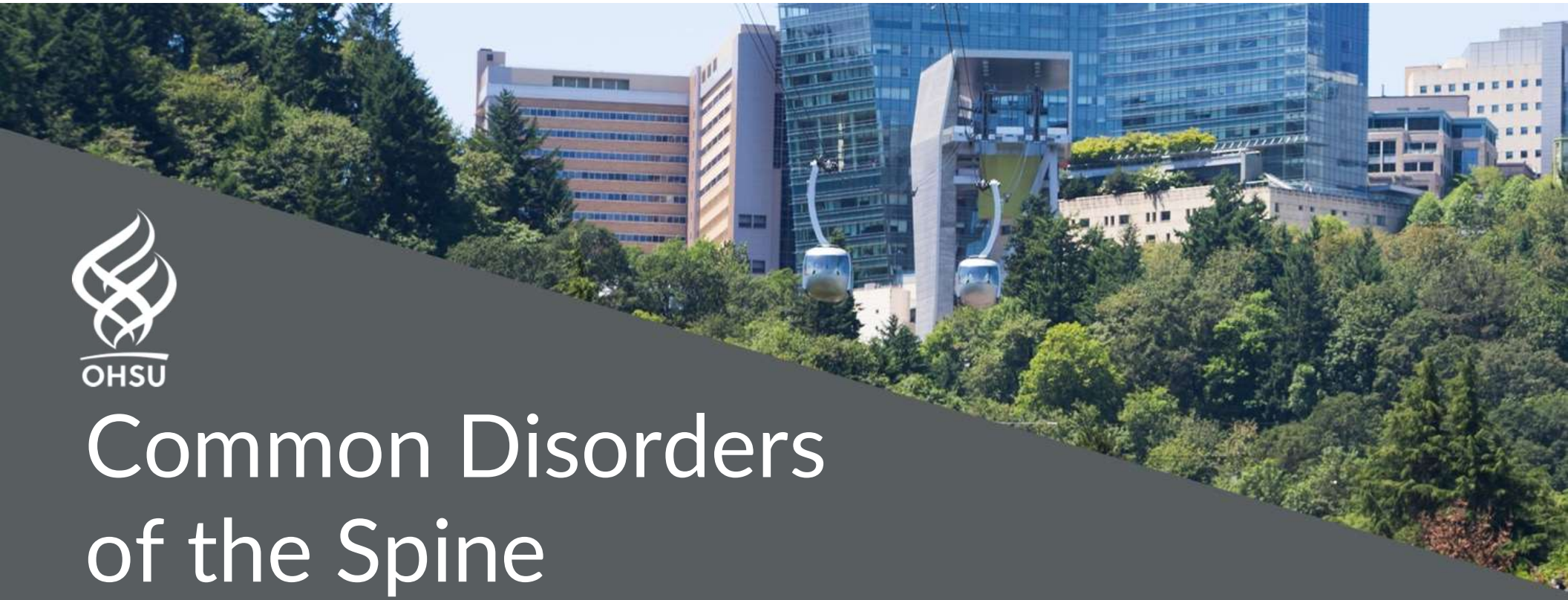


Common Disorders of the Spine

Travis Philipp MD
Assistant Professor
Orthopaedic Spine Surgeon
Oregon Health and Science University, Portland OR

Disclosures

- No relevant commercial relationships to disclose

Learning Objectives

- At the conclusion of this session, participants should be able to:
  1. Describe the natural history and initial treatment of mechanical low back pain
  2. Know the components of a lumbar spine exam
  3. Be able to identify where a nerve may be getting compressed based on symptoms
  4. Describe the symptoms of neurogenic claudication

  ---

  1. Know the components of a cervical spine exam
  2. Be able to identify cervical myelopathy

Topics:

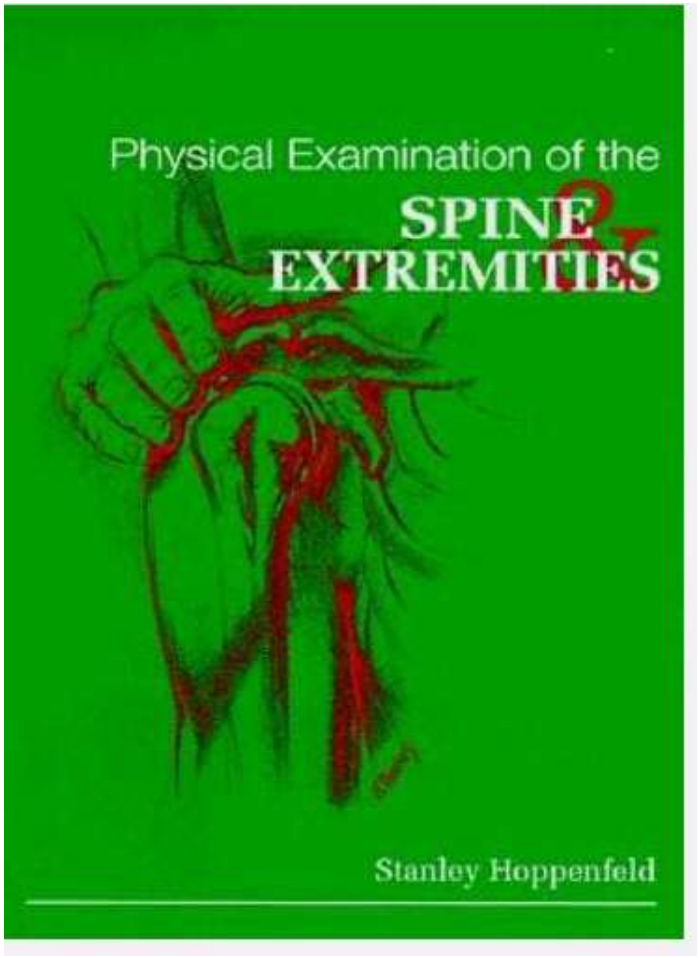
1. Back Pain
2. Hip Pain vs Back Pain
3. Lumbar Stenosis and Radiculopathy
4. Lumbar Stenosis and Neurogenic Claudication
5. Cauda Equina Syndrome
6. Cervical Spine – Radiculopathy and Myelopathy

Patient 1

- 40-year-old roofer presents with complaints of axial back pain, no radiation into the legs. No inciting event, rather gradual onset.

Patient 1 - Exam

- Pain with forward flexion past 30 degrees, feels better with extension
- Mild pain to palpation along the paraspinal muscles
- Motor and sensory intact in the lower extremities
- Normal reflexes
- Full hip ROM without pain



Next Steps

Imaging?

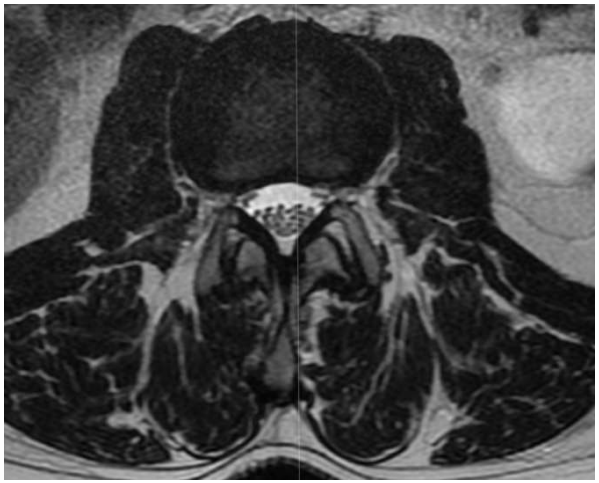
Medications?

Physical therapy?

Surgery?

I: Back Pain:

- Mechanical low back pain: Refers to back pain that arises intrinsically from the spine, disks, facets or surrounding tissues.
- Patients will often characterize their pain as a deep dull ache in the lower lumbar region, can be exacerbated by rotation, flexion or bending. May be relieved with rest.



I: Back Pain

- Is common
  - 60-80% of adults can expect to experience low back pain at some point during their lifetime.
  - Back pain occurs with equal frequency in men and women, ages 35-55 are the most commonly effected
  - The annual incidence of back pain in adults is 15% with a point prevalence of 35%
  - By the age of 30, half of adults will have experienced a significant episode of low back pain

I: Back Pain

- The good news
  - 80-90% of these episodes resolve within 6 weeks regardless of the type of treatment
- The bad news
  - 2-3% of the working population are on permanent disability for LBP
  - ~2% of the working population are on temporary disability for LBP
- The ugly news
  - Only 20% of patients still on disability after 1 year will ever return to work
  - Only 2% of patients return after 2 years
  - The strongest predictive factor for a new episode of low back pain is a previous episode of low back pain.

I: Back Pain: A Significant Public Health Problem

- Health care utilization is skewed with 25% of cases of back pain accounting for more than 75% of the costs.
- Workers compensation claims cost more than $20 billion dollars annually
- The total health care expenditures incurred by patients with back pain in the US reached nearly $91 billion dollars in 1998

I: Back Pain

- Acute: Typically, can be associated with a specific inciting event
  - Lasts < 12 weeks
  - 90% of subjects cease to pursue consultation about symptoms within 3 months of onset
- Chronic:
  - > 12 weeks in duration
  - Often has associated social and psychologic factors contributing

I: Back Pain – Acute

- Mechanical Disorders:
  - Muscle strain vs. Disc Herniation
  - Muscle Strain:
    - Acute back pain limited to the lumbosacral area without radiation to the legs
    - Limited ROM with Para spinous muscle contraction/spasm
    - 90% back to baseline at 12 weeks
  - Disc herniation:
    - Will also have radicular pain that travels down the leg in the anatomic distribution of the compressed nerve.

I: Back Pain: Initial Workup

- History and physical exam
  - Need to identify any red flags that may warrant more urgent workup or referral
  - If negative for red flags no need for additional workup at that time as 90% of cases of acute LBP will improve in 1 month
- Persistent symptoms after 4-6 weeks of conservative treatment obtain plain x-rays; you can also obtain basic labs

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An initiative of the ABIM Foundation

ABIM FOUNDATION

AMERICAN ACADEMY OF FAMILY PHYSICIANS

Recommendation	Organization
Do not perform imaging for low back pain in the first six weeks unless red flags are present. Red flags include, but are not limited to, severe or progressive neurologic deficits or suspected serious underlying conditions such as osteomyelitis.	**American Academy of Family Physicians and American College of Physicians**
Do not recommend advanced imaging (e.g., magnetic resonance imaging) of the spine within the first six weeks in patients with nonspecific acute low back pain in the absence of red flags.	**North American Spine Society**

I: Back Pain: History Red Flags

Cancer
History of Cancer
Unexplained weight loss
No relief at rest or lying down
Night Pain

Fracture
Known osteoporosis or osteopenia
History of chronic steroid use
DISH or Ankylosing Spondylitis
Trauma

Infection
Fevers
IV drug use
Recent known infection
Previous spine surgery
Immunosuppressed

Cauda Equina Syndrome or Spinal Cord Injury
Progressive limb weakness
Progressive balance deficit
Bowel or bladder dysfunction
Numbness or paresthesia's in the perineum or saddle anesthesia

I: Back Pain: History Yellow Flags

- It is also important to evaluate the social and psychological situation of the patient
- The presence of 1 or more of these factors is a predictor of poor outcome and chronic pain and disability with back pain.

