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A COMPARATIVE STUDY BETWEEN INTERSCALENE BLOCK AND SUPRASCAPULAR PLUS AXILLARY NERVE BLOCK IN PATIENTS UNDERGOING SHOULDER SURGERY

Anaesthesiology

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ABSTRACT

The interscalene block is the gold standard for shoulder anesthesia. The suprascapular nerve block combined with an axillary nerve block may provide an efficacious alternative to the interscalene nerve block for shoulder surgery. To compare interscalene block with suprascapular plus axillary nerve block for shoulder surgery in terms of quality of anaesthesia, duration of analgesia and, associated complications.

Seventy one patients were randomly allocated in two groups to receive either interscalene block (Group IG, number of patients =35) or suprascapular plus axillary nerve block (Group SG, number of patients = 36). Onset of block, quality of block, failure rate and incidence of complications were observed. Postoperative pain was assessed by Visual Analog Scale. Score ≥4 was considered as significant pain and, rescue analgesic injection tramadol 100 mg was administered.

Onset of sensory block was 17.67±6.11 min and 15.29±1.72 min in group SG and IG respectively. Similarly duration of block was 247.61±78.46 min (Group SG) and 268.11±24.78 min (Group IG) (p=0.1332). Majority of patients had grade III motor block in group IG (74%) and grade II in group SG (89%). Three patients had either partial or complete failure of block in SG group. Interscalene block provided longer duration of postoperative analgesia.

Both interscalene block and suprascapular plus axillary nerve block provide effective anaesthesia and analgesia for shoulder surgery. Although quality of block is better following interscalene block; suprascapular and axillary nerve blocks are associated with fewer side effects.

KEYWORDS

Shoulder surgery, interscalene block, suprascapular nerve plus axillary nerve block

INTRODUCTION:

During last two decades, there has been an exponential growth in shoulder surgery. Patients posted for shoulder surgery range from young adults with sport injuries to old patients with trauma or arthritic complications. Both arthroscopic and open shoulder surgeries are done under general or regional anaesthesia.[1]

General anaesthesia is associated with several disadvantages such as higher postoperative pain scores, more readmissions and, late discharge.[2,3] Therefore use of regional anaesthetic technique is increasing day by day. It improves quality of postoperative care and permits more sick patients to undergo shoulder surgery.

Inter scalene block is most commonly used regional anaesthetic technique for shoulder surgeries. It is associated with less intraoperative blood loss, reduced postoperative complications, early recovery and early discharge from hospital.[4,5] However search for newer regional technique is continued to prevent unwanted adverse effects such as phrenic nerve palsy associated with inter scalene block. The suprascapular nerve block combined with axillary nerve block has been introduced as an effective alternative to the interscalene nerve block for shoulder anesthesia.[6,7]

Based on these observations present study was designed to compare interscalene block with suprascapular block plus axillary nerve block for patients undergoing shoulder surgery and to evaluate quality of intraoperative block, incidence of complications and postoperative pain.

METHODS:

After obtaining clearance from institutional ethics committee (approval code: MC/KOL/IEC/NON-SPON/427/11-2014), this randomized, prospective and comparative clinical trial was done in patients admitted for shoulder surgery under orthopedics department of Medical College, Kolkata from January 2015 to June 2016. The study was carried out at orthopaedic operation theatre under department of anaesthesiology, Medical College, Kolkata.

Patients with ASA physical status I and II, between 18 to 60 years of age and body mass index < 30 kg/m^2 was included in this study. Patients with known cardiovascular disease (hypertension, ischemic heart disease, valvular heart disease), neuromuscular disease, thyroid disease, diabetes mellitus, hepatic failure, renal failure and, pregnancy were excluded from the study. Local infection, bleeding disorder and allergic to local anaesthetics drug were other exclusion criteria.

Eighty nine patients planned for shoulder surgery were admitted in the institute during the study period. Seventy six patients fulfilled the inclusion and exclusion criteria and primarily enrolled for this study. Four patients were unwilling for regional anaesthesia and surgery was extended beyond shoulder region in one patient, therefore finally study was conducted on seventy one patients. All procedures were performed by the same anaesthesiologist. Patients were randomly allocated in two groups; group IG (35 patients) to receive interscalene block or group SG (36 patients) to receive suprascapular and axillary nerves block.

