A PROSPECTIVE ANALYSIS OF EFFICACY OF MICROLUMBAR DISCECTOMY USING MAGNIFYING LOUP IN PATIENTS WITH SYMPTOMATIC LUMBAR DISC PROLAPSE

DISSERTATION SUBMITTED FOR

MS (ORTHOPAEDICS)

TIRUNELVELI MEDICAL COLLEGE

TIRUNELVELI

2010

THE TAMIL NADU

DR. MGR MEDICAL UNIVERSITY

CHENNAI, TAMIL NADU

CERTIFICATE

This is to certify that the work entitled **"A PROSPECTIVE STUDY OF EFFICACY OF MICROLUMBAR DISCECTOMY USING MAGNIFYING LOUP IN PATIENTS WITH SYMPTOMATIC LUMBAR DISC PROLAPSE"** which is being submitted for M.S. Orthopaedics, is a bonafide work of **Dr. K. RAJAVEL**, Post Graduate Student at Department of Orthopaedics, Tirunelveli Medical College, Tirunelveli.

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He has completed the necessary period of stay in the Department and has fulfilled the conditions required for the submission of this thesis according to the University regulations. The study was undertaken by the candidate himself and the observations recorded have been periodically checked by us.

Recommended and forwarded

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This is to certify that the INSTITUTIONAL ETHICAL COMMITTEE OF TIRUNELVELI MEDICAL COLLEGE AND HOSPITAL, TIRUNELVELI– 11 has unanimously approved the dissertation titled **"A PROSPECTIVE STUDY OF EFFICACY OF MICROLUMBAR DISCECTOMY USING MAGNIFYING LOUP IN PATIENTS WITH SYMPTOMATIC LUMBAR DISC PROLAPSE"** by **Dr.K.Rajavel**, MS Orthopaedics Post graduate student of Tirunelveli Medical College, Tirunelveli in its meeting held on 09.09.2008.

Tirunelveli, **Sd/-**

09.09.2008 **SECRETARY**

ACKNOWLEDGEMENT

It gives me great pleasure to acknowledge all those who guided, encouraged and supported me in the successful completion of my dissertation.

I am very thankful to **PROF.R. RAMAKRISHNAN**, head of the department of Orthopaedics, Tirunelveli Medical College Hospital, Tirunelveli for giving me this topic, guidance, and constant supervision throughout the study. Without him, I could not have learnt honesty, sincerity and dedication towards work.

I am immensely thankful to **Prof. Elangovan Chellappa** and **Prof. R. Arivasan**, Prof. of Orthopaedics for their guidance and ingenious suggestions and ever available help.

I am extremely thankful to **Dr. N. Manikandan**, Asst. Prof. of Orthopaedics, who had been a constant source of inspiration to me and whose excellent guidance, day to day help and dedication paved the way for successful completion of this study. Without him, I could not have learnt perfection in doing the work.

I humbly acknowledge and express my thanks to **Dr. Ajith Inigo** and **Dr. A. Sureshkumar** for their valuable suggestions and guidance.

I am extremely thankful to all my Assistant Professors for their constant help, guidance and expert advice towards the successful completion of this study.

INTRODUCTION

Back pain ranks second only to upper respiratory illness as a symptomatic reason for office visits to physicians.[1] Approximately 70% of adults have low back pain at some time, but only 14% have an episode that lasts more than 2 weeks. About 1.5% have such episodes with features of sciatica.[2,3]

Most causes of back pain respond to symptomatic and physical measures, but some are surgically remediable and some are systemic diseases (cancer or disseminated infection) requiring specific therapy, so careful diagnostic evaluation is important.

Features of the clinical history and physical examination influence not only therapeutic choices but also decisions about diagnostic imaging, laboratory testing, and specialist referral. ..."

AIM OF THE STUDY

To evaluate the efficacy of MICRO LUMBAR DISCECTOMY using magnifying loup in symptomatic lumbar disc prolapse.

CONTENTS

HISTORICAL REVIEW

The first successful laminectomy was performed by ALBAN GILPIN SMITH of America to treat traumatic paraplegia in 1828. First clinical description of disc pathology was by VIRCHOW, who identified a fracture disc at autopsy in 1857.Lasegue's sign or SLR was described by FROST but attributed to LASEGUE, his teacher in 1881. GEORGE MIDDLETON and JOHN TEACHER diagnosed first case of disc extrusion clinically resulting in paraplegia and urinary tract dysfunction in 1911. GOLDTHWAITE showed the clinical association between disc rupture and back pain in 1911.

SICCARD observed that lumbar nerve roots could be compressed by ruptured disc and confirmed by myelography using poppy seed oil in 1921.BARR removed a mass of tissue in a patient with sciatica in 1933. The histopathological report came as chordoma but he proved it as disc material later. HULT reported successful anterolateral decompression of lumbar disc herniation by percutaneous discectomy in 1954. Lyman Smith first used Chymopapain to treat a lumbar disc disorder in 1964.

The posterolateral extradural route to the lumbar disc was described by DAY in 1969. Percutaneous nucleotomy was developed by Hijikata in 1975. ROBERT WILLIAMS was the first to introduce microsurgical discectomy in 1978.Kambin, described arthroscopic techniques and

equipment for posterior and posterolateral herniated disc removal, via intradiscal access in 1983. ONIK developed the nucleotome for automated percutaneous lumbar discectomy in 1985. CHOY introduced Laser Disc surgery in 1987. Percutaneous endoscopic discectomy with a medium-size, straight, rigid endoscope, at L4-5 and above, was described by Mayer and Brock in 1993.

Goupille et al published a comprehensive systematic review of PERCUTANEOUS LASER DISC DECOMPRESSION for the treatment of lumbar disc herniation in 2007.

INTERVERTEBRAL DISC ANATOMY

The Intervertebral Disc has a complex structure. The nucleus pulposus has an organized matrix, which is laid down by relatively few cells. The central gelatinous nucleus is contained around the periphery by the collagenous annulus, the cartilaginous annulus and the cartilage and plates cephalad and caudad.

The outer annulus fibrosus consists of densely packed layers of type I collagen , giving it form and tensile strength. The layered fibres are oriented at about 30 degrees to the horizontal , the direction alternating with each layer, enabling the disc to resist both distractive and shear forces.

Collagen fibres continue from the annulus to the surrounding tissues, tying into the vertebral body along its rim, and into the anterior and posterior longitudinal ligaments and the hyaline cartilage end plates superiorly and inferiorly. The cartilage end plates are secured into the osseous end plates by the calcified cartilage. The annulus has a lamellar structure with interconnections between adjacent layers of collagen fibrils.

Nucleus is made up of type II collagen in a mucoprotein gel rich in polysaccharides and a proteoglycan matrix, that gives it visco – elasticity, stiffness and resistance to compression through its interaction with water.

The disc can be divided into two regions, outer third and inner two third. In the outer third the disc is anchored to the vertebra on either side by sharpe's fibres forming a ring apophysis. The layers of the inner two thirds curve into and form the cartilaginous component of the vertebral end plate.

The end plate consists of hyaline cartilage in children and young adults and calcified cartilage and bone in elderly. The end plate has no fibrillar connection with the collagen of the vertebral subchondral bone, making it susceptible to horizontal shear forces.

Apart from type I & II collagen V, VI, IX, XI, XII are also present. The normal adult disc has a large amount of extra cellular matrix and a few cells that account for about 1% by volume. These cells are of two phenotypes, annulus cells and nucleus cells.

The annulus cells are elongated and appear more like fibroblasts, whereas nucleus cells are oval and resemble chondrocytes. These two cells behave differently and may be able to sense mechanical stresses. The annulus cells produce predominantly type I collagen. Nucleus cells synthesize type II collagen.

Embryological development of the vertebral column and discs occurs at 4 weeks of gestation. The notochord (derived from endothelial germ layer) forms the nucleus pulposus.

The discs become larger caudally. In the cervical region, the discs are thicker in their anterior portion, contributing to the lordosis. Thoracic discs are uniform in height and thicken caudally. Lumbar discs are again thicker anteriorly maximally at L5/S1. The largest disc is at the level of L4/5, this is also the most avascular disc.

In normal children, who usually learn to walk unaided before the age of two, the resultant change from a primary to secondary lumbar curvature is accompanied by a change in the relative position of the nucleus pulposus within the intervertebral disc, from a predominantly posterior situation to a central situation. During the third and fourth years of life, an increase in the rate of vertical growth of the L 4-5 "total disc", as measured at its centre, is associated with the gradual change from convexity to concavity in the shape of the bony vertebral end surfaces bounding the disc.

It is suggested that while vertical growth of the central region of lumbar vertebral bodies may be genetically determined and independent of mechanical factors, vertical growth of lumbar intervertebral discs and anteroposterior growth of lumbar vertebral bodies and discs are dependent on the activity associated with weight-bearing in the erect posture.

NUTRITION:

At birth, the disc has some direct blood supply contained within the cartilaginous end plates and the annulus. These vessels recede in the first years of life and by adulthood, there is no appreciable blood supply to the disc.

The cells within the disc are sustained by diffusion of nutrients into the disc through the porous central concavity of the vertebral end plate. The central portion of the end plate is permeable to dye. Motion and weight bearing are believed to be helpful in maintaining this diffusion. The glycosaminoglycan turnover in the disc is quite slow, requiring 500 days.

NERVE SUPPLY:

Disc innervation is through afferent axons with cell bodies within the Dorsal Root Ganglion. Nociceptive signals are transmitted to the spinal cord by neurons by the DRG. There are two paths between the annulus and the DRG.

1. Sinu vertebral Nerve, is a recurrent branch of the ventral ramus, that supplies posterior disc and PLL.
2. Paravertebral sympathetic trunk have axons that course through the grey rami communicantes to the spinal Nerve.

The disc is innervated by fibres from multiple levels. At each disc level, innervation is by fibres coursing from the index level and two additional superior levels through the sinu – vertebral Nerves, that from sympathetic trunk supplies even 3 levels superior.

Intra-osseous nerves follow the osseous vasculature. This end plate innervation is through a branch of the sinu – vertebral nerve, the basivertebral nerve. This nerve enters the foramen, and the nerve fibers enter the vertebral margin with the vessels. The density of this innervation is similar to that of annulus innervation.

