

Ultrasound Guided Motor Sparing Sensory Blocks for Hand and Fore Arm Surgery

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Background

New methods for regional blocks are possible with ultrasound guidance. US-guided small nerves block requires medical skills thorough knowledge of sensory and motor innervations corresponding surgical site. Motor sparing sensory blocks are opted to obtain anaesthesia and analgesia for hand and distal upper limb surgery. They may be also used as supplementary option for brachial plexus block or to provide analgesia after a regional or a general anaesthetic. Ultrasound guided Motor sparing sensory blocks per se may be used to obtain anaesthesia for minor hand procedures; therefore, reducing the complications of general anaesthesia and attaining pretty good postoperative analgesia with a decreased requirement for opioids. USGR techniques minimize the time taken for block performance, the dose of LA used, and the need for nerve stimulation, therefore improving patient satisfaction. Moreover, under direct visualization, the incidence of nerves injury and vessels penetration are reduced and therefore injection of LA into these structures is markedly decreased.

Whenever tourniquet anaesthesia is required, proximal brachial plexus block is done and associated with more motor paralysis. Therefore, sole reliance on peripheral arm blocks can only be used in operations that do not require a tourniquet or last less than 20 min. Successful blockade of the forearm and hand depends on knowledge of sensory and motor innervations as well as cutaneous nerve supply. Knowledge of the anatomical landmarks is of utmost importance for success.

Methods

Several variations exist in the neuro-anatomy of the forearm as described in textbooks. This variability and overlap of nerve supply mean that it is illogical to depend on the block of a single nerve supplying sensation to the operative field unless proper testing of sensory loss is obtained. Six nerves may be blocked around the elbow and provide anaesthesia for the forearm and hand. The following key points are important when performing these techniques:

- a. Informed patient consent.
- b. Trained staff in an appropriate setting and rapid access to resuscitation equipment and drugs.
- c. Patient monitoring as per the JCI recommendations.
- d. A conscious patient can help in avoiding intraneuronal injection.
- e. Proximal and distal Ultrasound tracing of the nerve to confirm its identity
- f. Intravenous access.
- g. Adequate infiltration of the skin at the injection site with local anaesthetic (LA).
- h. Aspiration before injection to check for intravascular placement.
- i. Stop injecting if there is resistance.

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- j. Deliver the injection slowly in 2-5 ml aliquots with repeated aspiration to allow the detection of intravenous injection of LA.

Results

Peripheral nerve block around the elbow and wrist provides excellent postoperative analgesia. US-guided small nerves block requires medical skills thorough knowledge of sensory and motor innervations corresponding surgical site. Motor sparing sensory blocks are opted to obtain anaesthesia and analgesia for hand and distal upper limb surgery. They may be also used as supplementary option for brachial plexus block or to provide analgesia after a regional or a general anaesthetic. Ultrasound guided Motor sparing sensory blocks per se may be used to obtain anaesthesia for minor hand procedures; therefore, reducing the complications of general anaesthesia and attaining pretty good postoperative analgesia with a decreased requirement for opioids.

- A. Medial cutaneous nerve of the forearm: arises from the medial cord of the brachial plexus with fibers from the 8th cervical and 1st thoracic roots. At its origin it is located medial to the axillary artery and gives off, near the axilla, a branch that penetrates the fascia and supplies the skin over the biceps muscle, down to the elbow. The nerve descends to the ulnar side of the arm with the basilic vein at the basilic hiatus and then divides into anterior (volar) and posterior (ulnar) branches. It is pure and strong sensory nerve.
- B. Lateral cutaneous nerve of the forearm: branch of musculocutaneous nerve, also sometimes named lateral "antebrachial" passes behind the cephalic vein, and divides, opposite the elbow-joint, into a volar and a dorsal branch.
- C. Posterior cutaneous nerve of the forearm: It arises from the radial nerve in the posterior compartment in the radial groove of the arm, often along with the posterior cutaneous nerve of the arm.

D. Median Nerve at the mid of the forearm for hand surgery.
 E. Ulnar Nerve at the mid of the forearm for hand surgery.
 F. Superficial Radial Nerve at the mid of the forearm for hand surgery.

