Evaluation, Diagnosis and Treatment of Low Back Pain and Neck Pain

Parveen Khanna M.D.

Objectives

- Review the functional anatomy of lumbo-sacral spine and cervical spine.
- List essential components of a LBP and Neck pain history, including RED FLAGS
- Describe common causes of LBP and Neck Pain
- Review proper indications for imaging and referral
- Review Physical Examination of LS and Cervical spine
- Correlate pathology with pertinent physical findings
- Vertebra
  - Body, anteriorly
    - Functions to support weight
  - Vertebraarch, posteriorly
    - Formed by two pedicles and two laminae
    - Functions to protect neural structures
Ligaments supporting the spine

Is Low Back pain common?

- About 80% of people will have back pain at least one time in their life.
- Low Back pain is the number five reason to visit the doctor.
- It is the number one reason for work related disability.
- It is the most expensive disease entity in terms of loss of productivity and medical care.
LBP: Risk Factors

- Heavy lifting and twisting
- Obesity
- Poor physical fitness/conditioning
- History of low back trauma
- Psychosocial: Hysteria, Malingering, Somatization.
- Being unemployed due to pain.
- Smoking.

Differential Diagnosis for all back pain

- Etiology
  1. Mechanical Spinal Condition (97%)
  2. Non-mechanical Spinal Condition (1%)
  3. Non-spinal/Visceral Disease (2%)

- Temporal
  - Acute
  - Chronic
Differential: Mechanical LBP

- Lumbar Strain or Sprain (70%)
- Degenerative processes of disc and facets (10%)
- Herniated disc (4%)
- Osteoporotic Compression Fracture (4%)
- Spinal Stenosis (3%)
- Spondylolisthesis (2%)
- Traumatic Fractures (<1%)
- Congenital disease (<1%)
  - Severe Kyphosis or Scoliosis
  - Transitional Vertebrae
- Spondylolysis*
- Internal Disc Disruption/Discogenic Back Pain

Nonmechanical spinal conditions
(1% OF ALL LOW BACK PAIN)

- Neoplasia: multiple myeloma, metastatic CA, lymphoma, leukemia, spinal cord tumors, retroperitoneal tumors, primary vertebral tumors (0.7%)
- Infection: osteomyelitis, septic diskitis, paraspinal abscess, epidural abscess, shingles (0.01%)
- Inflammatory arthritis: Ankylosing spondylitis, psoriatic Arthritis, Rheumatoid Arthritis, Reiter’s syndrome, CIBD (0.3%)
- Scheuermann Disease (osteochondrosis)
- Paget Disease
Visceral Disease
(2% OF ALL BACK PAIN)

1. Disease of pelvic organs: prostatitis, endometriosis, chronic PID
2. Renal Disease: nephrolithiasis, pyelonephritis, perinephric abscess
3. Aortic aneurysm
4. GI disease: pancreatitis, cholecystitis, penetrating ulcer

Terminology in back pain

- Spondylosis
- Spondylolysis
- Spondylolisthesis
**Spondylosis**

- Spondylolysis

**Spondylolysis**

- Spondylos (spine or vertebra)
- *Lysis* (a break or loosening)
- Loosening of the pars interarticularis fracture
Spondylolysthesis

- **Spondylos** (spine or vertebra)
- **Listhesis** (to slip or slide)
- A condition where one bone slips forward on another
**Mechanical LBP Differential Diagnosis**

**Clinical Features**

- **Herniated disk**
  - Usually occurs in adults aged 30 to 55 years
  - Sciatica, often associated with leg numbness or paresthesias, is a highly sensitive (95%) and specific (88%) finding for herniated disk
  - Exacerbation of pain may occur with:
    - coughing
    - sneezing
    - Valsalva maneuvers

- **Spinal Stenosis**
  - Usually occurs in older adults
  - Characterized by neurogenic claudication
    - Radiating back pain and lower extremity numbness
    - Exacerbated by walking and spinal extension
    - Improved by sitting

**Low Back Pain Classification**

*(Temporal)*

- **Acute Low Back Pain**
  - < 6 week duration
- **Chronic Low Back Pain**
  - > 6 week duration
PATIENT HISTORY
“OPQRSTU”

- Onset
- Palliative/Provocative factors
- Quality
- Radiation
- Severity/Setting in which it occurs
- Timing of pain during day
- Understanding - how it affects the patient

Other Symptoms

- Cough/valsalva exacerbation
- Distal neuro sx - weakness/paresthesia
- Perianal paresthesia
- Bowel/bladder sx
Other History