Occupational Factors
Poor perception of work environment
Poor job satisfaction
No light duty alternatives
Lower level of education
Physically demanding work
Extensive time off of work

Medical Factors
High levels of comorbidities
Widespread pain
Prior episode of severe back pain
Poor sleep
Severe radiating limb pain

Psychosocial Factors
Catastrophizing
Passive coping style
Depression
Anxiety
Somatization
Fear avoidance beliefs
History of abuse
Social withdrawal
History of substance abuse
Psychological distress
Self perception of poor health

I: Back Pain: Imaging

- In the absence of red flags or symptoms of radiculopathy or neurogenic claudication start with x rays of the spine

I: Back Pain - Imaging

DDD ≠ Pain

Abnormal Magnetic-Resonance Scans of the Lumbar Spine in Asymptomatic Subjects

A Prospective Investigation*

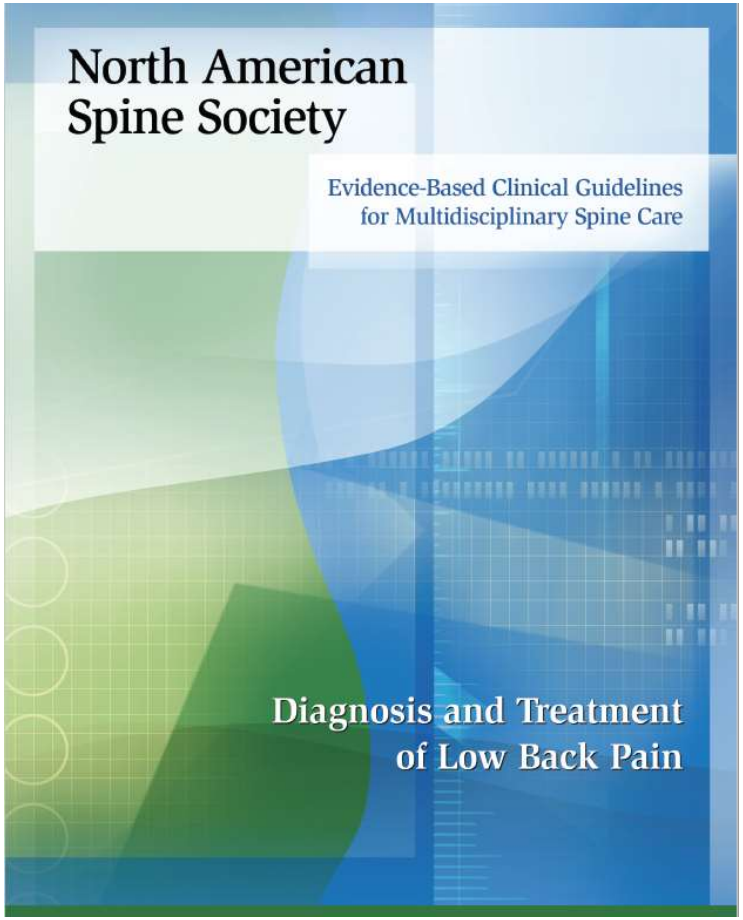
BY SCOTT D. BODEN, M.D.†, DAVID O. DAVIS, M.D.†, THOMAS S. DINA, M.D.†, NICHOLAS J. PATRONAS, M.D.‡, AND SAM W. WIESEL, M.D.§, WASHINGTON, D.C.

From the Departments of Orthopaedic Surgery and Radiology, George Washington University Medical Center, Washington

- Most patients will have some findings on an MRI
  - 36% of asymptomatic patients age 20-39
  - 93% of asymptomatic patients age 60+

I: Back Pain - Treatment

- Acute: Non Operative Management



I: Back Pain - Treatment

Recommendation	Grade of Recommendation
Cognitive behavioral therapy in combination with physical therapy, compared to physical therapy alone, is suggested to improve functional outcomes (disability) and return to work in patients with low back pain	B
Use of IV or Oral Steroids is not effective	B
It is suggested that the use of opioid pain medications should be cautiously limited and restricted to short duration for the treatment of low back pain.	B
Topical capsicum is recommended as an effective treatment for low back pain on a short-term basis (3 months or less).	**A**
It is suggested that the use of heat for acute low back pain results in short term improvements in pain.	B
For patients with acute low back pain, spinal manipulative therapy (SMT) results in similar outcomes to no treatment, medication or modalities. Periodically, short-term improvement is statistically better, but clinical significance is uncertain.	**A**
For patients with acute low back pain, it is suggested that advice to remain active within limits of pain compared to short periods of bed rest from 3 to 7 days all result in similar outcomes in pain and function at short- and medium- term follow-up.	B
In the long term, it is suggested that the addition of massage to an exercise program provides no benefit when compared to an exercise program alone.	B
Aerobic exercise is recommended to improve pain, disability and mental health in patients with nonspecific low back pain at short-term follow-up.	**A**

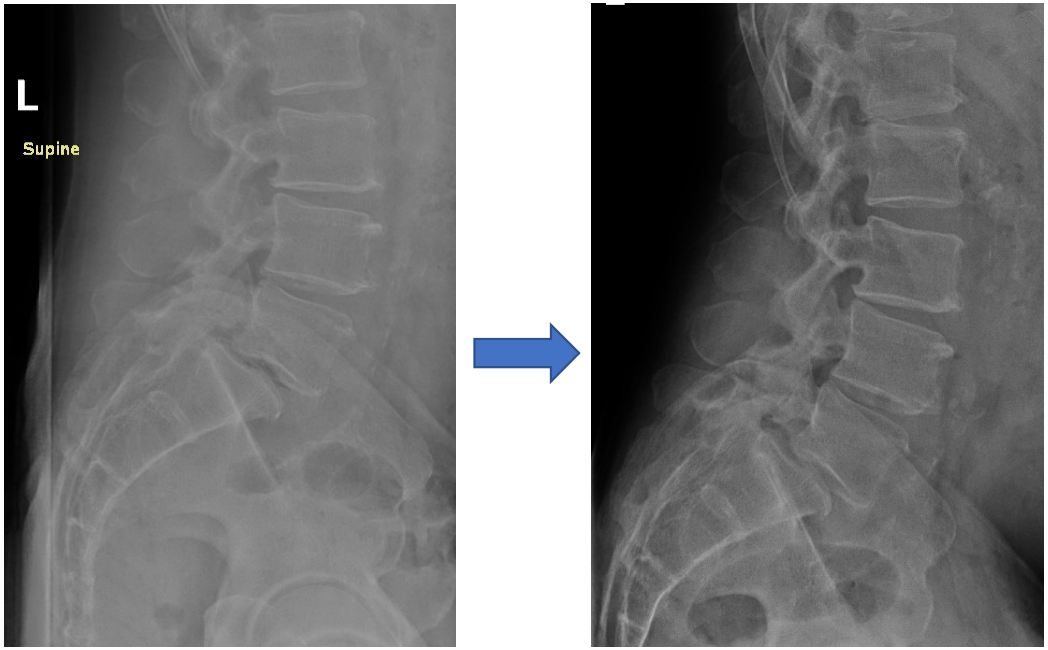
I: Back Pain – Treatment

- Acute:
  - Exercise as tolerated- encourage continued aerobic activity
  - Topical Capsicum, Ice, Heat
  - NSAIDs if able to tolerate, Tylenol if not
  - Reassurance!
  - Make sure any underlying depression or anxiety is addressed
  - CBT if yellow flags

I: Back Pain – Treatment

Operative Treatments:

- **Spondylolisthesis (instability)**
- Deformity
- Fracture
- Infection



I: Back Pain – Treatment

Operative Treatments:

- Spondylolisthesis (instability)
- **Deformity**
- Fracture
- Infection

The Impact of Positive Sagittal Balance in Adult Spinal Deformity

Steven D. Glassman, MD,* Keith Bridwell, MD,‡ John R. Dimar, MD,* William Horton, MD,§ Sigurd Berven, MD,† and Frank Schwab, MD‖

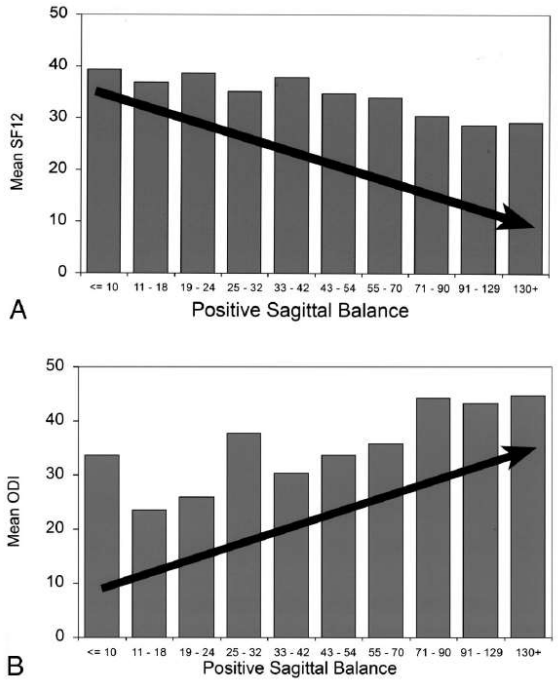
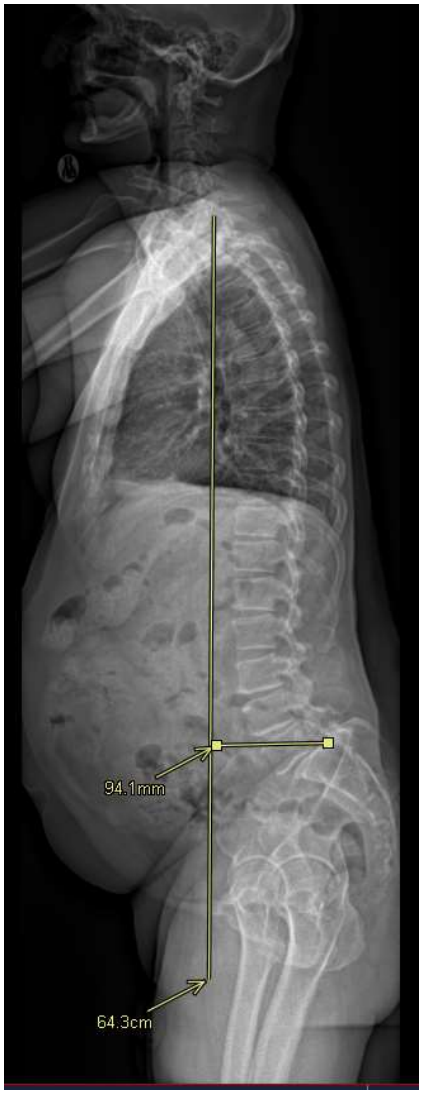


Figure 2. Deterioration in health status measures, including SF-12 physical health composite score (**A**) and ODI (**B**), were shown with progressive positive sagittal balance.