Nerve fibres are found in the outer rings of the annulus only, dorsally from the sinu – vertebral nerve and ventrally from the sympathetic chain.

Pain associated with disc degeneration is due to nerve and blood vessel in-growth, altered biomechanical loading of surrounding structures, and cell necrosis stimulating cytokines and free radical release, which may sensitize nerve endings.

BIOMECHANICS

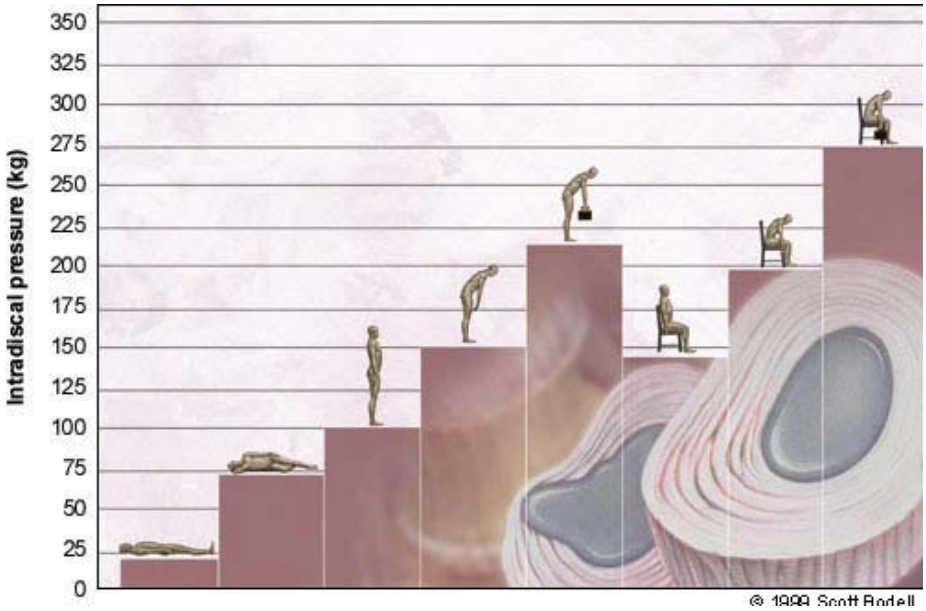
The Nucleus pulposus and the surrounding annulus behave as an elastic hydrostatic structure to take loads upto 70 Kg in a 70 Kg person on standing. This compression loading is reduced by half when supine, is decreased during walking and side flexion and is increased by jumping and by lifting weights with straight knees. Higher loads have faster rates of creep with greater deformation.

The annulus fibrosus with its complex orientation of collagen bundles receives the compressive forces transmitted from the disc. The annulus does not bulge when both structures are normal, but reduction in the nucleus material will result in bulging on extension posteriorly and on flexion anteriorly.

During the day with differing changes in the loading of the spine, there is change in the water content and height of the disc with secondary effects upon the posterior longitudinal ligament, facet joints and neural elements. The disc tissue on losing water becomes more elastic with prolapse less likely, but there is an increased loading of compression and bending stresses on the other spinal structures.

Measurement of the pressures in intervertebral disc has helped to explain their function. It has been confirmed that a healthy disc has a hydraulic function, with high pressure in the nucleus being contained by

hoop stresses in the annulus which itself caries a smaller pure compressive load. The pressure in the nucleus resulting from the compressive load on an intervertebral disc is about 1.5 times the average pressure over the whole of the healthy disc.



The lumbar disc pressure is higher in seated positions compared with standing due to increased muscular activity in the back in sitting. However provision of lumbar support by increasing the lordosis reduces tension in the posterior structures and helps to unload the disc.

The Physiologic function of the disc is to redistribute compressive load and resist tensile, rotational and shear forces, while facilitating smooth motion. The microscopic fibre arrangement of the annulus fibrosus enables it to resist tensile rotational and shear forces. The visco – elastic properties of the nucleus allow it to absorb load and maintain

height by a combination of the hydrostatic pressure in the interstitial fluid, the donnan osmotic pressure [repulsive forces between fixed negative charges on proteoglycans and also forces arising from freely mobile interstitial counter ions such as sodium and calcium] and the loose frame work of the porous permeable collagen – proteoglyan matrix. This is the basic for the biphasic theory. It relates to the hoop stresses generated during compression in the outer layers of annulus in comparison with the inner layers, which deform and act as shock absorbers.

During prolonged periods of axial loading interstitial water is squared out of the discs, causing a decrease in height and therefore bulging of the annulus. When loading is ceased (e.g.) during sleep, the disc height is restored by the in-flow of water back into the discs. This phenomenon explains why most disc herniations occur in the morning when the disc is loaded on upright posturing.

Herniation of the nucleus pulposus most often occurs at the insertion of outer annulus into the vertebral body. Herniation has the capacity to resolve with time but the ability to self repair is limited.

The results of recent studies demonstrate that multilevel fenestrations and discectomies affect lumbar spinal stability in flexion, but have no effect on the stability of the lumbar spine in lateral bending or axial rotation.

ETIOLOGY

Age – related changes within the nucleus are due to the gradual loss of cells and proteoglycans, leading to a decreased water and proteoglycan content and fibrous replacement of the nucleus from the third decade. The annulus becomes fibrotic, fissures and cracks appear with loss of orientation of the collagen fibres. The resultant loss of volume, shape and microstructure adversely effects the spinal biomechanics (i.e.) loss of disc height leads to abnormal loading, causes facet joint degeneration and weakens the disc increasing herniation.

Degeneration of the disc is due to decrease in the amount of nutrition reaching the cells and the removal of waste products. Blood supply gradually declines with onset of adulthood, further compounded by calcification of the cartilaginous end plates, accumulation of degraded matrix macromolecules and decrease in matrix water concentration. Additional factors that compromise blood supply include diabetes, smoking and arterial disease. Further degenerative changes include disruption of collagen fibrils and annulus delamination decreasing the ability of the disc to recover from deformation and resulting in more solid, like behavior. The end plate is also damaged with thinning and micro fractures preventing the disc from maintaining the hydrostatic pressure and leading to increased fluid exudation on loading.

The degenerative process of the disc occurs in three stages.

Kirkaldy Willis stages

3 stage of disc degeneration

I Stage of disc dysfunction

II Stage of instability

III Stage of stability

First stage is stage of dysfunction, in 15 – 45 years old patients. Characterized by circumferential and radial tears in the annulus and localized synovitis of facet joints. Second stage is instability occurring in 35 -70 years old, characterized by internal disruption of the disc, progressive disc resorption, degeneration of the facet joints, with capsular laxity, subluxation and joint erosion. Third stage is stabilization occurring in patient older than 60 years, due to the progressive development of hypertrophic bone around the disc and facet joints leading to stiffening or frank ankylosis.

Disc herniation is a complication of disc degeneration in the dysfunction and instability stages.

The symptoms of the annulus tear are thought to be due to the contents of the nucleus irritating the innervated outer layers of annulus.

The initial tear is due to sudden increase in intradiscal pressure and subsequent symptoms are due to fluctuations in pressure.

The genetic influence on disc degeneration may be due to a small effect from each of multiple genes or possibly a relatively large effect of a smaller number of genes. To date, several specific gene loci have been identified that are associated with disc degeneration. Other variations in the aggregan gene, metalloproteinase – 3 gene, collagen type IX , alpha 2 and 3 gene forms also have been associated with disc pathology and symptoms.

Types of disc lesions :

I Annular Bulge: Circumferential

II Disc Protrusions [Annulus fibrosus is still intact]

III Extruded [Out of annulus but in continuity]

IV Sequestrated [not continuous with the disc]

V Far out disc

Incidence of far out disc: 4%

Pressure on the nerve root outside the foramen

Exit root is involved

Location of the disc herniation:

Central

Postero-central

Foraminal

Extra-foraminal [Far Out Disc]

Normally at L4/L5 intervertebral foramen, L4 nerve root emerge called "Exit nerve root" and L5 nerve root traverse in the canal called as "Transit nerve root".

With a disc lesion, it is transit nerve that is commonly involved. In a far out lesion, it is exit nerve root that is commonly involved.

FUNCTIONAL BACK PAIN

Musculoskeletal pain syndromes that produce low back pain include myofascial pain syndromes and fibromyalgia.

Myofascial pain is characterized by pain and tenderness over localized areas (trigger points), loss of range of motion in the involved muscle groups, and pain radiating in a characteristic distribution but restricted to a peripheral nerve. Relief of pain is often reported when the involved muscle group is stretched.

Fibromyalgia results in pain and tenderness on palpation of 11 of 18 trigger points, one of which is the low back area, as classified by the American College of Rheumatology. Generalized stiffness, fatigue, and muscle ache are reported.

Mechanical low back pain is a common complaint in patients with functional disorders. In addition, a functional overlay or component of secondary gain may be present in some patients with true organic pathology. The degree of psychosocial issues affecting the patient's condition may be assessed by the following:

Patient may receive compensation for injury.

Patient has pending litigation.

Patient dislikes job.

Patient has symptoms of depression.

Patient caused the accident resulting in back pain.

Physical clues that help identify patients with significant functional overlay or component of secondary gain include the following:

Findings of nonanatomic motor or sensory loss

Nonspecific tenderness or generalized tenderness over the entire back.

Overly dramatic behavior and loss of positive straight leg raising test when patient is distracted.

A particularly useful test is to have patients hold their wrists next to their hips and turn their body from side to side. This test gives the illusion that we are testing spinal rotation, but no actual stress is placed on any muscles or ligaments. Any complaint of pain during this maneuver is strongly suggestive of a functional overlay or component of secondary gain in the presentation.

CLINICAL FEATURES

Disc herniation is most prominent in the third and forth decades of life. The patient has had intermittent episodes of back pain for many months or even years before the onset of leg pain. Back pain is brought on by heavy exertion, repetitive bending twisting, or heavy lifting. The pain usually begins in the lower back, radiating to the sacroiliac region and buttocks. The pain can radiate down the posterior thigh. Radicular pain usually extends below the knee and follows the dermatome of the involved nerve root.

