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Case Report

Subperiosteal Ulnar Nerve Entrapment at the Wrist

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Ulnar nerve entrapment at the wrist can cause debilitating sensory, motor, or sensory and motor deficits in the hand. The sources of compression have been well documented, with ganglions, lipomas, and trauma being common etiological factors. We treated a professional sculptor with intrinsic pain and weakness in her dominant hand because of compression caused by the subperiosteal course of her deep motor branch of the ulnar nerve. The nerve traversed on the radial side of the hook of the hamate and descended into the floor of the palm in the carpal tunnel through the transverse carpal ligament. We present this previously unreported anatomical anomaly and the subsequent operative treatment. Knowledge of this anatomical variation is paramount in avoiding injury to the ulnar nerve when operating the Guyon canal or carpal tunnel, among other hand and wrist surgeries.

Ulnar nerve compression neuropathy at the wrist is well studied and linked to an array of causes. Anomalies can severely impair the function of the hand and may manifest as sensory, motor, or combined sensory and motor deficits depending on the location of the compression.[1] Space-occupying lesion (tumors, ganglions, lipomas, ulnar artery aneurysms, or thrombosis), anomalous muscles, trauma, pisohamate hiatus syndrome, and rare variations of the anatomy are potential sources of compression of the ulnar nerve.[2–6]

The ulnar nerve passes through the Guyon canal, frequently diagnosed as a site of compression in the wrist, before bifurcating into the deep motor branch and the superficial sensory branch.[7] Both branches traverse palmar to the transverse carpal ligament (TCL), radial to the pisiform, and ulnar to the hook of the hamate before divergence (Fig. 1). The deep motor branch of the ulnar nerve vitally innervates the intrinsic musculature of the hand, including the deep head of flexor pollicis brevis in the thenar eminence and adductor pollicis.[1]

We report a previously unknown case of ulnar nerve entrapment in a 42-year-old professional sculptor with an anatomically unique source of compression of her deep motor branch (Fig. 2). Accordingly, we present the reasoning behind our surgical investigation of the abnormal course of the nerve through the TCL, the identification of the site of compression, and the operative treatment of the paralysis.

Case Report

A 42-year-old right-handed professional sculptor presented with a primary complaint of pain in her second metacarpophalangeal joint. Additionally, she experienced cramping and weakness in her first dorsal interossei muscle and in the middle of her palm when she sculpted to the extent that it interfered with the completion of her work. Her 5 stations average grip strength of the injured, dominant hand was 41 kg, whereas that of the nondominant hand was 49 kg.[8] Wrist and hand x-rays and vascular studies were normal. A 0.5-T magnetic resonance image of the wrist did not show any space-occupying lesions in the Guyon canal and was interpreted as normal. EMG and nerve conduction studies localized entrapment of the deep motor branch of the ulnar nerve distal to the Guyon canal, sparing the hypothenar muscles and affecting the first dorsal interosseous muscle.

Surgical exploration of the ulnar nerve at the wrist revealed a typical Guyon canal and bifurcation of the ulnar nerve (Fig. 3). However, the radial branch took an abnormal course, penetrating the TCL radial to the tip of the hook of the hamate (Fig. 4). We exposed the radial branch of the ulnar nerve by meticulous

Declaration of interests: No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Written informed consent: Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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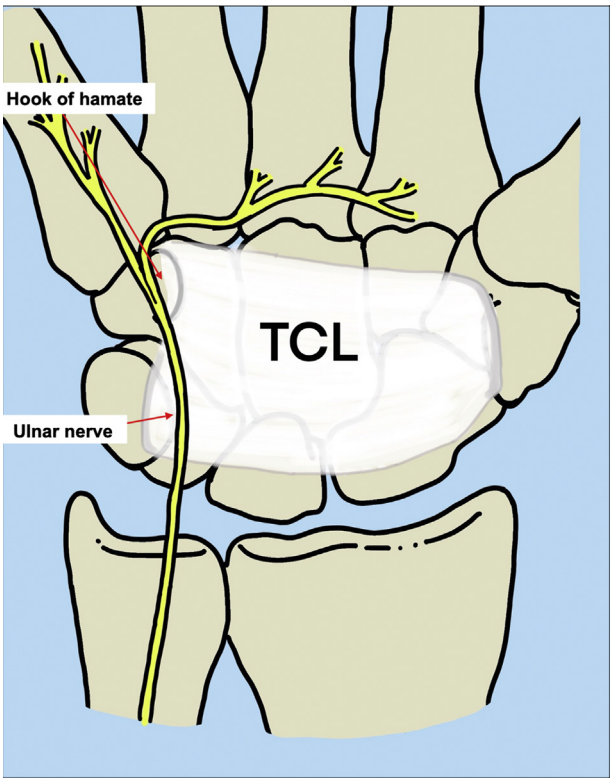

