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Case Report

Hangman's fracture surgical management with posterior C2-4 fusion: Case description and literature review

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Abstract

Background: Hangman's fractures of the C2 verebrae represent approximately 20% of all cervical fractures. They are challenging cases and there is still no consensus regarding the optimal surgical vs nonoperative treatment.

Case Description: A 40-year-old female presented with a C2 bilateral pars articularis fracture. She exhibited a partial spastic quadriparesis. Computed tomography and magnetic resonance imaging showed a C2 "hangman's" fracture with compromise of the C2-3 intervertebral disk. Adequate reduction of the fracture and subaxial stabilization were achieved utilizing C2 transarticular and C3-4 transfacet screws.

Conclusions: The optimal management of unstable hangman's fractures remains controversial. They represent challenging cases, and new treatment options are available. Here, we successfully utilized a C2 transarticular and C3-4 transfacet screw fusion without neurological sequelae.

Key Words: C2 transpedicular screws, Hangman's fracture, posterior fusion

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INTRODUCTION

In 1964 Garber introduced the term "traumatic spondylolisthesis of the axis.".[3] A year later Schneider noted the similarity with judicial hangings, and introduced the term "hangman's fracture."[8] These fractures are defined by bilateral laminae, articular facets, pedicles, and/or pars articularis fractures of the axis, and are typically attributed to trauma (e.g., motor vehicle accidents, falls, or diving). Nevertheless, there are different management and surgical options for treating hangman's fractures, and, particularly for types II, IIa, and III (e.g., according to Effendi, Levine, and Edwards).[2,5]

CASE DESCRIPTION

A 40-year-old female, following a motor vehicle accident, presented with severe neck pain and decreased motor function (e.g. 4/5 in the right arm, left arm 2/5 proximally, 1/5 distally, but 5/5 in both lower extremities). Reflexes were diminished in both arms, and she had no sensory deficit. Magnetic resonance imaging (MRI) and computed tomography (MRI) documented a C2 Hangman's fracture type IIa [Figures 1 and 2]. MRI also showed rupture of the C2-3 intervertebral disk and ligaments at the C1-2 junction, resulting in angulation of 13.3 degrees [Figure 3].

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Cervical surgery

The patient underwent a posterior instrumented fusion performed under fluoroscopy. First, C3 and C4 facet screws were placed followed by bilateral C2 transpedicular screw application. Prior to the placement of 2 titanium bars, the C2-3 subluxation was reduced with active manipulation of the craniocervical joint under direct fluoroscopy. Next, 2 titanium bars/six locks, cross link, and 10 ml of bone matrix were applied [Figures 4-8].

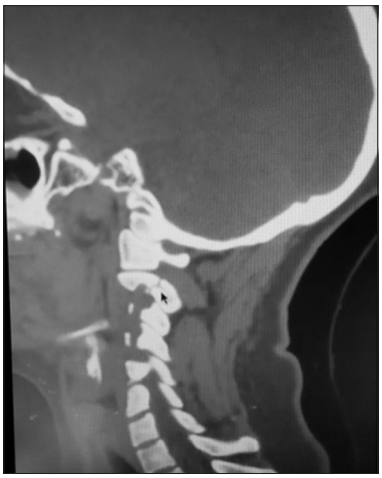

Figure 1: CT sagital scan showing C2 Fracture

Figure 3: Sagital MRI that shows the angulation greater than 11 grades and comprise of the C2-3 intervertebral disc

Figure 5: Sagital CT scan that shows reduction of fractured elements

Figure 2: CT axial scan showing bilateral facet C2 fracture

Figure 4: Axial CT scan that shows adequate reduction of C2 fracture with transpedicular screws

