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Prevalence of Concurrent Disorders of Ulnar Nerve Entrapment at the Elbow and Carpal Tunnel Syndrome Ahvaz Imam Khomeini Hospital During 2009 to 2012

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ABSTRACT

Carpal tunnel syndrome (CTS) is the most well-known and frequent form of median nerve entrapment, and accounts for 90% of all entrapment neuropathies. Entrapment neuropathies of the ulnar nerve are relatively common with ulnar neuropathy at the elbow more prevalent than ulnar neuropathy at the wrist. The diagnosis of ulnar neuropathy at the elbow is usually confirmed in a relatively straight – forward manner by nerve conduction studies. Electrophysiology studies performed on 63 patients with carpal tunnel syndrome that had referred to Golestan hospital, Ahvaz, Iran from 1388-1391 and neuropathies of the ulnar nerve was evaluated in them. Entrapment of the ulnar nerve was seen in 49/2% of patients. This disease was more in men significantly (p=0.001). The mean of motor conduction velocity in both hand was different in ulnar nerve conduction disturbance group importantly (p=0.001). As finding results, Entrapment neuropathies of the ulnar nerve can associate with carpal tunnel syndrome amount. It is better evaluation of the ulnar nerve are performed with carpal tunnel syndrome at the same time to prevent from misdiagnosis and treatment.

Keywords: Carpal tunnel syndrome, Entrapment neuropathie, Electrophysiology studies, Conduction velocity

INTRODUCTION

Carpal tunnel syndrome (CTS) is the best-known and the most prevalent entrapment of the median nerve (1-6) and accounts for more than 90% of all entrapment neuropathies (7). Entrapment neuropathy, or nerve entrapment, is a chronic local neuropathy that occurs due to increased compression of the median nerve located inside the inflexible carpal tunnel (9). CTS is a neuropathy that happens because of entrapment of the median nerve within the carpal tunnel at the level of the wrist and hand by the carpal bones and the transverse carpal ligament 10). Physiological evidence indicate increased compression inside the carpal tunnel because of which the performance level of the median nerve at that level is reduced (1). Ulnar nerve entrapment is relatively prevalent with ulnar neuropathy at the elbow being more common than that at the wrist. Relative and direct diagnosis of ulnar neuropathy is confirmed by nerve

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conduction studies, although localization of ulnar neuropathy at the wrist by nerve conduction studies may be difficult. The usual method for diagnosing ulnar neuropathy at the wrist is to find prolonged distal motor latency relative to the first dorsal interosseous muscle in keeping with the natural sensory response of the ulnar nerve (8). Guyon's canal syndrome is a neuropathy caused by compression at the wrist that can cause motor, sensory, motor-sensory problems depending on the location of the entrapment along the canal (11). The most common factor causing the compression of the ulnar nerve at the wrist is a ganglion. However, other conditions such as abnormal muscular-tendonal curve, lipoma, ulnar artery diseases, hamate fracture, direct blow to the hand on the ulnar side, and prolonged hyperextension of the wrist and work-related traumas may cause compression of the ulnar nerve at the wrist (12, 13, 14, and 15). Given the high prevalence of carpal tunnel syndrome, and since its concurrence with ulnar nerve entrapment (and failure in its timely and correct diagnosis) can cause the continuation or the recurrence of symptoms after the treatment of carpal tunnel syndrome, this study was conducted to find the frequency of ulnar nerve entrapment in patients exhibiting CTS.

