Indications for imaging in acute low back pain: workup of an unusual osteomyelitis

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Learning Objectives

- Anatomy and pathoanatomy of the lumbosacral spine
- Review differential diagnosis of low back pain (LBP) and frequencies of various etiologies
- Indications for imaging patients with acute low back pain
  - Important "red flag" history and physical exam findings
- Menu of tests for imaging the lower back
Low Back Pain: a few stats

-2/3 of adults experience low back pain at some point

-2nd most common symptom bringing patients into doctor's office

-Most common and most expensive cause of work related disability in adults under age 45

-In one year 15% of Americans have LBP lasting for at least 2 weeks. 5-10% of this group will have pain lasting at least 3 months (chronic low back pain).

• Deyo and Weinstein
• National Committee for Quality Assurance
Overview of the differential diagnosis of low back pain

Mechanical—97%

Visceral—2%

Spine non-mechanical—1%

Up to 85% of adults presenting with isolated low back pain will not ever receive a conclusive, precise, anatomic diagnosis

Percentages are out of all patients presenting with low back pain

*Deyo and Weinstein*
# Mechanical causes of low back pain

- Lumbar strain/sprain - 70%
- Degenerative processes of disks/facets (age related) - 10%
- Herniated disk — 4% — associated with radicular leg pain
- Spinal stenosis — 3% — associated with pseudoclaudication
- Osteoporotic compression fracture fracture — 4%

- Spondylolisthesis (anterior displacement of vertebra) — 2%
- Traumatic fracture — <1%
- Congenital disease — <1% (severe kyphosis, scoliosis, transitional vertebrae)
- Spondylolysis — equally common in those w/ and w/o LBP
- Internal Disk Disruption
- Presumed instability

*Percentages are out of all patients presenting with low back pain*
Visceral causes of low back pain

Pelvic organs
- prostatitis, endometriosis, chronic PID

Renal
- nephrolithiasis, pyelonephritis, perinephric abscess

Aortic aneurysm

GI disease
- pancreatitis, cholecystitis, penetrating ulcer

*Deyo and Weinstein*
Non-mechanical spinal causes of LBP

Neoplasia (0.7%)
- multiple myeloma, metastatic carcinoma, leukemia/lymphoma, spinal cord tumor, retroperitoneal tumor, primary vertebral tumor

Infection (0.01%)
- osteomyelitis, septic diskitis, paraspinal abscess, epidural abscess, shingles

Inflammatory arthritis-HLA B27 associated-(0.3%)
- ankylosing spondylitis, psoriatic spondylitis, Reiter's syndrome, IBD

Osteochondrosis

Paget’s disease of the bone

Percentages are out of all patients presenting with low back pain

*Deyo and Weinstein*
History in patients with low back pain

Ask about:

HPI
-onset--any significant OR mild trauma preceding onset
-duration--affects imaging and management decisions
-alleviating/exacerbating factors--positions, timing, past treatments
-associated symptoms--sciatica, paresthesias, pseudoclaudication, hip/knee pain (inflammatory arthritis), bowel/bladder dysfunction

PMH/PSH
-cancer history
-medications
-osteoporosis/pathologic fractures

SH
-Ergonomics of work environment
-Worker's comp, disability payments, litigation, job dissatisfaction
-substance history: IV drug use, analgesic use/abuse
ROS and physical exam in patients with LBP

ROS
- visceral causes (pelvic, renal, GI)
- systemic symptoms of infection and cancer (e.g. fever, sweats, weight loss)
- mental health/depression/somatization

PE
- Point tenderness (sensitive but not specific for infection)
- Straight leg raise test (ipsilateral and contralateral)
- L5 nerve root (ankle and great toe dorsiflexion)
- S1 nerve root (plantar flexion, ankle reflex)

• Deyo and Weinstein

L5 and S1 are the nerve roots most likely to be compressed by a disk herniation
Our patient: A 43 y o homeless man with one month of LBP

HPI:
-victim of assault one year ago. Was hit in the jaw, fell, does not remember specific back trauma
-began to have "muscular" left leg pain above the knee after the assault
-history of IV drug use, clean for 8 months prior to admission
-self medicated with heroin and cocaine after assault, detoxed, relapse on account of pain severity, detoxed again, began methadone
-was diagnosed with sciatica
-LBP began one month ago, worse with walking.
-Denies: electric pain radiating to foot, pain keeping him awake at night, new weakness, bowel/bladder dysfunction
Our Patient: history, physical exam, and labs

PMH/PSH:
-Hep C; s/p I&D for arm abscesses

Meds: naproxen, methadone 125 mg qd

SH: hx of EtOH abuse (sober x 6 yr)
    hx of heroin and cocaine abuse (clean x 8 mo)
    homeless

ROS: Denies fevers, sweats, chills, weight loss.

PE: Vitals: T 98.3 BP 124/72 HR 69 RR 20 sat 97% RA
    Neuro: L paraspinous lumbar pain, no point tenderness. DTR symmetric, Babinski negative, full strength
    Ext: No swollen joints, no septic spots, no rash

Labs: WBC 5.8K, 55% polys. ESR 47. HIV negative.
Does our patient need any imaging studies?

