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COMPARISON OF INTERSCALENE BRACHIAL PLEXUS BLOCK AND COMBINATION OF INTERSCALENE BRACHIAL PLEXUS BLOCK AND SUPRASCAPULAR NERVE BLOCK FOR ANAESTHESIA FOR SHOULDER SURGERIES

Anaesthesiology

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ABSTRACT

Objective- To compare analgesia, degree of motor block and hemodynamic effects of interscalene block with a combination of interscalene block and suprascapular nerve block employed for anaesthesia for shoulder surgeries.

Methods- 46 patients of ASA grade I or II posted for shoulder surgery were divided into two groups of 23 patients each. Group IS received 15 ml local anaesthetic mixture for interscalene brachial plexus block whereas group ISSB received suprascapular nerve block with 5 ml local anaesthetic mixture in addition to interscalene brachial plexus block with 15 ml of similar mixture of local anaesthetic. Heart rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), degree of analgesia and degree of motor blockade were assessed intraoperatively. General anaesthesia was administered in the event of inadequate blockade. Any adverse events were documented.

Results- A combination of interscalene block and suprascapular nerve block was superior to interscalene block alone in terms of degree and duration of analgesia as well as degree of motor blockade for shoulder surgeries without any significant hemodynamic effects in either of the groups.

Conclusion- A combination of interscalene brachial plexus block and suprascapular nerve block is superior to isolated interscalene brachial plexus block for anaesthesia for shoulder surgeries.

KEYWORDS

Analgesia, Motor Block, Anaesthesia, Shoulder Surgeries, Interscalene Block, Brachial Plexus, Suprascapular Nerve Block

INTRODUCTION

Common shoulder procedures include hemiarthroplasty, total shoulder arthroplasty, shoulder arthroscopy, subacromial decompression, and shoulder instability procedures such as rotator cuff repair. There is considerable diversity in the manner in which anaesthetists approach the provision of shoulder surgery. The increasing confidence of anaesthetists in their use of regional anaesthesia for shoulder surgery is allowing more morbid patients access to shoulder surgery, improving the quality of post-operative care, and permitting a wider choice for patients in how they have their surgery.[1]

Only three nerves of the brachial plexus innervate the shoulder. The most proximal of these is the upper lateral brachial cutaneous nerve, a branch of the axillary nerve that innervates the lateral side of the shoulder and the skin overlying the deltoid muscle. the upper medial side of the arm is innervated by both the medial brachial cutaneous and the intercostobrachial cutaneous nerves. In the anterior portion of the arm over the biceps muscle, the skin is innervated by the medial antebrachial cutaneous nerve.[2] The suprascapular nerve provides 70% of the sensory input to the glenohumeral joint and also innervates the infraspinatus and supraspinatus muscles with the remainder largely from the axillary and lateral pectoral nerves.[1] Posterior, superior, and anterior approaches may be used, the most common being the posterior.[3]

For the suprascapular nerve block, the ideal approach ensures blockade of the more proximal branches to the acromion and the subacromial region to maximize coverage. This may be achieved by blocking the nerve in the suprascapular notch.[4]

The interscalene block is the gold standard for shoulder anesthesia and the most commonly used block for shoulder procedures. This approach blocks the brachial plexus at the nerve root or trunk level. Local anesthetic is directed toward C5-C6 nerve roots or the superior trunk. Depending on the volume of local anesthetic used, C7 and even C8 nerve roots may be blocked. The block is especially useful for procedures involving the shoulder, including the lateral two-thirds of the clavicle, proximal humerus, and shoulder joint[5]. The classic approach of Winnie, which is considered the anterior approach, is still commonly performed, especially for single-injection blockade[6]. The technique is performed by palpating the interscalene groove at the level of the cricoid cartilage (C6 vertebra). The needle is directed medially, slightly caudal, and slightly posterior (toward the contralateral elbow) while seeking to elicit a paresthesia in the C5-C6 nerve distribution as the endpoint for injection. The nerve stimulation technique is more commonly used with this approach today, with a relevant motor twitch being the endpoint for injection. Winnie's technique was modified by Meier et al.[7] to reduce complications and to facilitate placement of catheters by entering the skin at 30 degrees and 2-3 cm cephalad to the Winnie approach with the needle directed towards the middle to lateral third of the clavicle. Interscalene nerve blockade (ISB) provides optimal analgesia for shoulder surgery patients; it reduces pain scores for at least 8 h and decreases opioid consumption for between 8 and 12 hours postoperatively[8].

