Low Back Pain

Michelle Lin, MD
Associate Professor of Clinical Emergency Medicine, UCSF
San Francisco General Hospital
(Michelle.Lin@emergency.ucsf.edu)

Acute Low Back Pain (LBP):
- **Definition**: Back pain for < 6 weeks
- 70-90% have pain resolution within 6 weeks

“Red flag” conditions (Agency for Healthcare Research and Quality guidelines, 1999)
1. Fracture
2. Cauda equina syndrome
3. Spinal infection
4. Vertebral malignancy

Benign acute conditions
1. **Intervertebral disk herniation**
   - Herniation of the nucleus pulposus through the annulus fibrosis into the spinal canal, most frequently posterolaterally to compress a peripheral nerve root
   - Age predominance: 30-50’s
     - 3rd decade: Disk starts to dessicate and degenerate— higher risk for herniation
     - 6th decade: Disk shrinks—lower risk for herniation
   - Symptoms:
     - Lower extremity pain severity often overshadows back pain
     - Worse with sitting and Valsalva (sneezing, laughing, coughing)
   - **Lower Lumbar Disk Herniation (L4-L5, L5-S1)**:
     - Accounts for 95% of all disk herniations
     - Often associated with an L5 or S1 radiculopathy (sciatica)
   - Complications: Massive central disk herniation can cause cord compression or cauda equina syndrome
   - **Natural course of symptoms**: Self-resolution after 4-6 weeks with non-operative management usually

2. **Musculoskeletal back pain**
   - Back pain with possible radiation to buttocks (but no radiation beyond knee)
   - A diagnosis of exclusion, once more concerning causes of thoracolumbar pain ruled-out

The History

<table>
<thead>
<tr>
<th>Thoracolumbar Pathology</th>
<th>Historical Clues</th>
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<tr>
<td>Herniated disk</td>
<td>Back pain radiates down the legs, past the knees</td>
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<td>Spinal stenosis</td>
<td>Pain worse with walking and better with bending forward</td>
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<td>Ankylosing spondylitis</td>
<td>Morning back stiffness which improves with exercise</td>
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<td>Fracture</td>
<td>History of blunt trauma</td>
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<td>Risk: age &gt; 50 yrs old, chronic steroid use</td>
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<tr>
<td>Spinal infection</td>
<td>Fevers, chills</td>
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<td>Back pain persistent at rest</td>
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<td>Back pain worse at night</td>
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<td>Risk: age &gt; 50 yrs old, chronic steroid use, immunocompromised, IVDU</td>
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<tr>
<td>Vertebral malignancy</td>
<td>Persistent back pain &gt; 6 weeks duration</td>
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<td>Back pain worse at night</td>
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<td>Unexplained weight loss</td>
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<td></td>
<td>Risk: age &gt; 50 yrs old, history of malignancy</td>
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<td>Cauda equina syndrome</td>
<td>Bilateral leg pain, numbness, or weakness</td>
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<td>Bowel or bladder changes</td>
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The Physical Exam

**Abdomen:** Palpate for pulsatile mass and tenderness

**Back:**
- Palpate for tenderness midline and paraspinous
- Percussion-induced back pain suggests spinal infection or malignancy

**Straight-Leg Raise (SLR) Maneuvers:**
- Stretches sciatic nerve when elevate supine patient’s extended leg
- Radiation of pain distal to knee suggests radiculopathy
- Sensitivity = 80%, specificity = 40%
- More specific test for L5-S1 radiculopathy (sciatica) is crossed-SLR test, where pain radiates down affected leg when contralateral leg is raised (sensitivity 25%, specificity 90%)
- An L5-S1 radiculopathy is 95% sensitive for lumbar disk herniation (thus, the absence of radiculopathy almost rules-out a herniated disk)
- **Reverse SLR:** Stretches L3 and L4 nerves by elevating PRONE patient’s extended leg

**Neurologic:**
- Sensory, motor, reflexes, gait

**Rectal exam:** For patients exhibiting severe back pain, bilateral leg symptoms, or bowel/bladder changes (to check for decreased tone, as found in cord compression and cauda equina syndrome)

**Vascular:**
- Check pedal pulses to help distinguish vascular claudication versus spinal stenosis pseudoclaudication
- A decreased pulse is worrisome for acute limb ischemia (thromboembolic disease, AAA, aortic dissection)

**Imaging: Plain Radiograph**

Plain radiographs should be obtained if concerned of one of the “red flag” diagnoses

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<th>Indications for Plain Radiographs for Back Pain Patients</th>
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<td>Extremes of age (&lt; 18 years and &gt; 50 years old)</td>
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<td>History of malignancy or unexplained weight loss</td>
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<td>History of fever, immunocompromised status, IV drug use</td>
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<td>Recent trauma, other than simple lifting</td>
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<td>Neurological deficits or other findings consistent with cauda equina syndrome</td>
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<td>Prolonged symptom duration &gt; 4-6 weeks</td>
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**RED FLAG #1: Thoracolumbar Fracture**

- 90% of all thoracolumbar fractures occur in T12-L4 region, because of change of spinal curvature and more mobility than thoracic spine
- Incidence of spinal cord compression if fracture in T12-L2 region = 40%
- Incidence of non-contiguous fractures = 10.5% *(Vaccaro et al, 1992)*
- Incidence of concurrent intra-abdominal injury = 30%

**Spine biomechanics:** Three-column Denis model —— >
- **Anterior Column:** anterior 2/3 vertebral body, anterior longitudinal ligament
- **Middle Column:** posterior 1/3 vertebral body, posterior longitudinal ligament
- **Posterior Column:** posterior neural arch (pedicles, laminae, facets, transverse processes, spinous process), supraspinous/ interspinous ligaments, ligamentum flavum

