



Defining a Safe Working Zone for Lateral Lumbar Interbody Fusion in Indian Population: A Radiographic, Cross-Sectional Study

Bhavuk Garg, Nishank Mehta, **Devansh Goyal**

DEPARTMENT OF ORTHOPAEDICS

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, NEW DELHI



Defining a Safe Working Zone for Lateral Lumbar Interbody Fusion in Indian Population: A Radiographic, Cross-Sectional Study

INTRODUCTION

- LLIF is the most recently described technique that accesses the spine through a direct lateral retroperitoneal approach.
- LLIF employs an operative corridor through the psoas muscle. The position of the lumbar plexus within the posterior one-third of the psoas body necessitates that this operative corridor pass through ‘safe working zones’ (SWZ) to avoid injuring the lumbar plexus or the genitofemoral nerve.
- The incidence of iatrogenic nerve injuries after LLIF has ranged from 0.7%-23% in previous studies.
- In light of these neurological complications, it is essential to understand the anatomy of the psoas, the lumbar plexus and the retroperitoneal vessels with respect to operative corridors in LLIF surgery.
- Previous studies of psoas morphology have been carried out in the Western population – with a single study emanating from South-East Asia.
- The purpose of our study is to present the first radiographic analysis of the anatomy of the lumbar plexus and retroperitoneal blood vessels with respect to psoas morphology and ‘safe working zones’ for LLIF in a sample of Indian population.



Defining a Safe Working Zone for Lateral Lumbar Interbody Fusion in Indian Population: A Radiographic, Cross-Sectional Study

AIM

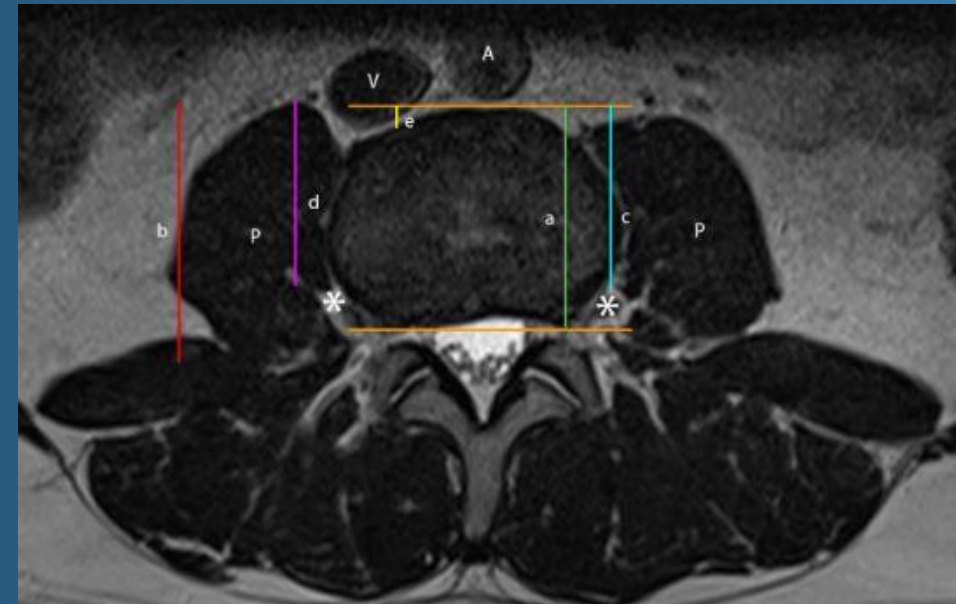
To present a radiographic analysis of the anatomy of the lumbar plexus and retroperitoneal blood vessels with respect to psoas morphology and safe working zones (SWZ) for LLIF



Defining a Safe Working Zone for Lateral Lumbar Interbody Fusion in Indian Population: A Radiographic, Cross-Sectional Study

METHODS

- Study Design : Retrospective, Observational
- A retrospective radiographic analysis of 158 MRI scans was performed. Selected morphometric measurements were performed at L1-L2, L2-L3, L3-L4 and L4-L5 levels:
 - a) disc anteroposterior distance
 - b) psoas anteroposterior distance
 - c) lumbar plexus-anterior disc distance
 - d) lumbar plexus-anterior psoas distance
 - e) vena cava-anterior disc distance
- Calculation of SWZ was done in psoas on both left and right sides.
- The morphometric measurements were analysed for differences with sex and the level.



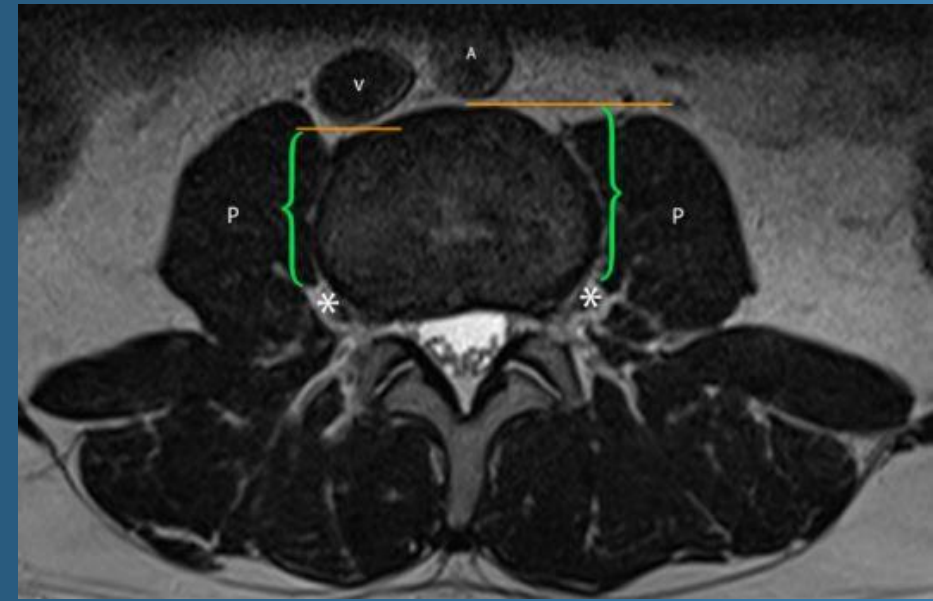
Representative illustration on an axial MRI section of various morphometric measurements used in this study.



Defining a Safe Working Zone for Lateral Lumbar Interbody Fusion in Indian Population: A Radiographic, Cross-Sectional Study

RESULTS

1. All the morphometric parameters differed significantly at all levels between males and females.
2. The SWZ was significantly wider on the left side compared to the right – at L2-L3, L3-L4 and L4-L5 levels in females and at L3-L4 and L4-L5 levels in males.
3. The SWZ at L4-L5 was narrowest on both left and right sides – and significantly reduced compared to other levels.
4. 6.9% patients had a SWZ > 20mm on left side, and 44.9% patients had SWZ < 20mm on right side.
5. With caudal progression of levels, the lumbar plexus and psoas muscle migrated anteriorly and the vena cava/right iliac vein migrated posteriorly.



Representative illustration on an axial MRI section of the safe working zone (SWZ) on the left and right sides



Defining a Safe Working Zone for Lateral Lumbar Interbody Fusion in Indian Population: A Radiographic, Cross-Sectional Study

CONCLUSION

A detailed study of preoperative MRI scans should be carried out in patients planned for LLIF – particularly, at L4-L5 level and in females. A left-sided trans-psoas approach is safer to perform compared to the right side – a right sided approach should be avoided at L4-L5 considering the narrow SWZ at that level.