Concomitant compressive neuropathy of the ulnar and median nerves in the hand by midpalmar ganglion

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Introduction

Ganglia are the most common benign tumor lesions affecting the hand [4,12]. They are typically asymptomatic but can be associated with peripheral nerve compression in the upper extremity. Volar wrist ganglia are the most common cause of ulnar neuropathy originating at or below the wrist [8]. Ganglia of the carpometacarpal joints are also common but typically do not cause ulnar neuropathy [6]. Even more rare is a ganglion causing a concomitant compressive neuropathy of the median and ulnar nerve. Here, we describe a case of a ganglion cyst of the third carpometacarpal joint simultaneously associated with compression of both the deep motor branch of the ulnar nerve and the median nerve.

Case Report

A 66-year-old right-hand dominant male presented to our office with numbness and weakness of the right hand for

one and a half months. He complained of decreased sensation in the thumb, index, and long fingers and the inability to use a nail clipper, button his shirt, or hold a pen. On physical exam, a compressible, nonmobile mass was noted in the midpalm. He had a significant atrophy of the thenar muscles and fasciculation in the area of the abductor pollicis brevis. There was also atrophy of the second and third webspace, but the fourth webspace was normal. There was weakness of the abductor pollicis brevis and flexor pollicis brevis. Normal strength was preserved in the flexor digitorum profundus and flexor digitorum superficialis. The patient was unable to cross his index and middle fingers. Froment's sign was positive, but Wartenberg's sign was negative. Sensation and two-point discrimination along the palmar aspect of the thumb and index fingers was decreased compared with the contralateral hand, but sensation was intact in the ulnar nerve distribution. Tinel's sign was negative at Guyon's canal and at the carpal tunnel.

Electromyographical and nerve conduction studies showed denervation of the first dorsal interosseous, but not of the abductor digiti minimi, suggesting a compression of the deep motor branch of the ulnar nerve distal to its innervation of the hypothenar muscles. Compression of the median nerve within the carpal tunnel was also indicated by prolongation of its distal onset latency across the wrist. Magnetic resonance imaging was obtained, which demonstrated a multiloculated ganglion cyst deep to the flexor tendons in the palm (Fig. 1). The ganglion was 3 by 1.3 by 0.9 cm and originated from the third carpometacarpal joint, spanning the joint, and extending proximally into the carpal tunnel. Given its location and size, the ganglion was the most likely source of both the ulnar and median nerve symptoms in this patient.

The patient was taken to the operating room, and the carpal tunnel was released and explored. On gross inspection, the transverse carpal ligament did not appear pathologically

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Fig. 1 MRI image of the ganglion cyst deep in the palm

thickened and was easily divided. The proximal aspect of a large ganglion cyst was visualized deep to the flexor tendons and median nerve within the carpal tunnel. The incision was extended distally and the ganglion traced to its origin, which was the third carpometacarpal joint. The deep motor branch of the ulnar nerve and the deep palmar branch of the ulnar artery were observed to pass directly beneath the ganglion cyst in their ulnar radial course across the palm, and they were severely compressed at this point (Fig. 2). The ganglion was carefully excised, allowing for decompression of the artery and nerve (Fig. 3). The ganglion stalk origin at the carpometacarpal joint was gently coagulated with bipolar electrocautery to decrease risk of recurrence.

Two weeks after operation, the patient's complaints of numbness in the thumb and index finger had resolved. The fasciculation within the thenar musculature that had been observed preoperatively ceased. Strength within the first and second dorsal interossei was still decreased but had a notable improvement.

Fig. 2 Deep motor branch of the ulnar nerve and the deep palmar branch of the ulnar artery compressed beneath the ganglion cyst

Fig. 3 Decompression of the median nerve and deep motor branch of the ulnar nerve after ganglion excision

Discussion

Compressive lesions of the ulnar nerve in the wrist and hand result in a variety of combinations of motor and sensory manifestations due to the unique anatomy of the ulnar nerve. Upon entering the wrist, the ulnar nerve passes through Guyon's canal, a fibro-osseous tunnel running between the pisiform and the hook of the hamate and extending distally to the region just beyond the fibrous arch of the hypothenar muscles. Near the distal border of the pisiform, it divides into superficial and deep motor branches. The superficial branch innervates and passes beneath palmaris brevis and then continues distally to divide into the fourth common digital nerve and the ulnar proper digital nerve to the small finger. The deep motor branch passes through the hypothenar fibrous arch to run between the abductor digiti minimi and flexor digiti minimi, innervating both. It then perforates and innervates the opponens digiti minimi, curves around the hook of the hamate, and courses radially across the palm beneath the flexor tendons, sending off branches to the interossei. It terminates in branches to the adductor pollicis and flexor pollicis brevis.

