CADAVERIC STUDY OF THE SAFE ENTRY ZONES TO LUMBAR DISC THROUGH TRANSPSOAS APPROACH

Alaa Abdelraoof Bayomy¹, Ehab Helmy Zidan¹, Mohamed Mostafa Agamy¹, Melad Naim Bushra Eskander Kelada², Ahmed Mohamed Mohamed Abdelaziz Elrahmany¹

¹Department of Neurosurgery, Faculty of Medicine, University of Alexandria, ²Department of Anatomy, Faculty of Medicine, University of Alexandria, Egypt

The authors declare no conflict of interest.

INTRODUCTION

- Low back pain (LBP) is a common musculoskeletal disorder. In Egypt, patients with LBP constitutes a high percentage of patients seeking medical care at outpatient clinics. Spinal fusion is a common treatment for spinal disorders such as disc degeneration, deformity, spondylolisthesis or fracture.

- The minimally invasive lateral retroperitoneal transpsoas approach is a recent technique developed to avoid complications associated with traditional or minimally invasive anterior or posterior approaches to the lumbar spine. This technique was popularized by Pimenta and Ozgur. This technique provides small incision that avoids significant abdominal muscle injury and provides lateral access to the disc space from L1–L2 to L4–L5. However, the limitation of lateral transpsoas approach is the proximity of lumbar plexus which is embedded inside psoas substance.

METHODS

- This study is descriptive study on 10 cadavers, each cadaver was dissected from both sides. The cadavers should fulfill these criteria: intact lumbar spine and sacrum with no deformity (scoliosis or kyphosis) and Psoas muscle intact with its sheath. Each cadaver is placed in lateral decubitus, skin incision in midaxillary line from last rib to iliac crest.

- Incision of abdominal muscle then retraction of peritoneum, psoas muscle exposed. The psoas muscle is dissected, and nerve roots are identified and reported at each disc space from L1–L2 to L4–L5. The safe entry zone is defined by the absence of crossing of a lumbar plexus branch.

RESULTS

- Our results are comparable to previous anatomical studies. Each disc space divided into four zones:
  - Zone 1 the posterior quadrant
  - Zone 2 the middle anterior quadrant
  - Zone 3 the middle posterior Quadrant
  - Zone 4 the posterior quadrant

- The safe working zone includes zones 2 and 3 at level L1–L2, zone 3 at level L2–L3, zone 3 at level L3–L4, and zone 2 at level L4–L5. There is no variance was observed between either side as regards the relationships between the lumbar plexus and the intervertebral disc.

- Table showing our results; at each level dividing of each disc level from L1 to L4 into four zones from anterior (zone 1) to posterior (zone 4) and reporting the zone that each lumbar nerve passing through. The number of cadavers is written between brackets for nerves recorded in two zones in some cadavers.

DISCUSSION

- The direct lateral transpsoas method has an interest over subsequent approaches: minimally invasive muscle splitting method, avoiding the need to compromise the back spinal column, thereby enabling extensive disk space access to place a massive interbody graft, quicker operation times, reduced blood loss, and indirect decompression of the neurological tissue. The main concern of the approach is possible injury to lumbar plexus especially motor roots.

- Our finding concerning safe entry zones to lumbar disc are comparable with most of previous studies. Dissection of all zones is safer anterior than posteriorly for fear of injury of femoral or lumbar roots that will result in weakness post-operative which is serious in patient undergoing lumbar fusion specially at level L4–L5.

- The crossing of genitofemoral nerve at level L2–3 responsible for narrowing the safe zone at this level. For the level L1–2 and L3–4 zone 2 and 3 are safe.

SUMMARY

- The transpsoas approach is minimally invasive approach developed to prevent major complications of traditional approaches. However, the proximity of lumbar plexus is the main limitation of the approach. Knowledge of anatomy of lumbar plexus roots in psoas muscle is mandatory to prevent injury to lumbar plexus roots during entry of dilator through psoas muscle.