CASE REPORT

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BILATERAL HYPERMOBILITY OF ULNAR NERVES AT THE ELBOW JOINT WITH UNILATERAL LEFT ULNAR NEUROPATHY IN A COMPUTER USER: A CASE STUDY

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Abstract
Occupational ulnar neuropathy at the elbow joint develops in the course of long term direct pressure on the nerve and a persistently flexed elbow posture, but first of all, it is strongly associated with "holding a tool in a certain position" repetitively. Therefore, computer work only in exceptional cases can be considered as a risk factor for the neuropathy. Ulnar hypermobility at the elbow might be one of the risk factors in the development of occupational ulnar neuropathy; however, this issue still remains disputable. As this condition is mostly of congenital origin, an additional factor, such as a direct acute or chronic professional or non-professional trauma, is needed for clinical manifestations. We describe a patient – a computer user with a right ulnar nerve complete dislocation and left ulnar nerve hypermobility, unaware of her anomaly until symptoms of left ulnar neuropathy occurred in the course of job exposure. The patient was exposed to repetitive long lasting pressure of the left elbow and forearm on the hard support on the cupboard and desk because of a non-ergonomically designed workplace. The additional coexistent congenital abnormal displacement of the ulnar nerve from the postcondylar groove during flexion at the elbow increased the possibility of its mechanical injury. We recognized left ulnar neuropathy at the ulnar groove as an occupational disease. An early and accurate diagnosis of any form of hypermobility of ulnar nerve, informing patients about it, prevention of an ulnar nerve injury as well as compliance with ergonomic rules are essential to avoid development of occupational and non-occupational neuropathy.

Key words:
Ulnar nerve, Ulnar nerve compression, Ulnar neuropathies, Hypermobility, Neuropathy, Computer

INTRODUCTION

Ulnar nerve is prone to injuries due to its anatomical topography, especially at the elbow, where it passes behind the medial epicondyle to the groove between olecranon and the medial epicondyle of the humerus. The so-called ulnar groove is located just behind the medial epicondyle of the humerus, at the entrance to the cubital tunnel – the next site of the possible ulnar nerve injury.

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Ulnar neuropathy at the elbow is the second most common upper extremity neuropathy, which most frequently occurs in the ulnar groove, as a result of acute or chronic external pressure. Compression at this site can be also caused by lesions within the groove and conditions that predispose the nerve to be displaced from the groove.

A condition when ulnar nerve shifts out of the epicondylar groove with elbow flexion and returns to its normal position with elbow extension has several names in medical literature: instability, hypermobility, recurrent luxation/subluxation "habitual," "congenital" or "idiopathic" dislocation of the ulnar nerve [1–5]. Dislocation (total/complete subluxation) refers to the nerve coming completely out of the groove during flexion of the elbow, whereas subluxation (or partial subluxation) refers to a condition when the nerve stops on the top of the medial epicondyle.

Relationship between ulnar nerve subluxation and ulnar neuropathy is still disputable [6].

Recently, van der Berg et al. [7] have not found a correlation between subluxation of the ulnar nerve and the incidence of ulnar neuropathy at the elbow.

However, some authors suggest that the chronic subluxation and relocation of the ulnar nerve from its groove with flexion and extension of the elbow results in a tractional and frictional neuritis. Hypermobile nerves are also at risk of compression, when the elbow is flexed by external forces [1,3,4,8,9].

The concept of the predisposed vulnerability of the ulnar nerve to trauma in its subluxed position, when it lies superficially on the medial humeral epicondyle, seems to be less controversial [1,8,10].

We report a case of a complete right ulnar dislocation and left ulnar instability/hypermobility in a female computer user who had not been aware of her anomaly until symptoms of left ulnar neuropathy occurred in the course of job exposure in a non-ergonomically designed workplace.

CASE PRESENTATION

A patient – a 34-year-old, right-handed slim (body mass index (BMI): 20.31 kg/m^2) woman – was referred to the Department of Occupational Diseases and Toxicology with a suspicion of occupational ulnar neuropathy at the elbow. By profession, she had been a computer user for 10 years (typing average 7 h a day). She had been symptomatic for 3 years before her admittance to our department. At the beginning, she experienced paresthesies of the 4th and 5th fingers, when placing her flexed left elbow on a desk and trying to type. Then, a strong pain of the left elbow during manual activities, and a weakened grip of the left hand occurred. There was no history of trauma to the elbows. She denied any other diseases.

