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COMPARISON BETWEEN SUPRA-SCAPULAR NERVE BLOCK COMBINED WITH AXILLARY NERVE BLOCK AND INTERSCALENE BRACHIAL PLEXUS BLOCK FOR POSTOPERATIVE ANALGESIA FOLLOWING SHOULDER ARTHROSCOPY

Shashank Sahu[1], Abhishek Kumar[2]

[1]Assistant Professor, Shri Shankaracharya Institute of medical Sciences, Bhilai, India.
[2]Consultant, Department of Anaesthesia and Critical Care, Apollo Hospitals, Bilaspur, India.

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CORRESPONDING AUTHOR

Dr. Abhishek Kumar
Consultant, Department of Anaesthesia and Critical Care, Apollo Hospitals, Bilaspur, India.
Email: dr.abhishek21031987@gmail.com

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ABSTRACT

Background: After performing shoulder arthroscopy, a lot of pain persists after an operation; therefore, often there will be a need for regional anaesthetic blockade that is effective. To date, many have argued that the interscalene brachial plexus block has proven to be the best and the most reliable means of providing good postoperative pain control with the potential for complications such as diaphragmatic paralysis or respiratory deterioration. The Suprascapular +Axillary block would serve as a replacement method; providing similar, effective analgesic benefits without the potential complication of diaphragmatic paralysis. A comparative study of these two techniques would help establish the efficacy and safety of both techniques to patients who undergo shoulder arthroscopies. **Aim:** To compare the analgesic efficacy and safety of suprascapular nerve block combined with axillary nerve block with interscalene brachial plexus block for postoperative pain control following shoulder arthroscopy.
Methods: An 18-month prospective study was performed in the Anaesthesiology Department of a tertiary hospital in India comparing two techniques for shoulder arthroscopy performed under general anaesthesia. Eighty adult patients were randomized into two groups of 40 to receive either ultrasound-guided suprascapular nerve (combined with axillary) block (Group SA) or ultrasound-guided interscalene brachial plexus block (Group IS). Each group's postoperative pain was evaluated with a 10cm visual analogue scale at multiple times up to 24 hours postoperatively; timing of first rescue analgesic administration, total perioperative analgesic consumption, and complication rates were recorded and analysed.
Results: Baseline demographic characteristics were comparable between both groups. Postoperative visual analogue scores were significantly lower in the interscalene block group during the immediate postoperative period up to sixth hourly for six hours. However, from 8-24 hours; pain scores were comparable between both groups. The mean time to first rescue analgesia was longer in the interscalene block group compared with the suprascapular–axillary block group. Total analgesic consumption during the first 24 hours was similar between both groups. Respiratory discomfort and transient diaphragmatic paresis was seen 58% in the interscalene block. Suprascapular–axillary block technique shows less respiratory-related complications.
Conclusion: Effectiveness in providing postoperative analgesia after arthroscopy of the shoulder contributes evidence that both suprascapular nerve block with axillary nerve block 186 and interscalene brachial plexus block 187 are suitable techniques. Although the interscalene block provides marginally better early postoperative analgesia than block of suprascapular and axillary nerves, the latter provides comparable total analgesia with fewer respiratory complications.
Keywords: Shoulder arthroscopy, suprascapular nerve block, axillary nerve block, interscalene brachial plexus block, postoperative analgesia, regional anesthesia.

INTRODUCTION

Shoulder arthroscopy is one of the more commonly performed arthroscopic surgeries, performed for repair of rotator cuff tears, labral tears, impingement, adhesive capsulitis, etc. Although they are minimally invasive, arthroscopy of shoulder can be painful, especially in the early postoperative period[1]. Adequate analgesia will not only increase the comfort of the patient but also aid in early mobilization, decrease the minimum hospital stay, and aid to return to functional recovery. Post-operative pain may be managed by regional anesthesia. Interscalene brachial plexus block has been the "gold standard" regional anesthetic technique for shoulder surgery over the years[2]. The block anaesthetizes the

