DIAGNOSTIC TESTING FOR PAINFUL SPINE CONDITIONS

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GOALS

- Brief discussion of commonly encountered work-related painful spine conditions
- Physical examination
  - Objective findings
  - Examination maneuvers
- Imaging
  - X-ray
  - MRI
  - CT
  - Nuclear
- EDX Studies
- Diagnostic Spinal Interventions

FINANCIAL DISCLOSURES

- No conflicts of interest to report ☹

CASE #1

- 53 year-old male
- H/O lumbar radiculopathy, resolved after L5-S1 fusion
- 2nd episode lumbar radic resolved after L4-5 microdisc
- Acute-onset back pain, left leg pain and weakness after lifting injury
- Physical Examination:
  - Unable to heel walk on left side
  - Left pretibial atrophy
  - 4/5 strength left tibialis anterior, EHL, tibialis posterior
  - Diminished sensation left 1st webspace
  - Pain reproduced with seated and supine straight leg raising

CASE #2

- 60 year-old female
- Acute-onset neck pain after being struck on her head by a basketball
- PT/MT/Chiro
- Left-sided neck pain
- Physical Examination:
  - Normal gait
  - Normal upper and lower extremity strength/sensation/reflexes
  - Normal cervical spine ROM
    - Pain with flexion, extension and rotation to the left

WHICH STUDIES TO ORDER?

- Is there a “Gold Standard?”
- Which tests are best?
- Considerations:
  - Presumptive diagnosis
  - Objective findings
  - Mechanism of injury
  - Preexisting condition(s)

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LOW BACK PAIN

- 70% lifetime prevalence
- 2nd or 3rd most common reason for doctor's office visits
- Leading cause of workplace disability, early retirement

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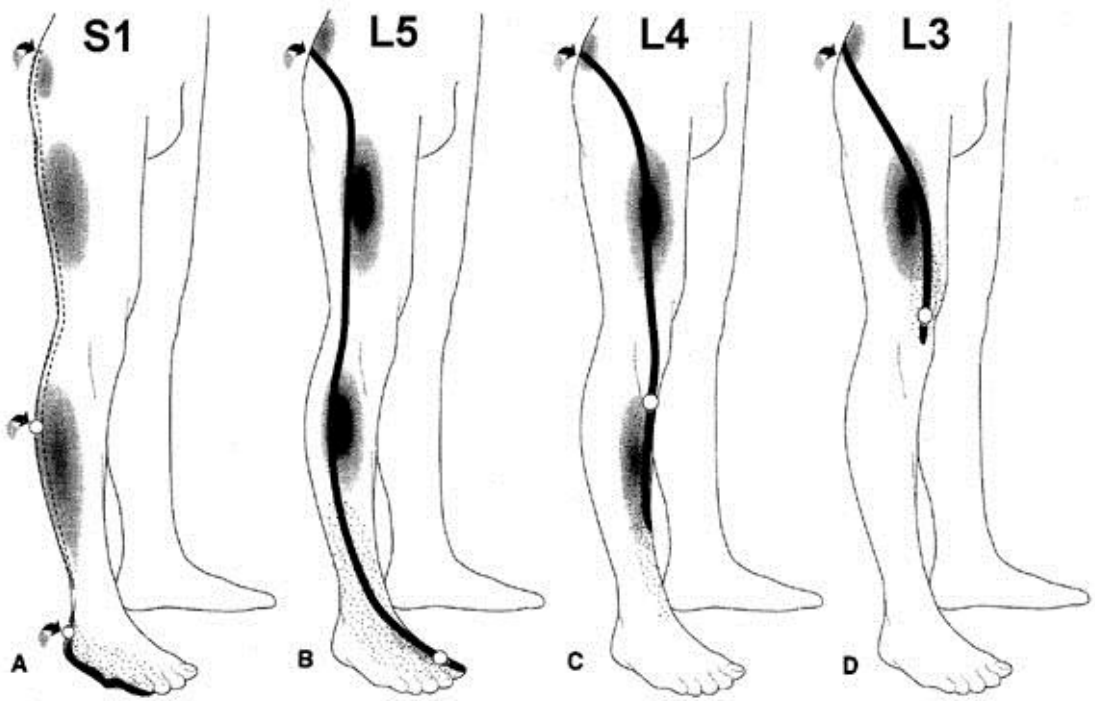
LOW BACK PAIN

