Ultrasound guided distal nerve blocks

We are in a very exciting phase in the history of regional anesthesia. Ultrasound has led to a significant change in regional anesthesia practice. It has added vision to the doctrine of depositing the right drug in the right place. The ability to identify the nerve, visualize the needle trajectory and monitor the local anesthetic spread has revolutionized regional anesthesia practice. Ultrasonography improves reliability, decreases block time but what is less talked about is that by delineating the anatomy it also improves the clinical anatomical knowledge of the practitioner.

Distal blocks of the forearm are commonly used to provide analgesia following hand surgery, to augment a more proximal brachial plexus block or to provide anesthesia for operations on hand not requiring tourniquet in an emergency department and theatres. Peripheral nerve blocks in upper limb using landmark-based, neurostimulation or both methods have remained vastly underutilized due to perceived issues of reliability, time required for block performance, and delayed onset time. The presence of ultrasound in the anesthetic rooms have led to a resurgence in the distal nerve blocks in the upper limb. A review published in this issue of JOACP provides a comprehensive account of the technical aspects of ultrasound guided distal peripheral nerve blocks of the upper limb.

The first ultrasound guided distal nerve block (median nerve in the forearm) was described in 2001 and the most recent, another novel approach to identify the median nerve was described by us this month. In the last 13 years with the use of ultrasound, the regional anesthetists have not only evolved their practice but also understood the three-dimensional anatomy of the nerves and relating structures as never before.

While deciding the specific nerves to block for a particular procedure in hand or forearm, the dermatomal, myotomal and osteotomal innervation of that area should be carefully thought upon. The same is true while augmenting a partially functioning proximal brachial plexus block. The regional anesthetist should be able to recognize the nerve that is missed by a proximal block by clinical examination and use the knowledge and description in the review to augment the block. It makes a substantial difference to the success rate for regional anesthesia.

A clinical “pearl” that helps to assess a brachial plexus block before initiating the surgical procedure is the “five Ps.” (the Portsmouth Ps). “Push, pull, pinch, pinch, pinch” assist us to check five peripheral nerves. The motor innervation of biceps and hence the musculocutaneous nerve can be assessed by pulling the forearm away from the upper arm while the patient resists it. The radial nerve is assessed by asking the patient to extend the forearm using triceps. The adequacy of the median and ulnar nerve block is checked by pinching the fingers in the sensory distribution of the respective nerve. This technique for checking the upper extremity has been developed during World War II to allow medics a method for quickly analyzing injuries to the brachial plexus.

The last P is equally important and is often forgotten is to assess the blockade of medial cutaneous nerve of the arm and forearm which have significant dermatomal innervation of the arm.

The identification of distal nerves can be quite challenging in the elderly population. The median nerve that shines between the flexor muscles in a young anesthetists forearm can be very difficult to spot in 80-year-old frail patient. This easy identification of the forearm nerves is based on the contrast between the appearance of the nerve and the muscles of the forearm. There is published data which reveals that the echo intensity (EI) of skeletal muscles is significantly increased in the elderly. This increase in EI leads to a reduction in contrast between the nerve and the adjoining muscles which makes identification of the nerves challenging in elderly patients. It again reiterates the importance of comprehensive anatomical understanding in three dimensions so that the nerves can be followed in real-time and their position confirmed. The ulnar dive of the ulnar artery which leads to the median nerve is a vivid example.

The Association of Anesthetists of Great Britain and Ireland in its recent guidelines have stratified the risks of regional anesthesia blocks in anti-coagulated patients.
In an anti-coagulated patient, the distal peripheral nerve blocks are a very safe anesthetic technique for hand and distal forearm operations which could be done without a tourniquet. [8]

A helpful feature is that distal nerve blocks in upper limb are low volume blocks. The mean volume of 0.7 mL represents the ED₉₅ dose of 1% mepivacaine to block the ulnar nerve at the proximal forearm. It helps us to stay within safe dose limits while supplementing a supraclavicular block by distal blocks. [9]

A regional anesthesia technique we use works very well for hand surgery. We perform a short-acting supraclavicular block (with 1% prilocaine/1-2% lidocaine with adrenaline) with long-acting (levobupivacaine) distal nerve blocks. It provides a very dense block with rapid onset and perfect surgical anesthesia but also ensure that the supraclavicular block has worn off by the time patient leaves hospital so they have a moving shoulder and elbow but continue to be pain free for next 14-18 h. This technique has been studied to improve patient satisfaction. [10] A word of caution for this technique is to be aware of cumulative toxic dose and plan your local anesthetic technique accordingly.

Poorly controlled perioperative pain can trigger central sensitization which can further lead to hyperalgesia and chronic pain. A meta-analysis by Andreae and Andreae [11] analyzed regional anesthesia and chronic pain and found favorable results. The upper limb block studies comprised of brachial plexus blocks. There are no randomized trials that would demonstrate the benefits of distal nerve blocks in the upper limb in preventing chronic pain, but the longevity, and the quality of pain relief they offer would make it highly likely. It would be food for thought for future research. [11]

In conclusion, it is worthwhile to reiterate the importance of understanding the three-dimensional anatomy of the related structures while performing nerve blocks. It’s a step further than traditional pattern recognition. This not only improves reliability and safety of regional anesthesia but also leads to innovation of new regional anesthesia blocks. [12]

Happy ultrasounding.

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