

CASE REPORT



Neglected floating cervical spine fracture with myelopathy and Anderson lesion of D2 D3: report of an unusual case

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INTRODUCTION: The cervical spine is the most commonly affected region in traumatic spine injuries of patients with Ankylosing Spondylitis (AS), accounting for 75% of cases, followed by the thoracic and lumbar spine. The fracture may not be detectable in plain radiographs alone due to pre-existing kyphotic deformity with distorted anatomy and high-riding shoulders.

CASE PRESENTATION: We present a case with a floating cervical spine following a trivial trauma injury and with cervical myelopathy symptoms. After posterior fixation of the cervico-thoracic spine, the patient improved with Nurick score and mJOA score improvement. After 6 months follow up the patient was walking without support, and myelopathy symptoms were negligible.

DISCUSSION: In this patient, a posterior approach was performed. We obtained a rigid construct so that we were able to mobilize a patient on the very next day and his myelopathy symptoms improved with minimal postoperative complications.

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INTRODUCTION

The cervical spine is the most commonly affected region in traumatic spine injuries of patients with Ankylosing Spondylitis (AS), accounting for 75% of cases, followed by the thoracic and lumbar spine [1]. Long lever arm due to extensive ossification of disco-ligamentous complex renders the mobile cervical spine often unstable with potentially devastating consequences. The instability can ensue even with trivial trauma. The sub-axial cervical spine is the most frequent site of traumatic cervical spine injury, and C6–C7 fracture-dislocation is the most common pattern reported [1]. Multilevel injuries have also been reported in 8–13% of cases [2].

These fractures occurring in patients with AS are often diagnosed late as the history of significant trauma is not evident, as patients may not be able to differentiate the pain of fractures from that of arthritis [1]. The fracture may not be detectable in plain radiographs alone due to pre-existing kyphotic deformity with distorted anatomy and high-riding shoulders [3]. Treatment considerations for these fractures are different from the general population due to the long lever arm and inherent instability at the fracture site. Long-segment posterior instrumentation with or without supplementary anterior stabilization has been preferred in literature over isolated anterior fixation in these patients [2].

This report presents a rare case of segmental fracture of the cervical spine (floating cervical spine), fractures in both supra- and sub-axial region, and Anderson lesion in the upper dorsal spine. The case presented to us 6 weeks after the initial trivial injury with frank upper cervical myelopathy with Nurick Grade 4, and mJOA score 8. The patient was successfully treated with long posterior segment cervico-thoracic instrumented fusion.

CASE PRESENTATION

A Forty-four-year-old male presented to the emergency department with complaints of pain in the neck region and paresthesia in the upper limb for 4 weeks, difficulty in using his upper limbs for the past 2 weeks, decreased grip strength, and instability while walking for the past 1 week. There was an alleged history of falls from standing height 6 weeks back. On further inquiry, there was also a history of significant neck trauma 4 years back, which was symptomless and no treatment was taken by the patient. The patient also had a history of morning stiffness for the past several years and was diagnosed as a case of AS, for which he was taking Disease-Modifying Anti-Rheumatoid Drugs—Sulfasalazine and Methotrexate.

At the presentation, the patient was unable to walk without assistance. On neurological examination, the tone was increased on bilateral upper limbs. On Motor examination, muscle power was decreased in distal myotomes of the upper limb as compared to proximal myotomes, as shown in the ASIA chart (Fig. 1), having ASIA D neurology [4]. On sensory examination, pain and temperature sensations were normal. In contrast, deep touch and vibration sense were decreased in bilateral upper limbs. All the deep tendon reflexes were exaggerated bilaterally and plantar reflex was showing Babinski Sign. No bladder and bowel involvement was present. On special test, Hoffman's sign was positive, the Finger escape sign was positive, grip and release test were also positive and the Inverted radial reflex was negative.