- Nonspecific low back pain
  - No definite pathoanatomical cause
  - Absence of specific disorders including
    - Referred extraspinal pathology (kidney stones, aortic aneurysm)
    - Epidural abscess/osteomyelitis/discitis
    - Compression fracture
    - Spondyloarthropathy
    - Malignancy
    - Cauda equina
    - Radiculopathy
  - Estimated 90% of low back pain is nonspecific

LUMBAR RADICULOPATHY

- Compression/irritation of a lumbar spinal nerve
- Pain
- Sensory loss
- Weakness
- Dermatomal/myotomal distribution

LUMBAR RADICULOPATHY



Anterolateral view of the lower extremity. The black thick line represents the sharp, radiating pain, which often has a dermatomal distribution. The sharp radiating pain in S1 radiculopathy is indicated by interrupted lines. It tends to be in the center of the posterior thigh and calf. The diffuse gray areas represent the poorly localized dull ache. The circles indicate areas where pain may concentrate. The area covered by small dots indicates the location of paraesthesiae and sensory impairment. **A.** S1 radiculopathy. **B.** L5 radiculopathy. **C.** L4 radiculopathy. **D.** L3 radiculopathy.

LOW BACK PAIN/RADICULOPATHY

- Physical Examination
  - Range of motion
    - Flex 40-60°, Ext 20-35°, Lat Flexion 15-20°, Rotation 3-18°
  - Gait
    - Heel/toe walk
    - Standing calf raise
  - Neurologic
    - Strength
      - Low sensitivity (13-60%), high specificity (70-97%) for radiculopathy
    - Sensation
      - Low sensitivity (10-30%), high specificity (80-100%) for radiculopathy
    - Reflexes
      - Low sensitivity (14-67%), high specificity (63-93%) for radiculopathy

LOW BACK PAIN/RADICULOPATHY

- Palpation
  - Myofascial trigger points
- Specific Tests
  - Straight Leg Raise (L5,S1)
    - Ipsilateral (69% sens, 84% spec)
    - Crossed (7% sens, 96% spec)
  - Slump Test
    - More sensitive, less specific
  - Femoral Stretch (L2, L3, L4)
    - Ipsilateral (50% sens, 100% spec)
    - Crossed (5% sens, 100% spec)

LOW BACK PAIN/RADICULOPATHY

- Axial low back pain
  - No characteristic set of exam findings for myofascial, facet joint or discogenic pain
  - Sacroiliac joint pain
    - Pain at/below L5
    - Exam maneuvers
      - FABER/Patrick
      - Thigh Thrust
      - Compression
      - Distraction
      - Gaenslen
    - ≥3/5 positive tests 85-94% specific
  - Manual examination

NECK PAIN

- Prevalence less well-studied
  - Highly variable estimates (0.4-86.8% lifetime prevalence)
- Similar challenges to diagnosing nonspecific LBP

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CERVICAL RADICULOPATHY

- Upper limb symptoms
  - Pain
  - Numbness
  - Weakness
  - Dermatomal/Myotomal distribution

NECK PAIN/CERVICAL RADICULOPATHY

- Physical examination
  - Gait
  - Cervical spine ROM
    - Flexion 50°, extension 60°, lateral flexion 45°, rotation 80°
  - Neurologic
    - Strength, sensation, reflexes
    - Upper AND lower extremities
    - Assess for pathologic reflexes
      - Hoffmann
      - Babinski
      - Ankle clonus (most specific for cervical myelopathy)
  - Palpation
    - Myofascial trigger points

NECK PAIN/CERVICAL RADICULOPATHY

- Cervical radiculopathy
  - Spurling
    - 30% sensitive, 90% specific
  - Shoulder abduction, neck traction
    - Also poor sensitivity, high specificity
  - Upper limb tension test
    - High sensitivity, poor specificity

