Original Article

Spectrum of Upper Limb Surgeries Performed Under Supraclavicular Brachial Plexus Block in a Tertiary Care Hospital: A One-Year Review

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Abstract

Background: *The supraclavicular brachial plexus block (SCB) is a widely used regional anesthesia technique for upper limb surgeries. It offers excellent surgical anesthesia and postoperative analgesia, with minimal systemic effects. This study aimed to analyze the types and frequency of upper limb surgeries conducted under SCB over one year in a tertiary care hospital, assessing its clinical applicability and success rates.* ***Materials & Methods:*** *A prospective observational study was conducted in Eastern Medical College Hospital from January 2024 to December 2024. A total of 100 patients underwent upper limb surgeries under supraclavicular block was included in this study which were selected by purposive sampling. patient demographics, type of surgery, side and level of surgery, block success rate, intraoperative complications and postoperative analgesia duration and complications were recorded in data collection sheet. Data was entered into Microsoft Excel and analyzed using SPSS version 25.0. Categorical variables were expressed as frequencies and percentages.* ***Results:*** *Among the 100 participants mostly were male (65%) compared to female cases (35%). Surgeries on the right upper limb (80%) were more common than those on the left upper limb (20%). The block had a high success rate of 98% with no intraoperative complications. Conversion to general anesthesia was required in 2% of cases. The wrist was the most common surgical site (61%), followed by the hand (18%), elbow (11%) and forearm (10%). Most surgeries were for combined fractures of the radius and ulna (50 cases), followed by isolated radius fractures (20 cases), while ulna fractures, hand fractures, tendon repairs, soft tissue repairs, and implant removals each accounted for 5 to 10 cases.* ***Conclusion:*** *The supraclavicular block is a reliable and effective regional anesthesia technique for a wide range of upper limb surgeries in a tertiary care setting. Its use is associated with high success rates, minimal complications, and satisfactory postoperative analgesia, making it a valuable anesthetic option for upper extremity surgical procedures.*

Keywords: Supraclavicular brachial plexus block, regional anesthesia, upper limb surgery, postoperative analgesia.
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Introduction

Effective pain management is a key component of enhanced recovery after surgery (ERAS) protocols. The concept of multimodal analgesia in providing a balanced and effective approach to perioperative pain management is widely accepted and practiced, with regional anesthesia playing a pivotal role[1]. Regional anesthesia has long been a fundamental component of contemporary anesthetic practice, valued for its capacity to deliver localized pain relief while avoiding the broad systemic effects of general anesthesia. Regional anesthesia provides targeted pain relief by blocking nerve signals in specific areas of the body, delivering effective analgesia while minimizing the need for systemic opioids, which can cause side effects like nausea, respiratory depression, and the risk of addiction[2]. Regional anesthesia is a dynamic field, marked by ongoing advancements and continuous refinement of techniques and technologies. Recent advancements in this field, including the adoption of ultrasound-guided techniques, the development of novel nerve blocks, approaches, and the introduction of long-acting local anesthetics, have revolutionized how anesthesia is administered[3].

Among the various regional anesthesia techniques for upper limb surgeries, the supraclavicular brachial plexus block (SCB) is considered one of the

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most effective approaches, particularly for procedures involving the arm, forearm, and hand[4]. This technique is often called the "spinal of the arm[5]." The first brachial plexus block used cocaine and was performed with direct visualization of the neck nerves. The earliest recorded percutaneous method for brachial plexus blockade was documented in 1911[6]. The brachial plexus originates from the ventral rami of the C5 to T1 spinal nerves. These nerve roots merge to form trunks, which then split into divisions, reorganize into cords, and finally give rise to the peripheral nerves. The supraclavicular block focuses on the brachial plexus at the level of the distal trunks or proximal divisions, where the nerves are tightly clustered, enabling the local anesthetic to cover a broad area effectively[7].

Brachial plexus blocks can be guided using ultrasound (USG), a nerve stimulator (NS), or conventional landmark-based methods[8]. All brachial plexus blocks are contraindicated if there is active cellulitis or an abscess at the injection site, or a known allergy to the local anesthetic[9]. SCB should be used cautiously in patients with poor pulmonary reserves, as any resulting pneumothorax may significantly worsen their respiratory status. An example of this relative contraindication is known pneumonia on the contralateral side[10]. The disadvantages of this technique include patient anxiety and discomfort due to pain in muscle twitching[11].

In 1994, Kapral, et al[12] were the first to report the use of ultrasound to guide needle insertion around the brachial plexus. This approach has gained popularity in recent years because of the direct visualization of anatomical structures, reduces the volume of local anesthetic required, and minimizes complications such as pneumothorax and vascular puncture[13]. However, even with traditional landmark-based techniques, the supraclavicular block remains a practical and effective choice in resource-limited settings. This study aimed to analyze the types and frequency of upper limb surgeries performed under SCB over one year in a tertiary care hospital, assessing its clinical applicability and success rates.

