Electrodiagnostic Evaluation of Ulnar Neuropathy and Other Upper Extremity Mononeuropathies

Elliot L. Dimberg, MD

KEYWORDS

• Mononeuropathy • Ulnar • Radial • Axillary
• Musculocutaneous • Suprascapular • Long thoracic
• Electromyography

Upper extremity mononeuropathies are common in clinical practice and in the electrodiagnostic (EDX) laboratory. Clinicians and electrodiagnosticians must understand the anatomy and function of peripheral nerves potentially involved, features of the history and physical examination that narrow the differential diagnosis, and EDX findings to arrive at a diagnosis. EDX studies serve to localize a lesion, confirm a suspected diagnosis, exclude alternate possibilities, discover unsuspected conditions, determine the functional involvement and pathophysiology of the lesion, and assess severity, timeframe, and prognosis of the lesion.

Most clinicians and electromyographers have already used their clinical assessment to narrow the differential diagnosis of a possible mononeuropathy to a few most likely localizations before the performance of EDX testing. This article assumes that an appropriate clinical examination has occurred as the first step in the EDX testing and that the suspected nerve localization has been defined. Therefore, the article focuses on the EDX approach to confirming a clinically suspected mononeuropathy using both nerve conduction studies (NCS) and needle examination (NEX), according to each specific mononeuropathy: ulnar, median in the forearm (median neuropathy at the wrist is discussed in a separate article), radial, musculocutaneous, axillary, suprascapular, and long thoracic neuropathy.

The author has no funding support.
The author has nothing to disclose.
Department of Neurology, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32224, USA
E-mail address: Dimberg.Elliot@mayo.edu

Neurol Clin 30 (2012) 479–503
doi:10.1016/j.ncl.2011.12.003 **neurologic.theclinics.com**
0733-8619/12/$ – see front matter

In general, EDX studies of suspected mononeuropathies should be performed 2 weeks or more after the suspected onset or injury, if known, to allow for the development of more complete EDX findings and specifically to assess the extent of axon loss. In many cases of nontraumatic mononeuropathies, however, the time of onset of symptoms is not known or the symptoms develop gradually. In either circumstance, most mononeuropathies are characterized by axon loss, whereas focal demyelination may occur but is less common. In lesions characterized by axon loss, nerve conduction studies reveal low-amplitude compound muscle and sensory nerve action potentials. NEX demonstrates fibrillation potentials and reduced recruitment of long duration motor unit potentials, depending on the degree of reinnervation that has occurred. Finally, the electrodiagnosis of a mononeuropathy should be interpreted cautiously when there are only borderline or equivocal findings, especially because there may be surgical implications that result from the findings.

ULNAR NEUROPATHY

The ulnar nerve is derived from the C8 and T1 nerve roots, fibers from which travel through the lower trunk and medial cord of the brachial plexus terminating in the ulnar nerve in the axilla.[1] The ulnar nerve courses in the medial upper arm, through the medial intermuscular septum and its apposed arcade of Struthers, passing behind the medial epicondyle (ME) in the retrocondylar groove (**Figs. 1** and **2**). It then proceeds through the humeroulnar arcade into the cubital tunnel and through the flexor carpi ulnaris (FCU) (**Fig. 3**). As it continues to the wrist it passes through Guyon canal between the pisiform bone and the hook of the hamate before going on through the hand (see **Fig. 1**; **Fig. 4**).

The first branch of the ulnar nerve is the motor branch to the FCU muscle, arising variably above the ME (above elbow [AE]) or below the ME (below elbow [BE]). The next branch to the flexor digitorum profundus (FDP) arises in the forearm. The palmar cutaneous sensory nerve to the medial palm and the dorsal ulnar cutaneous (DUC) nerve to the dorsal medial hand and proximal little and medial ring finger branch next in the forearm. The superficial radial nerve (SRN) may also give rise to the DUC, the importance of which is discussed later.[2]

In the Guyon canal, the nerve separates into the superficial terminal and deep ulnar branches. The superficial terminal branch supplies the palmaris brevis muscle before providing sensory innervation to the palmar aspect and dorsal distal phalanges of the fifth and medial fourth fingers. The deep branch innervates the abductor digiti minimi (ADM) initially before curving around in the hand, supplying the interossei, third and fourth lumbricals, adductor pollicis, and potentially flexor pollicis brevis muscles. The ulnar nerve can be affected at multiple sites along the course of the nerve; however, the most common sites of ulnar neuropathy occur at or around the elbow or at the wrist (see **Figs. 1, 3**, and **4**).

ULNAR NEUROPATHY AT THE ELBOW

Ulnar neuropathy at the elbow (UNE) is the second most common mononeuropathy, behind median neuropathy at the wrist.[3–5] Symptoms include sensory loss in the medial hand, pain or paresthesia in the hand and arm (often subjectively outside of the distribution of the ulnar nerve itself), and weakness and atrophy of ulnar innervated muscles and the ulnar claw with extension of the metacarpophalangeal joints and flexion of the interphalangeal joints of the ring and little fingers. Paresthesias are reported to be the most common symptom and are more common than pain, whereas ulnar distribution sensory loss is more common than weakness.[6] Other conditions that