Cervical & Lumbar Spine: For the Chiropractic Clinician

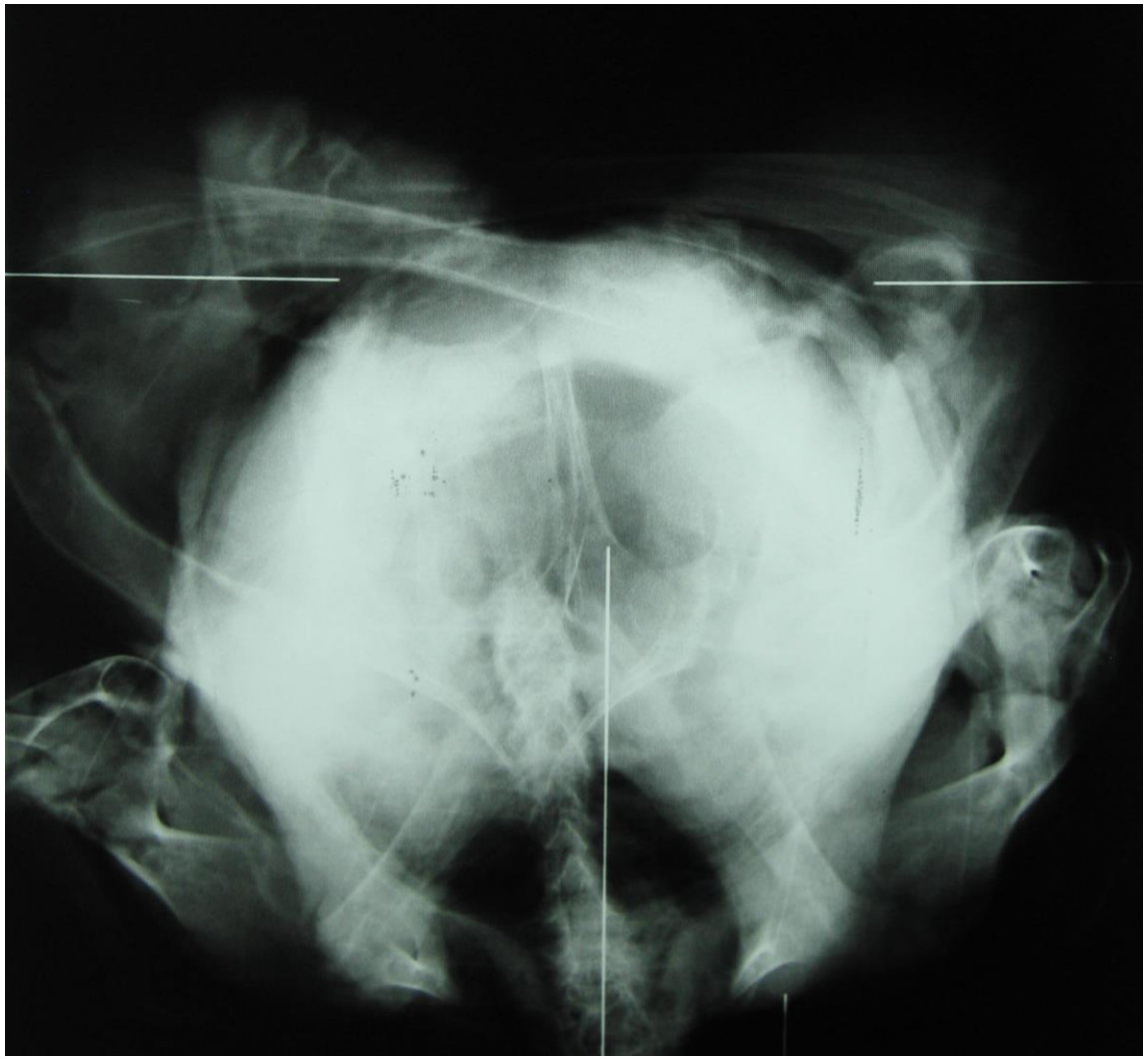
Jennifer Pedley, MS, DC, CCSP, DACBR
Chiropractic Radiologist

www.jprad.com

FOOT LEVELERS

FOOT LEVELERS

LETS HAVE SOME FUN☺



Case: MVA, car rollover

- What imaging do you order? Or, not order?

ED: CT after injury

FOOT LEVELERS

Neutral

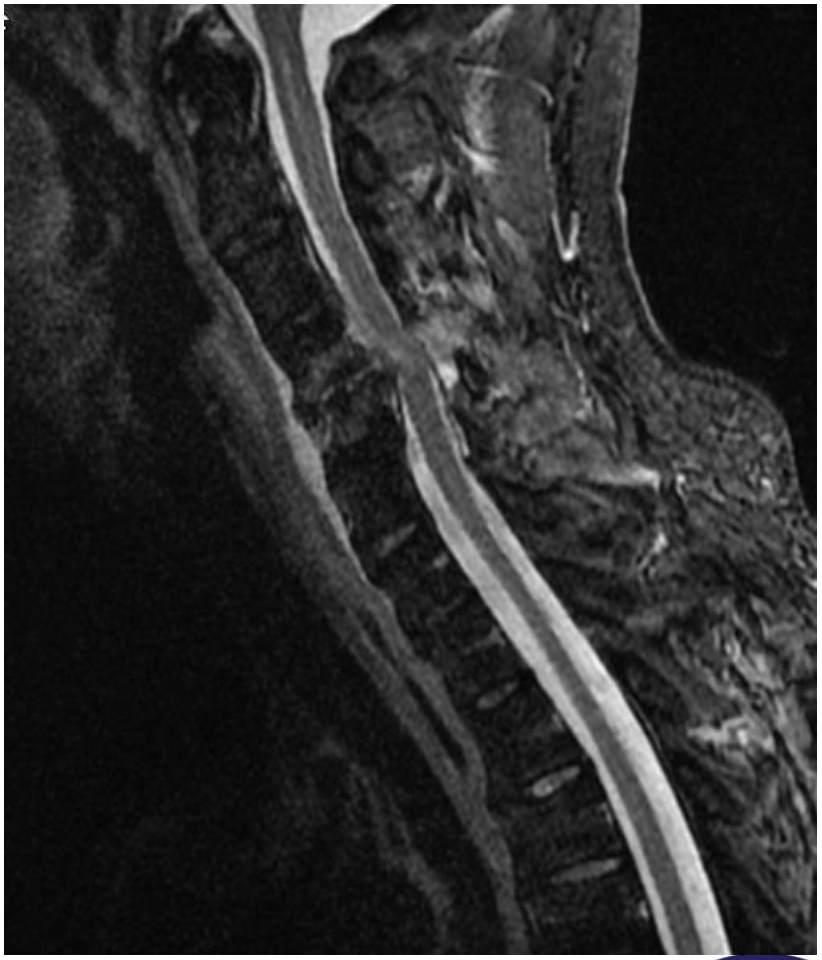
FOOT LEVELERS

Xrays several months after injury

FOOT LEVELERS

6 months after accident

- Edema of spinal cord, anterior and posterior soft tissues, and C4 and C5 vertebral bodies.
- Torn disc at C4-C5.
- Hypolordosis—how?
  - Cannot see dislocated facet joints on MR



FOOT LEVELERS

CT: one year after MVA

Another spine case

Patient was hit by a car while skateboarding

FOOT LEVELERS

- AP and lateral x-rays performed at the chiropractic office, 2 weeks after accident

- X-rays from Urgent Care were similar and Urgent Care said it was normal with anterolisthesis at C2

FOOT LEVELERS

Lesson

- Repeat x-rays and please take x-rays
  - Trauma: Things change over time. Retake x-rays.
- Additional imaging: MR and/or CT
- Always look at the imaging particularly with trauma.

FOOT LEVELERS

Low Back Pain + Foot Levelers

ACRM
AMERICAN CONGRESS OF REHABILITATION MEDICINE

Archives of Physical Medicine and Rehabilitation

journal homepage: www.archives-pmr.org

Archives of Physical Medicine and Rehabilitation 2017;98:1752-62

ORIGINAL RESEARCH

Shoe Orthotics for the Treatment of Chronic Low Back Pain: A Randomized Controlled Trial

Jerrilyn A. Cambron, DC, MPH, PhD,[a] Jennifer M. Dexheimer, BS, LMT,[a]
Manuel Duarte, DC, MSAc, DABCO, DACBSP,[b] Sally Freels, MS, PhD[c]

From the [a]Department of Research, National University of Health Sciences, Lombard, IL; [b]Department of Clinical Practice, National University of Health Sciences, Lombard, IL; and [c]School of Public Health, Division of Epidemiology and Biostatistics, University of Illinois, Chicago, IL.

FOOT LEVELERS

Research Results

- Foot Levelers orthotics plus chiropractic care reduce low back pain by 40.4%

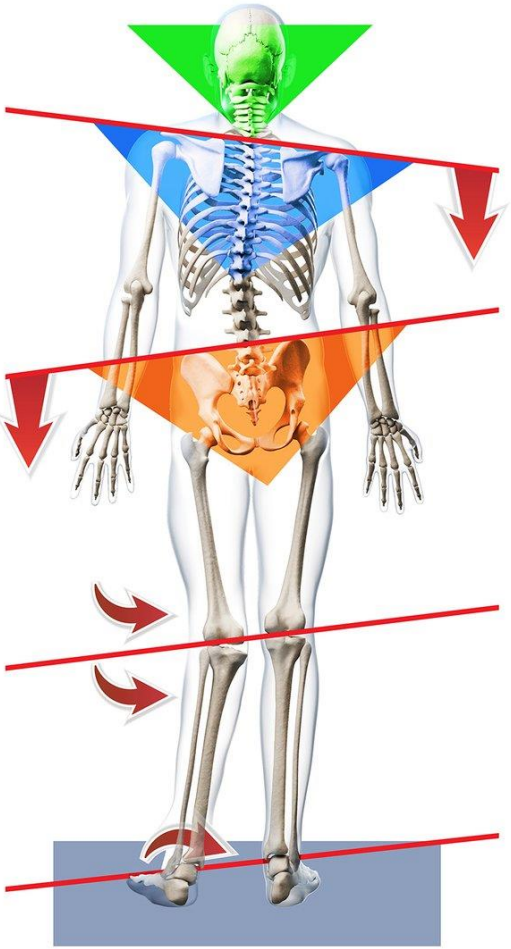
- Foot Levelers orthotics reduce low back pain by 34.5%.

FOOT LEVELERS

Dysfunction of the Kinetic Chain

- Abnormal stress and abnormal biomechanics placed on joints of the **Entire** body.

- Increased stress above and below= increase likelihood of injuries or poor recovery from injuries



FOOT LEVELERS 65 YEARS

FOOT LEVELERS

OBJECTIVE

- This will not make you into a radiologist;)
- Review search pattern on xrays.
- This will familiarize you with the anatomy on the *MRI images, and familiarize you with the terminology commonly used on the radiology reports.
- This will give you guidance and confidence in treating your patient with disc pathology.

- ***MRI=Magnetic Resonance Imaging**

FOOT LEVELERS

Our To Do List

- ABC's search pattern
- When to send patient's out for MRI: Criteria for ordering MRI.
- How does xrays, MRI and CT differ?
- Ordering MRI: With or without contrast
- Anatomy shown on the sagittal, parasagittal and axial images
- Nomenclature of disc pathology
  - See Article listed at the end of the lecture
- What is the disc doing to the nerves…..there are 2 types of nerve roots!
- How does the information on MRI affect my treatment plan/protocol?

FOOT LEVELERS

AP Lumbar Spine

- **FFD** 40”
- **CR** 1” above iliac crest
- **Collimate** 10 x17

National University of Health Sciences

FOOT LEVELERS

Lateral Lumbar View

- **FFD** 40”
- **CR** 1” above iliac crest
- **Collimate** 11x17

FOOT LEVELERS

AP and Lateral Views

www.uwmsk.org

AP Angulated Lumbosacral

- **FFD** **40”-5”**
- **CR** **1” below ASIS**
- ***Tube tilt*** ***25-35 °***

  cephalad (25 degrees caudad for PA angulation)
- **Collimate** 10x12

FOOT LEVELERS

AP (PA) Angulated Lumbosacral

Structures Visualized

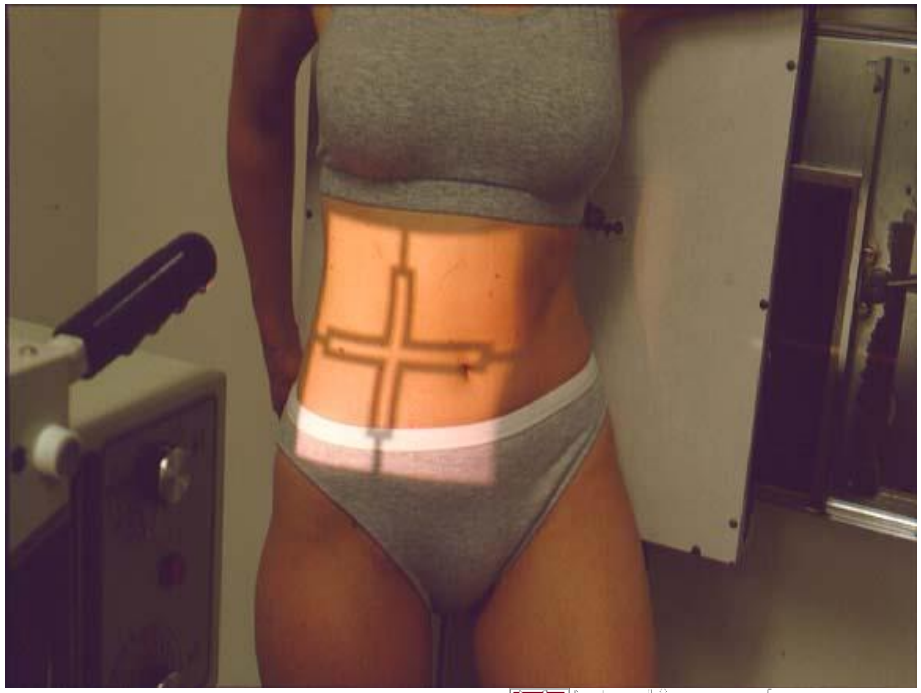
- L5-S1 Disc Space
- Sacroiliac (SI) Joints: Best radiograph to evaluate for the SI joints
- Sacrum Sacral Foramen
- L5 TP's and SP's
- L5 Vertebral Body

National University of Health Sciences

FOOT LEVELERS

(Left) Posterior Oblique View

- **FFD** 40”
- **CR** 1” above iliac crest
- **Collimate** 11x14



National University of Health Sciences

FOOT LEVELERS

Scotty Dog

- Nose =Transverse process
- Eye =Pedicle
- Ear =Superior facet
- Front leg =Inferior
- Collar thru the neck= Fracture

www.imageinterpretation.co.uk

FOOT LEVELERS

Evaluation: ABC’S

- Alignment
- Bone
- Cartilage
- Soft tissue

FOOT LEVELERS

Alignment-ABC's

- Anterior and posterior vertebral body line (lateral radiograph)
  - Evaluate for anterolisthesis/retrolisthesis of the lumbar segment, compare to the level below.
    - Cause of anterolisthesis= degenerative changes or pars interarticularis defect or fracture
    - Cause of retrolisthesis= most commonly degenerative changes
- Posture
  - Gravity Line
    - Anterior shift in weightbearing
    - Posterior shift in weightbearing

FOOT LEVELERS

GRAVITY LINE

- FERGUSON GRAVITY LINE
- Anterior or Posterior shift in weightbearing

FOOT LEVELERS

LUMBAR LORDOSIS

- Normal lordosis: 50-60 degree

Alignment- continued

- Lordosis
  - Normal lordosis: 50-60 degree
  - Hypolordosis: loss of the lumbar lordosis with straightening.
  - Hyperlordosis: increased lumbar lordosis

- Scoliosis/convexities
  - If 10-15 years of age, curve less than 20 degrees maybe monitored, assess for progression of 5 degrees or more in a 3 month timeframe.
  - Curves 20-40 degrees may be surgical

FOOT LEVELERS

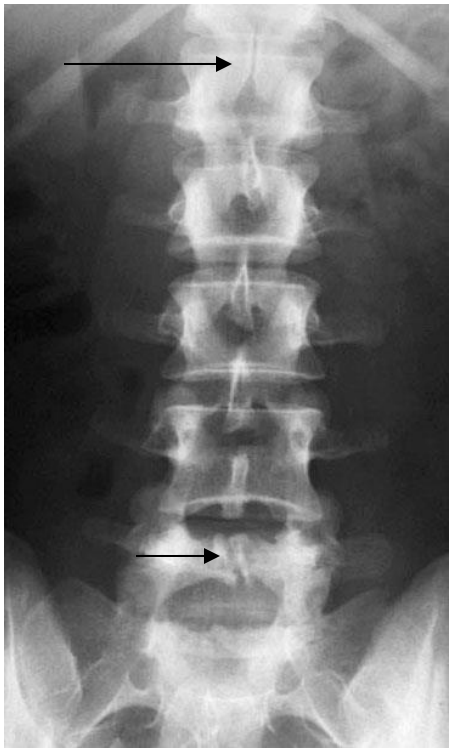
Bone- ABC's

- Shape and size of vertebral bodies
  - Compression deformities
- Pedicles and spinous process
  - Make sure they are present and in the correct location
  - Fractures of pedicles
  - Spina bifida occulta, normal variant.

FOOT LEVELERS

Normal spina bifida occulta

- No fusion at the junction of the lamina and spinous process
- Posterior cleft

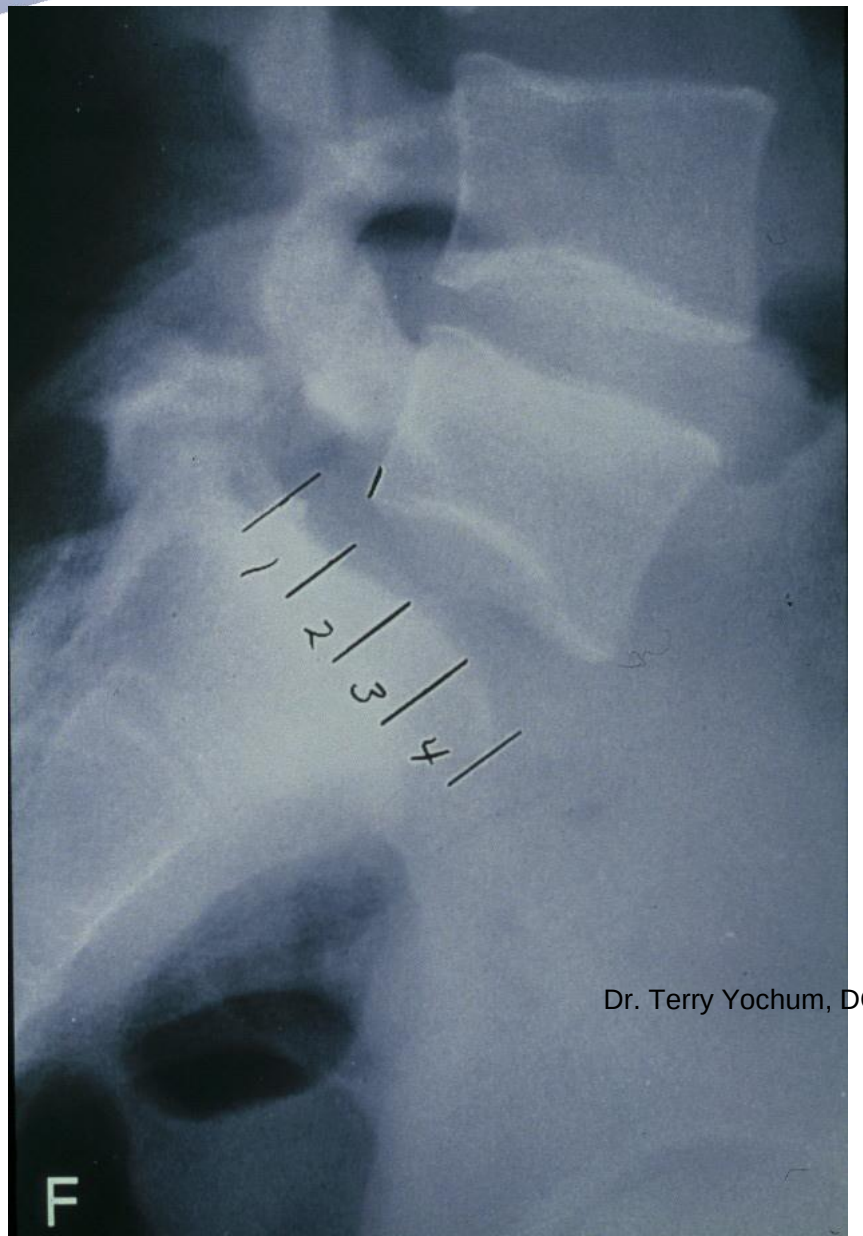


FOOT LEVELERS

Bone-continued

- Pars interarticularis
  - Defect/fracture
  - Classification of pars interarticularis defects/fractures
    - Grade of spondylolisthesis (anterolisthesis)

FOOT LEVELERS



Dr. Terry Yochum, DC, DACBR

FOOT LEVELERS

Bone- continued

- Intervertebral foramina
  - Make sure they are clear and equal size
  - Stenosis= posterior osteophyte, degenerative disc disease, degenerative retrolisthesis, and/or facet degeneration.

Bone-continued

- Lower ribs
  - Normal costochondral cartilage calcification
- Sacrum/Ilium
- Hips-femur and acetabulum if included in the AP lumbar study

FOOT LEVELERS

Cartilage-ABC's

- Facet joints
  - Degenerative changes

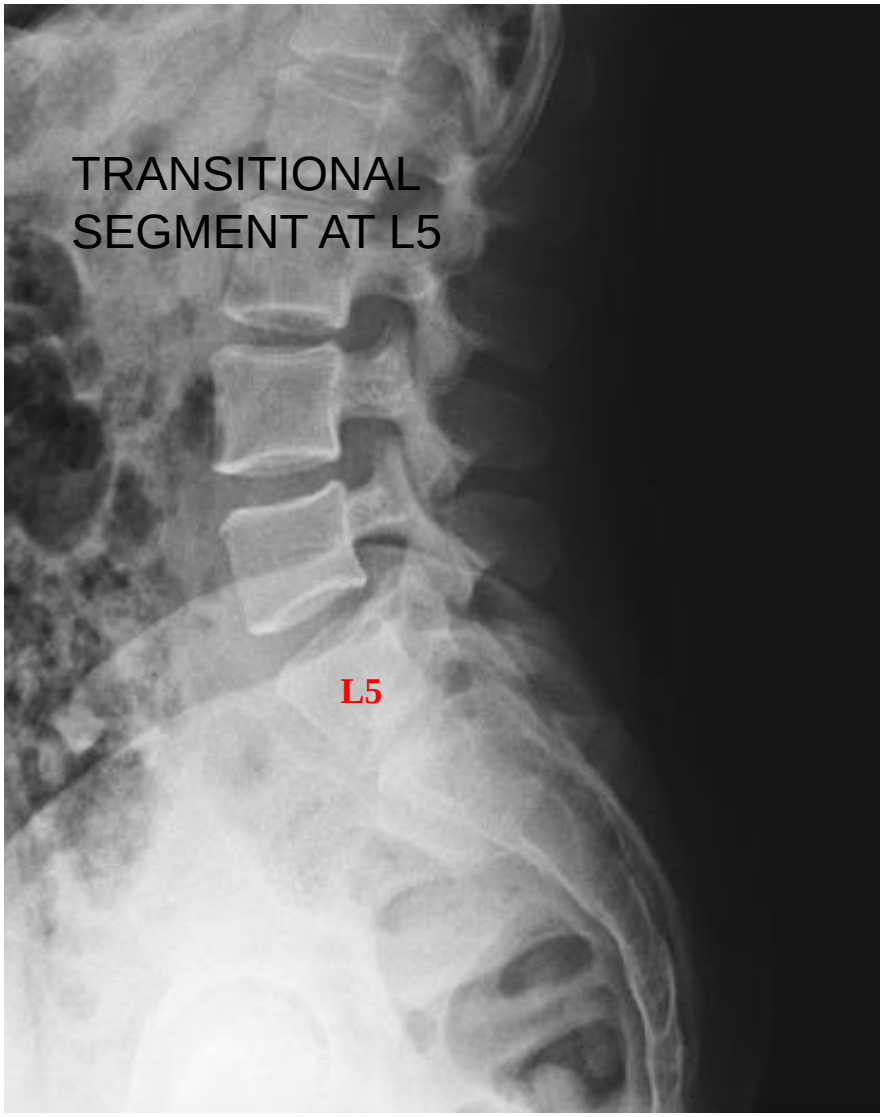
- Sacroiliac joints
  - Degenerative changes= bony proliferation, sclerosis and joint narrowing.
  - Inflammatory (ankylosing spondylitis)=bilateral erosive changes, widening of the joint; or complete fusion

FOOT LEVELERS

Cartilage-continued

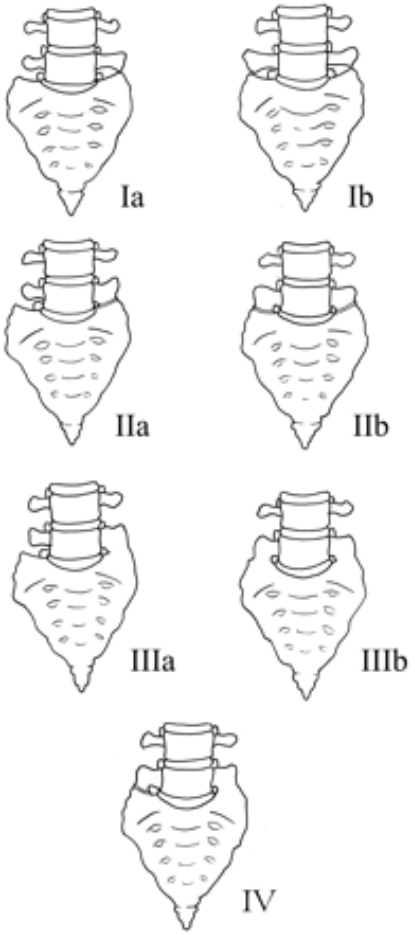
- Transitional segments
  - L5= sacralization
  - S1=lumbarization
  - Classification
- Intervertebral discs
  - Disc spacing= narrowing with/without spondylophytes is degenerative changes.

FOOT LEVELERS



FOOT LEVELERS

Bertolotti's Syndrome- type II and IV



FOOT LEVELERS

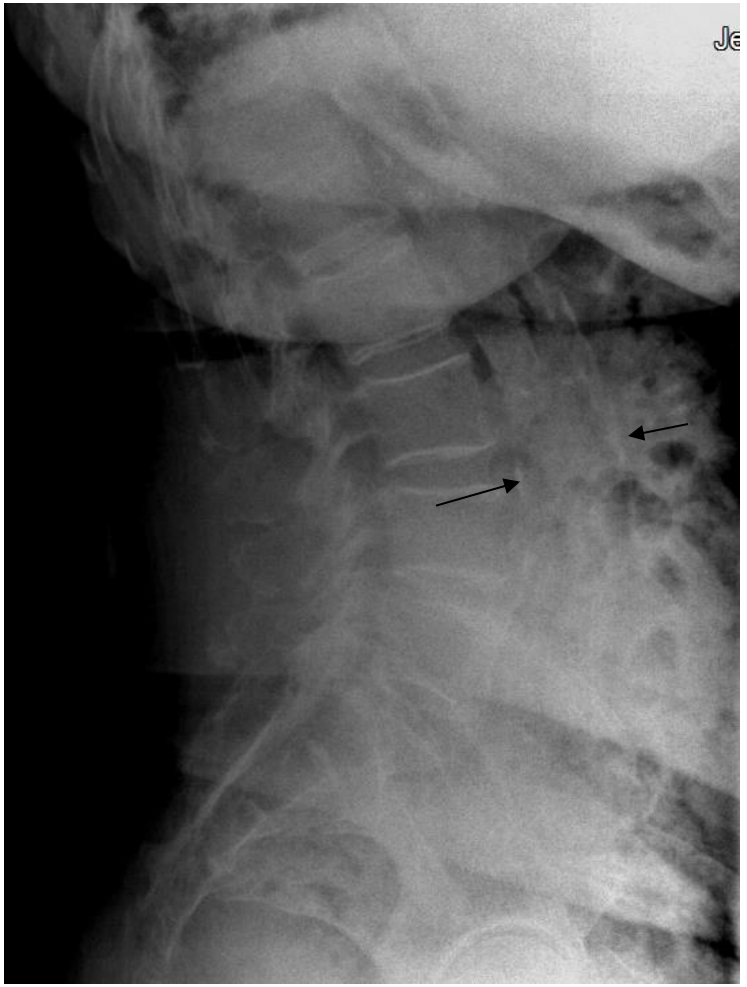
Soft tissues- ABC's

- Anterior soft tissues
  - Atherosclerosis of abdominal aorta, iliac arteries
    - Calcification of abdominal aorta: width of abdominal aorta should not exceed 2.0 cm (lateral radiograph)
  - Gallstones: right upper abdominal quadrant, AND anterior to the spine
  - Kidney stones: right or lower abdominal quadrant, but overlies or adjacent to the spine.
- Lower lung field
  - Check for radiopacities or tumors/masses
- Bowel gas

FOOT LEVELERS

Atherosclerosis of abdominal aorta

- Widening of abdominal aorta, greater than 4.5 cm; Normal is 2.0 cm



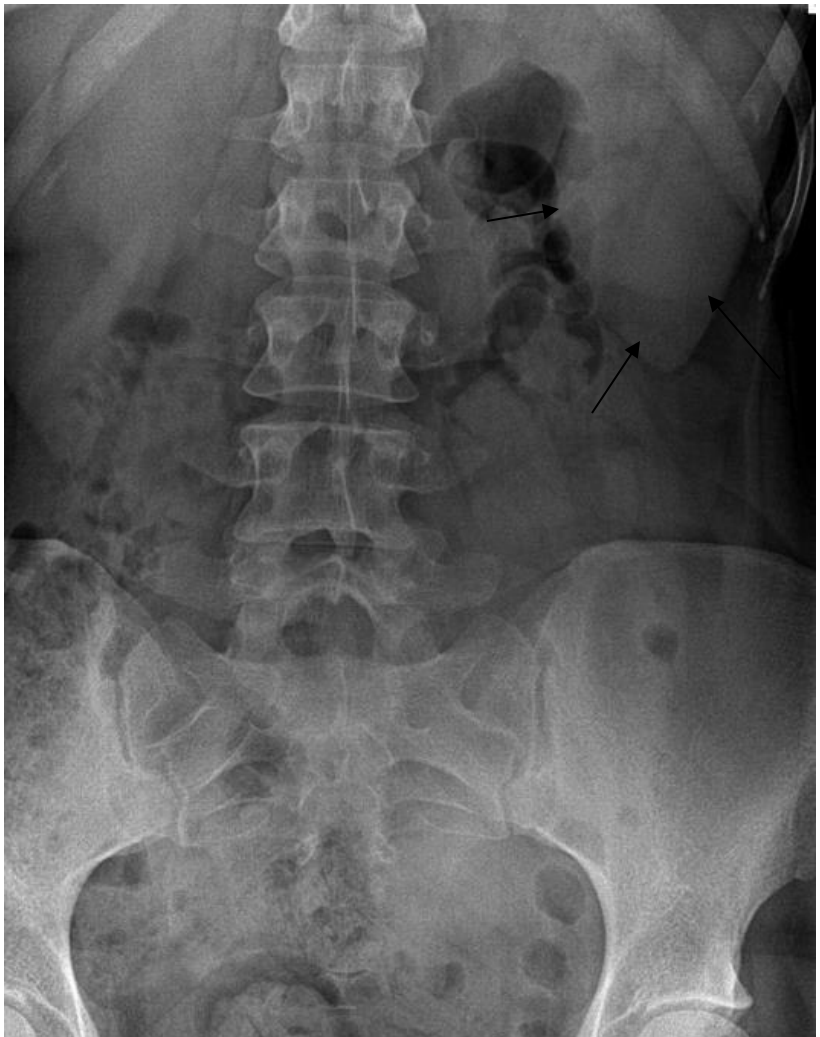
Soft tissues-continued

- Organ shadows
  - Kidney: calcifications/stones
  - Liver: Enlarged (hepatomegaly)
  - Spleen: Enlarged (splenomegaly); extending inferiorly from the left 12th rib.

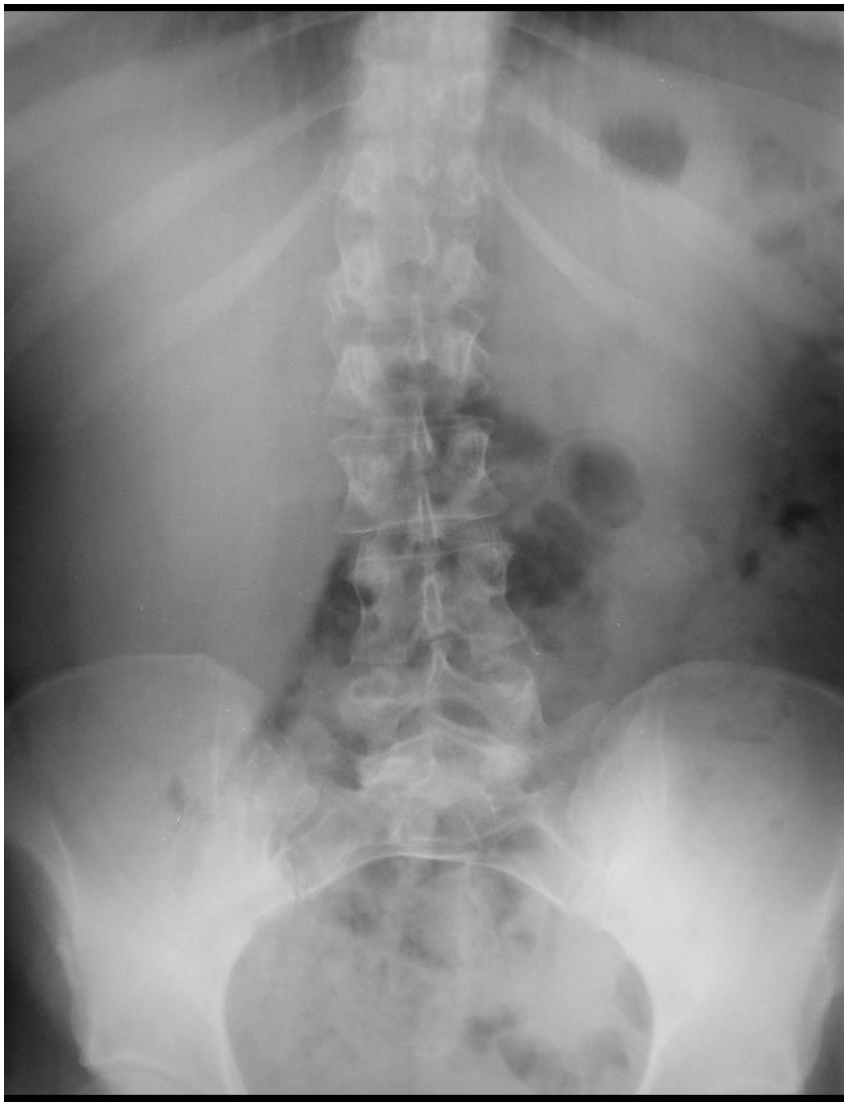
- Pelvic basin—Bladder shadow: Distended= prostate pathology
  - Uterine fibroids (benign calcifications)
  - Vas deferens calcification= V-shaped tubular calcification within the mid portion of pelvic basin
    - Associated with diabetes

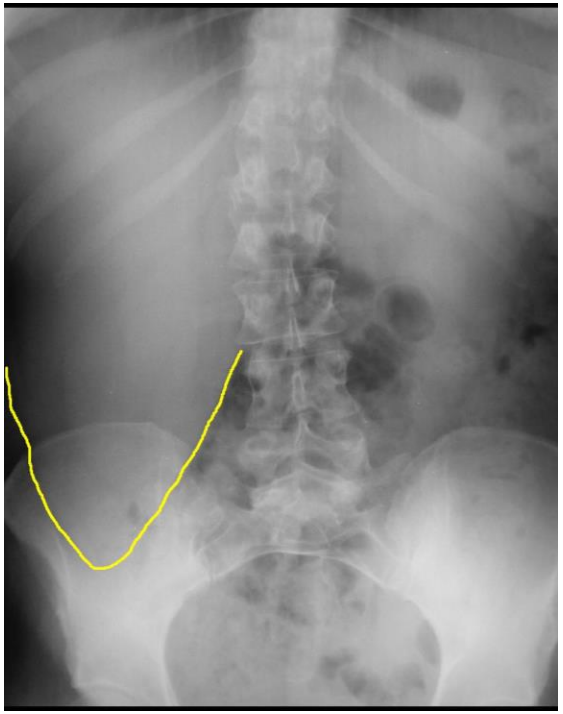
FOOT LEVELERS

Splenomegaly



Hepatomegaly





Soft tissues-continued

- Surgical artifact within the abdomen and pelvic basin
  - Cholecystectomy (gallbladder removal)
  - Vascular clips
  - Intrauterine device

FOOT LEVELERS

Criteria for Ordering MRI

- Some indicators:
  - Neurological deficit
  - Radiculopathy with no response to 4 weeks of *conservative treatment
  - Spinal stenosis: spinal canal or neural foramina stenosis
  - Spinal fracture: compression fracture, pathologic versus non-pathologic
  - Degenerative disc disease with no response to 4 week treatment
  - Recurrent symptoms after spinal surgery
  - Clinically/Radiographic evidence of: infection, cancer, metastatic disease.