upper roots of brachial plexus which supply most of the shoulder joint. There is ample evidence in literature in favour of interscalene block which has been tried and tested as analgesia after shoulder arthroscopy showing lower scores, lesser opioids consumption[3]. But interscalene block has its own complications like ipsilateral diaphragm paralysis (due to involvement of phrenic nerve), hoarseness of voice, Horner's syndrome, in some cases respiratory failure especially due to pulmonary disease[4]. In past couple of years, newer regional analgesic techniques targeted at specific sensory nerve of shoulder are coming into limelight.The suprascapular nerve and axillary nerve together main supply of the shoulder joint is sensory in nature[5]. Suprascapular nerve supplies approximately 70 percent of the sensory innervation of the shoulder joint and the remaining portion, particularly the anterolateral part of the joint is supplied by the axillary nerve. Blocking both the suprascapular and axillary nerves was therefore suggested as a means of supplying enough postoperative analgesia for surgery on the shoulder[6]. The combined suprascapular nerve block and axillary nerve block in theory should have advantages. Pain control by selectively blocking the principal sensory nerves of the shoulder may give good relief of pain without blocking the entire brachial plexus[7]. Less likely the phrenic nerve will be blocked and cause the patient diaphragm paralysis. It would be more favorable to the patient especially with respiratory compromise. The use of ultrasound in regional anesthetic techniques have improved the anatomy and safety of suprascapular nerve block. Though interest is building in the suprascapular-axillary nerve block combination, the analgesic efficacy of this combination of regional anesthetic techniques in comparison to interscalene brachial plexus block has yet to be identified[8].

Early literature claims the interscalene block superior for early postoperative analgesia, whereas, the latter literature suggests that suprascapular and axillary nerve blocks supply adequate pain control without increasing complications. In light of this, it has been decided that the two regional anesthesia techniques should be compared in patients undergoing shoulder arthroscopy. The question to be answered is whether the combined suprascapular and axillary nerve blocks are a valid alternative to interscalene brachial plexus block for postoperative analgesia. The aim of our study was to compare the analgesic efficacy, duration of analgesia, need of rescue analgesics and complications between suprascapular nerve block with axillary nerve block and interscalene brachial plexus block in patients undergoing shoulder arthroscopy.

Aim

To compare the effectiveness of suprascapular nerve block combined with axillary nerve block and interscalene brachial plexus block for postoperative analgesia in patients undergoing shoulder arthroscopy.

Objectives

The purpose of this study is to:

1. Compare the level of pain experienced after surgery between two groups of patients who utilized a combination suprascapular/axillary nerve blocks and patients utilizing the interscalene/suprascapular nerves to manage postoperative pain.
2. Determine the duration of analgesia provided by the two nerve block methods after shoulder arthroscopy.
3. Assess the time to first rescue analgesia between the two groups studied.
4. Analyze the total amount of medication consumed by both experimental groups for pain control during the first 24 hours postoperatively.
5. Determine the rate of complications and adverse events related to either of the types of blocks utilized for pain control in our study.

Compare the effectiveness and safety of suprascapular/axillary nerve block combination with interscalene/suprascapular nerve blocks for postoperative pain management following a shoulder arthroscopy.

MATERIAL AND METHODS

Study Design

The present research was performed as a prospective, randomized comparative study comparing two regional analgesic techniques to provide pain management after shoulder arthroscopy surgery.

Study Setting

The study was conducted within the department of Anaesthesia at a tertiary care hospital located in the country of India along with the Orthopaedic Department of that hospital, which is involved with performing shoulder arthroscopy procedures on a daily basis.

Study Duration

The time frame for the present research study covered a period of 18 months and included subject selection, procedure, post-operative follow-up, and data acquisition.

Study Population

This study involved patients who were female or male, aged 18 years or older and who were being scheduled to receive a shoulder arthroscopy surgical procedure using general anesthesia.

Sample Size

Of the 80 patients that participated in the research, they were randomly separated into 2 groups of 40. The first group, referred to as Group SA, had the suprascapular nerve block mixed with an axillary block administered to them and the second group, identified as Group IS, received the interscalene brachial plexus block.

Inclusion Criteria

The inclusion criteria for patients are as follows: All patients will be:

(a) males or females between the ages of 18 - 65;

(b) belonging to American Society of Anesthesiologists' Physical Status I or II;

(c) undergoing elective arthroscopic shoulder surgery;

(d) have signed a written informed consent form authorising their participation in the study.

