Original Article

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Supraclavicular versus Infraclavicular Approach to Brachial Plexus Block under Ultrasound Guidance for Elective Surgeries of the Upper Limb: A Randomised Clinical Trial

Anaesthesia Section

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ABSTRACT

Introduction: Ultrasonography has revived the infraclavicular approach to brachial plexus block resulting in many studies available in the literature. However, very few studies have assessed the sensory block characteristics of individual nerve territories by this approach.

Aim: To compare the supraclavicular with the infraclavicular approach with special emphasis on the assessment of block characteristics of each nerve domain.

Materials and Methods: This randomised clinical trial was conducted on 40 patients of American Society of Anaesthesiologist (ASA) physical status I and II, aged between 20-60 years of age undergoing elective surgical procedures of the upper limb. They were randomly allocated into either group Supraclavicular (SC group) or Infraclavicular (IC group). Ultrasound-guided block was performed using 30 mL of 0.25% bupivacaine. The primary outcome measure was the efficacy of block, and the secondary outcome was the time taken for performance of block. Categorical variables were compared with the Chi-square test or Fisher's-exact test. Continuous variables were analysed using the unpaired t-test. The p-value <0.05 was considered significant.

Results: Sensory block was complete in radial, median, and musculocutaneous nerve territories in both groups. All patients in the IC group had a complete sensory block in the ulnar nerve territory, compared to 80% patients in the SC group (p=0.036). Patients in the IC group had higher motor block scores in the shoulder joint (p=0.016), elbow, and wrist joints (p=0.036) and finger joints (p=0.038). Block performance time was significantly longer in the IC group (p<0.001).

Conclusion: Infraclavicular approach provides better motor block and more complete sensory block of the upper limb. However, the time taken for performing the block was longer.

Keywords: Bupivacaine, Nerve block, Regional anaesthesia

INTRODUCTION

Brachial plexus block is increasingly being used as the primary mode of anaesthesia for surgical procedures on the upper limb distal to the mid arm. This technique has several advantages over general anaesthesia, such as maintaining consciousness, avoiding polypharmacy, better haemodynamic stability, excellent postoperative analgesia and avoiding postoperative nausea and vomiting associated with general anaesthesia. It is especially advantageous in patients with morbid obesity and difficult airway [1,2].

The various approaches to brachial plexus block are interscalene, supraclavicular, infraclavicular and axillary [1]. The supraclavicular approach is traditionally preferred for surgeries of the upper limb as it has a rapid onset and provides a reliable block [2]. A small but significant incidence of complications has however been a growing cause for concern [3]. Ultrasound in regional anaesthesia has made possible the safe performance of infraclavicular block, the advantages being avoiding complications and suitability for catheter techniques [4]. The advantages of ultrasound are real-time plexus visualisation, accuracy of needle placement, visualisation of local anaesthetic spread, and avoidance of intraneural or intravascular injection and pleural puncture [1].

With the advent of ultrasound guidance in regional anaesthesia, there is improved feasibility of using brachial plexus block as the sole anaesthetic technique for surgeries on the upper limb. However, the success rate, need for sedation, general anaesthesia, or supplemental nerve blocks remains a concern [5]. Even with the use of ultrasound, incomplete blocks do occur. Thus, there is a search for an ideal technique to block the brachial plexus using ultrasound, which would give a reliable and complete block, with minimum number of needle passes, lower volume of local anaesthetic, with minimum time taken to perform the block, and with a low rate of complications [3,6].

Very few published studies have analysed in detail the quality of sensory block in the individual nerve territories, namely the radial nerve, ulnar nerve, median nerve, and musculocutaneous nerve in various approaches to brachial plexus block [7-10]. Therefore, it was decided to conduct this study to compare the quality of sensory block in the different nerve distributions between the supraclavicular and infraclavicular approaches using ultrasound guidance.

The primary outcome was block efficacy, which was assessed based on sensory and motor block characteristics. The secondary outcomes were block-performance time and occurrence of complications such as vascular puncture, pneumothorax, and Horner's syndrome. It was hypothesised that the infraclavicular approach would give either similar or even better efficacy of block than the supraclavicular approach.

MATERIALS AND METHODS

This randomised clinical trial was conducted in Sree Balaji Medical College and Hospital, Chennai, India, during the period from September 2018 to August 2019. Institutional Ethical Committee approval was obtained for the study (Ref. no. 002/SBMC/IHEC/2017/1029). The study was registered with the Clinical Trials Registry of India (CTRI/2018/09/015723). Informed consent to participate in this study was obtained from all the patients.