**Classic Fracture Patterns:**
1. **Wedge fracture**
   - **Mechanism:** Spinal flexion and axial loading, yielding a compressive fracture of anterior column only
   - **Radiograph:**
     - Described as % anterior height loss as compared to posterior vertebral body height
     - Intact posterior vertebral line (otherwise a burst fracture)
   - **Controversy:** A plain film poorly differentiates a wedge fracture from a burst fracture.
14-22% of burst fractures appear as wedge fractures on xray (Ballock et al, 1992; Dai et al, 2004)

Thus, have a low threshold to obtain a spinal CT to confirm an intact middle column

2. Burst fracture
   - Mechanism: Spinal flexion and axial loading, yielding a compressive fracture of anterior and posterior vertebral body (compromised anterior and middle columns)
   - Incidence of neurological deficit = 65%

3. Chance fracture ("Seatbelt fracture")
   - Mechanism: Distraction injury, yielding fractures through posterior -> middle -> anterior columns
     ✓ Usually see horizontal fracture through spinous process/ lamina and vertebral body
   - Incidence of concurrent intra-abdominal injury as high as 50% (pancreas, duodenum, mesentery)

4. Transverse process fracture
   - Comprises 15% of all thoracolumbar fractures
   - Incidence of concurrent intra-abdominal injury = 21%
   - Incidence of concurrent pelvic fractures = 29% (especially with L5 transverse process fracture)

RED FLAG #2: Cauda Equina Syndrome

A neurosurgical emergency from compression of multiple lumbar and sacral nerve roots in the cauda equina
Etiology: Massive central disk herniation >> epidural abscess, hematoma, trauma, malignancy, spinal surgery

Importance of Timely Diagnosis:
- Equivocal literature, but likely greater chance of irreversible neurological damage if surgery occurs >48 hours after onset of symptoms. (Ahn et al, 2000; Shapiro, 2000)

Presentation: (Deyo et al, 1992)
- Severe back pain
- Bilateral lower extremity pain, radiculopathy, and diminished lower extremity reflexes
- Saddle anesthesia (sensitivity 75%)
- Decreased rectal tone (sensitivity 60-80%)
- Urinary retention
  ✓ Most consistent exam finding with sensitivity 90%, using post-void residual>100-200 cc
  ✓ Rough bladder volume calculation using ultrasound: Volume (mL) = 0.52 x height x width x depth. Measurements in cm.
- Patients often do not notice urinary retention, but remark on urinary incontinence (from overflow)

Plain radiographs: Normal

RED FLAG #3: Spinal Infection (Spinal Epidural Abscess)

Classic triad of findings: Back pain, fever, and neurologic deficits

Spinal epidural abscess (SEA):
- Classic triad: Back pain, fever, and neurological deficits found in only 15% patients (Davis et al, 2004)
- Difficult to diagnose:
  ✓ 75-89% have delayed diagnosis, defined as multiple ED visits prior, admission without a diagnosis of SEA, or >24 hrs to definitive study (Davis et al, 2004; Tang et al, 2002)
- Risk factors: IV drug use, diabetes mellitus, trauma, alcoholism, immunocompromised status (HIV, chronic renal failure, chronic corticosteroid use), elderly, recent back trauma (includes iatrogenic epidural anesthesia needle puncture), indwelling catheter, recent bacterial infection
  ✓ Reihsaus et al, 2000: A meta-analysis review of 915 SEA patients showed that 3-20% of patients have zero risk factors
  ✓ Davis et al, 2004: Need to obtain 49 negative MRI’s to pick up one positive MRI for patients with at least one risk factor PLUS back pain
- Exam:
  ✓ Fever in only 50-67% of patients
  ✓ Neurologic exam can range from normal (grade 1), radiculopathy (grade 2), sensory or motor deficit (grade 3), or paralysis (grade 4)
• **Laboratory tests:**
  ✓ Average ESR = 77-87 mm/hr
  ✓ Sensitivity of ESR >30 is 81% (Sidman et al, 2002)
  ✓ Sensitivity of ESR >20 is 98% (Davis et al, 2004)
  ✓ ESR is more sensitive and specific than serum WBC result
  ✓ Poor prognostic indicators: Thrombocytopenia<100K, ESR>110, abscess in cervical spine (Tang et al, 2002)
  ✓ Blood cultures: Organism is *Staphylococcus aureus* (90%) >> streptococcus, enteric GNR

• **Plain radiograph:**
  ✓ Only 25% do have associated spondylitis—otherwise normal films

• **MRI:** Definitive diagnostic imaging

**RED FLAG #4: Vertebral Malignancy**

**Etiology:**
- Metastatic disease 25x more likely than primary malignancy (eg. multiple myeloma)
- 60-70% of all vertebral metastases occur in the thoracic spine
- Most common metastatic malignancy: Prostate, Breast, Kidney, Thyroid, Lung, Lymphoma (“Lead kettle” mnemonic = PB KTLL)

**Classic symptoms:** Pain worse at night and at rest

**Plain radiograph:**
- **Classic findings:** Blastic or lytic lesions in *vertebral body* or *pedicle* (“winking owl” sign), sparing the intervertebral disk
- **Note:** Radiographic evidence of bony erosion requires >50% of vertebral bone loss. There is a false negative rate of 10-17% in detection of vertebral bony metastasis.

**Laboratory:**
- The ESR can help risk-stratify a patient with concerning risk factors for a malignancy, especially if very high (>100 mm/hr)

**MRI:**
- Expediency of ordering MRI based on risk of spinal cord compression

**References**


