LUMBAR DISC DISEASE AND LUMBAR SPONDYLOSIS

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LUMBAR DISC HERNIATION

- **Introduction**
  - Large amount of lost productivity in the workforce
  - First published report by Mixter and Barr in 1934
  - **Frequency:** Almost 5% of males and 2.5% of females experience sciatica at some time in their lifetime

ANATOMY

- Largest mobile segment of spine
- The normal disk: nucleus pulposis surrounded by the annulus fibrosus
- The annulus has more collagen and is therefore tougher than the more gelatinous center
- 12 lamellae
- Fibres in lamellae at 60 degree to vertical and run in opposite directions.
- Arrangement—strength and elasticity
- The annulus is fused to the epiphyseal ring above and below by Sharpey's fibers along with the ALL & PLL

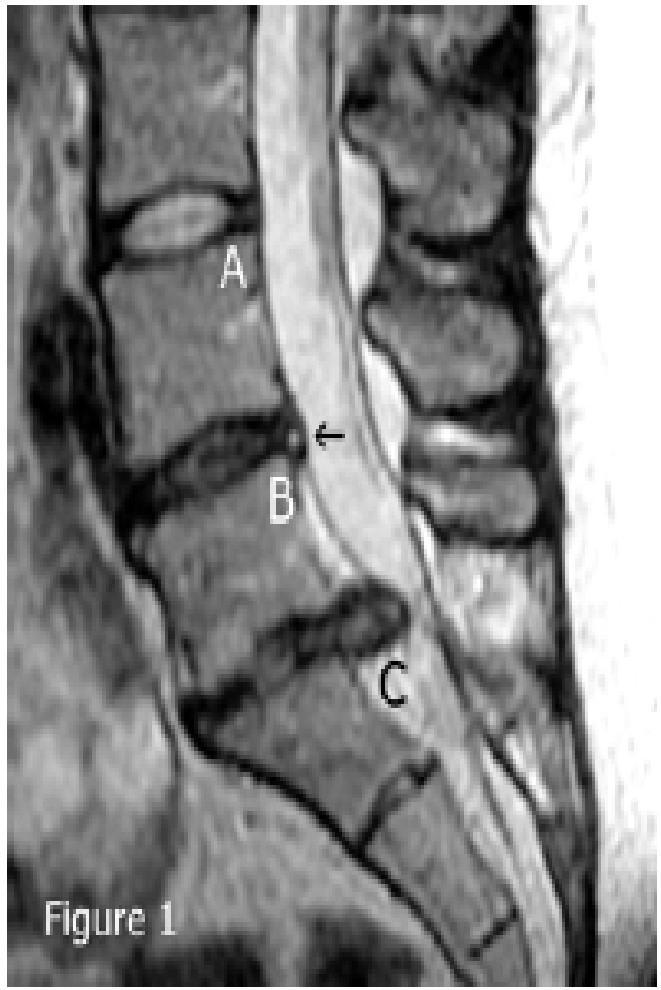
A normal disk : 80-85% water ,. bright appearance of a disk on MRI with central high T2 signal. As a disk ages, its water content ↓ and its T2 signal ↓. this IS disk "desiccation"

Figure 1:

A – Normal disk.

B – Desiccated disk with annular tear.

C – Extruded disk material.



PATHOGENESIS

- Normal degeneration: equal loss of NP & AF-narrowed disc
- Degenerated AF-bulging disc
- Loss of AF>NP centrifugal forces ↑ and may tear AF→extrusion
- After excess nucleus has herniated-disc is stable as forces on NP and AF are in balance

- If loss is more in nucleus only-intra discal gas formation
- Not result of trauma but degenerative changes
- MC- Posterolateral herniation
  - PLL strongest in midline