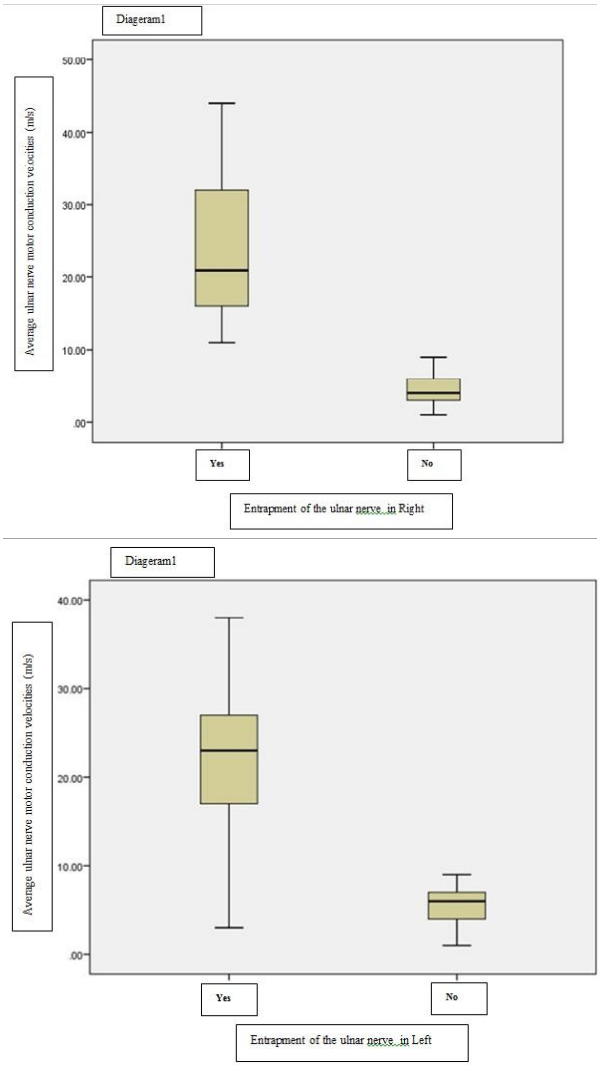
MATERIALS AND METHODS

After obtaining permission from the Student Research Committee of Ahvaz Medical Sciences University, a descriptive-analytic study was conducted from the first month of fall of 2009 until the first month of fall of 2012 on all patients who visited the infirmary of the Ahvaz Imam Khomeini Hospital because of pain, heaviness, tingling, and numbness in their fingers. Our purposes were to determine the presence of carpal tunnel syndrome and investigate its concurrence with ulnar nerve entrapment at the elbow through electrodiagnostic evaluation. All these patients were examined to see if they suffered from muscular pain inside or outside of the elbow (tennis elbow, golfer's elbow) and from muscular pains in the upper shoulder and in the trapezius muscle (supraspinatus, trapezius). Demographic information regarding the patients together with other clinical information was recorded in the questionnaire. Electrodiagnostic studies were conducted using a Toenies model electromyography machine at the room temperature of 26 degrees centigrade. The following three methods, suggested by the Demetrios Group, were used to determine ulnar nerve entrapment at the elbow: 1) Sensory nerve conduction velocity was measured in a 10-centimeter piece from the top to the bottom of the elbow. If this velocity were less than 50 meters per second and less than those of a lower or an upper part of the nerve, it would be considered as abnormal. In this method, the velocity on the skin of the fifth digit of the hand was recorded and the start of the sensory conduction was the basis for measuring sensory latency. Speeds of less than 50 meters per second were assumed abnormal. 2) Motor nerve conduction velocity was also measured in a 10-centimeter piece of the elbow in a way that the recording site was on the muscle surrounding the little finger and the start of the motor conduction was the basis for measuring motor effects. Speeds of less than 40 meters per second were considered abnormal. 3) Five centimeters above and five centimeters below the epicondyle area on the inside of the elbow at one- centimeter intervals were stimulated and the responses of the muscle surrounding the little finger were measured. Any latency longer than o.4 thousandth of a second in these one-centimeter intervals was considered abnormal. Supramaximal stimulation was used in all of the above methods, and if ulnar nerve sensory conduction velocity at the forearm was normal and the disease was at variance with one of the above methods, entrapment of the ulnar nerve would be recorded. Finally, the findings of this research were analyzed using the SPSS software.

RESULTS

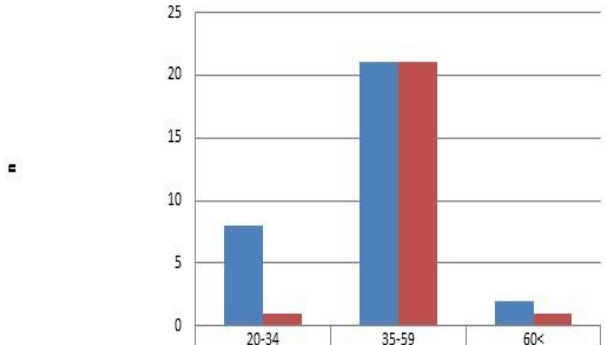
In this descriptive-analytic study, 63 patients suffering from carpal tunnel syndrome were studied to see if they were concurrently afflicted with ulnar nerve entrapment. Thirty-four point nine percent of the patients were men and 65.1 percent women. In 49.2% of the patients, concurrent ulnar nerve entrapment and carpal tunnel syndrome was observed. Average ulnar nerve motor conduction velocities on the right hand in the case and control groups were 23.92 and 4.52 m/s, respectively, which was a significant difference (p=0.01). On the left hand too, the average motor ulnar nerve conduction velocities in the case

and control groups were 21.75 and 5.38 m/s, respectively, which indicated a significant difference(p=0.01) (Diagrams 1,2).

