



Delayed surgical treatment of asymptomatic severe traumatic C7–T1 spondylolisthesis: a rare case report from Syria

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Introduction: Spondylolisthesis is described as the displacement of one vertebra over another, leading to spinal instability and potential nerve compression. When this occurs in the cervicothoracic junction, it can result in unique clinical manifestations. High-grade spondylolisthesis caused by trauma in the cervicothoracic junction of the spine usually results in acute spinal cord injury and quadriplegia. However, a few uncommon cases of the same injury reported minimal or no neurological deficits. Biomechanical evaluation of the underlying pathology can offer insights into the mechanism of injury and the preservation of neurological function.

Case presentation: This paper explains the case of a 32-year-old white male patient who suffered from a traumatic C7–T1 spondylolisthesis. Despite having radiographic evidence of grade III traumatic spondylolisthesis, cord compression, fracture in the isthmus of the C7 vertebra, and intervertebral disc traumatic change and protrusion, the patient did not exhibit any motor neurological deficits. The patient underwent posterior spine fixation via the posterior approach as the first step of the surgical management, followed by anterior spine fixation via the anterior approach after several days (360° fixation). Fortunately, after 6 months of follow-up, the patient showed good outcomes. The patient was pain-free with an intact neurological clinical examination, the radiographs showed well-maintained fusion and alignment.

Discussion: The best management approach to cervical spondylolisthesis without neurological injury is complicated and arguable due to the rarity of occurrence of such cases.

Conclusion: A combined anteroposterior surgical approach, or 360° fixation, is a valuable technique for addressing complex spinal conditions such as the condition seen in our case, offering comprehensive stabilization and improved outcomes.

Keywords: Cervical spondylolisthesis, cervicothoracic junction, neurological deficit, spinal trauma

Introduction

Spondylolisthesis is the anterior or posterior dislocation of the vertebral body over another sub-adjacent one^[1–3]. Cervical spondylolisthesis is the most severe form of cervical spine injury, with 80% of the cases associated with impairing neurological deficits, which can be of similar severity as quadriplegia^[3,4].

Trauma is the most common cause of spondylolisthesis^[5], while congenital and other etiologies are less frequent^[6,7]. Compared with lumbar spondylolisthesis, a commonly witnessed

HIGHLIGHTS

- Cervical spondylolisthesis without neurological injury is a rare occurrence.
- Prompt management is mandatory to avoid devastating neurological sequelae.
- So far, the best management approach remains complicated and arguable.
- We chose the combined anteroposterior fixation with successful outcomes.

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case, cervical spondylolisthesis is subtly encountered^[8]. In this regard, only thirteen cervical spondylolisthesis cases (with an injury to the cervicothoracic junction) were described in the literature without resulting in any neurologic abnormalities^[9–18].

The treatment of such cases remains a debate due to its rarity; however, it is inevitable that the fixation should be 360°, with many suggested approaches; including conservative management, anterior fusion/fixation, posterior fusion/fixation, or combined anteroposterior fusion/fixation^[2].

Our case is of a 32-year-old male who suffered from a traumatic spinal injury after a 3 m height falling accident. Four months later, he presented to the neurosurgery outpatient clinic at Al-Muwassat University Hospital with a severe, undiagnosed anterior C7–T1 spondylolisthesis without any remarkable motor

neurological deficits during the mentioned period. We described a traumatic spondylolisthesis at the C7–T1 level without motor neurological impairments. This case was addressed through surgical intervention involving a combined anteroposterior surgical approach or 360° fixation.

The work has been reported in line with the SCARE criteria^[19].

Case presentation

A 32-year-old white male presented to the neurosurgery outpatient clinic at Al-Muwassat University Hospital complaining of neck pain with a history of falling accident from 3 m height 4 months ago. He is a construction worker.

The patient was first succoured to a nearby clinic in a rural area, with no history of loss of consciousness but a mild numbness of both upper extremities reaching down to the fingers. Upon arrival at the clinic, he was awake and alert with a Glasgow Coma Scale (GCS) of 15/15 and was hemodynamically stable. He had multiple skull and facial wounds that were all sutured and taken care of. His past medical and surgical history were unremarkable. He does not smoke or consume alcohol.