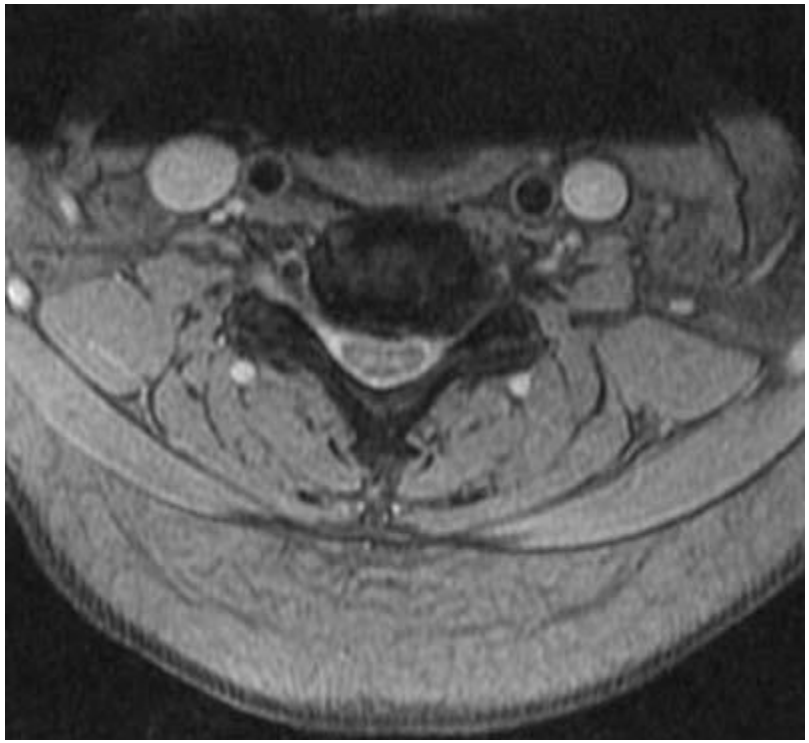
IMAGING STUDIES

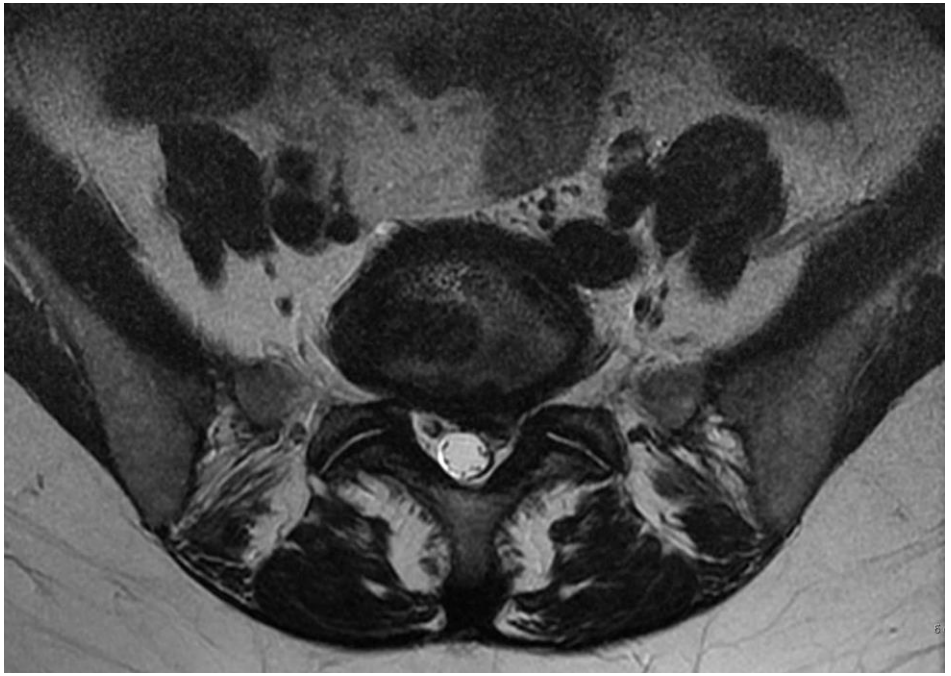
- Spinal Imaging
  - X-ray
  - CT
  - MRI
- Highly sensitive
- Must be correlated with clinical presentation