- *Note: Conservative treatment may include chiropractic, physical therapy, acupuncture, massage therapy, etc.

FOOT LEVELERS

What is the difference between Xray, MRI and CT (brief list):

- Xray and CT show **bony detail**
  - Radiation (greater with CT)
  - Fractures/dislocations, *Acute* brain trauma and bleeds, chest, abdomen, pelvic regions.

- Generally speaking, MRI shows **soft tissue and what's inside the bone**.
  - No radiation
  - *Subacute to chronic* brain trauma and bleeds; tumors/lesions of bone and soft tissue; and spine and extremities.
    - Stress fractures; Impaction fractures and bone contusions
    - Disc; Spinal cord
    - Tendons, ligaments, labrum, meniscus, etc.

FOOT LEVELERS

MRI- With or without contrast?

- Most patients do not require gadolinium contrast

- Most common reasons to add contrast to MR study
  - Intravenous Gadolinium Contrast
    - Prior spinal surgery due to epidural fibrosis which is scar tissue in the spinal canal-- scar tissue will absorb contrast.
    - Tumor/mass and Infection detected clinically or on radiographs.

FOOT LEVELERS

MRI- With or without contrast?

- Arthrography contrast: gadolinium contrast solution injected into the joint capsule
  - Rule out labral tear of the hip
  - Previous meniscectomy with a second knee injury.

  - Most of the time, shoulders do not need contrast.
    - Scenario: Initial shoulder MR study detected no labral tear and/or no tears of the tendons. The clinician is suspecting a labral tear and/or tendon tear, and patient continues to not respond to care. Now, the clinician should order a repeated MRI *with arthrography.* Sometimes (very rare), these tears can hide☺

FOOT LEVELERS

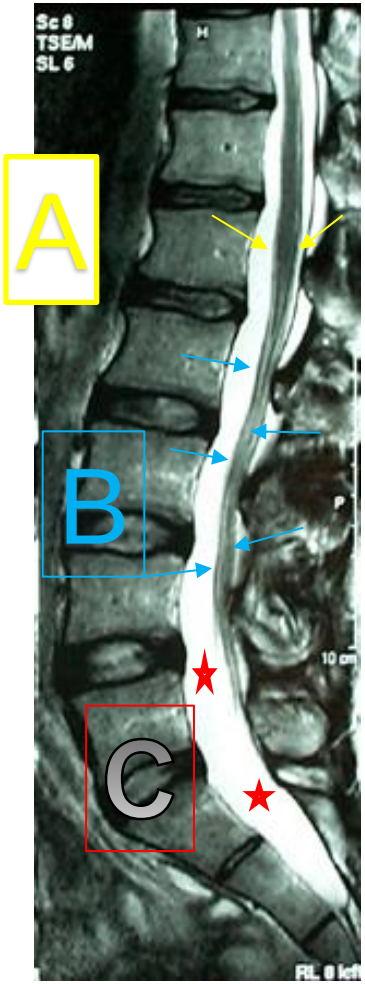
Anatomy on Sagittal images

- Distal spinal cord=Conus medullaris
- Cauda equina
- Cerebrospinal fluid
- Intervertebral discs
- Vertebral bodies
- Spinous processes
- Ligaments
  - Anterior longitudinal ligament-ALL
  - Posterior longitudinal ligament-PLL
  - Ligamentum flavum
  - Interspinous ligaments

FOOT LEVELERS

Anatomy on Mid-Sagittal images

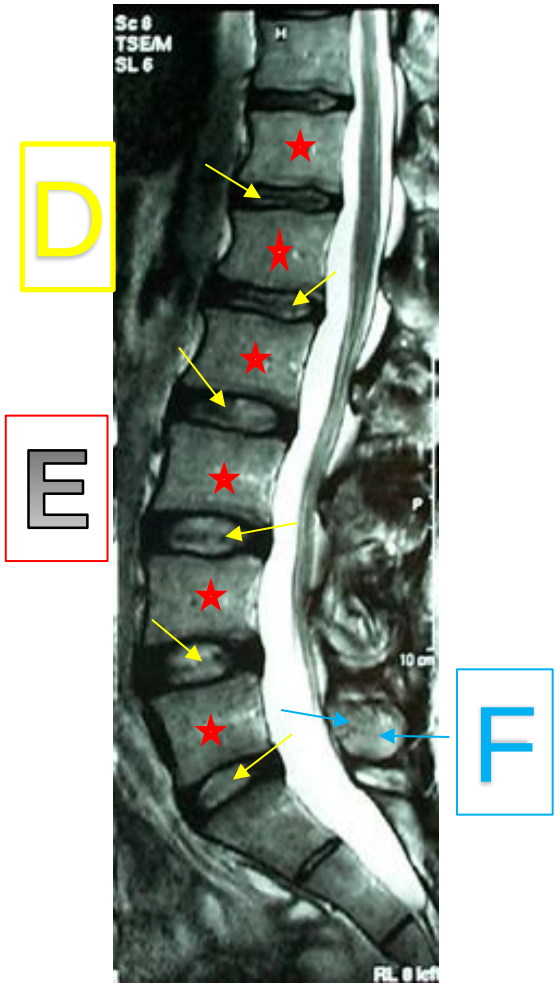
- **A.** Distal Cord is the Conus medullaris (yellow arrows): Typically terminates at the level of T12, L1 or L2.
- **B.** Cauda equina (blue arrows): Nerve roots extending from the conus medullaris.
- **C.** Cerebrospinal Fluid (red star): Inside the spinal canal, normal fluid surrounding the spinal cord, conus medullaris and cauda equina.



FOOT LEVELERS

Anatomy on Mid-Sagittal images

- Central canal- looking for stenosis and/or lesions in the canal.
- D. Intervertebral disc (yellow arrows)
- E. Vertebral bodies (red star)
- F. Spinous processes (blue arrows)-
  - There is slice asymmetry, therefore, we are not seeing all of the spinous processes above at each level, within this particular sagittal slice/image.



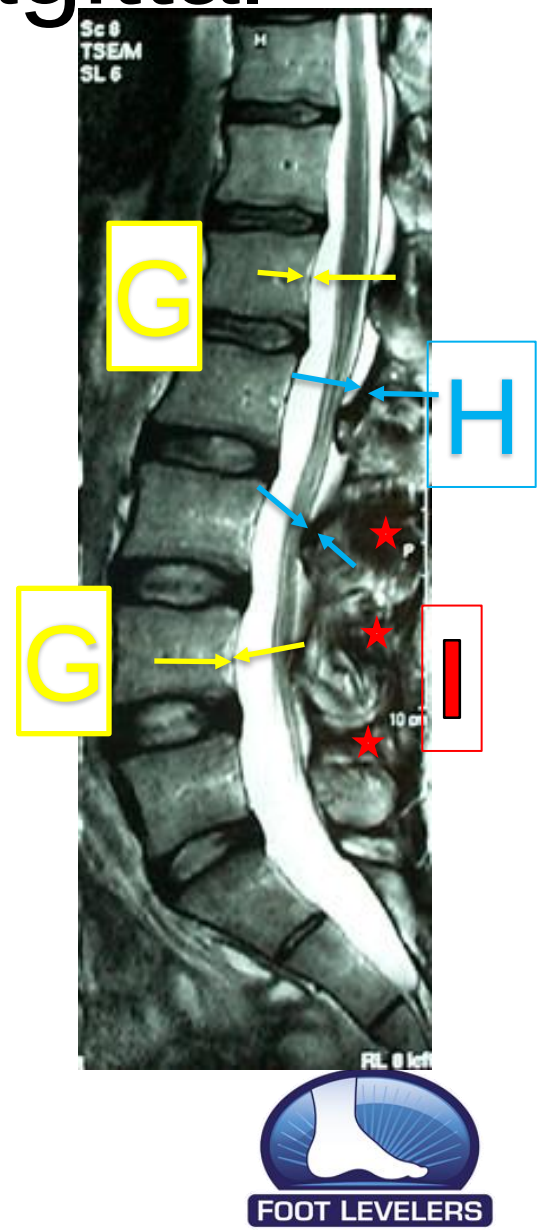
FOOT LEVELERS

Anatomy on Mid-Sagittal images

Ligaments

- Anterior longitudinal ligament (ALL)- when normal, you cannot see the ALL along the anterior aspect of the vertebral bodies and disc levels.

- **G.** Posterior longitudinal ligament (PLL) (yellow arrows)- normal, very thin ligament.

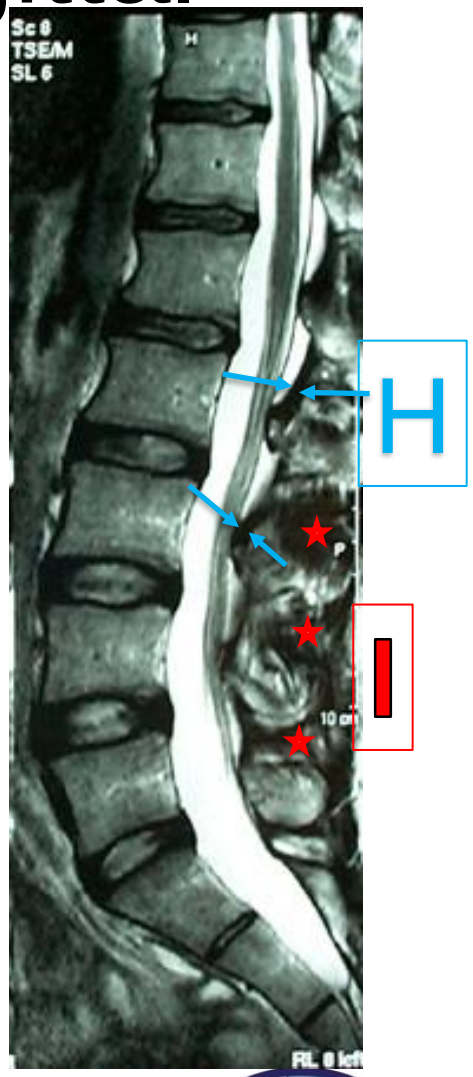


Anatomy on Mid-Sagittal images

Ligaments

- **H.** Ligamentum flavum (blue arrows)- a thin black line along the anterior aspect of the lamina.

- **I.** Interspinous ligaments (red star)- ligaments between each spinous process



FOOT LEVELERS

Anatomy on the Right & Left Parasagittal images

- Pedicles
- Exiting nerve roots & Neural foramina
- Facet joints
- Pars interarticularis

Right/Left Parasagittal Images

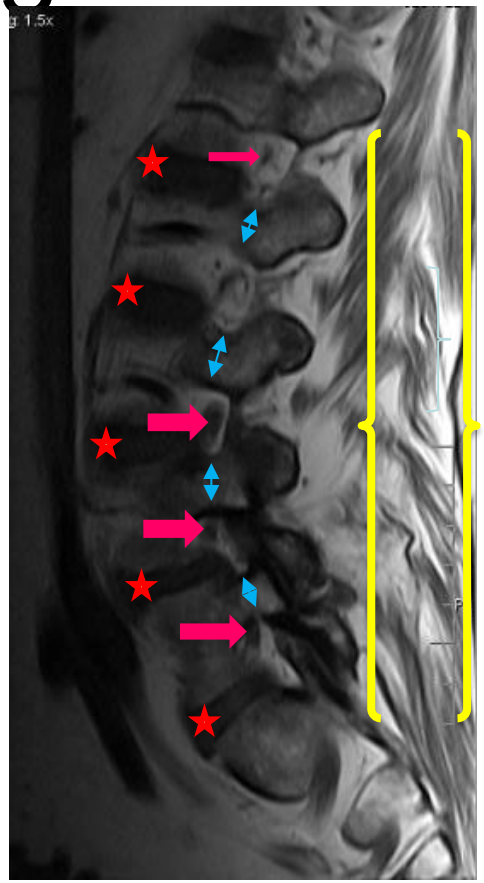
- **Parasagittal images allow to evaluate the following:**
  - Neural foramina- to evaluate for stenosis (Grading stenosis by mild, moderate or severe, while dividing into thirds);
  - Disc and facet joints- to see what they are doing to the exiting nerve roots, such as encroaching, effacing/abutting, or compressing the nerve roots.
  - Pars interarticularis- to evaluate for defects or stress fracture/reactive bone changes.

FOOT LEVELERS

Reminder: The exiting nerve root exits ‘below’ in the lumbar spine. Example, at the L3-L4 disc level, the exiting nerve root in the neural foramina would be L3. The L4-L5 disc level, the exiting nerve roots in the neural foramina would be L4.

FOOT LEVELERS

Anatomy on the Right or Left Parasagittal Images



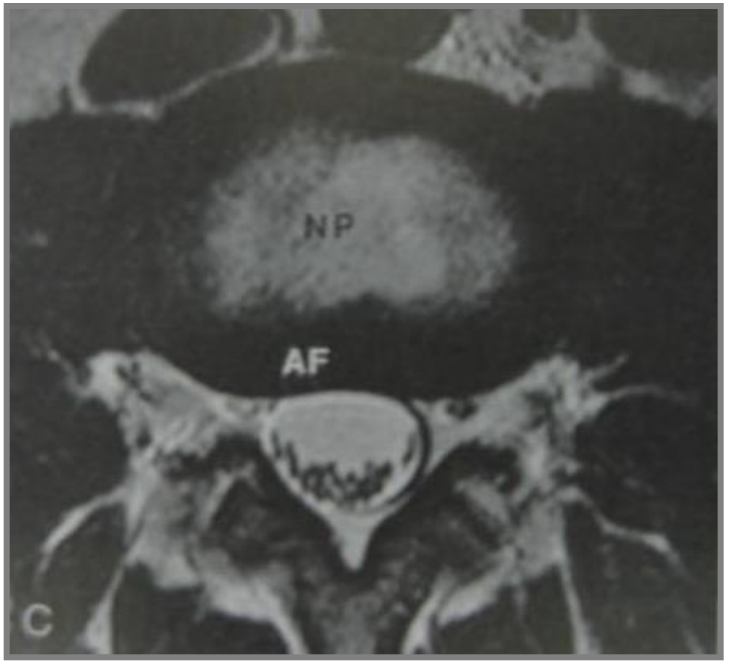
- **J.** Pedicles (blue double arrows)
- **K.** <u>Exiting nerve roots</u> (pink arrows)- is the black dot within the neural foramina.
- Disc= ☆
- Posteriorly, normal muscle with normal fat striations= { }

Right or Left Parasagittal Images

- Facet joints- blue rectangle
- Pars interarticularis- orange circle

Anatomy on Axial Images

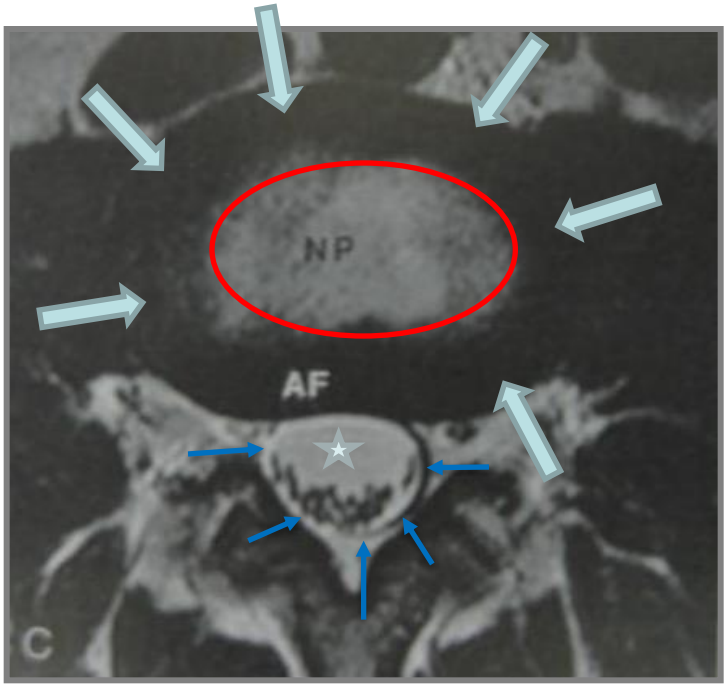
- Intervertebral disc: Nucleus pulposus & Annulus fibrosus
- Thecal Sac
- Epidural fat
- Cauda equina
- Cerebrospinal fluid
- Descending nerve roots
- Exiting nerve roots
- Lamina & Ligamentum flavum
- Facet joints
- Spinous process
- Iliopsoas, dorsal musculature; Aorta/iliac arteries



FOOT LEVELERS

Anatomy on Axial Images

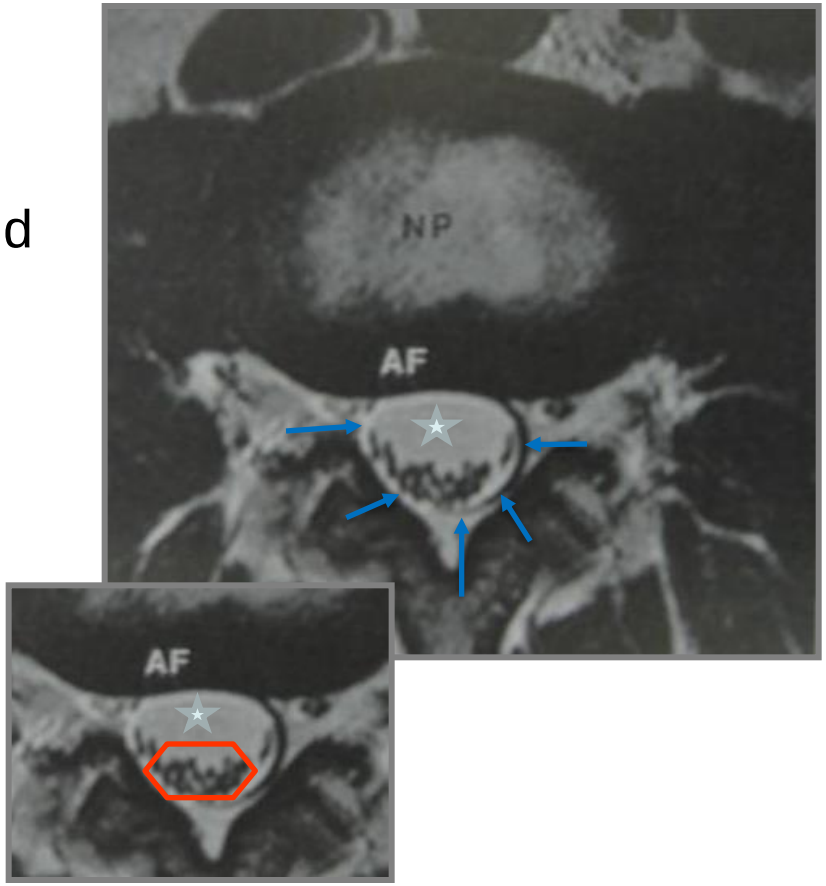
- Intervertebral disc:
  - Nucleus pulposus (NP)
  - Annulus fibrosus (AF)
- Thecal sac- Thin dura lining, contains the cauda equina and cerebrospinal fluid
- Cerebrospinal fluid= ☆ The fluid is contained by the thecal sac.



FOOT LEVELERS

Anatomy on Axial Images

- Thecal sac (blue arrows)- Thin dura lining, contains the cauda equina and cerebrospinal fluid
- Cerebrospinal fluid= ☆ The fluid is contained by the thecal sac.
- Cauda equina= All of the black dots (orange hexagon) within the thecal sac.

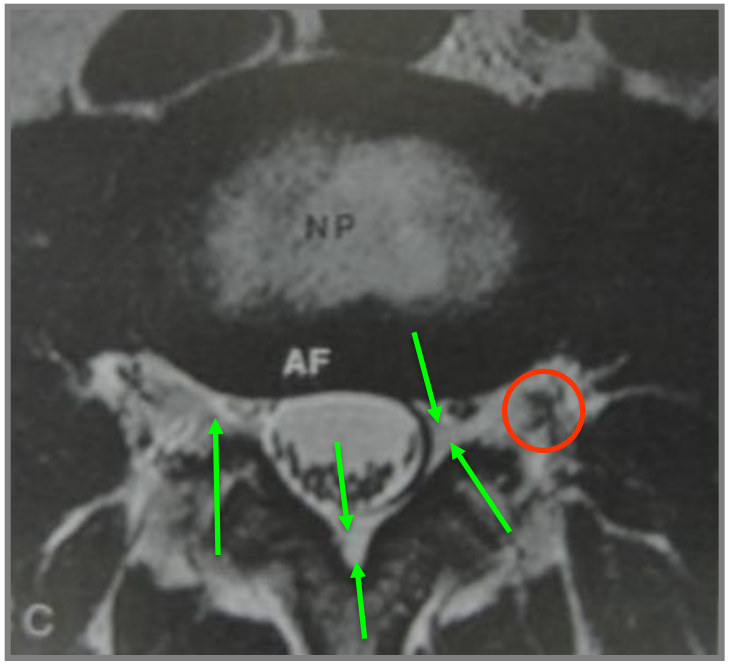


FOOT LEVELERS

Anatomy on Axial Images

- Epidural fat (green arrows)- bright signal surrounding the thecal sac and nerve roots. Fat is bright on T2 and T1 weighted images

- Exiting nerve roots (red outline)- sometimes appears oval or squiggle line on the axial images, posterolaterally.



FOOT LEVELERS

REMINDER

Reminder: The parasagittal images are the best images to evaluate the exiting nerve roots, not the axial images.

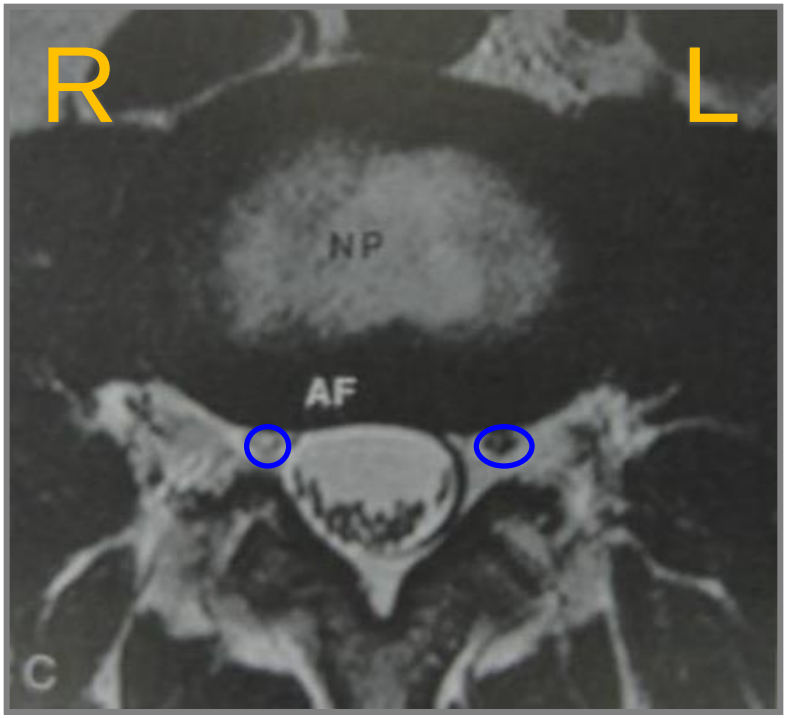
FOOT LEVELERS

Anatomy on Axial Images

- Descending nerve roots- (blue circle). The black dot is the typical presentation on the axial images.

- There is some slice asymmetry involving the right descending nerve root, catching some of the epidural fat and nerve root.

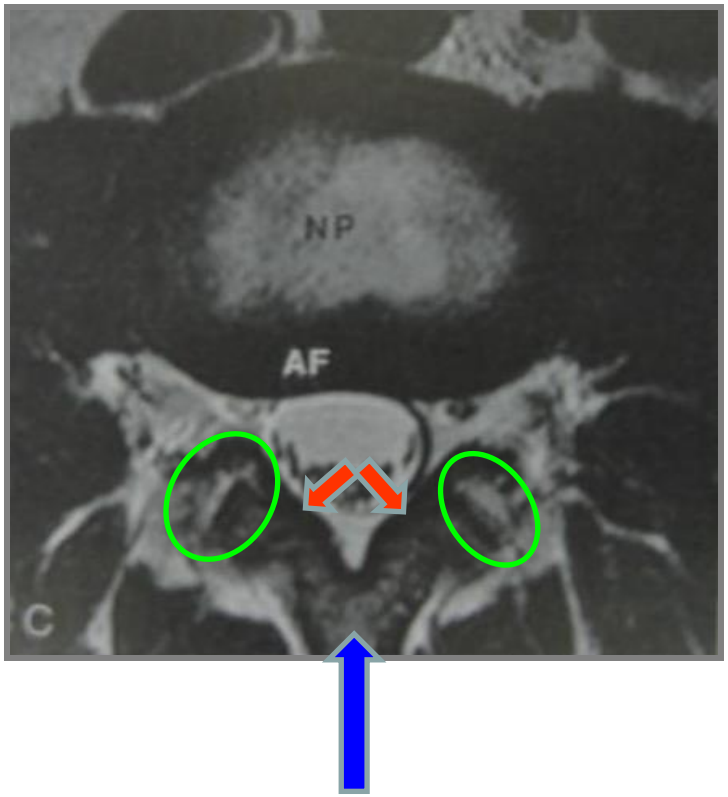
- NOTE: PATIENT'S RIGHT SIDE IS ON YOUR VIEWING LEFT; PATIENT'S LEFT SIDE IS ON YOUR VIEWING RIGHT.



FOOT LEVELERS

Anatomy on Axial Images

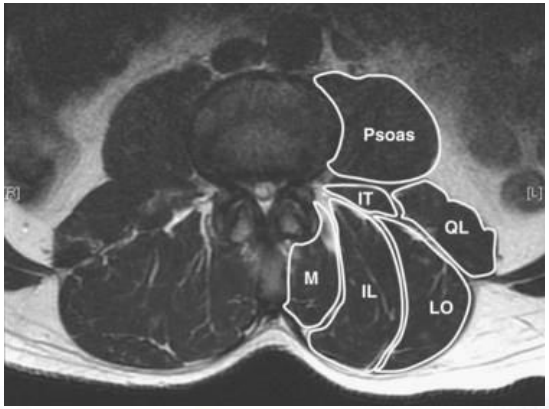
- Lamina & Ligamentum flavum- (orange arrows)
  - Ligamentum flavum is the black thin ‘line’ along the anterior margins of the lamina.
- Facet joints- (green circle outline)
  - These are normal facet joints….we will see more examples☺
- Spinous process- (blue arrow)

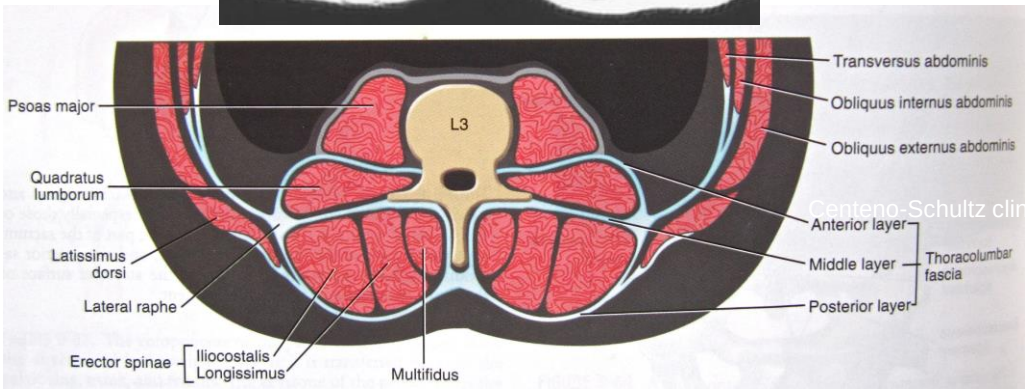


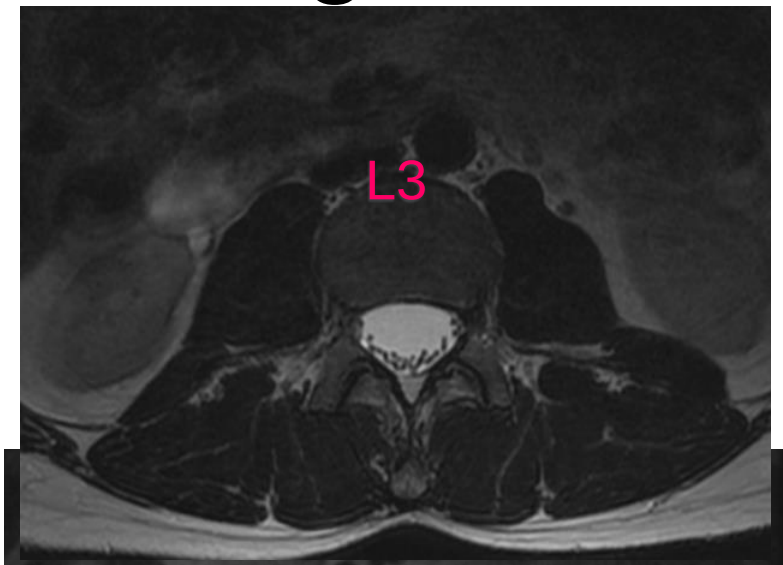
FOOT LEVELERS

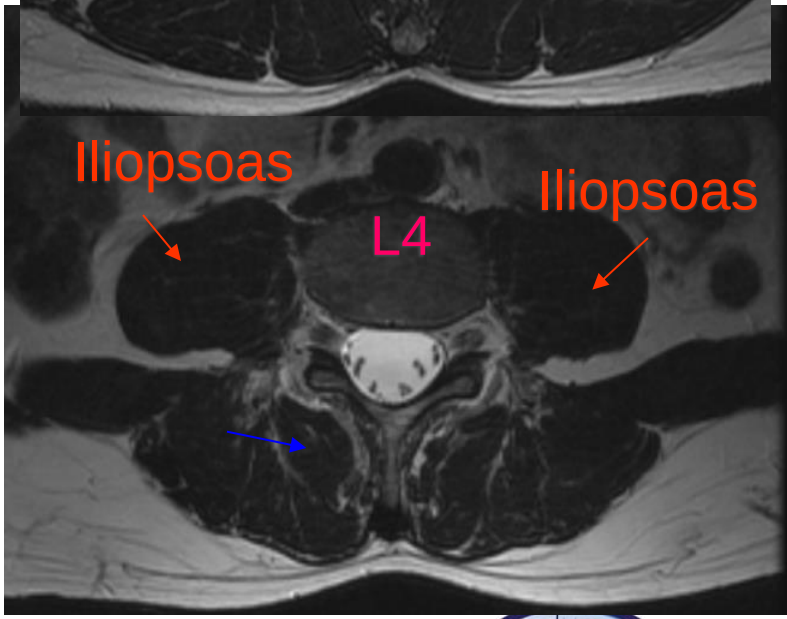
Anatomy on Axial Images

- Iliopsoas (orange), dorsal musculature (multifidus)





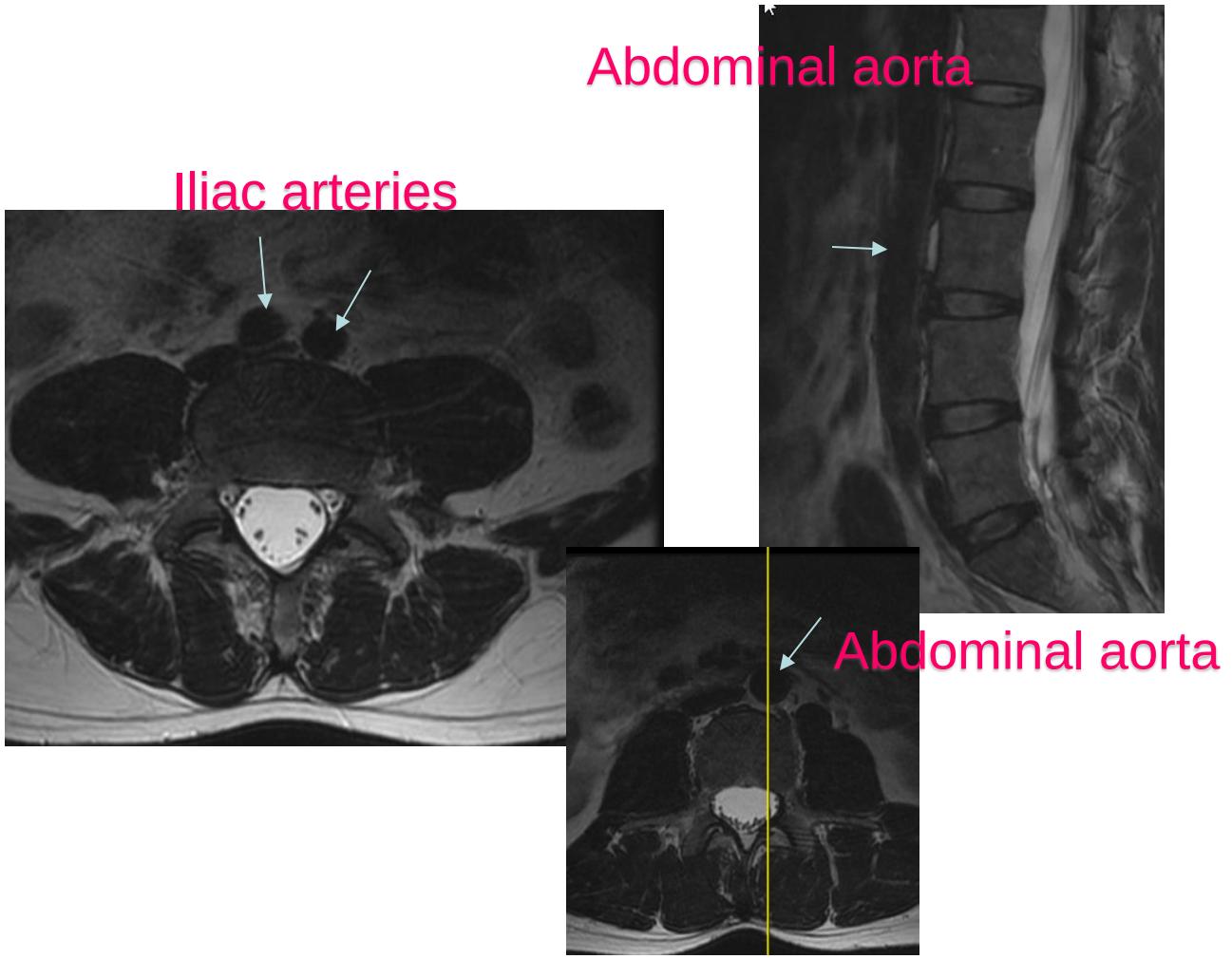




Anatomy on Axial Images

- Abdominal aorta- Level L3.

- Level of L4-L5: abdominal aorta bifurcates at the level of L4 into the right and left iliac arteries.



Note

- The multifidus muscle lies deep to the erector spinae muscles, where it fills the groove between the transverse and spinous processes of the vertebrae.

Nerve Roots in the Lumbar Spine- Two types

Exiting Nerve Roots

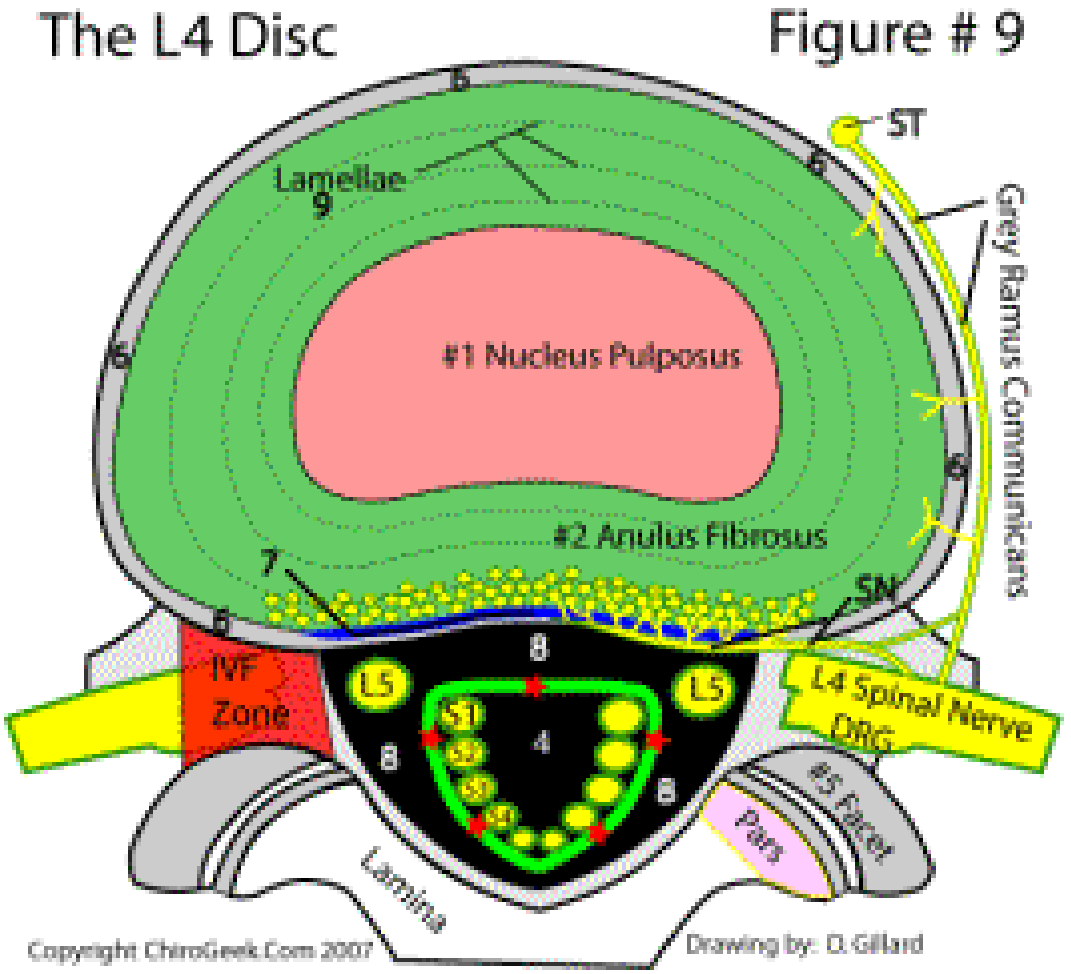
- **The exiting nerve root exits 'below' in the lumbar spine. Example: At the L3-L4 disc level, the exiting nerve roots in the neural foramina are L3. At the L4-L5 disc level, the exiting nerve roots in the neural foramina are L4.**
- **At the L5-S1 disc level, the exiting nerve roots in the neural foramina are L5.**

Descending Nerve Roots- Most commonly, cannot visualize the descending nerve roots at the disc levels of L1, L2 or L3, on the axial images. They tend to exit out of the thecal sac more inferiorly, in comparison to the L4 and L5 descending nerve roots.

