

Prediction Algorithm of Indirect Decompression of Lumbar Spinal Stenosis Using a Minimally-invasive Trans-Psoas Approach Noojan Kazemi MD; Marcus Lamar Stephens; Angela Wilcox Palmer University of Arkansas for Medical Sciences Department of Neurological Surgery



Learning Objectives

By the conclusion of this session, participants should be able to:

1) Understand the relationship between intervertebral distraction and spinal canal diameter increase - termed indirect decompression ratio

2) Understand that this ratio increases for descending lumbar levels in the spine

3) Understand that PLL retraction is the major contributor to this indirect decompression

Introduction

Recent studies have shown that lumbar canal stenosis can be successfully treated through indirect decompression through a minimallyinvasive trans-psoas approach in carefully selected patients. However, there is uncertainty regarding the extent of decompression achieved with this approach. In this study, we aim to find a relationship between the increase in intervertebral height achieved with the XLIF technique and the resulting AP diameter changes of the spinal canal for each vertebral level in the lumbar spine.

Methods

The pre-operative and immediate post-operative MRI scans of patients who underwent XLIF procedures were retrospectively reviewed and changes in intervertebral body height, AP canal diameter and posterior longitudinal ligament position, relative to the vertebral bodies, were all calculated. A coefficient, termed the indirect decompression ratio was calculated using the quotient of the interverebral body height and resulting mid-sagittal AP spinal canal diameter.

Results

A total of 56 patients were treated with indirect decompression through the XLIF technique over 18 months. Of these, a total of 24 levels (12 patients) were treated at L2-3 (5); L3-4 (9); L4-5 (10) for which post-operative MRI was available. The mean changes in intervertebral height at L2-3, L3-4, and L4-5 were 5.7mm, 3.4mm, and 3.3mm respectively. The mean changes in AP diameter of the spinal canal at L2-3, L3-4, and L4 -5 were 3.2mm, 3.6mm, and 4.7mm respectively. All patients had significant improvement in lower extremity symptoms. The posterior longitudinal ligament (PLL) was repositioned completely (100% PLL to vertebral body retraction) at every level. The ratios of intervertebral body distraction to spinal canal decompression at L2-3, L3-4, and L4-5 were 0.57, 1.1, 1.4 respectively.



Lumbar Level	No. of Patients	Graft Height & No.	Mean change (Δ) in Intervertebral Height – A (mm)	Mean change (Δ) in AP Spinal Canal Diameter -B (mm)	Indirect Decompression Ratio – A/B
L2/3	5	10mm x 3 12mm x 2	5.7	3.2	0.57
L3/4	9	10mm x 4 12mm x 5	3.4	3.6	1.1
L4/5	10	10mm x 5 12mm x 5	3.3	4.7	1.4



Conclusions

There appears to be a proportional correlation between the degree of spinal canal diameter increase achieved from intervertebral body distraction with indirect decompression, corresponding to each lumbar level. This is labelled the indirect decompression ratio. There is a trend for increasing ratio achieved with each descending level, implying that less distraction is required to achieve the same degree of canal decompression. Additionally, we found that the posterior longitudinal ligament appeared to be more buckled with additional load at lower levels. Some inconsistencies with the data trend also occured in patients with discitis/osteomyelitis as well as hypertrophy of the ligamentum flavum.