Utilization Of USG Guided Musculocutaneous And Axillary Nerve Block For Distal Forearm And Hand Surgeries : A Case Series Of 11 Patients

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Abstract:

Background: Axillary block and musculocutaneous nerve block are established regional anesthesia techniques increasingly utilized for distal arm and hand surgeries due to their efficacy in providing anesthesia and analgesia. This case series examines the outcomes of 11 patients who underwent various distal arm and hand surgeries under these nerve blocks. The primary objectives were to assess the adequacy of anesthesia, perioperative pain management, complications, and patient satisfaction. All procedures were performed in an outpatient setting. Data on block success rates, onset time, surgical outcomes, postoperative pain scores, and adverse events were collected and analyzed. Our findings suggest that axillary block and musculocutaneous nerve block are effective options for providing surgical anesthesia with minimal complications, demonstrating promising outcomes for distal arm and hand surgeries.

Methods: A retrospective study was conducted on 11 patients who underwent distal forearm and hand surgeries under usg guided musculocutaneous and axillary nerve blocks. After obtaining consent from all the patients were pre-medicated and after positioning of the arm by abducting the arm with external rotation and elbow flexed to 90 degrees. Using USG guidance with the linear probe 15-20 ml 0.5% Ropivacaine with 4mg dexamethasone given around the axillary artery followed by 5-10 ml around the musculocutaneous of 0.5% ropivacaine between coracobrachialis and biceps muscle. The patients remained hemodynamically stable intraoperative period. Pain scores were assessed using the Visual Analog Scale (VAS) at 1, 6, 12, and 24 hours postoperatively. Additional analgesic requirements, side effects, and complications were also recorded.

Results: All 11 patients experienced successful anesthesia with the usg guided musculocutaneous and axillary nerve blocks, with complete sensory and motor blockade achieved in the targeted regions. The onset of anesthesia was rapid, and the duration was adequate for the surgical procedures. There were no significant anesthesia-related complications reported, and patients exhibited quick recovery times, with minimal postoperative pain and early discharge. Patient satisfaction was high, attributed to the effectiveness of the nerve blocks and the absence of systemic anesthesia side effects.

Conclusion: The utilization of usg guided musculocutaneous and axillary nerve blocks for distal forearm and hand surgeries is an effective and safe anesthetic technique. This approach provides adequate anesthesia, minimizes complications, and promotes faster recovery, making it a valuable alternative to more invasive anesthesia methods. Further studies with larger sample sizes are recommended to validate these findings and potentially expand the application of this anesthetic technique in similar surgical context..

Keywords:

Axillary block, Musculocutaneous nerve block,distal arm surgeries, Hand surgeries, Regional anesthesia,postoperative analgesia, opioid consumption, patient recovery, USG guided block

INTRODUCTION:

Regional anesthesia techniques play a vital role in modern surgical practice, offering numerous advantages over general anesthesia, including reduced systemic side effects, improved postoperative pain management, and faster recovery times.

Most hand and wrist surgeries can be performed under ultrasound guided regional anesthesia. Interscalene, supraclavicular, axillary and infraclavicular approaches to brachial plexus blockade provide effective anesthesia for surgical procedures [1].

USG guided Axillary block and musculocutaneous nerve block have gained popularity for distal arm and hand surgeries due to their ability to selectively anesthetize the upper extremity while preserving motor function and patient comfort.

This case series aims to contribute to the existing literature by presenting our institution's experience with these nerve blocks in a cohort of 11 patients undergoing various distal arm and hand procedures.

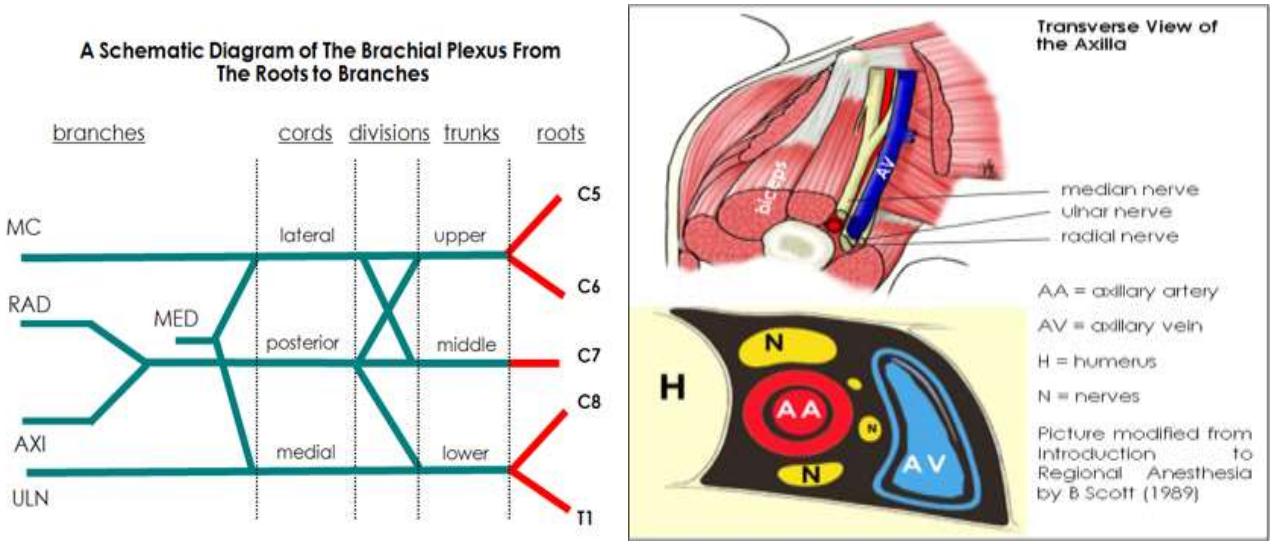
Anatomy:

The brachial plexus arises from the ventral primary rami of the spinal nerves C5 to T1 and extends from the neck to the apex of the axilla. It is a complex network of nerves organized from proximal to distal as follows:

- **Roots** (in the interscalene region)
- **Trunks and Divisions** (in the supraclavicular region)
- **Cords** (in the infraclavicular region)
- **Terminal Branches** (in the axillary region)

The primary function of the brachial plexus is to provide sensory and motor innervation to the upper limb. However, some exceptions include:

- The **lateral pectoral nerve** (C5-C7) and **medial pectoral nerve** (C8, T1), which innervate the pectoral muscles.
- The **long thoracic nerve** (C5-C7), which supplies the serratus anterior muscle.
- The **thoracodorsal nerve** (C6-C8), which supplies the latissimus dorsi muscle.
- The **suprascapular nerve**, which innervates the supraspinatus and infraspinatus muscles.



The axillary block targets the terminal branches of the brachial plexus, including the median, ulnar, radial, and musculocutaneous nerves. The musculocutaneous nerve often branches from the lateral cord in the proximal axilla and is frequently spared by the axillary approach. To block musculocutaneous nerve selectively, we do USG guided musculocutaneous nerve block. The median, ulnar, and radial nerves are positioned adjacent to the axillary artery and are surrounded by the biceps, coracobrachialis, and triceps muscles.

METHODOLOGY:

1. Case Series:

We present a retrospective analysis of 11 consecutive patients who underwent distal forearm and hand surgeries and received USG guided Axillary block and Musculocutaneous nerve block at our institution between February 2024 to may 2024.

Patient demographics, surgical indications, axillary block and musculocutaneous nerve block technique, perioperative analgesic requirements, pain scores, complications, and length of hospital stay were recorded.

2, Patient demographics:

- Mean age: 44yrs
- Gender distribution: Male=7; Female=4
- Surgical indications: Distal forearm and hand surgeries

- ASA grading: ASA II (n=7); ASA III (n=4)

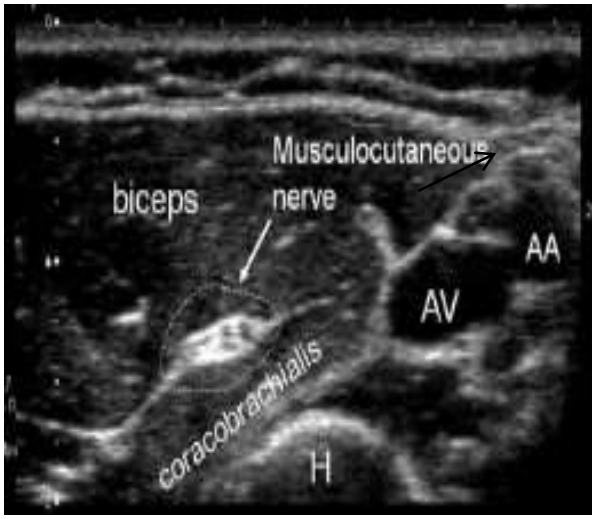
3. Technique of Axillary nerve block:

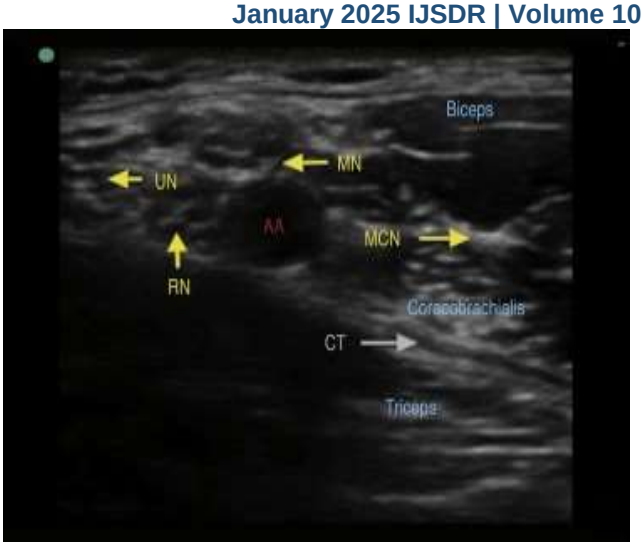
- After obtaining written consent from all the patients were pre-medicated and after positioning by abducting the arm with external rotation and elbow flexed to 90 degrees.
- The axillary artery is the initial landmark to locate. It appears as a spherical, pulsatile hypoechoic structure that is not easily compressible. Positioned over the conjoined tendon formed by the latissimus dorsi and teres major tendons, it serves as a critical reference point.
- Identification of the axillary vein is also crucial. It presents as a spherical hypoechoic structure but lacks pulsatility and can be readily compressed.
- Surrounding the artery are the median, ulnar, and radial nerves, each exhibiting various shapes and echogenicities. These nerves can appear spherical, oval-shaped, hyperechoic, hypoechogenic, or resembling a beehive. Their positions around the artery are variable, though the radial and median nerves typically maintain consistent locations.
- In most cases, the radial nerve is situated between 4 and 6 o'clock (83% prevalence), the median nerve between 9 and 12 o'clock (88% prevalence), and the ulnar nerve between 12 and 3 o'clock (85% prevalence) relative to the artery.
- Using USG guidance with the linear probe 15-20 ml 0.5% Ropivacaine with 4mg dexamethasone given around the axillary artery.

4. Technique of musculocutaneous nerve block:

- The musculocutaneous nerve is usually located laterally, positioned between the short head of the biceps and the coracobrachialis muscle.
- Using USG guidance with the linear probe 5-10 ml 0.5% Ropivacaine with 4mg Dexamethasone injected around the musculocutaneous nerve between coracobrachialis and biceps muscle.

Anesthesia was maintained with midazolam 0.08mg/kg and opiod pentazocine 30mg iv before surgery. The patients remained hemodynamically stable intraoperative period. Pain scores were assessed using the Visual Analog Scale (VAS) at 1, 6, 12, and 24 hours postoperatively. Additional analgesic requirements, side effects, and complications were also recorded.





Perioperative analgesic requirements:

The duration successful block remained on and average 18 to 24 hours. There was no intraoperative and postoperative complications noted related to the block up to 24 hours.

RESULTS:

Sl no	Age/sex	Surgery (<3hrs)	Volume (Ml)	Onset of blockade		VAS score (During surgery)	Complication (After 24 hrs)
				Sensory	Motor		
1.	45y / F	Distal end radius #	25	3 min	8 min	0	Nil
2.	36y / M	Metacarpal #	25	5 min	10 min	0	Nil
3.	54y / M	Distal end radius #	25	4 min	9 min	0	Nil
4.	64y / F	Both bone forearm #	25	4 min	7 min	0	Nil
5.	61y / M	Both bone forearm #	25	5 min	7 min	0	Nil
6.	38y / F	Distal end radius #	25	5 min	8 min	0	Nil
7.	26y / M	Tendon repair	25	4 min	9 min	0	Nil
8.	44y / M	Both bone forearm #	25	4 min	9 min	0	Nil
9.	29y / M	Distal end radius #	25	5 min	10 min	0	Nil
10.	52y / M	Contracture release	25	4 min	8 min	0	Nil
11.	33y / F	Distal end radius #	25	5 min	9 min	0	Nil

- All patients received the block remained stable throughout the surgery.
- On and average onset of action of the block was 5 mins for the sensory block and 9 mins for the motor blockade.

Complications:

- No major complications related to the axillary block and musculocutaneous nerve block were observed in any of the patients.

Limitations:

- The study is limited by its small sample size.
- Results may be influenced by variations in patient characteristics and surgical techniques.
- Prospective studies with larger cohorts are needed to validate these findings.

Discussion:

Axillary block and musculocutaneous nerve block have proven effective in providing surgical anesthesia for distal arm and hand surgeries in our case series. These techniques offer advantages such as precise anesthesia delivery, minimal systemic effects, and rapid recovery compared to general anesthesia.

Guntz et al. [2] reported that an ultrasound-guided brachial plexus block at the humeral canal can facilitate forearm flexion recovery while ensuring effective postoperative analgesia.

Soberón [3] reported that distal peripheral nerve blocks at the forearm are typically limited to wrist and hand surgery.

Moayeri [4] reported that variations in neural architecture and the size of adipose tissue compartments surrounding the brachial plexus significantly influence the success of nerve blocks.

Our findings are consistent with previous studies suggesting the safety and efficacy of these nerve blocks for upper limb surgeries. Limitation includes small sample size, potential selection bias. Further research is warranted to validate these findings in larger patient cohorts and explore long-term outcomes.

Conclusion:

The utilization of usg guided musculocutaneous and axillary nerve blocks for distal forearm and hand surgeries is an effective and safe anesthetic technique. This approach provides adequate anesthesia, minimizes complications, and promotes faster recovery, making it a valuable alternative to more invasive anesthesia methods. Further studies with larger sample sizes are recommended to validate these findings and potentially expand the application of this anesthetic technique in similar surgical context.

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