ORIGINAL ARTICLE

Comparative Study between Combined Infraclavicular-Suprascapular Nerve Blocks versus Interscalene Block for Post-Operative Analgesia in Arthroscopic Shoulder Surgery

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Abstract

Background: ***Recovery from arthroscopic shoulder surgery may be impeded by moderate to severe postoperative discomfort. As a result of narcotic side effects or insufficient pain management, a large number of patients end up in the hospital again after ambulatory surgery.***

Aim and objectives: ***When it comes to arthroscopic shoulder surgery pain management, we want to see how well an interscalene block works compared to a combination infraclavicular-suprascapular nerve block.***

Subjects and methods: ***From January 2024 through January 2025, sixty patients were randomly recruited from the anaesthesia clinics at Al-Azhar University Hospitals to participate in this prospective clinical comparative double-blind randomised study. We used a systematic random sampling procedure to gather our samples.***

Results: ***There was a statistically significant difference in heart rates between the interscalene block group and the combined block group ($p=0.003$). In terms of the other vital indicators, no significant variations were detected. The laboratory results did not show any statistically significant difference between the combined block group and the interscalene block group. Concerning the incidence of complications, there was no statistically significant distinction between the Interscalene block group and the combined block group ($p>0.05$). Regarding the post-operative pain score, there was no significant distinction between the Interscalene block group and the combination block group ($p>0.05$).***

Conclusion: ***Concerning postoperative analgesia and the occurrence of complications (pneumothorax, haematoma, local anaesthetic toxicity), there was no statistically significant distinction between the ISB group and the mixed nerve groups. Regardless, the incidence of unilateral diaphragmatic paralysis was greater in the ISB group, and both groups had an acceptable satisfaction score.***

Keywords: Interscalene block; Arthroscopic shoulder surgery; Infraclavicular-suprascapular nerve blocks

1. Introduction

For patients undergoing shoulder arthroscopic procedures, in terms of analgesic efficacy, the simultaneous utilization of the suprascapular nerve block(SSB) and conventional para-coracoid infraclavicular nerve block(ICB) was not comparable to the standard ISB 30 minutes after recovery, with minimal incidence of hemidiaphragmatic (HD) effect.[1]

Within the traditional Para coracoid ICB approach, the local anaesthetic (LA) is placed in the lateral infraclavicular fossa, which is located dorsal to the axillary artery. The ICB numbs the axillary, subscapular, and lateral pectoral nerves, while the SSB numbs the back of the shoulder.[2]

In ultrasonography, the lateral infraclavicular fossa cords may be found deep and challenging to identify, and have a variety of anatomic locations surrounding the axillary artery.[3]

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Placing a barrier across the brachial plexus at the mid infraclavicular fossa, situated beneath the clavicle's midpoint, is the costoclavicular approach to ICB. In contrast to the Para coracoid approach, the brachial plexus is located superficially, making its cords easier to see. It is also regularly located lateral to the axillary artery in a small region.[4]

If you suffer from shoulder discomfort, whether from rheumatologic illnesses, cancer, trauma, or postoperative pain from shoulder arthroscopy, a simple and safe approach to alleviate your pain is suprascapular nerve blocking (SSNB). The most typical approach is the posterior one; however, the other two are superior and anterior. A recent description of a technique that is guided by ultrasonography has been made. Here we shall go over the fundamentals of the supra scapular nerve's anatomy. The various SSNB procedures and their indications will be covered. In this article, we will take a look at the positive and negative effects of SSNB on the treatment of both short-term and long-term shoulder pain.[5]

For patients experiencing pain following arthroscopic shoulder surgery, this study aimed to examine the analgesic efficacy of two different nerve blocks: one that combined the infraclavicular and suprascapular nerves, and another that used the interscalene block.

2. Patients and methods

In this randomised, prospective, clinical trial, 60 patients were chosen at random from the anaesthesia clinics at Al-Azhar University Hospitals between January 2024 and January 2025. Using a systematic random procedure, samples were obtained.

The Local Ethical Committee gave its blessing to the research methodology, and patients gave their signed informed consents.

Inclusion criteria:

Age between 21-45 years, both sexes, patients undergoing arthroscopic shoulder surgeries, patients with ASA(I-II), and BMI<40 kg/m2.

