Original Research Paper

Volume-9 | Issue-4 | April-2019 | PRINT ISSN No 2249-555X

Anesthesiology

A COMPARATIVE STUDY OF NERVE STIMULATOR VERSUS ULTRASOUND-GUIDED PARASCALENE APPROACH OF SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

Dr. Karthikeyan Natarajan — Assistant Professor, Department of Anaesthesiology, Pudukottai Government Medical College, Pudukottai, Tamil Nadu, India

Dr Senthil Chidambaram* — Assistant Professor, Department of Anaesthesiology, Thanjavur Government Medical College, Thanjavur, Tamil Nadu, India *Corresponding Author

ABSTRACT

Aim: A comparative evaluation of Parascalene approach of brachial plexus blockade using nerve stimulator and ultrasound guidance

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 N – Parascalene approach using nerve stimulator and Group U - Parascalene approach using ultrasound guidance)

Result: Ultrasound guided Parascalene approach was found to have statistically significant advantages over the Parascalene approach using nerve stimulator in terms of less time to perform block, more success rate and less rescue analgesia requirement

Conclusion: It can be concluded that Parascalene approach of supraclavicular brachial plexus block using ultrasound guidance is associated with high success rate in comparison to using nerve stimulator.

KEYWORDS : Parascalene Approach, Nerve Stimulator, Ultrasonogram , Supraclavicular Brachial Plexus Block

INTRODUCTION

BACKGROUND

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 parascalene approach using nerve stimulator and ultrasound guidance was taken, as studies comparing this techniques are much less .

Vongvises and Panijayanond described parascalene approach[3] in 1979. This block approaches at the lateral border of the anterior scalene muscle and superior to the clavicle. At this level, the incidences of phrenic nerve paralysis and spinal or epidural anesthesia should be minimized. Previous studies have reported on ultrasound-assisted brachial plexus blocks, but few studies have applied ultrasound guidance to the parascalene region.

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 were included in the study. Institutional Ethical Committee approval and informed consent were obtained. Patients were allocated into two groups: Group N (n = 30) receiving Parascalene approach using nerve stimulator and Group U (n = 30) receiving Parascalene approach using ultrasound guidance.

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 counselled 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 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 theatre 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, SpO2, 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 N 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. 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.

In Group U, the skin and subcutaneous tissue is infiltrated with local anesthetic solution. A 22-gauge, 5 cm long insulated short bevel needle and a linear probe (5-10 MHz transducer) were used. The probe was sterilized with sterile gel. After disinfection, the transducer is lowered to the supraclavicular fossa. At this position, the brachial plexus is identified posterior and superficial to the subclavian artery. From here, the brachial plexus is traced cranially to the desired level[4]. The brachial plexus are seen in the space between the anterior and middle scalene muscles. The needle is then inserted in-plane toward the brachial plexus, typically in a lateral-to-medial direction.

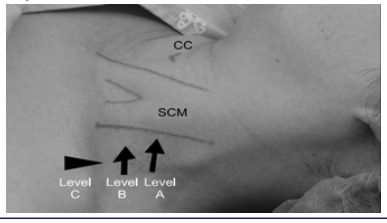

Fig. 1. The photograph shows patient's position and landmarks. SCM - sternocleidomastoid muscle: CC- cricoid cartilage:
Level A - Interscalene approach
Level B - Parascalene approach
Level C - Supra-clavicular approach.

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/SpO2 were recorded and monitored. Time required for performing the block, onset, and completion of blockade, successful blockade, 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 nerve stimulator and ultrasound guided group (Table 1).

Time to perform block is 4.7 ± 0.92 min and 2.9 ± 0.84 min in Group N and Group U, 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 N and Group U, 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 U nearly about 93.3% compared with 70% of the Group N. The difference was statistically significant ($P = 0.0453$) (Table 2).

The rescue analgesia requirement in the Group U (6.7%) is less than compared with 30% of the Group N. This difference was statistically significant ($P < 0.05$).

Table 1 : Population Characteristics

Analysis	Group N	Group U	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 N	Group U	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

DISCUSSION

Supraclavicular parascalene technique was chosen for this study because it provides a rapid onset, dense, and predictable anesthesia with a high success rate. This approach devoid of vascular injuries, pneumothorax associated with supraclavicular perivascular technique and phrenic nerve paralysis associated with interscalene block[5]. 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)[6].

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)[7]

CONCLUSION

Ultrasound guided parascalene approach of Supraclavicular block of brachial plexus provides an adequate sensory blockade and motor blockade, with less time to perform block and high success rate.

REFERENCES

1. Morgan EG Jr, Mikhail MS, Murray MJ. Clinical Anaesthesiology. New York: Lange Medical Books / McGraw-Hill Medical Publishing Division: Elsevier; 2005. p. 324-56.
2. Healy EJ, Knight Paul R. In: Wyle & Churchill-Davidson. Brachial Plexus Nerve Block-A Practice of Anaesthesia 2003;7: p. 599-628.
3. Miller's Anaesthesia 8 th edition: Regional anaesthesia in children: Chapter 92 p-2714, 2732
4. Tsui BC, Lou L: Learning the "traceback" approach for interscalene block. Anaesthesia 2014;69:83–85.
5. Mantuani D, Nagdev A: Sonographic evaluation of a paralyzed hemidiaphragm from ultrasound-guided interscalene brachial plexus nerve block. Am J Emerg Med 2012;30:2099.e5–7.
6. Vongvises P, Panijayanond T. A parascalene technique of brachial plexusanesthesia. Anesth Analg 1979;58:267-73.
7. Dalens B, Vanneuville G, Tanguy A. A new parascalene approach to the brachial plexus in children: Comparison with the supraclavicular approach. Anesth Analg 1987;66:1264-71.