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BMH Med. J. 2017;4(4):134-138 **Case Report**

Carpal Tunnel Syndrome - An Unusual Entrapment Neuropathy With Hypertensive Microvascular Insufficiency

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Abstract

This case report envisages the significance of reviewing the age old carpal tunnel syndrome. A 48 year old male, manual laborer with no significant past history presented with complaints of numbness of both hands and bilateral pedal edema of two years and 2 months duration respectively. On examination he was found to have high blood pressure, parasthesia of both hands, and finger grip of lesser strength on right compared to left. His routine investigations and thyroid function test were normal. Nerve conduction study revealed distal latency in bilateral median nerve and the patient was diagnosed as a case of carpal tunnel syndrome. On evaluating the response with medical management, the sequence of recovery proved that involvement of ulnar territory was an add-on to carpal tunnel syndrome proper and systemic hypertension supplements to its severity. The varying grades of severity and role of systemic hypertension can be a focus of study in carpal tunnel syndrome.

Keywords: Carpal tunnel syndrome, ulnar nerve involvement, systemic hypertension, nerve conduction study, intraductal pressure

Introduction

Carpal tunnel syndrome CTS is a syndrome that causes pain and weakness in the hand and wrist due to compression of median nerve inside the carpal tunnel. Almost 90% of entrapment neuropathies are due to CTS [1,2]. The incidence and prevalence are 0.125% - 1% and 5 - 16% respectively [1]. The exact cause and pathogenesis is unclear and hence it is related to numerous risk factors like size of the tunnel, pregnancy, occupations involving exposure to high pressure, high force, repetitive work, and vibrating tools and systemic co-morbidities like thyroid dysfunction, diabetes mellitus, and rheumatoid arthritis. Clinical presentation shows varying presentation like involvement of all the digits and associated weakness of forearm and is attributed to anomalies of median nerve, ulnar nerve entrapment in Guyon's canal and cubital tunnel syndrome [3]. Almost 9% of CTS has associated ulnar involvement [4]. The patient with mild symptoms of CTS can be managed with conservative treatment, particularly local injection of steroids, pyridoxine or diuretics [1, 3]. However, in moderate to severe cases, surgery is the best treatment that provides cure [1, 3]. The basic principle of surgery is to expand the volume of the carpal tunnel by dividing transverse carpal ligament (TCL) to release the pressure on the median nerve [1]. This case report emphasizes the

significance of ulnar nerve involvement in CTS as rather a sign of increased severity than a mere association and the lack of well-structured algorithm in classifying the disease and its management based on its severity. This article also suggests a probability of systemic hypertension as an aggravating factor which has not been discussed in prior literature.

Case Report

A 48 year old male manual laborer with little significant past history presented with complaints of numbness of palmar aspect of both hands of around two years duration. Complaint was more on the right compared to left. The numbness increased after mobile overuse, and during his work time. Over the due course the symptoms followed a progressive fashion, and other than that there were no associated features. He also complained of bilateral pedal edema noted since two months which was more towards evening. There was no history of any other sensory or motor weakness, headache, visual disturbance, loss of weight, back pain, bowel or bladder disturbances. On general examination, he was found to be moderately built and moderately nourished and had bilateral pitting pedal edema from around mid leg and downwards. His BP was 180/100mmHg. His system examination were within normal limits except for peripheral nervous system which revealed bilateral parasthesia of palmar aspect of hands and all the digits with decreased finger grip. The parasthesia was more at the tip of third digit (**Figure 1**). The findings were more on right side comparatively. There was no evidence of muscle wasting. Tinel sign and Phalen test were negative. His routine blood and urine examination were within normal limits. In spite of arrays of investigations, there was no evidence of diabetes mellitus rheumatoid arthritis and functioning of thyroid, liver, and kidney. He was started on folic acid, methylcobalamine, gabapentin, losartan and sent for neurological evaluation and kept under follow up during which the symptoms alleviated. Numbness was present only in the lateral three and half digits which was more on the tip of third digit and power of the finger grip had improved bilaterally. NCS was done after one month and revealed prolonged distal latency and low conduction velocity of bilateral median nerve and was hence diagnosed as a case of CTS (**Figures 2** and **3**). One month of medical management had alleviated his symptoms to numbness limited to median nerve territory. Following diagnosis torsemide was added for another one month. On next follow up after one month numbness of lesser severity was noted which was limited to the tip of third digit and his finger grip strength had improved remarkably and his BP was under control (**Figure 4**).

