CASE REPORT

Compressive radial neuropathy induced by 'hooking' manoeuvre in a tetraplegic person

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Study design: Case report.

Objective: To describe a case of radial nerve compression neuropathy caused by a common wheelchair technique (hooking manoeuvre) used by a tetraplegic person to maintain truncal stability on a wheelchair.

Setting: Department of Rehabilitation Medicine, University of Malaya Medical Centre, Kuala Lumpur, Malaysia.

Method and results: A 45-year-old man with American Spinal Injury Association Impairment Scale A C6 for the last 32 years developed progressive weakness of the right upper limb that was associated with pain in the shoulder and arm. Serial physical examinations demonstrated motor and sensory deterioration. Magnetic resonance imaging of the spinal cord showed no evidence of syringomyelia. Electrodiagnostic study showed motor and sensory neuropathy of the right radial nerve in the axillary region.

Conclusion: The act of hooking the arm behind the wheelchair push handle causes trauma leading to radial nerve compression neuropathy. Because this technique is used frequently by wheelchair users, future studies should examine the prevalence of radial neuropathy in this population and develop alternative methods to maintain balance on the wheelchair.

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Keywords: spinal cord injury; tetraplegia; radial nerve compression; hooking manoeuvre; wheelchair stability

Introduction

Tetraplegic patients have lack of functional truncal musculature and commonly need compensatory techniques to achieve independence in activities of daily living. One of the techniques taught is to hook the push handle of a wheelchair using the arm, forearm or wrist to achieve truncal balance, whereas using the other upper extremity to reach an object.¹ Little is known about the nature and frequency of complications from this manoeuvre. We describe a case of radial nerve injury in a tetraplegic patient due to this manoeuvre.

Case reports

This patient is a 45-year-old man who has American Spinal Injury Association Impairment Scale A C6 for the past 32 years. He is independent in most of his personal activities of daily living and his primary mean of mobility is a motorized wheelchair, but uses a manual wheelchair for short distances at home. He has been using the 'hooking' manoeuvre ever

since his injury and uses it during reaching movements and lateral weight shift for pressure relief.

He first complained of right shoulder pain in November 2006 and attributed it to an accidental 'twisting' of the arm that occurred 2 weeks earlier. Apart from an ill-defined tenderness around the shoulder area, there were no significant clinical findings. After 5 months, he presented with progressive weakness of the right upper limb and was unable to extend the elbow and wrist. The new deficits meant that he could no longer transfer himself or propel the manual wheelchair, therefore severely restricting his independence.

The patient demonstrated neurological deterioration of the right upper limb. The level of normal pin-prick sensation ascended to C4 on the right arm, with a hypersensitive area over the posterior aspect of the right arm. The right upper limb strength deteriorated with Medical Research Council (MRC) grade 4/5, 2/5 and 2/5 over the elbow flexors, wrist extensors and elbow extensors, respectively. The biceps, supinator and triceps reflexes were reduced.

Magnetic resonance imaging of the spinal cord showed no evidence of syringomyelia. Nerve conduction study showed sensory motor neuropathy of the right radial nerve (motor latency of 13.65 ms, amplitude of 0.1 mV and velocity of

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12 m s⁻¹), and concentric needle electromyography recorded neurogenic changes in radial nerve distribution. The findings are consistent with a compressive right radial nerve lesion at the axillary region.

The patient then stopped using the hooking manoeuvre and adopted a different method to maintain truncal stability. He installed a metal bar in front of his wheelchair as a fulcrum to stabilize his forearm, whereas doing forward reaching with the other arm. He recovered some motor functions of his wrist extensors (MRC grade 4) 3 months later but the others remained the same. The sensory level improved to C5 dermatome.

Discussion

Compressive neuropathies in wheelchair users have been widely described in literatures. There are many areas of possible compression, depending on the nature of activities that the person adopts. For example, carpal tunnel syndrome is common in paraplegic patients propelling manual wheelchairs.² There is also report on radial neuropathy caused by passive compression between the spiral groove of the humerus and parts of the wheelchair.³ Nonetheless, we believe there is no research to date that looks exclusively at compression neuropathy in tetraplegic patients using compensatory techniques.

In our case, the compression occurs between the axilla and the vertical edge of the wheelchair back support when the patient performed the 'hooking' manoeuvre. The pathomechanics of the compression may be similar to that of crutch palsy, where it is believed that application of differential pressure along the nerve trunks cause invagination of the nodes of Ranvier.⁴ We hypothesized that the occurrence of radial neuropathy in our case was caused by a combination of repetitive chronic compression and the particular way he hooked his upper limb.

Transient palsies of the peripheral nerve due to compression are not uncommon.²⁻⁵ The patient may have had episodes of transient radial neuropathy but was unaware of the problem. This could be attributed to the fact that the weakness occurred in muscles that are partially innervated, making it less appreciated.

Conclusion

Radial nerve compressive neuropathy can be a significant cause of morbidity in tetraplegic patients. Common compensatory technique can attribute to this neuropathy, as in our case. Although the mechanism, frequency and outcome of compressive peripheral neuropathies are not well described in tetraplegic patients, clinicians should consider potential compromise of the radial nerve in patients with chronic use of hooking manoeuvre to achieve truncal stability.

Conflict of interest

The authors declare no conflict of interest.

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