Inclusion criteria: Age between 20-60 years, ASA physical status I and II, undergoing elective surgery, orthopaedic and plastic surgeries on the distal arm, elbow, forearm and hand were included in the study.

Exclusion criteria: Allergy to local anaesthetics, infection at puncture site, bleeding disorders, unco-operative patients, neurological deficit in the limb, significant respiratory disorders, pregnancy, patients not willing to participate were excluded from the study.

Sample size calculation: Sample size estimation was done based on a previous study, where the block performance time for the infraclavicular group was 9.57±3.19 minutes, whereas for supraclavicular group, it was 11.53±2.90 minutes [11]. To detect a 15% change, with a power of 80% and type I error of 0.05, the sample size required was 16 per group, using the following formula:

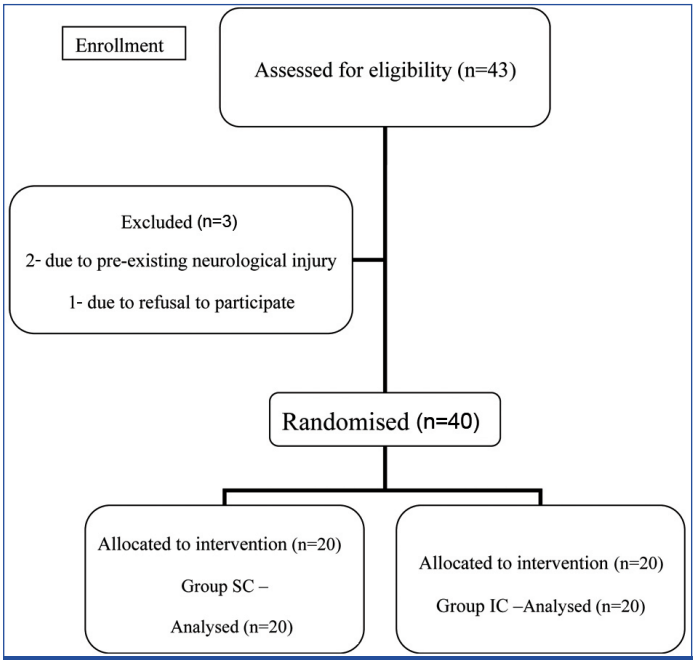
$N=2\ (z\sigma/e)^2$

$=2\{(1.96^*\ 3.04)/2\}^2$

$=16$

It was decided to enroll 20 patients in each group, to adjust for any possible drop-outs.

Randomisation was done using a computer generated random number table into one of the two groups: supraclavicular approach or infraclavicular approach group with each group comprising 20 patients. A total of 43 patients were assessed. Three patients were excluded, two due to pre-existing neurological injury and one due to refusal to participate in the study [Table/Fig-1].



[Table/Fig-1]: CONSORT Flow-chart representing study design.

Study Procedure

All the patients were assessed preoperatively. Under standard monitoring Electrocardiogram (ECG), Oxygen saturation (SpO_2), Non Invasive Blood Pressure (NIBP), 18 G intravenous access was secured. Patients were positioned supine with the arm adducted or abducted to 90° for supraclavicular or infraclavicular approach respectively. Anxiolysis was provided by injection midazolam 1 mg intravenously. The "Sonoscape S6" ultrasound machine was used, with a high frequency (8-13MHz) linear transducer to perform the blocks.

In the SC group, the probe was positioned in the supraclavicular fossa. A 22G nerve block needle was inserted in-plane, from lateral to medial. A 30 mL of 0.25% bupivacaine was injected in two aliquots. The first aliquot was injected into the 'corner pocket' between the subclavian artery and the first rib. The second aliquot was injected superficial to the first one, into the neural cluster of the brachial plexus. In the IC group, the transducer was placed in the parasagittal plane 2 cm medial and 2 cm caudad to the coracoid process. The medial, lateral, and posterior cords were identified at caudad, cephalad and posterior to the artery respectively. A 22G nerve block needle was inserted in-plane 2-3 cm cephalad to the transducer following piercing through the pectoralis major and minor muscles, the tip of the needle was placed near the posterior cord, located behind the axillary artery. A 30 mL of 0.25% bupivacaine was injected. The spread of local anaesthetic solution was confirmed.