NERVE ROOT AFFECTED

- L4-L5 DISC:
  - POSTEROLATERAL –L5
  - FAR LATERAL -L4

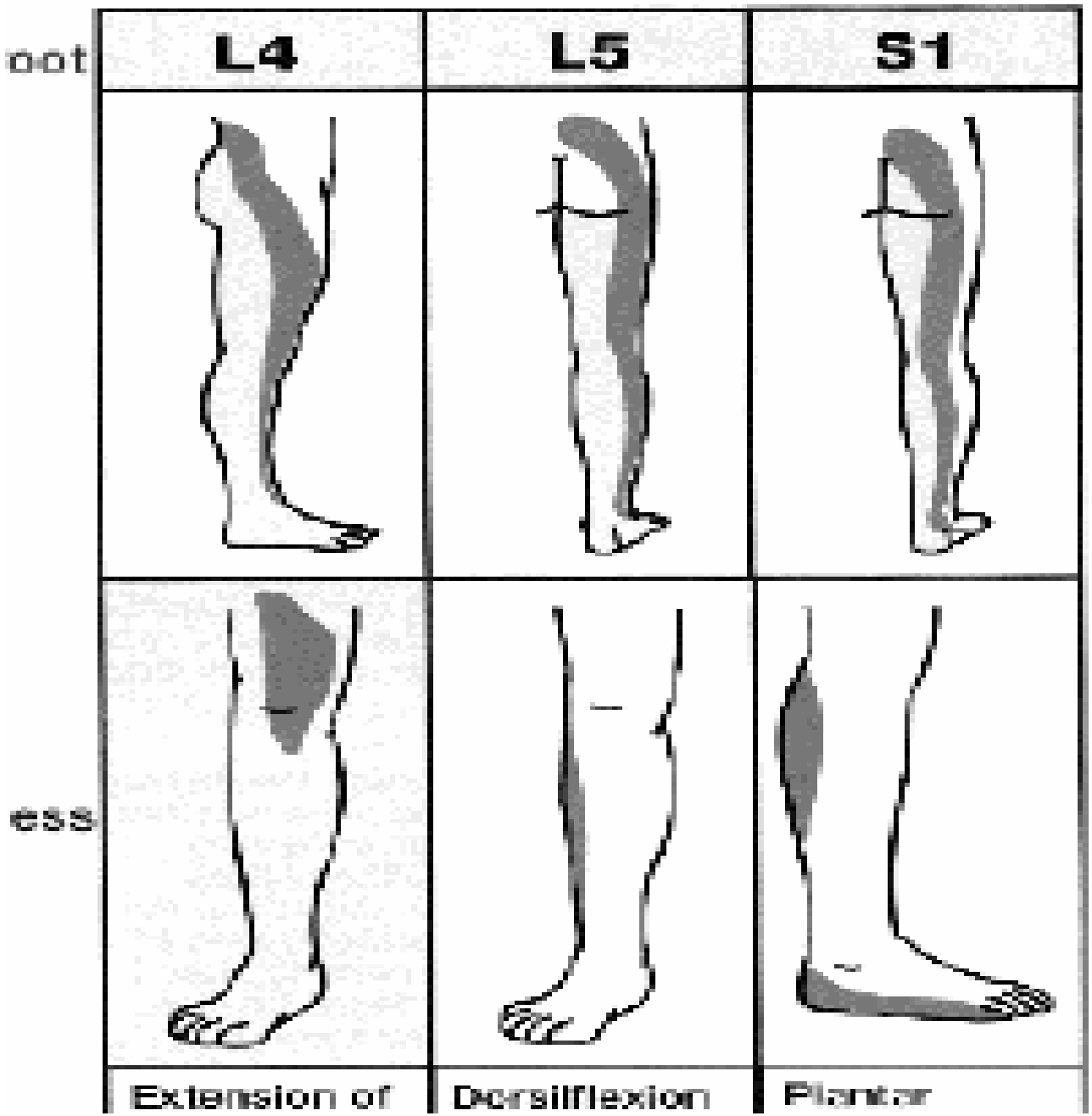
- **Disc herniation** :
  - **Protrusion** (aka: contained herniation or sub-ligamentous herniation)
  - **Extrusion** (aka: non-contained herniation or trans-ligamentous herniation)
  - **Sequestration** (aka: free fragment)

DEPENDING ON LOCATION

- CENTRAL AND PARACENTRAL(15%)
- POSTEROLATERAL(70%-80%)
- EXTREME LATERAL(15%)