- **At the L4-L5 disc level, the descending nerve roots are L5.**
- **At the L5-S1 disc level, the descending nerve roots are S1.**

FOOT LEVELERS

- If you need more information on anatomy, I suggest checking out www.chirogeek.com. I enjoy this website for more detail of the anatomy. I don't know the doctor but the illustrations are nice, like this one on this slide ☺



Types of MR Sequences

- You will never tell the MR technician or MR center what sequences to perform. Each scanner may have a different protocol.

- However, it is best to inform the imaging center that a stress fracture is a consideration or trauma has occurred. The imaging center will then perform a STIR (short tau inversion recovery) sequence.
  - Stress fractures and insufficiency fractures are best detected on STIR sequences.

FOOT LEVELERS

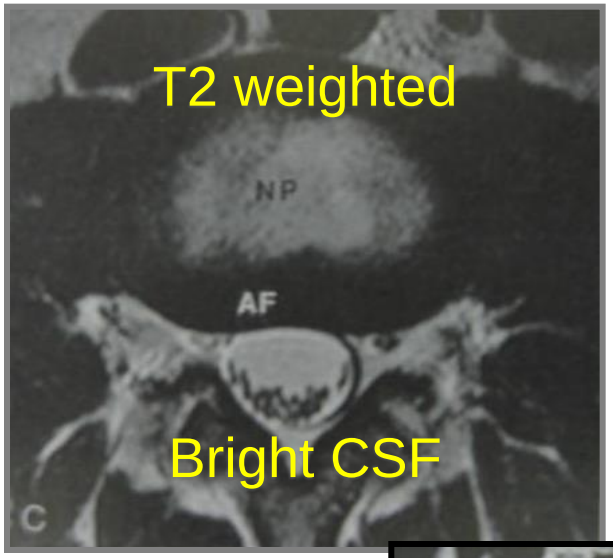
Types of MR Sequences

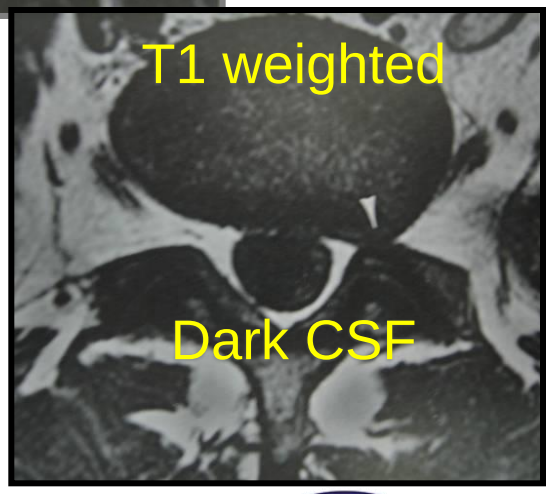
- T1 and T2 weighted images are the most common sequences performed for the spine.
- You don't need to know the physics of T1 or T2☺ That's a different lecture!
- When evaluating the images, find the bright fluid signal of cerebrospinal fluid in the thecal sac….that would be the T2 weighted image. It is easy to find and easier to show your patient, in comparison to the T1 weighted images.

FOOT LEVELERS

Types of MR Sequences

- Axial image= Normal bright fluid content in the nucleus pulposus (NP)= T2 weighted image.
- Bright CSF= T2 weighted image
- Dark CSF= T1 weighted image

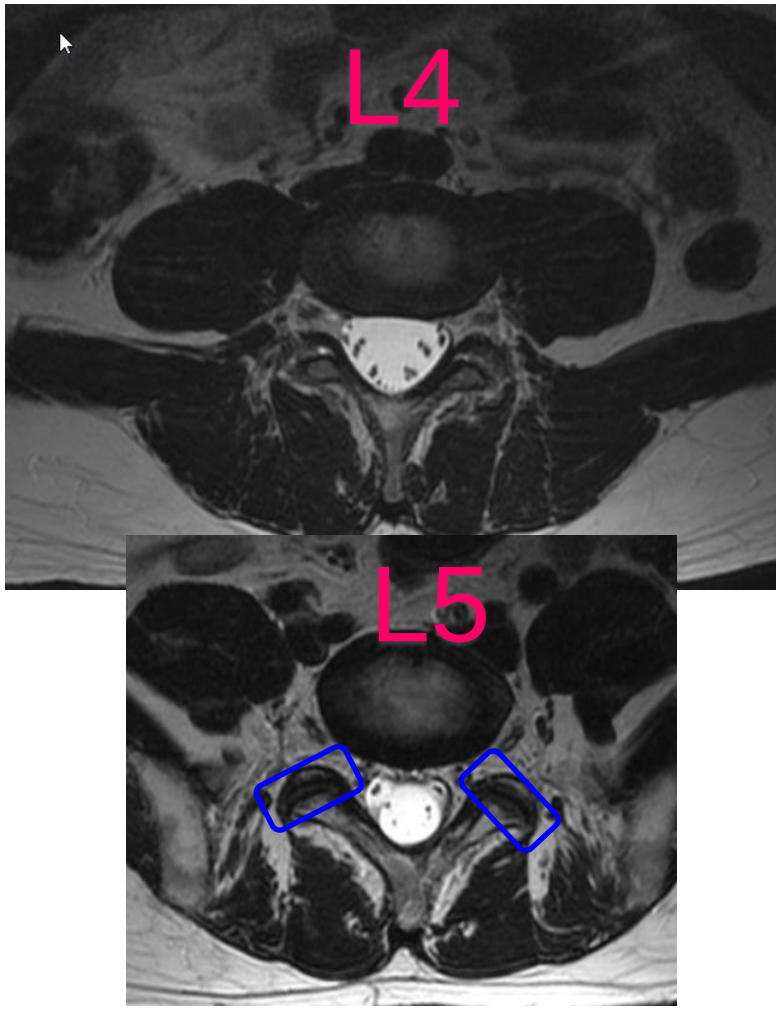




FOOT LEVELERS

Normal Intervertebral Discs

- Normal disc spacing and normal disc signal intensity.
- Normal facet joints (blue rectangle)



FOOT LEVELERS

Nomenclature- Types of Posterior Disc Displacement

- Disc Bulge: Diffuse/Circumferential/Annular disc bulge----it all means the same.
- Disc Protrusion: Broad-based or Focal
- Disc Extrusion
- Sequestration

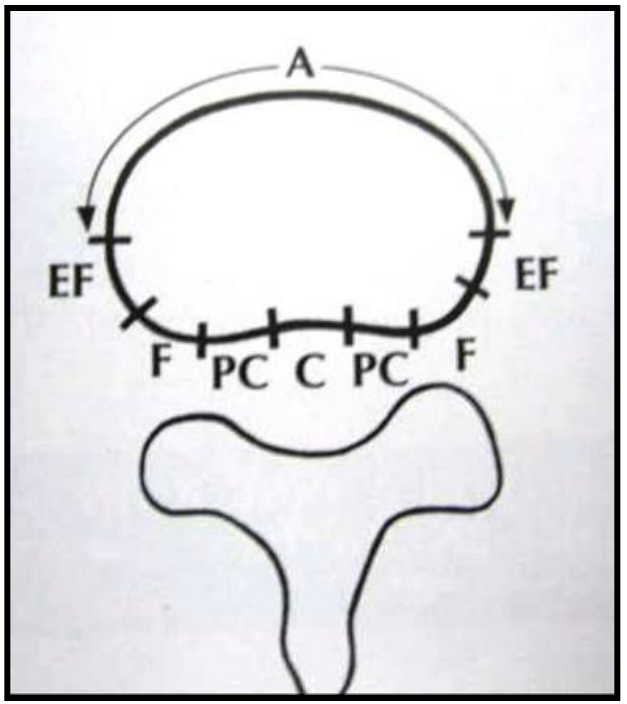
- Herniation: It is a generalized term for posterior disc displacement. Typically, it is used for protrusions, however, I have seen radiologists use it as a general term for any type of posterior displacement which is not helpful clinically.

FOOT LEVELERS

Location of (Posterior) Disc Displacements

- Central
- Left/Right Central
  - Previous nomenclature was right and left paracentral (PC)
- Foraminal
- Extraforaminal

- Anterior



FOOT LEVELERS

Further Grading

- Disc bulge, Protrusions and Extrusions
  - Mild, moderate & severe grading terminology is subjective when evaluating the disc.
  - Measurements of the disc are more objective and gives the clinician a visual of the size of the disc.

    - NOTE: The measurement of the disc does **Not** depict surgery; surgery is based on decreased **patient function**, not the size of the disc bulge, protrusion or extrusion.

FOOT LEVELERS

Further Grading

- Evaluating the neural elements: What is the posterior disc displacement doing to the nerve roots and thecal sac:
  - Encroachment,
  - Effacement or abutment, or
  - Compression (with displacement).

FOOT LEVELERS

Evaluating Nerve roots and Thecal Sac

- Encroachment
  - The best example is when someone is standing too close for comfort; or when someone is ‘in-your-bubble’.
  - The disc is near the nerve roots or thecal sac, but not touching it.

- Effacement or abutment
  - The disc is ever so slightly touching the nerve roots and/or thecal sac, but not compressing or indenting the margins of the nerve root or thecal sac.

- Compression
  - Indents the margins of the thecal sac and/or nerve roots, and could possibly displace these structures out of the normal position.

FOOT LEVELERS

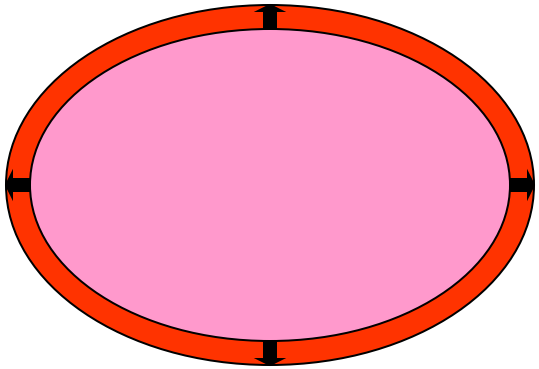
Disc Nomenclature

- Diffuse disc bulge
  - Asymmetrical disc bulge
- Broad-based protrusion
- Focal disc protrusion
- Disc extrusion
- Disc sequestration

FOOT LEVELERS

Diffuse Disc Bulge

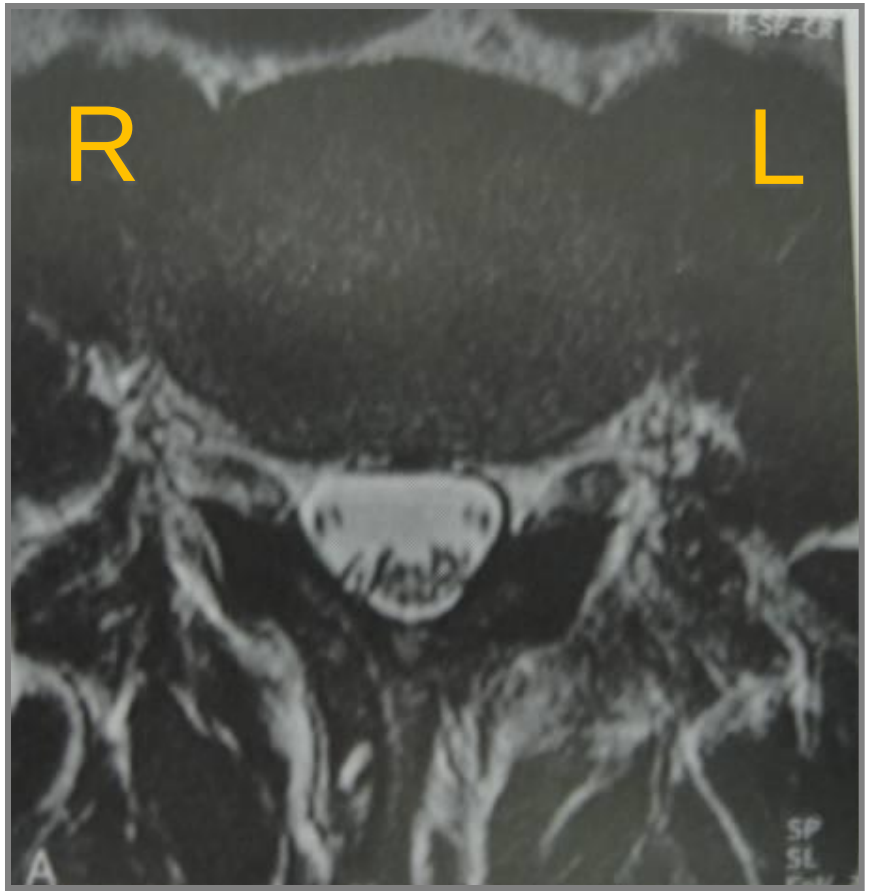
- The margins of the disc surpass the entire circumference of the endplates.
- Also called a diffuse annular or circumferential disc bulge
- This can also be considered a “normal” finding in the aging spine; and cadaver studies have found bulging discs in asymptomatic patients as well.
- However, can bulging discs cause pain….Yes!



Diffuse Disc Bulge

- Axial, T2 weighted image of unknown level.

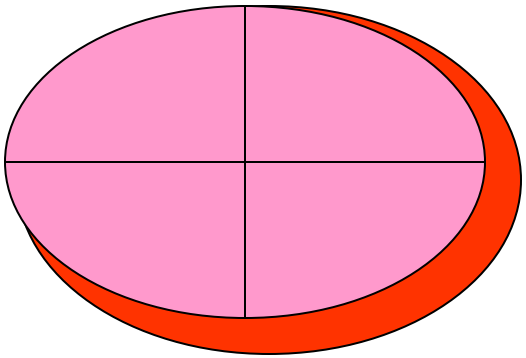
- CSF within the thecal sac is bright= T2 weighted image.



FOOT LEVELERS

Asymmetrical Disc Bulge

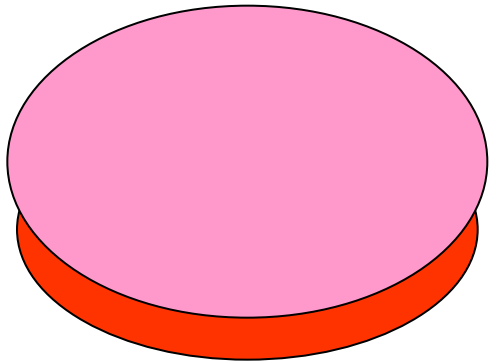
- Asymmetrical (or right/left lateral) disc bulge involving more than 50% of the disc circumference.
- Commonly seen with scoliosis patients due to the convexities.

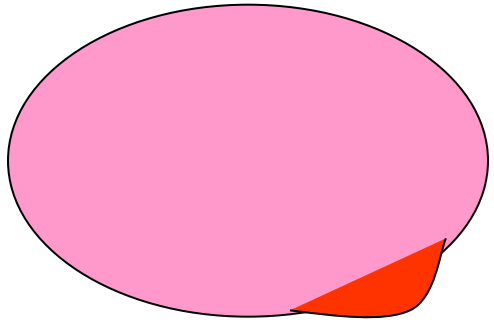


Broad-based Protrusion & Focal Protrusion

Broad-based Disc Protrusion

- The disc is being displaced 25% to 50% of the disc circumference.
- Base of the disc protrusion is wider than the AP diameter.





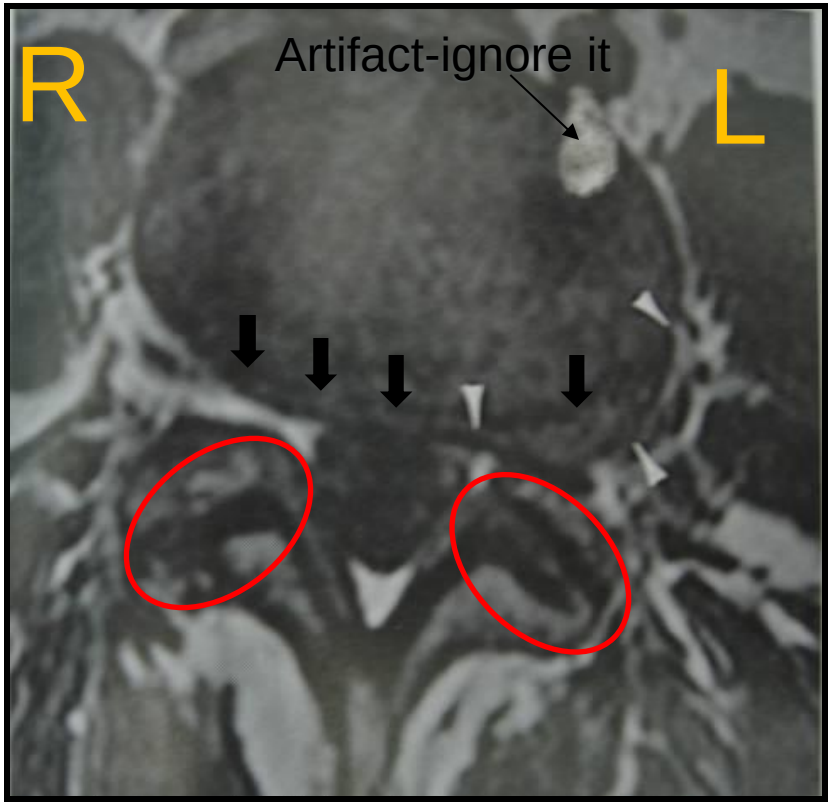
Focal Disc Protrusion

- The disc is being displaced 25% or less of the disc circumference.

FOOT LEVELERS

Broad-based Disc Protrusion

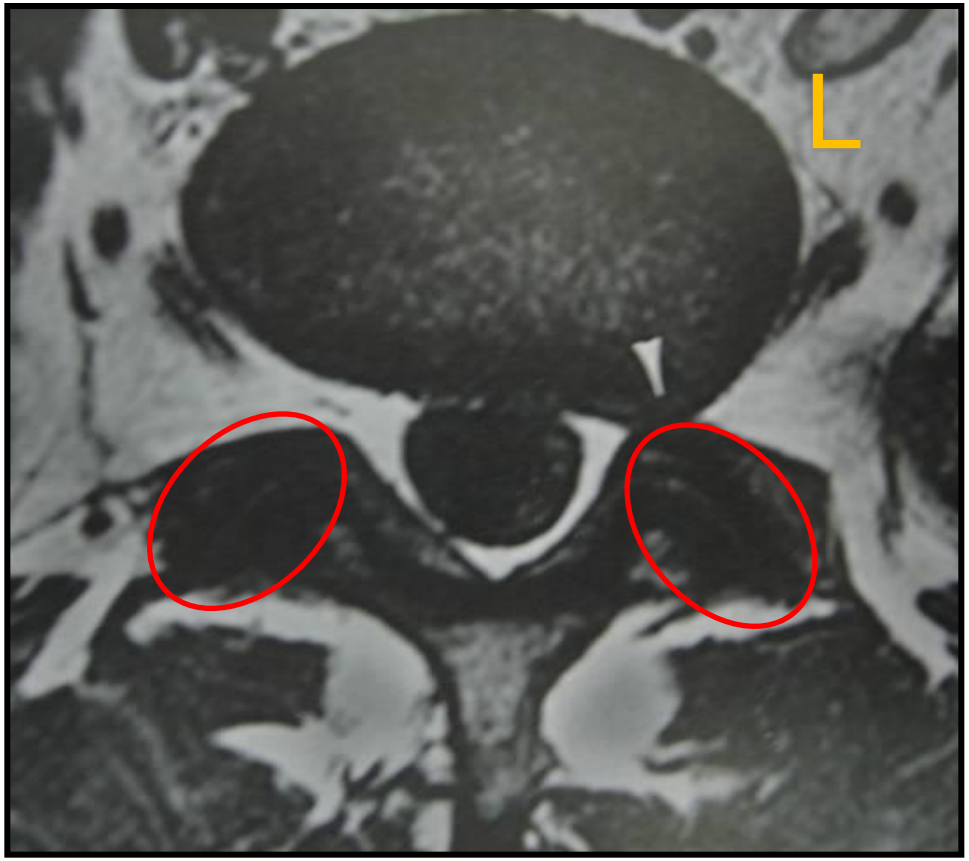
- Axial, T1 weighted image of unknown level, CSF is dark on T1 weighted image.
- Broad-based left foraminal disc protrusion (white arrows).
- Need parasagittal images to comment on exiting nerve roots
- Facet joints (red circle) are normal.



FOOT LEVELERS

Focal Disc Protrusion

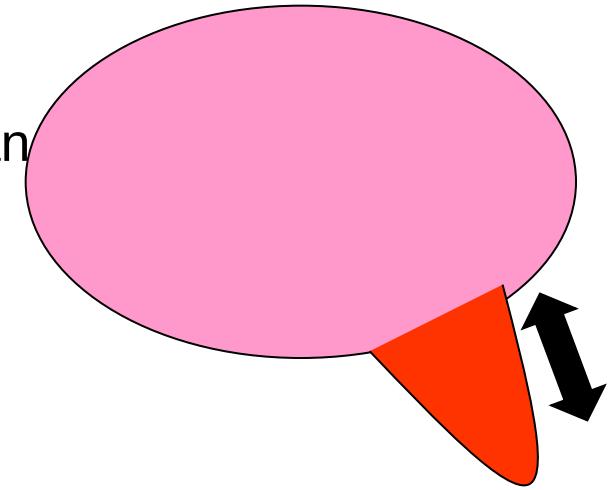
- Axial, T1 weighted image of unknown level.
- Focal left foraminal disc protrusion.
- Need parasagittal images to comment on exiting nerve roots
- Facet joints (red circle) are normal.



FOOT LEVELERS

Disc Extrusion

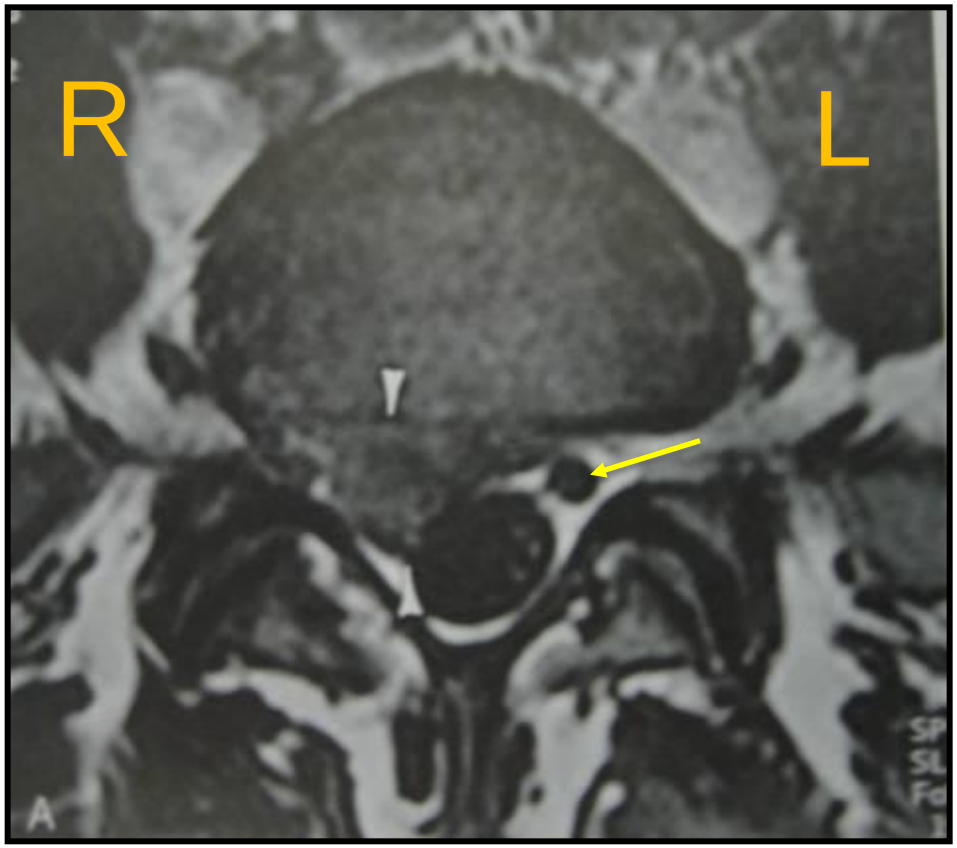
- The disc is being displaced posteriorly at less than 25% of the disc circumference.
- The AP diameter is greater than the base, whereas, the protrusions have a wider base and does not extend posteriorly as much as an extrusion.
- Maintains contact with parent disc



FOOT LEVELERS

Disc Extrusion

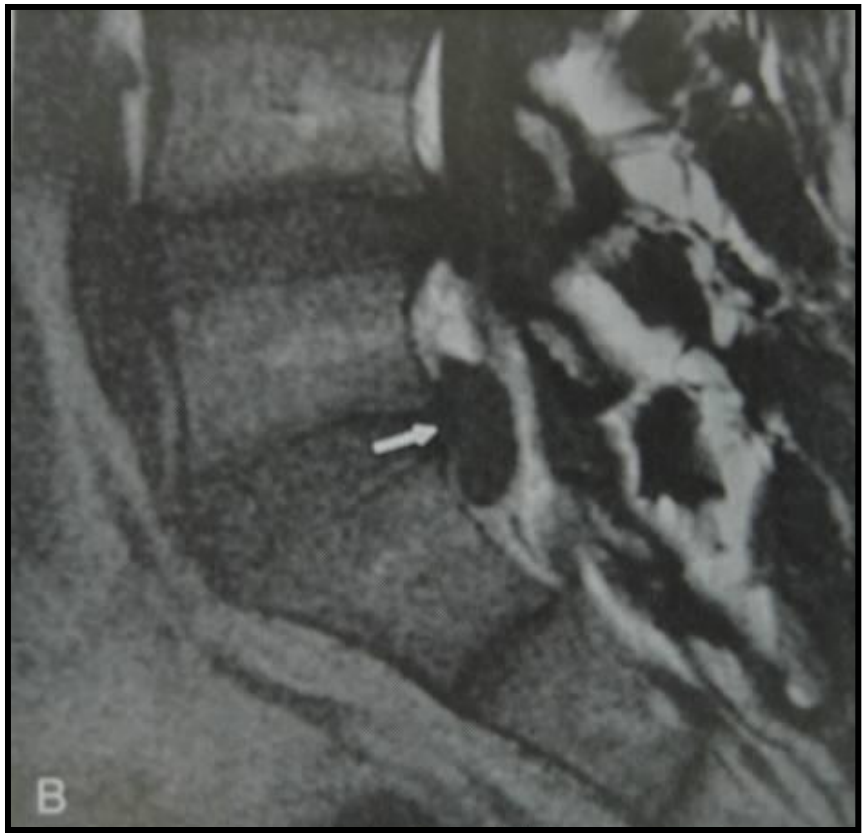
- Axial image of L4-L5.
- L4-L5: Right central disc extrusion is compressing the thecal sac and right L5 descending nerve root.
- There is also encroachment to the left L5 descending nerve root (yellow arrow).



FOOT LEVELERS

Disc Extrusion

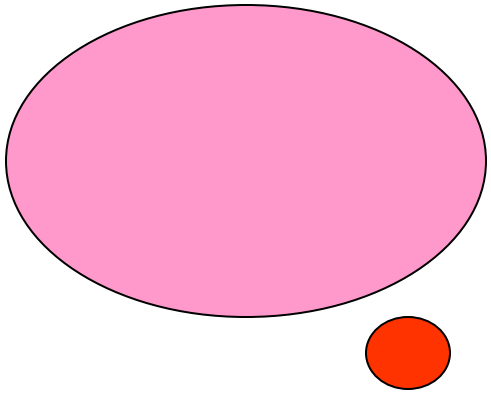
- Sagittal image
- L5-S1: Disc extrusion with cephalad and caudal migration is compressing the thecal sac with severe spinal canal stenosis.
- Suspected disc protrusion at L4-L5.



FOOT LEVELERS

Disc Sequestration

- Loss of continuity to the parent disc; Free fragment—might be a better term.



Disc Sequestration

- Sagittal image
- Arrow is pointing to a sequestration, where a piece of disc material broke off from the parent disc (in this pic, not sure where it came from).
- The signal is bright within the fragment due to inflammatory properties.

FOOT LEVELERS

Other Items: Annular Fissure/Defect/Tear

- Aka High Intensity Zones
  - Typically, shown as a small globular bright white signal on the T2 and STIR weighted images within the annulus fibrosus.
  - Pain generators particularly when located in the posterior aspect of the disc, a highly innervated region of the disc.

Annular Fissure/Tear/Defect

- Linear or globular high signal intensity within the annulus fibrosus.
- These are detected on the T2 and STIR weighted images.

Annular Fissure/Tear/Defect

- Axial T2 weighted image: Linear/globular high signal intensity within the annulus fibrosus.

- Focal right and left foraminal disc protrusions with superimposed diffuse disc bulge are compressing the thecal sac, resulting in mild spinal canal stenosis.

FOOT LEVELERS

Keep in Mind When Viewing Cases

- What type of disc are we looking at relative to the sagittal and axial images?
- Where is the disc going? (Location-central, right/left central, foraminal)
- What is the disc doing to the thecal sac? (Encroachment, Effacement, Compression)
- What is the disc doing to the descending and exiting nerve roots?
- Is the disc and/or bony structures resulting in spinal canal or neural foramina stenosis? If so, how much?
  - We can grade spinal canal and neural foramina stenosis by using mild, moderate or severe.
  - When writing reports, the terms mild, moderate or severe (subjective) are **NOT** used when describing a disc. It would be ideal to give measurements (more objective) of the disc bulge/protrusion/extrusion.

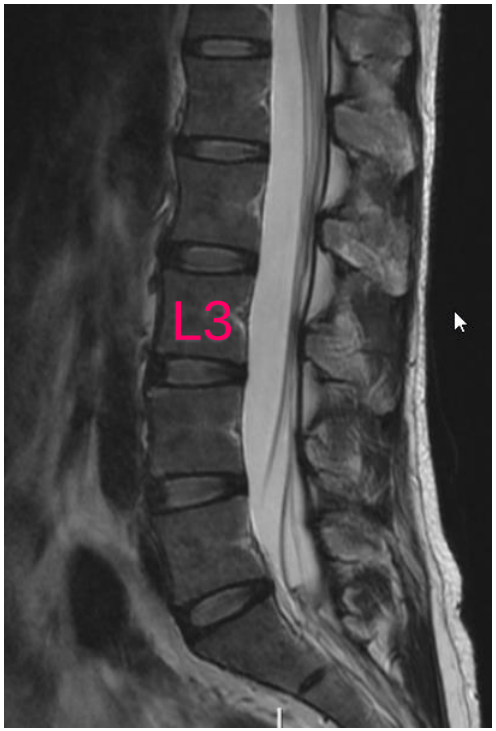
FOOT LEVELERS

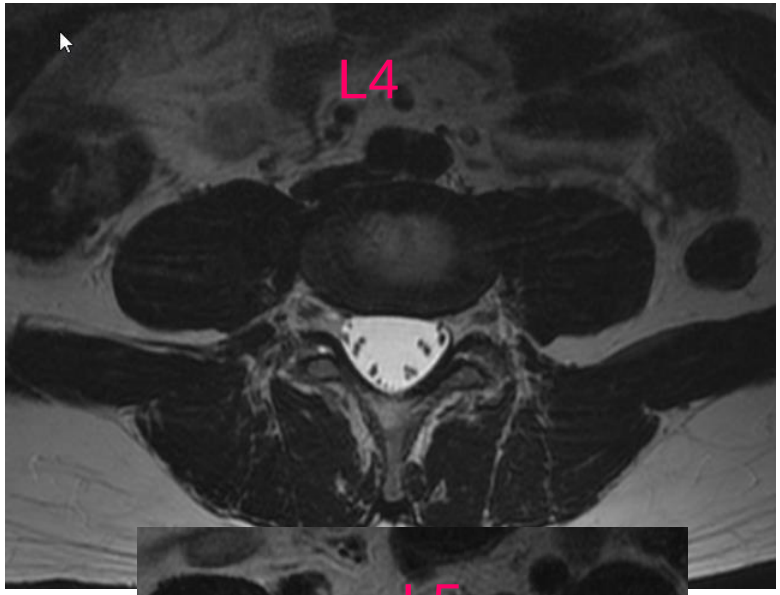
To Start, Examples of Normal versus Abnormal Discs

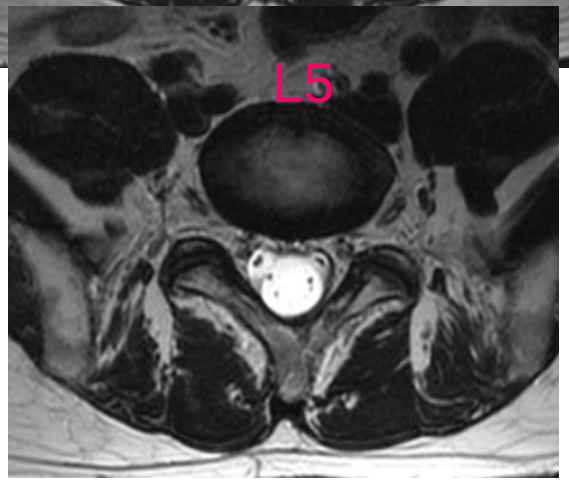
FOOT LEVELERS

Normal Intervertebral Discs

- Normal disc spacing and signal intensity.
- Top is L4 axial; Bottom is L5 axial
- Normal facet joints



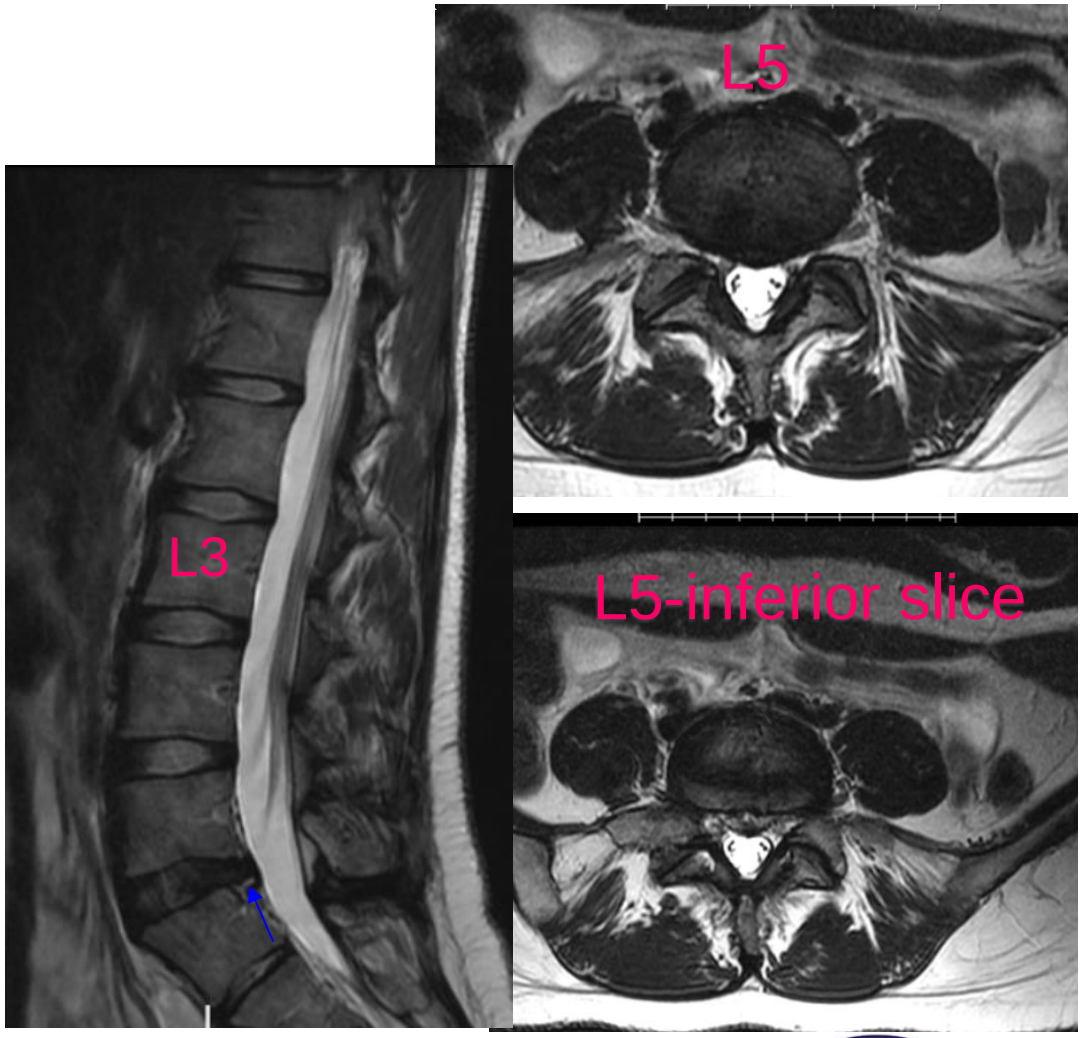




FOOT LEVELERS

Abnormal disc at L5-S1

- L5-S1: Central disc extrusion with inferior migration is compressing bilateral S1 descending nerve roots; Disc desiccation/dehydration .
- Annular fissure/tear/defect (blue arrow).
- Normal discs from T12 to L4.