Discussion and Conclusion

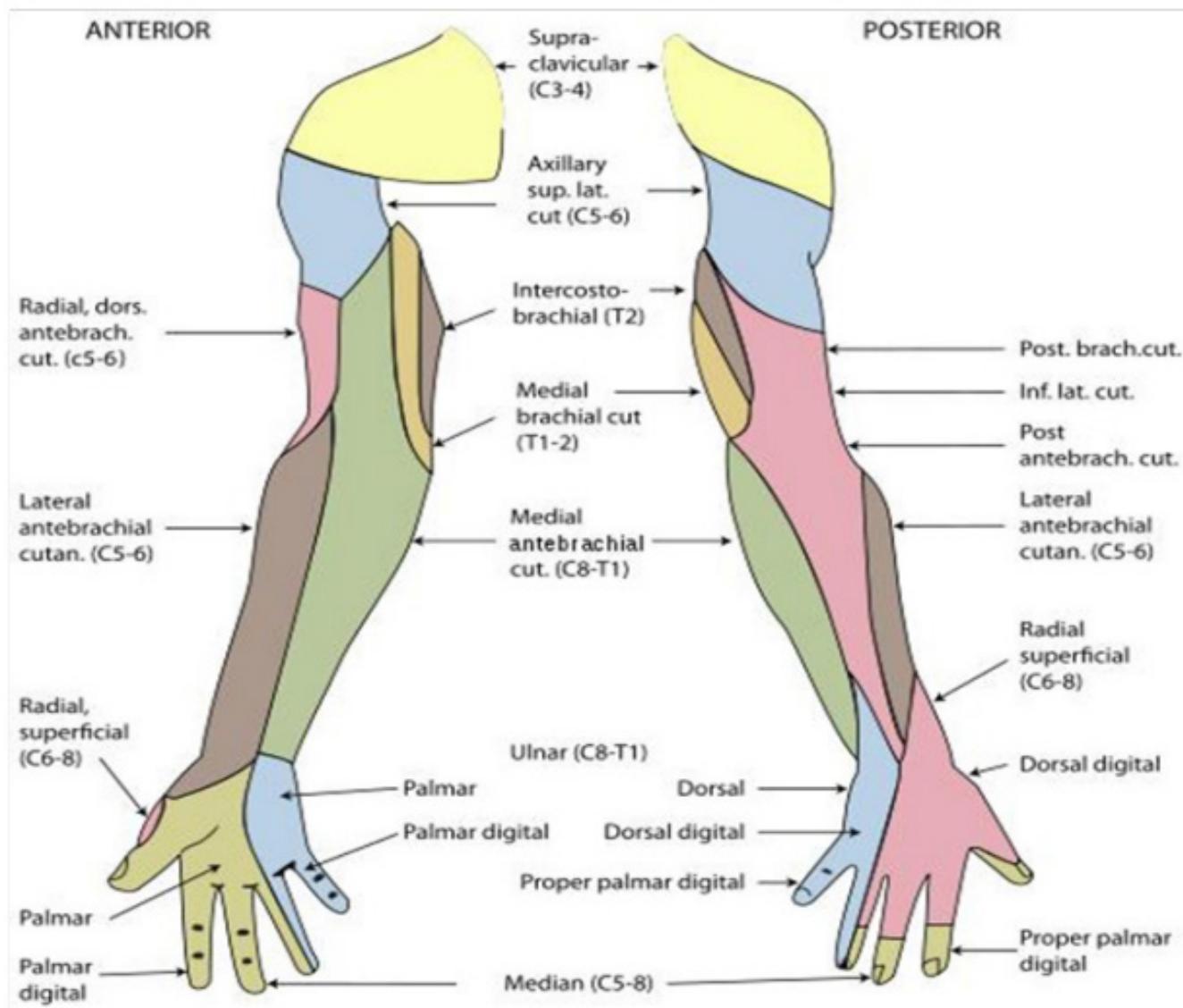
Although of the need of technical skills and high resolution machines, as well as limitation related to the use of tourniquet that may limit the duration of pain free period yet the benefits of motor sparing blocks make it pretty good alternative for pain free minor procedures both in the hand and forearm surgeries. The keys of success rely on:

