

**“STUDY OF MANAGEMENT OF SYMPTOMATIC
INTERVERTEBRAL DISC PROLAPSE OF
LUMBOSACRAL REGION WITH DISCECTOMY”**

BY

DR. PRANEETH .R

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& RESEARCH, TAMAKA, KOLAR, KARNATAKA**



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**UNDER THE GUIDANCE OF
DR. P.V. MANOHAR
PROFESSOR & HOD**



**DEPARTMENT OF ORTHOPAEDICS
SRI DEVARAJ URS MEDICAL COLLEGE,
TAMAKA, KOLAR - 563101**

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ALMA MATER



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Date :

DR. PRANEETH.R

Place : Kolar

Department of Orthopaedics,
Sri Devaraj Urs Medical College,
Kolar – 563 101.

CERTIFICATE BY THE GUIDE

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Date :

Place :

Dr. P.V. MANOHAR, MS. Ortho

Professor & HOD,

Department of Orthopaedics,

Sri Devaraj Urs Medical College,

Kolar – 563101.

**ENDORSEMENT BY THE HOD, PRINCIPAL/HEAD OF
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guidance of **Dr. P.V. MANOHAR**, M.S Ortho, Professor & HOD,
Department of Orthopaedics, Sri Devraj Urs Medical College, Kolar*

Dr. P.V MANOHAR

Professor and HOD,
Department of Orthopaedics,
Sri Devaraj Urs Medical College
Kolar – 563 101.

Dr. M.B.SANIKOP

Principal,
Sri Devaraj Urs Medical College
Kolar – 563 101.

Date :

Place :

Date :

Place :

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Signature of the Member Secretary

Ethical Committee

Sri Devaraj Urs Medical College
Tamaka, Kolar – 563101.

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Sri Devaraj Urs Medical College
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**Yada yada hi dharmasya glanir bhavati bharatha! Abhiyuddhanam
adharmaschyas tadatemanam srujamyaham! Pavitranaya sadhunam
vinashaya chaturshrutam! Dharma samshapanarthaya sambhavami yuge
yuge!! This is how it unveiled and ended with smiles.... I thank God, for
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Date :

Dr. PRANEETH.R

Place : Kolar

ABSTRACT

Key words: Fenestration, Discectomy, Laminectomy, hemilaminectomy, Lumbar Disc prolapse.

INTRODUCTION

Numerous retrospective and some prospective reviews of open disc surgeries are available. The results of these series vary greatly with good results ranging from 46-97% and reoperation rate of 3.33%.

The need for this study is to evaluate the results of discectomy for lumbar disc prolapse. With regard to patients post operative subjective evaluation of low back pain and radicular symptoms, the objective Physical findings and the complications.

REVIEW OF LITERATURE

There are many new techniques for treatment of lumbar disc prolapse but conventional standard discectomy through a fenestration is still the most acceptable method today.

Most previous investigators found favorable outcome for discectomy of Lumbar disc prolapse in the post operative period. After discectomy, the results are Satisfactory in approximately 85% of patients.

MATERIAL AND METHODS

30 Cases of lumbar disc prolapse treated with conventional discectomy satisfying inclusion and exclusion criteria treated in RL JALAPPA HOSPITAL were studied.

Japanese Orthopaedic Association Low Backache score was used to assess the outcome, pre operative and post operative scores were taken and the rate of improvement in terms of percentage was calculated.

RESULTS

In our study we achieved 90% excellent to good results, 6.4% of fair results with a complication rate of 3.3% only. The results were comparable to other studies.

CONCLUSION

There are many new techniques for treatment of lumbar disc Prolapse but conventional standard discectomy through a fenestration, Laminectomy or Hemilaminectomy, Laminectomy is still the most acceptable method today. Various studies have shown 91% of patients had excellent, good and satisfactory outcome. 9% of patients had moderate and poor categories of outcome.

LIST OF ABBREVIATIONS

1. AP – ANTEROPOSTERIOR
2. CT – COMPUTED TOMOGRAPHY
3. LA – LUMBAR ARTERY
4. MRI –MAGNETIC RESONANCE IMAGING
5. NSAIDS – NONSTEROIDAL ANTI INFLAMMATORY DRUGS
6. PET – POSITRON EMISSION TOMOGRAPHY
7. SSEP – SOMATOSENSORY EVOKED POTENTIAL
8. T2 – LONGITUDINAL RELAXATION TIME
9. TENS – TRANSCUTANEOUS ELECTRICAL NERVE
STIMULATION
- 10.SLRT – STRAIGHT LEG RAISING TEST
11. HL – HEMILAMINECTOMY
12. L – LAMINECTOMY
13. LT – LAMINECTOMY BY FENESTRATION
14. JOA – JAPANESE ORTHOPAEDIC ASSOCIATION
15. B&B – BOWEL AND BLADDER INVOLVEMENT

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INTRODUCTION

Humans have been plagued by back and leg pain since the beginning of recorded history. Back pain, the ancient cures, is now appearing as a modern international epidemic. Up to 80 % of people are affected by this symptom at some time in their lives. Impairments of the back and spine are ranked as the most frequent cause of limitation of activity in people younger than 55 years by the national center for health statistics. Inter vertebral disc disease and disc herniation are most prominent in otherwise healthy people in the 3 rd and 4 th decades of life. It accounts for a majority of cases of low backache seen by an orthopaedician in clinical practice and is a major contributor of functional disability.

In 1934, Mixter and Barr published their study that concluded that laminectomy with decompression and extraction of herniated lumbar disc could improve suffering caused by sciatic pain ². Since then increasing number of patients have been operated upon for this disorder. Open discectomy is now the “gold standard” for operative intervention in patients with herniated lumbar discs whose conservative treatment has failed. However, the outcome studies of lumbar disc surgery document a success rate of 51 to 89%, ^{4,5,6}, in spite of advances in investigations, operative technique and postoperative care. Therefore the need appropriately presenting and reviewing this subject is important.

AIMS AND OBJECTIVES

- 1) To study the outcome of the surgical management of lumbar Inter vertebral disc prolapse in adults by laminectomy, hemilaminectomy or fenestration and discectomy
- 2) To know the complications following laminectomy, hemilaminectomy or fenestration and discectomy for lumbar inter vertebral disc prolapse by Conventional method.

REVIEW OF LITERATURE

HISTORICAL REVIEW

Though humans have been tormented by back and leg pain since the beginning of recorded history, it is astonishing that origin of disc related sciatica with its clear morphologic and clinical neurologic findings were not recognized until the 20th century. Lumbar disc surgery and intra discal therapy are relatively recent developments. The following is a brief review of the subject.

In the 5th century AD Aurelianus clearly described the symptoms of Sciatica.

In the year 1543 Andreas Vesalius first described the intervertebral disc.

In the 18th centuries Contugnio (Cotunnus) attributed the leg pain to the sciatic nerve.

In 1881 Frost described the Lasegue sign. He attributed it to Lasegue. His teacher.

Virchow (1857), Kocher (1896) and Middleton and Teacher (1911) described acute traumatic ruptures of intervertebral disc that resulted in death.

These examiners did not appreciate the correlation between the disc rupture and sciatica.

Von Luschka 1858, Krause and Oppenheim 1909 and Elysborg 1916 have reported isolated cases of ruptured discs in the spinal canal.

In 1909 Oppenheim and Krause performed the first successful surgical excision of a herniated intervertebral disc. Unfortunately they did not recognize the excised tissue as disc material and interpreted it as an enchondroma.

In 1911 Goldthwaite first made an observation that an intervertebral disc lesion was responsible for compression of the cauda equine and sciatica. He postulated that a rupture of the annulus fibrosus of L5-S1 with posterior protrusion caused back and leg pain.

In 1928 Schmorl, a pathologist from Dresden did extensive studies on the human spine. He described the development of intervertebral disc protrusion into the vertebrae known as Schmorl nodes, as well as disc protrusions into the spinal canal.

In 1929 Dandy reported removal of a disc tumour or chondroma from patients with sciatica. Many other authors reported lumbar laminectomies done to decompress the dural sac and nerve root from what was called ventral extramural chondromas (Steinke 1918, Clymer et al 1921, Adson and Ott 1922, Elsberg 1928, Alajouanine 1928 etc). The commonly held belief of that time was that disc hernia was a neoplasm.

Finally in 1934 Mixter and Barr published in the New England Journal of Medicine, what is now regarded as a classic paper on ruptured intervertebral disc. They described disc protrusions and their relevance for sciatica and showed the effectiveness of operative treatment in 58 cases².

The standard procedure for disc removal was a total laminectomy followed by a transdural approach to the disc. In 1939 Semmes presented a new approach to remove the ruptured disc that included a subtotal laminectomy and retraction of the dural sac to expose and remove the ruptured disc.

In 1948 Lindblom first described discography¹. Witt in 1951 noted therapeutic aspects when he saw marked improvement of symptoms after discography in some patients⁷.

In 1963, Lyman Smith suggested a radical departure in treatment – enzymatic dissolution of the disc by injection of chymopapain. He coined the term “chemonucleolysis”⁷.

The enthusiasm to solve sciatica problems surgically by disc excision and started what Macnab (1977) called “dynasty of the disc”⁷.

In 1974 A. Naylor reported on the late results of laminectomy for lumbar disc prolapse in 204 patients. It was a long-term review after nearly 10 to 25 years of the operation. He made some important observations. Closed treatment should not be continued in the absence of detectable signs of improvement.

A central disc prolapse is an indication for urgent operations if persistent sphincter disturbance or incomplete bladder evacuation is to be avoided. He also concluded that operations gives early and lasting relief of sciatic pain and assists the patient to an early return to work. Operation does not affect the decision to change work. The length of history decides this before operation and the amount of disc degeneration. The need of change of work is the same whether the patient is treated by closed means or by operation. He had 79% good to excellent results in his study⁸.

In 1980 S.Sharma and B.Sankaran conducted a study in 117 patients with prolapsed lumbar discs, 57 were treated with laminectomy and excision of the disc. They found that the operation yielded satisfactory results with 81.6% good results and no poor outcomes. Myelography was very useful in establishing the diagnosis and localizing the level of the lesion⁹.

Kambin and Gillman in 1983 reported on percutaneous approach for lumbar discectomy¹⁰.

In 1983 Weber compared disc herniations which were treated by surgery to those who were treated conservatively He found that operated patients improved more rapidly during the first year than patients who

had no surgery, but in 4 to 5 years the statistical difference between the groups was negligible. Neurological recovery was noted in both the groups. He concluded that surgery provided better results in the short term, but long term results were essentially the same regardless of treatment¹¹.

In 1983 Manucher et al conducted a randomized double blind study to compare the efficacy of intradiscal injection of chymopapain with injection of placebo in patients with a herniated lumbar disc. They found a success rate of 82% in patients who received the drug at initial injection at the 6-month follow up. This coupled with the 91% success rate in patients receiving the drug after placebo failure, demonstrated the chemonucleolysis using Chymopapain was a useful alternative to patients¹ who are candidates for laminectomy¹².

John Godersky et al in 1984 reported on the diagnosis by CT scanning of extreme lateral disc herniation. They described 12 cases of lateral disc herniations, which were diagnosed by CT scanning and were surgically confirmed. They found CT scan to provide accurate means of diagnosis in these cases. It prevented unnecessary exploration of uninvolved levels¹³.

In 1984 Michael Modic et al conducted a study on the magnetic resonance imaging of intervertebral disc disease. Comparison with radiographs, high resolution CT scans and myelograms showed that MRI was the most sensitive for identification of degeneration and disc space infection, separating the normal nucleus pulposus from the annulus and degenerated disc¹⁴.

In 1985 Nagi et al reported early results of discectomy by fenestration technique in lumbar disc prolapse. They found this technique to be extremely satisfactory. They reported 93.3 percent good to excellent, early results¹⁵.

In 1985 Larry Herron et al evaluated a revised objective rating system for patient selection for laminectomy and discectomy based on four categories (neurologic signs, root tension signs, myelogram/CT scan finding and psychosocial environment). They found this rating system to be highly predictive of the surgical result¹⁶.

In 1986 Ebeling et al reported the results of microsurgical lumbar discectomy in 485 patients. They had 39% excellent, 34% good, 19% satisfactory and 9% poor results. They concluded that the results obtained with microsurgery are attained with standard techniques only by highly experienced surgeons. Following microsurgery a uniformly high percentage (88 to 98%) of results are reported as satisfactory, whereas with the standard technique it was 40 to 98%¹⁷.

In 1987 Matti Hurme et al evaluated factors predicting the result of surgery for lumbar disc herniation. They found that the best results were achieved when the patient was operated on before 2 months duration of disabling sciatica. The operative finding graded as 'protrusion' predicted poor result. The social and psychological factors influenced the outcome more than either the findings in the preoperative physical examination or the grade of operative finding¹⁹.

In 1987 Jeffrey et al reported a long-term prospective study of 100 patients who underwent lumbosacral discectomy. They found that the preoperative factors found to be significantly associated with outcome at 1 year postoperatively were not significantly associated with outcome 5 to 10 years postoperatively. They found that surgical outcome was favourable²⁰.

Roy Silver in 1988 compared 270 patients treated with standard discectomy with 270 patients treated with micro lumbar discectomy. He found 98% success rate in the microsurgical group as compared to 95% success rate in the standard laminectomy group. The postoperative

hospital stay and the time before return to work was significantly shorter in patients undergoing microdiscectomy²¹.

In 1988 Blaauw et al evaluated results of neurological assessment one year following surgical treatment of herniated lumbar discs and lumbar stenosis in 443 patients. They found that normal muscle power was found 1 year after surgery in about 75% of patients who had muscle weakness preoperatively. However deterioration of muscle power was observed in 4% of patients with normal power prior to surgery a large number of patients showed significant improvement of neurological dysfunction after surgery²³.

In 1989 S.K. Gupta et al reported on surgery in lesions of lumbar intervertebral disc degeneration. They had 85.2% good to excellent results. There was one case of superficial infection and 4 cases of failed back surgery syndrome²⁴.

In 1990 Spengler et al evaluated an objective scoring system for assessment of patients who have persistent low back pain and sciatica. They concluded that use of their scoring system reduced the incidence of negative findings at exploration and improved the clinical result after elective discectomy²⁵.

In 1991 Casper et al compared microsurgical with conventional standard lumbar disc procedure. They found that results in the microsurgical group were significantly favorable. There was less blood loss and fewer levels were explored. The time to full ambulation, discharge and return to work was faster²⁶.

In 1991 Abramovitz et al published their results of lumbar discectomy study. They found, on analysis of unsatisfactory outcomes, that there were two patterns of failure; one as a result of mechanical back pain and one as a result of radiculopathy. Factors predictive of outcome did no influence the type of failure²⁷.

In 1992 Pappas et al reported their outcome analysis in 654 surgically treated lumbar disc herniations. They reported 80% good outcome. Professionals with legal concerns and laborers with industrial insurance had good outcome⁵.

In 1993 Tullberg et al reported a randomized prospective study on 60 patients with single level lumbar disc herniation with the aim to see if there was any difference between the microscopic removal of a disc herniation and the standard procedure. They concluded that the decision to use the microscope may be left to the surgeon, because it had no effect on the short-term results or those at 1 year²⁸.

In 1993 Mochida et al published their study on percutaneous nucleotomy. They found that the 73% success rate in patients who underwent percutaneous nucleotomy was not satisfactory in comparison with that (88%) in the open surgery through posterior approach²⁹.

In 1994 Davis in his paper on long term follow up study of 984. Patients surgically treated for herniated lumbar discs found a 89% good outcome. The recurrence rate was 6% and complication rate. 4% Majority of patients with failed back surgery had pending legal or workers compensation claims or were at psychological risk for surgery⁶.

In 1995 A. Junge et al evaluated the predictors of good and bad outcomes that influence outcome of lumbar disc surgery. They had 51.5% good outcome and 20.1% bad outcomes. The predictor score gave an overall appropriate prediction of 80%⁴.

In 1995 Erico et al stated that open discectomy is the “Gold standard” for operative intervention in patients with herniated lumbar disc. Recurrent herniations occur at a low rate and serious complications are rare³.

In 1996 MuCulloch et al stated that outcome of surgery for lumbar disc herniation depend on patient selection Short term results are excellent when there is agreement between clinical presentation and imaging studies. Long term results are only slightly better than conservative measures and natural history of disc herniation. The outcome did not seem to be affected by the use of a microscope and depends more on patient selection than on surgical technique³⁰.

In 1998 Wang et al reviewed 88 patients who had sustained a dural tear during sugary on the lumbar spine. Of the 88, 45 were revision surgeries all of which had resulted in a scar adherent to the dura. 76 patients had good or excellent results. They concluded that dural tears could be successfully treated with primary repair and bed rest. It does not appear to have any long-term deleterious effects³¹.

In 1999 Daneyemez et al analyzed the outcome in 1072 surgically treated lumbar disc herniations. They stated that there are many new techniques treated lumbar disc herniations, but also that the conventional standard discectomy is still the most acceptable method today. They that the results. Surgery depends not only upon the degree of neurological impairment, operative technique and skill, but also upon the correct selection of cases³².

In 2003 Morgan – Hough et al presented a review of 553 patients who underwent surgery for lumbar intervertebal disc prolapse 42 patients subsequently required a second operation for recurrent sciatica (7.9% revision rate). They concluded that a contained disc protrusion was almost three times more likely to need revision surgery compared with extruded or sequestered discs. Also they had a significantly greater straight leg rise and reduced incidence of positive neurological finds. Therefore a more enthusiastic conservative Programme ³³. Should treat these patients.

In 2003 Yadav et al evaluated 40 Patients of lumbar disc herniation with myelography and CT scan. Myelography had a sensitivity of 89.6% as compared to 100% sensitivity with CT scans. Myelogram supplements CT scan by limiting the number of scans to the level of interest and reduces radiation exposure. However CT scan is superior in the diagnosis of lumbar disc herniation.³⁴

Endoscopic spine surgery is evolving rapidly due to improvements in surgical technique, endoscope design, and instrumentation. The current technique expands on the basic features and principles of Kambin's access to the spine through the triangular zone. (Surg Technol Int. 2003 Jun; 11:253-61. Advances in endoscopic disc and spine surgery: foraminal approach. Yeung AT, Yeung CA. Arizona Institute for Minimally Invasive Spine Care, Phoenix, Arizona.) J Clin Neurosci. 2003 Mar; 10(2):231-5.

Microendoscopic discectomy (MED), which combines traditional lumbar microsurgical techniques with endoscopy, is being used as a minimally invasive procedure for lumbar disc herniation. We reviewed 30 patients who underwent MED at our institution and compared their outcome with that of patients subjected to the conventional method. Laboratory data suggested that MED was less invasive surgery. Moreover, MED allowed an early return to work. However, the difficulties of this endoscopic procedure were evident, because of the limited exposure and two-dimensional video display. The potential injury of the nerve root and prolonged surgical time remain as matters of serious concern. To overcome this problem, we used an operative magnifying glass during surgery and this helped us to accomplish the procedure comfortably. We recommend the use of an operative magnifying glass in the early stage of the introduction of MED, for it is quite useful to identify the three-dimensional relationships of the structures. (Microendoscopic discectomy (MED) for lumbar disc prolapse.

