

Case Report

MRI confirmed cervical cord injury caused by spinal manipulation in a Chinese patient

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Objective: To report a rare case of cervical cord injury caused by spinal manipulation in a Chinese patient.

Method: A 46-year-old man suffered from acute tetraplegia immediately after spinal manipulation by a bonesetter. There was nothing abnormal in the plain X-ray but Magnetic Resonance Imaging (MRI) of his cervical spine demonstrated cervical cord oedema at the level of C1/2.

Result: The patient was treated with high doses of methylprednisolone. Coupled with intensive rehabilitation, the patient made a nearly complete recovery 6 months after injury. Repeated MRI demonstrated syrinx formation at the previous location of cervical cord oedema.

Conclusion: Spinal manipulation may cause cervical cord injury. MRI is useful in the documentation of this injury and exclusion of other pathology.

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Introduction

Neck pain is a very common orthopaedic problem. Among various treatment modalities, manipulation, as a form of mechanotherapeutic procedure, is commonly practiced by trained physicians, physiotherapists, osteopaths as well as chiropractors. In Chinese societies, some bonesetters also use this technique to treat patients with neck pain.

This is a case report on a rare complication of spinal manipulation. The Chinese patient suffered from acute cervical cord injury without spinal column injury as fully documented by serial MRI. This study describes the clinical progress in detail and reviews the literature on this problem.

Case report

A 46-year-old man who recovered from a left 6th cranial nerve palsy and left retrobulbar neuritis was referred by his ophthalmologist to the Medical Department of our hospital in November 1997 because of suspected multiple sclerosis. Further investigations in early 1998 included contrast MRI of the brain but no abnormalities were detected. The upper cervical cord shown up in one image was also found to be

normal (Figure 1). The patient then developed aching neck spontaneously in late 1998 and the symptom persisted for more than 1 month. X-ray of his cervical spine revealed minimal degenerative changes only.

He consulted a bonesetter for his persistent neck pain on 10th February 1999 and was advised to receive spinal manipulation. He was instructed to lie on a bed in a supine position. The bonesetter suddenly and forcefully rotated his head to one side and then to the other side. Immediately the patient developed numbness of his whole body and difficulty of breathing. He could not move his four limbs. He was then sent to the Accident & Emergency Department of our hospital.

He was found to be fully conscious and alert on admission to the orthopaedic ward. The blood pressure was 120/60 mmHg and the pulse rate was 55/min. The respiratory rate was 20/min. The cervical spine was non-tender with good neck control. The muscle power was grade 0 by Medical Research Council scale over right upper limb, grade 1 over left upper limb, grade 5 over right lower limb and grade 4 over left lower limb. There were diminished pain and touch sensations from the neck downwards. Proprioceptive sensation was intact. There was slight hyporeflexia over left upper limb but other reflexes were normal. The anal tone was normal. The X-ray of his cervical spine revealed minimal degeneration without

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Figure 1 Contrast MRI of brain in 1998 showed normal upper cervical cord

any obvious bony or soft tissue abnormalities. The developmental sagittal diameter was measured to be 18 mm and the Pavlov ratio was found to be 1.0 at the level of C5. He was diagnosed to have incomplete cervical cord injury. He was treated with high doses of methylprednisolone immediately, just 1 h after the incident.¹

His left upper limb muscle power improved to grade 2 on the 3rd day of hospitalisation when MRI was performed. The MRI revealed mild cervical cord swelling at the level of C1/C2 together with a T1 isointense and T2 hyperintense area measuring 3 × 8 × 40 mm at the lower medulla and upper cervical cord (Figure 2). The cervical spine showed normal alignment, disc and marrow signal with no prevertebral or epidural haematoma. The radiologist reported that the patient suffered from oedema or contusion in the lower medulla and upper cervical cord.

The patient was able to walk with a frame on the 5th day. He was transferred to another rehabilitation centre for intensive training about 2 weeks after admission. There was progressive improvement in all limbs. He was discharged from the rehabilitation centre on 1st April 1999. At the 6th month after injury, he had mild residual paraesthesia of right upper limb. His ambulation, hand function, and sphincter control were normal. There was minimal weakness of left upper limb (grade 4 plus) detected on examination. Hoffman sign was slightly positive on both sides.

