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Electrodiagnosis of Neuropathy at the Elbow

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The ulnar nerve is derived from spinal nerves C8-T1 with a minor contribution from C7. The ulnar nerve arises from the lower trunk, anterior divisions and medial cord of the brachial plexus. It descends in the lateral wall of the axilla and courses medially at the rostral humeral region. The ulnar nerve then travels posteriorly and passes between the medial epicondyle and olecranon. The ulnar nerve continues distally passing through the humeroulnar arcade and then enters the flexor carpi ulnaris. It then gives off muscular twigs to the flexor carpi ulnaris and the medial half of the flexor digitorum profundus. The nerve then travels on the flexor digitorum profundus toward the wrist. Proximal to the wrist, two cutaneous branches are given off. The dorsal ulnar cutaneous branch supplies the skin of the medial dorsal hand while the palmar cutaneous branch supplies the medial proximal palm. The ulnar nerve proper then enters Guyon's canal and divides into the superficial sensory and deep muscular branches. The superficial sensory branch supplies the palmaris brevis muscle and provides sensation to the fifth and medial half of the fourth digit. The deep muscular branch supplies the three hypothenar muscles, the deep head of the flexor pollicis brevis, the adductor pollicis, the third and fourth lumbricals and all the interossei.

Ulnar neuropathy at the elbow (UNE) is a common lesion second only to carpal tunnel syndrome.¹ Alcoholic neuropathies of the axonal sensorimotor type have a predilection for UNE.² It has been recently shown that this mononeuropathy can occur at one of three sites.³ The nerve can be compressed in the retroepicondylar groove, entrapped at either the humeroulnar arcade (cubital tunnel) or at the flexor carpi ulnaris exit zone. Compression neuropathy refers to nerve damage due to pressure applied to the nerve; entrapment neuropathy applies when the pressure is exerted by some anatomic structure. Therefore, entrapment neuropathies are chronic conditions, but compression neuropathies may be acute.

In the past, these syndromes have been collectively lumped together and called tardy ulnar palsies. This term should be reserved for the original description given by Pannas. In 1878, Pannas published a paper associating bony abnormalities of the elbow region with neurological deficits.⁴

Clinically the most common presentation in a patient with a ulnar neuropathy at the elbow is sensory abnormalities and pain within the ulnar cutaneous distribution. Aguayo demonstrated in experimental compression that large fibers are more susceptible in injury than small fibers and that peripheral fibers are more vulnerable than central fibers.⁵ Based on this data, evaluation of large diameter sensory axons should be stressed in these patients. The finger flexor reflex may be of value if the medial half of the flexor digitorum profundus is involved.⁶ Motor strength may be decreased in the flexor carpi ulnaris and medial half of the flexor digitorum profundus, but in most cases these muscles are spared because of their fascicular arrangement at the elbow level.⁷ The intrinsic ulnar muscles are more prominently involved and should be examined thoroughly. Various maneuvers have been described to aid in the localization of ulnar neuropathy at the elbow. Tinel's sign and the ulnar flexion maneuver are both of clinical value.⁸

The differential diagnosis of UNE includes C8 radiculopathy, lower trunk and medial cord brachial plexopathy, motor neuron disease and ulnar neuropathy at the wrist or hand. Electrodiagnostic evaluation when properly performed can serve to localize and quantify the lesion. Routine electrodiagnostic evaluation would consist of motor nerve studies of the median and ulnar nerves, sensory nerve studies of the median, ulnar and radial nerves, median and ulnar F waves and electromyographic examination of the cervical paraspinals, deltoid, biceps, brachioradialis, extensor digitorum communis, triceps, flexor carpi ulnaris, first dorsal interossei and abductor pollicis brevis.

The localization and quantification of UNE requires the addition of studying the dorsal ulnar cutaneous nerve, short segment incremental stimulation of the ulnar nerve around the elbow region (inching technique)⁹ and electromyography of the medial flexor digitorum profundus and abductor digiti quinti.

The following classification may be applied for the electrodiagnostic evaluation of ulnar neuropathy at the elbow¹⁰:

Mild: abnormalities of the ulnar F wave, dorsal ulnar cutaneous or the ulnar sensory from the fifth digit;

Moderate: abnormalities of ulnar motor nerve conduction and/or decreased motor amplitude;

Severe: both criteria of mild and moderate plus evidence of denervation limited to the ulnar distribution.

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