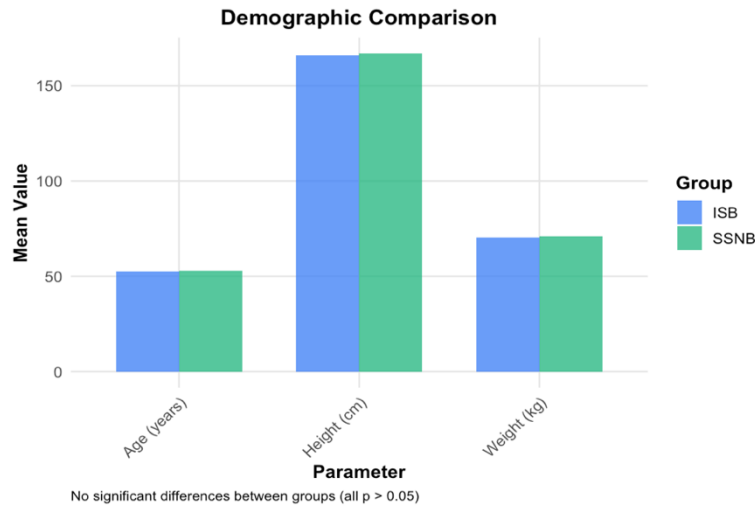
**Study population and demographics:** A total of 84 patients aged 18-75 years with ASA grade I or II undergoing shoulder arthroscopy were recruited and randomized into two groups (Fig.1).



**Figure 1: CONSORT 2025 Flow Diagram:**

**Table 1: Demographic Characteristics and Baseline Comparisons**

Parameter	Group A (ISB) n=42	Group B (SSNB) n=42	p-value
<b>Age (years)</b>			
Mean ± SD	52.60 ± 6.20	53.05 ± 5.89	0.366
Range	42-65	43-66	
<b>Weight (kg)</b>			
Mean ± SD	70.33 ± 10.75	71.21 ± 11.95	0.362
Range	54-93	50-96	
<b>Height (cm)</b>			
Mean ± SD	165.88 ± 5.01	166.98 ± 4.63	0.151
Range	155-178	158-178	



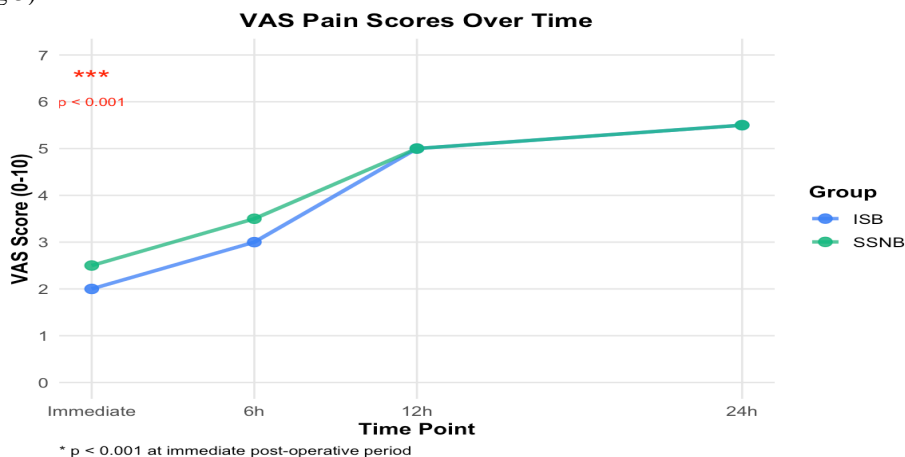
**Figure 2: Graphical representation of demographic characteristics and baseline comparison**

No statistically significant differences were observed between the two groups for any demographic variable (table1& fig.2).

**Table 2: Primary Outcome - Pain Assessment**

Time Point	Group A (ISB)	Group B (SSNB)	p-value
Immediate	2.0	2.5	<0.001
6 hours	3.0	3.5	0.276
12 hours	5.0	5.0	0.470
24 hours	5.5	5.5	0.618

Statistically significant difference ( $p < 0.05$ ) observed only at immediate post-operative period with moderate effect size. ISB group demonstrated significantly lower VAS scores immediately post-operatively ( $p < 0.001$ , moderate effect size  $r = 0.36$ ). No significant differences in pain scores at 6, 12, and 24 hours post-operatively (table 2 & fig.3).



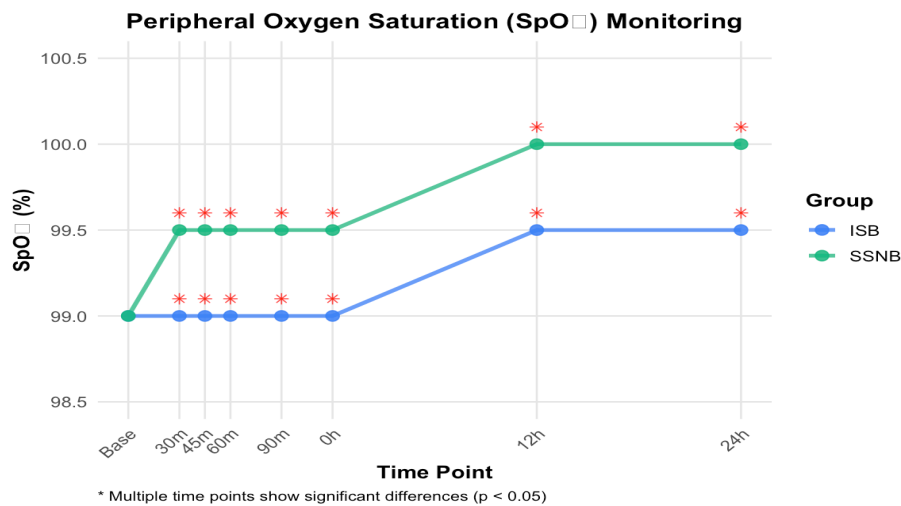
**Figure 3: Comparison of VAS score between the two groups**

