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Original Article

Comparative Study of Lateral Approach and Parascalene Approach of Brachial Plexus Block for Upper Limb Surgeries using Nerve Stimulator

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Abstract

Background: Upper limb surgery previously done under general anesthesia has now been revolutionized with the advent of various regional blocks. The advantages of two approaches - lateral and parascalene for brachial plexus blockade - are discussed in this study and compared.

Aim: A comparative evaluation of brachial plexus blockade using supraclavicular lateral approach and parascalene approach.

Materials and Methods: A prospective, randomized, comparative study with 60 patients of American Society of Anesthesiologists Physical Status I and II category of both sexes in the age group of 20-50 years posted for upper limb surgeries formed the study group. Patients were allocated into two groups (Group A - lateral approach and Group B - parascalene approach), and the block was performed using a nerve stimulator.

Result: Parascalene approach was found to have statistically significant advantages over the lateral approach in terms of less time to perform block, more success rate, and less vascular complications.

Conclusion: It can be concluded that supraclavicular brachial plexus block by parascalene approach is associated with minimal adverse events with high success rate in comparison to lateral approach.

Key words: Lateral approach, Nerve stimulator, Parascalene approach, Supraclavicular brachial plexus block

INTRODUCTION

Brachial plexus blockade is gaining popularity day by day for upper extremity surgery because it lends a lot of advantages over general anesthesia.[1,2] It is possible and desirable for the patient to remain awake intraoperatively and ambulatory postoperatively. Patients who present for surgery with an upper extremity injury may improve as soon as pain has been relieved with a successful blockade. Various approaches for successful performance of the blocks and for reducing the complication have been described. The present study on brachial plexus blockade-a comparative study on supraclavicular lateral approach with parascalene approach was taken, as studies comparing both these approaches are much less and devoid of complications such as pneumothorax (usually associated with classical subclavian perivascular approach). Moorthy introduced the modified lateral paravascular approach of the supraclavicular block. Vongvises and Panijayanond described parascalene approach in 1979.

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MATERIALS AND METHODS

A prospective, randomized, comparative study of 60 patients of American Society of Anesthesiologists Physical Status (ASA PS) I and II category of both sexes in the age group of 20-50 years posted for upper limb surgeries in the

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Department of Orthopedics and Department of Plastic Surgery, Government Kilpauk Medical College Hospital and Government Royapettah Hospital, were included in the study. Institutional Ethical Committee approval and informed consent were obtained. Patients were allocated into two groups: Group A ($n = 30$) receiving supraclavicular brachial plexus block using lateral approach and Group B ($n = 30$) receiving supraclavicular brachial plexus block using parascalene approach. Brachial plexus block was performed by supraclavicular block technique assisted with nerve stimulator. Inclusion criteria are all consented patients of both sexes weighing between 50 and 70 kg and aged between 20 and 50 years belonging to ASA PS I and II category undergoing upper limb surgeries. Exclusion criteria are patient refusal, those with pre-existing coagulation disorders, peripheral neuropathy, allergy to any of the drugs used in the study, any distortion of local anatomy, contractures, local infection, previous history of surgery involving brachial plexus, and patients on anticoagulant therapy. ASA PS III and IV and failed block were other exclusion criteria. Patients were evaluated preoperatively both clinically and with routine baseline investigations and assessed for fitness. Patients selected were counseled about the risks and benefits involved in performing the block. After getting informed and written consent, patients willing to be included in the study were enrolled. All patients were kept in nil per oral state at least for 8 h before the procedure. Intravenous access secured with 18-gauge intravenous cannula. Local anesthetic test dose was done. Injection ranitidine 50 mg and injection ondansetron 4 mg were given intravenously 30 min before the procedure and sedated with injection midazolam (0.02-0.05 mg/kg). Boyle's machine, suctioning equipment, emergency intubation cart, and manual resuscitation bag with mask were kept ready. The procedure was carried out in the theater where facilities for resuscitation were available. Drugs used were 0.5% bupivacaine vial and 2% lignocaine with adrenaline (1:200,000) vial. Intra- and post-operative monitors used were pulse oximeter, non-invasive blood pressure (NIBP), and electrocardiogram (ECG). Initially, the pre procedure parameters were recorded, i.e., pulse rate, BP, SpO_2, and ECG. Then, block was administered; these parameters were monitored continuously except the NIBP, which was recorded intermittently. Patients were observed vigilantly for the development of any complications. Surface landmarks: The needle puncture site in Group A was 1 cm above the clavicle at the junction of medial two-third and lateral one-third of the clavicle. After raising a skin wheal, a 22-gauge short bevel 50 mm insulated needle was directed medially and toward the plane of interscalene groove, parallel to clavicle. The needle insertion point in Group B was identified by drawing a line from Chassaignac's tubercle to midpoint of the clavicle. The entry point of the block was at the junction of the upper two-thirds and lower one-third of the line drawn. The skin and subcutaneous tissue is infiltrated with local anesthetic solution. A 22-gauge, 50 mm long insulated short bevel needle, directed posteriorly at right angle to the skin. In both groups, the block was performed using a nerve stimulator connected to the proximal end of the needle which is set at 1 mA. The patient may feel discomfort if more than 1 mA current is used. The needle position is adjusted while decreasing the current to 0.5 mA with a sustained distal motor contraction response. A cough from the patient is a warning sign that the pleura is being contacted by the needle. Incremental injection of 15 ml of 0.5% bupivacaine with 15 ml of 2% lignocaine with adrenaline (1:200,000) injected slowly with intermittent aspiration. After injecting the local anesthetic, the block is tested for both sensory (using pin prick) and motor (using muscle power) and is compared with same stimulation or power in the contralateral arm using the Hollmen scale. Onset of blockade means minimum Grade 2 and complete blockade means minimum Grade 3 of Hollmen scale. Motor block is evaluated by thumb abduction (radial nerve), thumb adduction (ulnar nerve), thumb opposition (median nerve), and flexion of the elbow in supination and pronation of the forearm (musculocutaneous). Rescue analgesia was achieved with injection fentanyl 1-2 mcg/kg. Patients with failed block are excluded from the study. Postoperatively patient was monitored for 24 h. Baseline vital signs pulse rate/BP/SpO_2 were recorded and monitored. Time required for performing the block, onset, and completion of blockade, duration of blockade, level of sensory block to pinprick, successful blockade, complications of the block, and rescue analgesia was assessed. Data were analyzed using independent sample *t*-test performed in SPSS 17.

