www.jkns.or.kr

J Korean Neurosurg Soc 42 : 141-144, 2007

Case Report

Sang-Hoon Yoon, M.D.[1]
Youn-Ho Hong, M.D.[2]
Young Seob Chung, M.D.[1]
Hee-Jin Yang, M.D.[1]

# The Cubital Tunnel Syndrome with Medial Ganglion Cyst

The association of medial elbow ganglion cyst with cubital tunnel syndrome has been rarely reported. A 61-year-old man presented with progressive right hypothenar atrophy and paresthesia for 7 months. Ultrasonography and magnetic resonance imaging revealed ulnar nerve entrapment with a cystic ganglion in cubital tunnel. Decompression of ulnar nerve and excision of the ganglion were performed. Motor function of the ulnar nerve showed an improvement four months later after surgery. Because most ganglia are occult, imaging study is warranted especially in case with osteoarthritis. Excision of the ganglion performed concurrently with decompression of the ulnar nerve provide satisfactory results.

**KEY WORDS :** Cubital tunnel syndrome · Ganglion · Ultrasonography · Magnetic resonance imaging (MRI).

*Departments of Neurosurgery[1] Neurology,[2] Seoul National University College of Medicine Boramae Hospital, Seoul, Korea*

## INTRODUCTION

Cubital tunnel syndrome is the most common form of ulnar nerve entrapment and the second most common entrapment neuropathy of the upper extremity[18]. Reported causes are prolonged elbow flexion, trauma to the medial epicondyle, repetitive overhead arm movements, space occupying lesions, metabolic derangements, and extremity immobilization[19].

Ulnar nerve entrapment rarely coexist with tumorous condition such as ganglion cyst[7,8]. This condition further aggravates ulnar neuropathy. This report shows a case of cubital tunnel syndrome caused by ulnar nerve entrapment with medial ganglion cyst and the usefulness of high resolution ultrasonography and magnetic resonance imaging for diagnosis of occult ganglion cyst causing cubital tunnel syndrome.

## CASE REPORT

A 61-year-old man who had suffered with progressive paresthesia on right upper extremity visited our hospital. Tingling sensation on medial two fingers and forearm of ulnar side developed 7 months ago. He also complained of right hypothenar atrophy and hand weakness. There was no history of previous trauma at the right elbow. He had neither history of diabetes, nor any other conditions causing any causative vasculopathy and neuropathy. On neurological examinations, mild weakness (Grade IV+) in right hand grasping was observed. Hypothenar atrophy and wasting of intrinsic hand muscles were observed. There was no definite weakness in wrist flexion.

Plain radiographs showed osteoarthritis on both elbow without fracture or dislocation. Needle electromyography (EMG) performed prior to surgery showed prominent denervation and reinnervation with decreased recruitment in the first dorsal interossei (FDI), abductor digiti minimi (ADM), and the flexor digitorum profundus (FDP) to 4$^{th}$ and 5$^{th}$ digits. The flexor carpi ulnaris (FCU) muscle was normal. Given that the branch to FCU is often spared in ulnar neuropathy at the elbow, an electrophysiologic impression was an ulnar neuropathy at the elbow. However, without localizing abnormalities such as focal slowing or conduction block, the electrophysiologic studies could not precisely locate the lesion to the elbow because unusual lesions proximal to the elbow could not be excluded (Table 1). Ultrasonography disclosed ulnar nerve compression by $1.08 \times 1.02 \times 0.4$ cm sized anechoic mass. Magnetic resonance imaging revealed a cystic mass with lobulating contour that compressed the ulnar nerve at the level of cubital tunnel. The ulnar nerve showed increased signal intensity due to

• Received : May 2, 2007
• Accepted : July 19, 2007
• Address for reprints :
Hee-Jin Yang, M.D.
Department of Neurosurgery
Seoul National University College of Medicine, Boramae Hospital
425 Sindaebang 2-dong
Dongjak-gu, Seoul 156-707, Korea
Tel : +82-2-840-2436
Fax : +82-2-831-0714
E-mail : nsyang@brm.co.kr

compression. These results were compatible to cubital tunnel syndrome by ganglion cyst (Fig. 1).