Materials and Methods

A prospective observational study was conducted in Eastern Medical College & Hospital (EMCH) from January 2024 to December 2024. A total of 100 patients aged 18 years and above who underwent upper limb surgeries under a supraclavicular block were included in this study. All the cases were selected by purposive sampling. Patients who received other forms of anesthesia, failed or incomplete blocks, have contraindications to regional anesthesia, under 18 years of age and pregnant female were excluded from the study. Ethical clearance was obtained from the Institutional Ethical Review Board EMC.

Block Technique: After all pre-anaesthetic checkup and informed consent, the supraclavicular block was performed using a landmark-based technique. Patients were placed in the supine position, with their arms by their sides and their head rotated to the side opposite that of the injection, at an angle of 45° from the midline. Then the clavicle was located, particularly at the junction of its medial two-thirds and lateral one-third. After that, subclavian artery pulsation was identified just posterior to the clavicle. A 22-gauge 60-mm needle was deep between the subclavian artery and the first rib; subsequently, 2 ml to 3 ml of a local anaesthetic [e.g., bupivacaine, lignocaine] was injected very carefully to avoid accidental intravascular injection. By the end of the procedure, a total of 25-30 ml of anaesthetic had been injected.

Data analysis: Patient demographics, type of surgical procedure, side and level of surgery, block success rate, intraoperative complications and postoperative analgesia duration and complications were recorded in data collection sheet. Data was entered into Microsoft Excel and analyzed using SPSS version 25.0. Categorical variables were expressed as frequencies and percentages.

Results

Among the 100 participants mostly were male (65%) compared to female cases (35%) (Figure-1). The majority of patients were in the 31-40 year age group (41), followed by those in the 15-30 year age group (25) (Figure-2). Surgeries involving the right upper limb (80%) were more frequent than those performed on the left upper limb (20%) (Table-I). Only two (2) cases required conversion to general anesthesia, and no complications were reported in any of the cases included in this study.

In this study the wrist was the most common surgical site (61%), followed by the hand (18%), elbow (11%) and forearm (10%) (Table-II). Table-III shows that the majority of surgeries were for combined fractures of the radius and ulna (50 cases), followed by isolated radius fractures (20 cases), while ulna fractures, hand fractures, tendon repairs, soft tissue repairs, and implant removals each accounted for 5 to 10 cases.

Table-I: Side distribution of upper limb in the study cases (n=100)

Surgical side of limb	Number (n)	Percentage (%)
Right upper limb	80	80
Left upper limb	20	20
Total	**100**	**100**

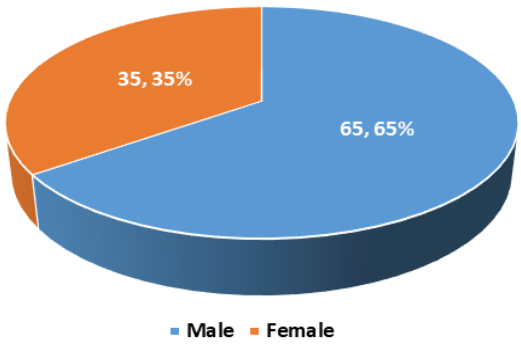

Figure-1: Gender distribution of the study cases (n=100)

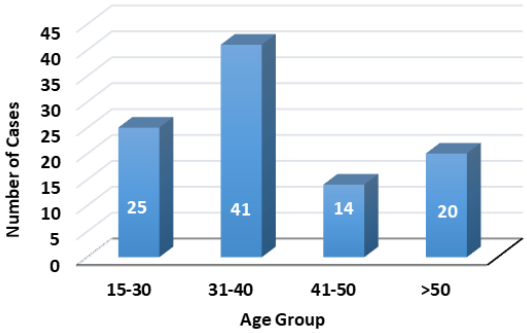

Figure-2: Distribution of cases according to age (n=100)

Table-II: Site of surgery in the upper limb (n=100)

Surgical Site	Number (n)	Percentage (%)
Elbow	11	11
Forearm	10	10
Wrist	61	61
Hand	18	18
Total	**100**	**100**

Table-III: Details of surgical procedure in the upper limb (n=100)

Surgical Procedure	Number (n)	Percentage (%)
Fracture of radius	20	20
Fracture of ulna	05	05
Combined fracture of radius & ulna	50	50
Implant removal	10	10
Fracture hand structure	05	05
Tendon repair	05	05
Cellulitis & soft tissue repair	05	05
Total	**100**	**100**

Discussion

Local anesthetics produce anesthesia by preventing the excitation of nerve endings or by blocking the conduction of nerve impulses in peripheral nerves. This occurs when the anesthetic molecules reversibly attach to sodium channels, inhibiting their function[14,15]. Supraclavicular approach for brachial plexus block is the popular approach because the plexus is shallowest, and the local anesthetic injected will be around the trunks and divisions of the plexus[11]. Brachial plexus block, when performed using only surface landmarks, has mainly been utilized for orthopedic surgeries of the upper limb[16]. The findings of the study indicate that most patients undergoing such surgery were males (65%), which aligns with existing literature suggesting higher incidence of upper limb trauma in males due to greater exposure to occupational hazards, sports-related injuries, and risk-taking behaviors[17]. Sriramatr, et al[11] also showed the male was predominant cases of supraclavicular block in their study.

