Differential Diagnosis of the Spine

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Etiology of Back Pain

Fig. 19-46. Back pain etiology with intrinsic and extrinsic causes.

“Red Flags” of Back Pain

- **Cancer** (<1%)
  - Patient Presentation: Unexplained weight loss (>10%), past Hx of cancer, night pain, duration > 1 month, failure of conservative back treatment

- **Spinal Infection** (.01%)
  - Patient Presentation: Fever, chills, night pain that interrupts sleep, IV drug use, Hx of infection elsewhere
“Red Flags” of Back Pain

- **Ankylosing Spondylitis (0.3%)**
  - Inflammatory arthropathy that first affects spine, then other joints and organs
  - As disease progresses, patient assumes fixed, stooped posture with flexion in lumbar spine, knees, and hips to decrease pain
“Red Flags” of Back Pain

Ankylosing Spondylitis

Patient Presentation:
- Lumbar pain that resolves with activity
- Occurs in men <40 yo, AM stiffness, night pain, gradual onset, >3 months with symptoms
“Red Flags” of Back Pain

- **Cauda Equina Syndrome**
  - Compression on Cauda Equina due to massive, central disc herniations (occurs in only 1-2% of all disc protrusions)
  - Requires surgical intervention
  - **Patient Presentation:** Bladder dysfunction (urinary retention, increased frequency, overflow, incontinence, saddle anesthesia, bilateral pain and/or weakness
“Red Flags” of Back Pain

- **Cerebral Spinal Fluid Leakage**
  - Usually occurs following back surgery
  - Clear/slightly yellow-tinged fluid slowly drips from spinal incision
  - As amount of Cerebral Spinal Fluid loss increases, patient develops following
    - Severe headache
    - Nausea
    - Slight disorientation
Sciatica

- Injury, Problem, Symptom

- Inflammation of the Sciatic Nerve (neuritis) usually associated with peripheral nerve root compression

- Sciatic Nerve is susceptible to:
  - Torsion
  - Direct blows - ischial tuberosity
  - Compression - spasms/tightness in piriformis muscle
Sciatica

- **Mechanism of Injury**
  - Disc/nerve injury
  - Hip hyperflexion
  - Piriformis pathology

- **Patient Presentation:**
  - Parasthesia/anesthesia along portion/length of nerve (proximal $\rightarrow$ distal)
  - Muscle weakness
  - Possible decrease in Achilles/Hamstring reflexes
<table>
<thead>
<tr>
<th>Condition at Presentation</th>
<th>Investigation</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sciatica. Reflex changes. Muscle weakness. Altered bladder function</td>
<td>CT Scan or MRI</td>
<td>Consider immediate surgical decompressions</td>
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<tr>
<td>Sciatica, sensory changes, mild or no reflex changes. Normal muscle strength. Bladder normal.</td>
<td>Plain lumbar spine films. If not improvement at 6 weeks, consider further investigation.</td>
<td>Take careful history. Elicit aggravating factors. Two weeks rest from activity. Therapy. NSAIDS. If no improvement, further modify activity. If improves, progress treatment as per symptoms.</td>
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<tr>
<td>Sciatica only. Sensory normal. Muscle normal.</td>
<td>Plain films of lumbar spine. If no improvement at 6 weeks, consider further investigation.</td>
<td>Detailed active history. Modify activity appropriately. Therapy. NSAIDS. If improves progress PRN.</td>
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<tr>
<td>Sciatica with atypical features such as fever, weight loss, chronic cough, abdominal pain, altered bowel habits or rectal bleeding, long tract signs or onset in very young or elderly.</td>
<td>Plain films of lumbar spine. Consider complete blood screen. ESR. Acid and alkaline phosphatase. Bone scan. Where diagnosis not apparent, CT or MRI. Chest film.</td>
<td>Treat according to magnitude of symptoms and findings of screening tests.</td>
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Common Pathologies of the Spine