Exclusion Criteria

Individuals who are hypersensitive to local anaesthetics

Individuals who have an infected area around the block

Individuals who have blood disorders (coagulopathy) or currently under medications to prevent (block) clotting of blood (anticoagulants)

Individuals with severe lung disease or other respiratory problems

Individuals who have neurological problems affecting their upper limb

Individuals who do not wish to take part in the study

Randomization and Group Allocation

A computer-generated randomization method was utilized to randomly assign eligible participants to one of two treatment groups. Allocation was completed prior to any surgical procedures being performed on participants in either group; thus, no selection bias was introduced. Each participant had the potential to be included in one of two experiment groups each containing 40 participants. Participants in Group SA received ultrasound-guided suprascapular nerve block and an axillary nerve block. Participants in Group IS received ultrasound-guided interscalene brachial plexus block.

Anesthetic Technique

Every patient received an evaluation prior to surgery. In the OR, we used a combination of standard monitoring, including NIBP, ECG, and Pulse Oximetry. General anesthesia was given according to the same protocol for all patients. In Group SA, an ultrasound-guided suprascapular nerve block was completed first, followed by the axillary nerve block with an appropriate volume of local anesthetic solution. In Group IS, an ultrasound-guided interscalene brachial plexus block was completed with local anesthetic solution around the roots of the brachial plexus. All nerve blocks were performed under aseptic conditions by experienced anesthesiologists.

Postoperative Analgesia Protocol

Postoperative pain was assessed using the Visual Analogue Scale (VAS) where 0 represented no pain and 10 represented the worst imaginable pain.

Pain scores were recorded at predetermined intervals: immediately after surgery, and at 2, 4, 6, 8, 12, and 24 hours postoperatively.

Rescue analgesia was administered when the VAS score was greater than or equal to 4. The time to first rescue analgesia and total analgesic consumption within the first 24 hours were recorded.

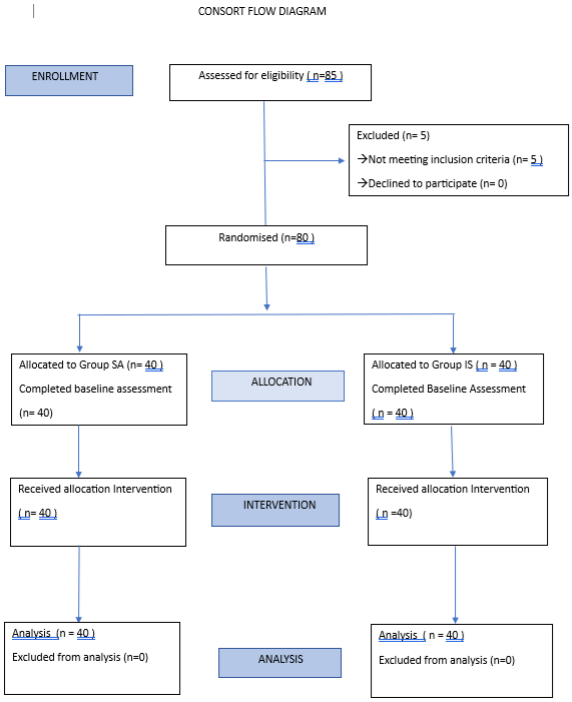
Outcome Measures

Primary outcome measures included postoperative pain scores and duration of analgesia.

Secondary outcome measures included time to first rescue analgesia, total analgesic consumption within 24 hours, and incidence of complications such as respiratory discomfort, diaphragmatic paresis, nausea, vomiting, and neurological symptoms.

Statistical Analysis

All analysis was carried out using structured database with data entered into the computer. Continuous variable is expressed in mean ± standard deviation and categorical variables as frequency and percentage. The comparisons between group was made by appropriate statistical tests. P value <0.05 was considered statistically significant.



