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Cubital tunnel syndrome: Anatomy, clinical presentation, and management

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ABSTRACT

Cubital tunnel syndrome is the second most common peripheral nerve compression seen by hand surgeons. A thorough understanding of the ulnar nerve anatomy and common sites of compression are required to determine the cause of the neuropathy and proper treatment. Recognizing the various clinical presentations of ulnar nerve compression can guide the surgeon to choose examination tests that aid in localizing the site of compression. Diagnostic studies such as radiographs and electromyography can aid in diagnosis. Conservative management with bracing is typically trialed first. Surgical decompression with or without ulnar nerve transposition is the mainstay of surgical treatment. This article provides a review of the ulnar nerve anatomy, clinical presentation, diagnostic studies, and treatment options for management of cubital tunnel syndrome.

1. Introduction

Ulnar nerve entrapment is the second most common compression neuropathy in the upper extremity after carpal tunnel syndrome.[1,2] Compression of the ulnar nerve may occur at multiple points along its course; however, entrapment of the ulnar nerve at the elbow, known as cubital tunnel syndrome, is the most common site.[3] Symptoms of ulnar neuropathy may manifest due to impingement of the nerve roots in the cervical spine, compression in the brachial plexus, thoracic outlet syndrome, or entrapment at the elbow, forearm, or wrist.[3–5] Despite the myriad of literature available regarding cubital tunnel syndrome, the diagnosis remains a challenge as patients often do not recognize the presence of ulnar nerve entrapment until the symptoms are severe and the nerve has been damaged. Patients often present with both sensory and motor deficits, the latter indicating a late presentation consistent with a less favorable prognosis.[6] The degree of sensory and motor deficits dictate treatment recommendations ranging from conservative treatment to surgery. A detailed understanding of the anatomy and pathophysiology of each individual patient's case of cubital tunnel syndrome is paramount for proper diagnosis and treatment.

2. Anatomy

The ulnar nerve originates from the C8 and T1 nerve roots which coalesce to form the medial cord of the brachial plexus (Fig. 1).[1,2,4,5] The medial cord gives off numerous branches as it works through the brachial plexus before bifurcating into two terminal branches, one contributing to the median nerve, and the other becoming the origin of the ulnar nerve. The ulnar nerve then courses down the arm in the anterior muscular compartment, eventually transitioning to the posterior muscular compartment by penetrating the medial intermuscular septum of the arm. The nerve is commonly compressed as it passes under the arcade of Struthers (Fig. 2a), an aponeurotic band that connects the medial intermuscular septum to the medial head of the triceps.[4] At the elbow, the ulnar nerve traverses through structures that make up the cubital tunnel. The cubital tunnel's ceiling is formed by Osborne's ligament (also known as the cubital retinaculum) (Fig. 2b), a ligament spanning from the medial epicondyle to the olecranon process that is continuous with the fascia connecting the humeral and ulnar heads of the flexor carpi ulnaris (FCU) (Fig. 2c).[7] In some patients, the ceiling is replaced by the aconeus epitrochearlis muscle, thought to be an accessory cause of ulnar nerve compression in some patients.[4] The tunnel floor is made up of the medial collateral ligament (MCL) and elbow joint capsule, while the medial epicondyle and olecranon act as the walls on either side.[8] James et al.[9] showed that the ulnar nerve is maximally compressed between Osborne's ligaments and the MCL in this tunnel at 135° of elbow flexion, decreasing the tunnel's height, area and sagittal curvature. After the ulnar nerve passes posterior to the medial epicondyle, it enters the forearm between the two heads of flexor carpi ulnaris (FCU), which is the most common site of ulnar nerve compression.[10] It then travels alongside the ulna as it courses towards the wrist, staying deep to the FCU and superficial to the flexor digitorum profundus (FDP). In the distal part of the forearm, the ulnar nerve moves lateral to the FCU and medial to the ulnar artery as it traverses Guyon's canal to enter the palm. Pressure on the nerve at any of these sites can cause numbness or pain in the elbow, hand, or fingers.