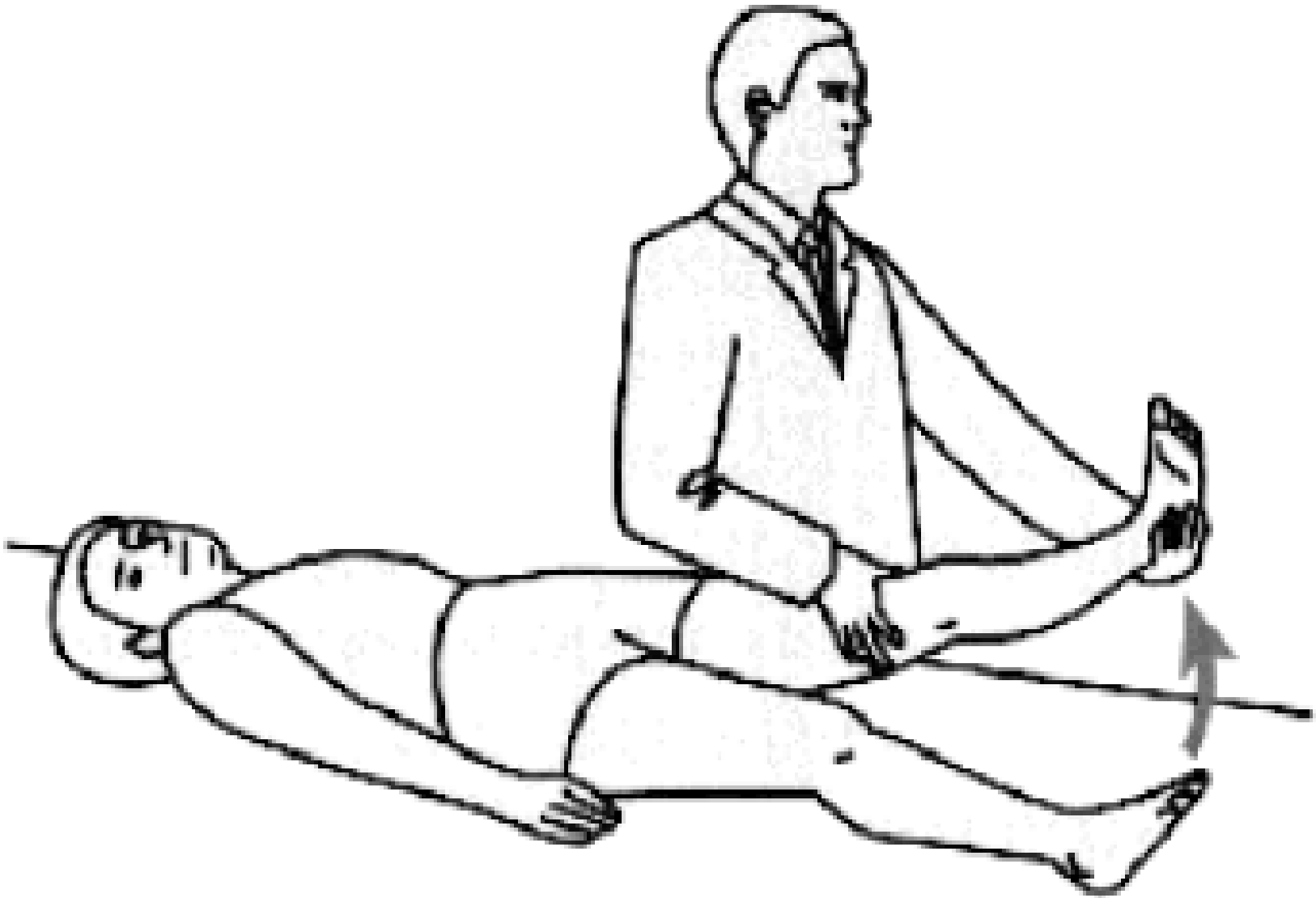
CLINICAL PRESENTATION & HX

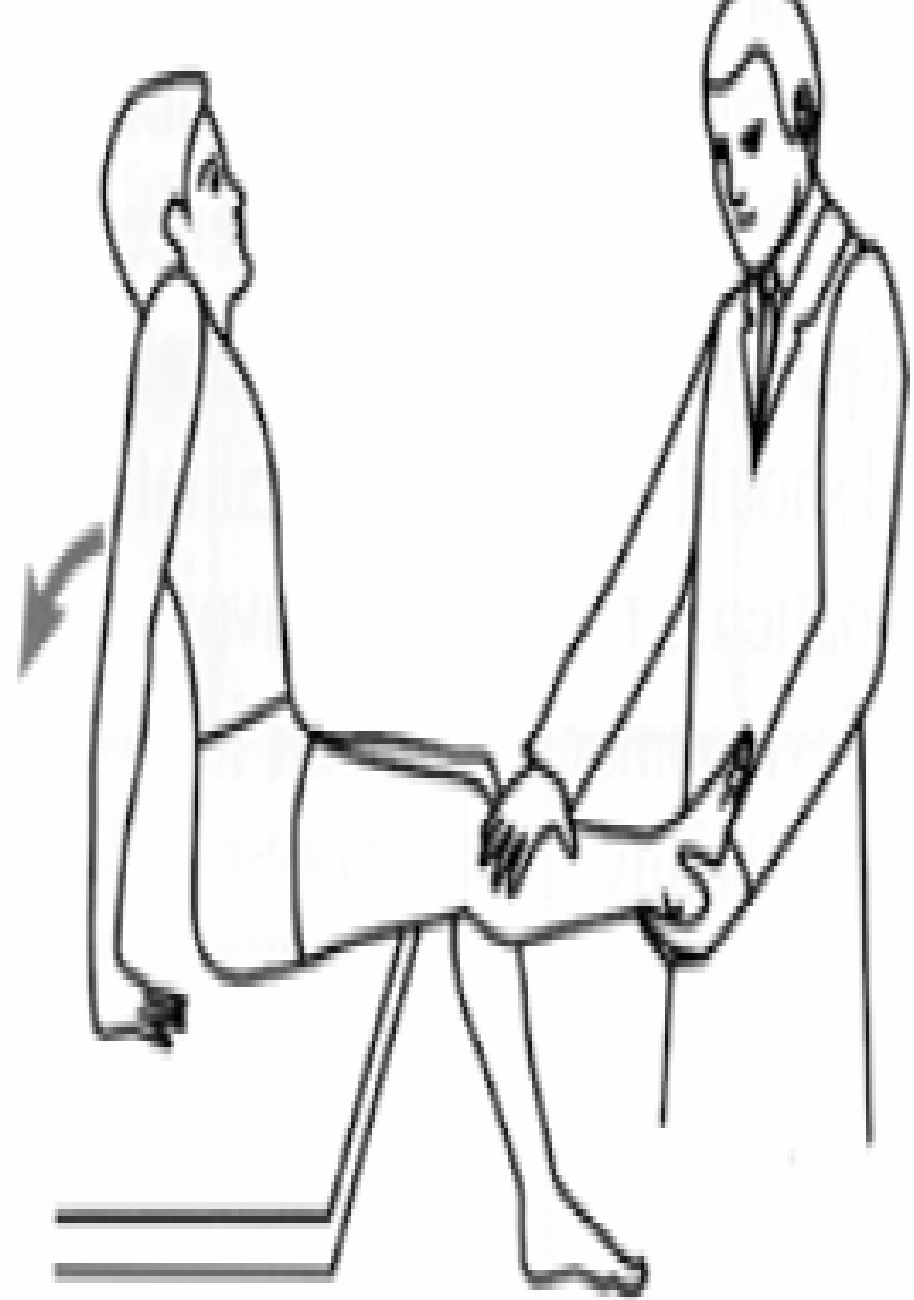
- Back pain
- Gradually (over days to weeks) or suddenly followed by radicular pain
  - very sensitive for disc herniation
  - disc herniation in absence of sciatica are-1/1000
- Pain relief on flexing knee and thigh
- Exacerbation with coughing ,sneezing,straining
- Bladder symptoms-1-18%
- Reduced bladder sensation.difficulty voiding straining
- Symptoms of LCS/CES


oot
ess
L4
L5
S1
Extension of
Dorsiflexion
Plantar

Nerve root tension signs:

- Straight leg raising test: Sciatica vs Hip pathology(sensitivity 80%,specificity40%)
- Tenses L5, S1 most, L4 less & proximal roots little
  - Positive test:leg pain or paresthesia in distribution of pain at less than 60 degree
  - May be positive in lumbosacral plexopathy
- Crossed SLRT: SLR on painless leg causes contralateral limb pain (sensitivity25%,specificity 90%)





With the patient sitting on a table, both h
and knees flexed at 90 degrees, slowly
extend the knee as if evaluating the patel
or bottom of the foot. This maneuver
stretches nerve roots as much as a
moderate degree of supine SLR.

