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COMPARISON OF ULTRASOUND-GUIDED AXILLARY BRACHIAL PLEXUS BLOCK AND DISTAL PERIPHERAL FOREARM NERVE BLOCK FOR HAND AND WRIST SURGERY

Anaesthesiology

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ABSTRACT

Background: Ultrasound-guided regional anaesthesia is widely used for ambulatory hand and wrist procedures due to its favourable recovery profile and high patient satisfaction. The axillary brachial plexus block remains a conventional technique; however, distal peripheral forearm nerve blocks have gained popularity for their rapid onset, reduced motor impairment, and potential workflow advantages. This prospective comparative study evaluated anaesthesia-related time and perioperative performance of these two approaches. **Methods:** Seventy adult patients undergoing elective unilateral hand or wrist surgery were enrolled in a prospective comparative study. Participants received either an ultrasound-guided axillary brachial plexus block or a distal peripheral forearm nerve block. The primary endpoint was total anaesthesia-related time. Secondary endpoints included needling time, block onset, procedural success, pain scores, patient and surgeon satisfaction, and postoperative analgesic requirement. **Results:** Total anaesthesia-related time was significantly shorter with distal forearm blocks compared with axillary blocks (7:11 ± 3:16 min vs 11:29 ± 4:05 min; $P < 0.001$). Needling, performance, and onset times were all faster in the distal block group. Both groups achieved high surgical anaesthesia success with no conversions to general anaesthesia. Distal blocks produced marginally higher procedural discomfort but lower incision pain. Satisfaction scores, surgical duration, and postoperative analgesic use were comparable between groups. **Conclusion:** Distal peripheral forearm nerve block substantially reduces anaesthesia-related time while providing reliable surgical anaesthesia and maintaining high patient satisfaction. It represents an efficient and effective alternative to the axillary brachial plexus block for hand and wrist surgeries.

KEYWORDS

INTRODUCTION

Ultrasound-guided regional anaesthesia has become integral to ambulatory upper-limb surgery due to its advantages of rapid recovery, reduced analgesic requirement, and improved patient experience. The axillary brachial plexus block is a well-established technique for hand and forearm anaesthesia; however, it is sometimes associated with prolonged block onset and increased risk of vascular puncture owing to the proximity of the axillary artery.

Distal peripheral forearm nerve blocks have recently emerged as viable alternatives. By targeting nerves at a more distal level, these blocks tend to preserve proximal motor function, facilitate earlier mobilisation, and offer faster onset due to the smaller nerve calibre and reduced connective tissue barriers. Despite growing interest, few prospective studies have specifically examined anaesthesia-related time—an important determinant of operating room efficiency.

This study compares distal peripheral forearm nerve blocks with axillary brachial plexus blocks in terms of anaesthesia-related time, block characteristics, perioperative pain, and overall clinical performance.

Aims

To compare the efficiency and clinical performance of ultrasound-guided axillary brachial plexus block versus distal peripheral forearm nerve block for hand and wrist surgeries.

Objectives

1. Compare total anaesthesia-related time.
2. Assess needling time, performance time, and onset time.
3. Evaluate surgical block success.
4. Compare patient and surgeon satisfaction.
5. Analyse perioperative pain and postoperative analgesic use.

MATERIALS AND METHODS

Study Design

A prospective comparative study was conducted from January to June 2025 at a tertiary care centre following institutional ethics committee approval.

Participants

Seventy adult ASA I–II patients scheduled for unilateral hand or wrist procedures—including trigger finger release, tendon repair, Dupuytren's contracture release, foreign body removal, abscess drainage, and carpal tunnel release—were included. Exclusion criteria were BMI ≥40 kg/m², diabetes mellitus, peripheral neuropathy, chronic opioid use, coagulopathy, local infection, or known drug allergy.

Group Allocation
Group A: Distal peripheral forearm nerve block
Group B: Axillary brachial plexus block

Interventions
1. Distal Peripheral Forearm Block
Performed at the mid-forearm level targeting:
Median nerve
Ulnar nerve
Radial nerve (subcutaneous infiltration at wrist)
Technique based on Jalil et al.[2]
2. Axillary Brachial Plexus Block
Performed using standard ultrasound-guided technique described by Tran et al.[3]

Outcome Measures
Primary Outcome
Total anaesthesia-related time (performance time + onset time)

Secondary Outcomes
Needling time
Block success rates (complete, incomplete, failed)
Procedural and incision pain
Patient satisfaction (EVAN-LR)
Surgeon satisfaction
Tourniquet time and surgical duration
Postoperative analgesic requirement

Statistical Analysis

Continuous variables were analysed with t-test/Mann–Whitney U test; categorical variables with χ^2/Fisher's exact test. Statistical significance was set at $P < 0.05$.

RESULTS

Participant Flow and Baseline Characteristics

All 70 participants completed the study. Baseline demographics and surgical profiles were comparable between groups.

Primary Outcome
Total anaesthesia-related time:
Distal block: 7:11 ± 3:16 min
Axillary block: 11:29 ± 4:05 min
$P < 0.001$

Secondary Outcomes
Performance Measures
Needling time: 2:17 ± 0:35 vs 2:56 ± 0:39 min ($P < 0.001$)

Performance time: 2:39 ± 0:34 vs 3:21 ± 0:44 min (P < 0.001)
Onset time: 5:42 ± 5:11 vs 8:08 ± 3:57 min (P = 0.03)

Block Success
Distal: 86% complete, 14% supplemented, 0% failed
Axillary: 71% complete, 29% supplemented, 0% failed

Pain Scores
Procedural pain slightly higher in distal blocks (P = 0.04)
Incision pain lower in distal blocks (P < 0.01)

Satisfaction
Patient EVAN-LR and surgeon satisfaction scores showed no significant difference (P > 0.1).

Surgical Timings
Tourniquet time, surgical duration, and OR time were similar.

Postoperative Analgesia
Rescue analgesic consumption did not differ significantly between groups.

DISCUSSION

This study demonstrates that distal peripheral forearm nerve blocks significantly shorten anaesthesia-related time compared with axillary brachial plexus blocks. The reduced needling, performance, and onset times likely reflect the smaller nerve size, less connective tissue, and improved ultrasound visibility at the distal level. These findings are consistent with previous literature describing the efficiency and motor-sparing benefits of distal blocks.[2–7]

Despite their faster onset, distal blocks achieved comparable surgical success, with no conversions to general anaesthesia—aligning with other studies supporting their effectiveness in hand surgery.[8–10] Although procedural discomfort was marginally higher with distal blocks, this difference was clinically minimal and did not influence satisfaction scores.

Overall, distal nerve blocks offer a highly efficient alternative to axillary blocks, particularly in ambulatory or high-turnover surgical settings where time optimisation is crucial.

CONCLUSION

Ultrasound-guided distal peripheral forearm nerve blocks markedly reduce anaesthesia-related time while offering reliable surgical anaesthesia and high patient satisfaction. They represent an efficient and effective alternative to axillary brachial plexus blocks for hand and wrist surgeries.

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