- **Facet Joint Injuries**
  - Normally non-weight bearing joint
    - Becomes weight bearing with increased trunk extension
  - Trunk extension also places stress on longitudinal ligaments
  - Injury may be to capsule or meniscal-like structure in joint
Facet Joint Injury

- **Patient Presentation:**
  - Back Pain > Leg Pain
  - Pain increases with standing, sitting, walking
  - Pain with rolling over in bed
  - Pain with trunk extension and rotation
  - + SLR
  - Pt tender over lateral to spinous process (over facet joint)
Common Pathologies of the Spine

- **Disc Injury**
  - Pain produced is as a result of
    - Associated nerve being stretched across and pressed upon the bulging disc into the posterolateral space and/or
    - Change of spinal mechanics that result in abnormal function at the vertebral joint
  
  - 90% of disc injuries occur at L4 → S1
  
  - Only 1% of those diagnosed cases occur in 10-20 year olds
Annular Fibrosus Tear

- Usually a circular or “bucket handle” tear that occurs in the annular fibers

- **Patient Presentation:**
  - Pain with twisting/bending (torsion) type motion
  - Pain mostly in center of spine
  - Normal SLR test, because usually no nuclear bulge
  - + MRI
Schmorl’s Nodes

- Pressure on the disc becomes great enough to cause defects in cartilaginous end plate
- Pressure causes herniation of the nucleus pulposus into the vertebral body
- Normal fluid mechanics of the disc become impaired/disrupted
Normal and Impaired Disc Function
(Schmorl’s Nodes/End Plate Fracture)
Progression of Nucleus Pulposus Injury

1. Disc Protrusion
2. Disc Prolapse
3. Disc Extrusion
4. Sequestrated Disc
Nucleus Pulposus Injuries

- **Disc Protrusion**
  - The nucleus pulposus of the disc begins to bulge posteriorly without rupturing the annulus fibrosus

- **Disc Prolapse**
  - Only the outermost fibers of the annulus fibrosus can contain the nucleus
Nucleus Pulposus Injuries

- **Disc Extrusion**
  - The nucleus pulposus moves into the epidural space, placing pressure on nerve root

- **Sequestrated Disc**
  - Formation of discal fragments that may leave the disc area after the nucleus and annulus fibrosus ruptures
Pain from Nerve Root Pressure

- McKenzie Derangements
Sacro-iliac Joint (SI Joint)

- Diarthroidial joint until early in adult life
- ROM decreases and joint may become ankylosed during aging process
  \[\rightarrow\] arthrosis
- No muscles actually move the SI joint; joint supported solely from capsules and ligaments
SI Joint Dysfunction

Mechanism

- Ilium (ilium) wedging and locking with sacrum
- Result of abnormal pelvic motion and/or rotation on the sacrum

Common mechanisms

- Hurdling/punting
- Change of terrain
- Chronic crowned-road running
- Stepping in hole or off curb
- Abnormal heel strike and/or running technique
SI Dysfunction

**Patient Presentation:**
- May occur secondarily to lower leg injury that results in irregular mechanics
- Pain increases with sitting
- Pain and limited ROM with same side side-bending
- Pain when going down stairs
- Heaviness or dullness in leg
- Possible impaired reflexes
- Ilium position either anterior or posterior to neutral
SI Dysfunction Special Tests

- SI Compression
- SI Distraction (Spring)
- SI Rock Tests
- FABER
- Prone Knee Flexion Test
- Long Sitting Test
- SI Fixation Test
- Standing Flexion Test
- Sphinx Test
Spondylolysis

- Fracture of the Pars Interarticularis
- Etiology debate
- Mechanism:
  - Gravitationally-related to hyperlordosis
  - Severe impact to low back forcing hyperlordosis
  - Chronic stress to low back
- Occurs in 6-10% of normal population
Spondylolysis

- Usually associated with segmental lordosis
- Often palpable bony prominence in lumbosacral segment