- Prior treatments and response
- Prior h/o back pain
- Exercise habits
- Occupation/recreation activities

History – Questions to ask

- Evaluate three concerns in taking a history
  - Is there evidence of systemic disease?
  - Is there evidence of neurologic compromise?
  - Is there social or psychological distress that may contribute to chronic disabling pain?
Red Flags

- Age > 70
- Fevers, chills, recent UTI/skin infection, penetrating wound near spine
- Recent significant trauma or milder trauma age > 50
- Unrelenting night pain or pain at rest
- Progressive motor or sensory deficit
- Saddle anesthesia, bilateral sciatica or leg weakness, difficulty urinating, fecal incontinence
- Unexplained weight loss
- History of cancer or strong suspicion of cancer
- History of osteoporosis
- Immunosuppression
- Chronic oral steroid use
- IV drug use, substance abuse
- Failure to improve after 6 weeks of conservative therapy
- Point tenderness

Physical Examination

- Observation of walking
- Inspection of back and posture
- Palpation of the spine and soft tissue
- Range of motion
- Strength testing
- Straight leg raising (for patients with leg symp)
- Neurologic assessment of L4, L5, S1 roots (for patients with leg symptoms)
- Special tests
  - Evaluation for malignancy (breast, prostate, LN exam)
  - Peripheral pulses in older patients with exercise-induced calf pain.
Special Tests

- Tests to stretch spinal cord or sciatic nerve
- Tests to increase intrathecal pressure
- Tests to stress the sacroiliac joint

Tests to Stretch the Spinal Cord or Sciatic Nerve

- Straight Leg Raise
- Cross Leg SLR
- Kernig Test
Kernig Sign

Pain present

Pain relieved
Test to increase intrathecal pressure

- Valsalva Maneuver
  - Reproduction of pain suggestive of lesion pressing on thecal sac

Tests to stress the Sacroiliac Joint

- FABER Test (Patrick’s Test)
- Gaenslen sign
Patrick’s Test

FABER test:
Flexion
Adduction
External
Rotation

FABER test:
Flexion
Adduction
External
Rotation

Gaenslen’s sign

FIGURE 2. Gaenslen’s sign. With the patient supine, the examiner abducts one hip and knee while extending the other to elicit counter-rotation and to stress both sacroiliac joints simultaneously. Back or buttck pain is a positive sign. Care should be taken to avoid aggravating the femoral nerve.
Neurologic Examination

- Includes an exam of entire lower extremity, as LS spine pathology is frequently manifested in extremity as altered reflexes, sensation and muscle strength.
- Describes the clinical relationship between various muscles, reflexes, and sensory areas in the lower extremity and their particular cord levels.

Nerve Root Syndromes

<table>
<thead>
<tr>
<th>Nerve root</th>
<th>L4</th>
<th>L5</th>
<th>S1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>![Pain L4]</td>
<td>![Pain L5]</td>
<td>![Pain S1]</td>
</tr>
<tr>
<td>Numbness</td>
<td>![Numbness L4]</td>
<td>![Numbness L5]</td>
<td>![Numbness S1]</td>
</tr>
<tr>
<td>Motor weakness</td>
<td>![Motor L4]</td>
<td>![Motor L5]</td>
<td>![Motor S1]</td>
</tr>
<tr>
<td>Screening examination</td>
<td>![Screening L4]</td>
<td>![Screening L5]</td>
<td>![Screening S1]</td>
</tr>
<tr>
<td>Reflexes</td>
<td>![Reflexes L4]</td>
<td>![Reflexes L5]</td>
<td>![Reflexes S1]</td>
</tr>
</tbody>
</table>

- Extension of quadriceps
- Dorsiflexion of great toe and foot
- Plantar flexion of great toe and foot
- Squat and rise
- Heel walking
- Walking on toes
- Knee jerk diminished
- Ankle jerk diminished
- None reliable
Nonorganic Physical Signs

- Psychological distress may amplify low back symptoms
- Superficial tenderness
- Distracted SLR
- Patient overreaction during the physical examination

Fig 6. Overreaction to examination: disproportionate verbalization, facial expression, muscle tension and tremor, collapsing or sweating.
Approach to LBP

- History & physical exam
- Classify into 1 of 4:
  - BAD: LBP from other serious causes
    - Cancer, infection, cauda equina, fracture
  - LBP from radiculopathy or spinal stenosis
  - Non-specific LBP
  - Non-back LBP
- Workup or treatment

What if there are no red flags?