Nakagawa H, Kamimura M, Uchiyama S, Takahara K, Itsubo T, Miyasaka T. Department of Orthopedic Surgery, Suwa Red Cross Hospital, Kogandori 5-11-50, 392-8510, Suwa-City, Japan)

ANATOMY

The human spinal column is an articulated segmental structure that serves the dual purpose of protection. Thirty-three vertebrae segmentally connected with one another, form a protective housing for the spinal cord and nerves³⁵.

It is made up of 7 cervical, 12 thoracic, 5 lumbar, 5 sacral and 4 coccygeal segments³⁶.

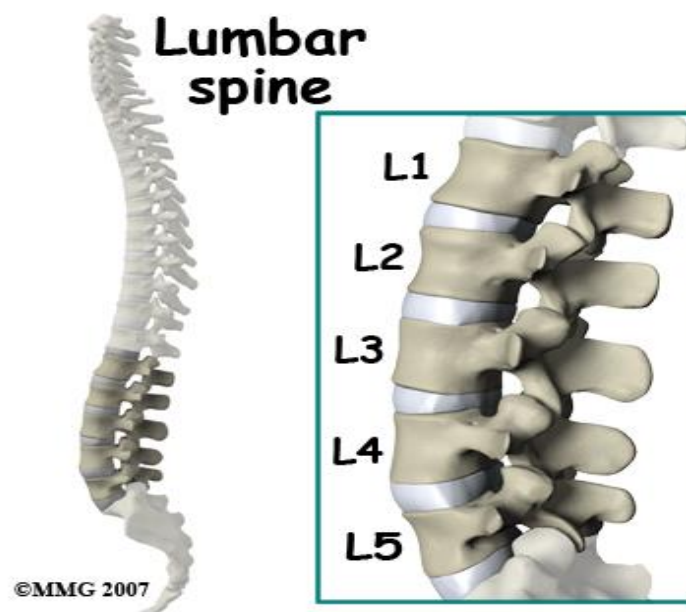


FIG.1

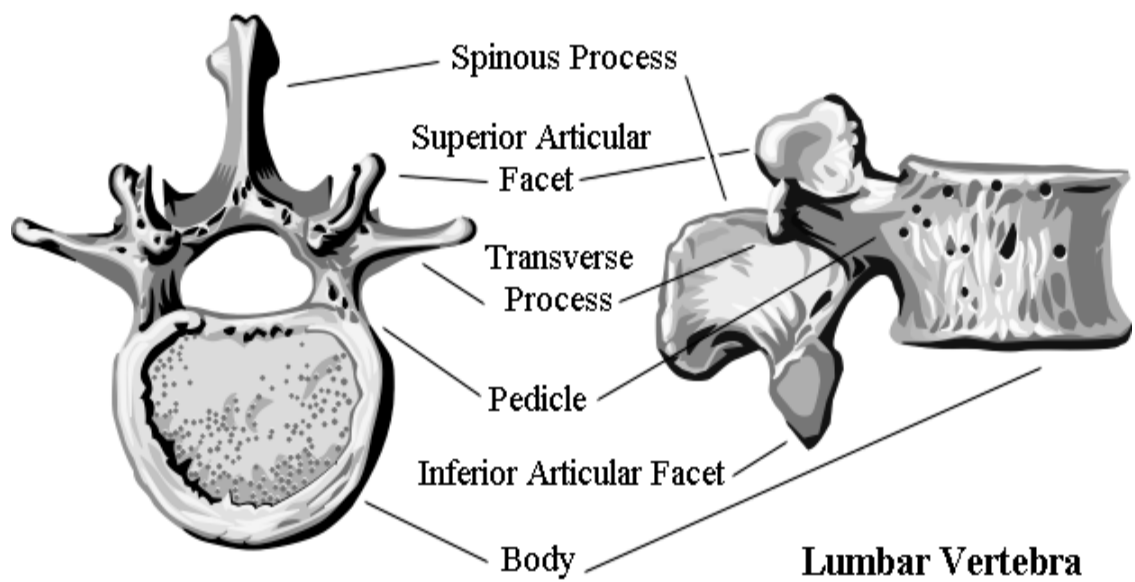


FIG. 2

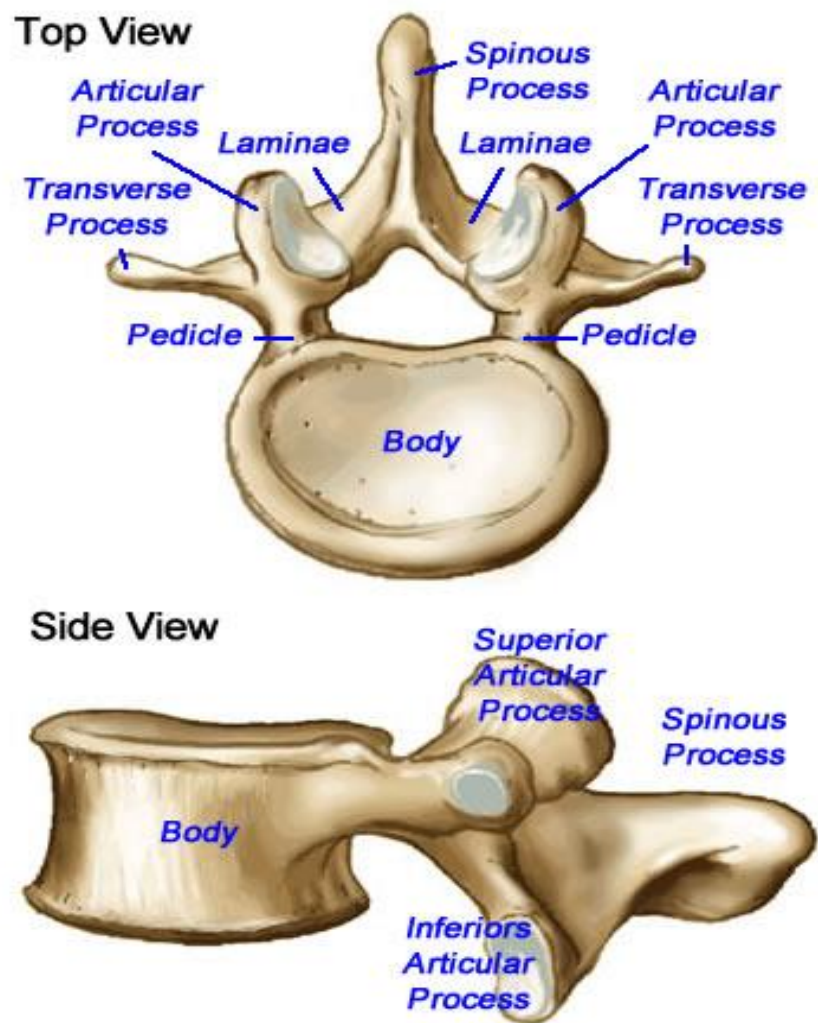


FIG.3

EMBRYOLOGY:

The development of the spine begins in the 3rd week of gestation. Formation of the primitive streak marks the notochordal process. This process includes neurectodermal, ectodermic and mesodermal differentiation. Somites form in the mesodermal tissue adjacent to the neural tube (neurectoderm) and notochord. They number 42 to 44 in humans. They sometimes begin to migrate in preparation for the formation of skeletal structures. At the same time, the portion of the somite around the notochord separates into a sclerotome with loosely packed cells cephalad and densely packed cells caudally. Each sclerotome then separates at the junction of the loose and densely packed cells. The caudal dense cells migrate to the cephalad-loose cells of the next more caudal sclerotome.

The space where the sclerotome separates eventually forms the intervertebral disc. Vessels that originally were positioned between the somites are now overlying the middle of the vertebral body. As the vertebral bodies form, the notochord that is in the center, degenerates. The only remaining notochordal remnant forms the nucleus. The chordal cells disappear by early childhood and are not distinguishable in the adult nucleus pulposus¹.

The vertebral column: There are 33 vertebrae in the human body. The complete column of bodies and discs forms a strong but flexible central axis of the body supporting the full weight of the head and trunk. It encloses the spinal canal, which is occupied by the spinal cord, meninges and their vessels³⁷.

The vertebral column possesses 2 primary curvatures, thoracic and sacral. They are convex posteriorly, present during fetal life and retained after birth.

There are 2 secondary or compensatory curvatures-cervical and lumbar. They are convex forwards. The cervical curvature becomes well pronounced by the 3rd to the 9th month when the child is able to hold its head up and sit upright. The lumbar curvature appears by 12-8 months after birth when the child begins to walk so that the center of gravity of the trunk is brought over the legs³⁶.

The intervertebral disc:

In the lumbar spine it constitutes up to 33% of the vertebral height³⁸. The intervertebral disc is composed of three histological different components.

They are:

- a. Nucleus pulposus
- b. Annulus fibrosus
- c. The cartilage end plates³⁹.

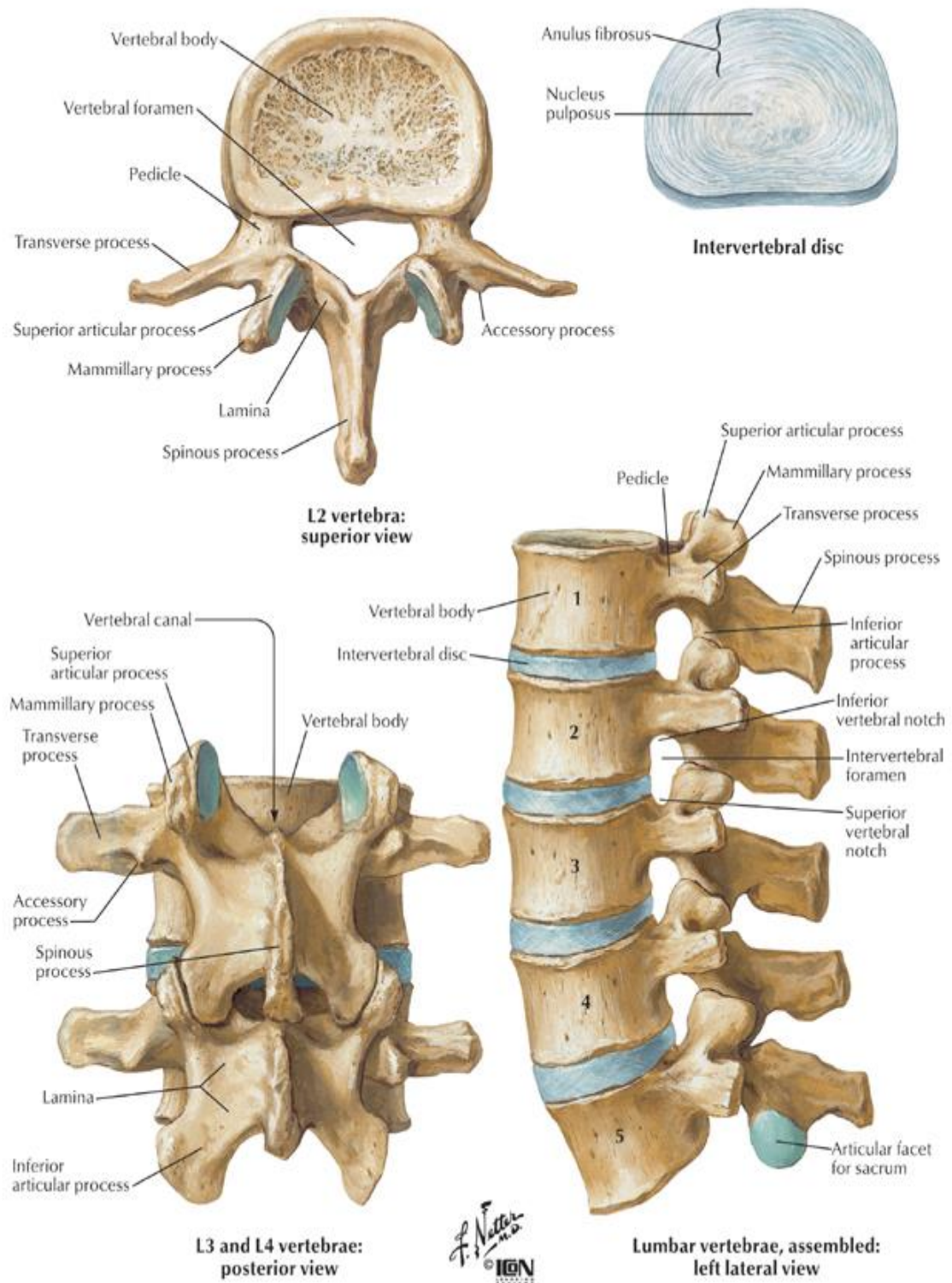


FIG. 4 : Lumbar vertebrae and intervertebral disc

Normally 23 discs exist throughout the spine being absent only at the atlanto axial articulation. They are thinnest in the thoracic and thickest in the lumbar region⁴⁰; discal outlines correspond to the bodies, which they connect. The thickness varies in different parts and regions of the same disc. They are anteriorly in the cervical and lumbar regions, contributing to the anterior convexity³⁷.

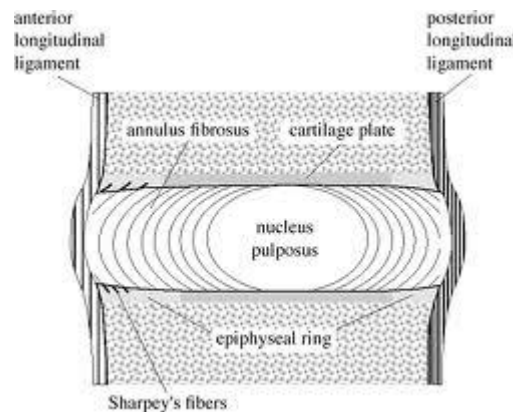


FIG. 5

a. Nucleus pulposus:

It lays a little posterior to the central axis of the vertebrae. It is composed of whitish, glistening, mucoid semi fluid material, which is composed principally of, glycosaminoglycans, water and salts. At birth it contains a few multinucleated notochordal cells. The notochordal cells disappear in the first decade, followed by gradual replacement of mucoid material of fibro cartilage, derived mainly from the annulus fibroses and the hyaline cartilaginous end plates throughout life. With these changes the nucleus pulposus becomes amorphous and discolored. Its water binding capacity and elasticity diminish because these properties are due to its mucopolysaccharide and protein component³⁷.

Microscopically, it shows fine fibrillar structure with clear stroma resembling connective tissue, mucin and fibroblastic cartilage and rarely notochordal cells. The borders of the nucleus are not distinct, as they gradually merge into the annulus fibroses.

The turgor of the disc is dependent on high osmotic pressure of the nucleus pulposus, drawing fluid, from the spongiosa of the vertebrae. The nucleus, being non-compressible, transmits the pressure against the cartilage plate and annulus fibroses. Diurnal variations in height being up to 1.5cm taller in the morning than in the evening are mostly due to alterations in water content of the nucleus³⁹.

b. The annulus fibroses:

It has a narrow outer collagenous zone and a wider inner fibrocartilagenous zone. It is composed of numerous concentric rings of fibrocartilagenous tissue. Fibres in each ring cross radially and the rings attach to each other by additional diagonal fibres. The outer rings or lamellae are attached to the epiphyseal ring by Sharpey's fibres. The rings or laminae, convex peripherally, are incomplete collars connected by fibrous bands overlapping one another. Posteriorly, laminae or lamellae join in a complex manner. Fibers in the rest of each lamina are parallel and run obliquely between vertebrae; fibers in contiguous laminae criss cross, thus limiting rotation in both directions. Predominantly vertical posterior fibers have been described, predisposing to herniation³⁷.

c. Cartilage plates:

These are layers of hyaline cartilage adherent to the trabeculae of cancellous bone of the vertebral body through a thin layer of calcified cartilage at the junction. Thus the plate comes into contact with marrow, between the trabeculae from which it receives nutrition. Vascular channels are said to be present in the cartilage plate extending from the marrow but disappear before the third decade. The cartilage plate fades peripherally into the annulus fibrosus³⁹.

Applied anatomy:

Intervertebral discs form a fifth of the postaxial vertebral column. In young adults the discs are so strong that violence first damages bones. After the second decade, degenerative changes in discs may result in necrosis, sequestration of nucleus pulposus, softening and weakening of the annulus fibrosus. Then comparatively minor strains may cause internal derangement with eccentric displacement of the nucleus pulposus. It then bulges or bursts through annulus fibroses, usually posterolaterally³⁷.

Important Ligaments:

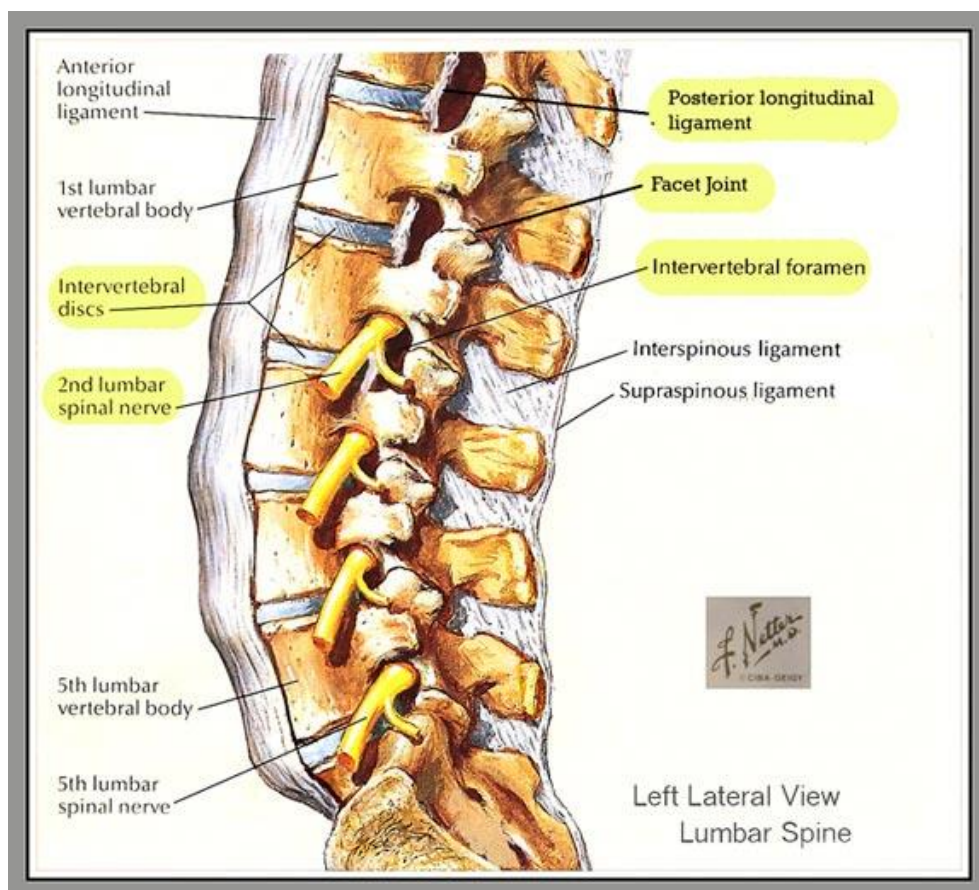


FIG. 6

1. Anterior longitudinal ligament:

It is a strong band extending along the anterior surfaces of the vertebral bodies. Attached to the basilar occipital bone, it extends to the atlantal anterior tubercle, hence to the front of the body of the axis and

then continuous caudally to the intervertebral discs, hyaline, cartilage laminae and margins of adjacent vertebral bodies. At the various levels the ligamentous fibers blend with the peripheral fibers of the annulus fibroses.