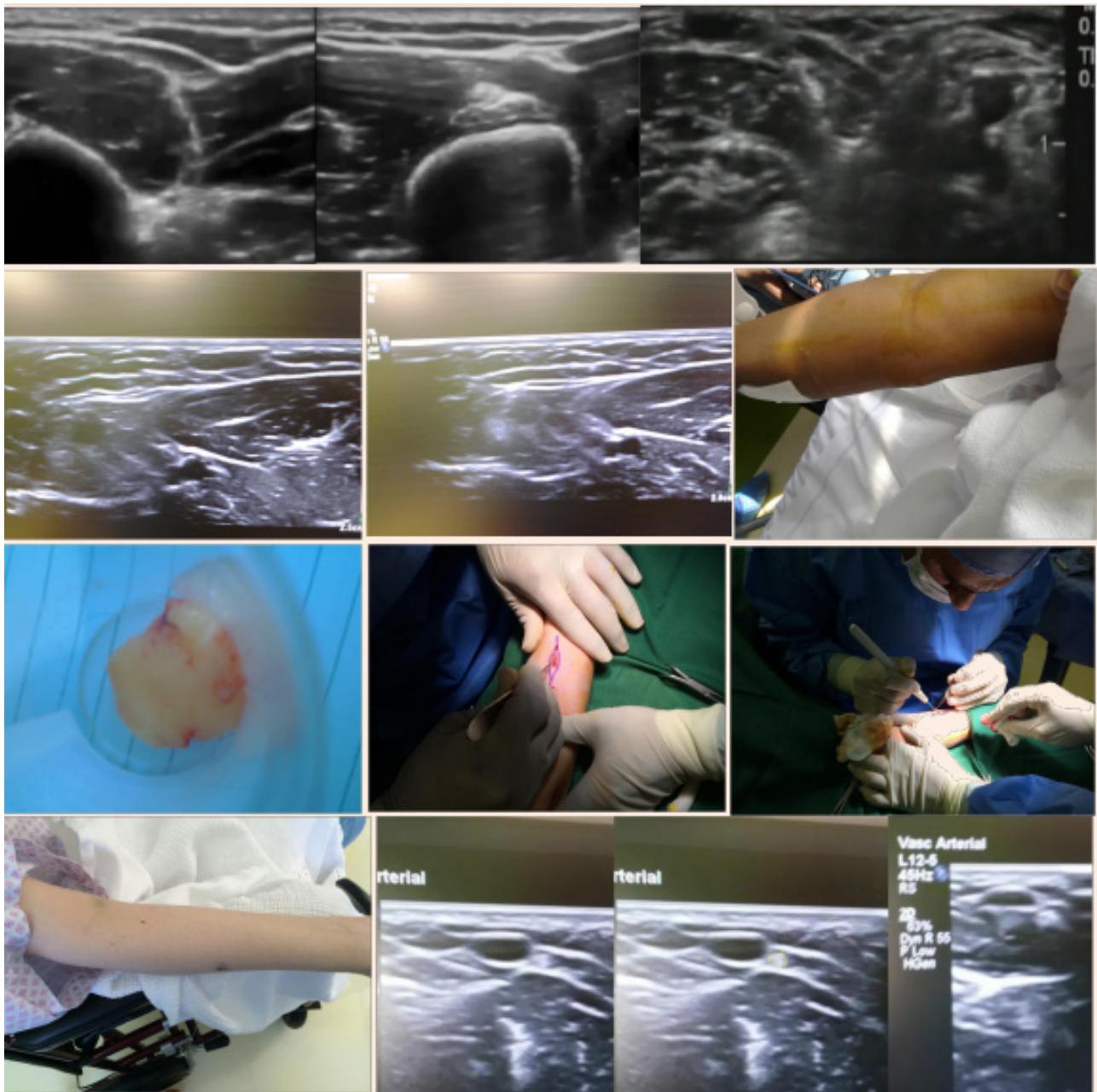
- Proper selection of the cases mainly minor surgeries that are can be done without the use of tourniquet short in duration if we used tourniquet.
- Proper knowledge of the anatomy and variations as well as tracing the nerves to identify the identity of respective nerves.
- Realistic expectations including accepting mild muscle weakness

in relation to some sensory nerves that lie in proximity to motor branches for example the proximity of the ulnar nerve to the medial cutaneous nerve of the forearm, the proximity of the lateral and posterior nerves of the forearm to the radial nerve. The amount of weakness is related to the volume injected. However it is usually slight weaknesses that vanish fast.

- Informed consent with detailed realistic expectations and benefits.
- When longer than 20 minutes tourniquet is required light sedation or intravenous infusion of propofol can be used.

Ultrasound guided Motor sparing sensory blocks alone may be used to provide anaesthesia for minor hand procedures; thus, sparing the patient the complications of general anaesthesia and providing excellent postoperative analgesia with a reduced requirement for opioid analgesics. Ultrasound guidance reduces the time taken for block placement, the dose of LA required, and the need for stimulation currents, improving patient comfort. Under direct visualization, the incidence of nerves injury and vessels penetration are reduced and therefore injection of LA into these structures is markedly decreased.





Example of surgery at the distribution of lateral cutaneous nerve of the forearm and sonoanatomy as well as nerve block.

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Conflicts of interest

The authors declare there is no conflict of interests.

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