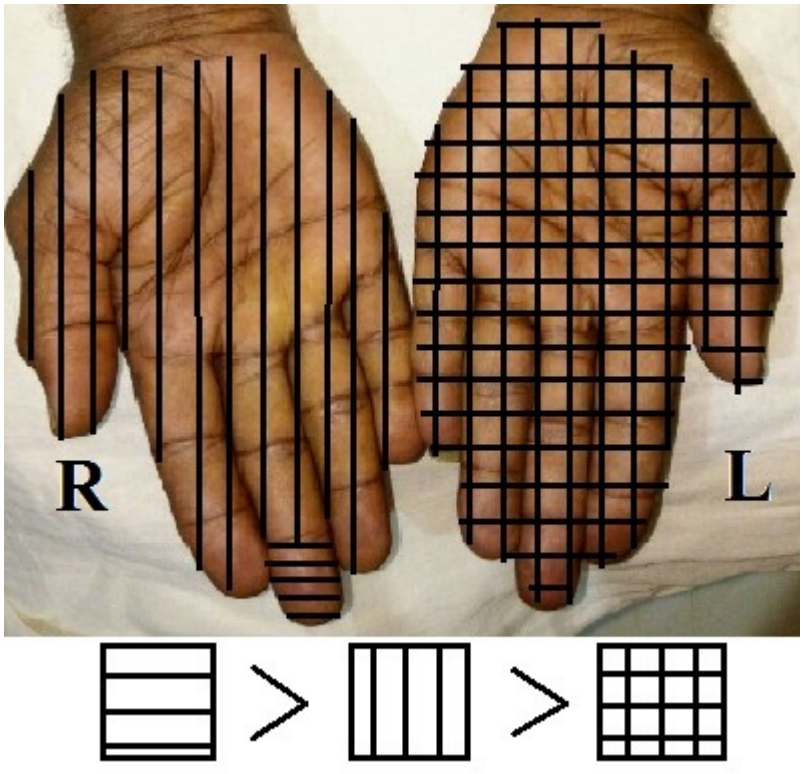
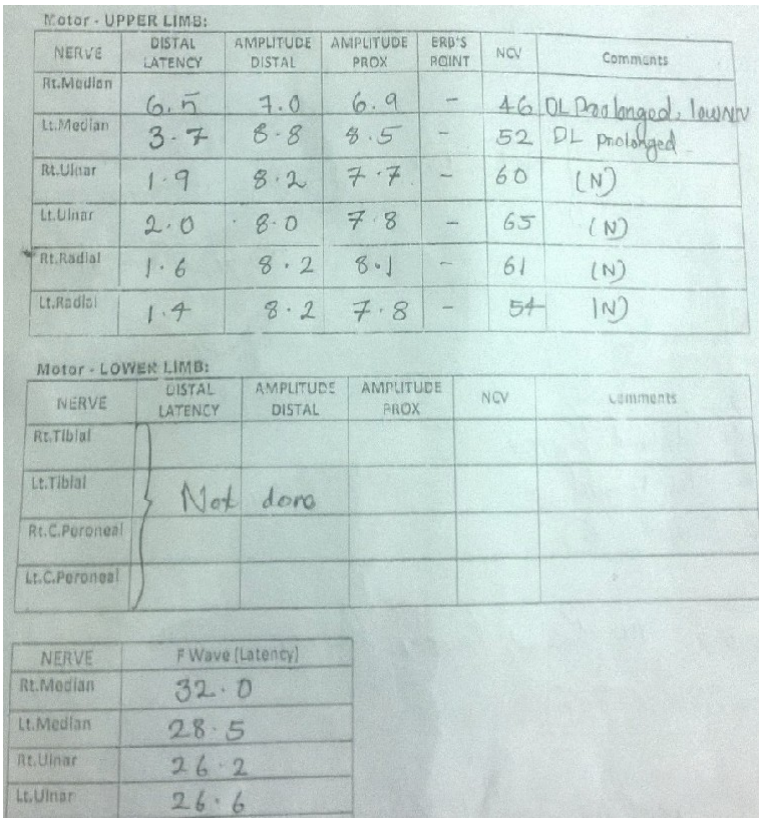