On the day of operation, patients were premedicated with tab aprazolam 0.5 mg and tab omeprazole 40 mg orally 2 hour before surgery. On arrival in the operation theatre, monitors were attached and intravenous cannulation done for perioperative fluid therapy.

As per the allocated group of patient either interscalene or suprascapular plus axillary nerve blocks were given with the aid of the nerve stimulator connected to 22 gauge, 50 mm long needle.

Interscalene nerve block was given according to the classic approach of Winnie[8]. The interscalene groove was palpated at the level of the cricoid cartilage and C6 vertebra. The needle was directed medially, slightly caudal, and slightly posterior, toward the contralateral elbow.

Suprascapular nerve block was performed according to the Meiers technique[9]. The needle was inserted lateralocaudally, 45° in the coronal plane with a ventral inclination of about 30° at a point approximately 2 cm medial to the posterolateral edge of the acromion and 2 cm cranial to the upper border of the scapular spine until motor response of the supraspinatus and/or infraspinatus muscles was obtained.

Axillary nerve block was performed according to the technique of Price[10]. A line was drawn connecting the anterior edge of the acromion to the inferior angle of the scapula, then a second line was drawn horizontally at its midpoint to represent the level at which the quadrangular space would be identified. The puncture site was at the convergence of the second line with one that began in the posterior edge of the acromion. Needle was advanced slowly until deltoid motor response was obtained.

After appropriate motor response of deltoid, lateral pectoral, biceps or triceps muscle, interscalene group received 39.80 ml of 0.5% levobupivacaine and 0.20 ml epinephrine (1:1000). Suprascapular group received 20 ml of the same solution for each nerve, suprascapular and axillary nerve.

Ten minutes after the injection of the local anaesthetics, sensory and motor blocks was assessed on the operated limb, using the contralateral arm as a control and the procedure was repeated at an intervals of 3 minutes till 22 minutes. Success of sensory blocks was assessed by loss of pin-prick sensation in the innervation sites of respective nerves. Motor block was assessed using the modified Bromage scale; grade 1 = no blocking, grade 2 = unable to abduction and lateral rotation of the arm, grade 3 = complete blockade of the shoulder, arm, and forearm. Blockades were classified as adequate (complete sensory anaesthesia) and inadequate (partial or no loss of sensation). In case of inadequate block, general anaesthesia was administered. Complications or adverse effects were recorded.

Postoperative pain was assessed using the visual analog scale. VAS ≥ 4 was considered as significant pain, injection tramadol 100 mg was administered intravenously and, time was noted as duration of analgesia.

Data analysis was performed using software SPSS version 26. Data were presented in frequency distribution tables for discrete variables or mean and standard deviation for continuous variables. Comparison between variables was performed using the chi-square test for discrete variables or Student t-test for continuous variables. For calculation purposes, pain scores greater than three were considered. The value of $\alpha = 5\%$ was adopted as the level of significance in all statistical tests.

RESULTS:

Seventy six patients were primarily enrolled for this study. Four patients were unwilling for regional anaesthesia and surgery was extended beyond shoulder region in one patient, therefore finally study was conducted on seventy one patients. They were randomly allocated in two groups; supracapular and axillary nerve block group includes 36 patients and interscalene group includes 35 patients.

Demographic profile of two groups of patients was comparable in terms of age, gender, height, weight, body mass index and ASA grades (table 1).

Table 1: Demographic profile of two groups of patients:

S No	Parameters	Group SG (N=36)	Group IG (N=35)	p value
1	Age in yrs (mean±SD)	37.39 ± 11.69	37.14 ± 11.56	0.9971
2	Gender Male/Female ratio	23/13	25/10	0.6138
3	Height in cm (mean±SD)	153.10±3.01	153.17±2.94	0.9213
4	Weight in kg (mean±SD)	50.88±6.25	50.94±6.18	0.9611
5	BMI (mean±SD)	21.64±2.14	21.65±2.13	0.9843
6	ASA I/II	24/12	23/12	0.9329

Onset of sensory and motor blocks was marginally earlier in interscalene group as compared to suprascapular plus axillary nerve block group. Duration of block; sensory as well as motor was more in interscalene group (table 2 and, 3). However these differences were statistically insignificant.