All the blocks were performed by either one of the authors VN or SP, who had performed each block atleast 15 times before the commencement of the study. Following the block procedure, another anaesthesiologist (authors AKA or SS), who was not involved in the procedure, collected the clinical data of the patient to ascertain the quality parameters of the block. Observer blinding was thus ensured. Sensory block was assessed after removal of the needle every 10 minutes for 30 minutes. Sensory block was assessed by pinprick stimulation in the areas supplied by the median nerve, ulnar nerve, radial nerve, and musculocutaneous nerve. The sensory block score was recorded for each nerve as: score 2- no pain or touch sensation; score 1- no pain, touch sensation present; score 0- pain sensation present.

Motor block (shoulder, elbow, wrist, and hand grip) was assessed 30 minutes after removal of the needle. Motor function was assessed by flexion and extension of the joints with and without applied resistance. Motor function was graded as: score 2- no movement; score 1- reduced movement; score 0- normal movement.

Sensory block score 2 in all four nerve territories was considered as "complete sensory block" while a motor block of score 2 in all the four joints was considered as "complete motor block". Sensory block score of 2 in all four nerve territories after 30 minutes of the block, regardless of the motor block was considered as "surgical block", while the combination of complete sensory, as well as motor block, was considered as "effective upper limb block". The time duration from the first insertion to the removal of the needle was defined as "block performance time". The anaesthesia assistant recorded the block performance time with a stopwatch. In case of inadequate block effect, a supplemental block was performed after 30 minutes. Intravenous opioids or general anaesthesia were administered, if required.

The adverse events such as accidental vascular puncture, Horner's syndrome, and pneumothorax were looked for in all the patients. Surgery was started after ascertaining that "surgical block" was achieved. All patients were given oxygen supplementation (four to five liters per minute through a face mask) intraoperatively. At the end of the procedure, patients were transferred to postanaesthesia care unit and monitored for 24 hours.

STATISTICAL ANALYSIS

Statistical Package for Social Sciences (SPSS Version 16.0) software was used. Categorical variables were expressed as counts and percentages. Group comparisons were made with the Chi-square test or Fisher's-exact test. Continuous variables were analysed with the unpaired t-test. A p-value <0.05 was considered statistically significant.

RESULTS

The patients in the two groups were comparable with respect to age, sex distribution, weight, and ASA physical status [Table/Fig-2].

Variables	SC Group	IC Group	p-value
Age (years, mean±SD)	39.10±16.88	31.60±14.17	0.136
Sex (M:F)	11:9	14:6	0.327
Weight (kg, mean±SD)	64.50±8.29	61.30±8.11	0.334
ASA status (I:II)	14:6	15:5	0.723

[Table/Fig-2]: Age, sex, weight, and ASA physical status of patients in the two groups. unpaired t-test for age and weight, Chi-square test for sex and ASA status

Analysis of the sensory block score data revealed comparable and complete blocks in radial, median, and musculocutaneous nerve territories in both groups. However, there was a statistically significant difference (p= 0.036) in the sensory block score in the ulnar nerve territory; all patients in the IC Group had complete block (score 2, anaesthesia) whereas, in the SC Group, 80% of the patients had a complete block (score 2, anaesthesia) whereas 20% had a score 1 (analgesia) [Table/Fig-3]. Supplemental block of the ulnar nerve was performed in these patients. No patient in present study required more than 1 µ/kg of fentanyl or general anaesthesia.

Nerve territory	SC Group	IC Group	p-value
Radial nerve (score 2: score 1: score 0)	20:0:0	20:0:0	0.999
Median nerve (score 2: score 1: score 0)	20:0:0	20:0:0	0.999
Ulnar nerve (score 2: score 1: score 0)	16:4:0	20:0:0	0.036*
Musculocutaneous nerve (score 2: score 1: score 0)	20:0:0	20:0:0	0.999

[Table/Fig-3]: Number of patients having sensory block scores of 2, 1 and 0 in the different nerve territories 30 minutes after performance of block.
*A p-value <0.05 is considered to be statistically significant; p-value (Chi-square test)

Analysis of the motor block score data showed a statistically significant difference, with patients in the IC Group having higher motor block scores in the shoulder joint (p=0.016), elbow and wrist joints (p=0.036) and finger joints (p=0.038) [Table/Fig-4].

