

CASE REPORT

Diagnosis and surgical management of ulnar nerve neuropathy due to a ganglion cyst: A case report

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Abstract

Cubital tunnel syndrome (CTS) of the elbow secondary to a ganglion cyst is uncommon, with an incidence of 4 – 10% reported in some studies. This case report describes the ultrasound (US) and intraoperative findings of CTS caused by a ganglion cyst. It highlights the diagnostic importance of US and how it can provide detailed information regarding the severity of CTS. This report aims to raise awareness of ganglion cysts as a possible differential in cases of ulnar nerve neuropathy and to emphasize their relevance in surgical planning and management.

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1. Background

Cubital tunnel syndrome (CTS) is a condition caused by compression of the ulnar nerve at the elbow. The cubital tunnel is a narrow passage, bounded medially by the medial epicondyle of the humerus, laterally by the olecranon process of the ulna, and with Osborne's ligament forming its roof. CTS is often caused by pressure or irritation of the ulnar nerve due to repetitive movements, such as elbow flexion and extension, which stretch the ulnar nerve.¹ Less common causes include structural lesions, such as ganglion cysts, which can result in ulnar nerve irritation if they become large or exert direct pressure on the nerve. We present a case report of CTS secondary to an extraneural ganglion cyst at the elbow, which was detected through ultrasonography. This report highlights the findings and surgical management for this patient.

2. Case presentation

A 66-year-old male presented with a 1-year history of gradual weakness in his right hand and forearm pain. On physical examination, there was wasting of the right hypothenar muscle and the first dorsal interosseous muscle, with a partial claw deformity at rest due to the unopposed action of the flexion digitorum profundus muscle. On assessing the strength of his right hand and fingers, weakness was noted in the right adductor pollicis, opponens pollicis, abductor pollicis brevis, and in the flexion of the right ring and little finger's distal interphalangeal joint. There was also sensory loss in the right medial one-

and-a-half fingers. A positive Froment's sign was observed. These findings were consistent with Grade IIB McGowan ulnar nerve neuropathy.

Electrophysiologic studies, including nerve conduction studies (NCS) and electromyography (EMG), revealed severe sensorimotor axonal ulnar neuropathy at or above the origin of the flexor carpi ulnaris muscle.

Further diagnostic evaluation with ultrasound (US) of the ulnar nerve demonstrated a multi-lobulated cyst measuring 0.45 cm^2 located at the entrance of the cubital tunnel. The cyst, consistent with an extraneural ganglion or synovial cyst, extended into the retroepicondylar groove. This finding was likely responsible for his CTS, as the measurement of the ulnar nerve at the cubital tunnel had a cross-sectional area (CSA) of 0.16 cm^2 (Figure 1). A CSA $>0.10\text{ cm}^2$ is suggestive of ulnar neuropathy.²

The patient was counseled for ulnar nerve decompression at the cubital tunnel and retrocondylar groove, followed by anterior subcutaneous transposition to alleviate his symptoms. Intraoperative findings confirmed the presence of the cyst (Figure 2A), and histopathologic examination of the excised tissue confirmed it to be a ganglion cyst. After the excision of the ganglion cyst, narrowing of the

nerve was noted intraoperatively, likely due to prolonged compression (Figure 2B).

The patient was followed up in the outpatient clinic, and repeat EMG and NCS were performed at 5 and 10 months postoperatively, showing mild recovery. The relevant studies are presented below (Tables 1-4). The US was also repeated at the 10-month mark, confirming that the previously observed ganglion cyst had been removed (Figure 1D).

As no formal questionnaire was used in the assessment of his ulnar neuropathy, the patient's improvement was mainly assessed during clinic follow-ups. At the 10-month follow-up, he reported improvement in pain, with both reduced frequency and intensity, along with decreased numbness and weakness. In terms of right-hand function, the patient reported an improved ability to use utensils and hold objects.