Exclusion criteria:

Patients' refusal, patients had contraindications to regional anesthesia(bleeding tendency, local sepsis), communication difficulties with patients, which might prevent a reliable post-operative assessment, patients with chronic pain disorders and/or necessitating analgesics, patients with previous neck or infraclavicular/suprascapular fossa surgery, and allergy to local anesthetics.

Randomization and blinding:

The patients were divided into two equal groups based on the block utilising the closed wrapped procedures, using computer-generated randomised numbers.

Sample Size:

This research is based on work done by Botros et al.,[4] The following assumptions were taken into account when using Epi Info STATCALC to determine the sample size: There is an 80% power and a 95% two-sided confidence level. I calculated an odds ratio of 1.115 with a 5% margin of error. Based on the results from Epi-Info, the maximum sample size was 53 in the end. After considering the possibility of dropouts during follow-up, the sample size was boosted to 60 individuals.

The studied patients were subdivided into: Group-(A): 30-patients underwent inter scalene Block; Group-(B): 30-patients underwent combined infraclavicular and suprascapular nerve blocks.

Methods:

Before surgery, every patient underwent a mental status evaluation, a thorough medical history (including personal, family, and occupational details), a full physical examination (including the chest, heart, and abdomen), vital signs (including blood pressure, heart rate, and respiratory rate), and investigations (including complete blood count, fasting blood sugar, phosphorus, creatinine, liver enzymes, coagulation profile, electrocardiogram, and chest x-ray). Normal ASA monitoring (including non-invasive blood pressure, 5-lead electrocardiogram, and pulse oximetry) and all patients' baseline vitals were documented.

Anesthetic technique:

Pre-anesthetic medication, all patients were given intravenous premedication(fentanyl, 50µg; midazolam, 2mg). Throughout the block procedure time, all patients were given supplemental oxygen(2L/min via a nasal cannula). Real-time ultrasound guidance was utilized to complete the blocks (Philips® ClearVue 350, Philips Healthcare, Andover, MA 01810).

Group-(A):

To see the hypoechoic structures that represented the roots of the brachial plexus, an ultrasonic transducer was sterilely placed on the side of the neck, just below the cricoid cartilage. After positioning itself in-plane, the 22-G, 50mm Stimuplex D® block needle (B Braun, Melsungen, Germany) was advanced laterally to the medial side until its tip was sandwiched between the two most superficial hypoechoic structures beneath the prevertebral fascia. The injection sites for bupivacaine were C5–C6, and again at C7–C8, with a concentration of 0.5% and 10 millilitres of the drug, respectively.

Figure 1. Interscalene nerve block with visualization of needle

on ultrasound and brachial plexus roots.

Group-(B):

Patients underwent suprascapular block while lying on their backs with their operating limbs bent at a 90-degree angle. After being moved off the inferior border of the clavicle, the probe was inserted into the medial infraclavicular fossa. It was determined that the subclavian artery ran beneath the subclavius muscle in the costoclavicular area.

On the outside of the artery, you could see the three brachial plexus cords. A proper sonographic picture of the costoclavicular area and access to the brachial plexus cords were achieved by tilting the ultrasound transducer slightly cephalad after visualising the cephalic vein or thoracoacromial artery.

Using a cephalad-to-caudal trajectory and an in-plane approach, the 22-G, 80mm, Stimuplex D® block needle from B Braun, Melsungen, Germany was advanced until its tip reached the middle of all three cords. The injection site was treated with bupivacaine (0.5%, 10 mL).

The next step was to place the patient in a lateral decubitus position, with the operative limb elevated above. The sterile ultrasonic transducer was implanted in a cephalad direction parallel to the scapular spine in order to offer a view of the suprascapular fossa. Three millilitres of 1% lidocaine caused an increase in skin peel.

The 22-G, 80mm Stimuplex D® block needle was advanced in an in-plane manner from the lateral to medial direction until its tip was in the floor of the suprascapular fossa, ventral to the fascia of the supraspinatus muscle. A 10 mL injection of 0.5% bupivacaine was administered to this region.

