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Ganglion Cyst: A Culprit for Unilateral Carpal Tunnel Syndrome (Common, Yet Under-Reported)

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Abstract: ***Carpal tunnel syndrome (CTS) is most commonly idiopathic and typically presents bilaterally. When symptoms are unilateral, however, an underlying etiological factor should be considered. Among the various structural causes, ganglion cysts represent the most common tumors of the wrist and are frequently cited as potential contributors to CTS. Despite this, carpal tunnel syndrome secondary to ganglion cysts remains underreported in the literature. Clinically, affected patients usually present with wrist swelling and pain associated with paraesthesia in the median nerve distribution. Physical examination commonly reveals positive Tinel's sign and Phalen's manoeuvre. Electromyography (EMG), although useful for functional assessment, should be supplemented with imaging- preferably ultrasonography or magnetic resonance imaging (MRI)- to confirm the presence and location of space-occupying lesions prior to surgical intervention. While endoscopic carpal tunnel release has gained popularity, it provides limited visualization of the carpal tunnel and is therefore not ideal when a mass lesion is suspected. Open carpal tunnel release with simultaneous excision of the ganglion cyst remains the gold standard, offering excellent functional recovery and long-term prognosis. We report the case of a 52-year-old woman with unilateral carpal tunnel syndrome caused by a ganglion cyst, emphasizing the characteristic clinical presentation, the diagnostic value of imaging in unilateral CTS, and the benefits of early identification and appropriate surgical management.***

Keywords: Carpal tunnel syndrome, ganglion cyst, wrist, hand surgery, Plastic surgery

1. Introduction

The carpal tunnel is a rigid, narrow osteo-fibrous canal located on the volar aspect of the wrist. It is bounded dorsally by the concave arrangement of the carpal bones and by the transverse carpal ligament (flexor retinaculum) on the volar aspect. The tunnel contains the median nerve along with nine flexor tendons: four tendons of the flexor digitorum profundus, four tendons of the flexor digitorum superficialis, and the tendon of the flexor pollicis longus.

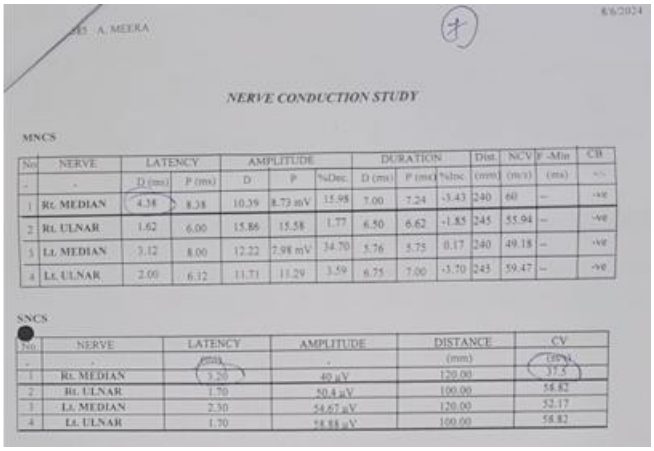
Any condition that increases pressure within the carpal tunnel can result in compression of the median nerve and subsequent development of carpal tunnel syndrome (CTS). Because CTS often presents bilaterally, the presence of unilateral symptoms should raise suspicion for an underlying secondary cause. Space-occupying lesions are well-recognized etiologic factors, and their incidence is significantly higher in unilateral CTS compared with bilateral cases. A secondary etiology should be strongly considered in patients with unilateral CTS—particularly when symptoms have been long-standing and when neurophysiological studies demonstrate marked impairment in the affected hand while the contralateral side remains normal.

In such cases, imaging studies play an essential role and should be pursued when idiopathic CTS is unlikely. Modalities such as ultrasonography or magnetic resonance imaging (MRI) can identify structural lesions responsible for compression.

2. Case Report

We report here the case of a 52 year old female patient who presented at the Plastic Surgery OPD with complaints of numbness, loss of strength of right hand with swelling and pain at the volar aspect of right forearm near wrist since past 3 months. On examination, there was a cystic swelling of size approximately 5cm x 2cm x 1cm located on the volar aspect of right forearm around the wrist crease. The swelling was non-tender, soft, fluctuant, non-pulsatile and was relatively mobile horizontally but fixed vertically. Phalen's test and Tinel's sign were positive.

