



COMPARISON OF SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK BY NERVE STIMULATOR AND ULTRASOUND GUIDED METHOD

Anaesthesiology

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ABSTRACT

Background: Supraclavicular brachial plexus blocks are most effective regional anaesthetic technique than other methods for upper limb surgeries with minimal adverse effects. Advantages over general anaesthesia are Better hemodynamic stability Avoidance of poly pharmacy Preservation of Consciousness and Respiration Reduced neuro- endocrine stress response and postoperative nausea, vomiting. **Aim:** To compare the effects of supraclavicular brachial plexus block using nerve stimulator and USG technique. **Materials and methods:** This is a prospective, randomized, observer blinded study in Supraclavicular brachial plexus blocks using nerve stimulator and ultrasound guidance to evaluate the effectiveness, safety and to compare different parameters. An individual informed consent was taken from all patients selected for the study. All patients belonging to ASA grade 1 and 2, between the age group of 18 to 50 years posted for elective upper limb surgeries. Patients having coagulation disorders, ASA Grade III and IV and age 60 are excluded. Patient's refusal is excluded. Total 60 patients are selected and randomized into two groups of 30 each. **Discussion:** supraclavicular brachial plexus block can be done under both ultrasound guidance and nerve stimulator. The real time ultrasound imaging showed better visualization of the brachial plexus, accurate position of the needle placement and spread of local anaesthetic around the brachial plexus. But block execution time was significantly decreased in NS group when compared to US group. Also, onset time of sensory blockade was significantly decreased in US group when compared to NS group. **Conclusion:** Ultrasound guided supraclavicular brachial plexus block for patients undergoing upper limb surgeries provided rapid onset of sensory and motor blockade than NS group and also extends the duration of analgesia with good hemodynamic stability.

KEYWORDS

Supraclavicular brachial plexus block, Nerve stimulator, Ultrasound.

INTRODUCTION

Supraclavicular brachial plexus blocks are most effective regional anaesthetic technique than other methods for upper limb surgeries with minimal adverse effects. Advantages over general anaesthesia are Better hemodynamic stability Avoidance of poly pharmacy Preservation of Consciousness and Respiration Reduced neuro- endocrine stress response and postoperative nausea, vomiting.

In peripheral nerve stimulator the electrical current required to elicit muscle contractions which well correlates with the distance between the tip 2 of the needle and nerve. The needle malposition was minimal and localization of individual nerve was without elicitation of a paraesthesia, thus guaranteeing a better blockade than the conventional paraesthesia elicited method. It is also an anatomical landmark oriented technique and may lead to residual neuronal damage. The scarcity of appropriate instruments, high cost and lack of training are the reasons for the hindrance in the usage of nerve stimulator in routine clinical practice.

The introduction of Ultrasonogram has generated a yearning of identifying the better technique with more success and least complication rate. There-fore we conducted a study to compare the usefulness of ultrasound and nerve stimulator for supra clavicular brachial plexus block in upper limb surgeries.

MATERIALS AND METHODS

The present clinical observative, analytical study entitled — comparison of supraclavicular brachial plexus block by nerve stimulator and ultrasound guided method was conducted on 60 patients posted for elective upper limb surgeries selected randomly.

The study was conducted between december 2022 - october 2023 at alluri sitarama raju academy of medical sciences, eluru, after getting approved by the institutional ethical committee. An individual informed consent was taken from all the patients selected for the study from general surgery and orthopedics departments posted for elective upper limb surgeries.

Inclusion criteria:

- Patients aged 18 – 60 years of either sex
- ASA grade I and II
- Undergoing elective upper limb surgeries under brachial plexus

block

Exclusion criteria:

- Patients 60 years of age.
- Patient refusal
- Patients with significant coagulopathy or peripheral neuropathy
- ASA Grade III and IV patients
- Allergy to local anaesthetic

Total 60 patients are included in the study. Preanaesthetic evaluation was done a day prior to the elective surgery. History of present complaints, history of allergy to study drugs and any other drugs, any co-existing disease, medication, previous surgery, hospitalization etc. were noted. A thorough physical and systemic examination (including weight of the patient, height of the patient, vital signs, spine, air way assessment, etc.) was done. On the day of surgery, on arrival at operation theatre two IV lines were secured. They were randomly selected to 30(n=30) in each group and named as Group US (ultrasound) and Group NS (Nerve stimulator).

Group NS: Patient receiving brachial plexus block by using nerve stimulator guided method.

Group US: Patient receiving brachial plexus block by using ultrasound guided method.

Position: After ensuring adequate fasting, premedication been given and patient in supine position on O.T table with arm placed by side. Head is positioned without head rest and head turned 45o opposite side.

Procedure:

Group NS- Under all aseptic precaution local site was prepared. The Positive electrode of the nerve stimulator was connected to an ECG lead and fixed on the ipsilateral arm. The subclavian artery was then palpated 1-1.5 cm above the mid clavicular point, immediately lateral to the sternomastoid muscle and was pushed medially by the thumb and an intradermal wheal was raised with 1% lignocaine (2 mL) using a 24 G needle. A 20 G insulated needle attached to the negative electrode of the NS was then pierced through the skin wheal in a posterior, medially, and caudally. NS was set to deliver acurrent of 1.5 current at 1Hz frequency and 0.1ms of pulse duration. After finger

flexion was obtained with stimulation, the current was reduced in to 0.2 mA till the presence of a muscle twitch with 0.6mA was observed and no twitch with a current of 0.2 mA was observed. This ensures the proximity of the needle tip to the nerve and the drug was injected after negative aspiration of air or blood.