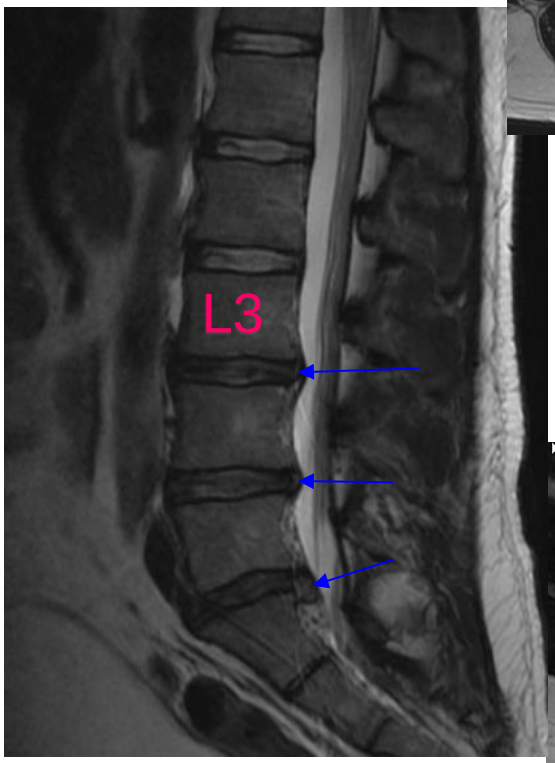
FOOT LEVELERS

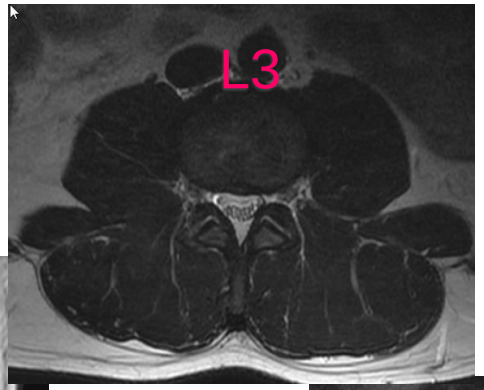
Examples of Abnormal discs

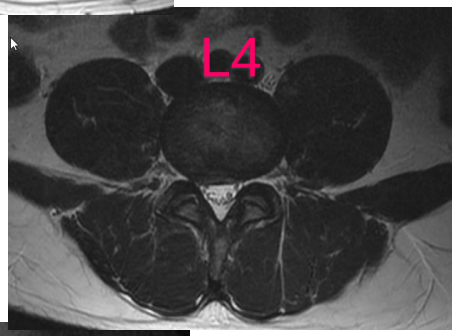
- Disc desiccation and disc narrowing at L3, L4 & L5.

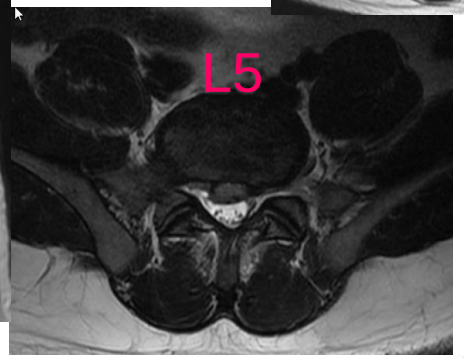
- L3-L4: Diffuse disc bulge
- L4-L5: Right central focal disc protrusion; Annular fissure/tear/defect
- L5-S1: Central disc extrusion; Annular fissure/tear/defect

- T12, L1 and L2 discs are normal.









FOOT LEVELERS

Case 1

FOOT LEVELERS

www.spineuniverse.com

FOOT LEVELERS

Diagnosis for Lateral Lumbosacral spot

- Mild disc space narrowing at L4-L5 and L5-S1.
- Degenerative retrolisthesis at L5 of 1.7 mm.
- Mild facet arthrosis at L4-L5 and L5-S1.
- Osseous neural foramina stenosis at L4-L5 and L5-S1 due to the forementioned degenerative changes.

FOOT LEVELERS

Lateral Lumbosacral spot

- Follow-up imaging
  - MRI….why?
    - Degenerative changes, osseous neural foramina stenosis, symptoms/function of the patient, not responding to conservative treatment.
    - The next step is MRI without contrast.
      - Note: Conservative treatment is considered as physical therapy, acupuncture, chiropractic, massage therapy, etc.

FOOT LEVELERS

Sagittal T2 and is magnified area

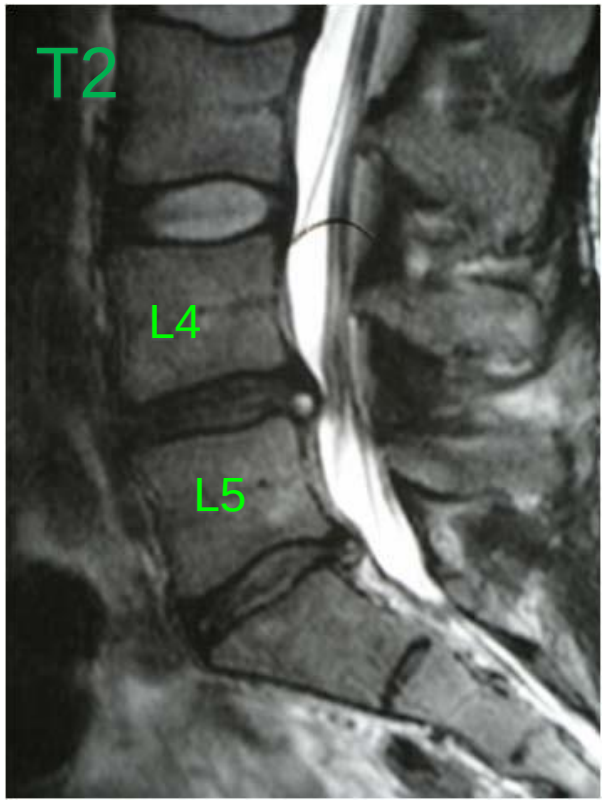
Artifact- ignore it☺

www.spineuniverse.com

FOOT LEVELERS

Diagnosis

- L4-L5: Disc protrusion is compressing the thecal sac with mild spinal canal stenosis.
  - Annular fissure/tear/defect, and disc desiccation/dehydration and disc narrowing
- L5-S1: Disc protrusion is compressing the thecal sac with mild spinal canal stenosis.
  - Annular fissure/tear/defect and disc desiccation and narrowing.
- Mild posterior spondylosis at L5-S1.
- We need the axial images to evaluate if the protrusion is central, right/left central, etc.

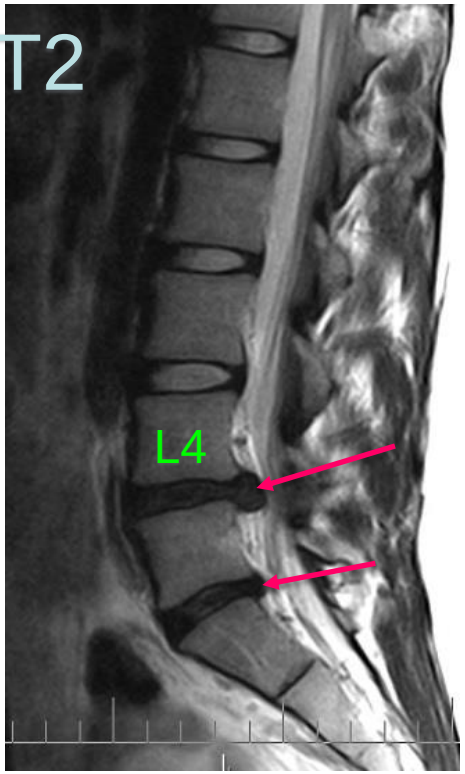


FOOT LEVELERS

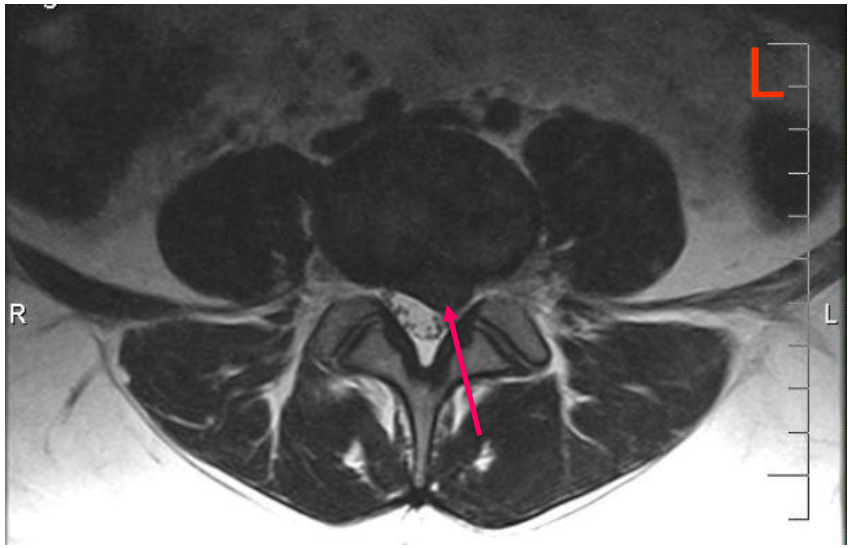
Case 2

FOOT LEVELERS

Sagittal T2 and Axial T2 weighted images



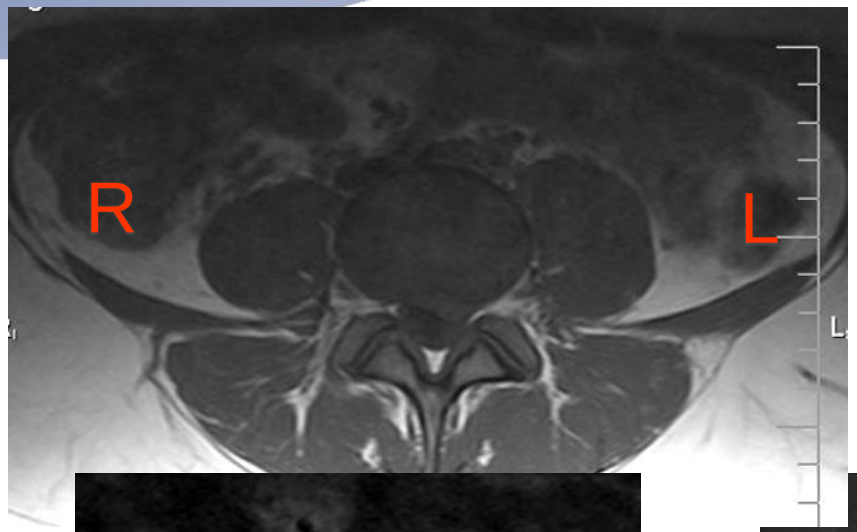
- No axial images available for disc level L5-S1

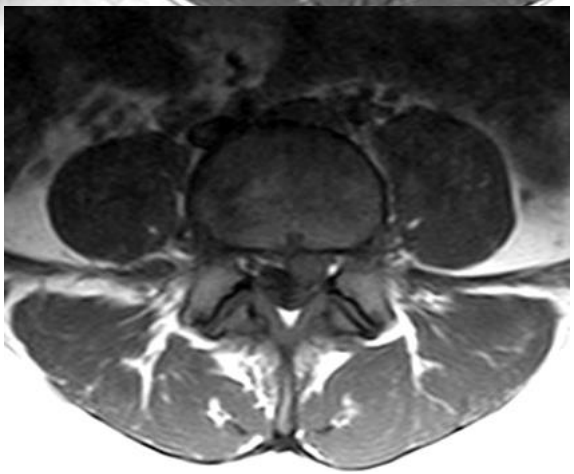


FOOT LEVELERS

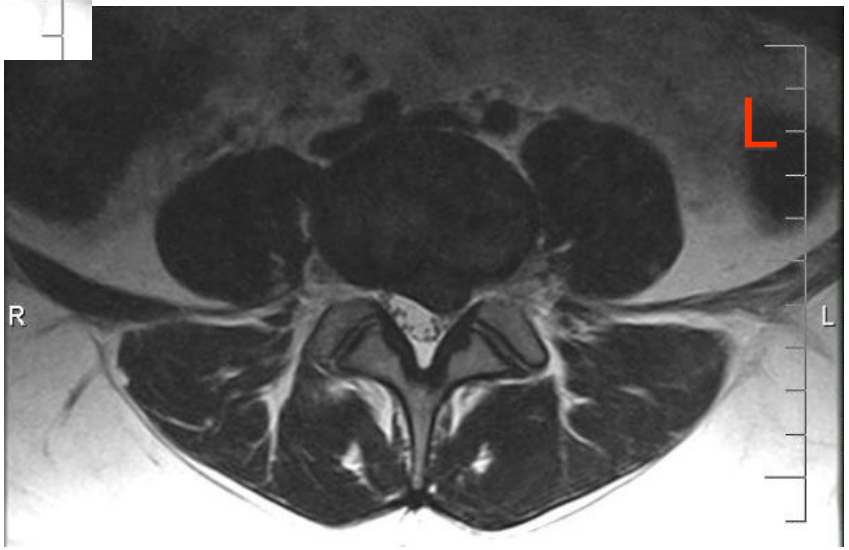
www.mypacs.net

T1





T2

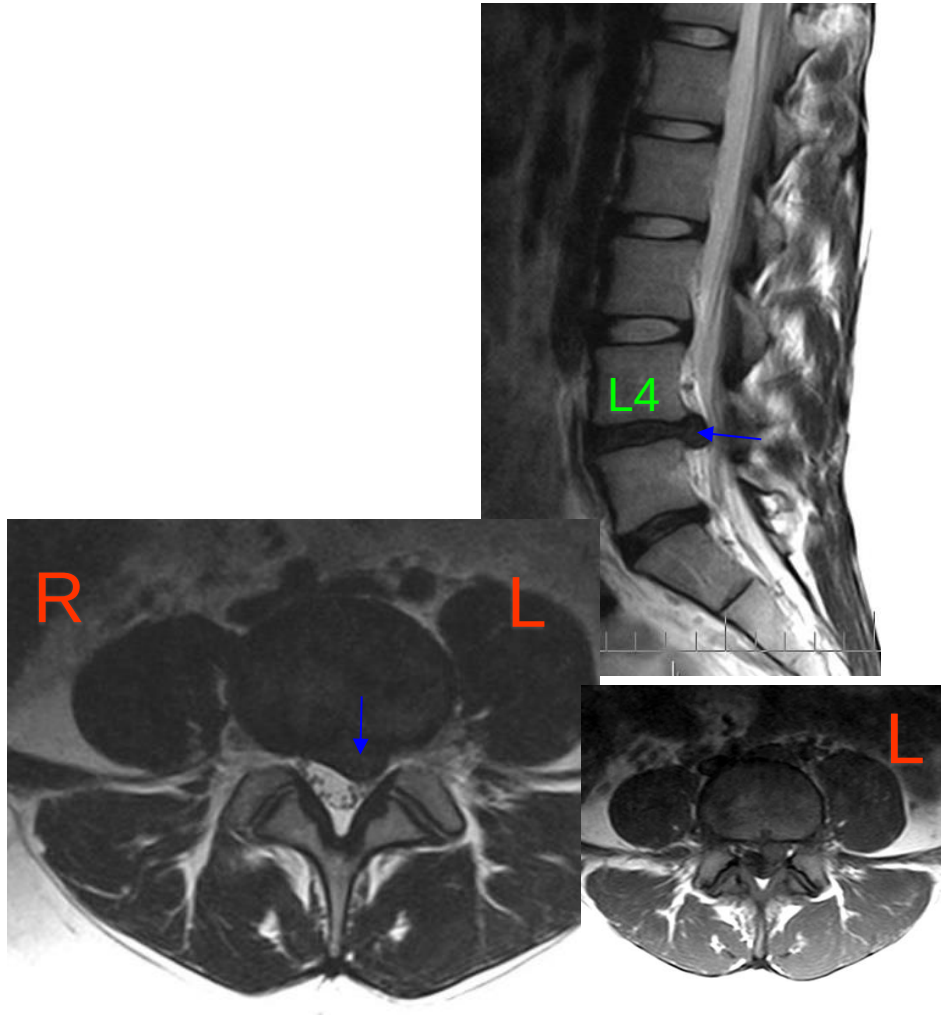


www.mypacs.net

FOOT LEVELERS

Diagnosis

- L4-L5: Left central disc extrusion (blue) with inferior migration is compressing the thecal sac and left L5 descending nerve root, resulting in moderate spinal canal stenosis.

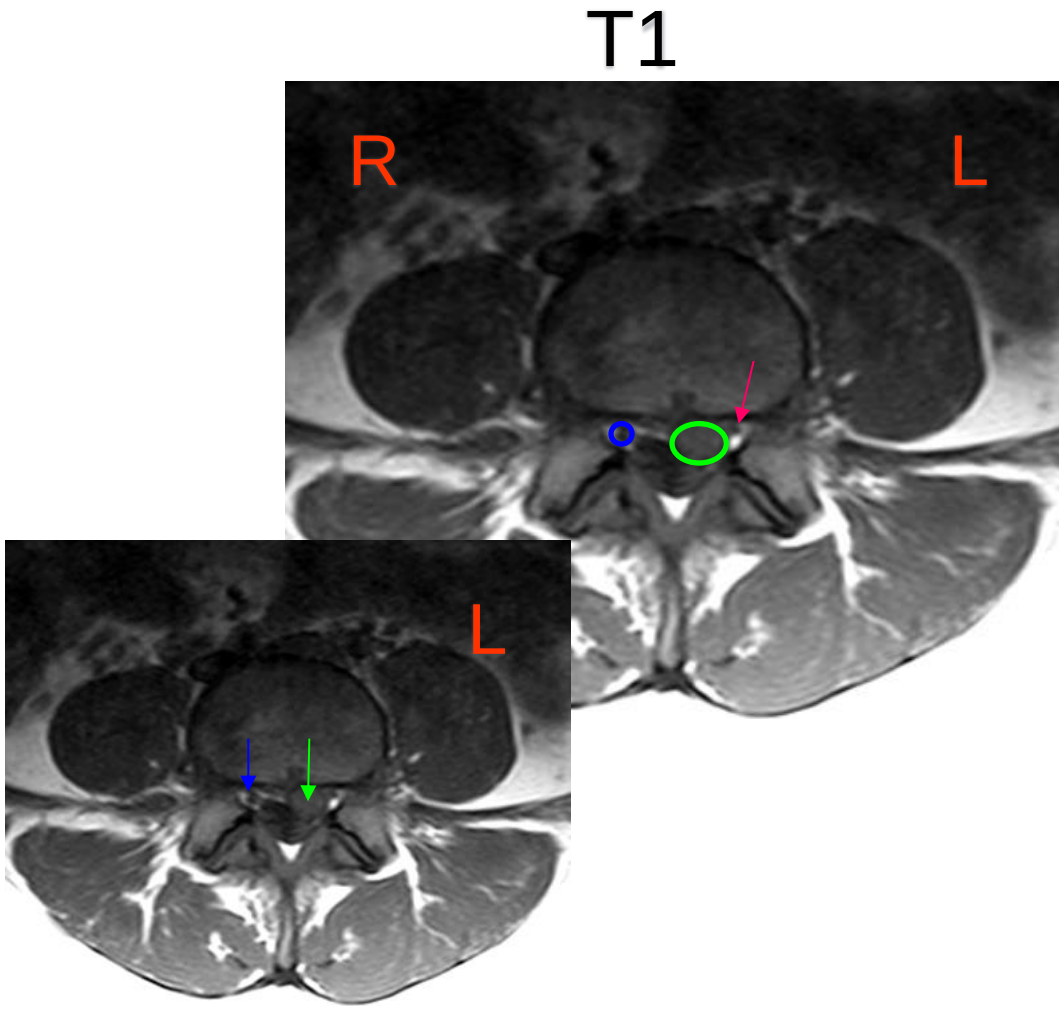


FOOT LEVELERS

- This is an axial T1 weighted image with the slice through the superior endplate of L5, traversing through the inferior migrated disc extrusion of L4-L5.

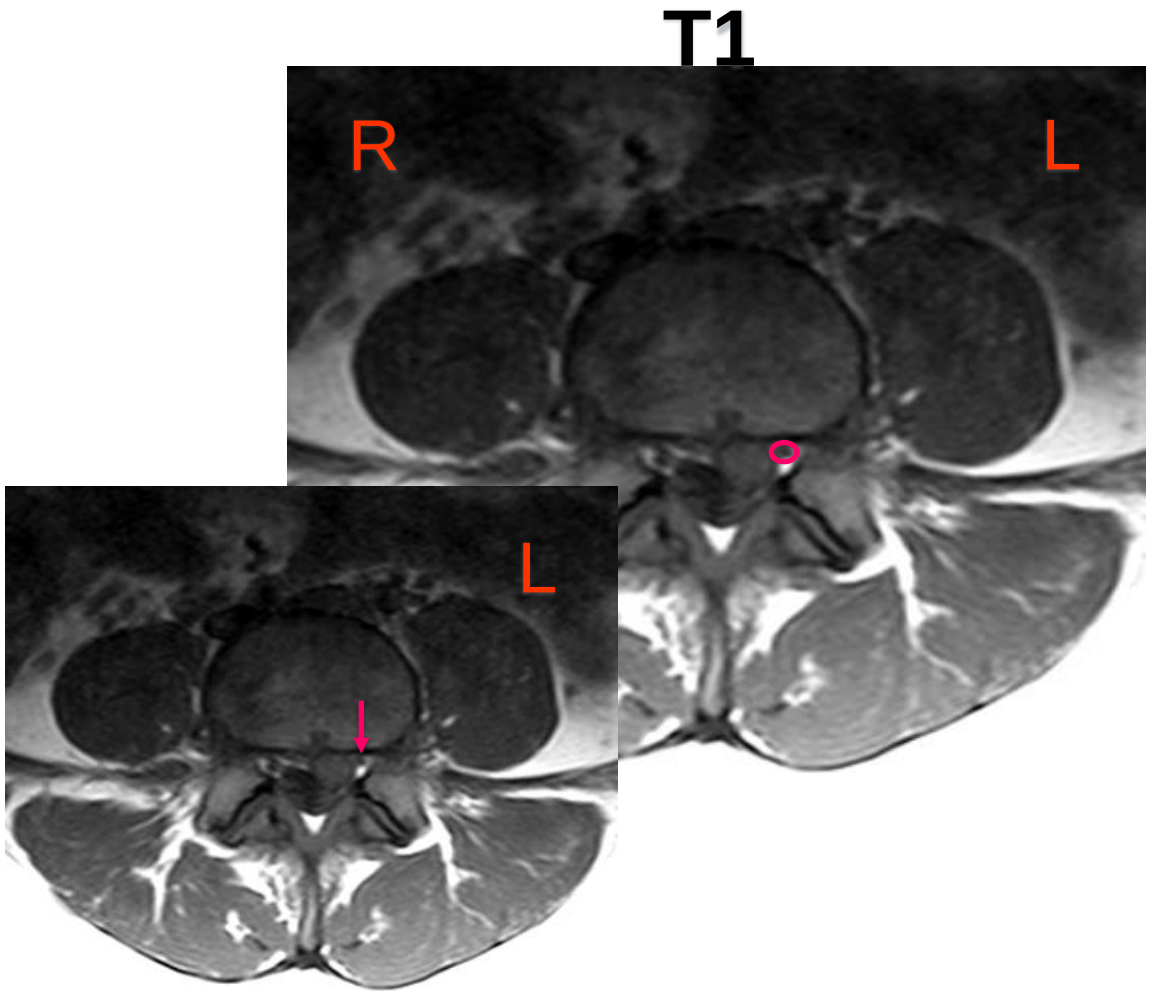
- Inferior migration of the disc extrusion (green circle and arrow) continues to compress the thecal sac and left L5 descending nerve root (barely visible).

- Right L5 descending nerve root (blue circle and arrow) is normal.



FOOT LEVELERS

- This is an axial T1 weighted image slicing through the superior endplate of L5 and through the inferior migrated extrusion.
- Inferior migration of the disc extrusion continues to compress the thecal sac and left L5 descending nerve root (pink circle and arrow).
- Right L5 descending nerve root is is normal.



www.mypacs.net

FOOT LEVELERS

Diagnosis

- L5-S1: Disc protrusion or diffuse disc bulge (axial images are not available).

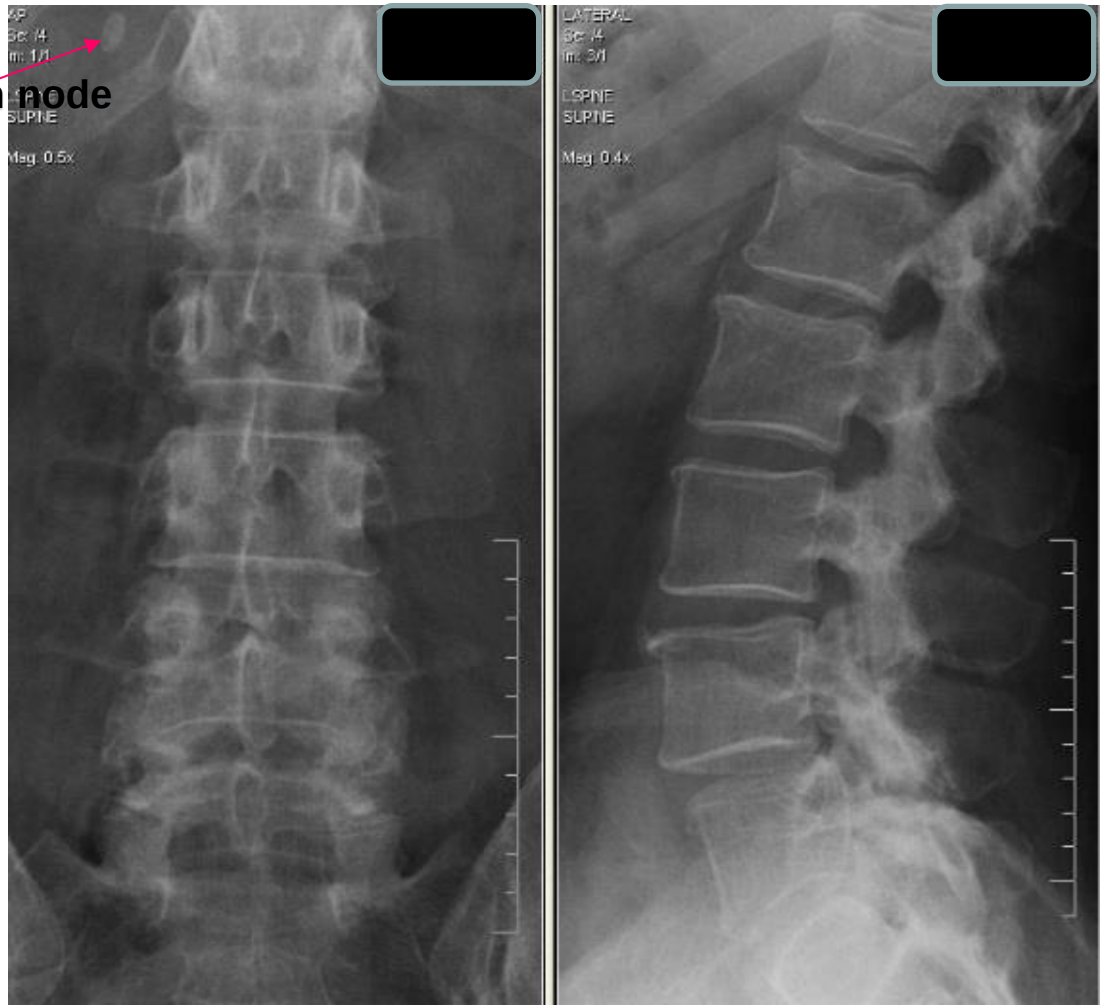
- Mild disc narrowing with dehydration at L4-L5 and L5-S1.
- Congenital small disc, known as hypoplastic disc, at L5-S1.
- Normal: facet joints, muscles, bone, and ligamentum flavum are all normal.

FOOT LEVELERS

Case 3: 65 year-old male

FOOT LEVELERS

Calcified lymph node



www.mypacs.net

FOOT LEVELERS

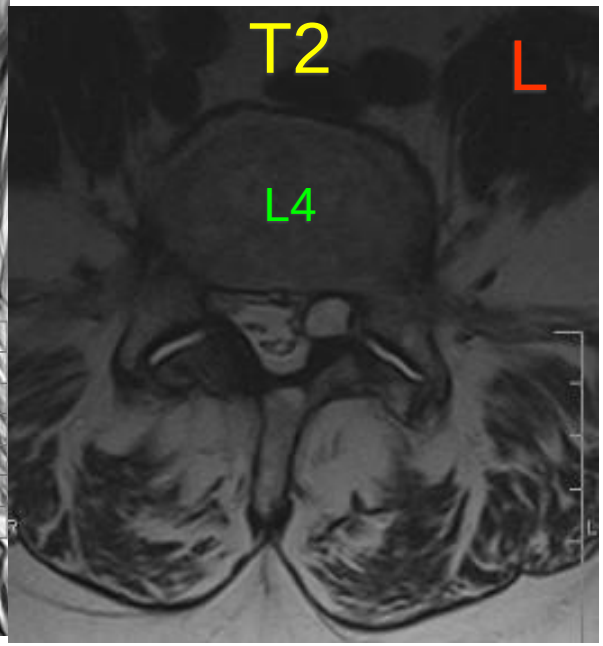
Diagnosis

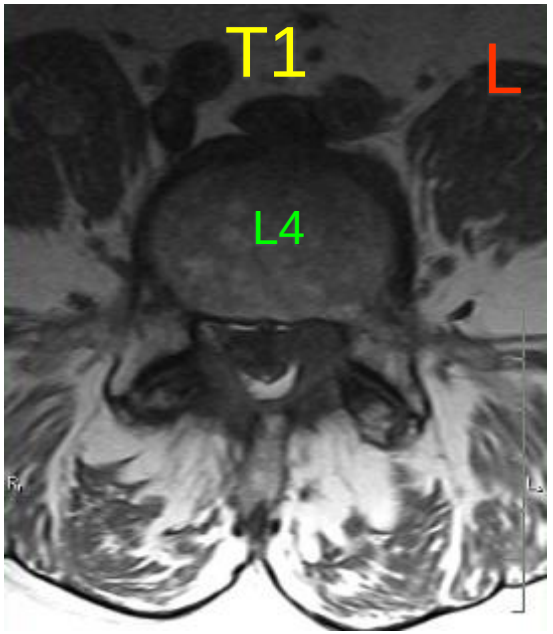
- Degenerative disc disease at L3-L4, L4-L5 and L5-S1.
- Grade 1 degenerative anterolisthesis of L4 (intact pars interarticularis).
- Moderate facet arthrosis at L4-L5 and L5-S1, mild severity from L1-L2 to L3-L4.
- Generalized osteopenia, advanced for the patient's age.
- Small calcified lymph node from previous infection within the upper right quadrant.

- Advanced imaging and Why?
  - Reason for MRI: Osteopenia, degenerative changes, patient symptoms and not responding to care.
    - Note: Differential diagnosis for osteopenia is metastatic disease, multiple myeloma, and lymphoma; medications, nutrition, inactivity, etc.

FOOT LEVELERS

Sagittal T2 and Axial T2; Sagittal T1 and Axial T1





FOOT LEVELERS

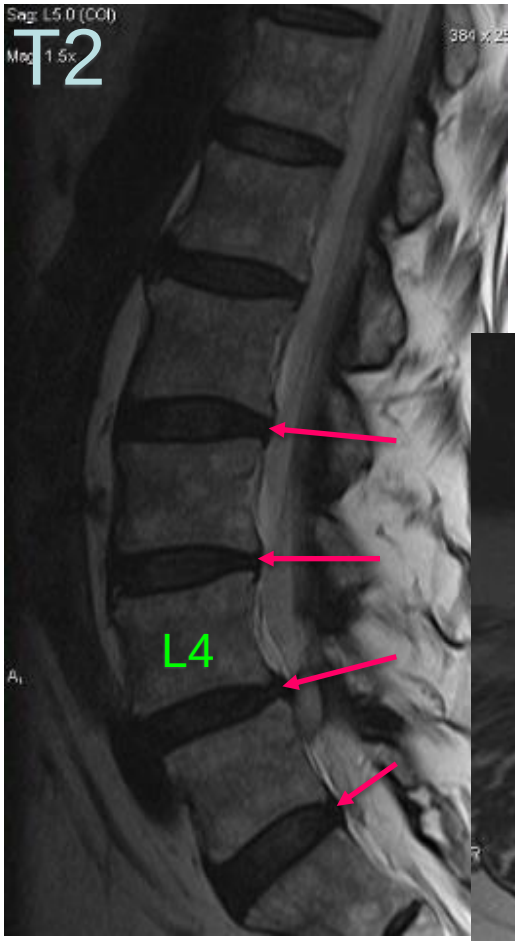
Diagnosis

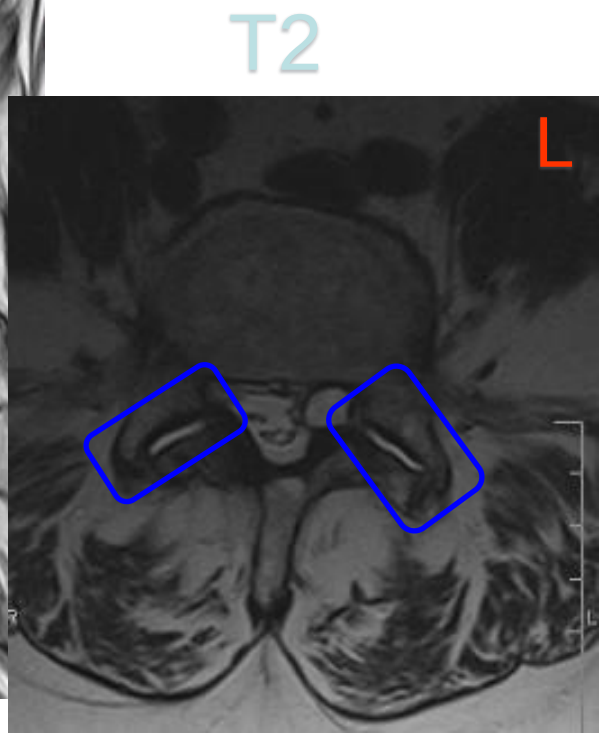
- Fatty infiltration of the vertebral bodies, multilevel.
  - Multiple round-like or patchy signal intensities, bright on T1 and T2 weighted images.
  - This may be due osteopenia, medications, inactivity, obesity, etc.
  - This is <u>not</u> metastatic disease.

FOOT LEVELERS

Diagnosis

- Multilevel disc bulges with mild disc narrowing and dehydration, from L2-L3 to L5-S1 (pink arrows).
  - Parasagittal images is needed to evaluate the exiting nerve roots.
- Grade 1, Degenerative anterolisthesis at L4 (intact pars interarticularis).
- Moderate to severe bilateral facet arthrosis (blue rectangle) at L4-L5 (only axial image at L4-L5).



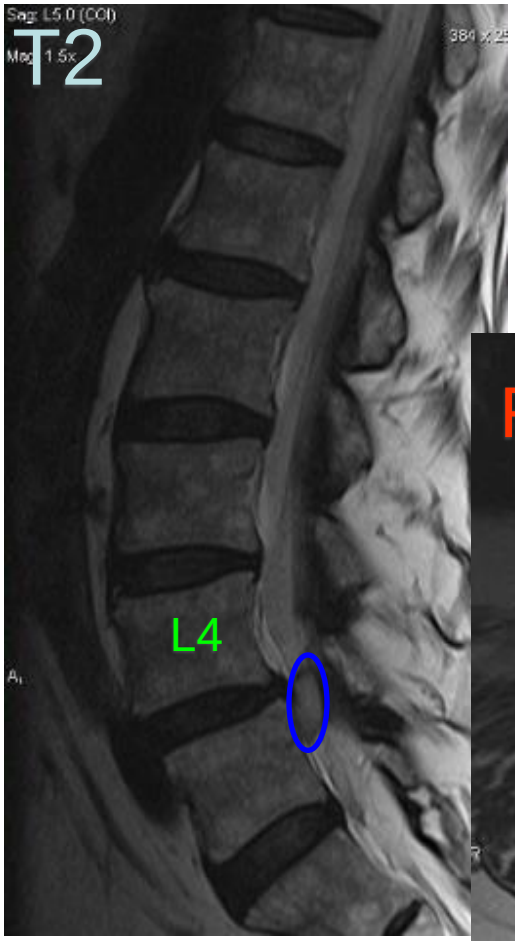


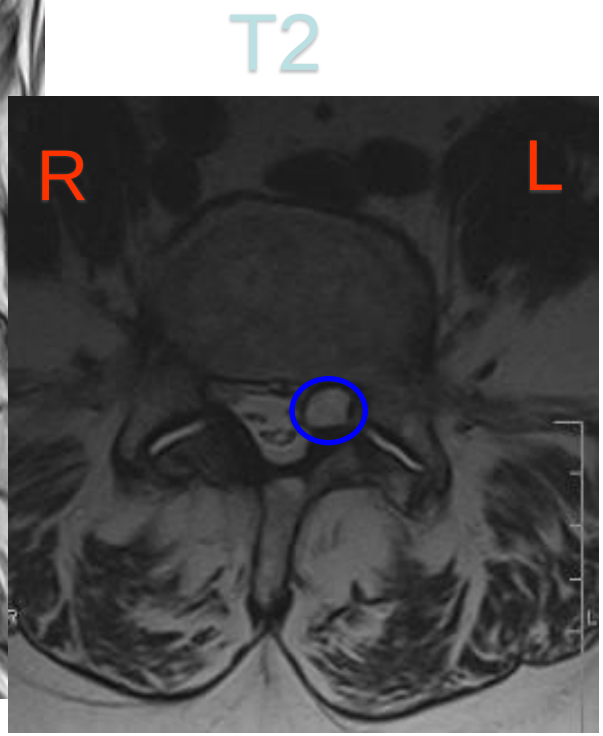
FOOT LEVELERS

Diagnosis

- Oval cyst-like lesion (blue oval) is noted within the left aspect of the spinal canal>>>>This is a left facet cyst or synovial cyst

- Left facet cyst (blue oval) is compressing the thecal sac and left L5 descending nerve root, resulting in spinal canal stenosis.
  - The left descending nerve root is not visualized due to compression of the left facet cyst.