In order to relieve the nerve compression, surgery was planned. After induction of general anesthesia, anterior-sweeping incision around medial epicondyle was made. The ulnar nerve was identified at superior to medial epicondyle. The nerve was traced distally where it was compressed by dense fascia spanning the two head of the FCU. The fascia was divided until there was no remaining compression of the ulnar nerve in the forearm. After division of fascia, bulbous swelling of the ulnar nerve just proximal to the compression by fascia became evident. There was still remained compression at just proximal to the divided fascia. Cystic mass compressing the nerve at deeper side was dissected and removed in one piece. After resection of the cystic mass, remaining compression of the nerve was completely resolved. The nerve became freely movable in operative field (Fig. 2). Anterior transposition of the nerve was not performed. The cystic mass was diagnosed as ganglion on pathological examination. He was discharged at 3rd postoperative day without new neurological deficit.

Four months later after operation, there was some improvement in motor function of hand, although there were no definite improvements of hypothenar atrophy and muscle wasting of intrinsic hand muscles. EMG and NCS performed 2 and 6 months after operation revealed a little improvement compared to preoperative status (Table 1).

**Table 1.** Results of serial ulnar nerve conduction study

| Ulnar nerve conduction study | Before surgery | 2 months after surgery | 6 months after surgery | Upper or lower limits of normal values |
|---|---|---|---|---|
| Motor conduction | | | | |
| CMAP (mV) | NP/NP/NP* | 0.7/0.5/0.2 | 1.0/0.9/0.9 | 5 |
| Terminal latency (msec) | NA | 4.6 | 4.3 | 2.7 |
| NCV (m/sec) | | | | |
| Wrist–Elbow | NA | 55.9 | 54.3 | 50.6 |
| Across elbow | NA | 7.1 | 10.4 | 42.8 |
| Sensory conduction | | | | |
| SNAP ($\mu$V) | NP | NP | NP | 10 |
| NCV (m/sec) | | | | |
| 5th finger–wrist | NA | NA | NA | 39.3 |

*Values expressed are CMAP recorded at abductor digiti minimi with supramaximal stimulation at the wrist/3cm below elbow/7 cm above elbow. CMAP : compound muscle action potential, NCV : nerve conduction velocity, SNAP : sensory nerve action potential, NP : no potential, NA : not available

## DISCUSSION

Second only to carpal tunnel syndrome, cubital tunnel syndrome is a common peripheral neuropathy of the upper extremity. It is caused by the mechanical or dynamic compression of a segment of ulnar nerve at cubital fossa level as it passes through a narrow fibro-osseous tunnel or an opening in a fibrous or muscular structure[20]. The ulnar nerve, arising from the medial cord of the brachial plexus, travels down the arm along the medial head of the triceps. At the distal humerus it passes through the cubital tunnel and exists between the two heads of the FCU. There are 4 sites where the ulnar nerve is frequently vulnerable to compression. These are (1) the arcade of Struthers (medial intermuscular septum), (2) the ulnar groove, (3) the humeroulnar arcade (or cubital tunnel), and (4) the exit point between the 2 heads of FCU. Among these locations, the most common sites of compression are the ulnar groove and humeroulnar arcade[19].

There are various clinical presentations of ulnar nerve compression at cubital tunnel. These variations in clinical feature are due to topography of nerve fibers in cubital tunnel or varying susceptibility of different

