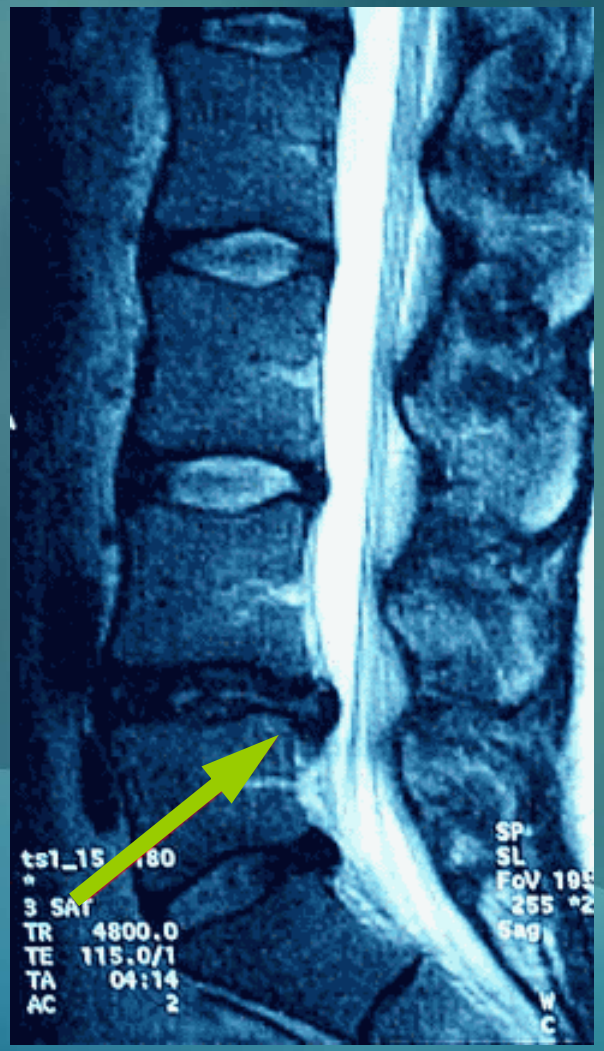
Lumbar Spine Pathologies and Treatments

www.fisiokinesiterapia.biz

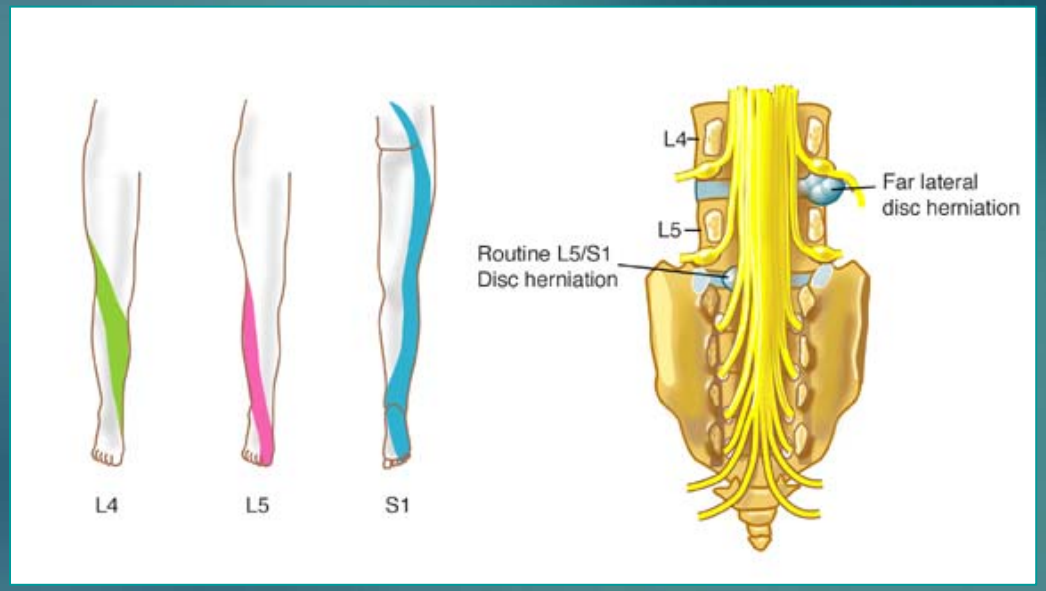
Herniated Nucleus Pulposus

- The progressive degeneration of a disc, or traumatic event, can lead to a failure of the annulus to adequately contain the nucleus pulposus
- This is known as *herniated nucleus pulposus* (HNP) or a herniated disc



Herniated Nucleus Pulposus

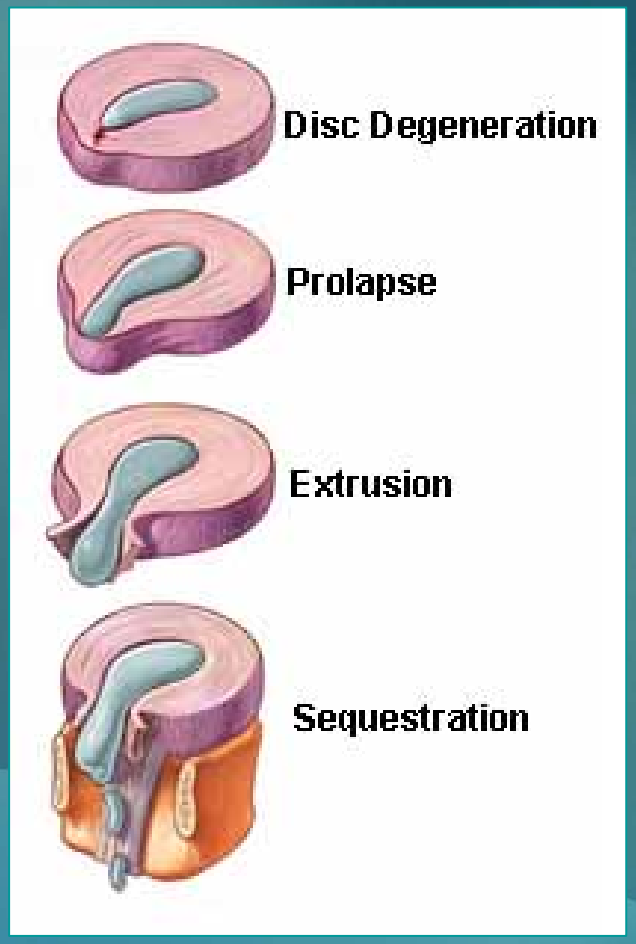
- Symptoms
  - Back pain
  - Leg pain
  - Dysthesias
  - Anesthesias



Herniated Nucleus Pulposus

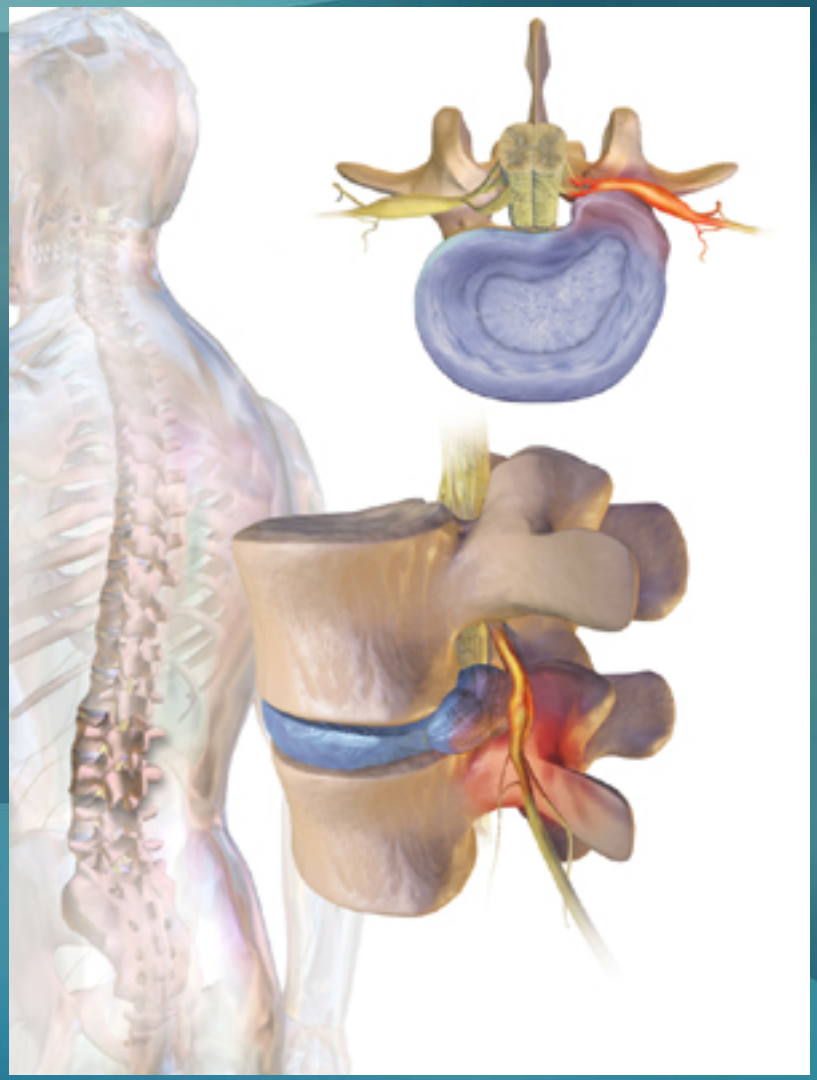
Varying degrees

- Disc bulge
  - Mild symptoms
    - Usually go away with nonoperative treatment
  - Rarely an indication for surgery
- Extrusion (herniation)
  - Moderate/severe symptoms
    - Nonoperative treatment