2. Posterior longitudinal ligament:

It is in the vertebral canal on the posterior surfaces of the vertebral bodies, attached to the body of the axis and continued to the sacrum. Its smooth, glistening fibers are attached to the intervertebral discs, laminae of hyaline cartilage and adjacent margins of the vertebral bodies. Its superficial fibers bridge 3 or 4 vertebrae, the deeper fibers extending between adjacent vertebrae as perivertebral ligaments close and in adults fused with annuli fibrosus of the intervertebral discs³⁷. The lateral expansions over the intervertebral discs are rather weak and form a vulnerable point for disc herniations compared to the strong central band.

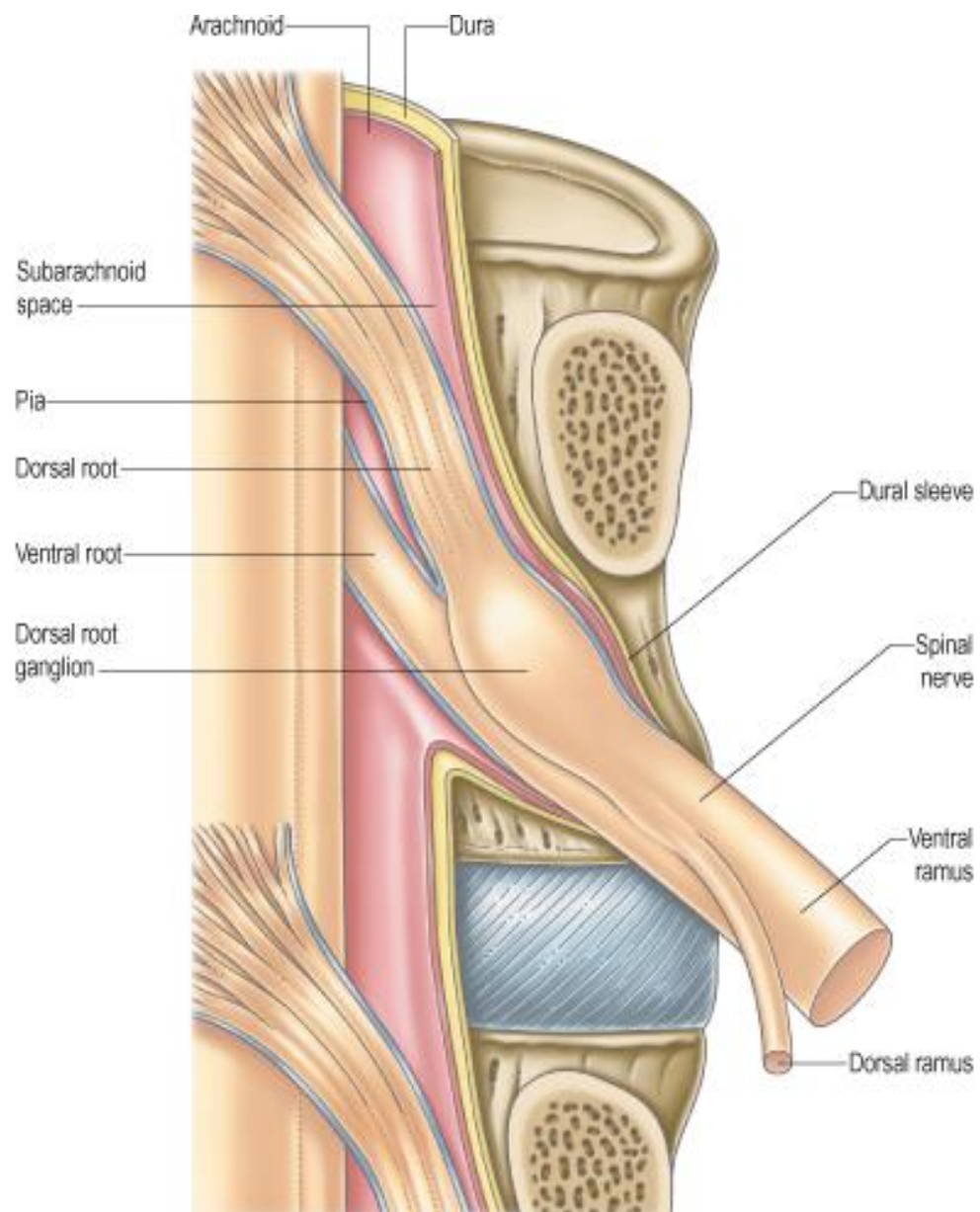
The other ligaments of the vertebral column are the intertransverse ligaments, the supraspinous and interspinous ligamentum flavum. The ligamentum flava are yellow ligaments attached inferiorly to the superior edge and postero superior surfaces of the laminae above.

Denticulate ligament runs like a band along each side of the spinal cord and by means of strong tooth like process anchor the spinal cord to the dura between successive nerve roots¹⁶.

Nerve disc relationship:

The lumbar nerves emerge from the intervertebral foramen below the corresponding numbered vertebrae. The lumbar nerves exit sufficiently high in the intervertebra foramen above the disc and hence will not be affected by a degenerated disc at the same level. For example disc herniation between L₃ and L₄ usually will compress the fourth lumbar

root as it crosses the disc at this level etc. Thus in the lumbar spine each root crosses the disc above the vertebral body but not the one below the vertebral body¹.



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FIG. 7

Relation of spinal nerve roots to vertebrae

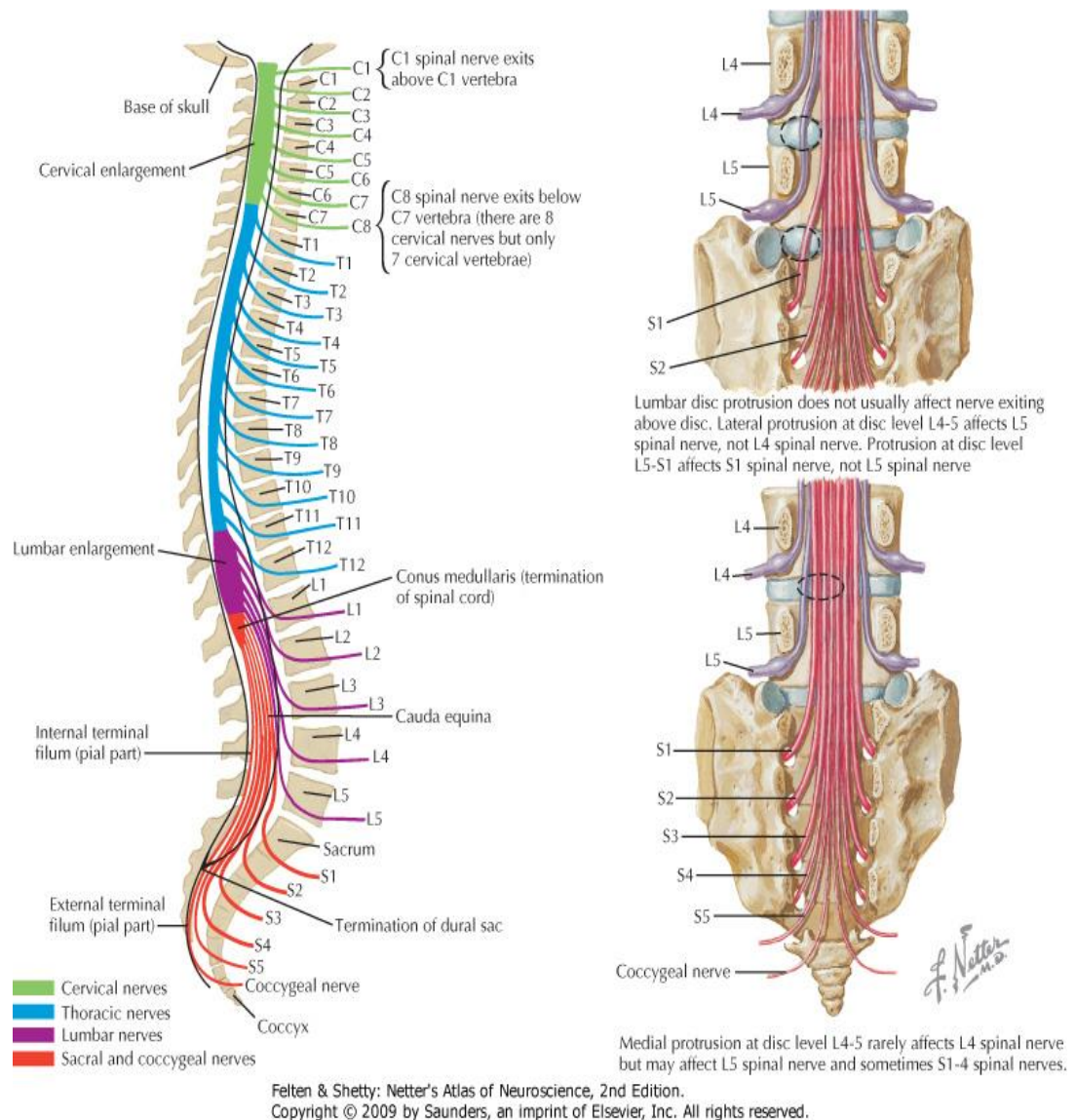


FIG. 8

Blood supply:

The intervertebral disc in the adult is Avascular. The cells within it are sustained by diffusion of nutrients into the disc through the porous central concavity of the vertebral end plate. Regions where the marrow spaces of the trabecular bone of adjacent vertebrae are in direct contact with the cartilage and central portion of the end plate are permeable to dyes. Motion and weight bearing are believed to be helpful in maintaining this diffusion¹.

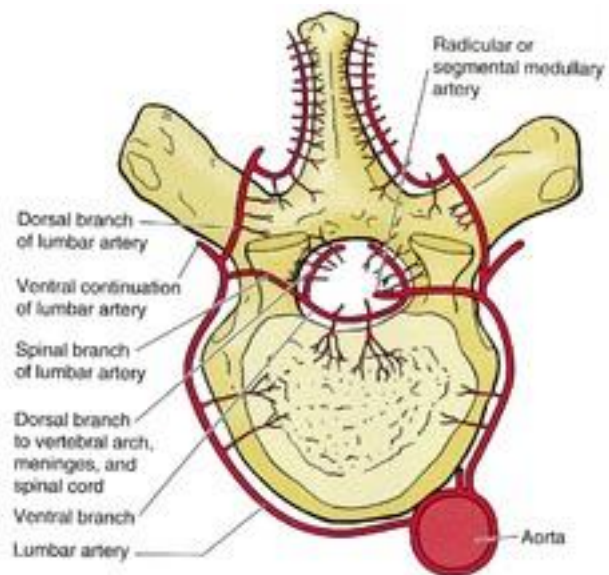


FIG. 9

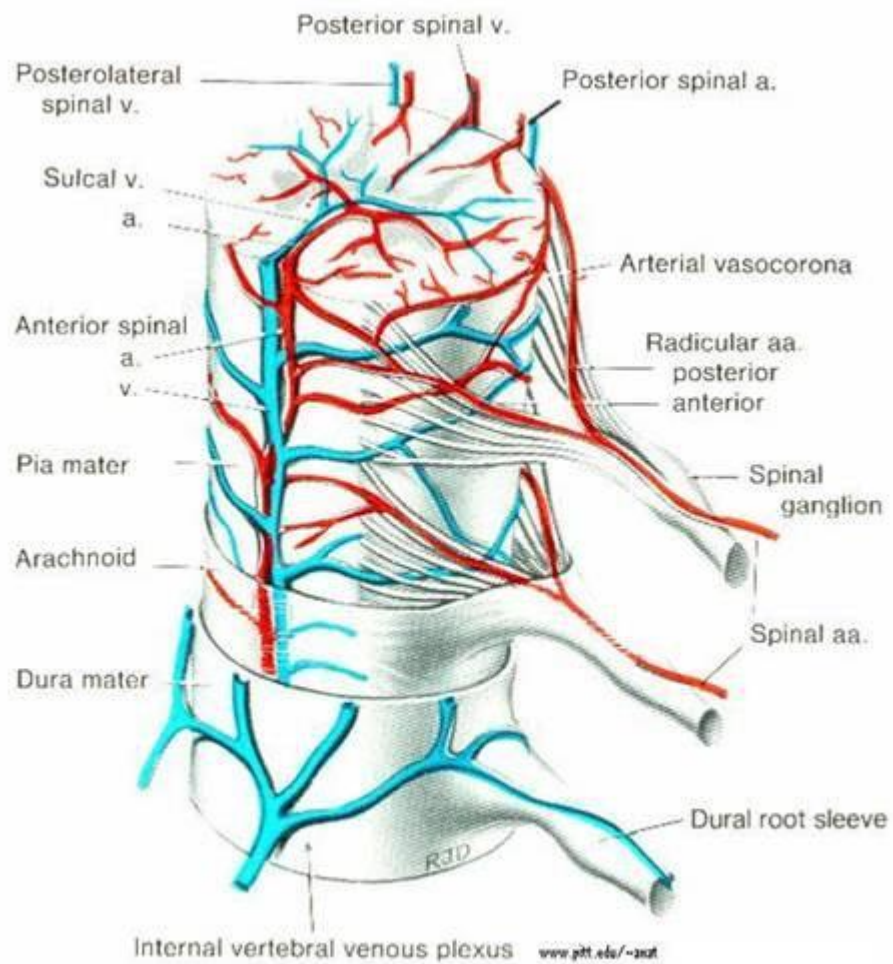


FIG. 10

The sinu-vertebral nerve is a recurrent branch of the spinal nerve, which originates just distal to the dorsal root ganglion and re-enters the neural foramen. It divides into superior and inferior branches, which arborise to supply the periosteum, the posterior longitudinal ligament, the dura and outer most layers of the annulus fibrosus. The nucleus pulposus and innermost layer of annulus fibrosus have no nerve supply³⁵.

Functions of the lumbar spine are:

1. It transfers the weight from head and trunk to the pelvis.
2. It allows physiologic motion between head, trunk and pelvis.
3. It protects the spinal cord from potential damaging forces³⁸.

The Motion segment:

It is the basic functional unit of the spine. It comprises of adjacent halves of 2 vertebrae, the interposed disc and facet joints with supportive ligaments. Its primary functions are weight bearing, protection of neural elements and provide motion to the spinal column.

The intervertebral disc with corresponding facet joints is termed as three joint complexes. The disc plays a crucial role in shock absorption, allowing smooth motion between vertebral bodies in various planes⁴¹.

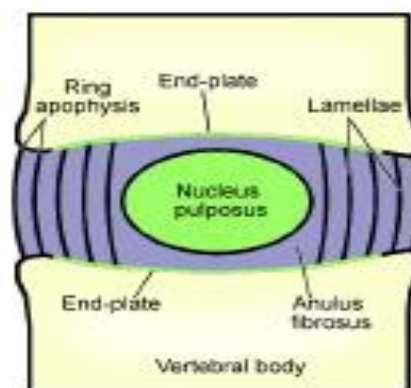


FIG. 11

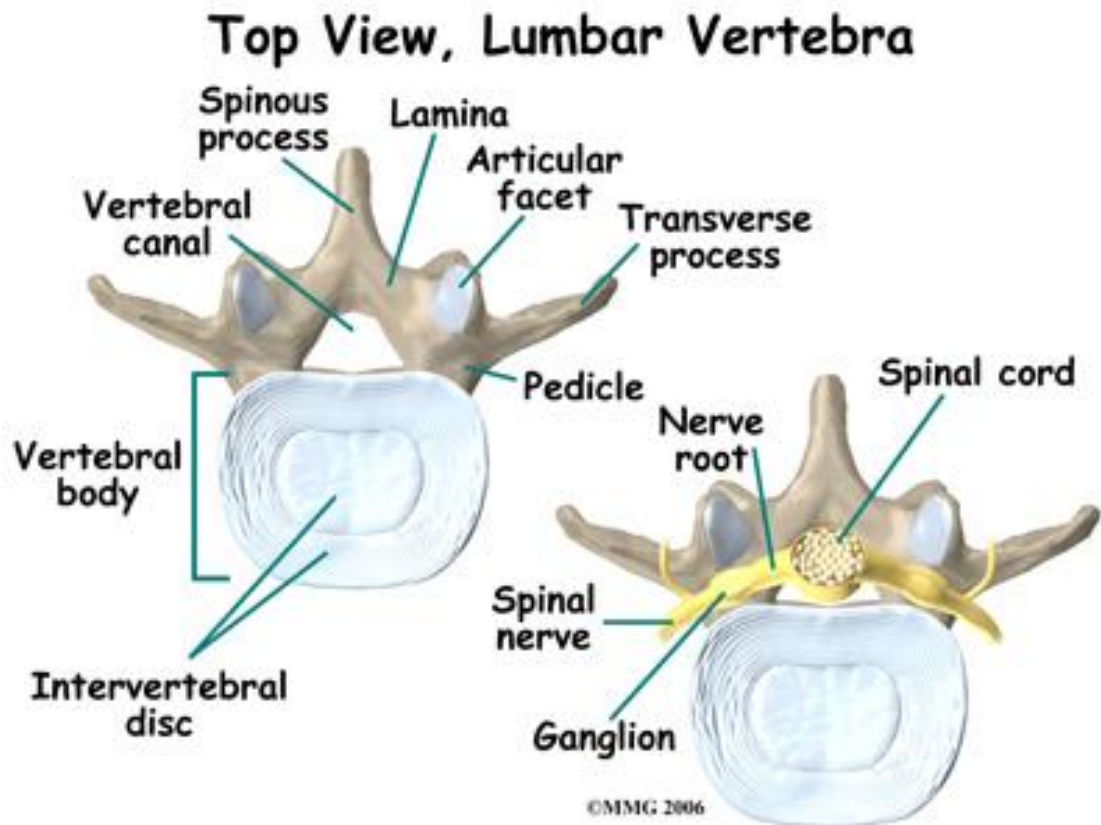


FIG. 12

PATHOGENESIS OF DISC DEGENERATION AND NATURAL HISTORY OF DISC DISEASE

Kirkaldy – Willis and Hill and others have studied the natural process of spinal aging through observation of clinical and anatomical data. A theory of spinal degeneration has been postulated that assumes that all spines degenerate and that our current methods of treatment are for symptomatic relief and not for cure¹.