- Reverse SLRT: Prone patient, palm at popliteal fossa and knee is flexed
  - Positive in L2 L3 L4 root compression
- CRAM TEST: Raise symptomatic leg with knee flexed, then extend knee

Other signs in evaluation for lumbar radiculopathy

- FABER test: flexion, abduction, external rotation
  - Positive in hip disease, Sacroilitis

FINDINGS

- SIGNS/SYMPTOMS OF RADICULOPTHY

L1-2	Pain in anterior and medial aspect of upper thigh	Slight weakness in quadriceps; slightly diminished suprapatellar reflex
L2-3	Pain in anterolateral thigh	Weakened quadriceps; diminished patellar or suprapatellar reflex
L3-4	Pain in posterolateral thigh and anterior tibial area	Weakened quadriceps; diminished patellar reflex
L4-5	Pain in dorsum of foot	Extensor weakness of big toe and foot
L5-S1	Pain in lateral aspect of foot	Diminished or absent Achilles reflex

Radiographic evaluation

- **MRI**: MC ,RARELY NORMAL
  - very sensitive in delineating . Far lateral discs are best evaluated with this test.
    - In reoperations, MRI can delineate the full extent of scar tissue and, with moderate reliability, differentiate it from recurrent disc herniation.
- **CT SCAN MYELOGRAPHY** :for evaluating patients who have severely spondylotic changes,
  - CLAUSTROPHOBIA
  - SEVERE PAIN-PATIENT CAN NOT LIE FOR LONG PERIODS
  - delineate bony structures better than MRI.

False Positive Rates for Lumbar MRI

Investigation:	Disc Bulge	Disc Protrusion	Disc Extrusion	Disc Pathology (Bulge, Protrusion,extrusion, sequestration)	Root Deviation o Compression
Boden et al.		20%		NA	
Jensen et al.	52%	27%	1%	64%	
Boos et al.*		63%	13%		4%
Greenberg et al.	39%	18%		57%	
Weishaupt et al.	24%	40%	18%		4%
Wood et al (11)*	53%	37%		63%	
*	Because these investigation used a 'high risk' asymptomatic groups of people, i.e., people whose occupation required frequent heavy lifting, twisting, and bending; frequent exposure to vibration; and sedimentary occupations, I have EXCLUDED the results from the averaging below.				
AVERAGES:	**38%**	**29%**	**9.5%**	**60.5%**	**4%**

- Plain radiographs, flexion and extension
  - views :Some spine tumors, instabilities, malalignments, and congenital anomalies can be identified best with plain radiographs.
  - Obtain plain films on all patients prior to surgery.

MANAGEMENT

- Nonsurgical treatment: all patients with sciatica and disc herniations deserve a trial of medical therapy.
- except patient presenting with cauda equina syndrome or profound motor deficits.
- Counseling and education about the disease
- bedrest
- prescribe anti-inflammatory agents with analgesic

- ?Muscle relaxants aid in relieving associated muscle spasm
- After 7-14 days, slow mobilization is started.
- Once the patient has recovered from radicular pain,
- physical therapy can be instituted .. Return to work (either limited or full) is important at this point

SURGICAL TREATMENT

- Indications:
  - 1.CES
  - 2.progressive motor deficite.g. foot drop
  - 3.A patient with persistent bothersome sciatic pain, despite conservative management, for a period of 6-12 weeks (a time period that varies from surgeon to surgeon)

  - ????? patient presenting with a profound motor deficit of varying duration

Contraindications

- A patient with unrelenting back pain: Patients who have back pain after a bout of sciatica has resolved are not good candidates for operative treatment
- A patient not provided adequate conservative treatment:
- A patient with an incomplete workup: When diagnosis is uncertain, postpone surgery. ?? diabetic plexopathy ??? an epidural metastasis

Surgical options

- ***Trans canal approaches***:
  - 1.standard open lumbar laminectomy and discectomy : no sciatica in 80% operated patients as compared to 36% conservatively managed patients
  - 2.Microdiscectomy: small incision
    - **Advantage**: cosmesis,
    - shorter hospital stay
    - Lower blood loss
  - 3.Minimally invasive

