LUMBAR DISC DISEASE AND LUMBAR SPONDYLOSIS

Presented By: Hitesh K Gurjar
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
<table>
<thead>
<tr>
<th>L4</th>
<th>L5</th>
<th>S1</th>
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<tbody>
<tr>
<td><img src="oot.png" alt="Diagram" /></td>
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<tr>
<td>Extension of</td>
<td>Dorsiflexion</td>
<td>Plantar</td>
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</table>
Nerve root tension signs:

• Straight leg raising test: Sciatica vs Hip pathology(sensitivity 80%, specificity 40%)

• 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
  (sensitivity 25%, specificity 90%)
With the patient sitting on a table, both hand 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 RADICULOPATHY

<table>
<thead>
<tr>
<th>Level</th>
<th>Symptoms</th>
<th>Reflex Changes</th>
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<tbody>
<tr>
<td>L1-2</td>
<td>Pain in anterior and medial aspect of upper thigh</td>
<td>Slight weakness in quadriceps; slightly diminished suprapatellar reflex</td>
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<tr>
<td>L2-3</td>
<td>Pain in anterolateral thigh</td>
<td>Weakened quadriceps; diminished patellar or suprapatellar reflex</td>
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<tr>
<td>L3-4</td>
<td>Pain in posterolateral thigh and anterior tibial area</td>
<td>Weakened quadriceps; diminished patellar reflex</td>
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<tr>
<td>L4-5</td>
<td>Pain in dorsum of foot</td>
<td>Extensor weakness of big toe and foot</td>
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<tr>
<td>L5-S1</td>
<td>Pain in lateral aspect of foot</td>
<td>Diminished or absent Achilles reflex</td>
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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

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Disc Bulge</th>
<th>Disc Protrusion</th>
<th>Disc Extrusion</th>
<th>Disc Pathology (Bulge, Protrusion, extrusion, sequestration)</th>
<th>Root Deviation or Compression</th>
</tr>
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<tbody>
<tr>
<td>Boden et al.</td>
<td></td>
<td>20%</td>
<td></td>
<td>NA</td>
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<tr>
<td>Jensen et al.</td>
<td>52%</td>
<td>27%</td>
<td>1%</td>
<td>64%</td>
<td></td>
</tr>
<tr>
<td>Boos et al.*</td>
<td></td>
<td>63%</td>
<td>13%</td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>Greenberg et al.</td>
<td>39%</td>
<td>18%</td>
<td></td>
<td>57%</td>
<td></td>
</tr>
<tr>
<td>Weishaupt et al.</td>
<td>24%</td>
<td>40%</td>
<td>18%</td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>Wood et al (11)*</td>
<td>53%</td>
<td>37%</td>
<td></td>
<td>63%</td>
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* Because these investigations 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 sedentary 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 deficit e.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 SURGICAL 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 adequate,  
  – retraction → CES
FAR LATERAL OR EXTRAFORAMINAL HERNIATION

• 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
ADVERSELY 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, sensory & 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