Figure 1: The shaded pattern shows the severity of paraesthesia



Motor - UPPER LIMB:

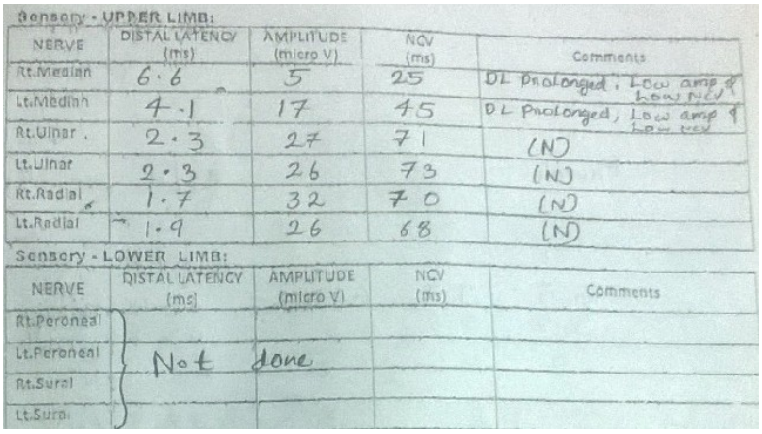
NERVE	DISTAL LATENCY	AMPLITUDE DISTAL	AMPLITUDE PROX	ERB'S POINT	NCV	Comments
Rt.Median	6.5	7.0	6.9	-	46	DL Prolonged, low NCV
Lt.Median	3.7	8.8	8.5	-	52	DL Prolonged
Rt.Ulnar	1.9	8.2	7.7	-	60	(N)
Lt.Ulnar	2.0	8.0	7.8	-	65	(N)
Rt.Radial	1.6	8.2	8.1	-	61	(N)
Lt.Radial	1.4	8.2	7.8	-	54	(N)

Motor - LOWER LIMB:

NERVE	DISTAL LATENCY	AMPLITUDE DISTAL	AMPLITUDE PROX	NCV	Comments
Rt.Tibial	Not done				
Lt.Tibial					
Rt.C.Peroneal					
Lt.C.Peroneal					

NERVE	F Wave (Latency)
Rt.Median	32.0
Lt.Median	28.5
Rt.Ulnar	26.2
Lt.Ulnar	26.6

Figure 2: Nerve conduction study (Motor)



Sensory - UPPER LIMB:

NERVE	DISTAL LATENCY (ms)	AMPLITUDE (micro V)	NCV (ms)	Comments
Rt.Median	6.6	5	25	DL Prolonged, Low amp & low NCV
Lt.Median	4.1	17	45	DL Prolonged, Low amp & low NCV
Rt.Ulnar	2.3	27	71	(N)
Lt.Ulnar	2.3	26	73	(N)
Rt.Radial	1.7	32	70	(N)
Lt.Radial	1.9	26	68	(N)

Sensory - LOWER LIMB:

NERVE	DISTAL LATENCY (ms)	AMPLITUDE (micro V)	NCV (ms)	Comments
Rt.Peroneal	Not done			
Lt.Peroneal				
Rt.Sural				
Lt.Sural				

Figure 3: Nerve conduction study (Sensory)