Gross and Gelberman divided Guyon's canal into three zones, the first surrounding the ulnar nerve prior to its bifurcation, the second surrounding the superficial branch of the ulnar nerve, and the third surrounding the deep motor branch of the ulnar nerve [4]. As described above, the deep motor branch innervates the hypothenar muscles within zone two and innervates the interossei as it courses across

the palm. Thus, in patients presenting with motor deficits in the ulnar nerve distribution, lesions can be localized based on whether any of the interossei, the hypothenar muscles, and/or sensation are spared. Of all compression lesions of the ulnar nerve at and below the wrist, approximately half occurs in zone two proximal to the innervation of the hypothenar muscles, half occurs in zone two distal to the innervation of the hypothenar muscles, and a very small minority occurs distal to Guyon's canal [1,3,12].

Ganglion cysts are the most common cause of ulnar nerve compression at or below the wrist and the most common cause of compression within zone two [4,12]. The majority of these ganglia arise from the pisotriquetral joint, affecting the ulnar nerve near the origin of its deep motor branch [2]. To our knowledge, only four cases of ulnar neuropathy due to midpalmar ganglia have been previously reported [2,3,6,7]. Involvement of the interossei was variable, but in all but one case, the hypothenar muscles were completely spared. In three of these cases, the ganglia appeared to originate in the third carpometacarpal joint. In the remaining case, the ganglion was at the level of the middle third of the third metacarpal beneath the origin of the transverse head of the adductor pollicis, with no definite origin in any joint or tendon identified.

Here, we present a fourth case of compression of the deep motor branch of the ulnar nerve by a ganglion arising from the third carpometacarpal joint. Carpometacarpal ganglia of other fingers have not been reported to cause ulnar neuropathy, although the deep motor branch runs in close proximity to all the carpometacarpal joints except the thumb. The reason for this is unclear. There may be a closer anatomic relationship of the deep branch to the third carpometacarpal joint. Alternatively, the ganglia of the third carpometacarpal joint may be more common than the ganglia of the other carpometacarpal joints.

Lesions of the deep branch of the ulnar nerve can prove challenging to diagnose, especially when they occur distal to the innervation of the hypothenar muscle, causing subtle signs and symptoms. The coexistence of symptoms in the median nerve distribution can be particularly confusing and can occur in the context of concomitant carpal tunnel syndrome or a Riche–Cannieu anastomosis [10,11].

The description of a ganglion cyst associated with symptoms of median neuropathy is not novel. Volar wrist ganglia

have long been associated with carpal tunnel syndrome, and on occasion, compression of the motor branch of the median nerve has been observed with the ganglia arising from the first and second carpometacarpal joints [5,6,9]. To our knowledge, this is the first description of a midpalmar ganglion associated with carpal tunnel syndrome and also the first description of midpalm ganglion affecting both the ulnar and the median nerves. In this case, whether there was direct compression of the median nerve by the ganglion is unknown, but the clear displacement of the contents of the carpal tunnel by the ganglion strongly suggests that it was a major factor in his developing carpal tunnel syndrome.

Conflict of interest All named authors hereby declare that they have no conflicts of interest to declare.

References

1. Chaise F, Sedel L. Isolated compression of the motor branch of the ulnar nerve. *Ann Chir Main.* 1983;2:33–7.
2. Duggal A, Anastakis DJ, Salonen D, Becker E. Compression of the deep palmar branch of the ulnar nerve by a ganglion: a case report. *Hand (N Y).* 2006;1:98–101.
3. Feldman MD, Rotman MB, Manske PR. Compression of the deep motor branch of the ulnar nerve by a midpalmar ganglion. *Orthopedics.* 1995;18:65–7.
4. Gross MS, Gelberman RH. The anatomy of the distal ulnar tunnel. *Clin Orthop Relat Res.* 1985;169:238–47.
5. Kerrigan JJ, Bertonni JM, Jaeger SH. Ganglion cysts and carpal tunnel syndrome. *J Hand Surg Am.* 1988;13:763–5.
6. Kobayashi N, Koshino T, Nakazawa A, Saito T. Neuropathy of motor branch of median or ulnar nerve induced by midpalm ganglion. *J Hand Surg Am.* 2001;26:474–7.
7. McDowell CL, Henceroth WD. Compression of the ulnar nerve in the hand by a ganglion. Report of a case. *J Bone Joint Surg Am.* 1977;59:980.
8. Nahra ME, Bucchieri JS. Ganglion cysts and other tumor related conditions of the hand and wrist. *Hand Clin.* 2004;20:249–60.
9. Nahra ME, Bucchieri JS. Ganglion cysts and other tumor related conditions of the hand and wrist. *Hand Clin.* 2004;20:249–60.
10. Saperstein DS, King RB. Motor neuron presentation of an ulnar neuropathy and Riche–Cannieu anastomosis. *Electromyogr Clin Neurophysiol.* 2000;40:119–22.
11. Seror P. Ulnar conduction block at the wrist. *Arch Phys Med Rehabil.* 1999;80:1346–8.
12. Shea JD, McClain EJ. Ulnar-nerve compression syndromes at and below the wrist. *J Bone Joint Surg Am.* 1969;51:1095–103.