Group US- After proper positioning of hand, skin preparation done with povidone iodine and draping with sterile sheet, Transducer is placed in coronal plane just above the clavicle at approximately its midpoint. (Land mark: subclavian artery, scalenus muscle, first rib). The probe focused acutely down the neck. Attempts are made to appreciate the subclavian artery (hypo echoic) pulsation is visible. The artery lies on the hyper echoic line of pleura or first rib. Brachial plexus is posterior-lateral to the artery (or) superior to the artery, looks like bunch of grapes, hypo echoic structure encases hyper echoic fascia. During In plane technique, needle placed medial to lateral (or) lateral to medial towards and below the transducer. Needle should be advanced at the junction of the artery and rib. To make sure the needle does not cross beyond the hyper echoic line (pleura, rib). After the injection of local anaesthetic mixture, the plexus will separate away from the artery and is displaced. Remaining LA injected on the superficial aspect of the plexus after change the needle position.

OBSERVATION AND RESULTS

This is study comparing the nerve stimulator and ultrasound on the duration of block execution time, time taken for sensory and motor onset, success rate and complications in supraclavicular brachial plexus blocks.

After performing the study, the results were compiled and analyzed. For analyzing comparison among groups Chi square test was used. Student t test helped to quantify the variables. Mean age, weight, gender and ASA grade of the patient in both the groups were comparable and P value between groups was <0.05 (Statistically insignificant). The mean heart rate, systolic and diastolic pressures were comparable between the groups.

The mean block exclusive time was 6.67 ± 1.516 min in Group NS compared to 9.63 ± 2.470 min in Group US with P value <0.0001 (Statistically significant). The mean onset of sensory blockade was 8.23 ± 4.305 min in Group NS compared to 4.87 ± 3.256 min in Group US with P value = 0.001 (Statistically significant). The mean onset of motor blockade was 12.67 ± 5.857 min in Group NS compared to 8.47 ± 5.501 min in Group US with P value = 0.006 (Statistically significant).

The success rate of Group NS was 83.33% with 16.67% failure rate compared to success rate of Group US 93.33% with failure of 6.67% with P value of 0.0228 (P>0.05) statistically insignificant. Complications were significantly high in Group NS compared to Group US with P value 0.107 (p>0.05) statistically insignificant.

The mean duration of analgesia was 4.95 ± 1.289 hours in Group NS compared to 6.47 ± 1.299 hours in Group US with P value = 0.000 (Statistically significant).

Block parameters	Group NS (n=30)	Group US (n=30)	P value
Block exclusive time (min)	6.67 ± 1.516	9.63 ± 2.470	<0.0001
Onset of sensory blockade (min)	8.23 ± 4.305	4.87 ± 3.256	0.001
Onset of motor blockade (min)	12.67 ± 5.857	8.47 ± 5.501	0.006
Success rate	83.33% (25)	93.33% (28)	0.0228
Complications	13.4%	40%	0.107
Duration of analgesia(hr)	4.95 ± 1.289	6.47 ± 1.299	0.000

DISCUSSION

In our study, supraclavicular brachial plexus block was done under both ultrasound guidance and nerve stimulator. Most of the patients had successful brachial plexus block and hence satisfactory surgical anaesthesia. The real time ultrasound imaging showed better visualization of the brachial plexus, accurate position of the needle placement and spread of local anaesthetic around the brachial plexus. We observed that 15 ml of Inj. Lignocaine (2%) and Inj. Bupivacaine (0.5%) with Adrenaline (1:200000), resulted in excellent quality of supraclavicular brachial plexus block for upper limb surgeries. In our study, we observed that block execution time was significantly decreased in NS group when compared to US group. The mean

duration of block performance in NS group was 6.67 min and in US group 9.63 min. Onset time of sensory blockade was significantly decreased in US group 5.27 min when compared to NS group 8.23 min. The mean onset time of motor blockade was faster in US group 8.47 min as compared to NS group 12.67 min. The duration of analgesia was significantly prolonged in US group 6.47hr than NS group 4.95hr which was statistically highly significant.

In US group the drug was injected under direct visualization and equal distribution around the brachial plexus assured, may be the reason for extended duration of block than NS group. Even though proximity ensured in NS group the even drug distribution is doubtful. Our study showed that the block success was 93.33% in US group (28/30) where as it was 83.33% in NS group (25/30). All the block failures were managed with general anaesthesia. We monitored hemodynamic vital parameters such as Pulse rate, Systolic and Diastolic blood pressure and oxygen saturation percent periodically with appropriate monitors. There been no obvious changes between two groups during all over the study. This results no significant difference between two groups clinically and statistically (P>0.05).

CONCLUSION

We concluded that Ultrasound guided supraclavicular brachial plexus block for patients undergoing upper limb surgeries provided rapid onset of sensory and motor blockade than NS group and also extends the duration of analgesia with good hemodynamic stability. Block execution time by US group was longer than NS group. Success rate achieved by both methods are similar and occurrence of complications such as vascular puncture and paraesthesia was seen more in NS group.

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