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Short Report

Upper limb entrapment neuropathies in multiple sclerosis

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Abstract

Introduction: Entrapment neuropathies of upper limbs such as carpal tunnel and cubital tunnel syndromes are common in the general population. Identification of entrapment neuropathies of upper limbs in patients with multiple sclerosis can be clinically challenging as signs and symptoms could be attributed to multiple sclerosis. People at later stages of multiple sclerosis use mobility aids and wheelchairs. Weakness of hands in this cohort due to entrapment neuropathies could adversely affect their mobility and independence.

Methods: This was a retrospective review of records of patients with multiple sclerosis referred for clinical neurophysiological studies with clinical suspicion of upper limb entrapment neuropathies over a 10-year period. We collected demographic details, clinical features, clinical neurophysiological data and details of aids and appliances used for mobility.

Results: Among 71 patients, 38 (53.5%) patients had at least one entrapment neuropathy of upper limb confirmed by clinical neurophysiological studies. Twelve (31%) patients had median nerve entrapment, 20 (53%) had ulnar nerve entrapment and six (16%) had both. Risk of ulnar nerve entrapment was significantly higher in patients using a powered wheelchair (odds ratio 5.7, 95% confidence interval (1.7–18.7, $p = 0.0037$).

Discussion: Entrapment neuropathies should be considered in patients with multiple sclerosis reporting sensory and motor symptoms of hands.

Keywords: Multiple sclerosis, rehabilitation, upper limb, entrapment neuropathies, carpal tunnel syndrome, cubital tunnel syndrome.

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Introduction

Multiple sclerosis (MS) is an immune -mediated disorder of the central nervous system causing sensory disturbances, motor weakness and autonomic symptoms like problems with control of bowel and bladder. The prevalence of peripheral neuropathy in MS is around 5.8% and is usually attributed to nutritional factors, cytotoxic drugs or independent concomitant conditions such as diabetes.[1,2]

Entrapment neuropathies (EN) are caused by the chronic focal compression of a peripheral nerve. Carpal tunnel syndrome (CTS), caused by the entrapment of the median nerve in the carpal tunnel, is the most common entrapment neuropathy with a prevalence of 2.7% in the general population.[3] It is characterised by numbness, tingling, pain and weakness of the hand. Cubital tunnel syndrome (CuTS) is caused by entrapment of the ulnar nerve as it passes behind the medial epicondyle of the humerus. The prevalence of CuTS in the general population is 1.8%.[4,5] Use of mobility aids is a risk factor for entrapment neuropathies of the upper limbs.[6]

People with moderate to severe forms of MS often use mobility aids like crutches, sticks and wheelchairs. Clinical recognition of entrapment

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neuropathies in patients with MS can be challenging as their signs and symptoms could be masked by those of MS. Clinical neurophysiological studies could help to diagnose the median and ulnar entrapment neuropathies. Prompt diagnosis and intervention for entrapment neuropathy could potentially preserve hand function. Our search of PubMed with key words 'multiple sclerosis', 'entrapment neuropathies', 'ulnar nerve', 'median nerve', 'carpal tunnel syndrome' and 'cubital tunnel syndrome' did not identify any studies on entrapment neuropathies in people with MS.

This is a retrospective clinical records review of people with MS who underwent clinical neurophysiological studies for CTS and CuTS.

Methods

We reviewed records of all patients with MS who were referred for clinical neurophysiological studies with suspected upper limb entrapment neuropathies from 2007–2016. We recorded age, gender, type of MS, duration since diagnosis of MS, Extended Disability Status Scale (EDSS) score, clinical diagnosis of entrapment neuropathy and use of mobility aids. All clinical neurophysiological studies were carried out as per the recommendations from the British Society for Clinical Neurophysiology.[7] We obtained the approval of the clinical effectiveness unit of the Sheffield Teaching Hospitals NHS Foundation Trust for this study (STHCEU project number: 5494).

Results

The age, gender, duration of MS, type of MS and EDSS of the 71 patients are shown in Table 1. Thirty-seven patients (52%) presented with bilateral hand symptoms. Clinical neurophysiological studies confirmed at least one entrapment neuropathy in 38/71 patients (53.5%). The clinical neurophysiological studies confirmed CTS in 12 of 14(85.71%) patients with the clinical diagnosis of CTS. The clinical neurophysiological studies also confirmed CuTS in 20 of 27 (74%) patients with the clinical suspicion of CuTS. In 10 patients both CTS and CuTS were suspected clinically and clinical neurophysiological studies confirmed both in six (60%) patients. Thirty-three of 71 patients with clinical suspicion of CTS, CuTS or both (46.47%) did not have either condition on clinical neurophysiological studies. Surgical decompression was offered to 21/38 (55.2%) and was done in 17/38 (44.7%). Twelve out of 17 (70.6%) patients had surgical decompression for ulnar nerve entrapment and 5/17 (29.4%) had median entrapment.

All except two patients required mobility aids. The types of aids are shown in Table 2. Among 33 patients using a powered wheelchair 18 had CuTS. Only eight of the 38 patients who were not using powered wheelchairs had CuTS. The use of powered wheelchairs significantly increased the risk of CuTS in patients with MS (odds ratio (OR) 5.7, 95% confidence interval (CI) –1.7–18.7, $p = 0.0037$).