RESULTS

The present prospective randomized comparative study included 80 patients undergoing shoulder arthroscopy, equally allocated into Group SA and Group IS. Baseline demographic characteristics including age distribution, gender, and BMI were comparable between both groups, ensuring homogeneity of the study population. Postoperative pain assessment using the visual analogue scale demonstrated lower pain scores in the interscalene block group during the early postoperative period up to 6 hours. However, beyond 8 hours up to 24 hours, pain scores were comparable between both groups. The mean time to first rescue analgesia was longer in Group IS compared to Group SA, indicating a relatively prolonged duration of analgesia with interscalene brachial plexus block. Despite this, total analgesic consumption within the first 24 hours was comparable between both groups. With regard to safety outcomes, respiratory-related complications including respiratory discomfort and transient diaphragmatic paresis were observed more frequently in Group IS, whereas these complications were minimal in Group SA. Other complications such as nausea, vomiting, and neurological symptoms were comparable between the groups.

Table 1: Combined demographic profile of patients in the study groups

Parameter	Category	Group SA (n=40)	Percentage (%)	Group IS (n=40)	Percentage (%)
Age group (years)	18–30	8	20.0	7	17.5
	31–40	12	30.0	13	32.5
	41–50	11	27.5	10	25.0
	51–60	7	17.5	8	20.0
	>60	2	5.0	2	5.0
Gender	Male	28	70.0	27	67.5
	Female	12	30.0	13	32.5

BMI category	<18.5	3	7.5	2	5.0
	18.5–24.9	19	47.5	20	50.0
	25–29.9	13	32.5	12	30.0
	≥30	5	12.5	6	15.0

Table 1 shows that the distribution of patients based on age, gender, and BMI was comparable between both groups.

Table 2: Duration of surgery in the study groups

Duration of surgery (minutes)	Group SA (n=40)	Percentage (%)	Group IS (n=40)	Percentage (%)
<60	6	15.0	5	12.5
60–90	18	45.0	17	42.5
91–120	12	30.0	13	32.5
>120	4	10.0	5	12.5

Table 2 shows that the majority of surgical procedures in both groups lasted between 60–90 minutes.

Table 3: Postoperative VAS pain scores at different time intervals

Time interval	Group SA (Mean ± SD)	Group IS (Mean ± SD)
0 hour	1.9 ± 0.6	1.4 ± 0.5
2 hours	2.3 ± 0.8	1.6 ± 0.7
4 hours	2.8 ± 0.9	1.9 ± 0.8
6 hours	3.2 ± 1.0	2.3 ± 0.9
8 hours	3.5 ± 1.1	3.1 ± 1.0
12 hours	3.7 ± 1.2	3.5 ± 1.1
24 hours	3.9 ± 1.3	3.8 ± 1.2

Table 3 shows the mean visual analogue scale pain scores in both groups at different postoperative time intervals.

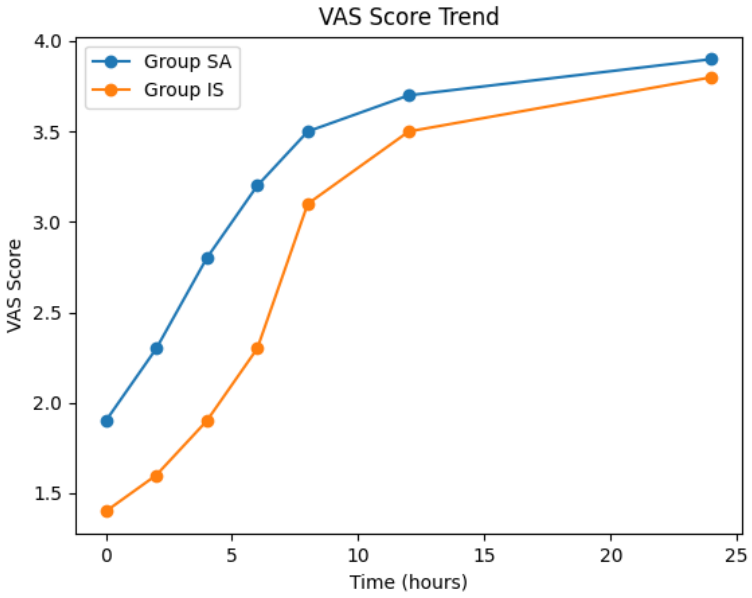


Figure 1: VAS Score Trend

Table 4: Time to first rescue analgesia

Parameter	Group SA	Group IS
Time to first rescue analgesia (hours)	7.1 ± 1.6	8.4 ± 1.8

Table 4 shows the average duration before the requirement of the first rescue analgesic.