Figure 1. A simplified schematic illustrating the normal path of the motor branch of the ulnar nerve ulnar to the hook of the hamate.

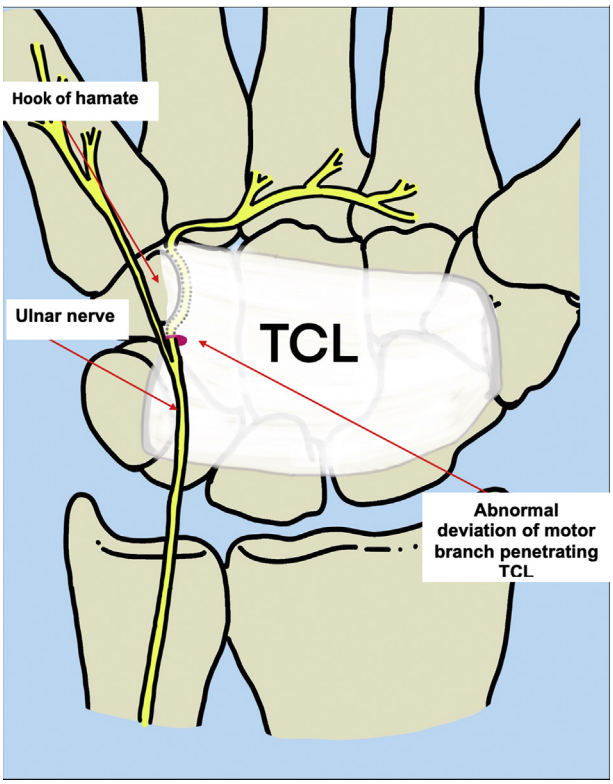

Figure 2. A simplified schematic illustrating the abnormal path of the motor branch of the ulnar nerve radial to the hamate, penetrating the TCL.

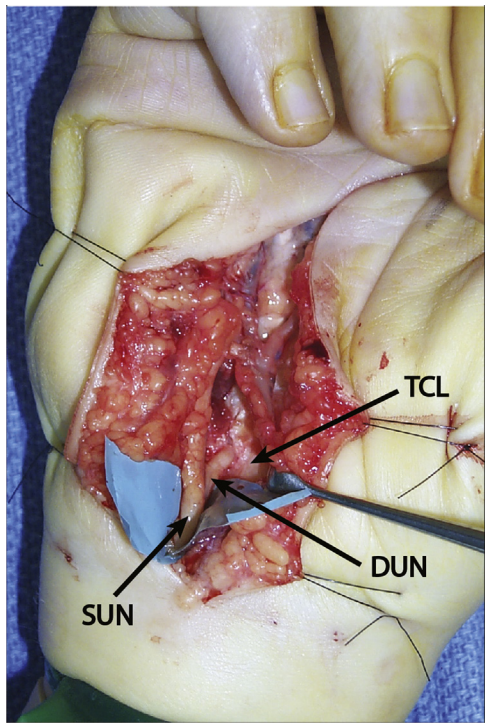

Figure 3. Surgical view. Identification of the superficial and deep branches of the ulnar nerve. The deep branch is shown penetrating the TCL. DUN, deep motor branch of ulnar nerve; SUN, superficial sensory branch of ulnar nerve.

