

Missed cervical spine fracture-dislocations prior to manipulation: A review of three cases

J. W. Nykoliotion, BSc, DC, FCCS(C)*

J. D. Cassidy, BSc, DC, FCCS(C)**

P. Dupuis, MD, FRCS(C)**

K. Yong-Hing, MB, ChB, FRCS(Glasg.), FRCS(C)**

M. Crnec, BA, DC***

Three cases of patients with fracture-dislocations of their cervical spines following forced flexion injuries are presented. All received cervical manipulation without proper clinical and radiographic evaluation. These cases stress the importance of a thorough examination prior to the application of manipulative therapy.

KEY WORDS: Fracture, cervical spine, diagnosis, manipulation.

Introduction

Fracture-dislocations of the cervical spine demand early and accurate diagnosis so that proper treatment can be instituted to produce a stable, painless neck and prevent damage to the spinal cord or nerves. Failure to recognize fracture-dislocations, and to determine the stability of the spine prior to treatment, can lead to potentially disastrous consequences. These illustrative cases reinforce the need for a thorough assessment of all patients prior to therapy.

Case One

W.R. is a 17-year-old male, who, in January, 1984, was tobogganing down a hill and ran into some bystanders. He described a forced flexion injury to his neck upon impact. He had immediate, constant neck pain and sought treatment from his chiropractor, whom he had visited many times in the past for various complaints, always with good results. The chiropractor did, in fact, manipulate his neck once, and there was temporary relief of discomfort. However, his pain returned and progressively worsened.

Upon consultation at our centre, he had neck and interscapular pain, but denied any parasthesia, pain or numbness in his upper or lower extremities. His pain was aggravated by flexion and turning his neck, and relieved by sitting straight or lying flat.

On examination, he had full range of movement of the neck, but there was pain with forced flexion and lateral flexion. He exhibited a tender step between spinous processes at the C5-6 level. Muscle strength, reflexes and sensations were normal in the upper extremities. Knee, ankle and plantar reflexes were also normal.

On présente trois cas de patients souffrant de fractures-luxations de leurs vertèbres cervicales par suite de blessures dues à des flexions forcées. Tous ont reçu des manipulations cervicales sans un bon diagnostic clinique et radiographique. Ces cas permettent de souligner l'importance d'un examen attentif avant de mettre en oeuvre une thérapie à base de manipulations.

MOTS CLÉS: fracture, moelle épinière, diagnostic, manipulation.



Figure 1: Case one. Neutral lateral view of cervical spine showing a forward slippage of C5 on C6.

Radiographic examination of his cervical spine, including lateral views in flexion and extension, showed displacement of C5 on C6. Fracture of the right articular mass was suspected. (Figure 1,2)

The immediate problem in this case was to realign the C5-6 level. W.R. was admitted to hospital and placed in a halo traction device. Over the next five days, the weight on the traction device was increased to 30 pounds, and the position of the dislocation improved so that he had only a 2 or 3 mm displacement of C5 on C6. (Figure 3) During some phases of the reduction, he experienced transient pain in the right shoulder.

* Fourth Avenue Chiropractic Clinic, 208 - 119 4th Avenue South, Saskatoon, Saskatchewan

** From the Division of Orthopaedics, University Hospital, Saskatoon, Saskatchewan

*** Resident III, Chiropractic Sciences, Canadian Memorial Chiropractic College, 1900 Bayview Avenue, Toronto, Ontario.

Reprints requests should be addressed to Dr. J. W. Nykoliotion, Fourth Avenue Chiropractic Clinic, 208 - 119 4th Avenue South, Saskatoon, Saskatchewan S7K 5X2.

