Radicular Spine Pain

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Disclosures

- I have nothing to disclose

Objectives

- Participants will identify 3 causes of radicular spine pain
- Participants will be able to identify location of nerve root impingement location given symptom complaints when it is a single nerve root problem.
- Participants will be able to differentiate myelopathy from radiculopathy.

Radiculopathy - Definition

- damage or disturbance of nerve function that results due to nerve root compression

Radiculopathy - Presentation

- Sharp, Shooting, Burning pain along the course of the nerve root
  - Can also be described as ache
  - Occasionally it can be diffuse (all over) pain
- Paresthesia (tingling or pins and needles) especially distally
- Slight sensory loss
- Hyperesthesias
- Muscle weakness – indicates nerve damage
- Cauda equina often produces a "saddle" distribution of sensory loss by affecting the lower sacral nerve roots. This saddle distribution of sensory loss can also be seen in anterior spinal cord damage
- Pain can also "refer" – (less localized) and is often felt in the muscles (myotomal) or skeletal structures (sclerotomal) that are innervated by the nerve root. The person usually complains of a deep aching sensation.


Anatomy Cervical Radiculopathy
Anatomy of Thoracic Radiculopathy

- More rare with support of ribs
- Wraps around to chest
- Upper vs Lower

Anatomy of Lumbar Radiculopathy

Diagnosis of Radiculopathy

- Medical History - knowing the exact location of the symptoms helps localize the nerve responsible
  - Type of symptoms (pain, tingling, numbness)
  - Location of symptoms
  - When did it start
  - What makes it better or worse
  - Other medical problems

- Physical examination - focus on the central location and on the extremity involved.

Diagnosis of Radiculopathy vs. Myelopathy

- Radiculopathy describes the loss of function in a specific region that is secondary to compression and/or irritation of a spinal nerve root
  
- Myelopathy describes a loss of function in a person's upper and lower extremities because of compression of the spinal cord.
Radiculopathy vs. Myelopathy

Symptoms
- Cervical radiculopathy presents as pain traveling from the neck to a particular region of a patient's arm, forearm or hand. This may be accompanied by numbness or weakness in specific muscle groups in the arm, forearm or hand.

- Cervical myelopathy may present subtly at first, causing slight changes in the way a patient's hands work—a patient may feel their hands being clumsier, or their handwriting worsens, or may find themselves dropping things or finding it harder to button their shirts. Other symptoms may include:
  - Unsteady gait
  - Loss of sense of body consciousness, where hands and feet are relative to things around them
  - In extreme cases, symptoms may include:
    - Pronounced weakness and numbness in arms and legs
    - Loss of bladder or bowel control

(www.NMH.org)

Cervical Radiculopathy

Clinical Evaluation
- Arm pain (99.6%), neck pain (79.7%), scapular pain (52.9%), anterior chest pain (17.8%) and headache (9.7%). (Henderson CM, Neurosurgery. 1993;33:304)
- Pain / paresthesia in a dermatomal pattern (55.9%), diffuse/nondermatomal pattern (45.5%)
- Sensory change to pinprick (89.3%), motor deficit (68.8%), decrease in a DTR (71.2%)
- Cervical aching – left chest and arm pain
- Neck, shoulder, arm pain, paresthesias and numbness in a dermatomal distribution weakness in a myotomal distribution, ± occipital headache
- Atypical findings such as deltoid weakness, scapular winging, weakness of the intrinsic muscles of the hand, chest or deep breast pain, headaches
- Spurling’s test positive/increased symptoms with rotation and lateral bend with a vertical compressive force
- Abduction relief sign: relief of pain when the arm is placed overhead. (eORIF 2008)

