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Dr Gayatri Jain
Department of Anaesthesiology, MGM Medical College and Hospital, Kamothe, Mumbai, Maharashtra, India

Dr Ankita Joshi
Department of Anaesthesiology, MGM Medical College and Hospital, Kamothe, Mumbai, Maharashtra, India

Dr Vishwas Sathe
Department of Anaesthesiology, MGM Medical College and Hospital, Kamothe, Mumbai, Maharashtra, India

Corresponding Author:
Dr Gayatri Jain
Department of Anaesthesiology, MGM Medical College and Hospital, Kamothe, Mumbai, Maharashtra, India

Comparing supraclavicular and axillary approaches for ultrasound-guided brachial plexus block for upper extremity surgeries

Dr. Gayatri Jain, Dr Ankita Joshi and Dr Vishwas Sathe

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Abstract
The study focusses on ultrasound guided Brachial Plexus Block (BPB) which are routinely administered for upper extremity surgeries. The brachial plexus can be blocked by several techniques but the most commonly used are the Supraclavicular (SCB) and Axillary (AXB) blocks.
Aims and objectives: The aim of this randomized study was to compare the ultrasound guided supraclavicular block and axillary block for upper extremity surgeries. To assess the effectiveness of the upper limb block based on:
1. Block performance time
2. Onset of action (sensory & motor)

Methods: After approval of the ethical committee and obtaining a written informed consent from patients, this prospective, randomized study was conducted on patients undergoing elective upper extremity surgeries. 50 patients were allocated randomly into two equal groups. Under ultrasound guidance, the SCB and AXB were performed for the two groups, respectively. The block performance time, sensory & motor onset time were noted.
Results: Longer block performance time in the AXB group as compared to SCB and similar onset of block were noted with both the groups.
Conclusion: Both blocks are equally effective in providing surgical anaesthesia, with the AXB requiring a longer performance time when compared to SCB.

Keywords: Comparing supraclavicular, axillary approaches, ultrasound-guided

Introduction
Surgical procedures of the upper extremity can be performed under regional anaesthesia (Peripheral Nerve Blocks) or general anaesthesia. Performing a surgery under nerve blocks is relatively safer and free of the risks associated with general anaesthesia. Patients with multiple associated co morbidities tend to have better outcomes if the surgery is performed under a peripheral nerve block as compared to general anaesthesia. Also nerve blocks provide adequate post-operative analgesia and alleviate the need for intravenous opioids. Brachial plexus blocks can be performed via various methods like Blind/Anatomic landmark technique (paresthesia guided), Peripheral Nerve Stimulator guided and USG guided. The various approaches are Supraclavicular, Interscalene, Axillary and more recently Infraclavicular. Ultrasound guided peripheral nerve blocks are very popular as it aids in accurately locating the peripheral nerves and reduces the amount of drug required to achieve adequate surgical anaesthesia. It is also associated with fewer risks of intravascular injections and toxicity to local anesthetic drugs. Upper extremity surgeries are the most common indications for supraclavicular, infraclavicular and axillary blocks. Due to its advantage of real time visualization, ultrasonography reduces the number of needle pricks to reach the target nerve groups, which in turns shortens the block performance time and increases the success rate. Ultrasound guided supraclavicular and axillary approaches for brachial plexus blockade has exponentially increased the success rate of blocks due to its accuracy and lesser duration required to perform the block. Also due to the ongoing COVID 19 pandemic airway handling is usually avoided and hence regional nerve blocks are preferred over general anaesthesia. Thus, this study was planned to compare the clinical efficacy of ultra-sonogram guided supraclavicular and axillary approaches of brachial plexus block in distal upper extremity surgeries.