IMAGING STUDIES

- X-rays
  - Nondiagnostic for nonspecific LBP/neck pain
  - Eval for instability/deformity
    - Instability criteria less well-defined in cervical spine
  - Procedure planning
  - Patient reassurance
- MRI
  - Study of choice for soft tissue imaging
  - Radiculopathy
    - HNP
    - Stenosis

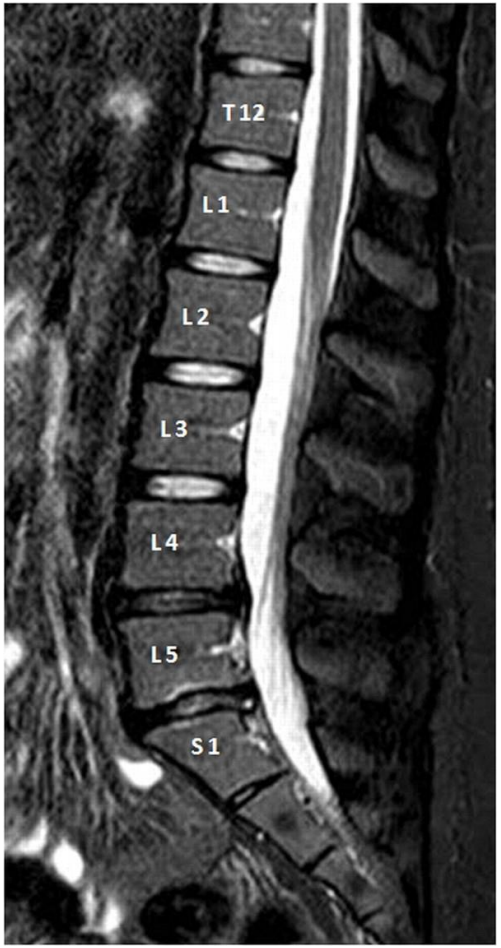
IMAGING STUDIES





IMAGING STUDIES

- “Pictures don’t show pain!”
- Prevalence of lumbar findings in asymptomatic patients
  - Any disc degeneration 92%
  - Disc desiccation 83%
  - Disc height loss 56%
  - Disc bulge 64%
  - Disc protrusion 32%
  - Annular tear/HIZ 38%
    - Jarvik et al, Spine 2001



IMAGING STUDIES

- Cervical spine MRI
  - Nakashima 2015
    - 1211 asymptomatic subjects
    - Disc bulging in 87.6%
    - 73.3% of males and 78% of females in their 20s
  - Lee 2013
    - 102 asymptomatic subjects
    - Disc bulging 68.6%
    - Disc protrusion 29.4%
    - Disc extrusion 22.9%
    - Annular fissure/HIZ 85.9%
    - Desiccation 95.4%

IMAGING STUDIES

- CT Scan
  - Largely supplanted by MRI
  - Fracture/Trauma
  - MRI contraindicated/nondiagnostic
    - Pacemaker
    - Metallic artifact
  - Operative planning

IMAGING STUDIES

- SPECT/CT scan
  - Fusion of SPECT with CT scan images
  - Can also be done with MR
  - May help identify painful facet joints/predict response to interventions