On investigation, radiographs showed diffuse syndesmophytic ankylosis of the cervical vertebral column, the suggestive feature of AS as shown in Fig. 2A, B. On CT scan, C7-T1 fracture-dislocation was present, as shown in Fig. 3A. At the T2–T3 level, the Anderson lesion was also present, as shown in Fig. 3B. CT

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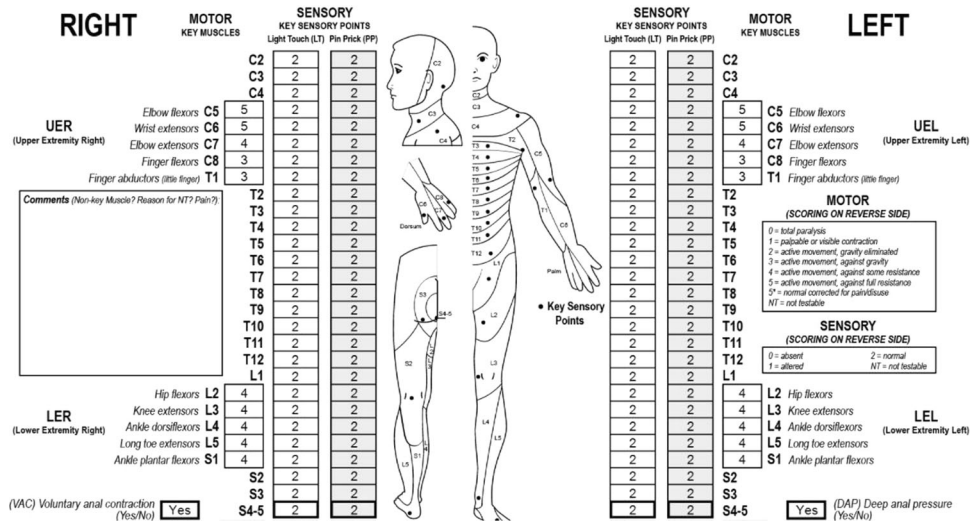


Fig. 1 ASIA chart at the time of presentation showing ASIA D neurology, where on motor examination, muscle power was decreased in distal myotomes of the upper limb as compared to proximal myotomes.

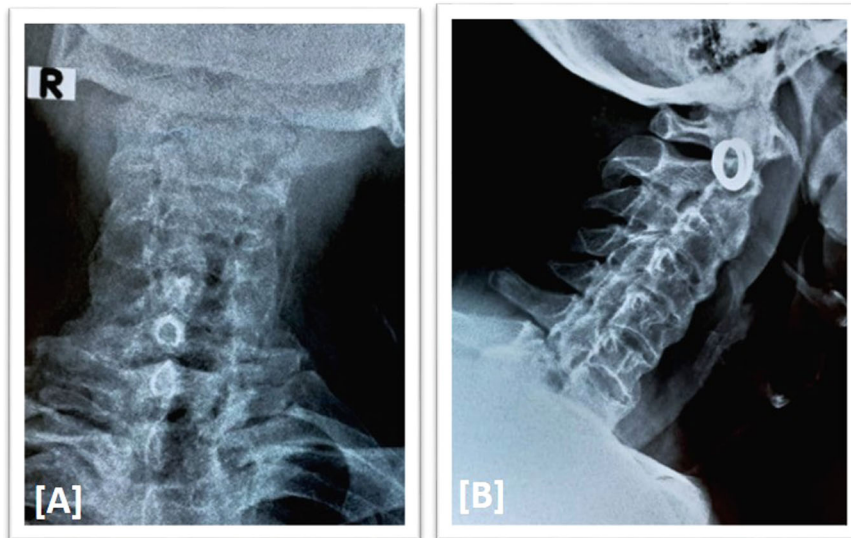


Fig. 2 Preoperative X-ray of cervical spine. AP view (A), lateral view (B), showing diffuse syndesmophytic ankylosis of the cervical vertebral column.

scan also showed Type IIB odontoid fracture with posterior displacement of the odontoid process and distraction with sclerosis of fracture margins suggestive of non-union. CT angiography didn't show any anomalous course of the vertebral artery. On MRI, there was C7-T1 disc disruption and the T2-hyperintense lesion in the posterior elements at the C7-T1 region. No signs of edema were present around the fracture site conforming to the non-union of the odontoid fracture. T2W images showed hyperintensity in the spinal cord at the level of the C1-C2 with the displaced odontoid process severely compressing the spinal cord against the posterior margin of a foramen magnum, as shown in Fig. 4.

The final diagnosis of extradural compressive cervical myelopathy with traumatic cervical spine injury with odontoid fracture type IIB and C7-T1 fracture-dislocation and Anderson lesion at T1-T2 vertebral level was made. The grading of cervical myelopathy according to various classification systems is presented in Table 1.

After obtaining consent the patient underwent closed reduction of the odontoid and long-segment posterior instrumented fusion from C1-T3 level.