The process of spinal degeneration has been described by Kirkaldy – Willis and Hill with regard to the three joint complexes.

The degenerative cascade proceeds through 3 phases or stages.

1. Stage of dysfunction
2. Stage of instability
3. Stage of stabilization

The disc and corresponding facet joints will follow one another in the degenerative process. At any given time, different parts of the same segment may show different phases of degeneration.

The patients may be symptomatic intermittently or suffer for a long time; some patients may not show any clinical suffering during their life time⁴².

1. Stage of dysfunction:

It is usually found in the age group of 15 to 45 years. It is characterized by circumferential and radial tears in the disc annulus and localized synovitis of the facet joints¹. The natural aging process, with or without repeated minor trauma, which produce end plate failures, leads to nutritional deprivation, failure to resynthesize the degraded proteoglycans, failure of collagen linking and disturbed water exchange across the disc. This lead to loss of nuclear jelly and weakening of annular support, leading to annular tears. At this stage there may be symptoms of pain, muscular spasm and hypomobility⁴².

2. Stage of instability:

This is found is 35 to 70-year-old patients and is characterized by internal disruption of the disc, progressive disc resorption, degeneration of facet joints with capsular laxity, subluxation and joint erosion¹. With advancement, of degenerative changes there is fragmentation of the nucleus pulposus, tears in the annulus or a break in the hyaline cartilage end plate. The disc now loses its structural integrity. The movement between adjacent vertebral segments becomes uneven and irregular. Excessive degrees of sagittal translatory movements, flexion – extension and rotation movements occur⁴².

c. Stage of stabilization:

Seen in patients older than 60 years, this stage is characterized by progressive developments of hypertrophic bone about the disc and facet joints leading to segmental stiffening or frank ankylosis¹. Progression of degenerative changes, both in discs and facet joints leads to progressive reduction in the hyper mobility of the segment. The reduction in disc height reduces angular motions. The enlargement and entophytic bridging of the facet joints may also stabilize the segment⁴².

Disc herniation in this scheme is considered a complication of disc degeneration in the dysfunction and instability stages¹. Annular protrusion or bulging is a common and natural happening in disc degeneration. But disc extrusion is not a natural happening in disc degeneration. Some other operant factors like trauma must exist for the nucleus to extrude⁴².

Miller, Schmatz and Schultz noted that disc degeneration progresses histologically as age increases. Males were found to have more degeneration than females. L_{4,5} and L_{3,4} disc levels showed the greatest deadeast degree of disc degeneration. The natural history of disc disease is one of recurrent episodes of pain followed by periods of significant or complete relife¹.

Back pain can be expected to precede the onset of radicular symptoms by approximately 6 to 10 years. The initial low back pain episode is of acute onset, whereas subsequent recurrences tend to surface insidiously. The radical component originates insidiously and recurs in a similar manner. In general an encouraging picture insidiously and recurs in a similar manner. In general an encouraging picture is found when one examines the natural history of low back pain. Although neurologic deficits, including motor weakness are helpful diagnostically they are not necessarily compelling surgical factors because residual weakness in not

markedly different in patients treated surgically and those treated non operatively. Bowel and bladder dysfunction affects a relatively smaller percentage of patients, but assumes greater significance in terms of surgical urgency⁴³.

Weber in 1983 compared disc herniations, which were treated by surgery to those who were treated conservatively. He found that patients who did not respond to initial inoperative management, surgery provided the best short-term results, but 4 years later the results of continued non – operative therapy were indistinguishable from those of surgery. Neurological recovery was noted in both operative and no operative group who had neurological deficit at the beginning of the study¹¹.

In general low back pain is a self –limiting condition Sciatica tends to have a more protracted course, but 50% of patients with the symptom recover within a month. Although low back pain represents a continuum of symptoms, it is useful to categorize acute (0-6 weeks), sub acute (6 to 12 weeks), chronic (>12 weeks) and recurrent phases⁴⁴

PATHOLOGY

The function of the disc may be disturbed in a two-fold manner either by alteration of the water content of the nucleus pulposus or “wear and tear” changes in the annulus fibrosus leading to partial or complete extrusion of its interior Desiccation of the nucleus may occur through fissural tears in the annulus, degenerative or traumatic. Disc space becomes diminished followed by proliferation of collagenous tissue of the annulus and its calcification at the edges of the vertebrae results in osteophyte formation.

The fibers in the lamellae of the annulus may give way gradually. The name protrusion of herniation is given to the lesion in which some form of capsule still limits the nucleus pulpous. The term prolapsed or

ruptured disc means that the nucleus has ruptured completely and extruded material lays freely in the epidural space.

In patients over the age of 60 years, changes in the annulus fibrosus were more extensive in prolapsed discs than in protruded discs, Changes seen were myxomatous degeneration, fibrosis and swollen annular fibers with cyst formation. There is reversal of the orientation of the inner fiber bundles of the annulus and bizarre giant cells. In the younger age group 20 to 59 years, these changes are less pronounced³⁹.

BIOMECHANICAL FACTORS AND BIOCHEMICAL FACTORS ASSOCIATED WITH DISC PROTRUSION

A Supine patients weighing 70 kg has a load of 20 kg on his L₃ disc. This increases to 100kg on standing with 20 kg in his hand to 270 kg when sitting and leaning forward with 20 kg weight in his hands.

Intra discal pressures, myoelectric activity and intra abdominal pressure measurements have shown that distance between the weight and the body influences stress on the back.

Disc pressures and myoelectric activity are highest in an anterior unsupported sitting and lowest when sitting straight. They are decreased on adding a backrest or Disc degeneration is characterized by:

1. Reduction in the amount of glycosaminoglycans
2. Increase in the low molecular weight glycoproteins.
3. Increase in fibrillation, fissuring and precipitation of collagen.
4. In nuclear herniation the changes seen are:
5. Fall in total protein polysaccharides, with increased fibrillation and precipitation of collagen content.
6. Increase in the less mature and degraded collagen
7. Increase in the lower molecular glycoproteins³⁹.

TYPES OF DISC PROLAPSE

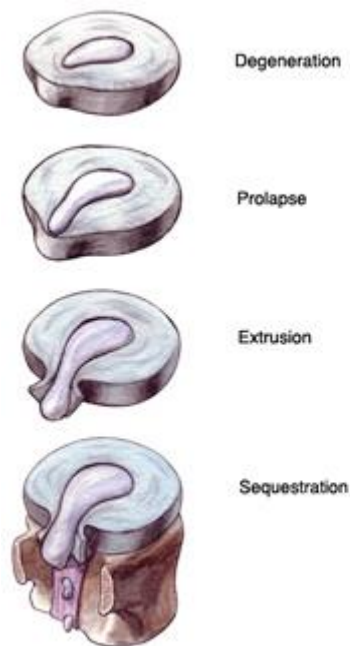


FIG. 13

1. Intradiscal-nuclear herniation:

Nucleus migrates from the central region of the disc and into the inner annular fibers but does not cause any change in the configuration of the outer most annular fibers.

2. Protrusion:

The displaced disc material causes a bulging of the outermost annular fibers.

3. Extrusion:

The nuclear material escapes through all the annular fibers but still remains connected to the nuclear material within the disc.

4. Sequestration:

Nuclear material has extruded through the fibers of the annulus fibrosus and lies in the canal as a free fragment⁴⁵.

Discs: Healthy to Surgery

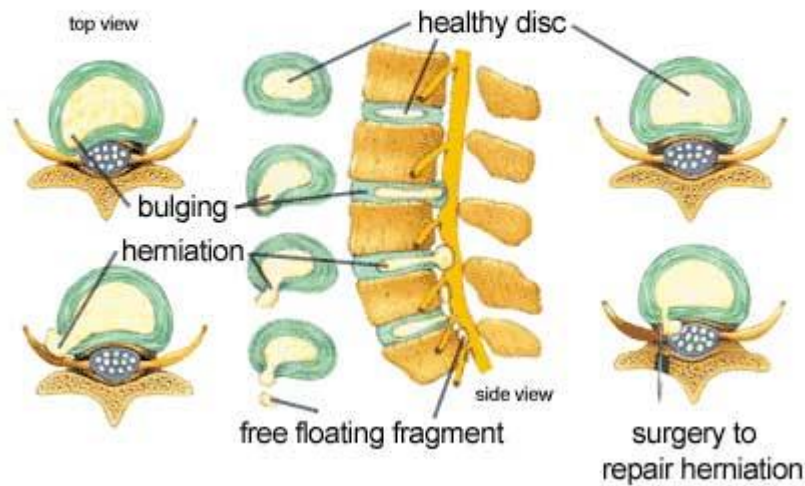


FIG. 14

The site of disc prolapse is important clinically and operatively.

The disc protrusion may be-

- a. Central type- rare
- b. Para median type- Often affects 2 nerve roots one in its extradural course and the other intradurally.
- c. Lateral type- May affects 2 nerve roots both extradurally.

Lateral to the posterior longitudinal ligament is the commonest site of disc protrusion. Depending on its size, the root may be compressed backwards and medially. Or backwards and laterally.

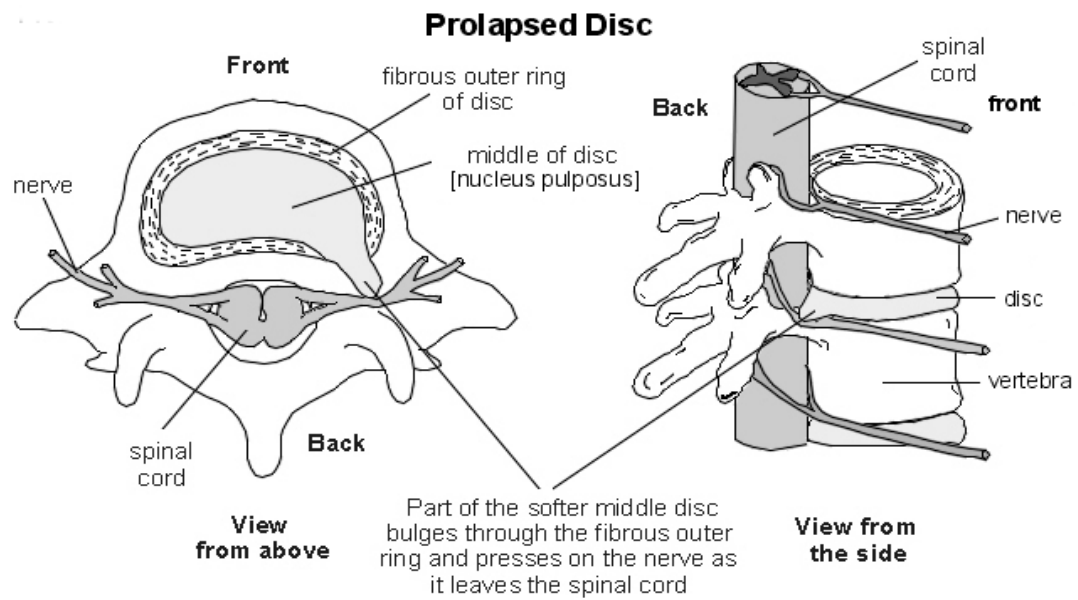


FIG. 15

Intermittent herniation of Falconer or Concealed disc of Dandy is a herniation that is not obvious from the position of flexion on the operating table. The abnormality may be betrayed by the softness of the annulus fibrosus and bulging can be reproduced by hyperextension of the spine³⁹.

INCIDENCE

Hult estimates that up to 80% of people are affected by back pain at some time in their lives.

Svenson and Anderson noted the lifetime incidence of low back pain to be 61% and prevalence 31% in a random sample of 40-47 year old men. In women 38 to 64 year of age the incidence was 66% and prevalence 35%.

Kave estimated the incidence of lumbar discectomy in the USA to be approximately 70/100,000 patients. In most reports, the average age of patients who undergo surgery for lumbar disc herniation is 38 years and twice as many men are affected as women⁴⁶.

The age incidence of lumbar disc prolapse is fairly evenly distributed in the 3 decades between 20 and 50 years³⁹.

The average age of patients undergoing lumbar discectomy is 42 years. The lifetime prevalence of sciatica is 40%, but only 3 percent of patients with acute back pain have nerve root symptoms⁴⁴.

Horal noted that 35 percent of patients with low back pain will at some time develop sciatica. Nachemson in his review indicated that 4.8 percent of male population and 2.5 percent of female population beyond the age of 35 years will at some time in their life experience sciatica. Hakelius reported that, 75 percent of patients with acute lumbar radiculopathy will experience improvement within 10 to 30 days of onset of their symptoms and less than 20 percent of these will eventually become surgical candidates⁴⁷.

CLINICAL FEATURES

HISTORY:

a. Back pain:

Most patients with degenerative disc diseases have low back pain as the earliest symptom.

The usual history of lumbar disc herniation is of repetitive episodes of lower back and buttock pain, relieved after a short period of rest. Most people relate their back pain to a traumatic incident, but close questioning reveals that the patient as had intermittent episodes of back pain for many months or years. Pain is often brought on by heavy exertion, repetitive bending, twisting or heavy lifting¹. Trauma is a precipitating rather than a causative factor⁴³.

Pain from disc herniation is usually intermittent increasing with activity especially sitting. Pain can be relieved by rest, especially in the semi-fowler position and can be exacerbated by straining, sneezing or coughing.

Referred Pain:

Pain begins in the lower back and is referred to the sacroiliac region and buttocks or in some cases to the posterior thigh. Back and posterior thigh pain of this type can be elicited from many areas of the spine, including the facet joints, longitudinal ligaments and periosteum of the vertebrae.

The above-mentioned structures are mesodermal structures which when irritated give rise to referral of pain to sacroiliac joint, buttocks etc. This pattern of referral is to the area-designated sclerotome, which has the same embryonic origin as the mesodermal tissues stimulated⁴³. This is called referred pain.

Radicular pain:

This should be differentiated from the above-mentioned referred pain. Radicular pain usually extends below the knee and follows the dermatome of the involved nerve root. Both the above types may be present concurrently.

Pressure on an inflamed nerve root by the disc fragment or bulging annulus produces pain and motor and/or sensory signs/symptoms along the dermatome of the nerve root. These are called radicular symptoms⁴³.

In most cases of disc herniation there is leg pain equal to or much greater than the back pain.

Sciatica:

The onset of leg pain may be insidious or extremely rapid and dramatic, the former being more common. This leg pain is pathognomonic of disc herniation. Valsalva maneuver or any activity that increases the intradiscal pressure, CSF pressure and neural irritation accentuates this leg pain. The patient in acute cases may list usually away from the side of the sciatica or occasionally towards the said of sciatica depending on the site of disc herniation, whether it is lateral to the nerve root respectively. Some patients may have isolated areas of pain, rather than the typical dermatome involvement, with symptomatic areas between the painful foci⁴³.

b. Motor and sensory symptoms:

Some patients with disc herniation have weakness and par aesthesia weakness is usually intermittent and variable with activity and localized to the neurological level of involvement. Par aesthesia and sensory involvement are also limited to the dermatome of the involved nerve root¹.

c. Cauda equina syndrome:

A large midline or a higher disc herniation may compress several roots of the cauda equine. Raff found an incidence of 2 percent in 624 patients with protruded discs Spangfort reported 1.2% in 2500 cases.

Symptoms include numbness and weakness in both legs, rectal pain numbness in the perineum and paralysis of sphincters. Difficulty with urination, frequency or over flow incontinence, develop early. In males there may be a history of impotence perianal numbness, saddle dysaesthesia and loss of anal reflex or diminished rectal tone characterize advanced cauda equina syndrome⁴³.

d. Bladder symptoms:

1. Total urinary retention
2. Chronic, long standing, partial retention
3. Vesicular irritability
4. Loss of desire to void associates with unawareness of the necessity to void⁴³.

SIGNS/ PHYSICAL EXAMINATION:

Inspection:

The gait and stance of patients with acute disc syndrome is characteristic. The patient holds the painful leg in a flexed position and is reluctant to place the foot flat on the floor. While walking, the patient has an antalgic gait, putting as little weight as possible on the extremity and there is also a significant loss of lumbar mobility.

Loss of lumbar lordosis and Para vertebral muscle spasm are seen in acute phase of the disease.

Limitation of spine motion is also present. In acute cases the patient may also list away from the side of the sciatica ("Sciatic

Scoliosis”), when the disc herniation is lateral to the nerve root a vice-versa in an attempt to decompress the nerve root⁴³.

Palpation:

There is tenderness on palpation of the lumbar spine at the level of the symptomatic degenerative disc. Para spinal muscle spasm may be felt, sometimes unilaterally.

Patients with symptoms of radiculopathy have tender motor points in the myotome corresponding to the probable segmental level of nerve root involvement. These points represent the main neuro-muscular junction of the involved muscle groups.

Neurological examination:

A meticulous neurological examination yields evidence of nerve root compression and suggests the level of the disc. Most common levels are L₄₋₅ and L₅-S₁ followed by L₃₋₄. Disc herniation at L₃₋₄ will compress the L₄ nerve root, as has been described earlier.

Compression of motor nerve fibers of the nerve root results in weakness or paralysis of the muscle group in its distribution and loss of tone and wasting or atrophy of the muscle belly. Reflexes may be diminished or lost.

The pattern of involvement follows the dermatome of the affected nerve root for example, S₁ radiculopathy usually involves posterior aspect of the calf and lateral aspect of the foot and sole etc, sensations should be checked in the autonomous zones for the nerve root also.

DIAGNOSTIC TESTS:

Sciatic tension signs:

These are maneuvers that tighten the sciatic nerve and in doing so further compress the inflamed nerve root against a herniated lumbar disc.

They are:

- a. Straight leg raising test – It is positive in 90% of the cases. Younger patients have a marked propensity for limitation in the SLRT. After the age of 30 years a negative SLRT may occur in the presence of a herniated disc. Other tests of sciatic nerve tension are
- b. Lasegue test
- c. Bowstring test
- d. Contra lateral straight leg raising test or the well leg-raising test.
- e. Circumduction test: It helps to define the relationship between the nerve root and the disc protrusion (Whether medial or lateral to nerve root).
- f. Braggards sign.

The femoral nerve stretch test:

This is seen in cases of disc prolapse at higher levels i.e., when roots of the femoral are involved. It is also called the reverse SLR test. The patient is placed prone and the knee is flexed and hip extended. Pain will be produced over the anterior thigh area⁴³.

INVESTIGATIONS

1. **Roentgenography:**

AP and lateral X-rays of the lumbosacral spine are useful.

They have a two-fold value – to exclude the possibility of the presence of bone pathology, and they may have disc diagnostic significance.

Narrowing of the disc space is frequently seen and is the primary indication of disc degeneration. Early narrowing is usually seen in anterior disc space.