MATERIALS AND METHODS

46 patients undergoing shoulder surgery, aged between 18-80 years, both genders, ASA physical status I – II and with no allergies to the drugs being used were selected for the study. The patients were randomly divided into two groups of 23 patients each, viz. Interscalene Group (Group IS) and combined Interscalene and Suprascapular group (Group ISSB) by computerised randomisation. The Visual Analog Scale (VAS) (0-10, where 0 indicates no pain while 10 corresponds to maximum pain), was explained to the patients during the preoperative visit. After monitoring with electrocardiogram, noninvasive blood pressure, and pulse oximetry, and securing an intravenous access with an 18G cannula, all patients were sedated with 0.03 mg/kg midazolam and anatomical landmarks were marked accordingly in the respective groups in supine position.

Using a 22G, 5cm needle 15 ml local anesthetic containing equivolume mixture of bupivacaine (0.5%) and lignocaine (2%) with adrenaline (1:200,000) interscalene blockade was performed using modified Winnie's technique after eliciting an appropriate motor response of ipsilateral deltoid, lateral pectoral, biceps or triceps muscle group on neurostimulation at frequency 2 Hz, 100s amplitude and 0.5 mA intensity in both groups. In addition, Group ISSB also received suprascapular nerve block with 5 ml equivolume mixture of bupivacaine (0.5%) and Lignocaine (2%) with epinephrine (1:200,000) using a 22G 1.5-inch needle positioned under C-arm guidance in sitting position into the suprascapular notch 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.

Sensory and motor blocks were assessed on the operated limb, using the contralateral arm as a control every 20 minutes till end of surgery. Success of sensory block was assessed by loss of cold sensation in the

innervation sites of respective nerves using cotton ball soaked in spirit and pain was assessed intraoperatively using the visual analog scale (VAS) on a scale of 1 to 10. Motor block was assessed using modified Bromage scale[9] (grade 1 = no blocking; grade 2 = inability of abduction and lateral rotation of the arm; grade 3 = complete blockade of the shoulder, arm, and forearm). Blockades were classified as adequate (defined as complete sensory and motor anaesthesia of the shoulder) and inadequate (defined as partial or complete absence of sensory and/or motor anaesthesia of the shoulder area).

Heart rate (HR), Systolic Blood Pressure (SBP) and diastolic blood pressure (DBP) were recorded at baseline, then every 5 minutes till 20 minutes and thereafter at interval of 20 minutes till the end of the surgery.

In case of failure, suggested by inadequate sensory and/or motor blockade, after premedication with 4 mg ondansetron, 0.2 mg glycopyrrolate and 1 mcg/kg fentanyl, general anaesthesia was administered with 2 mg/kg propofol and vecuronium (0.08 mg/kg) and maintained with isoflurane, 50% nitrous oxide and vecuronium. Complications and/or adverse effects were recorded.

STATISTICAL ANALYSIS

The data was managed in Microsoft Excel spreadsheet. The data were expressed as mean ± SD or as median values. Nominal data were computed using 2 independent sample t-test and nonparametric Mann Whitney test. Ordinal data were computed using the Chi Square test and Fischers exact test. P value less than 0.05 was considered statistically significant.

OBSERVATION AND RESULTS

Cardiovascular stability occurred in both groups, with just difference in diastolic blood pressures between 15 and 40 minutes being statistically significant whereas there was no statistically significant difference in values of heart rate and systolic blood pressure between the two groups. **(Table I, II, III) (Graph I, II)**.

