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Case report

Traumatic Sacral Spondyloptosis; Report of an Extremely Rare Case

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Abstract

Background: Traumatic sacral spondylosis is a sporadic injury. It is accompanied by damage to the cauda equina with perineal numbness, paralysis of sphincters, and sacral root weakness.

Case presentation: A 35-year-old male complained of low back pain, left-sided foot drop, and sphincter dysfunction after a 9-meter fall. On imaging, he had S1-S2 spondylosis. We operated on the patient with a single posterior approach. The L3-S3 instrumented fusion after stepwise distraction to reduce deformity concomitant with L5-S2 laminectomy and foraminotomy was done. After two years of follow-up, the sphincter disturbance was relieved, but the limb deficit had no change. On follow-up images, the fusion between S1 and S2 was confirmed.

Conclusion: We recommend surgical treatment of this injury to allow some neurological improvement and stabilization of the spine of the pelvis. Also, the operation must be delayed for days to rule out any intra-pelvic life-threatening, primarily vascular injury. A stepwise intraoperative distraction could be helpful in the reduction of this deformity.

Keywords: Spondyloptosis, S1-S2, Sacral, Instrumentation, Neurological deficit.

Introduction

Spondyloptosis is a complete slippage of one vertebra relative to the adjacent lower vertebra [1,2]. Traumatic spondylosis is a rare condition, especially in the sacrum, and is typically attributed to high-energy trauma 3-5. On the contrary, the gradual progression of slippage in high-grade spondylolisthesis is the underlying mechanism in degenerative cases [2].

Spondyloptosis has been categorized as fracture-dislocation in the Denis classification of spinal fracture and is considered a very unstable injury involving all three sections of the spinal column 1. In 80% of cases, it is usually associated with a complete neurological deficit 1.

Traumatic sacral spondylosis is an infrequent injury pattern. In sacral fractures, anterior dislocation of the proximal part of the sacrum usually occurs. They are frequently accompanied by injury to the cauda equina with perineal numbness, paralysis of sphincters, and sacral root weakness [4].

In this paper, we present a 35-year-old man with a rare complete slippage of the S1 vertebra on S2 who was referred to us with symptoms of post-traumatic low back pain, left foot drop, and both fecal and urinary sphincter disturbance.

Case presentation

A 35-year-old male complained of low back pain, left-sided dropped foot, urinary retention, and bowel dysfunction. He had a 9 meters fall during work ten days before admission. During this period in the first center, he was treated for hemothorax and pulmonary contusion and referred to our center. On physical examination, he had decreased perineal sensation to pinprick and light touch, and the tone of the anal sphincter was decreased. Also, he had a left dropped foot concomitant with bilateral pelvic pain that caused an inability to walk without assistance.

He had both bowel and bladder dysfunction without foley catheter sensation. Tenderness in the lower lumbar and sacrum region was also present, with a step-off palpable at the upper part of the sacrum. A straight leg raise test was positive on the left side. Deep tendon reflexes were bilaterally symmetrical and regular except for the bilateral diminished Achilles tendon reflex. Computed tomography (CT) scanning revealed a complete slippage of the S1 vertebra on S2, grade 5 (spondyloptosis) based on Meyerding and types IV (post-traumatic) based on Wiltse classification (Figure 1a, 1b) [6,7].

An acute deep vein thrombosis (DVT) of the left extremity before surgical treatment made the case more complicated; preoperatively, an inferior vena cava (IVC) filter was placed for the patient. We also excluded any suspected injured pelvic vasculature by consulting with a vascular surgeon, although this issue was less likely after this time.