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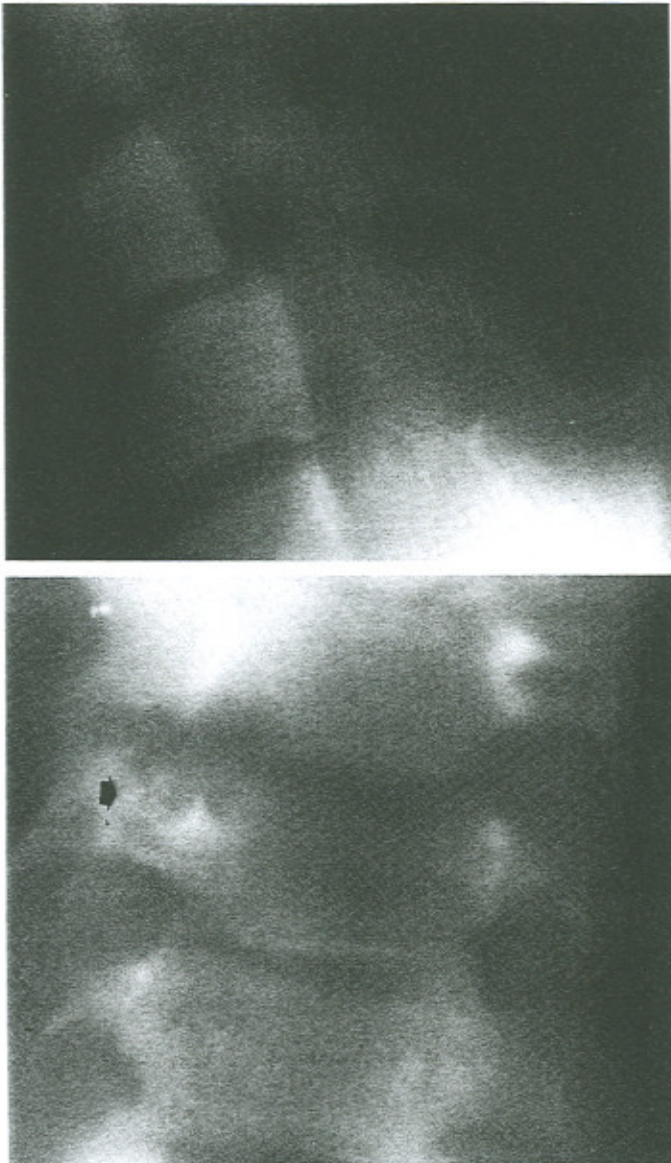


Figure 2: Case one.

- A) Lateral tomogram confirming x-ray findings in Figure 1.
- B) A-P tomogram showing disruption suggestive of fracture of the right articular pillar of C5 (arrow).



Figure 3: Case one..Lateral cervical view with the patient in a halo traction device. Note the improvement in position of the C5-6 fracture-dislocation compared to Figure 1.

der. He also had some numbness on the radial aspect of the left forearm, but this passed after a few hours. There was never any objective weakness.

Once the dislocation was reduced, a C5-6 fusion by wiring and bone grafting was performed because there was a good chance that instability would persist. (Figure 4) The patient was put in halo traction post-operatively. Subsequently, a halo vest was fitted and he was discharged to be followed-up on an outpatient basis. He did well with only minor weakness (4+/5) and wasting of his right deltoid muscle two weeks post-operation. This subsequently improved, and the halo vest was removed at six weeks post-operation and replaced by a Philadelphia brace. He gradually discarded this and began an isometric neck exercise program. X-rays at that time showed complete fusion and excellent alignment. (Figure 5)



Figure 4: Case one. Immediately following a C5-6 fusion by wiring and bone grafting. Note there is almost perfect alignment at C5-6.



Figure 5: Case one. Six weeks post-operation; lateral view of the cervical spine in flexion showing excellent alignment maintained on movement.

Case Two

J.B. is a 58-year-old housewife who, in January of 1979, fell off a toboggan and sustained a hyperflexion injury to her neck. She went home, and that same day was seen by a chiropractor who took x-rays of her cervical spine. He subsequently manipulated her cervical spine three times weekly for the next four weeks. She did not complain of pain again for the next several months, but in May of 1979 began to notice coldness and diminished sensation in her left hand which progressed to weakness of the small muscles of her hand. Further cervical manipulations did not offer any relief.

When she was admitted to hospital on June 5, 1979, there was an obvious and palpable deformity in her cervical spine. There was no detectable muscle wasting in her extremities. Sensation and motor power were normal and reflexes were bilaterally symmetrical. Plantar responses were downgoing.

An x-ray of her cervical spine on June 5, 1979, revealed a complete fracture-dislocation of C5 on C6 with the body of C5 completely anterior to C6 and lying parallel to the anterior surface of C6 (Figure 6).



Figure 6: Case two. Complete fracture-dislocation of C5-6, with the body of C5 lying completely anterior to C6.

This fracture-dislocation was subsequently greatly reduced by eleven pounds longitudinal traction (Figure 7). She was then taken to the operating room for wiring and fusion with bone graft of the spinous processes of C5-6 (Figure 8). She tolerated the procedure well and continued with skull tongs for the next two weeks. Two months after her operation she had no pain, no instability and the neurologic deficit had recovered (Figure 9).