Causes of Cervical Radiculopathy

Any condition that injures or somehow irritates the cervical nerve. The most common causes include:
- Cervical Herniated Disc - inner material of the cervical disc herniates, or leaks out, and infalms and/or impinges on the adjacent nerve, it can cause a cervical radiculopathy.
- Cervical Spinal Stenosis - degenerative process of the cervical spine, changes in the spinal joints can lead to tightening of the space for the spinal canal.
- Cervical Spondylosis - degenerative changes that occur in the spine, including degeneration of the joints, intervertebral discs, ligaments and connective tissue of the cervical vertebrae
- Cervical Degenerative Disc Disease - cervical spine degenerates over time, it can result in degenerated discs and a pinched nerve.
- Other conditions: tumor, fracture or sarcoidosis, scoliosis, osteophytes, osteoarthritis, infection, which can compress or cause damage to the cervical nerve roots

Cervical Radiculopathy Testing

Certain movements, like bending the back or forward, side to side, or rotating (cervical), may increase the pain. Some patients report that pain decreases when they place a hand behind their head; the movement may be relieving the pressure and traction on the nerve root which then lessens their symptoms

(Ben-Yosef, 2012)

C2, C3, C4 Cervical Radiculopathy

- C2: extremely rare-jaw pain and occipital headaches, but no motor deficit is seen.
- C3: most often caused by disk disease at C2-3, is not common-headaches and pain along the posterior aspect of the neck that extends to the posterior occipital region and occasionally to the ear. There are no motor deficits. DDX: tension headaches.
- C4: typically C3-4 HNP, posterior neck and trapezial pain, decreased sensation in C4 dermatome, no motor deficits, and diaphragmatic involvement has not been well documented. Patients occasionally complain of numbness and pain at the base of the neck that extends to the shoulder and scapular region.

(eORIF 2008)
C5 Cervical Radiculopathy

- **C5 radiculopathy** can cause pain and/or weakness in the shoulders and upper arms. Especially may cause discomfort around the shoulder blades. It rarely causes numbness or tingling.  
  (Ben-Yishay, 2012)

- C5: pain and/or numbness in an "epaulette" pattern that includes the superior aspect of the shoulders (suprascapular) and the lateral aspect of the upper arm. Deltoid motor function is often weakened, as in an intrinsic shoulder disorder; the diagnosis of radiculopathy at this site is crystallized by observing the absence of impingement signs or pain with passive shoulder motion. Patients may complain of difficulties with activities of daily living if there is involvement of the supraspinatus, infraspinatus, or elbow flexors. Depression of the biceps reflex is an inconsistent finding.  
  (CREF 2008)

C6 Cervical Radiculopathy

- **C6 radiculopathy** (one of the most common), causes pain and/or weakness along the length of the arm, including the biceps (the muscles in front of the upper arms), wrists, and the thumb and index finger.  
  (Ben-Yishay, 2012)

- C6: pain or sensory abnormalities extending from the neck to the biceps region, down the lateral aspect of the forearm to the dorsal surface of the hand, between the thumb and index finger, and including the tips of these fingers. May have suprascapular shoulder pain. The triceps reflex may be depressed, and wrist extensor weakness is usually present. The infraspinatus, serratus anterior, triceps, supinator, and extensor pollicis muscles may also be affected.  
  (CREF 2008)

C7 Cervical Radiculopathy

- **C7 radiculopathy** (the most common) causes pain and/or weakness from the neck to the hand and can include the triceps (the muscles on the back of the upper arms) and the middle finger.  
  (Ben-Yishay, 2012)

- C7: most common. Pain and sensory abnormalities extend down the posterior aspect of the arm and the posterolateral aspect of the forearm and typically involve the middle finger, which is rarely affected in C6 disorders. May have interscapular shoulder pain. Absence of the triceps reflex is common, and triceps weakness is almost always present. The wrist flexors, wrist pronators, finger extensors, and latissimus dorsi may also be affected. May have scapular winging.  
  (CREF 2008)

C8 Cervical Radiculopathy

- **C8 radiculopathy** causes pain from the neck to the hand. Patients may experience weakness in handgrip, and pain and numbness can radiate along the inner side of the arm, ring, and little fingers.  
  (Ben-Yishay, 2012)

- C8: least likely to be associated with pain, but may have interscapular or scapular shoulder pain. Sensory changes usually restricted to below the wrist; interossei motor involvement. DDX: ulnar neuropathies, intrinsic hand disorders, myelopathy.  
  (CREF 2008)

Myelopathy

- Long Track signs indicate myelopathy

- Babinski’s Reflex: upturning and splaying of the toes with plantar stimulus

- Hoffmann’s sign: flexion of the thumb and index fingers in response to flicking the tip of the outstretched middle finger

- Hermitte’s sign: shooting sensations down the arm with rapid neck flexion.

