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Review Article

Clinical Outcome Following Halo-Traction and Surgical Fusion of Acute C2 Fracture-Dislocation: A Case Report

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Keywords

- Odontoid fracture
- Dens
- Halo-Traction
- C1-2 screw fixation
- Anderson D´Alonzo Type II

Abstract

Background Context: 25% of all cervical spinal injuries affect the axis. The nonunion rate for odontoid fractures is between 4% and 64% depending on the fracture site and method of treatment. Posterior fixation of C1-2 achieves higher fusion rates compared to conservative treatment

Purpose: To report the successful clinical outcome following Halo-traction and surgical fusion of acute C2 fracture-dislocation.

Methods: An 89-year-old woman was brought to the emergency department with complaints of inability to stand without support and complete loss of motor power in the right upper limb. The patient was admitted in the department of Neurology suspicious of a stroke. The stroke was later excluded and further diagnostics revealed an acute C2 dens fracture-dislocation, Anderson D´Alonzo Type II.

Results: The patient underwent Halo-Traction to reduce the dislocation preoperatively and surgical fusion of odontoid fracture. Post-surgery, patient showed significant recovery of her motor power in right upper limb and was also able to walk with walker support.

Conclusion: Treatments of odontoid fracture type II and III are associated with favorable clinical outcomes. Surgical treatment by posterior fusion yields a better fusion rate and shorter healing time thereby greatly improving quality of life.

INTRODUCTION

More than 60% of spinal injuries involve the cervical spine, and about 25% of all cervical spinal injuries affect the axis [1,2]. The most common axis injury is odontoid fracture, of which the majority are type II or type III dens fractures [1,3]. Treatment strategies for odontoid fractures are based on fracture type, the degree of initial dens displacement, the angulation of the dens with respect to the body of C2, and the age of the patient. The nonunion rate for odontoid fractures is between 4% and 64% depending on the fracture site and method of treatment [4-6].

Therapeutic options range from conservative treatment, including soft neck collars, rigid cervical orthosis and halo-vest immobilization, to surgical treatments including anterior screw fixation, posterior C1-2 screw fixation, or transarticular screw fixation.

Non-surgical treatment with cervical collar or halo-vest immobilization may provide adequate support in type II or type III stable fractures. Posterior fixation of C1-2 achieves higher fusion rates compared to conservative treatment, but is a challenging surgical technique [7-10].

In this case report, we prospectively analyzed preoperative and postoperative clinical and radiographic findings of a patient with odontoid fracture-dislocation who was initially treated with Halo-traction and later surgical fixation using the posterior approach. Efficacy and treatment outcomes are discussed.

CLINICAL PRESENTATION

In December 2012, an 89-year-old woman was brought to our hospital emergency service with complaints of inability to stand without support and complete monoplegia of the right upper limb. She also had slurred speech and appeared confused. The patient was admitted in the Department of Neurology suspicious of a stroke. The stroke was later excluded and further diagnostics showed an acute C2 dens fracture-dislocation, Anderson D´Alonzo Type II.

Evaluation and Assessment

X-ray film of the cervical spine: Dislocation of dens at the base consistent with Anderson D'Alonzo type2. There was no lateral overhang of the dens (Figure 1).

Computerized Tomography (CT) of cervical spine: Diagonally running fracture line through the body of C2 vertebra. The cranial part of the dens was shifted dorsally resulting in spinal cord being pressed by a dish shaped part of the outgoing dens fragment. Other CT findings included Osteopenia and spondylosis of the spinal column, atlanto-axial arthritis and chondro-calcinosis of intervertebral disc area C2-C3 (Figure 2).

MRI of cervical spine: Dens Fracture with dislocation and relative narrowing of spinal canal.

PROCEDURE AND OUTCOME

Halo-traction was applied after proper understanding of the fracture pattern. After couple of days of traction, patient underwent operative procedure - Harms technique of C1-C2 fixation and fusion with polyaxial screws and rods (Figure 3 and Figure 4).

Post-operatively, patient showed excellent recovery of motor power in the right upper limb and was also able to walk with walker support (Table 1).

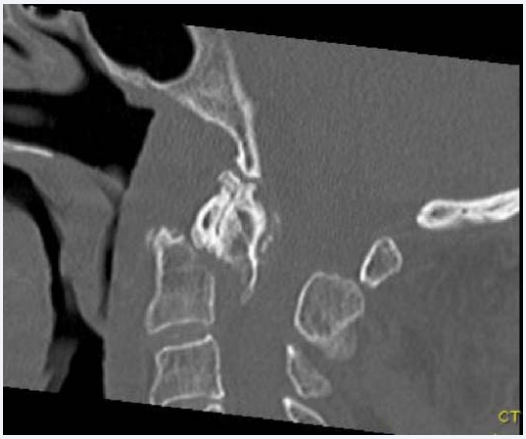

Figure 1 CT scan cervical spine showing dens fracture dislocation.