RESULTS

There was no statistically significant difference ($P > 0.05$) in population characteristics in lateral and parascalene approach group (Table 1).

Time to perform block is 4.7 ± 0.92 min and 2.9 ± 0.84 min in Group A and Group B, respectively. The difference was statistically significant ($P = 0.0001$). Time for onset of the sensory block is 6.13 ± 1.28 min and 6.2 ± 1.42 min in Group A and Group B, respectively. There was no significant difference ($P = 0.8915$). Time for onset of motor block is 11.87 ± 1.68 min and 11.93 ± 1.78 min. There was no significant difference ($P = 0.8801$). The procedure was more successful in the Group B nearly about 93.3% compared with 70% of the Group A. The difference was statistically significant ($P = 0.0453$) (Table 2).

No complications in the Group B and 7 cases of complications such as vessel injury in Group A. This difference was statistically significant ($P = 0.0053$). The

Table 1: Population characteristics

Analysis	Group A	Group B	*P* value
Age (in years)	36.6±11.6	35.4±10.8	0.5385
Sex (M: F)	80:20:00	60:40:00	0.159
Weight (in kg)	59.4±6.3	57.1±7.0	0.1693

Table 2: Analysis of outcome of the blocks

Analysis	Group A	Group B	*P* value
Time to perform block	4.7±0.92	2.9±0.84	0.0001
Time for onset of sensory block	6.13±1.28	6.2±1.42	0.8915
Time for onset of motor block	11.87±1.68	11.93±1.78	0.8801
Success rate	70	93.3	0.0453

Table 3: Analysis of outcome of the blocks

Analysis	Group A	Group B	*P* value
Complications	7	0	0.0053
Rescue analgesia (%)	30	6.70	<0.05
Level of sensory block to pin prick (shoulder level) (%)	0	76.70	<0.05

rescue analgesia requirement in the Group B (6.7%) is less than compared with 30% of the Group A. This difference was statistically significant ($P < 0.05$). The level of sensory block to pinprick up to the level shoulder level in the Group B (76.7%) is more than compared with Group A. This difference was statistically significant ($P < 0.05$) (Table 3).

DISCUSSION

Supraclavicular technique was chosen for this study because it provides a rapid onset, dense, and predictable anesthesia with a high success rate. In this study, two approaches of the supraclavicular block are compared. Kulenkampff in Germany, in 1911, performed the first percutaneous supraclavicular approach. This technique was later published, in 1928, by Kulenkampff and Persky (classical) approach the subclavian perivascular approach by Winnie and Collins, in 1964, parascalene approach by Vongvises and Panijayanond in 1979. Vongvises and Panijayanond described parascalene approach of brachial plexus block, conducted in 100 patients undergoing upper extremity surgery and found that it was a useful, simple, safe, and reliable technique for brachial plexus block, avoiding the complication of pneumothorax (1979).[3] Dalens *et al.* prospectively evaluated parascalene approach with the subclavian perivascular approach in 120 children, 60 patients in each group. The parascalene approach proved to be easier and more reliable while also being almost free of complications, although both techniques produced a high degree of sensory blockade in almost all infraclavicular branches of the brachial plexus (1987).[4] Sahu and Sahu found that supraclavicular brachial plexus block by lateral approach associated with minimal adverse effect in comparison to any other supraclavicular approach and more effective with high success rate.[5] A new approach Dr. Kothari evaluated supraclavicular brachial plexus block by the lateral approach. Quick and complete analgesia and motor loss with no serious side effect were the main features of this approach.[6]

CONCLUSION

Supraclavicular block of brachial plexus by parascalene approach provides an adequate sensory blockade and motor blockade, with less time to perform block, level of sensory block is higher (up to shoulder), high success rate, and fewer complications when compared to lateral approach.

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