3. Discussion

Although it is uncommon for space-occupying lesions to cause CTS at the elbow, ganglion cysts can be an etiology of ulnar neuropathy. The majority of ganglion cysts are found in the hand and wrist.³ Ganglion cysts at

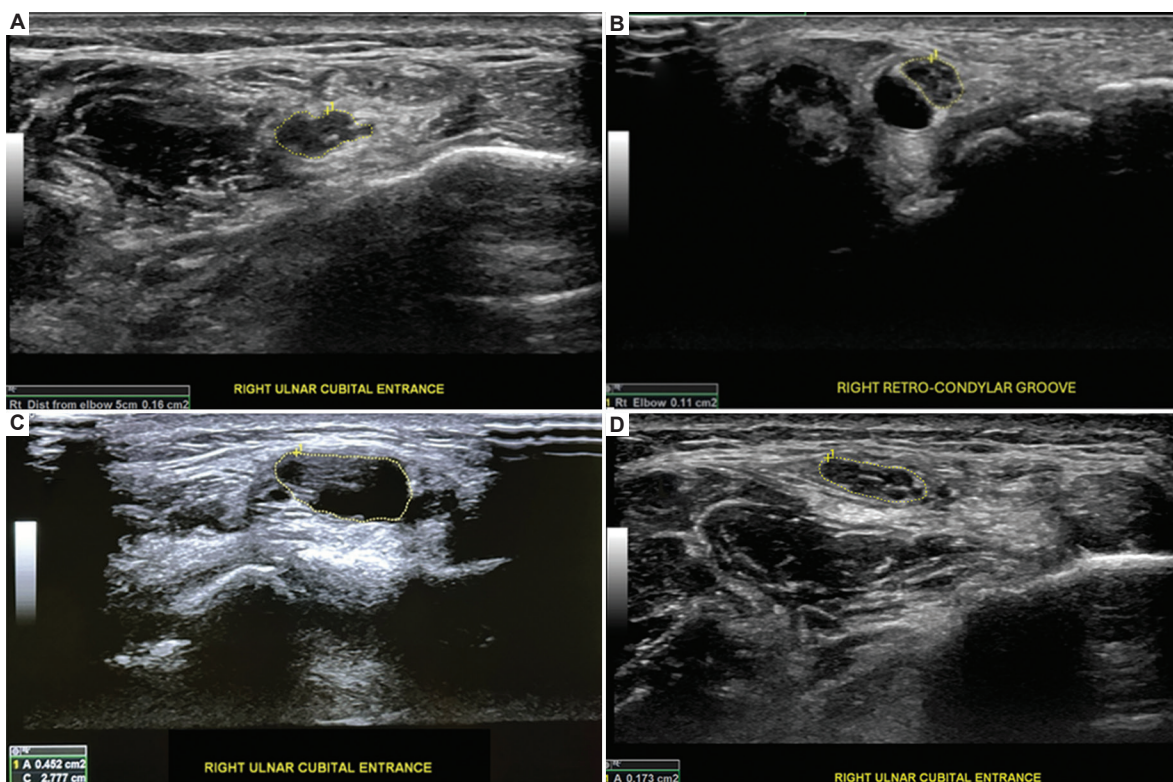


Figure 1. Ultrasound findings. (A) Ultrasound (US) of the right ulnar cubital entrance showing a cross-sectional area of the thickened nerve circled measuring 0.16 cm^2 . (B) US at the retrocondylar groove showing a cross-sectional area of the ulnar nerve measuring 0.11 cm^2 (circled) and an adjacent ganglion cyst. (C) US of the multi-lobulated 0.45 cm^2 cyst at the ulnar cubital entrance. (D) US of the ulnar cubital entrance at 10 months post-operation.

