

Comparison between Interscalene Block and Combined Suprascapular and Axillary Nerve Block as Postoperative Analgesia in Arthroscopic Shoulder Surgery.

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Abstract

Background: Despite its minimally invasive nature, arthroscopic shoulder surgery is often associated with severe postoperative pain in patients which limits the initial recovery and rehabilitation. This is difficult to manage without large dose of opioids. The suprascapular nerve block combined with axillary nerve block may provide an efficacious alternative to interscalene block for shoulder arthroscopy. The aim of this study was to compare interscalene block with combined suprascapular and axillary nerve block in shoulder arthroscopy for postoperative analgesia. **Patients and methods:** The study was conducted in 60 patients aged between 25 -50 years belonging to ASA grade I and II. The patients were divided in two groups of 30 each. The nerve block was guided by ultrasound. Visual analog score was assessed at PACU and 4,6,12 and 24 h postoperatively. The patients were compared for postoperative pain, patient satisfaction and any complications. **Results:** The two groups were compatible in age, sex, weight, physical status and duration of surgery. Patient satisfaction was similar in both groups and not statistically significant. Postoperative pain assessment showed no statistically significant differences between two groups as regards to VAS and requirement for analgesia. The incidence of complications was significantly higher in interscalene block group compared with shoulder block group. **Conclusion:** Both techniques provide similar postoperative analgesia but the higher incidence of complications in interscalene group made combined suprascapular and axillary nerve block superior for use in shoulder arthroscopic surgery.

Key words: Arthroscopic shoulder surgery, interscalene block, suprascapular nerve block.

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I. Introduction

Although shoulder surgery is considered minimally invasive, it is associated with severe intraoperative and postoperative pain which has a very high incidence [1]. It is often significant enough to interfere with initial recovery and rehabilitation [2]. Analgesic techniques, such as intra-articular injection of local anesthetics, parenteral opioids, brachial plexus block, and suprascapular nerve block have been used with varying effectiveness, but not without side effects [3-6]. This pain is difficult to manage without large dose opioids which may result in adverse reactions such as nausea, dizziness, sedation and respiratory depression [3]. So a multimodal analgesic approach and complementary analgesic techniques should be considered to minimize the postoperative opioid requirement. For shoulder arthroscopy regional anesthesia is better than general anesthesia because of the extended postoperative analgesia and rapid recovery towards discharge [7-9]. Borgeat and EkatoDRAMIS reported that GA with a regional block reduces intraoperative anesthetic requirements resulting in rapid recovery. The authors further reported that the pain may be exacerbated by movement during rehabilitation [10].

Interscalene block has traditionally been used to control the pain following shoulder surgery and is associated with lower pain scores and less requirement of rescue analgesia [6]. Although rare, this technique is associated with well documented adverse effects including temporary blockade of phrenic nerve which can result in respiratory distress in patients with other predisposing factors such as pulmonary disease, obesity and phrenic nerve palsy [11-12]. These potential side effects and other complications prompted several authors to seek options to minimize it.

The shoulder joint and associated structures are innervated by five nerves. Of these the suprascapular nerve carries the most extensive supply (70%), a lesser amount travels via the axillary nerve whereas the lateral pectoral, musculocutaneous and subscapular nerves are responsible for only minor contributions [2]. On the

basis of this fact the combined block of suprascapular and axillary nerve was proposed to provide postoperative analgesia for shoulder surgery as a safe alternative to interscalene block [2]. The use of ultrasound provides better visualization and localization of these nerves resulting in successful blockade with fewer complications [13-15]. In previous studies, this combined block was reported to be a safe and effective technique for postoperative analgesia for shoulder arthroscopy [2, 16, and 17].

The aim of this prospective randomized study was to compare the combined blockade of the suprascapular and axillary nerves with interscalene block using ultrasound guidance and assess the postoperative analgesia, patient satisfaction and incidence of complications.

II. Material and methods

The institutional ethical committee approved the study protocol and all the patients signed the informed consent. Sixty patients scheduled for arthroscopic shoulder surgery aged between 25-60 years having ASA physical status I and II with body mass index less than 35kg/m² were included in this prospective, comparative and randomized study. Exclusion criteria included allergy to local anesthetics, patients with history of diabetic neuropathy or bleeding tendency and infection at the site of injection. Patients on chronic analgesic therapy were also excluded from the study.