The present study showed the high success rate of supraclavicular brachial plexus block for hand and forearm surgery. The study had a 98% success rate. The success rate of this technique reported elsewhere varied between 78-95%[18,19]. There were no complications reported in any of the cases in this study. The age distribution showed that the majority of patients were in the 31-40 year age group, followed by those in the 15-30 year age group. This suggests that younger and middle-aged adults are more likely to sustain injuries related to work or physical activity, leading to upper limb fractures and requiring surgical intervention. In this study the predominance of right upper limb surgeries (80%) over the left (20%) may be explained by the higher frequency of dominant hand involvement in trauma, as the majority of the population is right-handed[20].

The analysis of the types of surgeries performed showed that combined fractures of the radius and ulna were the most frequent (50%), with isolated radius fractures being the next most common (20%). Other procedures, including tendon repair, implant removal, and soft tissue repair, were less frequent but represent the diversity of conditions managed using the supraclavicular approach. The study by Chaturvedi, et al[21] reported that 40% of the cases involved both radius and ulna fractures, 12% had isolated radius fractures, 4% had isolated ulna fractures, and 16% had supracondylar fractures. Another study with 202 cases found that fracture repair was the most common type of surgery (92), followed by implant removal (45), tendon repair (17) and soft-tissue tumor resection (9)[22].

In this study, the wrist was the most common surgical site (61%), followed by the hand (18%), elbow (11%), and forearm (10%). A similar study reported that the wrist was the most frequent fracture site (105/202 cases), followed by the hand (83/202 cases), with the elbow and forearm being the least

commonly affected sites[22]. Other studies showed the forearm was the common surgical site followed by hand[11,23]. The use of the supraclavicular brachial plexus block in this study provided effective anesthesia for a wide range of upper limb surgeries, supporting existing evidence on its efficacy and safety in upper extremity procedures[4].

Limitations

A single anesthesiologist performed all blocks, the study was single-centered, had no comparison group and had only short-term follow-up.

Conclusion

The supraclavicular brachial plexus block proved to be an effective and reliable anesthetic technique for a wide range of upper limb surgeries performed in our tertiary care center. Its use is associated with high success rates, minimal complications, and satisfactory postoperative analgesia, making it a valuable anesthetic option for upper extremity surgical procedures.

Recommendations

Regular training programs and standardized protocols should be developed to improve the proficiency and safety of performing the block, comparative studies with general anesthesia and other regional techniques should be conducted to strengthen the evidence base and future studies should include longer follow-up periods to evaluate chronic complications, functional outcomes, and patient satisfaction.

Conflict of Interest

The authors declared that they have no conflicts of interest.