Joint	SC Group	IC Group	p-value*
Shoulder joint (score 2: score 1: score 0)	15 :5:0	20:0:0	0.016
Elbow joint (score 2: score 1: score 0)	16:4:0	20:0:0	0.036
Wrist joint (score 2: score 1: score 0)	16:4:0	20:0:0	0.036
Hand grip (score 2: score 1: score 0)	16:4:0	19 :1:0	0.038

[Table/Fig-4]: Number of patients having motor block scores of 2, 1 and 0 in the different nerve territories 30 min after performance of block.
*A p-value <0.05 is considered to be statistically significant; p-value (Chi-square test)

There was a statistically significant difference in the block performance time between the two groups (p<0.001), with the IC group having a longer block performance time than the SC group [Table/Fig-5].

	SC Group Mean±SD	IC Group Mean±SD	p-value*
Block-performance time (min)	9.95±3.17	14.75±2.86	<0.001

[Table/Fig-5]: Block performance times in the two groups.
*A p-value <0.05 is considered to be statistically significant; p-value (unpaired t- test)

There was a statistically significant difference in the duration of analgesia between the two groups (p=0.001), with the IC group having longer duration of analgesia than the SC group [Table/Fig-6].

	SC Group Mean±SD	IC Group Mean±SD	p-value*
Duration of analgesia (hrs)	9.68±1.85	12.30±2.82	0.001

[Table/Fig-6]: Duration of analgesia in the two groups.
*A p-value <0.05 is considered to be statistically significant; p-value (unpaired t- test)

None of the patients developed pneumothorax. Only two patients in the IC group had vessel injury, indicated by aspiration of blood. The needle was repositioned and the drug was injected after negative aspiration for blood. No other complications were observed in this study.

DISCUSSION

Upper extremity surgeries are very common, and regional anaesthesia provides dual advantages of avoiding general anaesthesia and its complications, and providing excellent postoperative pain relief [12,13]. Use of ultrasound guidance in performing brachial plexus blocks has increased the success rate and safety of this procedure. However, the incidence of incomplete blocks still remains a problem, often requiring supplemental nerve blocks, sedation, or general anaesthesia. The aim of this study was to characterise in detail, the sensory block produced by the two approaches to brachial plexus block. In this study, the success rate of IC block was 100%, whereas for SC block the success rate was 80%, since two patients required supplemental block of the ulnar nerve at 30 minutes. However, no patient required more than 1 µ/kg of fentanyl or general anaesthesia. A similar success rate was reported by Bharti N et al., the success rate for supraclavicular, infraclavicular, and interscalene being 86%, 90%, and 84%, respectively [14]. Koscielniak-Nielsen ZJ et al., demonstrated a success rate of 93% in infraclavicular, and 78% in supraclavicular approach [7]. The success rate was found to be comparable in supraclavicular and infraclavicular approaches in a systematic review conducted by Chin KJ et al., [15]. The high success rate for the surgical block was achieved due to the use of a high-frequency linear transducer, visualisation of the needle tip through in-plane approach, and visualisation of the spread of local anaesthetic.

The primary outcome of this study was to compare the block characteristics with respect to sensory and motor block. Significant ulnar sparing was found in the SC group in present study, with 20% patients having an incomplete block of the ulnar nerve. This has also been observed in previous studies. In the study conducted by Bharti N et al., the authors mention that a supplemental block of the ulnar nerve was performed in some patients receiving supraclavicular block [14]. Also, supplemental block of the radial nerve was performed in some of the patients receiving infraclavicular block. However, a detailed assessment of block characteristics in the individual nerve territories was not presented. Incomplete block of the ulnar nerve in the supraclavicular approach and incomplete block of the radial nerve in the infraclavicular approach has been observed by Park SK et al., in a systemic review of randomised controlled trials [10]. In the present study, incomplete sensory block was not observed in the IC group. Analysis of the motor block data also shows a more complete motor block of the shoulder, elbow, wrist, and finger joints in the IC group. Therefore, the IC approach was found to be the better approach.

A solution to the problem of ulnar sparing in supraclavicular blocks could be the use of nerve stimulation along with ultrasound. This has been demonstrated in a study by Luo Q et al., [16]. Most investigators have consistently found no significant difference in the quality of surgical anaesthesia provided by the supraclavicular or infraclavicular approaches to brachial plexus block [17,18].