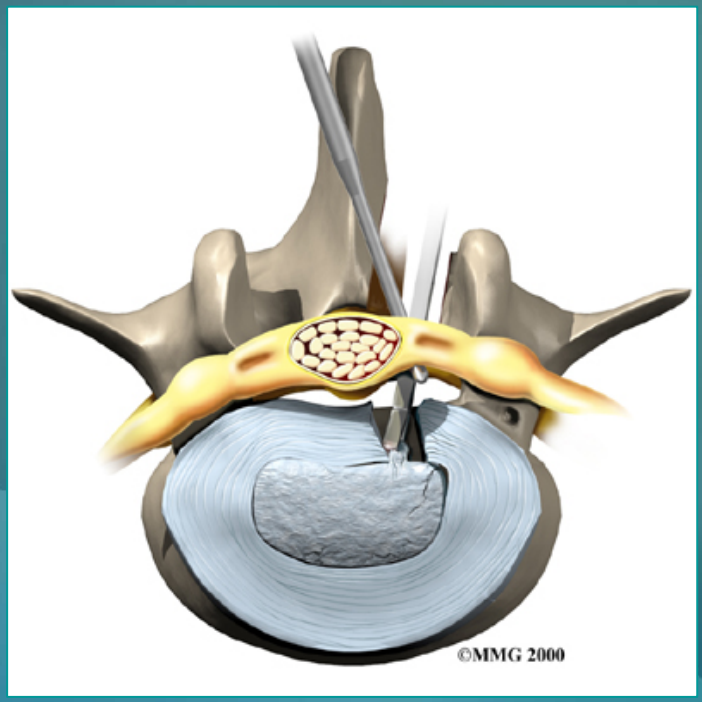
Herniated Nucleus Pulposus

- Diagnosis
  - Magnetic resonance imaging (MRI)/patient exam
- Nonoperative Care
  - Initial bed rest
  - Nonsteroidal anti-inflammatory (NSAID) medication
  - Physical therapy
    - Exercise/walking
  - Steroid injections



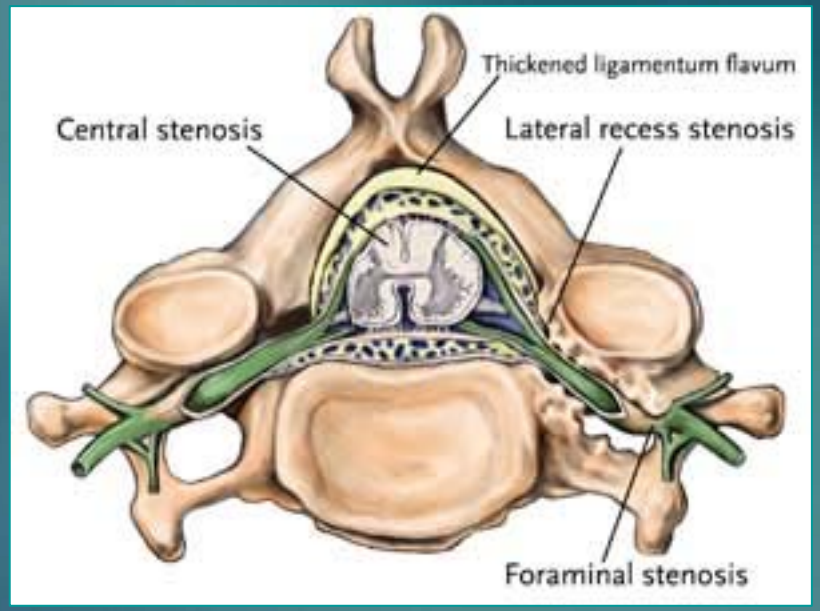
Herniated Nucleus Pulposus

- Surgical care
  - Failure of nonoperative treatment
    - Minimum of 6 weeks in duration
      - Can be months
  - Discectomy
    - Removal of the herniated portion of the disc
    - Usually through a small incision
    - High success rate



Spinal Stenosis

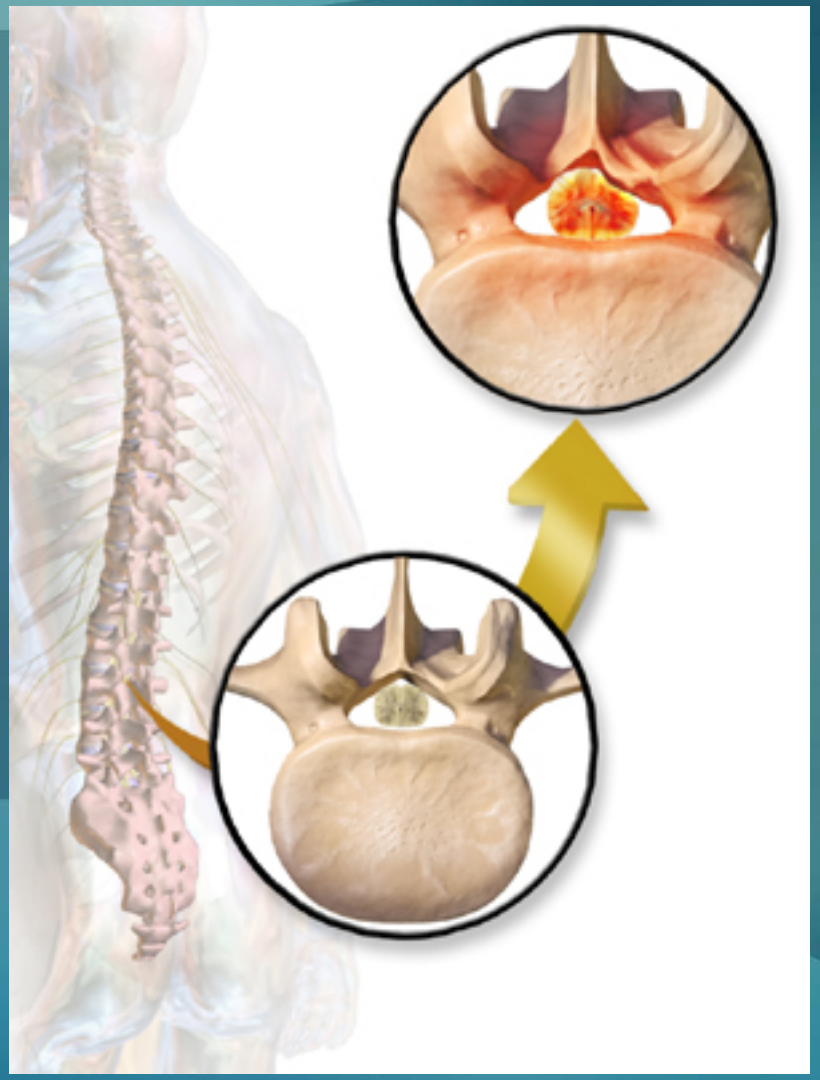
- Grouped as “spinal stenosis”
  - Central stenosis
    - Narrowing of the central part of the spinal canal
  - Foraminal stenosis
    - Narrowing of the foramen, resulting in pressure on the exiting nerve root
  - Far lateral recess stenosis
    - Narrowing of the lateral part of the spinal canal