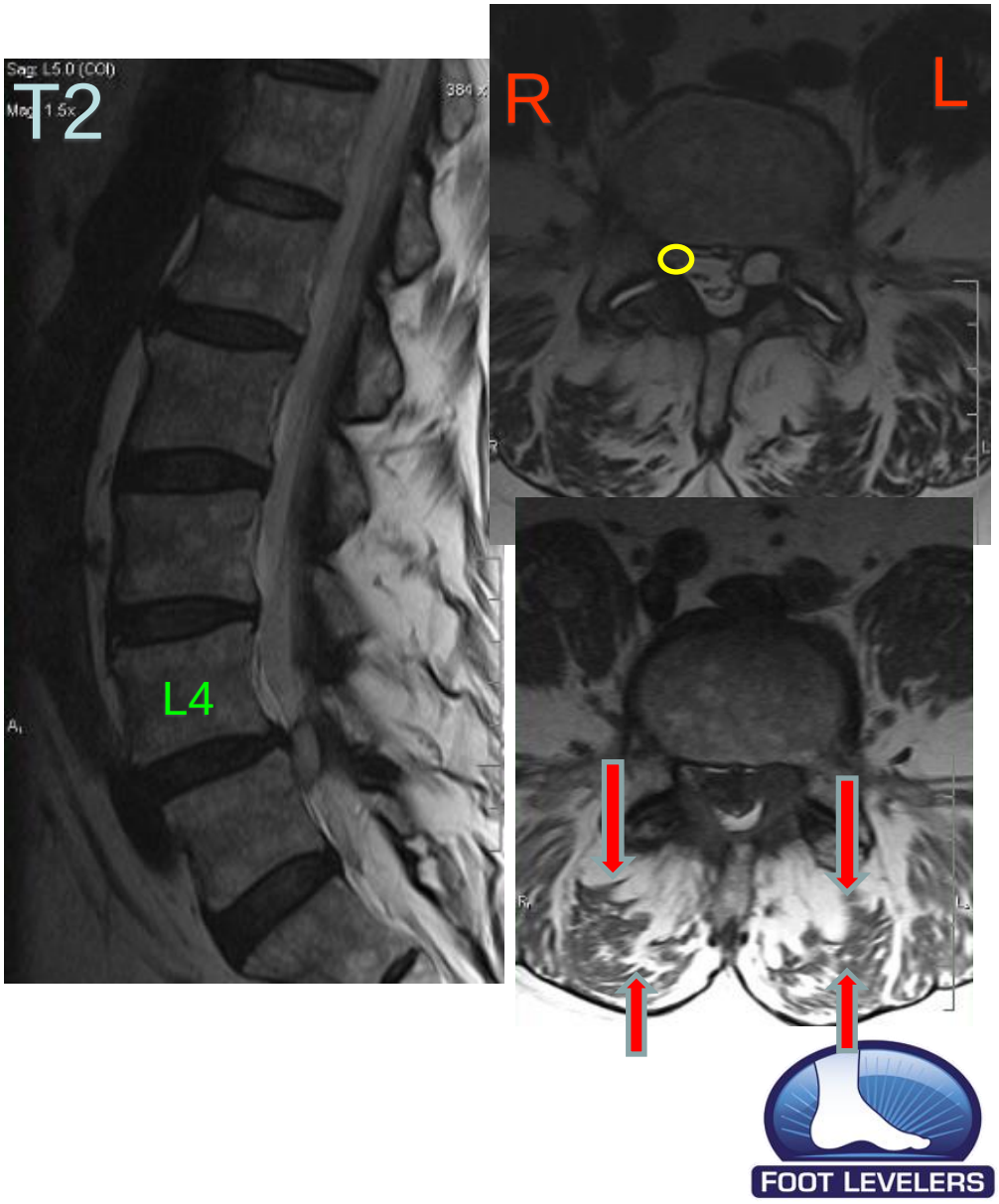




FOOT LEVELERS

Diagnosis

- Fatty infiltration of the dorsal musculature (red arrow).
  - Cause of fatty infiltration: chronic pain, inactivity, or body habitus.
- Normal right L5 descending nerve root, shown on the axial image, (yellow circle).



FOOT LEVELERS

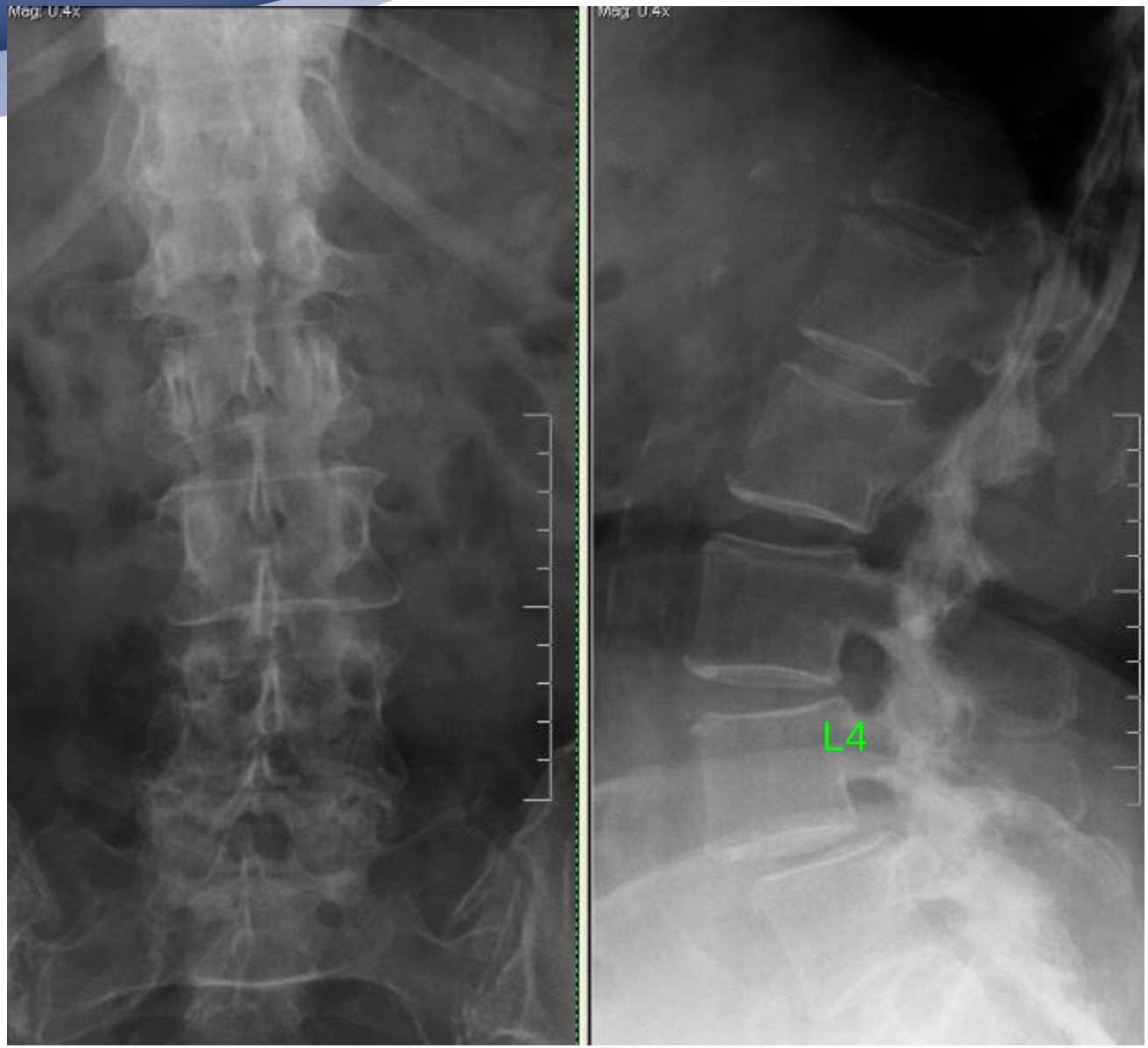
Synovial cyst/Facet cyst- Treatment

- Chiropractic care- can assist in shrinking the cyst.
- Corticosteroid injection- to shrink the cyst
- Surgical removal- depends on patient function; and failure to respond to trial conservative care and/or steroid injection.
- The cyst could potentially come back since the facet joints contain synovitis due to degenerative changes.

FOOT LEVELERS

Case 4: 83 year old female

FOOT LEVELERS


L4

Diagnosis

- Degenerative disc disease from L3-L4 to L5-S1.
- Grade 1 degenerative anterolisthesis of L4 (intact pars interarticularis)>>>>cause of the anterolisthesis of L4 was degenerative changes.
- Moderate to severe facet arthrosis.
- Mild bilateral sacroiliac arthrosis.
- Shallow left convexity of the lumbar spine.
- Anterior shift in weightbearing of the lumbar spine.
- Generalized osteopenia. Clinically correlate.
- Atherosclerosis of the abdominal aorta, on the lateral radiograph.

FOOT LEVELERS

Diagnosis

- Atherosclerosis of the abdominal aorta, on the lateral radiograph.
  - Normal diameter of the abdominal aorta is 2.0 cm; anything greater requires follow-up with Doppler ultrasound or CT with/without contrast.
  - This patients abdominal aorta is normal in diameter.

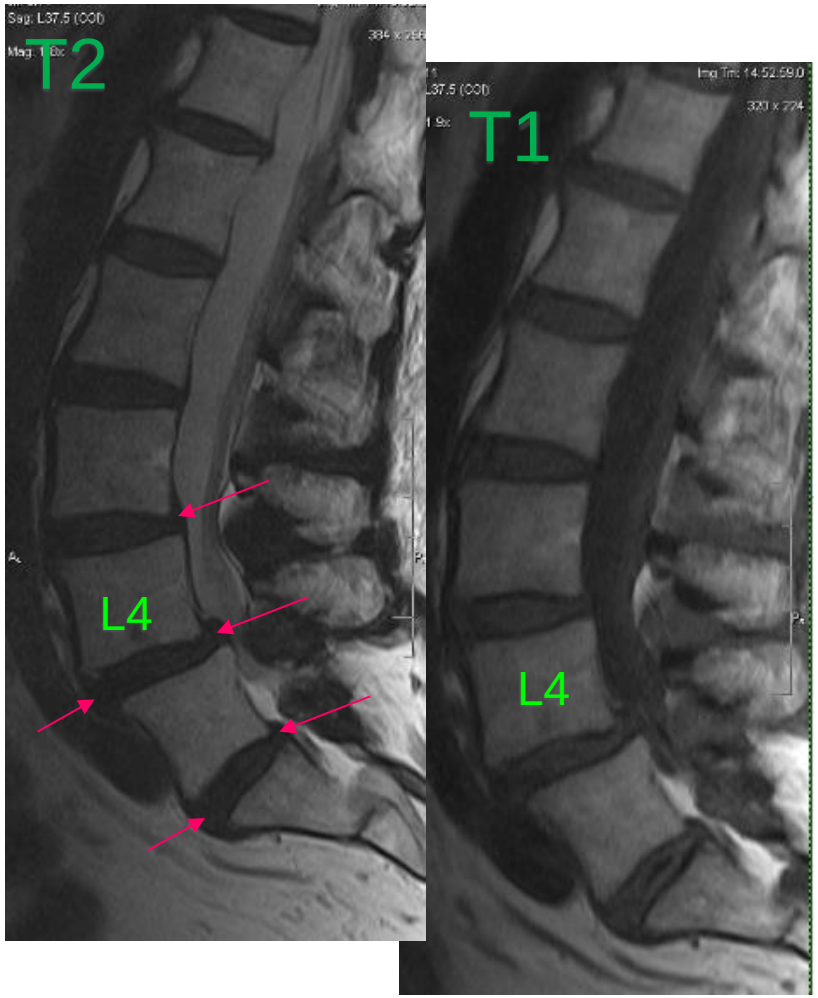
What's the next step to manage this patient?

- Advanced imaging and Why?
  - Reasons for MRI: Degenerative changes, patient symptoms and not responding to care; and generalized osteopenia.
  - If osteopenia is a concern….differential diagnosis is metastatic disease, multiple myeloma, and lymphoma, etc. MRI can help in detecting pathologic bony lesions.

FOOT LEVELERS

Sagittal T2 and T1

- Diffuse disc bulge (pink arrows) at T12-L1, L3-L4, L4-L5 and L5-S1 is compressing the thecal sac.
- Mild degenerative disc disease from L3-L4 to L5-S1, with disc narrowing and disc desiccation/dehydration.
- L4: Degenerative anterolisthesis, Grade 1 (The pars interarticularis are intact).

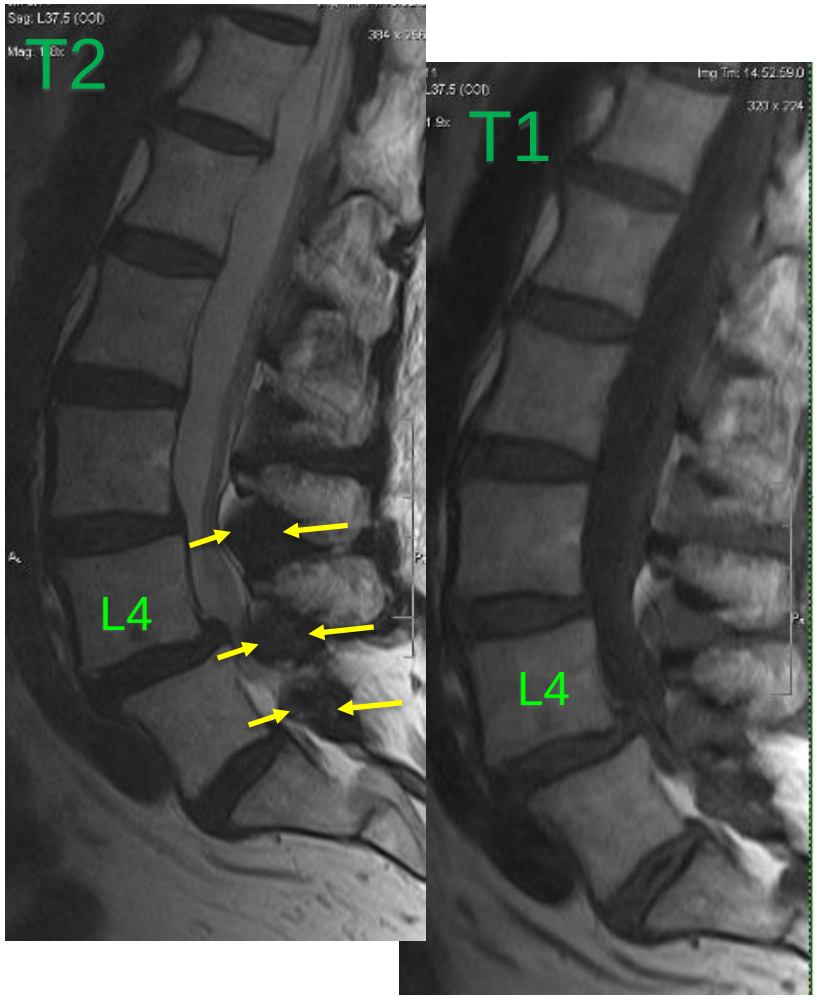


FOOT LEVELERS

Sagittal T2 and T1

- Thickening of ligamentum flavum (yellow arrows), along the anterior aspect of the lamina from L3 to L5.

- Spinal canal stenosis is due to disc bulges AND ligamentum flavum thickening, resulting in:
  - Mild spinal canal stenosis at L3-L4.
  - Severe spinal canal stenosis at L4-L5 and L5-S1.



FOOT LEVELERS

Spinal Canal Stenosis

- Treatment:
  - Chiropractic- Stenosis is difficult to treat. One day, you treat the patient and they respond favorably. At the next visit, the patient receives the same treatment and they flare up. Stenosis has its good and bad days. In Chiropractic, we have many tools and a variety of ways to treat stenosis.

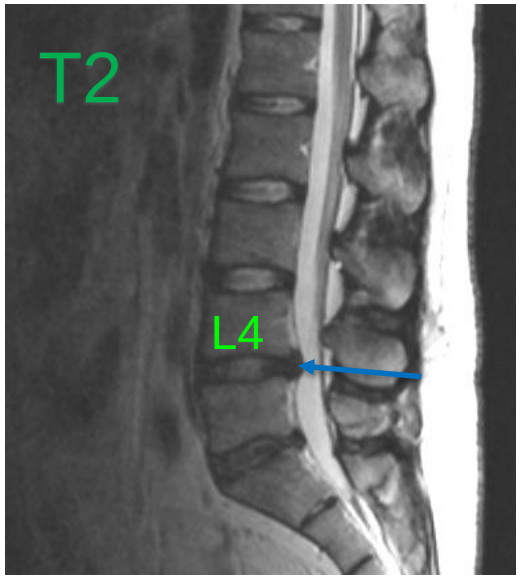
  - Surgery- In this case, I do not know the symptoms or the function of the patient. If conservative treatment has been tried and patient function is poor, then surgical intervention could be considered. In order to open the spinal canal, multilevel laminectomy would be performed. Now I realize this is an elderly patient…so they may not want surgery or they may not be a surgical candidate.

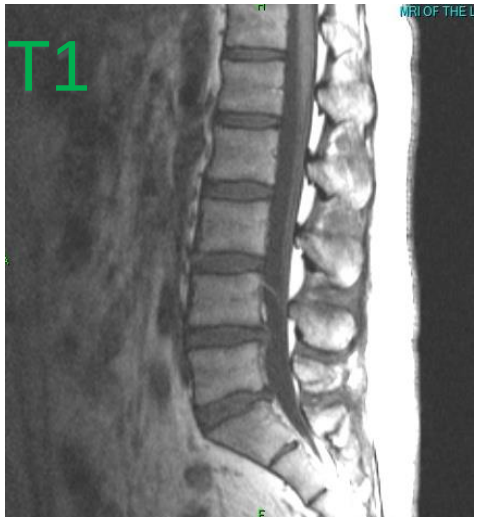
FOOT LEVELERS

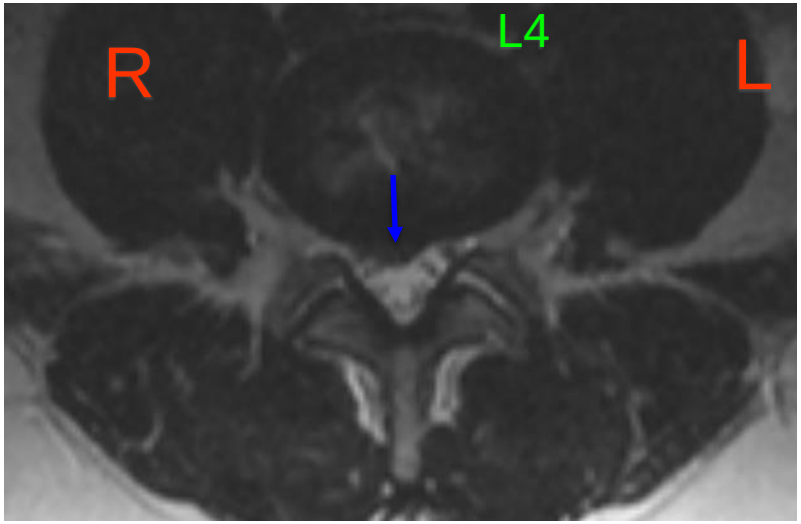
Case 5: Low back pain and radiculopathy

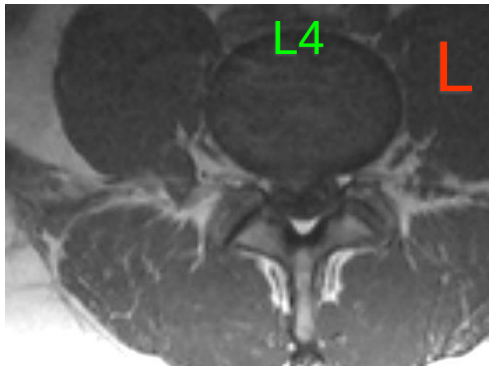
FOOT LEVELERS

L4-L5 Disc



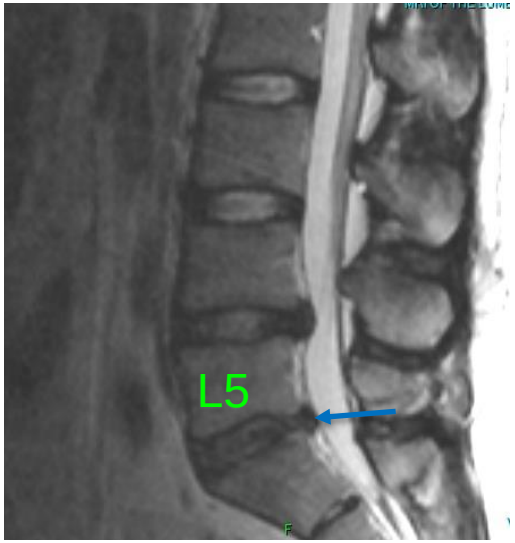


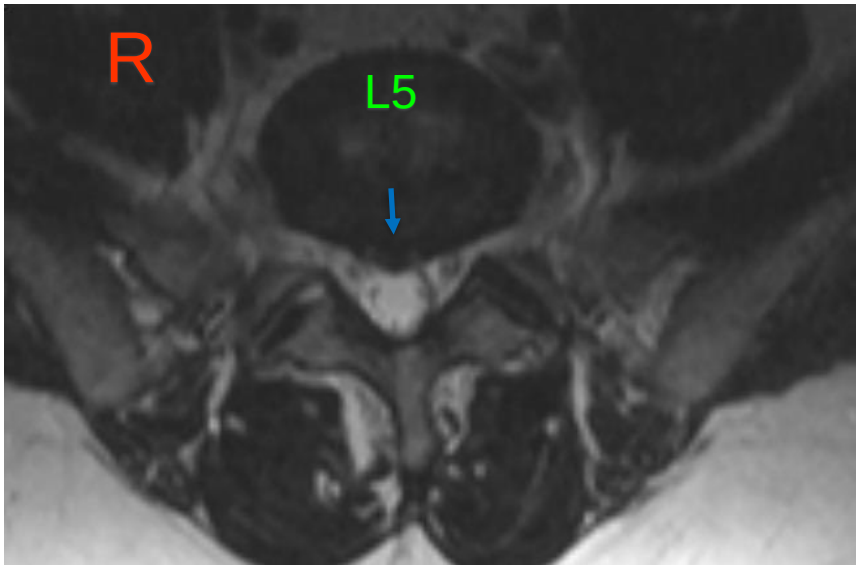




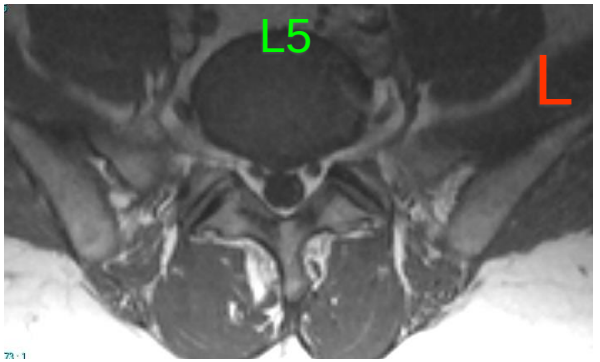
FOOT LEVELERS

L5-S1 Disc



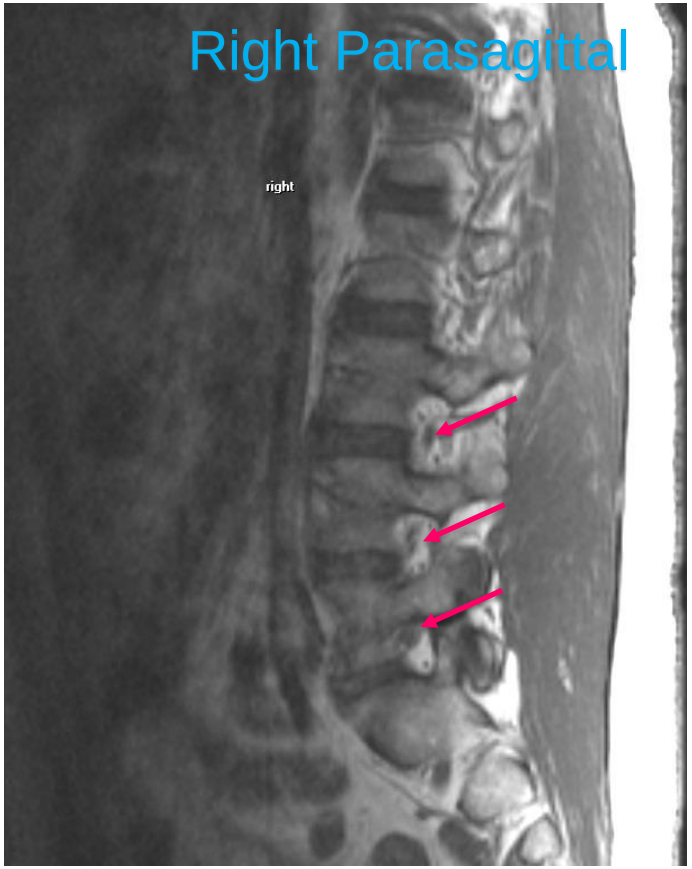


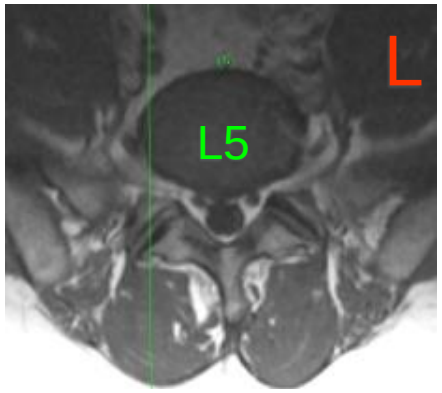
L

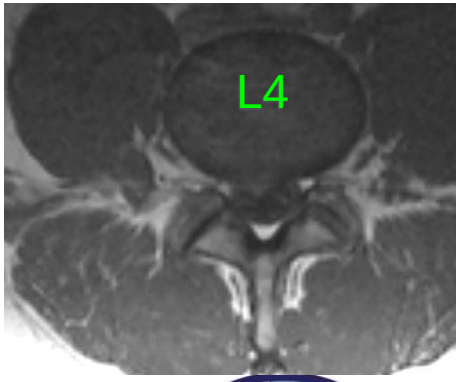


FOOT LEVELERS

Left & Right Parasagittal Images: No neural foramina stenosis, and normal exiting nerve roots (pink arrows)



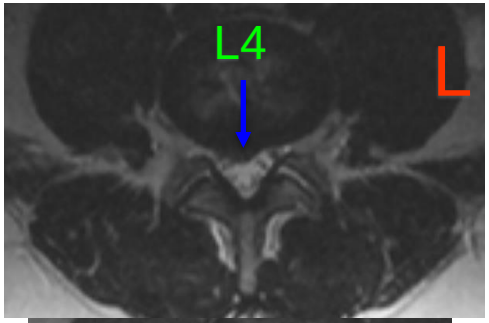


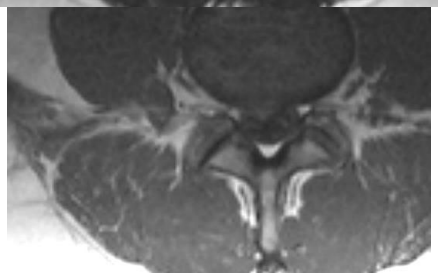


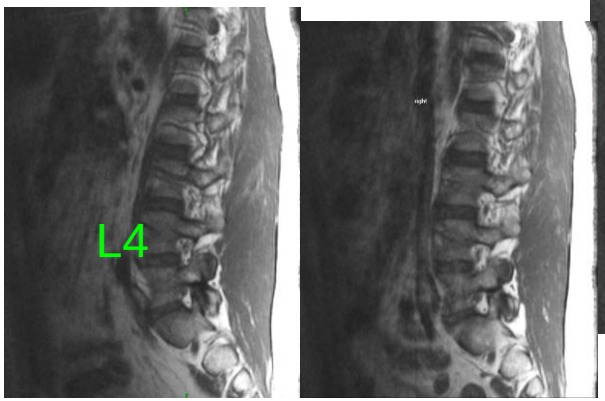
FOOT LEVELERS

Diagnosis

- L4-L5: Focal right central disc protrusion is compressing the thecal sac and effacing the bilateral L5 descending nerve roots.
  - Mild spinal canal stenosis.
  - No neural foramina stenosis; normal bilateral L4 exiting nerve roots.
  - It only takes a pressure of a dime on a nerve to be very painful; therefore, effacing a nerve root can cause pain.



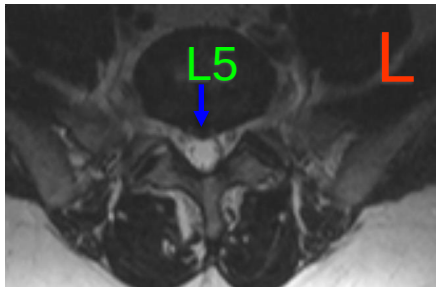


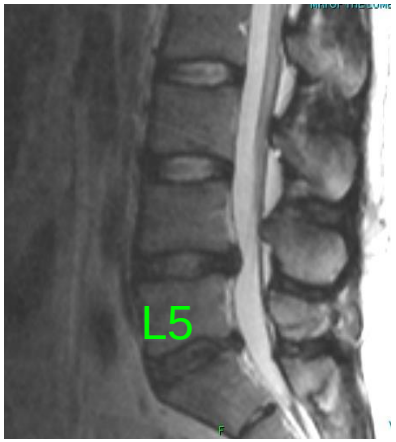


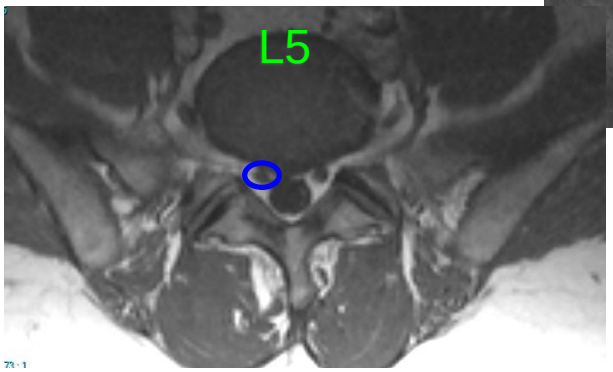
FOOT LEVELERS

Diagnosis

- L5-S1: Focal central disc protrusion (blue arrow) is effacing the thecal sac and slightly effacing the bilateral L5 descending nerve roots (blue circle).
  - There is no spinal canal or neural foramina stenosis.
  - The L5 exiting nerve roots are normal within the neural foramina.







FOOT LEVELERS

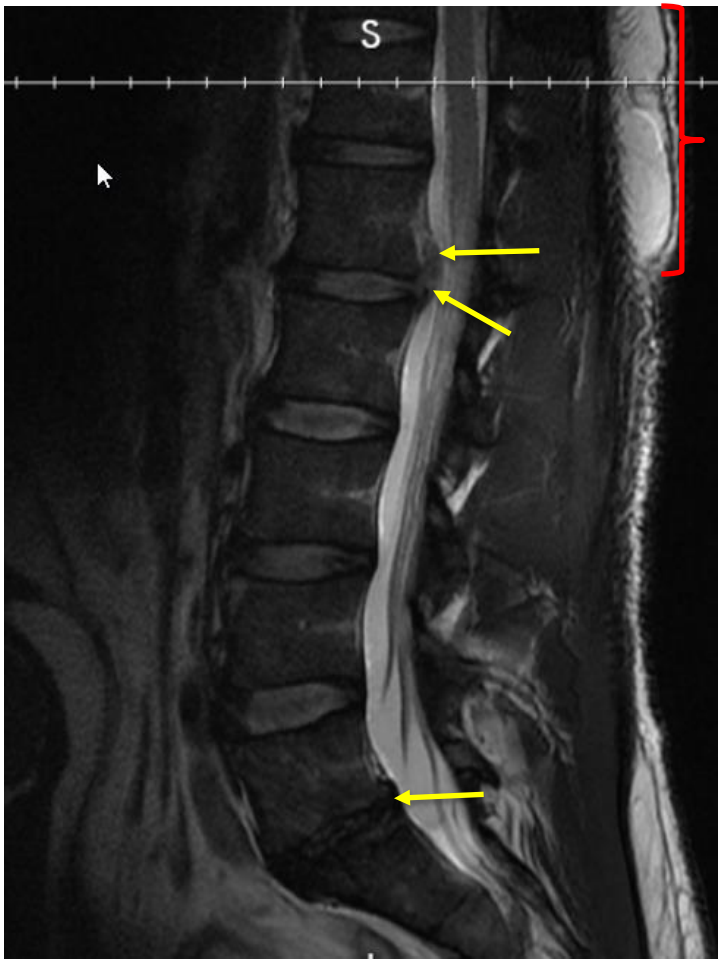
Case

- MVA

FOOT LEVELERS

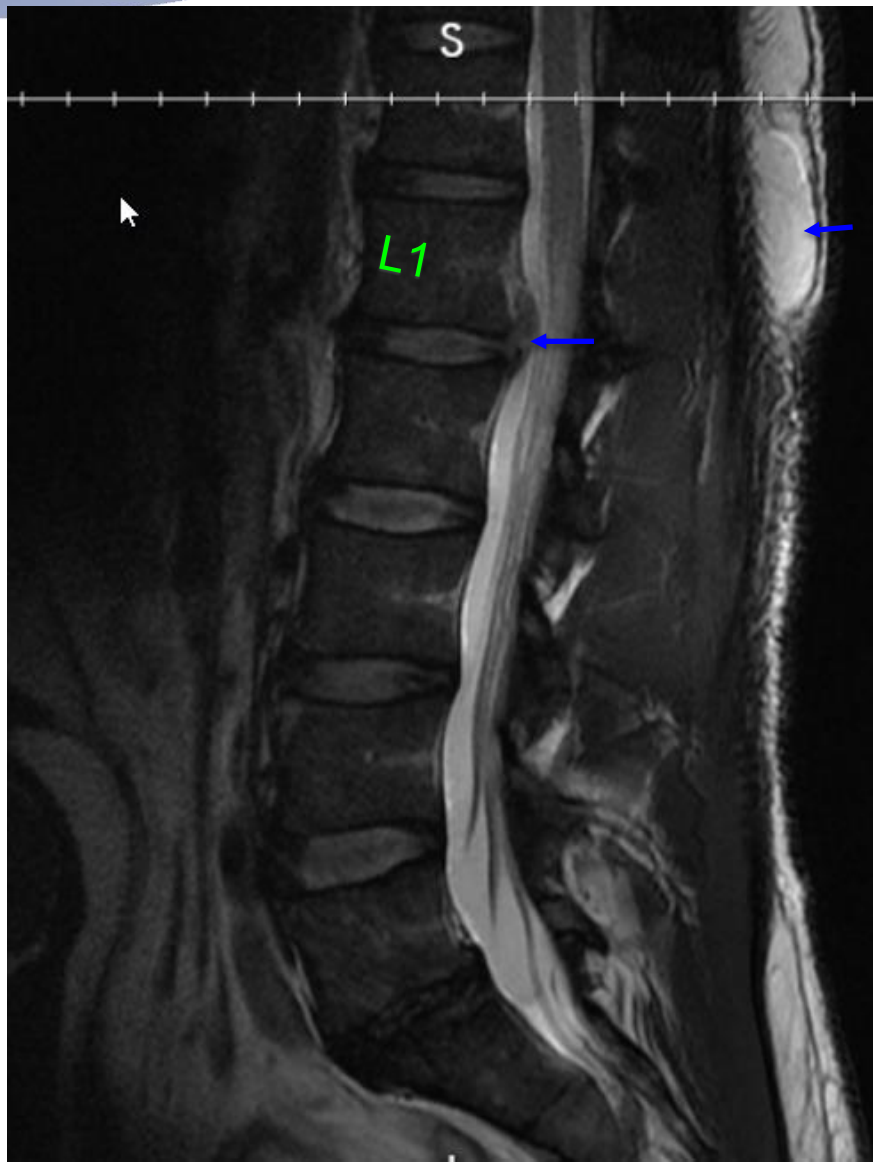
Sagittal T2 weighted image

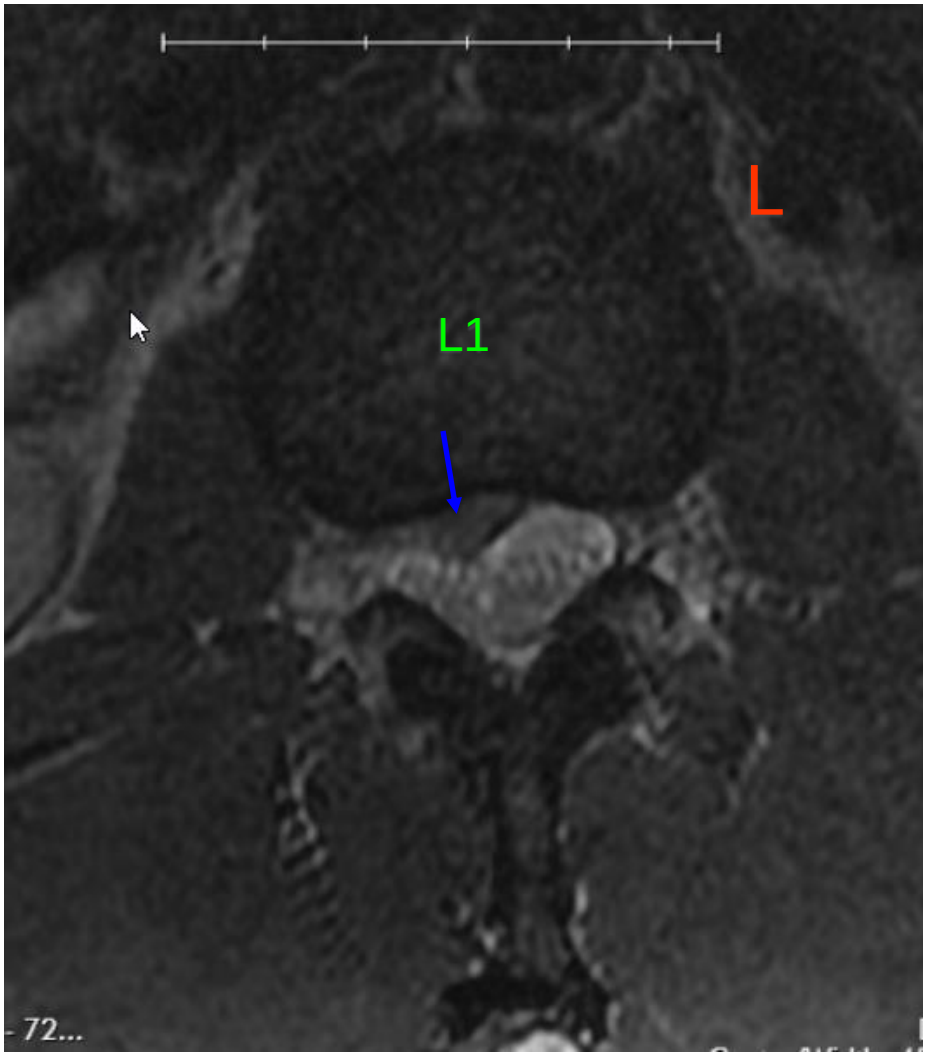
- Note: Sagittal image is slightly off centered to the right.



