

Low Back Pain



Nabeel Kouka, MD, DO, MBA

www.brain101.info



Epidemiology

- **Incidence of LBP:**
 - 60-90 % lifetime incidence
 - 5 % annual incidence
- 90 % of cases of LBP resolve without treatment within 6-12 weeks
- 40-50 % LBP cases resolve without treatment in 1 week
- 75 % of cases with nerve root involvement can resolve in 6 months
- **LBP and lumbar surgery are:**
 - 2nd and 3rd highest reasons for physician visits
 - 5th leading cause for hospitalization
 - 3rd leading cause for surgery



Disability

- Age and LBP:
 - Leading cause of disability of adults **< 45** years old
 - Third cause of disability in those **> 45** years old
- Prevalence rate:
 - Increased **140 %** from 1991 to 2000 with only **125 %** population growth
 - Nearly **5 million** people in the U.S. are on disability for LBP



Lifetime Return to Work

- Success of *< 50 %* if off work *> 6 months*
- *25 %* success rate if off work *> 1 year*
- *Nearly 0 %* success if return to work has not occurred in *2 years*



Occupational Risk Factors

- Low job satisfaction
- Monotonous or repetitious work
- Educational level
- Adverse employer-employee relations
- Recent employment
- Frequent lifting
 - Especially exceeding 25 pounds
 - Utilization of poor body mechanics in technique

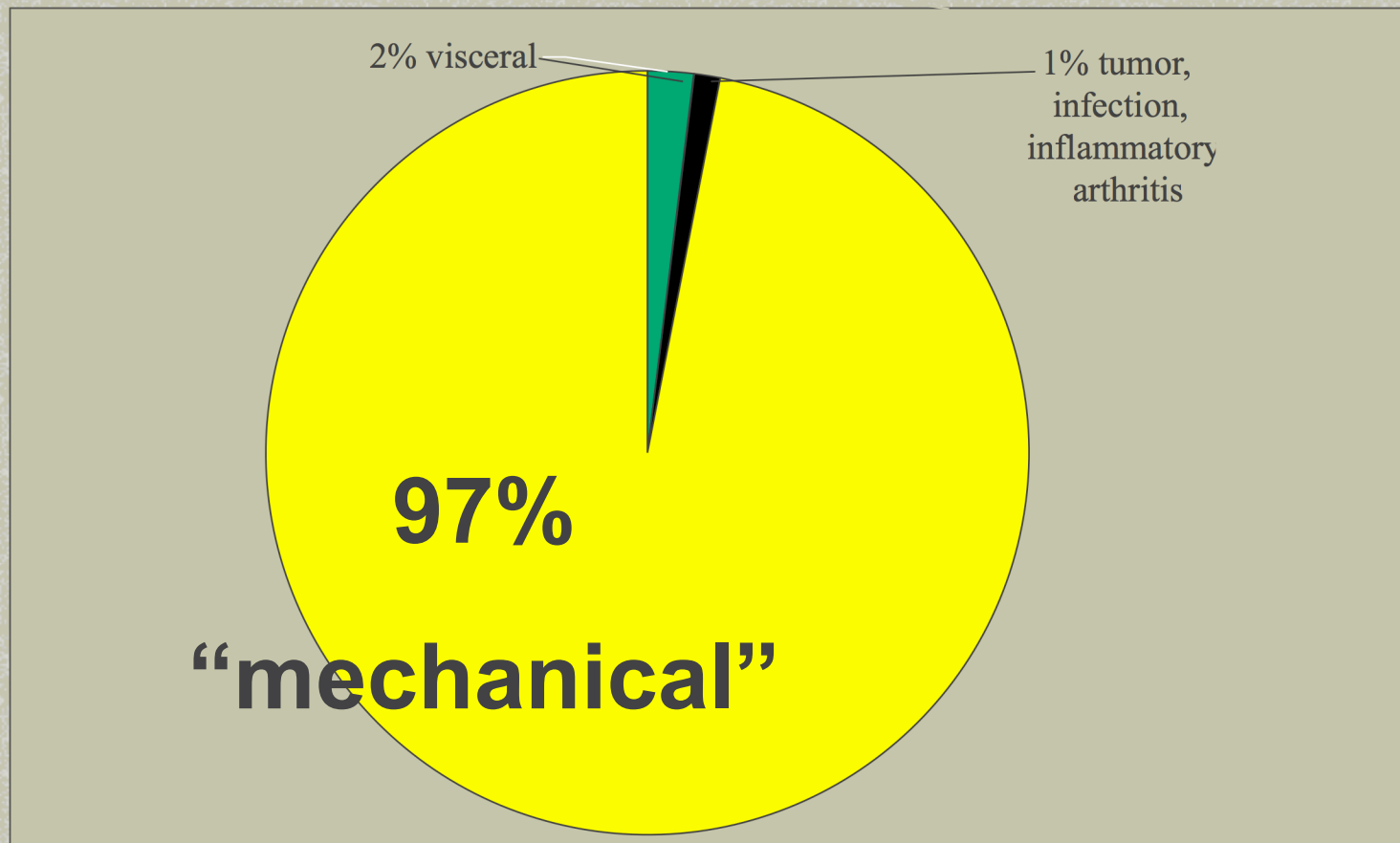


Differential Diagnoses

- Lumbar Strain
- Disc Bulge / Protrusion / Extrusion producing Radiculopathy
- Degenerative Disc Disease (DDD)
- Spinal Stenosis
- Spondyloarthropathy
- Spondylosis
- Spondylolisthesis
- Sacro-iliac Dysfunction



Frequency of Back Pain Types





Frequencies of Causes of LBP

Mechanical LBP 97%

- Lumbar sprain = Lumbago = 70%
- Disk/facet degeneration = 10%
- Herniated disk = 4%
- Spinal Stenosis = 3%
- Osteopor. Compre. Frx = 4%
- Spondylolisthesis = 2%
- Traumatic fractures = < 1%
- Congenital < 1%
- Severe kyphosis
- Severe Scoliosis
- Internal disk disruption

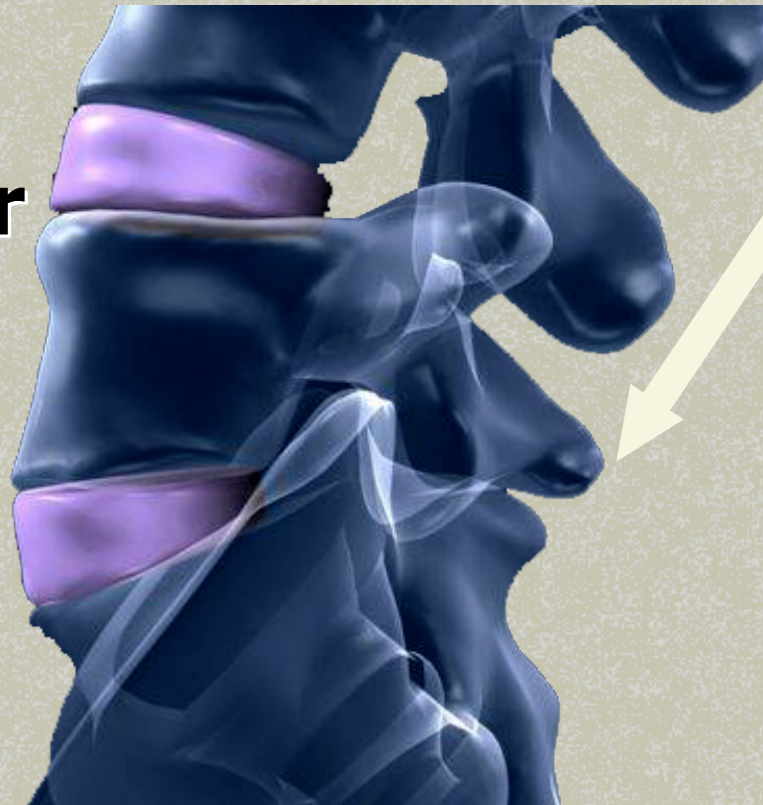
Non-Mechanical 1%

- Neoplasia = 0.7 %
- Multiple Myeloma
- Lymphoma/leukemia
- Spinal cord tumors
- Primary vertebral tumors
- Retroperitoneal tumors
- INFECTION (0.01%)
- Osteomyelitis
- Paraspinal abscess
- Herpes Zoster
- Spondyloarthropathy (0.3%)
- Ankylosing Spondylitis



Biomechanics

**80%
Anterior**



**20%
Posterior**

The 80-20 rule of Spine loading



Diagnosis

“Biggest challenge is to identify the pain generator”



Diagnostic Tools

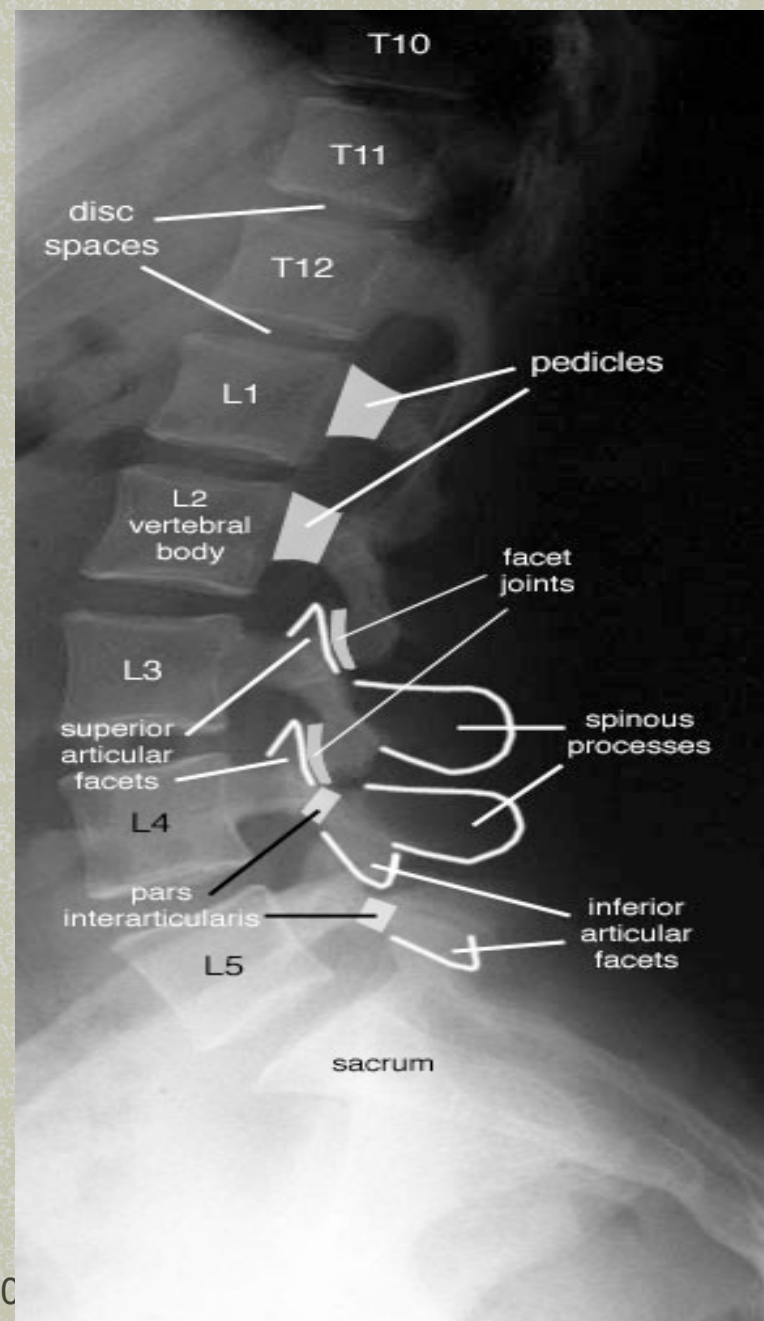
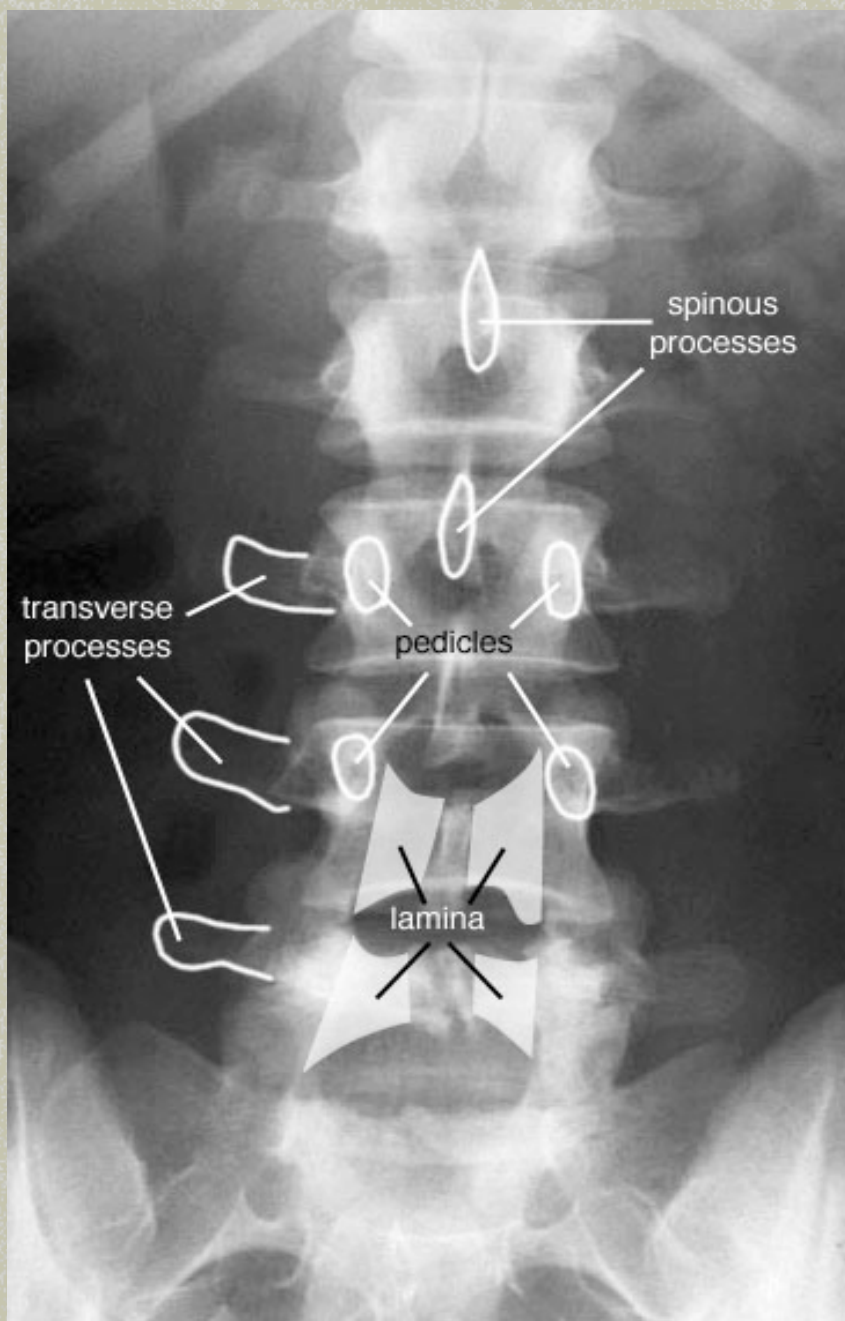
■ 1. Laboratory:

