

Neck and Low Back Pain

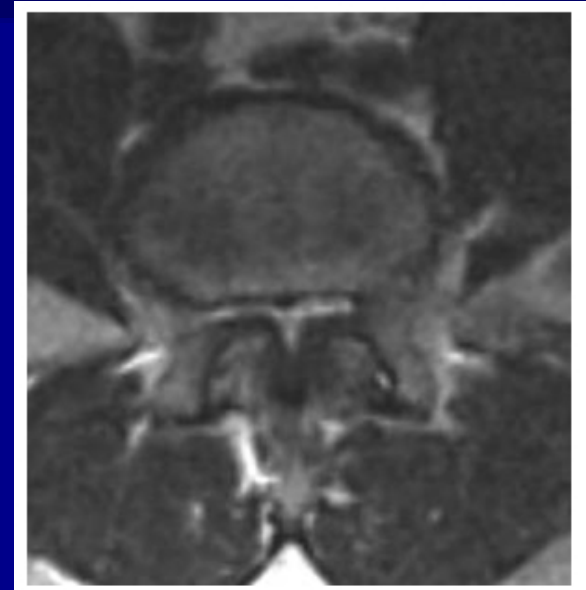


Ash Darwish, MD, JD
Minimally Invasive
Spine Surgeon



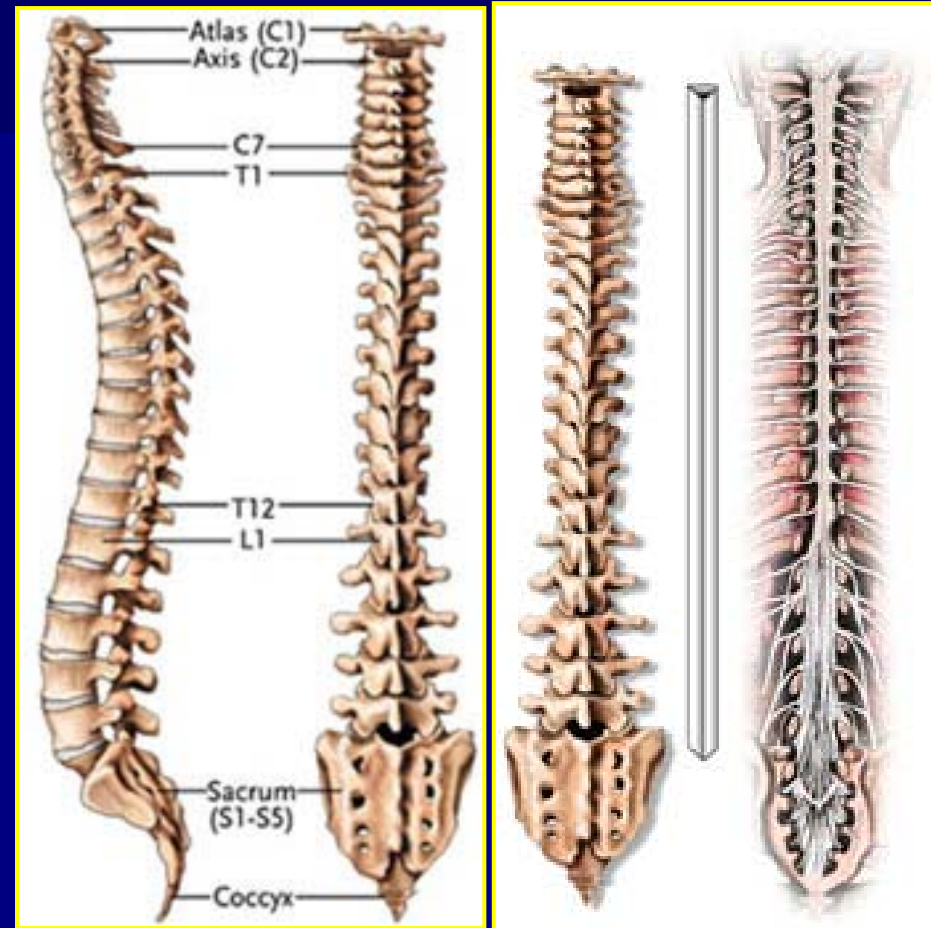
Outline-Spine 101

- Anatomy of the Spine
- Pathology/Disease
- Differential diagnosis
- Treatment approaches

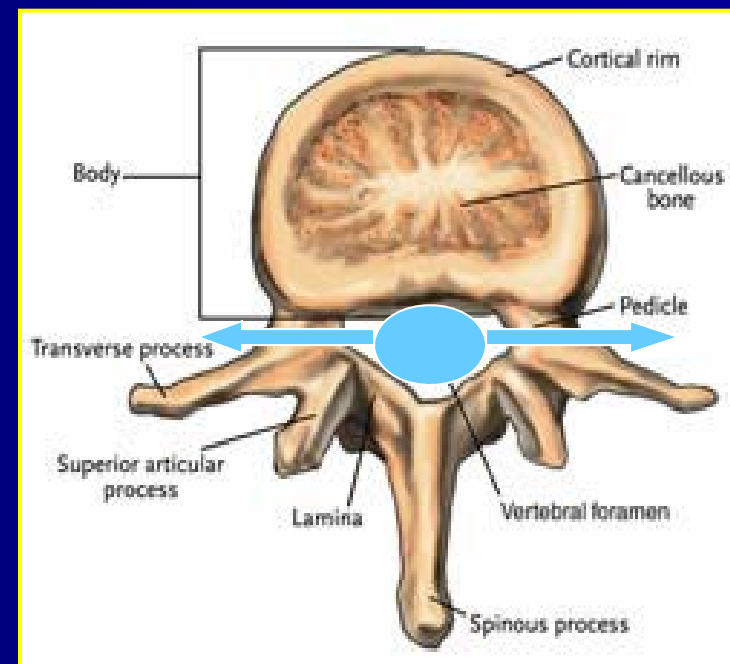
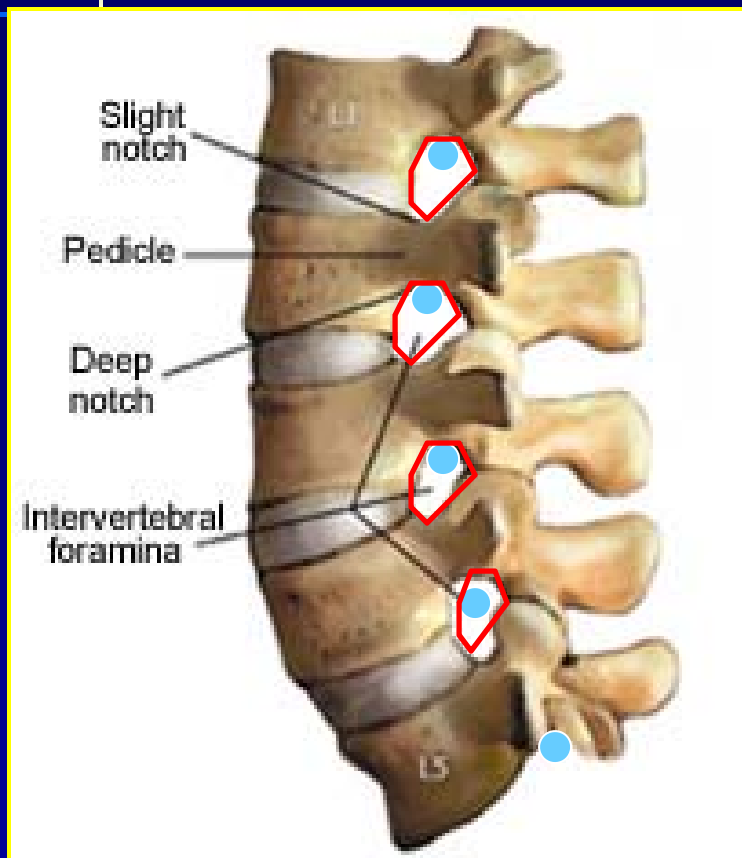


Functional Anatomy

- Provide Structural Support
- Maintain Motion
- Protection
 - Spinal Cord
 - Nerve Roots

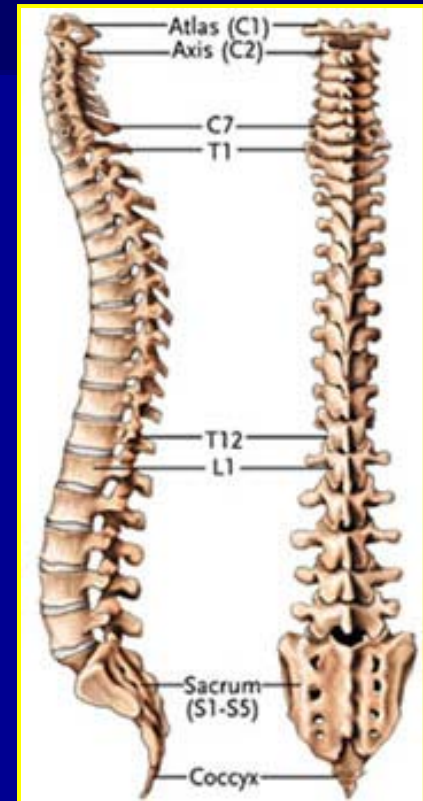


Lumbar Anatomy



Sources of Spinal Pain

- 34 levels in the spine
- At Each Level
 - Nerves (2)
 - Disc (1)
 - Facet Joints (2)
 - Bone
 - Muscle
- Correct diagnosis is the key!