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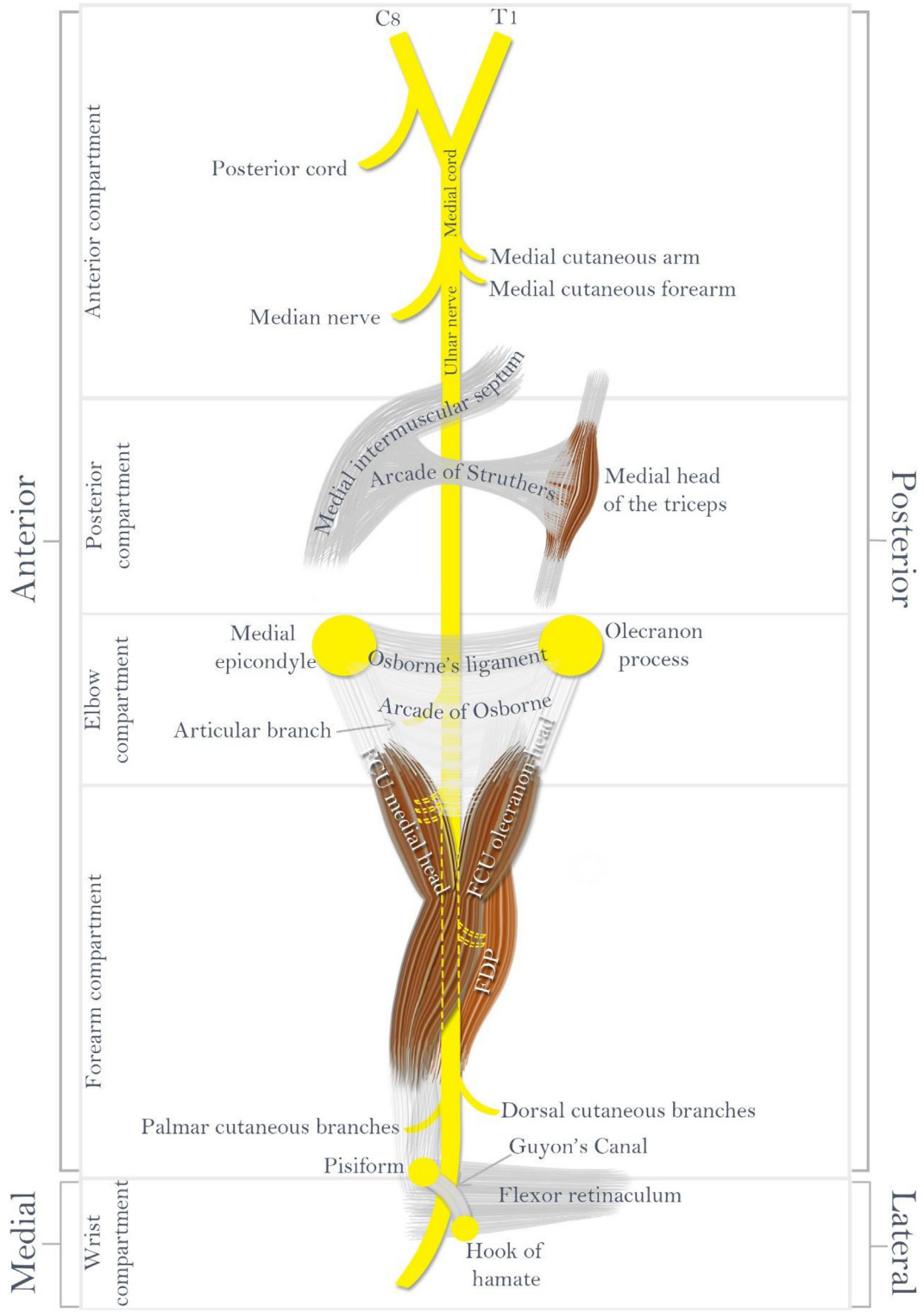

Fig. 1. Schematic of the major structures the ulnar nerve traverses through the arm.

The ulnar nerve gives off many branches throughout its path down the arm. It first provides an articular branch at the elbow, followed by multiple motor branches to the FCU and medial half of the FDP.[4] Prior to Guyon's canal, the nerve gives off dorsal and palmar cutaneous branches that supply the dorso-ulnar hand, and dorsal fourth and fifth digits, and ulnar palm, respectively.[2] Once in the palm of the hand, the nerve's terminal motor branches innervate the intrinsic muscles: hypothenars, interosseous, third and fourth lumbricals, palmaris brevis, and adductor pollicis.[8] Terminal sensory branching provides sensory innervation to the ulnar-sided palmar and dorsal aspects of the hand, as well as the small finger and ulnar half of the ring finger.[4]

3. Clinical presentation

Compression of the ulnar nerve can involve both sensory and motor deficits, ranging from intermittent to constant decrease in function.[5] It