Most patients with acute low back pain (less than 6 weeks in duration) do not need to be imaged, as most of this pain is due to sprains/strains that will resolve spontaneously.
Indications for imaging in acute LBP

1. Recent significant trauma or milder trauma with age > 50
2. Unexplained weight loss
3. Unexplained fever
4. Immunosuppression
5. History of cancer
6. IV drug use
7. Prolonged use of corticosteroids/osteoporosis
8. Age > 70
9. Focal neurologic deficit with progressive or disabling symptoms
10. Duration longer than 6 weeks

Bradley et al.
Frequency of inappropriate imaging

-A 2005 study showed that 25% of commercially insured patients and 29% of Medicaid patients ages 18-50 who receive imaging studies for low back pain had no identifiable indication for imaging.

-Complications from unnecessary surgery increase duration of low back pain.

• National Committee for Quality Assurance
Imaging is indicated for our patient.

What kinds of tests are available?
Menu of Tests

X-ray lumbar spine (AP and lat)
CT lumbar spine without contrast
MRI lumbar spine + or +/- contrast
X-ray or CT myelography
NUC Tc-99m bone scan with SPECT/CT
Usually AP and lateral views
May suggest infection, fracture, malignancy, spondylolisthesis, degenerative changes, disk space narrowing, prior surgery
Does not show herniated disks.

ESR can be used as a screening test before plain film in cases of concern for malignancy or infection--very unlikely if ESR<20 and there is only one risk factor for systemic illness. **Our patient's ESR was 47.**

Pictured here: Lateral view of 28 yo F jogger with LBP
Findings: **marked narrowing at L5-S1** with spurring and sclerosis c/w OA

* Deyo and Diehl*
Advanced imaging: MRI vs. CT

Advanced imaging is indicated in
- possible **emergencies** (cauda equina syndrome, infection, malignancies, fracture with neurologic impingement, other mass lesions)
- possible **surgical candidates** for disk herniation or spinal stenosis (4-6 weeks of radicular symptoms or several months of pseudoclaudication, respectively)

MRI—best for viewing **SOFT TISSUES**—indicated with neurologic signs/symptoms; most useful when there is concern for disk herniation, spinal stenosis, osteomyelitis, diskitis, spinal epidural abscess, bone metastasis, arachnoiditis, neural tube defects

CT—better than MRI for **BONY ABNORMALITIES**—e.g. sacroiliac joint disease, fractures, spondylolisthesis, unstable fusions, abnormal facet joints, degenerative changes, congenital abnormalities. Early detection of ankylosing spondylitis.
Companion Pt. 2: disk herniation

Pictured here:
Presurgical axial T2 MRI of L5-S1 disk herniating into spinal canal and impinging on the R L5 nerve root in a 37 yo F.
Sx:
- persistent back, buttock, and right leg pain, radiating to right posterior calf. 8/10 at rest and 9/10 with activity
- Positive straight leg test on right, negative on left

Leg pain resolved and back pain improved after diskectomy
Companion Pt. 3: Compression Fracture

MODALITY: CT

Loss of vertebral body height with interrupted cortical margin

78 y o F with known L1 compression fracture  PACS, BIDMC
Water soluble contrast is injected into the spinal canal with imaging by X-ray or CT. Allergies to the contrast agents used are rare, but it is an invasive procedure with all the risks of an LP.

Used to be common prior to disk herniation surgery, now rarely used and only ordered by spine specialists.
Bone scans are more sensitive than plain films but less sensitive than MRI for detection of infection or neoplasia. Unlikely to be helpful if ESR is not elevated and plain film is unremarkable.

SPECT/CT gives better 3D localization of lesions than the 2D bone scan image.

48 y o male with R hip pain and multiple foci of increased tracer uptake consistent with blastic metastatic disease.
Abnormal Radiologic Findings in Asymptomatic Patients

Plain Films: 23% of asymptomatic adults show age-related degenerative changes on plain film of lumbar spine.

CT: Radiologic facet joint osteoarthritis increases with age and does not correlate with low back pain. Found in 60-70% of adults age 40-80.
Spondylolysis is equally common in people with and without low back pain.

MRI: 22-40% of asymptomatic adults show disk herniation.
21% of adults over 60 show spinal stenosis.
Imaging studies from our patient

Our patient had CT and MRI imaging performed

All images from this patient are courtesy of Dr. James O’Connell, Boston Health Care for the Homeless Program and MGH
Our Patient: Osteomyelitis involving L3-S1 on sagittal MRI without contrast

T1

T2

T2 hyper-intensity in L3-S1 c/w edema and/or infarction

Loss of disk space height

Altered anterior and posterior soft tissue component

PACS, MGH
Our Patient: Osteomyelitis on coronal and sagittal CT reconstructions

Bony destruction of the vertebral column extending from the inferior endplate of L3 to the superior endplate of S1. Sclerotic changes in the involved vertebrae.

Mild levoscoliosis centered at L4.
Our Patient: Osteomyelitis on axial CT

Bony destruction of involved vertebral bodies as shown in preceding images.
Our Patient: Clinical Course

IR guided bone biopsy showed infection with Candida species. The patient was treated with fluconazole.
Take-Home Points:

- Unnecessary imaging in patients with acute low back pain creates huge waste in the health care system.

- Worry about neurologic compromise (cauda equina syndrome), malignancy, and infection. Many other causes will resolve on their own and most are not acutely dangerous. Image immediately if you are concerned about these diagnoses.

- Normal plain films do not rule out infection or cancer.

- Treat the patient, not the radiograph: radiologic abnormalities of the lumbosacral spine are extremely common in asymptomatic adults.
References


Up-to-Date
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