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Case Report

A case of cervical myelopathy following chronic hypertrophic non-union type 2 odontoid fracture managed with posterior C1 decompression and C1-3 instrumentation: Case report and brief review of literature

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ABSTRACT

Background: Type 2 odontoid fractures are the most common type of fracture of the axis. In rare cases, nonunion of a type 2 odontoid fracture can be hypertrophic resulting in myelopathy due to cervical cord compression.

Case Description: A 48-year-old male presented with hypertrophic nonunion of a chronic type 2 odontoid fracture resulting in cord compression/myelopathy. This was adequately treated utilizing a C1 decompression and C1-3 instrumented fusion; no anterior procedure was necessary.

Conclusion: Here, we successfully treated a patient with a hypertrophic nonunion of a chronic type 2 odontoid fracture utilizing a posterior only approach consisting of a C1 laminectomy with C1-C3 fusion.

Keywords: Fracture, Hypertrophic, Myelopathy, Non-union, Odontoid

INTRODUCTION

Type 2 odontoid fracture is the most common type of fracture of axis and most common cervical spine fractures in elderly population. Incidence in the USA is estimated 21.4/100,000 inpatient.[4,7] In rare cases, chronic nonunion of type 2 odontoid fractures can become hypertrophied resulting in ventral cord compression/myelopathy.[9] Nonunion type 2 odontoid fractures are usually managed with combined anterior/posterior decompressions/fusions.[2,6,8] Here, we present a 48-year-old male with a chronic nonunion of a type 2 odontoid fracture resulting in cord compression/myelopathy adequately managed with a posterior surgery alone (i.e., C1 decompression and C1-C3 instrumented fusion).

CASE DESCRIPTION

Clinical presentation

A 48-year-old male presented with chronic neck pain and 4 months of progressive myelopathy (i.e., unsteady gait and clumsiness). Two years ago, he had fallen from 2 m height, hitting his

head and neck on the ground. Since then, he continued to experience Lhermitte's signs. On examination, he had no motor or sensory deficits, but exhibited a spastic gait, bilateral Hoffman's sign, diffuse upper and lower extremity hyperreflexia, and bilateral ankle clonus.

Diagnostic studies

Cervical spine X-ray and computed tomography (CT) studies confirmed an old nonunited displaced fracture at the base of the odontoid process of the C2 vertebra narrowing the spinal canal at the C1-2 level due to displacement of C1 [Figures 1 and 2]. The magnetic resonance imaging of cervical spine showed severe canal stenosis and T2 hyperintense cord signal changes at level of C1 [Figure 3].

Surgery

The patient underwent awake fiber-optic endotracheal intubation. Intraoperative neurophysiological monitoring included somatosensory evoked and motor evoked potentials.

A C1 decompressive laminectomy was performed and all were placed under CT neuronavigation guidance. These included lateral mass screws at C1 applied (32 × 3.5 mm partially threaded), bilateral C2 pars articularis screws (18 × 3.5 mm), and C3 lateral mass screws (16 × 3.5 mm). After the rods were applied, the intraoperative CT showed reduction of the C1/2 malalignment. Routine completion of the Instrumentation and closure followed [Figures 4 and 5].

DISCUSSION

Frequency of type 2 odontoid fractures resulting in nonunion

Odontoid fractures are the most common fractures involving axis and are the most frequently encountered cervical spine fractures seen in adults over 65 years of age. Nonoperative management is associated with a high risk of nonunion (i.e., 36.3%).[7]

Figure 1: Preoperative X-ray cervical spine lateral showing old nonunited fracture of the base of the odontoid process of C2.

Incidence of hypertrophic nonunion of type 2 odontoid fractures

Hypertrophic nonunion of type 2 odontoid fracture is rare. Of five such cases found in the literature, four were managed with anterior decompression/posterior fusion, while one was treated nonsurgically [Table 1].[1,3,5,9] We believe that the combined anterior/posterior approach is not always needed and increases the risks/complications for older patients. As

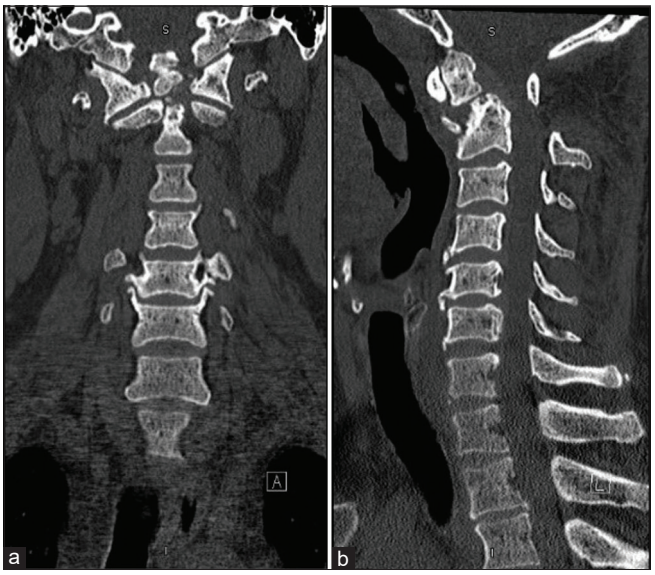

Figure 2: (a) Preoperative computed tomography (CT) cervical spine coronal showing old nonunited fracture at the base of the odontoid process of C2 with narrow spinal canal at C1-2 levels. (b) Preoperative CT cervical spine sagittal showing old nonunited fracture at the base of the odontoid process of C2 with narrow spinal canal at C1-2 levels.