In the preoperative visit at least one day prior to surgery, the study protocol was explained to each patient and they were familiarized with the use of visual analog scale (VAS) which consisted of a scale of 0-10 with 0 representing no pain and 10 representing the worst imaginable pain. On arrival to the operating room a multichannel monitor was attached and an i.v. line was secured. All patients received midazolam 1mg and fentanyl 50 microgram. Patients were divided into two groups, the interscalene block group (IS group) and the suprascapular and axillary nerve block group (SA group), each group comprising of 30 patients.

The interscalene block group (IS group) received interscalene block. Patients were placed supine with the head facing away from the side to be blocked. A slight elevation of the bed was given to make the patient more comfortable. This also allowed for better drainage of the neck veins and made them less prominent. The patient was asked to reach for the ipsilateral knee in order to lower the shoulder and provide more space for block performance. A high frequency linear probe was used. Scanning was started in the supraclavicular region just posterior to the clavicle. The subclavian artery and the brachial plexus trunk were identified. The plexus was traced up the neck to the interscalene groove till two or more nerve roots could be identified. The brachial plexus was usually visualized at a depth of 1-3cm. The needle was inserted in plane towards the brachial plexus in a lateral to medial direction. After careful aspiration 15ml of 0.2% ropivacaine was injected using a 5cm 22gauge needle.

The suprascapular and axillary nerve block group (SA group) received suprascapular nerve block with axillary nerve block. Patients were put in sitting position and were asked to put the hand over the contralateral shoulder. A linear high frequency probe was placed in the supraspinous fossa and scanning was done from medial to lateral side to identify the suprascapular nerve which lies in close proximity with the suprascapular artery in between the suprascapular and the spinoglenoid notches. A 23G Quincke spinal needle was inserted in plane in a mediolateral direction and 10ml of 0.2% ropivacaine was injected slowly under visualization. For the axillary nerve block the shoulder was rotated 45⁰ inwards and the elbow flexed at 90⁰ while the hand rested on the knees. A high frequency linear probe was placed parallel to the longitudinal axis of the shaft of the humerus and the axillary nerve was located in the quadrilateral space in close relation to the posterior circumflex humeral artery. An inplane approach is used and needle is advanced from the cephalad end. 5ml of 0.2% ropivacaine was injected. All the patients received general anesthesia with propofol 2-2.5mg/kg and atracurium 0.5mg/kg and were intubated following which controlled ventilation was started. For maintenance of anesthesia we used isoflurane (1-1.5%) in 50% nitrous oxide. Patients also received i.v. paracetamol 1gm 15-20min prior to the end of surgery. At the end of surgery neuromuscular blockade was reversed and patients were extubated.

VAS score was assessed at 0, 4, 6, 12 and 24 hr postoperatively. At VAS >3 patients received rescue analgesia i.e., tramadol 50mg i.v. repeated again if required after 30 min. The time to first analgesic request was noted and total analgesic consumed in 24hrs was recorded. Patient satisfaction was assessed the next day on a scale of 1-10 where a score of 1 indicated strongly dissatisfied and score of 10 indicated strongly satisfied. Any complications during and after the performance of the block (pneumothorax, Horner's syndrome, hoarseness of voice, dyspnea, weakness and paraesthesia in the arm) were recorded. Also postoperative nausea and vomiting was recorded.

III. Results

The study was successfully conducted on all the 60 patients and there was no perioperative protocol deviation. The demographic data, type of surgery, evaluated variables are shown in table 1. The demographic data reveals that both the groups were comparable in age, BMI, gender distribution, ASA physical status and duration of surgery (Table 1).