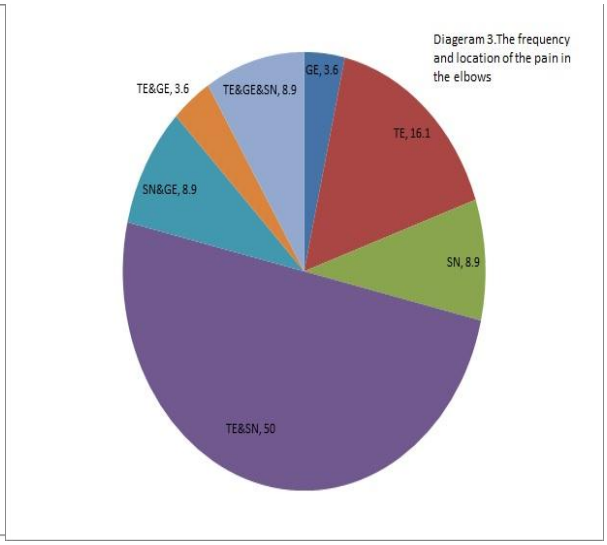


Ulnar nerve entrapment was significantly more common in men compared to women (p=0.001). 84.1% of the patients were right-handed and 15.9% left-handed. 23.8% of the patients had right hand ulnar nerve entrapment, 19% left hand ulnar nerve entrapment, and 57.1% ulnar nerve entrapment on both hands. The dominant hand and the hand with ulnar nerve entrapment were not significantly correlated (p=0.77). In manual occupations where there was greater probability of excessive bending of the elbows, the probability of ulnar nerve entrapment in patients afflicted with carpal tunnel syndrome would significantly increase (p=0.001). Nineteen percent of the patients had hazardous occupations and 81 percent and non-hazardous ones. There was no significant correlation between the duration of carpal tunnel syndrome and ulnar nerve entrapment (p=0.065). All patients were over 20 years old. They were divided into the three age groups of 20-34, 35-59, and 60 or older. No significant differences were observed between these age groups (p=0.76) (Table 1). There were no significant correlations between gender and pain around the arms (p=009). The correlation between ulnar nerve entrapment and pain around the elbows was significant in women (p=0.04), but not in men (p=0.71). However, in general, there were no significant correlations between ulnar nerve entrapment and pain around the elbows (p=0.07) (Diageram 3).

Table1. Entrapment of the ulnar nerve in patients with carpal tunnel syndrome



	20-34	35-59	60<
Entrapment of the ulnar	8	21	2
Non-Entrapment of the ulnar	1	21	1



DISCUSSION

All patients exhibited clinical CTS manifestations and in all of them electrophysiological disturbances were compatible with the related diagnoses. Mondelli et al. (2005) conducted a retrospective study on the appearance of ulnar neuropathy at the elbow in Sienna in Italy. They used the statistics of the years 1995 to 1999 (311 cases, 112 women, and 100 men, with the average age of 56 years). Gender-specific appearances were 32.7 percent for men and 17.2 percent for women, and in residents of the outskirts of the city who mostly had manual occupations the rate of UNE was higher compared to residents of other areas (16). In 2009, Rayegani et al. carried out a study on the prevalence of carpal tunnel syndrome and related factors in patients suffering from pain in upper body organs in 1000 patients and stated that 25% of these patients exhibited carpal tunnel syndrome, with 1.6% being afflicted with ulnar nerve entrapment. Of course, they studied ulnar nerve entrapment at the wrist, and this difference was not statistically significant. However, results of the study conducted by us indicated that there was a significant correlation between carpal tunnel syndrome and ulnar nerve entrapment (17). In our study, 34.9% of the patients were men and 65.1% women. Ulnar nerve entrapment was significantly more common in men compared to women (p=0.001). Moreover, in patients who had manual occupations where there was a high probability of excessive bending of the elbows, chances of ulnar nerve entrapment were significantly higher (p=0.001). Nineteen percent of patients had manual occupations and 81% low-risk ones. Our results were similar to the study mentioned above. Buchthal and Rosenfalck (18) found that motor nerve conduction declined while sensory nerve conduction was not affected above the wrist. It is not clear why motor nerve conduction of the median nerve above the wrist declines. In 1960, Thomas suggested that selective degradation of large-diameter fibers, or a reduction in the diameters of all fibers above the wrist, might be the reason for this decline (19). Gilliatt, Fullerton, Anderson, and Hern (20) showed that, in guinea pigs, the reduction in fiber diameter in the surface under pressure was a very important factor, at least in severe and chronic damages. In another study, conducted on 234 patients with CTS, it was shown that there was a significant correlation between ulnar nerve sensory action potential amplitudes and median nerve motor conduction velocity. Abnormal ulnar nerve sensory action potential was observed in 39.3% of the patients. There was a correlation between the ulnar nerve sensory action potential amplitudes, the median nerve sensory action potential amplitudes, and the median nerve motor

conductance velocity in the forearm (21). In our study, 49.2% of patients with CTS suffered from ulnar nerve entrapment (which is higher than the corresponding percentage in the above-mentioned study) (22). Kemble, Buchthal, and Rosenfalck (18) stated that the ulnar nerve sensory conductance in their patients was normal. In another study that they conducted, the ulnar nerve motor conduction velocity was not determined in any of the patients. However, in more than half of their patients with abnormal ulnar nerve sensory action potential who took part in motor conduction studies, damages in the elbow were observed. Loong and Seah conducted a study amd showed that the ratio of the median nerve sensory action potential to that of the ulnar nerve may help in CTS diagnosis (23). We could not find a clear reason for the high prevalence of damaged ulnar nerve in our study. Some researchers have stated that a number of patients may have a subclinical background neuropathy that makes them susceptible to ulnar nerve entrapment (24). Some people have a genetic predisposition to palsies caused by pressure on peripheral nerves(25).

CONCLUSION

As a finding results, Entrapment neuropathies of the ulnar nerve can associate with carpal tunnel syndrome amount. It is better evaluation of the ulnar nerve are performed with carpal tunnel syndrome at the same time to prevent from misdiagnosis and treatment.

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