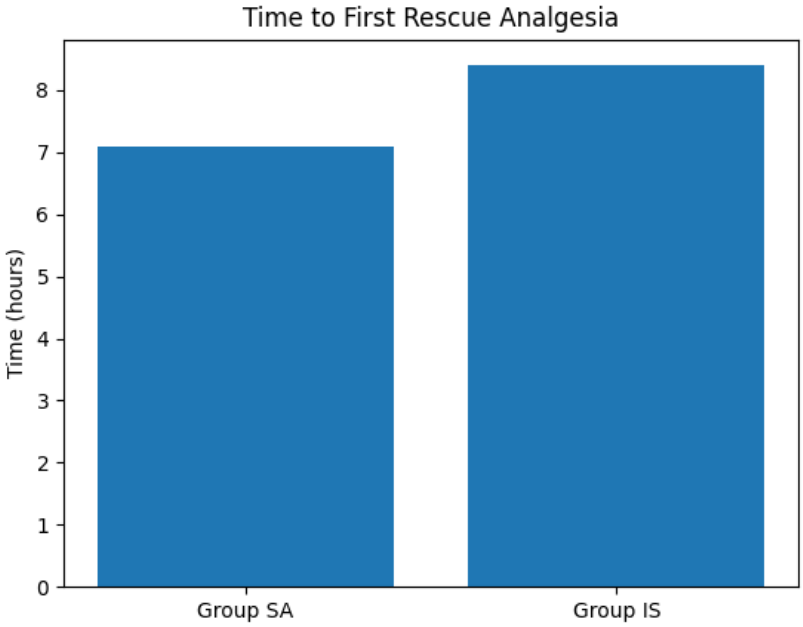


Figure 2: Time to First Rescue Analgesia

Table 5: Total analgesic consumption within 24 hours

Analgesic consumption	Group SA	Group IS
Mean dose equivalent (mg)	118 ± 24	110 ± 21

Table 5 shows the total postoperative analgesic requirement in both groups.

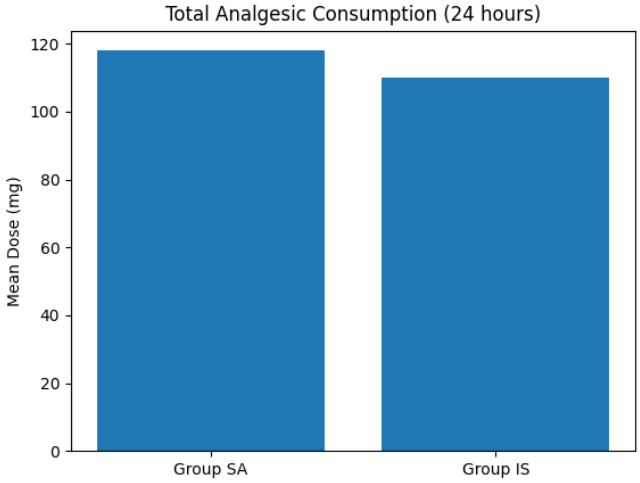


Figure 3: Total Analgesic Consumption

Table 6: Postoperative complications observed in the study groups

Complication	Group SA (n=40)	Percentage (%)	Group IS (n=40)	Percentage (%)
Respiratory discomfort	1	2.5	6	15.0
Nausea/Vomiting	3	7.5	4	10.0
Transient diaphragmatic paresis	0	0	5	12.5
Neurological symptoms	1	2.5	1	2.5

Table 6 shows the incidence of complications in both groups.

