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Combined minimally invasive anterior and posterior inter-body fusion role in the correction of lytic spondylolisthesis: a case report.

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Summary:

Introduction: Low back pain associated with radiculopathy is a common condition that may persist or recur even after prior lumbar spine surgery. In cases of previous fusion and progressive symptoms, revision strategies combining anterior and posterior approaches can be considered to restore alignment, achieve adequate decompression.

Case Report: A 43-year-old woman with a history of prior L5–S1 laminectomy and fusion for grade II lytic spondylolisthesis presented with progressive chronic low back pain and right-sided radiculopathy without motor deficit. Physical examination revealed decreased right Achilles reflex and lumbar tenderness. The patient underwent a combined surgical approach, including anterior L5–S1 anterior lumbar interbody fusion (ALIF) using a 12 × 34 × 24 mm, 12° cage, and posterior L4–L5 transforaminal lumbar interbody fusion (TLIF) with a 9 × 11 × 30 mm, 15° cage, along with posterior instrumentation from L4 to S1. Adequate decompression and spinal alignment were achieved.

Conclusion: Combined ALIF and TLIF provides effective circumferential fusion, enabling adequate neural decompression and restoration of segmental lordosis and global sagittal alignment. This approach represents a valuable strategy in complex or revision cases of isthmic spondylolisthesis, with potential benefits for functional recovery and quality of life.

Key-words: MISS, TLIF, ALIF, Lytic Spondylolisthesis, Spine Deformity.

Introduction

Isthmic spondylolisthesis is associated with progressive disc degeneration, foraminal narrowing, and spinopelvic imbalance. Current surgical strategies aim not only to achieve neural decompression and solid fusion, but also to restore disc height, segmental lordosis, and sagittal alignment, which are strongly associated with functional outcomes.[3,7] At L5–S1, ALIF enables insertion of a large lordotic cage and provides robust anterior column support with significant improvement in lumbar lordosis and foraminal height[4,6], whereas TLIF allows direct posterior decompression and circumferential stabilization with reduced neural retraction[5,6]. In complex or revision settings, combining both approaches may improve fusion rates, enhance segmental lordosis restoration, and optimize overall sagittal balance[4,6].

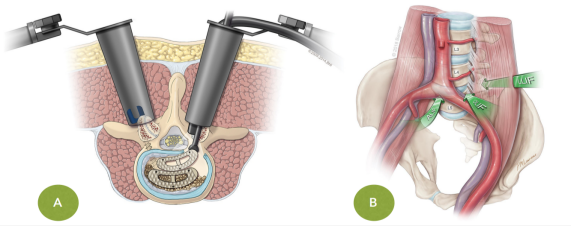

Figure 1: (A) Minimally invasive transforaminal lumbar interbody fusion (TLIF) technique at L4-L5 and (B) Anterior lumbar inter body fusion corridor. Adapted from Barrow Neurological Institute.

Case Report

A 43 - year -old female with a history of L5–S1 laminectomy and posterior transpedicular fusion performed 18 years prior, secondary to a graden II lytic spondylolisthesis presented with chronic low back pain that had progressively worsened over the past months. The pain was associated with radicular symptoms in the right lower limb, radiating along the posterior aspect of the leg to the foot, accompanied by paresthesias but without motor deficit. Her past medical history was otherwise unremarkable.

Neurological examination showed no motor or sensory compromise but a decreased right Achilles reflex and a neutral plantar response on the right. Lumbar examination revealed midline and paravertebral tenderness.

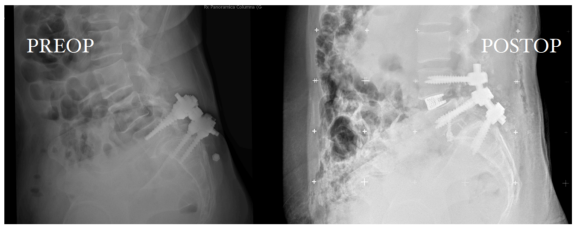

Figure 2: Left image represent preoperative Xr-ay and right image postoperative X-ray.