Disc Degeneration

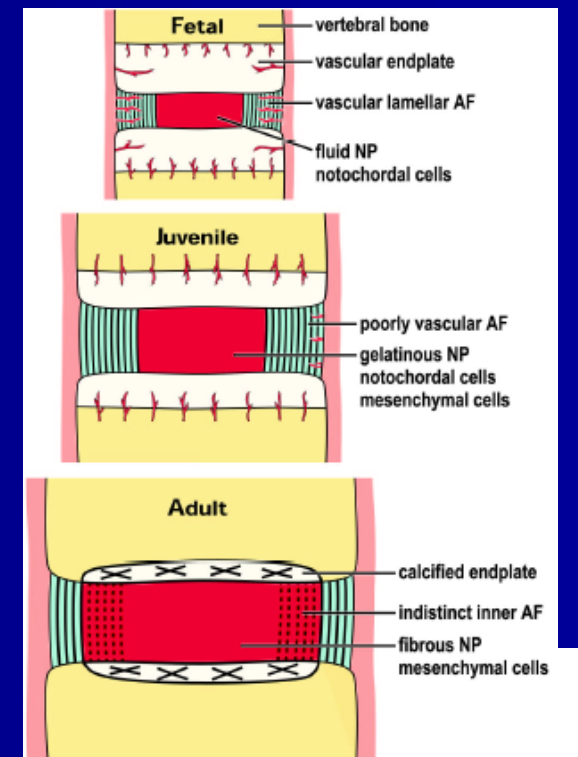
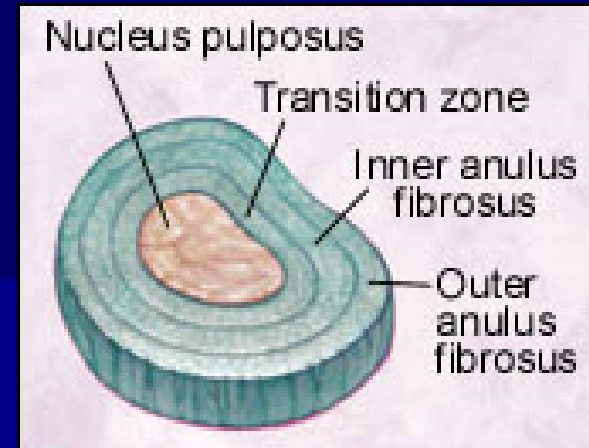
- Big factor in spinal problems
 - Genetics
 - Smoking
 - Weight
 - Occupation
 - Aging
 - Arthritic Changes



The Intervertebral Disc

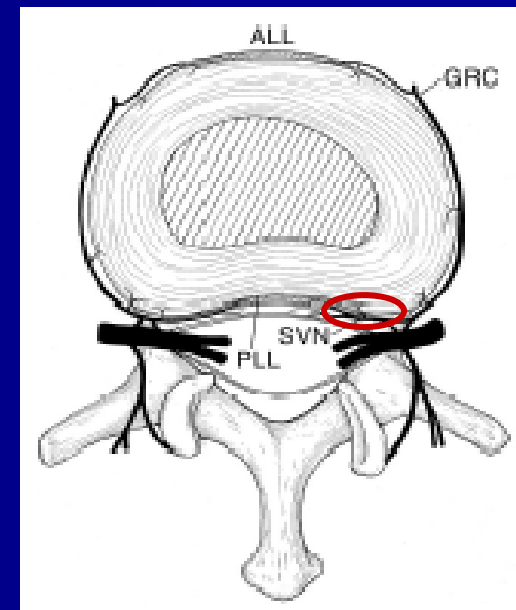
■ Structure

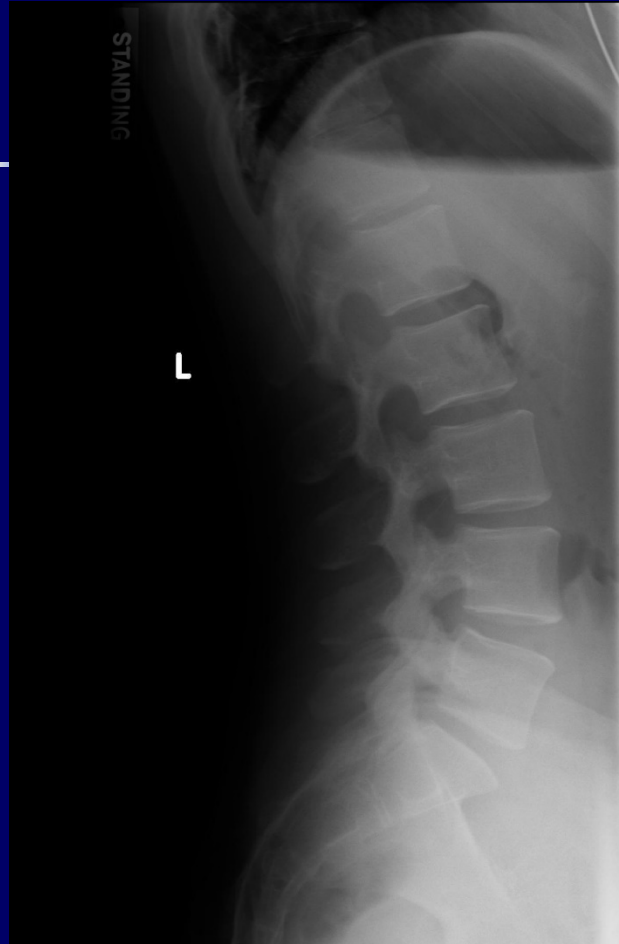
- Outer Annulus Fibrosus (AF)
 - Resists tensile forces
- Inner Nucleus Pulposus (NP)
 - Type II collagen and PG
 - 70-90% water
 - Resists compressive forces due to hydrophilic PG
 - Transmits tensile forces to AF
 - Properties provide nutrition to disc
 - Imbibition of interstitial fluid
 - Clearance of waste products



Degenerative Disc Disease

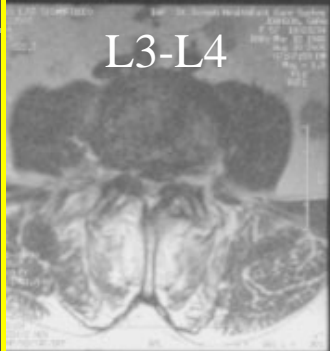
- Spinal Motion Segment
 - Intervertebral disc
 - Altered load absorption-endplate pain
 - Loss of disc height/lordosis
 - Annular disruption
 - Paired Posterior Facet joints
 - Increased load transmission
 - Facet Arthrosis
 - Spinal stenosis
 - Ligamentous Laxity
 - Spondylolisthesis
 - Segmental Instability





Spinal Stenosis

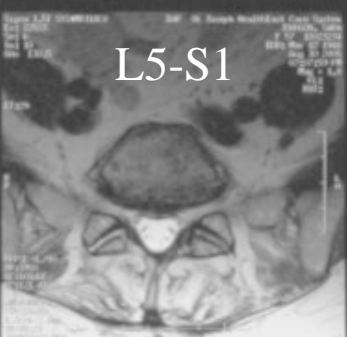
- Incidence increases with Age
- Arthritis causes narrowing of canal where nerves live
- Compression of nerves
- Inflammation
- Back and leg pain



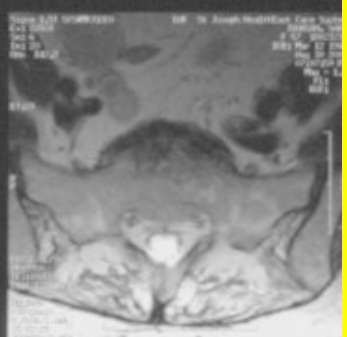
L3-L4



L4-L5



L5-S1



Epidemiology

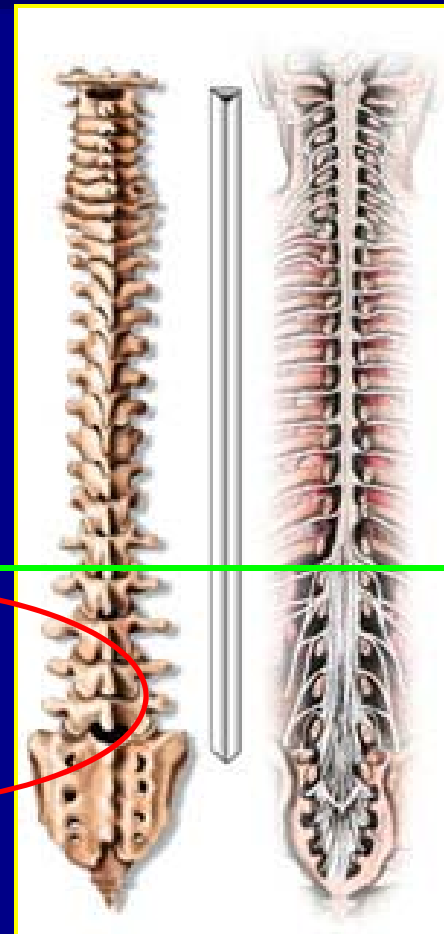
- Incidence of symptomatic stenosis 1.7 to 8%
- Typically presents in 5th to 7th decade of life
- No association with occupation or body habitus
- No sex predominance (exception: degenerative spondylolisthesis)
- Surgery rate increased 8X from 1979-1992 (7.8- >65/100,000)
- It is the most common indication spine surgery (Medicare population)

Location Determines Presentation



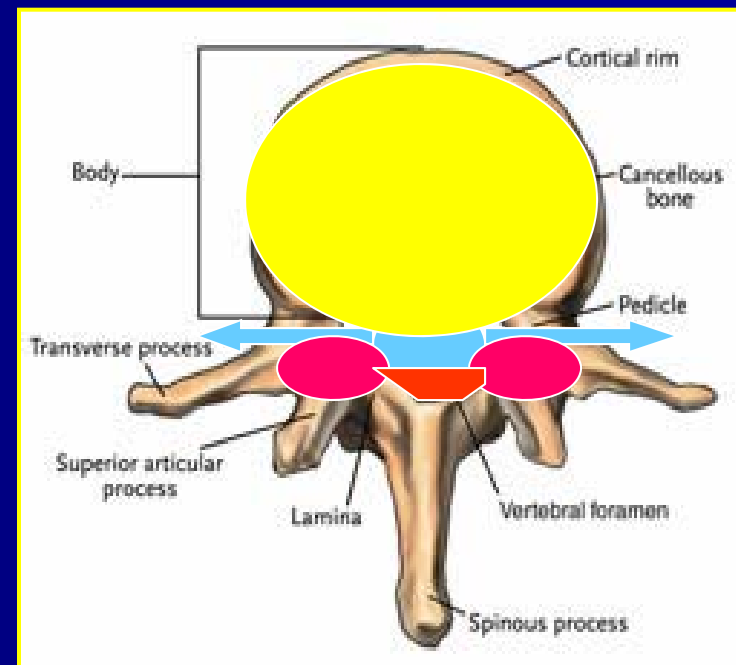
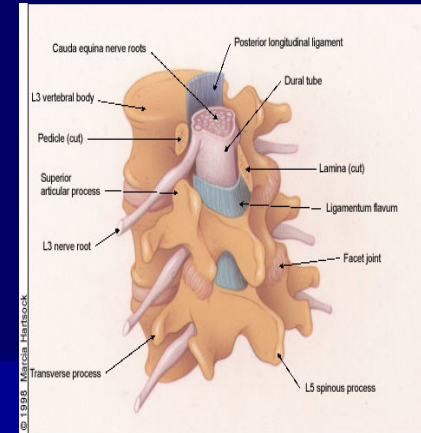
UMN