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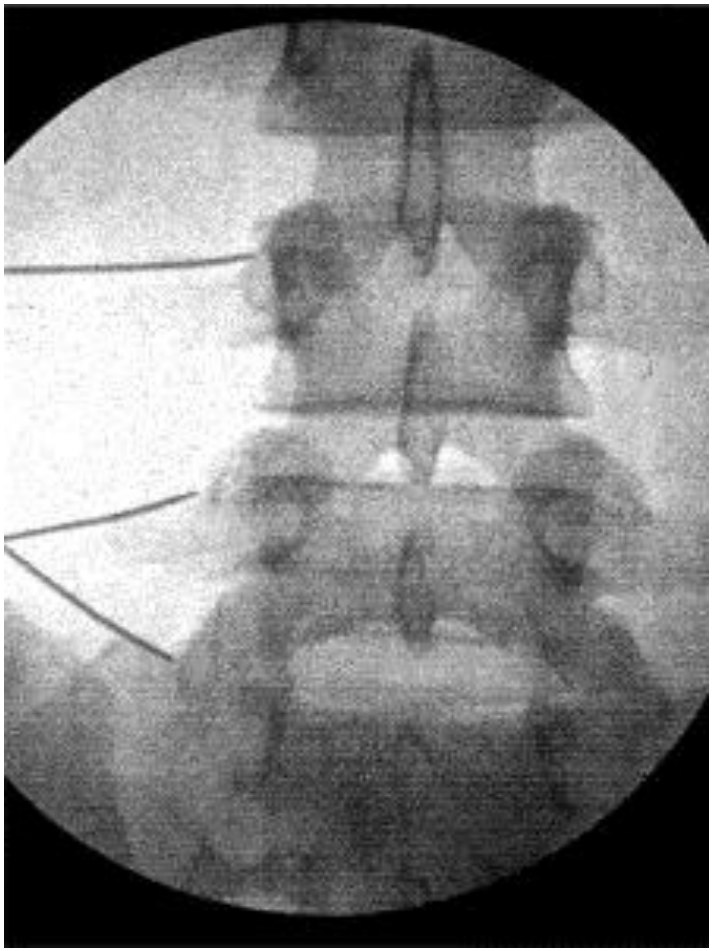
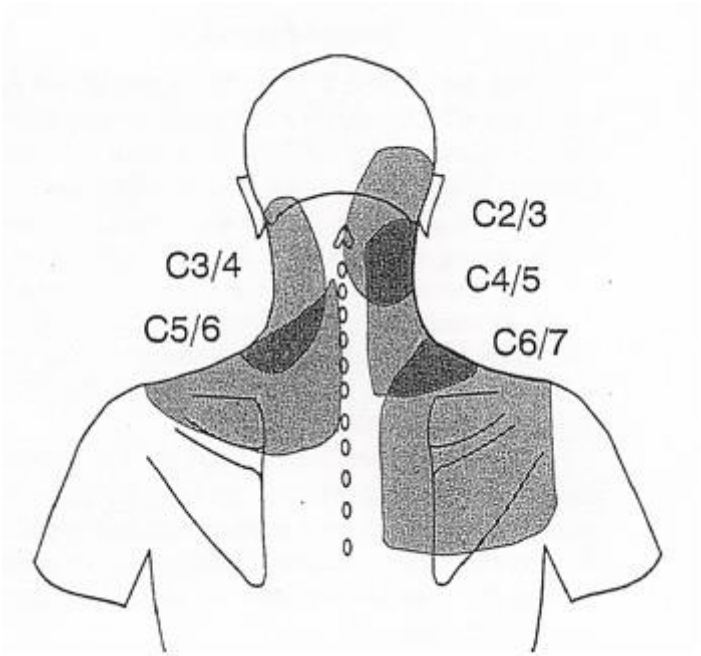
INTERVENTIONAL PROCEDURES

- Lumbar Medial Branch Block
  - "Gold standard" for diagnosis of facet pain
  - Most thoroughly validated interventional spine procedure
  - Must have relief with a second confirmatory injection (25-45% false positive for single block)



INTERVENTIONAL PROCEDURES

- Cervical Medial Branch Block
  - Similar criteria as lumbar MBB
  - May be more useful due to higher prevalence of facet pain in cervical spine
  - More predictable pain referral patterns