- ***Intradiscal procedures***:
  - Most controversial PROCEDURES
  - Concept: remove disc material from center and ↓↓ intradiscal pressure
  - Only 10-15%surgical candidates are fit

1. percutaneous endoscopic discectomy
2. automated percutaneous lumbar discectomy
3. intradiscal endothermal therapy
4. laser disc decompression
5. chemonucleolysis

- Indications:
  - 1.contained herniation(outer margin of annulus intact)
  - 2.appropriate level:best for L4-5 difficult at L5-S1
- Not recommended in presence of severe neurological deficits
- Advantage:
  - epidural scarring avoided
  - Small incision or only puncture
  - Less post op pain and hospital stay

LUMBAR MICRODISCECTOMY

- Position
  - prone
  - knee chest-interlaminar space opens,depth of wound-minimum,epidural veins decompressed,great vessels fall away
- Belly should hang FREELY
- 3-cm incision is made over the disc space (as determined by radiograph)-median/paramedian
- The lumbodorsal fascia is opened paramedially Muscles are stripped from the lamina

- Small laminotomy with a drill or rongeurs or hemilaminectomy
- Operating microscope is now used
- The root is then identified and retracted. disc fragment is evident below the retracted root.
- The annulus is incised and the disc removed Remove loose fragments.
- Palpate the course of the nerve root with an angled instrument along its entirety to ensure adequate decompression

- Therapeutic portion is removal of epidural mass
- Removal of herniated portion of disc is sufficient
- Recurrence is equally likely even if interspace curettage is done
- Mobilise 4-6 hours after surgery.
- Once the patient tolerates fluids, he or she may be discharged

MINIMALLY INVASIVE TECHNIQUE

- Utilizing a tubular device inserted through a very small incision.
- Used to remove a herniated nucleus pulposus
- Incision-2 cm long, 2 cm from midline
- Place guidewire at inferior edge of lamina
- Sequential dilation of muscle and fascia about interlaminar space
- Use microscope or endoscope(***endoscopic lumbar discectomy***) to visualise interspace

RESULTS

- In experienced hands upto 70% results
- Long term recurrence ???high

INTRADISCAL SRGICAL PROCEDURES

- 1. PERCUTANEOUS LUMBAR ENDOSCOPIC DISCECTOMY
  - For contained disc herniations
  - Not proven

2.PLLD (Percutaneous lumbar laser discectomy)

- Places a laser fiber into the disc
- It is blind and can effect the nerve root Not very effective and not done often anymore

3. CHEMONUCLEOLYSIS

- Intradiscal CHYMOPAPAIN
- For soft disc
- Anaphylaxis, neurologic injury, vascular injury

4.AUTOMATED PERCUTANEOUS LUMBAR DISCECTOMY

- NUCLEOTOME
- less effective than CHYMOPAPAIN
- 1 year success-37%

PARACENTRAL DISC HERNIATION

- 15% of disc herniations
- large bony exposure rostrocaudally and laterally is required ,sometimes across midline
- If exposure is not adequqte,
  - retraction →CES

FAR LATERAL OR EXTRAFORAMINALHERNIATION

- 15% cases of disc herniation
- Mass lateral to foramen on axial cuts
- Surgical approaches:
  - Lateral approach through muscle splitting incision to expose FJ and TS
  - Identify pedicle and nerve root

SURGICAL OUTCOME IN DISC DISEASE

- Patient selection
- High quality imaging

ADVERSLY AFFECTING OUTCOME

- Atypical symptoms
- Equivocal imaging
- Very long duration of symptoms
- Workers compensation claims
- Litigation
- Drug, alcohol dependence
- Smoking
- Obesity
- Concurrent medical problems

COMPLICATIONS

- Intraoperatively
  - Operate on wrong level
  - Bleeding due to malpositioning
    - Engorged venous epidural channels can make the operation more difficult ,dangerous
  - Major vessel injury –visible bleeding in less than 10%
  - CSF leak-repair immediately
- Infections
  - Usually skin infections
  - Discitis can cripple a patient who is recovering. fevers, severe localized pain & recurrent symptoms, ↑ESR