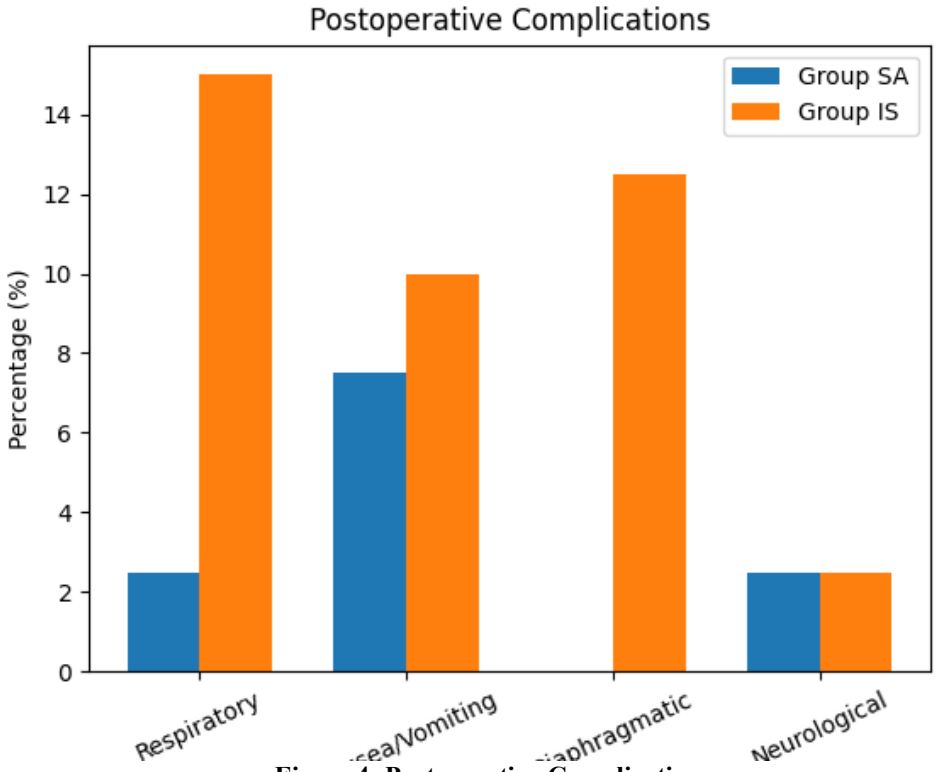


Figure 4: Postoperative Complications.

Table 1: Table 1 shows that the majority of patients belonged to the 31–40 years age group, comprising 12 patients (30.0%) in Group SA and 13 patients (32.5%) in Group IS, followed by the 41–50 years group with 11 patients (27.5%) in Group SA and 10 patients (25.0%) in Group IS. Male predominance was observed with 28 patients (70.0%) in Group SA and 27 patients (67.5%) in Group IS, while females constituted 12 patients (30.0%) and 13 patients (32.5%) respectively. Regarding BMI distribution, the majority of patients were in the normal BMI category (18.5–24.9), accounting for 19 patients (47.5%) in Group SA and 20 patients (50.0%) in Group IS, followed by overweight category (25–29.9) with 13 patients (32.5%) and 12 patients (30.0%) respectively. These findings indicate that both groups were comparable in baseline demographic characteristics.

Table 2: Table 2 shows that the majority of surgical procedures lasted between 60–90 minutes, comprising 18 patients (45.0%) in Group SA and 17 patients (42.5%) in Group IS. Procedures lasting 91–120 minutes were observed in 12 patients (30.0%) in Group SA and 13 patients (32.5%) in Group IS. Shorter procedures (<60 minutes) were less common, seen in 6 patients (15.0%) and 5 patients (12.5%) respectively, while longer procedures (>120 minutes) were least frequent, accounting for 4 patients (10.0%) in Group SA and 5 patients (12.5%) in Group IS. This indicates comparable distribution of surgical duration between both groups.

Table 3: Table 3 shows that postoperative VAS pain scores were consistently lower in Group IS during the early postoperative period. At 0 hours, the mean VAS score was 1.9 ± 0.6 in Group SA compared to 1.4 ± 0.5 in Group IS. At 2 hours, scores were 2.3 ± 0.8 versus 1.6 ± 0.7, and at 4 hours, 2.8 ± 0.9 versus 1.9 ± 0.8 respectively. At 6 hours, the scores were 3.2 ± 1.0 in Group SA and 2.3 ± 0.9 in Group IS. However, from 8 hours onward, the difference reduced, with scores at 8 hours being 3.5 ± 1.1 and 3.1 ± 1.0, at 12 hours 3.7 ± 1.2 and 3.5 ± 1.1, and at 24 hours 3.9 ± 1.3 and 3.8 ± 1.2 respectively. This demonstrates that interscalene block provided superior early analgesia, while both techniques showed comparable pain control in the later postoperative period.