The usual history is of repetitive lower back and buttock pain, relieved by a short period of rest. This pain is suddenly exacerbated by a flexion episode, with the appearance of leg pain equal to or greater than the back pain. The pain increases with activity, sitting, straining, sneezing & coughing .Pain decreases by rest in semi – fowler position.

Other symptoms include weakness and paraesthesias. The weakness is intermittent, varies with activity, localized to the neurological level of involvement. Paraesthesias occur in the particular dermatomes.

If the fragment is large, pressure on cauda equina can occur with development of cauda equina syndrome, characterized by numbness and

weakness in both legs, rectal pain, numbness in the perineum, paralysis of sphincters.

SIGNS:

- Paraspinal spasm that is sustained during walking.
- A scoliosis or a list in the lumbar spine may be present.
- Lumbar lordosis is lost.
- Point tenderness may be present over the spinous process at the level of the disc involved, and pain may extend laterally.
- LASEGUE sign, or straight leg raising test, described by FROST in 1881, is positive. A positive test should elicit buttock and leg pain distal to the knee.
- If the leg pain is significant, the patient leans back from an upright sitting position and assumes the tripod position to relieve the pain. This is referred to as the 'FLIP sign'.
- Contra lateral leg pain produced by straight leg raising should be regarded as pathognomonic. Older individuals may not have positive Lasegue sign.

L3 – L4 disc herniation compresses the L4 nerve root. Pain is localized around medial side of the leg. Numbnes over the anteromedial aspect of the leg. The anterior tibial muscle is weak, evidenced by inability

to heel walk. The quadriceps and hip adductor group may be weak. Diminished or absent knee reflex. Autonomous zone of sensory testing is at the level of medial malleolus.

L4 – L5 disc results in compression of L 5 root. . Numbness along the antrolateral aspect of the leg, dorsum of foot and great toe. Autonomous zone is the dorsal first webspace and dorsum of third toe. Extensor Hallucis Longus, Gluteus medius, Extensor Digitorum Longus, Extensor Digitorum Brevis weakness. Reflex change is usually not found.

L5 – S1 disc – pain and numbness along the lateral malleolus and lateral, plantar surface of foot & heel. The autonomous zone is the dorsum of fifth toe. Weakness of peroneus longus ,brevis, gastro soleus, gluteus maximus. Ankle jerk is reduced or absent.

95% of ruptures occur at L4 – L5. Ruptures at higher levels cause positive femoral stretch test. This test is done by patient in prone position, actively flexing the knee, while placing the hand in the popliteal fossa – causing anterior thigh pain.

DIFFERENTIAL DIAGNOSIS:

Differential diagnosis include Extinsic lesions - Urogenital, gastrointestinal, vascular, endocrine, nervous system lesions including infections, tumours, metabolic disturbances, congenital abnormalities.

Intrinsic lesions – spinal, musculo-skeletal, hematopoeitic neurological system, including trauma, tumors, infections, immune disease.

Common differential diagnosis include ankylosing spondylitis, multiple myeloma, vascular insufficiency, arthritis of the hip, osteoporosis with stress fractures, extra dural tumours, peripheral neuropathy and herpes zoster. Infrequent conditions include synovial cysts, rupture of medial head of gastrocnemius , sacroillac joint dysfunction, lesions in sacrum and pelvis, fracture of the ischial tuberosity.

IMAGING

X ray :

- To rule out other possibility like pars defect
- Disc narrowing [chronic]
- Instability signs: 3.5 mm of translation or 11^{o} angulation

CT Scan: Soft tissue less sensitivity than MRI

CT myelogram [indicated in a claustrophobic patient]

MRI:

Gold standard

- T1 and T2 Sagittal; T2 axial and Sagittal
- T1 Sagittal: Start in the middle and go to right and left
- T2 axial: Look at the Pedicle level for Lumbar canal stenosis.
- Look for the shape of the canal and disc herniation,
- Relation of disc lesion to the nerve root.

Gadolinium Very useful in failed back syndrome.

- Enhances scar means scarring
- No enhancement means recurrent disc

The term disc herniation is an all-encompassing, nonspecific term to indicate disc extension in some abnormal manner beyond the vertebral body margin. The four main types of herniations, in increasing order of severity, are:

1. Disc bulge
2. Disc protrusion
3. Disc extrusion
4. Sequestrated disc, a completely separated disc fragment, carrying the risk of Cauda Equina syndrome.

There is a 29% prevalence of disc herniation in asymtomatic individuals

In patients less than 60 years of age

- 20% will have a herniated nucleus pulposus
- degeneration or bulging of a disc at atleast one lumbar level in 35 % of patients less than thirty-nine years of age

DISC HERNIATION:

- Disc herniation is characterized by extension of the disk beyond margins of adjacent vertebral bodies

- Type I Changes: includes decreased signal intensity on T1 images & increased signal intensity on T(2) images; associated with end-plate disruption and fissuring with ingrowth of vascularized fibrous tissue; - seen in about 5 % of patients who undergo MRI scanning for disc disease
- Type II Changes: characterized by increased signal intensity on T1 images & slightly increased signal intensity on T2-weighted images.

  -seen in about 16 % of the patients; - These changes are associated with fatty marrow replacement in vertebral body.
- Type III Changes: sclerosis is caused by the presence of woven bone.

TREATMENT

Non operative Treatment:

Before proceeding to surgical excision of prolapsed disc, non operative treatment modalities should be tried.

The simplest treatment is Rest. 2 days of bed rest were better than a longer period. Biomechanical studies indicate that semi – fowler position (on the side with the hips and knees flexed) with a pillow between the legs should relive most pressure on the disc and nerve roots.

Local therapy including application of ice, ultrasound and short wave diathermy produce symptomatic relief.

Some do well with pelvic traction, but its scientific efficacy has not been proved.

Education in proper posture and body mechanics is helpful in returning the patient to the usual level of activity after the pain has subsided. This type of education is referred to as "Back school".

Back care

Do not stoop

Do not lift weight >50 lbs in first 6 months

Do not put on weight

Do not get overtired

Do not maintain any one position for a prolonged period

Firm mattress

Whenever possible sit with knees higher level than hips

Stand with one leg higher than other

Never bend with knees straight

The mainstay of non –operative treatment is the variety of drugs including anti-inflammatory agents , mood elevators and muscle relaxants.

Physical therapy should be used judiciously. Any exercise that increase pain should be discontinued. Lower extremity exercise increase strength and relieve stress on the back. Patients with acute back and leg pain relieved by passive extension of the spine in the prone position can benefit from Extension exercises. Improvement in symptoms with Extension indicates good prognosis.

Operative treatment:

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

procedure has now been improved with the use of microscope and video imaging.

Before this option is chosen, the surgeon must be sure of the diagnosis. The surgeon and the patient must realize that disc surgery is not a cure, but may provide symptomatic relief. It neither stops the pathological process that allowed the herniation to occur, nor restores the disc to a normal state. The patient must practice good posture and body mechanics after surgery.

The key to good results in disc surgery is appropriate patient selection. The optimal patient is one with predominant unilateral leg pain, extending below the knee, that has been present for atleast 6 weeks despite conservative measures.

Surgical disc removal is mandatory and urgent only in cauda equina syndrome. All other disc excisions should be considered elective. The incidence of persistent back pain after surgery was inversely proportional to the degree of herniation.

Microdiscectomy :

Micro lumbar discectomy has replaced the standard open laminectomy as the procedure of choice for herniated lumbar disc. Generally this procedure is performed under general endotracheal anaesthesia. Modified kneeing position, allows the abdomen to hang free, minimizing epidural venous dilation and bleeding.

The addition of loupe magnification greatly improves the identification and exposure of various structures. Most surgeon use an operative microscope to improve visibility further.

Radiographic confirmation of the proper level is necessary. Care should be taken to protect the neural structures. Epidural bleeding should be controlled with bipolar electrocautery. The use of cotton patties should be minimized to prevent epidural fibrosis.

WILLIAMS, the originator of the term microlumbar discectomy questioned its current usage because the concept of the technique has changed over the years.

Microlumbar disectomy requires an operating microscope with a 400mm lens, a variety of small angled kerrison rongeurs, micro-instruments, a combination suction – nerve root retractor.

PROCEDURE:

- Incision is made from the midspinous process of the upper vertebra to the superior margin of the spinous process of the lower vertebra at the involved level. This usually results in one inch skin incision.
- Incise the fascia at the midline using electrocautery. The paraspinal muscles are elevated subperiosteally from the spinous processes and lamina on the involved side only.
- Obtain a lateral radiograph to confirm the level.
- Micro lumbar retractor is inserted. Interlaminar space and edge of each lamina are exposed.
- Ligamentum flavum is identified, the lateral portion of ligamentum flavum is detached from the caudal edge of the superior lamina and the cephalad edge of the inferior lamina. The kerrison rongeur is oriented parallel to the nerve roots as much as possible.
- Removal of some bone, usually from the superior lamina is necessary. The lamina facet and capsule should remain intact.
- The nerve root is identified and retracted medially. If the root is difficult to mobilize, consider that a conjoined root may be present. Epidural fat is not removed in this procedure.

- Insert the suction nerve root retractor and identify the disc as a white, fibrous avascular structure. Small tears in the annulus is visible under magnification.
- Enlarge the annular tear with a penfield No.4 dissector and remove the disc material with the microdisc forceps. Inspect the root and adjacent dura for disc fragments.
- Obtain meticulous haemostasis, close in layers.

Post operative Instructions

- The patient can be mobilized immediately post operatively.
- Patient is discharged the day of surgery.
- Patient is instructed to minimize sitting and riding in a vehicle. Lifting, bending and stooping are limited for 3 weeks following which they are gradually restarted.
- Patients are allowed to return to their work after 3 weeks in jobs that does not require lifting, after 6 weeks in jobs that require prolonged sitting and 8 weeks for heavy labor.

CONJOINED NERVE ROOTS:

Conjoined roots are the most common lumbar root anomaly. They are classified into 3 types

Type I – two roots exit the dura with one common sheath.

Type 2 – two roots exit, through the single foramen

Type 3 – Anastamosing branch between two adjacent nerve roots.

