Pathophysiology of Acute and Chronic Low Back Pain

Mary Beth Partyka MSN APN
Adult Nurse Practitioner
Adult Pain Service
Advocate Christ Medical Center

Presentation Objectives

- Review the incidence of acute and chronic low back pain
- Recall the anatomical structures of the lumbar spine
- Identify the differential diagnosis of acute and chronic low back pain
- Explain “red flags” for serious etiologies of acute low back pain
- List components of the physical exam for patients presenting with low back pain
- Outline treatment approaches for both acute and chronic low back pain

Low Back Pain

LOW BACK PAIN
- A symptom, not a disease
- Generally described as pain between the costal margin and the gluteal folds
- Extremely common
- The leading cause of disability and loss of productivity.
Acute Low Back Pain

- Acute Low Back Pain is defined as 6 weeks or less of pain between the costal angles and gluteal folds that may radiate down one or both legs.
- One of the most common reasons for adults to seek medical care.
- 80% of the population will experience low back pain during their lifetime.
- First episode usually occurs between 20-40 years of age.
- Pain can be moderate to severely debilitating.
- Many cases are self-limiting and resolve with little intervention.
- Sub-acute low back pain is defined as pain that lasts 7-12 weeks.

Chronic Low Back Pain

- Chronic low back pain is defined as pain that persists for 12 weeks or longer, even after an initial injury or underlying cause of acute low back pain has been treated.
- About 20 percent of people affected by acute low back pain develop chronic low back pain with persistent symptoms at one year.
- In some cases, treatment successfully relieves chronic low back pain, but in other cases pain persists despite medical and surgical treatment.
- Significant economic burden due to loss of function, loss of work productivity, treatment costs and disability payments.

Spinal Anatomy
Assessment-History of Present Illness

- OLD CARTS
  - Onset (acute or gradual)
  - Location/radiating
  - Duration (recent/chronic)
  - Characteristics
  - Aggravating factors
  - Relieving factors
  - Treatments previously tried—response, dose/duration, why discontinued
  - Severity (NRS and functional impact)

Assessment- Important additional history

- Recent unexplained weight loss
- History of cancer
- Fever or chills
- History of trauma
- Prolonged morning stiffness
- Pain unrelieved by rest/right pain
- Bowel or bladder dysfunction
- Saddle anesthesia
- Lower extremity weakness or numbness
- Long-term steroid use
Differential diagnosis of Acute Low Back Pain

- Intrinsic Spine Pathology
- Systemic Pathology
- Referred Pain from non spine source

Red Flags for Serious Etiology of Acute Low Back Pain

<table>
<thead>
<tr>
<th>Possible Etiology</th>
<th>History Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>Cancer metastatic to bone, unexplained weight loss, pain unrelieved by rest</td>
</tr>
<tr>
<td>Cauda Equina Syndrome</td>
<td>Bladder or bowel incontinence, urinary retention, progressive motor or sensory loss</td>
</tr>
<tr>
<td>Fracture</td>
<td>Significant trauma, prolonged use of steroids, history of osteoporosis (over age 70)</td>
</tr>
<tr>
<td>Infection</td>
<td>Severe pain and lumbar spine surgery with the past year, IV drug use, immunosuppression, pain unrelieved by rest</td>
</tr>
</tbody>
</table>

Red Flags for Serious Etiology of Acute Low Back Pain

1. Cancer
   - Cancer metastatic to bone, unexplained weight loss, pain unrelieved by rest
2. Cauda Equina Syndrome
   - Bladder or bowel incontinence, urinary retention, progressive motor or sensory loss
3. Fracture
   - Significant trauma, prolonged use of steroids, history of osteoporosis (over age 70)
4. Infection
   - Severe pain and lumbar spine surgery with the past year, IV drug use, immunosuppression, pain unrelieved by rest
Management of Red Flags

- Cauda Equina Syndrome or severe or progressive neurologic deficit—Refer for emergency MRI and definitive care
- Spinal fracture or compression—Plain LS spine x-ray. After 10 days, if fracture still suspected or multiple sites of pain, consider either bone scan or referral before considering CT or MRI
- Cancer or infection—CBC, urinalysis, ESR. If still suspicious, consider referral or seek further evidence (e.g., bone scan, other labs). Negative plain X-ray does not rule out disease

Intrinsic Spine Pathology

- Lumbar strain/sprain (non-specific low back pain)
- Compression fracture
- Herniated nucleus pulposus
- Spinal Stenosis
- Spondylolisthesis
- Spondylolysis (degenerative disc or facet joint arthropathy)

Referred pain from non spine source

- Abdominal aortic aneurysm
- Gastrointestinal conditions
  - Pancreatitis
  - Peptic ulcer disease
  - Cholecystitis
- Herpes Zoster
- Pelvic pathology
  - Endometriosis
  - Pelvic inflammatory disease
  - Prostatitis
- Retroperitoneal pathology
  - Renal calc
  - Pyelonephritis
Systemic Pathology

- Inflammatory spondyloarthropathy
  - Psoriatic arthritis
  - Ankylosing spondylitis
- Cancer
  - Metastatic carcinoma
  - Multiple Myeloma
  - Spinal cord tumors
- Infection
  - Discitis
  - Osteomyelitis
  - Epidural abscess

Physical Examination of the Lumbar Spine

- Inspection
- Palpation
- Active ROM
- Strength Testing
- Neurological Examination
- Neural tests

Inspection

- Gait
- General willingness to move/shift/change position
- Asymmetry, A05 levels, muscle tone
- Lordosis, kyphosis, scoliosis
- Skin changes
Palpation