When extensive disc degeneration has occurred, disc height loss may be severe. Narrowing of the disc may be associated of adjacent end plates, which most commonly appears as a band across the end plate. As degeneration progresses osteophytes and facet joint changes become prominent⁴⁸,

2. **Myelography:**

It has proven efficacy in the diagnosis of lumbar herniated discs and has been the gold standard against which CT and MRI have been measured. The materials employed are water-soluble contrast compounds (e.g. Omnipaque). 3-5 ml of the solution is slowly injected into the sub-arachnoids space, followed by X-ray screening on a tilting table. In positive films shadow defects of the column in the thecal sac are seen. Deflection or abolition of small subarachnoid pouches at and below the origin of the nerve root is of diagnostic significance. This procedure is also of value in cases of multiple disc protrusion.

The typical myelographic appearances of disc lesions are

- a. Lateral indentation and deformation of the contrast column by a postero lateral disc.
- b. Hourglass deformity from a midline herniation.

- c. Root-pouch filling defects.
- d. Complete or partial blocks at the level of the disc or rarely opposite a vertebral body³⁹.

3. Computed Tomography:

CT scan is an extremely useful tool in the evaluation of spinal disease. A high resolution CT scan with multiplanar reformations (CT-MPR) transforms the standard axial CT examination of the spine into a more complete evaluative imaging study. The optimum delineation of spinal anatomy and pathologic processes is obtained by studying the spine in complementary orthogonal planes.

Optimal reformatted CT should include enlarged axial and sagittal view with clear notation as to laterality and sequence of cuts. The study can be further enhanced when it is done after water contrast myelography or with intravenous contrast medium.

The reformatted views allow an almost three-dimensional view of the spine and its structures. The lumbar disc herniation is usually found to be focal, asymmetric and dorsolateral in position and is seen to lie directly under the nerve root traversing that disc causing demonstrable nerve root compression or displacement indicating nerve root compression.

The greatest advantage of this technique is the ability to see beyond the limits of the dural sac and root sleeves. Thus the diagnosis of foraminal encroachment by disc material can be made.

Limitation of CT scan is that it cannot differentiate between scar tissue and new disc herniation. Also the CT scan does not have sufficient soft tissue resolution to allow differentiation between annulus and nucleus. Therefore it is difficult to differentiate accurately between a contained disc herniation and a non-contained one⁴⁸.

4) MRI scan:

In 1977, the first magnetic resonance imaging (MRI) scans of the human anatomy were created in the laboratory of the physics department in Nottingham¹¹. This technique uses the interaction of nuclei of a selected atom with an external oscillating electromagnetic field than is changing as a function of time at a particular frequency. Present MRI techniques concentrate on imaging the proton (hydrogen) distribution¹. The contrast between tissues is demonstrated by the main imaging sequences of T1 (spin-lattice) and T2 (spin-spin) relaxation times and the proton density of individual tissues. T1 images provide a good anatomic display of cord and the nerve roots, and highlight fat and marrow space. T2-weighted sequences highlight fluid, producing a myelogram like effect in the lumbar dural sac and differentiate the nucleus from the annulus fibrosus.

The MRI scan can be enhanced further with the use of intravenous gadolinium labeled diethylene triamine pentaacetate (Gd-DTPA). MRI enables a more accurate sub grouping of the disc prolapse in line with the classification. The non-contained extruded disc can often be defined separately from the contained protrusion. Sequestered disc prolapse can also be demonstrated⁴⁸. MRI is clearly superior in the detection of disc degeneration. They allow evaluation of a complete spinal group (cervical or lumbar etc.,). They can also clearly view areas in the foramen¹.

OTHER DIAGNOSTIC TESTS:

Numerous diagnostic tests have been used in the diagnosis of disc prolapse. The primary advantage of these tests is to rule out diseases other than primary disc herniation.

- 1) Electromyography – to rule out peripheral neuropathy.

- 2) Somatosensory evoked potentials (SSEP) – to identify the level of root involvement.
- 3) Positron emission tomography (PET).
- 4) Injection studies -
 - a) Differential spinal
 - b) Root infiltration or block
 - c) Discography¹.

TREATMENT

CONSERVATIVE TREATMENT:

The number of variety of nonoperative therapies for back and leg pain are overwhelming. A majority of patients with disc respond well to conservative therapy. Treatments range from simple bed rest to expensive traction apparatus.

The essence of treatment is the acute stage is bed rest with total relief from weight bearing, analgesics, muscle relaxants and physiotherapy.

a) Bed rest:

Strict bed rest is required. A minimum of 3 weeks of bed rest is usually necessary. Mobilization is gradually instituted once the patient has had substantial relief of pain and muscle spasm. Biomechanical studies indicated that lying in a semi-fowler position or on the side with both hips and knees flexed with a pillow between the legs should relieve most of the pressure on the disc and the nerve roots. Use of pelvic or skin traction is disputed.

As the pain diminishes, the patient should be encouraged to begin isometric abdominal and lower extremity exercises, walking within limits of comfort is encouraged. Sitting, especially riding car or bike is discouraged¹.

b) Drug therapy:

Bed rest is supplemented with non-steroidal anti-inflammatory drugs (NSAIDS), muscle relaxants and night sedation³⁹.

c) Physiotherapy:

It should be used judiciously. The exercise should be fitted to the symptoms and not forced as an absolute group of activities. Patients with acute back pain eased by passive extension of the spine can benefit with extension exercise and vice-versa. These exercises should not be forced in the face of increased pain. Lower extremity exercise can increase strength and relieve stress on the back.

Education in proper body posture and body mechanics should be given. This education can take many forms, from individual instruction to group to group instruction. Back education of this type is now usually referred to as “back school”.

Some patients respond well to transcutaneous electrical nerve stimulation (TENS), skin traction in bed with 5 to 8 pounds of weight. Back braces or corsets may also be helpful. Ultrasound and diathermy are also used in conservative treatment¹.

d) Epidural steroids:

The epidural injection of a long acting steroid with epidural anesthetic is an excellent method for symptomatic treatment of discogenic pain. They are not a cure, but provide prolonged pain relief without excessive narcotic intake. The local effects of steroid have been shown to last for 3 weeks¹.

CHEMONUCLEOLYSIS:

Enzymatic dissolution of the disc using chymopapain was first described by Lyman Smith in 1963. This is a useful alternative for patients who are candidates for laminectomy a discectomy⁷.

SURGICAL TREATMENT

Indications:

- 1) Paraplegia or acute bladder paralysis due to caudaequina compression – this is an absolute indication.
- 2) Neurological impairment – patients with severe peripheral neurological deficit which is progressing – surgery in these cases may accelerate neurological improvement.
- 3) Failure of nonoperative treatment – severe sciatic or back pain persisting or increasing despite 4 to 6 weeks of conservative therapy.
- 4) Recurrent sciatica – recurrent incapacitating episodes of sciatic pain⁴⁹.

Surgical options available are –

- 1) The posterior approach :-
 - Standard laminectomy and discectomy
 - Fenestration operation – limited laminotomy
 - Microsurgical laminotomy with disc fragment excision
- 2) Anterior approach with or without interbody fusion.
- 3) Percutaneous approach – suction, laser or arthroscopic discectomy⁴⁹.

General principles:

It is usually performed under general endotracheal anesthesia; Patient is positioned in the modified kneeling position or on a specialized or custom frame. This allows the abdomen to hang free, minimizing epidural venous dilation and bleeding.

Care should be taken to protect the neural structures. Epidural bleeding should be controlled by bipolar cautery. Any sponge, pack or cottonoid patty placed in the wound should extend to the outside. Pituitary rongeurs should be marked at a point equal to the maximal allowable disc depth to prevent accidental trauma to viscera or aorta. The placement of large chunk of autogenous fat is a reasonable complication-free technique of minimizing post-operative epidural fibrosis¹.

Whether one uses magnification (loupes or microscope) to accomplish the operative goals remains controversial. Surgeons who use magnification believe that the surgical technique can be improved with the assistance of the magnification and illumination provided by the microscope. However outcomes of lumbar discectomy for disc herniation depend on patient selection. Short-term results are excellent when there is agreement between the clinical presentation and imaging studies. The outcome of lumbar discectomy does not appear to be affected by the use of a microscope and depends more on patient selection³⁰.

A review of the natural history of symptomatic lumbar disc herniation reveals that, surgery plays only a palliative role in its management. Long-term studies comparing operative and non-operative treatment groups of patients with herniated discs show no statistically significant differences in outcome. Operative treatment provides a quicker relief from sciatic pain⁴⁹.

COMPLICATIONS

The complications associated with standard laminectomy and discectomy are –

- 1) Infection
 - a) Superficial wound infection
 - b) Deep – disc space infection
- 2) Thrombophlebitis / Deep vein thrombosis
- 3) Pulmonary embolism
- 4) Dural tears – may results in (a) Pseudomeningocele, (b) CSF leak, and (c) Meningitis

Dural tears must be sutured with 6.0 or 7.0 dual nature with a reverse cutting needle using a simple or running locking stitch. Incase of large defects a free fat or fascial graft may be sutured to the dura. Muscles and fascia are closed with nonabsorbable sutures in two layers. Drains should not be used and postoperatively bed rest in supine position for 4 to 7 days is observed.

- 5) Postoperative cauda-equina lesions
- 6) Neurological damage or nerve-root injury
- 7) Urinary retentions and urinary tract infection
- 8) CSF fistula
- 9) Pyogenic spondylitis
- 10) Lacerations of abdominal vessels
- 11) Injury to abdominal viscera
- 12) Paralytic ileus¹

MATERIALS AND METHODS

Cases satisfying the inclusion and exclusion criteria in R.L Jalappa hospital were studied.

INCLUSION CRITERIA:

- a. Age 18-55 years
- b. Both Sexes
- c. Failure to respond to non-operative treatment.
- d. Patients with Intervertebral disc prolapse in Lumbosacral region.
- e. Patients with disabling Sciatica.
- f. Patients with or with out neurological deficits

EXCLUSION CRITERIA:

- a. Prior lumbar spine surgery.
- b. Vertebral fractures.
- c. Elderly patients with co-morbidities – unfit for surgery.
- d. Patients with motion segment instability diagnosed on flexion/extension x-rays

All the patients were assessed clinically. A detailed history was obtained and they were subjected to a thorough clinical examination. The findings were noted in the proforma (appendix-I). Radiological investigations (plain x-ray lumbar myelogram and MRI) were carried out to confirm the diagnosis and know the level of the lesion. The patients were also assessed preoperatively and postoperatively with the Japanese Orthopedic Association low backache score. (Appendix-II)

All patients underwent conventional open fenestration and discectomy surgery in the prone position. The level and type of disc

protrusion was observed intraoperatively. Postoperatively the patients were followed up in the immediate post-operative period. 1 month, 3 months and 6 months after the surgery.

The Japanese Orthopedic Association low backache score was used pre and postoperatively to assess the outcome analysis of functional status.

The outcome designation of

- Excellent. More than 90% improvement.
- Good. 75 to 89% improvement
- Fair. 50 to 74% improvement.
- Poor. Below 49%

The improvement in pain and neurological deficit were recorded. Peri and postoperative complications if any were noted. Significance of postoperative changes was assessed by the Chi-square test.

OPERATIVE PROCEDURE:

Standard open fenestration and discectomy:

Preoperative preparations:

- 1) Patient was kept nil orally since the night prior to the day of operation.
- 2) Entire back was prepared by shaving the part and thorough soap and water wash was given.
- 3) Preoperative antibiotics were administered thirty minutes before surgery.

Anesthesia:

- General anesthesia was used.
- Position of the patient:

The patient was placed prone in the knee-chest position. The abdomen was kept free, so as to keep the respiration free and prevent engorgement of the epidural veins and thus reduce bleeding.

Approach:

A mid-line vertical incision over the affected interspace of 8-10cms is made after the back has been thoroughly painted and draped. The incision is deepened to the subcutaneous tissue and deep fascia. The lumbodorsal fascia is incised and the supraspinous ligament is incised over the affected disc space. By subperiosteal dissection, strip the paraspinal muscles from the spines and laminae of the vertebrae on each side and self retaining retractors are applied.

The laminae are carefully nibbled and the ligamentum flavum is removed using a Kerrison rongeur.

After the dura has been exposed adequately the dura is retracted medially and nerve root is inspected. The nerve root is retracted medially using a blunt dissector in order to visualize the underlying disc. It may be seen as an extruded fragment or a bulging posterior longitudinal ligament. Cottonoid patties are used to tamponade the epidural veins once the root is retracted. If an extruded fragment is not seen the posterior longitudinal ligament is carefully examined for any defect or hole in the ligament, laterally. Gently the disc fragments are removed using disc forceps until the bulge has been decompressed. Suction and cottonoid patties control bleeding. They are removed before closure. Gel foam is placed over the cord. The wound is closed in layers over a suction drain. Sterile dressing is applied.

After care: Patient was allowed to turn in bed. Pain was controlled with injectable and oral NSAIDS. Postoperative antibiotic were administered. Neurological function was monitored closely. For urinary retention patients were given antispasmodics and encouraged to pass urine. Catheterization was done if supportive measures failed. Sutures were removed after 10-12 days. Patient was allowed out of bed after 1 week, patient was advised isometric abdominal and lower extremity exercises. At discharge patient was advised not to strain the back by lifting weights. Patients were instructed to minimize sitting and riding in a vehicle. Lifting weight, bending and stooping were prohibited and gentle isotonic leg exercise was started.

Long trips were avoided for 3 months. Patients with jobs requiring prolonged sitting and minimal lifting allowed to return to work after 6 to 8 weeks and those with jobs requiring heavy labour were not allowed to return to work until the 12th week and thereafter to a modified duty or were asked to modify their occupation permanently. They were also advised not to do stretching exercises for more than 6 months.

Findings were noted in the PROFORMA.

Radiological investigations (plain X-ray and MRI) were carried out to confirm the diagnosis and know the level of the lesion. Patients were also assessed preoperatively and postoperatively with JOA LOW BACKACHE SCORE for analysis of outcome. All patients underwent fenestration discectomy operation in the prone position. The level and type of disc protrusion were observed intra operatively. Post operatively patients were followed up in the immediate post operative period, 1 month and 6 month after surgery.

JAPANESE ORTHOPEDIC ASSOCIATION LOW BACK ACHE SCORE

1. Subjective symptoms **Score**

A. Low Back pain

(3points)

- | | |
|--|---|
| a. No Low back pain | 3 |
| b. Occasional mild low back pain | 2 |
| c. Low back pain always present / Severe low back pain occurs occasionally | 1 |
| d. Severe low back pain always presents | 0 |

B. Leg pain and / or tingling

(3 points)

- | | |
|---|---|
| a. No lower extremity pain or numbness | 3 |
| b. Occasional mild lower extremity pain and numbness | 2 |
| c. Lower extremities pain and numbness always present / Severe lower extremities pain and numbness occur occasionally | 1 |
| d. Severe lower extremities pain and numbness | |

c. Ability to walk

(3 points)

- | | |
|--|---|
| a. Normal walking | 3 |
| b. Walking at least 500m is possible, but pain, numbness & weakness are felt | 2 |
| c. In walking 500m or less, pain, numbness and weakness occur, and Walking becomes impossible. | 1 |
| d. In walking at most 100m, pain, numbness and weakness occur, and Walking becomes impossible. | 0 |

Objective findings.	Score
A. SLRT	
(2 points)	
a. Normal	2
b. 30degree – 70 degree	1
c. Less than 30 degree	0
B. Sensory Abnormality	
(2 points)	
a. Normal	2
b. Mild sensory disturbance (Hypoaesthesia)	
c. Distinct sensory symptoms (Anaesthesia)	0
C. Motor Abnormality	
(2 points)	
a. Normal	2
b. Slightly decreased muscle strength	1
c. Markedly decreased muscle strength	0
Total score	15

Rate of Improvement = $\frac{\text{post op score} - \text{pre op score}}{15 - \text{pre op score}} \times 100$

RESULTS AFTER SURGERY ARE ASSESSED ACCORDING TO THE RATE OF IMPROVEMENT

Good: >75 % *improvement*

Fair: 50 to 74% *improvement.*

Poor: <49%

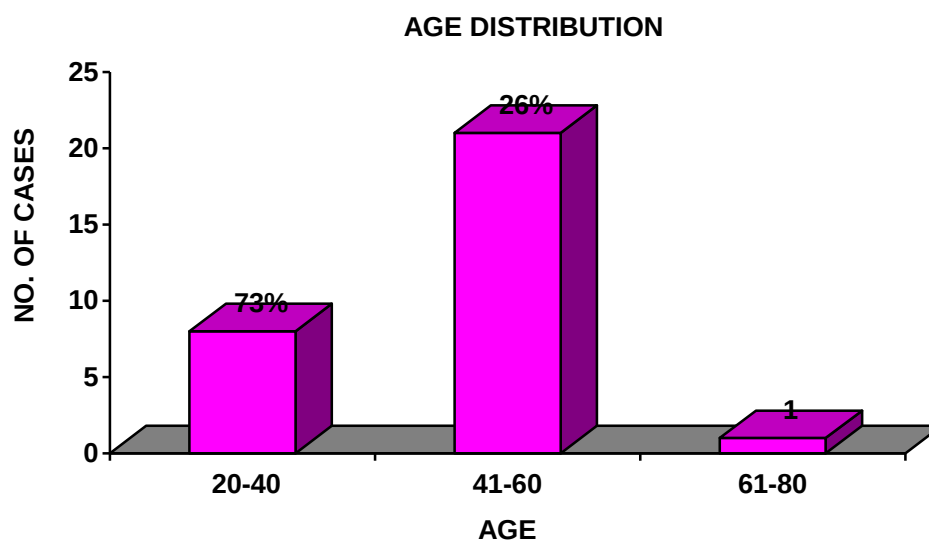
RESULTS AND ANALYSIS

This study consists of 30 cases of lumbar disc prolapse treated by conventional discectomy in 2010-12. The follow up was 6months.

The age of these patients range from 23 to 75 years with an average of 45.7 years, female patients were aged between 28 and 60 years with an average of 43.5 years; males were aged between 23 years and 75 years with an average of 46.8 years.