We later requested the cervical spine x-rays from the chiropractor who initially treated this patient, and these films clearly demonstrate the fracture-dislocation (Figure 10).

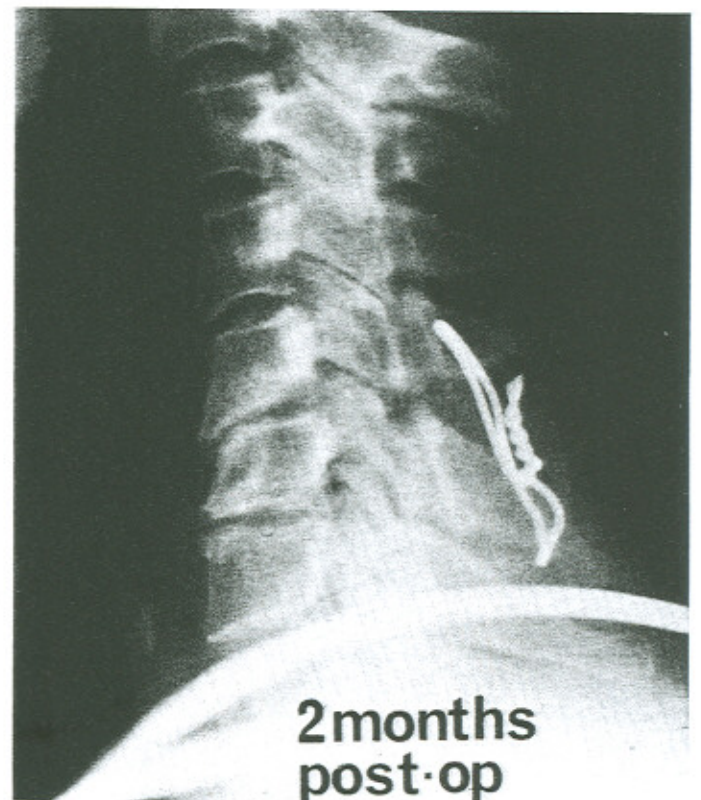


Figure 7: Case two. Lateral cervical view two days later, taken with 11 pounds of longitudinal traction being applied. Note the vast improvement in alignment!

Figure 9: Case two. Two months post-operatively; excellent alignment continues to be maintained. ▶



Figure 8: Case two. Immediately following a C5-6 wiring and fusion by bone grafting, showing excellent alignment.



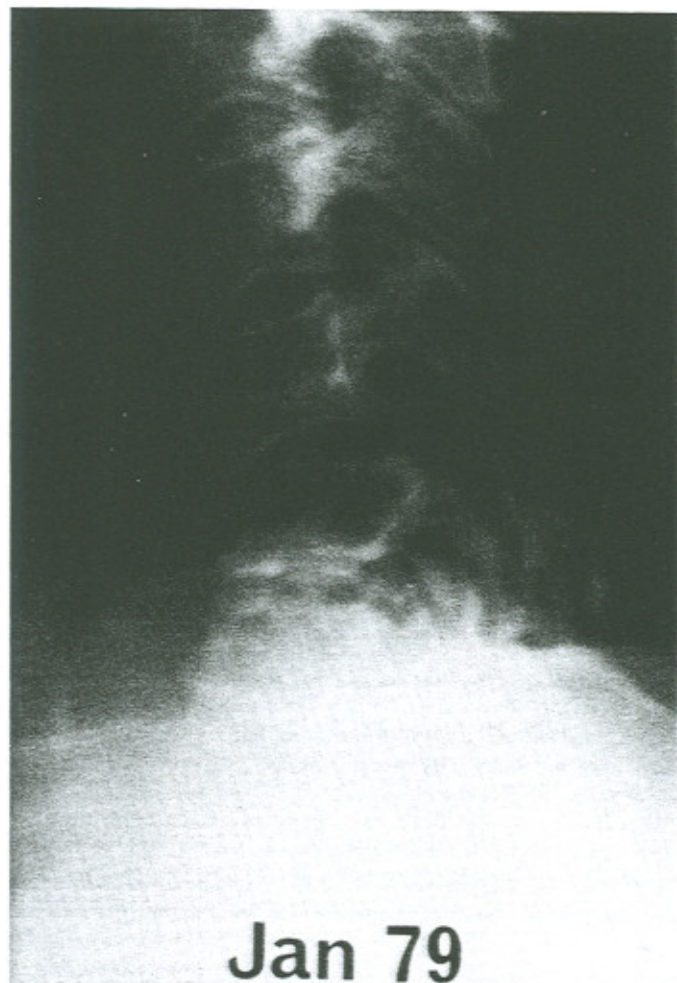


Figure 10: Case two. The chiropractor's films clearly show the C5-6 fracture-dislocation.