- After a history and exam eliminates the possibility of a serious back condition, we can move on to treatment. Most people will fall into this category. No radiographs or labs will be necessary.
- One can reassure patients that 90 percent of cases resolve in one month with only conservative treatment.
Cauda Equina Syndrome

- Back pain, lower limb weakness, saddle anaesthesia, sphincter disturbance, impotence
- Causes – usually disc, rarely tumour, abscess, advanced AS
- Diminished sensation L4 to S2 (sacral numbness), weakness ankle and plantar dorsiflexion, loss ankle jerks, urinary retention, loss anal tone
- Urgent MRI and surgical decompression

BAD low back pain (examples)
Labs

- Labs are generally not necessary, but may be helpful if cancer or infection or visceral disease is suspected.

- The following laboratory studies should be considered if there is concern for cancer or infection

  1. CBC
  2. ESR/CRP
  3. PSA
  4. Alkaline phosphatase
  5. Serum immunoelectrophoresis
  6. Urine testing for light chains

Diagnostic Studies

- Radiographs
  - Early if RED FLAGS
  - Symptoms present > 6 weeks despite tx
Further studies

- **CT and MRI should be considered when:**
  1. If a serious problem is suspected (cancer/infection) and is not visualized on plain film
  2. Suspicion of cauda equina or spinal stenosis or presence of neurological deficits on the clinical exam.
  3. If there is a plan for surgery or other intervention
  4. To diagnose visceral disease, if indicated.

**CT**

- Much better for bone
- **CT Reconstruction** – allows more views besides just axial cuts
- **CT Myelogram**
  - Useful to evaluate for spinal stenosis, epidural scarring
  - Commonly used to evaluate area that has hardware (can’t use MRI)
MRI

- Much better at showing anatomy of soft tissues, disc, spinal cord
- Not as good as CT for bone
- T1
  - Water / CSF – dark (low signal)
  - Bone – lighter than on T2
- T2
  - Water / CSF – light (high signal)

Treatment

- The initial treatment is bed rest for 3-4 days.
- Moderate activity with Physical Therapy recommended thereafter.
- Follow up in 2-4 weeks to monitor progress.
- Start NSAIDS, anticonvulsants, anti-depressants and or Narcotics if needed.
- Neuroaxial pain injection interventions, for example, Epidural injections are recommended to help decrease the pain if no relief with above treatment.
- If the workup indicates neurological deficits then Surgical referral is indicated.
Epidural Steroid Injections

- Response to ESI is predicted by nerve root irritation, recent onset of symptoms and absence of Psychological overlay.
- ESI could be therapeutic for patients with herniated disc and or nerve root irritation and compression. It could help decrease the pain because of spondolisthesis or scoliosis.
- Relief is transient in DDD or Spinal Stenosis.

Mechanism of Action of Epidural Steroids.
The herniated disc material contains high level of Phospholipase A2. This enzyme liberates arachadonic acid from cell membranes. Steroids induces the synthesis of phospholipase A2 inhibitor preventing the release of substrate for prostaglandin synthesis Therefore it interferes with inflammatory process at an earlier step than NSAIDS. Steroids also block nocioceptive input.
When is surgical referral indicated?

- **Sciatica and probable herniated discs**
  - Cauda equina syndrome
  - Progressive or severe neurological deficit
  - Persistent neuromotor deficit after 4-6 weeks conservative treatment
  - Persistent sciatica with consistent neurologic and clinical findings

- **Spinal Stenosis**
  - Progressive or severe neurological deficit
  - Persistent back and leg pain improving with flexion and associated with spinal stenosis on imaging

- **Spondylolisthesis**
  - Progressive or severe neurological deficit
  - Severe back pain/ sciatica with functional impairment that persists > 1 year
Key Points about low back pain

– >90% are due to mechanical causes and will resolve spontaneously within 6 weeks to 6 mths
– Pursue diagnostic workup if any red flags found during initial evaluation
– If ESR elevated, evaluate for malignancy or infection
– In older patients initial Xray useful to diagnose compression fracture or tumor

Neck Pain
Cervical Spine

- 1st seven vertebra
- Support & motion
- Transfer/absorbs loading
- Normal lordosis & kyphosis

Anatomy

- 7 cervical vertebra
  - C1 and C2 are specialized
- Unique characteristics
- More than just the bones
  - Skin, soft tissue, muscles
Cervical Vertebra

- Unique shape
- Designed for motion
Spinal Support

- **Anterior support**
  - Ant. longitudinal ligament
  - Post. longitudinal ligament

- **Posterior support**
  - Ligamentum flavum
  - Interspinous ligament
Intervertebral Disc

- The intervertebral disc consists of an outer annulus fibrosus and an inner nucleus pulposus. The intervertebral disc is thicker anteriorly, contributing to the normal cervical lordosis. The C6-7 disc is the thickest disc of the cervical spine. The nucleus pulposus and the inner one half of the annulus fibrosus are avascular.

