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Original Research Article

A prospective study of ultrasound guided infraclavicular brachial plexus block by coracoid approach for orthopedic surgery below mid humerus

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Abstract

Background: The use of ultrasound for precise nerve/plexus localization has recently revolutionized the field of regional anesthesia, with ultrasound probes with appropriate frequencies being successfully tried. Present study was aimed to study ultrasound guided infraclavicular brachial plexus block by coracoid approach for orthopedic surgery below mid humerus.

Material and Methods: Present study was prospective, observational study, conducted in patients of either sex, aged between 18-60 years, belonging to American Society of Anesthesiologists Grade I/II/II, posted for operations on upper Limb below mid humerus surgeries under ultrasound guided infraclavicular brachial plexus block.

Results: Present study was conducted in department of anesthesiology in 50 patients aged between 18-60 years. There were 10 females and 40 males out of 50. Majority were from age group 31-45 years (40%). As per ASA grading, there were 39 patients of ASA I, 8 patients of ASA II and in ASA 3, there were 3 patients. The mean time taken for complete sensory block was 18 ± 0.70 minutes. The mean time taken for complete motor block was 26.1 ± 0.71 minutes. The mean Duration of sensory blockade was 8.58 ± 0.70 hours. The mean Duration of Motor blockade was 6.80 ± 0.70 hours. Rescue analgesia was required after 6,8,10 & 12 hours in 4,10, 24 & 12 patients respectively. Success rate of USG guided infraclavicular block is 100%. Among 50 patients 38 patients had excellent quality of block, good in 7 and moderate quality in 5 patients During the study of Ultrasound guided infraclavicular brachial plexus block there were 2 vessels puncture, no nerve injury, no hematoma, no hemothorax happened.

Conclusion: Ultrasound-guided infraclavicular brachial plexus block coracoid approach for surgery below mid humerus is very easy to perform with 100% success rate and very less

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chances of complications because of real time imaging.

Keywords: Ultrasound-guided block, infraclavicular brachial plexus block, coracoid approach, mid humerus surgery

Introduction

The growing recognition that regional anesthesia can satisfy expectations for ambulatory, cost-effective surgery was generating an increase in demand for regional anesthesia from patients and surgeons [1]. Modern anesthetic techniques allow for a quick, painless, and complete recovery following surgery. Regional Anesthesia can lessen or eliminate the risks and discomforts of general Anesthesia, such as sore throats, airway trauma and muscle pain, while simultaneously providing several benefits to outpatients undergoing surgery [2, 3].

The use of ultrasound for precise nerve/plexus localization has recently revolutionized the field of regional anesthesia, with ultrasound probes with appropriate frequencies being successfully tried. In the upper limb, surface ultrasound can clearly identify neural elements of the brachial plexus as well as surrounding structures [4-6].

The advantages of an ultrasound-guided brachial plexus block include accurate nerve localization, real-time viewing of the brachial plexus and blood vessels, needle placement, and local anesthetic spread. Ultrasound has also been utilized to visualize the spread of local anesthetic from a catheter as well as to confirm the accuracy of currently used landmarks.[7]

Present study was aimed to study ultrasound guided infraclavicular brachial plexus block by coracoid approach for orthopedic surgery below mid humerus.

Material and Methods

Present study was single-center, prospective, observational study, conducted in department of anaesthesiology, at Dr. V.M. Govt. Medical College, Solapur, India. Study duration was of 2 years (January 2019 to December 2020). The study was conducted after obtaining Ethics committee approval.

Inclusion criteria

- Patients of either sex, aged between 18-60 years, belonging to American Society of Anesthesiologists Grade I/II/II, posted for operations on upper Limb below mid humerus surgeries under ultrasound guided infraclavicular brachial plexus block, willing to participate in present study.

Exclusion criteria

- Patient refusal for the procedure.
- Patients with significant coagulopathies and other contra-indications for brachial plexus block.
- Patient allergic to amide local Anesthetics.
- Patients with skin infections at the site of block.
- Patients with ASA grade 4.

Informed written consent was obtained from the patients who were included in the study. 50 patients posted for upper limb surgeries below mid humerus and satisfying study criteria were selected. Patient underwent routine pre-Anesthetic evaluation. Routine NPO protocol was followed.

