Indirect Decompression Progresses Substantially after Immediate Postoperative Period following Lateral Lumbar Interbody Fusion

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Introduction

Lateral lumbar interbody fusion (LLIF) is a useful technique for the treatment of lumbar spinal stenosis combined with spinal instability. LLIF is discectomy and interbody fusion via a lateral transpsoas approach to the lumbar spine.[1] Compared to posterior techniques, this approach allows a thorough discectomy and disc space preparation and placement of a large interbody device on the lateral apophyseal rings of the vertebral body.[2] In the setting of a preserved anterior longitudinal ligament, ligamentotaxis and tensioning of the annulus and the hypertrophic ligamentum flavum allows restoration of disc height and subsequent reduction of spondylolisthesis. These unique technical aspects allow for the phenomenon of indirect decompression. This reduction of spondylolisthesis and tensioning of the ligametum flavum has been shown radiographically to enlarge the area of the neural foramina and central canal post-operatively.[3] Indirect decompression via LLIF can obviate the need for a posterior decompression in the form of laminectomy, laminotomy, facetectomy, or foraminotomy.[4,5] The complications germane to open decompression procedures such as epidural hematoma, postoperative anemia, nerve root injury, CSF leak, epidural fibrosis, and additional muscle disruption may be avoided if indirect decompression via LLIF is successful.[6]

Radiographs and MRI have been used to quantify the indirect decompression that occurs in the 2 week immediate post-operative period with a documented average 41.9% increase in disc height, 13.5% increase in foraminal height, 24.7% increase in foraminal area, and 33% increase in central canal area.[3] There has not yet, however, been a study noting continued progression of the indirect decompression achieved by LLIF after the immediate post-operative period.

Materials and Methods

A 63 year old female presented with 6 months of mechanical back pain and neurogenic claudication in the setting of a previous L2-L3 LLIF with lateral plate and interspinous process plate by an outside surgeon 8 years prior. MRI demonstrated adjacent segment degeneration and severe spinal stenosis and degenerative spondylolisthesis at L3-L4. The patient failed conservative treatment and was a candidate for surgical intervention. An L3-L4 LLIF with percutaneous bilateral pedicle screw instrumentation was performed. A direct posterior decompression was not performed (CoRoent XL, NuVasive Inc, San Diego, CA). There was complete resolution of neurogenic claudication on post-operative day (POD) one. On POD two, a lumbar spine MRI was obtained incidentally. At 19 months post-operatively the patient had another MRI for symptoms of lumbar radiculopathy unrelated to the surgical level. This series of MRIs provided the opportunity to compare the amount of indirect decompression achieved long term with the immediate post-operative decompression.

Results

The pre-operative axial images demonstrate severe central canal and lateral recess stenosis at L3-L4 (Figure 1). Despite the immediate post-operative resolution of symptomatic neurogenic claudication, the MRI that was performed on POD two continues to demonstrate severe spinal stenosis in the central canal and lateral recess of the L3-L4 segment (Figure 2). At 19 months, images demonstrate nearly full resolution of spinal stenosis in the central canal and lateral recess, with significant attenuation of the facet joints, annulus, and ligamentum flavum (Figure 3).

Discussion

In this case, there was not only successful immediate resolution of the patient's neurogenic claudication but also an improvement in the radiographic degree of stenosis at the surgical level that continued to improve beyond the immediate post-operative period following LLIF. LLIF has been shown to indirectly decompress the neural elements immediately following surgery, but this case suggests that decompression may continue to progress well after the immediate post-operative period. This is the first report that suggests long term progression of indirect decompression of

Figure 1. Preoperative T2 mid-sagittal and axial images of the L3-L4 level.