References

1. Chitnis SS, Tang R, Mariano ER. The role of regional analgesia in personalized postoperative pain management. Korean J Anesthesiol. 2020; 73 (5): 363-71. doi: 10.4097/kja.20323.
2. Malviya AK, Khanna P. Emerging trends in regional anesthesia techniques. Natl Board Exam J Med Sci. 2024; 2 (Special Issue): S32–S42. doi: 10.61770/NBEJMS.2024.v02.i11.S05.
3. John R, Alexander D. Recent advances in regional anesthesia: Enhancing perioperative pain management. 2021; 3 (1): 125-32. doi: 10.13140/RG.2.2.21088.25604.
4. Neal JM, Gerancher JC, Hebl JR, Ilfeld BM, McCartney CJ, Franco CD, et al. Upper extremity regional anesthesia: essentials of our current understanding, 2008. Reg Anesth Pain Med. 2009; 34 (2): 134-70. doi: 10.1097/AAP.0b013e31819624eb.
5. Songthamwat B, Karmakar MK, Li JW, Samy W, Mok LYH. Ultrasound Guided Infraclavicular Brachial Plexus Block: Prospective Randomized Comparison of the Lateral Sagittal and Costoclavicular Approach. Reg Anesth Pain Med. 2018; 43 (8): 825-31. doi: 10.1097/AAP.0000000000000822.
6. Matas R. Local and regional anesthesia: A retrospect and prospect. Am J Surg. 1934; 25 (1): 189-96. doi: 10.1016/s0002-9610(34)90158-6.
7. 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. Anesth Pain Med. 2021; 11 (5): e120658. doi: 10.5812/aapm.120658.
8. Nijs K, Hertogen P, Buelens S, Coppens M, Teunkens A, Jalil H, et al. Axillary brachial plexus block compared with other regional anesthesia techniques in distal upper limb surgery: a systematic review and meta-analysis. J Clin Med. 2024; 13 (11): 3185. doi: 10.3390/jcm13113185.
9. Langlois PL, Gil-Blanco AF, Jessop D, Sansoucy Y, D'Aragon F, Albert N, et al. Retro clavicular approach vs infraclavicular approach for plexic bloc anesthesia of the upper limb: study protocol randomized controlled trial. Trials. 2017; 18 (1): 346. doi: 10.1186/s13063-017-2086-1.
10. Tran DQ, Elgueta MF, Aliste J, Finlayson RJ. Diaphragm-Sparing Nerve Blocks for Shoulder Surgery. Reg Anesth Pain Med. 2017; 42 (1): 32-8. doi: 10.1097/AAP.0000000000000529.
11. Sriramatr D, Chongarunngamsang W, Kusumaphanyo C, Promma J. Ultrasound-guided supraclavicular brachial plexus block in hand and forearm surgery: case series. J Med Assoc Thai. 2018; 101 (10): 1457-61.
12. Bruce BG, Green A, Blaine TA, Wesner LV. Brachial plexus blocks for upper extremity orthopaedic surgery. J Am Acad Orthop Surg. 2012; 20 (1): 38-47. doi: 10.5435/JAAOS-20-01-038.
13. Chan VWS, Perlas A, Rawson R, Odukoya O. Ultrasound-guided supraclavicular brachial plexus block. Anesth Analg. 2003; 97 (5): 1514-7. doi: 10.1213/01.ANE.0000062519.61520.14.
14. Fozzard HA, Lee PJ, Lipkind GM. Mechanism of local anesthetic drug action on voltage-gated sodium channels. Curr Pharm Des. 2005; 11 (21): 2671-86. doi: 10.2174/13816120545468 33.
15. Dullenkopf A, Borgeat A. Lokalanästhetika. Unterschiede und Gemeinsamkeiten der "-caine" [Local anesthetics. Differences and similarities in the “-cains"]. Anaesthesist. 2003; 52 (4): 329-40. German. doi: 10.1007/s00101-003-0463-5.

16. Kulenkampff D. Brachial Plexus Anaesthesia: Its Indications, Technique and Dangers. Ann Surg. 1928; 87 (6): 883-91. doi: 10.1097/00000658-192806000-00015.
17. Rohilla RK, Kumar S, Singh R, Devgan A, Meena HS, Arora V. Demographic Study of Orthopedic Trauma among Patients Attending the Accident and Emergency Department in a Tertiary Care Hospital. Indian J Orthop. 2019; 53 (6): 751-7. doi: 10.4103/ortho.IJOrtho_161_19.
18. Tsui BC, Doyle K, Chu K, Pillay J, Dillane D. Case series: ultrasound-guided supraclavicular block using a curvilinear probe in 104 day-case hand surgery patients. Can J Anaesth. 2009; 56 (1): 46-51. doi: 10.1007/s12630-008-9006-5.
19. Chan VW, Perlas A, McCartney CJ, Brull R, Xu D, Abbas S. Ultrasound guidance improves success rate of axillary brachial plexus block. Can J Anaesth. 2007; 54 (3): 176-82. doi: 10.1007/BF03022637.
20. Karl JW, Olson PR, Rosenwasser MP. The Epidemiology of Upper Extremity Fractures in the United States, 2009. J Orthop Trauma. 2015; 29 (8): e242-4. doi: 10.1097/BOT.0000000000000312.
21. Chaturvedi A, Vaidya A, Vinay A, Nayar S. A comparative study of supraclavicular brachial plexus block using nerve stimulator versus ultrasound guided method in Indian population. J Popul Ther Clin Pharmacol. 2024; 31 (2): 836-43. doi: 10.53555/jptcp.v31i2.4509.
22. Gamo K, Kuriyama K, Higuchi H, Uesugi A, Nakase T, Hamada M, et al. Ultrasound-guided supraclavicular brachial plexus block in upper limb surgery: outcomes and patient satisfaction. Bone Joint J. 2014; 96-B(6): 795-9. doi: 10.1302/0301-620X.96B6.31893.
23. Yang CW, Kwon HU, Cho CK, Jung SM, Kang PS, Park ES, et al. A comparison of infraclavicular and supraclavicular approaches to the brachial plexus using neurostimulation. Korean J Anesthesiol. 2010; 58 (3): 260-6. doi: 10.4097/kjae.2010.58.3.260.

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