Table .1
Age distribution

Age	No. Of cases	%
20-40	8	26.67%
41-60	21	70%
61-80	1	3.33%
Total	30	100%

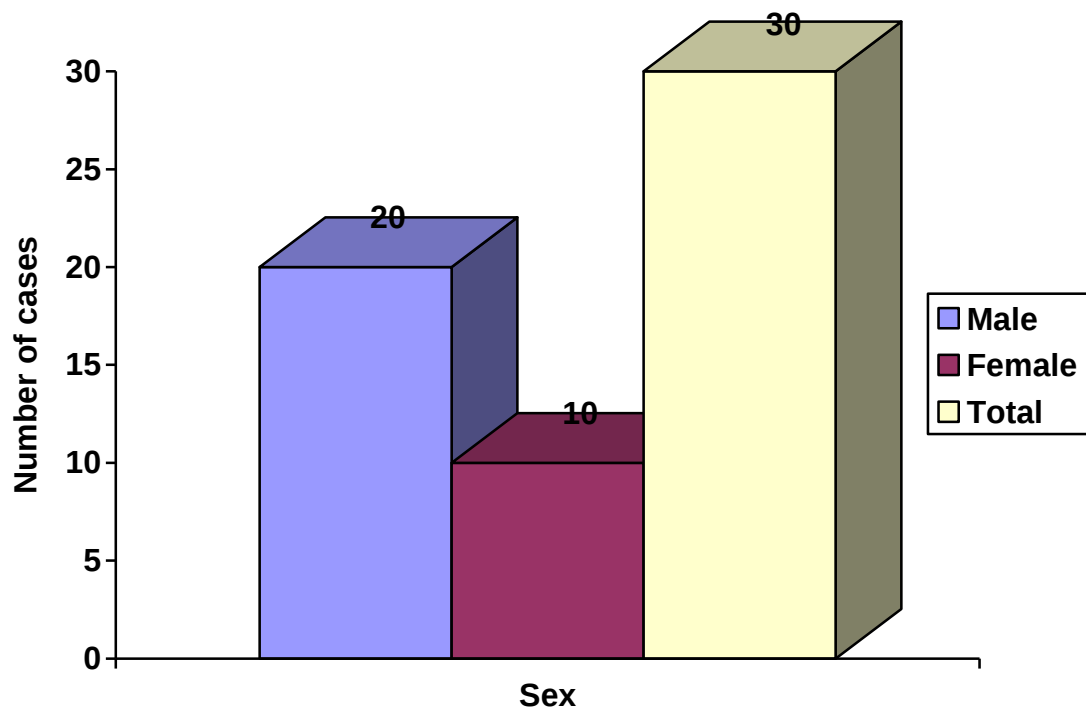


In our study age below 50 years were 18 cases(60%), and age above 50 years were 12 cases(40%).

Table 2
Sex distribution

Sex	No. of cases	%
Male	20	66.67%
Female	10	33.33%
Total	30	100%

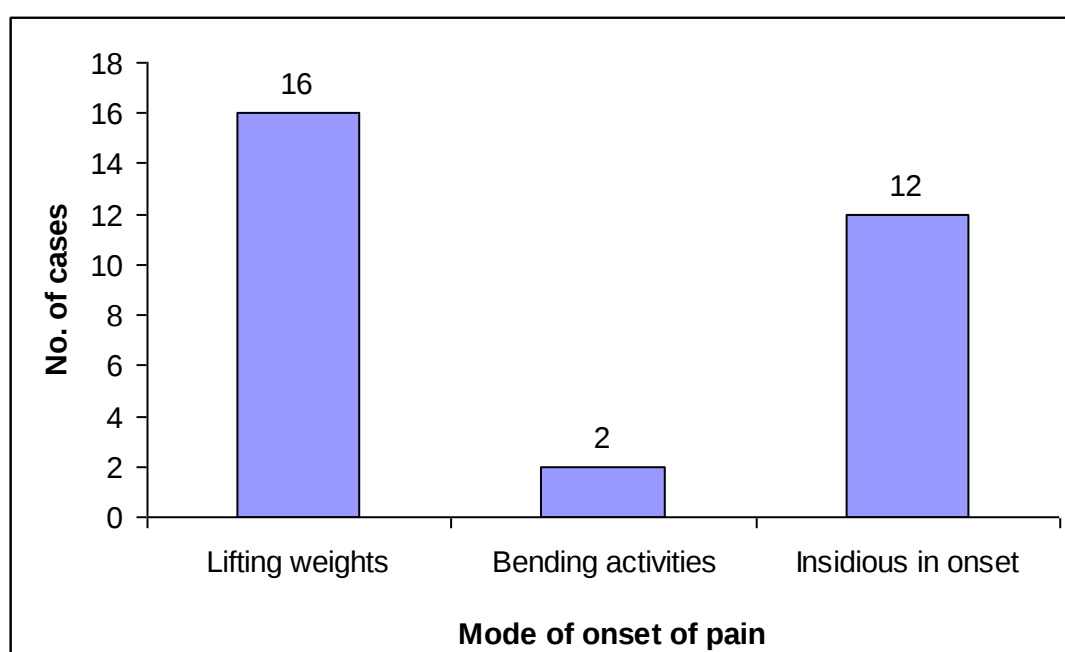
Chart showing the sex distribution



Mode of onset of pain –

Mode of onset	No. of cases	Percentage
Lifting weights	16	53.3%
Bending activities	2	6.67%
Insidious in onset	12	40%

Chart depicting the mode of onset of pain



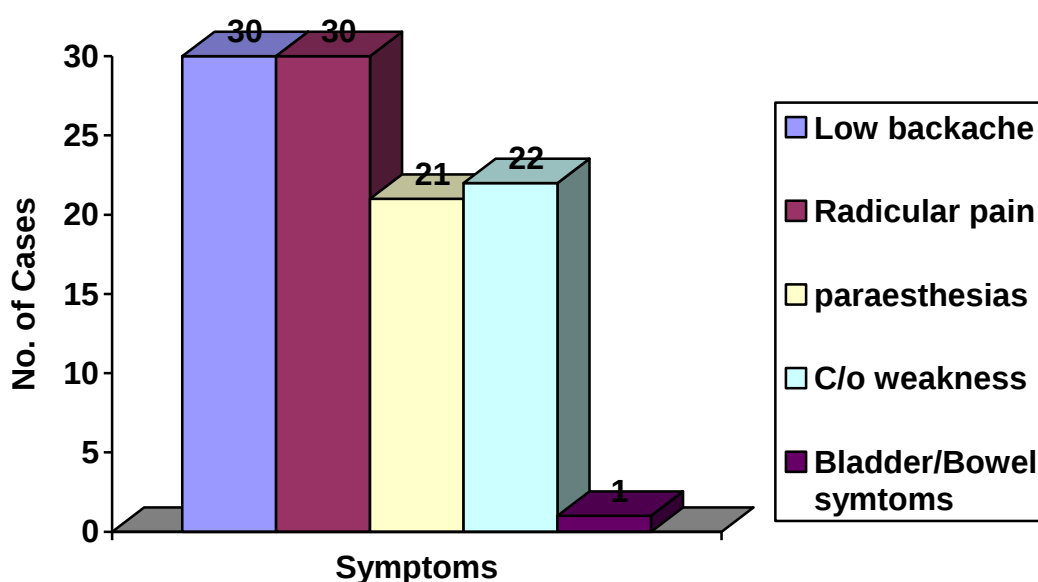
Events, which precipitated the onset of pain, were analyzed. History of lifting heavy weights was present in 53.33% (16cases), insidious onset was present in 40% (12cases) and bending activity in 6% (2cases).

Average duration of symptoms before surgery was 6months, ranging from 2 weeks to 11months. Majority of cases came with complaints of low backache and radicular pain.

Table 3
Distribution of symptoms

Symptoms	No. Of cases	%
Low backache	30	100%
Radicular pain	30	100%
Paraesthesias	21	70%
C/O weakness	22	73.33%
Bladder/Bowel symptoms	1	3.33%

Chart showing the distribution of symptoms



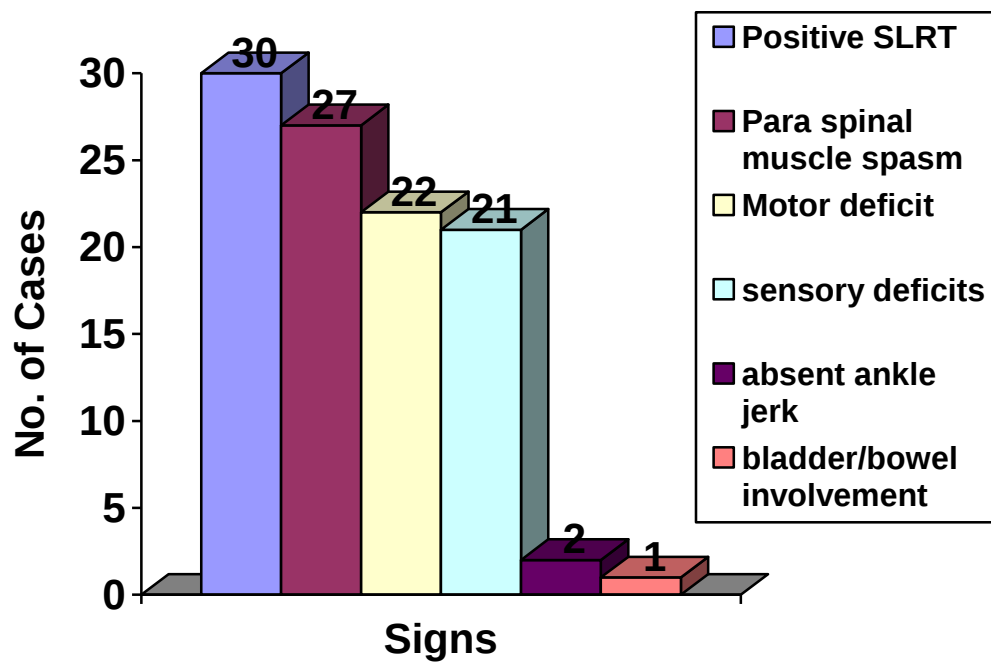
All patients had received a trial of conservative treatment in the form of bed rest and physiotherapy with no significant improvement.

On examination a positive SLRT was the most common finding followed by restricted spinal movements and neurological deficits.

Table 4
Distribution of signs

Signs	No. Of cases	%
Positive SLRT	30	100%
Para spinal muscle spasm	27	90%
Motor deficits	22	73.33%
Sensory deficits	21	70%
Absent ankle jerk	2	6.67%
Bladder/Bowel involvement	1	3.33%

Chart showing the distribution of signs

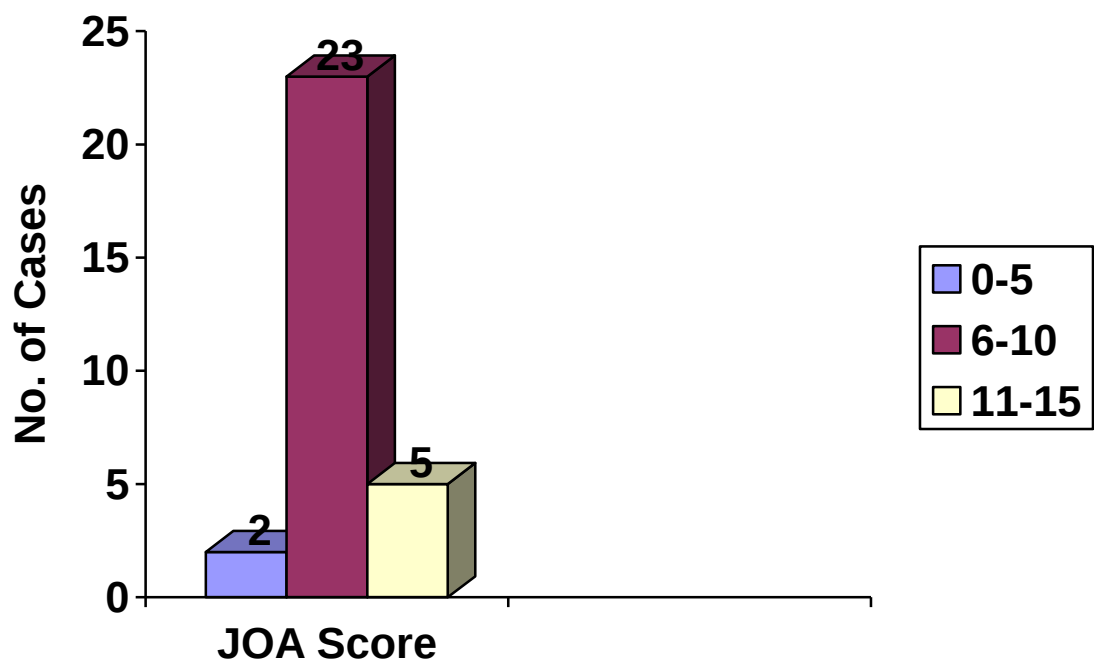


The distributions of JOA score Pre –op is given below.

Table 5
Distribution of JOA score Pre –op

Pre-op JOA score	No. Of cases	%
0-5	2	6.67%
6-10	23	76.67%
11-15	5	16.67%

Graph depicting the JOA Pre-operative score

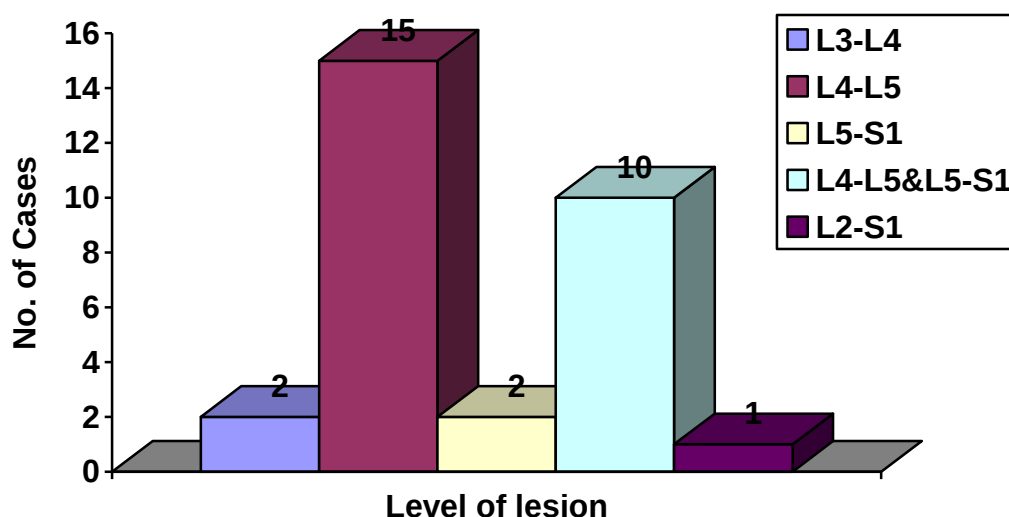


All patients had undergone MRI scan to know the level of the lesion.

Table 6
Distribution of level of disc prolapse

Level of disc prolapse	No. Of cases	%
L3-L4	2	6.67%
L4-L5	15	50%
L5-S1	2	6.67%
L4-5 and L5-S1	10	33.33%
L2 – S1	1	3.33%

Chart representing the distribution of levels of disc prolapse based on MRI findings



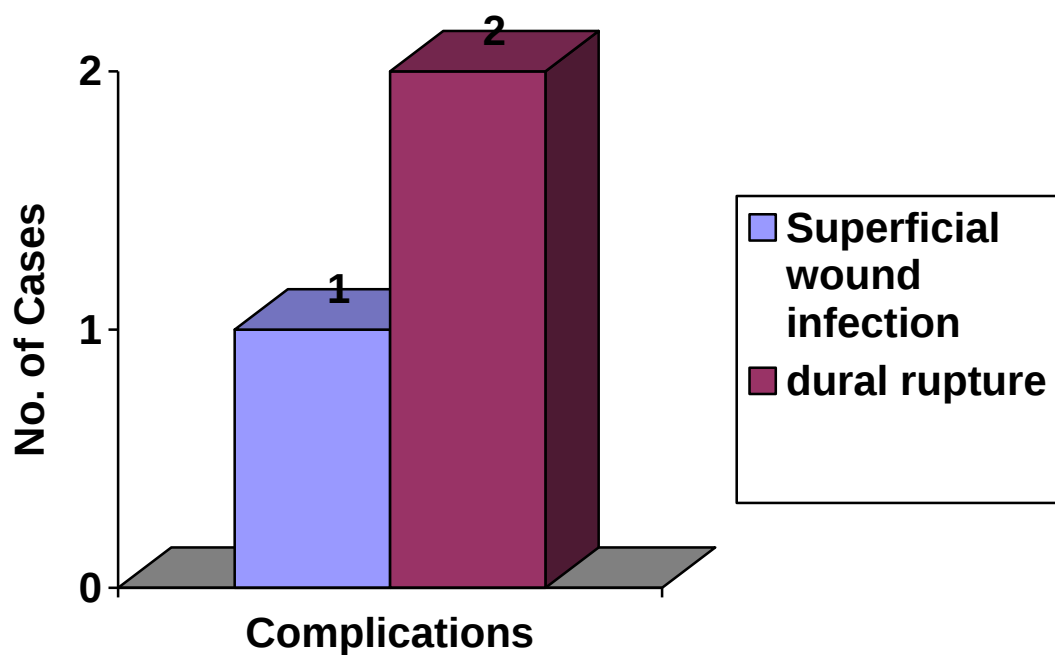
L4-5 disc prolapse was the commonest in our study, followed by double level disc prolapse in 33.33%(10 cases). Multiple level disc prolapse was seen in 3.33%(1 case).

Complications encountered in our study were

Table 7
Distribution of complications

Complications	No. of cases	%
Superficial wound infection	1	3.3%
Dural rupture	2	6.67%

Chart depicting the complications encountered in this study



Picture showing superficial wound infection and wound gaping



Patient with above wound was taken for debriment and secondary closure was done.

As the Surveyed hospital is a teaching institute and after the proper pre op work up the patient was posted to surgery and hence the average duration of hospital stay was 14 days ranging from 4 days to 20days.

Surgical outcome:

The postoperative JOA score after a mean follow up of 6 months is given below.