**Table 3: SpO<sub>2</sub> Monitoring over different time point**

Time Point	Group A (ISB)	Group B (SSNB)	p-value
	Mean Rank	Median (IQR)	Mean Rank
Baseline	40.42	99 (98-99)	44.58
Intraoperative 30 min	36.02	99 (98-99)	48.98
Intraoperative 45 min	33.95	99 (98-99)	51.05
Intraoperative 60 min	36.19	99 (98-99)	48.81
Intraoperative 90 min	10.42	99 (98-99)	15.38
Post-operative 0 hours	36.96	99 (99-99)	48.04
Post-operative 12 hours	34.29	99 (99-100)	50.71
Post-operative 24 hours	36.21	99 (99-100)	48.79

Statistically significant differences observed at multiple time points, with SSNB group showing consistently higher SpO<sub>2</sub> values (table3 & fig.4). Both groups showed comparable blood pressure control with no significant differences. Pulse Rate

shows single significant difference at 12 hours post-operatively favouring SSNB group (p=0.033). SSNB group demonstrated significantly higher SpO<sub>2</sub> values at multiple intra operative and post-operative time points.



**Figure 4: Comparison of SpO<sub>2</sub> between the two groups**

**Discussion**

This randomized controlled trial compared the analgesic efficacy and safety profiles of interscalene block (ISB) versus anterior subomohyoid approach suprascapular nerve block (SSNB) in patients undergoing arthroscopic shoulder surgery. The findings provide valuable insights into the clinical applicability of these nerve block techniques and their impact on postoperative pain management and patient safety.

**Primary outcomes and analgesic efficacy:** The present study demonstrated that ISB provided significantly superior immediate postoperative analgesia compared to SSNB (p<0.001), with VAS scores of 2.0 versus 2.5 respectively. However, this advantage was short-lived, as no significant differences were observed at 6, 12, and 24 hours postoperatively.

This finding aligns with previous research by Hussain et al. (2017), who reported that while ISB may provide slightly better immediate pain control,

the clinical significance diminishes over time as both techniques maintain comparable analgesic efficacy in the extended postoperative period.[6] Other authors also found subomohyoid anterior approach SSNB to be non-inferior to ISB in terms of analgesic efficacy.[5,7]

The moderate effect size (r=0.36) for immediate postoperative pain relief suggests that while ISB demonstrates statistical superiority, the clinical relevance may be limited given the transient nature of this benefit. This observation supports the growing body of evidence suggesting that anterior approach SSNB provides clinically adequate analgesia for shoulder arthroscopy, particularly when considering the risk-benefit profile of each technique. Superior analgesic efficacy of anterior approach SSNB compared to traditional posterior approach may be attributed to the possibility of local anaesthetics spread to superior trunks. Some authors have compared efficacy of anterior approach block to superior trunk block. [7,8]

**Respiratory function and safety profile:**

One of the most significant findings of this study was the consistently higher SpO<sub>2</sub> values observed in the SSNB group at multiple intraoperative and postoperative time points.

This finding has profound clinical implications, as it corroborates previous research highlighting the respiratory safety advantages of SSNB over ISB. The preservation of respiratory function with SSNB is particularly relevant given that ISB is associated with hemidiaphragmatic paralysis in up to 40% to 100% of cases, as demonstrated by various studies. [2,9] The anterior approach SSNB has been shown to significantly reduce the incidence of hemidiaphragmatic paralysis comparable to traditional posterior approaches. This dramatic reduction in respiratory complications makes SSNB an attractive alternative, especially for patients with pre-existing respiratory comorbidities. [10] Lim Y C et al. (2020) similarly demonstrated that anterior SSNB preserved lung function better than ISB while maintaining comparable analgesic effects, supporting our findings. [11]

#### **Clinical implications and risk-benefit analysis:**

The findings of this study contribute to the ongoing discourse on optimizing analgesic techniques for shoulder arthroscopy. While ISB provides marginally superior immediate pain relief, this clinical advantage must be weighed against the significantly higher risk of complications, including dyspnoea, hoarseness, and Horner's syndrome. Sun et al. (2021) emphasized that SSNB presents a clinically attractive alternative due to its favourable safety profile while maintaining adequate analgesic efficacy. [12]

The anterior approach to SSNB has been shown to reduce the incidence of Horner's syndrome (relative risk = 0.17) and voice hoarseness (relative risk = 0.24) compared to ISB, as demonstrated in a systematic review by White et al. (2022). These findings support the clinical superiority of SSNB from a safety perspective. [13]

#### **Limitations**

While this study provides valuable insights, several limitations should be mentioned. The relatively short follow-up period of 24 hours may not capture the full spectrum of complications or long-term outcomes associated with each technique. Additionally, the study was conducted in a controlled clinical setting with experienced practitioners, which may limit general applicability to centers with varying levels of expertise in ultrasound-guided nerve blocks.

The exclusion of patients with significant respiratory comorbidities from this study may have underestimated the clinical importance of the respiratory safety advantages observed with SSNB. Future research should specifically focus on high-

risk populations to fully establish the clinical utility of SSNB in vulnerable patient groups.

#### **Conclusion**

This randomized controlled trial demonstrates that while ISB provides marginally superior immediate postoperative analgesia, SSNB offers a clinically acceptable alternative with significant safety advantages.

The preservation of respiratory function, reduced complication rates, and comparable pain control at extended time points support the adoption of SSNB as the preferred technique for postoperative analgesia in arthroscopic shoulder surgery.

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