LMN



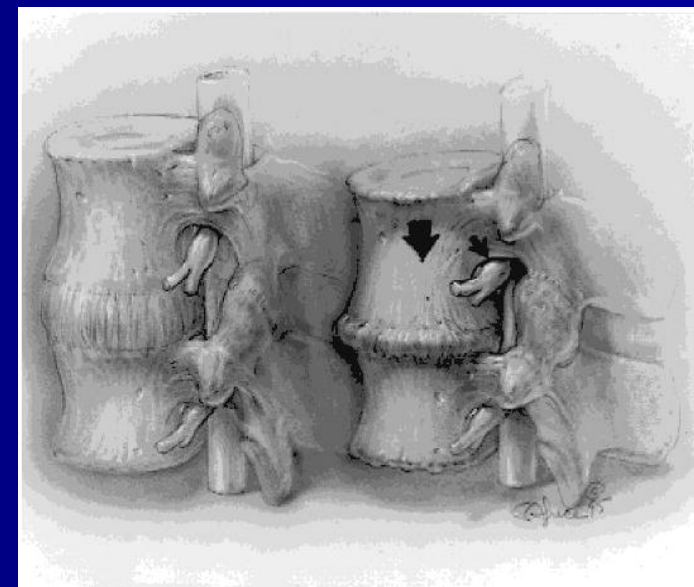
Lumbar Stenosis: Pathology

- Disk herniation/bulge
- Ligamentum flavum
- Facet arthropathy
- All of the above
- Result: narrow canal
 - Symptoms $< 75 \text{ mm}^2$



Pathogenesis

- Disk dehydration
- Loss of disc height
- Bulging of annulus and flavum into canal
- Posterior elements bear more stress
- Facet arthrosis/sclerosis with osteophytes
- Central stenosis
- Impingement of nerve roots

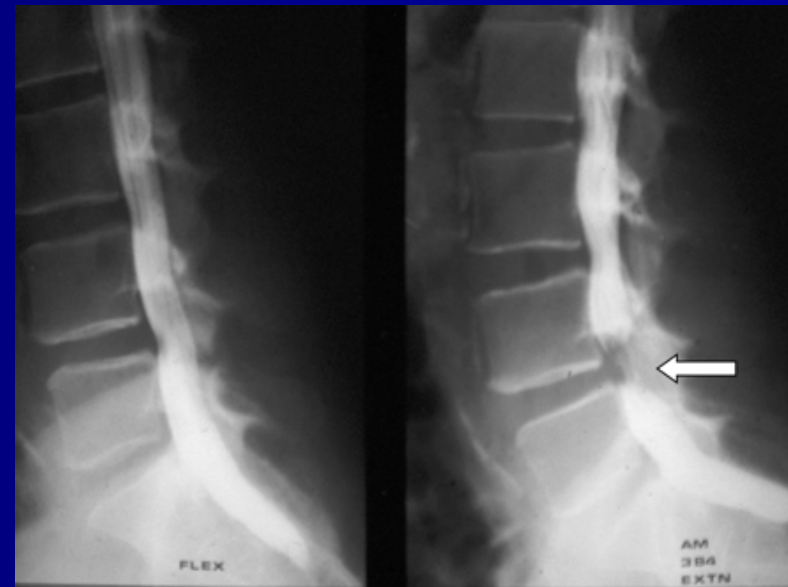


Lumbar Stenosis: Classic Symptoms

- Lower back pain with standing or walking, sleeping flat on back
- Radiates to buttocks, thighs, or feet
- Relieved by sitting, walker, grocery cart
- Progressive over time
- Decreasing walking distances
- Downhill worse than uphill

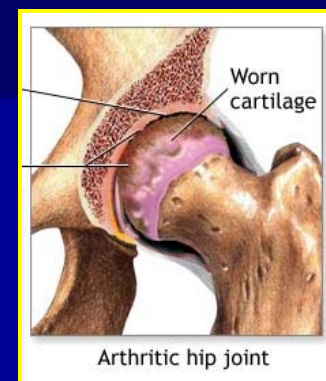
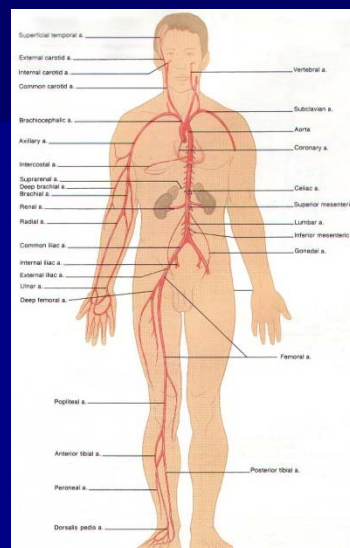
Neurogenic Claudication

- Sensation of pain, heaviness, tightness and subjective weakness, relieved by sitting down or leaning forward
- Etiology
 - 1.increased venous pressure
 - 2.decreased blood supply leads to ischemia
 - 3.perineural inflammation of unknown origin

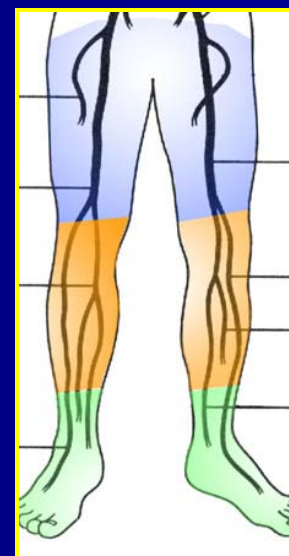


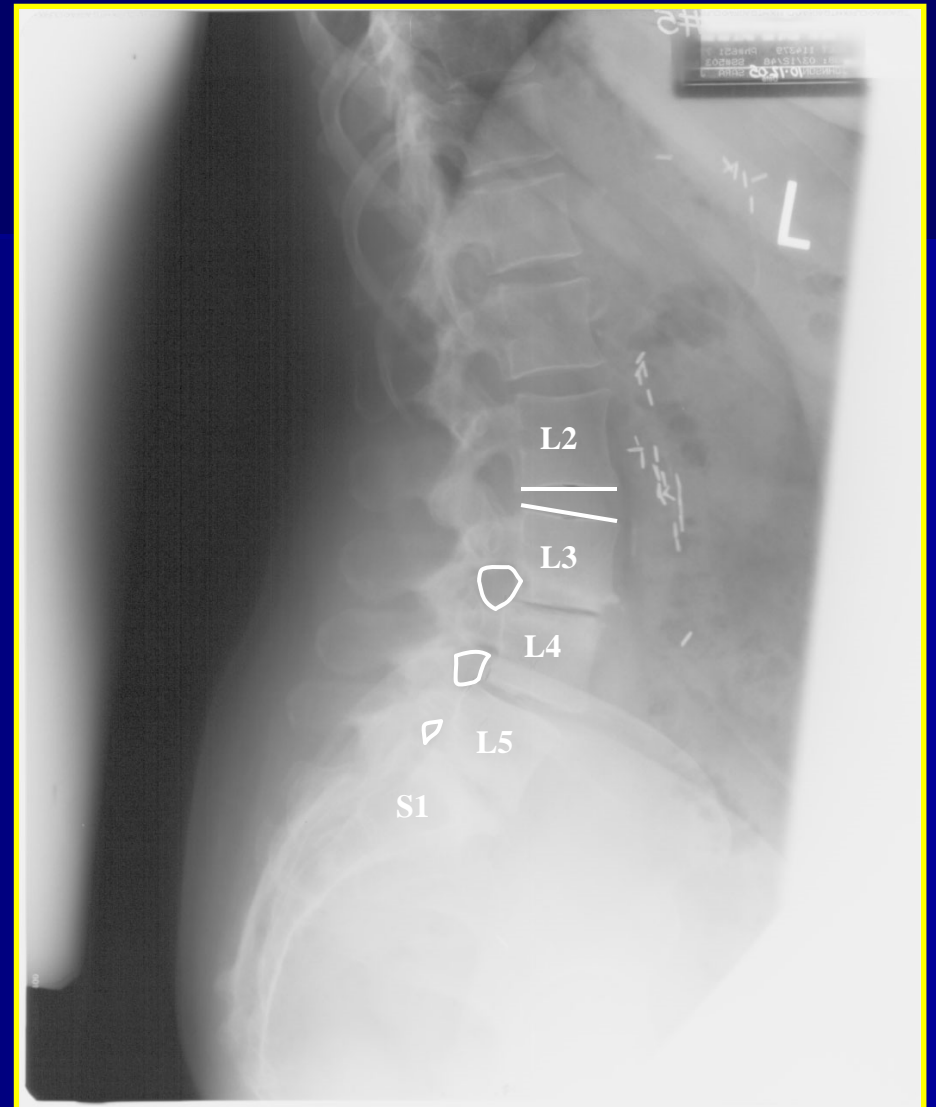
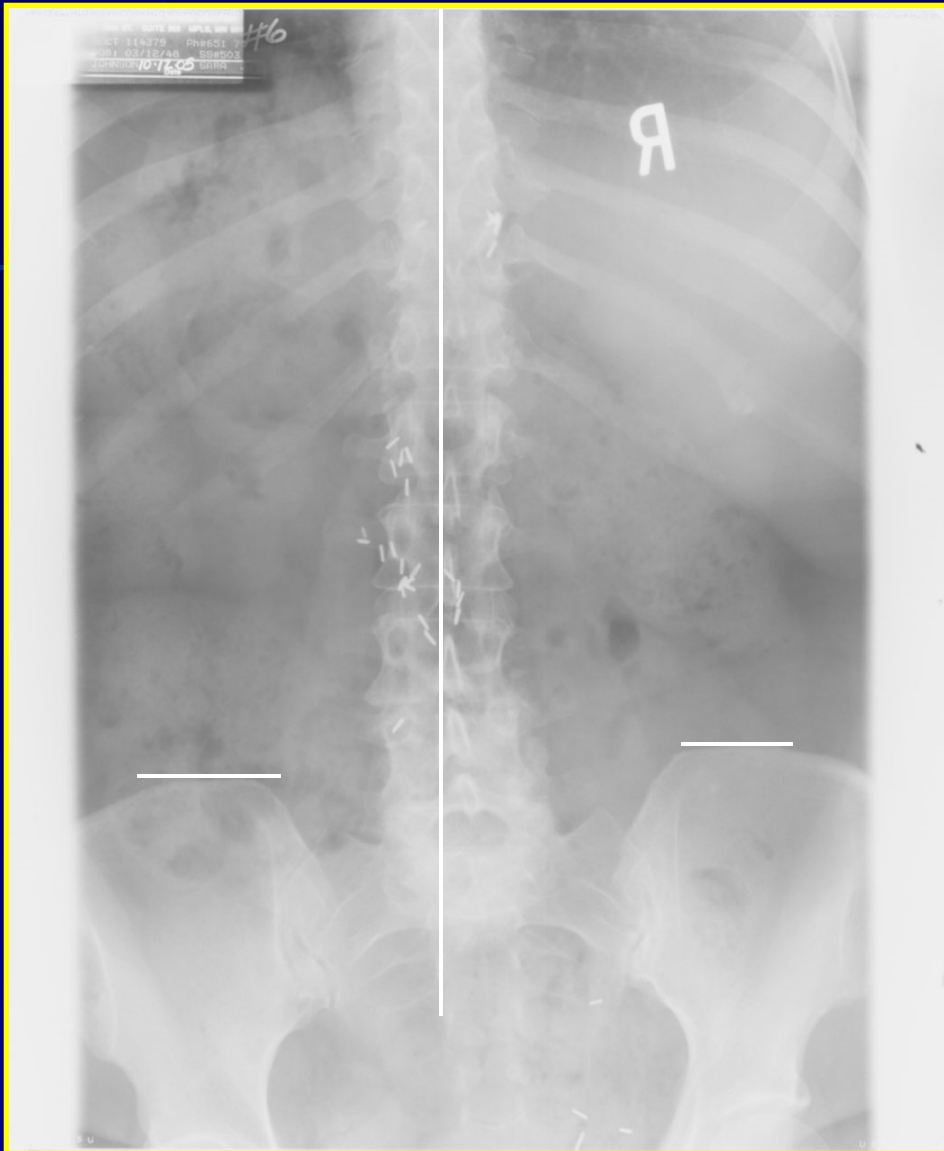
Differential Diagnosis