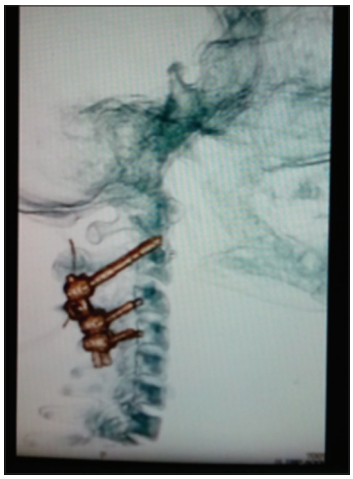

Figure 6: 3D reconstruction showing posterior C2-4 fusion

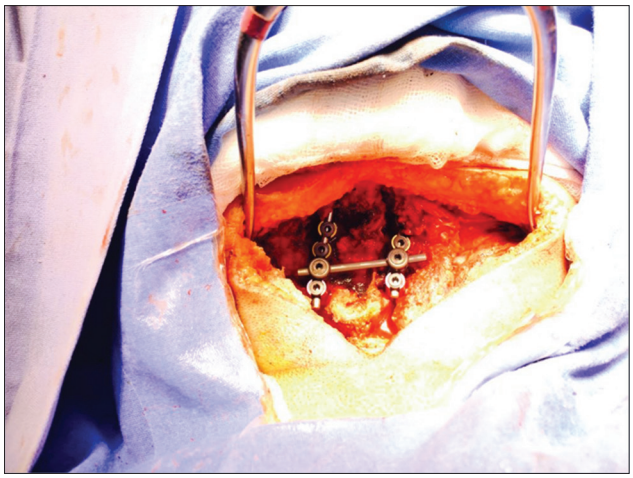

Figure 7: Transoperative view of the cervical screws in place

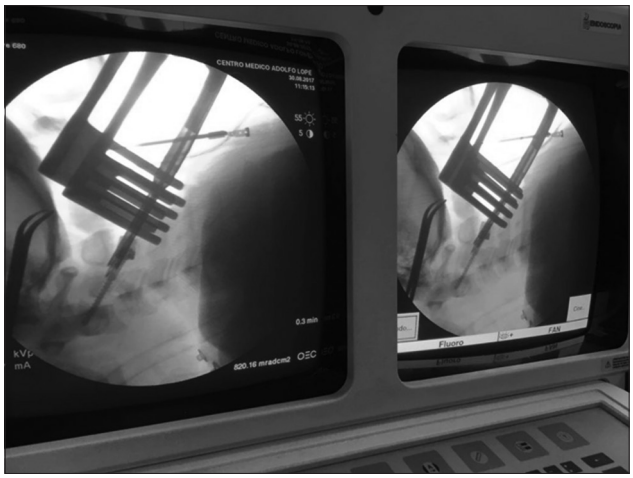

Figure 8: Transoperative fluoroscopic control showing adequate placement of cervical C2-4 screws

Postoperatively, the patient regained motor function as follows: right arm 4/5, left arm 3/5 proximal and distal, and both legs remained at 5/5 (Daniels scale). Reflexes in both her arms also improved +/++.

DISCUSSION

Hangman's fractures (bilateral fracture of pars interarticularis) constitue approximately 20% of all C2 injuries, and the optimal management of unstable hangman's fractures remains controversial.[6,7,9]

The optimal management of unstable hangman's fractures (Effendi, Levine, and Edwards types II, IIa and III) remains controversial, and different approaches have been recommended.

Available surgical options include anterior C2-3 discectomy with fusion, posterior C2-3 fusion, r C2 pars pedicle screw fusion alone, and combined anterior and posterior fixation.[9] Here, a patient with a hangman's Fracture underwent a posterior instrumented fusion with C2 transarticular and C3-4 transfacet screws without neurological sequelae.

Nonoperative management

Management guidelines in the literature are based on level III evidence. External immobilization is recommended for the initial management of traumatic spondylolisthesis. Most authors suggest nonoperative treatments for stable fracture types.[1]

Surgical management

Surgical stabilization and fusion are reserved for severe angulation of C2 over C3, disruption of C2-3 disk, and/or inability to achieve/maintain fracture alignment with external immobilization. In 2006, Li *et al*. reviewed the management of hangman's fractures and concluced that patients with Effendi, Levine, and Edwards IIa and III might be candidates for surgical stabilization and fusion.[6] In 2017 Kovari *et al*. described a mini open approach for a posterior C2 fracture fixation and fusion with transpedicular and transmuscular screws.[4] Here, we concluded that surgical reduction with posterior cervical fusion was the best operative choice, and included the placement of bilateral C2 transpedicular screws and bilateral C3-4 transfacet screws.

CONCLUSION

Here, the patient presented an unstable C2 Hangman's fracture successfully managed with the placement of bilateral C2 transpedicular screws and bilateral C3-4 transfacet screws.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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