Materials and method

After obtaining Institutional Ethical Committee approval, a prospective study was performed at MGM Medical College and Hospital, Kamothe, using data gathered between 1st September 2020 to 31st December 2020. We included 50 patients in this study between the age of 18-50 years of either sex undergoing upper extremity surgeries with an ASA grading of I or II. Exclusion criteria included patient refusal, known allergy to LA, know coagulopathy, pregnant females, and infection at needle insertion site or any neurological deficit. An informed written consent was obtained after explaining the procedure to the patients. Inside the operating room the patients were randomly allocated into either Group A (Supraclavicular Block) or Group B (Axillary Block). After attaching all standard monitors, the patients were pre medicated with Inj. Midazolam 2mg and administered oxygen at 2L/min via nasal prongs. A standard regional anesthesia tray was prepared containing sterile towels, gauze pieces, Bupivacaine 0.5%. Two 10 ml syringes, 2% Lidocaine vial for skin infiltration, 23-gauge needle and a 10cm extension with a *leur* lock, sterile gloves, marking pen and emergency drugs (epinephrine, atropine, and ephedrine) were prepared. Inj. Fentanyl 25mcg was added as an adjuvant. A linear ultrasound probe was used for all patients. Toxic doses of local anaesthetic drugs were calculated according to body weight. Patients in the axillary group were placed in the supine position with the arm to be blocked abducted and externally rotated. After sterilization of the axilla, the Ultrasound probe was placed parallel to the anterior axillary fold at the axilla to identify the axillary artery and to identify the radial, median and ulnar nerves of the brachial plexus. Lidocaine 2% was infiltrated subcutaneously 1 cm lateral to the probe then 5-10 ml of Bupivacaine 0.5% with Inj. Fentanyl 25mcg as adjuvant was injected around each nerve. The musculocutaneous nerve which supplies the skin of the lateral side of the forearm was also blocked. It is found between the biceps brachii and coracobrachialis muscles. In the supraclavicular group, patients were placed in the supine position with patient's head turned away from the side to be blocked. After painting and draping, the ultrasound probe was placed transversely parallel to and above the middle third of the clavicle. The probe was tilted to identify the subclavian artery and trunks and divisions of the brachial plexus which lie lateral to the subclavian artery. Lidocaine 2% was infiltrated subcutaneously 1 cm lateral to the lateral side of the probe. The needle was then inserted in plane to the probe and when adjacent to the brachial plexus, 25 ml of Bupivacaine 0.5% with Inj. Fentanyl 25mcg as adjuvant was injected around the brachial plexus. According to the allocated group either of the 2 blocks were performed and the block performance time, duration of onset of action, complete sensory and motor blocks were assessed. All emergency intubation and resuscitation equipment's were checked and kept ready.

Results

A total of 50 patients were included in the study. Patients were randomized into Group a (SCB) and Group B (AXB). The two groups were similar in demographic data. M: F proportion, preoperative diagnosis and type of surgery was also similar on comparing the two groups. The block performance time were significantly shorter in Group A than Group B.

There were no significant differences between the groups with regard to the sensory and motor onset time. The success rate was high in both groups without any significant difference between them. None of the patients suffered from any block related complications, procedure-related pain, persistent paraesthesia or any sensory or motor deficit.

Table 1: Show the parameter SCB and AXB

Parameter	Group A (SCB) (mean)	Group B (AXB) (mean)
Age	38.8	41.4
Sex	11 Male, 14 Female	12 Male, 13 Female
Side affected	16 Right, 9 Left	15 Right, 10 Left
Block performance time	5.8mins	9.1mins
Onset of sensory blockade	6.9mins	7.4mins
Onset of motor blockade	7.5mins	8.6mins

Discussion

Ultra sound guided peripheral nerve blocks have gained a lot of popularity in the recent years. The conventional methods for performing BPB before the use of ultra sound guidance were peripheral nerve stimulator and anatomical landmark techniques. In contrast to traditional methods, ultra sound guidance provides accurate needle visualization for correct identification of peripheral nerves, optimization of the distribution of the local anaesthetic injection and correct placement of needle [1, 2]. It avoids intravascular or intraneuronal injection and can be used in patients having a poor twitch response. Ultra sound guidance provides an effective and minimally invasive method of peripheral nerve block [3]. The most commonly encountered fractures of the upper extremity in the younger population are mainly caused due to trauma and may often be associated with chest trauma, thus complicating administration of general anaesthesia. In our hospital, we prefer peripheral nerve blocks in patients with multiple co morbidities, especially with respiratory compromise or any underlying cardiac illness. Franco and Vieira [4] collected 1,001 consecutive BPB blocks and observed them using a single shot technique and found no major clinical complications. In our study we did not observe any major complications as the blocks were performed by senior anaesthesiologists. Due to the long anatomical journey of the brachial plexus, there are several techniques for blocking the nerves of the brachial plexus. These techniques are classified by the level at which the needle is inserted for injecting the local anaesthetic drug. Interscalene block in the neck, supraclavicular block immediately above the clavicle, an infraclavicular block below the clavicle and axillary block in the axilla [5]. Although general anesthesia is a popular method for surgical anesthesia especially in small hospitals, Regional Anesthesia (RA) and especially peripheral nerve blocks provide superior pain control during the surgery and the postoperative period as well [6]. The ultrasound-guidance of the peripheral nerve block renders it safe [7], highly effective, minimally invasive [8] and a cost-effective method of anesthesia as reported by Sandhu *et al*. [9] However, that was not measured in the current study. In the current study we observed that the SCB was performed from the first needle pass via the same puncture site as the local anaesthetic infiltration. On the other hand, AXB required multiple needle entries and a slightly longer performance time.

Conclusion

Thus we conclude that both approaches to block the brachial plexus are equally effective in providing adequate surgical anaesthesia and post-operative analgesia & are relatively free of any complications. However, AXB requires more performance time as compared to SCB and more number of needle pass but no significant effect on onset of the block.

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