Discectomy And Fusion Techniques Versus Discectomy alone In Management Of Recurrent Herniated Lumbar Disc

A Systematic Review

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LSS	Lumbosacral spine
PLL	Posterior longitudinal ligament
ALL	Anterior longitudinal ligament
IVD	Intervertebral disc
IAR	Instantaneous axis of rotation
TLIF	Transforaminal lumbar interbody fusion
PLIF	Posterior lumbar interbody fusion
ALIF	Anterior lumbar interbody fusion
PLF	Posterolateral fusion
MRI	Magnetic resonance imaging
PXR	Plain x ray
AP	Anteroposterior
JOA	Japanese orthopedic association
VAS	Visual analogue scale
ODI	Oswestry disability index

Introduction

Rationale and justification of the study

Lumbar discectomy for sciatica is one of the most common back surgeries,(1) despite significant improvement in surgical technique and technology,complications do occur,(2) such as recurrence of back and/or radicular pain. Possible causes of recurrent pain include recurrent lumbar disc herniation, new disc herniation, epidural fibrosis, scarring, degenerative lumbar disease, segmental instability, and infection.(3)

Recurrent lumbar disc herniation occurs in approximately 5% to 15% of patients and contributes significantly to poor clinical outcomes.(4-6)

By definition, patients with recurrent lumbar disc herniation have a pain-free period of 6 months after the index surgery before recurrence of symptoms.(4) However, in the clinical setting, no strict time interval is required to elapse before a diagnosis of recurrent disc herniation can be made.(3)

Many modalities have been used to evaluate the lumbar spine after surgery. The current neuroimaging tool of choice is gadolinium enhanced magnetic resonance imaging to investigate postdiscecetomy recurrent symptoms.(7)

The optimal surgical technique for treating recurrent lumbar disc herniation is controversial.(8) Some authors believe that in absence of objective evidence of spinal instability, recurrent lumbar disc herniation may be adequately treated by repeated discectomy alone.(6;9-11)while others believe that repeated discectomy alone without fusion remains the major source of complications.(12;13)

Fusion with repeated discectomy can be broadly categorized as posterolateral fusion (PLF) and interbody fusion. Various techniques for interbody fusion have been described in the literature, including anterior lumbar interbody fusion(ALIF), posterior lumbar interbody fusion (PLIF) and transforaminal lumbar interbody fusion (TLIF).(14)

Through a wide systematic review, we intend to evaluate the results of more than 30years experience in treating recurrent herniated lumbar disc with different surgical techniques, assessing short term outcome as improvement of low back pain and radicular pain, and long term outcomes as appearance of spinal instability and complications of different surgical techniques.

Faced with this therapeutic dilemma of "disectomy" versus "discectomy and fusion" for recurrent herniated lumbar disc, we think an up-to-date reviewing and pooling of available data will summarize the current state of knowledge on the management of recurrent herniated lumbar disc. This will provide strong evidence that will help redefine the role of the fusion associated with discectomy alone amongst other surgical techniques for management of recurrent herniated lumbar disc.

Goal of the study

To review and summarize available knowledge on the role of discectomy and fusion techniques versus discectomy alone in management of recurrent herniated lumbar disc.

Objectives

To review, revise and redefine the role of discectomy with different fusion techniques in improving low back pain and radiculopathy in comparison to discectomy alone in patients with recurrent herniated lumbar disc, and its role in prevention of further recurrence of the lumbar disc and the development of spinal instability.

Review of literature

Anatomy

➢ The lumbar vertebrae

The lumbar vertebrae are the lowest five vertebrae of the presacral column. All their features are expressed in more massive proportions. They are easily distinguished from other regional elements by their lack of a transverse foramen or costal articular facets.(15)

The body is large, having a width greater than its antero-posterior diameter, and is slightly thicker anteriorly than posteriorly. All structures associated with the vertebral arch are blunt and stout. The thick pedicles are widely placed on the dorso-latero-superior aspects of the body, and with their laminae they enclose a triangular vertebral foramen. Although the inferior vertebral notch is deeper than the superior, both make substantial contributions to the intervertebral foramen.(15)

The transverse processes are flat and wing like in the upper three lumbar segments, but in the fifth segment they are thick, rounded stumps. The fourth transverse process is usually the smallest.(15)

Aside from their relative size, the lumbar vertebrae can be recognized by their articular processes. The superior pair arise in the usual manner from the junction of the pedicles and laminae, but their articular facets are concave and directed dorsomedially, so that they almost face each other. The inferior processes are extensions of the laminae that direct the articulating surfaces ventrolaterally and lock themselves between the superior facets of the next inferior vertebrae. This arrangement restricts rotation and translation in the lumbar region.(15)

The lumbar segments also have pronounced mammillary processes, which are points of origin and insertion of the thick lower divisions of the deep paraspinal muscles.(15)

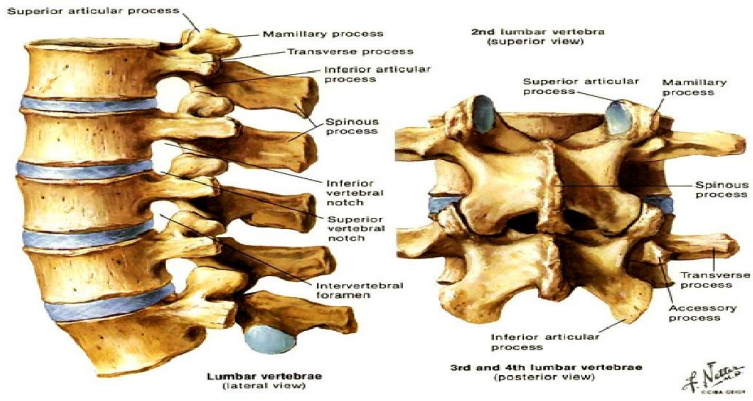

Figure 1: Lateral and posterior view of lumbar spine. (Netter atlas of human anatomy(16))

➢ The intervertebral disc

The intervertebral disc is composed of three main structures: the cartilaginous endplates, the central nucleus pulposus, and the peripherally located annulus fibrosus, their relation to each other is shown in figure 2.(17)

- **Cartilaginous endplates**

The intervertebral disc is separated from adjacent vertebral bodies by a cartilaginous endplate superiorly and inferiorly. In humans, the endplate serves as the growth plate for the vertebral bodies, having the typical structure of an epiphyseal growth plate.(18)

The endplates consists of1-mm-thick, avascular layer of hyaline cartilage in adults. Most compressive forces are transmitted through the superior vertebral body to the endplate, to the nucleus pulposus, and to the inferior endplate and vertebral body.(19)

- **Nucleus pulposus**

The nucleus lies between adjacent endplates and forms the gel-like core of the disc. It consists of a proteoglycan and water matrix, held together by an irregular network of collagen type II and elastin fibers. Proteoglycans have numerous highly anionic glycosaminoglycan (GAG) side chains, which