

A Fracture of Unilateral Pars Interarticularis of the Axis: A Case Report

ABSTRACT

OBJECTIVE: To present a case of a fracture of the unilateral pars interarticularis of the C2.

METHODS: There is confusion in the use of anatomic terminology of the pars interarticularis and pedicle of the C2 in literature. A fracture of the unilateral pars interarticularis of the C2 was diagnosed and treated nonsurgically by a Philadelphia collar.

RESULT: The patient was free of pain and obtained a full range of motion.

CONCLUSION: The presumed mechanism of injury in the fracture described here was hyperextension and axial loading.

KEY WORDS: C2 fracture, Unilateral pars interarticularis, Axis

INTRODUCTION

The cervical spinal region is very susceptible to impact injury. The complex structures of C1 and axis (C2 vertebra) serve as a transmission zone from the cranium to the lower cervical spine (C3-C7) (1, 2, 3, 4, 5, 6, 7). Application of sudden disruption forces will detach the junction of the cervico-cranium with the pars interarticularis of the neural arch of C2 from the lower cervical spine by fracturing, as in a hangman's fracture (5).

Acute traumatic fractures of the C2 are usually seen in cervical spine injuries. Odontoid process fractures and traumatic spondylolisthesis are very common in C2 fractures and have been described previously by many authors (2, 3, 4, 5, 8). However, not many articles have reported fractures of the unilateral pars interarticularis of the C2.

There is confusion in the description of the anatomical location of pars interarticularis of the C2 in the medical literature and clinical applications. The pars interarticularis or isthmus is the narrower portion between the superior and inferior facets and located posteromedial to the transverse foramen (1, 2, 3, 4).

We reported a case of fractures of unilateral pars interarticularis of the C2 and defined the precise locations of the pars interarticularis and pedicle.

CASE REPORT

A 38-year-old man was admitted to the emergency department after being involved in a traffic accident. The patient noticed moderate neck pain without any other symptoms. He had no neurological deficit. A right frontal scalp injury was visible.

A lateral cervical radiograph showed no abnormal finding. Spinal computed tomography with bone window showed a fracture of the unilateral pars interarticularis of the C2 (Figure 1).

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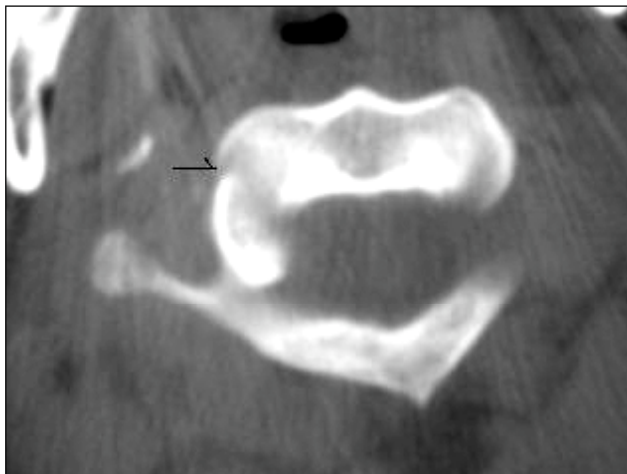


Figure 1: Spinal computed tomography showed a fracture of the unilateral pars interarticularis of the C2.

A rigid Philadelphia type external cervical collar was applied to the neck. He was discharged 3 days later after admission. The follow-up period was 16 months.

DISCUSSION

Traumatic C2 fractures are relatively common pathologies in neurosurgical practice. Greene et al (9) analysed C2 fractures of 340 patients and classified these into three types: odontoid fractures, bilateral traumatic spondylolisthesis of C2 with pars interarticularis fractures (hangman's fractures), and miscellaneous fractures. They noted that odontoid fractures were the most common, accounting for 199 of patients (58%); 74 patients (22%) sustained hangman's fractures, and 67 patients (20%) had miscellaneous fractures. Fractures of the odontoid process and traumatic spondylolisthesis have been widely described previously, but fractures of the unilateral pars interarticularis of the C2 are uncommonly reported in the literature.

The anatomic term of pars interarticularis has not been well defined in literature. In the lumbar spine, the portion that connects posterior elements with the vertebral body is named as the pedicle, and the portion located between the superior and inferior articulating facets named as the pars interarticularis or isthmus (Figure 2). Biomechanically, this region is the weakest portion because the superior and inferior facets are not oriented in same plane. The angular and shear stresses are maximal in this region during hyperextension and axial loading.

The presumed mechanism of injury is unilateral axial compression occurring in association with an

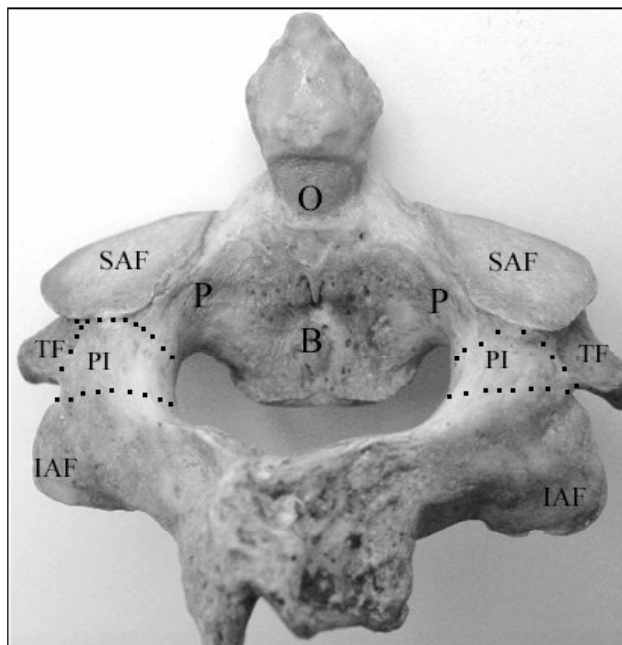


Figure 2: Portion located between the superior and inferior facets as the pars interarticularis or isthmus.

asymmetrical lateral or rotational component of the atlas on unilateral pars interarticularis of the C2. Our patient had a head injury at the right frontal area, supporting the axial compression force as the injury mechanism of the pars interarticularis fracture of the C2. Another mechanism of injury of the unilateral pars interarticularis is angular and shear stresses with hyperextension and axial loading.

Radiographical diagnosis of the unilateral pars interarticularis fractures is difficult. Plain X-ray usually does not show any finding. CT images with bone window and three-dimensional reconstruction of CT of the C2 are the gold standard in the neuroradiological evaluation. Treatment strategies for traumatic fracture of the pars interarticularis of C2 can be conservative and surgery depends on the type of fracture. Most patients with pars interarticularis fractures reported in the reviewed literature were treated with cervical immobilization with good results. Effendi et al. reported that surgery should be reserved for unusual Type III fractures and those patients with failure of fusion despite 3 months of halo immobilization (10).

Moderate or severe neck pain may be the only symptom in the patient with unilateral pars interarticularis fractures of the C2. Unilateral undisplaced fracture of the pars interarticularis of the C2 is a stable fracture. Conservative management

with external immobilisation (Philadelphia type rigid cervical collars) is usually sufficient.

Running Head: Unilateral fracture of pars interarticularis of C2.

Abbreviations:

Axis: C2

Computed Tomography: CT

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