



ULTRASONOGRAPHY GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK AIDED WITH PERIPHERAL NERVE STIMULATOR, AN OBSERVATIONAL STUDY.

Anaesthesiology

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ABSTRACT

Background: The supraclavicular approach is considered to be most effective approach to block the brachial plexus for upper limb surgery. The aim of the study is to know how far USG with PNS guided supraclavicular block improves the block success rate and decreases complication. **Method:** In this study 40 patients under ASA Class 1 to 3 between 18 to 60 years of age were included in study who were posted for elective upper limb surgery. Total 30ml of drug volume given to each patient. The block was performed by placing linear phased array transducer (5 to 13MHZ) USG probe in supraclavicular fossa which provides real time visualisation of brachial plexus and correct needle position was confirmed by PNS. After conforming nerve plexus, the drug was injected by two needle technique (one at lower trunk and other near upper or middle trunk). The total block performance time (the time from needle insertion to injection of drug), onset of sensory blocked and motor blocked was noted. **Results:** Out of 40 patients only one patient required sedation before the skin incision. The average blocked performance time was 12.69 min. The average time of onset of sensory block is 5.30min and for motor block is 7.06 min. Pneumothorax, Dizziness, seizures or local anaesthetic toxicity complication are not occurred. **Conclusion:** We conclude that USG with PNS guided supraclavicular block increases the success rate and decreases complications.

KEYWORDS

Ultrasonography, Peripheral nerve stimulator, Supraclavicular block,

INTRODUCTION:

All upper limb surgeries can be performed under general anaesthesia or regional anaesthesia. In general anaesthesia patients may have complications related to difficult airway, aspiration pneumonia, post op nausea vomiting delayed recovery, etc. In regional anaesthesia, we may avoid complications of general anaesthesia mentioned above.

Brachial plexus block is an excellent method of regional anaesthesia for upper limb surgeries.

The supraclavicular approach of brachial plexus block is associated with high success rate. So, supraclavicular block is often called the "spinal anaesthesia of the upper extremity". The first percutaneous supraclavicular block was performed in Germany by Kulenkampff in 1911, on himself.⁽³⁾ Initially the classic approach of block was which was landmark guided by paraesthesia technique.

The Peripheral nerve stimulation guided technique has been used since last few decades. It associated with complications like pneumothorax, vascular injury and local anaesthetics toxicity, etc.

Ultrasound guided brachial plexus block has gained popularity now a days because it provides real time visualisation of plexus, rib, pleura, and subclavian artery, thus it has increased safety due to better visualization needle placement as per anatomy. The Ultrasound guided technique has evolved in past few years with encouraging results. We had planned to study brachial plexus block along by USG aided with PNS.

MATERIAL AND METHOD:-

After clearance from the ethical committee, patients posted for planned upper limb surgeries under supraclavicular brachial plexus block were included.

Inclusion Criteria

1. Patients who will undergo upper limb surgeries under supraclavicular brachial plexus block and give informed consent.
2. Patients belonging to ASA grade I, II or III.
3. Patients between the age group of 18-60 years.

Exclusion Criteria

1. Patients who are contraindicated for giving regional block like, allergy to local anaesthesia, local site infection, coagulopathies if any etc.
2. Patients with preexisting neurological disorders.

3. BMI more than 30kg/m².

The Standard Protocol For Giving Blocks Was As Follows.

A detailed pre anesthetic checkup was done before surgery. The procedure to be performed was explained to the patient and their relatives and informed written consent was taken. In the pre-operative room patient's baseline vital parameters were recorded and IV ringer lactate solution was given. Patients were pre medicated, with Inj. midazolam 0.02mg/kg. After taking the patient to the operation table, non-invasive blood pressure and pulse oximeter (Spo₂) was attached. We used 30ml (Inj. Bupivacaine (0.5%) 15ml, Inj. Lignocaine 2% 10ml Inj. Dexamethasone 2ml and Inj. Normal saline 3ml) local anesthetics.

Technique Of The Ultrasound Guided Block Aided With PNS

The block was performed by using 5- to 13MHZ linear phased array transducer (E1 EXP, SONOSCAP) equipped on an ultrasound machine. The patient was placed in supine position and head turned away to opposite side. After taking all aseptic precaution, the ultrasound probe was placed in an oblique plane in the supraclavicular region above the mid clavicular area. The brachial plexus was identified as a honeycombed Hyper and Hypoechoic structure lateral to the Subclavian artery above the first rib and pleura. The supraclavicular region and skin were infiltrated with 2% lignocaine 1.5ml. The supraclavicular artery was taken as a landmark for identification of supraclavicular brachial plexus. After visualization of pulsatile subclavian artery, the nerve stimulator needle was inserted to stimulate the Brachial plexus, after that attempt was made to identify each trunk, upper trunk by shoulder twitch, middle trunk by bicep, triceps and pectoralis twitch, and lower trunk (finger or wrist flexion) when muscle twitch observed, current is gradually reduced from 0.9mA to 0.4mA, then the drug was injected into brachial plexus sheath under vision in at least two different needle positions, one at lower trunk and other near upper or middle trunk.

OBSERVATION AND RESULTS:

- The block was successful in 39(99%) patients out of 40 patients.
- Out of these 40 patients 39(99%) patients had complete block & required no analgesic supplementation intraoperatively.
- 1(1%) patient had inadequate block which required general anaesthesia & considered as failed block.
- The mean block performance time was 12.69±2.64 min.
- Sensory blockade was assessed by pin prick method. Mean onset time of sensory blockade was 5.30±1.05 min.
- Motor blockade was assessed by modified bromage score. Mean onset time of motor blockade was 7.06±1.62 min.