- Clonus

Diagnosis of Lumbar Radiculopathy

- A radiculopathy is caused by compression, inflammation and/or injury to a spinal nerve root in the low back. Causes of this type of pain, in the order of prevalence, include:

  - Herniated disc with nerve compression - by far the most common cause of radiculopathy

  - Foraminal stenosis (narrowing of the hole through which the spinal nerve exits due to bone spurs or arthritis) - more common in elderly adults

  - Diabetes

  - Nerve root injuries

  - Scar tissue from previous spinal surgery that is affecting the nerve root  
  (Ben-Yishay, 2012)
Diagnosis Lumbar Radiculopathy
- Examination of the Back
- Asymmetry
  - Back
  - Pelvis
- Lumbar ROM
  - Look for radicular symptoms with

Lumbosacral radiculopathy
- The lumbosacral spine is the most commonly affected area for disorders of the spinal nerve roots.
- Lumbosacral radiculopathies comprise 62% to 90% of all radiculopathies. More than 75% of all herniated discs compressing nerve roots along the entire spinal column involve the L5 and S1 nerve roots.


Lumbar Radiculopathy
- Pain is often deep and steady, and can usually be reproduced with certain activities and positions, such as sitting or walking.
- Radicular pain may also be accompanied by numbness and tingling, muscle weakness and loss of specific reflexes.
- Radicular pain radiates into the lower extremity (thigh, calf, and occasionally the foot) directly along the course of a specific spinal nerve root.
- The leg pain is typically much worse than the low back pain, and the specific areas of the leg and/or foot that are affected depends on which nerve in the low back is affected. Compression of higher lumbar nerve roots such as L2, L3 and L4 can cause radicular pain into the front of the thigh and the shin.

Sciatica
- Sciatica, the term commonly used to describe radicular pain along the sciatic nerve, describes where the pain is felt but is not an actual diagnosis. The clinical diagnosis is usually arrived at through a combination of the patient's history (including a description of the pain) and a physical exam. Imaging studies (MRI, CT-myelogram) are used to confirm the diagnosis and will typically show the impingement on the nerve root.

L1 Lumbar Radiculopathy
- Nerve Root: L1
- Pain Radiation:
- Gait Deviation:
- Motor Weakness: Hip flexors
- Sensory Loss: Inguinal
- Reflex Loss:

L2 Lumbar Radiculopathy
- Nerve Root: L2
- Pain Radiation:
- Gait Deviation:
- Motor Weakness: Hip flexors
- Sensory Loss: Anterior mid-thigh
- Reflex Loss:
<table>
<thead>
<tr>
<th><strong>L3 Lumbar Radiculopathy</strong></th>
<th><strong>L4 Lumbar Radiculopathy</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nerve Root: L3</td>
<td>Nerve Root: L4</td>
</tr>
<tr>
<td>Pain Radiation: Groin and inner thigh</td>
<td>Pain Radiation: Anterior thigh or knee, or upper medial leg</td>
</tr>
<tr>
<td>Gait Deviation: Sometimes antalgic</td>
<td>Gait Deviation: Sometimes antalgic, difficulty rising onto a stool or chair with one leg</td>
</tr>
<tr>
<td>Motor Weakness: Hip flexion</td>
<td>Motor Weakness: Knee extension, hip flexion and adduction</td>
</tr>
<tr>
<td>Sensory Loss: Anteromedial thigh</td>
<td>Sensory Loss: Lateral or anterior thigh, medial leg and knee</td>
</tr>
<tr>
<td>Reflex Loss: Patellar (variable)</td>
<td>Reflex Loss: Patellar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>L5 Lumbar Radiculopathy</strong></th>
<th><strong>S1 Lumbosacral Radiculopathy</strong></th>
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</thead>
<tbody>
<tr>
<td>Nerve Root: L5</td>
<td>Nerve Root: S1</td>
</tr>
<tr>
<td>Pain Radiation: Buttocks, anterior or lateral leg, dorsal foot</td>
<td>Pain Radiation: Posterior thigh, calf, plantar foot</td>
</tr>
<tr>
<td>Gait Deviation: Difficulty heel walking; if more severe, then foot slap or steppage gait</td>
<td>Gait Deviation: Difficulty toe walking or cannot rise on toes 20 times</td>
</tr>
<tr>
<td>Trendelenburg gait</td>
<td>Motor Weakness: Foot plantar flexion</td>
</tr>
<tr>
<td>Motor Weakness: Ankle dorsiflexion, foot eversion and inversion, toe extension, hip abduction</td>
<td>Sensory Loss: Posterior thigh and calf, lateral and plantar foot</td>
</tr>
<tr>
<td>Sensory Loss: Posterolateral thigh, anterolateral leg, and mid-dorsal foot</td>
<td>Reflex Loss: Achilles</td>
</tr>
<tr>
<td>Reflex Loss: Medial hamstring (variable)</td>
<td></td>
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</table>