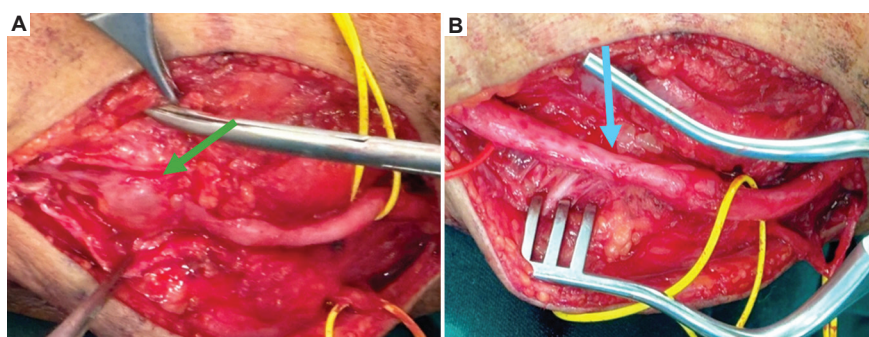


Figure 2. Intraoperative findings. (A) Intraoperative photograph of the ganglion cyst (green arrow) before excision. (B) Intraoperative photograph following excision of the extraneural ganglion cyst, showing mild narrowing of the nerve, likely due to prolonged compression (blue arrow).

Table 1. Findings of the motor nerve conduction study

Time	Nerve and site	Latency (ms)	Amplitude (mV)	Segment	Duration (ms)	Area (mVms)	Latency difference (ms)	Distance (mm)	Conduction velocity (m/s)
Ulnar at abductor digiti minimi (ADM) of right hand									
Before op	Wrist	NR	NR	ADM—wrist	NR	NR	-	-	-
Five months postop	Wrist	4.8	0.2	ADM—wrist	7.0	0.9	4.8	-	-
10 months postop	Wrist	4.1	0.5	ADM—wrist	7.1	2.1	4.1	-	-
Ulnar at first digitorum interosseus (FDI) of right hand									
Before op	Wrist	3.5	0.5	FDI—wrist	5.1	1.6	3.5	-	-
Five months postop	Wrist	3.4	1.3	FDI—wrist	7.2	4.5	3.4	-	-
10 months postop	Wrist	4.1	0.5	FDI—wrist	9.2	3.6	3.0	-	-

Abbreviations: NR: Non-recordable; op: Operation; postop: Post-operative.

Table 2. Findings of the sensory nerve conduction study

Time	Nerve and site	Onset latency (ms)	Peak latency (ms)	Amplitude (mV)	Segment	Latency difference (ms)	Distance (mm)	Conduction velocity (m/s)
Right ulnar								
Before op	Digit V (ulnar)	-	-	-	Wrist-digit V (ulnar)	-	110	-
Five months postop	Digit V (ulnar)	NR	NR	NR	Wrist-digit V (ulnar)	-	-	-
10 months postop	Digit V (ulnar)	NR	NR	NR	Wrist-ulnar digit V (ulnar)	NR	-	-

Abbreviations: Digit V: Fifth digit; NR: Non-recordable; op: Operation; postop: Post-operative.

the elbow, particularly those compressing the ulnar nerve or causing other symptoms, can be clinically elusive and difficult to diagnose without appropriate imaging. A variety of investigations are commonly performed to confirm the diagnosis and determine the extent of nerve involvement.

3.1. Investigations

NCS can help assess the function of the ulnar nerve. In cases involving ganglion cysts, NCS findings often reveal slowed conduction velocity, decreased amplitude, and possible

conduction block. EMG is often used in conjunction with NCS. It evaluates muscle activity and helps detect signs of denervation or axonal damage in muscles innervated by the ulnar nerve, such as the hypothenar muscles.

Imaging modalities such as the US are excellent non-invasive tools for identifying and localizing ganglion cysts, particularly in the cubital tunnel area. US can demonstrate the CSA, shape, and location of the cyst, as well as its relationship to the ulnar nerve. If aspiration is considered a management option, the US can also be used to guide injection and aspiration. Advantages of the

Table 3. Needle electromyography findings of the right flexor digitorum profundus

Time	Insertional activity	Spontaneous activity			Volitional MUAPs			Max volitional activity		
	Insertional	Fibs	+wave	Fasc	Duration	Amplitude	Poly	Recruitment	Activities	Effort
Before op	Normal	None	None	None	Slight increase	Slight increase	Many	Reduced	Normal	Max
Five months postop	Normal	None	None	None	Normal	Normal	Normal	Normal	Full	Max
10 months postop	Normal	None	None	None	2+	Slight increase	Few	Moderately reduced	Normal	Max

Abbreviations: Fasc: Fasciculation; Fibs: Fibrillation; Max: Maximum; MUAPs: Motor unit action potentials; op: Operation; Poly: Polyphasic; postop: Post-operative; +wave: Positive sharp waves.