These conjoined roots are less mobile than normal roots. Common location is at L_5-S_1 level, If the herniation appears in an atypical location or if the signal intensity is different from disc material, conjoined root should be considered. They are prone for injury by excessive traction.

Results of Surgery

- Good results range from 46% to 97%.
- Complications range from none to 10%.
- Reoperation rate ranges from 4 – 20%.

COMPLICATIONS

- Worsening of Neuropathy, nerve root injury
- Disc space infection, pyogenic spondylitis, wound infection
- Dural tears, CSF fistula, meningitis, pseudo meningocoele formation

DURAL TEAR:

The development of headaches on standing and a stormy postoperative period should alert one to the possibility of CSF leak. This can be confirmed by MRI.

REPAIR OF DURAL TEAR:

Eismont, Wiesel, Rothman suggested five basic principles in the repair of dural tear.

- The operative field must be unobstructed, dry, and well exposed
- Dural suture of a 4-0 or 6-0 gauge with a tapered or reverse cutting needle is used in a simple or a running locking stitch. If the leak is large or inaccessible, a free fat graft or fascial graft can be sutured to the dura. Fibrin glue applied to the repair also is helpful, but used alone does not provide an adequate seal.
- All repairs should be tested by using the reverse trendelenburg position and Valsalva maneuvers.

- Paraspinal muscles and overlying fascia should be closed in two layers with non-absorbable suture used in a watertight fashion. Drain should not be used.
- Bed rest in the supine position should be maintained for 4 to 7 days after the repair

MATERIALS AND METHODS

This study has been made with the prospective analysis of 20 cases of symptomatic lumbar disc prolapse, not responding to conservative measures for 6 weeks, being treated by MICRO LUMBAR DISCECTOMY using magnifying loup. They were followed for a period of $2_{1/2}$ years from 2007 to 2010.

Back pain, radiating leg pain, functional endurance and neurological features were the main aspects analyzed.

An objective evaluation regarding spinal movements, local tenderness, sciatic scoliosis, SLR, and neurological signs also recorded.

Inclusion criteria

- Age between 20 -45 years.
- Single level Disc
- Unilateral Disc
- With or without Neurological Deficit.
- Those patients, who are subjected to 6 weeks of non-operative management, but symptoms being not relieved.

Exclusion criteria

- Age less than 20, more than 45 years.
- Multilevel disc
- Central Disc
- Cauda equina syndrome
- Those patients who underwent less than 6 weeks of non operative measures.
- Failed Back syndrome.
- Spinal instability.

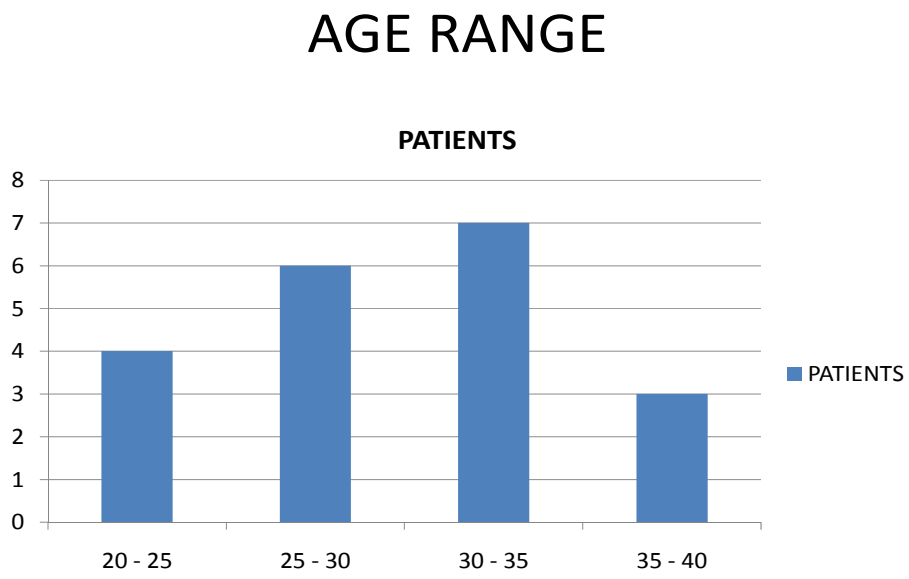
The diagnosis confirmed by clear history, physical examination and imaging modalities. All the patients were subjected to MRI. Micro lumbar discectomy done for all the patients using magnifying loup only.

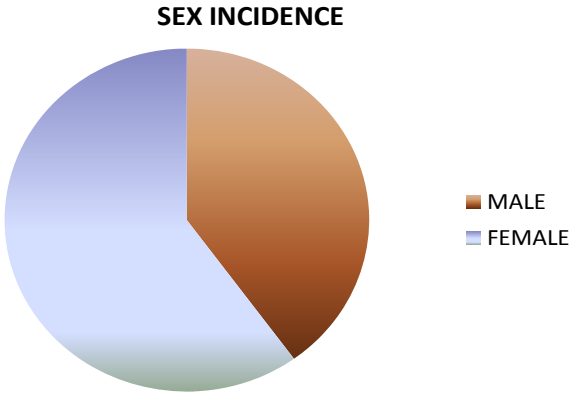
The results were grouped into four categories according to the relief of pain , working ability and clinical signs.

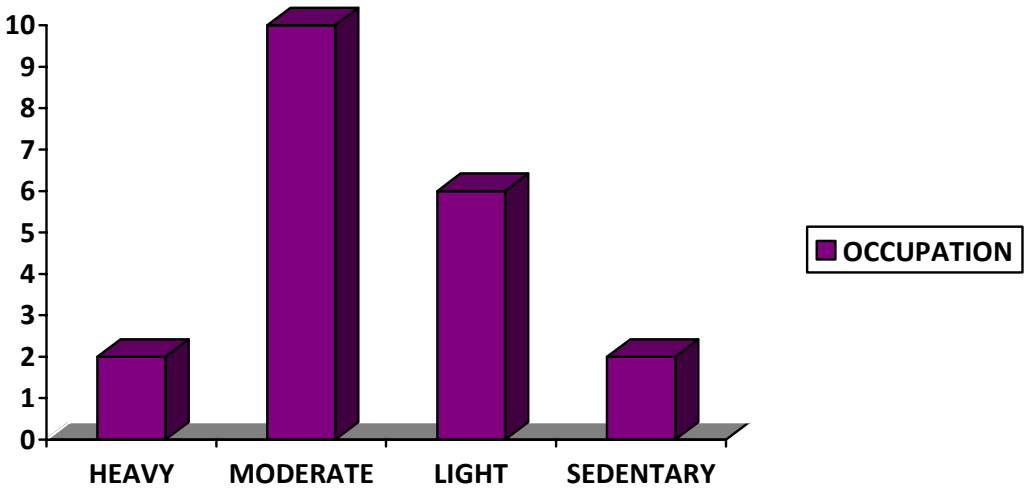
Best	Complete pain relief, full spinal movements, negative SLR, no work restrictions, no need for further treatment.
Good	Near complete pain relief, minimal restrictions of work, require intermittent treatment.
Fair	Moderate pain relief, moderate work restrictions, need further evaluation.
Poor	No pain relief, unable to work, require further investigations and treatment.

ANALYSIS OF RESULTS

DISTRIBUTION OF THE PATIENTS :







ONSET OF SYMPTOMS:

NATURE OF ONSET	NUMBER OF PATIENTS	PERCENTAGE
INSIDIOUS	5	25%
FOLLOWING LIFTING HEAVY WEIGHT	8	40%
FOLLOWING TWISTING	3	15%
OTHERS	4	20%

DURATION OF SYMPTOMS:

DURATION	NUMBER OF PATIENTS	PERCENTAGE
< 4 MONTHS	2	10%
4 – 8 MONTHS	12	60%
8 – 12 MONTHS	4	20%
>1 YEAR	2	10%

SYMPTOMS:

	NUMBER OF PATIENTS
RADIATING PAIN	20
NUEROLOGICAL SYMPTOMS	14
BLADDER AND BOWEL DISTURBANCE	0

OBJECTIVE EXAMINATION:

SIGNS	NUMBER OF PATIENTS	PERCENTAGE
SCIATIC SCOLIOSIS	12	60%
LOSS OF LORDOSIS	20	100%
POSITIVE SLR	20	100%
CONTRALATERAL SLR	4	20%
NEUROLOGICAL SIGNS	8	40%
LIMITATION OF SPINAL MOVEMENTS	18	90%

History

- Precipitating event was enquired.
- Radiating pain below the knee was enquired.
- Severity of pain graded by using visual analog scale.
- Relief of symptoms with conservative measures assessed.
- Relation of pain to postural variations, coughing, sneezing assessed.
- Patients with history of previous spine surgery for the same complaint excluded from the study.

Physical findings :

- Spinal tenderness
- Paraspinal spasm
- Positive straight leg raising test
- Contralateral straight leg raising test or well leg raising test.
- Range of spinal motion assessed.
- Neurological deficits were recorded under three separate columns including motor deficits, sensory disturbances and diminished or absent reflexes.
- Other causes of back pain ruled out by examining sacro – iliac joint and hip pathology.

Diagnostic Imaging:

- X – ray lumbosacral spine is considered mandatory to look for disc space narrowing, sacralisation or lumbarisation to confirm the level.
- Dynamic X – rays were taken to rule out spinal instability
- All the patients in this study were subjected to MRI. Downward protrusion of disc is considered an absolute indication for surgery.
- Disc Bulge or minimal Disc protrusion were excluded.

- Fair lateral disc protrusion noted in MRI and surgical technique planned accordingly.

Procedure

All 20 cases were done under general endotracheal anaesthesia. Prone position with pillows under chest and pelvis were used with particular care not to compress the abdomen.

The operative field was routinely infiltrated with adrenaline saline solution to minimize bleeding. Only magnifying loup was used for all the cases. Always the level was confirmed under image intensifier. Some piece of bone from superior Lamina removed in selected cases, based on the availability of working space.

- Most of the lamina and facet joints were left undisturbed.
- Bipolar electrocautery was used to coagulate the bleeding epidural vessels.
- Use of cotton patties were kept to a minimum.
- Far lateral disc noted in the MRI was excised by angled disc punch in reverse direction.