Spinal Stenosis

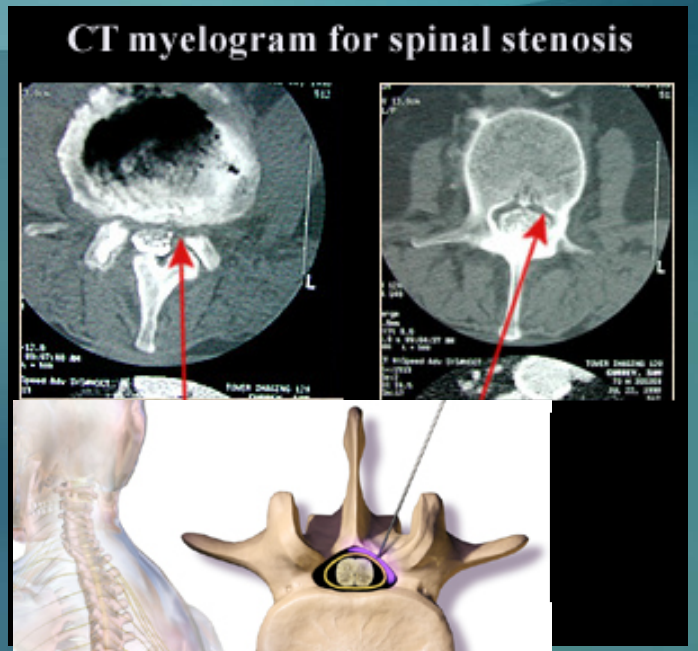
Spinal Stenosis

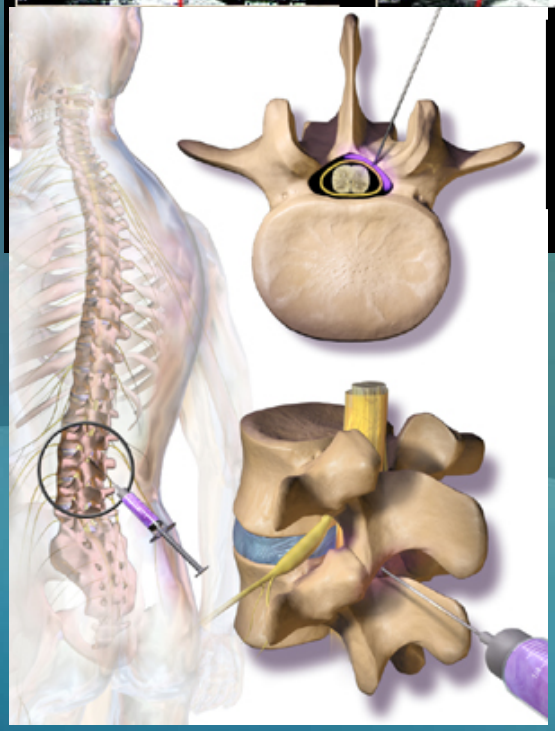
- Symptoms
  - Back pain
  - Pain, dysthesias, anesthesias in the buttocks, thighs, and legs
  - Unilateral or bilateral
  - Symptoms occur while walking or standing, and remit when sitting
  - May start in the buttocks and traverse to the legs or vice versa



Spinal Stenosis

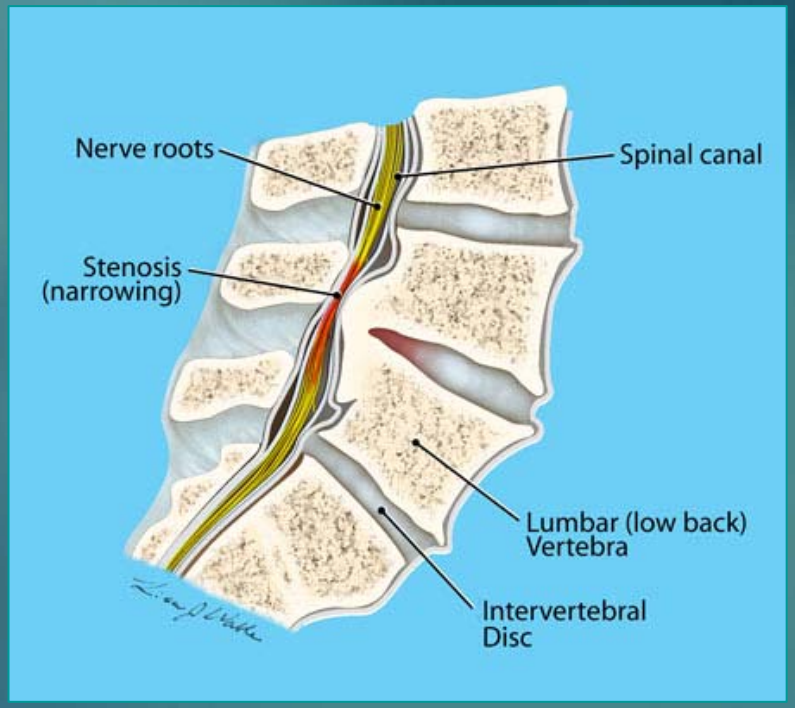
- Diagnosis
  - MRI/computerized tomography (CT) scan/ patient examination
- Nonoperative care
  - Rest
  - NSAID medication
  - Physical therapy
    - Exercise/walking
  - Steroid injections





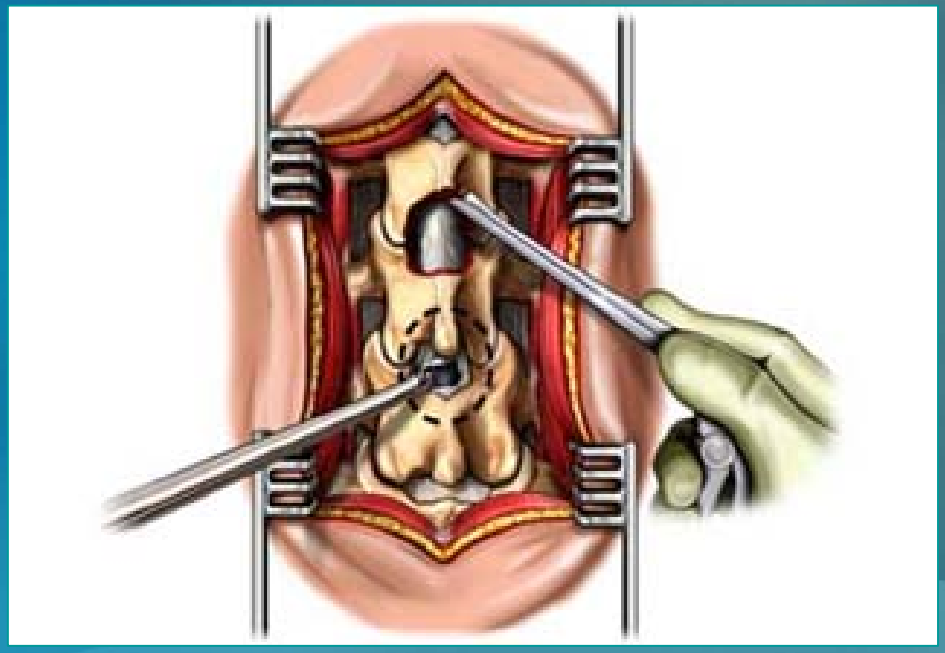
Spinal Stenosis

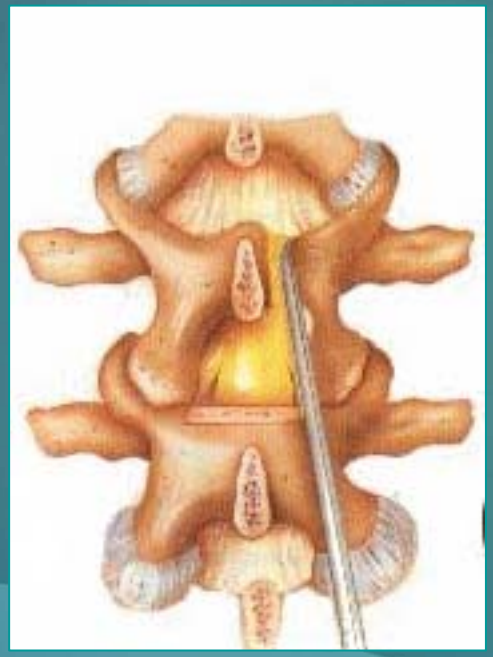
- Surgical care
  - Failure of nonoperative treatment
    - Minimum of 3-6 months' duration
  - Decompression
    - Bone removal to widen area
      - Laminectomy
      - Foraminotomy
    - High success rate
    - May require adjunct fusion to address instability



