

## Case Report

## Long iliac screw fixation in a case of isthmic spondyloptosis

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**Abstract****Background:** We report the case of a patient with a spondyloptosis who presented with progressive deformity and worsening neurological deficits. The patient had two previous lumbosacral instrumented fusions.**Case Description:** A salvage revision surgery was performed, in which long iliac screws along with anterior column support at L5-S1 were used to immobilize the lumbosacral junction. Two years after the procedure a solid fusion is seen along with marked neurological improvement.**Conclusions:** Pelvic fixation using long iliac screws is a very useful technique that can be employed when revision surgery for high-grade spondylolisthesis is needed.**Key Words:** Iliac screws, lumbosacral fusion, pelvic fixation, spondylolisthesis, spondyloptosis

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**INTRODUCTION**

Achieving a solid fusion across the lumbosacral junction in complex deformity cases is challenging due to the unfavorable biomechanics at this level, poor sacral bone quality, and high cantilever loads. Complications include the loss of sacral fixation, sacral fractures, rod breakage, and pseudoarthrosis. The addition of iliac screws improves fusion rates and decreases the incidence of these complications.<sup>[7]</sup> Here, we present a patient with a spondyloptosis, with progressive deformity, and multiple failed prior fusions, whose long iliac screws provided a strong anchoring arm to immobilize the lumbosacral junction.

**CASE REPORT**

A.P.L.S, a 31-year-old female presented with progressive severe back/buttocks pain, tenesmus, urinary incontinence, nocturnal enuresis, bilateral foot drop and plantar flexion weakness (strength II out of V) related to a spondyloptosis [Figure 1a]. She had three failed lumbosacral spinal operations. At the age of 13, she

had a decompression for an L5-S1 disc herniation. At the age of 29, she had an L4-S1 posterior fusion with anterior column support that resulted in pullout of the sacral screws and cage migration [Figure 1b]. The third operation, at the age of 30, required a posterior L4-S2 instrumented revision, also failed resulting in pullout of the sacral screws and slip recurrence [Figure 1c].

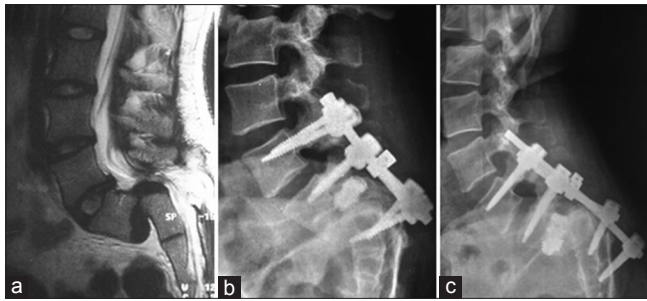
**Fourth surgery**

The fourth surgery included a posterior lumbopelvic instrumented fusion using bilateral long iliac screws, with the addition of BMP-2 into the disc space. Four iliac screws were placed, two on each side, three of them

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**Figure 1:** (a) T2-weighted sagittal MRI showing a L5-S1 spondyloptosis. (b) Plain lateral X-ray demonstrating pullout of the sacral screws and cage migration into the spinal canal following the first lumbopelvic fixation. (c) Plain lateral X-ray demonstrating pullout of the S1 and S2 screws with loss of correction and spondyloptosis after the second lumbopelvic fixation

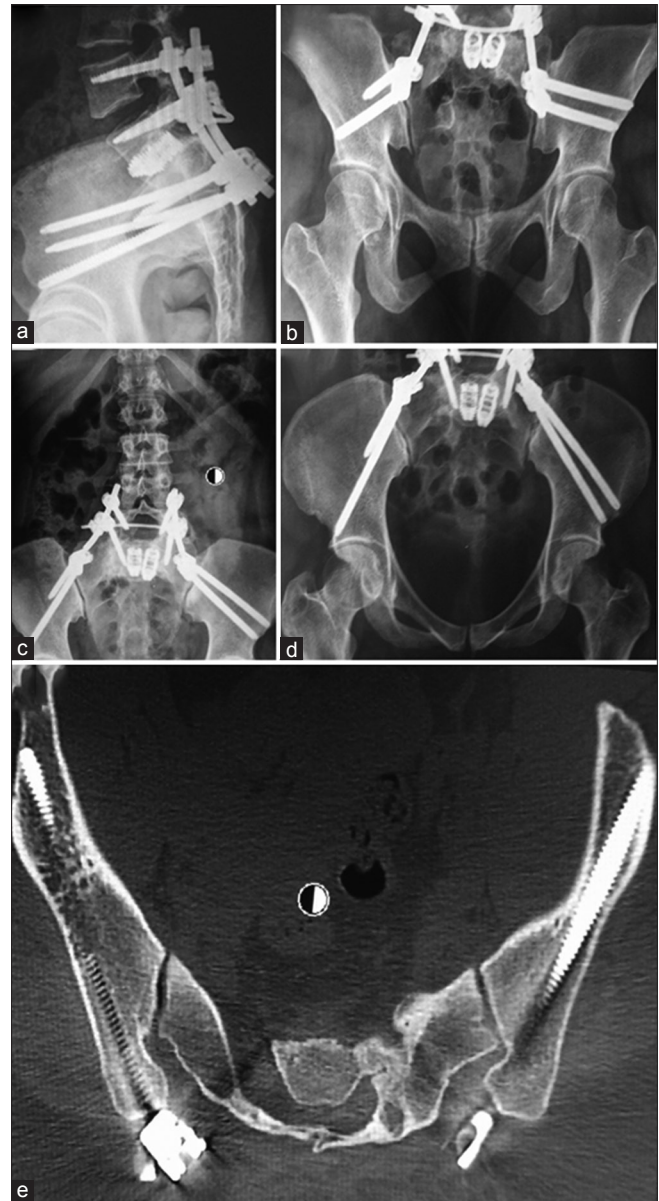
measuring  $7 \times 120$  mm and the other  $7 \times 45$  mm. Although known to be very useful in spine surgery, we did not have navigation nor neurophysiological monitoring available at that time. After iliac screw placement, anteroposterior (AP), outlet, inlet and combined obturator-outlet pelvis views were used to confirm adequate placement without sciatic notch or acetabular fossa penetration. All screws were connected directly to the rods without the use of offside connectors. This allowed a cantilever force that enabled partial reduction of the slip and indirect decompression of the spinal canal. The cages that had been previously inserted were left in place to maintain an anterior column support. The patient was allowed to ambulate immediately after surgery without any type of cast, as recommended by some authors when performing lumbopelvic fixations.<sup>[1]</sup>