Post operative Protocol

- Patients were mobilized on the day of surgery upto pain tolerance.
- Neurological status assessed.

- One dose of pre-operative antibiotic and 5 day course of post – operative antibiotics used.
- Pain relief assessed by visual analog scale.
- Post operative counseling given to all the patients regarding good posture, body mechanics, spinal extension exercises, Back muscle strengthening exercises, avoiding lifting heavy weight, bending for 3 weeks, ergonomics, lifestyle changes, change of job in heavy manual laborer, return to sports in sports persons.

FOLLOW UP:

All the patients were followed up for a period of two and a half years.

RESULTS

The efficacy of the treatment was assessed by the following criteria.

1. Pain relief by visual analog scale and comparison with preoperative values.
2. Recovery or worsening of neurological deficits.
3. Post operative straight leg raising test
4. Post operative complications like infection, CSF fistula, new neurologic deficit.

PAIN:

RESULTS	NUMBER OF PATIENTS
BEST	16
GOOD	2
FAIR	1
POOR	1

IMPROVEMENT IN CLINICAL SIGNS:

1. SPINAL MOVEMENTS:

Spinal movement	Number of patients
Improved	16
Worsened	1
Same	3

2. SLR [Straight leg raising test]

SLR	Number of patients
Improved	19
Same	1

3. Neurological signs :

Neurological signs	**Number of patients [out of 8 patients]**
Improved	6
Same	2
worsened	0

4 . Recurrence of symptoms :

Symptoms	Number of patients
Radiating pain	2
Neurological deficit	0

OVERALL RESULTS:

Best results	16
Good results	2
Fair results	1
Poor results	1

Complications

- One case of infection leading to Discitis occurred.
- One case of EHL weakness due to the presence of conjoined nerve roots, occurred due to excessive traction.
- 3 cases of dural tears occurred.
- One case converted into laminectomy and discectomy due to profuse bleeding from the epidural veins not controlled by electrocautery.

COMPLICATIONS	NO OF PATIENTS
Dural tear	3
EHL weakness	1
Infection	1

DISCUSSION

AGE:

In this study, age group of 20 to 45 was selected. This age group was selected because this period is the most productive period of life. 7 patients belong to 30 to 35 age group, 6 patients belong to 25 to 30 age group,4 patients belong to 20 – 25 age group and remaining 3 patients to 35 to 40 age group. In the very young persons, the disc is more resilient and there are protective mechanisms to resist failure. In the aged, the fall in resilient of the annulus is balanced by the change in nucleus making it less vulnerable to prolapse.

SEX:

In this study, 60 % of patients are females. 40% are males. Symptoms of disc prolapse were more exaggerated in females. Compared to male patients, arriving to diagnosis was difficult in female patients due to functional overlay. Functional backpain and malingering was carefully ruled out in females by clinical examination.

OCCUPATION:

In this study, 50% of patients were doing moderate work. 30% were doing light work. 10% were doing heavy work. Remaining 10% were sedentary.

SYMPTOMS:

In this study, 40% of patients have an inciting event like lifting heavy weight. In 25% of cases, onset of symptoms was insidious. In 15% of patients, inciting event was twisting injury.

60% of patients have symptoms for a period of 4 to 8 months. 20% have symptoms for 8 to 12 months. 10% have symptoms for less than 4 months. Remaining 10% have symptoms for more than 1 year.

All the patients in this study have radiating pain below the knee. 70 % of patients had neurological symptoms either paraesthesia or weakness. No patients had bladder and bowel symptoms.

All the patients had loss of lumbar lordosis. 60 % of patients had sciatic scoliosis. All the patients have positive straight leg raising test. About 20% had contralateral straight leg raising test positive. About 40% of patients had neurological deficits. 90% of patients had limitation of spinal movements.

The most common location of disc prolapse noted in this study was L4 – L5 seen in 75 % of patients.. Next most common being L5 – S1 seen in 20 % of patients. Remaining 5 % had prolapse in L3-L4 level.

Commonest site of disc prolapse noted was posterolateral type

A careful history, nature and distribution of pain, and careful physical examination was sufficient to diagnose a case of disc prolapse. Straight leg raising test have good correlation with the severity of disc prolapse. In cases of malingering, diverting the patient while doing the test or doing the test in sitting position was found to be helpful.

INVESTIGATIONS:

X – ray lumbosacral spine was the basic investigation done to all the patients. All the patients had loss of lumbar lordosis. 90 % of patients had disc space narrowing. 30 % of patients had sacralisation of L5.

All the patients were subjected to stress views – flexion and extension lateral view of lumbosacral spine. If instability determined, they were excluded from the study. Thus 20 patients without instability were selected.

CT was not routinely done for all the patients.

In this study, it was considered as a dictum that, no patients should be subjected to surgery without MRI. 85 % of patients had disc protrusion.

15 % of patients had disc extrusion. Central disc, multilevel disc, disc bulge were excluded. All the patients had spinal canal antero-posterior dimensions less than 8 mm.MRI showing myelographic block were excluded from the study.

CONSERVATIVE TREATMENT:

In this study, all the patients were initially treated with 6 weeks course of non operative treatment like bed rest, continuous pelvic traction, local heat therapy, non steroidal anti inflammatory agents, steroids, muscle relaxants, antidepressants and spinal extension exercises. Patients not responding to conservative measures for 6 weeks were subjected to Micro-Lumbar Discectomy.

SURGERY:

In this study, all the patients were operated by Micro-Lumbar Discectomy using magnifying loup using general anaesthesia in prone position with pillows beneath the chest and pelvis. Care taken to prevent excessive bleeding by proper positioning, hypotensive anaesthesia and infiltration with adrenaline saline solution.

Only ligamentum flavum and small part of lamina removed. Major portion of lamina and facet joint remain undisturbed. Use of cotton patties were kept to minimum.

POST OPERATIVE ASSESSMENT:

- Among the symptoms, radiating pain was the symptom that responded very well.
- 6 out of 8 patients neurological deficit recovered during first 6 months.
- 2 patients does not recover from neurological deficit.
- 1 patient developed neurological deficit postoperatively, which recovered during the course of 6 weeks.
- 1 patient developed Discitis giving rise to poor result.

CONCLUSION

Micro lumbar discectomy with loup magnification, without operative microscope is an excellent cheap procedure, which can be done on outpatient basis. The key to good results in disc surgery is appropriate patient selection. The optimal patient is one with predominant unilateral leg pain, extending below the knee, that has been present for atleast 6 weeks despite conservative measures.

The operated patients had less postoperative pain due to the minimal soft tissue exposure, minimal handling of paraspinal muscles on one side only, less or no damage to lamina, no damage to facet joints. All the patients required less dose of postoperative analgesics.

Postoperative mobilization is very earlier compared to laminectomy and discectomy. All the patients were mobilized on the day of surgery. Patients are allowed to return to their work after 3 weeks in jobs that does not require lifting, after 6 weeks in jobs that require prolonged sitting and 8 weeks for heavy labor.

All the patients had less postoperative morbidity. Problems associated with prolonged bed rest like bed sores, deep vein thrombosis, lung and urinary tract infections, hypocalcemia are not encountered.

80% of patients had best results, 10% good results, 5% fair result and 5 % poor result. The success of surgery depends on selection of the patient and correct identification of the level and avoiding complications.

BIBLIOGRAPHY

1. Saal JA. Natural history and nonoperative treatment of lumbar disc herniation. Spine 1996;21(24 suppl):2S-9S.
2. Buckwalter JA. Aging and degeneration of the human intervertebral disc. Spine 1995;20:1307-14.
3. Panagiotacopulos ND, Pope MH, Bloch R, Krag MH. Water content in human intervertebral discs, part II: viscoelastic behavior. Spine 1987;12:918-24.
4. Naylor A. The biochemical changes in the human intervertebral disc in degeneration and nuclear prolapse. Orthop Clin North Am 1971;2:343-58.
5. Nachemson A. Disc pressure measurements. Spine 1981;6:93-7.
6. Waddell G, Somerville D, Henderson I, Newton M. Objective clinical evaluation of physical impairment in chronic low back pain. Spine 1992;17: 617-28.
7. Bell GR, Ross JS. Diagnosis of nerve root compression. Myelography, computed tomography, and MRI. Orthop Clin North Am 1992;23:405-19.
8. Boden SD, Wiesel SW. Lumbar spine imaging: role in clinical decision making. J Am Acad Orthop Surg 1996;4:238-48.
9. Haughton VM. MR imaging of the spine. Radiology 1988;166:297-301.

10. Faas A, Chavannes AW, van Eijk JT, Gubbels JW. A randomized, placebo-controlled trial of exercise therapy in patients with acute low back pain. Spine 1993;18:1388-95.
11. Bush K, Cowan N, Katz DE, Gishen P. The natural history of sciatica associated with disc pathology: a prospective study with clinical and independent radiologic follow-up. Spine 1992;17:1205-12.
12. White AH, Derby R, Wynne G. Epidural injections for the diagnosis and treatment of low-back pain. Spine 1980;5:78-86.
13. Abdullah AF, Ditto EW 3rd, Byrd EB, et al: Extreme lateral lumbar disc herniations. Clinical syndrome and special problems of diagnosis. J Neurosurg 1974; 41: 229-234.
14. Baba H, Maezawa Y, Furusawa N, et al: Extraforaminal lumbar disc herniation at two contiguous intervertebral levels. Spinal Cord 1997; 35: 725-7
15. 04. Wiltse LL, Spencer CW: New uses and refinements of the paraspinal approach to the lumbar spine. Spine 1988; 13: 696-706.
16. 05. Abdullah AF, Wolber PG, Warfield JR, et al: Surgical management of extreme lateral lumbar disc herniations: review of 138 cases. Neurosurgery 1988; 22: 648-653.
17. 07. Hood RS: Far lateral lumbar disc herniations. Neurosurg Clin N Am 1993; 4: 117-124.