I: Back Pain – Treatment

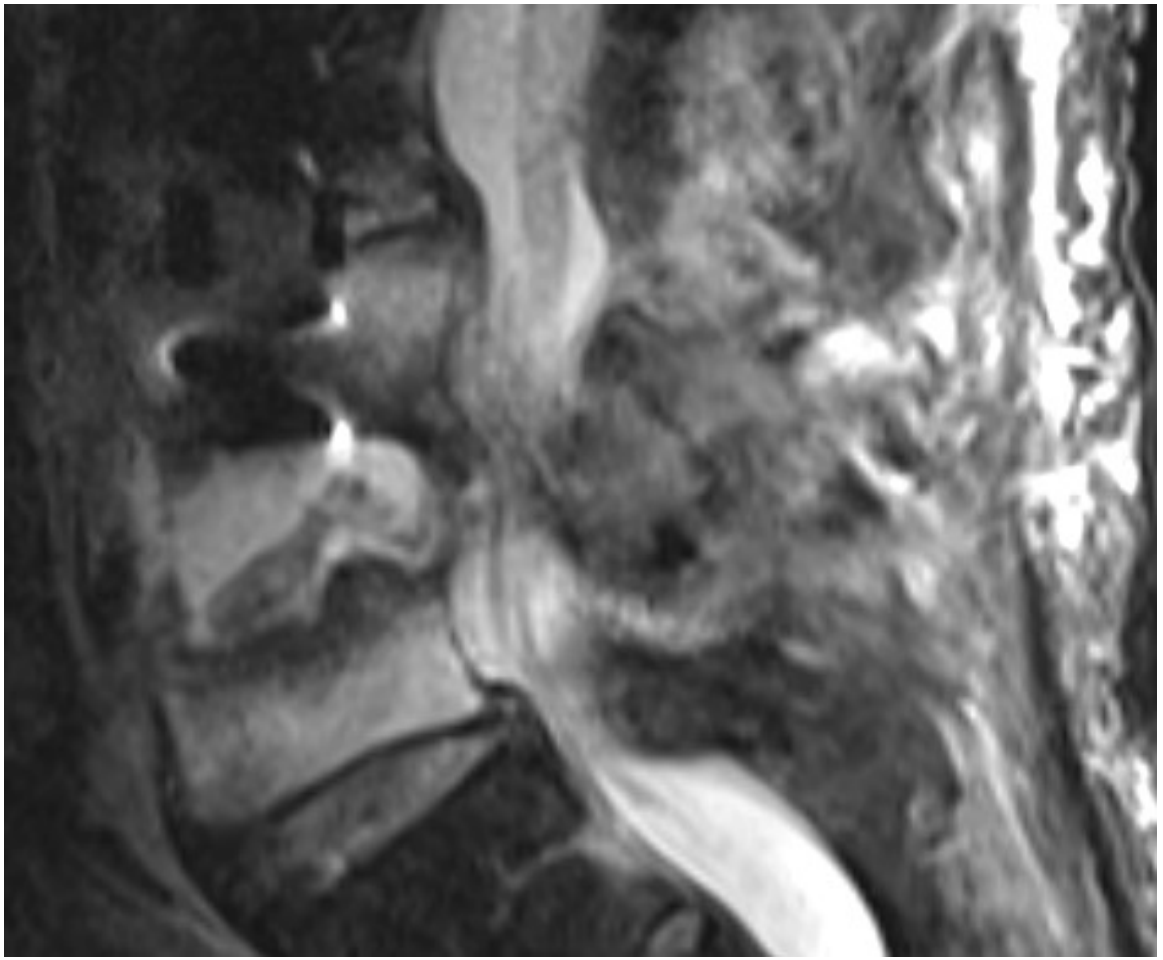
Operative Treatments:

- Spondylolisthesis (instability)
- Deformity
- **Fracture**
- Infection

I: Back Pain – Treatment

Operative Treatments:

- Spondylolisthesis (instability)
- Deformity
- Fracture
- **Infection**



I: Back Pain - Summary

1. Is Common!
2. The Majority of Patients Will Improve on their Own
3. Mainstay of Treatment is Non-operative Management
4. Look for Red Flags, accelerate workup if identified
5. There is a large psychological and social component in patients with nonspecific low back pain, especially if chronic

I: Back Pain

Review Question:

A 45 year old patient who works as an ice cream deliveryman has acute onset of low back pain when lifting a 50lbs tub of icecream off of the ground. He had to take the rest of the day off of work and presents to your office the following afternoon. He has no red flag symptoms or radicular symptoms going down his legs. What are the chances he will return to work within 12 weeks of the injury?

- 50 – 60 %
- 40 - 50 %
- 70 - 80 %
- 80 – 90%

I: Back Pain

Review Question:

A 45 year old patient who works as an ice cream deliveryman has acute onset of low back pain when lifting a 50lbs tub of icecream off of the ground. He had to take the rest of the day off of work and presents to your office the following afternoon. He has no red flag symptoms or radicular symptoms going down his legs. What are the chances he will return to work within 12 weeks of the injury?

- 50 – 60 %
- 40 - 50 %
- 70 - 80 %
- **80 – 90%**

II: Hip Pain vs Low Back Pain

- History and physical examination are paramount for teasing out symptoms from either – some patients will have symptoms from both.
- Pain from the back can refer to the hip or knee and pain from the hip can refer to the back

II: Hip Pain vs. Low Back Pain

Hip	Spine
Groin pain, reproduced with rotation and loading	Burning pain, pain in the buttocks or down the leg past the knee
Limited internal rotation	Numbness/ Weakness
Trendelenburg Gait*	Shopping cart sign

II: Hip Pain vs. Low Back Pain

- Trochanteric Bursitis:
  - Patients will often report that they are unable to lay on that side
  - Pain can be reproduced with palpation over the trochanter
  - * pain can travel down the lateral aspect of the thigh to the knee, can be mistaken for L5 radiculopathy

ıess over the bony point of the hip bone.

n, *MC Hubbard (eds.): Essentials of Musculoskeletal Care, ed. 5. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2016, p. 663.*

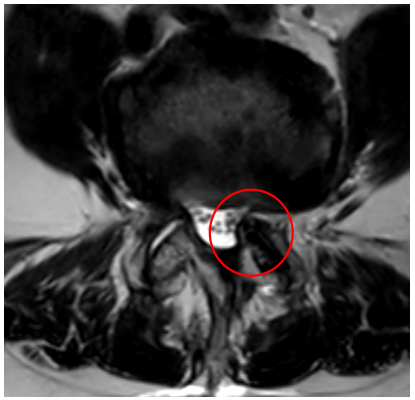
III: Patient 2

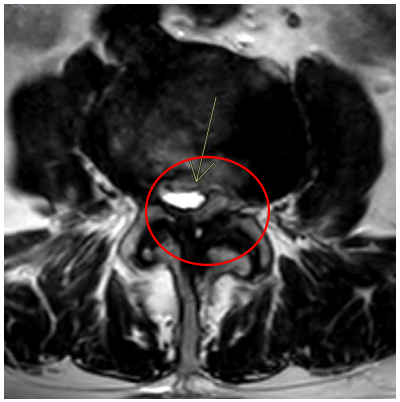
- 45-year-old truck driver who had immediate onset of back and left leg pain after picking up a heavy box from the ground
- Initially presented to urgent care and was given NSAIDs with instructions to follow up with PCP should symptoms persist

- What questions do you want to ask initially?
- How are you going to focus your exam?
- What images do you want?

III: Lumbar Stenosis and Radiculopathy

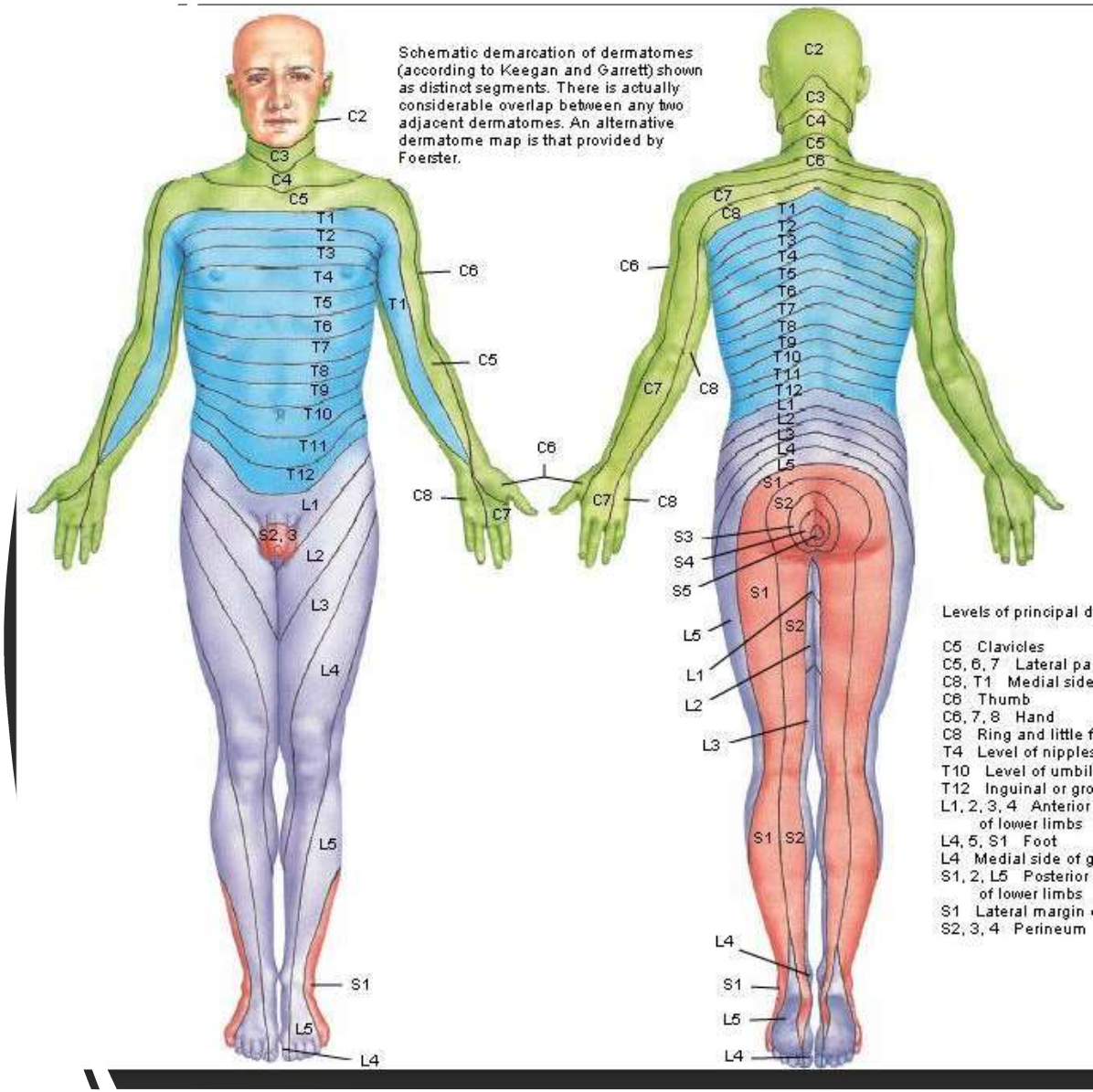
- Stenosis = narrowing
- Etiology can be multifactorial from degeneration of different components of the spine
- Patients with congenital stenosis are more prone to this





III: Lumbar Stenosis and Radiculopathy

- Important to keep in mind your different dermatomes
- Pathology at the nerve root level should follow a dermatomal distribution- different than peripheral nerve compression



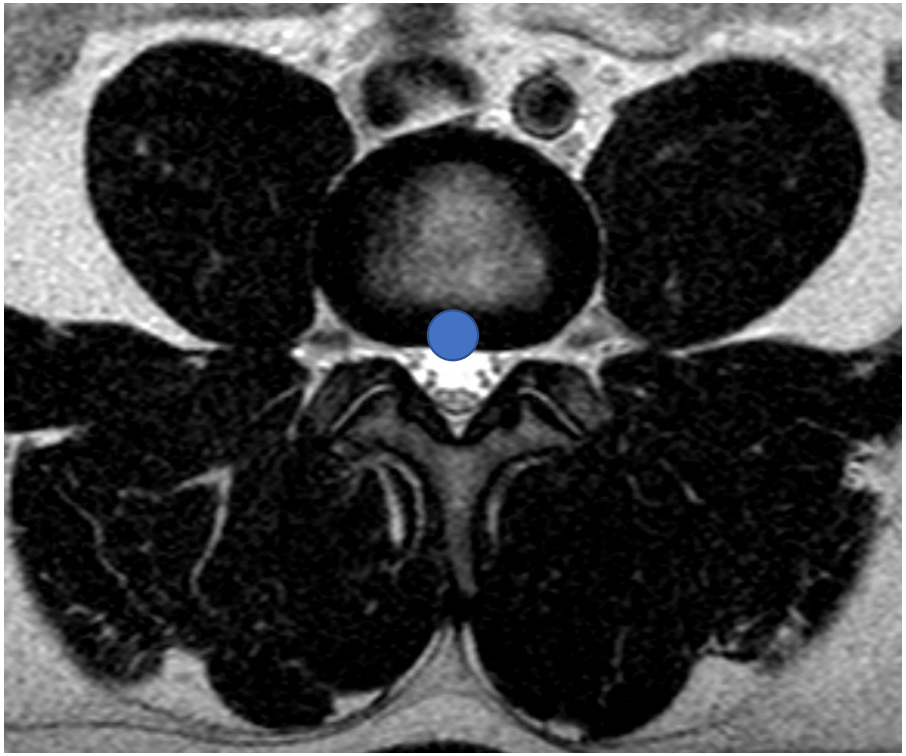
III: Lumbar Stenosis and Radiculopathy

- Disc Herniations:
  - Can be described based on **location**
    - **Central**
    - **Paracentral/Lateral Recess**
    - **Foraminal**
    - **Extraforaminal**