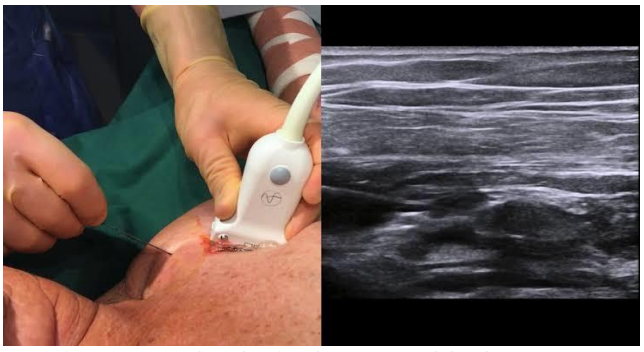

Figure 2. Infraclavicular nerve block.

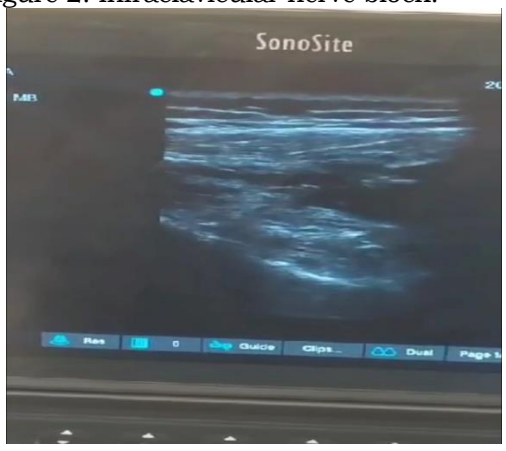

Figure 3. Suprascapular nerve block with ultrasound guidance.

Both groups:

Alcohol swabs were used to assess sensory blockage on the skin covering the lateral side of the deltoid and clavicle (supraclavicular nerves). The cold test scored each component on a 3-point scale: 0 indicated no block, 1 indicated analgesia (patient could feel touch but not cold), and 2 indicated anaesthesia. If a global composite score of 6 points (out of a maximum of 8 points) was reached at 30 minutes after injection, the incidence of entire blocks was recorded. Motor blockades should be observed between 0-5, such as 0-complete paralysis, 1-visible contraction, 2-active movement with gravity, 3-active movement against gravity, 4-active movement against gravity and resistance, and 5 contractions against gravity.

Regional anaesthesia failure disqualified the patient from the research and replaced them. The transducer was adjusted cephalad and caudal to see the pleural line's end-expiratory and end-inspiratory levels on the patient's skin to rule out phrenic nerve paralysis. The patient was supine before the regional anaesthetic approach and one hour after surgery in the post-anesthesia care unit. This distance decreases when a phrenic nerve block occurs, while a slight change implies no block.

General anaesthesia was induced with 1 μg/kg fentanyl, 0.5mg/kg atracurium, 1.5mg/kg propofol, endotracheal intubation, 1.5% isoflurane in 2 L/min oxygen-air mixtures (50% 50%), and

0.1mg/kg atracurium every 30 minutes after sensory and motor block assessments.

Patients were then slowly placed in the beach chair position for shoulder surgery. A 50-µg fentanyl bolus was given intraoperatively if the patient's heart rate or blood pressure exceeded 20% of their preoperative value.

Extubated and aware, all patients were taken to the PACU for a 2-hour assessment after surgery. At 2 hours postoperatively, the Numeric Rating Scale (NRS-11) was used to evaluate pain from 0 (no pain) to 10 (worst pain), then at 4, 8, 12, and 24 hours in the inpatient department. For 48 hours, the institution administered 100mg ketoprofen every 12 hours and 1 g paracetamol every 8 hours as part of its postoperative pain-control strategy.

Statistical analysis

SPSS 26 (SPSS Inc., PASW Statistics for Windows 26) analysed data. SPSS Inc., Chicago). The Shapiro-Wilk test was used to test data normality. Numerical data were formatted as mean±SD for normally distributed data and median(interquartile range) and minimum-maximum for non-normally distributed data. For non-numerical statistics, frequency and percentage were used.

The statistical significance of the difference between the two study group means was assessed using the Student t-test (t). Mann-Whitney. The statistical significance of the difference between the two study group non-parametric variables was assessed using the U-test(z). Qualitative variables were compared using Chi-Square, Fisher exact, and Monte Carlo tests. The Chi-Square test (x2) compared many groups. When more than 20% of cells in (2*2) tables had a count less than 5, Fisher Exact Test (FET) was performed to correct the Chi-Square test. Monte-Carlo test (MC) corrected Chi-Square test when more than 20% of cells had a count less than 5 in tables(>2*2). The probability p-value is significant if <0.05 with a 95% confidence interval.