Nerve-conduction studies of the median nerve revealed a distal sensory latency (DSL) of 3.2 ms, a distal motor latency (DML) of 4.38 ms, a sensory nerve-conduction velocity (SNCV) of 37.5 m/s, and a motor nerve amplitude (MA) of 8.73 mV in the right side. Pathological needle electromyography (EMG) findings were also present. The left hand was neurophysiologically intact.



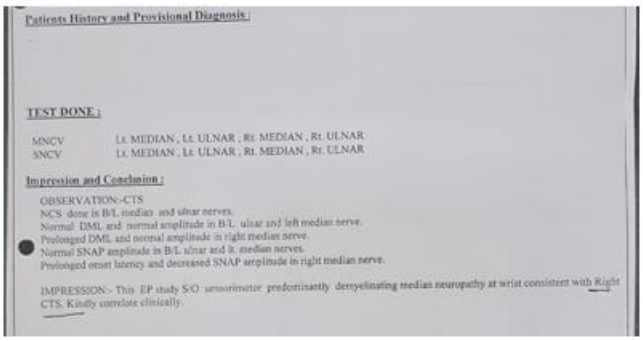
NERVE CONDUCTION STUDY

MNCS

No	NERVE	LATENCY D (ms)	LATENCY P (ms)	AMPLITUDE D	AMPLITUDE P	AMPLITUDE %Dec.	DURATION D (ms)	DURATION P (ms)	DURATION %Dec.	Dist. (cm)	NCV (m/s)	F -Min (ms)	CB
1	Rt. MEDIAN	4.38	8.38	10.39	8.73 mV	15.95	7.00	7.24	-3.43	240	60	--	-ve
2	Rt. ULNAR	1.62	6.00	15.86	15.58	1.77	6.50	6.62	-1.85	245	55.94	--	-ve
3	Lt. MEDIAN	3.12	8.00	12.22	7.98 mV	34.70	5.76	5.75	0.17	240	49.18	--	-ve
4	Lt. ULNAR	2.00	6.12	11.71	11.29	3.59	6.75	7.00	-3.70	245	59.47	--	-ve

SNCS

No	NERVE	LATENCY (mm)	AMPLITUDE	DISTANCE (mm)	CV (m/s)
1	Rt. MEDIAN	3.20	49 µV	120.00	37.5
2	Rt. ULNAR	1.70	50.4 µV	100.00	58.82
3	Lt. MEDIAN	2.30	54.67 µV	120.00	52.17
4	Lt. ULNAR	1.70	58.88 µV	100.00	58.82



Patients History and Provisional Diagnosis :

TEST DONE :

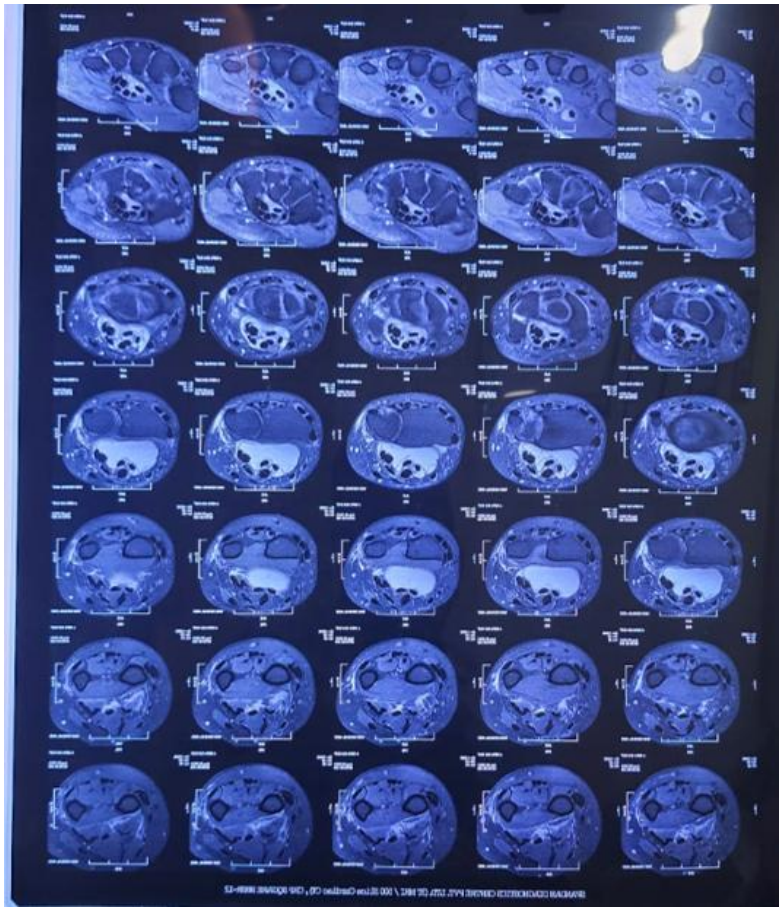
MNCV Lt. MEDIAN , Lt. ULNAR , Rt. MEDIAN , Rt. ULNAR
SNCV Lt. MEDIAN , Lt. ULNAR , Rt. MEDIAN , Rt. ULNAR