Spinal Stenosis

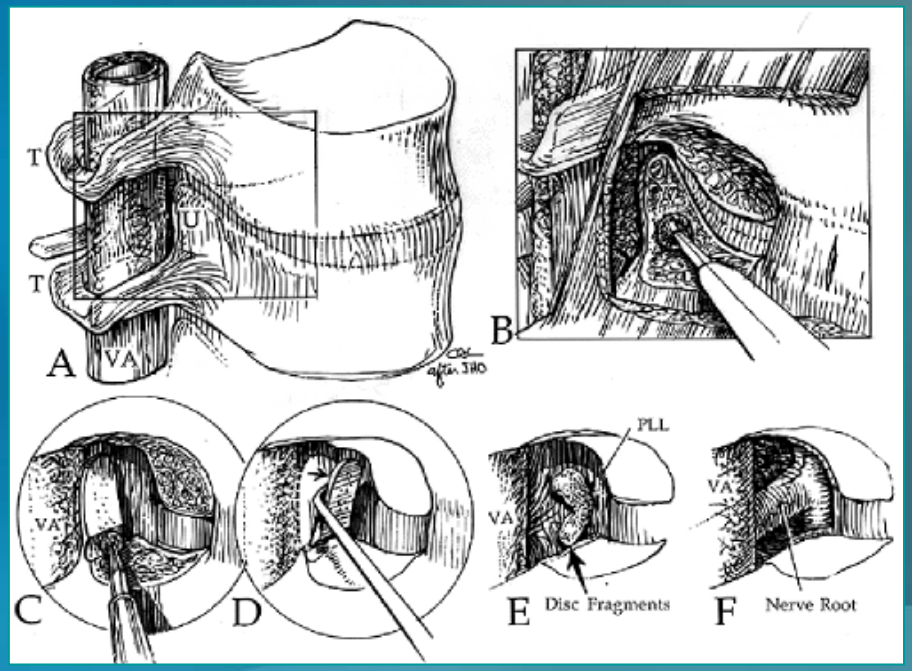
- Laminectomy

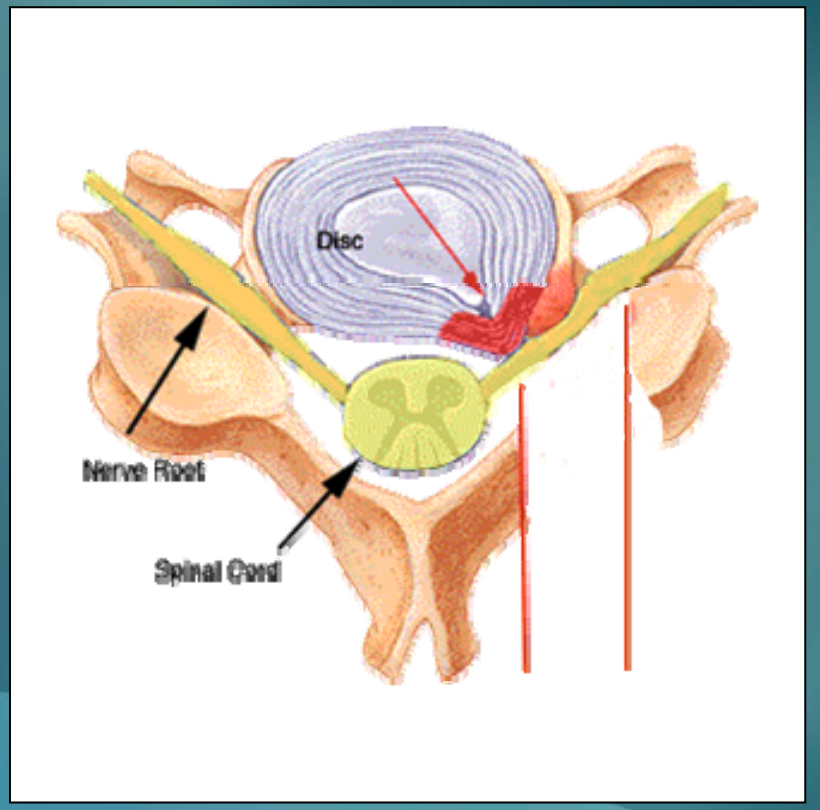




Spinal Stenosis

- Foraminotomy



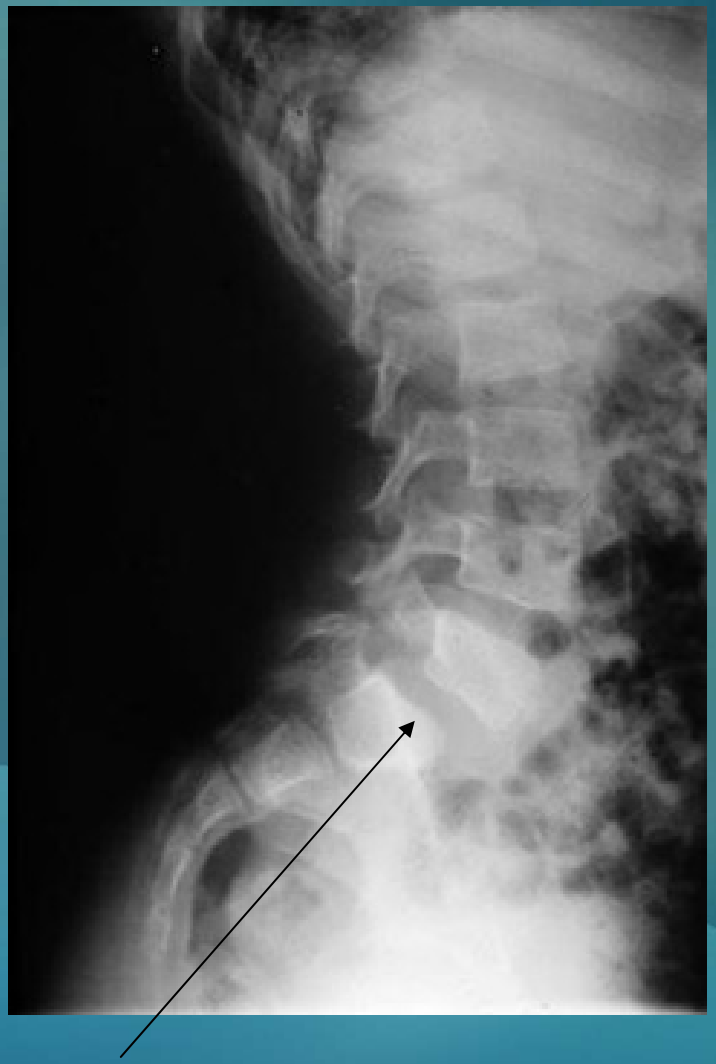


Segmental Instability

- Spondylolisthesis
  - A forward translation of 1 vertebral body over the adjacent vertebra
    - Degenerative
      - "Adult-onset" progressive slip
    - Lytic
      - Develops in children or adolescents, but only 25% experience symptoms
- Spondylolysis
  - A fracture or defect in the vertebra, usually in the posterior elements—most frequently in the *pars interarticularis*
- Spondyloloptosis
  - Complete dislocation

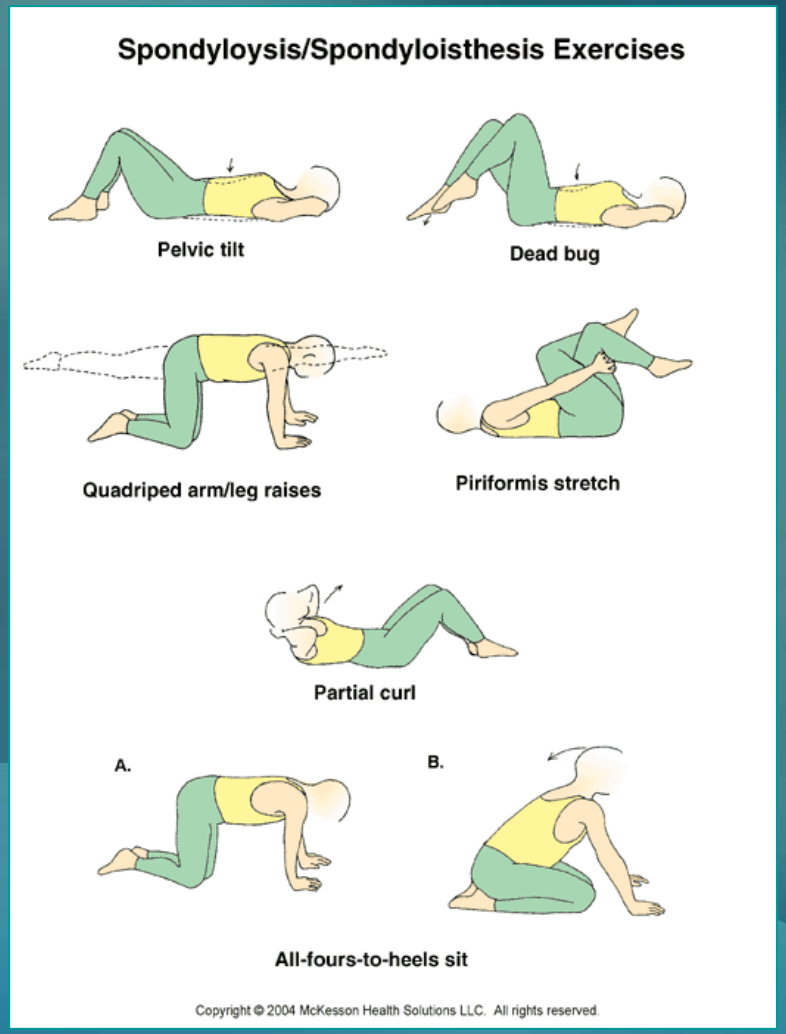
Spondylolisthesis

- Symptoms
  - Low back pain
    - With or without buttock or thigh pain
  - Pain aggravated by standing or walking
  - Pain relieved by lying down
  - Concomitant spinal stenosis, with or without leg pain, may be present
  - Other possible symptoms
    - Tired legs, dysthesias, anesthesias
    - Partial pain relief by leaning forward or sitting



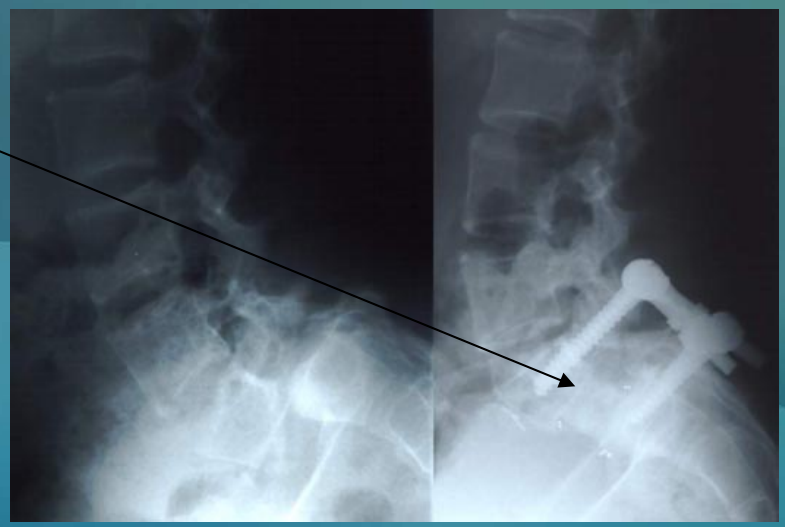
Spondylolisthesis

- Diagnosis
  - Plain radiographs
  - CT, in some cases with leg symptoms
- Nonoperative Care
  - Rest
  - NSAID medication
  - Physical therapy
  - Steroid injections