III: Lumbar Stenosis and Radiculopathy

The location of stenosis will determine distribution of symptoms

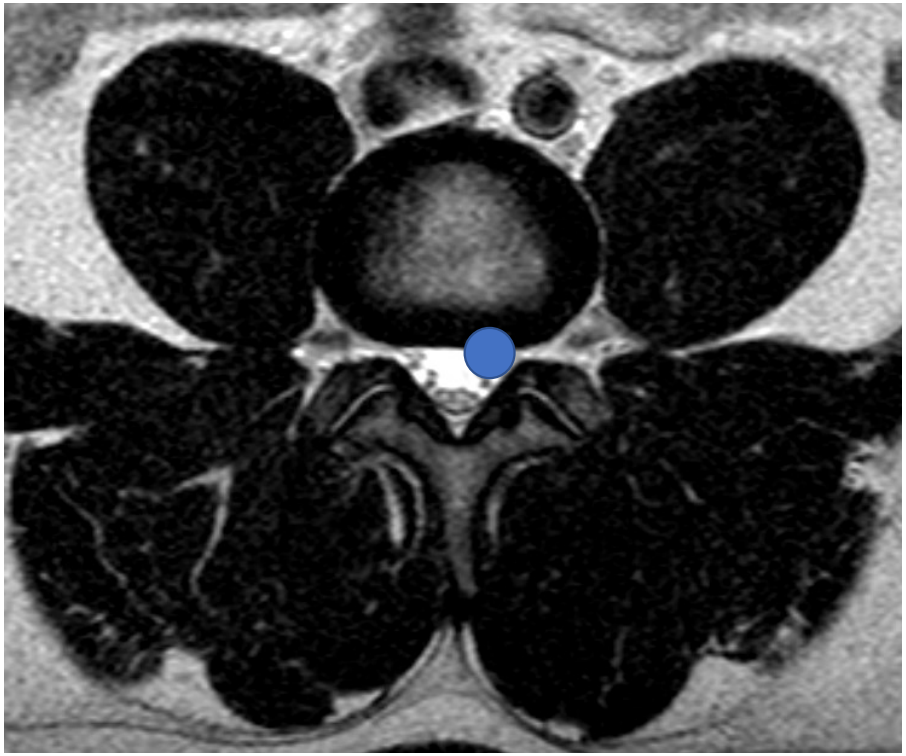
- Central



III: Lumbar Stenosis and Radiculopathy

The location of stenosis will determine distribution of symptoms

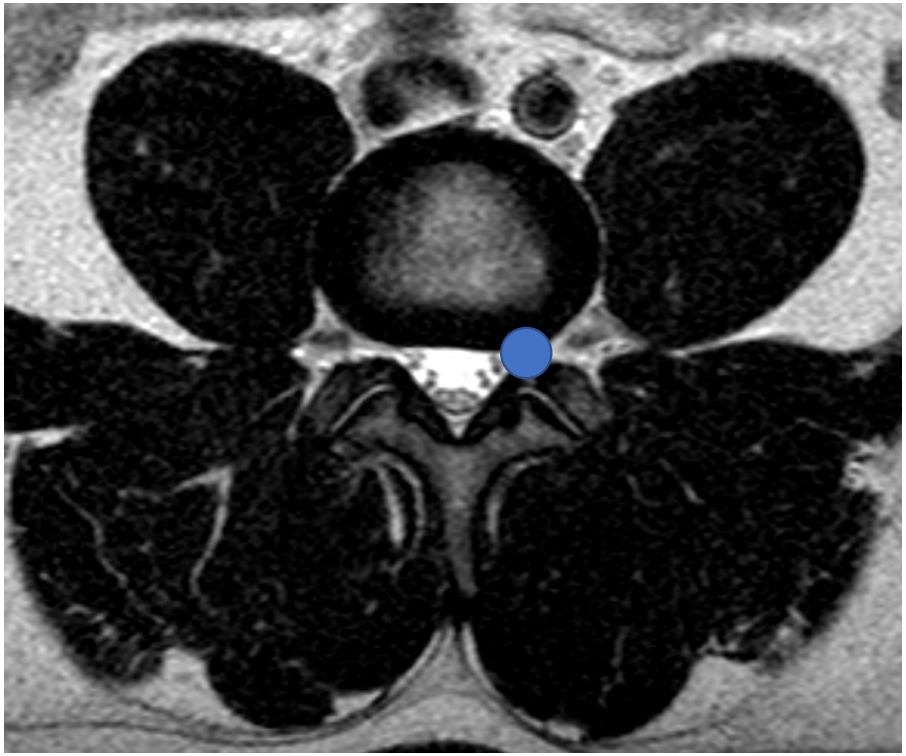
- Paracentral/Lateral Recess



III: Lumbar Stenosis and Radiculopathy

The location of stenosis will determine distribution of symptoms

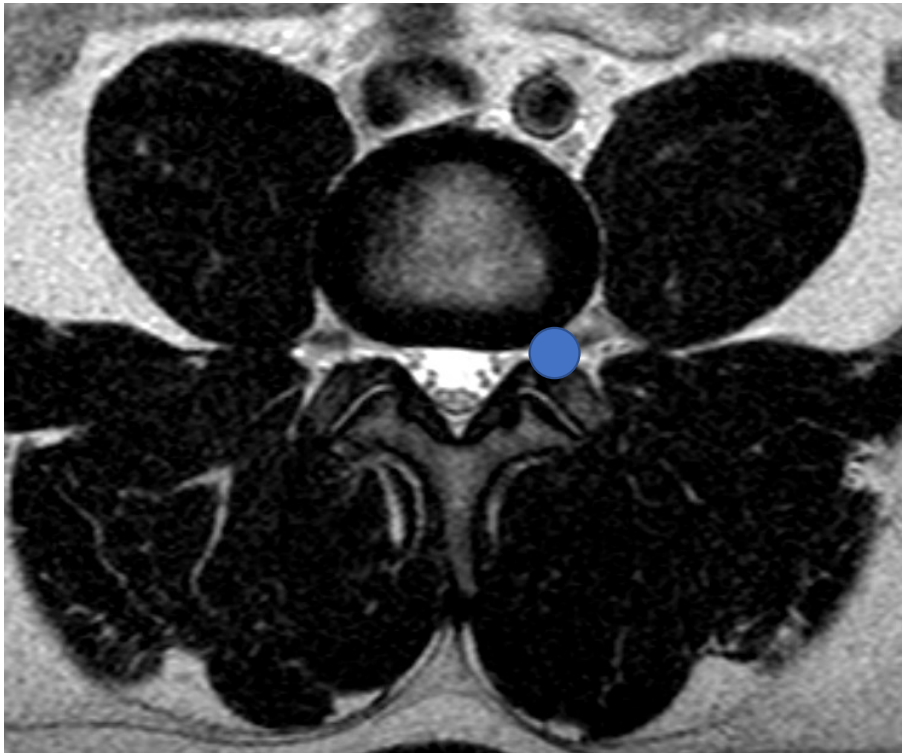
- Foraminal



III: Lumbar Stenosis and Radiculopathy

The location of stenosis will determine distribution of symptoms

- Extraforaminal

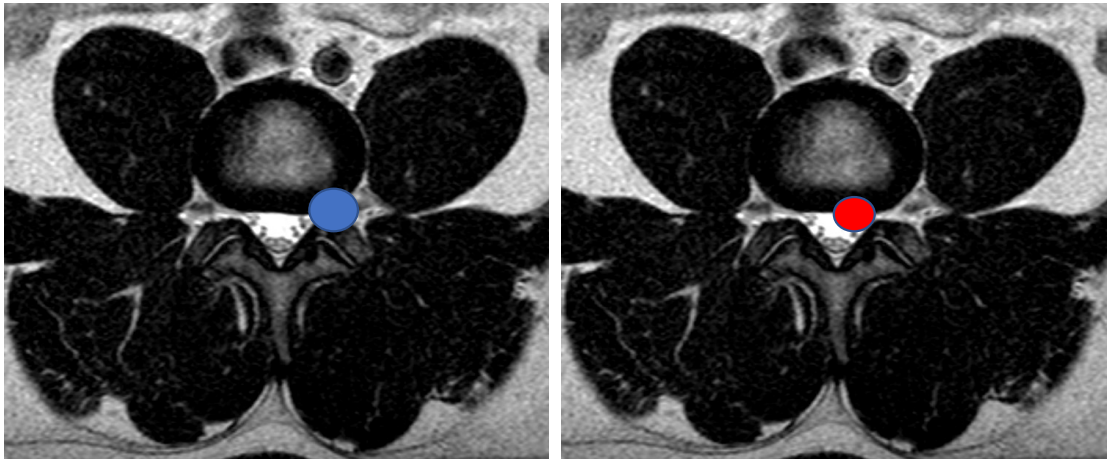


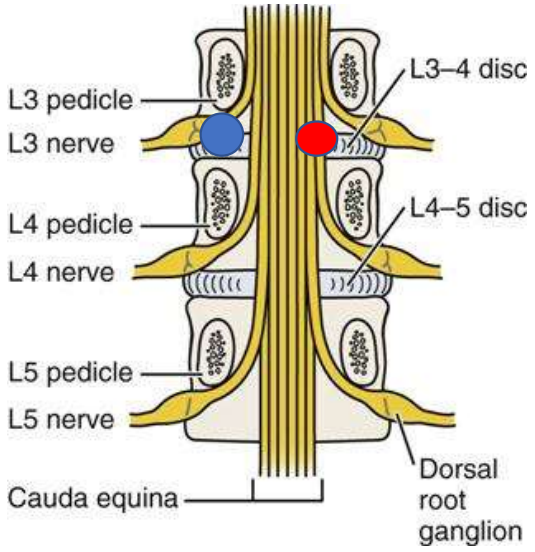
III: Lumbar Stenosis and Radiculopathy

- The location of stenosis will determine distribution of symptoms
  - Up-Down

III: Lumbar Stenosis and Radiculopathy

Important to understand how the site of compression will determine the nerve root effected





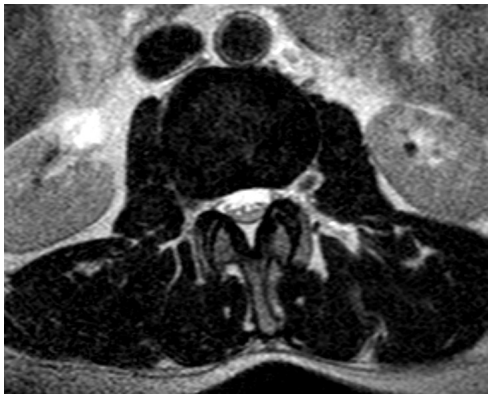
III: Lumbar Stenosis and Radiculopathy

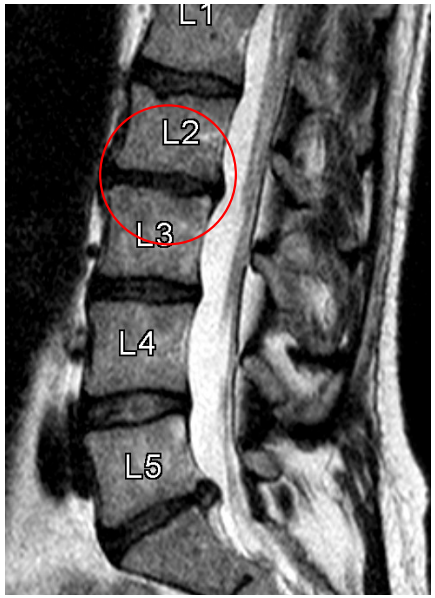
Disc Herniations:

Can be described based on **patho-anatomy**

Bulge

Disc Bulge: annular tissue projects beyond the margins of the vertebral body, circumference > 90 degrees





III: Lumbar Stenosis and Radiculopathy

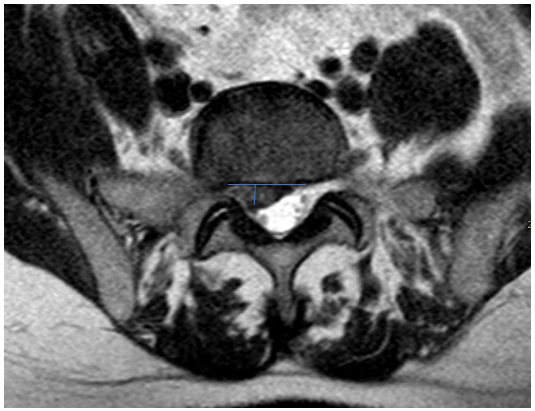
Disc Herniations:

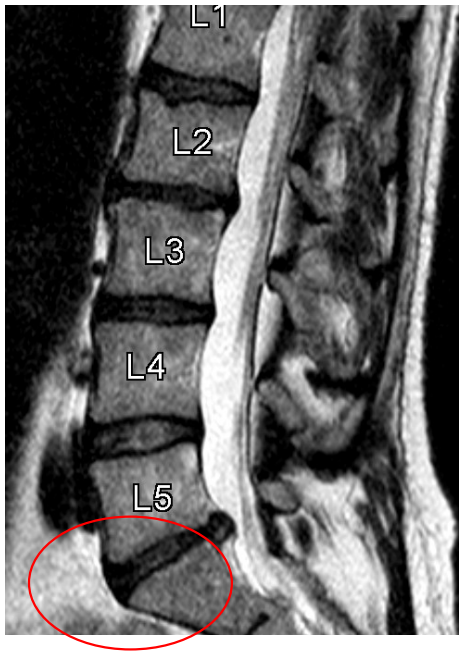
Can be described based on **patho anatomy**

Bulge

Protrusion

Protrusion: base wider than herniation, confined to disc level and outer annulus is intact





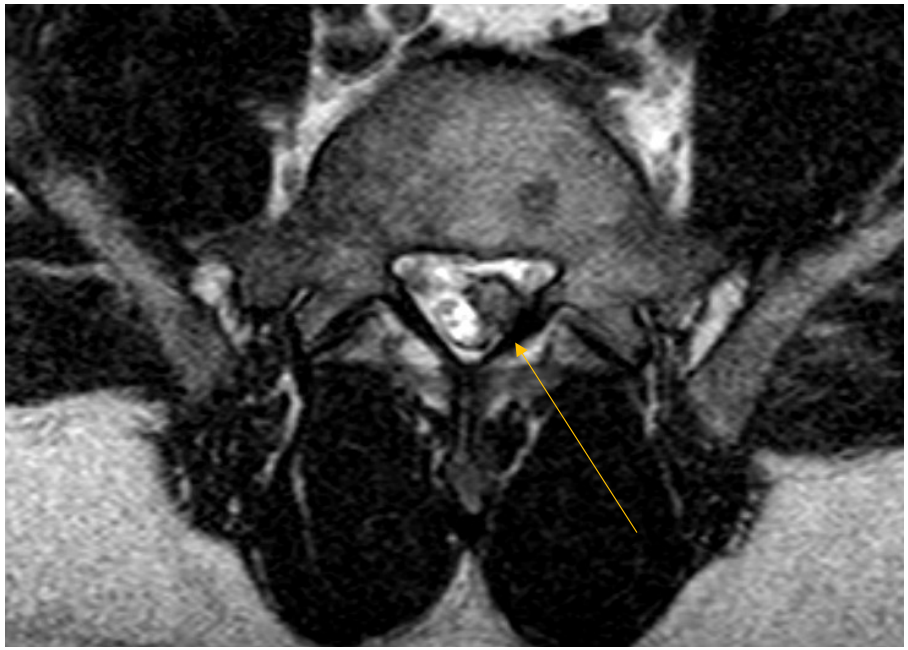
III: Lumbar Stenosis and Radiculopathy

- Disc Herniations:
  - Can be described based on **patho-anatomy**
    - Bulge
    - Protrusion
    - **Extrusion**
  - **Extrusion: Base is narrower than herniation's dome, may extend cephalad or caudal, annulus is completely torn**

III: Lumbar Stenosis and Radiculopathy

- Disc Herniations:
  - Can be described based on **patho anatomy**
    - Bulge
    - Protrusion
    - Extrusion
    - **Sequestration**

Sequestration: No longer in continuity with the annulus



III: Lumbar Stenosis and Radiculopathy

- Lumbar Disc Herniations
  - Symptoms:
    - Some patients may describe a history of prodromal mild to moderate back pain prior to the herniation
    - May have a specific event that they note an acute increase in pain and new onset leg pain
    - Radicular leg pain is more typical and thought to be the more treatable of the complaints
    - Remember that if the herniation is in the lower lumbar spine you would expect the symptoms to radiate past the knee
    - Remember to ask about bowel and bladder habits
    - A history of smoking is an independent risk factor for LBP and risk factor for poor result after surgery

III: Lumbar Stenosis and Radiculopathy

Lumbar Disc Herniation

Exam:

Watch the patient walk (trendelenberg, slappage gait, are the leaning to one side)

Inspection and palpation

Thorough neurologic exam

Straight leg raise

Nerve Root	Movement Tested
L1, L2	Hip Flexion
L2	Hip Adduction
L3	Knee Extension
L4	Ankle Dorsiflexion
L5	Great toe dorsiflexion, Hip Abduction
S1	Ankle Plantar Flexion

Motor Score	Ability
0	No visible contraction
1	Visible contraction, no movement of joint
2	Can move joint but cannot overcome gravity
3	Can overcome gravity but not resistance
4	Able to overcome some but not full examiner resistance
5	Full strength

III: Lumbar Stenosis and Radiculopathy

- Lumbar Disc Herniation
  - Imaging:
    - No imaging on initial presentation if symptoms < 6 weeks
    - Rule out any red flag symptoms
    - If persistent symptoms of radiculopathy X rays and MRI obtained (without contrast)

III: Lumbar Stenosis and Radiculopathy

- Lumbar Disc Herniation
  - Imaging:
    - No imaging on initial presentation if symptoms < 6 weeks
    - Rule out any red flag symptoms
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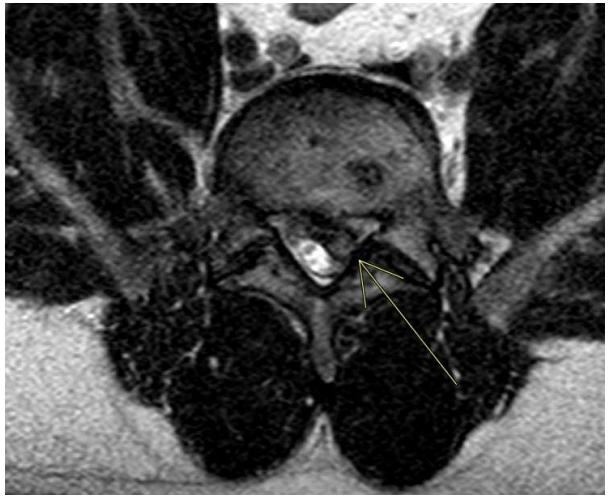
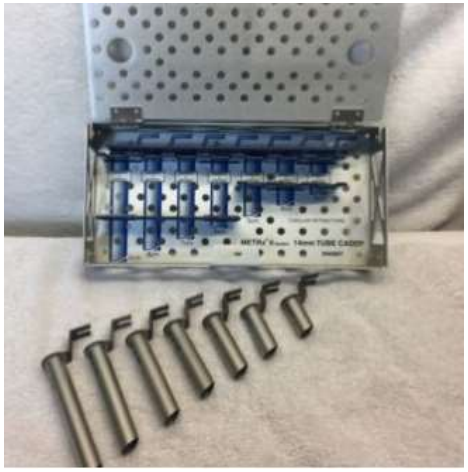


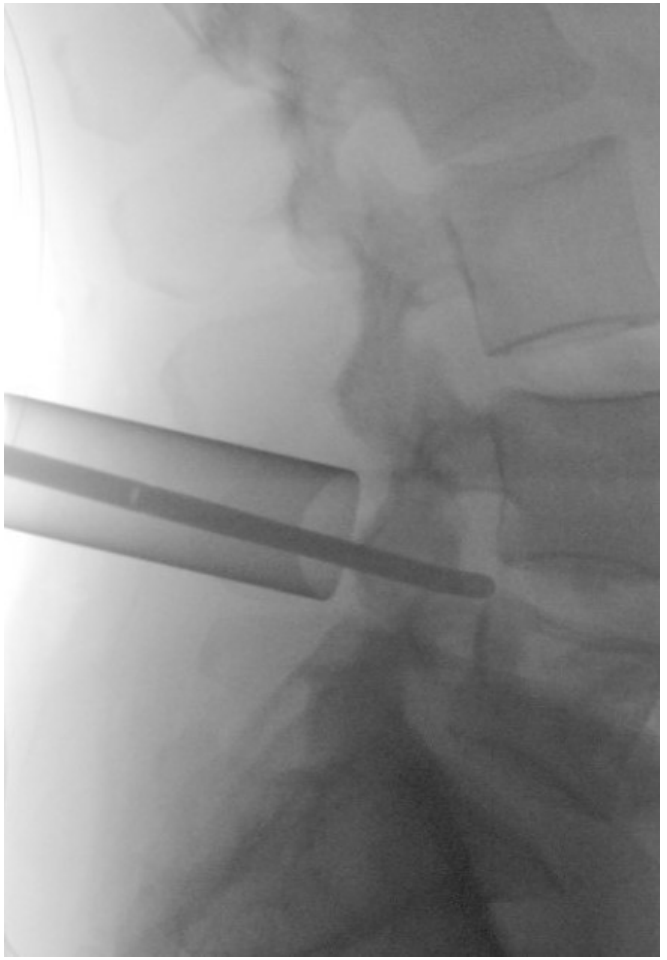
III: Lumbar Stenosis and Radiculopathy

- Lumbar Disc Herniation
  - Treatment – Non-operative/Noninvasive:
    - If recommending bedrest only for 2 days (prolonged inactivity linked to prolonged disability and continued pain)
    - Exercise therapy and rehab to focus on strength, flexibility and function and postural education
    - NSAIDs – first line medication
    - If pain is severe limit narcotics to only 2-3 day course
    - Can also try an oral steroid taper
  - Treatment – Non-operative/Invasive:
    - Transformational steroid injections: can serve both diagnostic and therapeutic benefit

III: Lumbar Stenosis and Radiculopathy

- Lumbar Disc Herniation
  - Treatment: Operative –
    - Only if radiologic identification of compressive pathology is concordant with patient's signs and symptoms
    - Only if failed non-operative management



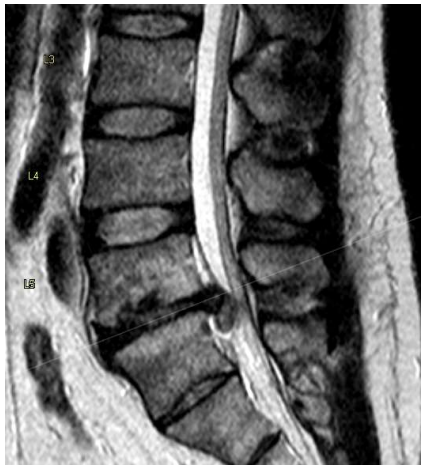


III: Lumbar Stenosis and Radiculopathy

- Lumbar Disc Herniation
  - Postop Care:
    - Most patients can discharge the same day
    - I tend to restrict bending/twisting or heavy lifting for 4-6 weeks (concern for re-herniation) *

III: Lumbar Stenosis and Radiculopathy

- L5-S1 disc herniation
- Based on these images what nerve root do you think is mainly being affected?
- Can you point on your leg where you think his symptoms would radiate?