Neurological examination came normal, with a full symmetric motor strength (M5/5), a full symmetric sensory examination (S2/2) in all four extremities, a normal rectal tone, and normal reflexes. The patient did not undergo any imaging tests due to the unavailability and insufficiency of equipment at the rural clinic. Besides, he was not offered any further medical consultation due to the existence of a normal neurological examination and the stability of his overall status.

During the four months before presenting to our centre, he reported having mild remittent numbness of both upper extremities reaching down to the fingers with minor leg weakness (which gradually diminished) after returning to his previous job as a workman. He also went to the gym to regain his fitness after the accident. Two months later, neck pain started to occur, which the patient first neglected. Unfortunately, his pain worsened over time and drove him to seek consult at our centre.

When he presented to our outpatient clinic, we ordered MRI based on his history, although he was neurologically intact. MRI revealed complete spondylolisthesis at C7–T1 level anterograde displacement (Fig. 1).

MRI showed C7–T1 anterior listhesis (grade III), with associated intervertebral disc traumatic change and protrusion, anterior and posterior longitudinal ligaments, ligamentum flavum, facet joints capsule, and interspinous ligaments disruption, and high-grade supraspinous ligament injury at the nuchal ligament at both C5/T2 levels. The C5–T1 levels were affected by oedematous cord alterations. Upper-end plate bone marrow contusions in T1, T2, T3, and T4 were also seen (Fig. 1).

On the fourth day of admission, posterior fixation was performed as follows: the patient was induced into general anaesthesia and placed in the prone position, utilizing a Mayfield 3-pin head holder for stabilization. A midline cervical incision was made at the levels of vertebrae C6, C7, and T1. Laminae of these vertebrae were bilaterally excised, and the corresponding vertebrae were secured with pedicle screws and rods, followed by the application of a drainage tube and layer-wise closure of the skin.

The anterior fixation was carried out on the seventh day of admission as follows: general anaesthesia was administered, and the patient was placed in a supine position. An anterior approach



Figure 1. Shows preoperative sagittal T2-weighted MRI image with complete spondylolisthesis at C7–T1 level anterograde displacement accompanied by disc protrusion. Spinal cord compression at the first thoracic level, evident by a high-signal intensity focus on the same level in the subsequent time frame, potentially indicative of contusion. Signs of both anterior and posterior longitudinal ligament injuries are observed.

was made to access the vertebral bodies C6, C7, and T1. A plate was positioned and secured to the aforementioned vertebral bodies using six screws. Subsequently, a drainage tube was applied, and the surgical incision was closed in layers.

The screws, rods, and plates are produced by Sharma Orthopedic (India) Private Limited Company.

Postoperative lateral plain MRI showed good realignment and correct screw placements (Fig. 2).

We observed the patient for ten days in the neurosurgery ward at Al-Muwassat University Hospital. Post-operation recommendations were to avoid repetitive movements, extreme flexion, and extension. Additional instructions were that the patient had to wear a cervical collar and remove it a month after his surgery.

Complications did not develop postoperatively while a rigid cervical collar was used. Follow-up examination was unremarkable for neurological deficits. After 6 months, the patient remained asymptomatic without any functional impairments.

Follow-up cervical X-ray images showed maintained fixation and alignment with good fusion (Figs. 3 and 4).

Pre-operation and post-operation computed tomography (CT) scans were not done due to the unavailability of CT scan imaging