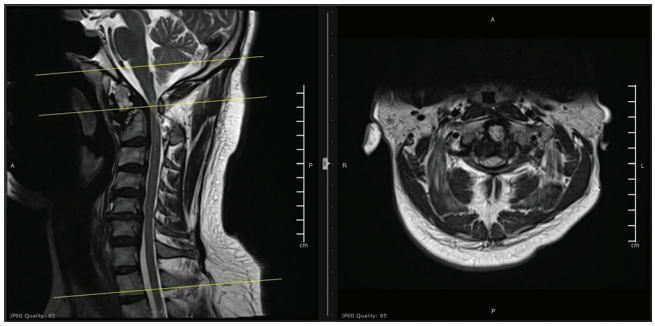

Figure 3: Preoperative magnetic resonance imaging cervical spine sagittal and axial showing in addition to old odontoid fracture thickening of ligamentous complex surrounding C2 fractured dens, severe canal stenosis, and cord signal changes below craniocervical junction.

Table 1: (Adopted from Shamji *et al.*, 2015)[9] Reported cases of chronic hypertrophic malunion of odontoid fractures since 1993.

Author/year	N	Patient data	Delay from fracture (years)	Management
Crockard (1993)[3]	2	30 females 55 males	4 5	Anterior transoral decompression and posterior atlantoaxial (C1-C2) instrumented fusion Outcome: improved anterior transoral decompression and posterior atlantoaxial (C1-C2) instrumented fusion Outcome: improved
Ho (2010)[5]	1	87 males previous head injury, progressive lower extremity weakness	2	Nonoperative Outcome: no change
Shamji *et al.*, 2015[9]	1	68 females history of MVA, progressive upper extremity loss of coordination and sphincter dysfunction	25	Anterior transoral decompression and posterior occipitothoracic (O-T1) decompression and instrumented fusion Outcome: improved
Bashir *et al.*, 2019[1]	1	43-year-old male with quadriparesis	28	An anterior cervical C2 decompression with a C1- C3 posterior fusion, followed by utilization of a hard collar
Our case	1	48-year-old male with neck pain unsteady gait	2	C1 posterior arch decompression, C1,2,3 screw fixation Outcome: improved

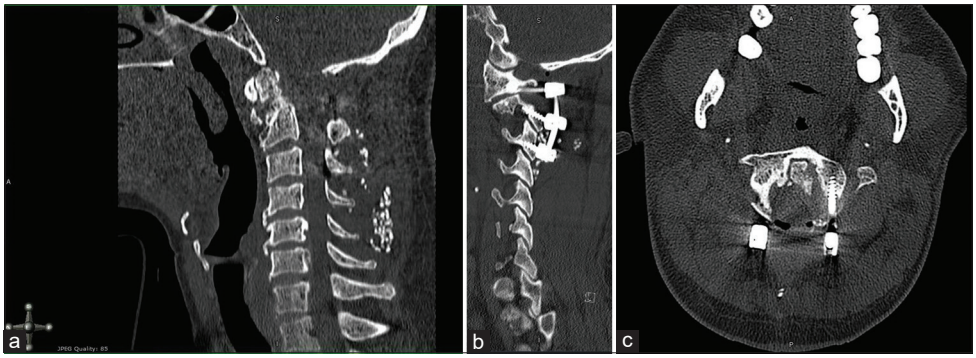

Figure 4: (a) Postoperative computed tomography (CT) cervical spine showing posterior decompression of C1 sagittal views. (b) Postoperative sagittal view showing screws and rods in C1, C2, and C3. (c) Postoperative CT axial at level of C1 showing lateral mass screws of C1.

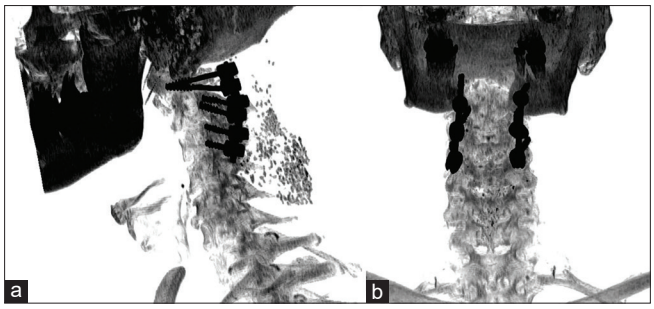

Figure 5: (a) Postoperative computed tomography (CT) cervical spine three-dimensional (3D) reconstruction view. (b) Postoperative CT cervical spine 3D reconstruction view.

we found here, a posterior only alternative procedure proved effective. In our case, we successfully utilized a posterior-only approach consisting of a C1 decompression with a C1-C3 posterior fusion.

CONCLUSION

We recommend a posterior only approach consisting of a C1 laminectomy with C1-C3 posterior fusion for managing a hypertrophic chronic nonunion of a type 2 odontoid fracture.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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