

# Prospective clinical study of USG guided perivascular supraclavicular brachial plexus block for upper limb surgeries

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## Abstract

**Background:** Brachial plexus block provides analgesia without sedation, prolonged postoperative analgesia and allow earlier patient's discharge. In the upper limb, surface ultrasound can clearly identify neural elements of the brachial plexus as well as surrounding structures. In present study we aimed to study USG guided perivascular supraclavicular brachial plexus block for upper limb surgeries at a tertiary hospital. **Material and Methods:** Present study was single-center, prospective clinical study, conducted in patients of either sex, aged between 18-65 years, belonging to ASA Grade 1, 2, 3, posted for upper limb surgeries (emergency or planned), willing to participate, underwent USG guided supraclavicular brachial plexus block. **Results:** Mean age include in the study was  $38.48 \pm 15.28$  years, youngest person was of 18 years and oldest person 65 years. In our study there was 9 females and 41 males out of 50. In ASA 1, there were 40 patients. In ASA 2, there were 4 patients and in ASA 3, there were only 1 patients. The mean time taken for the procedure to administer a block was  $8.13 \pm 0.83$  min. The mean time taken for onset of sensory blockade was  $10.16 \pm 0.85$  min. The mean time taken for onset of motor blockade was  $15.59 \pm 1.40$  min. The mean Duration of sensory blockade is  $7.71 \pm 0.94$  hrs. The mean Duration of Motor blockade is  $6.19 \pm 0.69$  hrs. In majority of patients rescue analgesia was required after 10 hours (46 %). 35 patients throughout the procedure do not require additional drug. 9 patients require only sedation and six patients require Sedation and Analgesia. During the study of Ultrasound guided supraclavicular brachial plexus block there were no vessel puncture, nerve injury, hematoma, hemothorax happened. **Conclusion:** Ultrasound guided technique for supraclavicular Brachial Plexus block for upper limb surgeries produces is the safe and effective method. There is almost hundred percent complete success rate without any complications.

**Keywords:** Ultrasound guided, supraclavicular block, Brachial Plexus block, upper limb surgeries.

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## INTRODUCTION

An ever increasing demand for regional anaesthesia from patients and surgeons matches the growing realization that it can provide expectations for ambulatory, cost-effective

surgery. Brachial plexus block was first accomplished by Halsted in 1884 when he freed the cords and nerves of the brachial plexus after blocking the roots by direct injection with cocaine solution. These techniques provide analgesia without sedation, prolonged postoperative analgesia and allow earlier patient's discharge.<sup>1</sup> Regional anaesthesia reduces the requirements of opioids, reducing the incidence of postoperative nausea and vomiting. It can be used alone, in combination with sedation or as a part of balanced analgesia with general anaesthesia.<sup>2,3</sup> Complications like pneumothorax, injury to surrounding structures especially vascular structure, nerve and local anaesthetic toxicity. When using a landmark technique for regional blockade, poor localization of nerves can result due to anatomical variation or trauma to the region, and

result in failed anaesthesia or cause morbidity. In the upper limb, surface ultrasound can clearly identify neural elements of the brachial plexus as well as surrounding structures.<sup>4,5</sup> In the upper limb, surface ultrasound can clearly identify neural elements of the brachial plexus as well as surrounding structures.<sup>4,5,6</sup> Ultrasound guided brachial plexus block gains the advantage of accurate nerve localization, real time visualization of brachial plexus, blood vessels, needle placement, local anaesthetic spread. It minimizes the number of needle attempts. In present study we aimed to study USG guided perivascular supraclavicular brachial plexus block for upper limb surgeries at a tertiary hospital.

**MATERIAL AND METHODS**

Present study was single-center, prospective clinical study, conducted in Department Of Anaesthesiology, Dr.V M Government Medical College Solapur, India. Study duration was of 18 months (July 2019 to January 2020). The study was conducted after obtaining Ethics committee approval.

**Inclusion criteria:** Patients of either sex, aged between 18-65 years, belonging to ASA Grade 1, 2, 3, posted for upper limb surgeries (emergency or planned), willing to participate.