Primary outcome:

To evaluate the post-operative analgesia in the first 48 hours using the numeric rating scale(NRS).

Secondary outcomes:

The first analgesic request: the total postoperative analgesic consumption in the first 48 hours; hemodynamics(pulse, blood pressure); patients' satisfaction; incidence of any complications(pneumothorax, unilateral diaphragmatic paralysis, hemothorax, local anesthetics toxicity).

3. Results

A total of 76 patients were considered for inclusion in the study; 9 did not fulfil the inclusion criteria, and 7 declined to take part. Two equal groups, each with 30 patients, were formed from the remaining patients through random assignment. All patients who were assigned were monitored and their data was statistically evaluated,(figure 4).

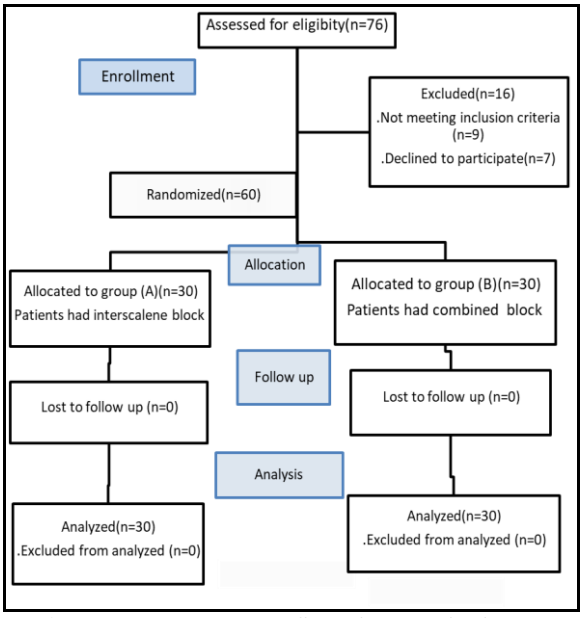

Figure 4. Consort flowchart of the enrolled patient.

There was no statistically significant variation between the combined block group and the interscalene block group with respect to age, sex, height, weight, body mass index, length of operation, or ASA (p>0.05),(table 1).

Table 1. Demographic data of studied groups.

VARIABLE	INTERSCALENE N=30	COMBINED N=30	TEST OF SIGNIFICANCE	P-VALUE
AGE(MEAN±SD)	28.93±7.27	31.2±7.62	t=1.15	p=0.25
SEX $\frac{Male}{Female}$ N(%)	17 (56.3%) / 13(43.7%)	15(50%) / 15(50%)	x2=0.49	p=0.48
WEIGHT(MEAN±SD)	67.4±11.7	70.06±12.11	t=0.84	p=0.4
HEIGHT(MEAN±SD)	171±13.55	168.3±11.24	t=0.82	p=0.41
BMI(MEAN±SD)	25.27±13.49	26.86±8.9	t=0.53	p=0.59
$\frac{ASA\ I}{ASA\ II}$ N(%)	22(73.30%) / 8(26.70%)	23(76.6%) / 7(23.30%)	t= 0.50	P=0.58
DURATION OF SURGERY (MEAN±SD)	102±30.17	99.50±29.88	t=0.55	P=0.55

BMI:Body mass index, t:Student t-test and X2:Chi-square test, p:comparison between interscalene and combined groups

Table(2) showed non-significant difference (p>0.05) among studied groups(Interscalene block and combined nerve block).

Table 2. Post-operative pain results according to NRS of the studied groups over time.

TIME	INTERSCALENE N=30	COMBINED N=30	TEST OF SIGNIFICANCE	P-VALUE
0	1.55±0.44	1.60±0.55	0.93	0.13 NS
2 HRS	2.90±0.55	2.93±0.57	0.94	0.14 NS
4 HRS	3.15±1.15	3.19±1.17	0.95	0.10 NS
6 HRS	3.34±1.18	3.37±1.20	0.96	0.10 NS
12 HRS	4.33±1.19	4.45±1.20	1.11	0.44 NS
24 HRS	4.45±1.20	4.55±1.22	0.99	0.35 NS
48 HRS	5.44±1.22	5.49±1.23	0.98	0.11 NS

NS=Non–significant(P 0.05).