Table 1. Clinical data, physical status, of patients and type of surgery

Data	IS group (n=30)	SA group (n=30)	P value
Age (Yrs)	54.07±12.05	51.7 ±14.89	0.417
BMI	28.15± 4.13	25.78 ± 4.11	0.263
ASA I/II	10/20	14/16	-
Gender Male/Female	19/11	16/14	0.621
Duration of surgery	100±27	95 ±32	0.273
Surgery- instability/cut injury	4/26	5/25	0.877

The pain intensity score (Table 2) reveals that pain increased with hours. In both the groups peak was observed six hours after operation. Post operative pain assessment as reflected in VAS showed no statistically significant difference between two groups. VAS remained less than 3 until the sixth hour postoperatively in both the groups. After sixth hour each of the six patients in the IS group required a dose of rescue analgesia, whereas in the SA group eight patients each received the same dose of rescue analgesia with a subsequent decrease in the VAS. A second dose of rescue analgesia was needed in between the 12th and 24th hour postoperatively for eight patients in the IS group and 10 patients in the SA group. Only one patient (3.33 %) at T6 and two patients (6.66 %) at T12 reported moderate to severe pain in SA group. In IS group one patient at T6 (3.33%) and three patients (10%) at T12 reported this type of pain.

Table 2. Comparison of Visual Analogue Score (VAS) between two groups.

VAS	IS group (n=34)	SA group (n=34)	P value
PACU	0.535 ± 0.179	0.579	0.049
4 h	1.642 ± 0.454	1.760	0.034
6 h	3.172 ± 0.568	2.971	0.019
12 h	3.401 ± 0.551	3.270	0.038
24 h	3.251 ± 0.474	3.067	0.012

Table 3. Patients required rescue dose of analgesia

Rescue analgesia	IS group	SA group
6-12 h	6 (20.00)	8 (26.66)
12-24 h	8 (26.66)	10 (33.33)
Not needed	16 (53.33)	13 (43.33)

P value 0.572. Data are shown as numbers and as percent

There was no significant difference in the time to first analgesia request. It was 10 hours in IS group and 9 hours in SA group. The total dose of rescue medication varied between 50 and 150 mg tramadol within 24 hours in both groups. There was no significant difference in the total consumption of tramadol in two groups of study. Satisfaction with the technique was similar in both groups and not statistically significant (Table 4). Five patients in IS group and three patient in SA group reported they would undergo the same anesthetic technique again if need arises. Patients were discharged 24 hours after surgery and referred for passive elbow and hand physiotherapy.

Table 4. Time to first analgesic request, total analgesic consumption and patient satisfaction.

Parameters	IS group (n=30)	SA group (n=30)	P vlue
Time to first analgesic request	10 (8-11)	9(8-10)	>0.001
Total tramadol consumption(24 hrs)	100mg	100 mg	>0.001
Patient satisfaction	8(8-10)	7(7-9)	>0.001

In the IS group seven patients developed weakness in the arm postoperatively. This difference was statistically significant. Other complications including Horner's syndrome, hoarseness of voice, difficulty in breathing, paresthesia in the arm were not significantly different. No patient developed pneumothorax. The incidence of nausea and vomiting was 6.66 % in SA and 10 % in IS with no significant difference.

Table 5. Complications in the studied groups

Complications	IS group (n=30)	SA group (n=30)	P value
Pneumothorax	0	0	-
Horner's Syndrome	3	0	0.114
Hoarseness of voice	2	0	0.131
Difficulty in breathing	1	0	0.360
Weakness in the arm	7	0	<0.001
Paresthesia in the arm	1	0	0.360
Nausea/Vomiting	3	2	0.120

IV. Discussion

Arthroscopic shoulder procedures cause severe intra operative and postoperative pain which ranges between 30-70% and is reported to interfere with the initial recovery and rehabilitation [1, 18, and 19]. Pain control is, therefore, a challenge during shoulder surgery and one of the major factors that can influence hospital discharge. By eliminating pain we can reduce the mean length of hospital stay after GA. Several analgesic techniques have been advocated with varying effectiveness. Although interscalene block has been considered one of the most reliable and effective methods of postoperative analgesia in arthroscopic shoulder surgery, it is associated with significant complications [7,20,21]. In previous studies combined blockade of suprascapular and axillary nerve was reported to be a safe and effective technique for intraoperative anesthesia and postoperative analgesia for shoulder arthroscopy [2, 16, 22-24].

The current clinical study was designed to compare the combined blockade of the suprascapular and axillary nerves with interscalene nerve block and assess the quality of analgesia, incidence of complications, patient satisfaction, and duration of analgesia and acceptability of technique. Ultrasound used as guidance for the blockade, facilitates the direct visualization and localization of neural structure which allows better local anesthesia disposition around the roots of the plexus and the peripheral nerves, thus improving the success of block performance and reducing complications of each blockade [25-27].