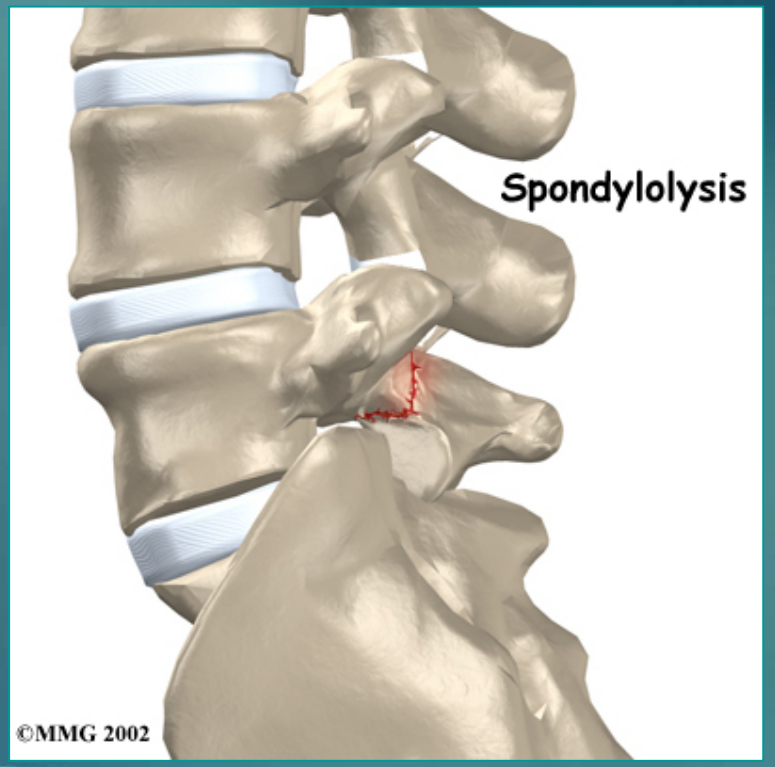
Spondylolisthesis

- Surgical care
  - Failure of nonoperative treatment
  - Decompression and fusion
    - Instrumented
    - Posterior approach
    - With interbody fusion



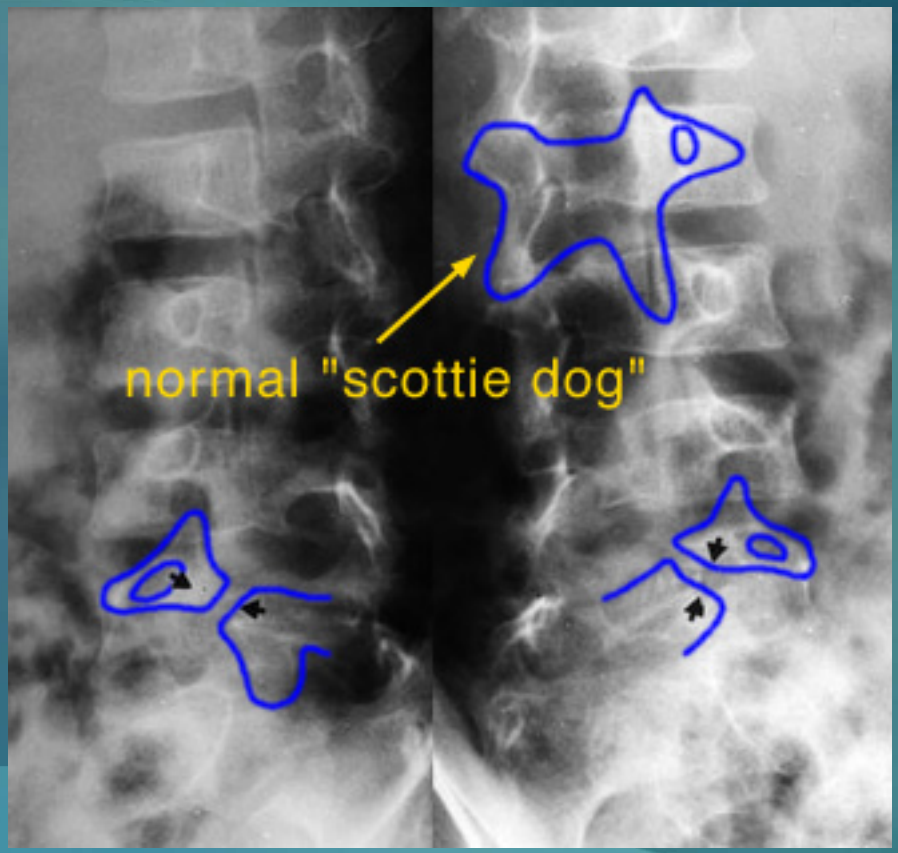
Spondylolysis

- Spondylolysis
  - Also known as pars defect
  - Also known as pars fracture
  - With or without spondylolisthesis
  - A fracture or defect in the vertebra, usually in the posterior elements—most frequently in the *pars interarticularis*



Spondylolysis

- Symptoms
  - Low back pain/stiffness
  - Forward bending increases pain
  - Symptoms get worse with activity
  - May include a stenotic component resulting in leg symptoms
  - Seen most often in athletes
    - Gymnasts at risk
    - Caused by repeated strain



Spondylolysis

- Diagnosis
  - Plain oblique radiographs
  - CT, in some cases
- Nonoperative care
  - Limit athletic activities
  - Physical therapy
    - Most fractures heal without other medical intervention

Spondylolysis

- Surgical care
  - Failure of nonoperative treatment
  - Posterior fusion
    - Instrumented
    - May require decompression

Degenerative Disease

- Occurs at all levels of the spine
- Asymptomatic degeneration in majority of the population

Normal

Degenerative

Degenerative Disease

- The spinal structures most affected by degenerative disease are
  - Intervertebral discs
  - Articular facet joints
- These conditions are similar to osteoarthritis and degenerative disease of the spine, which is often referred to as “osteoarthritis of the spine,” or *spondylosis*

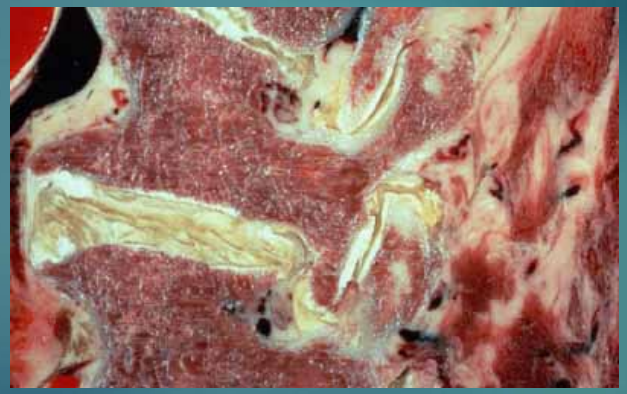
Degenerative Disc Disease

- The process is thought to begin in the annulus fibrosis with changes to the structure and chemistry of the concentric layers
- Over time, these layers suffer a loss of water content and proteoglycan, which changes the disc's mechanical properties, making it less resilient to stress and strain

Normal Anatomy

Degenerative Disc Disease

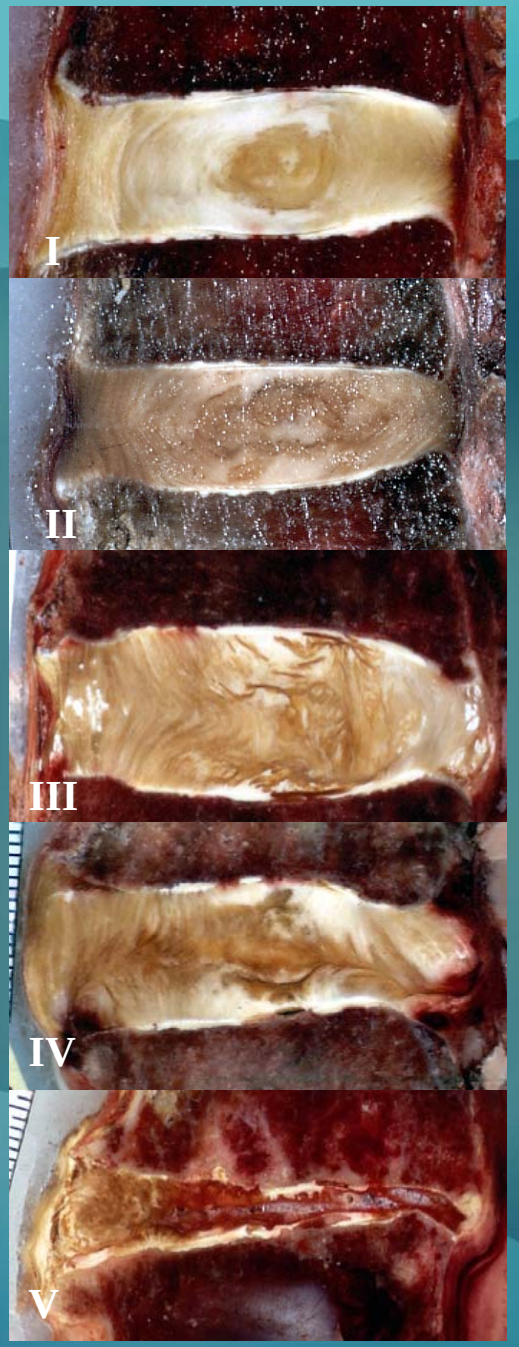
- The process is thought to begin in the annulus fibrosis with changes to the structure and chemistry of the concentric layers
- Over time, these layers suffer a loss of water content and proteoglycan, which changes the disc's mechanical properties, making it less resilient to stress and strain