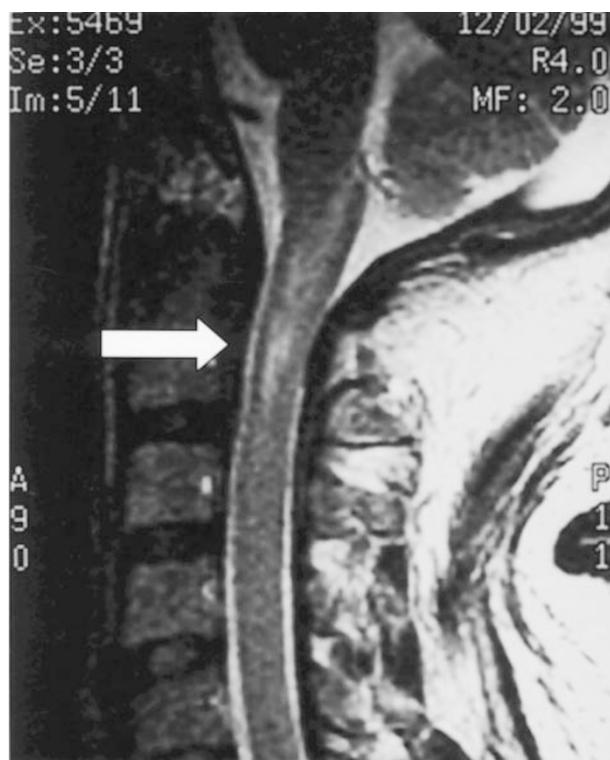


Figure 2 Sagittal MRI (T2 weighted image) of cervical spine showed an area of increased signal intensity at medulla and upper cervical cord (white arrow)

The patient developed sudden onset of diplopia again 8 months after the cervical cord injury. MRI of the brain and cervical spine was repeated. A right intraorbital mass involving the right lateral rectus muscle was shown up in the MRI of the brain. According to the radiologist, the finding was consistent with an idiopathic inflammatory pseudo-tumour. Moreover, the repeated MRI of the cervical spine showed a cystic area with myelomalacia of the spinal cord at the C1/C2 level (Figure 3).

The patient's diplopia gradually recovered spontaneously without any specific treatment. He was followed up regularly in both orthopaedic and medical clinics with no recurrence of ocular problem or other symptom that was suggestive of multiple sclerosis.

At the latest follow up, 28 months after the spinal cord injury, he had minimal paraesthesia over radial side of his right hand. Examination was unremarkable apart from the slightly positive Hoffmann sign on both sides.

Discussion

Spinal manipulation is a mechanotherapeutic procedure widely practiced among trained physicians, physiotherapists, osteopaths and chiropractors for treatment of neck pain. However, this treatment method is not without risk. Complications of spinal manipulation are well documented in the literature. A

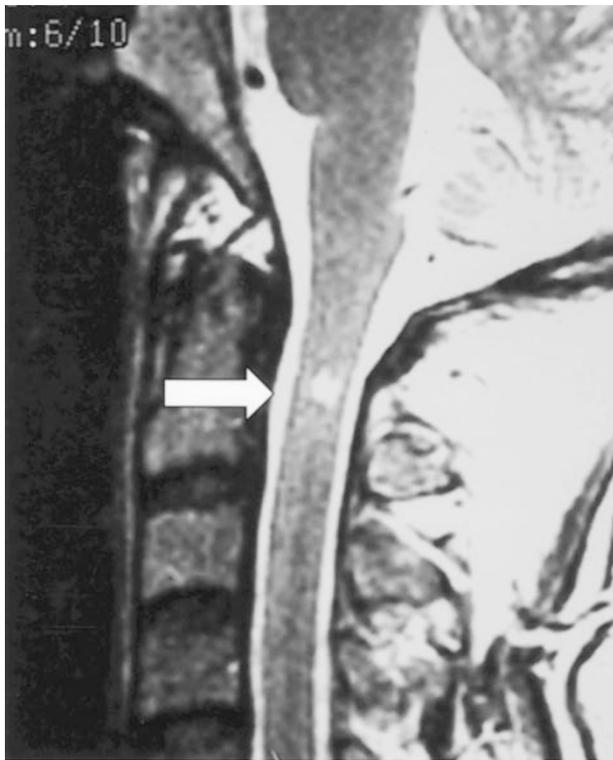


Figure 3 Repeated MRI demonstrated syrinx at upper cervical cord (white arrow) 8 months later

review of the data from a computerised registration system by Patijn showed a complication rate in 1 of 518 886 manipulations.² His literature study on 129 cases from 93 studies revealed that the most frequent complication was vertebral artery injury (65.1%). It was followed by intervertebral disc complications (22.5%).

Livingston classified injuries associated with spinal manipulation into direct injuries, including joint or soft tissue injury, nerve injury, vascular injury and bony injury as well as indirect ones (injury by omission).³ In his case descriptions, he regarded any increase in back pain after spinal manipulation as an 'injury'.