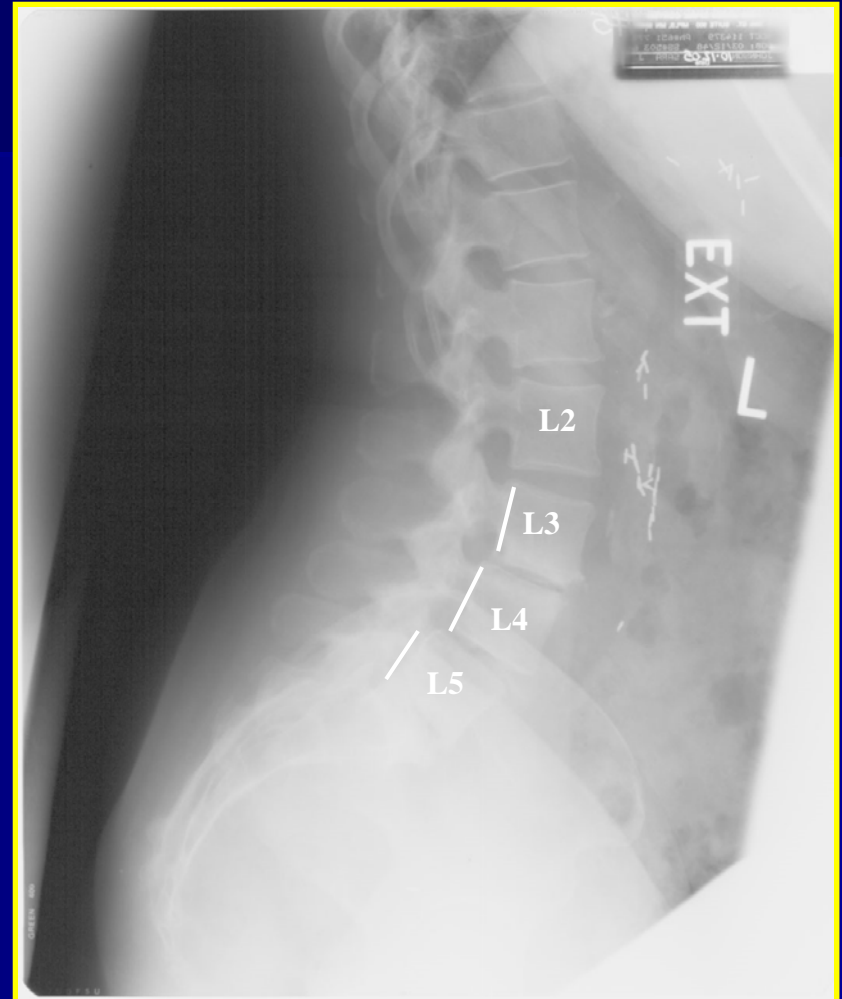
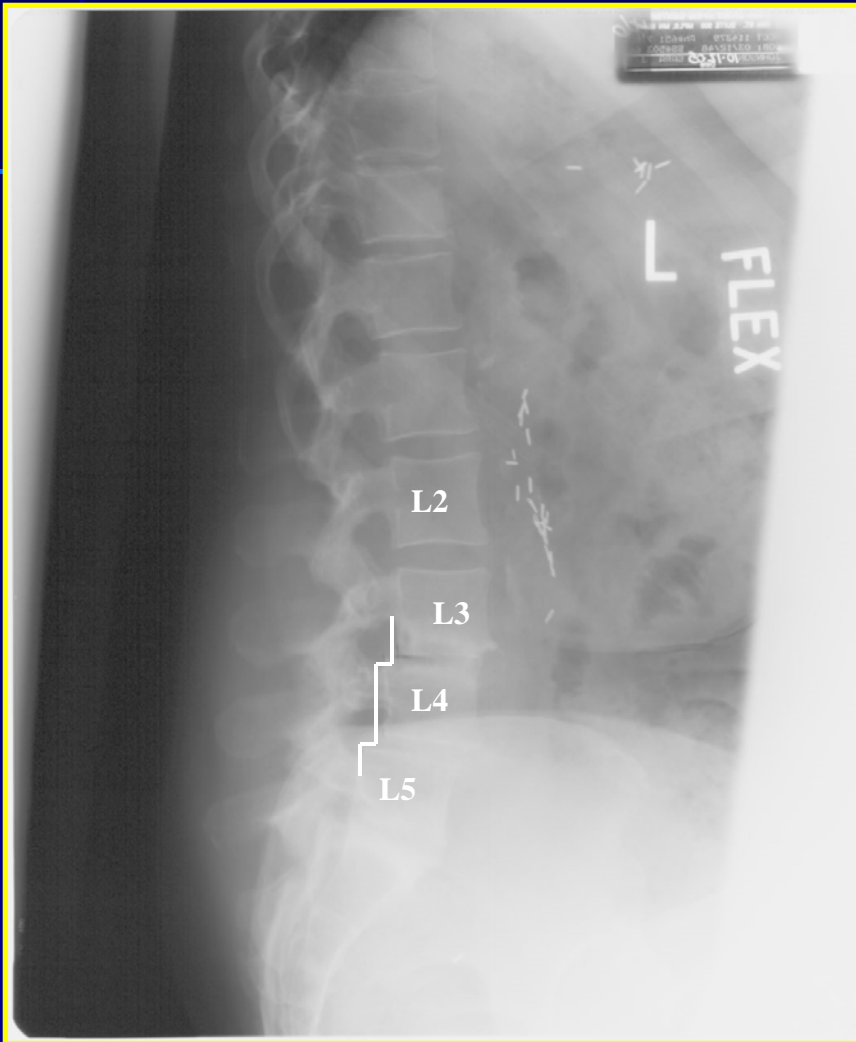
- Vascular conditions (PVD, aortic aneurysm)
 - *Must rule out vascular claudication
 - check pulses
 - loss of hair/skin changes
- Musculoskeletal diseases (OA of hip, knee)
- Neurologic disorders (DM, AMLS, MS)
- Peripheral neuropathy (stocking and glove)
- Renal disorders and retroperitoneal tumors
- Depression



Arthritic hip joint



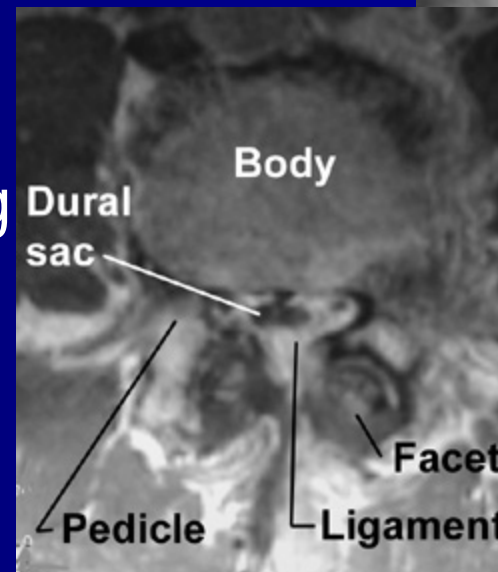
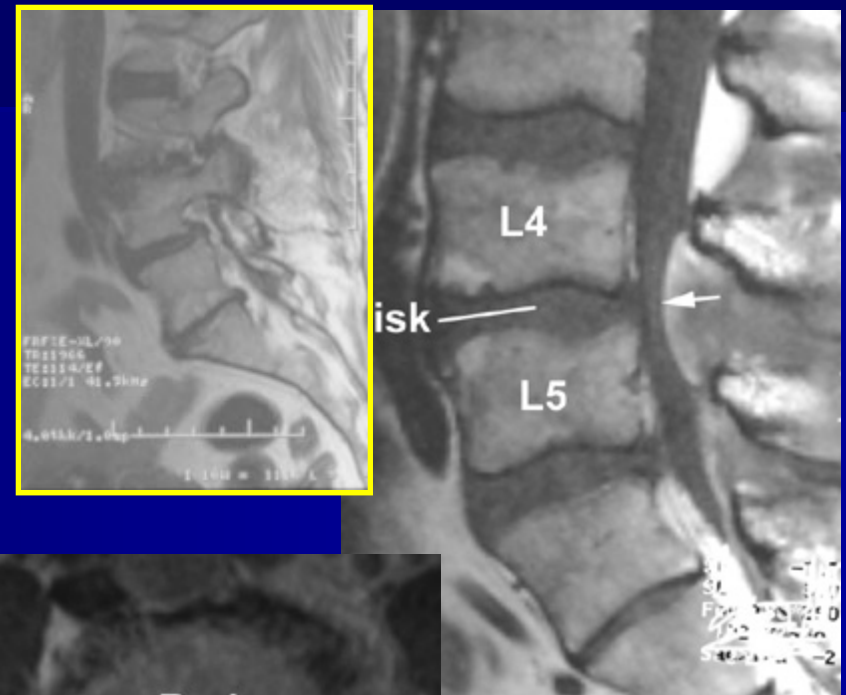