FOOT LEVELERS

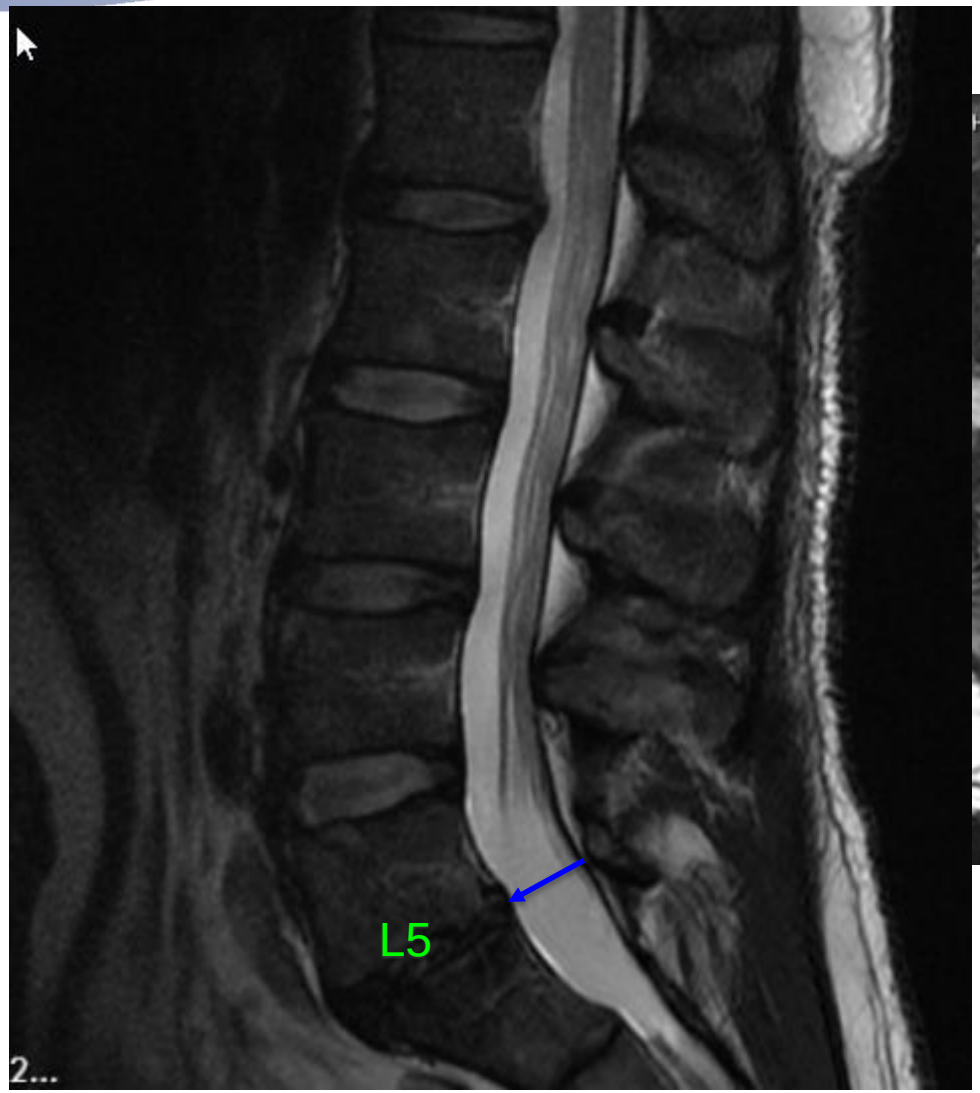
Slightly off centered to right

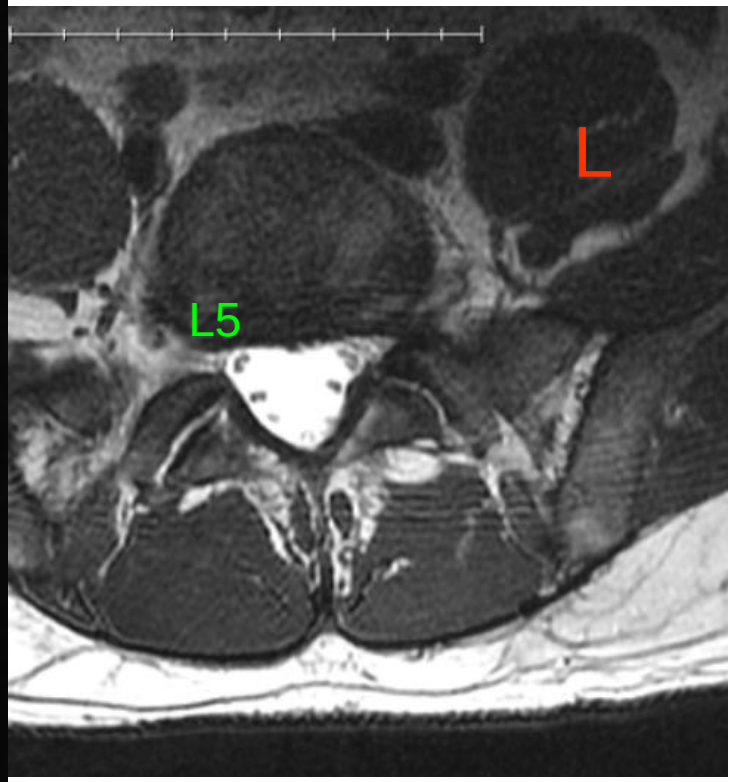




FOOT LEVELERS

Sagittal image is centered





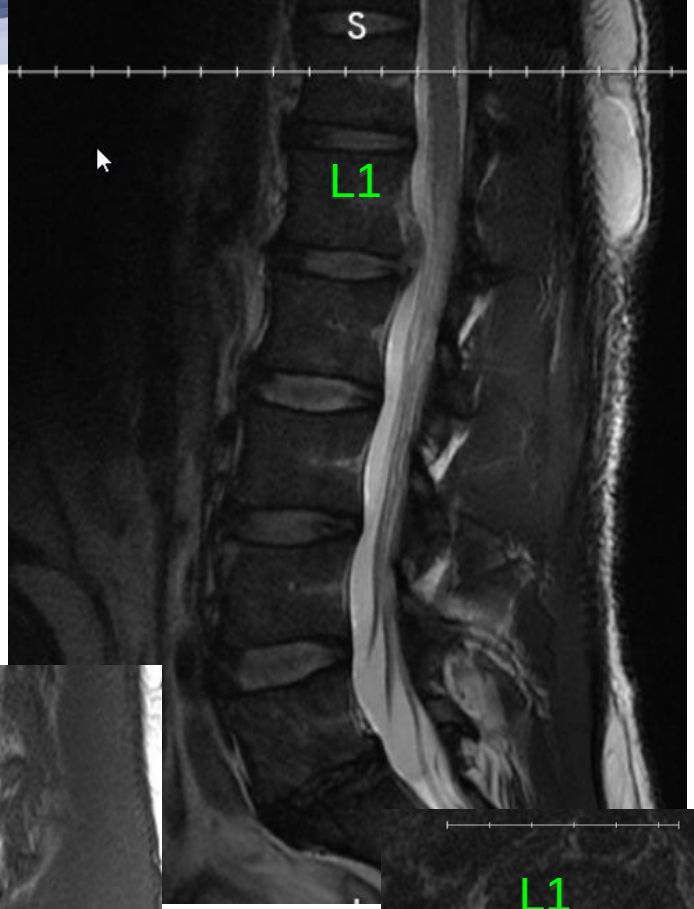
FOOT LEVELERS

Right Parasagittal

Left Parasagittal

FOOT LEVELERS

DIAGNOSIS



FOOT LEVELERS

Treatment for disc bulge/protrusion/extrusion

- Treatment is based on patient tolerance and patient function based on muscle testing, orthopedic and neurology testing. Nonsurgical treatment is what we do!
  - Yes, you can treat a patient with disc bulge/protrusion/extrusion BUT to patient tolerance.
    - Manipulation;Cox; Decompression
    - Kinesio taping; Graston technique
    - Laser
    - McKenzie
    - ETC.!!! Every patient is different, find what works for your patient. Chiropractic can treat spines with disc bulges/protrusions/extrusions.
  - <u>Remember to address inflammation!!!</u>

FOOT LEVELERS

Keep in Mind When Viewing Cases or Reading the MRI Report:

- What type of disc does the patient have or described on the report? Measurements should be used in describing the disc (I don't have measurements throughout the lecture, but I do include measurements on my reports).
- Where is the disc going….. What is the location of the disc displacement?
- What is the disc doing to the thecal sac?
- What is the disc doing to the descending and exiting nerve roots?
- Is the disc and/or bony structures resulting in spinal canal or neural foramina stenosis? If so, how much? (we can grade stenosis by using mild, moderate or severe).
- Lastly, do these findings correlate to the clinical findings, patient presentation and/or mechanism of injury?

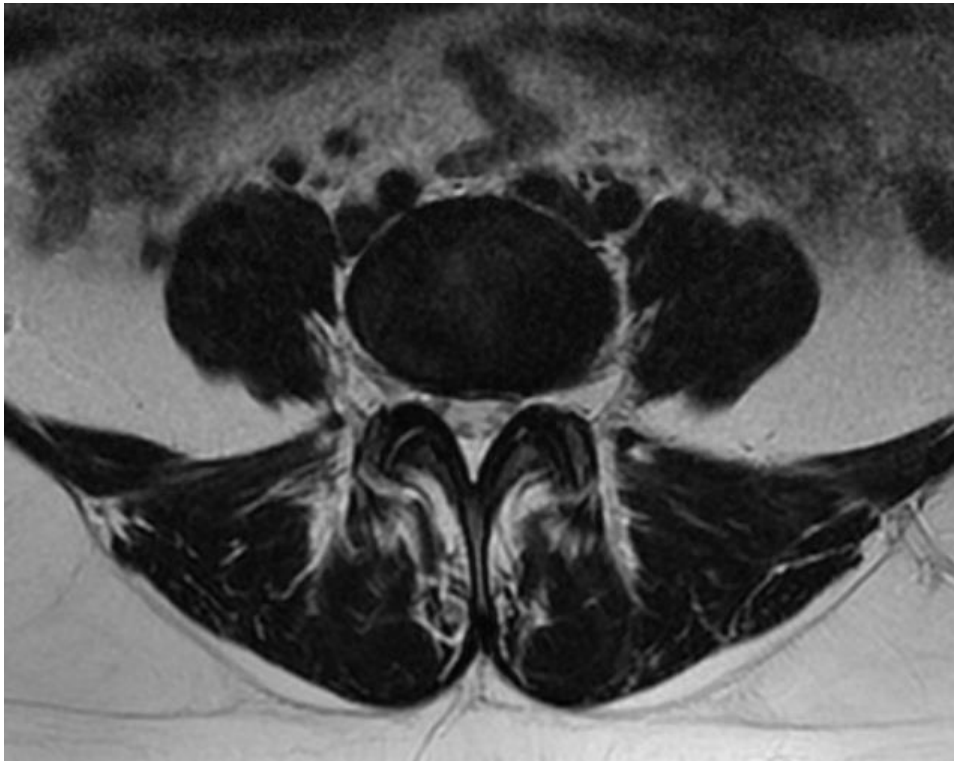
- Finally, I hope this lecture was helpful. It is a lot of information☺

FOOT LEVELERS

Brief Review of Cases

FOOT LEVELERS

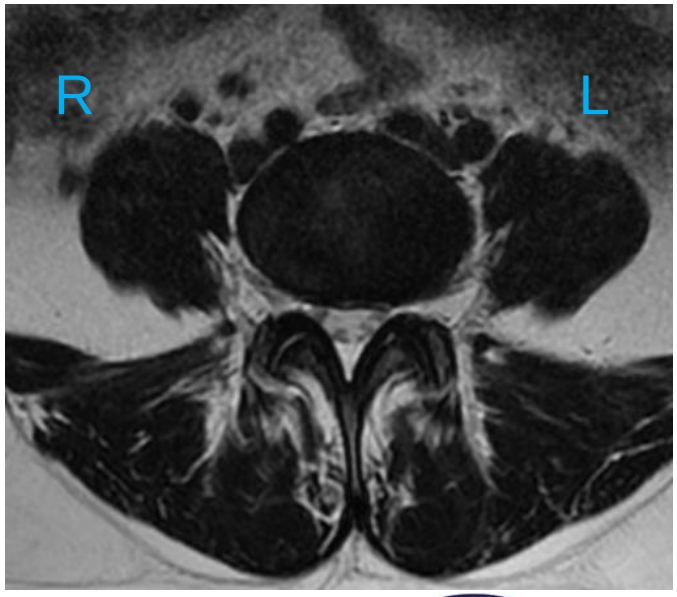
1



FOOT LEVELERS

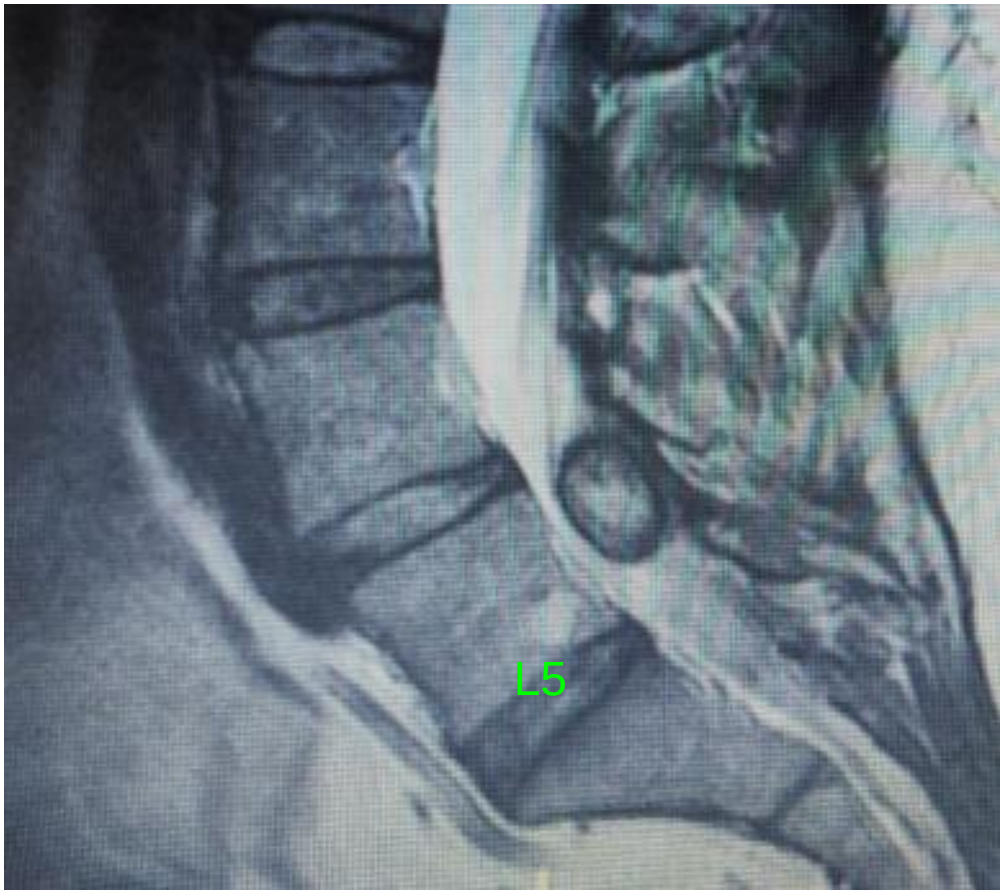
Diagnosis of #1

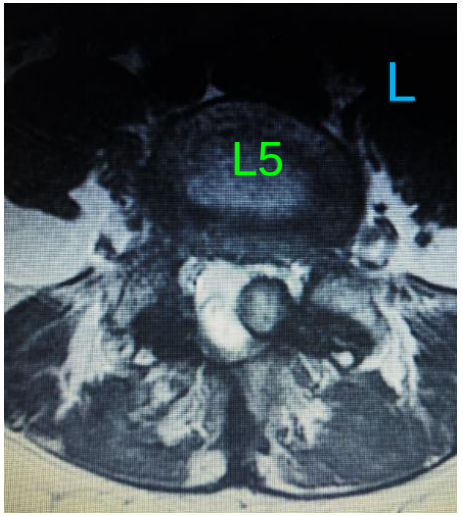
- Circumferential disc bulge is compressing the thecal sac with mild spinal canal stenosis; Posterior annular fissure/tear/defect; mild bilateral facet arthrosis.



FOOT LEVELERS

2





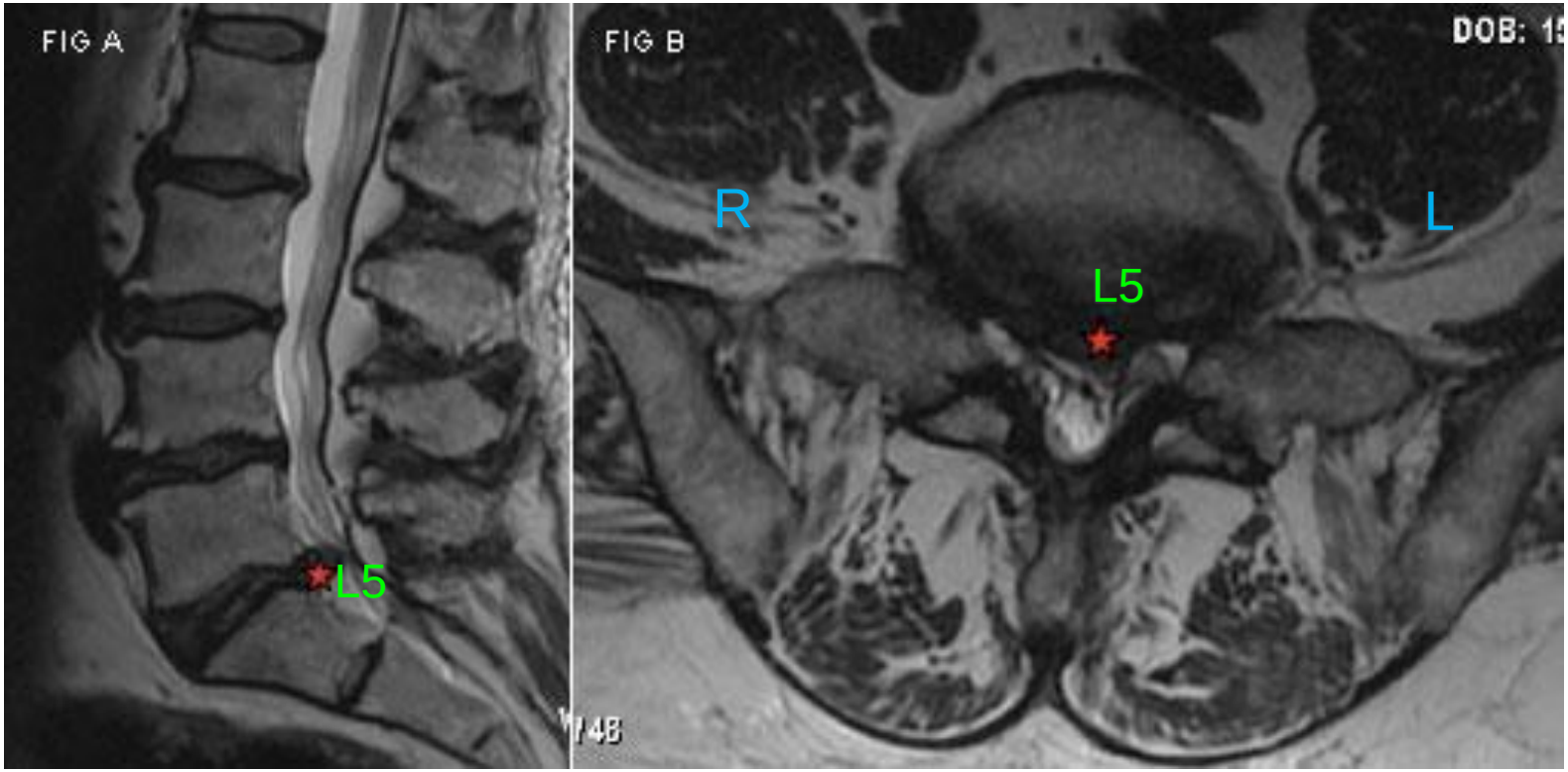
FOOT LEVELERS

Diagnosis of #2

- Left facet cyst- synovial cyst coming from the left facet joint. This is resulting in compression to the thecal sac and severe spinal canal stenosis.
- Diffuse disc bulge at L4-L5 and L5-S1.
- Bilateral facet arthrosis.

FOOT LEVELERS

3

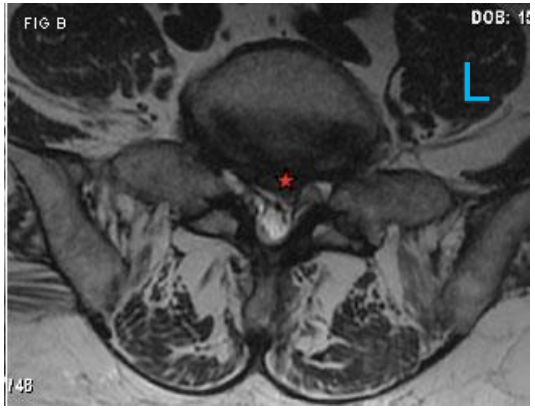


www.vancouverspinedoctor.com

FOOT LEVELERS

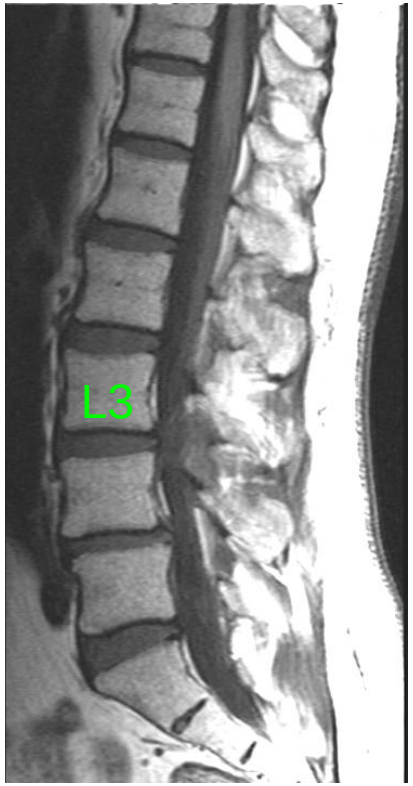
Diagnosis of #3

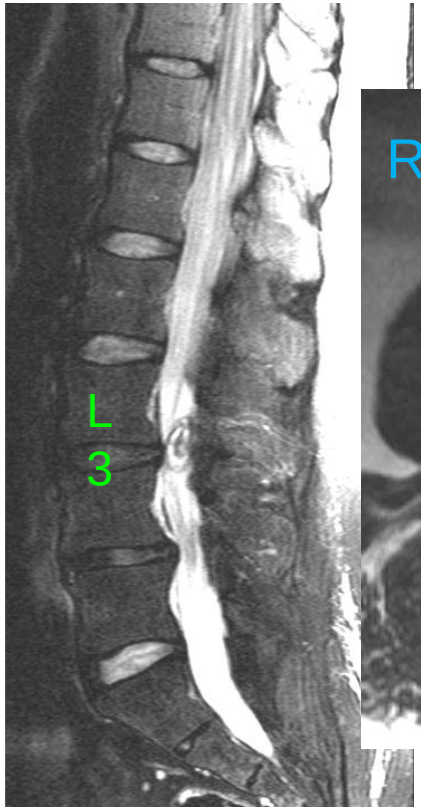
- Large left central broad-based disc protrusion versus extrusion at L5-S1, resulting in severe spinal canal stenosis.
- Compressing and displacing the thecal sac and left descending S1 nerve root
- Fatty infiltration of the posterior musculature
- Bilateral facet arthrosis
- Multilevel degenerative disc disease

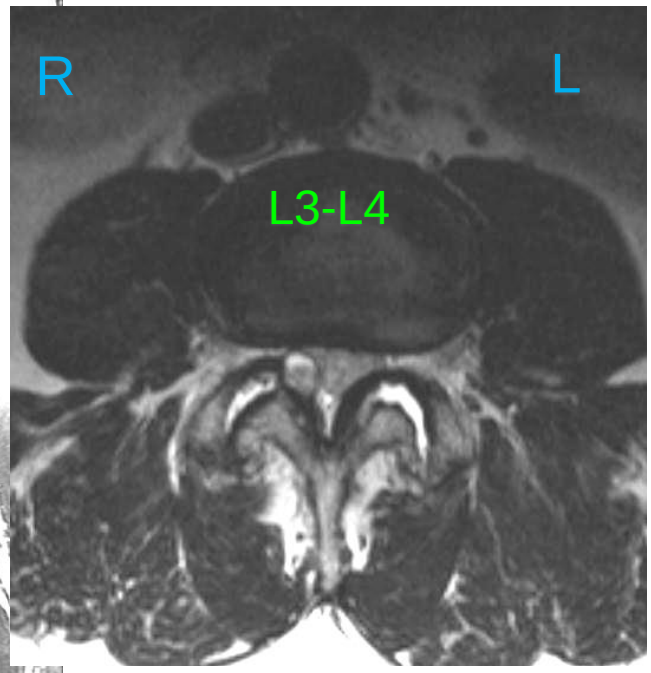


FOOT LEVELERS

4





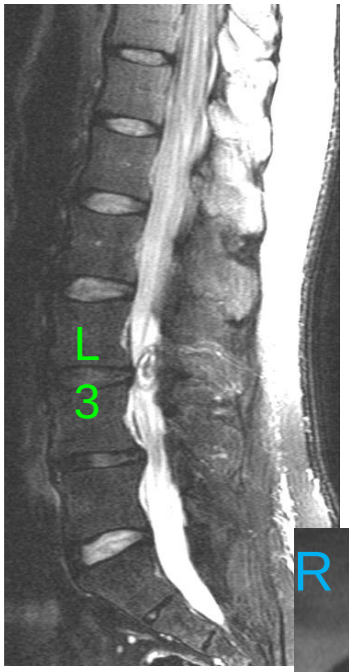


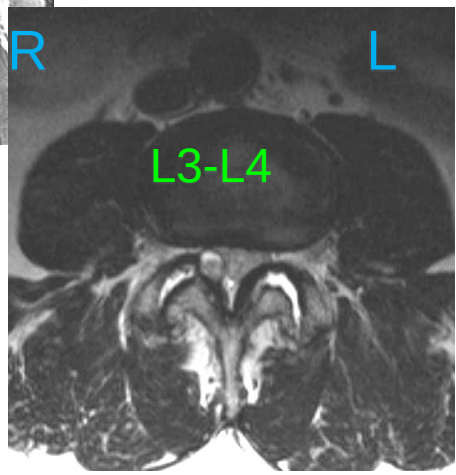
www.assr.org

FOOT LEVELERS

Diagnosis of #4

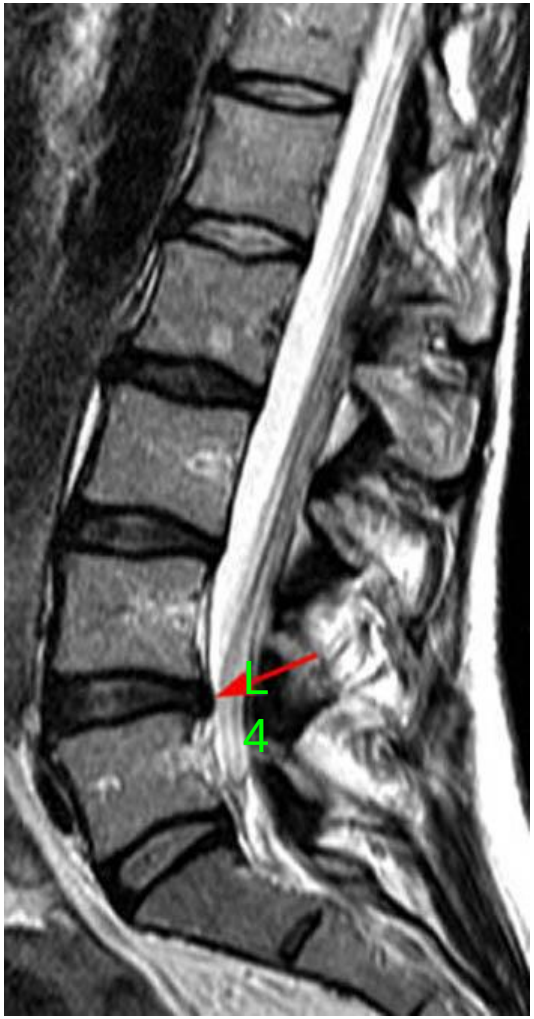
- Right synovial cyst or facet cyst with compression of the thecal sac on the left; Severe facet arthrosis.
- Degenerative anterolisthesis at L4.
- Diffuse disc bulge L3-L4 and L4-L5 is compressing thecal sac; disc dehydration at L3-L4 and L4-L5.
- L3-L4: Disc bulge, severe bilateral facet arthrosis, ligamentum flavum hypertrophy and the right synovial/facet cyst are all contributing to severe spinal canal stenosis.

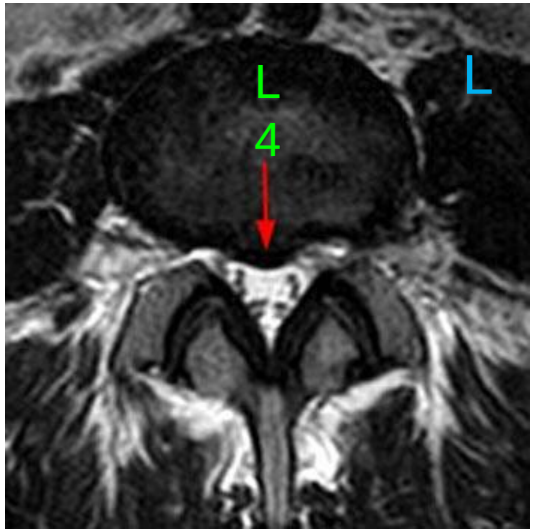




FOOT LEVELERS

5



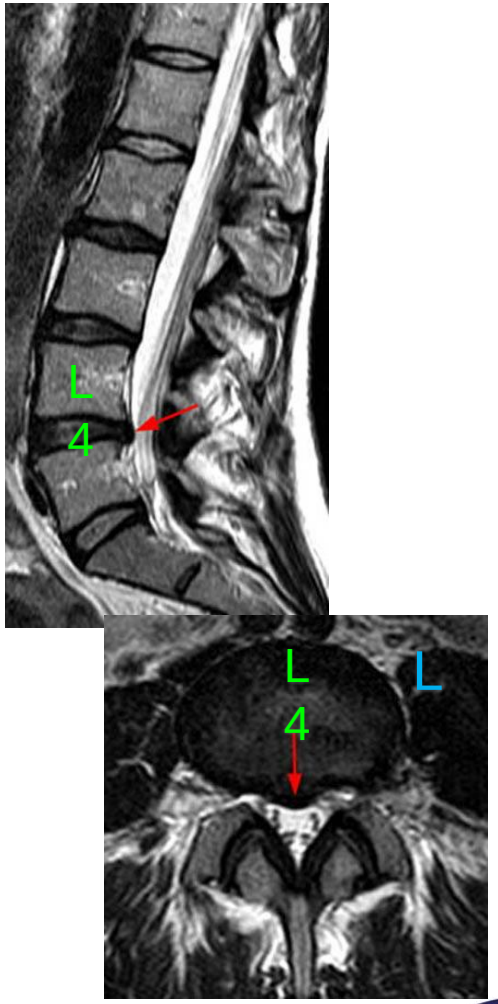


www.radsource.com

FOOT LEVELERS

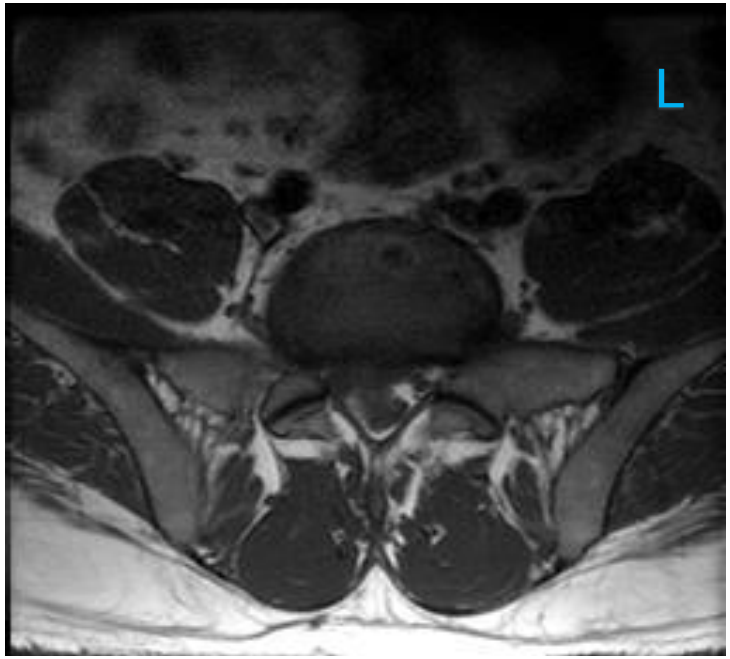
Diagnosis of #5

- L4-L5: Focal central disc protrusion is compressing the thecal sac with mild spinal canal stenosis.
- Mild disc desiccation/dehydration at L2-L3, L3-L4 and L4-L5
- Mild facet arthrosis



FOOT LEVELERS

6

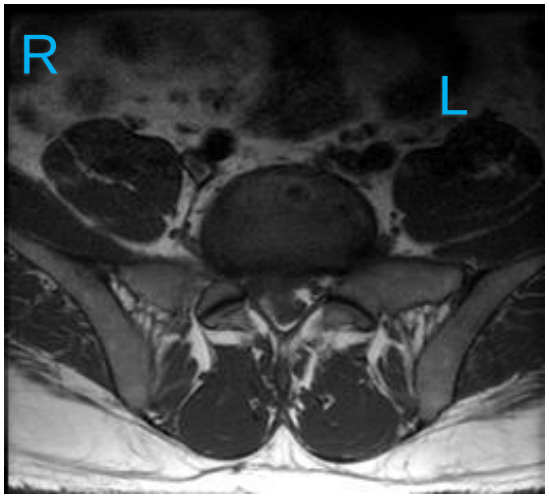


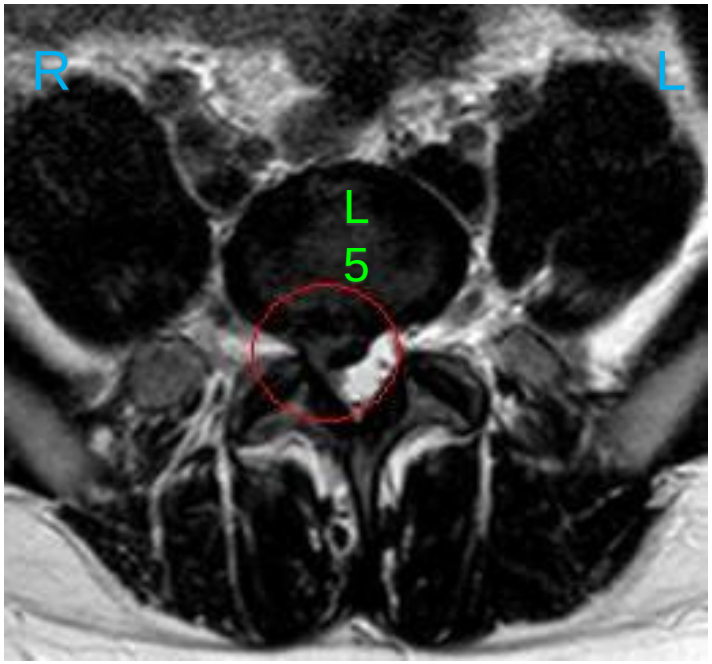
www.novaspineandinjury.com

FOOT LEVELERS

Diagnosis of #6

- L5-S1: Right central disc extrusion with inferior migration is compressing the thecal sac and right S1 descending nerve roots. There is effacement of the left S1 descending nerve root. Severe spinal canal stenosis is noted.
- Hypolordosis of the lumbar spine.
- Disc dehydration and disc narrowing at L5-S1.