To achieve direct decompression, reduction, and instrumented posterior fusion, we operated on the patient in a prone position using a standard posterior midline approach. After L5-S2 laminectomy and foraminotomy, because bilateral L5 and S1 pedicles were not accessible, we initially placed L3 and L4 pedicle screws and S2 and S3 alar and trans-SI joint screws. To use distraction for the reduction of spondyloptosis, we needed a more aligned place for temporary rod fixation. Because of this, we thought inferior sacral screws were more appropriate than an iliac screw. We used a step-by-step bilateral minimal distraction, removing locked bony elements, e. g. fractured facets and lamina. After primary reduction, L5 and S3 screws were placed, temporary rods were replaced with good lordotic curved permanent rods, and arthrodesis by autograft and allograft bone was performed (Figure 1c, 1d, 1e).

During the surgery, we repaired the dural rupture in the left S1 root sleeve in a watertight manner. The patient did not have a cerebrospinal fluid (CSF) leakage, and his lumbar drain was removed on postoperative day [3.]

He was mobilized on the 3rd postoperative day and discharged on the 14th day following admission. He did relatively well in rehabilitation, and his sphincter disturbance was fully recovered but left lower limb weakness remained unchanged. In a follow-up CT scan after two years, fusion in the S1-S2 interface is completed (Figure 1f).