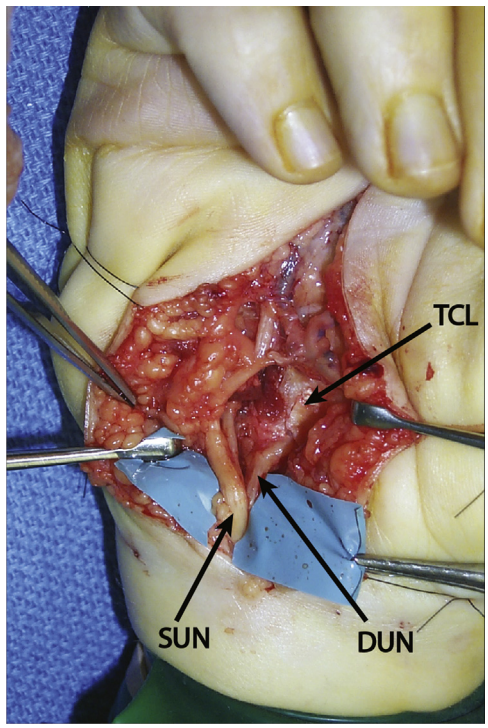

Figure 4. Surgical view. Retraction of tissue to reveal the ulnar nerve distal to the Guyon canal. Abnormal penetration of the TCL is shown clearly. DUN, deep motor branch of ulnar nerve; SUN, superficial sensory branch of ulnar nerve.

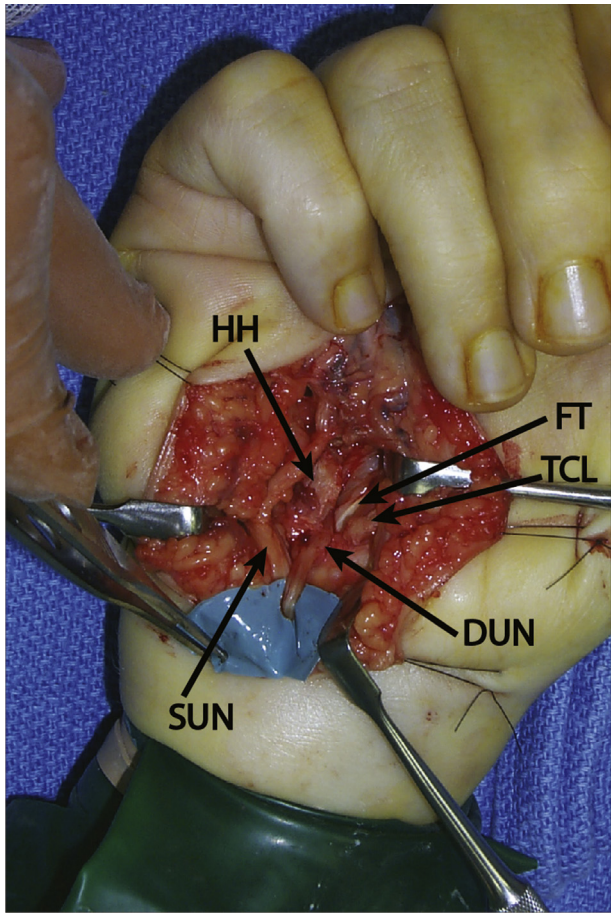

Figure 5. Surgical view. Meticulous dissection and transection of the TCL following the abnormal course of the ulnar nerve. DUN, deep motor branch of ulnar nerve; FT, flexor tendon HH, hook of the hamate; SUN, superficial sensory branch of ulnar nerve.

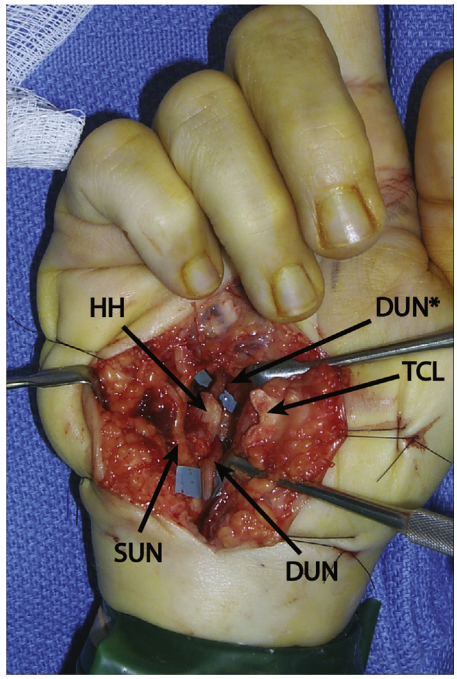

Figure 6. Surgical view. Initial identification of the deep branch of the ulnar nerve on the floor of the hand after cutting through the TCL. DUN, deep motor branch of ulnar nerve; DUN*, deep motor branch of the floor of the hand, emerging subperiosteally; HH, hook of the hamate; SUN, superficial sensory branch of ulnar nerve.