18. 08. Osborn AG, Hood RS, Sherry RG, et al: CT/MR spectrum of far lateral and anterior lumbosacral disc herniations.
19. 12. Maroon JC, Kopitnik TA, Schulhof LA, et al: Diagnosis and microsurgical approach to far-lateral disc herniation in
20. Eckardt JJ, Kaplan DD, Batzdorf U, et al: Extraforaminal disc herniation simulating a retroperitoneal neoplasm. Case report. J Bone Joint Surg Am 1985; 67: 1275-1277.
21. 2. Schlesinger SM, Fankhauser H, de Tribolet N. Microsurgical anatomy and operative technique for extreme lateral lumbar disc herniations. Acta Neurochir (Wien) 1992;118(3-4):117-29.
22. 3. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159-
23. Pheasant HC. Sources of failure in laminectomies. *Orthop Clin North Am*1975; 6 :319 –329
24. Muto M, Avella F. Percutaneous treatment of herniated lumbardisc by intradiscal oxygen-ozone injection. *Intervent Neuroradiol*1998; 4 :279 –286
25. Iliakis E. Ozone treatment in low back pain. *Orthopaedics*1995; 1 :29 –33
26. Choy D, Ascher P, Ranu HS, et al. Percutaneous laser decompression. *Spine*1992; 17 :949 –956
27. Smith L. Chemonucleolysis. *J Bone Joint Surg Am*1972; 54 :1795 –1802

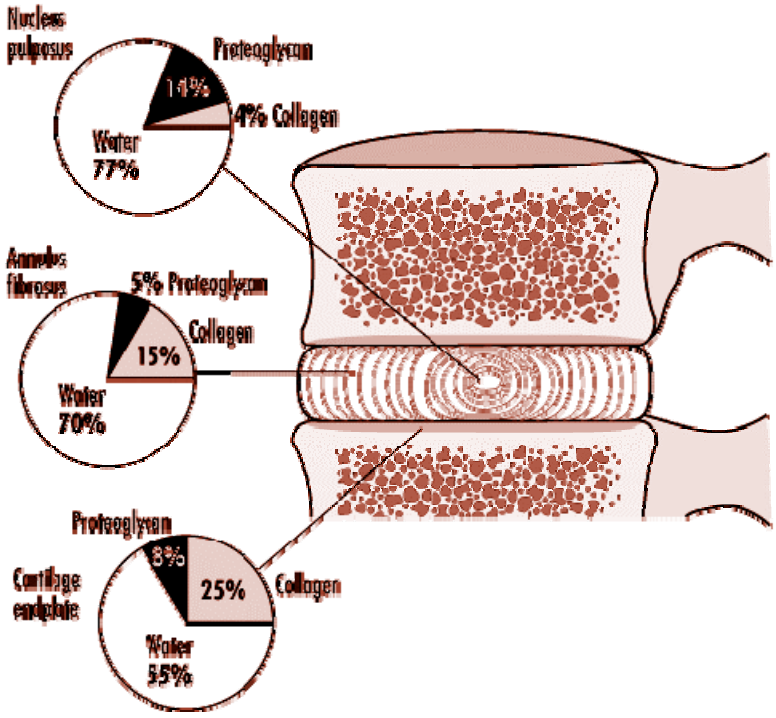
28. Leonardi M, Fabris G, Lavaroni A. Percutaneous discectomy and chemonucleolysis. In: Valavanis A, ed. *Medical Radiology: Interventional Neuroradiology*. Heidelberg: Springer-Verlag;1993 :173 –190.2
29. Suguro T, Degema JR, Bradford DS. The effects of chymopapain on prolapsed human intervertebral disc. *Clin Orthop*1986; 213 :223 –231
30. Eckel TS. New techniques: intradiscal electrothermal therapy . Presented at the 40th annual meeting of the American Society of Neuroradiology, Vancouver, May 11–17,2002
31. Simonetti L, Agati R, Cenni P, de Santis F, Leonardi M. Mechanism of pain in disc disease. *Riv Neuroradiol*2001; 14 :171 –174
32. Siddal PJ, Cousins MJ. Spine update spinal pain mechanism. *Spine*1997; 22 :98 –104
33. Weistein J. Mechanisms of spinal pain: the dorsal root ganglion and its role as a mediator of low back pain. *Spine*1986; 11 :999

MASTER CHART

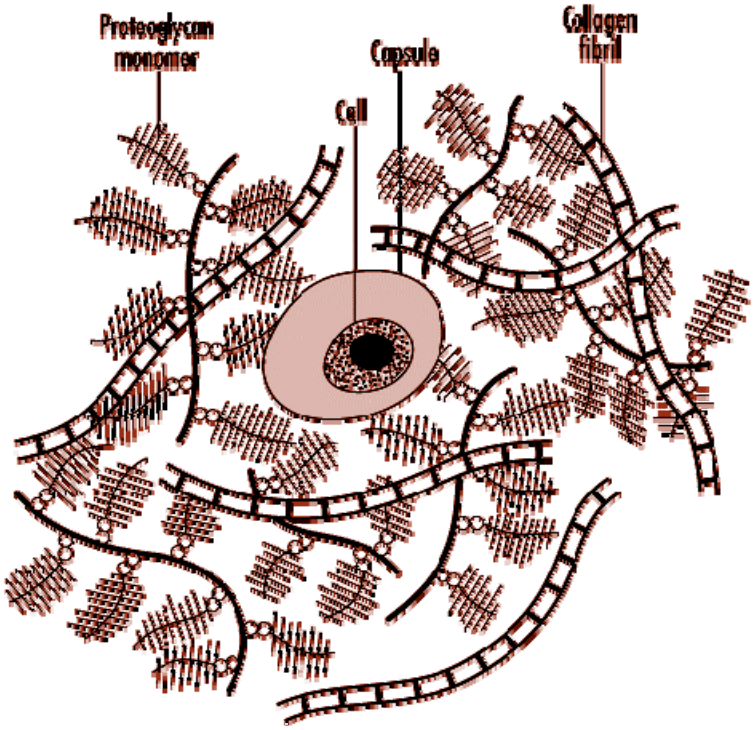
NO	AGE/SEX	SYMPTOMS	DURATION IN MONTHS	MRI FINDINGS	LEVEL	RESULT	COMPLICATIONS
1	31/F	LOW BACK PAIN ,LEFT SCIATICA,EHL WEAKNESS	7	DISC PROTRUSION	L4-L5	BEST	NIL
2	37/M	LOW BACK PAIN, RIGHT SCIATICA	6	DISC PROTRUSION	L4-L5	BEST	NIL
3	33/F	LOW BACK PAIN ,LEFT SCIATICA, EHL WEAKNESS	8	DISC PROTRUSION	L4-L5	BEST	NIL
4	28/F	LOW BACK PAIN, RIGHT SCIATICA	8	DISC PROTRUSION	L4-L5	BEST	NIL
5	33/F	LOW BACK PAIN ,LEFT SCIATICA	9	DISC EXTRUSION	L4-L5	BEST	NIL
6	36/M	LOW BACK PAIN, RIGHT SCIATICA	16	DISC PROTRUSION	L4-L5	FAIR	DURAL TEAR, EHL WEAKNESS
7	34/M	LOW BACK PAIN, RIGHT SCIATICA, EHL WEAKNESS	7	DISC PROTRUSION	L4-L5	GOOD	DURAL TEAR
8	32/F	LOW BACK PAIN ,LEFT SCIATICA, EHL WEAKNESS	8	DISC PROTRUSION	L4-L5	BEST	NIL
9	27/F	LOW BACK PAIN, RIGHT SCIATICA, EHL WEAKNESS	10	DISC EXTRUSION	L4-L5	BEST	NIL

10	24/F	LOW BACK PAIN, RIGHT SCIATICA	6	DISC PROTRUSION	L4-L5	BEST	NIL
11	28/M	LOW BACK PAIN, RIGHT SCIATICA, FHL WEAKNESS	7	DISC PROTRUSION	L5-S1	BEST	NIL
12	24/M	LOW BACK PAIN ,LEFT SCIATICA	8	DISC PROTRUSION	L4-L5	BEST	NIL
13	29/F	LOW BACK PAIN, RIGHT SCIATICA	6	DISC EXTRUSION	L4-L5	BEST	NIL
14	36/F	LOW BACK PAIN, RIGHT SCIATICA,EHL WEAKNESS	15	DISC PROTRUSION	L4-L5	POOR	DISCITIS
15	30/M	LOW BACK PAIN ,LEFT SCIATICA	3	DISC PROTRUSION	L4-L5	BEST	NIL
16	28/F	LOW BACK PAIN ,LEFT SCIATICA	11	DISC PROTRUSION	L5-S1	BEST	NIL
17	26/M	LOW BACK PAIN, RIGHT SCIATICA	7	DISC PROTRUSION	L4-L5	BEST	NIL
18	23/M	LOW BACK PAIN ,LEFT SCIATICA	10	DISC PROTRUSION	L3-L4	BEST	NIL
19	33/F	LOW BACK PAIN, RIGHT SCIATICA, FHL WEAKNESS	7	DISC PROTRUSION	L5-S1	GOOD	DURAL TEAR
20	22/F	LOW BACK PAIN, RIGHT SCIATICA	3	DISC PROTRUSION	L5-S1	BEST	NIL