Radiographic evaluation demonstrated significant sagittal imbalance. Full-spine standing radiographs showed pelvic incidence (PI) of 79°, pelvic tilt (PT) of 38°, sacral slope (SS) of 41°, lumbar lordosis (L1–S1) of 43°, and L4–S1 lordosis of 12°, with a sagittal vertical axis (SVA) of 5.2 cm. GAP score was 8, indicating severe disproportioned alignment with severe hypolordosis with severe hypolordotic maldistribution, moderate pelvic retroversion and moderate positive mallignment (Figure 3).

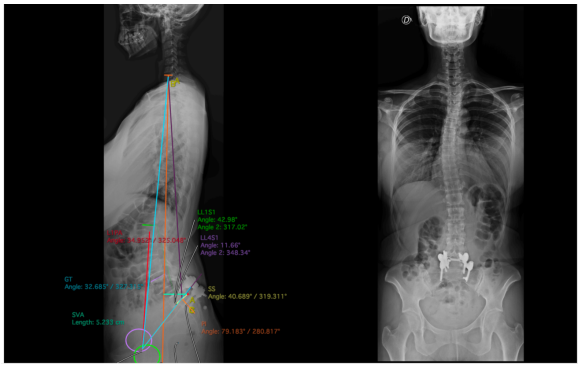

Figure 3: Preoperative panoramic X-ray indicating sagittal imbalance with severe hypolordosis with severe hypolordotic maldistribution, moderate pelvic retroversion and moderate positive malignment.

A CT scan was taken with evidence of grade 1 spondylolisthesis of L5 over S1, Knutsson sign at intervertebral space of L5-S1 level, halo sign around transpedicular screws in L5 and S1. Hounsfield units were measured with no evidence of osteoporosis (Figure 4).

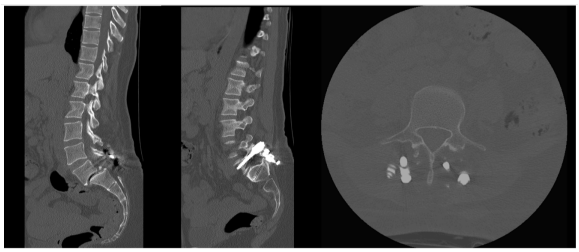

Figure 4: Postoperative image from the first surgery of stabilization and fixation of the L5S1 grade 2 lytic spondylolisthesis without interbody fusion.

MRI showed severe lumbar discopathy pffirman grade V in L5-S1 level and III in L4L5-L5S1 spondylolisthesis conditioning to spinal stenosis. Vascular structures for the anterior approach were stratified by the BDV (Berbeo-Diaz-Vargas) classification system, considering a type 4 which allows a wide corridor for the approach, with less risk of vascular injury (Figure 5.).

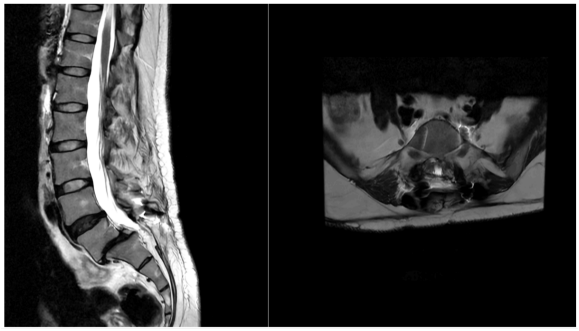

Figure 5: Preoperative MRI showing severe lumbar discopathy Pffirman grade V in L5-S1 level and III in L4L5 , L5S1 spondylolisthesis conditioning to spinal stenosis.