In the present study, the block performance time was longer for the IC group compared to the SC group. Yazer MS et al., compared infraclavicular block with targeted intracluster injection supraclavicular block [9]. A shorter time to onset of the block was obtained in the TII group but with a longer block performance time. Dhir S et al., compared the supraclavicular and infraclavicular approaches for elbow surgeries done on an outpatient basis [19]. The two approaches were found to be comparable with respect to block performance and onset times. However, occurrence of ulnar sparing was noted in some of the patients receiving the supraclavicular block. Other investigators have found no difference in block performance times [14,17,18]. The longer time taken for correct placement of needle posterior to the axillary artery in the IC group may have resulted in the longer block performance time for the IC group in this study. Also, the number of injections was restricted to two in the SC group, to minimise chances of nerve injury. The duration of analgesia was found to be significantly longer in the IC group in the present study. A longer duration of block for the infraclavicular approach was also found by Vazin M et al., while comparing three approaches, namely supraclavicular, infraclavicular, and axillary, using a lower volume (20 mL) of local anaesthetic [20]. The infraclavicular approach was found to require fewer needle passes, and had a longer duration of block. In the

study by Bharti N et al., the duration of analgesia was longer in the IC group, but it was not statistically significant [14]. More uptake of local anaesthetic into the nerves due to more proximity of injection might have led to better block efficacy as well as longer duration of analgesia in the IC group in the present study.

Complications of brachial plexus blocks have not been studied adequately. Petrar SD et al., compared the incidence of hemidiaphragmatic paralysis in supraclavicular and infraclavicular approaches and found that the infraclavicular approach reduced, but not eliminated the incidence of hemidiaphragmatic paralysis [21]. A meta-analysis of the complications associated with three approaches, namely supraclavicular, infraclavicular and axillary revealed the commonest complications to be inadvertent vascular puncture, nerve injury, diaphragmatic paralysis, and pneumothorax [3]. In this study, accidental vessel puncture was not seen in the supraclavicular group but was seen in two patients in the infraclavicular group (10% incidence). None of the patients in this study developed pneumothorax or Horners' syndrome.

In summary, this study has found the infraclavicular approach to have higher success rate, and better sensory and motor block, compared to the supraclavicular approach, however, with a longer block performance time.

Limitation(s)

The study was not powered to detect the incidence of complications, and this would have required larger sample size. Also, a standard dose of 30 mL of local anaesthetic solution was used in all patients. This ensured the high success rate of blocks.

CONCLUSION(S)

The infraclavicular approach has been found to be superior to the supraclavicular approach, with a higher success rate, and better sensory and motor block, for surgeries of the distal arm, elbow, forearm, and hand. As this approach provides a more complete block with a single injection of local anaesthetic, it would be beneficial to use this approach, though it may be difficult to perform, compared to the traditional supraclavicular approach.