- Performed primarily to screen for other disease etiologies
 - Infection
 - Cancer
 - Spondyloarthropathies
- No evidence to support value in first 7 weeks unless with red flags
- Specifics:
 - WBC
 - ESR or CRP
 - HLA-B27
 - Tumor markers: Kidney Breast Lung Thyroid Prostate



■ 2. Radiographs:

- Pre-existing Degenerative Joint Disease (Osteoarthritis) is most common diagnosis
- Usually 3 views adequate with obliques only if equivocal findings
- Indications:
 - History of trauma with continued pain
 - < 20 years or > 55 years with severe or persistent pain
 - Noted spinal deformity on exam
 - Signs / symptoms suggestive of spondyloarthropathy
 - Suspicion for infection or tumor

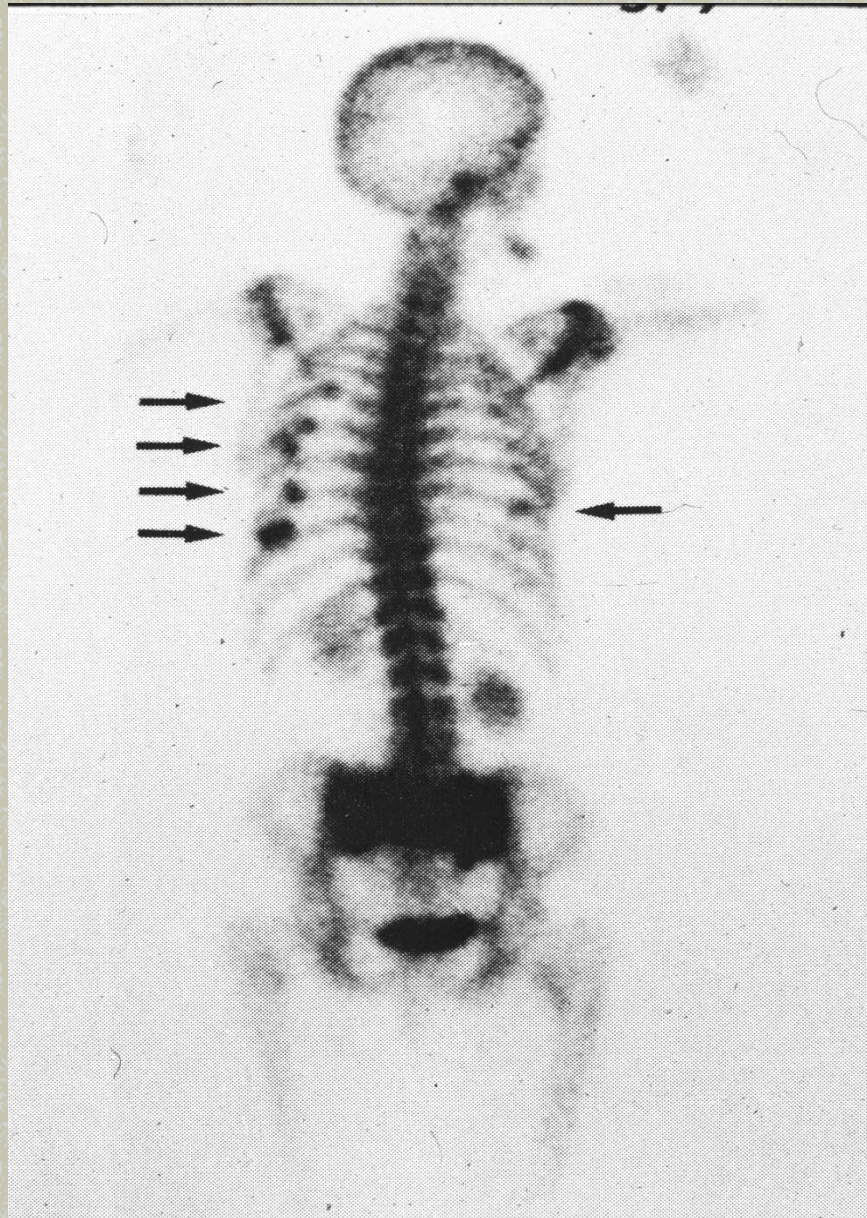




- **a** vertebral body
- **d** rt. pedicle, en face
- **i** interfacetal joint
- **o** rt. superior articular process
- **r** rt. inferior articular mass & facet
- **Arrow** absent pars = spondylolysis
- **o1** rt. superior articular process & facet, subjacent vertebra
- **d1** rt. pedicle, supraadjacent vertebra
- **p1** rt. subjacent intact pars



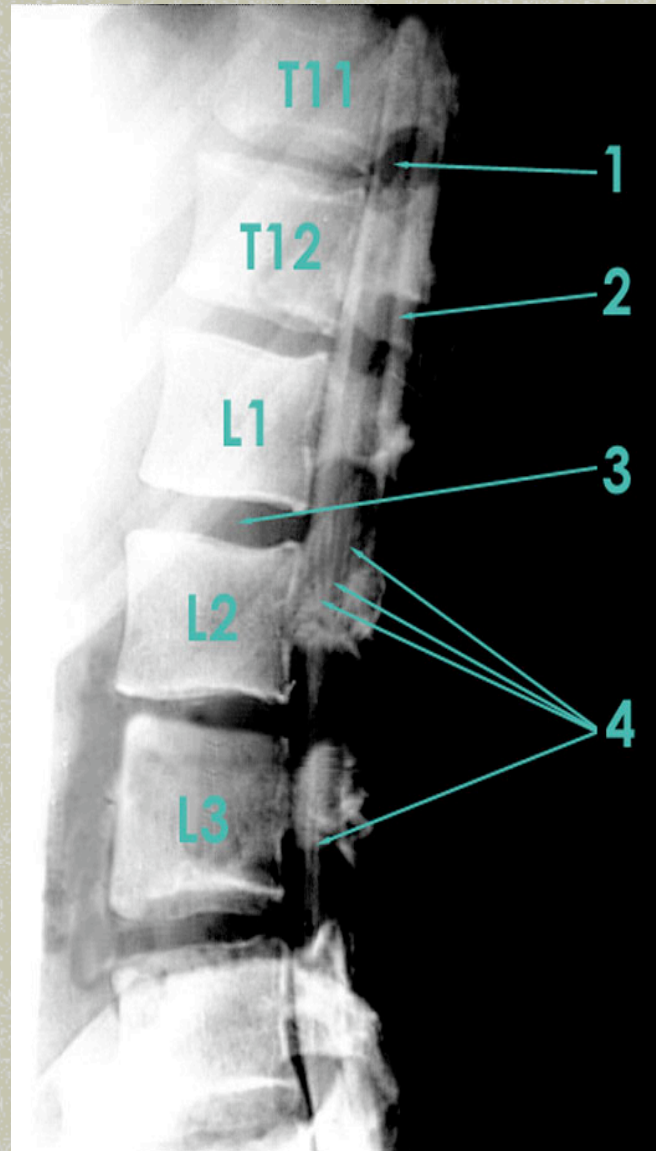
- **3. Electromyogram (EMG):**
 - Measures muscle function
 - Can demonstrate radiculopathy or peripheral nerve entrapment, but may not be positive in the extremities for the first 3-6 weeks and paraspinals for the first 2 weeks
 - Would not be appropriate in clinically obvious radiculopathy
- **4. Bone Scan:**
 - Very sensitive but nonspecific
 - Useful for:
 - Malignancy screening
 - Detection for early infection
 - Detection for early or occult fracture





■ 5. Myelogram:

- Procedure of injecting contrast material into the spinal canal with imaging via plain radiographs versus CT
- In past, considered the gold standard for evaluation of the spinal canal and determining the cause of pressure on the spinal cord or spinal nerves.
- With potential complications, as well as advent of MRI and CT, is less utilized:
 - More common: Headache, nausea / vomiting
 - Less common: Seizure, pain, neurological change, anaphylaxis
- Myelogram alone is rarely indicated.
- Hitzelberger study 1968 Journal of Neurosurgery:
 - 24 % of asymptomatic subjects with defects



- 1 Spinal cord
- 2 Contrast in subarachnoid space
- 3 Intervertebral disc
- 4 Nerve rootlets of cauda equina



Incomplete block
group



Complete block
group



■ 6. CT with Myelogram:

- Can demonstrate much better anatomical detail than Myelogram alone
- Utilized for:
 - Demonstrating anatomical detail in multi-level disease in pre-operative state
 - Determining nerve root compression etiology of disc versus osteophyte
 - Surgical screening tool if equivocal MRI or CT



A CT-myelogram sagittal 2D reconstructed image shows the expanding intraspinal low-density mass (arrow) surrounding by myelogram contrast.



A CT-myelogram coronal 2D reconstructed image shows the intraspinal lipoma (arrows). Note the displaced nerve roots to the left of the conus. A Tarlov cyst (nerve root sleeve cyst or diverticulum) of left S3 is incidentally noted (arrowhead).