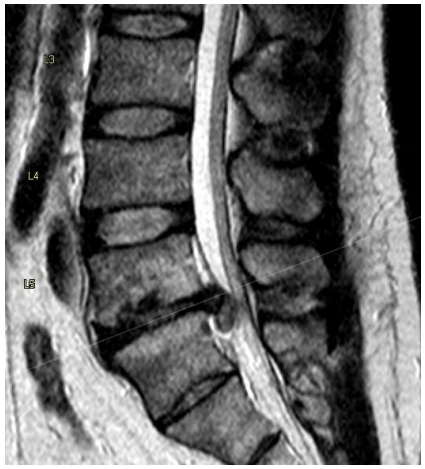


- Based on these images what nerve root do you think is mainly being affected?
  - A. L3
  - B. L4
  - C. L5
  - D. S1

- Can you point on your leg where you think his symptoms would radiate?
  A. Groin
  B. Anterior thigh to medial ankle
  C. Lateral Leg to top of the foot
  D. Back of the thigh, calf, bottom and lateral aspect of the foot

III: Lumbar Stenosis and Radiculopathy

- L5-S1 disc herniation: Lateral recess stenosis which mainly effects the traversing S1 nerve
- This would classically cause pain into the butt and down the back of the left leg into the lateral and plantar aspect of the left foot.



IV: Patient 3

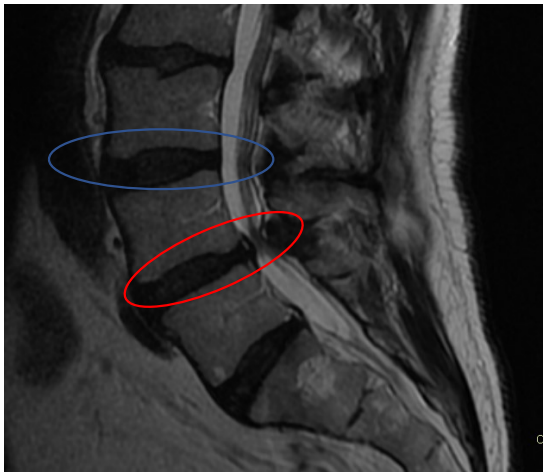
- 75-year-old retired teacher and avid hiker presents with 6 months of bilateral buttock, hip and thigh cramping pain. This is worse with standing and walking and improved with sitting. Walking tolerance has gone from 3-4 miles to 200 yards before needing a break

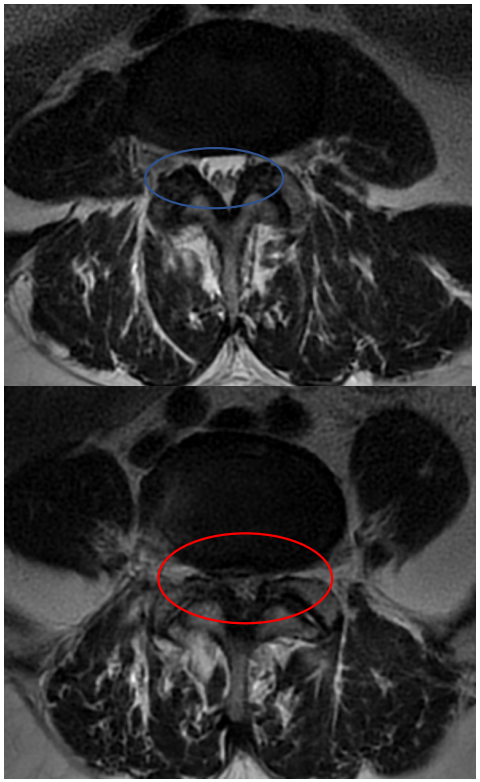
- What questions do you want to ask initially?
- How are you going to focus your exam?
- What images do you want?

IV: Lumbar Stenosis and Neurogenic Claudication

Natural History:

- Typically present later in life (unless component of congenital stenosis)
- Significant number of patients respond favorably to non operative treatment
- Rapid neurologic deterioration is exceedingly rare

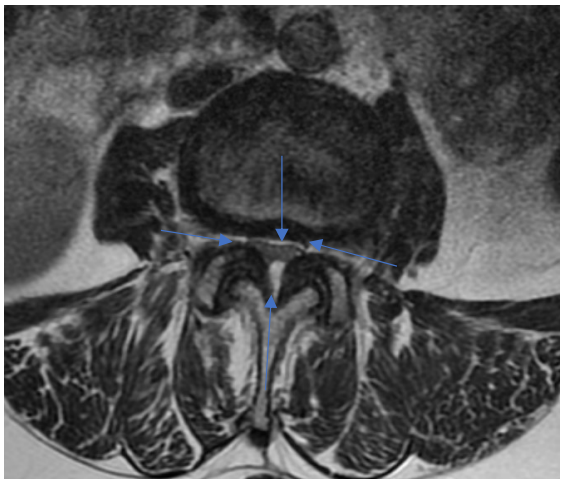




IV: Lumbar Stenosis and Neurogenic Claudication

Symptoms:

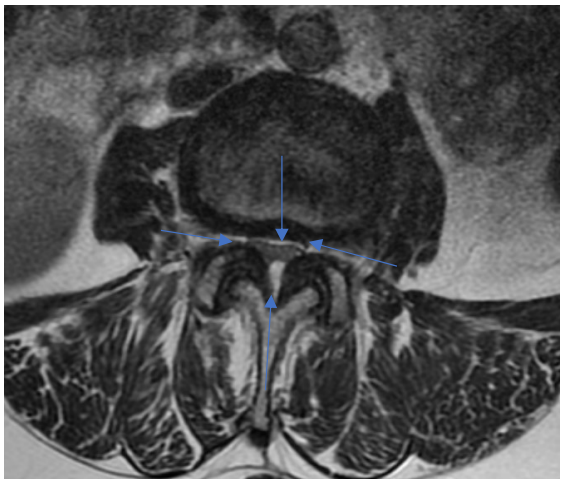
- Back and leg pain, non dermatomal, can affect 1 leg more than the other but usually both legs effected
- Heaviness, cramping, burning, weakness
- Worse with walking
- Better with leaning forward or walking uphill



IV: Lumbar Stenosis and Neurogenic Claudication

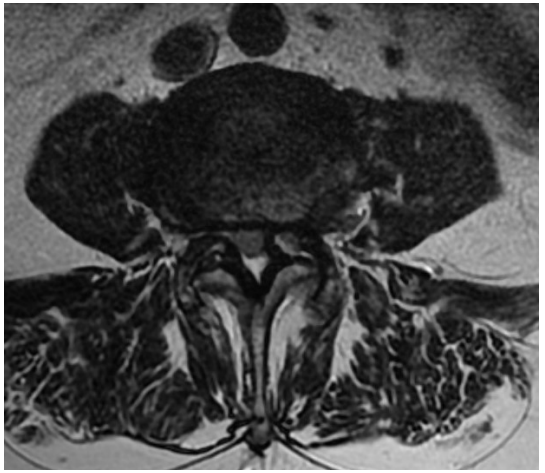
Exam:

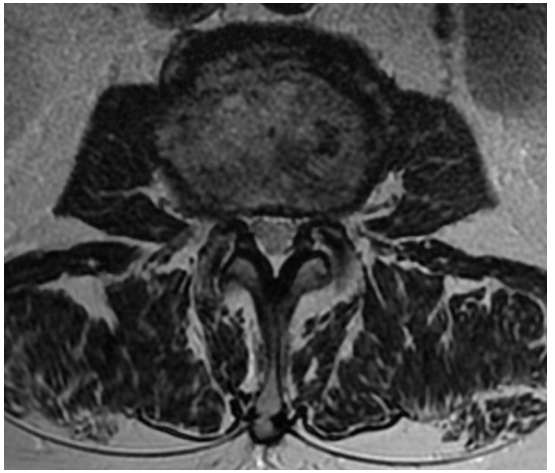
- Usually non-specific
- Watch them walk, often will lean forward slightly
- Make sure to check distal pulses in the feet- could have vascular claudication rather than neurogenic claudication