REFERENCES

[1] Kumar P, Raju BC, Coventry DM. Ultrasound-guided brachial plexus blocks. Continuing Education in Anaesthesia Critical Care & Pain. 2014;14(4):185-91.
[2] John RS, Mckean G, Sarkar RA. Upper limb block anaesthesia. In: StatPearls [Internet]. Treasure Island, FL: StatPearls Publishing; 2021. [Updated 2021 Jan 19]. Available from: https://www.ncbi.nlm.nih.gov/books/ NBK531460/.
[3] Casas-Arroyave FD, Ramírez-Mendoza E, Ocampo-Agudelo AF. Complications associated with three brachial plexus blocking techniques: Systematic review and meta-analysis. Rev Esp Anestesiol Reanim (Engl Ed). 2021;68(7):392-407. Doi: 10.1016/j.redare.2020.10.003. Epub 2021 Jul 20. PMID: 34294596.
[4] Williams LM, Singh K, Dua A, Singh A, Cummings A. Infraclavicular Nerve Block. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021. [Updated 2021 Jan 23]. Available from: https://www.ncbi.nlm.nih.gov/books/ NBK537016/.
[5] Kaye AD, Allampalli V, Fisher P, Kaye AJ, Tran A, Cornett EM, et al. Supraclavicular vs. infraclavicular brachial plexus nerve blocks: Clinical, pharmacological, and anatomical considerations. Anaesth Pain Med. 2021;11(5):e120658. Doi: 10.5812/aapm.120658.
[6] Datta R, Agrawal J, Narula G, Pahwa B. A fluoroscopic assessment of brachial plexus block by the supraclavicular approach: Have we been overmedicating? Med J Armed Forces India. 2020;76(4):410-17. Doi: 10.1016/j.mjafi.2019.06.004. Epub 2019 Dec 2. PMID: 33162649; PMCID: PMC7606091.
[7] Koscielniak-Nielsen ZJ, Frederiksen BS, Rasmussen H, Hesselbjerg L. A comparison of ultrasound-guided supraclavicular and infraclavicular blocks for upper extremity surgery. Acta Anaesthesiol Scand. 2009;53(5):620-26.
[8] Fredrickson MJ, Patel A, Young S, Chinchanwala S. Speed of onset of 'corner pocket supraclavicular' and infraclavicular ultrasound guided brachial plexus block: A randomised observer-blinded comparison. Anaesthesia. 2009;64:738-44.
[9] Yazer MS, Finlayson RJ, Tran DQ. A randomised comparison between infraclavicular block and targeted intracluster injection supraclavicular block. Reg Anaesth Pain Med. 2015;40(1):11-15.
[10] Park SK, Lee SY, Kim WH, Park HS, Lim YJ, Bahk JH. Comparison of supraclavicular and infraclavicular brachial plexus block: A systemic review of randomised controlled trials. Anaesth Analg. 2017;124(2):636-44.
[11] Abhinaya RJ, Venkatraman R, Matheswaran P, Sivarajan G. A randomised comparative evaluation of supraclavicular and infraclavicular approaches to brachial plexus block for upper limb surgeries using both ultrasound and nerve stimulator. Indian J Anaesth. 2017;61:581-86.
[12] Jones MR, Novitch MB, Sen S, Hernandez N, De Haan JB, Budish RA, et al. Upper extremity regional anaesthesia techniques: A comprehensive review for clinical anaesthesiologists. Best Pract Res Clin Anaesthesiol. 2020;34(1):e13-29. Doi: 10.1016/j.bpa.2019.07.005. Epub 2019 Jul 20. PMID: 32334792.
[13] Ardon AE, Prasad A, McClain RL, Melton MS, Nielsen KC, Greengrass R. Regional anaesthesia for ambulatory anaesthesiologists. Anaesthesiol Clin. 2019;37(2):265-87. Doi: 10.1016/j.anclin.2019.01.005. Epub 2019 Mar 15. PMID: 31047129.
[14] Bharti N, Bhardawaj N, Wig J. Comparison of ultrasound-guided supraclavicular, infraclavicular and below-C6 interscalene brachial plexus block for upper limb surgery: A randomised, observer-blinded study. Anaesth Intensive Care. 2015;43(4):468-72.
[15] Chin KJ, Alakkad H, Adhikary SD, Singh M. Infraclavicular brachial plexus block for regional anaesthesia of the lower arm. Cochrane Database Syst Rev. 2013;28(8):CD005487.
[16] Luo Q , YaoW, Shu H, Zhong M. Double-injection technique assisted by a nerve stimulator for ultrasound-guided supraclavicular brachial plexus block results in better distal sensory-motor block: A randomised controlled trial. Eur J Anaesthesiol. 2017;34(3):127-34.
[17] Tarikci KE, Akdemir MS.Comparison of supraclavicular, infraclavicular and axillary approaches for ultrasound-guided brachial plexus block for upper limb surgeries: A retrospective analysis of 182 blocks. Dubai Med J. 2018;1:33-37.
[18] Stav A, Reytman L , Stav MY, Portnoy I, Kantarovsky A, Galili O, et al. Comparison of the supraclavicular, infraclavicular and axillary approaches for ultrasound-guided brachial plexus block for surgical anaesthesia. Rambam Maimonides Med J. 2016;7(2):e0013.
[19] Dhir S, Brown B, Mack P, Bureau Y, Yu J, Ross D. Infraclavicular and supraclavicular approaches to brachial plexus for ambulatory elbow surgery: A randomised controlled observer-blinded trial. J Clin Anaesth. 2018;48:67-72. Doi: 10.1016/j.jclinane.2018.05.005. Epub 2018 May 26. PMID: 29778971.
[20] Vazin M, Jensen K, Kristensen DL, Mathias Hjort, Katrine Tanggaard, Manoj K Karmakar, et al. Low-volume brachial plexus block providing surgical anaesthesia for distal arm surgery comparing supraclavicular, infraclavicular, and axillary approach: A randomised observer blind trial. Res Int. 2016; 2016:7094121. Doi: 10.1155/2016/7094121. Epub 2016 Nov 21.PMID: 27990435.
[21] Petrar SD, Seltenrich ME, Head SJ, Schwarz SK. Hemidiaphragmatic paralysis following ultrasound-guided supraclavicular versus infraclavicular brachial plexus blockade: A randomised clinical trial. Reg Anaesth Pain Med. 2015;40(2):133-38. Doi: 10.1097/AAP.0000000000000215. PMID: 25650633.

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