■ 7. CT:

- Best for bony changes of spinal or foraminal stenosis
- Also best for bony detail to determine:
 - Fracture
 - Degenerative Joint Disease (DJD)
 - Malignancy
- SW Wiesel study 1984 Spine:
 - 36 % of asymptomatic subjects had “HNP” at L4-L5 and L5-S1 levels



- 8. Discography (Diagnostic disc injection)
 - Less utilized as initial diagnostic tool due to high incidence of false positives as well as advent of MRI
 - Utilizations:
 - Diagnose internal disc derangement with normal MRI / Myelogram
 - Determine symptomatic level in multi-level disease
 - Criteria for response:
 - Volume of contrast material accepted by the disc, with normals of 0.5 to 1.5 cc
 - Resistance of disc to injection
 - Production of pain - ***MOST SIGNIFICANT***
 - Usually followed by CT to evaluate internal architecture, but also may utilize MRI
 - As outcome predictor (**Coulhoun study 1988 JBJS**):
 - 89 % of those with pain response received benefit from surgery
 - 52 % of those with structural change received surgical benefit



Discography

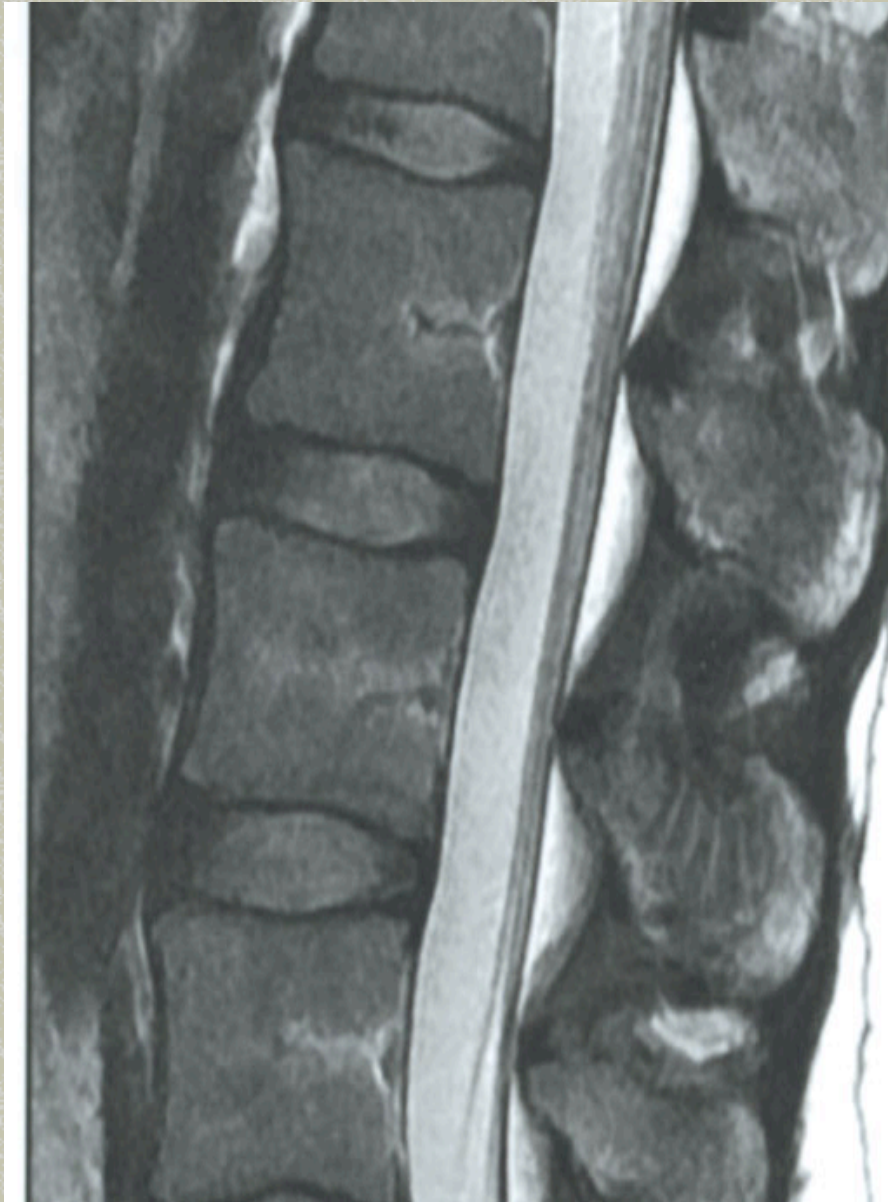
- Clinical pain provocation test
- Test is positive only if:
 - The disc is abnormal in appearance
 - AND
 - Patient's clinical pain is provoked during injection





■ 9. MRI

- **Best diagnostic tool for:**
 - Soft tissue abnormalities:
 - Infection
 - Bone marrow changes
 - Spinal canal and neural foraminal contents
 - Emergent screening:
 - Cauda equina syndrome
 - Spinal cord injury
 - Vascular occlusion
 - Radiculopathy
 - Benign vs. malignant compression fractures
 - Osteomyelitis evaluation
 - Evaluation with prior spinal surgery



**MRI of L Spine with Nerve Roots:
MR Myelogram**





- Has essentially replaced CT and Myelograms for initial evaluations

- Boden study 1990 JBJS:
 - 20 % of asymptomatic population < 60 years with “HNP”
 - 36 % of asymptomatic population of 60 years

- Jensen study 1995 NEJM:
 - 52 % of asymptomatic patients with disc bulge at one or more levels
 - 27 % of asymptomatic patients with disc protrusion
 - 1 % of asymptomatic patients with disc extrusion



- **MRI with Gadolinium contrast:**
 - Gadolinium is contrast material allowing enhancement of intrathecal nerve roots
 - Utilization:
 - Assessment of post-operative spine - **most frequent use**
 - Identifying tumors / infection within / surrounding spinal cord
 - Diagnosis of radiculitis
 - Post-operatively can take 2-6 months for reduction of mass effect on posterior disc and anterior epidural soft tissues which can resemble pre-operative studies
 - Only indications in immediate post-operative period:
 - Hemorrhage
 - Disc infection



■ 10. Psychological tools:

- Utilized in case scenarios where psychological or emotional overlay of pain is suspected
 - Symptom magnification
 - Grossly abnormal pain drawing
 - Non-responsive to conservative interventions but with essentially normal diagnostic studies
- Includes:
 - Pain Assessment Report, which combines:
 - McGill Pain Questionnaire
 - Mooney Pain Drawing Test
 - MMPI
 - Middlesex Hospital Questionnaire
 - Cornell Medical Index
 - Eysenck Personality Inventory

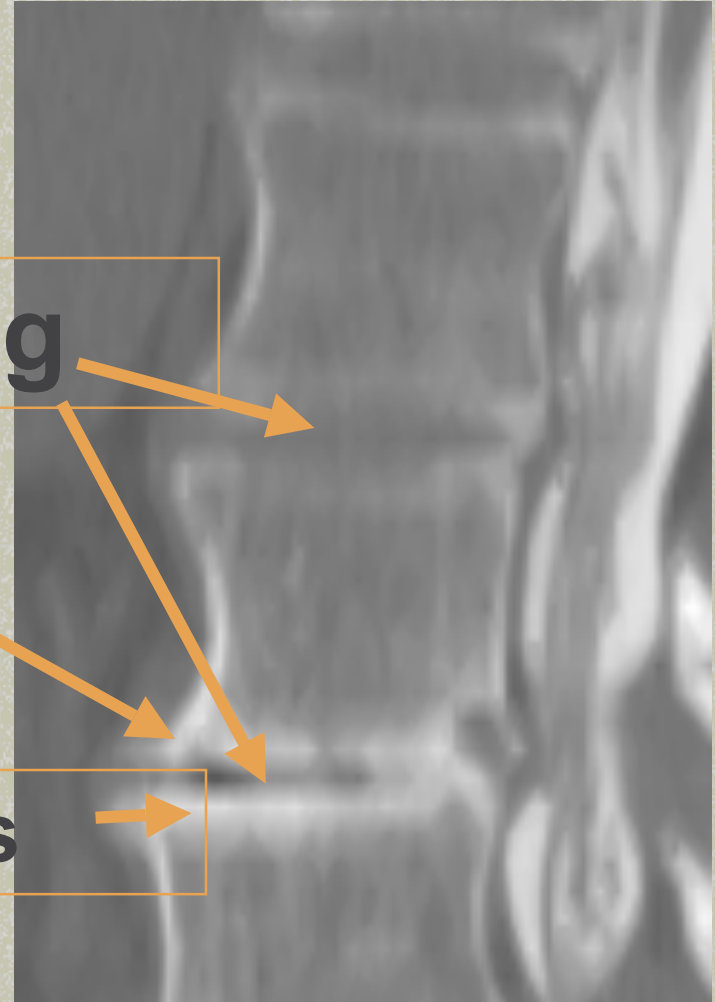


Disc Degeneration: Findings?

