Biportal Arthroscopic Lumbar Decompression & Discectomy

Essay

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CONTENTS

LIST OF ABBREVIATIONS

AF	**Annulus fibrosus**
APLD	Automated percutaneous lumbar discectomy
CT	Computerized tomography
FBSS	Failed back surgery syndrome
FDA	Food and drug association
FSU	Functional spinal unit
HNP	Herniation of nucleus pulposus
MAPN	Microscopically assisted percutaneous nucleotomy
MED	microendoscopic discectomy
MRI	Magnetic resonance imaging
NP	Nucleus pulposus
PELD	Percutaneous endoscopic lumbar discectomy
PLDD	Percutaneous lumbar disc decompression
PLL	Posterior longitudinal ligament
VEP	Vertebral endolate
YESS	Young endoscopic spine system

LIST OF FIGURES

Introduction

The lumbar spine is composed of five vertebrae and the intervening discs. Each vertebrae consists of a body anteriorly and a neural arch posteriorly that encloses the vertebral canal. In viewing the lumbar spine from the side in an upright posision , it shows a curve that is concave posteriorly. This curve is known as lumbar lordosis.(1)

Since the introduction of open hemilaminectomy 1934, spine surgeons have to face the postoperative complication of local epidural cicatrization and consecutive segmental dysfunction as later price for primary effectual neurological decompression; called "Post laminectomy syndrome", the functional inconvenience is generally limited by reduced muscular stabilization as the open surgical approach interferes directly with the main dorsal stabilizing muscles and ligaments.(2)

Neuroendoscopy has grown rapidly in the last 20 years as a therapeutic modality for treating a variety of spinal disorders. Spinal endoscopy has been widely used to treat patients with cervical, thoracic, and lumbosacral disorders safely and effectively. Although it is most commonly used with minimally invasive lumbar spine surgery, endoscopy has gained widespread acceptance for the treatment of the disc herniation and for anterior

release and rod implantation in the correction of spinal deformity. Arthroscopy has some significant advantages over open or other minimally invasive techniques in that it can allow for better visualization of the lesion, smaller incision sizes with reduced morbidity and mortality, reduced hospital stays, and ultimately lower cost.[3]

In 1997, the field of minimally invasive spine surgery was revolutionized by the introduction of the Micro Endoscopic Discectomy (MED) retractor system, followed shortly by its success. The system allowed for access to the lumbar spine by splitting of muscle fascicles with a series of dilators, allowing for a minimally invasive muscle splitting approach with minimal subsequent muscle dysfunction and pain. The use of such a tubular retractor allows the surgeon the choice of using loupes, the operating microscope, or endoscopy. Subsequently, excellent results have been reported for minimally invasive endoscopic lumbar discectomy and/or foraminotomy by using variants of this approach and similar retractor systems.[4]

Minimal invasive endoscopic discectomy opens a new horizon for treatment of herniated disc of the lumbar spine of disc surgery.[5]

The goal of minimum invasiveness is to minimize the added morbidity of a larger exposure, including the creation of perineural and intraneural scarring.

The recent techniques like percutaneous lumbar disc decompression (PLDD), percutaneous endoscopic lumbar discectomy (PELD), Young endoscopic spine system (YESS) Micro endoscopic discectomy(MED) need lots of expertise, experience and expensive equipments which are not available at every center.[6,7]

The biportal arthroscopic discectomy is a newer technique about which little has been published which allow the surgeon to address not only contained lumbar disc herniation, but also free-fragment disc pathology and symptomatic lateral recess stenosis secondary to bony hypertrophy.[8]

Advantages of biportal arthroscopic surgery:

(1) further reduction in surgical morbidity due to absence of any muscle retraction or dilatation; this is especially evident in patients with morbid obesity and at a double level where only additional 5 mm portals are required.

(2) cost reduction and the possibility of widespread application as a special endoscope or instruments are not required.

(3) free movement of the arthroscope with the ability to obtain a panoramic view on arthroscopic retraction, and zooming in on its advancement.

(4) superior image quality with no problem related to fog accumulation or the need to repeatedly clean the blood from the arthroscopic lens. [9]

(5) the absence of a common working portal for the arthroscope and instruments, allowed for independent movement and angulation of the surgical tool being unrestricted by the arthrooscope which markedly reduces the procedure's difficulty.

(6) pump irrigation under pressure served in opening a potential working space, furthermore the pressure created, acted as a tamponade against epidural bleeding.

(7) relatively easy learning curve once the surgeon gets acquainted to the triangulation technique.[10]

Aim of the work

The aim of this work is to review recent advances of arthroscopic discectomy of lumbar spine that allow the surgeon to handle a variety of herniated discs with minimally invasive surgery and minimal risk of complications.

Anatomy & biomechanics of motion segment of lumbar spine

Anatomical Consideration

The functional spinal unit (FSU) or the motion segment is the smallest segment of the spine that exhibits biomechanical characteristics similar to those of the entire spine. It consists of two adjacent vertebrae and the connecting ligamentous tissues figure(1).

The behavior of the FSU is dependent upon the physical properties of its components such as the intervertebral disc, ligaments and articulating surfaces. Because the spine may be considered as a structure composed of multiple FSU connected in series, its total behavior may be approximated as a composite of the behaviors of the individual FSUs constituting the spine. [11]

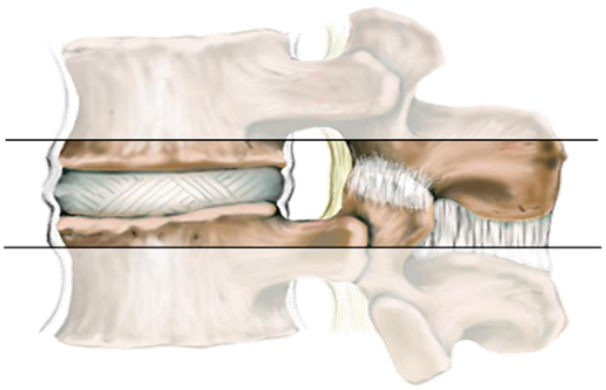

Fig (1)：motion segment of lumbar spine [11]

Anatomy of the lumbar spine

There are five lumbar vertebrae and the sacrum making up the lumbosacral spine. Each vertebra can be considered as having three functional components: the vertebral body designed to bear weight, the neural arches designed to protect the neural elements and the bony processes (spinous and transverse) designed as outriggers to increase the efficiency of muscle action figure (2).

The vertebral bodies are connected together by the intervertebral discs and the neural arches are joined by the facet (zygapophyseal) joints. The discal surface of an adult vertebral body demonstrates on its periphery a ring of cortical bone. This ring (epiphyseal ring) acts as a growth zone in the young and in the adult as an anchoring ring for the attachment of the fibers of the annulus. The hyaline cartilage plate lies within the confines of this ring. [(12)]

The neural arch is composed of two pedicles and two laminae. The pedicles are anchored to the cephalad half of the vertebral body and together with the laminae form a protective cover for the cauda equina contents of the lumbar spinal canal. The ligamentum flavum fills in the interlaminar space at each level.