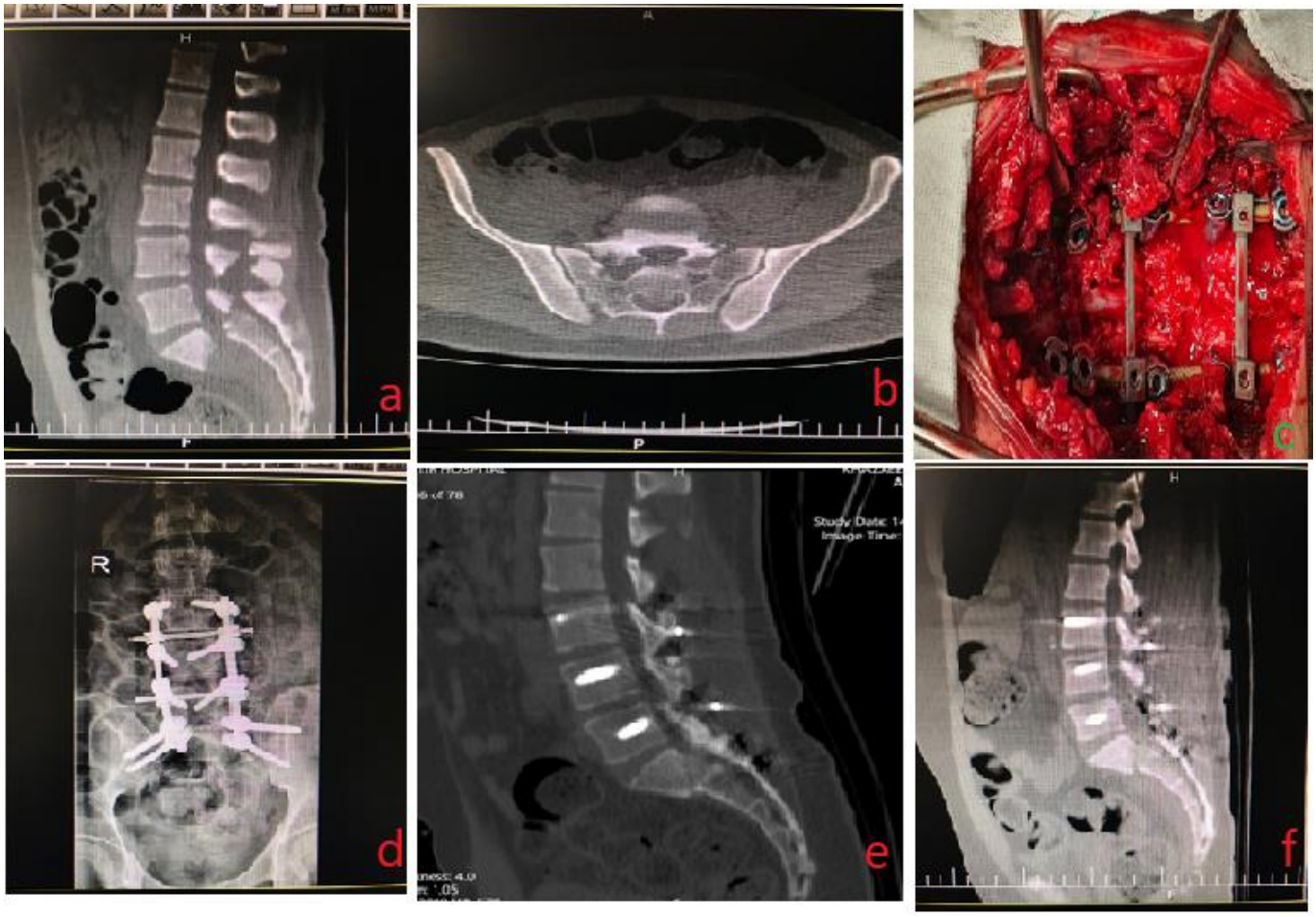

Figure 1: Preoperative CT scan in sagittal (a) and axial (b) views revealed S1-S2 spondyloptosis. We could see an intraoperative view after reduction (c). Just postoperative anteroposterior x-ray (d) and CT scan with sagittal reconstruction (e) revealed a promising reduction of deformity. After 2 years, the patient had no device failure and he had documented fusion in the interface of S1-S2 on sagittal CT scan (f).

Discussion

Sacral injuries might sometimes be challenging to diagnose and are generally known to accompany pelvic injuries [2,5].

Radiographs might be insufficient for diagnosis; therefore, the sagittal sections must be examined together with axial sections during a CT scan [5]. The anatomic configuration of the sacrum and its localization in the pelvic ring will need to be studied better to understand this isolated sacral fracture. The stability of the sacrum is determined by its anatomic shape. The middle and lower segments are shaped like a wedge, and this configuration limits rotatory movements on the anteroposterior plane. The upper part of the sacrum is not shaped like a wedge and is stabilized only by the posterior sacroiliac and iliolumbar ligaments. A line passing at the level of the first sacral vertebral foramen is the area of greatest weakness, and the resistance is the least at this point. This explains the greater vulnerability to traumatic sacrolisthesis at the S1-S2 level [4].

The sacral plexus is easily damaged in sacral injuries. A source of concern with these injuries is the possibility of damage to the sacral nerve roots, which can lead to pathologies in the bulbocavernosus reflex and anal and urethral sphincters, identical to our case [5]. The sacral nerve root diameter ratio to foraminal height decreases as one progresses in the caudal direction, making the attendant of root injury greater at S1 and S2 than at S3 and S4 [1]. This clarifies why lower degrees of foraminal entrapment can cause neurologic symptoms in the upper segments of the sacral spine, as we have seen in our patients. As stated by Rodriguez-Fuentes, these neurological lesions may be due to S1 compression of sacral roots or simply to the lengthening of the roots caused by the displacement of vertebral bodies [4]. Since

the sphincter disturbance of our patient resolved during that time, the second hypothesis seems more possible for him.

The primary goals of operative management for spondylolisthesis are multiple: to achieve a solid fusion, to correct deformity, to attain global balance, and to perform adequate nerve root decompression [8].

Because of the increased local deformity in spondyloptosis, reduction may be extremely challenging or impossible. On the other hand, there is an increased risk of pseudarthrosis in patients who do not undergo reduction. The rationale for reduction is multifactorial; the second significant advantage of decline is that it allows the correction of the local anatomy. The surgeon can directly influence the slip angle and improve it with the drop. The downstream effect is an improvement in the global sagittal alignment. Indeed, this has been used as the principal rationale for reduction.

