



Occult ligamentous injury of the cervical spine associated with cervical spine fracture

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We report the case of a 20-year-old patient with a C5 cervical spine fracture and an undetected ligamentous lesion between C1 and C2. Cervical spine lesion protocols and the rates of lesions that are not diagnosed with standard evaluation protocols are reviewed, with particular emphasis on comatose patients. Dynamic studies during the surgical procedure for fixation of the fracture are recommended to increase the detection of ligamentous lesions.

Key words : cervical spine ; fracture ; ligament injuries.

INTRODUCTION

Cervical spine injuries are a fairly common consequence of motor vehicle accidents and are often associated with traumatic brain injury and a decreased level of consciousness (Glasgow Coma Score [GCS] < 8) (4). The incidence of cervical spine injuries concomitant with traumatic brain injury is between 4% and 8% (4). Meticulous examination and management of these patients is required in the emergency room, where up to 45% of high cervical injuries may be misdiagnosed (9) even when specific protocols are followed (1,3,4,5). Among traumatic brain injuries, 5.4% are associated with cervical spine injuries that are not detected with standard radiological examinations. Unfortunately, there are no uniform protocols for the detection of cervical ligamentous injuries in comatose patients. C1-C2 instability without asso-

ciated bone fractures cannot be diagnosed without performing a dynamic radiological examination.

CASE REPORT

A 20-year-old patient sustained a motor vehicle accident. He was diagnosed with traumatic brain injury as evidenced by lacunar haematomas in the frontal lobe, chest trauma with haemomediastinum and bilateral pulmonary contusion, pelvic fracture with a bilateral rotational component (Tile B3), and a C5 comminuted fracture with retropulsion of the posterior spinal cord and medullary canal invasion without spinal cord injury (fig. 1 & 2). After initial stabilisation and while still in coma, the patient was transferred to our hospital for surgical treatment of the cervical spine injury. A C5 corpectomy and C4-C6 instrumented fusion with autologous iliac crest bone graft was performed.

The patient recovered from the coma and the neurological outcome was good. Functional radi-

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Fig. 1. — Initial radiograph showing C5 fracture and normal anatomical relationship between C1 and C2.



Fig. 2. — Initial MRI showing C5 fracture with retropulsion of the spinal cord and normal C1-C2 relationship.

ographs of the cervical spine (fig. 3 & 4) showed C1-C2 instability that had been missed previously with the standard radiographic series. Computed tomography (CT) scanning and magnetic resonance imaging (MRI) disclosed a ruptured transverse ligamentous complex with a 10-mm C1-C2 dislocation (fig. 5 & 6).

A further surgical procedure was performed with posterior C1-C2 instrumented fusion. After a follow-up of four years, the patient has no pain and has a normal range of motion.

DISCUSSION

In the polytrauma patient, the cervical spine should remain immobilised until the region can be carefully assessed. Inability to collaborate in dynamic testing for a patient with a neurological deficit or altered mental status (e.g., comatose state, intoxication, etc.) raises doubts as to how long the cervical spine should keep immobilised. The overall incidence of cervical spine injuries associated with traumatic brain injury is between



Figs. 3 and 4. — Extension–flexion dynamic radiographs clearly depict instability of the C1-C2 segment.

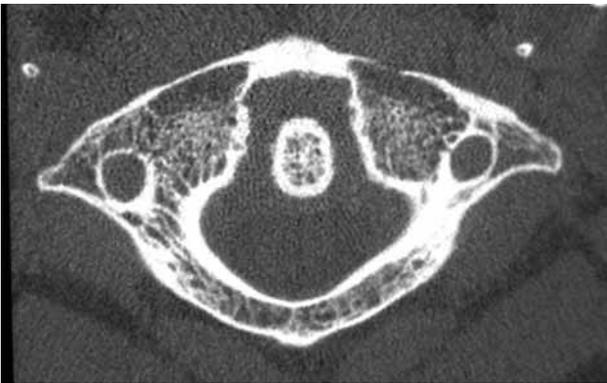


Fig. 5. — Axial CT scan showing the distance between the anterior arch of C1 and the odontoid process.

4% and 8% (4). Motor vehicle accidents as the mechanism of injury and a Glasgow Coma Score of less than 8 are associated with the highest rates of cervical injuries (4). Dynamic studies (traction, flexion, extension) visualise occult ligamentous injuries, but are not free of risk and, obviously, are not indicated in patients with vertebral fractures.

Most of the protocols for identifying cervical spine injuries following trauma recommend acquisition of lateral, anteroposterior and open-mouth odontoid views, and underline the difficulty of obtaining high quality radiographs in the emergency room. Almost 3% of occult cervical spine injuries are missed on standard radiography (6) and up to 45% of high cervical injuries are not visualised when CT and/or MRI are not performed (9). The Eastern Association for the Surgery of Trauma (EAST) has developed a protocol for the detection of cervical spine instability in the comatose patient, performing CT at the C0–C3 levels to reduce the number of missed diagnoses in the cervical spine ; nevertheless, 3%-4% of false-negatives and missed cervical spine injuries still occur (5,7). MRI is the most sensitive imaging modality for screening patients with suspected cervical injury, but fails to clearly establish the relationship between morphological injuries and clinically significant instability (high sensitivity, low specificity) (1).