Discussion and Conclusion

Given the clinical presentation, imaging findings, and failure of prior fusion, the patient was scheduled for revision surgery consisting of removal of previous instrumentation, L5–S1 anterior lumbar inter-body fusion (ALIF), L4–L5 transforaminal lumbar inter-body fusion (TLIF), and posterior instrumentation from L4 to S1. A combined anterior–posterior lumbar reconstruction was performed. In the anterior stage (ALIF L5–S1), a retroperitoneal approach allowed complete discectomy and endplate preparation, followed by placement of a 12 × 34 × 24 mm, 12° lordotic ALIF cage filled with bone graft substitute and secured with 4.5 × 20 mm screws into L5 and S1 under fluoroscopic guidance. In the posterior stage, prior instrumentation was removed and a left L4–L5 facetectomy, decompression, and discectomy were performed, followed by insertion of a 9 × 11 × 30 mm, 15° lordotic TLIF cage filled with autologous graft. Pedicle screw fixation from L4 to S1 and Smith-Petersen osteotomies at L4–L5 were completed to restore sagittal alignment, with final fluoroscopy confirming appropriate implant positioning. Surgery was performed without complications and clinically, the radicular component of the pain resolved. Postoperative panoramic X-ray was taken 24 hours later showing immediate correction demonstrating a significant improvement in the recovery of the lumbar lordosis with a global of 50° (previous 42°) and segmentary of 40° (previous 12°), a lower pelvic tilt conditioning to less retroversion , reduction of the spondylolisthesis, and a correction of positive malalignment (SVA from 5.2 to 4 cm) and also having an impact in gaining a better thoracic Kyphosis (Figure 6).

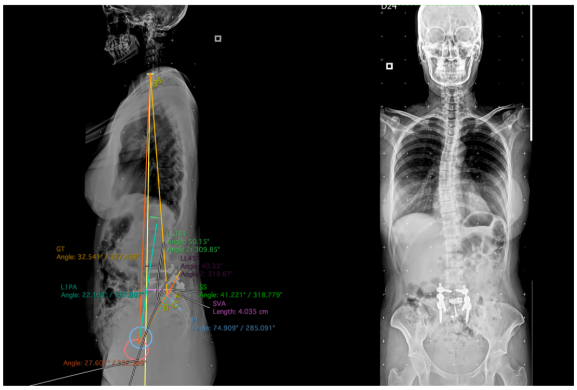

Figure 6: Postoperative panoramic X-ray showing improvement in the sagittal balance and lumbar lordosis gain.

Combined ALIF and TLIF provides effective circumferential fusion, allowing simultaneous neural decompression and restoration of segmental lordosis and sagittal alignment, making it a valuable strategy in complex or revision cases of isthmic spondylolisthesis. This case highlights the impact of minimally invasive techniques in the recovery of sagittal balance and quality life for the patients.

Conflicts of interest: The authors declare that they have no conflicts of interest related to this work.

References

1. Barrow Neurological Institute. Transforaminal lumbar interbody fusion (TLIF) illustration [Internet]. Phoenix (AZ): Barrow Neurological Institute; [cited 2026 Mar 29].
2. Barrow Neurological Institute. Anterior lumbar interbody fusion (ALIF) [Internet]. Phoenix (AZ): Barrow Neurological Institute; [cited 2026 Mar 29].
3. Labelle H, Roussouly P, Berthonnaud E, Transfeldt E, O'Brien M. Spondylolisthesis, pelvic incidence, and spinopelvic balance: a correlation study. Spine (Phila Pa 1976). 2004;29(18):2049-54.
4. Hsieh PC, Koski TR, O'Shaughnessy BA, Sugrue P, Salehi S, Ondra SL, et al. Anterior lumbar interbody fusion in comparison with transforaminal lumbar interbody fusion: implications for restoration of foraminal height, local disc angle, lumbar lordosis, and sagittal balance. J Neurosurg Spine. 2007;7(4):379-86.
5. Harms J, Jeszenszky D. The unilateral transforaminal approach for posterior lumbar interbody fusion. Orthop Traumatol. 1998;6:88-99.
6. Mobbs RJ, Phan K, Malham G, Seex K, Rao PJ. Lumbar interbody fusion: techniques, indications and comparison of interbody fusion options including PLIF, TLIF, MI-TLIF, OLIF/ATP, LLIF and ALIF. J Spine Surg. 2015;1(1):2-18.
7. Schwab F, Patel A, Ungar B, Farcy JP, Lafage V. Adult spinal deformity—postoperative standing imbalance: how much can you tolerate? An overview of key sagittal parameters. Spine (Phila Pa 1976). 2010;35(25):2224-31.