**Exclusion criteria:** Patient refusal for the procedure. Patients with significant coagulopathies and other contraindications for brachial plexus block. Patient allergic to amide local anaesthetics. Patients with skin infections at the site of block.

Patient was explained about the procedure and informed/written consent was obtained. Patient underwent routine preanaesthetic evaluation. Routine NPO protocol was followed. Intravenous line was secured on the opposite side of the limb undergoing surgery. Patient was kept in the supine position without pillow head turned to opposite side to be blocked. Blocks was performed under standard monitoring with pulse oximetry, noninvasive blood pressure measurement, heart rate, ECG. In premedication room i.v. line was started and 1 mg of midazolam was given intravenous before block. Local site was cleaned and with all aseptic precaution and USG guided supraclavicular perivascular brachial plexus block was performed with 20ml of 5% Bupivacaine. After block assessment was done regarding time taken to perform the block, onset and duration of sensory neural blockade, onset of surgical anaesthesia, onset and duration of motor blockade, need for supplementation of anaesthesia, any adverse effect and post op analgesia. Patients were monitored every 5 min. for first 15 mins. then every 15 min. till end of surgery. After the completion of surgery every 30mint for 2hrs and then hourly. Assessment of postoperative pain was done by VAS (Visual Analogue

Scale). VAS Score range from 0 to 10, 0-no pain to 10-worst pain. This scale was noted per every 60 minutes post-operatively till it comes to 5. Then the rescue analgesia was provided. The drug used was NSAIDS. The time of administration was recorded. The observations and particulars of each patient were recorded in the proforma enclosed. Statistical analysis was done using descriptive statistics.

**RESULTS**

Mean age include in the study was 38.48 ± 15.28 years, youngest person was of 18 years and oldest person 65 years. In our study there was 9 females and 41 males out of 50. In ASA 1, there were 40 patients. In ASA 2, there were 4 patients and in ASA 3, there were only 1 patients.

**Table 1: General characteristics**

Characteristics	Number	Percentage
Age group		
18-30	20	40%
31-50	18	36%
51-65	12	24%
Gender		
Female	9	18%
Male	41	82%
ASA Distribution		
Grade I	45	90%
Grade II	4	8%
Grade III	1	2%

The mean time taken for the procedure to administer a block was 8.13 ± 0.83 min. The shortest duration for Procedure was 6.5 min and longest duration for procedure was 9.5 min. The mean time taken for onset of sensory blockade was 10.16 ± 0.85 min. The shortest duration of Onset of sensory block was 8.2 and longest duration of onset of sensory block was 11.7 min. The mean time taken for onset of motor blockade was 15.59 ± 1.40 min. The shortest duration of Onset of motor block was 12.6 min and longest duration of onset of motor block was 18.7 hrs. The mean Duration of sensory blockade is 7.71 ± 0.94 hrs. The shortest duration of sensory block is 6.4 hr. and longest duration of sensory block is 12 hrs. The mean Duration of Motor blockade is 6.19 ± 0.69 hrs. The shortest duration of motor block is 4.5 hr. and longest duration of motor block is 8.0 hrs.

**Table 2: Characteristics of block**

Characteristics of block	Mean ± SD	Range
Time taken for procedure (min)	8.13 ± 0.83	6.5 -9.5
onset of sensory blockade (min)	10.16 ± 0.85	8.2 – 11.7
Onset of motor block (min)	15.59 ± 1.40	12.6 – 18.7
Duration of sensory blockade (hrs.)	7.71 ± 0.94	6.4 - 12
Duration of motor blockade (hrs.)	6.19 ± 0.69	4.5 - 8

Duration of complete Analgesia and time of first rescue pain medication. In majority of patients rescue analgesia was required after 10 hours (46 %).

**Table 3: Postoperative Rescue analgesia required**

Rescue Analgesia required	No. of Patients
After 6 hrs.	1
After 8 hrs.	12
After 10 hrs.	23
After 12 hrs.	14

35 patients throughout the procedure do not require additional drug. 9 patients require only sedation and six patients require Sedation and Analgesia. No patient converted to General Anesthesia. Success rate of nerve block is when no requirement of conversion to General Anesthesia.