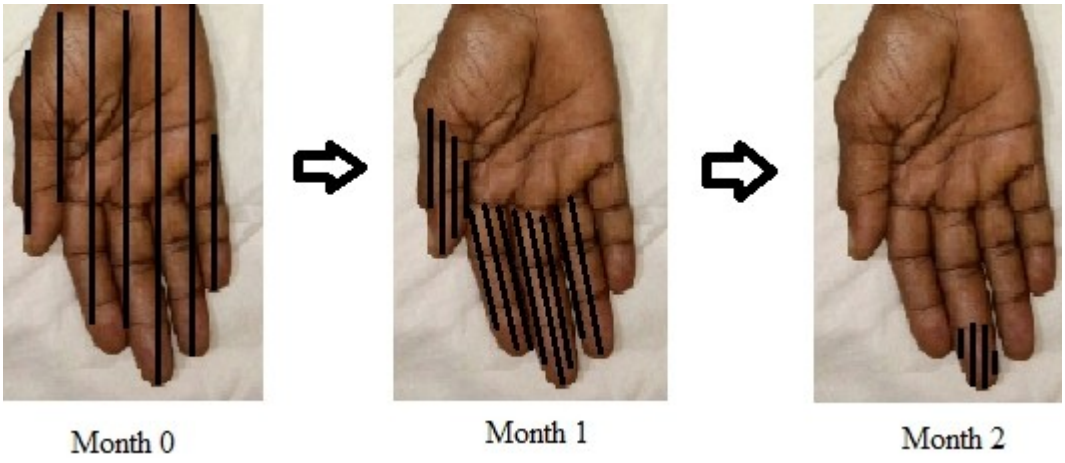


Figure 4: Progressive reduction in the area of paraesthesia with treatment

Discussion

CTS typically affect the thumb, index, and middle fingers, but in this case it involved the UN territory. Moreover, the sequential improvement of the symptoms, from involvement of whole of the palm to the tip of the third digit over a two month medical management was the peculiarity noted in this case. CTS is usually diagnosed based on the complaints of the individual combined with physical tests and often electrical tests like NCS. The uniqueness in this case can be analyzed and discussed as follows.

Understanding the anatomy of the TCL helps to correlate the UN involvement in this case. The TCL is a rectangular-shaped fibrous band in the ventral aspect of the wrist. On the lateral aspect, it attaches to the scaphoid tubercle and the ridge of the trapezium. Medially, it attaches to the pisiform and the hook of the hamate. It forms the roof of the Carpal tunnel. The medial aspect of the TCL forms the floor of Guyon's canal. Proximally it is attached to deep fascia of the forearm and to palmar aponeurosis distally. Anatomical relations include contents of the Carpal tunnel in the inferior aspect, and ulnar artery and nerve (in Guyon's canal), palmar cutaneous branch of the median and ulnar nerves, palmaris longus tendon, superficial palmar branch of the radial artery superiorly [2]. In 2016, Sakly G et al conducted an electroclinical study to understand the impact of CTS on ulnar nerve, where they mentioned the contiguity of both carpal tunnel and Guyon's canal. Indeed they suggested the probability of ulnar nerve involvement to the fact that, TCL share a common boundary between carpal tunnel and Guyon's canal. In brief the TCL forms the roof as well as the floor of Carpal tunnel and Guyon's canal respectively. Perhaps as in this case, the gradual rise in pressure inside Carpal tunnel and its impact on ulnar nerve and palmar cutaneous branch of the median and ulnar nerves is implicated in the anatomical relations of TCL, carpal tunnel and Guyon's canal [5].