Narrowing

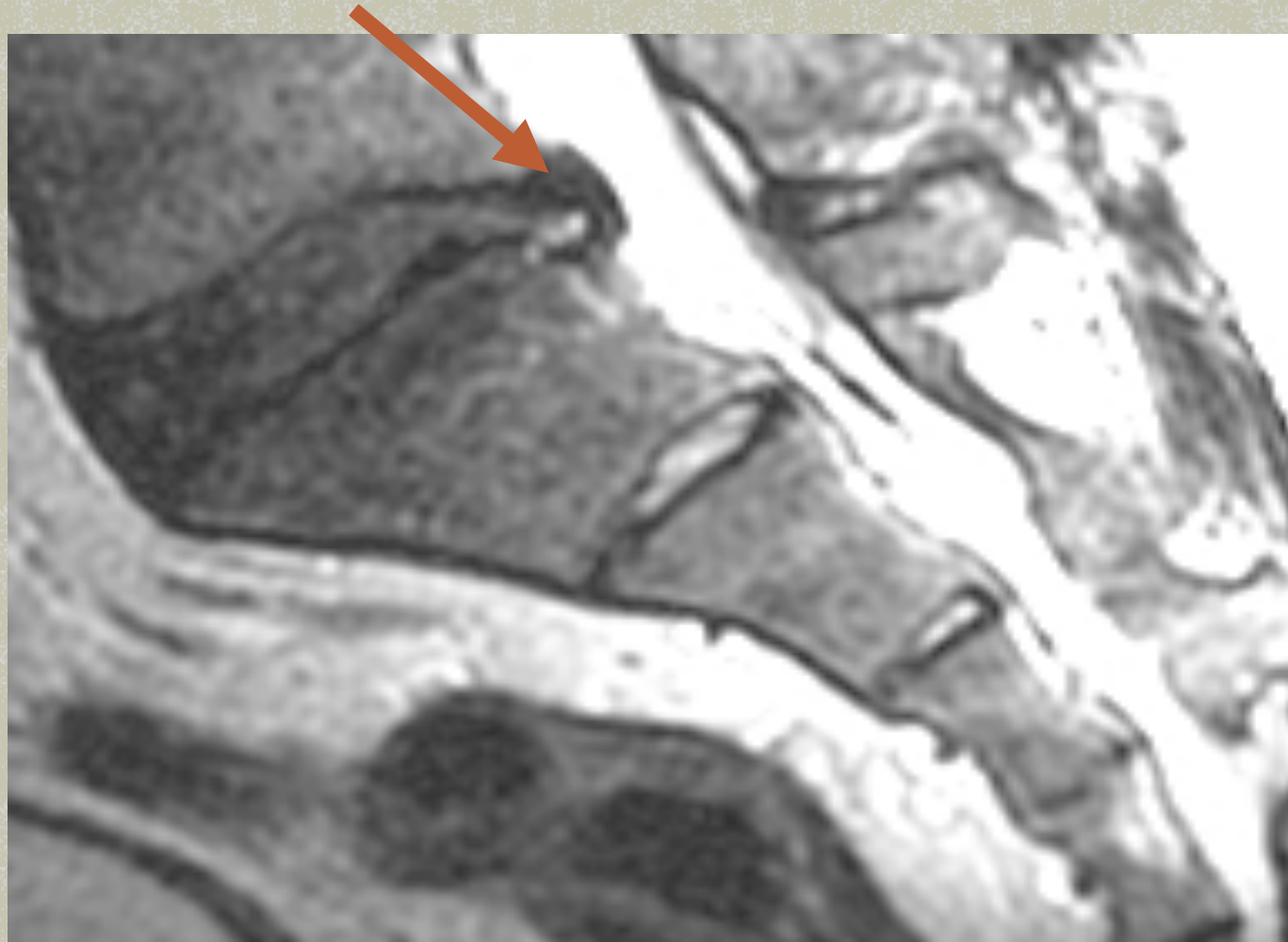
Osteophyts

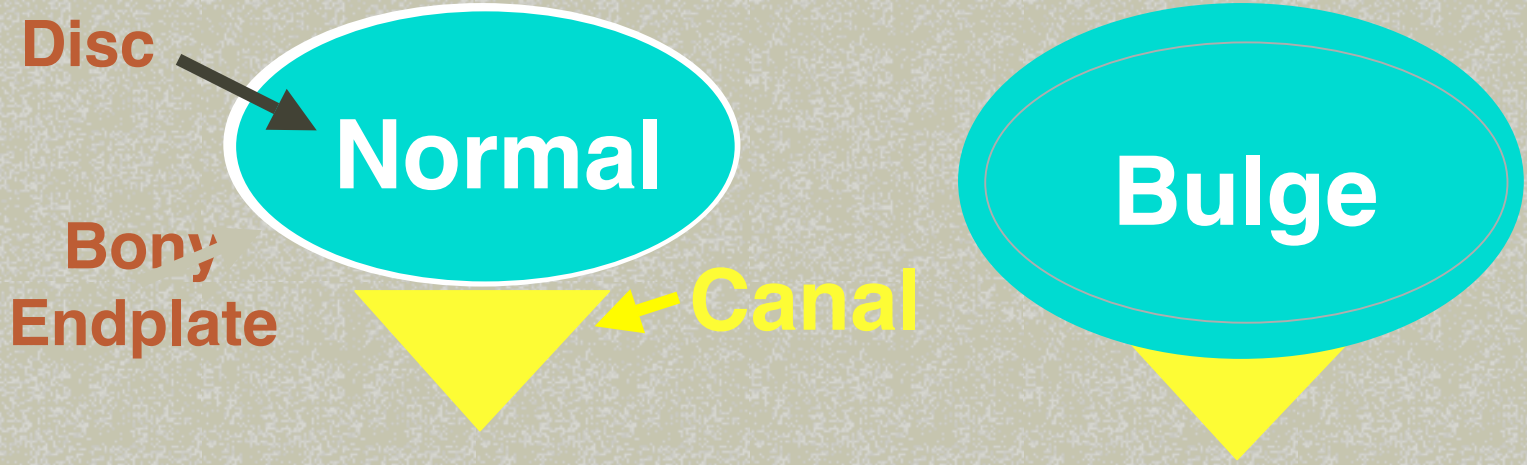
Endplate sclerosis



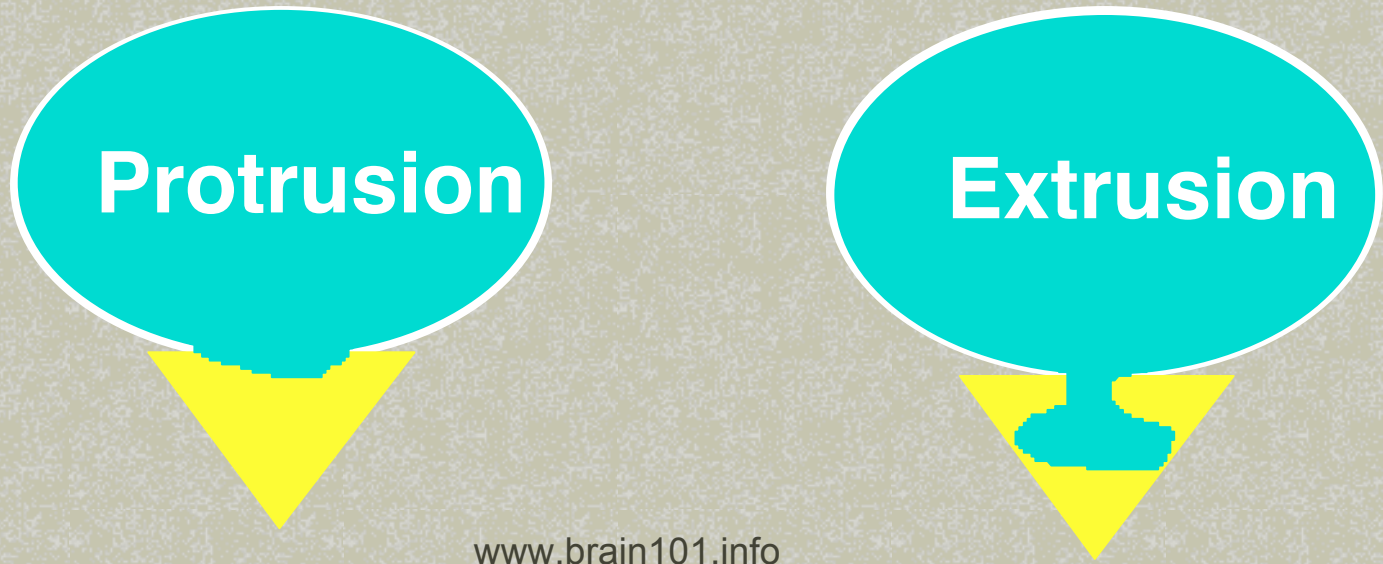


Degeneration & Tears





Disc Classification

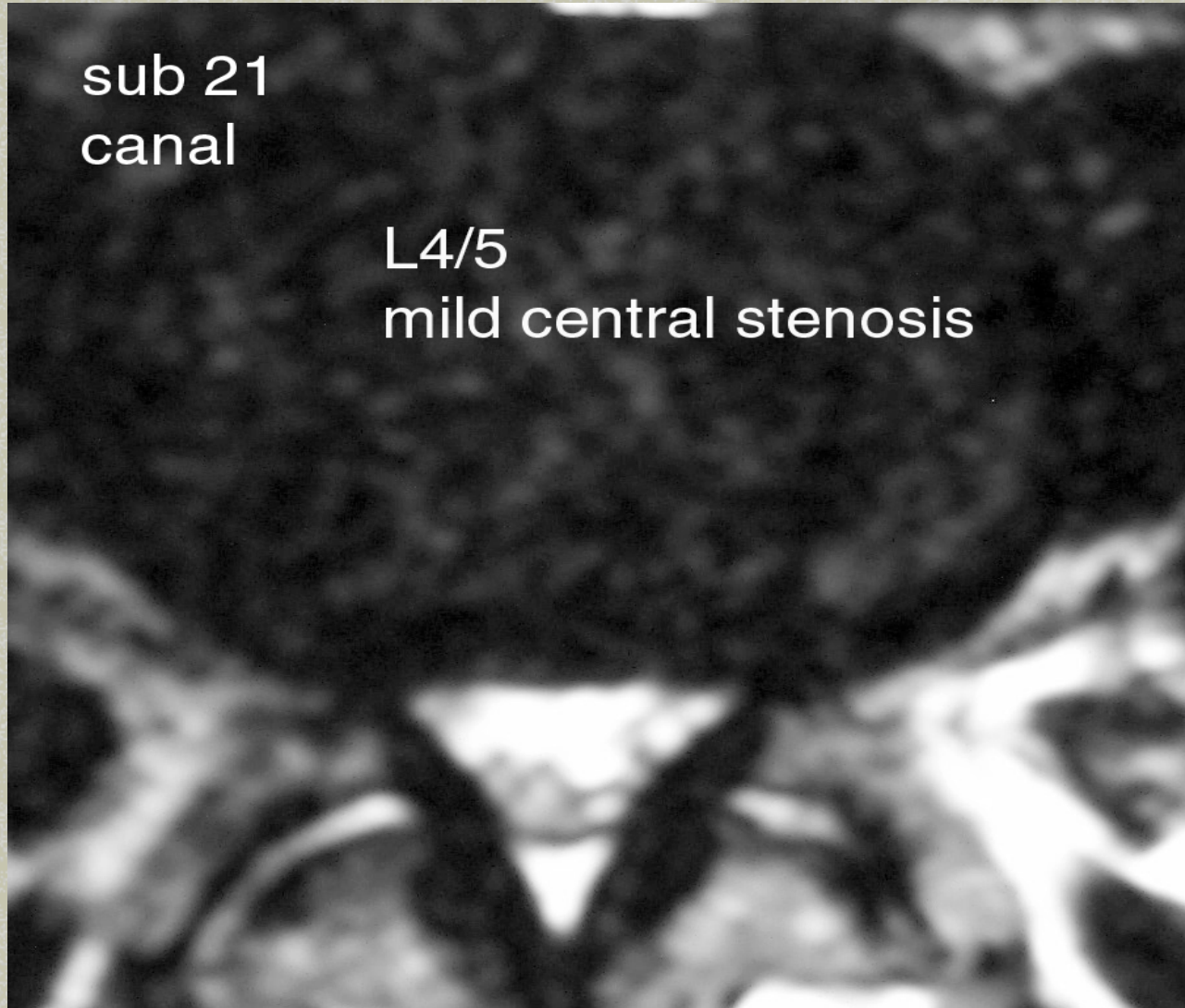




Bulging

sub 21
canal