Table 2: Onset, duration and, quality of sensory block in two groups of patients

S No	Sensory block	Group SG (N=36)	Group IG (N=35)	p value
1	Onset of block (minute) Mean±SD	17.67±6.11	15.29±1.72	0.2023
2	Duration of block (minute) Mean±SD	247.61±78.46	268.11±24.78	0.1332
3	Quality of block			
A	Complete No of patients (%)	33 (92%)	35 (100%)	0.2181
B	Partial/ fail No of patients (%)	3 (8%)	0 (0%)	

Complete or partial failure of sensory block was observed in 8% patients of suprascapular group (p value 0.2181).

Table 3: Onset, duration and, intensity of motor block in two groups of patients

S No	Motor block	Group SG (N=36)	Group IG (N=35)	p value
1	Onset of block (minute) Mean±SD	19.37 ± 6.4	18.11 ± 2.68	0.286
2	Duration of block (minute) Mean±SD	160.86 ± 46.94	174.37 ± 16.98	0.1134
3	Quality of block			
A	Bromage Score I No of patients (%)	3 (8%)	1 (3%)	0.001
B	Bromage Score II No of patients (%)	32 (89%)	8 (23%)	
C	Bromage Score III No of patients (%)	1 (3%)	26 (74%)	

Degree of motor block was more intense in interscalene group than suprascapular + axillary group and difference was statistically highly significant ($p<0.001$).

Table 4: Severity of postoperative pain by VAS score in two groups:

Postoperative period	SG group VAS (Mean±SD)	IG group VAS (Mean±SD)	Mean difference	t value	p value
0 Hour	0.417 ± 0.638	0.371 ± 0.492	0.046	0.34	0.7352
4 Hour	4.16 ± 0.759	1.63 ± 0.777	-2.53	-14.98	< 0.0001
6 Hour	1.61 ± 0.549	1.65 ± 0.683	0.04	0.272	0.7862
12 Hour	2.33 ± 0.676	4.13 ± 0.59	2.1	13.93	< 0.0001
24 Hour	2.53 ± 0.506	4.06 ± 0.655	1.53	13.547	< 0.0001

VAS was 4.16 in suprascapular group 4 hour after surgery while it remained less than 4 until 12 hour in interscalene group. Duration of analgesia was significantly more in interscalene group.

Incidence of complications such as phrenic nerve palsy, horner's syndrome and recurrent laryngeal nerve palsy was observed in interscalene group (table 5). Endotracheal intubation and ventilatory support were required in patients developed phrenic nerve palsy following interscalene group. General anaesthesia was required in 3 patients of SG group due to partial or complete failure of block.

Table 5: Incidence of complications following regional block and requirement of rescue procedures in two groups of patients

S No	Complications	Group SG No of patients (%)	Group IG No of patients (%)	p value
1	Phrenic nerve palsy	0 (0%)	2 (5.71%)	<0.001
2	Horner's syndrome	0 (0%)	18 (51.4%)	
3	Recurrent laryngeal nerve palsy	0 (0%)	7 (20%)	
4	Rescue procedures: Intubation GA and ventilation	3 (8.3%)	2 (5.71%)	

DISCUSSION:

Shoulder surgical procedures can be open surgery or arthroscopic surgery. Commonly used open surgical procedures are repair for instability, acromioplasty, fracture fixation and shoulder arthroplasty. Shoulder arthroscopy includes diagnostic arthroscopy, acromioplasty, stabilization of the glenohumerol joint and, rotator cuff repairs. Goal of anaesthesia for shoulder surgery are to provide adequate conditions for surgery and optimum postoperative analgesia. General and regional anaesthesia are equally good to achieve optimum intraoperative

conditions such as intraoperative analgesia and muscular relaxation. However general anaesthesia alone often results in poor postoperative analgesia and high opioid consumption.[3] Regional anaesthesia is more preferred technique for shoulder surgery either as a sole anaesthetic technique or it can be combined with general anaesthesia.

Interscalene block of brachial plexus is a popular and easy technique for shoulder surgeries but, associated with several risk factors. Suprascapular along with axillary nerve blocks have been used as a suitable alternate technique for shoulder surgery. Present study was designed to compare these two techniques in terms of suitability, efficacy, success rate and potential complications.