Aroori Somaiah and Roy J Spence in the year 2008 discussed the pathophysiology of CTS by explaining the mechanical compression, micro-vascular insufficiency, and vibration theories. To understand the supplementing effect of systemic hypertension the micro-vascular insufficiency theory has to be analyzed. It proposes that the lack of blood supply leads to depletion of oxygen and nutrients to the nerve causing it to slowly lose its ability to transmit nerve impulses. Fibrous tissue and scar eventually develop within the nerve [1]. The congruity between the severity of symptoms and control of systemic hypertension as described in this case well supports the theory of micro-vascular insufficiency. Seiler et al in the year 1989, showed (by laser Doppler flowmetry) how normal pulsatile blood flow within the median nerve was restored within 1 min of transverse carpal ligament release. The authors concluded that ischemia probably plays a significant role in the etiology of CTS. A number of experimental studies support the theory of ischemia due to external compression and due to increased pressure inside the carpal tunnel. The development of ischemia and therefore, symptoms will vary according to the systolic blood pressure and the integrity of the blood supply of the nerve [6]. In healthy individuals, the intraductal pressure is about 3-5 mm Hg in the neutral position of wrist. MN blood flow was found to be impaired when the carpal tunnel (CT) pressure reached or exceeded 20-30 mm Hg. Common functional positions of the wrist, e.g., flexion, extension or even using a computer mouse, might result in the rise of tunnel pressures to levels high enough to impair MN blood flow. For example, placing the hand on a computer mouse increase the CT pressure to 16-21 mm Hg, whereas using the mouse to point and click increased the CT pressure up to 28 to 33 mm Hg. Interestingly, CT pressure was shown to be around 63 mm Hg with 40 degrees of wrist extension and 0 degrees of metacarpophalangeal flexion [2].

Treatment of CTS can be classified as medical and surgical. Medical treatment, also referred to as conservative treatment, include a wide range of options such as splinting, cortical steroid injections, non-steroidal anti-inflammatory drugs, B6 vitamin, diuretics, ultrasound therapy, ergonomic positioning, manual therapy intervention, lidocaine patches and acupuncture. Surgical treatments include standard open carpal tunnel release, endoscopic carpal tunnel release, open carpal tunnel release combined with procedures and open carpal tunnel release using various incision techniques.

Treatment decisions on carpal tunnel syndrome are based on the severity of the symptoms. Medical treatments are recommended for patients with mild symptoms of CTS. Patients with moderate to severe symptoms are recommended for surgical intervention [2, 5].

Conclusion

Even though there are numerous literatures and literature reviews regarding CTS and its etiological factors the studies and methodologies itself has stated its limitations regarding electro diagnostic criteria for diagnosis and variability in epidemiological factors like race, sex, age, BMI etc among the study. Few of the studies have related the significance of TCL sharing its anatomy with both carpal tunnel and Guyon's canal. Aberrant course and branches of the nerve can also be attributed to peculiar area of involvement. The micro vascular insufficiency theory gains importance in this case and implicit the role of systemic hypertension as an aggravating factor. Sequential improvement of the symptom is a telltale evidence of the same. For perfect management of a disease, it has to defined and classified according to its severity. Adding the intraductal pressure to the definition and classifying the CTS based on clinical feature, NCS and intraductal pressure would help the clinicians to choose appropriate timely management measures and thus would reduce the morbidity related to nerve damage.

References

1. Aroori S, Spence RA. Carpal tunnel syndrome. The Ulster Medical Journal. 2008; 77(1):6-17.

2. Ghasemi-rad M, Nosair E, Vegh A, et al. A handy review of carpal tunnel syndrome: From anatomy to diagnosis and treatment. World Journal of Radiology. 2014; 6(6):284-300.

3. Spinner RJ, Bachman JW, AmadioPC. The many faces of Carpal tunnel syndrome. MayoClin Proc. 1989; 64(7):829-36.

4. Vahdatpour B1, Raissi GR, HollisazMT.Study of the ulnar nerve compromise at the wrist of patients with Carpal tunnel syndrome.ElectromyogrClinNeurophysiol. 2007; 47(3):183-6.

5. Sakly G, Affes Z, Dhia SB, et al. The Impact of Carpal Tunnel Syndrome on Ulnar Nerve: An Electro-Clinical Study. J Neurol Neurosci. 2016, 7:5.

6. Seiler JG, 3rd, Milek MA, Carpenter GK, Swiontkowski MF. Intraoperative assessment of median nerve blood flow during Carpal tunnel release with laser Doppler flowmetry. J Hand Surg [Am] 1989;14(6):986-91.