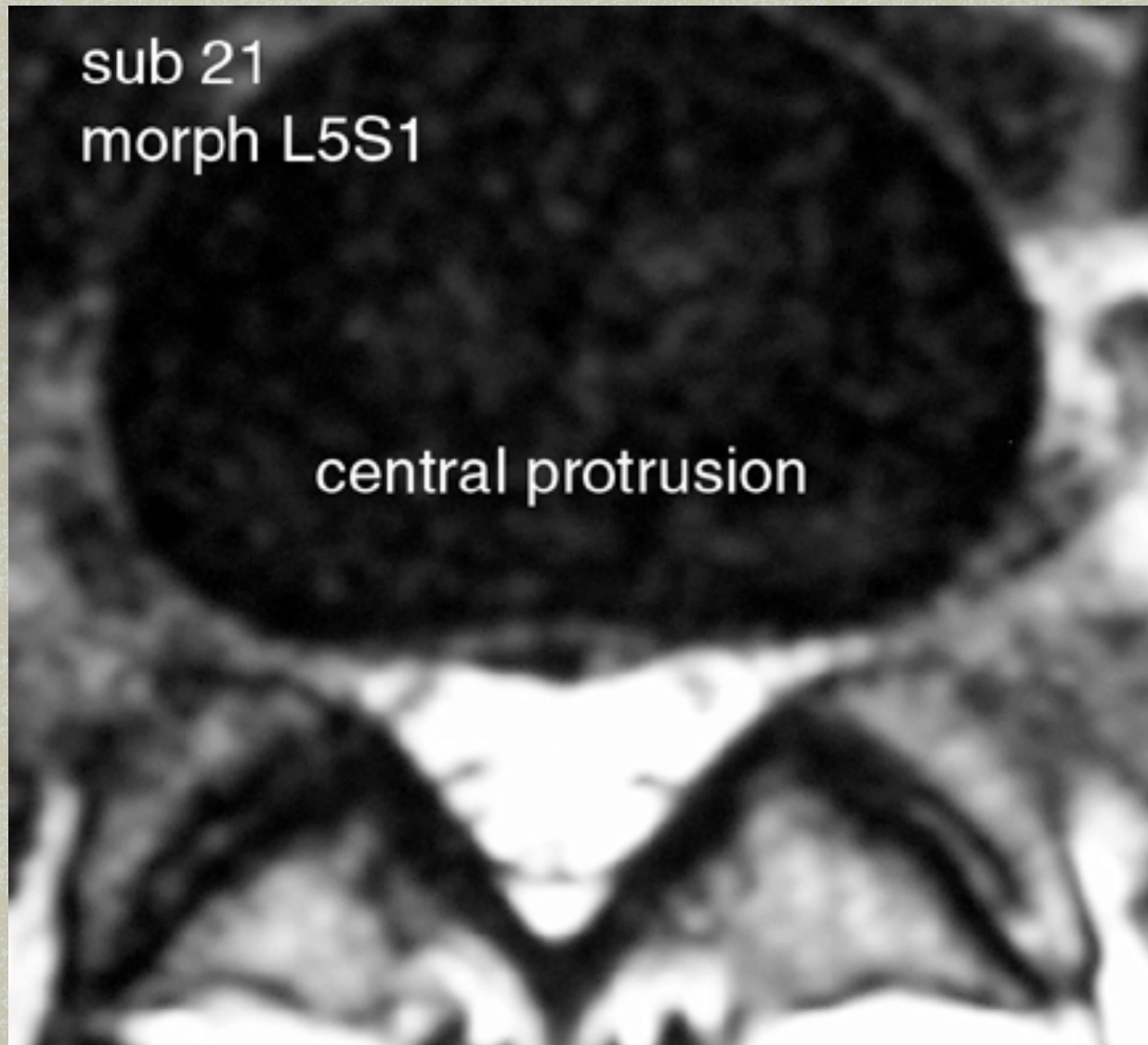
L4/5
mild central stenosis





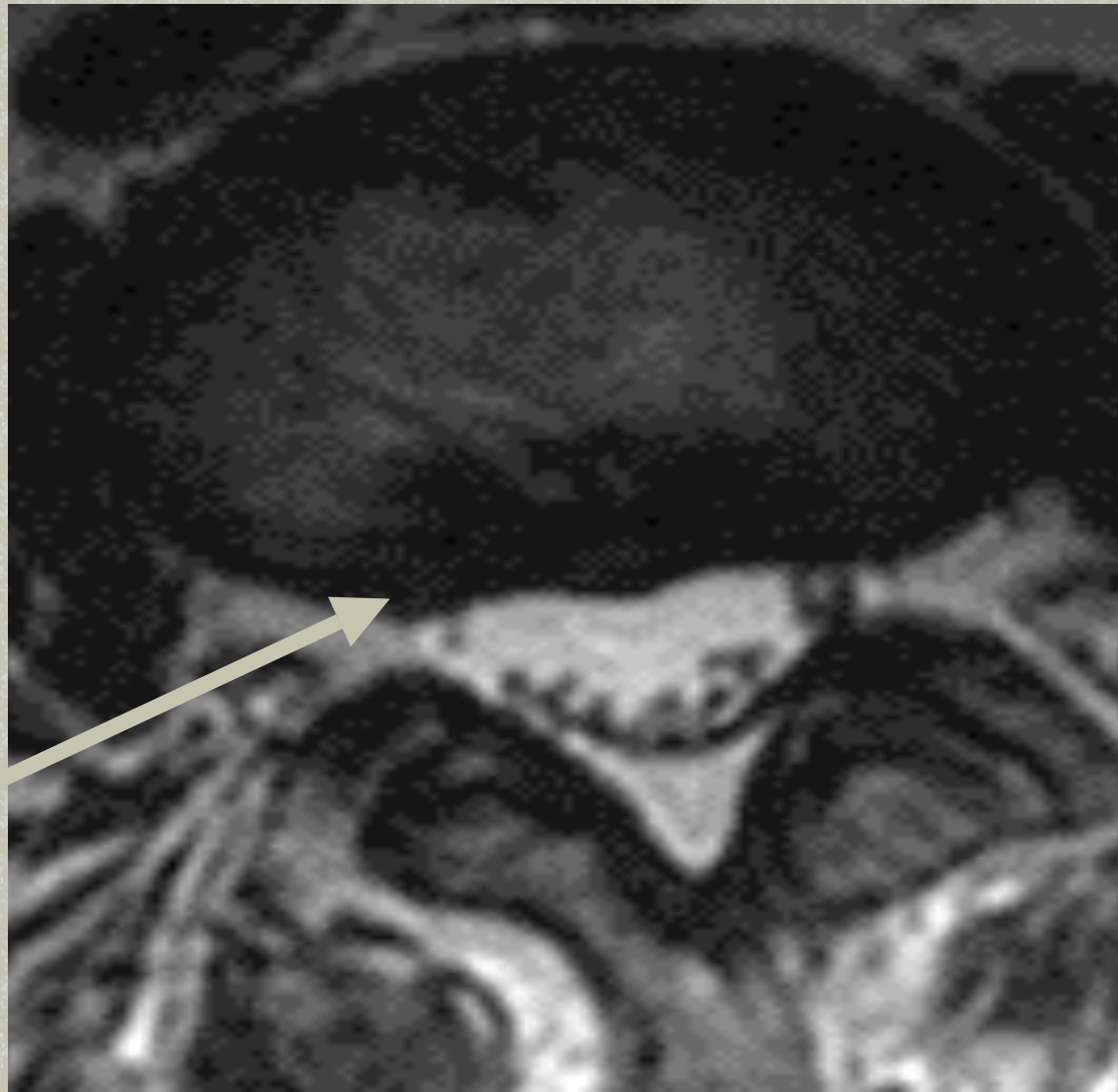
Protrusion

sub 21
morph L5S1



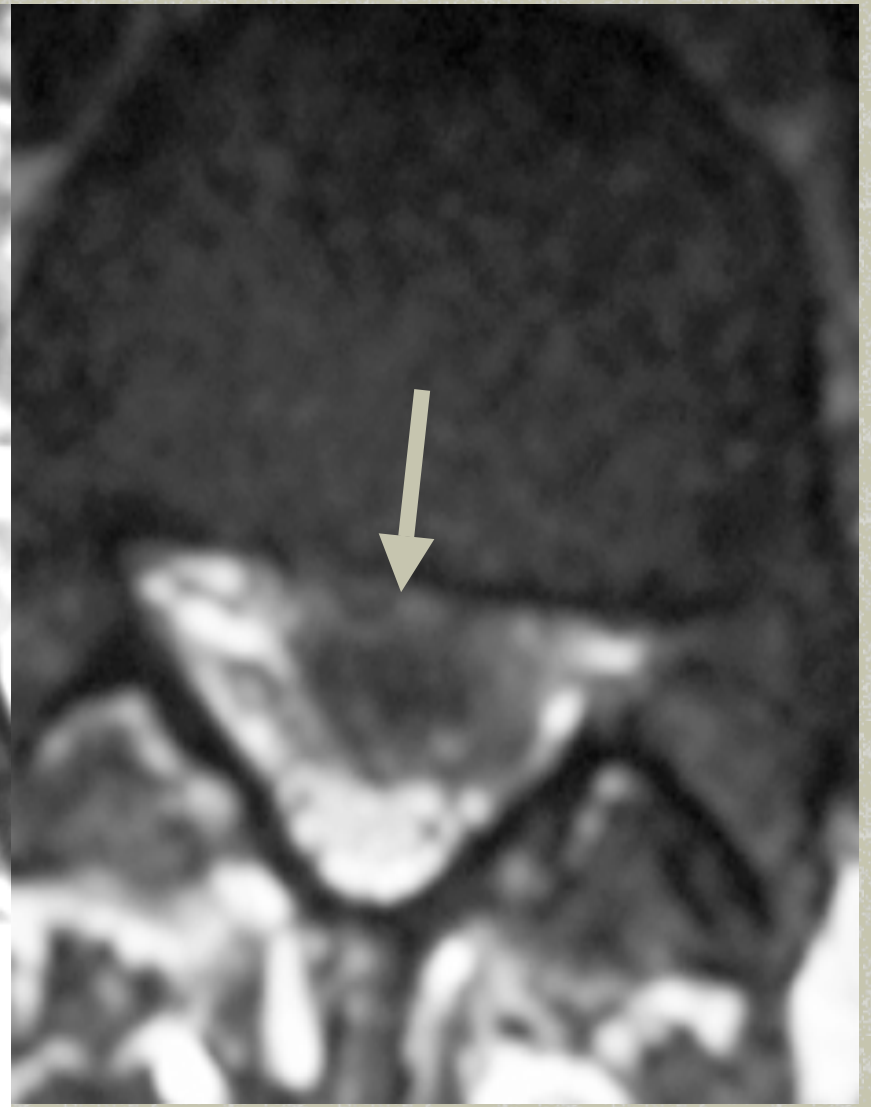


Protrusion



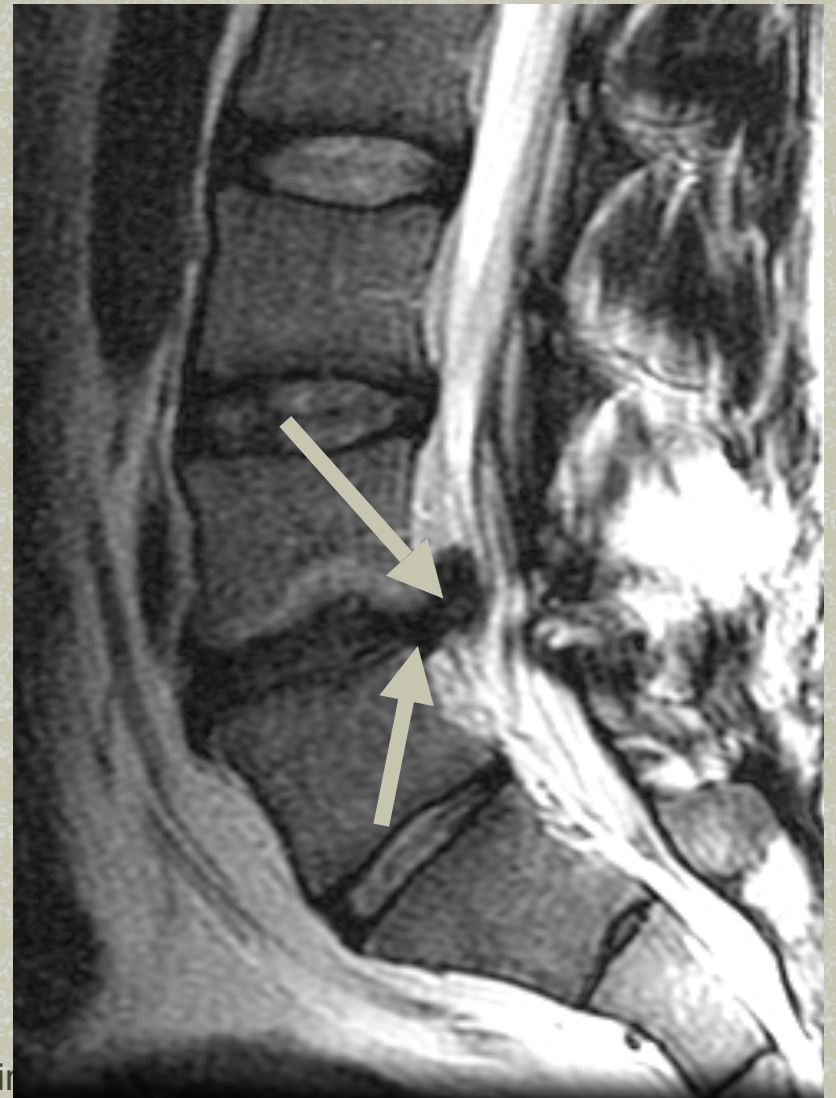
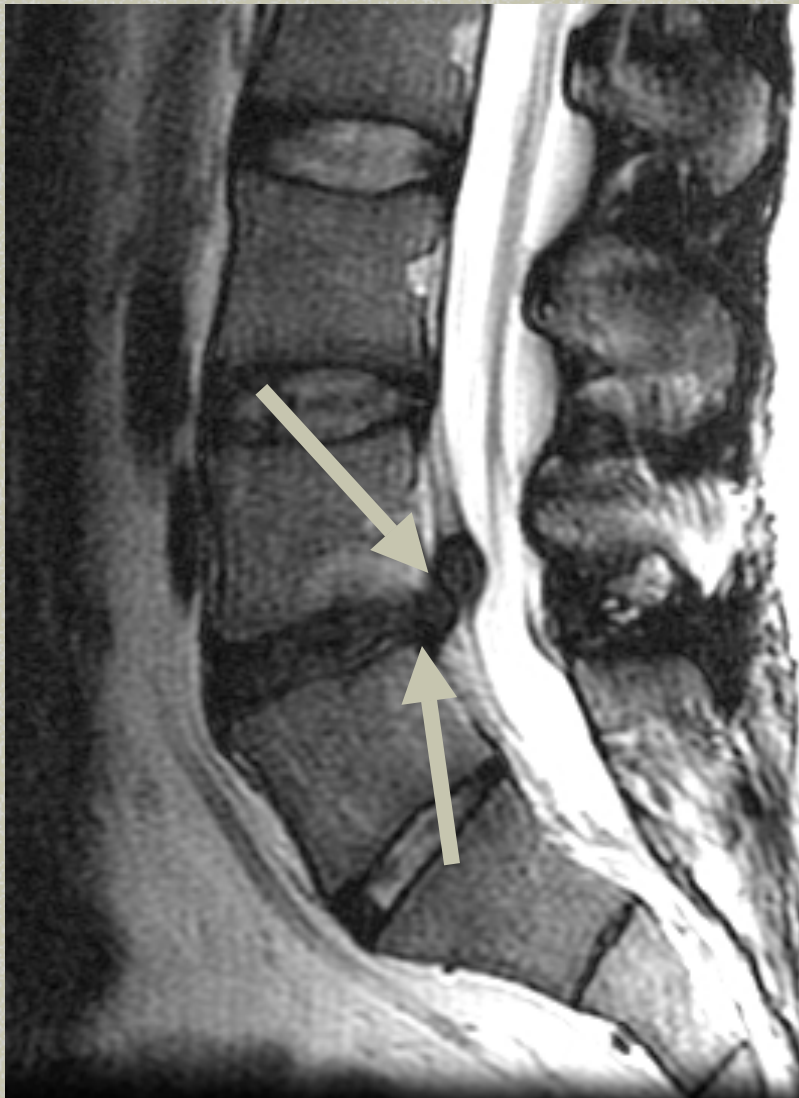