Table 8
Distribution of post-op JOA score based on percentage of improvement

Post-op JOA score	No. Of cases	%of improvement
0-5	0	0
6-10	2	6.67%
11-15	28	93.33%

Chart representing the Distribution of post-op JOA score based on percentage of improvement

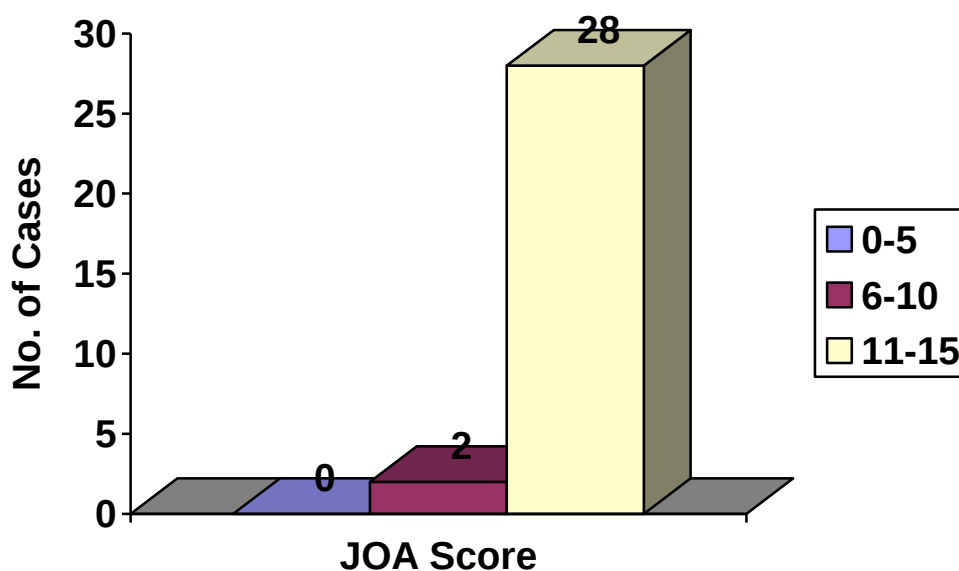
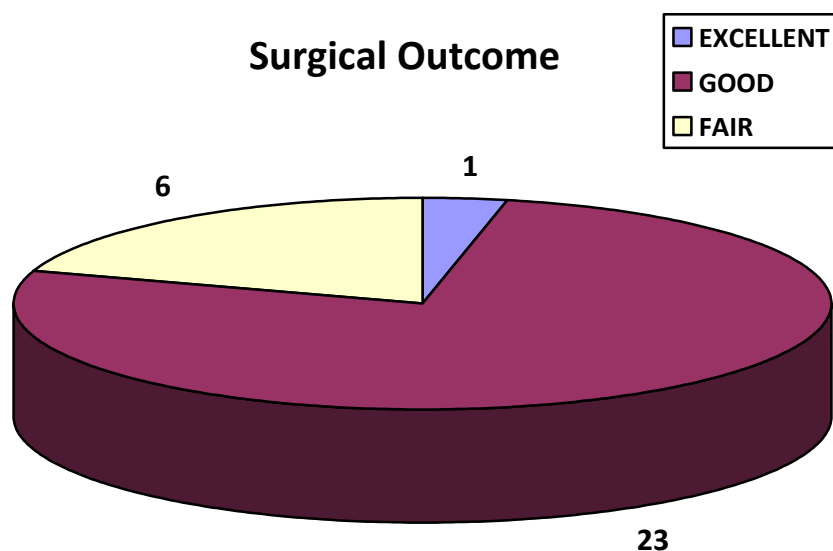


Table 9
Distribution of surgical outcome based on percentage of improvement

Surgical Outcome	No. Of cases	%
Excellent(>90%)	1	3.33%
Good (75%-89%)	23	76.67%
Fair (50-75%)	6	20%
Poor (<50%)	0	0

Pie chart depicting the Distribution of surgical outcome based on percentage of improvement



16 out of 22 patients with motor deficits before surgery had improved power post operatively.

Out of 21 patients whom had sensory deficit 19 improved, 2 patients had persistent sensory deficit post operatively.

Table 10
Outcome of neurological deficit after 3rd month review

Neurological deficit	Total no of cases	Improved	Not improved
Sensory	21	19	2
Motor	22	16	6
Bowel and bladder involvement	1	1	0

Improvement in neurological status was correlated with the duration of symptoms.

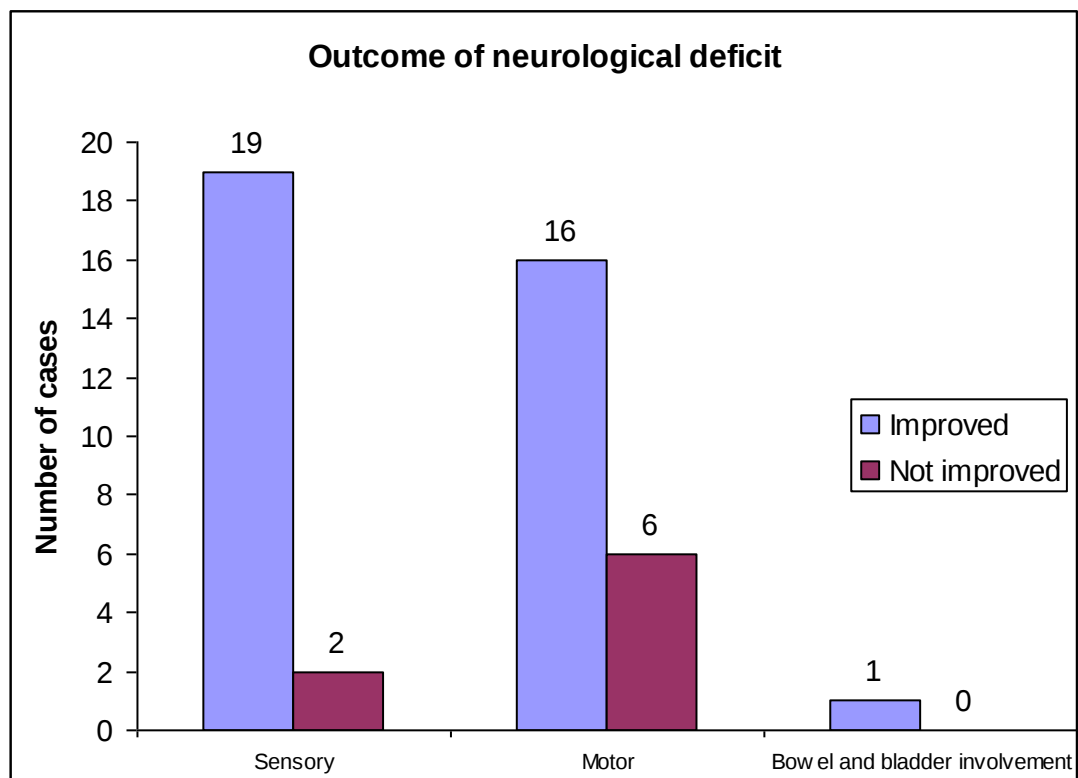
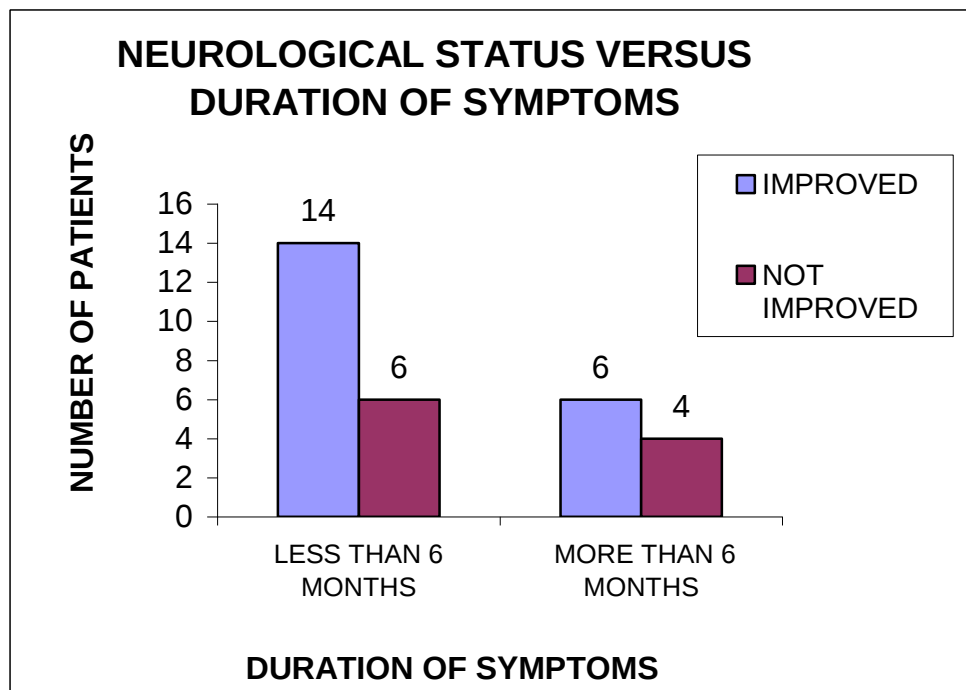


Table – 11 Outcome of neurological deficit in relation to duration of symptoms.

Neurological status	Duration of < 6months	Symptoms > 6months	Total
Improved	14	6	20
Not improved	6	4	10
Total	20	10	30



The outcome according to the JOA score was correlated and analyzed for the following variables.

1. Sex
2. Age
3. Duration of symptoms
4. Neurological deficit.

Results after surgery were assessed according to the rate of improvement

Excellent >90% improvement

Good: >75 % improvement

Fair: 50 to 74% improvement.

Poor: <49%

1. Correlation with sex

Outcome	Male	Female	Total cases
Poor	0	0	0
Fair	2	4	6
Good	17	6	23
Excellent	1	0	1
Total	20	10	30

6 out of 10 females had good outcomes, 17 out of the 20 males had good outcome, and 1 of the males had an excellent outcome.

2. Correlation with Age.

Outcome	<40 years	>40 years	Total cases
Poor	0	0	0
Fair	1	5	6
Good	3	20	23
Excellent	0	1	1
Total	4	26	30

3. Correlation with duration of symptoms.

Outcome	< 6months	> 6months	Total cases
Poor	0	0	0
Fair	4	2	6
Good	20	3	23
Excellent	1	0	1
Total	25	5	30

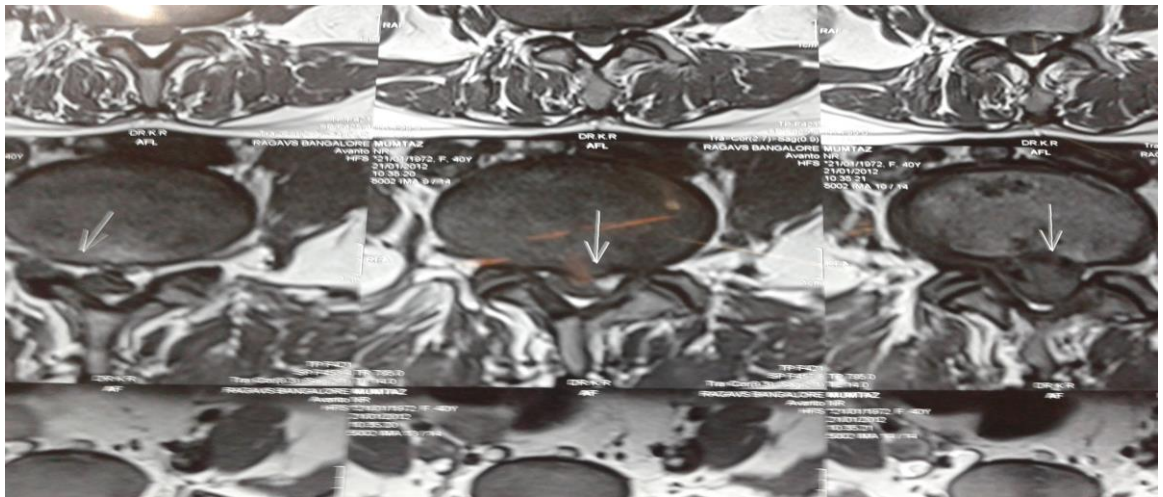
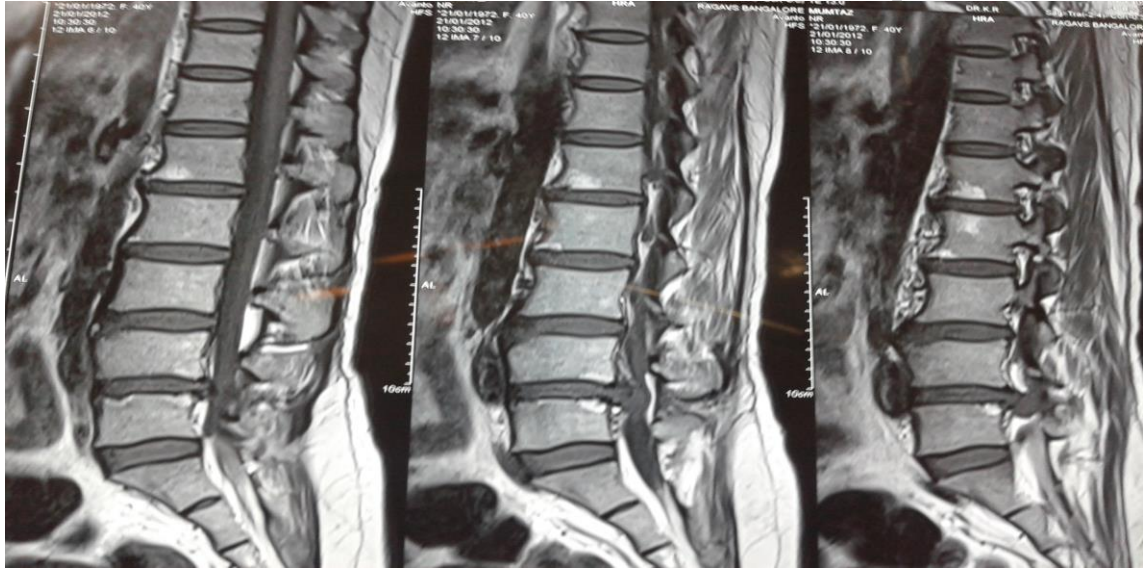
4. Correlation with neurological deficit.

Outcome	Neurological deficit	No neurological deficit	Total cases
Poor	0	0	0
Fair	6	0	6
Good	20	3	23
Excellent	0	1	1
Total	26	4	30

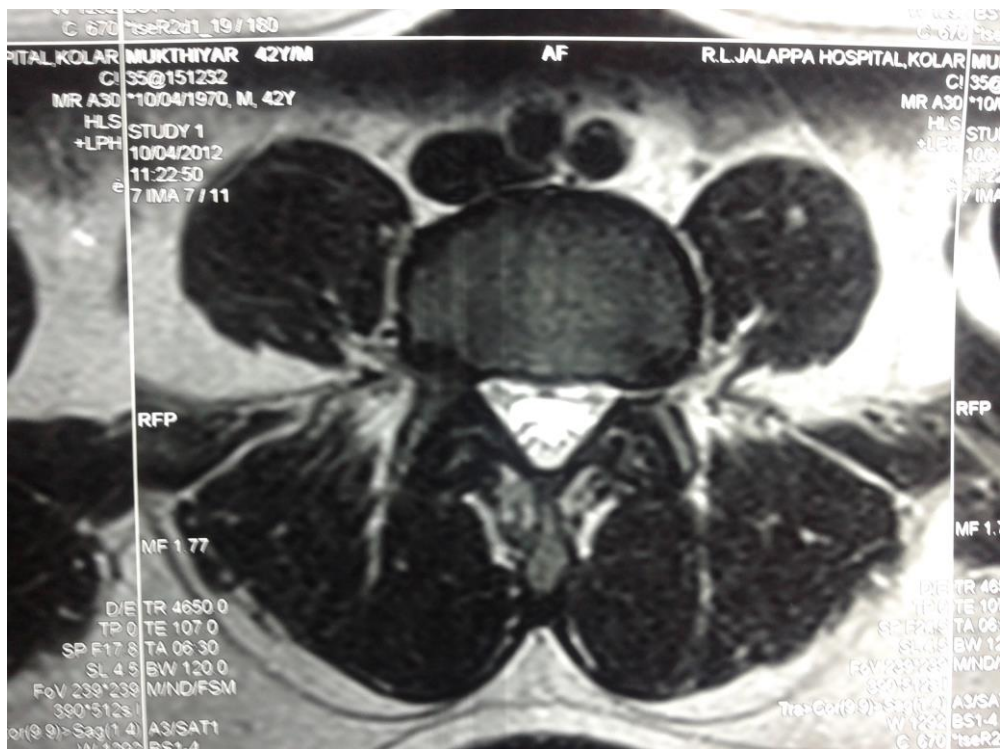
In our study chi square and p- value could not applied as >20% of cells have expected values as <5

MRI STUDY OF DIFFERENT PATIENTS SHOWING LEVELS OF DISC PROLAPSE

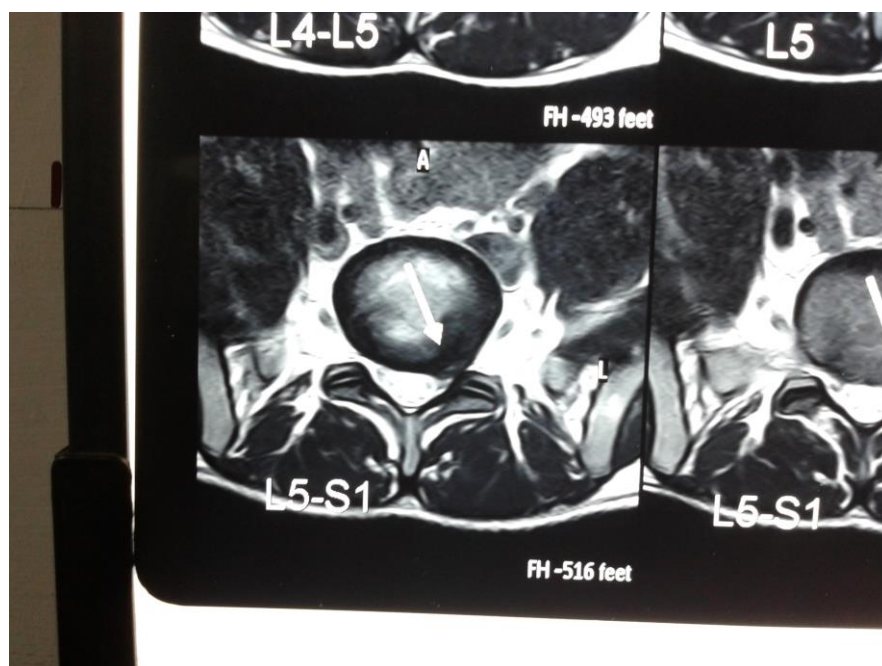
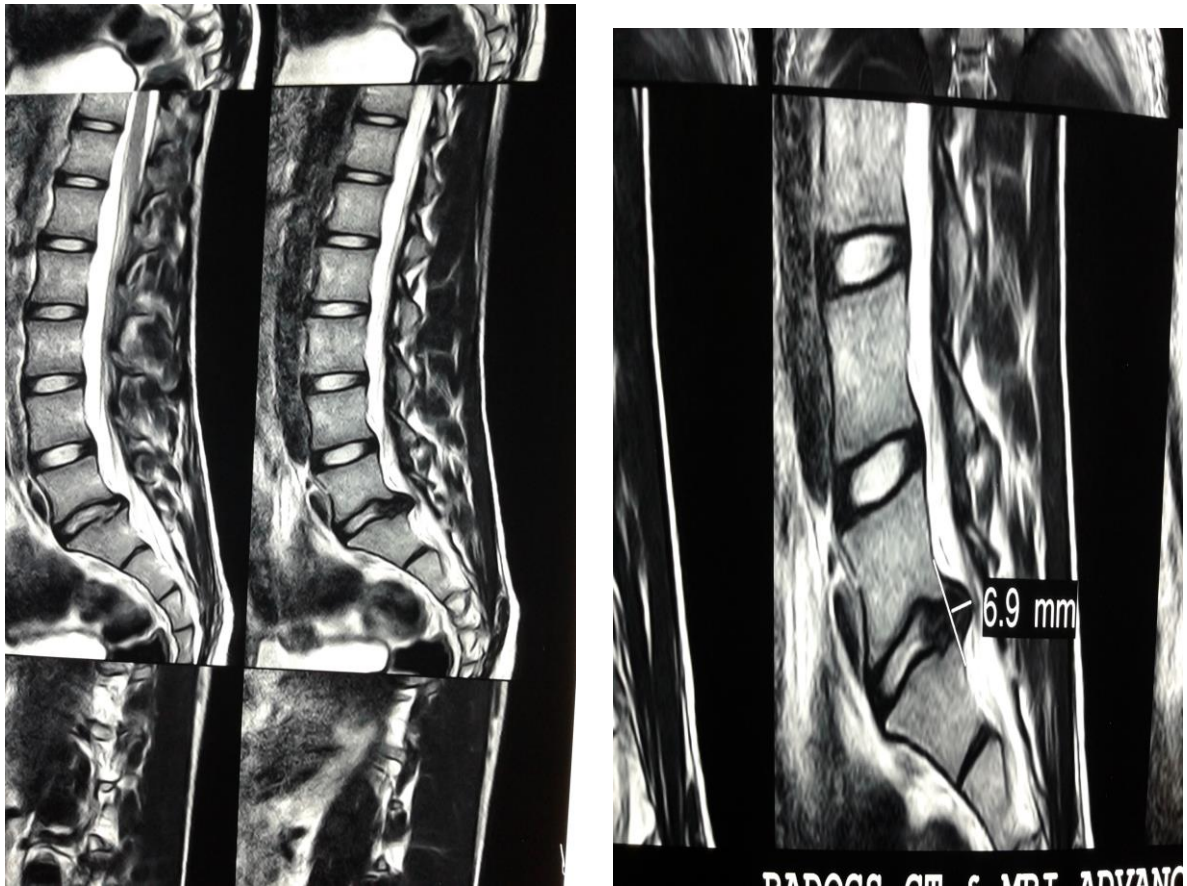
Patient – 1 (L4 – L5 Intervertebral Disc Prolapse)