Subjects who had either CTS or CuTS had a higher mean age of 61.7 years compared to subjects who did not have either (mean age of 56.2 years) ($t = –2.079$, $p = 0.042$). Overall, 20/27 men (74.1%) and 18/44 women (40.9%) had either CTS or CuTS (Chi-squared test $\chi^2 = 6.125$ and $p = 0.013$). Among the 52 subjects, those who had an EN had a mean disease duration of 25.1 years, whereas subjects who did not have an EN had a mean disease duration of 15.8 years (t-test = –2.626, $p = 0.012$). We did not have reliable data on the duration of MS in 19 patients.

The prevalence of CuTS was higher in men (18/27) than in women (8/44) (Chi-squared test $\chi^2 = 14.923$, $p < 0.001$). Among those subjects with CuTS, the mean age was 60.0 years, and among those without

Table 1. Demographics and clinical features.

Age (mean)	59.1 ± 11.3 years (range: 34–82 years)
Gender	
Women	44
Men	27
Duration of multiple sclerosis (mean)	20.8 ± 14.8 years (range: 0–60 years)
Type of multiple sclerosis	
Remitting–relapsing	2
Secondary progressive	68
Primary progressive	1
Extended Disability Status Scale (median)	7.5 (range: 5.5–7.5)

Table 2. Use of mobility aids and entrapment neuropathies in patients with MS.

Mobility aid	Number of patients	CTS	CuTS	Both	None
Powered wheel chair	33	1	16	2	14
Manual wheel chair	5	1	1	1	2
Crutches	7	1	3	0	3
Frame	8	2	0	0	6
Stick	7	4	0	0	3
No aids	2	1	0	0	1
Data not available	9	2	0	3	4

CTS: carpal tunnel syndrome; CuTS: cubital tunnel syndrome.

it was 58.7 years (t-test = –0.473 and $p = 0.638$). Subjects who had CuTS had a mean disease duration of 22.5 years, whereas subjects who did not have CuTS had a mean disease duration of 19.8 years (Wilcoxon rank sum test W-statistic = 264, $p = 0.296$).

Overall, 8/27 men and 10/44 women had CTS (Chi-squared test $\chi^2 = 0.135$, $p = 0.713$). The subjects with CTS had a mean age of 64.0 years, and among those without it was 57.5 years (t-test = –2.327, $p = 0.026$). Subjects who had CTS had a mean disease duration of 27.0 years, whereas subjects who did not have CTS had a mean disease duration of 19.0 years (Wilcoxon rank sum test W-statistic = 191.5, $p = 0.297$).

Discussion

Around 66% of people with MS have upper limb motor impairments that could affect daily living activities.[8] Concomitant CTS or CuTS could aggravate this hand dysfunction and contribute to the limitation of activities. Our data suggest that a proportion of hand problems in patients with MS could be due to CTS, CuTS or both. While CTS is more prevalent in the general population, our results show that CuTS was more prevalent in the patients with MS.[3]

We noted that the risk of developing CuTS was five times higher among people with MS using powered wheelchairs compared to those using other mobility aids or no mobility aids. The ulnar nerve while passing through the cubital tunnel at elbow is susceptible to injury due to compression and traction. The distance between the medial epicondyle and the olecranon increases by 5 mm for every 45° of elbow flexion.[9,10] During elbow flexion the shape of the cubital tunnel in cross-section changes from round to oval, with a loss of height of 2.5 mm and reduction of volume by 55%. Cadaveric studies have shown that the tissue pressure on the ulnar nerve in the cubital tunnel rose from 7 mm Hg to 11–24 mm Hg when the elbow was flexed to 90 degrees.[9,10] While seated in a power wheel chair, the upper limb assumes a position of shoulder abduction, elbow flexion and wrist extension which results in traction of the ulnar nerve. Prolonged sitting on a powered wheelchair with the elbow flexed and pressed down on the arm rest can cause traction and chronic pressure on the ulnar nerve resulting in CuTS.

People who used a cane/crutch were at increased risk of CTS.[6] Among 22 of our patients using stick, crutches or frames, seven had CTS (Table 2). Focal compression of median nerve in the carpal tunnel at wrist while walking with a stick, frame or crutches could be causing CTS in these patients.

Entrapment neuropathies of the upper limb were more frequent among men, those of older age and people with a longer duration of MS. CuTS was more common among men. The mean age of people with CTS was significantly higher than those without CTS. Most of our patients (68/71) were in the secondary progressive phase of MS. A larger study with more patients with remitting–relapsing MS (RRMS) and primary progressive MS (PPMS) may help to answer the question as to whether entrapment neuropathies are more common in any particular type of MS.

Limitations

This report is based on the retrospective collection of data and as such has several limitations. We did not collect data on handedness, hand used for controlling the powered wheelchair, duration of use of the powered wheelchair and functional outcomes after surgical management. We did not have the data on other conditions that can cause entrapment neuropathies in this cohort. We also did not collect the duration of hand symptoms and whether the diagnosis was potentially missed during earlier consultations. Although the *p*-values for gender, age and duration of MS are below the usual 5% significance level, because this is a secondary analysis the results should only be used to inform future areas of research rather than to make any bold claims about the relationship between gender, age, duration of MS and entrapment neuropathy.

Conclusions

CuTS and CTS should be considered in patients with advanced MS using mobility aids and experiencing sensory and motor symptoms of hands. Patients with MS using powered wheel chairs are more at risk of developing CuTS.

Conflict of Interests

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