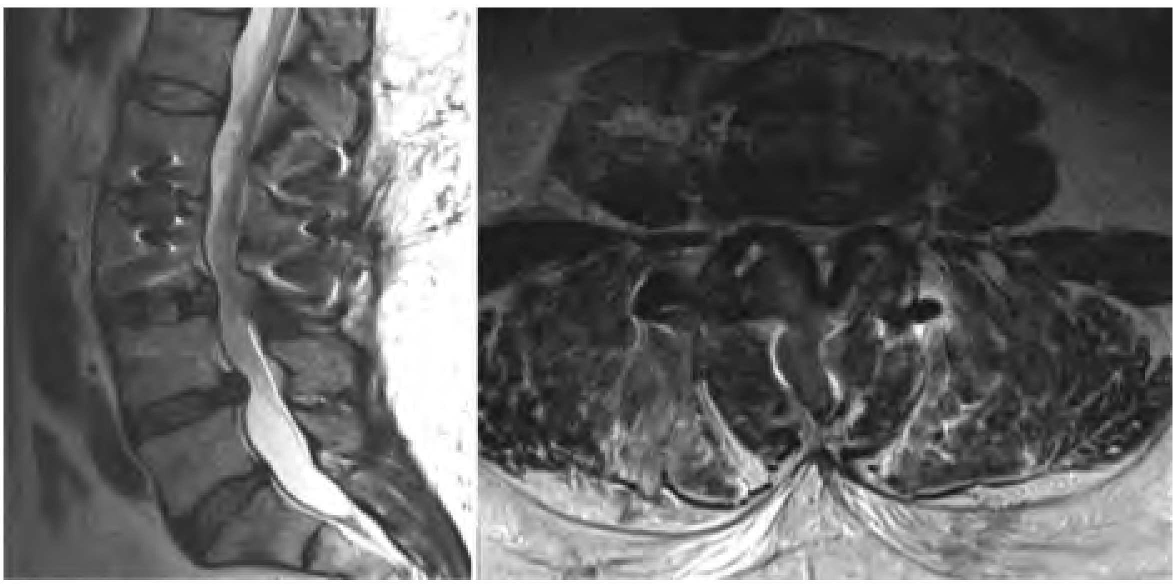

Figure 2. Post-operative day 2 T2 mid-sagittal and axial images of the L3-L4 (operative) level.

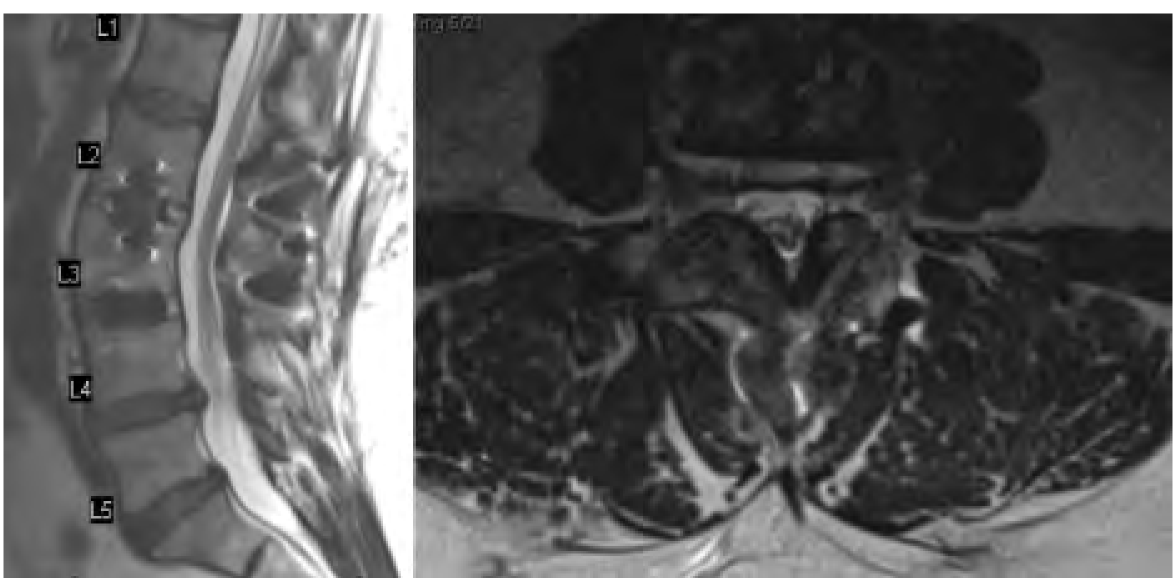

Figure 3. 19 months post-operative T2 mid-sagittal and axial images of the L3-L4 (operative level).

the lumbar spine with comparison to the immediate post-operative period. The attenuation of not only the bony facet joints but also the posterior soft tissues including the posterior annulus and ligamentum flavum is of particular interest.

Further research may include retrospective or prospective imaging studies of cases of LLIF that involved indirect decompression for symptomatic central and/or lateral lumbar stenosis to validate what this case study suggests. Furthermore, the extent of decompression could be quantified and the time-course of progressive indirect decompression established. Such information could be useful for patient counseling, pre-operative planning, and post-operative expectations.

References

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