Impression and Conclusion :

OBSERVATION:-CTS
NCS done in B/L median and ulnar nerves.
Normal DML and normal amplitude in B/L ulnar and left median nerve.
Prolonged DML and normal amplitude in right median nerve.
Normal SNAP amplitude in B/L ulnar and R. median nerves.
Prolonged onset latency and decreased SNAP amplitude in right median nerve.

IMPRESSION:- This EP study S/O sensorimotor predominantly demyelinating median neuropathy at wrist consistent with Right CTS. Kindly correlate clinically.

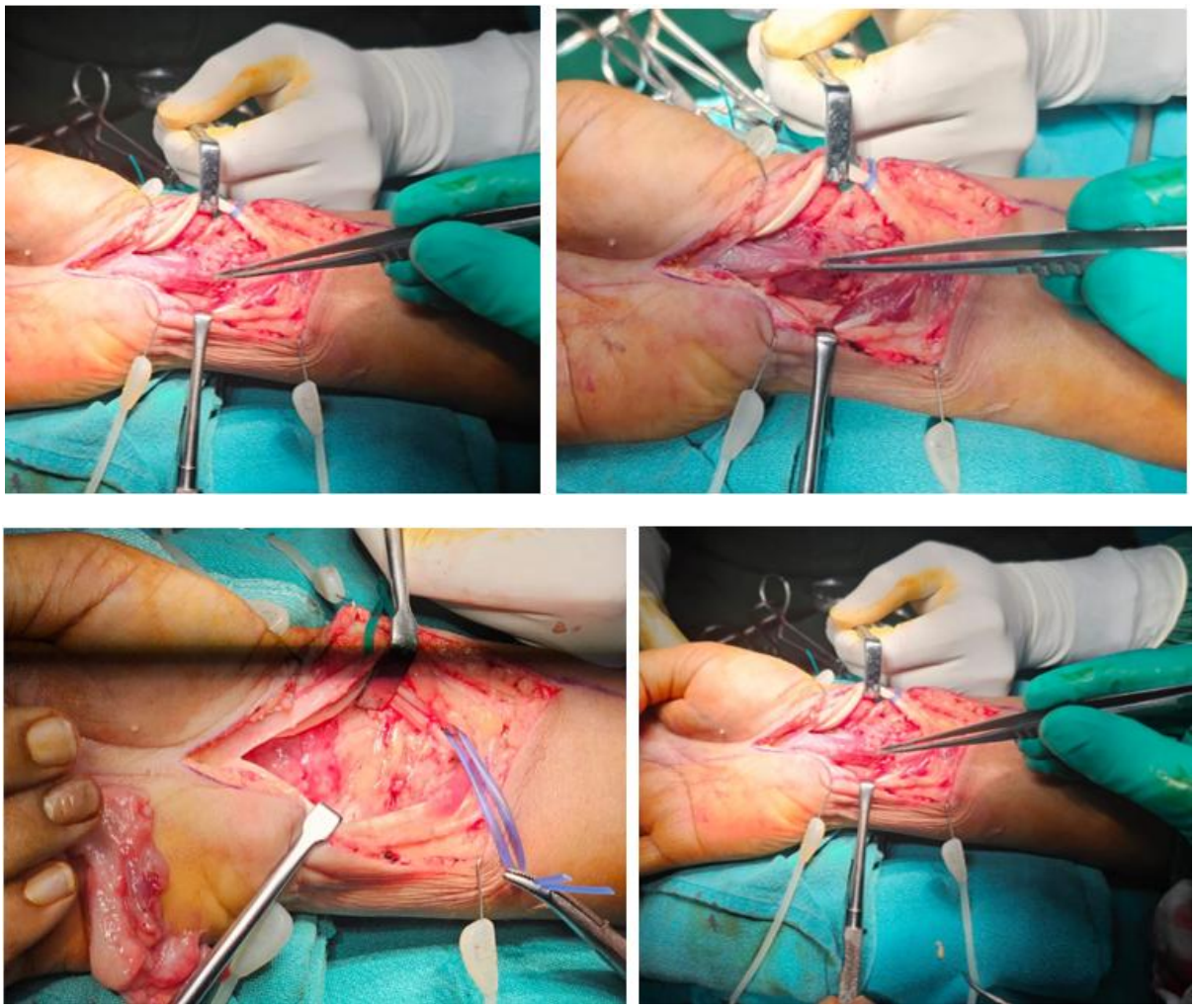
Both clinical symptoms and signs and the neurophysiological tests showed severe CTS in one hand while the contralateral hand was completely healthy, implying a secondary disease. No external signs or palpable masses were present.