- **Complications** such as pneumothorax, vascular puncture, dizziness, circumoral numbness, local anaesthetic systemic toxicity **were not observed in any of the patients.**

Distribution Of Population According To Type Of Surgery

Table: Distribution of study population according type of surgery

Type of surgery	Number(n=40)	%
ORIF+PLATING	32	84%
NAILING	3	8%
IMPLANT REMOVAL	2	5%
TENDON REPAIR	1	3%

Out of 40 patients, 32 patients were operated for Open reduction with internal fixation and plating of radius with ulna or head of radius fracture. 3 patients underwent Nailing in radius with ulna fracture. 2 patients were operated for Implant removal from SCIC humerus. 1 patient underwent for tendon repair of forearm and 1 were operated for debridement of forearm.

DISCUSSION:

We inferred from our observational study that combining USG with PNS for supraclavicular brachial plexus block gives real time image, reducing complications with limited amount of drug volume. The patient was placed in supine position and head turned away to opposite side with arm by the side which was similar to following study **K. gemo et al (2014)** ⁽¹³⁾, **Anupriya et al (2020)** ⁽¹⁸⁾ and **Vinu Alfrd et al (2018)** ⁽¹⁶⁾.

In my study supraclavicular brachial plexus block was performed with 5-to-13 MHz linear phased array transducer (E1 EXP, SONOSCAP) equipped on an ultrasound machine with in plane approach, following study are in correlation with my study **Vinu Alfrd et al (2018)** ⁽¹⁶⁾, **Thrivikrama Padur Tantery et al (2015)** ⁽¹⁴⁾ and **K. gemo et al (2014)** ⁽¹³⁾.

We used total 30ml Inj. Bupivacaine (0.5%) + Inj. Lignocaine 2% 10ml+ Inj. Dexamethasone + Normal saline 3ml. Following studies used similar volume, **Dae geun jeon et al (2013)** ⁽¹²⁾ did a study on different drug volume for supraclavicular block. They divided patients in following groups, group 35(35ml), group 30(30ml), group 25(25ml) and group 20(20ml). They used 1% mepivacaine. The complete success rate of group 35ml was 96.7%, group 30 was 90%, group 25ml was 80.0% and group 20ml was 66.7%(least). The individual success rate of ulnar and medial cutaneous were lower than those of other nerve. In group 35, one failure was operated under sedation. In group 30, one failure was operated under sedation and other two failures received general anesthesia. In group 25, four failures were given sedation only and 2 failures received general anesthesia. In group 20, six failures were operated under sedation only, and four failures received general anesthesia. Horner syndrome higher in group 35 than other group. In conclusion, we achieved 90% success rate 30ml of 1% mepivacaine and **Bhagavath Kumar Natarajan et al (2022)** ⁽²¹⁾.

In our study we used double injection technique for supraclavicular block. Initial 15ml drug was given at corner pocket at lower trunk on finger or wrist flexion and remaining 15ml drug was given at upper or middle trunk by shoulder or biceps twitches. Following studies are in correlation with my study **Suresh Kumar Vallapureddy et al (2021)** ⁽²⁰⁾ and **Hemlata Kamat et al (2020)** ⁽¹⁹⁾.

The time interval between the first needle insertion with giving drug in two different needle position and its removal at the end of the block is taken as the procedure time. In our study the Mean block performance time was 12.69±2.64 min which was similar to following studies **Sakshi Kaiden et al (2019)** ⁽¹⁷⁾ has mean block performance time was 15.92 ± 3.03 min in group A(PNS) and 8.04 ± 1.32 min in group B(USG) and **Srinivas Ht et al (2019)** ⁽³⁾ mean time to administer block was 10.17 ± 1.58 minutes in group-US and 10.67 ± 2.58 minutes in group PNS.

The mean onset time of sensory block was the time from the removal of the block needle to the time when a score of zero (no sensation felt) has been achieved is taken as the onset time of the sensory block for each nerve. The mean time of onset of sensory block was 5.30 ± 1.03mins. Following studies were in correlation, **Srinivas Ht et al (2019)** ⁽³⁾, Found that, the mean time for onset of the sensory block was 3.63 ± 1.33 minutes in group-US and 6.79 ± 1.76 minutes in group PNS. The onset of sensory block was shorter group US compared to group PNS and **Anil Ratnawat et al (2016)** ⁽¹⁾, found that, the onset of

sensory and motor block was 7.68±1.33 minutes and 9.94±1.28 minutes in group PNS and 6.46±1.02 minutes and 8.10±1.02 minutes respectively in group US.

The mean onset time of motor blockade was taken as the time to injection of drug to inability to move hand. Motor block assessed at an interval of the 5, 10, 15, 20, 25 and 30 minutes after injection of the drug according to modified Bromage scale. In our study the mean onset of motor block 7.06±1.62min. **Srinivas Ht et al (2019)** ⁽³⁾, conclude that mean time for onset of the motor block was 6.17 ± 1.82 minutes in group-US and 8.79 ± 1.61 minutes in group PNS. Thus, onset of motor block was statistically significant in group US.

Patients were observed for complications such as pneumothorax, vascular puncture, dizziness, circumoral numbness, local anaesthetic systemic toxicity during time of giving block, during intraoperative & post-operative period. None of the patients developed any complication. Following study are in correlation with my study. **Vinu Alfrd et al (2018)** ⁽¹⁶⁾, In their study none patient developed any complications.

CONCLUSION:

This study brings to forefront results of 40 patients for orthopedic forearm and hand surgeries under USG aided with PNS guided brachial plexus block. USG being newer technique if aided with PNS gives good success rate, minimizes complications at the same time requires less volume of local anesthetics.

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