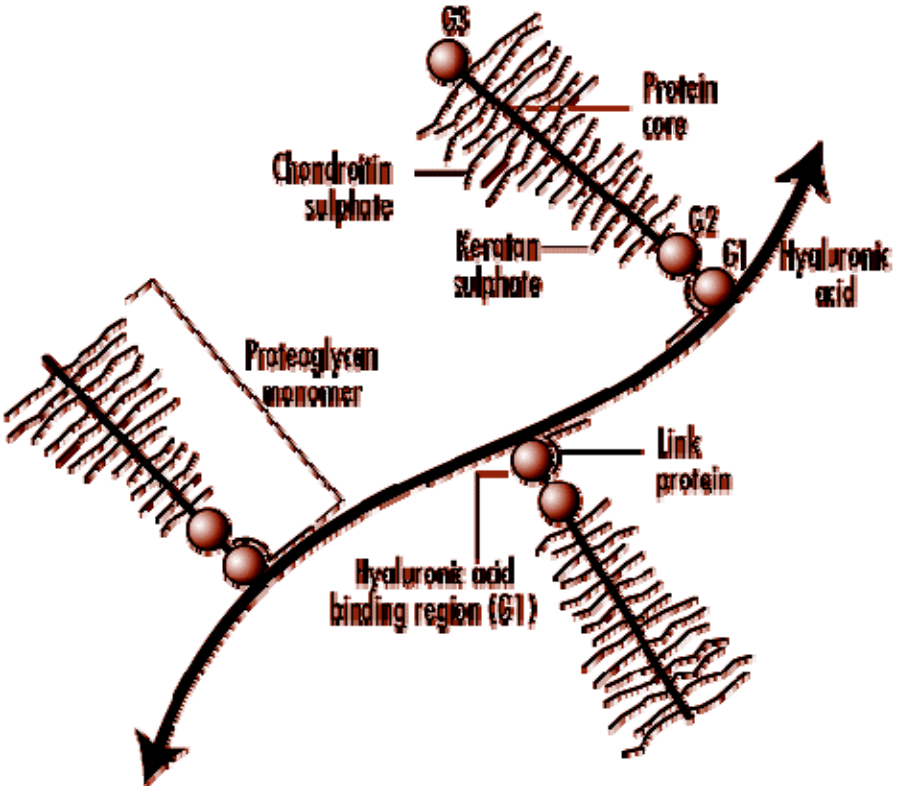
ANATOMY OF DISC



NUCLEUS PULPOSUS



PROTEOGLYCAN MATRIX IN NUCLEUS



LOSS OF LUMBAR LORDOSIS

SCIATIC SCOLIOSIS

CASE 1

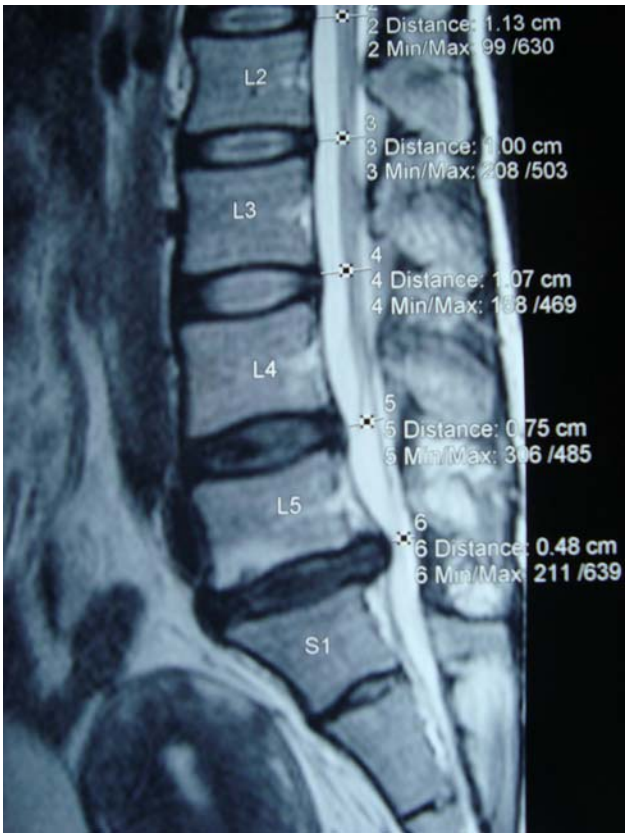
L4 – L5 DISC PROLAPSE

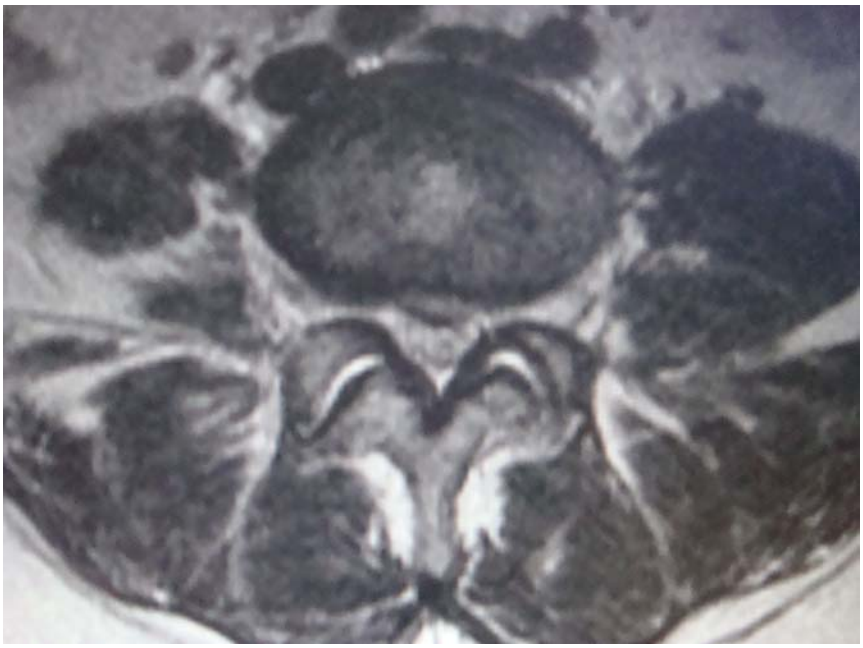
CASE 2

L4 – L5 DISC PROLASPE

CASE 11

L5 – S1 DISC PROLAPSE





PROCEDURE

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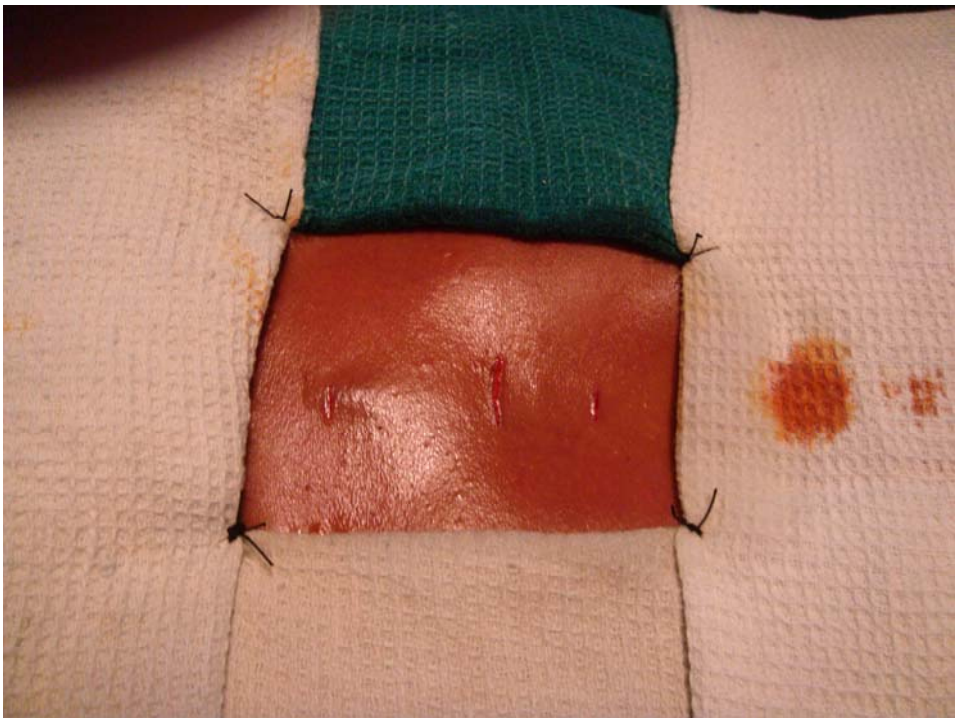