The elbow X-ray examination was normal. Electroneurography results were positive for left ulnar neuropathy at the elbow. Electrodiagnostic tests performed in the right ulnar nerve were normal. The dynamic sonography showed instability and hypermobility of the left ulnar nerve above the medial humeral epicondyle. She was diagnosed with ulnar neuropathy at the elbow. She had undergone rehabilitation treatment, but after 7–8 months the symptoms became more severe. The patient was operated on. After anterior submuscular transposition of the left ulnar nerve, the patient felt improvement, relief of pain and paresthesia. Additionally, during history taking, the patient reported paresthesia in the 4th and 5th fingers during long-lasting flexion of the right elbow.

She considered non-ergonomic occupational conditions to be responsible for the diagnosed left ulnar neuropathy. A cupboard placed on her left side caused that during working hours she constantly pressed her left elbow and forearm against the hard surface (Figure 1).

On the day of admission to our department, general and neurological examinations were normal except for the findings in the upper extremities. On a neurological examination, postoperative scar and tenderness over the left medial humeral epicondyle, slightly limited extension

Fig. 1. The work post arrangement in the workplace

of the left elbow (about 15°), asymmetry of the elbows and wrist, and slight tenderness over the right medial humeral epicondyle were noted. Right forearm was shorter than the left one by 2 cm (Photo 1). No neurological deficits (either motor or sensory) were recorded, but a clinical examination revealed a complete dislocation of the right ulnar nerve. The nerve was palpable and observed to translocate anteriorly sliding over the medial epicondyle during flexion and then to relocate posteriorly during the elbow extension. Though episodes of paresthesia were provoked by prolonged flexion of the elbow, the nerve appeared to dislocate every time the patient flexed and extended her elbow (Movie 1: http://dx.doi.org/10.13075/ijomeh.1896.00398).

X-ray examination of both elbow joints was normal. Dynamic sonography showed instability/hypermobility of the right ulnar nerve. Electrodiagnostic examinations were performed in accordance with the American Association of Electrodiagnostic Medicine guidelines with surface stimulation and recording. Limb temperature was monitored and maintained at 32°C or higher. Bilateral median and ulnar, sensory and motor nerve conduction tests were performed (the same elbow position was employed during both stimulation and measurement). Electroneurography showed signs of ulnar neuropathy at the elbow in the left limb (slowing of motor conduction velocity across the elbow: motor nerve

Photo 1. The case of a 34-year old, right handed woman with normal general and neurological examinations (except for the findings in the upper extremities)

conduction velocity from above the elbow to below the elbow segment was slower by 24.4 m/s than motor conduction velocity from below the elbow to the wrist segment). Electroneurography results (including short segments nerve conduction test at 2 cm intervals) of the right ulnar nerve were normal. Median motor and sensory conduction latencies, velocities and amplitudes were within normal ranges.

Based on the anamnesis, neurological examination and electroneurography tests, as well as on job exposure in a non-ergonomically designed workplace, left ulnar neuropathy at the ulnar groove was recognized in the patient as an occupational disease.

DISCUSSION

In the relevant literature, the incidence of ulnar hypermobility is reported to range between 2–37%. Childress [3] has reported ulnar nerve dislocation in 16.2%