Degenerative Anatomy

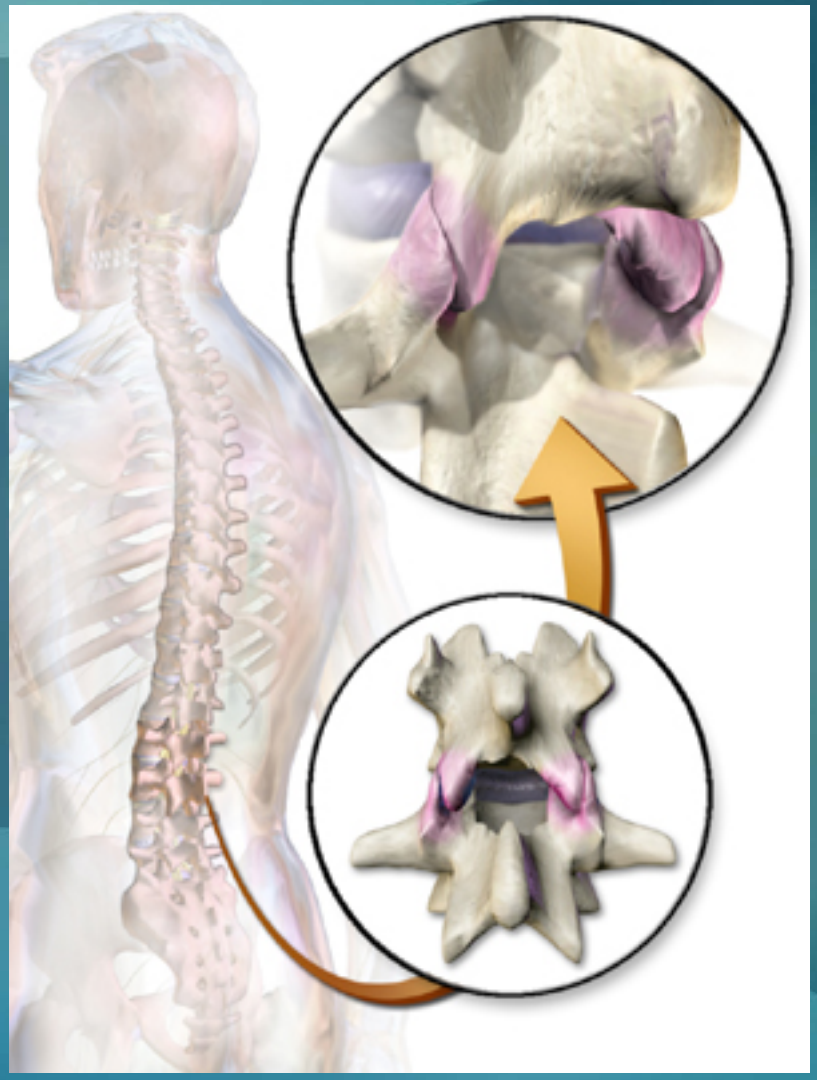
The Aging Disc

- Thompson criteria
  - Loss of cells
  - Loss of H_20/ ↓ proteoglycans
  - ↓ Type II/ ↑ Type I collagen
  - Annular fissures
  - Mechanical incompetence
  - Bony changes



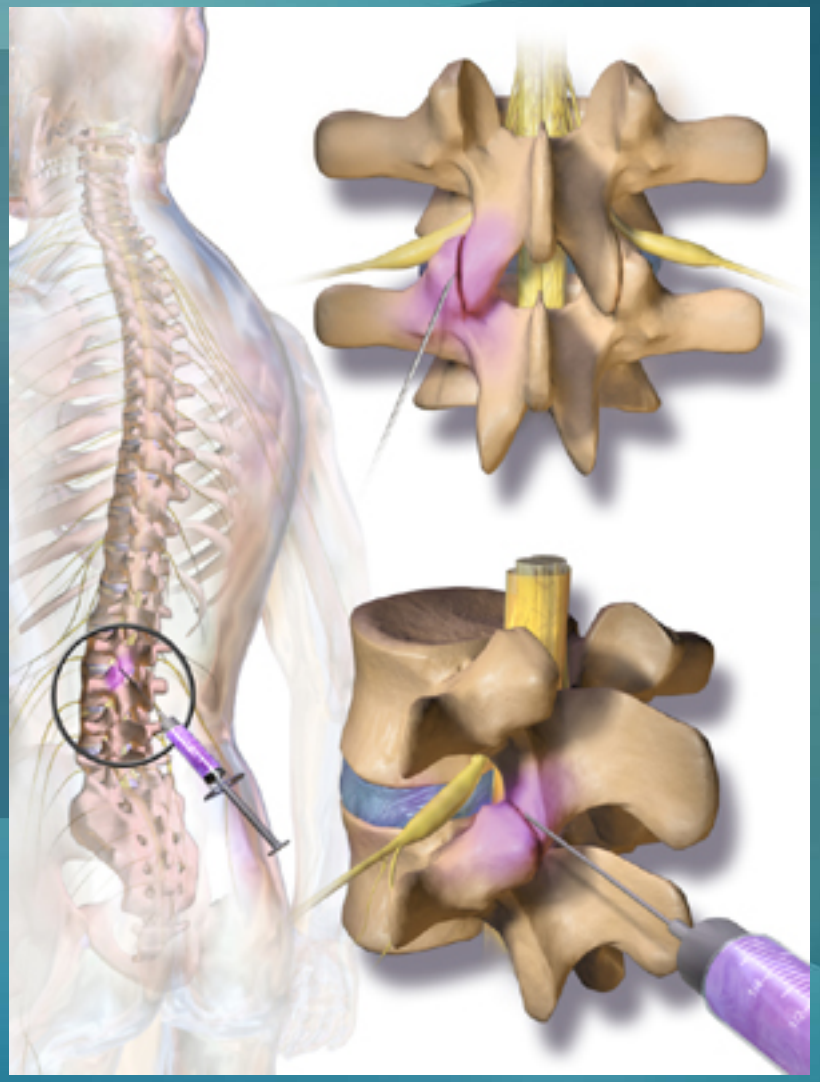
Degenerative Disease: Facet Arthritis

- Changes in disc structure and function can lead to changes in the articular facets, especially *hypertrophy* (overgrowth), resulting from the redirection of compressive loads from the anterior and middle columns to the posterior elements



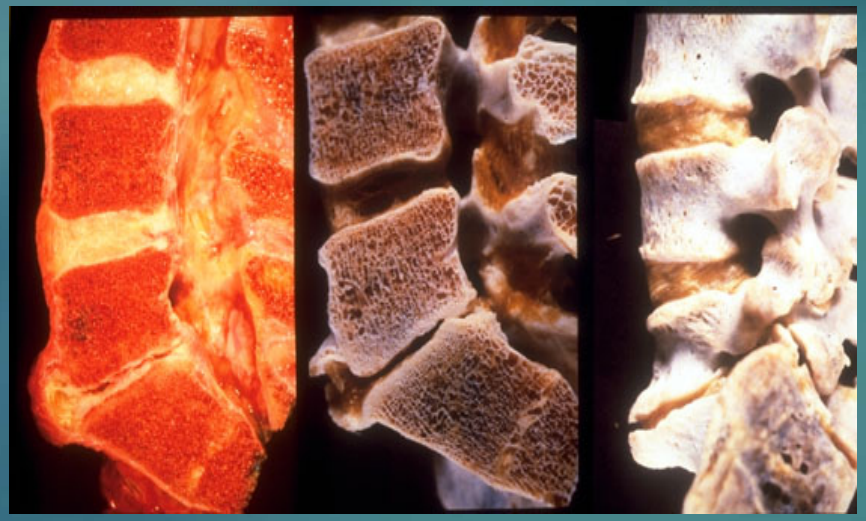
Degenerative Disease: Facet Arthritis

- Facet Injections
  - Anesthetic effect
  - Relief may last for several months or only a few weeks, or a few days



Degenerative Disease: Osteophytes

There may also be hypertrophy of the vertebral bodies adjacent to the degenerating disc; these bony overgrowths are known as *osteophytes* (or bone spurs)



