AxiaLIF

The AxiaLIF transsacral instrumentation system has been used for the treatment of L5-S1 spondylolisthesis and degenerative disc disease since its introduction in 2005 as a potentially less invasive alternative to traditional anterior or posterior interbody fusion.

Technological advances have allowed surgeons to perform L5-S1 fusions via posterolateral or anterior approaches through less invasive techniques. The development of the AxiaLIF system (TranS1, Inc., Wilmington, NC) is predicated on the application of minimally invasive techniques to attain fusion at L5-S1 and L4-S1 levels with a novel corridor of approach, described as the presacral “safe zone.”

Complications

Pseudarthrosis

In cases of anterior pseudarthrosis following this device, a paramedian retroperitoneal approach to L5-S1 not only allows for adequate visualization for revision but also provides adequate and safe caudal exposure over the sacral promontory to remove the implant through its previous osseous path.

This technical note highlights the concerns for revision of the AxiaLif (TranS1) screw through the presacral scarred tract.

The AxiaLif (TranS1), used in this case is an alternative method to anterior, posterior, or transforaminal lumbar interbody fusion. Removal of this implant for pseudarthrosis was performed through a paramedian retroperitoneal approach with caudal extension. After anterior discectomy, the AxiaLif screw was removed via manipulation through the disc space and delivered through the sacrum. This was followed by complete discectomy and bone grafting of the voids left in the L5 and sacral vertebral bodies. Standard anterior lumbar interbody reconstruction was then performed using a polyetheretherketone implant followed by revision of the pedicle screw construct posteriorly.

Preoperative symptoms were resolved in the immediate postoperative period secondary to the immediate stability afforded by the revision of the loose implants. Fusion was achieved within 6 months and confirmed with fine-cut computed tomography images.

This novel technique of avoiding a scarred down presacral corridor in the hands of surgeons unfamiliar with the technique allows for safe removal of the AxiaLif (TranS1) implant coupled with revision to anterior lumbar interbody fusion through the same incision [1)].

Failed rod implant

In a retrospective analysis two cases of failed AxiaLIF that required rod removal were identified for detailed study. Available literature on the minimally invasive presacral techniques for rod retrieval was researched, and the use of a novel rod retrieval device with an expanding hex tip is discussed.

Using a minimally invasive presacral approach through the previous surgical corridor, the authors were able to retrieve the AxiaLIF rod implant and then proceed with an alternative fusion technique. Both patients improved clinically and radiographically after revision. Removal of the presacral rod was

not associated with vascular or bowel complications and required minimal operating room time with minimal blood loss [2].

Rectal perforation

Mazur et al, report a case of a rectal perforation as a complication of placement of the AxiaLIF instrumentation system that was successfully treated without the removal of the device.

The patient presented with progressive back pain and sepsis 3 weeks after an L5-S1 fusion done with the AxiaLIF technique at an outside facility. The patient was managed with antibiotic therapy and a diverting ileostomy, without the removal of the AxiaLIF device.

Over the next year, she had symptoms indicative of nonunion of the operated level and breakdown at the adjacent level, which were confirmed with imaging. She underwent revision posterior spinal fusion without the removal of the AxiaLIF device. Eighteen months after the AxiaLIF device was placed, the patient continued to demonstrate no signs of infection recurrence.

Delayed presentation of rectal perforation with a subsequent anaerobic sepsis is a potential complication of the presacral approach to the L5-S1 disc space. Recognition and treatment with fecal diversion and long-term intravenous antibiotics is an alternative to device removal and sacral reconstruction. [3].

Migration

For the retrieval of migrated AxiaLIF lumbosacral screws, intraoperative sigmoidoscopy is technically feasible and serves as a useful adjunct to ensure the integrity of the rectal mucosa is maintained. This technique can be used to avoid the potential morbidity of rectal perforation, and subsequent laparotomy and defunctioning colostomy [4].

Subsidence

A retrospective study of 38 consecutive patients who underwent either 1-level (32 patients) or 2-level (6 patients) AxiaLIF procedures allowed for intraoperative distraction of the L5/S1 intervertebral space and resulted in increased segmental lordosis postoperatively. At a mean follow-up time of 26.2 ± 2.4 months, however, graft subsidence (1.9 mm) abolished partial correction of segmental lordosis. Moreover, subsidence of the construct reduced L5/S1 lordosis in patients with 1-level AxiaLIF by 3.2° and L4-S1 lordosis in patients with 2-level procedures by 10.1° compared with preoperative values ($p < 0.01$). Loss of segmental lordosis predicted failure to improve VAS scores for back pain in the patient cohort ($p < 0.05$). Overall, surgical intervention led to modest symptomatic improvement; only 26.3% of patients achieved an MCID of the Oswestry Disability Index and 50% of patients an MCID of the VAS score for back pain. At last follow-up, 71.9% of L5/S1 levels demonstrated bony fusion (1-level AxiaLIF 80.8%, 2-level AxiaLIF 33.3%; $p < 0.05$), whereas none of the L4/5 levels in 2-level AxiaLIF fused. Five constructs developed pseudarthrosis and required surgical revision.

The AxiaLIF procedure constitutes a minimally invasive technique for L5/S1 instrumentation, with low perioperative morbidity. However, the axial rod provides inadequate long-term anterior column support, which leads to subsidence and loss of segmental lordosis. Modification of the transsacral

technique to allow for placement of a solid interposition graft may counteract subsidence of the construct [5)].

1)
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