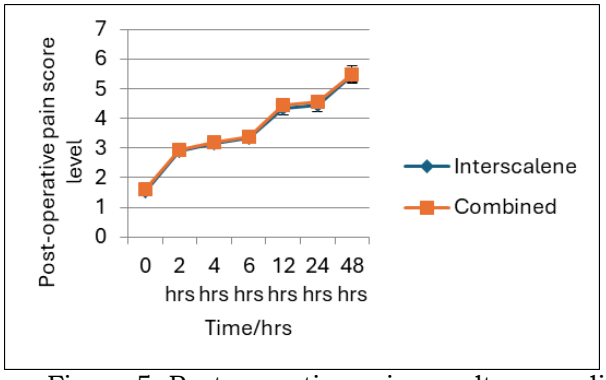

Figure 5. Post-operative pain results according to NRS of the studied groups at different time

At2,4,6,12,24, and 48 hours post-op, the interscalene block group had a noticeably greater heart rate than the combination block group (p=0.003). Apart from that, there were no other noteworthy variations in the vital signs (BP and RR). In comparison to the combined group, the group treated with interscalene had a considerably higher heart rate, particularly during the last post-operative visit compared to the first post-operative visit (P<0.01),(table 3;figure 6).

Table 3. Heart rate(Beats\min) results over post-operative time of the studied groups.

TIME	INTERSCALENE N=30	COMBINED N=30	TEST OF SIGNIFICANCE	P-VALUE
0	81±5.22	80±4.11	1.22	0.11
2 HRS	85±4.81	82±3.22	2.24	0.035*
4 HRS	85±5.44	81±3.22	2.56	0.044*
6 HRS	87±4.44	83±4.23	3.25	0.010**
12 HRS	88±5.46	83±3.24	3.52	0.010**
24 HRS	90±5.66	85±5.20	4.44	0.0014**
48 HRS	95±5.98	85±4.12	4.24	0.0013**

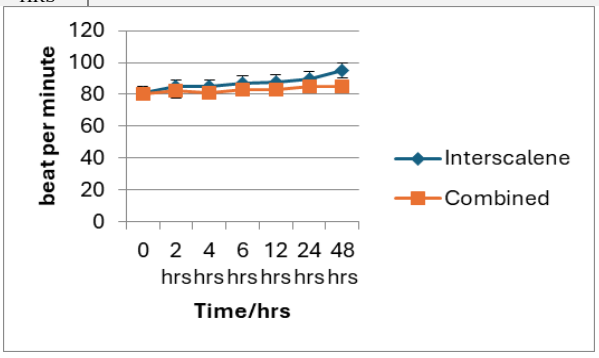

Figure 6. Heart rate (Beats\min) results of the studied groups at different time.

A statistically significant increase (p=0.006) was seen in the proportion of individuals with unilateral diaphragmatic paralysis, as shown in Table 4. Patients in the combined group reported higher levels of satisfaction compared to those in the interscalene block group (p=0.04). There was no statistically significant difference between the groups in terms of the first analgesic request, type of analgesia, or local anaesthetic toxicity, (table 4; figures 7-9)

Table 4. Post-operative secondary outcomes in the studied groups.

VARIABLE	INTERSCALENE N=30	COMBINED N=30	TEST OF SIGNIFICANCE	P-VALUE
1ST ANALGESIC REQUEST, (HOURS)				
MEAN±SD	6.10±3.73	7.8±4.95	z=1.83	p=0.16
TYPE OF ANALGESIA				
NO NEED	8(25.9%)	11(36.7%)	MC=0.76	p=0.68
MORPHINE (0.1MG/KG)	1(3.7%)	1(3.3%)		
PARACETAMOL(15MG/KG)	21(70.4%)	18(60%)		
BRUFEN(0.5 MG/KG)				
UNILATERAL DIAPHRAGMATIC PARALYSIS				
$\frac{YES}{NO}$ N(%)	$\frac{6(20.0\%)}{24(80.0\%)}$	$\frac{0(0\%)}{30(100\%)}$	FET	P=.006*
LOCAL ANESTHESIA TOXICITY				
$\frac{YES}{NO}$ N(%)	$\frac{1(3.34\%)}{29(96.66\%)}$	$\frac{1(3.34\%)}{29(96.66\%)}$	FET	p=0.87
SATISFACTION SCORES				
SCORE 1, N(%) VERY GOOD	7(23.2%)	7(23.3%)	MC=7.9	P=.04*
SCORE 2, N(%) GOOD	14(46.3%)	22(73.4%)		
SCORE 3, N(%) SATISFY	5(16.5%)	1(3.3%)		
SCORE 4, N(%) BAD	4(13.1%)	0(0%)		