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Intravenous line was secured on the opposite side of the limb undergoing surgery. In premedication room I.V. line was started and 0.03mg/Kg of Inj. Midazolam and Inj Glycopyrrolate 0.004mg/Kg were given intravenous before block. Patient was kept in the supine position without pillow head turned to opposite side to be blocked. Blocks were performed under standard monitoring with pulse oximetry, noninvasive blood pressure measurement, heart rate, ECG. Local site was cleaned and with all aseptic precaution and USG guided Infraclavicular brachial plexus block Coracoid approach was performed with 25-30ml of 0.25% Bupivacaine.

Assessment consists of Time taken to perform the block, Onset and duration of sensory neural blockade, Onset of surgical Anesthesia, Onset and duration of motor blockade - Need for supplementation of Anesthesia, Any adverse effect & Post op analgesia.

Patient was monitored every 10 min. for first 30 mins. then every 30 min. till 6 hours 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. If required, rescue analgesia was provided. The drug used was NSAIDS. The time of administration was recorded. All patients were monitored for complications (if any) during the intra- operative period and up to 48 hours post-operatively. The observations and particulars of each patient were recorded in the proforma enclosed.

Quality of block was assessed every 10 min from the end of the block until 30 min in the distribution of the motor nerves.

Quality of block was scored

- Grade 4 (excellent): no complaints from the patient.
- Grade 3 (good): minor complaints with no need for supplemental analgesia.
- Grade 2 (moderate): complaint that required supplemental analgesia.
- Grade 1 (unsuccessful): patient given general Anesthesia.

The study was conducted in terms of time taken for procedure, onset of sensory block, onset of motor block, duration of motor and sensory blockade, the success rate of block, duration of postoperative analgesia.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

Results

Present study was conducted in department of anesthesiology in 50 patients aged between 18-60 years. There were 10 females and 40 males out of 50. Majority were from age group 31 - 45 years (40%). As per ASA grading, there were 39 patients of ASA I, 8 patients of ASA II and in ASA 3, there were 3 patients.

Table 1: General characteristics

Study Population	Number	Percentage
Age group (in years)		
18-30	17	34%
31-45	20	40%
46-60	13	26%
Mean age	36.8 ± 8.49	
Gender		
Female	10	20%
Male	40	80%

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ASA Grade		
I	39	78%
II	8	16%
III	3	6%

The mean time taken for the procedure to administer a block was 7.20 ± 0.70 minutes. The mean time taken for onset of sensory blockade was 12 ± 1.41 minutes. The mean time taken for onset of motor blockade was 19.48 ± 3.20 minutes. The mean time taken for complete sensory block was 18 ± 0.70 minutes. The mean time taken for complete motor block was 26.1 ± 0.71 minutes. The mean Duration of sensory blockade was 8.58 ± 0.70 hours. The mean Duration of Motor blockade was 6.80 ± 0.70 hours.

Table 2: Anaesthesia characteristics

Characteristics	Mean± SD
Time Taken for Block Performance (minutes)	7.20 ± 0.70
Onset of Motor block (minutes)	19.48 ± 3.20
Onset of Sensory block (min)	12 ± 1.41
Time taken for complete sensory block (mins)	18 ± 0.70
Time taken for complete motor Block (mins)	26.1 ± 0.71
Duration of Sensory block (hours)	8.58 ± 0.70
Duration of motor block (hours)	6.80 ± 0.70

Rescue analgesia was required after 6, 8, 10 & 12 hours in 4,10, 24 & 12 patients respectively.

Table 3: Post-Operative Rescue Analgesia Required

Rescue Analgesia required	After 6 hours	After 8 hours	After 10 hours	After 12 hours
No. of Patients	4	10	24	12

Success rate of USG guided infraclavicular block is 100%. Among 50 patients 39 patients throughout the procedure do not require additional drug. 6 patients require only sedation and 5 patients require Sedation and Analgesia. No patient converted to General Anesthesia.

Table 4: Success Rate

Supplementation	No Sedation/Analgesia Required	Only Sedation	Sedation + Analgesia
No. of Patients	39	6	5

Among 50 patients 38 patients had excellent quality of block, good in 7 and moderate quality in 5 patients.