Neurological complications can be grouped into cerebrovascular and non-cerebrovascular accidents. It was estimated that the incidence of cerebrovascular accident after spinal manipulation ranged from 1 per 20 000 patients to 1 per million cervical manipulations.⁴ It occurs mainly after a cervical manipulation with a rotatory component. It is postulated that rotation and tilting the neck stretches the extracranial portion of vertebral arteries and produces a shearing force on the segment at the atlantoaxial joint, which may produce intimal tearing, dissection, and thrombus formation. It was found that treatment by chiropractors accounted for a high proportion of cerebrovascular complications compared with other professionals in the literature reviews by Patijn and Assendelft.^{2,4}

According to the survey of Lee *et al*⁵ among the practicing neurologists in California, there were 55 strokes, 16 myelopathies and 30 radiculopathies following chiropractic manipulations.⁵ They found that 86% of patients with complication of stroke, 88% with myelopathy and 97% with radiculopathy had persistent neurological deficit 3 months after onset.

Spinal cord damage after spinal manipulation can be associated with or without spinal column injury.³⁻⁹ Conditions such as vertebral bony abnormality, pre-existing myelopathy, hypermobility syndrome, infection, malignancy, severe diabetes and anticoagulation therapy are regarded as contraindications for spinal manipulation.⁵ Ankylosing spondylitis is also a predisposing condition to spinal column injury as a result of the ankylosis and the osteopenia of the bone. However, since some of the reported cases had a history of falling before the manipulation, it might be difficult to ascertain that the spinal manipulation produced the spinal column injury.^{8,9}

Torg *et al*¹⁰ has identified that cervical spinal stenosis, defined as Pavlov ratio less than 0.8, predisposed to transient quadriplegia in athletes. Kelwalramani *et al*⁶ reported two cases of spinal cord damage without spinal column injury after spinal manipulation. One patient had evidence of relative cervical spinal stenosis with a spinal canal measured to be 9–11 mm by Computerized Axial Tomography. Lipper has described one case of Brown-Sequard syndrome with MRI documentation.⁷ Investigation of choice for spinal cord injury after spinal manipulation is MRI. It is helpful in identification of the site and the extent of injury to the spinal cord. It can provide information on the status of intervertebral disc, ligaments and the presence of haematoma or other space-occupying lesion within the spinal canal, which is of great implication to the possible surgical management of these patients.

This patient is a well-documented case of cervical cord injury caused by spinal manipulation as evidenced by the immediate onset of neurological deficit after the manipulation and the absence of other etiological factors. The clinical picture of his spinal cord injury correlated with the acute oedema within the cervical cord captured by MRI, which progressed into syrinx with time.

One interesting point to note in this case was the clinical suspicion of multiple sclerosis arising from the two episodes of 6th cranial nerve palsy and optic neuritis before and after the injury respectively. The association of multiple sclerosis and spinal cord injury after spinal manipulation has been reported in literature. Kewalramani *et al*⁶ reported a case of 46-year-old male patient with a history of left sixth cranial nerve palsy and diagnosis of multiple sclerosis. His patient experienced tingling and burning sensation of right wrist, which radiated to right leg and foot with time. He underwent cervical manipulation, which was immediately followed by increase in the cervical

pain. He had progressive deterioration in his neurological status. Myelogram showed widening of spinal cord at C5/C7 with obliteration of root sleeves at C4/C6. He was treated by multiple laminectomy from C4 to C7. Bluish discoloration was noted over the posterolateral aspect of the spinal cord and haematomyelia was confirmed after myelotomy. Kewalramani *et al*⁶ speculated that this patient might have had an underlying vascular or coagulation abnormality induced by multiple sclerosis that resulted in haematomyelia following cervical manipulation.

The prognosis for cervical cord injury induced by spinal manipulation ranges from satisfactory to good. The case of Brown-Sequard syndrome reported by Lipper made some recovery after treatment with methylprednisolone. The patient could ambulate with a cane.⁷ The patient reported by Kewalramani *et al*⁶ also made some recovery after the multi-levels laminectomy and myelotomy. He was ambulatory with the help of two lower limb braces. The patient of this report also made a nearly complete recovery after treatment with steroid in high dosage despite the presence of syrinx in the repeated MRI.

In conclusion, the author reports a case of cervical cord injury without spinal column injury as confirmed by serial MRI in a suspected case of multiple sclerosis after spinal manipulation by a bonesetter. It is mandatory for medical professionals, who practice such a technique, as well as the patients themselves to understand the potential dangers associated with spinal manipulation. MRI is the investigation of choice, especially in the absence of radiological abnormality in the plain X-ray. The clinical outcome of our patient and the reported cases in the literature review suggest that steroid in high dosage might be

useful in the treatment of such a condition and it seems that steroid treatment is associated with a higher degree of recovery in the neurological function.

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