Case Three

L.B., a 21-year-old female lifeguard, rode her bicycle into the back of a trailer on August 12, 1985, sustaining a forced flexion injury to her neck. She felt immediate sharp interscapular pain and then became unconscious. She was transported by ambulance to a local hospital, where x-rays of her neck were taken and reported as normal (Figure 11). She was discharged, but ten days later returned to see her family physician, complaining of increasing neck and interscapular pain, as well as a protruding deformity in the cervico-thoracic region. The physician assured her that this was normal, gave her muscle relaxants and sent her home.

On August 24, 1985, she consulted a chiropractor who also took an x-ray, which he, too, reported to be normal. Manipulation and massage was administered, without benefit. She returned to her family physician, who again repeated cervical x-rays, this time including T1. These demonstrated a C7-T1

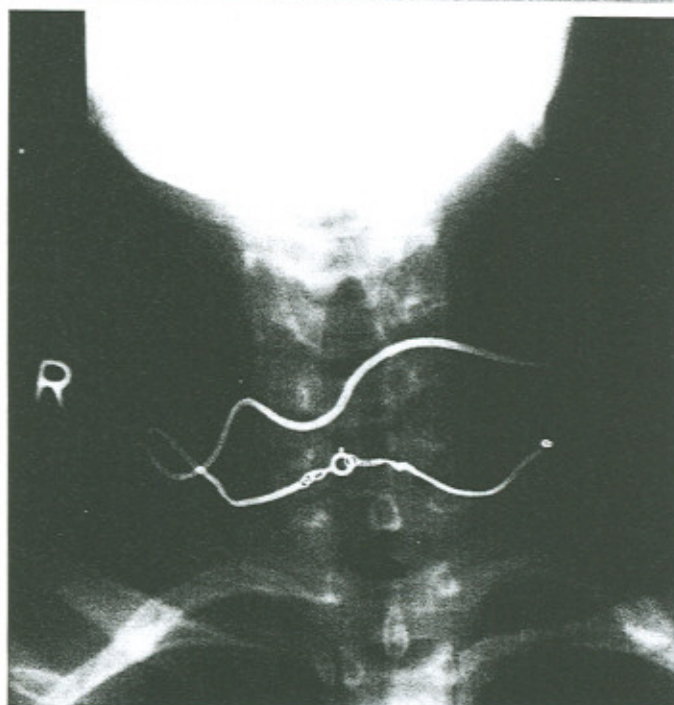
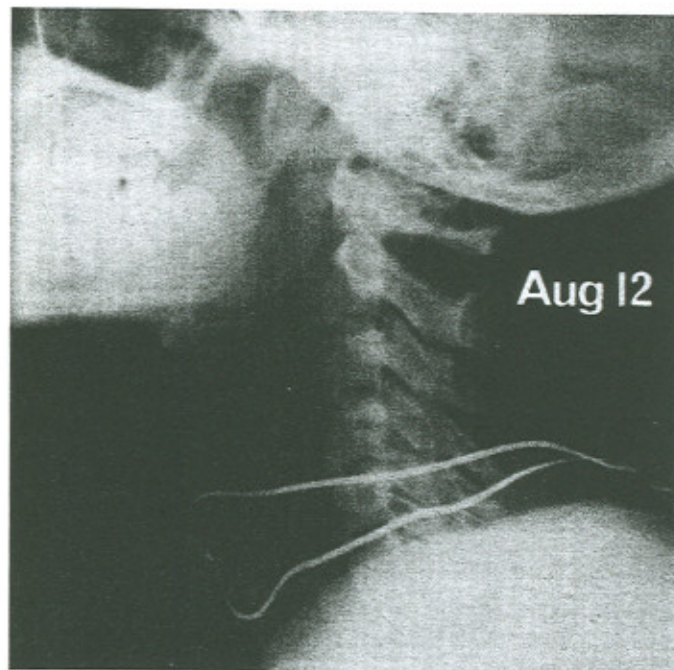


Figure 11: Case three.