Table 5: Quality of block

Intensity	Number	Percentage
Excellent	38	76%
Good	7	14%
Moderate	5	10%

During the study of Ultrasound guided infraclavicular brachial plexus block there were 2 vessels puncture, no nerve injury, no hematoma, no hemothorax happened.

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Table 6: Incidence of complications

Complications	Incidence	Study population	Percentage
Vessel puncture	2	50	4%
Nerve injury	0	50	0%
Hematoma	0	50	0%
hemothorax	0	50	0%

Discussion

Many practitioners consider regional anesthesia to be an art and continuous success with these procedures appears to be confined to anesthesiologists who are passionate about the technique [1]. Regional Anesthesia minimizes the need for opioids, lowering the risk of nausea and vomiting after surgery. It can be used alone, in combination with sedation or as a part of balanced analgesia with general Anesthesia [3].

The study was the prospective ultrasound-guided infraclavicular brachial plexus block. Our studies' results suggest that this approach has the potential to increase the block's success rate, time of onset, and block performance, as well as reduce problems such arterial puncture. Regional anesthesia techniques provide important advantages as compared to general anesthesia, including excellent pain control, reduced side effects, and shortened hospital stay after surgery [2].

The time for block performance is the time from the insertion of needle to injection of the drug completely. In our study the mean time to perform block was 7.2 ± 0.70 minutes. The time for block performance was 5 minutes in a recent study by Ootaki and colleagues [8]. In Sandhu *et al*., [9] study it was 10 minutes. Time to perform block in our study was comparable with above mentioned study.

In our study the mean time taken for onset of sensory blockade was 12 ± 1.414 minutes, the mean time taken for onset of motor blockade was 19.48 ± 3.2 minutes. Coracoid block, a variant of the infraclavicular block developed by Whiffler[10] had an onset time of 10-20 min. The onset time in Ootaki and colleagues [9], study appears to be 30 min. Raj and colleagues [11] reported 20-minute onset time for infraclavicular block in their original study. Sandhu *et al*., [9] study onset time was reported 3 minutes using 2% lidocaine. The mean time taken for onset of sensory blockade in our study (0.25% of bupivacaine) was similar to studies mentioned above.

The mean Duration of sensory blockade was 8.58 ± 0.70 hours, the mean Duration of Motor blockade was 6.68 ± 0.70 hours. In the study of Cox *et al*., [12] blockade occurred with 0.25% bupivacaine, disappearance of sensory block time was 892 ± 250 minutes (14.86 hours ± 4.16 hours). Duration of block in our study is comparable that of study mentioned above.

In our study Success rate of nerve block was when no requirement of conversion to General Anesthesia. Success rate in our study of USG guided infraclavicular block was 100%. Among 50 patients 39 patients throughout the procedure do not require additional drug. 6 patients require only sedation and 5 patients require Sedation and Analgesia. Coracoid block, a variant of the infraclavicular block developed by Whiffler [31] had a success rate of 92.5%; modified Raj technique [11], the success rate was improved to 97%. A recent study by Ootaki and colleagues, reported 100% success rate with the use of ultrasound guidance in infraclavicular block. Our study success rate is similar to that of studies mentioned above.

During the study of Ultrasound guided infraclavicular brachial plexus block among 50 patients there were 2 vessels puncture (4% complications), no nerve injury, no hematoma, no hemothorax happened. Wu and colleagues [13] reported eight successful blocks in nine patients, but three were complicated by subclavian artery puncture (33%) complications.

The entire length of the needle was always seen. We believe this simple measure was a major factor in lowering the rate of vascular puncture. When the block begins to dissipate, the block

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can be repeated at the same spot with ultrasound guidance; this was not possible with the nerve stimulator procedure. Similarly, a successful block can be administered with this technique in patients with amputated distal upper extremities.

Conclusion

Ultrasound-guided infraclavicular brachial plexus block with coracoid approach for surgery below mid humerus is very easy to perform with 100% success rate and very less chances of complications because of real time imaging. It is safer technique than other approaches of brachial plexus block.

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