Hong Kong Journal of Orthopaedic Research
(An Open Access Journal for Orthopedics and Trauma Research)

Technique

Hong Kong J Orthop Res
2022; 5(1): 9-10
ISSN (e): 2663-8231
ISSN (p): 2663-8223
Received: 22-02-2022
Accepted: 10-04-2022

www.hkorthopaedicjournal.com
DOI: 10.37515/ortho.8231.5103

Technical steps to improve lumbar lordosis restoration in transforaminal lumbar interbody fusion (TLIF) surgery

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Abstract

Satisfactory post-operative lumbar lordosis correction following Transforaminal Lumbar Interbody Fusion (TLIF) is associated with better patient outcomes. Our technique to maximise lumbar lordosis restoration in TLIF surgery is described and can be summarised into 7 simple steps. We anticipate that this technique will result in improved radiological and clinical outcomes.

Keywords: Lumbar lordosis, TLIF surgery, Surgical technique.

INTRODUCTION

The goals of Transforaminal Lumbar Interbody Fusion (TLIF) surgery include lumbar lordosis restoration, which correlates with improved patient outcomes [1,2]. It has been suggested, however, that TLIF surgery is less successful at restoring lordosis as compared to approaches such as oblique lumbar interbody fusion [3,4].

We believe that our technique, consisting of seven sequential steps, overcomes this limitation by maximising lordosis correction achievable using TLIF surgery.

SURGICAL TECHNIQUE

Patient positioned in prone on appropriate spinal table under general anaesthesia and set up according to surgeon's preference. Posterior midline incision is utilised over the appropriate spinal segment and a level check is performed under fluoroscopy. Dissection of the paraspinal muscles to visualise bilateral facets and transverse processes of the targeted level(s), followed by bilateral facetectomies to expose the superior articulating facets for pedicle screw insertions on both sides. Laminectomy is performed where indicated, for example, central canal and / or lateral recess stenosis in degenerative spondylolisthesis with concordant signs.

Correct length spinal rod is placed on the side contralateral to the planned cage insertion. An inter-spinous distraction is performed using a laminar spreader initially, with further distraction achieved along the rod using a distractor, followed by temporary fixation of the rod. Pedicle screw distraction is then performed on the side of cage insertion, followed by discectomy and preparation of the end plates by decortication and sequential distraction. The appropriately sized TLIF cage is inserted into the anteromedial aspect of the disc space under image guidance. The second spinal rod is inserted with sequential screw-rod compression to improve segmental lordosis and to lock in the interbody cage. For multi-level surgery, this is repeated for all appropriate levels. Final intra-operative images are obtained and saved. Wound closure is performed as per surgeon's preference, as well as post-operative management plan.

The pre- and post-operative radiological appearances of a patients in our series who underwent the described surgical technique for TLIF are shown in Figure 1. This is a 60-year-old female patient who suffered from chronic back pain and bilateral leg pain, especially on the left side.

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Multiple pain management strategies had failed before presentation to the spinal clinic. Pre-operative imaging showed L4/5 canal stenosis with Grade I spondylolisthesis, with a segmental lumbar lordosis of 5.8° between L4 and L5 and an overall lumbar lordosis of 24.7° between L1 and L5.

Patient opted for surgical treatment in the form of L4/5 TLIF in view of the fact that all other treatment modalities had failed to improve her symptoms. Standard pre-operative pathway was followed and proposed surgery was performed utilising the described surgical technique. Post-operative imaging showed correction of the spondylolisthesis, improvement in segmental lumbar lordosis between L4 and L5 (13.0°), while the overall lumbar lordosis returned to normal physiological range (38.1°).

Patient returned to work in a supermarket by 6 months post-operatively, with significant improvement of her symptoms. She remains happy with the outcome of the surgery at 2 years post-operatively.

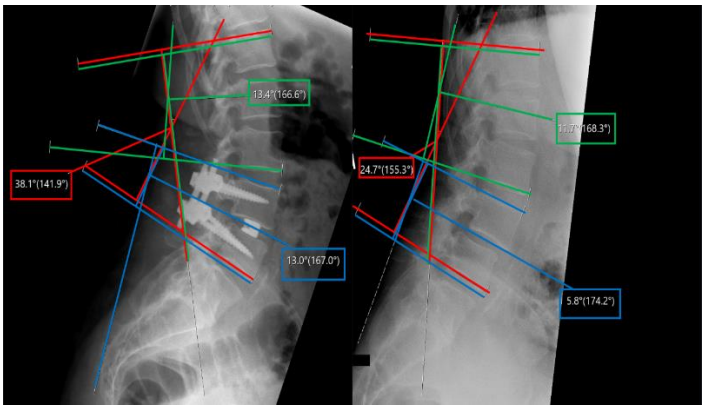

Figure 1: (Right) Pre-operative and (Left) Post-operative lateral standing radiographs demonstrating the changes in the segmental and overall lumbar lordosis. Note the low-grade spondylolisthesis was also corrected in this patient

DISCUSSION

Several recent studies have looked at the effect of lumbar lordosis correction following TLIF surgery [3-7]. However, these studies utilised different surgical techniques, and unsurprisingly, reported conflicting outcomes and conclusion.

Previous study by Jagannathan et al described a similar technique to ours, with partial facetectomy initially performed, before complete excision of the facets towards the later part of the procedure [8]. In their series, they found significant lumbar lordosis correction.

In our experience, bilateral facetectomy allows both better interspinous distraction using a laminar spreader and with a distractor along the spinal rod. This also allows better clearance of the disc space for cage placement. As demonstrated by our patient, segmental and overall lumbar lordosis can be significantly improved and restored to the physiological range, along with the correction of a low-grade spondylolisthesis.

Previous studies suggested that correction of lumbar lordosis is associated with better clinic outcomes [1,2]. Therefore, we anticipate that optimising lordosis restoration using this technique will also improve the radiographic, and possibly clinical, outcomes following TLIF surgery.

CONCLUSION

In summary, our surgical technique can be consolidated into seven simple steps:

1. Bilateral facetectomy.
2. Inter-spinous distraction.
3. Distraction of the rod contralateral to the side of planned cage insertion.
4. Pedicle screw distraction on the side of planned cage insertion.
5. Distraction of the vertebral endplates to aid discectomy.
6. Cage Insertion into the anteromedial aspect of the disc space.
7. Screw-rod compression to improve segmental lordosis and lock in cage

Conflict of Interest

None declared.

Financial Support

None declared

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