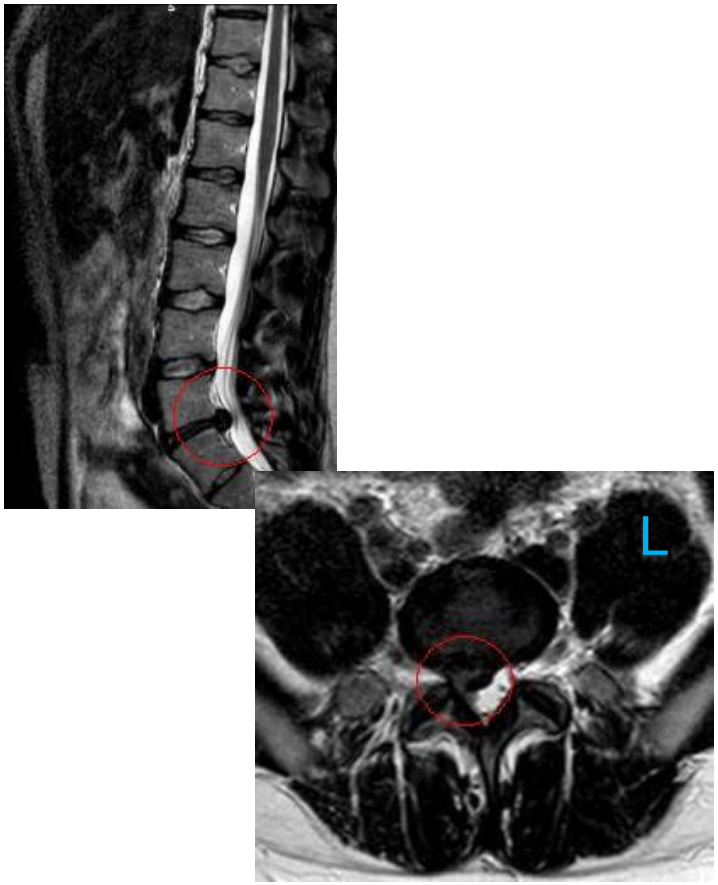


www.londonspine.co.uk

FOOT LEVELERS

Diagnosis of #7

- L5-S1: Right central disc extrusion is compressing the thecal sac and right S1 descending nerve root, resulting in moderate spinal canal stenosis.
- Mild facet arthrosis at L5-S1
- Transitional segment with a rudimentary disc at S1.
- Multilevel Schmorl's node throughout the lumbar spine.



FOOT LEVELERS

8

www.radpod.org

FOOT LEVELERS

Diagnosis of #8

- Multilevel disc bulges or protrusions and thickening of the ligamentum flavum at L2, L3 and L4, resulting in severe spinal canal stenosis.
- Also, there is congenital spinal canal stenosis.
- Mild degenerative disc disease with disc desiccation and disc narrowing.

FOOT LEVELERS

Diagnosis of #8

- Irregular contour of the cauda equina at the level of L3 within the spinal canal due to the protrusion and thickening of ligamentum flavum while constricting the thecal sac/cauda equina.

FOOT LEVELERS

References

- Fardon D, et al. *Nomenclature and Classification of Lumbar Disc Pathology: version 2.* Spine Journal 14 (2014); 2525-2545.

- Resnick D. *Diagnosis of Bone and Joint Disorders*, 4th ed. 2002, 1420-1457.

- Rahme and Moussa. AJNR May 2008 29: 838-842.

FOOT LEVELERS

NEXT….

CERVICAL SPINE:

Radiographs and MRI Cases

FOOT LEVELERS

Cervical Spine Views

3 Views:

APOM, APLC, and neutral lateral performed first

Followed by extended and flexed lateral views.

Oblique views are helpful

APOM

CR **uvula**

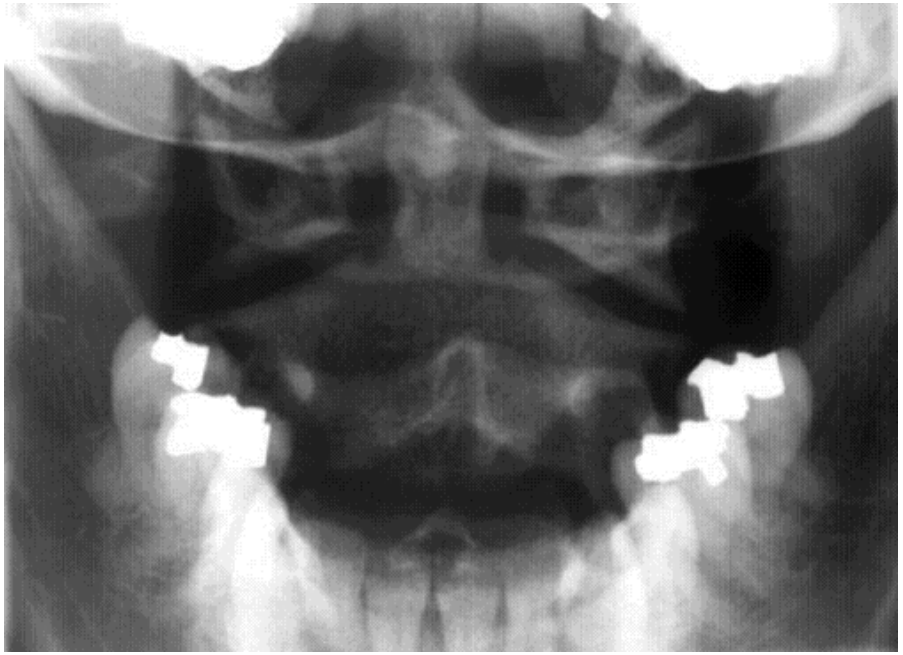
Collimate **5x5**

Double mAs from APLC

National University of Health Sciences

FOOT LEVELERS

AP OPEN MOUTH



Structures Visualized:

- **Dens**
- **C1 lateral masses**
- **Occipital Condyles**
- **C2 body**
- **C2 SP**

National University of Health Sciences

FOOT LEVELERS

AP-Lower Cervical

FFD	40-3”
Tube Tilt	**15˚ cephalad**
CR (thyroid cartilage)	C3/4
Collimate	7x10

National University of Health Sciences

FOOT LEVELERS

AP LOWER CERVICAL

Structures Visualized:

- Vertebral Bodies
- TP's
- SP's
- Upper Ribs
- Upper Lung Fields
- Uncinate Processes
- Tracheal Air Shadow

National University of Health Sciences

FOOT LEVELERS

NEUTRAL LATERAL

CR **C3**

Collimate **7X10**

National University of Health Sciences

FOOT LEVELERS

LATERAL CERVICAL

Structures Visualized:

- Vertebral bodies C2-T1
- Disc Spaces
- ADI
- SP's, Lamina, Pedicles,
- Articular Pillars and Facets
- Tracheal Air Shadow
- George's Line & Spino-laminar line
- Sella Turcica
- C1 Arches

National University of Health Sciences

FOOT LEVELERS

LATERAL EXTENDED

CR C3

Collimate 8x10

May need to be landscape in patients with greater range of motion

National University of Health Sciences

FOOT LEVELERS

LATERAL FLEXED

CR C3

Collimate 8x10

May need to be landscape in patients with great range of motion

National University of Health Sciences

FOOT LEVELERS

Posterior vs. Anterior Obliques

Posterior

Visualize the opposite IVF's

Marker goes under the mandible

Anterior

- Visualize the same side IVF's
- Marker goes posterior to the spine.

LEFT ANTERIOR OBLIQUE

CR	**C3**
Grid	**None**
Tube tilt	**15 ° caudad****
Collimate	**7x10**

LEFT POSTERIOR OBLIQUE

CR	**C3**
Tube tilt	**15 ° cephalad**
Collimate	**7x10**

National University of Health Sciences

FOOT LEVELERS

CERVICAL OBLIQUE

Structures Visualized

- IVF's
- Vertebral Bodies
- C1 arches
- Ribs
- SP's
- Facets

Radiographic Signs of Instability

Vertebral body displacement >2mm; *>3.5mm

Angulation greater than 11 degrees

Widened interlaminar & interspinous space

Widened facet joints

Widened interpediculate distance (AP view)

Atlanto-dental interspace>3mm adults; >5mm in children

These findings indicate skeletal, ligamentous and articular disruption.

www.radiologyassistant.nl

*AMA Guides, 5th ed.

Resnick D. Diagnosis of Bone and Joint Disorders, 4th ed. 2002; 2936.

FOOT LEVELERS

Normal lateral cervical spine

Alignment:

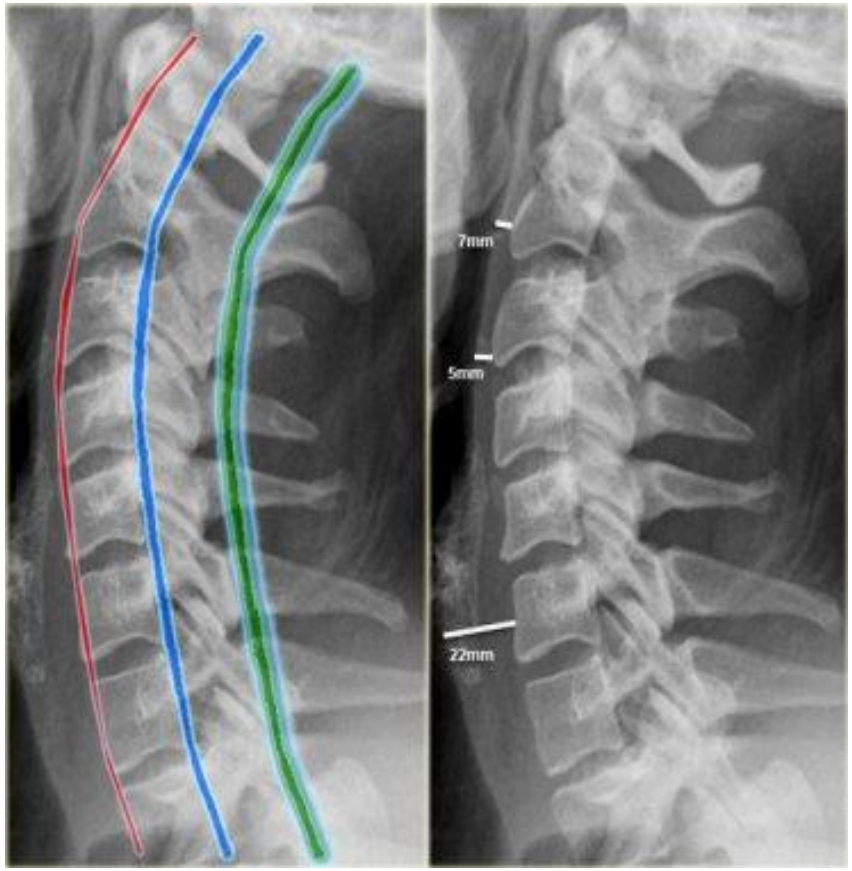
Spinolaminar line

Posterior vertebral body line

Anterior vertebral body line

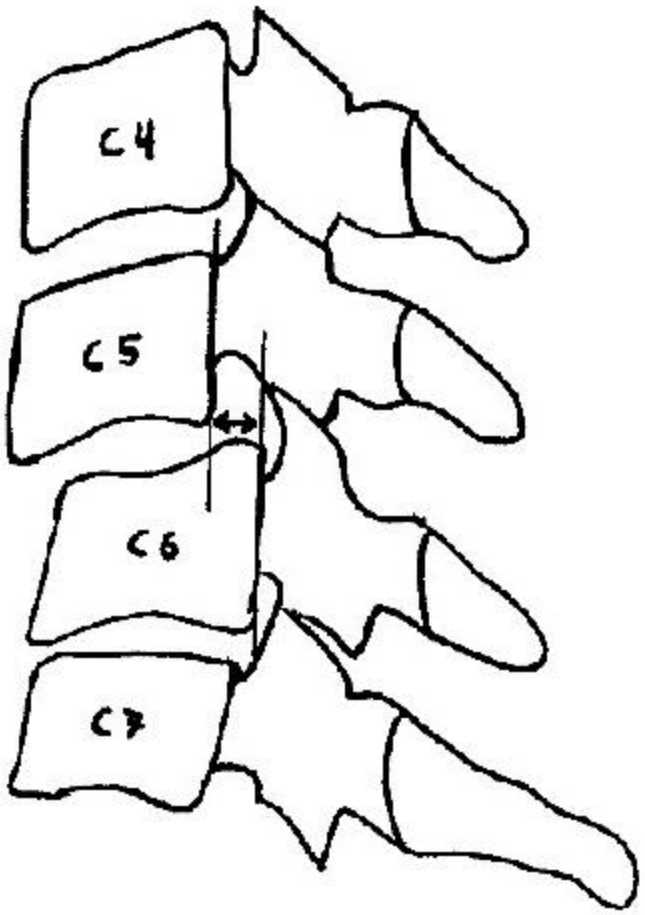
Prevertebral soft tissue (within 3 days of injury)

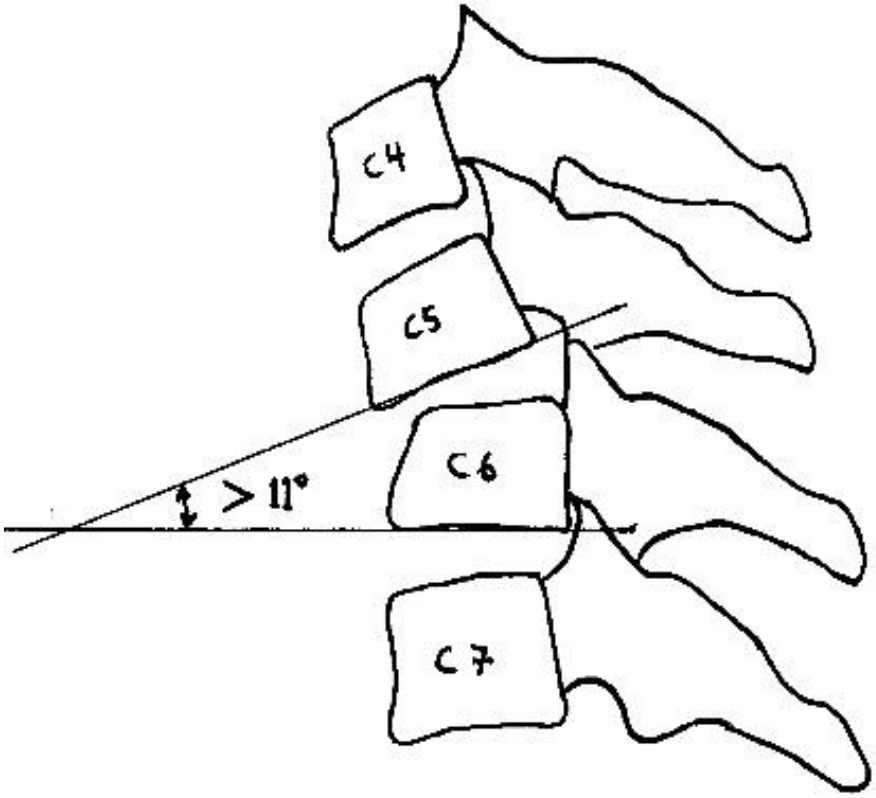
- Retropharyngeal: >7.0-mm
- Retrotracheal: >22.0-mm



www.radiologyassistant.nl

Translation and Angulation





FOOT LEVELERS

Cervical MRI

Sequences: T1, T2, PD, STIR

Anatomy

Disc Herniation Types

- Description; Location; Complications

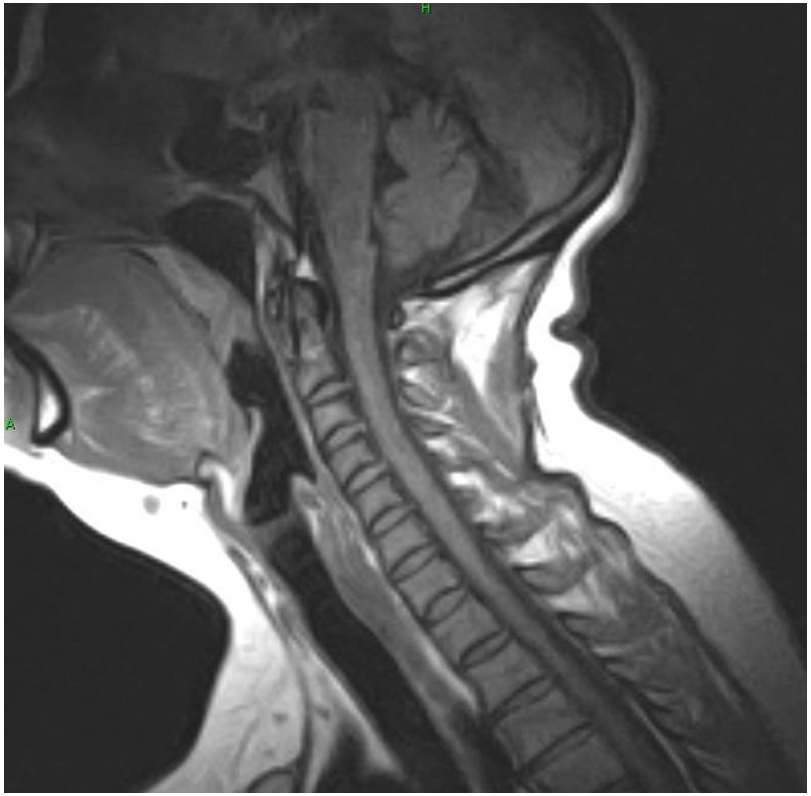
Degenerative Disc Disease and Degenerative Joint Disease

Case Presentations

- Various DDD, DJD, Tumor, etc

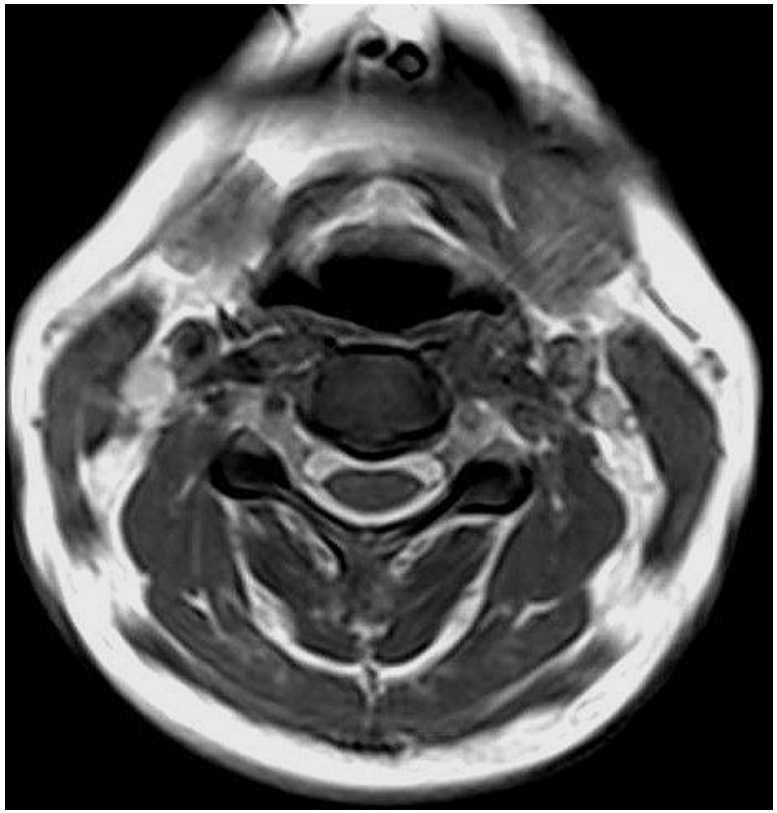
FOOT LEVELERS

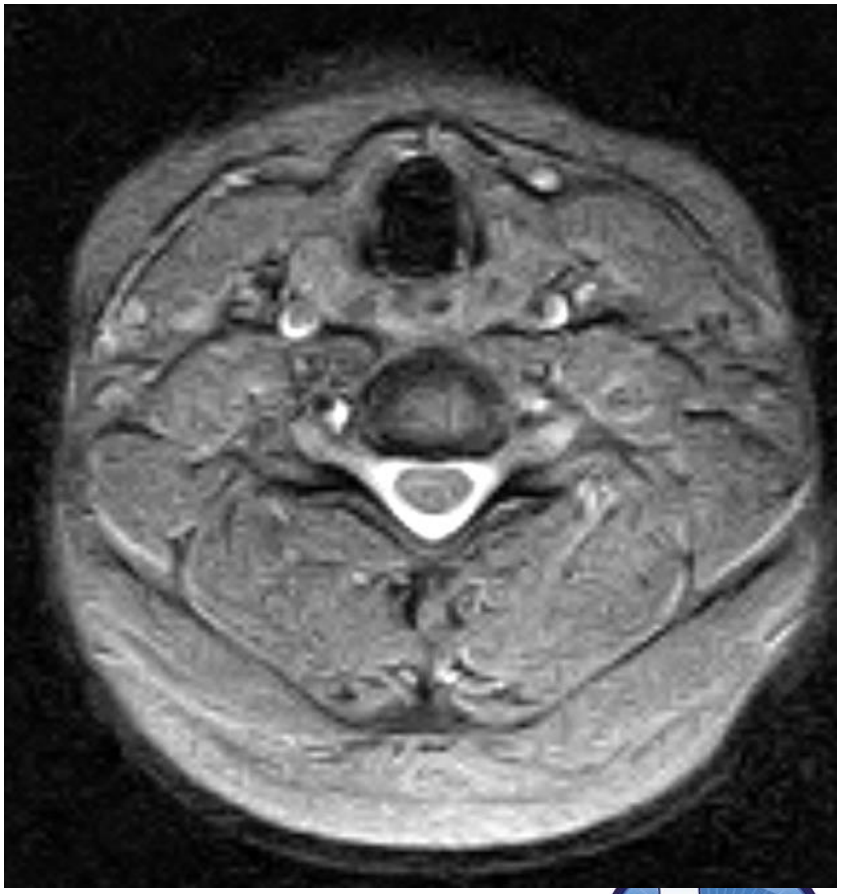
Normal Sagittal T1 & T2 Weighted Images



FOOT LEVELERS

Axial T2 Weighted Image





FOOT LEVELERS

Location of Posterior Disc Displacement

Central

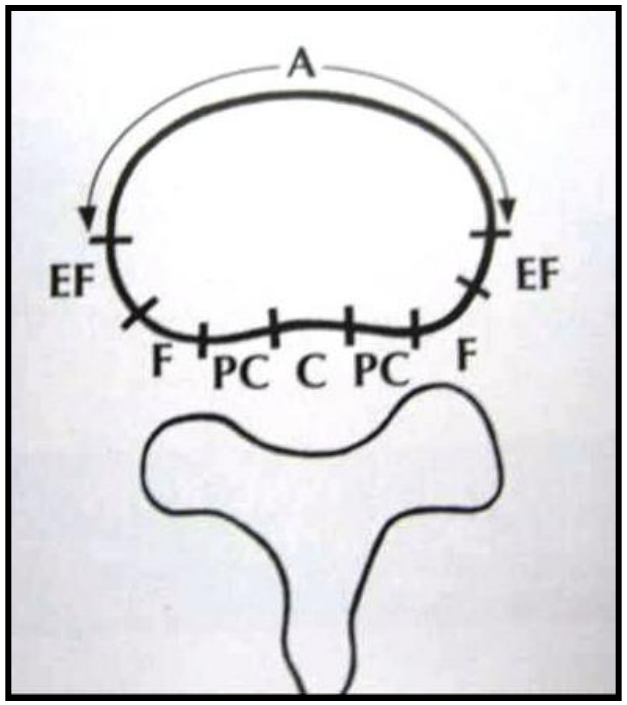
Right and Left central

-Subarticular

Foraminal

Extraforaminal

Anterior



Disc Nomenclature

“Herniation” is non-specific

Diffuse disc bulge

Asymmetrical disc bulge

Broad-based protrusion

Focal disc protrusion

Disc extrusion

Disc sequestration

FOOT LEVELERS

MRI Nomenclature

Disc-osteophyte complex bulge or Diffuse disc bulge with osteophytic changes

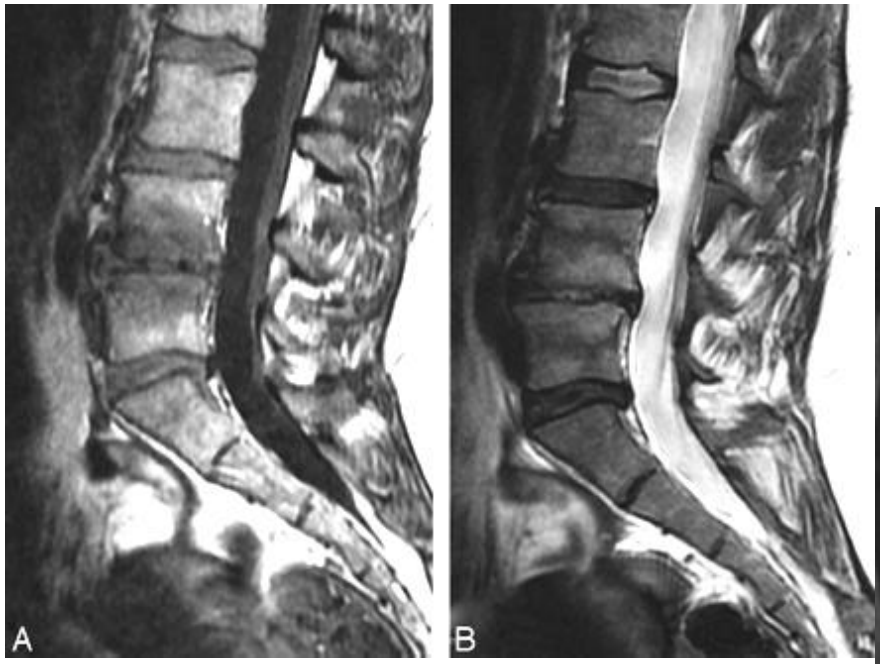
- Degenerative Disc Disease

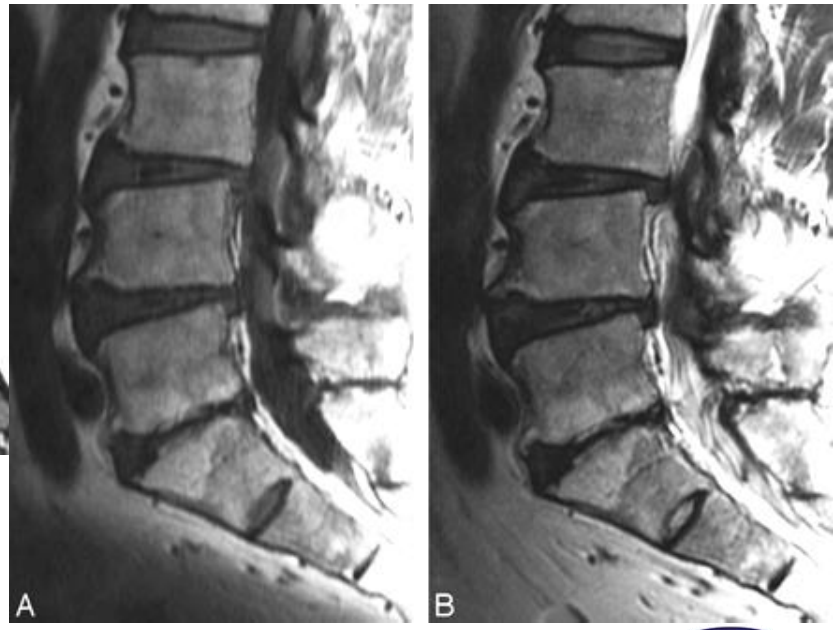
Endplate degeneration

- Modic type I—pain generator
- Modic type II
- Modic type III

FOOT LEVELERS

Modic Type I & II





FOOT LEVELERS

Modic type III-subchondral sclerosis

Rahme and Moussa. AJNR May 2008 29: 838-842.

Case

FOOT LEVELERS

Hydroxyappatite Deposition Disease of the anterior longus colli tendon

Aka calcific tendinitis

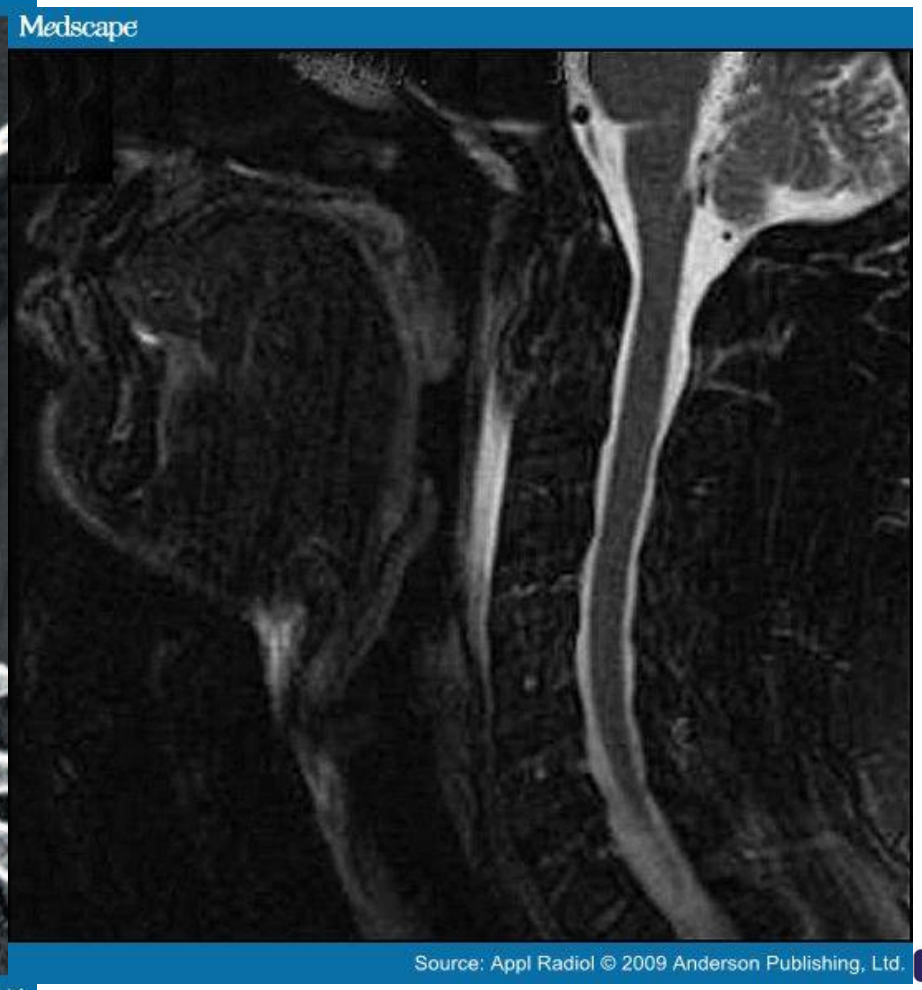
S/S: px, stiff neck, muscle spasms, painful swallowing

Occurs due to trauma

Self limiting 1-2 weeks

FOOT LEVELERS

Sagittal Reformatted CT and Sagittal T2 weighted MR images



FOOT LEVELERS

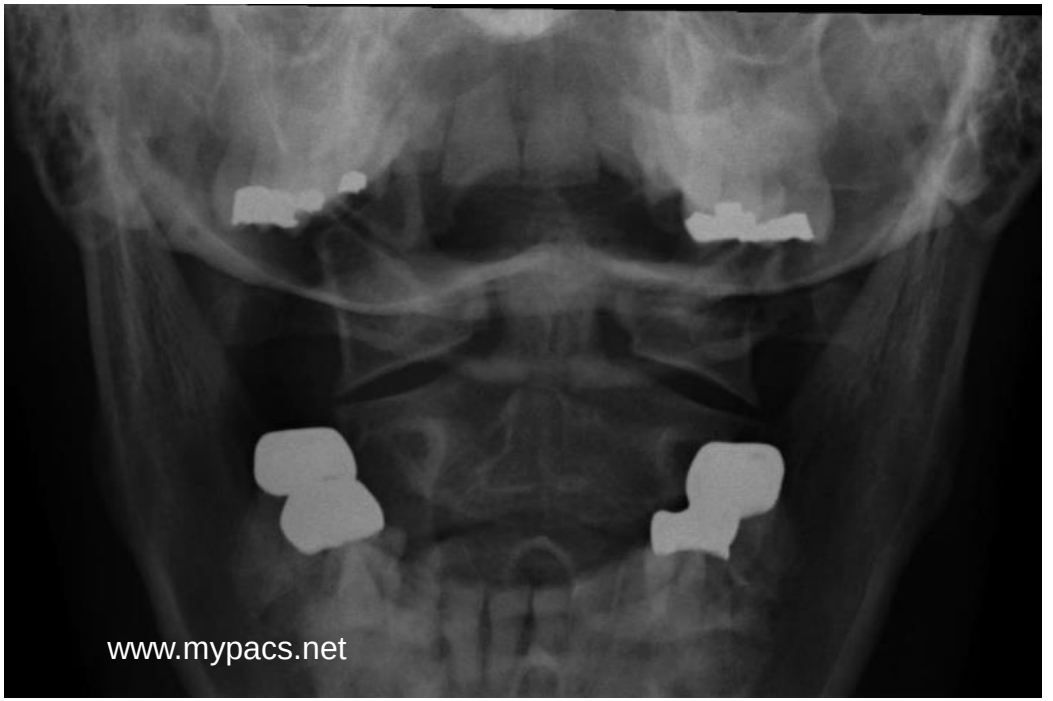
Case 1

Patient experiences numbness and tingling down the right arm and thumb

Motor test: 3/5 (able to move but not full ROM) elbow flexion and wrist extension

FOOT LEVELERS

Case 1



FOOT LEVELERS

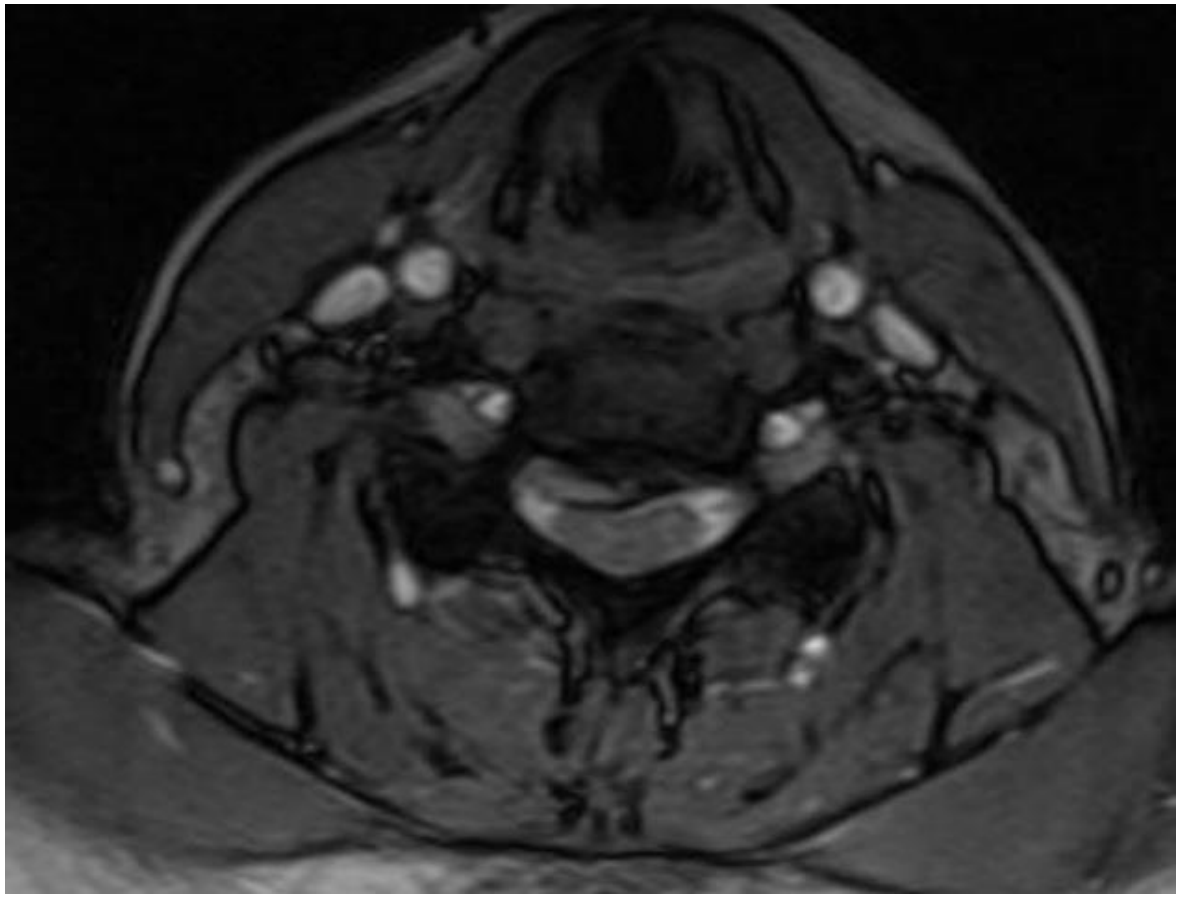
FOOT LEVELERS

FOOT LEVELERS

Sagittal T2 & T1 Weighted Images

FOOT LEVELERS

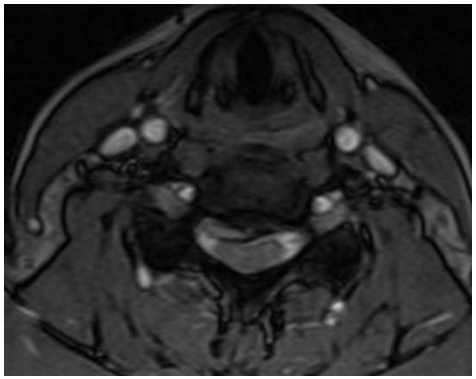
Axial GRE Weighted Image



FOOT LEVELERS

Diagnosis

Broad-based right paracentral disc protrusion at C5-C6



Compression of the spinal cord and of the right C6 nerve root

FOOT LEVELERS

Case 2

Spastic gait

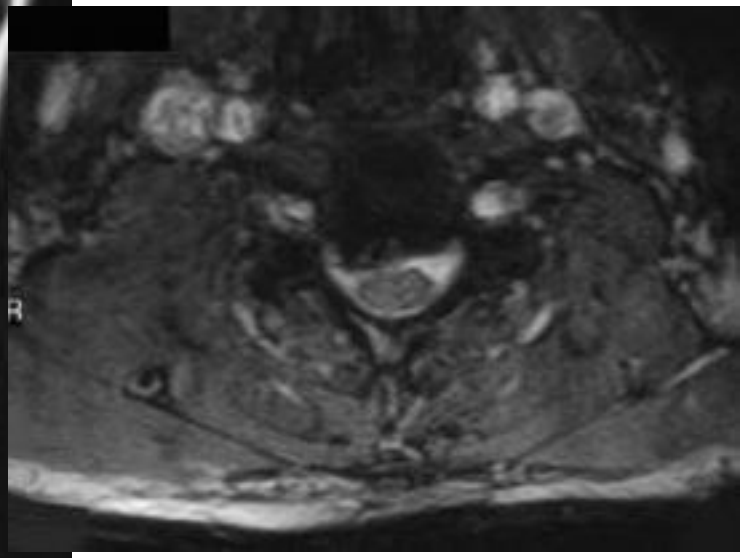
Upper extremity numbness

Loss of fine motor control in the hands

Chronic and gradually worsening

FOOT LEVELERS

Sagittal & Axial T2 Weighted Images



FOOT LEVELERS

Diagnosis

Ventral cord compression from broad-based right paracentral disc protrusion C4-C5 and C5-C6;

- Myelomalacia of spinal cord

Compression of the C5 and C6 nerve roots.