Extrusion



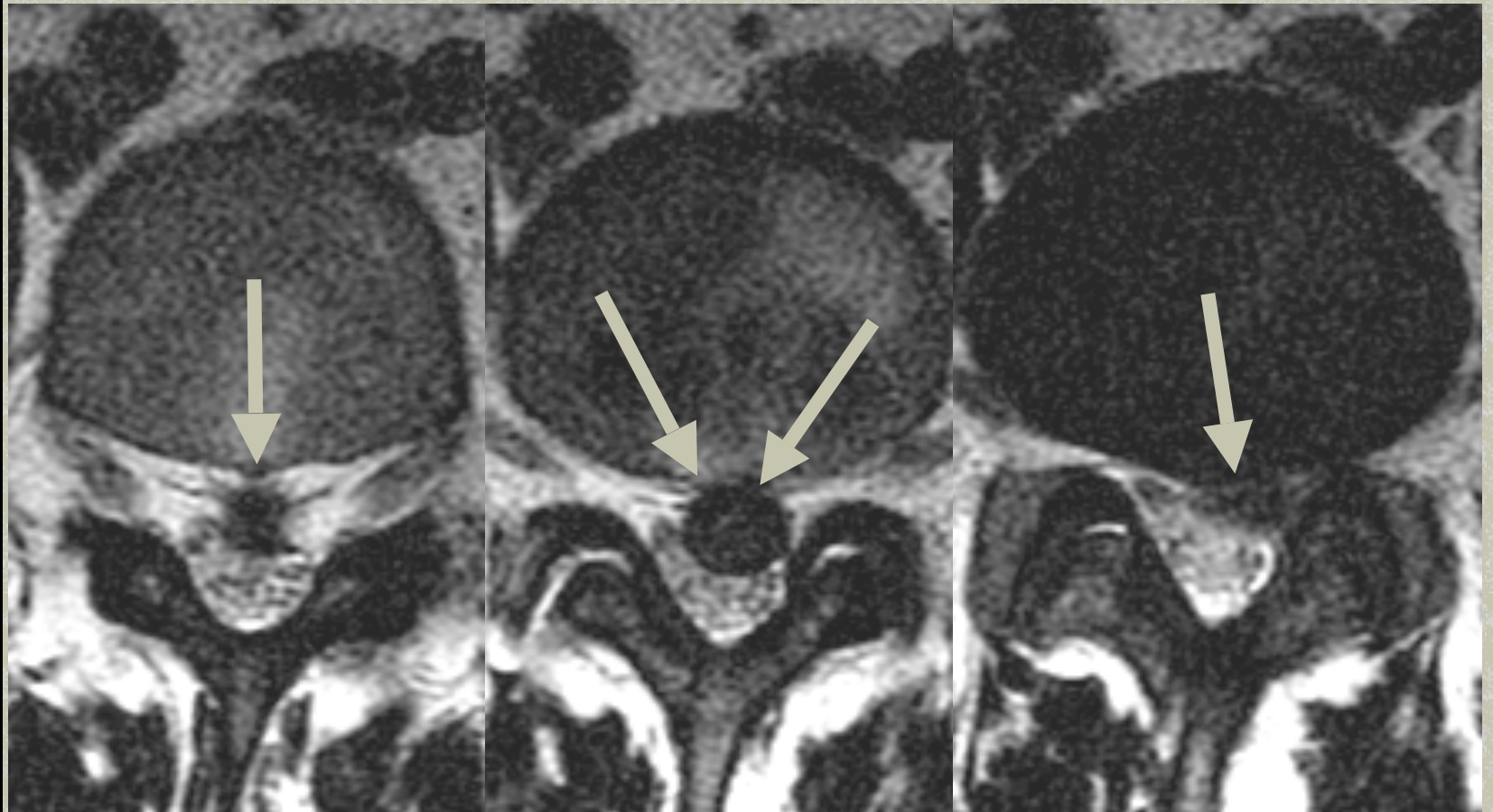


Extrusion





Extrusion

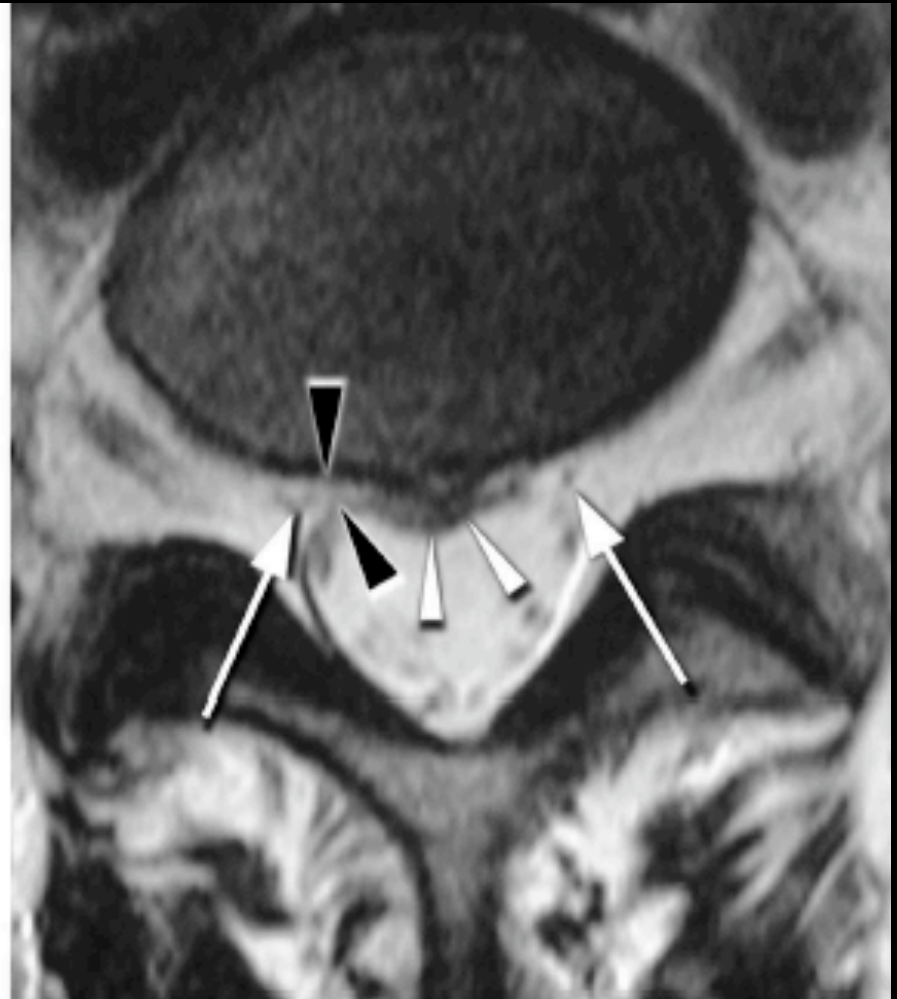
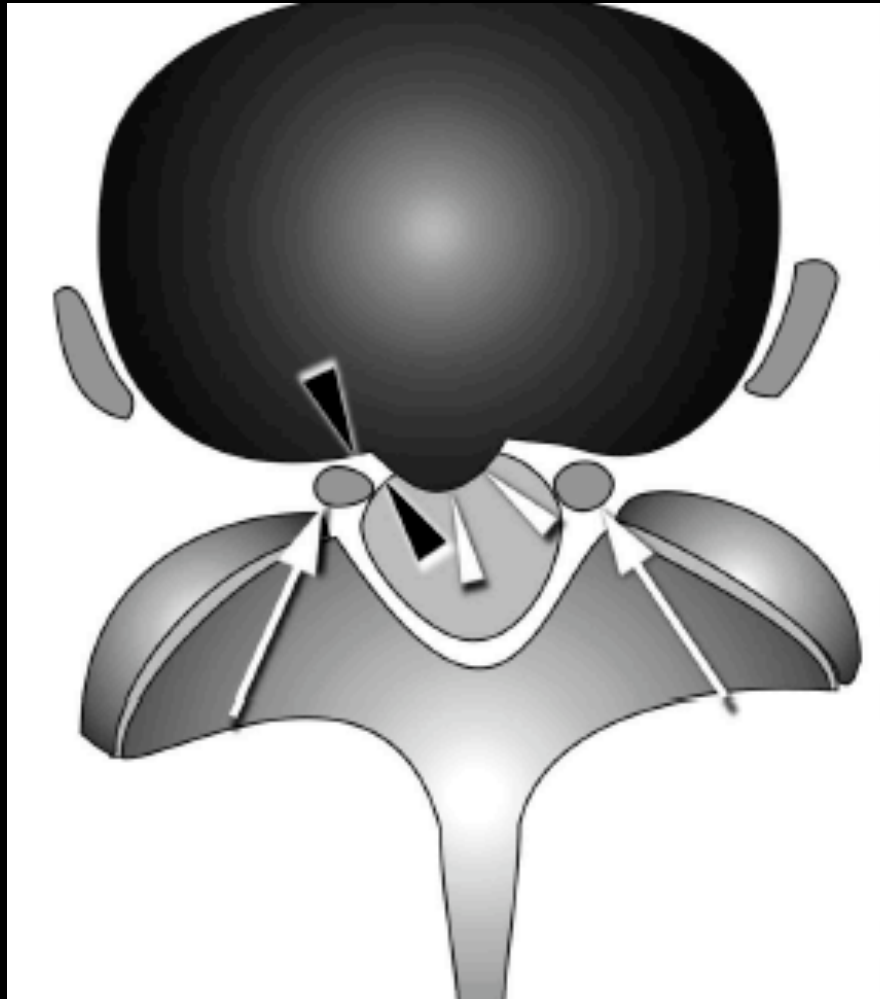