Magnetic Resonance Imaging

- Study of Choice
- Superior to myelography or plain CT, and precisely depicts anatomy contributing to stenosis
- 21% of 60-80 year olds without symptoms have lumbar stenosis by MRI
- Good for preop planning to determine levels and contributing structures

Boden JBJS 1990



Non-operative Treatment

- Anti-Inflammatory meds
- Physical Therapy
- Activity Modification
- Steroid Injection
 - Targeted anti-inflammatory
 - Not Barry Bonds steroids

Operative indications

- Intractable pain due to lumbar stenosis with failure of non-operative treatment
- Progressive Neurologic Deficit
- Functional Neurologic Deficit



Indications

- Severe debilitating neurologic deterioration is rare.
- Complete resolution is also rare.
- The decision for surgery generally should be made by the patient and based on how the disease adversely affects the quality of their life.
- Do not base decision on MRI findings or subtle neurologic findings

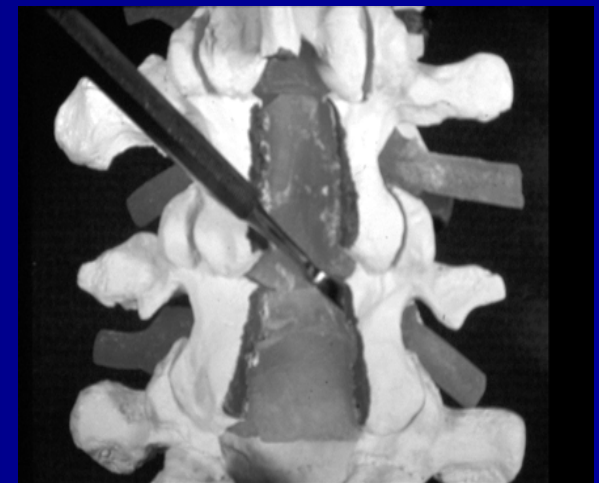
Operative Contraindications



- Comorbidities of sufficient severity to preclude safe anesthesia and surgery
- Age alone is NOT a contraindication

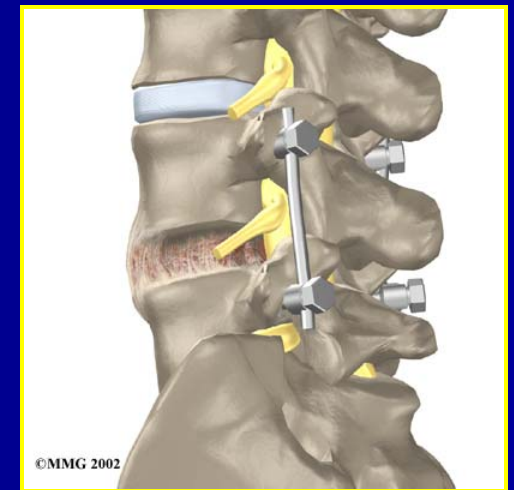
Operative options

- Decompression alone
 - Laminectomy
 - Multiple laminotomies
- Decompression and fusion
 - Instability
 - Deformity
- Minimally Invasive Surgery
 - Indirect Decompression
 - Fusion



Operative Decision Making

- Do the least amount of surgery possible
 - Decompress fewest # levels
- Fusion Indicated For:
 - Spondylolisthesis
 - Anticipate iatrogenic instability
 - Progressive degenerative scoliosis



Spine Patient Outcomes Research Trial (SPORT) Study

- NIH funded study
- \$21M Grant
- Multi-Center Study
- Surgical outcomes vs. Non-operative
 - Disc Herniation
 - Spinal Stenosis
 - Spondylolisthesis
- Observational and Randomized Groups
 - SF-36 Bodily pain and physical function
 - Oswestry Disability Index

SPORT Study

- Spinal Stenosis
 - Clinical improvement in bodily pain, physical function, and ODI at 3 months in surgical patients
 - Outcome maintained at 2 years
- Spondylolisthesis with Stenosis
 - Improvement in all 3 categories at 3 mos in surgical compared to non-surgical patients
 - Increased at one year and maintained to 2 year follow up

SPORT Summary

- Initial treatments remain non-operative in neurologically stable
- Surgical options are excellent for those who do not improve
- Lifestyle considerations are extremely important on patient by patient basis

Degenerative Disc Disease and Low Back Pain

■ Epidemiology

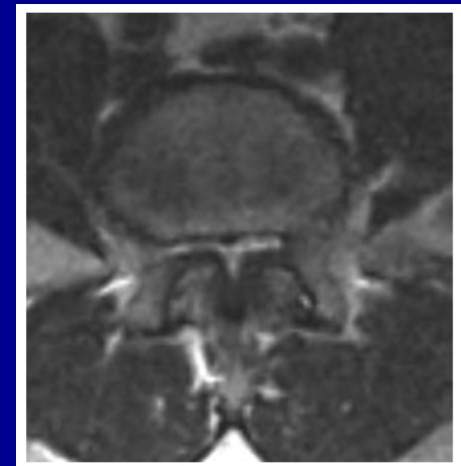
- 70% of people have major episode of back pain
- DDD is leading cause of disability in adults in US
- Health care cost estimated over \$34 billion
- Another \$16 billion due to disability
- 50-65% of all fusions are performed due to DDD

Degenerative Disc Disease

- Pain worse with activity
- More back than leg pain
- NSAIDs
- Therapy
- Surgery is last line
- Fusion is gold standard treatment
 - Mixed results 70% success with 1 level
 - 60% 2 level

Facet Arthropathy

- Arthritic Changes of joints
- Secondary to disc degeneration
- Pain with Activity
- Low back pain
- Can extend to buttocks



Herniated Disc

- Mostly 30-50 year olds
- Mostly leg pain
- May have numbness or weakness
- Pain can be severe and unrelenting
- NSAIDs
- Injection
- Discectomy
 - Excellent success rates 90-95%

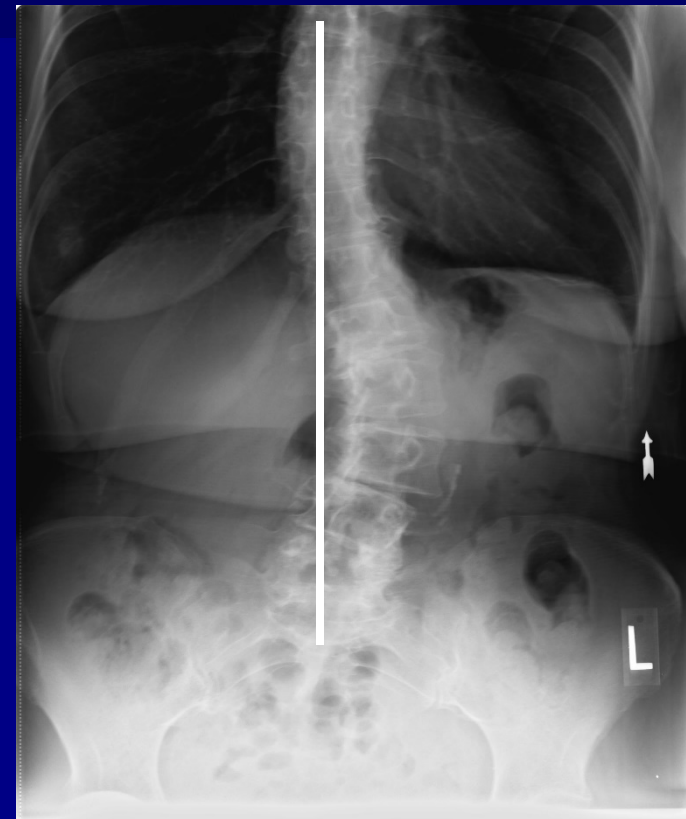
Spondylolisthesis

- Back/Leg pain
- Worse with extension
- Disc and facet degeneration
- Women more common
- NSAID's
- PT
- Injections
- Surgery



Spine Deformity/Scoliosis

- Degenerative
- Idiopathic
- Instability
- Progression?



Compression Fractures

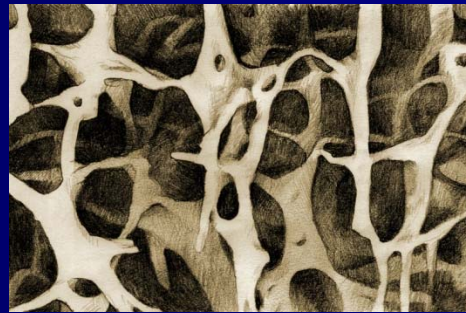
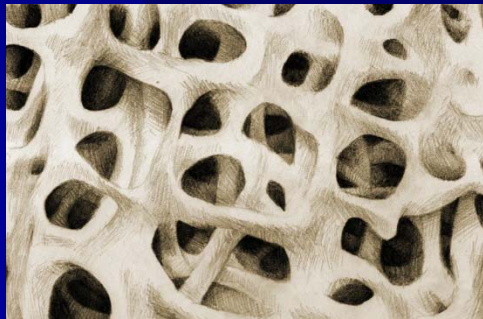
- Osteoporosis
- Kyphosis

Osteoporosis Definition

- Quantative bone disease
- Not a Qualitative problem (normal make-up, just less bone)

- Primary Osteoporosis
 - Type I
 - Post-menopausal
 - Type II
 - Senile (over 70)

- Secondary Osteoporosis
 - Corticosteroid use
 - Endocrine disorders
 - Renal disease