Degenerative Disc Disease C3 to C6; Facet arthrosis

Reversal of the cervical lordosis; Degenerative retrolisthesis at C4 and C5

FOOT LEVELERS

Complication

Compression of cord due to osteophytes or disc>>>stenosis

Result

Compresses the blood supply to the cord and nerve roots (venous congestion and edema)

Demyelination or axonal destruction

Demyelination or axonal destruction

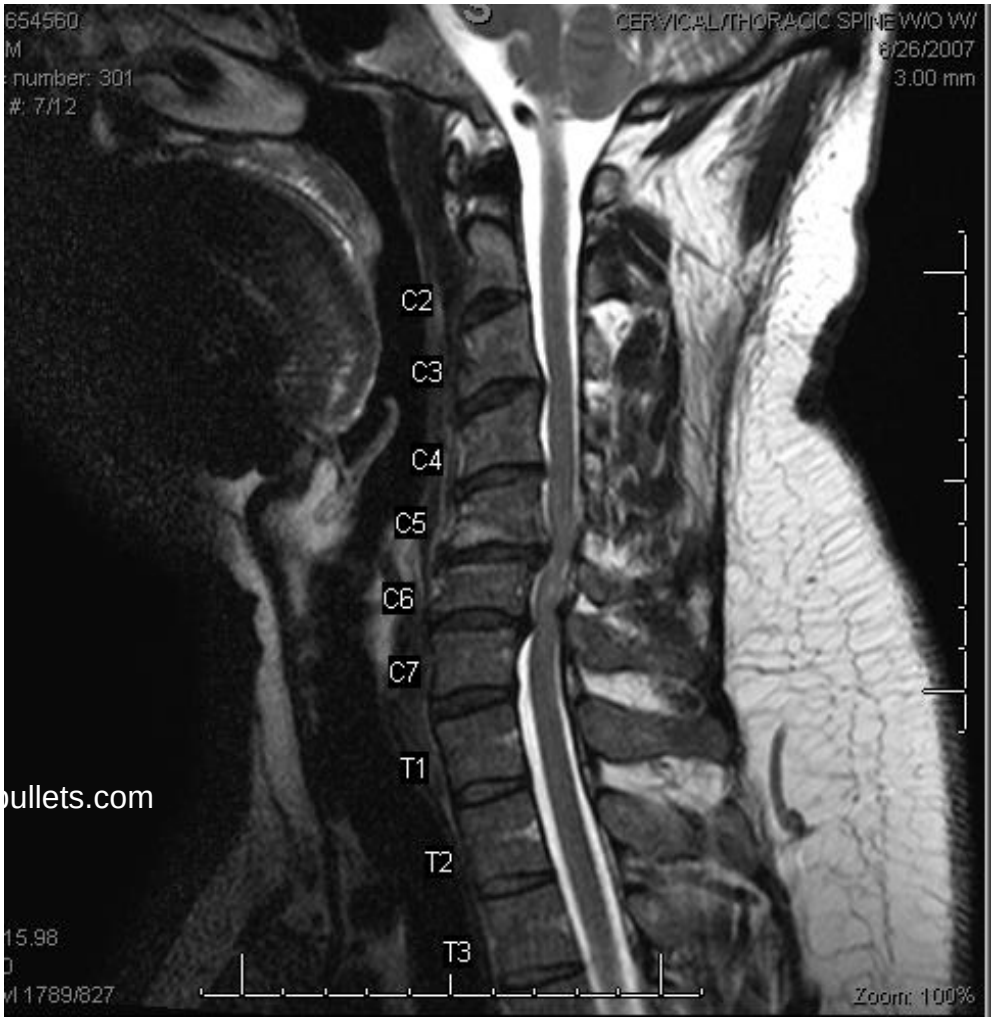
Case 3

Radiculopathy: right fingers with numbness and tingling.

Mild weakness of the right bicep, tricep and shoulder abduction.

FOOT LEVELERS

Sagittal T2 Weighted Image



Diagnosis

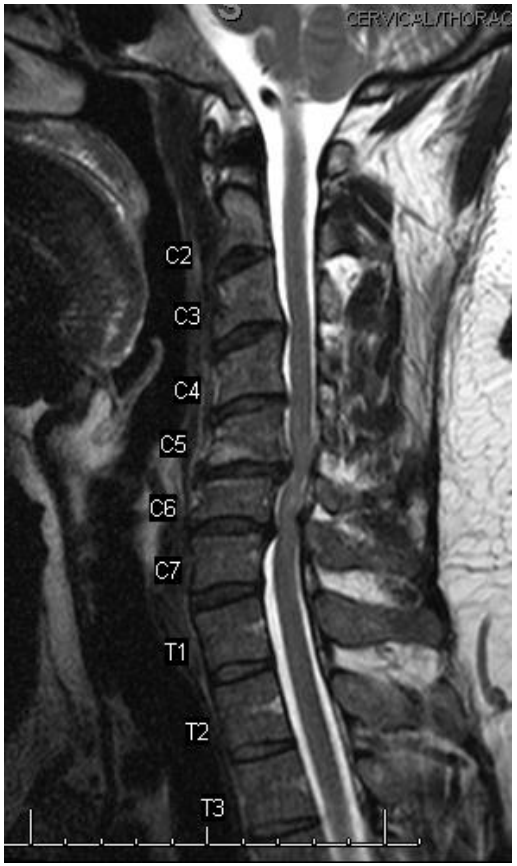
Multiple disc bulges and protrusion

Degenerative disc disease

Myelomalacia of spinal cord

Straightening and reversal of the cervical lordosis; Degenerative retrolisthesis, C5; Modic endplate changes

Result: Spinal canal stenosis



FOOT LEVELERS

Case 4

Radiculopathy down the right arm with severe lower neck pain

Car accident a few months ago

FOOT LEVELERS

FOOT LEVELERS

FOOT LEVELERS

X-ray Findings

Limited range of motion in flexion and extension;

Straightening of the cervical spine, apexing at C4-C5.

FOOT LEVELERS

Sagittal T2 Weighted Image

ealth.org

FOOT LEVELERS

Diagnosis

Disc protrusion at C4-C5 and C5-C6 compressing the cord

Degenerative retrolisthesis at C4 and C5.

FOOT LEVELERS

Case 5

Pain and decreased ROM in bilateral lateral flexion and rotation.

Constant hypertonicity of the upper trapezius

FOOT LEVELERS

FOOT LEVELERS

X-ray Findings

Reversal lordotic curve, apex at C4-C5 with anterior head carriage

Posture: tilting to the left; right shoulder low

Osteopenia

Anterolisthesis at C3, C4 and C6

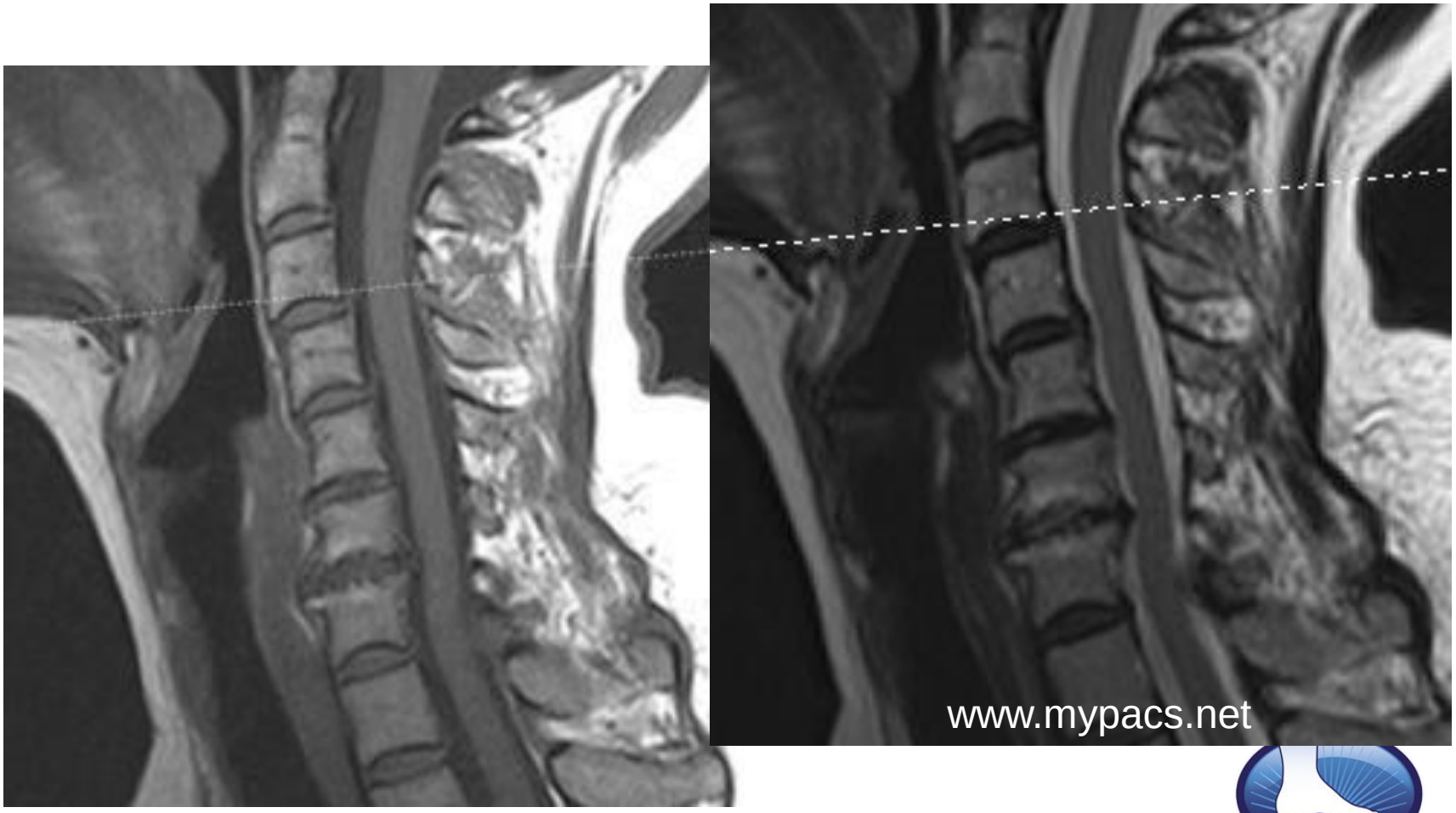
Disc wedging at C4

Degenerative disc disease at C5-C6 and C6-C7

Facet arthrosis, primarily on the left

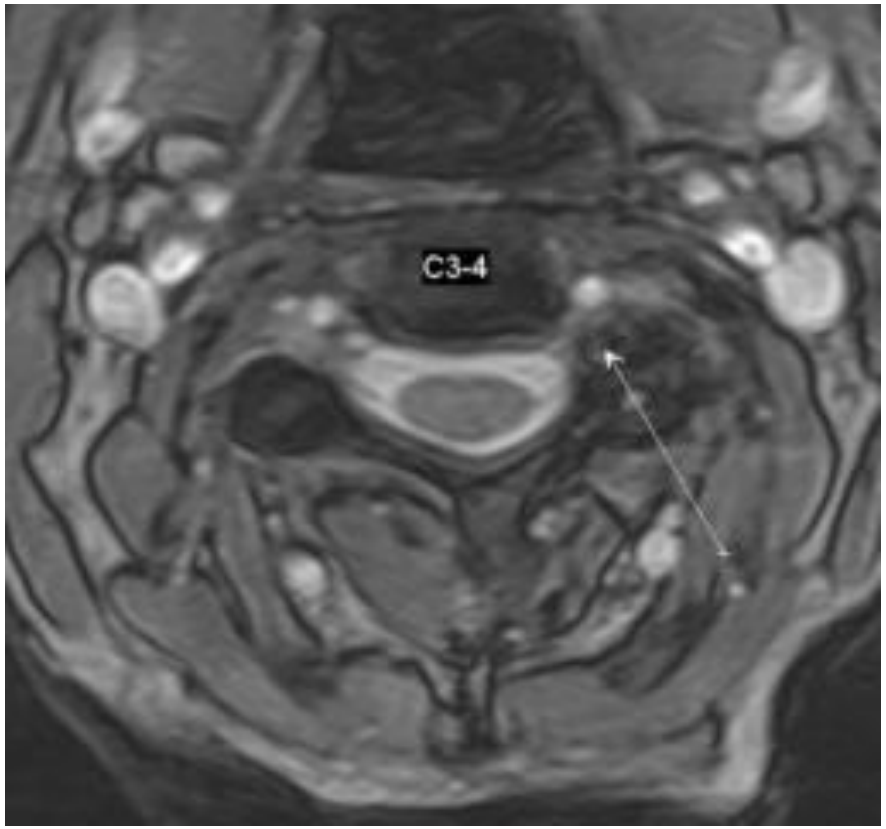
FOOT LEVELERS

Sagittal T1 & T2 Weighted Image



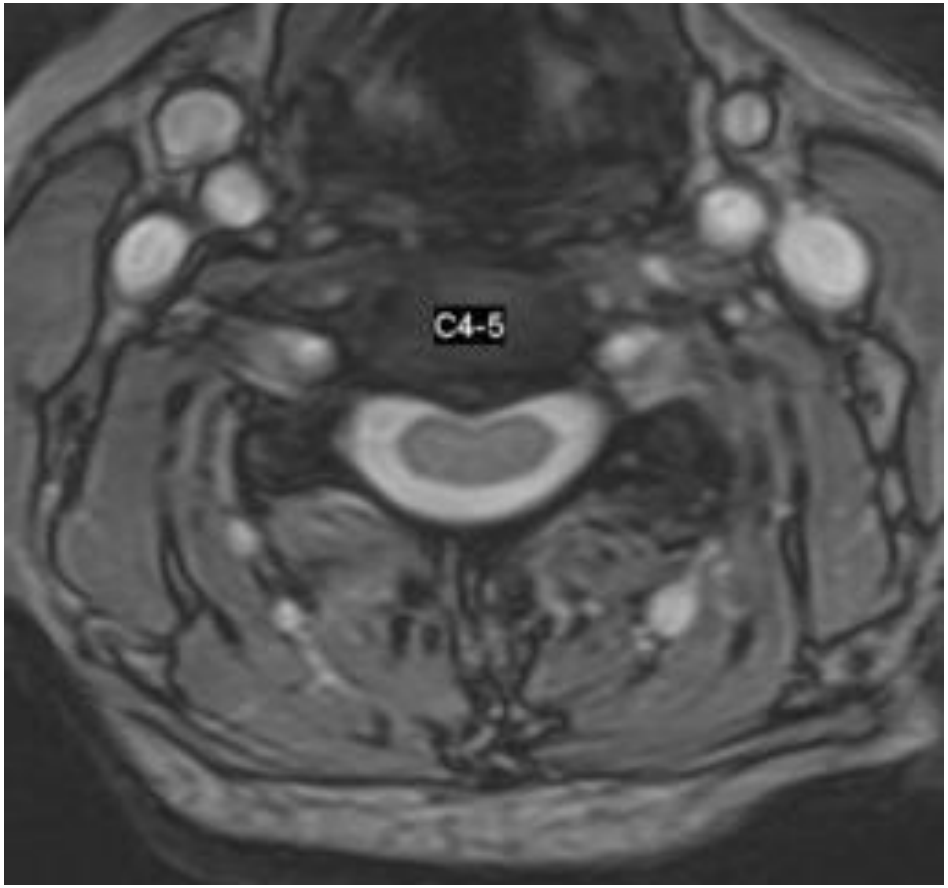
FOOT LEVELERS

Axial T1 Weighted Image



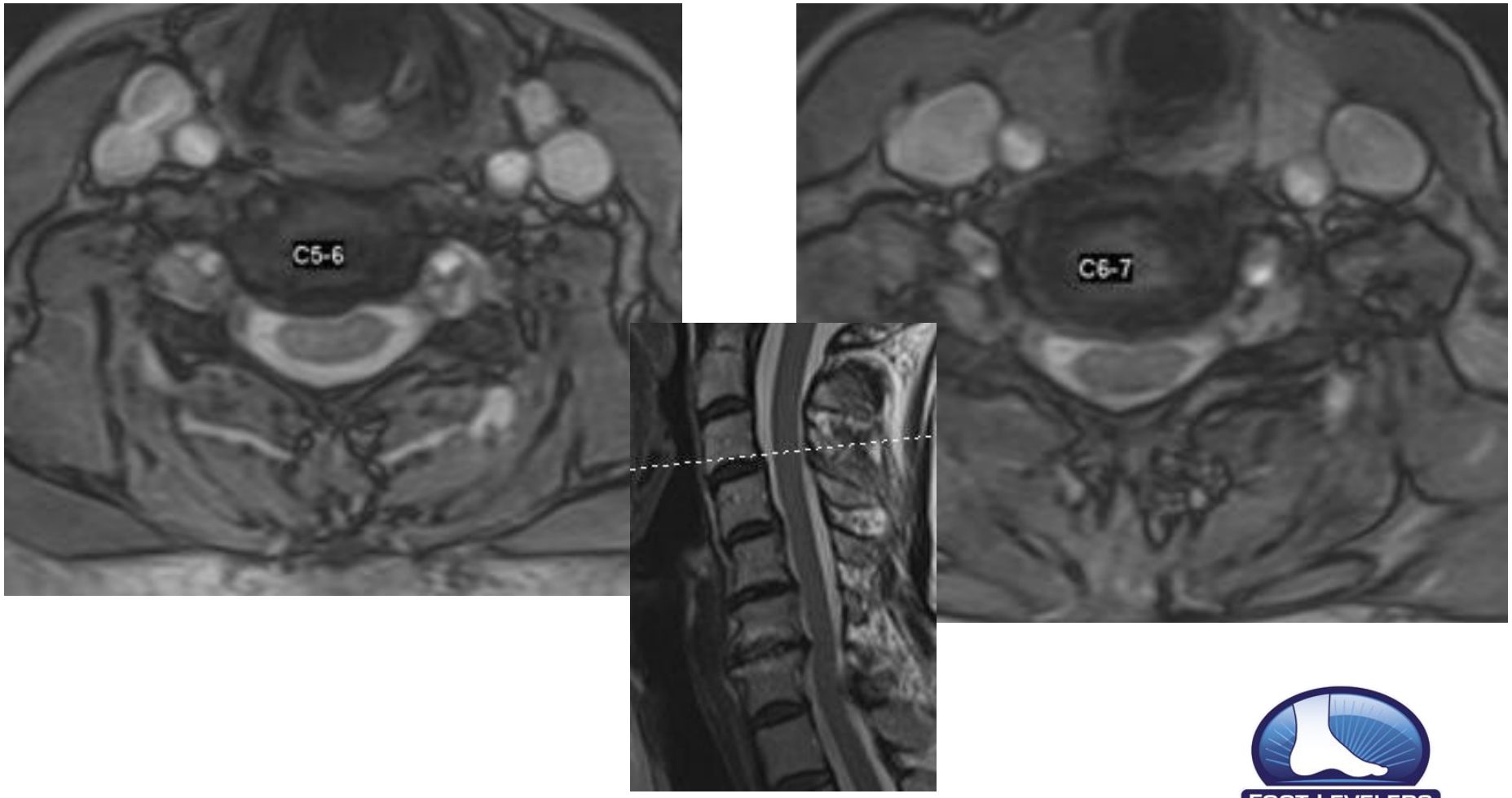
FOOT LEVELERS

Axial T2 Weighted



FOOT LEVELERS

Axial T1 Weighted Image



FOOT LEVELERS

Diagnosis

C3-C4, C4-C5 facet hypertrophy on the left

C4-C5 focal central disc protrusion

C5-C6 and C6-C7 spondylosis and broad-based central disc protrusions with compression and displacement of the spinal cord

Other: Degenerative anterolisthesis; Mild to moderate uncovertebral arthrosis; C6-C7, Modic type II endplate changes (fatty infiltration)

FOOT LEVELERS

Case 6

Frequent numbness and tingling of both hands/fingers

Neck stiffness and getting worse

Headaches

FOOT LEVELERS

FOOT LEVELERS

FOOT LEVELERS

X-ray Findings

Posture: low occiput on the right; spine tilting to the right with low right shoulder;

Reversal of cervical lordosis, apex at C5

Disc narrowing at C3-C4 and C4-C5

Degenerative disc disease at C5-C6 and C6-C7

Degenerative retrolisthesis at C5

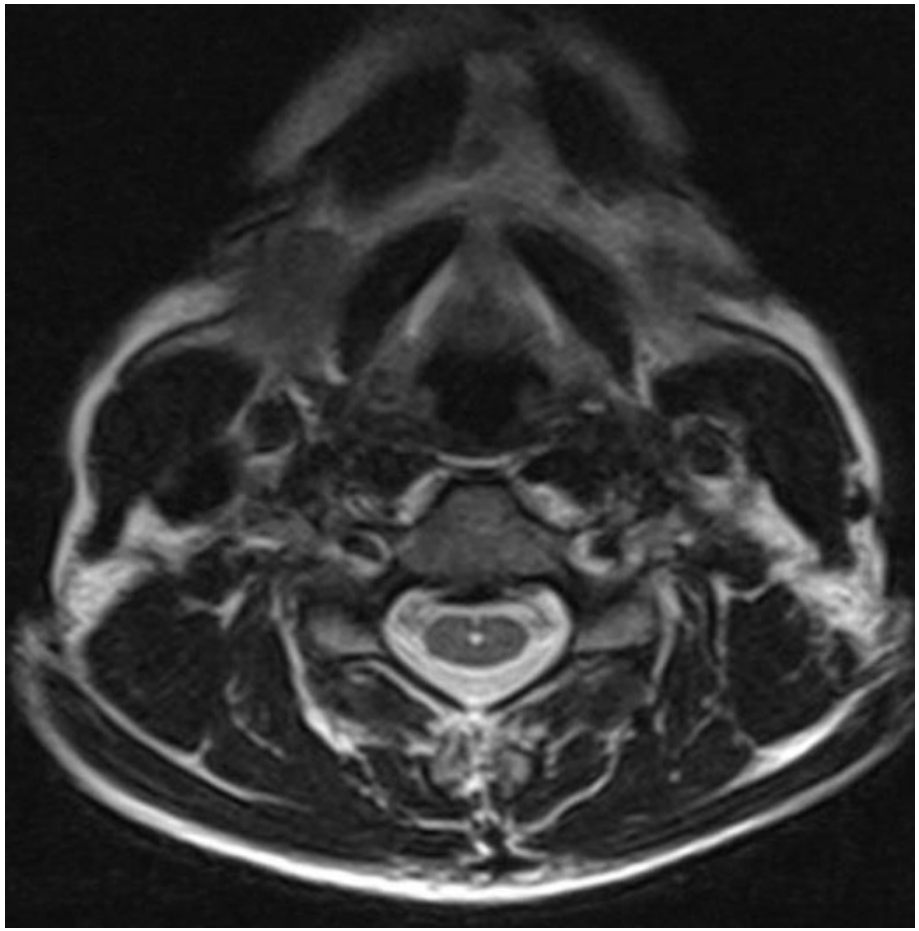
Moderate facet and uncovertebral arthrosis

FOOT LEVELERS

Sagittal T1 & T2 Weighted Images

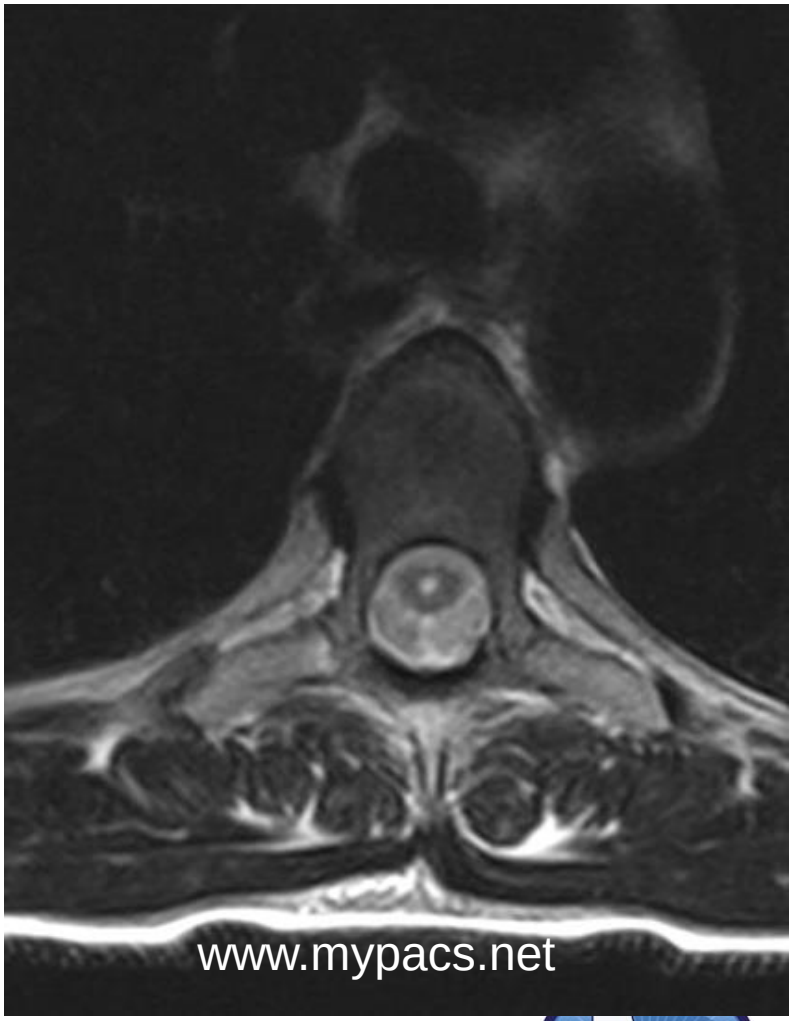
FOOT LEVELERS

Axial T2 Weighted Image



FOOT LEVELERS

Sagittal & Axial T2 Weighted Image



FOOT LEVELERS

Diagnosis

Arnold Chiari malformation with syrinx (syringomyelia)

Multilevel diffuse disc bulges with osteophytic changes, C5-C6 and C6-C7

Facet and uncovertebral arthrosis

Degenerative retrolisthesis, C5 and C6; Reversal of lordosis

FOOT LEVELERS

Case 7

70 year-old male with chronic mid and low back pain

FOOT LEVELERS

Sagittal T1 Weighted Image

Differential Diagnosis

Multiple Myeloma or Metastatic Disease

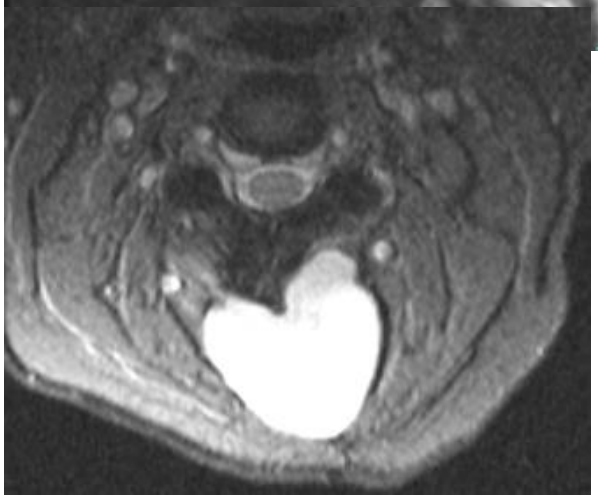
DX: Mets

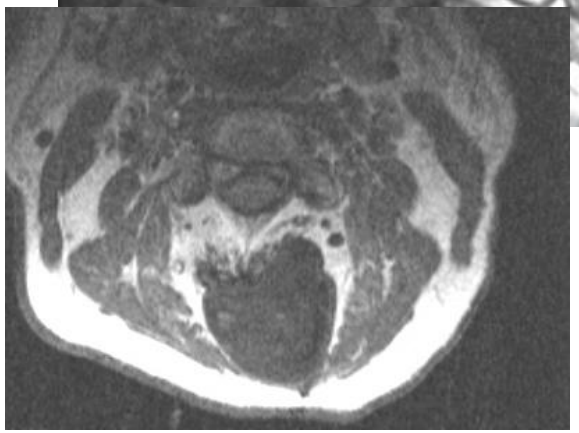
- Prostate
- Lung
- Breast
- Renal CA
- Gastric CA

FOOT LEVELERS

Case 8

46 yom with neck pain. The pain travels down both arms.





FOOT LEVELERS

FOOT LEVELERS

Diagnosis

Meningocele (possible neural tissue within the sac; subcutaneous tissue intact)

- May or may not be symptomatic
  - Sx's when located in cervical and thoracic

- MC in lumbar; cervical & thoracic spine
  - Dorsal defect

Other DDX: bone tumor, sarcoma

FOOT LEVELERS

Case 9

Numbness and tingling in the hands and feet

Chronic neck pain

Case donated by the patient

FOOT LEVELERS

X-rays

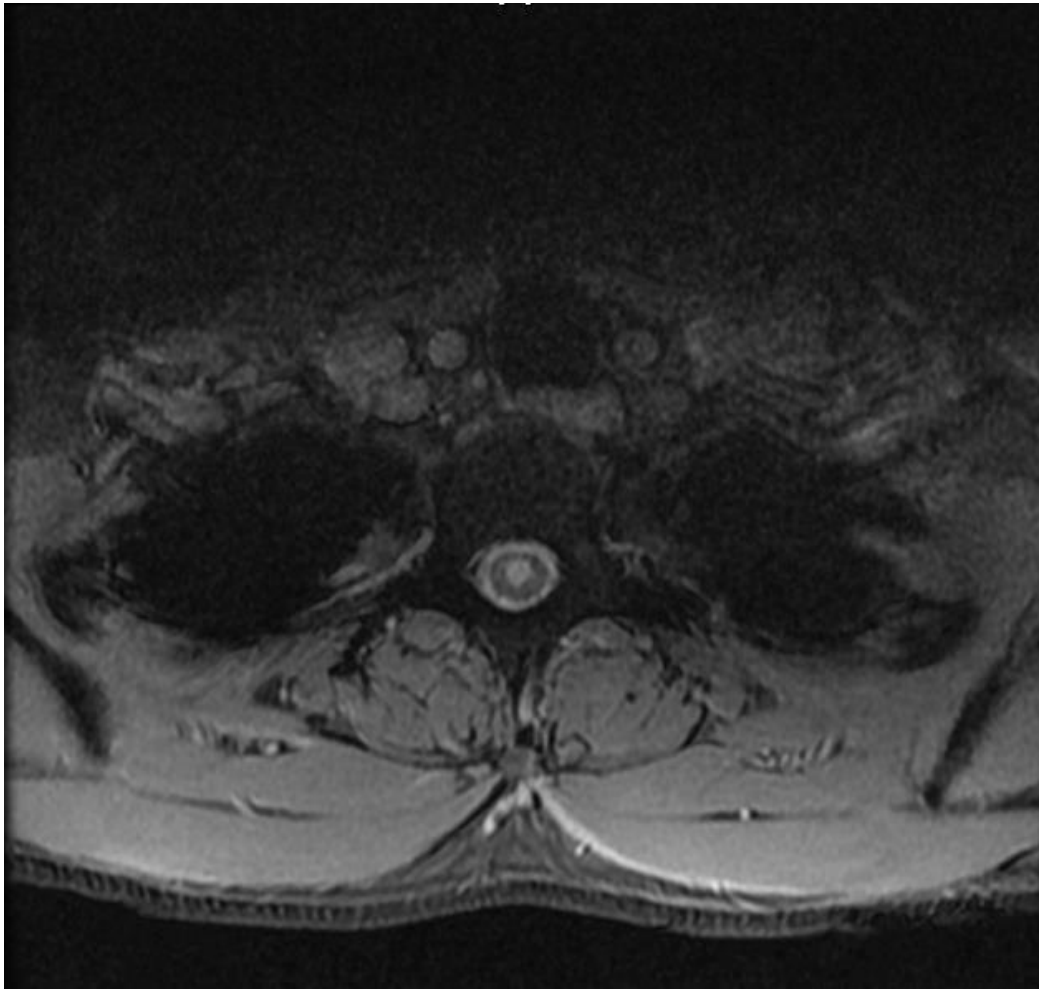
None given

FOOT LEVELERS

Sagittal Flexed & Extended T2 Weighted Images

FOOT LEVELERS

Axial T2 Weighted Image



FOOT LEVELERS

Sagittal T1 FLAIR

DDX

Syrinx

Arachnoid Cyst

Spinal cord tumor

Syrinx

What is it?

- A cyst in the cord that may elongate and expand
- Potential to cause myelopathy or demyelination of the cord
- Commonly seen in the cervical and thoracic cord

Sx: Pain, weakness and stiffness of the arms, legs, shoulders (cape like) and back.

- Other: Headaches, loss of temperature & loss of bowel and

Causes

- Previous trauma to the cord and manifests later in life
- Congenital developmental problems with brain and cord
- Chiari malformation (herniation of the cerebellum & brain stem)

Referral

- Neurologist
- MRI with contrast to rule out tumor & of the entire spine

FOOT LEVELERS

THE END

www.jprad.com

FOOT LEVELERS

THE END- THANK YOU!

Jennifer Pedley, MS, DC, CCSP, DACBR
Chiropractic Radiologist

www.jprad.com

FOOT LEVELERS

FOOT LEVELERS

JENNIFER PEDLEY

RADIOLOGY INTERPRETATION

700 East Redlands Blvd, Ste U130, Redlands CA 92373 909.353.9348 Jennifer@jprad.com

FOOT LEVELERS

Thank you

FOOT LEVELERS