Table 4. Needle electromyography findings of the right first dorsal interosseous muscle

Time	Insertional activity	Spontaneous activity			Volitional MUAPs			Max volitional activity		
	Insertional	Fibs	+wave	Fasc	Duration	Amplitude	Poly	Recruitment	Activities	Effort
Before op	Normal	2+	2+	None	-	-	-	-	-	-
Five months postop	Normal	1+	1+	None	Normal	Normal	Normal	Normal	Single unit	Max
10 months postop	Normal	3+	3+	Few	1+	Normal	Few	Normal	Severely reduced	Max

Abbreviations: Fasc: Fasciculations; Fibs: Fibrillation; Max: Maximum; MUAPs: Motor unit action potentials; op: Operation; Poly: Polyphasic; postop: Post-operative; +wave: Positive sharp waves.

US include increased comfort for patients and reduced procedure time.⁴ However, a notable disadvantage is its operator dependency; in inexperienced hands, the US may not localize the lesion accurately or identify important anatomical structures.

Magnetic resonance imaging (MRI) is another useful imaging modality, particularly when the cyst is deep, has a more complex structure, or is located in an area not easily visualized by the US. MRI can also detect associated pathologies such as synovial inflammation. MRI findings suggestive of ulnar nerve neuropathy often include a combination of high signal intensity and nerve enlargement. MRI hyperintensity has been reported to have 90% sensitivity and 80% specificity for the diagnosis of ulnar nerve neuropathy. In comparison, the US, by measuring the maximal CSA, has a sensitivity of 93% and a specificity of 68% for diagnosing ulnar nerve neuropathy.⁴ Thus, the use of either or both imaging modalities is considered reasonable.

3.2. Management

CTS due to ganglion cysts is uncommon, with reported incidence ranging from about 4% to 10%.^{5,6} The general approach to such cases typically involves cyst excision, ulnar nerve decompression, and often subcutaneous transposition. As there is a risk of cyst recurrence, subcutaneous transposition helps prevent compression of the anteriorly transposed ulnar nerve. In terms of recovery, the study by Tong *et al.*⁶ reported that 86.4% of

cases experienced improvement by at least one McGowan grade. Similar case reports and studies on CTS secondary to ganglion cysts have shown good recovery after surgical intervention.⁷⁻⁹ Thus, surgical intervention can result in satisfactory surgical outcomes and recovery for patients. However, recovery and improvement may take several months to years. Patients should also be informed of the potential for ganglion cyst recurrence. The post-operative recurrence rate of ganglion cysts varies between 5.6% and 40.7%.¹⁰ However, most of these data are based on wrist ganglion cysts. Factors associated with higher recurrence rates include male sex, lower surgical experience, and the use of an arthroscopic approach.^{11,12} Patients should also be followed up using validated outcome measures such as Patient-Rated Ulnar Nerve Evaluation to monitor their progress.¹³

4. Conclusion

This case highlights the importance of considering a ganglion cyst as a potential cause of ulnar nerve entrapment, even in the absence of obvious clinical or electrophysiological findings. Neuromuscular US is a valuable tool in diagnosing and providing additional information regarding the severity of CTS. Early surgical intervention can lead to favorable outcomes in patients with ulnar nerve compression caused by ganglion cysts.

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Conflict of interest

The authors declare no conflicts of interest.

Author contributions

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Ethics approval and consent to participate

Ethics approval was not required for this paper. Written informed consent was obtained from the patient involved in this case report.

Consent for publication

Patients consented on the publication of their data.

Availability of data

Data used in this work are available from the corresponding author on reasonable request.

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