Degenerative Disc Disease

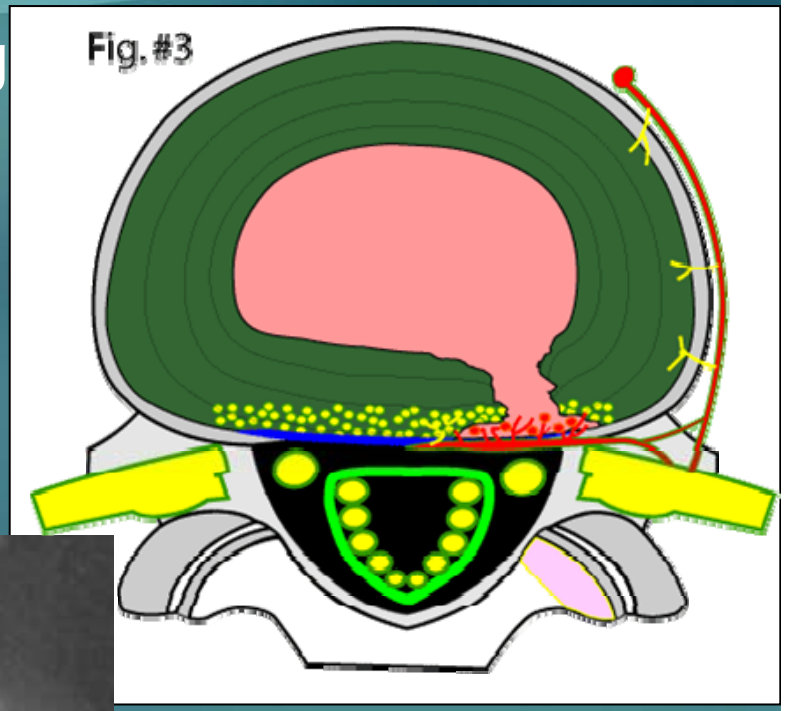
- Symptoms
  - Low back pain and/or buttocks pain
  - If leg pain also exists, there is likely an additional cause, eg, HNP, stenosis, etc
  - DDD is not usually the sole diagnosis

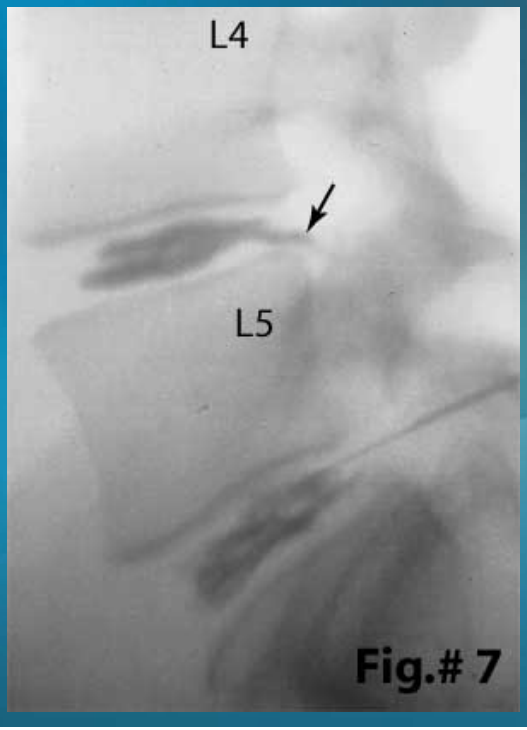
Degenerative Disc Disease

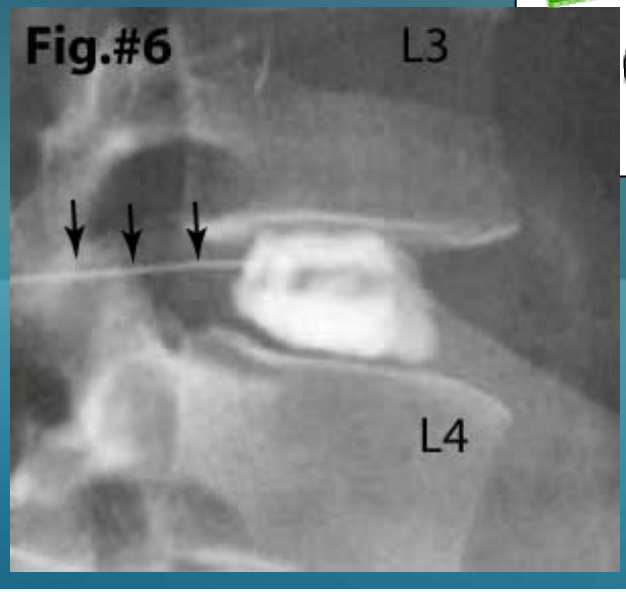
- Diagnosis
  - MRI/patient examination
  - CT, in some cases, to rule out other diagnosis
  - Discography
- Nonoperative care
  - Rest for acute, low back pain
  - NSAID medication
  - Physical therapy
    - Exercise/walking
    - Low-impact aerobics
    - Trunk strengthening

Degenerative Disc Disease: Discogenic Pain

- *Discogenic pain* is pain originating from the disc itself; an internally disrupted disc may result in disc material causing chemical irritation of nerve fibers







Degenerative Disc Disease

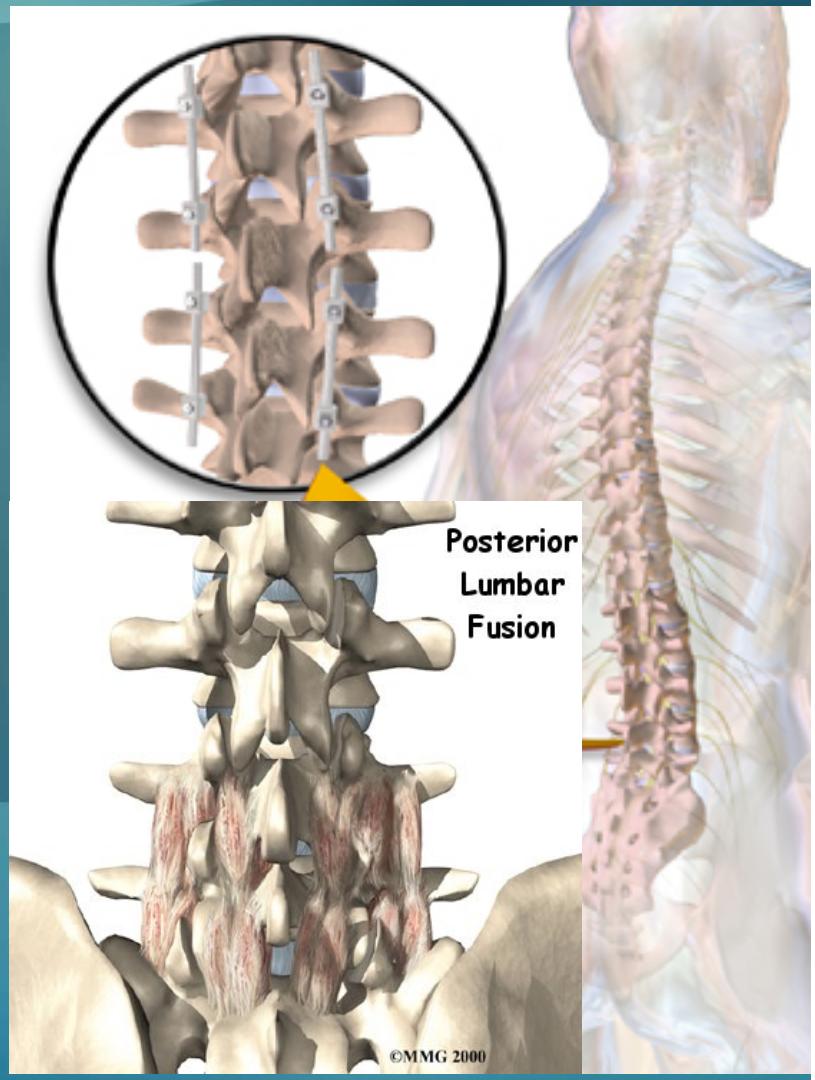
- Surgical care
  - Failure of nonoperative treatment
    - Minimum of 6 weeks
  - Fusion
    - Removal of disc and replacement with bone graft, or a cage-filled bone graft, or a bone graft substitute
      - Anterior approach
      - Posterior approach
      - Combined approach
  - Arthroplasty
    - Articulating disc replacement

Lumbar Fusion

- Fusion procedure used to treat:
  - Spondylolisthesis
  - Spondylolysis
  - DDD
- Multiple approaches
  - Posterior, anterior, transforaminal, combined anterior/posterior

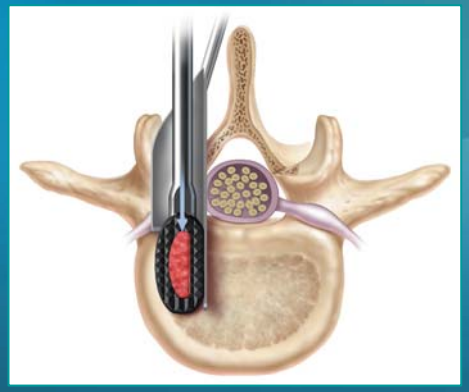
Posterior Lumbar Fusion

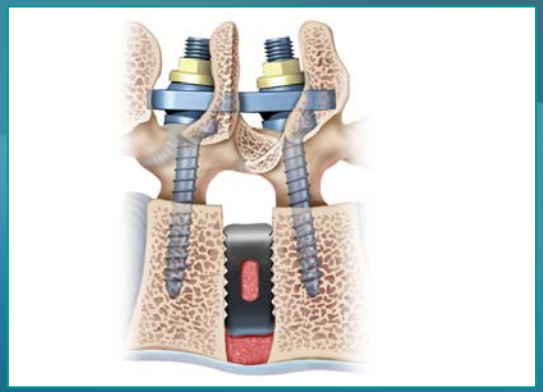
- Posterolateral fusion (PLF)
  - Spondylolisthesis and spondylolysis without disc involvement
  - Usually includes the use of screws/rods for stabilization until the fusion occurs