z:Mann-Whitney U test, MC:Monte Carlo test, FET:Fischer Exact-test,
p:comparison between interscalene and combined groups, *:significant if p<0.05
Interscalene group combined groups

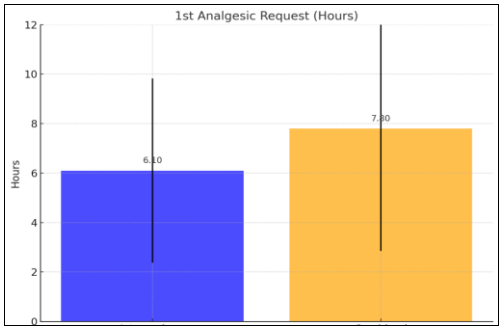

Figure 7. First analgesic request among the studied groups.

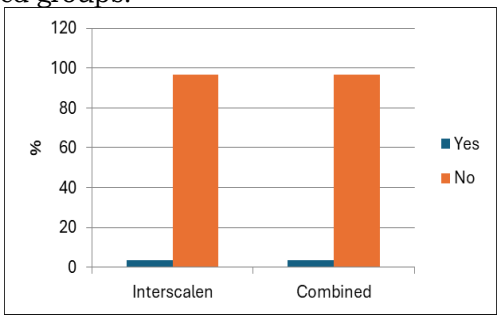

Figure 8. Comparison of the incidence of local anesthesia toxicity between the studied groups

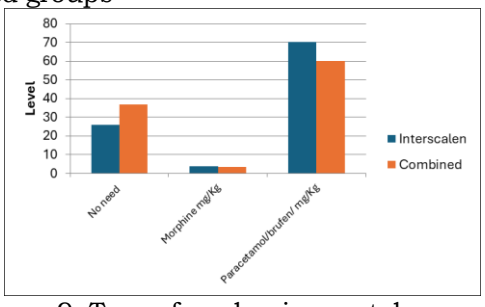

Figure 9. Type of analgesia was taken.

There was no statistically significant difference in the occurrence of complications between the interscalene block group and the combined block group (p>0.05), as shown in Table 5,(table 5;figure 10).

Table 5. The rate of complications incidence among the studied groups.

VARIABLE	INTERSCALENE N=30	COMBINED N=30	TEST OF SIGNIFICANCE	P-VALUE
PNEUMOTHORAX, N (%)				
YES	1(3.34%)	0(0%)	FET	p=0.35
NO	29(96.66%)	30(100%)		
HEMATOMA, N (%)				
YES	0(0%)	1(3.34%)	FET	p=0.35
NO	30(100%)	29(96.66%)		

FET:Fisher-exact test, p:comparison between interscalene and combined groups

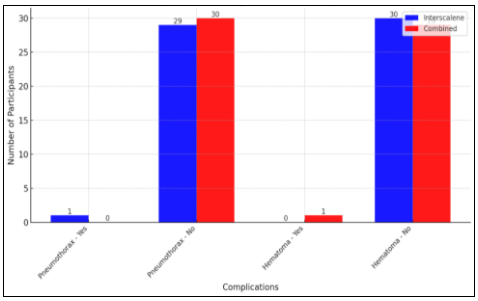

Figure 10. The rate of complication incidence among the studied groups.

4. Discussion

Consistent with previous research, our demographic analysis did not find a statistically significant distinction between the combined block group and the Interscalene block group (p>0.05). Aliste et al.,[6] had 40 patients undergoing arthroscopic shoulder surgery, who were randomly assigned to either the interscalene or combination infraclavicular-suprascapular blocks.

