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Technical Note

A novel technique to repair a transverse sacral fracture in a previously fused lumbosacral spondylolisthesis

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Abstract

Background: Transverse fractures of the sacrum are rare, and surgical treatment for these fractures ranges from conservative to challenging. Transverse stress fractures of the sacrum after placement of lumbar-to-sacral instrumentation have been previously described. We report a new technique to repair a transverse Type-2 Roy-Camille fracture with spondylolisthesis of S1 over S2 in a previously fused instrumented high-grade L4-L5, L5-S1 spondylolisthesis.

Case Description: A 64-year-old female who previously had an L4-L5, L5-S1 fusion for spondylolisthesis presented with excruciating lower back pain and radiculopathy for over 6 months. She was found to have an S1-S2 transverse fracture caused by previous implantation of pedicle screws. She underwent repositioning of several failed right lumbar and sacral screws and then had bilateral S1-S2 screws placed directly across the fracture line. The patient had an unremarkable postoperative course. She discontinued most of her pain medications within 6 weeks postoperatively. In the months following surgery, she reported only minimal lower back pain and no radiculopathy with the last appointment 5 years postoperatively.

Conclusions: We describe a novel technique to reduce an iatrogenic transverse type-2 Roy-Camille fracture at S1-S2 in a previously instrumented high-grade L4-L5, L5-S1 spondylolisthesis. The patient's fracture achieved adequate reduction and fusion with symptomatic relief.

Key Words: High-transverse Type-2 Roy-Camille fracture, L4-L5 spondylolisthesis, L5-S1 spondylolisthesis

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INTRODUCTION

Transverse fractures of the sacrum are a rare complication reported after multilevel lumbosacral fusion.[4,6,10,11,15-17] The pathogenesis is considered to be a result of significant stress on adjacent segments. As such, these fractures tend to occur in osteoporotic females often with long constructs and moment arms.[4-6,16] Diagnosis is often delayed and management ranges from conservative therapies to more challenging and complicated surgical measures. Conservative measures, especially in osteoporotic females, have shown fair to poor outcomes.[4,10,16]

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Surgical intervention is often necessitated by failure of conservative measures leading to pseudoarthrosis, severe pain, and deformity. In this case report, we describe a simple solution to these fractures using direct S1-S2 screws.

CASE REPORT

History and examination

A 64-year-old female initially presented with excruciating lower back pain and radiculopathy for over six months. Her medical history included three previous back surgeries, the most recent involving lumbosacral instrumentation. The pain began following the third surgery.

At initial examination on October 4, 2006, the patient showed no weakness, myelopathy, or muscular atrophy. She was able to ambulate slowly with a walker. Her lower back and sacroiliac area were tender to palpation. A positive bone scan, which included single-photon emission computerized tomography imaging, demonstrated abnormal activity along the sacral ala. Electromyography showed a mild left L5 radiculopathy. Her work-up also included a normal dual-energy X-ray absorptiometry (DEXA) scan, X-rays and a computed tomography (CT) scan with contrast and three-dimensional imaging. The scans revealed an S1-S2 transverse fracture caused by her previous sacral pedicle screws [Figure 1a and b].

Surgical technique

We began with a posterior approach and exposed the lumbosacral area, allowing us to identify the site where the pedicle screw had fractured the sacrum. After repositioning the right pedicle screws, two 50-mm lag screws (DePuy Spine, Raynham, MA) were used directly from S2 to S1 through the lateral sacral crest and across the fracture line (bilaterally). We then filled the fracture with cement (Kyphon, Memphis, TN). Anteroposterior (AP) and lateral C-arm images were used to confirm accurate placement of pins [Figure 2a and b].

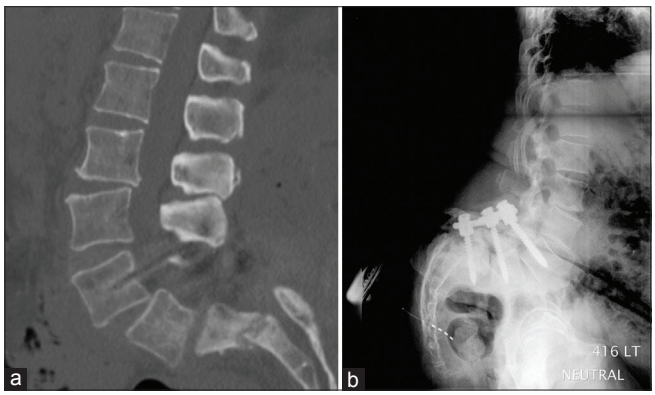

Figure 1: Initial sagittal non-contrast computed tomography scan showing S1-S2 fracture (a). Preoperative lateral X-ray demonstrating S1-S2 fracture (b)

The patient recovered well from the surgery with only minimal lower back pain and no radiculopathy. On subsequent follow-up appointments, CT images demonstrated bony fusion of the sacrum with the last appointment 7 years postoperatively [Figure 2c and d]. She discontinued most of her pain medications early on.