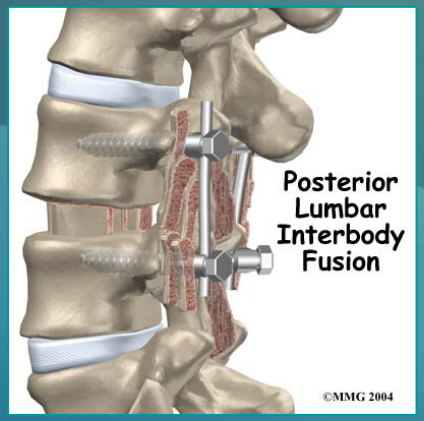


Posterior Lumbar Fusion

- Posterior lumbar interbody fusion (PLIF)
  - Used with disc involvement in conjunction with PLF
  - Usually includes the use of screws/rods for stabilization until the fusion occurs
  - Bone graft
  - Cages

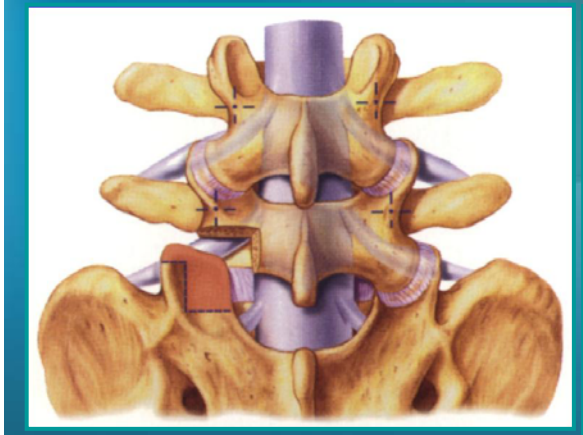
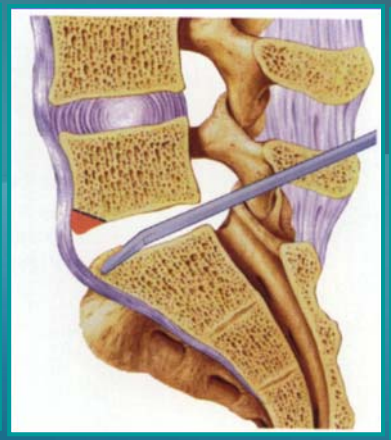
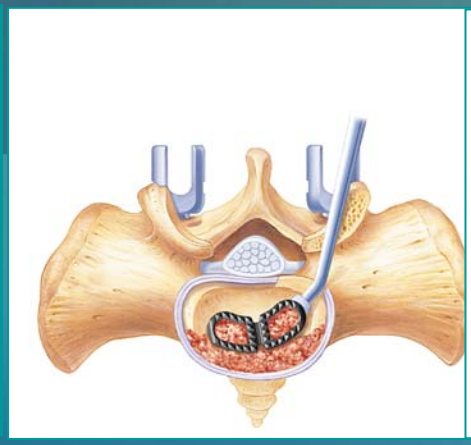
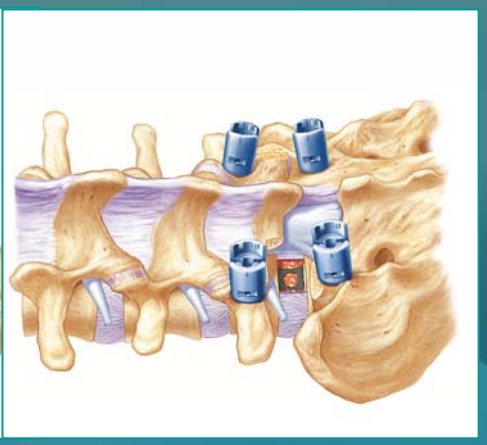






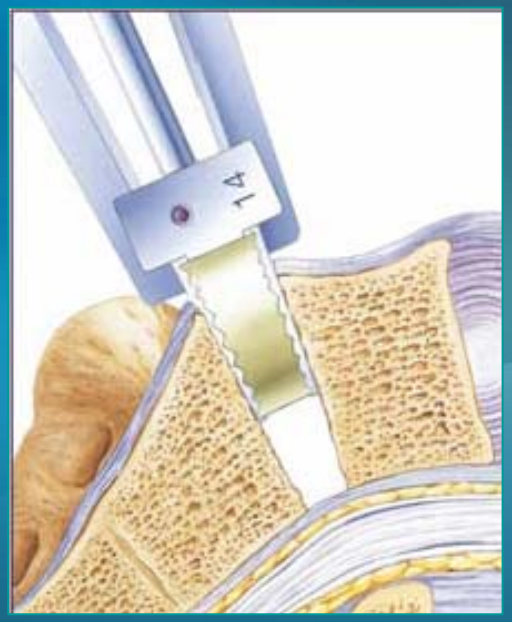
Posterior Lumbar Fusion

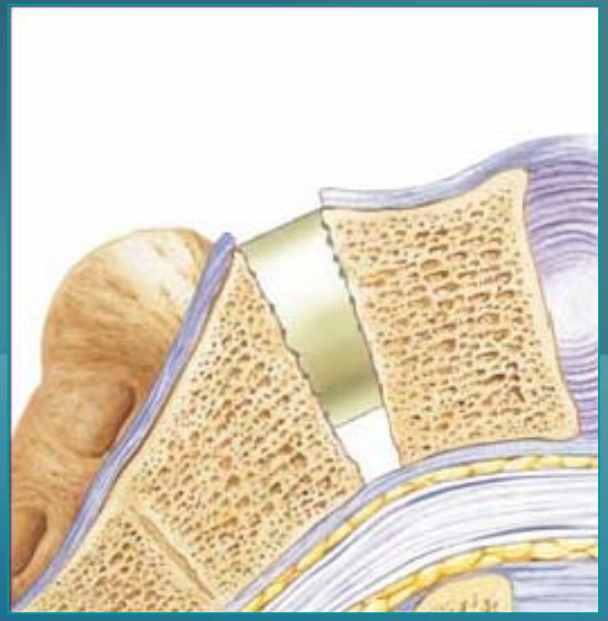
- Transforaminal lumbar interbody fusion (TLIF)
  - Used with disc involvement with or without PLF
  - Usually includes the use of screws/rods for stabilization until the fusion occurs
  - Bone graft/cages
  - Less soft-tissue and bone trauma

Anterior Lumbar Fusion

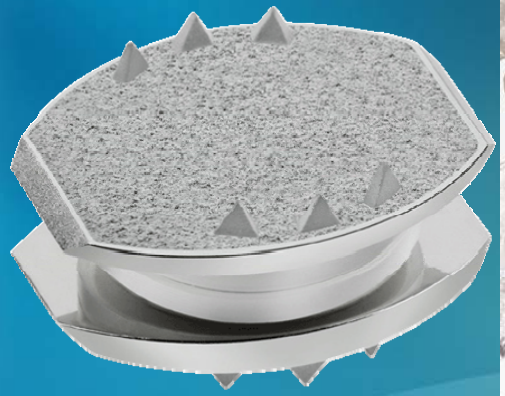
- Anterior lumbar interbody fusion (ALIF)
  - Used with disc involvement primarily with, but sometimes without, PLF
  - Bone graft/cages

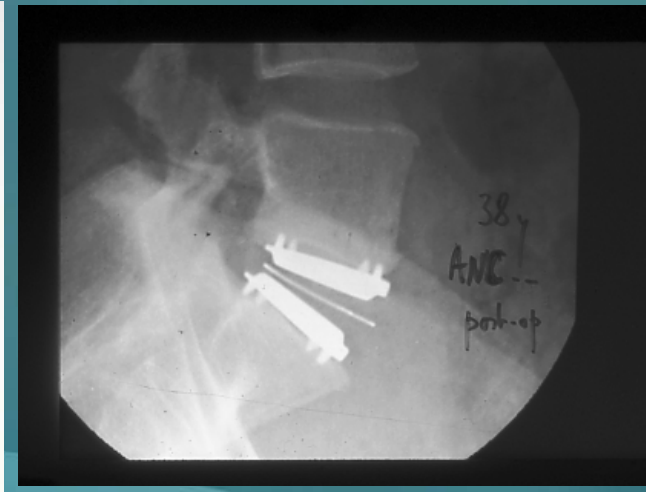




Lumbar Arthroplasty

- Total disc replacement (TDR)
  - DDD
  - Contraindicated for spondylolisthesis and spondylolysis





The CHARITÉ Artificial Disc is indicated for spinal arthroplasty in skeletally mature patients with DDD at one level from L4-S1.