Risk Factors for Osteoporosis

■ Others

– Age

■ Independent of bone density

– Low body weight

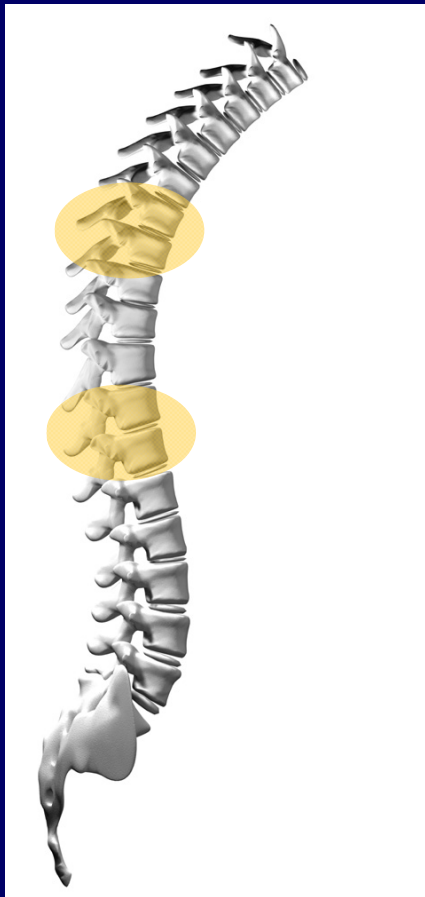
– Caucasian

– Recent weight loss

– Family history

– History of smoking, caffeine,
alcohol

Location of Vertebral Fractures



- Are most commonly located at the midthoracic region (T7–T8) and the thoracolumbar junction (T12–L1)¹
 - Midthoracic region–thoracic kyphosis is most pronounced and loading (stress) during flexion is increased
 - Thoracolumbar junction–the relatively rigid thoracic spine connects to the more freely mobile lumbar segments²
- Correspond to the most mechanically compromised regions of the spine

Medical Management- Prevention

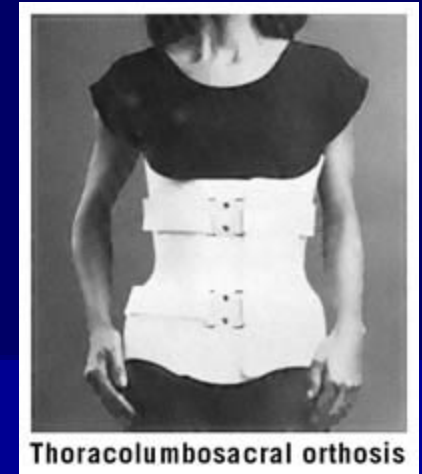
- Most important principle: **PREVENTION!**
- Identifying risk factors
- Early counseling and education
- **Weight bearing exercise**
- Smoking cessation
- **Early calcium and Vit D supplementation**
 - 400 IU Vit D QD
 - 1500 mg Calcium QD
- Fall prevention
- **SCREENING!**
 - DEXA Scan

Treatment Goals Post VCF



- Early mobilization
- Pain control
- Deformity prevention
- Resumption of normal activities
- Independent ADL's

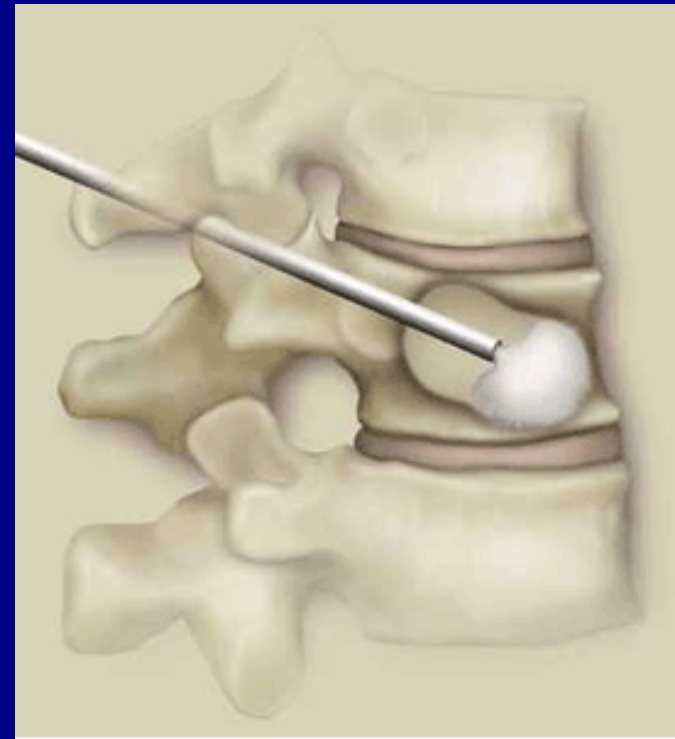
Interventional Treatments



- Bracing / Activity Modification
 - Hyperextension to help prevent deformity
 - No evidence bracing prevents deformity
 - Pain control
 - Allows mobilization
- 8-12 weeks or until pain resolves
- Occasionally poorly tolerated in the elderly
- Followed by rehabilitation
 - Fall prevention
 - Back extension exercises

Operative Treatment

- Surgical Indications
 - Persistent pain
 - Progressive Deformity
 - Functional limitations
 - Loss of mobility
- Options
 - Minimally invasive
 - Vertebral Augmentation
 - Kyphoplasty
 - Vertebroplasty
 - Open
 - Progressive neurologic deficit
 - Significant deformity
 - Unrelenting pain

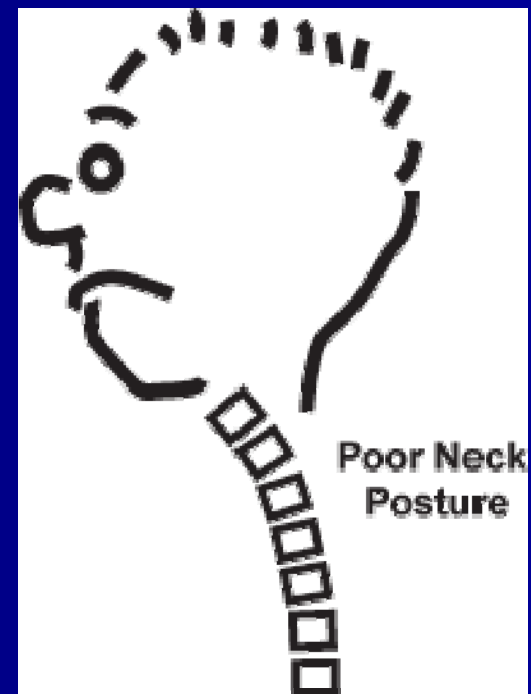


J.L. post-op



Neck Pain-Outline

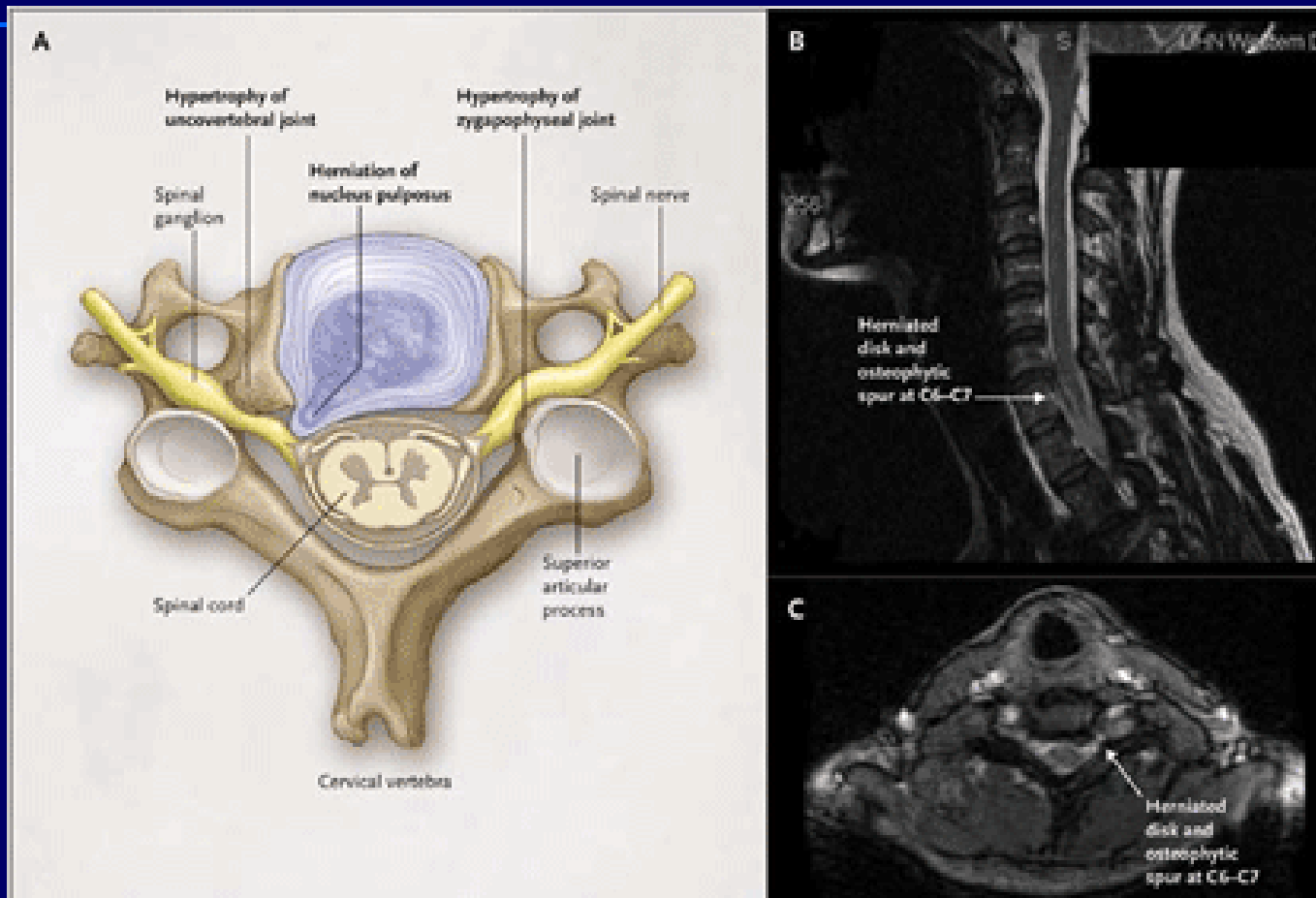
- Axial Neck Pain
 - Muscular strain/sprain
 - Facet injury
 - Discogenic pain
 - C4 Radiculopathy
 - Non- Organic Pain
 - Job, family, psych
- Radiculopathy
 - Disc Herniation
 - Cervical Spondylosis
- Myelopathy
- Fracture