Postoperatively, the patient was mobilized in the wheelchair with a CTLSO brace in place on Day 2. Postoperative neurological examination showed recovery as tabulated in Table 1.

On postoperative radiographs, odontoid fracture-dislocation was reduced; the vertebral column was well aligned, as shown in Fig. 5A, B. On postoperative MRI T2W images, the rim of CSF around the spinal cord was visible, as shown in Fig. 6.

On a follow-up visit at 6 months, the patient was able to walk independently and write and use his phone effortlessly. At the latest follow-up visit, his Nurick grade was zero, Ranawat's grade was I, and his mJOA score was 15, as shown in Table 1. X-ray on the sixth-month follow-up shows a well-aligned cervical vertebral column and reduced odontoid process, as shown in Fig. 7A, B.

DISCUSSION

Ankylosing spondylitis (AS) is a very disabling condition rendering the patient prone to three column injuries of the cervical spine following low-velocity trauma. There is a high propensity for spinal

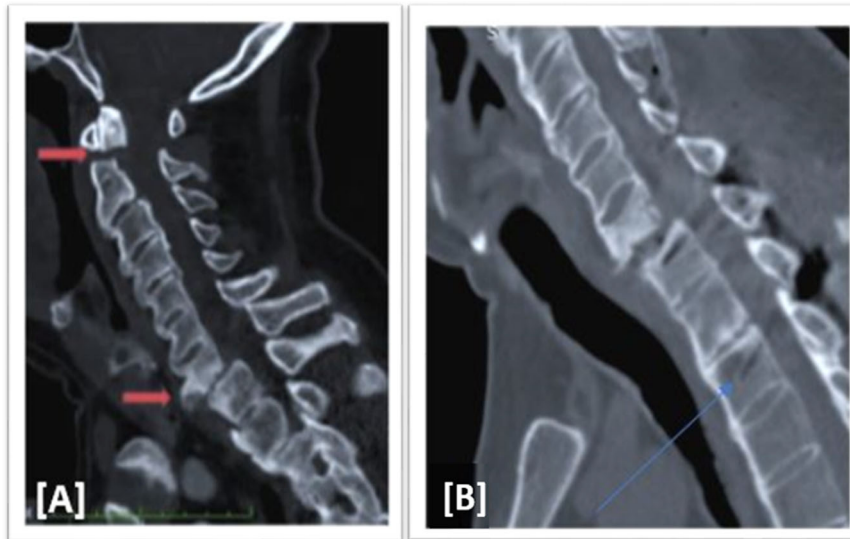


Fig. 3 Preoperative CT scan of mid-sagittal cut. C7-T1 fracture-dislocation (A), Anderson lesion at T2 T3 region (B).

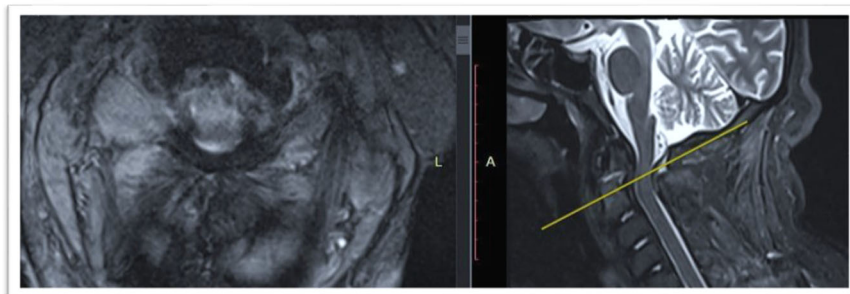


Fig. 4 Preoperative MRI T2 W images, showing C7-T1 disc disruption and the T2-hyperintense lesion in the posterior elements at the C7-T1 region, with no signs of edema around the fracture site conforming to the non-union of the odontoid fracture. T2W images showing hyperintensity in the spinal cord at the level of the C1-C2 with the displaced odontoid process severely compressing the spinal cord against the posterior margin of a foramen magnum.

Table 1. Functional scoring on Preop, Post op, and 6-month follow-up.