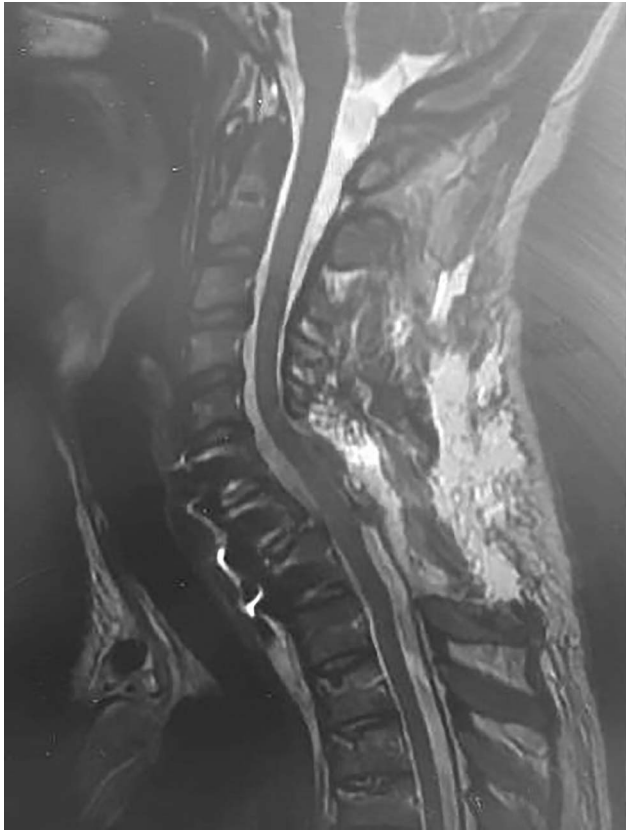


Figure 2. Shows immediate postoperative sagittal T2-weighted MRI with an improvement in alignment, as well as alleviation of compression and a reduction in oedema.

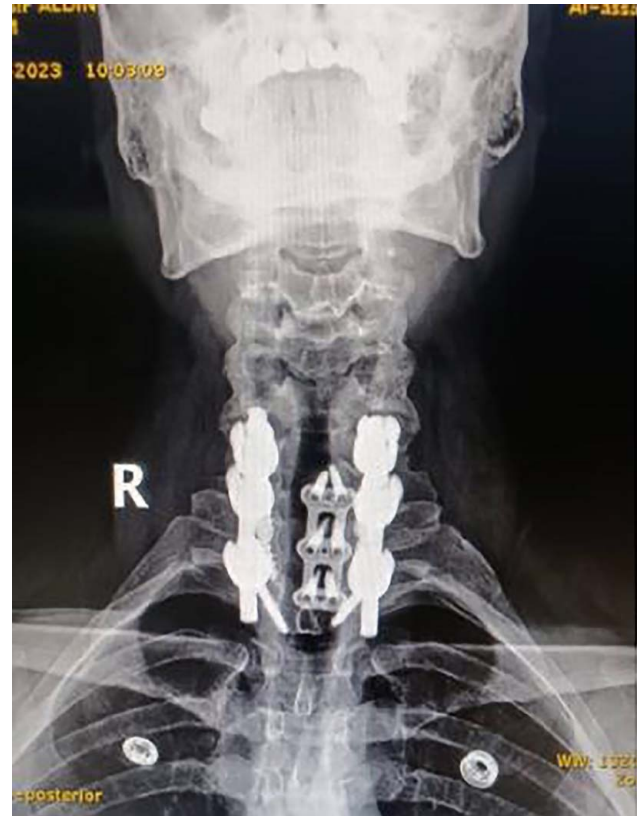


Figure 3. Shows a simple anteroposterior X-ray image of the cervical spine that demonstrates screws and two rods at the C6–C7–T1 vertebral levels and an anterior plate extending from C6 to T1.

in our institution at that time. No post-surgical deficits were be-added that required a CT scan to check the placement of the screws. Thus, we ordered an MRI and simple anteroposterior and lateral X-ray images.

Ethical approval was granted by the Biomedical Research Ethics Committee at the Faculty of Medicine, Damascus University. Informed consent for the publication of the case was obtained from the patient.

Discussion

Cervical spondylolisthesis is uncommon injury as it is more prevalent in the thoracic-lumbar column^[3]. It causes significant instability due to the front slide of the body of the vertebra and the fractions of multiple posterior elements^[16].

Few studies documented similar cases with sub-axis cervical injuries; a connecting point between the fixed thoracic column and the mobile cervical column^[8], which could be a predisposing factor for this type of injury^[13].

Forty-four percent of cervical injuries usually result from motorcycle accidents, while falls constitute 22% of the possible causes^[20]. Similar injuries are often associated with irreversible neurological sequelae, such as quadriplegia and permanent disability^[3,11].