Neck Pain

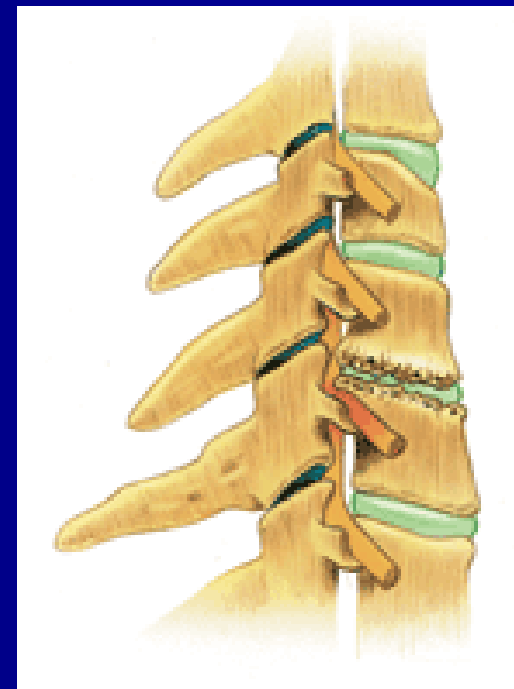
- Need to establish a diagnosis or pain generator!
 - History
 - Exam
 - Diagnostic Studies

Neck Pain



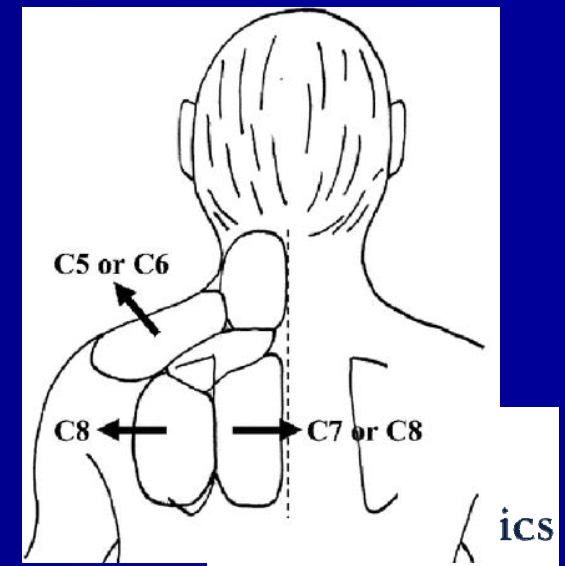
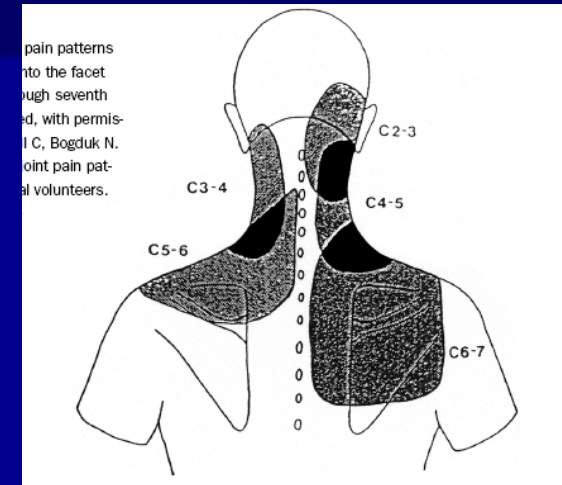
Cervical Disk Disease Pathophysiology

- Decreased ability to support load
 - Load transferred to facet, uncovertebral joints
 - Osteocartilaginous overgrowth (Wolff's Law)
- Disk height decreases
 - Ligamentum flavum becomes redundant
- Loss of normal cervical lordosis
 - Postural pain/Muscle strain



Neck Pain Presentation

- Multiple factors may complicate diagnosis of Neck and Arm Pain
 - Axial neck pain from DDD
 - Pain pattern may be obscured by facet symptoms
 - Axial/Scapular pain patterns may be caused by direct nerve root compression Tanaka, et al Spine 2006



Cervical Radiculopathy Imaging

- Who gets imaging and when



Neck Pain

Plain films

- AP and lateral
 - Assess overall alignment and spondylosis
 - Exclude structural lesions, deformity
- Flexion-extension
 - Angular or translational instability
 - Can normal lordosis be achieved?
- Obliques
 - Neural foramina, facets
- Swimmer's
 - cervicothoracic junction



- Disc and foraminal narrowing is a poor predictor of nerve root or cord compression (55% PPV)

Pyhtinen, et al. Neuroradiology

Neck Pain Imaging

■ MRI Indications-Early

- Symptoms of myelopathy
- Red Flags
 - Tumor
 - Infection
- Progressive Neurological Deficits
- Functional Neurological Deficits

■ Overly sensitive



– Patient Symptomatic X 4-6 weeks

- High frequency for asymptomatic abnormalities
- 57 % Disc herniation or bulge
- 26% Cord impingement
- 7% Cord compression

Teresi, et al. Radio

Cervical Radiculopathy

Electrodiagnostic studies

- Abnormal insertional activity within 3 weeks
 - Positive Sharp Waves
 - Fibrillation Potentials
 - Paraspinal EMG increases sensitivity
 - Changes at 10 days
 - differentiates radiculopathy from brachial plexopathy
- Positive EMG may predict surgical outcomes (Alwari, ESJ 2006)
 - + EMG better outcomes (p=0.001)



Cervical Radiculopathy Diagnostic Injections

- SNRB can identify areas of question from exam or MRI
- 91 patients + SNI
 - 91% Good outcome
- 10 patients – SNI
 - 60% Good outcome

Sasso, et al. JSDT 2005



Neck Pain

- Whiplash injury
 - Deceleration injury
 - Muscular disruption
 - Facet joint injury
 - Capsular stretch
 - Synovial injury
 - Cartilage damage
 - Disc mediated pain



Neck Pain

■ Acute Phase

- PT to restore mobility, strength
 - Modalities as needed
 - Spinal manipulation unproven
- Should resume activity as soon as possible
- NO COLLAR!

■ Chronic Pain

- ROM, strengthening
- Anterior, Posterior, Interscapular muscles
- Body Mechanics for work and ADLs

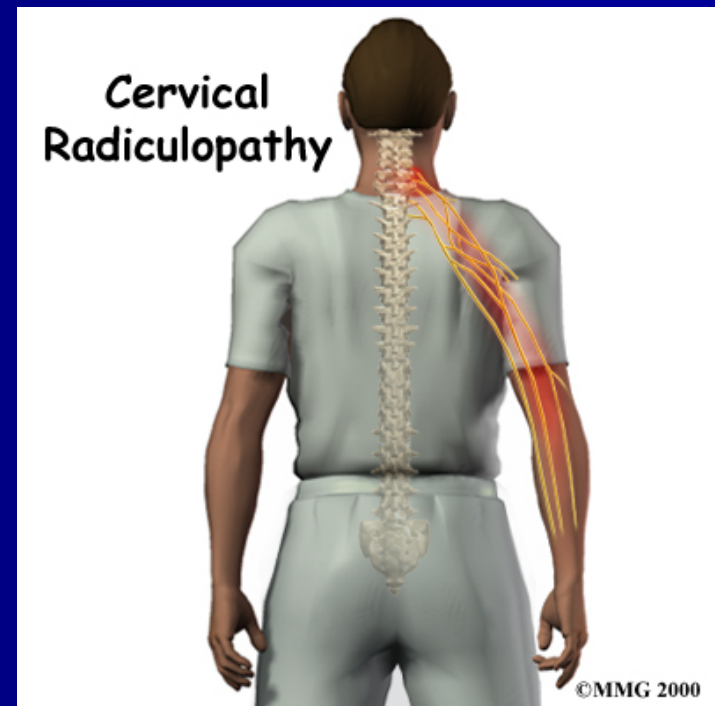
Neck Pain

- Treatment
 - Reassurance/Education
 - NSAIDs
 - Analgesics
 - Relaxants
- Facet Blocks/RFA
- ESI/Trigger point injection
 - Unproven
- Surgery
 - Cervical Discogram??



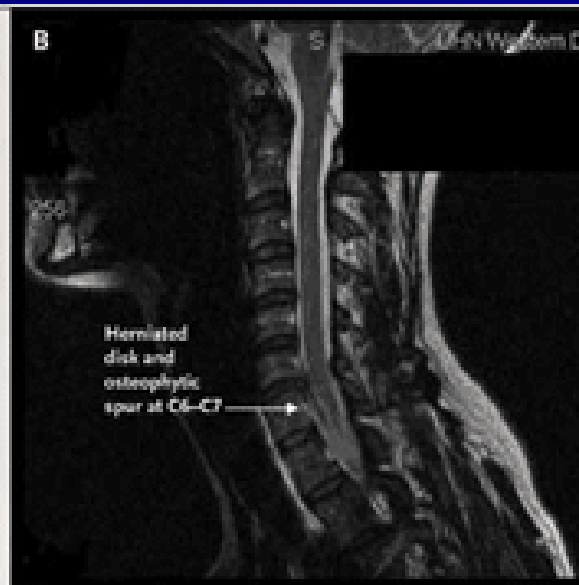
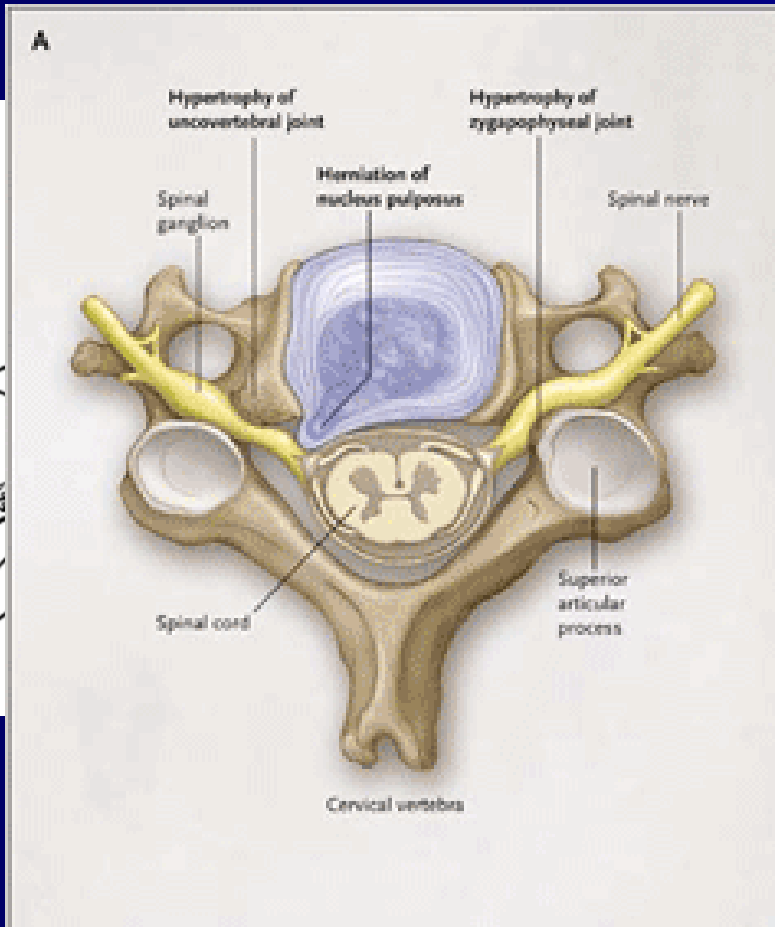
Cervical Radiculopathy Presentation