Additionally, one of the preoperative decisions that must be made involves which levels to fuse, whether to incorporate the pelvis, and whether to provide anterior column support. Considering all the above, in our case, we choose to perform an open reduction of S1 on S2, posterior fixation of L3 to S3 under the guide of C-arm, arthrodesis and decompressive laminectomy of L5 and S1 as the patient had left foot drop. This extended instrumentation was essential for us to achieve some support points during stepwise distraction and reduction of spondyloptosis.

Traumatic fracture-dislocation at the S1–S2 level represents an infrequent injury. The review of literature and screening of the PubMed database using the following keywords; sacral spondyloptosis, traumatic sacral spondylolisthesis, sacral fracture-dislocation, resulted in a few cases, and there is no exact strategy or treatment method to handle this kind of injury [1-3]. In a large cohort study by Mishra et al., the authors performed a retrospective chart review of 20 patients admitted with spondyloptosis at their department over five years [1]. They only had one patient with S1/S2 spondyloptosis concurrent with an L2 burst fracture. They treated L2 pathology with pedicle screw fixation, and spondyloptosis was managed conservatively. The patient showed no improvement in neurological status.

Vahedi et al. published a traumatic S2-S3 spondyloptosis with spontaneous fusion in a 27 years old female patient [2]. They advised a conservative approach for such a patient due to the solid fusion and no sign of neurological compromise on the physical exam. In another case, Isik et al. reported an isolated dislocation at the sacral third and fourth vertebrae without any fractures in a 4-year-old child managed conservatively, which is completely fused in a one-year follow-up with no functional pathology [5].

They recommended conservative treatment, especially for small children and adolescents in the absence of neurological deficits. Compared with former cases, our patient had neurological deficits that relieved his sphincter disturbance after surgery. Also, we think he would be unable to walk if we treated him conservatively. On the other hand, this type of fracture is volatile, and the spinal column has no reliable base.

Rodriguez-Fuentes et al. presented a 13-year-old boy with traumatic sacrolisthesis at S1-S2 due to a fall [4]. They first attempted to reduce sacral dislocation by halo-femoral traction, which was unsuccessful but changing the plan to using overhead traction in a 90-degree angle flexed position of the hip resulted in a partial reduction. The patient then had a posterior reduction, instrumentation, and arthrodesis from L3 to S2 using the technique described by Luque, using the 90˚ angle rods distally crossing the sacroiliac articulations at the S2 level and proximally anchored at the level of L3 spinal process, sublaminar wires through the L3- S2 laminas, inter-transverse processes arthrodesis of L3- S2 using an autologous bone graft. In contrast with this case, we did not use traction. Instead, we performed a delayed posterior approach with an intraoperative minimal stepwise distraction on not temporary curved rods with promising results.

Also, in contrast with the etiology of our case, Rajendra et al. reported a case of S1-S2 listhesis with degenerative and non-traumatic etiology. Still, they also treated him by single posterior approach surgery [3]. They performed laminotomy of S1 bilaterally, pedicular screw fixation at L5, S1, S2, and inter-transverse autologous bone grafting. Their patient had relief from his presenting symptoms, such as backache, urinary retention, and distal weakness.

Conclusion

Traumatic sacral S1-S2 spondyloptosis is a highly unusual injury pattern. Because of its unstable nature,

we recommend surgical treatment of this injury to give a chance for some neurological improvement and stabilize the spine on the pelvis. Also, the operation must be delayed for days to rule out any intra-pelvic life-threatening, primarily vascular injury. A stepwise intraoperative distraction on not curved rods could be helpful in the reduction of this deformity.

Abbreviations

CT: Computed tomography
DVT: Deep vein thrombosis
IVC: Inferior vena cava
CSF: Cerebrospinal fluid

Authors' contributions

Arash Fattahi: Correspondence, Conceptualization

Abdoulhadi Daneshi: Validation

Morteza Taheri: Writing

Armin Azimi: Data Gathering

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Disclosure statement

The authors declare that there were no financial interests that relate to the research described in this paper.

Ethical Statement

The authors took informed paper consent from the patient to present case without identity determination

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