

Compressive Hyperextension Injury of C2-C3 Managed With Anterior Plate Fixation: Case Report

ABSTRACT

We report a C2 tear-drop fracture of a 69-year-old patient which occurred after a fall. Although tear drop fractures of the subaxial cervical spine mostly develop due to a flexion type injury, the mechanism is often compressive hyper-extension injury at the C2 vertebra. Rigid external stabilization and internal fixation are the treatment alternatives. Internal fixation may be performed using the posterior or anterior approach. This paper describes a C2 tear drop fracture which was treated with an anterior plate fixation.

KEY WORDS: Cervical trauma, Tear drop fracture, Axis body fracture, Compressive hyper-extension injury

INTRODUCTION

Acute fracture of the axis makes up 20% of cervical spine fractures and nearly 20% of these are hangman's fractures that are attributed to develop from a disruptive hyperextension injury.

This paper presents a case with a C2 tear drop fracture. Although it is sometimes mistakenly thought to develop due to a flexion type injury, it actually occurs due to a compressive hyper-extension type injury. The typical findings in direct radiographs are generally an avulsed fragment from the anterior inferior angle of the body and backward displacement of C2 over C3.

CASE REPORT

A 69-year-old woman was diagnosed as having a hemothorax and a C2 fracture after a fall. A chest tube was inserted and she was referred to our hospital with a Philadelphia type collar. There were no neurological findings. Her radiological studies showed a fracture line in the C2 body and avulsion at the anterior inferior portion of the C2 body. Anterior longitudinal ligament disruption and posterior displacement of C2 over C3 were also detected but there was no isthmus or pedicle fracture (Figure 1-3). It was thought to be a C2 tear drop fracture. After skeletal traction for two days, the patient underwent C2-C3 anterior discectomy, allograft insertion and C2-C3 plating (Figure 4). The postoperative period was uneventful and she was discharged with a rigid collar without any neurological deficit.

DISCUSSION

Axis fractures make up 20% of cervical fractures and a fifth are Hangman's fractures. C2 body fractures are divided into three groups: vertical-cornally oriented, vertical sagittally oriented, transverse

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Figure 1: Lateral cervical X-ray showing C2 tear drop fracture.



Figure 3: T2-weighted sagittal MR image showing tear drop fracture and disruption of the anterior longitudinal ligament.

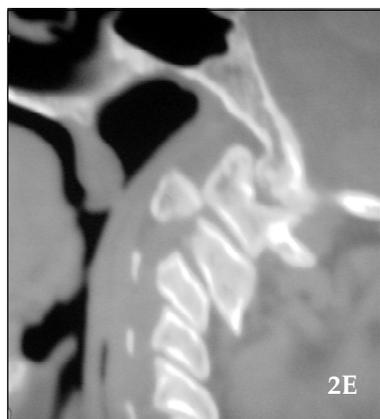
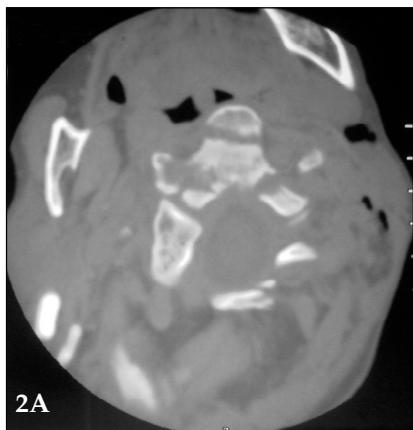


Figure 2: Axial (A,B,C) and sagittal (D,E) CT showing the fracture lines in the C2 body, but no fracture in isthmus or pedicle of the C2. The type of dislocation between C2 and C3 is posterior.



Figure 4: Postoperative cervical X-ray showing anterior plate between C2 and C3 and intervertebral graft.

axillary oriented (4). Isolated extension tear drop fractures and hyper-extension dislocations are variants of the type 1 C2 body fracture.

There are conflicting reports concerning the mechanism of tear drop fracture. The Allen-Ferguson classification is often employed for cervical trauma (1). Based on the dominant loading force and neck position, due to this classification, flexion with compression causes tear drop fracture, while extension with distraction causes disruption of anterior longitudinal ligament with retrolisthesis of the superior vertebra on the inferior one. Schneider and Kahn first described tear drop fracture as an acute flexion type injury (2).

Different injury mechanisms may lead to fractures that may seem to be similar at radiological studies. Tear drop fractures are often mistakenly thought as a result of hyperextension injury due to retrolisthesis. Radiological features include fracture through the sagittal plane of the body, a small piece of bone avulsion at the anterior inferior portion of the vertebral body, posterior dislocation of the upper column of the spine, widening of the interlaminar

and interspinous spaces and kyphotic deformity (2). Tear drop fractures must also be distinguished from simple avulsion fractures usually pulled off by traction of the anterior longitudinal ligament in hyperextension.

Extension tear drop fracture is a different type of injury with posterior dislocation of the upper vertebra, anterior longitudinal ligament disruption and avulsion at the anterior inferior portion of the body with an acute extension injury. The preferred site for extension tear drop fracture is the C2 vertebra. Hyper-extension type tear drop fracture of the axis represents 3% of cervical spine traumas (3). As the odontoid process of the axis may act as a moment arm, multiple potential mechanisms of injury can be applied to the C2 body through the odontoid process (4). With a hyperextension injury, the radiological features may include posterior laminar fractures with avulsion of the anterior longitudinal ligament, retrolisthesis, tissue swelling, widening of the disrupted intervertebral disc, and avulsion of the anterior inferior margin of the vertebral body. The posterior longitudinal ligament may also be disrupted and it is an unstable type of injury. C2 extension tear drop fractures are extremely rare and differ in many aspects from flexion teardrop fractures that are more common on the lower C-spine. On the other hand, the injury should be stabilized if unstable whether the injury mechanism is extension or flexion. The exact pathological mechanism of spine injuries may not be identified in some cases.

Rigid external stabilisation with a halo device or internal fixation is the treatment of choice after cervical traction. Overdistraction must be avoided. The internal fixation techniques enable early mobilization. Internal stabilization may either be performed using an anterior or a posterior fixation. Anterior fixation, which we also performed, has the advantage of having anterior support and a large fusion site. Posterior fixation and fusion may also produce adequate results, but disc protrusion should be excluded especially after reduction. Combined anterior and posterior fixation and fusion may also be performed although we do not think that it is necessary.

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