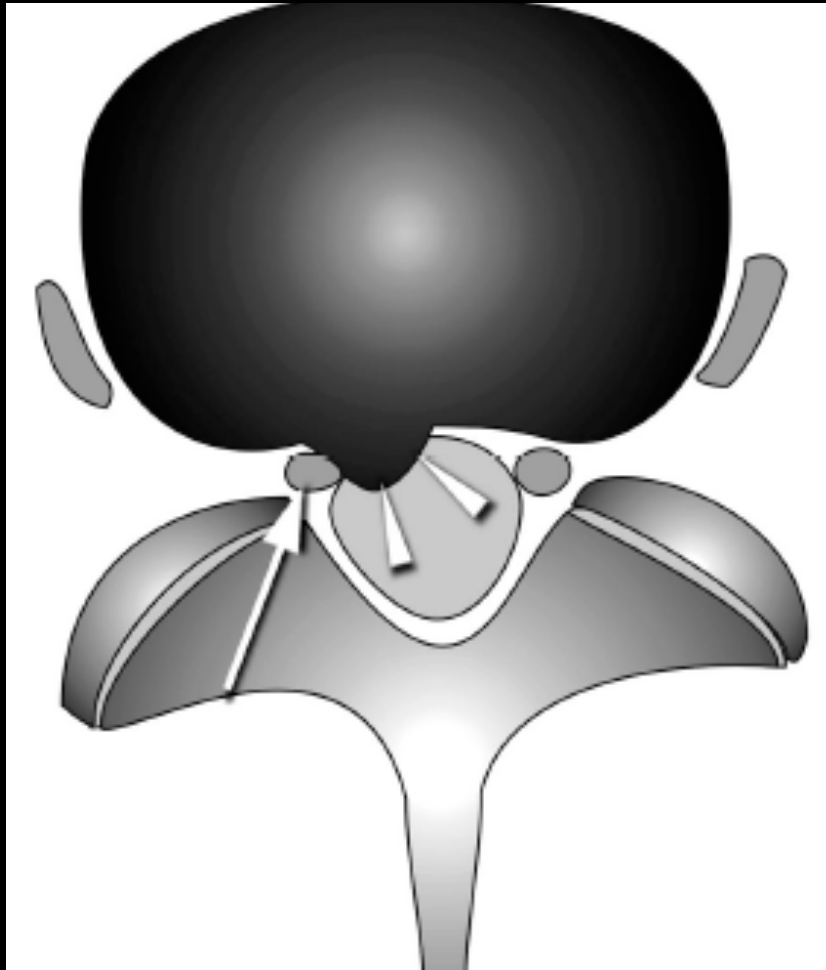
Classification of Nerve Roots

- Normal
- Contacted
- Displaced
- Compressed

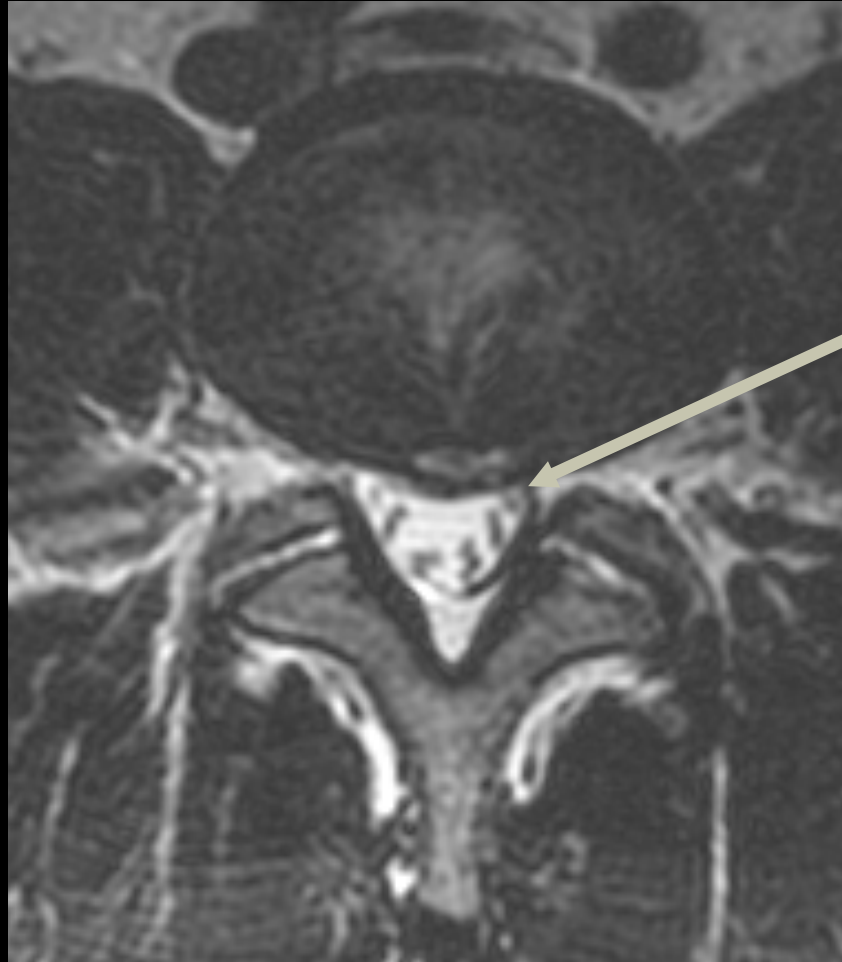
Normal Nerve Roots



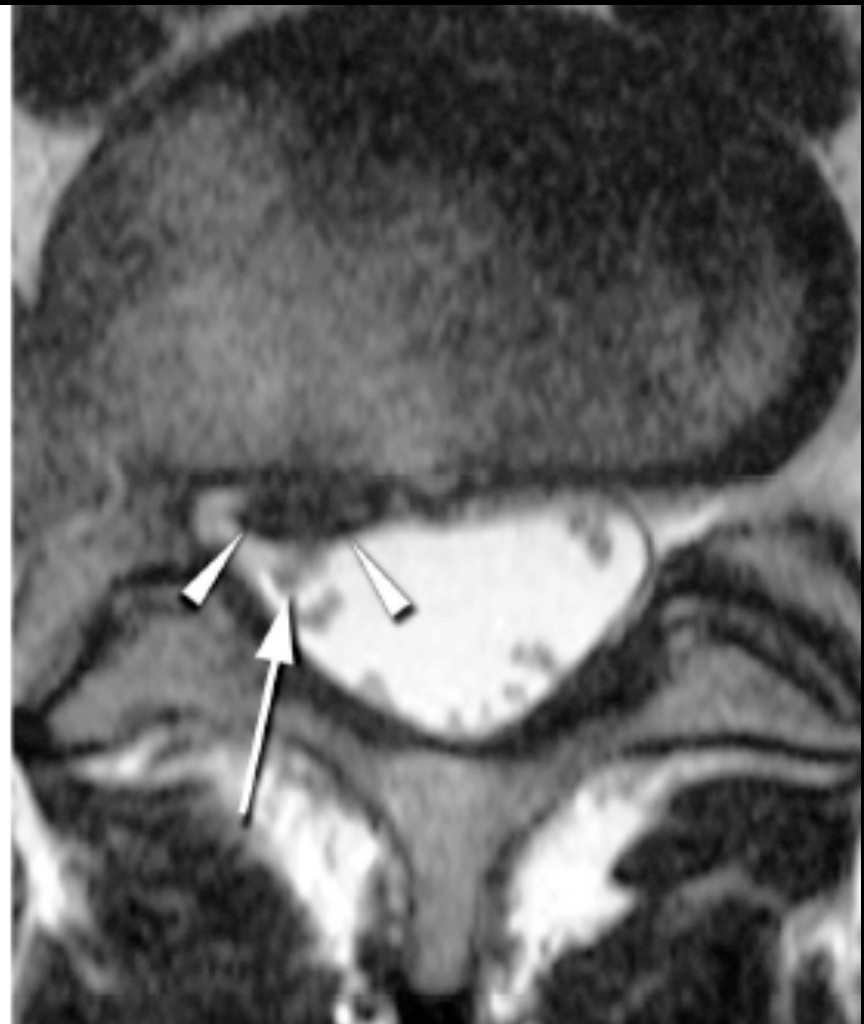
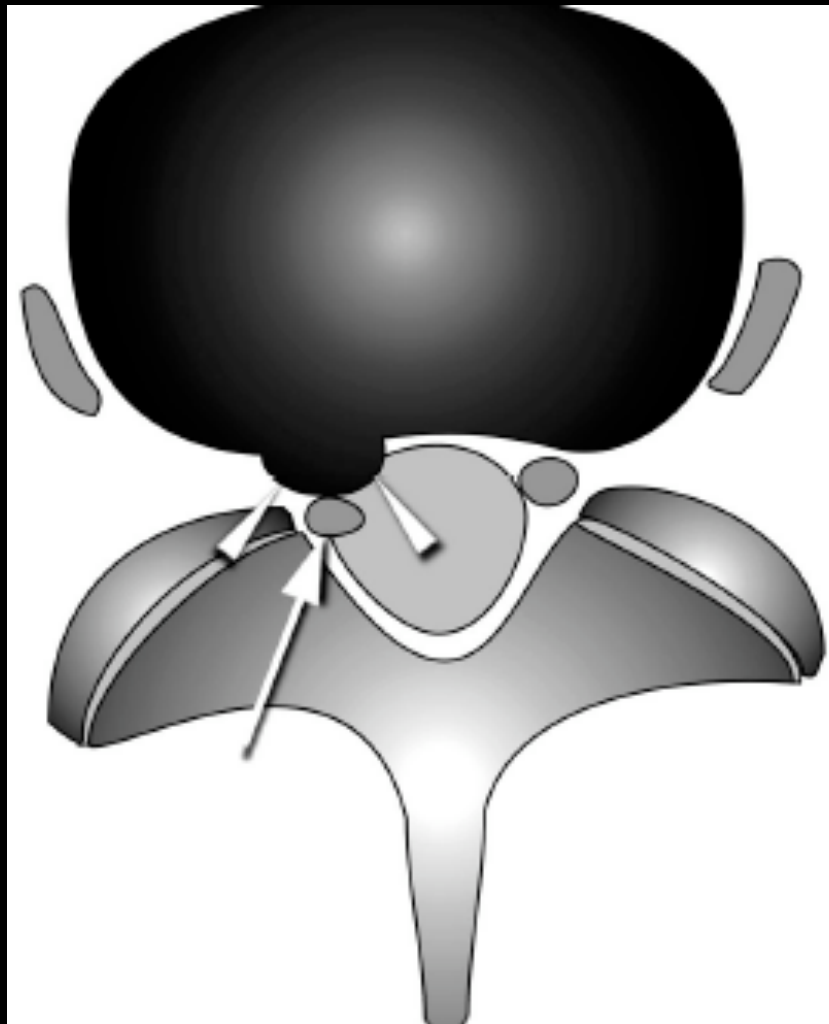
Contacted Nerve Root



Contacted Nerve Root



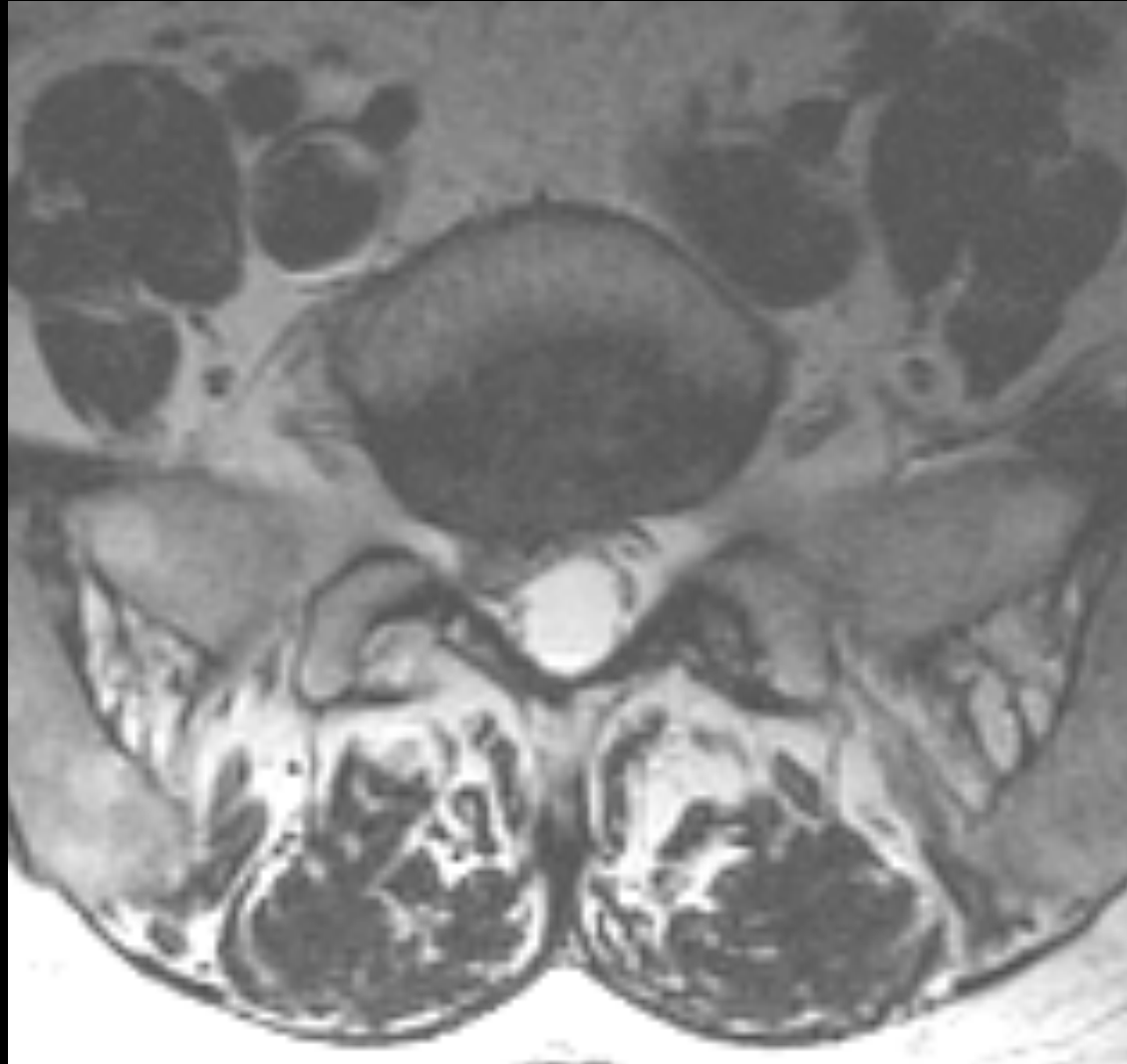
Displaced Nerve Root



Compressed Nerve Root



Displaced & Compressed Nerve Root



Displaced and Compressed Nerve Root





Treatment

“Every thing doctors do is to help patients to avoid surgery”