According to the research of Choi et al.,[7] is related to demographic information (such as gender ratio, age, weight, height, and body mass index).

We found no statistically significant difference (p>0.05) in postoperative analgesia between the combination block group and the Interscalene block group, which is in line with the findings of Lee et al.,[8] studied 61 patients having arthroscopic rotator cuff repair divided into 3 groups: patient-controlled analgesia(PCA) alone & PCA+ISB & PCA+SSNB, and ANB. They found that at 8hours postoperatively, the mean Visual Analog Scale(VAS) score of the PCA with SSNB & ANB group(3.9±2.2) was close to or lower than that of the ISB group(5.2±2.9) with an insignificant difference.

Also, against the study of Neuts et al.,[9] compared axillary and suprascapular nerve blocks to ISBs for pain control following an arthroscopic shoulder operation. Their study found that the postoperative pain scores at rest were more variable and elevated for suprascapular and axillary nerve blocks than ISB at most time intervals.

This difference may be explained by receiving a rotator cuff and an additional supply from other nerves, which are not anesthetized with SSNB and ANB.[10]

Our findings did not reveal a significant distinction between the combined block group and the Interscalene block group with respect to the initial analgesic request, regardless of the type of analgesia utilised (morphia 0.1 mg/kg, paracetamol 15 mg/kg-brufen 05 mg/kg).

In line with previous research on Choi et al.,[7] regarding the initial request for analgesics, no statistically significant difference was found between the groups under study.

Compared to the combined block group, participants' heart rates were noticeably higher in the interscalene block group (p=0.003). Intervals of 2, 4, 6, 12, 24, and 48 hours following surgery. Other than that, there were no other noteworthy variations in the vital signs (blood pressure, respiratory rate, and oxygen saturation) throughout that period.

When compared to the findings of the study of Lee et al.,[8] revealed that compared to the combined block groups, the interscalene group had a substantially higher HR (p=0.002).

In contrast to what was found in this study, Aliste et al.,[6] They came to the conclusion that the groups under investigation did not differ significantly with respect to heart rate.

Aside from unilateral diaphragmatic paralysis, which was more common in the interscalene block group compared to the combined block group, our data did not reveal a statistically significant difference (p>0.05) in the incidence of complications such as pneumothorax, haematoma, and local anaesthetic toxicity.

Findings from the study of Botros et al.,[4] Researchers discovered no statistically significant difference in the occurrence of side effects between the two groups. In the ISB group, there were 6-cases (18%), including 4-cases of Horner's syndrome, one case of blood aspiration, and one case of paraesthesia. In contrast, the CSB group had 2-cases (6%), including one case of parasthesia and one case of pleural puncture (P=0.25).Regarding the complication incidence on our study, we had one-patient had pneumothorax in the interscalene group, the patient was followed up with serial chest x-ray and pneumothorax resolved spontaneously and was not needed chest tube.

Regarding patient satisfaction, our data showed that patients in the combined groups had higher satisfaction scores than patients in the interscalene block group(p=0.04).

This result against the study of Aliste et al.,[6] who discovered that there were no differences between the groups in terms of the percentage of patients who reported being satisfied with their care after 24 hours.

The current study found that compared to the combined block group, the Interscalene block group had a considerably higher percentage of individuals with unilateral diaphragmatic paralysis (p=0.006). Every patient with unilateral diaphragmatic paralysis who underwent follow-up care remained haemodynamically stable and did not require intervention.

According to the research of Aliste et al.,[6] 18 out of 20 patients experienced hemidiaphragmatic paralysis (HDP) at 30 minutes after ISB compared to 0 out of 20 patients (P=0.001).

It is worth noting that a study conducted by Sivashanmugam et al.,[11] observed ipsilateral hemidiaphragmatic paresis following a supraclavicular and costoclavicular BPB in 40 patients who underwent right-sided upper extremity surgery.

4. Conclusion

There was no statistically significant difference in the rates of postoperative analgesia or complications (pneumothorax, haematoma, local anaesthetic toxicity) between the ISB group and the mixed nerve groups. If both groups were to be considered equally satisfied, the incidence of unilateral diaphragmatic paralysis would be lower in the ISB group.

Disclosure

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Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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