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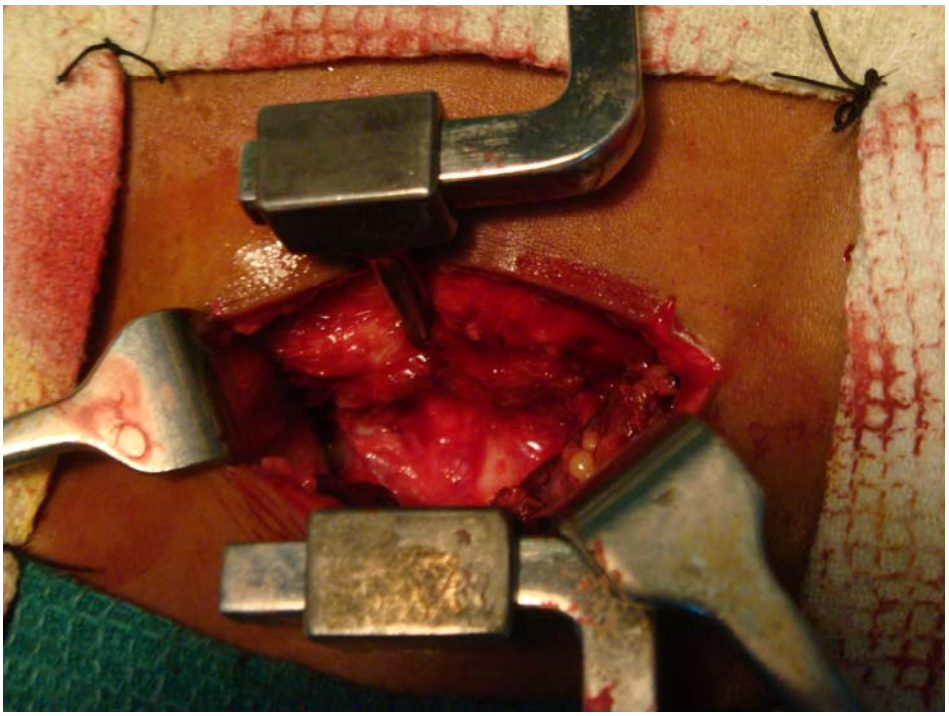
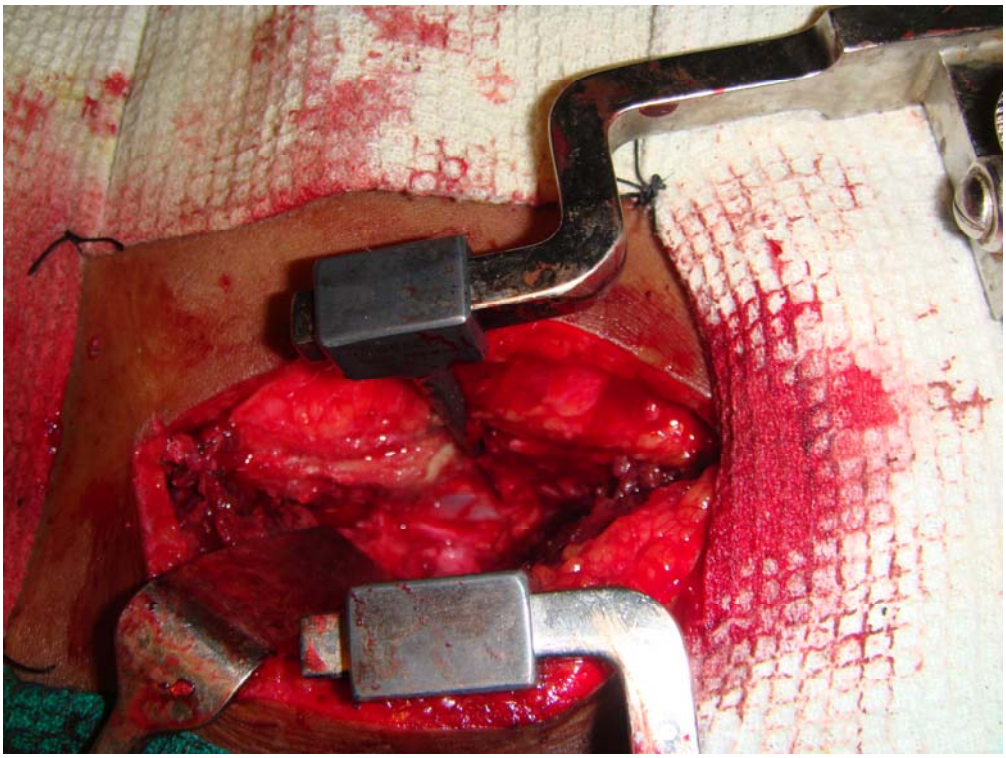
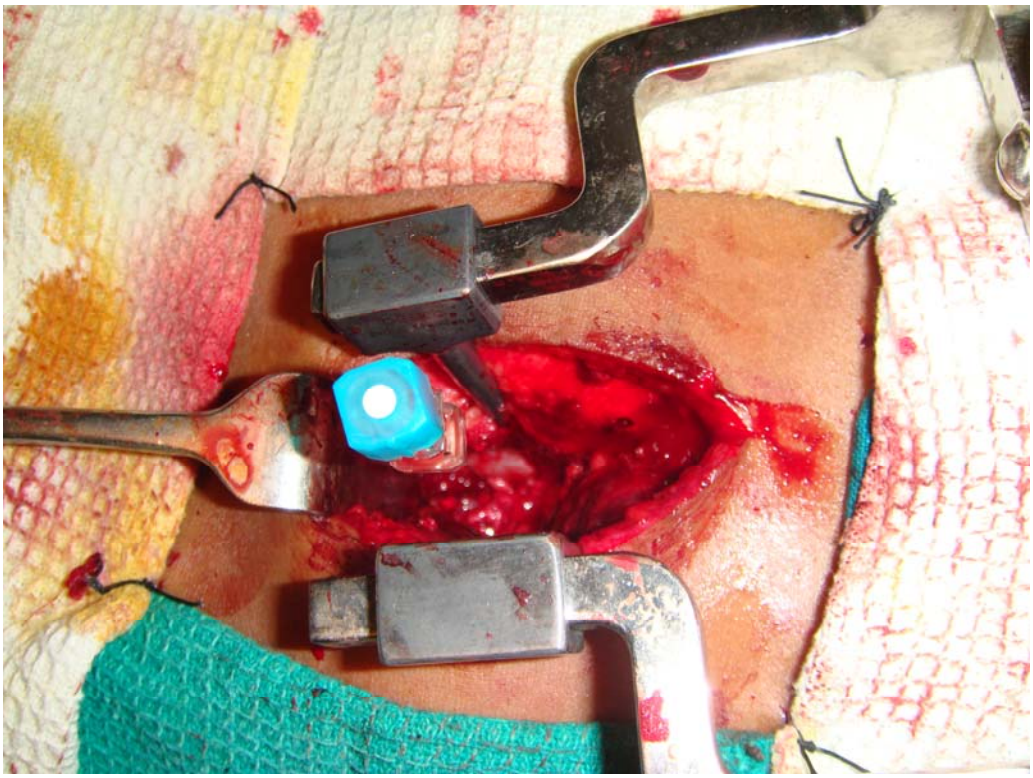


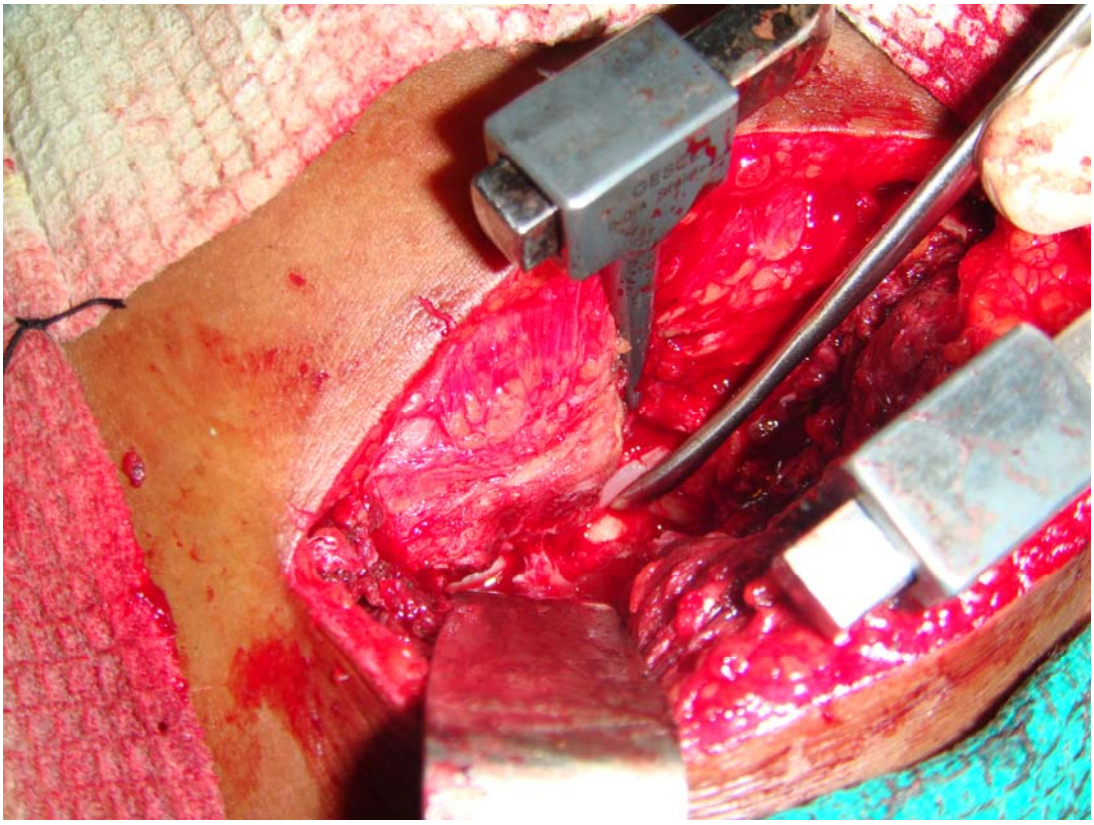
CORD AND NERVE ROOT



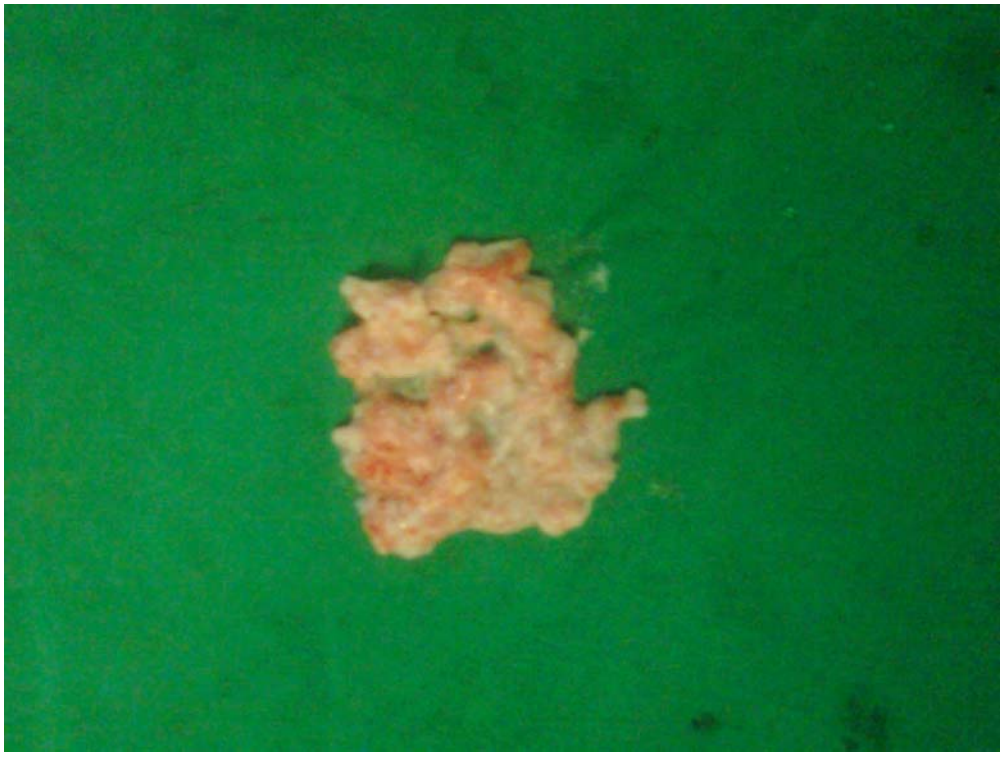
IDENTIFYING THE DISC LEVEL



GLISTENING DISC



DISC MATERIAL



INSTRUMENTS