Table 4: Table 4 shows that the mean time to first rescue analgesia was longer in Group IS (8.4 ± 1.8 hours) compared to Group SA (7.1 ± 1.6 hours), indicating a prolonged duration of analgesia with interscalene brachial plexus block.

Table 5: Table 5 shows that the mean total analgesic consumption within the first 24 hours was slightly lower in Group IS (110 ± 21 mg) compared to Group SA (118 ± 24 mg). However, the difference was marginal, indicating comparable overall analgesic requirements between both groups.

Table 6: Table 6 shows that respiratory discomfort was observed in 1 patient (2.5%) in Group SA compared to 6 patients (15.0%) in Group IS. Nausea and vomiting occurred in 3 patients (7.5%) in Group SA and 4 patients (10.0%) in Group IS. Transient diaphragmatic paresis was not observed in Group SA (0%), whereas it was present in 5 patients (12.5%) in Group IS. Neurological symptoms were equal in both groups, seen in 1 patient (2.5%) each. These findings indicate a higher incidence of respiratory-related complications in the interscalene block group.

Overall, the compiled results demonstrate that while interscalene brachial plexus block provides better early postoperative analgesia and slightly prolonged duration of pain relief, the suprascapular–axillary nerve block offers comparable overall analgesic efficacy with a

significantly lower incidence of respiratory complications, making it a safer alternative in selected patients.

Figure 1: Line graph showing postoperative VAS pain scores at different time intervals. Group IS demonstrates lower pain scores during the early postoperative period up to 6 hours, while scores become comparable between both groups thereafter.

Figure 2: Bar graph showing mean time to first rescue analgesia. Group IS shows a longer duration before requirement of rescue analgesia compared to Group SA.

Figure 3: Bar graph depicting total analgesic consumption within 24 hours. Both groups show comparable analgesic requirements with slightly lower consumption in Group IS.

Figure 4: Clustered bar graph illustrating postoperative complications. Respiratory complications and diaphragmatic paresis are more frequent in Group IS, while other complications are comparable between groups.

DISCUSSION

Effective postoperative analgesia is an important aspect of the perioperative care of patients undergoing arthroscopy of the shoulder. Although minimally invasive at the time of shoulder arthroscopy (as opposed to open shoulder surgery), significant postoperative pain may occur from extensive shoulder joint capsule manipulation, rotator cuff and surrounding soft tissues. Insufficient analgesia may result in delayed mobilization, prolonged hospital stay and affect functional recovery[9,10]. In addition to enhancing pain control after shoulder surgery, regional anaesthesia will also allow for a decreased requirement for systemic opioids[11]. Historically, the technique of choice for shoulder surgery has been the interscalene brachial plexus block, as it produces the most extensive area of numbness (i.e., produces a more dense block) because it is an interscalene block of the upper roots of the brachial plexus that innervate the shoulder joint. Although the interscalene block has an excellent analgesic effect on the shoulder region, there are some disadvantages, such as the potential for phrenic nerve involvement (which results in ipsilateral diaphragmatic paralysis and may create respiratory issues if there are pre-existing pulmonary problems). For this reason, some alternative regional analgesic techniques had to be developed[12,13]. The suprascapular nerve and axillary nerve together supply most of the sensory innervation to the shoulder joint. The suprascapular nerve derives a major portion of its sensory supply from the posterior and superior aspects of the shoulder joint to stage of the surgery, while the axillary accompanies the anterolateral capsule.Blocking these 2 nerves represents a method of achieving shoulder analgesia without resorting to a complete brachial plexus block while still disabling both nerves that primarily transmit pain from the shoulder[14,15]. In the present study, demographic factors of age, sex distribution, and body mass index were comparable between the 2 groups. This balance indicates that the 2 groups were similar, and the differences in the analgesic results between the 2 groups were probably due to the resort to regional anesthesia[16]. Post-operative pain was less in patients receiving interscalene brachial plexus block almost immediately. It may be due to the fact that the block renders a wider sensory field as multiple branches of the brachial plexus supplying the shoulder region are anesthetized[17]. However, as the post-operative period progressed, the pain scores became comparable between the 2 groups, indicating that the combined suprascapular and axillary nerves are probably capable of giving analgesia that is comparable to that achieved by interscalene block as these are probably the 2 nerves that supply the bulk of the sensory innervation of the shoulder joint[18]. Also, the duration of analgesia or the time before the first requirement of rescue analgesic medication was a little longer in those who were given interscalene block, but the difference between the two blocks was not statistically significant. Both seemed to provide satisfactory analgesia for a major part of the post-operative period[19]. The total analgesic requirement within the first post-operative day was similar between the groups and indicated the effectiveness of both techniques at reducing post-operative pain and the need for further analgesic requirements. Of interest in the present study was the difference (higher incidence) of block complications like respiratory discomfort and transient diaphragmatic paresis which was more in the patients who were given interscalene block[20]. This may be attributed to the simple physiological principles of the interscalene block where the block is so close to the phrenic nerve that the diaphragm is almost always involved. The suprascapular and axillary nerve block combination created lower respiratory complications probably due to the fact that blocks at a distal level do not involve the roots of the brachial plexus in the neck which consequently protects again the involvement of the phrenic nerve[21].