### Postoperative imaging

Postoperative imaging studies demonstrated reduction of the slip to a grade II and excellent placement of the iliac screws [Figure 2]. A robust fusion mass across the lumbosacral junction was documented in the follow-up CT scans [Figure 3]. Two years after surgery, she complained only of occasional tenesmus and minimal nocturnal enuresis, and her physical examination demonstrated that the strength in her distal lower extremities had improved to IV out of V. She has returned to work full time.

## DISCUSSION

Achieving fusion across the lumbosacral junction can be quite challenging in deformity cases, and different techniques can be employed to immobilize the L5-S1 disc in revision cases.<sup>[2]</sup> Biomechanically, the more distal to S1 body and the more anterior to the pivot point of the L5-S1 disc the internal fixation is, the more effective the additional fixation.<sup>[3]</sup> This can be well achieved with long iliac screws, which create a longer moment arm. Additionally, placing a screw with the maximal diameter

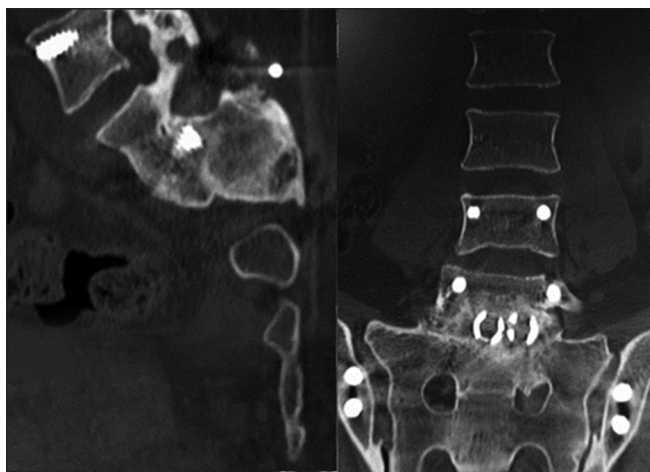


**Figure 2:** (a-e) Imaging studies demonstrating reduction of the slip to a grade II and adequate placement of the iliac screws

that will fit between both iliac cortices will provide higher pullout strength and increased torques can be achieved when larger diameter screws are inserted at least 80 mm from the posterior superior iliac crest.<sup>[5]</sup>

The technique of iliac fixation may or may not involve transfixation of the sacroiliac joint, depending on whether the starting point is located at S2<sup>[4]</sup> or at the posterior iliac crest, with the screw trajectory being pointed toward the anterior inferior iliac spine.<sup>[1]</sup>

One legitimate concern is that iliac fixation might immobilize the sacroiliac joint and lead to its early degeneration. Long-term studies have documented this not to be true and therefore there should not be a concern when opting for this type of fixation.<sup>[7]</sup> Rod



**Figure 3: Follow-up imaging studies demonstrating a solid fusion across the lumbosacral junction**

failure between the S1 and the iliac screws can be seen during follow-up due to maintenance of the sacroiliac joint motion, as well as iliac screw breakage inside the ilium.<sup>[7]</sup>

There are not many reports on the use of salvage iliac screws to manage failed instrumented fusions for high-grade spondylolisthesis.<sup>[2]</sup> Bridwell reported one case wherein short iliac screws, which were used in a revision surgery for a high-grade spondylolisthesis, failed due to pullout.<sup>[2]</sup> Biomechanically, short iliac screws ( $70 \pm 4$  mm) are susceptible to loosening after cyclic loading and can only achieve the same pullout strength of long iliac screws ( $120 \pm 4$  mm) when augmented with cement.<sup>[8]</sup> We electively decided to place two iliac screws on each side, since delivering a triangular screw purchase inside the ilium provides increased pullout strength and better rotational stability of the construct.<sup>[6]</sup> We chose 7 mm-diameter iliac screws to maximize the iliac fixation against pullout, and adding anterior column support at the L5-S1 disc also contributes to immobilizing the disc and aids in the development of a fusion mass.

The absence of sacral screws did not impair the formation of a solid fusion in the long term. While most reports

detail the use of iliac fixation to provide protection of sacral screws, we decided to remove the sacral screws instead and rely on the strong iliac fixation to immobilize the L5-S1 disc, which proved to be efficacious in our patient.

## CONCLUSIONS

In the presented case, salvage pelvic fixation was very effective in maintaining the lumbosacral joint immobility while fusion took place. This case highlights the usefulness of long iliac screws and L5-S1 anterior column support in cases of failed surgery for high-grade spondylolisthesis.

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## Conflicts of interest

There are no conflicts of interest.

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