Ulnar Tunnel Syndrome

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Learning Objectives

- Clarify the anatomy of the ulnar nerve in the Guyon canal.
- List the zones of ulnar nerve compression in the wrist.
- Elucidate the pathophysiology of ulnar tunnel syndrome (UTS).
- Discuss the clinical presentation of UTS.
- Describe the management options for UTS.

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Ulnar neuropathy at or distal to the wrist, the so-called ulnar tunnel syndrome, is an uncommon but well-described condition. However, diagnosis of ulnar tunnel syndrome can be difficult. Paresthesias may be nonspecific or related to coexisting pathologies, such as carpal tunnel syndrome, cubital tunnel syndrome, thoracic outlet syndrome, C8–T1 radiculopathy, or peripheral neuropathy, which makes accurate diagnosis challenging. The advances in electrodiagnosis, ultrasonography, computed tomography, and magnetic resonance imaging have improved the diagnostic accuracy. This article offers an updated view of ulnar tunnel syndrome as well as its etiologies, diagnoses, and treatments. *(J Hand Surg Am. 2014;39(3):571–579. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Ulnar tunnel, Guyon canal, pisohamate hiatus, ulnar neuropathy, ulnar nerve compression.

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ULNAR TUNNEL SYNDROME (UTS) is defined as a compressive neuropathy of the ulnar nerve at the level of the wrist, which was described in 1965 by DuPont et al,[1] concerning 4 patients with acquired ulnar neuritis. The ulnar tunnel proper, also known as *Guyon canal*, is 1 potential but not exclusive site of ulnar nerve compression. The eponym is derived from the description in 1861 by Guyon of a space at the base of the hypothenar eminence at which the ulnar nerve bifurcates and is vulnerable to compression from surrounding structures. Clinical presentation depends on the anatomical zone of compression and, therefore, may be purely motor, purely sensory, or both. In selected cases, nonoperative treatment such as activity modification may be helpful, but surgical exploration of the ulnar tunnel with decompression may be indicated.

ANATOMY

The ulnar nerve

The ulnar nerve emerges from the medial cord (C8−T1) of the brachial plexus and passes through the axilla into the anterior compartment of the arm, then pierces the intermuscular septum and travels in the posterior compartment medially. It then courses superficially and passes posterior to the medial epicondyle into the cubital tunnel. The nerve then continues in the forearm between the flexor carpi ulnaris (FCU) and the flexor digitorum profundus (FDP) and gives innervation to the FCU and the FDP of the ring and small fingers. Before its entrance into the ulnar tunnel, about 8.3 cm proximal to the pisiform, the ulnar nerve gives off the dorsal cutaneous branch that innervates the dorsoulnar side of the hand.[2]

The ulnar tunnel

This tunnel originates at the proximal edge of the palmar carpal ligament and extends distally to the fibrous arch of the hypothenar muscles at the level of the hook of the hamate. The ulnar nerve extends approximately 40 to 45 mm in its path through the tunnel. The boundaries of the tunnel vary along its entire course and the 4 walls are not distinct.[3,4] The roof of the tunnel consists of the palmar aponeurosis, palmaris brevis, and hypothenar fibroadipose tissue; the floor is composed of the FDP tendons, transverse carpal ligament, pisohamate ligament, pisometacarpal ligament, and opponens digiti minimi; the medial wall is made up of the FCU tendon, the pisiform, and the abductor digiti minimi; the lateral wall is formed by the extrinsic flexor tendons, the hook of the hamate, and the transverse carpal ligament.[4−6]

Within the canal lie the ulnar nerve, ulnar artery, concomitant veins, and connective fatty tissue.[1,3] The ulnar nerve lies slightly deep and ulnar to the ulnar artery (Fig. 1). During its course in the fibro-osseous tunnel, the ulnar nerve bifurcates into a superficial and a deep branch approximately 6 mm distal to the distal pole of the pisiform.[2,3] The superficial branch innervates the palmaris brevis and provides sensation to the hypothenar eminence, small finger, and ulnar aspect of the ring finger.

Pisohamate hiatus

The motor branch of the ulnar nerve exits the canal by coursing around the ulnar edge of the hook of hamate and runs radially between the abductor digiti minimi (ADM) and flexor brevis digit minimi and dorsal to the flexor tendons of the small finger.[3,4,7]

The flexor digiti minimi brevis muscle originates from the pisiform bone and the hook of the hamate. These origins are bridged by a stout, concave musculotendinous arch, first described by Hayes et al as pisohamate arch.[4−6,8] This arch may serve as a common origin of the hypothenar muscles (Fig. 2). The pisohamate arch forms the roof and the pisohamate ligament forms the floor of a narrow ovoid opening in the exit of the Guyon canal. Uriburu and coworkers[9] termed this opening the pisohamate hiatus, through which the deep branches of the ulnar nerve and artery leave the Guyon canal and enter the deep palmar space, which was also observed by McFarlane et al.[10] At the level of the pisohamate hiatus, the deep motor branch courses dorsally over the distal border of the pisohamate ligament and beneath the arch of the flexor brevis digiti minimi muscle. It then turns radially around the hook of hamate and passes underneath the flexor brevis digiti minimi and opponens digiti minimi muscles.

The branches innervating the abductor digiti minimi, flexor brevis digiti minimi, and opponens digiti minimi muscles arise from the deep branch of the ulnar nerve, but the branch to the ADM may arise either proximal or distal to the pisohamate arch.[8] In most cases, the branch to the ADM takes off proximal to the pisohamate arch and travels superficial to the arch; therefore, severe compression at the level of pisohamate hiatus causes weakness of the interosseous muscles but may spare the ADM.

ZONES OF COMPRESSION

Compression of the ulnar nerve at the wrist is not limited to the Guyon canal. In 1969, Shea and McClain[7] described 3 different types of ulnar nerve compression syndromes at the wrist based on the