MRI of right forearm with right hand showed a 50 × 20 × 10 mm cystic space-occupying lesion with well-defined margins resembling a ganglion, in carpal tunnel and compressing the flexor tendons. MRI also showed flattening

of the median nerve at the hamate level, palmar bowing of the flexor retinaculum, and increased signal intensity of the median nerve.

Open carpal tunnel release and mass excision were performed through a palmar incision.



Histological examination revealed thin connective tissue capsule made up of compressed collagen fibres lined with flattened cells without a synovial or epithelial lining, consistent with a ganglion.

The patient reported relief of all symptoms postoperatively, and no recurrence had occurred at 1-year follow-up.

3. Discussion

Although CTS is usually idiopathic, a certain etiology can be detected in some patients. Space-occupying lesions, tenosynovitis, gouty tophus, vascular anomalies, or malunited distal radial fractures may lead to CTS.

Although imaging studies for the diagnosis of CTS are becoming increasingly popular, most surgeons condemn these expensive studies as unnecessary. However, some authors report that ultrasound is an accurate and useful diagnostic tool in patients with CTS, with a sensitivity of 99% and specificity of 100%, that can be used as the initial diagnostic test in patients presenting with clinical symptoms of CTS, because it is equivalent to neurophysiological studies and provides additional valuable anatomical information [**6**].

We prefer using neurophysiological tests instead of imaging studies for the diagnosis of CTS when a diagnostic tool is necessary. However, imaging provides additional information compared with that obtained from clinical tests and neurophysiological studies; by allowing direct visualization of the compressed median nerve and the carpal tunnel content, imaging studies can reveal the causes of secondary CTS, depicting structural abnormalities. In the current patients, MRI showed space-occupying lesions as well as flattening of the median nerve at the hamate level, palmar bowing of the flexor retinaculum, and increased signal intensity of the median nerve, all of which are typical MRI findings of CTS. MRI also revealed a high signal intensity pattern in thenar muscles consistent with acute denervation in Case 2.

CTS presents bilaterally in 59% to 87% of patients, and approximately half of patients with unilateral symptoms were reported to have positive neurophysiological test results in the asymptomatic, contralateral hand. Follow-up of these patients with unilateral symptoms but bilateral neurophysiological impairment showed that contralateral symptoms developed in most cases and it is assumed that in some cases bilaterality may be time dependent. Hence, a patient with longstanding unilateral symptoms with severe neurophysiologic impairment and no neurophysiologic findings in the

contralateral hand should alert the physician about the probable secondary nature of the disorder. The incidence of space-occupying lesions in unilateral CTS is also higher than that of bilateral CTS. Nakamichi and Tachibana reported an increased incidence of space-occupying lesions in unilateral versus bilateral CTS and concluded that a space-occupying lesion should be suspected when the condition is unilateral and the etiology is unclear. The reported patient was evaluated in this regard and MRI studies revealed an intratunnel lesion compressing the median nerve and the flexor tendons.

Although ganglia are common soft tissue tumors in the wrist, compression of peripheral nerves by ganglia is unusual and only a few cases have been reported in the literature. Space occupying lesions in the carpal tunnel can be missed and symptoms may not improve after carpal tunnel release. If a space-occupying lesion is detected, MRI can also delineate the relationship between the lesion and adjacent structures allowing the surgeon to plan the operation.

4. Conclusion

Unilateral CTS should prompt evaluation for secondary causes, particularly when symptoms are longstanding and neuro-physiologically severe. Imaging studies such as MRI and ultrasonography are valuable in detecting space-occupying lesions, especially ganglion cysts, which may be easily overlooked. Open carpal tunnel release with excision of the lesion remains the treatment of choice and provides excellent outcomes.

Conflicts of Interests
None.

Funding
None.

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