dissection and transection of the TCL (Fig. 5). The nerve traversed subperiosteally and radial to the base of the hook of the hamate and emerged at the distal end of the carpal tunnel on the floor of the hand (Fig. 6). The nerve was unroofed from the radial side of the hook of the hamate. It was thin and hollow in appearance. We retracted the flexor tendons radially to complete the subperiosteal dissection of the radial side of the hook of the hamate and free the deep motor branch. The deep motor branch was considerably compressed where it passed under the periosteum and was enlarged proximal to the locus of compression (Fig. 7). When the flexor tendons were allowed to return to their normal position, they entrapped the nerve (Fig. 8). We excised the hook of the hamate to relieve the compression (Fig. 9).

Two years later, her intrinsic muscles regained their bulk, and the average grip strength of her right hand improved from 41 to 49.2 kg.[8] The artist returned to all normal activities, including creating large-scale public sculptures (Fig. 10).

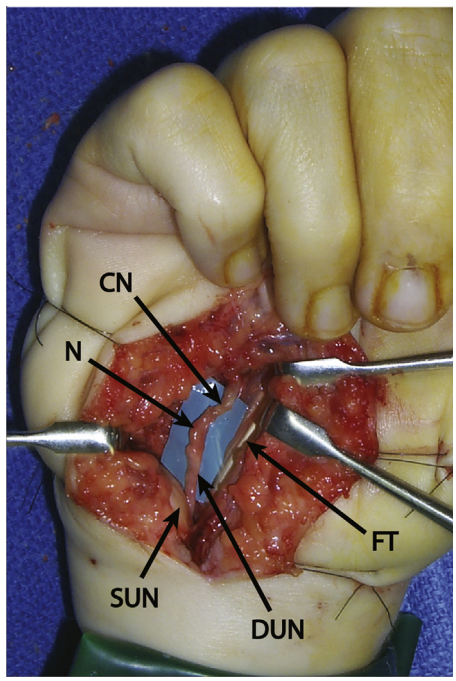

Figure 7. Surgical view. Demonstration of the compression-induced disfigurement of the deep branch of the ulnar nerve after being released from the periosteum of the hook of the hamate. CN, compressed nerve; DUN, deep motor branch of ulnar nerve; FT, flexor tendon; N, bulbus deformation prestricture; SUN, superficial sensory branch of ulnar nerve.

Discussion

The natural course of the motor branch of the ulnar nerve is ulnar to the hook of the hamate and it does not penetrate the

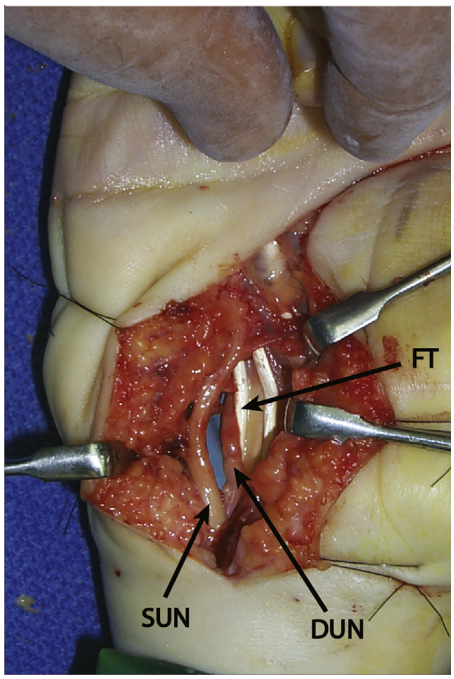

Figure 8. Surgical view. Flexor tendons allowed to return to their normal position; however, they compressed the ulnar nerve on the hook of the hamate. DUN, deep motor branch of ulnar nerve; FT, flexor tendon; SUN, superficial sensory branch of ulnar nerve.