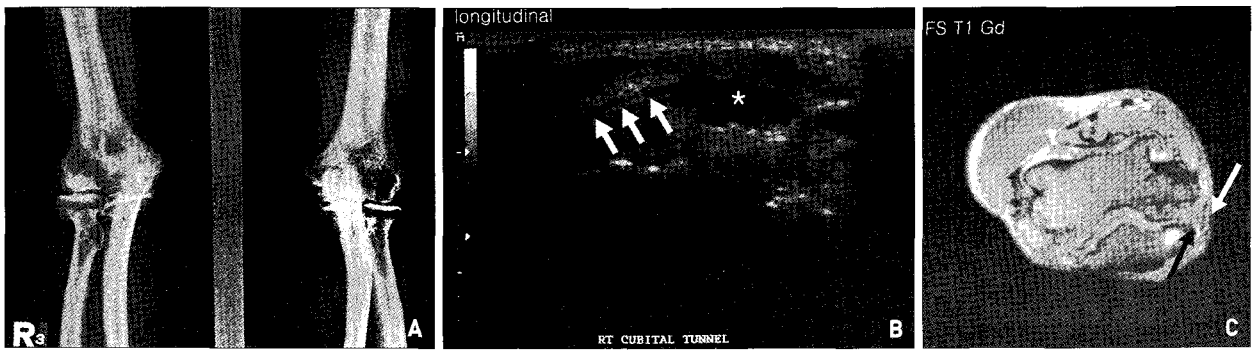


**Fig. 1.** Results of imaging studies. Plain radiographs show osteoarthritis on both elbow without fracture or dislocation (A). Ultrasonography shows ulnar nerve (arrows) compressed by anechoic mass (*). The size of mass is 1.08×0.42 cm (B). Magnetic resonance imaging (T1 weighted image fat suppression with gadolinium enhancement) reveals ulnar nerve (white arrow is compressed and deformed by underlying mass at cubital tunnel (black arrows) (C).

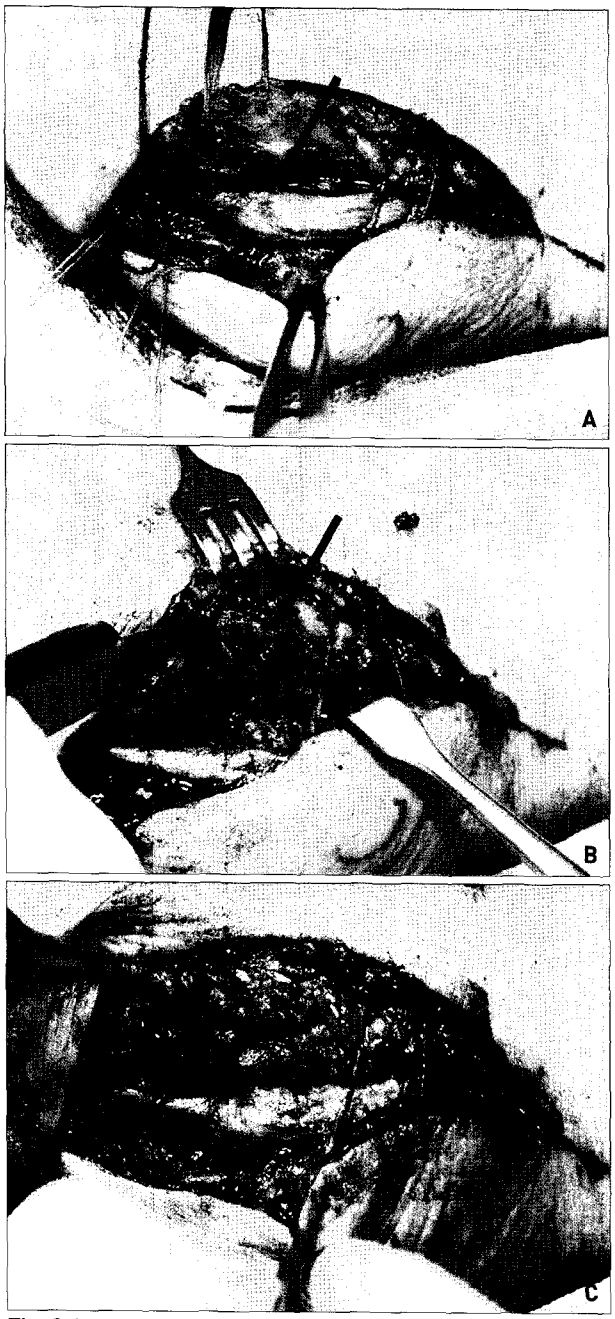


**Fig. 2.** Intraoperative photographs. The bulbous swelling of ulnar nerve just proximal to compression by fascia is visible after division of fascia (arrow) (A). The compression is further relieved after resection of ganglion (arrow) (B). Remaining compression of the nerve is completely resolved after resection of the cystic mass (C).

fascicles to injury[4,22]. Clinical manifestation of our case, prominent wasting of first dorsal interossei with sparing of wrist flexors, supports the notion of varying susceptibility.

