Compressive Neuropathy of the Ulnar Nerve: A Perspective on History and Current Controversies

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The untoward effects resulting from compression of the ulnar nerve have been recognized for almost 2 centuries. Initial treatment of cubital tunnel syndrome focused on complete transection of the nerve at the level of the elbow, resulting in initial alleviation of pain but significant functional morbidity. A number of subsequent techniques have been described including *in situ* decompression, subcutaneous transposition, submuscular transposition, and most recently, endoscopic release. This manuscript focuses on the historical aspects of each of these treatments and our current understanding of their efficacy. *(J Hand Surg Am. 2017;42(6):464–469.*

Key words Cubital tunnel, history, subcutaneous transposition, submuscular transposition, ulnar nerve.

Compression of the ulnar nerve is the second most common compressive neuropathy in the upper extremity.[1–3] It can result in pain, paresthesias, or weakness in the hand and, if untreated, can lead to intrinsic muscle wasting and irrevocable dysfunction.[4]

Given its intricate course, the ulnar nerve can be compressed at several points in the upper extremity. It is most commonly compressed at the cubital tunnel in the area of Osborne ligament.[5] However, it can also be affected at additional sites such as the medial head of the triceps,[6] the entrance or exit to the flexor carpi ulnaris,[7] the flexor-pronator aponeurosis,[8] and Guyon canal[9–14] (Fig. 1). The causes of compressive ulnar neuropathy can be structural in the form of fascial bands and soft tissue structures such as ganglion cysts or the presence of an anconeus epitrochlearis muscle. Compression can also be due to bony abnormalities such as bone spurs or cubitus valgus deformity or recurrent subluxation of the ulnar nerve over the medial epicondyle with elbow flexion.[15]

The natural history of untreated ulnar nerve compression remains debated. Some authors contend that without intervention ulnar nerve compression may be progressive and inexorable, resulting in sensory changes as well as motor weakness with associated morbidity.[16] Others, however, have proposed a more benign natural history of untreated compression and have demonstrated improvement without intervention, particularly if symptoms are mild.[15,17,18]

HISTORICAL APPROACH TO SURGICAL INTERVENTION

Earle[19] reported the first surgical treatment of ulnar nerve compression in 1816, described as a partial resection of the ulnar nerve for the treatment of intractable pain. In this seminal report, he describes the symptoms exhibited by a 14-year-old girl who presented with significant pain along the ulnar aspect

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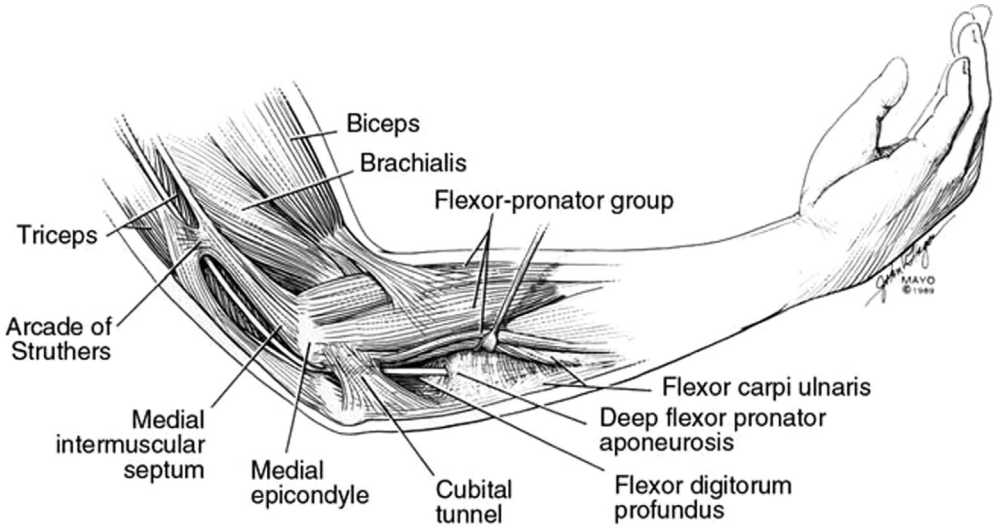

FIGURE 1: Course of the ulnar nerve and common sites of compression. (Reprinted with permission from Elhassan B, Steinman SP. Entrapment neuropathy of the ulnar nerve. *J Am Acad Orthop Surg*. 2007;15:672–681.)

of her forearm extending to the little finger. She is described to have had significant untoward effects from this affliction, suffering pain at night and "extreme torture." Surgical treatment involved division of the ulnar nerve immediately proximal to the elbow, after which her pain improved but her little finger remained in a "paralysed useless state." The patient's long-term function and outcome are not described in detail within his manuscript; however, there is a mention that she suffered from ulceration in the affected surfaces of her hands. This early intervention provided therapeutic reduction in pain but resulted in unintended collateral damage. The complete effects of ulnar nerve division were not well reported until Calder in 1833.[20]

Approximately 60 years later in 1878, Panas[21] described the correlation between the presence of ulnar nerve compression at the elbow and clinical palsy of the ulnar nerve in 3 patients, for whom he attempted to deepen the epicondylar groove for treatment. Marchand[22] was the first to describe elongation of the nerve as a method of treatment in 1878. He described a technique in which the nerve is lifted out of its native position while maintaining nerve continuity.[22] This technique quickly fell out of favor. Andrae in 1889[23] and Sherren in 1903[24] used the same resection treatment as Earle in his initial report[19]; however, the nerve was repaired following division.[25] The results of these interventions have not been well reported. In the late 19th and early 20th centuries, new techniques for treatment of ulnar nerve compression were described. These included the initial techniques for *in situ* decompression, subcutaneous transposition, and submuscular transposition. The term "cubital tunnel syndrome" was first coined by Feindel and Stratford in 1958.[26,27]

Bartels[28] reviewed the temporal history of treatment of ulnar nerve compression and categorized the evolution of surgical technique by time period, highlighting the transformative individuals involved in developing each operative intervention. Commencing with the first descriptions of Earle's treatment of ulnar nerve compression in 1816,[19] he categorized the advent of techniques into 3 periods. The first period (1816–1897) was characterized by the initial descriptions of ulnar nerve compression as a clinical entity and the first mode of treatment in the form of decompression (coined as liberation) and elongation of the nerve. This era was also characterized by the first descriptions of nerve subluxation as a clinical condition, for which creation of a new sulcus was the described treatment. The period to follow (1898–1959) was typified by descriptions of all known surgical techniques at the time. This included anterior subcutaneous transposition credited to Curtis,[29] supracondylar cuneiform osteotomy of the humerus described by Mouchet,[30] anterior intramuscular transposition as suggested by Klauser,[31] and anterior submuscular transposition (ASMT) as modified by Learmonth.[32] The period later included King's[33] medial epicondylectomy as a method of decompression, and Osborne's description of "Osborne's Ligament."[34] He describes the ligament as an aponeurotic band of fibrous tissue bridging the 2 heads of the flexor carpi ulnaris lying directly over the ulnar nerve as it forms the roof of the cubital