DISCUSSION

Although many of these fractures are treated conservatively, operative treatment of these transverse type II fractures, when indicated, typically involves decompression and/or stabilization. Roy-Camille *et al*. advocated a medial posterior incision with sacral decompression, followed by reduction and fixation with lumboiliac plates, lumbosacral plates, or Harrington rod fixation [Figure 3]. Lumbopelvic fixation, including iliac fixation, has been utilized, however, it is a more technically challenging procedure with significant complications and morbidity related to higher rates of blood loss, postoperative pain, and pseudoarthrosis.[1-3,7,9,11-13,15,16]

Bose used a modified sacralization technique previously described by Benzel and Ball.[3] Benzel and Ball initially derived this technique after cadaveric analysis to maximally increase the caudal moment-arm for lumbar fractures. The patient treated by Bose with this technique had successful fusions and did well clinically. However, the procedure requires many steps including extension of fusion, lordotic bending of wires, sublaminar-S1 wires, placement

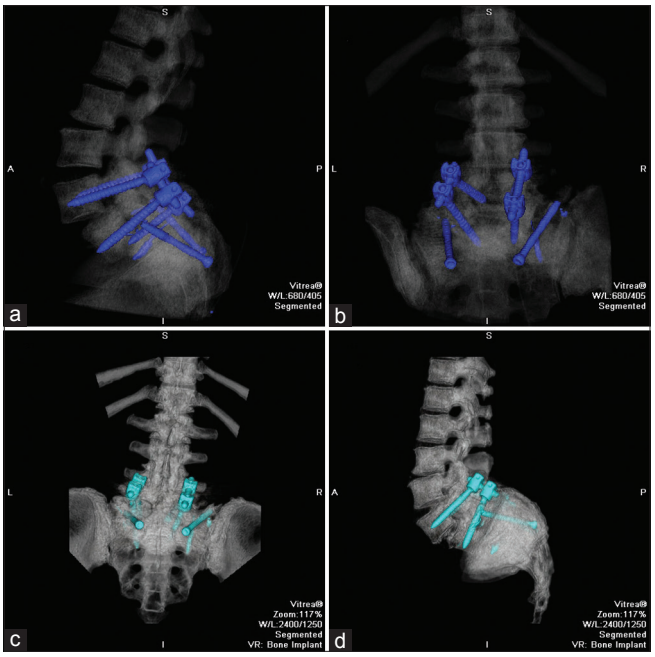

Figure 2: Initial sagittal non-contrast computed tomography (CT) scan showing S1-S2 fracture (a). Postoperative lateral X-ray demonstrating reduction of S1-S2 fracture (b). A 5-year, postoperative, reconstructed three-dimensional CT scan (c and d)

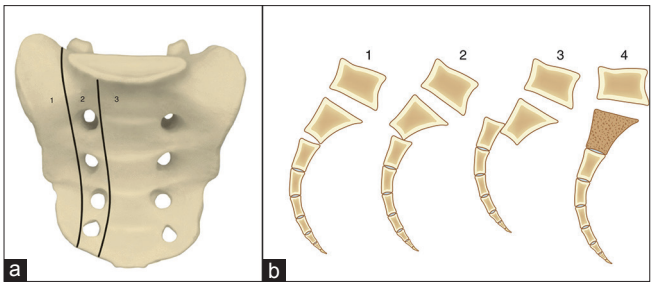

Figure 3: Denis zone classification of sacral fractures (a). Roy-Camille classification of sacral fractures (b). (Adapted from Herkowitz HN, Garfin SR, Eismont FJ, Bell GR, Balderston RA. Rothman-Simeone The Spine: Expert consultation. 6th ed. Saunders; 2011; and Roy-Camille R, Saillant G, Gagna G, Mazel C. Transverse fracture of the upper sacrum. Suicidal jumper's fracture. Spine (Phila Pa 1976) 1985;10:838-845)

of S2-foraminal hooks, and crossbar placement with reduction.[3,4] This is technically more challenging, however, both options are reasonable and should be considered.

Although the number of reports is limited, previous reports of post-fusion sacral fractures were in osteoporotic patients with larger fusions and longer moment-arms.[5,10,16] It is possible that the success of our technique was related/linked to a normal DEXA scan and a short fusion segment. Still, this minimalistic technique may be an important adjunct for other types of transverse sacral fractures including idiopathic insufficiency fractures[14] or even "suicide-jumper" fractures. The treatment algorithms for transverse "suicide-jumper" fractures can vary dramatically because they often include pelvic ring injury and neurologic compromise,[1,2,8,12] however, this technique could even then be considered to augment stability when these types of fractures occur.

CONCLUSION

Here, we report a new technique utilizing a direct S1-S2 screw to repair an iatrogenic transverse sacral fracture, which provided adequate reduction and symptomatic relief.

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Conflicts of interest
There are no conflicts of interest.

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