The association of medial elbow ganglion cyst with cubital tunnel syndrome has been known to occur rarely[8,12,20]. Although uncommon, medial elbow ganglia have a strong association with osteoarthritis of the elbow and can cause a relatively acute onset of cubital tunnel syndrome[7]. Because cubital tunnel syndrome associated with ganglion cyst shows more rapid clinical progression, proper diagnosis and prompt treatment is required for favorable outcome[10]. The importance of imaging study for cubital tunnel syndrome is to be noted. Cross-sectional imaging, primarily ultrasound and magnetic resonance imaging, can provide exquisite anatomical detail of peripheral nerves and the changes that may occur as a result of compression[5,11,20]. It is known that the ganglion cyst may have bilobular or multi-nodular contour and imaging study is useful for detection of site of nerve compression and for effective decompression[7]. As is shown in our case, for patients with severe nerve dysfunction, the exact level of compression cannot be determined by electrophysiological study alone and imaging study is very useful for correct preoperative diagnosis.

There are still debates on which surgical procedure is optimal for the treatment of cubital tunnel syndrome. Some authors favor anterior transposition[9], whereas others report high success rates with simple decompression[18] or medial epicondylectomy[15]. Anterior transposition of the ulnar nerve requires division of the segmental epineural vessels over 8 to 10 cm. Although there are anastomotic vessels, dissection of several centimeters of arteries considerably decreases the blood supply to the nerve[2]. As a result, the blood supply of the ulnar nerve, already impaired by compression, is likely to be compromised even further. There is also risk of denervating the FCU[19]. Medial epicondylectomy represents a technique for decompressing the nerve with less dissection and mobilization, better preservation of blood supply to the nerve when compared with anterior transposition[19,21]. There are also several disadvantages over simple decompression, such as tenderness at the osteotomy site, weakness in pronation and flexion, medial instability of the elbow[19]. As the medial collateral ligament is the primary stabilizer of the elbow, there is the risk of postoperative instability if the origin of the ligament is detached by removing too much of the epicondyle[13].

Simple decompression is less invasive. The nerve is left in its original and protected position. Neither the nerve's blood supply nor important structures of the elbow are harmed by simple decompression and external neurolysis. Epineuriotomy can be performed without reducing the vascularization if the incision is made only at levels of epineural thickness[18]. It is not known that definite difference in outcome exists between simple decompression and anterior transposition, although there is much less nerve dissection and manipulation, potential risk factor for nerve damage, in the former[3,6,14]. Anterior transposition may be restricted to limited cases of extreme cubitus valgus or subluxation of the nerve[1,17]. However, any pathologic condition impinging

on the nerve such as ganglion or osteophytes is to be removed altogether for effective decompression.

## CONCLUSION

A case of cubital tunnel syndrome associated with medial elbow ganglion is presented. Because most ganglia are occult, ultrasonography or magnetic resonance imaging is warranted especially in case with osteoarthritis. Careful excision of the ganglion performed concurrently with decompression of the ulnar nerve can provide favorable results.