- 736 Patients
 - 99.4% Arm Pain
 - 85% Sensory deficit
 - 80% Neck pain
 - 68% Motor deficit
 - 52% Scapular pain
 - 18% Chest pain
- 80% neuro deficit corresponded with offending disc level



Henderson, et al. NSurg, 1983

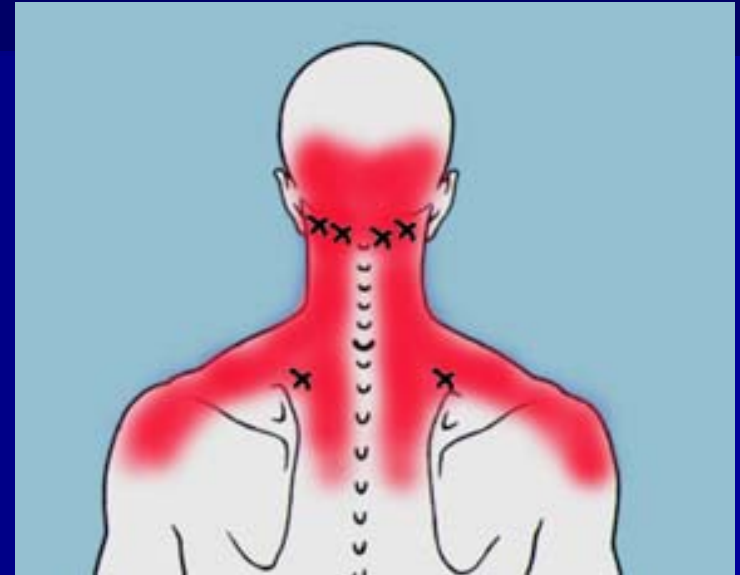
Cervical Radiculopathy Pathophysiology



Cervical Radiculopathy

Differential Dx

- Peripheral entrapment syndromes
- Rotator cuff/shoulder pathology
- Brachial plexitis
- Herpes zoster
- Thoracic outlet syndrome
- Sympathetic mediated pain syndrome
- Intraspinal or extraspinal tumor
- Epidural abscess
- Cardiac ischemia



Cervical Disk Disease

Non-Operative management

- Physical therapy
 - Isometric exercises 1st
 - No early aggressive ROM
 - Modalities
 - Brace wear
- Traction
 - 78% Success rate
- May relieve radicular symptoms
(Joghataei, et al. Clin Rehab. 2004)
 - Traction + PT vs. PT alone for C7 Radiculopathy
 - Grip strength increased early in traction group
 - Late result with similar improvements between groups



Cervical Radiculopathy

Non-Operative management

- Oral meds
 - NSAIDs
 - steroids
 - narcotics
- Selective root blocks, ESIs
 - Diagnostic and therapeutic potential (60% long term relief)
 - Risks of injection into stenotic canal



Cervical Radiculopathy

Non-Operative management

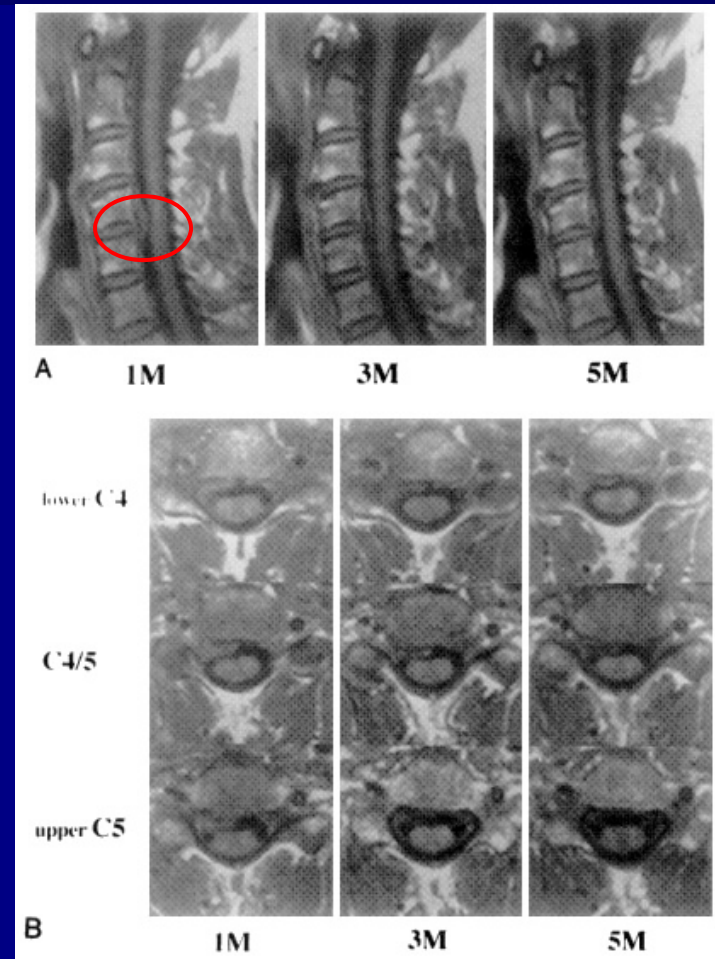
- Retrospective reports of significant pain reduction
 - 2/3 with 6 mos pain relief
- TFESI vs. Local Anesthetic (Anderberg et al. ESJ 2006)
- 40 patients (PRCBT) with isolated radiculopathy
 - No difference between groups
 - 30% relief at 3 weeks from injection



Cervical Disk Disease

Non-Operative management

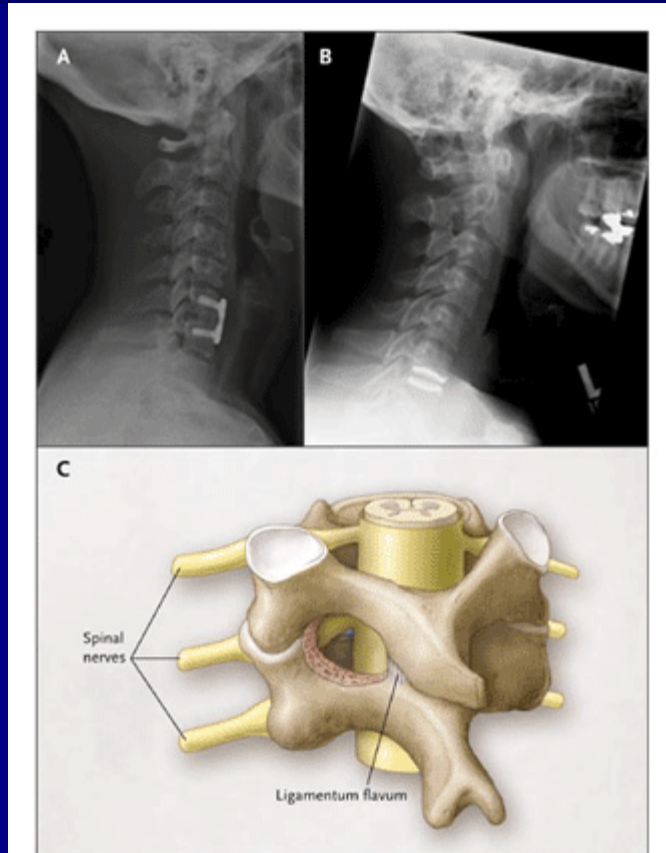
- Resolution of disc with conservative care
- Traction and steroid injection may help, but not proven



Cervical Radiculopathy

Surgical indications

- Persistent radicular sx unresponsive for 6 weeks
 - Disabling motor weakness
 - Progressive deficit
 - Static neuro deficit with radicular pain
 - Instability with radicular symptoms



Cervical Radiculopathy

Surgical management

- Optimal Timing of Surgery is UNKNOWN
- Generally NOT neck pain alone
 - Fusion success rates only 60-70%
 - Painful foci at other levels, facets, etc.
- Radiculopathy resistant to non-operative management
 - >90% success

Cervical Radiculopathy

Operative vs. Non-Operative

- Surgical success widely 85-90% success
- 81 Patients (Persson et al. Spine 1997)
 - Surgery Rx
 - Sig. less pain at 3 months
 - 42% VAS reduction
 - Non-surgical Rx
 - PT (18% VAS reduction)
 - Collar (2% VAS reduction)
- At one year no difference in pain, function, or mood outcomes

Cervical Radiculopathy

Anterior vs. Posterior Surgery

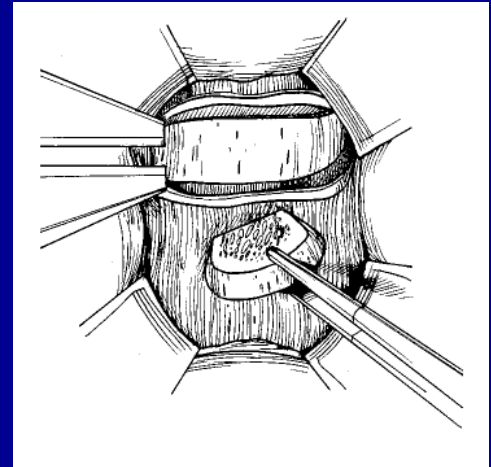
Characteristics of ACDF and Posterior Laminoforaminotomy

ACDF

- Good visualization of pathologic changes
- No manipulation of neural elements
- Access to central and lateral lesions
- Indirect decompression and enlargement of the neural foramen
- Stabilization of the cervical motion segment

Posterior laminoforaminotomy

- No need for fusion
- No complications of attempted fusion
- Postoperative cervical immobilization unnecessary
- Direct decompression of neural elements



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Cervical Disk Disease

Arthroplasty outcomes

- Bertagnoli 2005
 - 1 year Pro-Disc-C followup, 16 pts
 - Significant maintained improvement in disability score, neck & arm pain
- Sekhon 2005
 - Average 2 year Bryan prosthesis f/up, 24 disks
 - All with good outcomes (VAS improvement)
 - No difference in Oswestry Neck pain scores

Thank You!



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