Eighty nine patients were admitted in department of orthopedics, Medical College, Kolkata for shoulder surgical procedures from January 2015 to June 2016. On the basis of exclusion and inclusion criteria, seventy six patients were primarily recruited for this study. Further, four patients were unwilling for regional anaesthesia and surgery was extended beyond shoulder region in one patient and general anaesthesia was administered. Finally study was conducted on seventy one patients. Patients were randomly allocated in two groups; group IG (35 patients) to receive interscalene nerve block or group SG (36 patients) to receive suprascapular and axillary nerves block. Patients belong to interscalene group and suprascapular plus axillary group were compared in terms of age, sex, weight, body mass index and ASA grading and found no statistical difference (table 1).

Brachial plexus block by interscalene approach is the most appropriate block to provide anaesthesia and analgesia for shoulder surgery. Important landmarks for interscalene block was proposed and subsequently modified by Winnies and made this block popular[8]. Interscalene block is commonly performed in awake patients and same technique was followed in this trial. Suprascapular nerve block has been used as an alternative to interscalene block, where it is technically not possible or contraindicated. Suprascapular nerve supplies only a portion of shoulder joint and therefore quality of block is inferior to interscalene block. In this study axillary nerve and suprascapular nerve were blocked to provide complete anaesthesia in shoulder region and efficacy was compared with interscalene block.

Onset of sensory and motor block was maginally quicker in interscalene group than suprascapular and axillary group but difference was statistically insignificant (table 2 and 3). Dhir S et al[11] also found that onset of sensory block was later in suprascapular and axillary block (18.3310.4 min) than in interscalene block (12.56.45min). Quicker onset following interscalene block may be due to the deposition of drug directly at the root level of brachial plexus; whereas, in suprascapular and axillary blocks; drug is deposited at the cord and branch level of the brachial plexus, leading to delay in onset of the block. Duration of sensory and motor block was more in interscalene group but again it was not statistically significant (table 2 and 3). As per this trial, both the techniques are same in terms of onset and duration of block.

Motor block was more intense in interscalene group. Majority patients had Bromage grade III motor block in interscalene group while suprascapular and axillary group had grade II block (table 3). Patrícia Falcao Pitombo et al[6] found grade II motor block in 94.12% and grade I in 5.88% of patients in suprascapular group. In interscalene group 58.82% patients achieved grade III motor and 41.18% grade II motor block.

Three patients of suprascapular and axillary nerve block group had either inadequate or complete failure of block. General anaesthesia was required to complete the surgery. Interscalene block was 100% successful in this series. Liu et al[12] also observed 100% success rate of interscalene block and 99.7% success rate of suprascapular nerve and axillary nerve block. The suprascapular nerve is responsible for supplying 70% of sensory and motor coordination, which includes the upper, medial, posterior joint regions, posterior capsule, acromioclavicular joint, subacromial bursa, coracoclavicular ligament and, variably, the skin around these regions[7]. The axillary nerve complements the main innervation, positioned laterally to the radial nerve and entering the quadrangular space, where it divides into two branches; the anterior branch innervates the middle and anterior portion of the deltoid muscle and the posterior branch innervates the teres minor and the posterior fibers of this muscle and terminates as the lateral superior cutaneous nerve[9,13]. Compared to the interscalene blockade, which blocks the entire shoulder girdle and upper limb, the selective nerve block is limited to the supraspinatus, infraspinatus, and teres minor muscles, preserving the arm, forearm, and hand muscles[14]. Subscapularis muscle and the anterior glenohumeral joint capsule, supplied by the subscapular nerve, are not anesthetized by the selective technique.[7] This anatomic background may explain the above finding.

After 4 hour VAS score was 4.16 in suprascapular group while it remained <4 up to 8 hours in interscalene group during immediate post operative period. Similar observations were made by Neuts A et al[7] and interscalene is better technique to provide analgesia during immediate postoperative period.

Incidence of complications such as phrenic nerve palsy, Horner's syndrome and recurrent laryngeal nerve block was observed in interscalene group and in fact three patients needed endotracheal intubation and ventilatory support.

CONCLUSION:

Present study showed that combined suprascapular nerve block and axillary nerve block can be a good alternative for patients at high risk for adverse events associated with interscalene brachial plexus block. However, chances of failure of block are higher in suprascapular and axillary nerve blocks.

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