Neurology	Preoperative	Postoperative day 2	Six-month follow-up
Nurick Grade	4	3	0
Ranawat Grade	IIIA	II	I
mJOA Score	8	12	15

cord injuries in these patients due to the development of large epidural hematomas, with up to two-thirds of them presenting with neurologic deficits [3, 5]. In the present case, the patient was ambulatory for up to 5 weeks with no symptoms following trauma until the sixth week when he started noticing progressive weakness in his upper limbs with difficulty in walking. Though the level of injury was C7-T1 with (Anderson-D'Alonzo type IIB) Odontoid fracture in our case, predominantly the fractures occur at C5-C6 and C6-C7 levels due to the increased mobility at these levels [6]. Due to osteoporosis and deformity, these fractures often occur after minimal trauma. The amount of force required to fracture the cervical spine in these cases is much lower than the normal spine due to ankylosis, calcification of the intervertebral disc, and ossification of paravertebral tissues [1]. Furthermore, due to difficulty in reading the imaging modalities, there is often a delay in the diagnosis [5, 7, 8]. Hyperextension is the most

common mechanism of injury in ankylosing spondylitis [9]. Conservative methods, in the form of a hard cervical collar, halo vest application, and bed rest have been associated with the increased rate of complications. With the advanced techniques, the pendulum is swinging more toward surgical management, and conservative management is reserved for medically unfit patients [2]. In a systematic review by Westerveld et al. the authors noted that about 46% of the patients were treated by conservative methods. Nonsurgical management was chosen either because of high anesthetic risks following medical conditions or due to the patient's preference. Conservative management had higher rates of fracture mal-alignment, progressively worsening neurology, and non-union at the fracture site as compared to surgical treatment [9]. Werner et al. in their work on surgical management of Spinal fractures in Ankylosing Spondylitis patients favored posterior or combined anterior-posterior approach over anterior approach

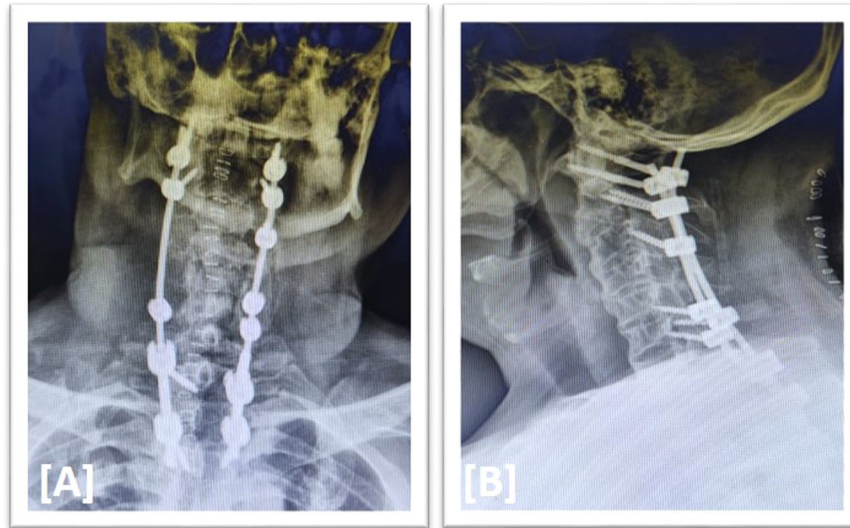


Fig. 5 Postoperative X-ray cervical spine. AP view (A) and lateral view (B) showing reduced odontoid fracture-dislocation, with aligned vertebral column.

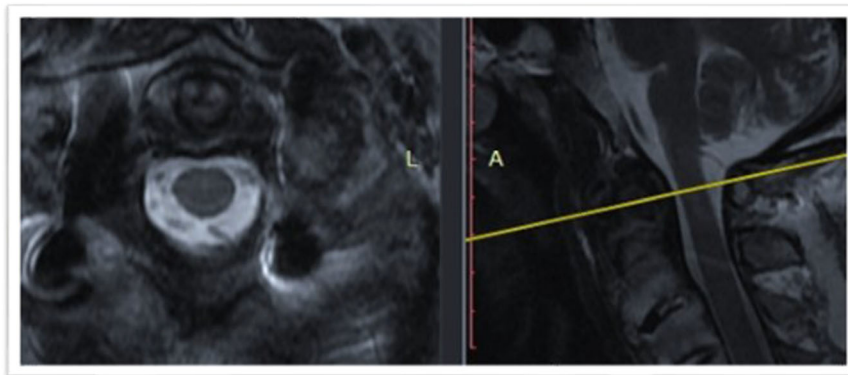


Fig. 6 Postoperative MRI T2 W images, showing the rim of CSF around the spinal cord.

alone [10]. Long segment fixation is advisable in the ankylosed spine due to high chances of biomechanical failure at fracture level [11].