Cervical injury in a neurologically intact patient is one of the rarest cases^[13]. We discussed a case of a patient with cervical

dislocation at the level of the cervical-thoracic junction with a fracture in the isthmus of the C7 vertebra without any motor neurological symptoms. Among the common features in similar cases is the presence of a bilateral vertebral pedicle or vertebral lamina fracture that can cause the opening of the vertebral foramen and the expansion of the vertebral canal, thus relieving pressure on the spinal cord, which may be the reason for the absence of motor neurological symptoms^[9,11]. Yet, the intervertebral foramen C7 did not open in our case. We suggest that gradual spondylolisthesis after the trauma could explain the absence of motor neurological symptoms at the time of diagnosis.

Prompt management is mandatory to avert devastating neurological sequelae. Unfortunately, the best approach remains controversial due to the low frequency for asymptomatic cases^[9] and depends on many factors: the patient's neurological condition, radiological findings, and the state of dislocation^[18]. Treatment restores stability and consistency of the spine, relieves nerve compression, prevents future instability, and provides early rehabilitation^[11,14].

Cervical traction achieves pre-surgery spinal alignment, especially with a recent fracture^[3]. Neurosurgeons anticipated probable catastrophic neurological consequences when managing spondylolisthesis through cervical traction^[17,21]. Some argue that closed reduction does not increase the likelihood of debilitating neurological deficits attributed to functional decompression of the spinal canal. They recommend closed reduction for C7–T1 fracture dislocation cases without neurological deficits^[16]. In our



Figure 4. Shows a simple lateral X-ray image of the cervical spine that demonstrates screws and two rods at the C7–T1–T2 vertebral levels and an anterior plate extending from C6 to T1.

case, chronic spondylolisthesis at the fracture site impeded cervical traction due to locked facets and the development of fibrosis or pseudoarthrosis.

Modi and colleagues propose utilizing the patient's neurological status to select the proper surgical approach following attempted closed reduction. They state that anterior reduction and fusion maintain spinal alignment in complete deficit cases because of the limited neurological recovery and heightened surgical morbidity in circumferential fixation. Despite this, circumferential reduction and fixation offer a robust construct and protect against neurological deterioration^[22].

The combined anteroposterior surgical approach (360° fixation) for fractured dislocations C7–T1 is the most stable used technique so far, as it results in good surgical outcomes in comparison to other surgical interventions^[10,23].

When considering the initial surgical approach, an anterior approach is preferred to prevent neurological deterioration in the presence of significant disc herniation and minimize the risk of additional trauma associated with turning the patient on the operation table for a posterior approach^[11,16]. Due to the absence of a nucleus pulposus, we started with the posterior fixation^[16].

Posterior open reduction for unreducible dislocations is an effective initial management, facilitating direct disengagement of the inferior facet from the superior facet^[16]. Given the long-standing highly mobile spondylolisthesis in the cervicothoracic junction, immediate 360° fixation was pursued to prevent the potential worsening of neurological symptoms and to establish enhanced stabilization^[10].

Conclusion

In acute traumatic injury, the cervicothoracic junction should be carefully examined to exclude hidden lesions, as high-grade traumatic C7–T1 spondylolisthesis without neurological deficits is extremely rare. The most commonly reported treatment for these fractures is anterior-only or combined anterior-posterior fixation. We chose the 360° fixation with successful outcomes and recovery.

Ethics approval statement

This provided material is the authors' own original work and has not been published elsewhere.

Ethical approval was granted by the Biomedical Research Ethics Committee at the Faculty of Medicine, Damascus University.

We declare that written informed consent for performing all the relevant investigations and procedures, and for the publication of the case was obtained from the patient.

This study has been reported in line with the SCARE criteria.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Author contribution

All the authors read and approved the final version of the manuscript. M.A.M.: conceptualization, investigation, acquisition of clinical data, writing original draft, review and editing, and validation. M. Abouassi: acquisition of clinical data, literature search and writing original draft. M. Albokai (MD): literature search and writing original draft. S.A.: conceptualization and investigation. A.H.: review and editing, visualization, validation, and supervision.

Conflicts of interest disclosure

There are no conflicts of interest.

Research registration unique identifying number (UIN)

Not applicable.

Guarantor

All authors accept full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

Data availability statement

Not applicable.

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