- A) Lateral view of cervical spine that appears normal, however, this view is unacceptable because C7-T1 is not adequately visualized.
- B) A-P view, which also appears normal. There *may* be separation of the spinous processes of C7-T1 (arrow). This suspicion should have been confirmed with a repeat view of the lateral cervical view, but was not.



Figure 12: Case three. Lateral cervical view taken upon admission to hospital, including a clear view of C7-T1. Dislocation and anterior slippage of C7 on T1 is now clearly seen.



Figure 13: Case three. Two months following a C7-T1 fusion with interspinous wiring and bone grafting, showing good alignment and stability.

bilateral facet dislocation, and this was confirmed by her hospital admission films on September 5, 1985 (Figure 12).

Upon examination in hospital, she exhibited mild swelling and tenderness over the cervico-thoracic region with a gibbus deformity. There was no neurologic deficit.

After 19 hours of recumbancy in a cervical collar without traction, the posterior joints resumed their normal relationship. Four days later, she underwent a C7-T1 fusion with interspinous wiring and bone grafting. Total disruption of the supraspinous and interspinous ligaments between C7 and T1, as well as disruption of the joint capsules, was noted. Post-operatively, she did well. X-rays two months later showed a stable, intact fusion (Figure 13).

Discussion

Sudden, forceful movement of the head and neck from any cause may result in flexion, extension, traction, compression and rotational injuries. The joints between C5 and C6 are at the apex of a backward curve when the neck is in flexion. As such, these joints are more vulnerable to stress, strain and injury than other joints of the cervical spine.¹

The literature is inconsistent in describing instability of the cervical spine. The clearest and most often used definition is that of White et al in 1975. They state that, "Clinical stability is defined as the ability of the spine to limit its pattern of displacement under physiologic loads so as not to damage or irritate the spinal cord or nerve roots."² Therefore, stable fractures are those in which the ligamentous structures remain sufficiently intact to protect neural structures. Flexion instability results from tears of the posterior ligamentous complex, usually due to an injury which combines forced flexion and rotation.³ In the cervical spine, when flexion-rotation injury occurs with subsequent rupture of the posterior ligamentous complex, the articular processes may slide off each other, and the disc may rupture, resulting in a pure dislocation – a very unstable injury.

In stable fractures, reduction and immobilization are not always necessary, but in unstable cases, reduction, immobilization and fusion are frequently required. This is because of the risk of neurological improvement and because spontaneous fusion frequently does not occur following dislocation of the facet joints. The stability restored by the healing of the posterior ligaments is not reliable.⁴

Diagnosis of cervical spine fractures is essential for proper management and is usually not difficult. The most important principle to remember is to proceed with caution if the patient's history includes trauma to the cervical spine. A neurologic examination of the extremities should be done immediately, including tests of sensation, motor power and reflexes. Neurological deficit and/or pathologic reflexes may indicate spinal cord compression due to surrounding bone damage. Palpation of the spine may sometimes reveal the deformity, but this should be performed cautiously, bearing in mind the possibility of an unstable lesion.

In all cases of cervical trauma, x-rays should be obtained. Initial x-ray views need only include antero-posterior and lateral views to rule out gross bony abnormality. However, all spinal fractures should be considered unstable until proven otherwise. Dynamic views in flexion and extension are often obtained to help determine the stability of the neck. Care should be taken not to further injure the cervical spine during the x-ray examination. In cases where instability of the spine is strongly suspected, dynamic films should only be obtained in hospital with a surgeon present.

Case Three illustrates two important basic principles; first, a lateral cervical x-ray is not diagnostic unless the superior aspect of T1 is seen. Secondly, when there is persistent pain, repeat films are often prudent to ensure that something ominous has not been missed.

Manipulation of a patient with a traumatic cervical spine injury is contraindicated until the possibility of fracture and/or instability has been unquestionably eliminated.

Comment

These are interesting cases of patients who received manipulation from chiropractors after traumatic neck injuries without adequate clinical and x-ray evaluations. Fortunately, there were no serious consequences, and all the patients subsequently received appropriate evaluation and treatment. Diagnosis of these injuries is usually not difficult and can easily be made on the basis of an appropriate history, physical and x-ray examination.

Chiropractors should be wary of these injuries and not be lulled into a false sense of security by the low morbidity and mortality associated with spinal manipulative therapy. They should be aware that a physician's responsibility to a patient goes much further than providing treatment, and that a proper evaluation and diagnosis of the problem is equally important. In cases with a history of traumatic injury to the spine, chiropractors should proceed with caution and should not hesitate to obtain a second opinion on questionable cases.

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