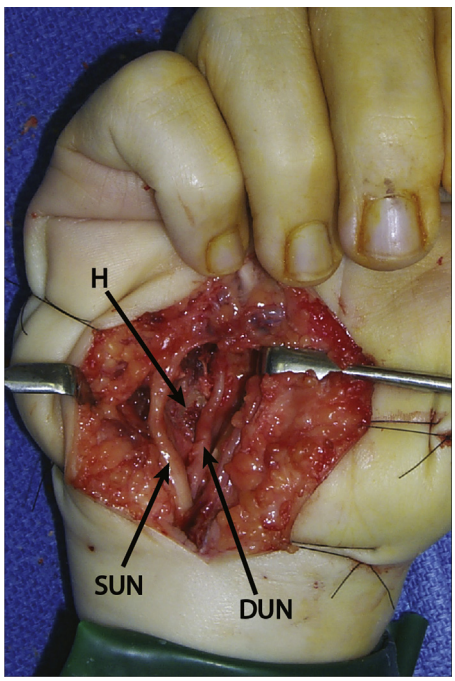

Figure 9. Surgical view. Excision of the hook of the hamate to relieve compression. DUN, deep motor branch of ulnar nerve; H, hamate with an excised hook of the hamate; SUN: superficial sensory branch of ulnar nerve.

Figure 10. The patient's sculpture was completed after the surgery.

TCL. In our case, the course of the motor branch of the ulnar nerve was radial to the hook of the hamate and penetrated the TCL. It traversed subperiosteally on the radial side of the hook of the hamate, emerging distal to the TCL on the floor of the hand. The hook of the hamate acts as a pivot point for the flexor tendons. Therefore, the anomalous pathway of the nerve made it susceptible to compression by the extrinsic flexor tendons in the carpal tunnel, in addition to the periosteum. By excising the hook of the hamate, we removed the pivot point, decompressing the nerve.

The evaluation of the branches of the ulnar nerve distal to the Guyon canal is recommended when the sensory component of the ulnar nerve is intact. The surgeon's awareness of this anomaly will prevent injury to the nerve when the focus of the operation encompasses the Guyon canal, carpal tunnel, fixation, or excision of the hook of the hamate.

References

1. Singh V, Trescot AM. Ulnar nerve entrapment. In: Trescot AM, ed. *Peripheral Nerve Entrapments: Clinical Diagnosis and Management*. Springer International Publishing; 2016:383–396.
2. Jeffery AK. Compression of the deep palmar branch of the ulnar nerve by an anomalous muscle. Case report and review. *J Bone Joint Surg Br*. 1971;53(4):718–723.
3. Zook EG, Kucan JO, Guy RJ. Palmar wrist pain caused by ulnar nerve entrapment in the flexor carpi ulnaris tendon. *J Hand Surg Am*. 1988;13(5):732–735.
4. Uriburu IJF, Morchio FJ, Marin JC. Compression syndrome of the deep motor branch of the ulnar nerve. (Piso-hamate hiatus syndrome). *J Bone Joint Surg Am*. 1976;58(1):145–147.
5. Tottas S, Kougioumtzis I, Titsi Z, Ververidis A, Tilkeridis K, Drosos GI. Ulnar nerve entrapment in Guyon's canal caused by a ganglion cyst: two case reports and review of the literature. *Eur J Orthop Surg Traumatol*. 2019;29(7):1565–1574.
6. Netscher DT, Cohen V. Ulnar nerve entrapment at the wrist: cases from a hand surgery practice. *South Med J*. 1998;91(5):451–456.
7. Aguiar PH, Bor-Seng-Shu E, Gomes-Pinto F, et al. Surgical management of Guyon's canal syndrome, an ulnar nerve entrapment at the wrist: report of two cases. *Arq Neuropsiquiatr*. 2001;59(1):106–111.
8. Kozin SH, Porter S, Clark P, Thoder JJ. The contribution of the intrinsic muscles to grip and pinch strength. *J Hand Surg Am*. 1999;24(1):64–72.