The present study used suprascapular and axillary nerve blocks as an alternative to interscalene block and found that it was safe and effective in producing postoperative analgesia with minimal complications. Postoperative pain assessed by the VAS score showed no significant statistical difference until the sixth hour postoperatively. It was noticed that the mean VAS score remained less than 3 until the sixth hour postoperatively. After six hours six patients in the IS group and eight patients in the SA group required a dose of rescue analgesia with a subsequent decrease in the mean VAS score. A second dose of rescue analgesia was needed in between 12th and 24 hour postoperatively in eight patients in IS group compared with 10 patients in SA group. Hala and Amani [22] and Abdalla [23] reported increase in VAS after 6 hours of the shoulder arthroscopic procedure requiring rescue analgesia. Lee et al [28] reported that VAS score of the patients in the interscalene block group was significantly lower than that of the patients in the suprascapular and axillary nerve block group. The authors concluded that combined suprascapular and axillary nerve block is a good alternative to interscalene block as a postoperative method of analgesia. These results were confirmed by other authors [29]. Checcucci et al [2] reported a low VAS score especially at 12 and 24 hour in patients with combined suprascapular and axillary nerve blocks. Another study showed that in the PACU and at the 4H follow-up, significantly less pain on movement was noticed in the interscalene block group with no difference in the total paracetamol consumption [6].

The present study showed a good level of patient satisfaction in the IS and SA groups with no statistically significant difference. Similar to the results of the current study, Singelyn et al. [6] reported that patient satisfaction in the interscalene block was 87%. Singh et al in their study demonstrated that patient satisfaction was 99.06% with the interscalene block [30]. In another study it was found that there were no significant differences between interscalene block and combined suprascapular and axillary nerve block as regards the patient satisfaction [22-24]. In contrast to the current study, Lee et al. [28] reported that the degree of patient satisfaction of the patients in the interscalene block group was significantly higher than those in the combined suprascapular axillary nerve group in the recovery room. However the authors are in agreement with the current study, of postoperative evaluations, and found no significant difference in the degrees of satisfaction between the two groups. Checcucci *et al* [2] reported that augmentation of suprascapular nerve block with axillary nerve block produced a high level of patient satisfaction.

In the current study the incidence of complications was significantly higher in the patients under IS group compared with SA group. Interestingly the SA group in this study showed minimal complications during and after block performance compared with the IS group. These results were confirmed by several previous studies [6, 16, 17, 22, and 23]. In contrast, the IS, SA groups showed a lower incidence of postoperative nausea and vomiting. These results were in accordance with the results of Al-Kaisy *et al.* [32] and Laurila *et al.* [33]. Similar observations have also been made by Abdalla Waleed [23] and Hala and Amani [22]. Patricia et al [24] found that there were no complications during and after blockades in both groups, confirming the safety interscalene and selective techniques involving suprascapular and axillary nerves. Simeoforidou et al reported that 33.33 percent patients complained of Horner's syndrome [34]. Similar to the results of the present study complications such as Horner's syndrome, hoarseness of voice, major weakness of upper arm and dyspnea were recorded in patients under interscalene block [23]. Pitombo et al [31] found that interscalene block resulted in paralysis of shoulder girdle, upper arm, and even extended to the forearm and hand. Also, Barber [18], Checcucci *et al.*[2], and Feigi *et al.* [36] demonstrated that there were no complications with shoulder blockade during the block performance, such as pneumothorax, suprascapular nerve injury, and hematoma.

In the present study, Horner's syndrome and weakness in the upper limb were the most common complications in the IS group, whereas other complications were few and temporary. Singelyn *et al.* [37]

reported Horner's syndrome and hoarseness as complications in interscalene block. Other studies [6, 36] found that extensive paralysis of the muscles of the upper limb was considered a sign of effective ISB, but it causes discomfort to the patient.

V. Conclusion

Both study groups provide similar postoperative analgesia but the higher incidence of complications in interscalene group made combined suprascapular and axillary nerve block superior for use in shoulder arthroscopic surgery. From the studies it is also suggested that combined suprascapular and axillary nerve block can offer a safe alternative to interscalene block as post operative analgesia.

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