- Increased neurologic deficit is usually mild & is due to excessive retraction of the root
- If a nerve root is mistaken for a disc herniation & is removed, the resultant injury can be severe
- Failure to relieve symptoms: MC complication
- Failed Back Syndrome: After discectomy 8-25%
- CAUSES:
  - Incorrect initial diagnosis
  - Residual/recurrent disc, disc at another level, epidural hematoma, pseudomeningocele,peridural scar

HERNIATED UPPER LUMBAR DISCS

- Approx. 2 %
- LBA with paresthesia pain in anterior thigh
- SLR positive in 40% cases
- Atrophy/weakness of quadriceps may be present
- Knee jerk may be absent

LUMBAR SPONDYLOSIS

- Encompasses degenerative disc disease with associated vertebral osteophytosis, ligamentous disease, facet joint disease & neurologic complications
- Usually begins by 45
- Frequent cause of low back & leg pain
- Primary cause of LCS

LCS

- Verbiest described in 1950
- Described 2 types:
  - Congenital –short pedicles, sag. diameter <10 mm
  - Acquired type: originally normal
    - APD<12 mm
    - Acquired changes due to thickened laminae, arthrotic facets, infolding of yellow ligament, protruding disc

PATHOPHYSIOLOGY

- Radiculopathy & neurogenic claudication: direct mechanical compression or due to ischemia of nerve roots
- Standing/walking increase lordosis exaggerating by infolding of yellow ligament
- Sitting reverses lordosis, increases blood flow, relieves complaints

SYMPTOMS

- Age-50s to 60s
- Radiculopathy U/L followed by B/L
- Claudication typically B/L
- Complaints of leg pain, numbness, tingling, weakness that are increased with standing, walking & relieved by rest esp. sitting lying down.Sensitive (60%) but highly specific
- Lower back pain in 60-80%
- CES (when associated with disc)

SIGNS

- Simian posture
- Findings of entrapment e.g. SLRT/RSLRT in 60%
- Motor, sensoy & reflex level according to level of involvement
  - L5 most common
  - L4
  - L3
  - S1
- Chronic bladder dysfunction often subclinical

DIAGNOSTIC STUDIES

- Plain radiographs:
  - AP diameter narrowed
  - Show curvature
  - Show instability (>4mm of translation and >10 degree of angulation)
- MRI: Better delineate soft tissue changes at foramen, laterally and far laterally
  - Loss of csf signal on T2 with nerve impingement
  - Other pathologies also identified better

- CT with 3D Reconstruction: Trefoil canal
- Provide structural definition of stenosis and accompanying pathology

DIFFERENTIAL DIAGNOSIS

- Accompanying cervical/thoracic stenosis
- OPLL/OYL
- Amyloidosis
- Diabetic Neuropathy
- Neurogenic VERSUS Vascular Claudication

MANAGEMENT

- Nonsurgical management
- NSAIDS
- Ultrasonic diathermy
- Lumbar flexion exercises

SURGICAL MANAGEMENT

- **Indications**:
  - Symptoms fail to respond adequately to nonsurgical care
  - Leg symptoms are severe and functionally disabling
- Laminectomy:
- All stenosis level should be decompressed at first surgery
- Good outcome in 64-80% patients

- Laminotomy
- Trumpet Laminectomy

INDICATINS OF FUSION

- Young patients with instability
- Presence of Scoliosis
- ? Repeat Surgery

- Most nonrandomized comparisons suggest an advantage in surgically treated patients, at least in the short term
- However, up to one third of patients treated nonsurgically also do well
- Stenotic symptoms improved significantly more often in surgically treated patients than in conservatively treated patients

LATERAL RECESS SYNDROME

- Bordered anteriorly by body, laterally by pedicle, posteriorly by SAF of lower vertebra
- Usually do not develop symptoms of NC
- Typically have radicular symptoms in a specific dermatomal pattern
- Often have pain at rest, at night & with Valsalva maneuver
- Younger (mean age 41 years) than patients with central canal stenosis

- EVALUATION: High resolution CT (lateral recess height <3mm)
  - MRI
- TREATMENT: Trial of Conservative Management
- SURGERY: Laminectomy and One third Medial Facetectomy

THANK YOU