Treatment

■ Pharmacological

- NSAIDS
- Muscle relaxants:
 - Re-establish sleep patterns
 - More useful in myofascial/muscular pain
- Membrane stabilizers
 - TCA / Neurontin
 - Re-establish sleep pain
 - Reduce radicular dysesthesias
- Narcotics: rarely indicated
 - Morphine, Oxy/hydrocodone, Oxymorphone, Hydromorphone, Fentanyl, Methadone
- Steroids: more useful for radiculitis
- Non-narcotic analgesics: Ultram (Tramadol)




■ Physical Therapy

■ Modalities

- Electrical Stimulation/TENS
- Postural Education / Body Mechanics
- Massage / Mobilization / Myofascial Release
- Stretching / Body Work
- Exercise / Strengthening
- Traction
- Pre-conditioning / Work-conditioning

■ Injections (Neural blockade)

- Epidural blocks
- Facet blocks
- Trigger point
- SI joint

- 
- **Osteopathic Manipulation**
 - Manipulation & Mobilization
 - Central & unilat PAs, Transverse
 - Specific Passive Physiological Rxs
 - Several tq's performed during 1 Rx session
 - 9 Rxs over 3 wks





EFFICACY OF SPINAL MANIPULATIVE THERAPY FOR LOW BACK PAIN OF LESS THAN THREE MONTHS' DURATION

Manuela L. Ferreira, MSc,^a Paulo H. Ferreira, MSc,^b Jane Latimer, PhD,^c Robert Herbert, PhD,^d and Christopher G. Maher, PhD^e

- Review of 27 SMT trials for acute NSLBP
 - SMT produces better outcomes than placebo, no Rx, & massage.
 - SMT vs placebo: -18mm (-24 to -13)
 - SMT vs no Rx: -17mm (-26 to -8)
[Pain reduction, 100mm VAS, $\leq 4/52$]
 - SMT & 'usual physiotherapy', & 'usual medical care' appear to produce similar outcomes.
 - SMT vs medical care: -4mm (-14 to 6)
[Pain reduction, 100mm VAS, $\leq 4/52$]



- **Psychological therapy**
 - Behavioral treatments (chronic LBP)
 - Biofeedback
- **Alternative Therapy**
 - Acupuncture
- **Multidisciplinary approaches**



Interventional Therapy

- **Sympathetic**
 - Diagnostic
 - Therapeutic
 - Neurolytic
- **Steroid injections**
- **Implantation technology**
 - Intrathecal pumps
 - Neuromodulation
 - Spinal cord stimulation
 - Peripheral nerve stimulation



■ Surgery

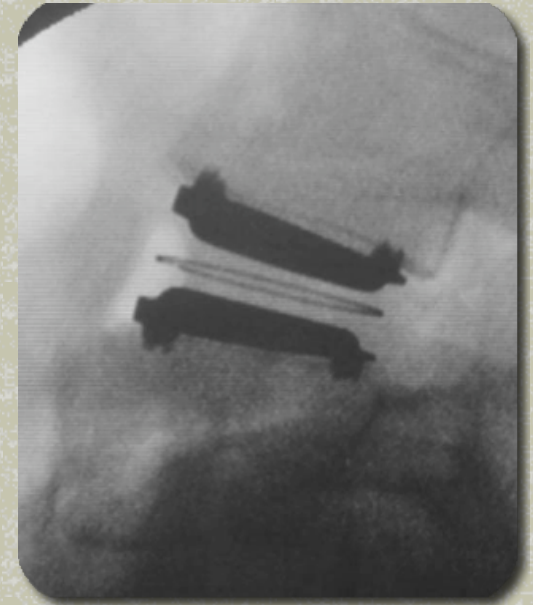
- Laminectomy
- Hemilaminectomy
- Discectomy
- Fusion
 - Instrumented
 - Non-instrumented fusion
- **Minimally Invasive Spine Surgery (MISS)**
 - **Kyphoplasty**
 - **Percutaneous Disc Decompression (PDD)**



Spine Arthroplasty (Fusion w/Disc Prosthesis)

■ Indications

- Chronic low back pain +/- leg pain
 - Persisting > 6 months
 - Associated with degenerative disc changes
- Leg pain
 - Radicular
 - Pseudoradicular
- Foraminal stenosis
 - Secondary to disc space height loss
 - may be relieved indirectly by disc height restoration





Kyphoplasty

- It is used to treat painful progressive vertebral body collapse/fracture due to osteoporosis or the metastasis to the vertebral body.
- Accomplished by inserting a balloon into the center of the vertebral body (See Figure 1). Then the balloon is inflated (See Figure 2). This pushes the bone back towards its normal height and shape. It also helps create a cavity. Then the cavity is filled with the bone cement.



Figure 1. Balloon tamp in place.

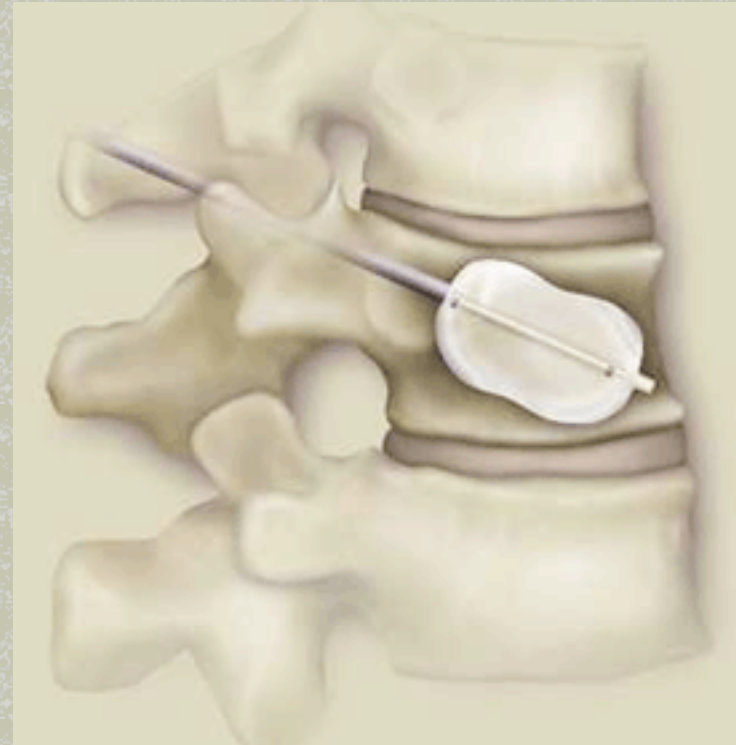


Figure 2. Balloon tamp inflated and collapsed vertebral bone restored back to near normal height.



Percutaneous Disc Decompression (PDD)

- Benefits:
 - Outpatient procedure
 - Minimal to no epidural scarring
 - No general anesthesia
 - Spine stability preservation
 - Decreased cost
- Low rate of complications:
 - Infection
 - Peripheral nerve injury



■ **Types of PDD**

- Chemonucleolysis (w/Papain)
- Intradiscal Electrothermy (IDET[®]) or Spine CATH
- Laser Disc Decompression (LASE[®])
- Intradiscal Coblation[®] Therapy (Nucleoplasty[®])
- Mechanical Nuclear Removal (DeKompressor[®]).
- **Endoscopic MISS**



Endoscopic MISS

- **The Goal of Endoscopic MISS**
 - “Less is Better, But Less is More”
 - Spinal Motion Preservation
 - Non-fusion Technology
 - Dynamic Stabilization
 - Spinal Arthroplasty



■ Indications for Endoscopic MISS

- Patients with uncomplicated herniated discs/degenerative spine disease accompanied by the following:
 - Pain of back, neck, trunk, and limbs with neurological deficit
 - Pain that has not responded to conventional treatments, including physical therapy, medication, exercise, rest for at least eight - twelve weeks
 - A positive CT scan, MRI scan, myelogram, and positive discogram for disc herniation
 - Positive virtual 3D endoscopic findings, and EMG findings are helpful



■ **Contraindications for Endoscopic MISS**

- Evidence of pathologies such as fracture-dislocation, large spinal tumors, pregnancy, or active infections
- Clinical findings that suggest pathology other than degenerative discogenic disease (e.g. multiple sclerosis, vascular anomalies, degenerative myelopathy)
- Evidence of neurologic or vascular pathologies mimicking a herniated disc
- Evidence of acute or progressive spinal cord disease
- Cauda equina syndrome
- Painless motor deficit



Possible Rx for chronic LBP European Guidelines 2004

- **Conservative treatments:** Cognitive behavioural therapy, supervised exercise therapy, brief educational interventions, multidisciplinary (bio-psycho-social) treatment, back schools, manipulation/mobilisation, heat/cold, traction, laser, ultrasound, short wave, interferential, massage, corsets, TENS.
- **Pharmacological treatments:** NSAIDs, weak opioids, noradrenergic or noradrenergicserotonineric antidepressants, muscle relaxants, capsicum plasters, Gabapentin.
- **Invasive treatments:** Acupuncture, epidural corticosteroids, intra-articular (facet) steroid injections, local facet nerve blocks, trigger point injections, botulinum toxin, radiofrequency facet denervation, intradiscal radiofrequency lesioning, intradiscal electrothermal therapy, radiofrequency lesioning of the dorsal root ganglion, spinal cord stimulation, intradiscal injections, prolotherapy, percutaneous electrical nerve stimulation (PENS), neuroreflexotherapy, surgery.



Recommended Treatments European Guidelines 2004

- **Conservative treatments:** Cognitive behavioural therapy, supervised exercise therapy, brief educational interventions, multidisciplinary (bio-psycho-social) treatment, back schools, manipulation/mobilisation, heat/cold, traction, laser, ultrasound, short wave, interferential, massage, corsets, TENS.

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Recommended under some situation

European Guidelines 2004

- **Conservative treatments:** Cognitive behavioural therapy, supervised exercise therapy, brief educational interventions, multidisciplinary (bio-psycho-social) treatment, **back schools, manipulation/mobilisation, heat/cold, traction, laser, ultrasound, short wave, interferential, massage, corsets, TENS.**
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Not Recommended

European Guidelines 2004

- **Conservative treatments:** Cognitive behavioural therapy, supervised exercise therapy, brief educational interventions, multidisciplinary (bio-psycho-social) treatment, back schools, manipulation/mobilisation, **heat/cold, traction, laser, ultrasound, short wave, interferential, massage, corsets, TENS.**
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Results: Acute LBP

- **Effective:** Advice to Stay Active, NSAIDs & Muscle Relaxants
- **Not effective:** **Bed Rest & Specific Exercises**
- **No consistent evidence** for Acupuncture & Lumbar Supports



Results: Chronic LBP

- **Effective:** Exercise Therapy, Osteopathic Manipulations, Behavioural Therapy & Multidisciplinary pain treatment programs
- **Likely to be effective:** Back Schools & Massage
- **Not effective:** TENS
- **No consistent evidence for:** Acupuncture; Facet, Epidural & Local Injections; Lumbar Supports



Results: Disc Prolapse Surgery

- No difference between Micro- & Standard Discectomy
- **Chemonucleolysis produced better clinical outcomes than Percutaneous Discectomy & Placebo**
- Surgical Discectomy produced better clinical outcomes than Chemonucleolysis with *Chymopapain*