Motion

- Flexion/Extension
  - 50% of motion occurs at Occipitoatlantal Joint,
  - 50% distributed over Lower Cervical Spine (C3-7)
  - About 100 degrees

- Rotation
  - 50% of motion occurs Atlantoaxial joint (C1-C2)
  - About 80 degrees

- Lateral Bending
  - About 30-50 degrees

- As we age cervical mobility usually decreases.
Is Neck Pain Common

- Neck pain is extremely common but non-specific symptom. Its prevalence increases with age and is higher in women than in men.

1. **Age:** degenerative process in cervical spine generally begins in 3rd decade. Symptoms of cervical spondylosis are commonly found in those aged 40-60 years.

2. **Sex:** Male to female ratio is 2:3

3. **Race:** No apparent correlation.

Predisposing and precipitating factors

- Predisposing and precipitating factors for cervical / neck pain include prolonged sitting with poor posture (e.g., protruded head posture), sudden unexpected movements, and trauma.
- Static loading with poor sitting or lying postures eventually lead to problems within the cervical spine. Poor posture can also enhance or perpetuate an already existing cervical pain from trauma or whiplash injury.
- Frequent flexion of the cervical spine is another predisposing factor in the production of symptoms from the cervical spine.
- Sudden unexpected movements, particularly those that involve lateral flexion and rotation of the head and neck with the neck in a protruded position, can cause or precipitate neck pain. Trauma to the cervical spine is commonly seen as a result of whiplash forces occurring during significant motor vehicle accidents or in sports-related cervical spine injuries.
Common Sources of Cervical Pain

- **Trauma:** Hyperflexion-Extension injury, Cervical vertebral fracture.
- **Infectious:** Cervical lymphangitis, Parotiditis, Meningitis, Salivary duct stones, Pleuritis.
- **Referred:** Angina, Myocardial Infarction.
- **Muscle:** Myofascial overuse of Trapezius, posterior cervicalis, Torticollis.
- **Cervical Degenerative Disease:** Disc degeneration, Cervical spondylosis, Cervical foraminal stenosis, Rheumatoid atlantoaxial subluxation.

History & Examination
History

OPQRSTU

- **When**
  - Injury?
- **Where**
  - Does it radiate?
- **Quality, intensity**
  - Sharp, dull, burning...
- **Alleviating factors**
- **Exacerbating factors**
- **Red Flags**
- **Family history of any neurological disorders**

Examination

- **Inspection**
- **Range of motion**
  - Flexion
  - Extension
  - Lateral bending
  - Rotation
  - *Do any of these movements reproduce their sxs?*
- **Palpation**
  - Bony or muscular tenderness
  - Diffuse or focal
Dermatomes

Skin area innervated by the sensory fibers of a single nerve root

C5 – shoulder & lat. arm
C6 – lat. forearm & thumb “thumbs up”
C7 – middle finger
C8 – little finger
T1 – medial forearm & elbow
Summary of Neurologic Examination

<table>
<thead>
<tr>
<th>Root/Disc</th>
<th>Muscle Weakness</th>
<th>Reflex Abnormalities</th>
<th>Sensory Deficits</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5</td>
<td>Biceps Brachii/ Deltoid</td>
<td>Biceps Brachii</td>
<td>Lateral arm</td>
</tr>
<tr>
<td></td>
<td>(Elbow flexion)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>ECR</td>
<td>Brachioradialis</td>
<td>Lateral Forearm</td>
</tr>
<tr>
<td></td>
<td>(Wrist extension)</td>
<td></td>
<td>Thumb</td>
</tr>
<tr>
<td>C7</td>
<td>Triceps</td>
<td>Triceps</td>
<td>Middle Finger</td>
</tr>
<tr>
<td></td>
<td>(Elbow extension)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C8</td>
<td>Flexor D. Profundus</td>
<td>None</td>
<td>Medial Forearm</td>
</tr>
<tr>
<td></td>
<td>(Finger flexion)</td>
<td></td>
<td>Little Finger</td>
</tr>
<tr>
<td>T1</td>
<td>Interossei</td>
<td>None</td>
<td>Medial Arm</td>
</tr>
<tr>
<td></td>
<td>(Finger abduction)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Special Tests