## References


1. Assmus H : Simple decompression of the ulnar nerve in cubital tunnel syndrome with and without morphologic changes. Report of experiences based on 523 cases. **Nervenarzt 65 :** 846-853, 1994
2. Barone CM, Jimenez DF, Frempog-Bodeau A : Blood-flow measurements of injured peripheral nerves by laser Doppler flowmetry. **J Reconstr Microsurg 8 :** 319-323, 1992
3. Boyer M : Simple decompression did not differ from simple decompression plus anterior transposition of the nerve for cubital tunnel syndrome. **J Bone Joint Surg Am 88 :** 1893, 2006
4. Campbell WW : The electrodiagnostic evaluation of patients with ulnar neuropathy at the elbow : Lieterature review of the usefulness of nerve conduction studies and needle electromyography. American Association of Electrodiagnostic Medicine, American Academy of Neurology, American Academy of Physical Medicine and Rehabilitation. **Muscle Nerve Suppl 8 :** S175-205, 1999
5. Chiou HJ, Chou YH, Cheng SP, Hsu CC, Chan RC, Tiu CM, et al : Cubital tunnel syndrome : diagnosis by high-resolution ultrasonography. **J Ultrasound Med 17 :** 643-648, 1998
6. Gervasio O, Gambardella G, Zaccone C, Branca D : Simple decompression versus anterior submuscular transposition of the ulnar nerve in severe cubital tunnel syndrome : a prospective randomized study. **Neurosurgery 56 :** 108-117; discussion 117, 2005
7. Kato H, Hirayama T, Minami A, Iwasaki N, Hirachi K : Cubital tunnel syndrome associated with medial elbow Ganglia and osteoarthritis of the elbow. **J Bone Joint Surg Am 84 :** 1413-1419, 2002
8. Kim DH, Han K, Tiel RL, Murovic JA, Kline DG : Surgical outcomes of 654 ulnar nerve lesions. **J Neurosurg 98 :** 993-1004, 2003
9. Kleinman WB : Cubital tunnel syndrome: anterior transposition as a logical approach to complete nerve decompression. **J Hand Surg Am 24 :** 886-897, 1999
10. Manninger J, Renner A, Zimmermann I : Ganglion in the ulnar nerve sulcus as a cause of ulnar nerve irritation. **Handchirurgie 12 :** 7-9, 1980
11. Martinoli C, Bianchi S, Gandolfo N, Valle M, Simonetti S, Derchi LE : US of nerve entrapments in osteofibrous tunnels of the upper and lower limbs. **Radiographics 20 Spec No :** S199-213; discussion S213-217, 2000
12. Matev B : Cubital tunnel syndrome. **Hand Surg 8 :** 127-131, 2003
13. Morrey BF, An KN : Articular and ligamentous contributions to the stability of the elbow joint. **Am J Sports Med 11 :** 315-319, 1983
14. Mowlavi A, Andrews K, Lille S, Verhulst S, Zook EG, Milner S : The management of cubital tunnel syndrome : a meta-analysis of clinical studies. **Plast Reconstr Surg 106 :** 327-334, 2000
15. Muermans S, De Smet L : Partial medial epicondylectomy for cubital tunnel syndrome : Outcome and complications. **J Shoulder Elbow Surg 11 :** 248-252, 2002
16. O'Driscoll SW, Horii E, Carmichael SW, Morrey BF : The cubital tunnel and ulnar neuropathy. **J Bone Joint Surg Br 73 :** 613-617, 1991
17. Osterman AL, Davis CA : Subcutaneous transposition of the ulnar nerve for treatment of cubital tunnel syndrome. **Hand Clin 12 :** 421-433, 1996
18. Pavelka M, Rhomberg M, Estermann D, Loscher WN, Piza-Katzer H : Decompression without anterior transposition : an effective minimally invasive technique for cubital tunnel syndrome. **Minim Invasive Neurosurg 47 :** 119-123, 2004
19. Robertson C, Saratsiotis J : A review of compressive ulnar neuropathy at the elbow. **J Manipulative Physiol Ther 28 :** 345, 2005
20. Spratt JD, Stanley AJ, Grainger AJ, Hide IG, Campbell RS : The role of diagnostic radiology in compressive and entrapment neuropathies. **Eur Radiol 12 :** 2352-2364, 2002
21. Tada H, Hirayama T, Katsuki M, Habaguchi T : Long term results using a modified King's method for cubital tunnel syndrome. **Clin Orthop Relat Res :** 107-110, 1997
22. Wadsworth TG : The external compression syndrome of the ulnar nerve at the cubital tunnel. **Clin Orthop Relat Res :** 189-204, 1977