**Diagnosis**
- AP/Lateral/Oblique* radiographs
- Bone scan if stress fracture
- Appears as a “Scotty Dog” with a collar
Spondylolysis

**Patient Presentation:**
- Point Tenderness
- Pain increases with activity
- Constant pain regardless of weight-bearing status
- Sciatica
- Muscle weakness/atrophy
- Possible impaired reflexes
- **Positive One-Leg Standing Test**
Spondylolisthesis

- Shift of the vertebral body anteriorly away from the spinous process following a spondylolysis
- May occur gradually
- Greater slippage → more unstable
- Diagnosis by x-ray only
- >1 cm slippage → neurological pathology
- Mechanism
  - Same as spondylolysis
intact pars interarticularis

L-4

L-5
Types of Spondylolisthesis

- **Dysplastic**
  - Congenital anomalies in upper sacrum or posterior arch of L5

- **Isthmic**
  - Defect in Pars Interarticularis, or fatigue fracture in bone, or elongated area with pars in tact

- **Degenerative**

- **Traumatic**

- **Pathologic**
Spondylolisthesis

- **Patient Presentation (General):**
  - Point tenderness
  - Activity and weight bearing increases pain
  - Sciatica
  - Muscle weakness and/or atrophy
  - Possible impaired reflexes
Grade 1 Spondylolisthesis

- Arch defect in L5
- Mild forward slippage of L5 on S1
- Backache
- No gross instability
Grade 2 Spondylolisthesis

- More slippage between L4-L5 with collapse of disc
- Definite symptomatic back
- Restricted ROM
- Muscle spasms
- Restricted activities
Grade 3 Spondylolisthesis

- More extensive slippage with wide separation of arch defect
- Degenerative changes in disc
- Grossly symptomatic
- Great instability
Grade 4 Spondylolisthesis

- Vertebrae slipped forward more than 50%
- Severe disability
- Severe instability
Spina Bifida

- Dysplastic congenital defects
  - Malformation of the posterior aspect of the spinal column in which some portion of the vertebral arch fails to form over the spinal cord
- 1/1000 infants born with this defect
- Athletes may develop neurological impairments
- Meninges may/may not be distended
Spina Bifida

- **Mechanism**
  - None

- **Patient Presentation:**
  - Pain in localized or general area of spine
  - Possible instability
  - Chronic neurological symptoms that are more difficult to resolve than normal
  - Palpable defect in spine
Piriformis Syndrome

- Low back pain in back, buttocks, posterior thigh caused by hyperirritability of the piriformis muscle

Mechanisms:

- (Trauma) Lifting heavy objects
- (Indirect) Tight hip external rotators apply pressure to sciatic nerve
Piriformis Syndrome

- **Patient Presentation:**
  - Non-specific sciatic pain
  - Pain increases with prolonged sitting, getting up from sitting or at night
  - Tight and/or painful hip internal rotation

- **Special Tests:**
  - FABER test
  - Laségue (SLR) test
  - Pain with resistive hip abduction
Spinal Stenosis (Spondylosis)

- Narrowing of spinal canal that places pressure on nerve roots and/or spinal cord

- **Mechanism:**
  - Arthritic changes and spurring vertebral bodies (permanent condition)
  - Pseudoclaudication (temporary condition)
Spinal Stenosis

- **Patient Presentation:**
  - Pain after long periods of walking or prolonged standing
  - In true stenosis, when activity stops, pain stops
  - Pain is alleviated with sitting or flexed posture to decrease lordosis
  - Positive Milgrim’s Test, SLR >70°
Erector Spinae Strain

- **Mechanism:**
  - Forced Flexion
  - Overuse/abuse in hyperextension
  - Eccentric Loads to spine (lifting, gardening)

- **Patient Presentation:**
  - Acute onset
  - Pain mostly in back
  - Pain increases with passive flexion
  - Weakness with trunk extension
Erector Spinae Strain

- **Special Tests:**
  - MMT for Erector Spinae (trunk extensors)
  - Pain alleviated when muscles shortened
Thank You

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