Table I. Comparison of heart rate (beats per minute) in Group IS and Group ISSB

Time	Group IS (n=23)		Group ISSB (n=23)		p value
	Mean	SD	Mean	SD	
0 min	76.61	8.19	77.78	10.67	0.819
5 min	79.61	7.72	79	10.43	0.9118
10 min	80.52	8.88	77.26	11.23	0.4287
15 min	80.61	9.15	74.69	10.72	0.1531
20 min	78.09	8.58	72.22	9.92	0.1531
40 min	78.26	10.18	69.96	10.86	0.0571
60 min	75.26	9.7	69.48	11.25	0.1531
80 min	72.43	10.73	69.52	10.14	0.4608
100 min	70.48	10.31	70.13	11.01	0.9129
120 min	72.13	10.09	69.83	10.59	0.5617
140 min	74.65	9.73	69.96	9.92	0.2789
160 min	76.48	8.76	72.61	9.34	0.3991
180 min	78.96	7.26	75.56	8.72	0.4287

Graph I. Graphical representation of comparison of mean heart rate (beats per minute) in Group IS and Group ISSB

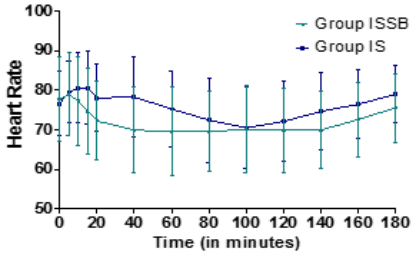


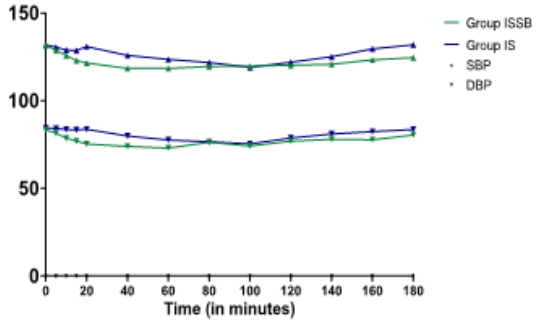
Table II. Comparison of systolic blood pressures in Group IS and Group ISSB

Time	Group IS (n=23)		Group ISSB (n=23)		p value
	Mean	SD	Mean	SD	
0 min	131.78	10.1	131.52	14.44	0.9457
5 min	130.52	11.44	128.61	15.4	0.6983
10 min	128.87	10.64	125.74	12.56	0.5533
15 min	128.69	10.3	122.83	10.62	0.1907
20 min	130.87	10.27	121.48	13.61	0.0538
40 min	125.82	10.64	118.43	11.88	0.1104
60 min	123.56	10.14	118.35	10.81	0.2415
80 min	121.78	10.9	119.52	8.52	0.6983
100 min	118.95	11.47	119.69	10.27	0.8976
120 min	121.95	10.38	120.17	10.71	0.6983
140 min	125.04	10.35	120.74	10.5	0.3516
160 min	129.52	8.83	123.26	10.47	0.1811
180 min	131.87	9.06	124.56	10.16	0.1104

Table III. Comparison of diastolic blood pressures in Group IS and Group ISSB

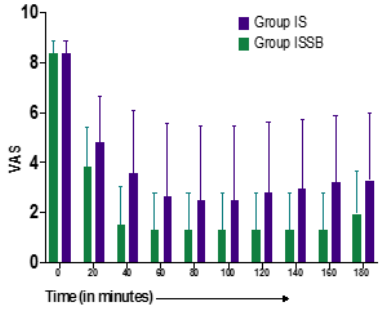
Time	Group IS (n=23)		Group ISSB (n=23)		p value
	Mean	SD	Mean	SD	
0 min	84.39	7.33	83.3	6.79	0.6141
5 min	84.09	6.74	81.43	8.27	0.2841
10 min	83.56	7.25	78.61	6.34	0.061
15 min	83.3	7.33	76.91	5.81	0.0166
20 min	83.65	7.53	75.26	7.57	0.0011
40 min	79.83	7.7	73.96	8.07	0.0238
60 min	77.56	7.75	72.96	6.43	0.0621
80 min	76.52	7.78	76.26	6.61	0.8415
100 min	75.34	8.95	74.13	7.42	0.6141
120 min	78.69	7.93	76.96	5.67	0.5038
140 min	80.96	7.78	77.91	7.07	0.2296
160 min	82.3	6.36	77.65	7.18	0.0621
180 min	83.61	6.9	80.43	5.53	0.2296