- Spurling’s sign
  - Designed to provoke sx(s) of neuroforaminal narrowing (radiculopathy)
  - Head is placed in extension and turned to one side while axial load applied
    - Examine both sided
  - POSITIVE: Pain reproduced in a dermatomal pattern into the arm(s)
    - Axial neck pain without radiation is not considered a positive test
    - Pain to the side of rotation is usually indicative of foraminal stenosis and nerve root irritation.
Special Tests

- **Distraction test**
  - Used for patients who may have sx/signs of a radiculopathy
  - Sxs alleviated when head is distracted (traction)
  - May also suggest part of your treatment option if positive
  - Physical therapy with trial of cervical traction
Special Tests

- Hoffman’s sign
  - Passively extend middle finger at MCP & flex DIP. Flick middle finger and observe thumb for any flexion
  - Analogous to Babinski
  - May indicate upper motor neuron problem
Imaging

X-Ray

- Bones, alignment, soft tissue, skin, spaces
- AP & Lat minimum
- Oblique
- Water’s (open mouth)
- Spondylosis – degenerative change, osteophytes, disc space changes
- Spondylolysis – pars interarticularis defect
- Spondylolisthesis – slipping of one vertebra on another
  - Grades: I – 0-25%, II – 25-50%, III – 50-75%, IV – 75-100%, V - >100%

12/21/2010
CT

- Much better for bone
- CT Reconstruction – allows more views besides just axial cuts
- CT Myelogram
  - Useful to evaluate for spinal stenosis, epidural scarring
  - Commonly used to evaluate area that has hardware (can’t use MRI)

MRI

- Much better at showing anatomy of soft tissues, disc, spinal cord
- Not as good as CT for bone
- T1
  - Water / CSF – dark (low signal)
  - Bone – lighter than on T2
- T2
  - Water / CSF – light (high signal)
Electrodiagnostics
Electromyelography & Nerve Conduction Studies
(EMG) (NCS)

Provide information about injured nerve roots, peripheral nerve injuries, and certain muscle disorders. Helps to locate and evaluate certain neuromuscular disorders.

Red Flags for simple neck pain

- Malignancy, infection, inflammation
  - Fever, unexplained weight loss, h/o inflammatory arthritis, h/o malignancy, drug abuse, AIDS, infection, immunosuppression, pain that is increasing, unremitting and/or disturbs sleep, lymphadenopathy
- Myelopathy (compression of the spinal cord)
  - Insidious progression, gait disturbance, clumsy/weak hand, loss of bowel/bladder/sexual function
  - Lhermitte’s sign = flexing neck the neck causes electric shock-like sensations that extend down the spine and shoot into the limbs
  - UMN signs = Babinski, Hoffmans, hyperreflexia, clonus, spasticity
  - LMN signs = atrophy, hyporeflexia
- Severe trauma/skeletal injury (rarely present in primary care)
  - History of trauma, previous neck surgery, osteoporosis, increasing and/or unremitting pain
- Vascular insufficiency
  - Dizziness, blackouts
Differentiating between referred and radicular pain is important. Referred pain is more diffuse, whereas radicular pain is more specifically along the course of a dermatome.

Patients with disc degeneration could have chronic low-grade pain that is periodically exacerbated for several weeks.

Mechanical pain can be constant or intermittent, whereas chemical pain is more likely to be constant.

Cervicogenic pain is usually worse in positions that involve prolonged sitting, especially in sitting positions with a protruded head posture or prolonged flexion. Bending positions also provoke cervicogenic pain. Frequent changes of position provide relief. However, in cases of severe acute pain, a still position may be most comfortable. Pain worse upon awakening is probably related to using an unsuitable pillow or having adopted an inappropriate posture while sleeping.

Conservative nonsurgical treatment includes use of medications, such as nonsteroidal anti-inflammatory drugs (NSAIDs), a short course of steroids on a tapering dose, nonnarcotic analgesics, or short-term narcotic analgesics; partial rest; and instructions on proper posture, proper body mechanics, home exercise program and Physical Therapy.

Trigger point injections, image-guided interventional pain procedures helps control pain and facilitate participation in physical therapy.

Surgical intervention is considered in cervical radiculopathy or myelopathy with persistent radicular pain, motor weakness, progressive neurologic deficits, or evidence of cord compression with no response to appropriate conservative treatment.