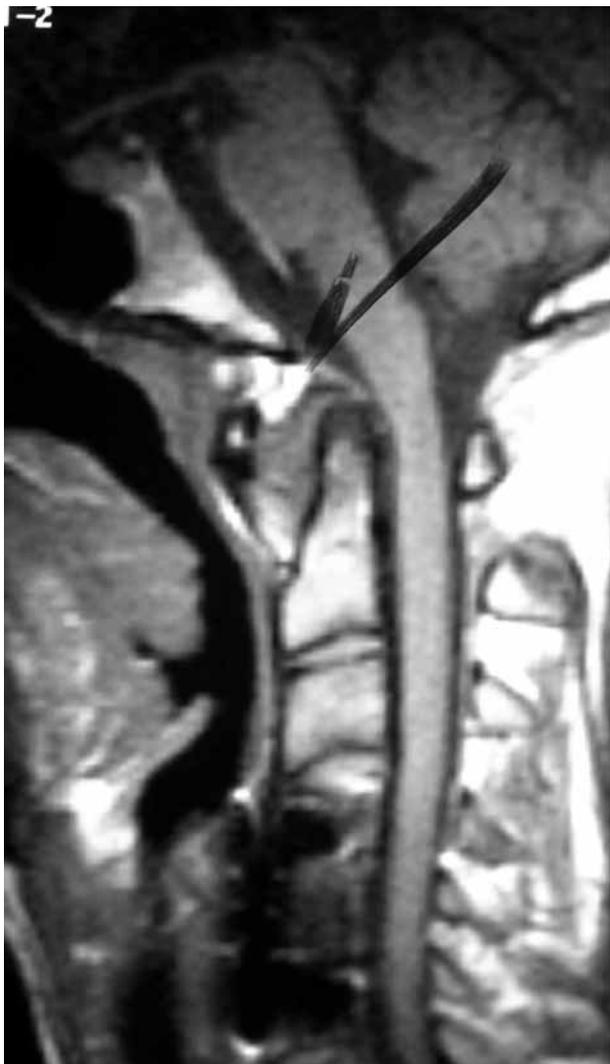


Fig. 6. — MRI after fixation of the C5 fracture discloses the increased distance between the anterior arch of C1 and the odontoid process.

Diagnosis of a C1-C2 ligamentous lesion without associated bone fracture cannot be made without dynamic tests ; hence, these must be performed as soon as possible in a patient with a suspected cervical spine injury, as recommended by the 1998 EAST protocol (2,8). The present case involved a ruptured transverse ligamentous complex with 10-mm C1-C2 dislocation, corresponding to

features in Dvorak's study in which various ligamentous complexes were cut and the distance between C1 and the odontoid was measured (3). In trauma patients with cervical injuries such as those in our reported case, we recommend acquisition of dynamic flexion and extension cervical spine views in the operating room, immediately after instrumented fusion of the fracture.

REFERENCES

1. **D'Alise MD, Benzel EC, Hart, BL.** Magnetic resonance imaging evaluation of the cervical spine in the comatose or obtunded trauma patient. *J Neurosurg* 1999 ; 91 (1 Suppl) : 54-59.
2. **Davis JW, Kaups KL, Cunningham MA et al.** Routine evaluation of the cervical spine in head-injured patients with dynamic fluoroscopy : a reappraisal. *J Trauma* 2001 ; 50 : 1044-1047.
3. **Dvorak J, Schneider E, Saldinger P.** Biomechanics of the craniocervical region : the alar and transverse ligaments. *J Orthop Res* 1998 : 452-461.
4. **Holly LT, Kelly DF, Counelis GJ, Blinman T, McArthur DL, Cryer HG.** Cervical spine trauma associated with moderate and severe head injury : incidence, risk factors, and injury characteristics. *J Neurosurg* 2002 ; 96 (3 Suppl) : 285-291.
5. **Marion D, Domeier R, Dunham CM, Luchette FA, Haid R, Erwood SC.** Determination of cervical spine stability in trauma patients (update of the 1997 EAST cervical spine clearance document). Available at : <http://www.east.org>. Accessed December 1, 2000.
6. **Mower WR, Hoffman JR, Pollack CV Jr, Zucker MI, Browne BJ, Wolfson AB.** Use of plain radiography to screen for cervical spine injuries. *Ann Emerg Med* 2001 ; 38 : 1-7.
7. **Pasquale M, Fabian T.** Practice management guidelines for trauma : EAST ad hoc committee on guideline development-identifying cervical spine instability after trauma. *J Trauma* 1998 ;44 :941-956.
8. **Robert KQ IIIrd, Ricciardi EJ, Harris BM.** Occult ligamentous injury of the cervical spine. *South Med J* 2000 ; 93 : 974-976.
9. **Schenarts PJ, Diaz J, Kaiser C, Carrillo Y, Eddy V, Morris JA Jr.** Prospective comparison of admission computed tomographic scan and plain films of the upper cervical spine in trauma patients with altered mental status. *J Trauma* 2001 ; 51 : 663-669.