This feature makes this technique reasonable and attractive in cases where the lung function is compromised or where there is the possibility of respiratory complications. The other reason for the increasing application of selective peripheral nerves has been the increasing application of ultrasound guided regional anaesthesia technique, along with the knowledge of anatomy that enhances location of the nerves such that complications are reduced**.**

CONCLUSION

We have shown that both suprascapular nerve block with axillary nerve block, and interscalene brachial plexus block provide adequate analgesia after shoulder arthroscopy. The interscalene block produced slightly better pain relief in the early postoperative period and also provided analgesia of slightly longer duration and ensuring a more potent analgesic effect during the first 24 hr after surgery. Use of the suprascapular with axillary nerves block results in a similar quality of postoperative pain relief with similar demands for analgesic, and had fewer respiratory side effects. This is a significant advantage in patients who may already be susceptible to respiratory complications due to limited pulmonary reserve from the surgical procedure. In view of these findings, a combination of suprascapular and axillary

blocks can be regarded as a safe and effective alternative to interscalene brachial plexus blocks in providing postoperative analgesia for shoulder surgery. These techniques provide analgesia to the shoulder joint while minimizing the complications associated with blockade of the proximal brachial plexus. Further larger and more prolonged studies may elucidate the place for selective peripheral nerve blocks to the shoulders in anaesthesia and analgesia of shoulder surgery.

Limitations of the Study

There are certain limitations of our study which should be kept in mind while interpreting the results. The study was undertaken in a single tertiary care center and multicentric studies involving larger patient population would hold stronger evidence for the comparative effectiveness of the two techniques of regional anesthesia.

Though adequate for comparison, the sample size of our patient population was limited and studies involving larger sample population would provide more statistical power and better delineation of rare complications associated with the regional blocks.

We evaluated the patients only for the first 24 hours postoperatively and follow up over a longer postoperative period may provide additional information regarding prolonged analgesic effects, late complications and functional recovery.

Other limitations were that we focused mainly on pain scores and analgesic consumption as outcome parameters. Incorporation of other outcome parameters like patient satisfaction, functional recovery of the shoulder and time to rehabilitation may enhance clinical relevance of the findings.

Future Scope

Future studies might be multicentre randomized trials with larger numbers for more thorough testing of some of the findings in our study. Dosing studies comparing different dilutions of local anesthetics, volumes and adjuncts may help us titrate an analgesic technique for shoulder surgery. Patient satisfaction, quality of rehabilitation and long term functional recovery may tell us more about the clinical benefit of selective peripheral nerve blocks. Ultrasound guided regional anaesthesia may further increase the safety and efficacy of targeted nerve blocks for shoulder surgery.

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