Patient – 2 (multiple level intervertebral disc prolapse)



Patient – 3 (L5 – S1 intervertebral disc prolapse with severe spinal canal stenosis)



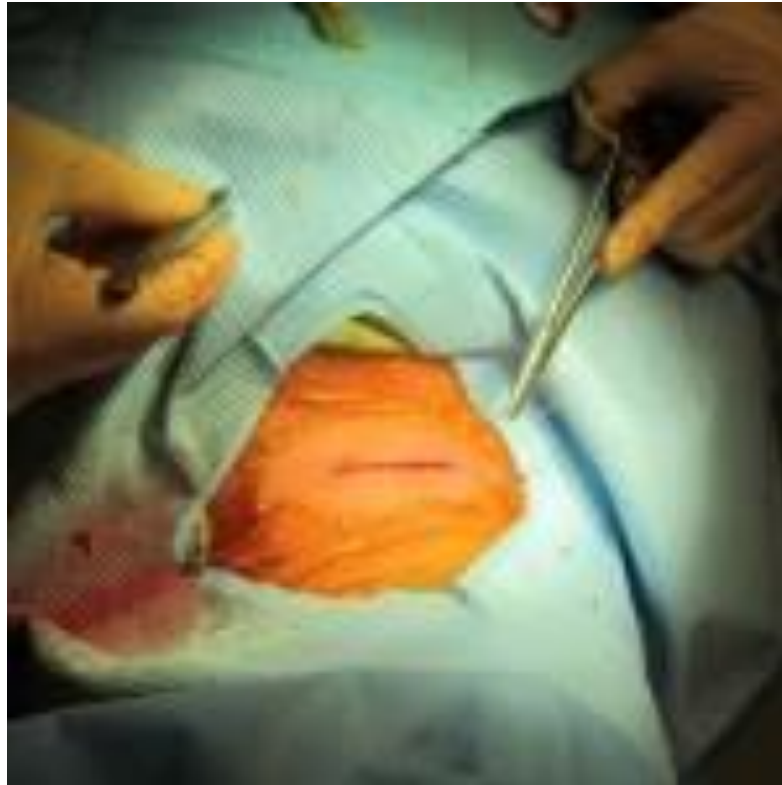
Instruments used in conventional discectomy



Pre-op positioning and draping and marking level of surgery for patients



Picture showing incision for conventional discectomy



Operating field showing extruded disc and spinal cord done by LAMINECTOMY

DISC material collected by Conventional Discectomy



Post operative follow up of patients
Patient - 1 (Showing complete range of motion around spine)



Patient - 2 (Showing 90° SLRT)



Patient – 3 (Patient showing 80° SLRT who had severe motor, sensory and bowel & bladder involvement pre-operatively)



DISCUSSION

What low back pain lacks in lethality is certainly makes it up in the wholesome misery it causes in modern industrial societies. Low back disorders have become the most common musculoskeletal disorders with the major impact on the costs of health care and are major source of disability.

One must recognize that low back pain is a symptom that has many causes, the commonest being a protruded disc. The origins of the disc related sciatica with its clear morphologic and clinical neurological findings were not recognized until the twentieth century. After Mixter and Barr in 1934 described disc protrusions and showed the effectiveness of surgery in its management. There has been increasing enthusiasm to solve sciatica problems surgically by disc excision.

However the results of good outcome after lumbar disc excision vary in literature from 51 to 89%. There is considerable number of failed back surgeries too, which may require revision surgery recurrence rate for lumbar disc excision varies from 6 to 11% in various studies. This implies that there are many factors, which influence the outcome of lumbar disc surgery. Therefore emphasis should be lead on proper patient selection. For great majority of patients with sciatica due to disc prolapse conservative treatment provides satisfactory relief from symptoms. In evaluating the disc disease, the natural history should be taken in to account which reveals that surgery plays only a palliative role in its management. Lumbar disc herniation shows a favorable response to conservative treatment even in the presence of some neurological deficit.

Hence any surgical intervention with out appropriate conservative therapy leads to unnecessary surgery and also a poor outcome. However a

protracted conservative regimen in the presence of severe radicular symptoms should be avoided, since this increases morbidity and reduces the chances of successful outcome. A longer preoperative interval in patients with chronic sciatica was associated with less predictable outcome.

It is therefore the surgeon's task to properly select patients for the surgery. The patients with the appropriate indications, who are expected to have symptomatic relief from the surgery with limited risks and least possible expense.

Better investigative modalities (myelography/CT/MRI) have lead to more accurate diagnosis of disc lesions. They have revolutionized the diagnosis of spinal disease by accurate visualization of all structures within the neural canal. In addition it offers the opportunity to outline the neural foramen and extraforaminal areas and thus guides the surgeon in planning the precise surgical correction, preventing unnecessary exploration of uninvolved levels. Results of lumbar disc surgeries are excellent when there is agreement between clinical presentation and imaging studies.

In our study we used Japanese orthopedic association low backache score to evaluate our results. This score was used as it is simple which assess the patient's outcome both subjectively and objectively. It also helps in correlating the results to various factors that may influence the outcome such as age, sex and duration of symptoms.

Correlation with other studies outcome –

When compared to other studies with that of our study using the same JOA scoring gave similar results as illustrated below.

Patient populations in our study 70% of the cases were males and 30% females.

SEX	PAPPAS ET AL	R. DAVIS	PRESENT STUDY
MALE	61%	64%	66.67%
FEMALE	39%	36%	33.33%

Males were affected more commonly than females, which were in accordance with studies, by Pappas et al and R. Davis who also had male preponderance.

Richard Davis had a mean age of 42 years range from 16 to 77 years; Pappas et al had a mean age of 42 years range of 15 to 83 years.

The event or precipitating factor that accounted for most of the cases was inappropriate lifting of weight (40%), 10% had history of fall. In Pappas et al study the lifting weight was the event in 31.4% of cases followed by falls (10%), sports injuries 10% and automobile accidents 6.1%.

The L4 –L5 was most commonly involved in our study.

Disc Prolapse Levelof	R.Davis	Pappas.Et.Al	Gupta Et Al	Present Study
L1-L2	.2%	-	-	-
L2-L3	.9%	2%	-	-
L3-L4	4.4%	9%	-	6.67%
L4-L5	46.7%	49%	35.2%	50%
L5-S1	47%	40%	22.3%	6.67%
Multiple Level	.8%	-	44.5%	36.67%

In our study we achieved 90% good outcomes and 6.67 % fair outcomes we had 3.34% of poor outcomes compared to Pappas et al and R. Davis who had 6.4% and 3.3% poor results respectively.

OUTCOME	R. DAVIS	PAPPAS ET AL	PRESENT STUDY
EXCELLENT	-	-	3.33%
GOOD	89%	77.3%	76.67%
FAIR	7.7%	16.5%	20%
POOR	3.3%	6.2%	0

In our study there was a low incidence of complications (10%), with one case of superficial wound infection, two cases of dural rupture. Which were treated with antibiotics based on culture and sensitivity and intraoperative foam gel application over the dural leak site respectively?

COMPLICATIONS	R.DAVIS	PAPPAS.ET AL	PRESENT STUDY
WOUND INFECTION	25(2.1%)	45(1.8%)	1(3.3%)
DURAL TEAR	6	6	2
<i>DISCITIES-</i>		-	
PARAPLEGIA	4	-	-
PSEUDOMENINGOCOELE	-	3	-
ARTERIAL INJURIES	-	2	-
SMALL INTESTINE INJURY	-	1	-
PULMONARY	-	6	-
PARALYTIC ILEUS	5	-	-

Various factors were correlated with the outcome

1. **Sex-** in our study we found that there was no significant correlation between outcome and sex. Weber in his study found that the female sex was associated with poor outcomes.

2. **Age:** one case in our study of aged 40 years showed excellent results in our study however the outcome of the patients more than 40 years of age was statistically not significantly different from the other group. Mathie Threme et al found that age order more than forty years was associated with poor outcome Weber found that the age was not predictive outcome.
3. **Duration of symptoms:** In our series the statistical difference was however not significant between those with less than six months and more than six months duration of symptoms. A. Naglor in his study found that a longer preoperative duration of symptoms was associated with less favorable outcome following surgery.
4. **Neurological deficit:** Surgical outcome was not significantly affected with absence or presence of neurological deficit in our study.

SUMMARY

The present study comprised of thirty cases of lumbar disc prolapse treated with conventional discectomy. The follow up was done until six months.

1. Male patients (66.67%) outnumbered female patients (33.33%) in incidence.
2. More common in 41 to 60 age group with the average age group of 45.7 years.
3. Low backache and radicular pain were the most common symptoms.
4. Positive SLRT was the most common sign.
5. 76.67% of cases had a pre op JOA score of between 6 to 10.
6. L4 –L5 was the most common disc to be herniated.
7. The average duration of hospital stay was 12 days.
8. 93.33% of cases had a post op JOA score between 11 to 15.
9. 76.67% cases had a good out come and 3.33% had an excellent outcome.
10. Complications were dural puncture in 2 (6.64%) and superficial infection in 1 case (3.34%).

CONCLUSION

Several conclusions can be drawn from our study. The fenestration and discectomy is an extremely useful and an effective surgery for the treatment of lumbar disc prolapse, consistently good results (76.67%) and excellent results(3.33%) in our study could be attributed to proper selection of cases and a meticulous surgical protocol. The results of lumbar discectomy are good when there is correlation between clinical presentation and imaging studies as was seen in our study. All our patients had radicular pain at presentation.

The variables which were found to have no correlation with the outcome were age, sex, duration of symptoms and neurological deficits.

The Japanese Orthopedic Association (JOA) low back ache score appears to be a useful tool for evaluation of disc surgery widespread use of this score will allow different studies and procedures to be compared more objectively to improve the outcome of disc surgery. In addition to the post operative score, change of postoperative score as compared to the preoperative score is also a useful indicator of the outcome. The only limitation of the study was sample size.

In our study we achieved results comparable to that achieved with the micro discectomy. Microsurgical techniques may have some advantages in terms of less invasive approach; short term hospital stay etc. But one must understand the demands, requirements and limitations of this technique. It also has a long learning curve. It is technique ally more demanding procedure in terms of surgical skills of surgeon and equipment required and thus is available in multi specialty hospitals. Also Conventional discectomy is more cost effective than micro discectomy.

Therefore for the Indian scenario and in rurally situated hospitals Conventional discectomy is still the “gold standard” in operative treatment of lumbar disc prolapse.

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ANNEXURES

ANNEXURE - I

STUDY OF MANAGEMENT OF SYMPTOMATIC INTERVERTEBRAL DISC PROLAPSE OF LUMBOSACRAL REGION WITH DISCECTOMY

PROFORMA FOR PATIENT EVALUATION

NAME D.O.A

AGE D.O.S

SEX D.O.D

ADDRESS DURATION OF STAY

OCCUPATION HOSP. NO.

HISTORY : (Duration, Details of each complaint)

Pain in the low back region

-Duration

-Onset

-Event related to onset –

Fall –

Inappropriate lifting of weights-

Bending forward –

Trauma –

-Nature

-Intensity

Radiation - unilateral / Bilateral

Aggravating factors

Relieving factors

Numbness in the lower limbs

H/o Previous similar episodes & duration

Limitation of daily activity

Treatment history :

Bed rest/physiotherapy/massage/traction/epidural steroid/surgery

Other medical illness:

Habits :

CHIEF COMPLAINTS

- Pain
- Radiculopathy,
- Motor, Sensory involvement
- Bowel / Bladder involvement

TREATMENT RECEIVED PRIOR TO ADMISSION

- None
- Treatment taken (Duration, Details of each treatment)
- Physiotherapy – Spinal exercises.

Physical Examination :

Build & weight :

Vital Signs : BP: Pulse : Temp. :

General condition :

Systemic Examination :

CVS :

RS :

Per abdomen :

Musculo-skeletal Examination of spine :

Gait :

Attitude :

Inspection :

Palpation :

-Tenderness

-Spasm

-Deformity

Movements :

-Flexion :

-Extension :

-Lateral Flexion :

-Rotation :

Others :

Special tests :

SLRT :

Rt.

Lt.

Active

Passive

Cross SLRT :

Lasegue test :

Femoral Nerve Stretch test :

Bow string test :

Neurological Examination :

HMF:

Cranial nerves:

Sensory deficits:

Pain:

Temperature:

Fine touch:

Crude touch:

Sensory deficits : Rt. Lt.

-Thigh

-Leg

-Foot

Motor deficits : Rt. Lt.

- Bulk : Thigh

Calf

- Tone

- Power : Hip - Flexion

Extension

Abduction

Adduction

Knee - Flexion

Extension

Ankle - DF

PF

EHL

EDL

TA

Invertors

Evertors

Reflexes :

Superficial : Plantar

Cremastric

Motor : Knee

Ankle

Bladder disturbances :

Pre op JOA score :

1. Subjective symptoms
 - a. Low backache :
 - b. Leg pain :
 - c. Ability to walk :
2. Clinical findings
 - a. SLRT :
 - b. Sensory deficits :
 - c. Motor weakness :

TOTAL SCORE :

Investigations :

Routine blood tests :

Hb :

Blood group :

HIV/HBsAg:

Plain x-ray of L-S spine – AP & Lateral :

Lumbar CT Myelography :

MRI findings :

Operative findings :

Per Operative complications:

Post op complications :

Post OP status :

Pain / Radiculopathy :

Degree of improvement :

Radiation /Numbness :

Ability to walk :

Sensory status :

Motor functions :

Bladder function :

Wound status :

Post OP JOA score :

Rate of improvement : %

JOA Low backache score at 1 month follow up

Rate of improvement : %

JOA Low backache score at 3 months follow up

Rate of improvement : %

JOA Low backache score at 6 months follow up

Rate of improvement : %

ANNEXURE – II : MASTER CHART

SL No.	NAME	IP No.	Age & sex	Level of lesion	Sensory deficits	Motor deficits	Procedure done	Hosp. stay	No. of followups	Pre-op JOA score	Post op JOA score	results
1	Gopinath	606556	40/M	L4-L5	-	-	HL	12	1,3,6	12	15	E
2	Narayana Swamy	629373	55/M	L4-L5	+	-	HL	10	1,3,6	10	14	G
3	Munawar Khan	662993	48/M	L4-L5&L5-S1	+	+	L	14	1,3,6	9	14	G
4	Reddappa	667132	35/M	L4-L5	+	+	HL	14	1,3,6	10	14	G
5	Munikrishna	667139	32/M	L4-L5	-	+	HL	11	1,3,6	7	13	G
6	Geetha	694342	28/F	L4-L5	-	-	HL	13	1,3,6	11	14	G
7	Parvathamma	696403	55/F	L4-L5	+	+	HL	16	1,3,6	10	14	G
8	Manjunath	696411	42/M	L4-L5&L5-S1	-	+	HL	16	1,3,6	9	14	G
9	Mukthiyar	705342	42/M	L4-L5&L5-S1	+	+	HL(L5-S1)	11	1,3,6	7	14	G
10	Nagamani	705358	45/F	L4-L5&L5-S1	+	-	HL	18	1,3,	10	13	F
11	Rajappa	705380	52/M	L3-L4	+	-	HL	14	1,3,6	11	14	G
12	Prabhakarachari	723871	42/M	L3-L4	+	+B&B	HL	14	1,3,6	5	11	F
13	Mumtaz	734561	40/F	L4-L5	+	+	L	20	1,3,6	10	14	G
14	Venkateshappa	735712	50/M	L4-L5	+	+	L	14	1,3,6	8	12	F
15	Narayanaswamy	745123	48/M	L4-L5	-	+	HL	12	1,3,6	10	13	F
16	Jayamma	770411	60/F	L5-S1	+	-	HL	15	1,3,6	12	14	G
17	Imtiyaz Pasha	770467	51/M	L4-L5&L5-S1	+	+	HL(L4-L5&L5-S1)	15	1,3,6	6	13	G
18	Baseer Sab	800199	45/M	L4-L5	+	+	LT	6	1,3,6	6	13	G
19	Basappa	800914	45/M	L4-L5	+	+	LT	4	1,3,6	6	13	G
20	Lakshminarayana	802405	52/M	L4-L5&L5-S1	+	+	LT(L5-S1)	6	1,3,6	6	13	G
21	Venu	802445	45/M	L4-L5&L5-S1	+	+	HL(L5-S1)	7	1,3,6	7	14	G
22	Lakshamma	809182	41/F	L4-L5	`	+	HL(L4-L5 &L5-S1)	8	1,3,6	6	13	G
23	Ramakrishna	812356	57/M	L4-L5&L5-S1	-	-	HL(L4-L5)	9	1,3,6	10	14	G
24	Padmanabiah	812357	57/M	L4-L5&L5-S1	-	-	HL(L4-L5&L5-S1)	9	1,3,6	10	14	G
25	Chikkagangappa	812420	75/M	L4-L5	-	+	LT	15	1,3,6	11	14	G
26	Hamsamma	813863	50/F	L4-L5	+	+	LT	7	1,3,6	8	12	G
27	Harish	814795	23/M	L4-L5	-	+	LT	5	1,3,6	10	14	G
28	Rajeshwari	822342	35/F	L4-L5	+	+	L	6	1,3,6	5	11	F
29	G.Jyothi	831232	41/F	L2-S1	+	+	L(L4-L5&L5-S1)	8	1,3,6	6	13	G
30	Bagyamma	832313	40/F	L5-S1	+	+	HL	7	1,3,6	6	9	F