- Palpate for tenderness over the spinous process
- Palpate for paraspinal tenderness
- Palpate for muscle tension or spasticity
- Tip: the lumbar L4-L5 interspace lies at the same level as the top of the iliac crest

Active Lumbar ROM

- Lumbar flexion
- Lumbar Extension
- Lumbar Rotation
- Lumbar extension with lateral rotation

Strength Testing

- Test muscle groups that correspond to specific nerve root innervation
- Myotomes:
  - L2, L3= hip flexion
  - L3, L4= knee extension
  - L4, L5= ankle dorsiflexion
  - L5, S1= great toe extension
  - S1, S2= ankle plantar flexion
Muscle Strength Scale

Muscle Strength Testing Scale

<table>
<thead>
<tr>
<th>Rating</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No recordable movement is observed.</td>
</tr>
<tr>
<td>1</td>
<td>A muscle contraction is present but it cannot be sustained or it is 2/5 or less.</td>
</tr>
<tr>
<td>2</td>
<td>The patient is able to actively move the muscle and gravity is eliminated.</td>
</tr>
<tr>
<td>3</td>
<td>The patient may move the muscle against gravity but not against resistance such as the examiner.</td>
</tr>
<tr>
<td>4</td>
<td>The patient may move the muscle group against some resistance from the examiner.</td>
</tr>
<tr>
<td>5</td>
<td>The patient moves the muscle group against total resistance of the examiner. This is normal muscle tone.</td>
</tr>
</tbody>
</table>

Neurological Examination

- Deep Tendon Reflexes
  - Patellar reflex=L3-L4
  - Achilles reflex=S1-S2

- Sensation: An assessment of light touch sensation aims to define any area of hypoesthesia or dysesthesia.

Dermatomes:

- L2: upper thigh
- L3: medial knee
- L4: medial aspect of lower leg (medial ankle)
- L5: lateral aspect of lower leg dorsum of foot
- S1: lateral aspect of foot-the heel and most of the sole
Neural Tests

- Straight Leg Raise: Used to evaluate for lumbar nerve root impingement or irritation
  - In the supine position the knee is extended and the hip flexed between 30-70 degrees. A positive test is demonstrated when reproduction of symptoms radiating down the leg is produced. If the pain radiates below the knee, L4-S1 impingement has been identified.
- Femoral stretch test: Used to evaluate for lumbar nerve root impingement or irritation at L1, L2, L3 level
  - In the prone position, stabilize the pelvis to prevent anterior rotation, flex the knee to end range, if no positive signs are noted in this position, extend the hip while maintaining knee flexion. If pain is produced in the lumbar region, buttocks, posterior thigh, the test is considered positive.

Imaging

- Do not routinely obtain diagnostic imaging in patients with non-specific LBP.
- Perform diagnostic imaging (MRI is preferred) for patients with LBP when severe neurologic deficits are present or when underlying conditions are suspected on the basis of history and physical examination (e.g., “red flags”).
- Evaluate patients with persistent LBP and signs or symptoms of radiculopathy or spinal stenosis with MRI (preferred) only if they are potential candidates for surgery or epidural steroid injection (for suspected radiculopathy).

Treatment: Non-specific Acute Low Back Pain

- Reassure: 90% of episodes resolve within 4 weeks regardless of treatment. Advise that minor flare-ups may occur.
- Therapy:
  - Stay active and continue ordinary activity within the limits permitted by pain.
  - Avoid bedrest.
  - Early return to work is associated with less disability.
  - Injury prevention (use of proper body mechanics, safe back exercises)
  - Ice to painful region and stretching exercises.
Treatment: Non-specific Acute Low Back Pain

- **Referral:**
  - Before considering surgery refer patient for physiatry consult
  - If persistent disability at 2 weeks, consider referral for non-invasive therapy for improved flexibility and strength, **NOT** modalities such as heat, traction, ultrasound or TENS
  - If persistent disability at 6 weeks, consider referral to a program that provides a multidisciplinary approach for back pain, especially if psychosocial risks to return to work exist
  - Surgical referral usually not required

- **Medication Strategies:**
  - Prescribe medications on a time-contingent basis, **not** pain-contingent basis
  - No drug category have been proven to be more effective in pain control, consider side effect profile
  - Opioids are generally not indicated as first-line treatment. Although opioids relieve pain, early opioid use may be associated with longer disability
  - If prescribed, opioid use should be limited to short-term (i.e. two weeks)

Differential Diagnosis of Chronic Low Back Pain

- Non-specific: lumbar sprain or strain (70%)
- Mechanical (27%)
- Degenerative process of discs and facet
- Herniated disc
- Osteoporosis: fracture
- Spinal Stenosis
- Nervous fracture
- Congenital disease
- Severe kyphosis
- Severe scoliosis
- Discogenic pain
- Presumed spine instability
Differential Diagnosis of Chronic Low Back Pain

- Referred pain
- AAA
- GI pathology
- Renal pathology
- Disease of pelvic organs
- Non mechanical
  - Neoplasia
  - Inflammatory arthritis
  - Infection

Treatment: Chronic Low Back Pain

- Opioids are not considered first line treatment for chronic pain
- Opioids should be prescribed on a trial basis
- Continued use is contingent on demonstrated improvement in analgesia, physical function and quality of life and absence of signs of maladaptive behavior

Treatment: Chronic Pain Management Key Concepts

- Treatment Goals
  - Reduced severity of pain
  - Improved quality of life
  - Decreased suffering
- Treatment Approach
  - Multimodal
  - Multidisciplinary
  - Patient education
  - Self-care
References

- www.pacific.edu/optometry/ce/courses/15840/neuroexampg3.cfm
- https://www.icsi.org/_asset/bjvqrj/LBP.pdf