**Table 4: Success Rate**

Supplementation	No. of Patients
No Sedation / Analgesia Required	35
Only Sedation	9
Sedation + Analgesia	6

During the study of Ultrasound guided supraclavicular brachial plexus block there were no vessel puncture, nerve injury, hematoma, hemothorax happened. So no complication found.

## DISCUSSION

Supraclavicular brachial plexus block is many times called as "spinal anaesthesia of the upper extremity". It is a popular mode of anaesthesia for various upper limb surgeries, due to its effectiveness in terms of cost, performance, margin of safety and good post-operative analgesia.<sup>7,8</sup> Regional anaesthesia makes simple demand that the right dose of the right drug is to be given in the right place. Regional anesthesia techniques provide important advantages as compared to general anesthesia, including excellent pain control, reduced side effects, and shortened hospital stay after surgery. Supraclavicular brachial plexus blockade is a time tested anaesthetic technique for upper limb surgeries. The classical approach using paresthesia technique is a blind technique and may be associated with a higher failure rate and injury to nerve, vessels and surrounding structures.<sup>9</sup> In the upper limb, surface ultrasound can clearly identify neural elements of the brachial plexus as well as surrounding structures. In our study the mean time taken to perform supraclavicular brachial plexus block under ultrasound guidance was  $8.13 \pm 0.83$  minutes. Singh *et al.*,<sup>10</sup> studied supraclavicular brachial plexus block between ultrasound versus nerve stimulator in which the time taken for ultrasound guided supraclavicular block was 8.14 minutes. In present study, mean onset of sensory block was 10.16 min and mean onset of Motor block action was 15.59 min. Williams, Stephan R.*et al.*,<sup>11</sup> conducted a study in ultrasound guided supraclavicular block in which their result for onset of sensory and motor block were similar to our study. In our study for ultrasound guided supraclavicular block mean

duration of sensory block was  $7.71 \pm 0.94$  hours and mean duration of motor block was  $6.19 \pm 0.69$  hours. Alfred VM *et al.*,<sup>12</sup> did a comparative study on ultrasound guided and nerve stimulator guided supraclavicular block in which they mentioned duration of sensory and motor block in ultrasound group was  $8 \pm 0.89$  hours and  $6.03 \pm 0.75$  hours respectively. In our study success is considered when able to conduct the surgery without converting to general anesthesia. As there is no case converted to general anesthesia, success rate of our study is 100%. Similarly Mohamed Hamed Salem *et al.*,<sup>13</sup> studied supraclavicular brachial plexus block comparing USG guided and nerve stimulator guided shows that success rate is 100% in USG group. Soeding PE *et al.*,<sup>14</sup> noted success rate using USG as 98%, both study results were comparable the present study. In our study there was no complications such as nerve injury, vessel puncture, hematoma, pneumothorax as in ultrasound guided supraclavicular brachial plexus block. We can insert needle with ultrasound guidance. Alfred VM *et al.*,<sup>12</sup> did a comparative study on ultrasound guided and nerve stimulator guided supraclavicular block in which they stated there was no incidence of complication during ultrasound guided nerve block. In the past, electrical stimulation or paraesthesia, both of which relied on surface landmark identification. However, landmark techniques have limitations of variations in anatomy and nerve physiologies, as well as equipment accuracy, have had an effect on success rates and complications. Brachial plexus block is an easy and relatively safe procedure for upper limb surgeries. The real time ultrasound guidance has been used to localize the peripheral nerve or plexus, accurate needle placement and verification of local anaesthetic spread in the appropriate tissue planes.

## CONCLUSION

Ultrasound guided technique for supraclavicular Brachial Plexus block for upper limb surgeries produces is the safe and effective method. There is almost hundred percent complete success rate without any complications as ultrasound provides real-time visualization of underlying structures and the spread of local anaesthetic. USG guided block has good result even in obese patients also.

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