of 1000 asymptomatic patients. Calfee et al. [2] have noted ulnar hypermobility in 37% of 400 elbows, but only 4% subjects in their study had a bilateral dislocation of the ulnar nerve. The incidence of the cases of a complete dislocation, when the ulnar nerve slides over medial epicondyle anteriorly during flexion and returns posteriorly during extension of the elbow, has been lower [1,2,8]. Childress [3] has classified ulnar nerve hypermobility into 2 groups: type A and type B. In type A, the nerve moves out of its post-condylar groove on the top of the humeral epicondyle when the elbow is maximally flexed, i.e., subluxation occurs in the case of extreme flexion. In type B, the nerve passes completely across, and to the front of the epicondyle when the elbow is flexed more than 90°. This condition is usually congenital, bilateral and initially asymptomatic. Normal life activity is usually not affected at the beginning, until the symptoms of ulnar neuropathy shall appear after a simple injury [3,8,10]. It occurs slightly more often in females than in males. It has been noted that type B is characterized by greater mobility and is more vulnerable to friction neuritis [3], whereas in type A, the ulnar nerve, lying superficially on the medial humeral epicondyle, is more exposed to direct trauma. The probable cause of such hypermobility is congenital laxity of supporting ligaments (epicondyloolecranial ligament) [3,4], dysplasia of the retrocondylar ulnar groove [10], pushing out the ulnar nerve from its sulcus by the prominent medial head of triceps muscle when flexing the elbow [10,11–13], muscular anomalies and muscular variations around the medial elbow [14,15].

Our patient had type B hypermobility of the ulnar right nerve according to Childress [3] classification, but clinical symptoms and neurophysiological signs of ulnar neuropathy were present in the non-dominant left limb, which is uncommon. Any form of hypermobility of the ulnar nerve requires a careful differential diagnosis in order to distinguish between dysplasia of the retrocondylar ulnar groove, snapping triceps syndrome, arcade of Struther, muscular anomalies at the medial elbow, distal humerus changes after trauma, and ulnar nerve compression by the humeroulnar apponeurotic arcade joining 2 heads of the flexor carpi ulnaris muscle. In this case, clinical examination, dynamic sonography, X-ray and electroneurography examinations ruled out the abnormalities specified above.

The difference in the prevalence rate of subluxation or dislocation in patients with ulnar neuropathy at the elbow compared to healthy people has not been established yet. Previous 2 studies have reported subluxation in 14–18.7% and luxation in 6.7–9.9% of patients with ulnar neuropathy at the elbow [7,16] compared to 5.7% and 5.7% in healthy controls, respectively [7].

Dislocation of the ulnar nerve has been reported more frequently in industrial workers [3], athletes [10,14,17,18] but also among musicians [5], a waitress [10] and a clerk/secretary [10].

Occupational ulnar neuropathy [19,20] at the elbow develops in the course of prolonged direct pressure on the nerve (resting of the proximal elbow or forearm on, or against a surface) and a persistently flexed elbow posture greater than 90°, but first of all, it is strongly associated with "holding a tool in a certain position" repetitively [21]. Therefore, computer use has not been considered as a potential activity related to the ulnar nerve injury at the elbow. The largest and the only study [22] which has focused on vocational computer use and the risk of ulnar neuropathy at the elbow has shown a negative exposure-response relationship between hours of daily computer use and the neuropathy. However, the authors have suggested that computer users whose elbows were in contact with a working table for 2 h or more during the workday were at an elevated risk of ulnar neuropathy [22]. They have underlined a specific role of the prolonged pressure on the left elbow of the non-dominant limb while the right limb was using mouse devices.

In the reported case, we hypothetize that the repetitive prolonged pressure of the elbow and forearm against

the hard surface because of job exposure in non-ergonomic circumstances was the indisputable chronic trauma etiologic factor of the injury of the left ulnar nerve, which was additionally predisposed to it in its subluxed position. It is noteworthy that the right-dominant limb was involved in the same (or even more frequent and varied) occupational tasks like the left one, except for the forced hard pressure against the cupboard and desk, like the one occurring on the left side. Apart from the right ulnar nerve irritation symptoms, there were neither clinical nor neurophysiological signs of right ulnar neuropathy. This is in concordance with previous reports about asymptomatic course of congenital hypermobility of the ulnar nerve until simple trauma occurs [3,8,10].

Our patient is an educational example how crucial it is to obey the principles of ergonomics in the workplace; a fact which is often neglected. Avoidance of a compression injury of the vulnerable ulnar nerve in addition to a well-designed ergonomic workplace with appropriate arm and elbow support provided, as well as compliance with ergonomic rules at work and during everyday activities may prevent development of ulnar neuropathy, also in the case of ulnar nerve hypermobility.

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