In the anterior approach, there is less chance of displacement of fracture during positioning and increased surface area gives more chances of fusion but the stability of fracture remains questionable, also long anterior plates sometimes need exposure inside the mediastinum [12].

According to Taggard et al., the posterior approach can lead to solid fusion if there is well-preserved alignment. Multisegmental posterior fixation should be done alone if anterior column alignment is not disrupted. The posterior approach is associated with decreased morbidity and has the biomechanical advantage over anterior fixation [13]. According to Panya Luksanapruksa et al., both posterior and combined approaches provide good clinical results concerning fusion rate and the need for reoperation. The posterior surgical approach had a lower effective blood loss and postoperative complication rate and a shorter length of stay [14].

In this case, we had used a stand-alone posterior approach along with long-segment fixation of the cervical spine from C1 to T3 level with indirect reduction and decompression of the upper cervical cord. Pedicle screws have been demonstrated to offer the best pull-out resistance of all available posterior fixation techniques, with an 88% increase in pull-out strength, compared with lateral mass

screws [15]. In this patient, we used pedicle screws for fixation in C2, T2, and T3 and lateral mass screws in C1, C3, C4, and C5.

The usual landmarks for screw placement are difficult to identify in ankylosis cases and at some levels, facets are not distinguishable due to fusion associated with the disease process. In these cases, the use of guidance systems like navigation and/or robotic system along with surgical skills can help to avoid injuries and undue complications. We did the extrapolation from known landmarks for screw entry point selection which was later confirmed with intraoperative imaging.

Apart from AS, Diffuse Idiopathic Skeletal Hyperostosis and Ossified Posterior Longitudinal Ligament are the other ankylosing conditions affecting the spine having similar treatment principles as of AS. These patients are at higher risk of operative complications than the non-ankylosed spine which should be considered while planning the management [16].

CONCLUSION

1. Multilevel injuries in the ankylosed spine should be suspected even in low-velocity trauma injuries.
2. Neglected displaced odontoid fracture causing delayed myelopathy may be treated with posterior instrumented

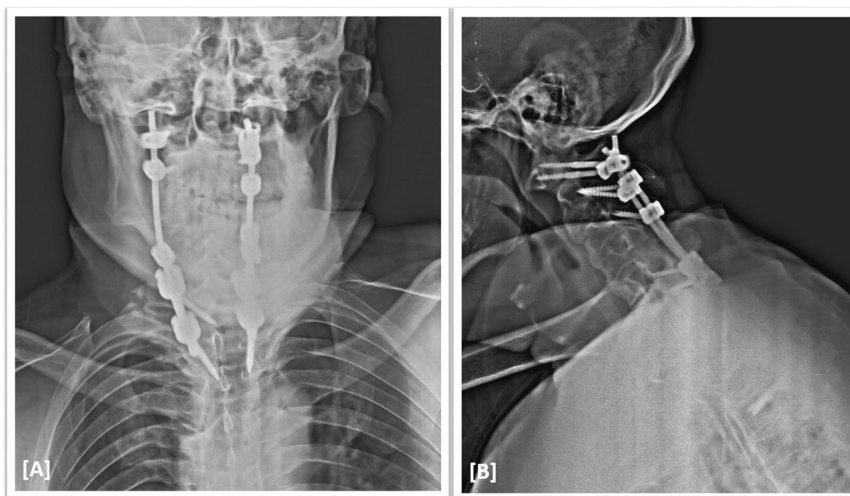


Fig. 7 X-ray of cervical spine at 6-month of follow up. AP view (A), lateral view (B), showing well-aligned cervical vertebral column and reduced odontoid process.

reduction and indirect decompression with a favorable outcome.

3. Stand-alone long-segment posterior instrumented fusion can give reasonable outcomes in these patients, obviating the need for additional anterior procedures.

DATA AVAILABILITY

Within the published paper.

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AUTHOR CONTRIBUTIONS

VV: planning of study, writing the manuscript, data management, and revising the manuscript. SI: data management and revising the manuscript. NG: data management and revising the manuscript. AR: writing the manuscript, data management, and revising the manuscript. PK: revising the manuscript. QA: revising the manuscript. BS: planning of study and writing the manuscript, data management, revising the manuscript, and corresponding author.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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