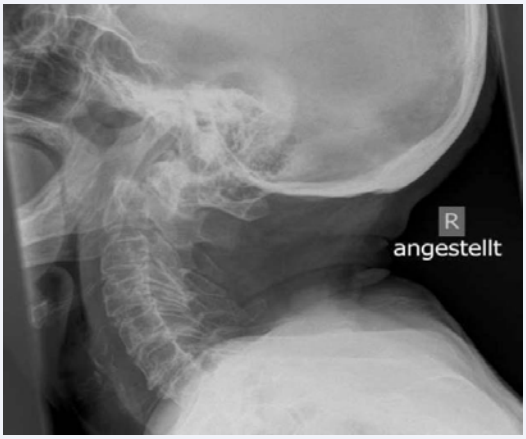

Figure 2 Lateral view cervical spine showing dens fracture.

Figure 3 Post op AP view showing C1-C2 fixation.

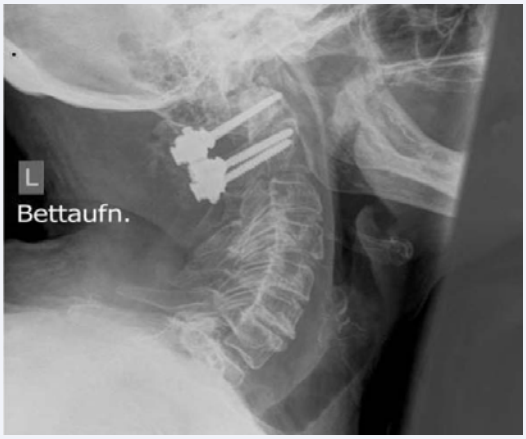

Figure 4 Post op lateral view showing C1-C2 fixation.

Table 1: Clinical outcome of muscle power in affected right upper limb after surgery. (MRC – Medical research council - United Kingdom).

Muscle group (Right upper limb)	MRC grading (Before surgery)	MRC grading (After surgery)
Elbow Flexion	0/5	4/5
Elbow Extension	0/5	4/5
Wrist Flexion	0/5	+3/5
Wrist Extension	0/5	+3/5
Finger Flexion	0/5	3/5
Finger Abduction	0/5	3/5

DISCUSSION

Type I and type III odontoid fracture based on the Anderson and D'Alonzo classification tend to heal well with external immobilization (healing rate of nearly 100% in type I and 84-88% in type III) [11,12]. Some reports cite nonunion rates ranging from 35% to 85% with nonsurgical management) [6,12,13]. In particular, treatment options for type II fractures

or type III fractures associated with atlanto-axial instability remain controversial [11,12]. Many authors advocate surgical intervention for fractures associated with atlanto-axial instability) [9,14].

The goals of odontoid fracture treatment are radiographic bony fusion, relief of pain, and maximized quality of life.

Surgical options, including posterior fusion of the C1 and C2 vertebrae using wire/cable instrumentation, have demonstrated fusion rates of 87% and 100% for type II and III fractures respectively [15,16]. This procedure is associated with morbidity and mortality rates between 2% and 4%. Specific complications include vertebral artery injury and new onset neurological deficits. C1 to C2 fusion also causes the loss of atlantoaxial movement, rendering the patient unable to rotate his or her head.

Several studies have reported that the healing rate after surgical treatment is superior to that after conservative treatment for odontoid fractures [15,17]. Clark and White documented a 96% healing rate after posterior surgery [18]. Surgical stabilisation of odontoid fractures type II improves survival in patients between 65 and 85 years of age compared to nonsurgical treatment. Posterior atlantoaxial fusion for odontoid fractures type II in the elderly has the greatest bony union rate. The complication rate of nonsurgical treatment is similar to the complication rate of surgical treatment of odontoid fractures type II in the elderly [19].

Other radiological factors related to bony fusion are the degrees of angulation and translation. Apuzzo et al., found that odontoid fractures that were displaced more than 4 mm healed 12% lower than overall 64% union rate [15]. They concluded that external immobilization was appropriate for the treatment of nondisplaced odontoid fractures, but that fractures displaced more than 4 mm were candidates for primary fusion.

Rates of odontoid non-union are high in patients with geriatric odontoid fractures that are treated conservatively [20]. However, as with many degenerative and traumatic conditions of the spine, treatment decisions must be based on individual patient characteristics and fracture patterns to optimize outcomes.

CONCLUSION

The Harms fixation of C1-C2 is a very effective technique for stabilizing the atlantoaxial complex. It enables us to provide temporary fixation without damage to atlantoaxial joints and to reduce the vertebrae after the screws and rods had been inserted, which is unique. Surgical treatment by posterior fusion yields a better fusion rate and shorter healing time. Further randomized, controlled trials are required to define optimal treatment strategies for this complex clinical problem.

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