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Case report

Variant location of the musculocutaneous nerve during axillary nerve block

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Abstract We present the case of a 56-year-old man who underwent axillary nerve block for a wrist arthroscopy procedure, with real-time ultrasound and peripheral nerve stimulator guidance. The ulnar nerve and radial nerve were located medial and posterior to the brachial artery, respectively. A large complex structure was noted in the position typically occupied by the median nerve. Contact of this structure with the stimulating needle produced strong biceps contraction, and slight adjustment of the needle resulted in forearm pronation. After injection of 10 mL of local anesthetic near this structure, it appeared to consist of two separate components on ultrasound. We believe that these components represented the median and musculocutaneous nerves lying together, lateral to the artery. Radial, median, ulnar, and musculocutaneous nerve block ensued, and wrist arthroscopy was carried out uneventfully. Knowledge of this anatomical variation may improve anesthesiologists' ability to provide effective axillary block.

1. Introduction

Understanding peripheral nerve anatomy is essential for effective nerve block. Variation from standard anatomic organization is not uncommon. In this case, real-time ultrasound needle guidance helped illustrate a case of the musculocutaneous nerve running with the median nerve, giving rise to an unusual nerve stimulation pattern.

2. Case report

A 56-year-old man presented for left wrist arthroscopy to evaluate chronic pain. After consent was obtained to administer regional anesthesia, monitors were placed and the patient received 1 mg of midazolam and 50 μg of fentanyl for sedation. He remained alert and responsive throughout the block. The axillary approach to brachial plexus block was elected, and it was carried out with real-time ultrasound guidance (5-10 MHz transducer; SonoSite Titan, Bothell, WA) in concert with peripheral nerve stimulation. The nerve stimulator was set at 0.4 mA and 2-Hz stimulating frequency. Medial and posterior to the brachial artery, the ulnar and radial nerves, respectively, were located and stimulated with the 50-mm 22-gauge needle tip (Stimuplex; B Braun, Melsungen, Germany) with ultrasound guidance, confirming their identities. Fifteen milliliters of an equal mixture of 0.5% ropivacaine and 1.5% mepivacaine was injected around the radial nerve and 10 mL around the ulnar nerve. The neurovascular bundle was then approached from the lateral side, and the needle was

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Fig. 1 Transverse ultrasonographic image of axillary region. The stimulating needle is shown contacting the large complex structure initially believed to be the median nerve.

directed toward a comparatively large complex structure thought to be the median nerve (Fig. 1). As the needle contacted this structure, strong biceps flexion was noted, in concert with pronation of the forearm. With slight adjustment of the needle tip, turning the bevel, the biceps flexion weakened, and pronation became more prominent, with palpable muscle contraction in the proximal forearm. Local anesthetic solution of 10 mL was then injected and was noted to spread about the structures noted.

Given this unusual pattern of peripheral nerve stimulation, we believe that the musculocutaneous and median nerves were fused into one structure or were running together along the lateral aspect of the brachial artery, at the axillary level (Fig. 2). Scanning the coracobrachialis muscle,

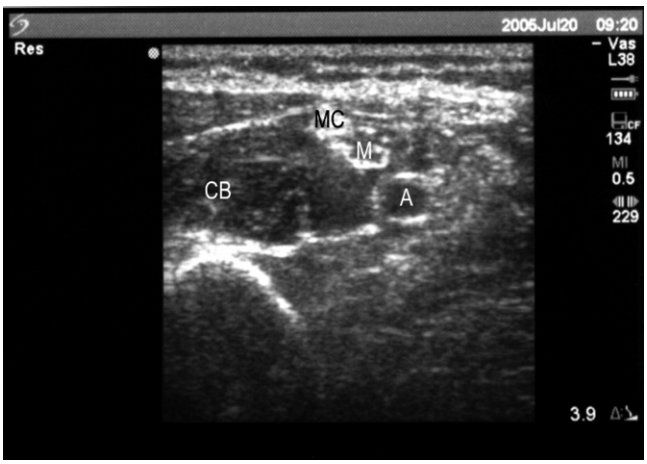

Fig. 2 Transverse sonographic image of axillary region. After injection of local anesthetic solution, the large irregular structure thought to be the median nerve appears to consist of two separate structures, most likely the musculocutaneous nerve (MC) and median nerve (M) lying together, according to the nerve stimulation patterns. A = brachial artery; CB = coracobrachialis muscle.

Fig. 3 Transverse sonographic image of high humeral region, with transducer position distal to that seen in Fig. 1. Here, the musculocutaneous nerve (MC) appears to proceed laterally, because it courses to innervate the elbow flexors. M = median nerve; A = brachial artery.

lateral and superior to the artery and the sheath (which were at this time well-delineated by the bolus of injected local anesthetic), revealed no apparent neural structures that could represent the musculocutaneous nerve. The apparent median nerve was traced distally with the ultrasound probe and appeared to release a large branch laterally, approximately 5 cm below the axillary level (Fig. 3).

Ultrasonography was used to confirm that a local anesthetic "halo" surrounded each of the three nerves of interest. The two structures considered to be the musculocutaneous and median nerves remained together after injection of local anesthetic, although they became separated from the artery (Fig. 2). Over the next 30 minutes, the radial, ulnar, and musculocutaneous nerves were completely anesthetized, whereas the median nerve was slower to achieve full block. By 45 minutes, the block was complete. Arthroscopy was carried out with two portals on the distal aspect of the wrist, with complete surgical anesthesia. The nerve territories affected by the surgical procedure included those of the radial, ulnar, and musculocutaneous nerves. No further sedation was necessary during surgery.

3. Discussion

Axillary nerve block may be carried out by paresthesia technique, transarterial technique, peripheral nerve stimulation, or real-time ultrasound guidance. No clear benefit has been established incontrovertibly for any one of these techniques, but it appears that specifically blocking the terminal nerves improves success [1].

Ultrasonography at the axillary level delineates the terminal nerves of the brachial plexus, the brachial artery, and one or more veins. The nerves at this level appear to be round or oval hypoechoic structures, with punctuated