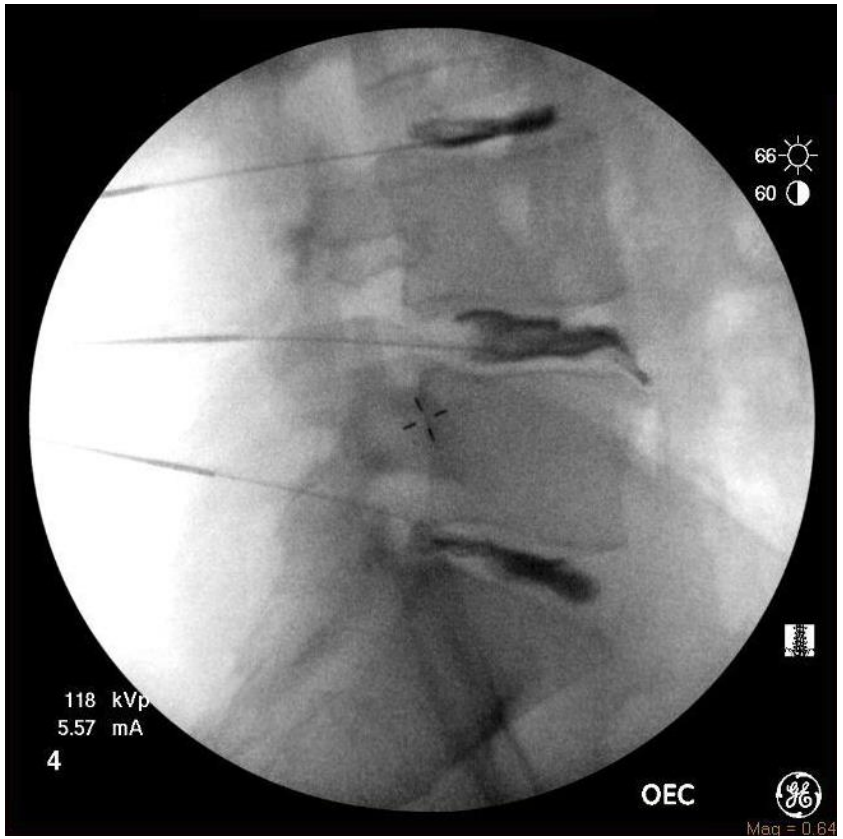


INTERVENTIONAL PROCEDURES

- Sacroiliac Joint Injection
  - “Gold Standard” for diagnosis of SIJ pain
  - ≤50% relief-negative
  - 51-74% relief—equivocal
  - ≥75% relief—positive

INTERVENTIONAL PROCEDURES

- Discography
  - Reference standard for **lumbar** discogenic pain
  - No true “gold standard”
  - Diagnosis difficult in setting of chronic pain states
  - Does not improve outcomes due to lack of effective treatments



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ELECTRODIAGNOSTIC TESTING

- Highly specific for diagnosis of cervical and lumbar radiculopathy
- Rule out alternative diagnoses
- May have prognostic value for recovery of function
- May provide information on age of lesion

ELECTRODIAGNOSTIC TESTING

- Caveats
  - Suboptimal sensitivity
    - 49-92% in lumbar spine
    - 50-71% in cervical spine
  - Normal EMG does **NOT** rule out radiculopathy!
  - Findings must be interpreted in context of the patient's clinical presentation
  - No utility in diagnosis of axial pain

IS THERE A "GOLD STANDARD?"

- Lacking for some diagnoses
  - Cervical/lumbar strain
  - Myofascial pain
  - Cervical discogenic pain
- Radiculopathy
  - MRI/CT myelogram imaging
  - EDX findings
  - Intraoperative findings
  - Objective findings not always clinically significant

IS THERE A “GOLD STANDARD?”

- Diagnostic injections
  - Facet joint pain
  - Sacroiliac joint pain
  - Rely on subjective patient response, not objective findings
- Discography
  - Utility currently limited in lumbar spine
- SPECT/CT?

CASE #1—DIAGNOSTIC STUDIES

- MRI Lumbar Spine
  - L4-5 facet hypertrophy and left-sided disc displacement causing lateral recess narrowing
- EMG LLE
  - Abnormal spontaneous activity in left TA, FL, TFL
    - Large amplitude PSWs
  - Neuropathic motor units in left TA, FL, TFL
- Impression
  - Acute on chronic left L5 radiculopathy
  - Aggravated preexisting condition

CASE #2—DIAGNOSTIC STUDIES

- Cervical spine X-rays
  - Multilevel facet arthropathy
- Cervical spine MRI
  - Multilevel facet arthropathy, most pronounced at left C3-4
- Impression
  - Cervical facet joint pain
- Considerations
  - SPECT/CT scan
  - Cervical MBB

THANK YOU!

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