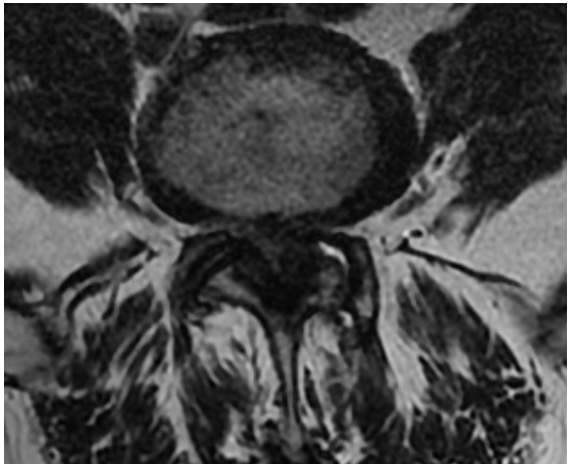


IV: Lumbar Stenosis and Neurogenic Claudication

- Treatment:
  - Decompression

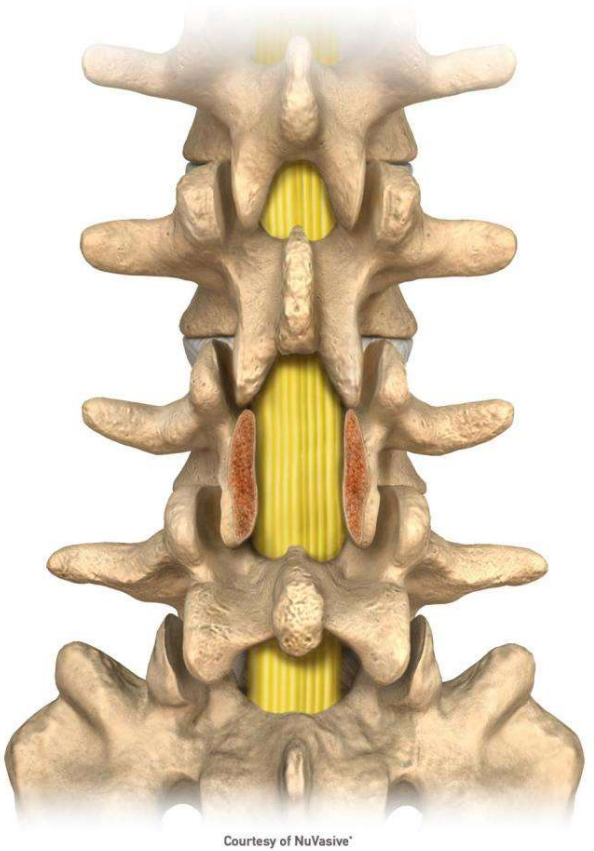






IV: Lumbar Stenosis and Neurogenic Claudication

- Treatment:
  - Decompression

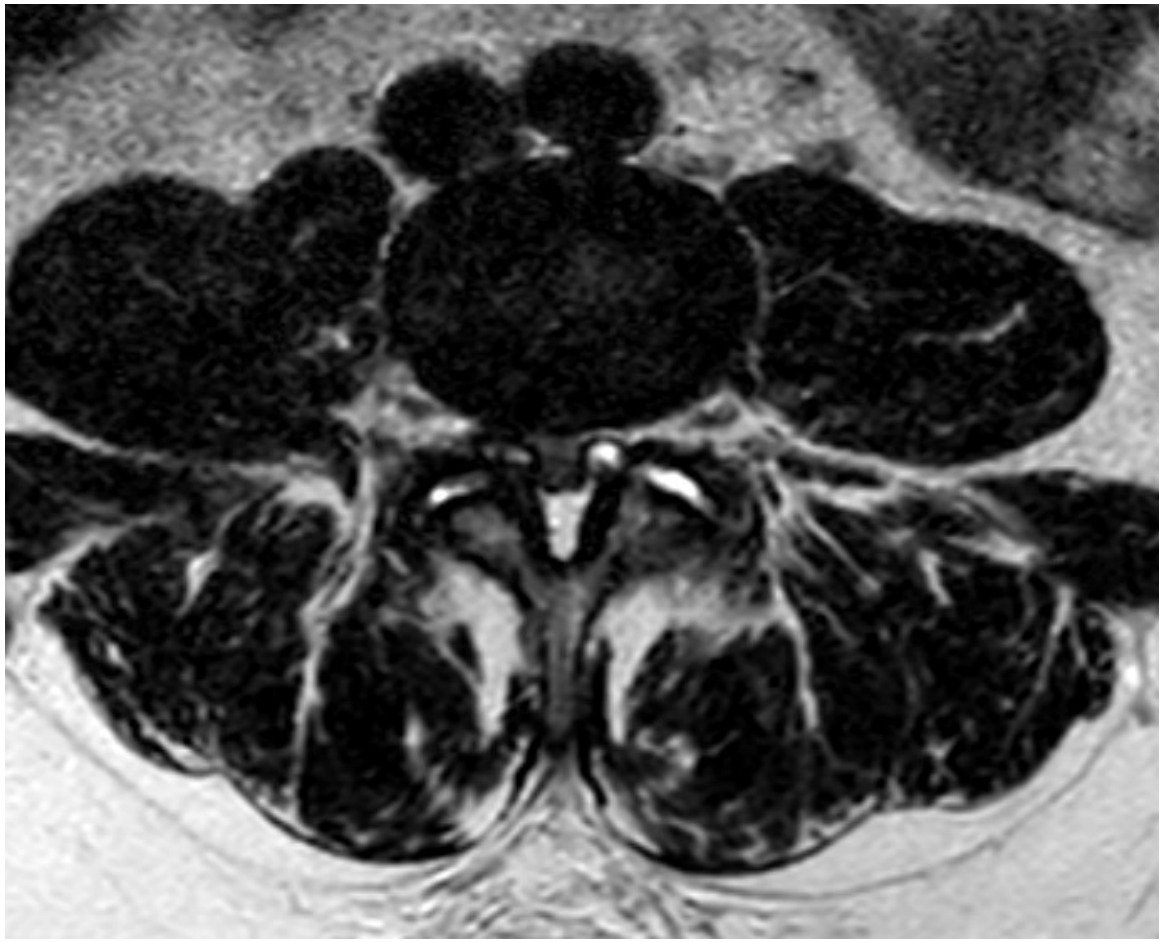


IV: Lumbar Stenosis and Neurogenic Claudication

- Postoperative Course:
  - Single Level: Home POD 0 or 1
  - Multilevel: Home POD 1 or 2
  - OK with NSAIDs if no fusion performed

V: Cauda Equina Syndrome

- Surgical Emergency
  - An L4-5 disc is the most common cause
  - Constellation of symptoms that don't all need to be present
    - Pain in the thighs and back of legs
    - Numbness in the buttocks, back of legs and soles of feet
    - Paralysis of legs and feet
    - Bowel and bladder dysfunction
  - Post void residual and bulbo-cavernosus reflex are important aspects of the workup



V: Cauda Equina Syndrome

- Treatment:
  - Decompression and discectomy
    - Best if performed within 48-72 hours of onset

Patient 4

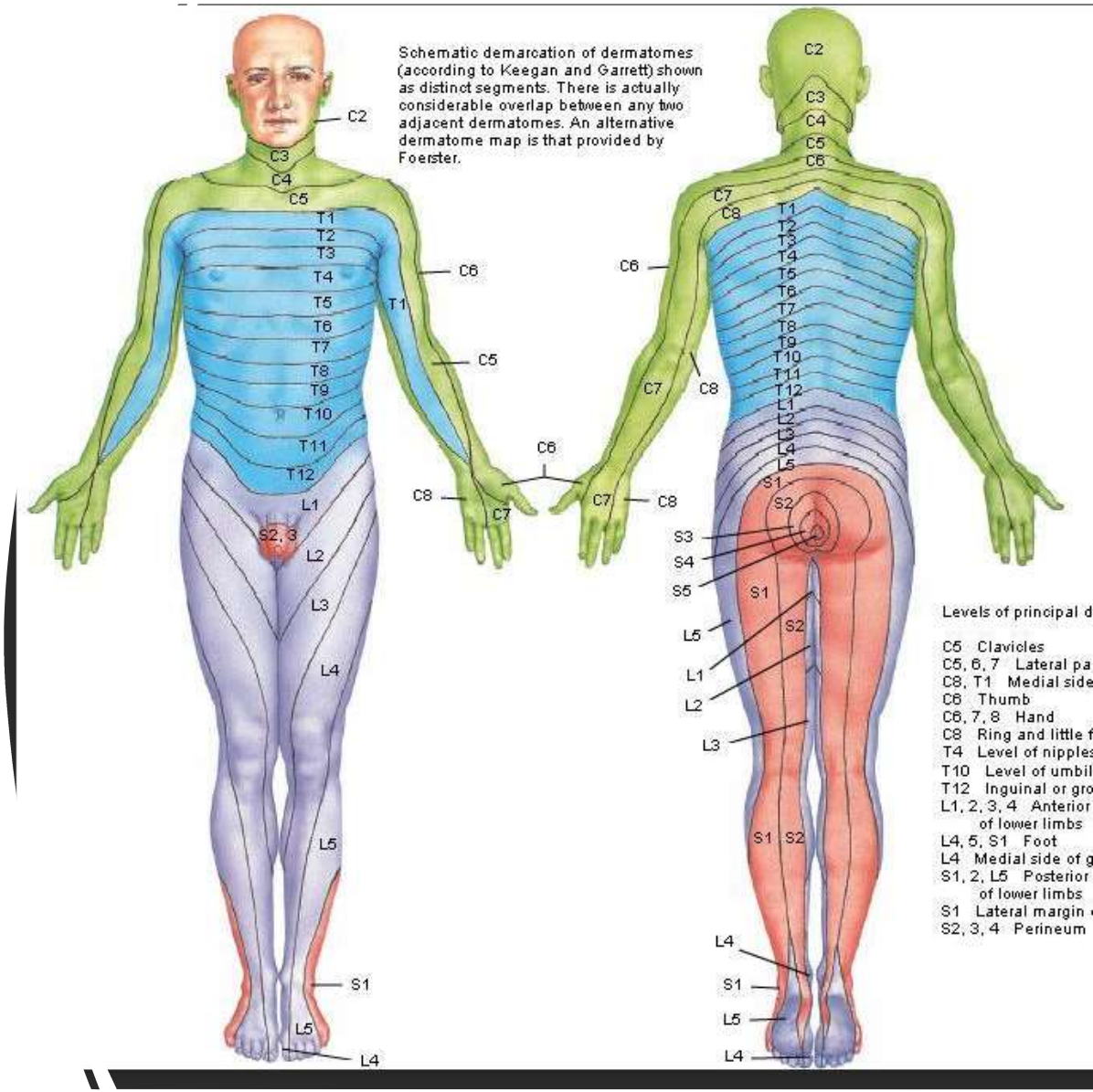
58-year-old patient presents with pain radiating from the base of the neck down the lateral aspect of the arm to the elbow and to the radial forearm and thumb and index finger

VI: Cervical Spine

- Neck vs. Shoulder
  - Every patient presenting with neck pain also gets a screening shoulder exam
- Check for a peripheral neuropathy
  - tinel's over the elbow and wrist, elbow flexion test, phalen's
- Careful assessment of sensation and motor function
- Careful assessment of reflexes
- Always watch them walk. I also have them heel-toe walk and check a romberg

VI: Cervical Spine: Radiculopathy

- Important to remember the dermatomes
- Different from the thoracic and lumbar spine in that the cervical roots exit <u>above</u> their respective pedicles (a herniation at C6-7 would affect the C7 nerve)



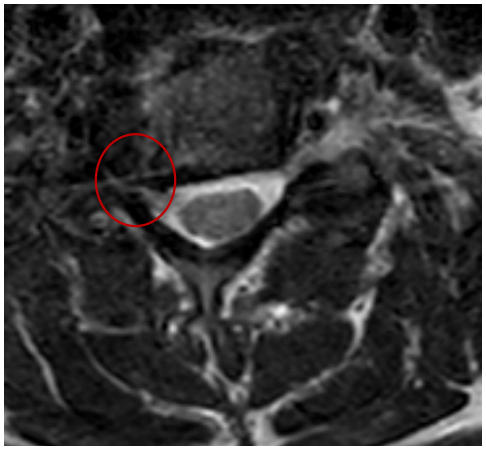
VI:Cervical Spine: Radiculopathy

- Neurologic examination is imperative
  - Spurling's Maneuver:
    - Extend, rotate and lateral bend the head to one side; reproduction of radicular pain on ipsilateral side is positive (poor sensitivity but good specificity)
  - Lhermitte's
    - Electric shock sensation down the arms that occurs with neck flexion
  - I will occasionally obtain UE EMG/NCS to rule out more peripheral neuropathy

Nerve Root	Movement Tested
C5	Shoulder Abduction
C6	Elbow flexors, wrist extensors
C7	Elbow extensors, wrist pronators
C8	Extension of index finger, finger flexion
T1	Finger Abduction

VI: Cervical Spine: Radiculopathy

- 4/5 biceps
- Imaging confirms C5-6 right sided foraminal stenosis



VI: Cervical Spine: Radiculopathy

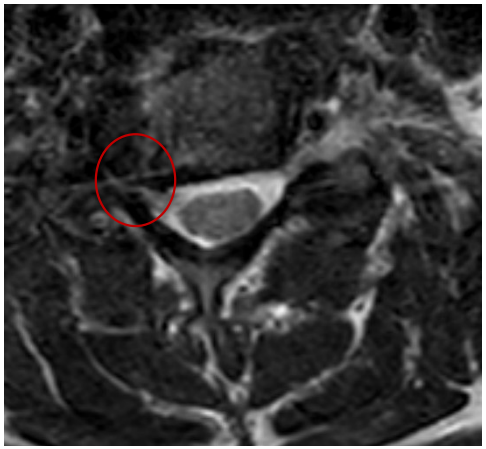
Indications for surgical treatment:

Persistent recurrent arm pain unresponsive to 3 months of conservative treatment

Progressive neurologic deficit

Static neurologic deficit associated with radicular pain

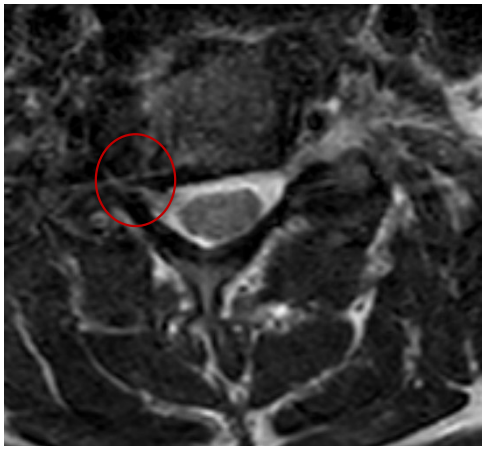
Imaging consistent with history and exam



VI: Cervical Spine: Radiculopathy

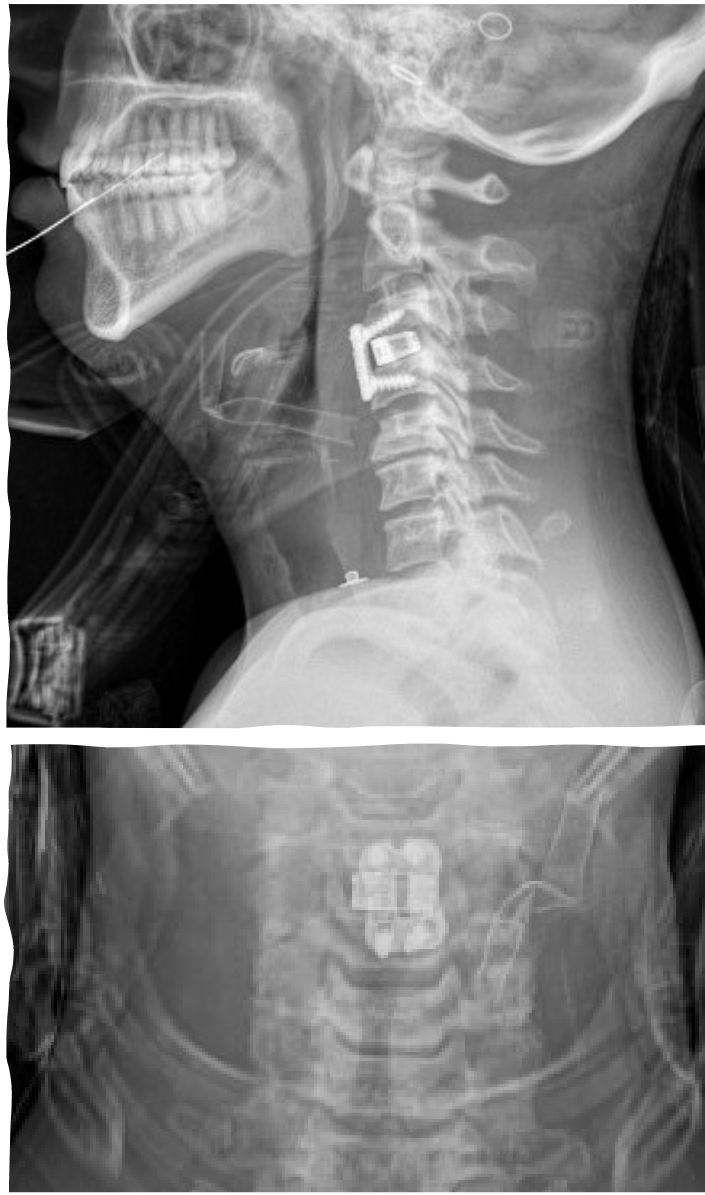
Surgical Options:

- Anterior cervical discectomy and fusion
- Anterior cervical disc replacement
- Posterior Foraminotomy



VI: Cervical Spine: Radiculopathy

- Postoperative Care:
  - If fusion was done avoid NSAIDs
  - Hard collar depending on how many levels fused (none if disc replacement or Foraminotomy)
  - Home POD 0 vs 1

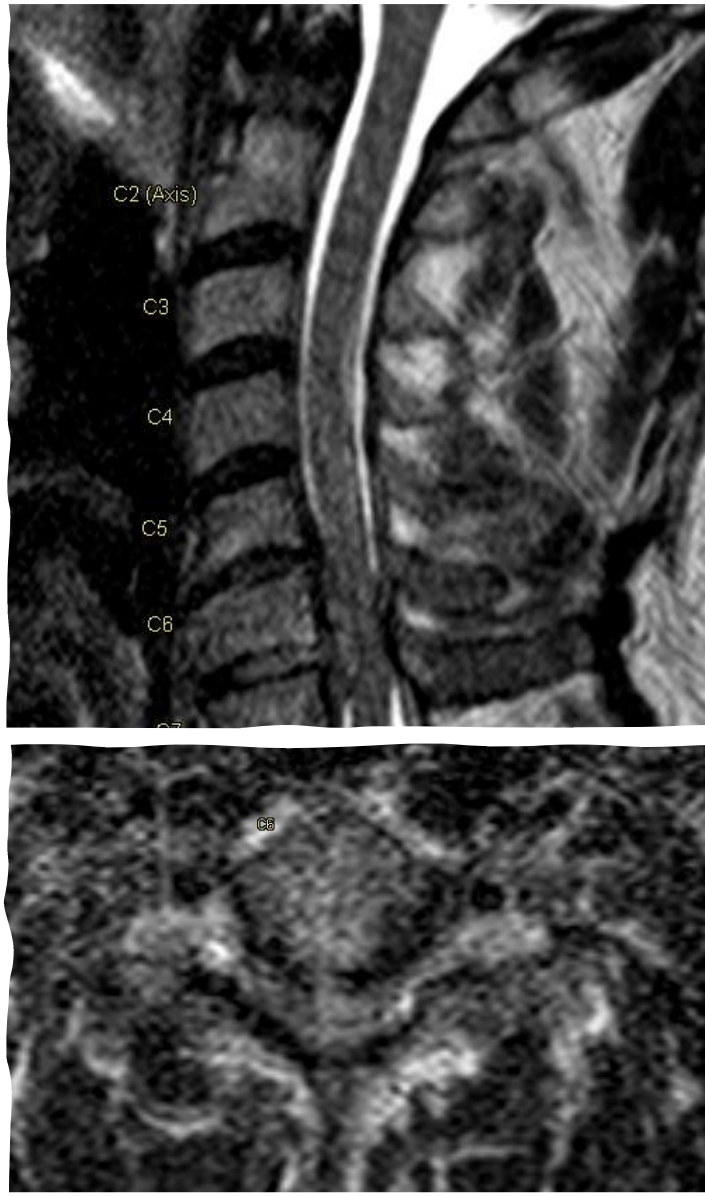


Patient 5

75-year-old presents with a chief complaint of hand numbness, intermittently dropping items and feeling off balance

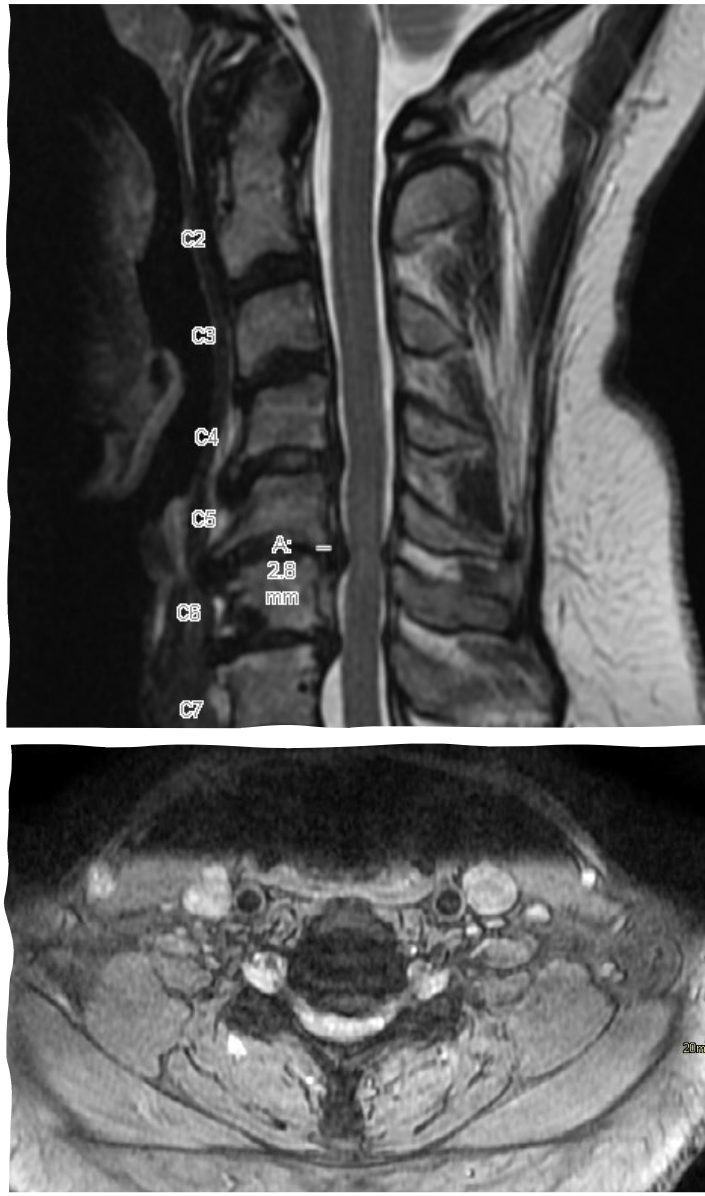
VI: Cervical Spine: Myelopathy

- Central compression on the spinal cord
- Symptoms are often of insidious onset
  - Gait disturbance
  - Deterioration in penmanship and dexterity (ability to fasten buttons)
  - Hyperactive DTRs, Clonus, Hoffman's, Babinski
  - In severe cases patients can have urinary retention with overflow incontinence



VI: Cervical Spine: Myelopathy

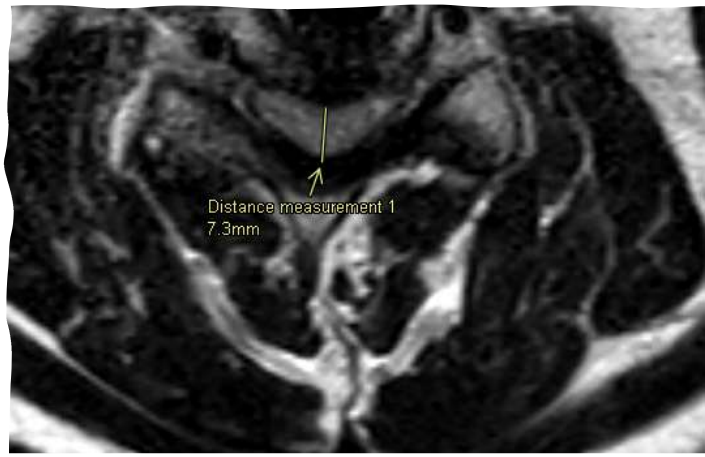
- Patients that present with moderate- severe symptoms are unlikely to have improvement without surgery
- Most will have slow stepwise deterioration of function
- Remember that normal midsagittal canal diameter in the C spine is 17mm; patients with <13mm have relative stenosis, < 10mm have absolute stenosis
- Also look for cord signal change on your T2 weighted MRI; myelomalacia



VI: Cervical Spine: Myelopathy

- Surgical Approach:
  - ACDF
  - Anterior cervical corpectomy
  - Posterior decompression and fusion
  - Laminoplasty

- * Decision based on sagittal alignment, location of compression, presence of axial neck pain and # of levels involved



Take Home Points

- Back pain is common and only under rare circumstances requires spine surgery
- The hip can be a source of back pain and the shoulder can be a source of neck pain, it is important to do a screening exam of both
- It is important to correlate symptoms to exam and imaging when working up and treating cervical or lumbar radiculopathy
- Central stenosis will cause a different constellation of symptoms than lateral recess or foraminal stenosis in the cervical and lumbar spine

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Thank You