Graph II. Graphical representation of comparison of systolic and diastolic blood pressures (mm Hg) in Group IS and Group ISSB



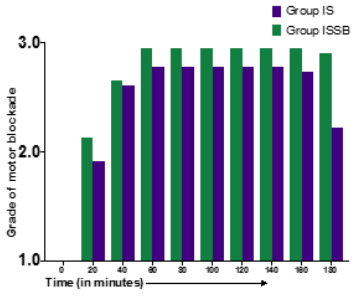
Degree of sensory blockade as assessed by intraoperative VAS scores was significantly more in group ISSB as compared to group IS (p=0.011) **(Graph III).** Mean duration of analgesia assessed into the postoperative period was significantly greater in group ISSB (26.4±1.27 hours) as compared to group IS (20.5±0.77 hours) (p=0.004).

Graph III. Comparison of pain scores (VAS) between Group IS and Group ISSB



In group IS 5 patients (21.74%) achieved partial motor blockade (grade 2) needing conversion to general anaesthesia whereas in group ISSB only 1 patient had grade 2 motor block (4.35%). Adequate motor block (grade 3) was achieved in 18 patients of group IS (78.26%) and 22 patients in group ISSB (95.65%) at 60 minutes which was statistically significant (p<0.001). Also, adequate motor block (grade 3) was achieved earlier in group ISSB (p=0.041) with 15 patients at 40 minutes as compared to 14 patients at 40 minutes in group IS **(Graph IV).**

Graph IV. Comparison of grade of motor blockade between Group IS and Group ISSB



There were no complications (pneumothorax, local anesthetic injection into the epidural space) and/or adverse effects (recurrent laryngeal nerve palsy and stellate ganglion blockade, venipuncture, seizures, or paresthesias) during the blockades.

DISCUSSION

The interscalene brachial plexus block remains the mainstay and current gold standard for analgesia in shoulder surgery. Although rare, the interscalene brachial plexus block can cause certain complications[10]. Significant among these is the temporary block of the phrenic nerve, which can result in respiratory distress in patients with predisposing factors such as pulmonary disease, obesity, and phrenic nerve palsy.

The suprascapular nerve is responsible for supplying 70% of sensory and motor coordination, which includes the upper, medial, and posterior joint regions, posterior capsule, acromioclavicular joint, subacromial bursa, and coracoclavicular ligament and, variably, the skin around these regions[11]. This explains the beneficial effect of this block in respect to shoulder surgeries as evidenced by several studies. Current estimates suggest that 82% and 42% of patients undergoing any type of shoulder surgery and total shoulder arthroplasty in particular, respectively, receive an ISB, with this rate increasing every year[12,13].

In our study the blocks were performed while the subjects were awake under mild sedation as complications with spinal cord lesions have been documented with interscalene block being performed during general anaesthesia.[14,15,16]

In our study, analgesia profile was better in group receiving a combination of interscalene as well as suprascapular nerve block as compared to the group that received interscalene block alone. As evidenced in a randomized control trial comparing interscalene and combined infraclavicular-suprascapular blocks for arthroscopic shoulder surgery by Aliste J et al[17], interscalene block provided non-equivalent (i.e., lower) postoperative pain scores 30 minutes after arthroscopic shoulder surgery.

In our study, the degree of motor blockade was significantly better in the group receiving combined interscalene and suprascapular block as compared to the group receiving only interscalene block. This can be attributed to the significant innervation of the muscles surrounding shoulder joint by the suprascapular nerve which are spared if interscalene block is performed alone. A study by Pitombo PF et al[18] shows that greater degree of motor block is offered in shoulder surgery by suprascapular nerve block than interscalene block.

CONCLUSION

A combination of interscalene brachial plexus block with suprascapular nerve block is superior to isolated interscalene block for anaesthesia for shoulder surgeries.

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