**Cauda Equina**

- Rectal examination and perianal and inguinal sensory testing should be done if there is history of bowel or bladder incontinence or retention or recent onset of erectile dysfunction. (Ellenberg M et al 2008)
- Although relatively rare, cauda equina syndrome is a serious condition resulting from a central prolapse of a nucleus pulposus in the lumbar region. Cauda equina syndrome will present as bowel and bladder impairments, saddle area paresthesia (S4), and possible gross limitation of all lumbar movement. This condition constitutes an immediate referral to the physician. (Dunn, M (2008). Orthopaedic Examination, Evaluation, and Intervention, 2nd ed. McGraw Medical, New York)

**Lumbar Radiculopathy - Treatment**

- Non-Surgical
  - Oral Medications
  - NSAIDs
  - Medrol dose pack
  - Oral Steroids
  - Physical Therapy
  - Injections
Lumbar Radiculopathy - Treatment

- Surgical
  - Decompressive surgery: laminectomy and/or discectomy/microdiscectomy
  - This type of surgery typically provides relief of radicular pain/leg pain for 85% to 90% of patients.
  - For patients with severe leg pain or other serious symptoms such as progressive muscle weakness, this type of surgery may be recommended prior to six weeks of non-surgical treatment.
  - Back surgery for relief of radicular pain (leg pain) is much more reliable than the same surgery for relief of low back pain.
  - The decision to proceed with surgery is based on severity of leg pain and/or the presence of significant muscle weakness. It is important to note that if definitive nerve compression cannot be documented on an MRI or CT myelogram, then back surgery is ill advised and unlikely to be successful.
  - Always check for stability on x-rays prior. If not stable may require fusion.

Thoracic Radiculopathy

- Rare when compared to lumbar and cervical radiculopathy.
- Relative rigidity of the thoracic spine, which serves as an anchor for the ribs as well as support for the torso and upper body.
- Relative lack of flexibility exposes the thoracic vertebrae to far less stress as the body ages as contrasted with the cervical and lumbar regions.
- Patients complaining of back or neck pain can't rule out the thoracic region as the origin without a proper radiculopathy diagnosis. Consider MRI or CT scan to determine the location of an impinged or irritated nerve root.

Thoracic Radiculopathy Causes

- Potential conditions that might impinge on a nerve root and cause thoracic radiculopathy include:
  - Degenerative disc disease
  - Bulging disc
  - Herniated disc
  - Osteoarthritis
  - Bone spur
  - Spinal injury, especially from repeated twisting or rotating
  - Spinal stenosis
  - Foraminal stenosis
  - Diabetes, especially in older patients

Thoracic Radiculopathy Management

The symptoms of thoracic radiculopathy normally can be managed through a course of conservative treatment.
- exercise
- physical therapy
- pain medications
- behavior modification
- therapeutic massage

If chronic back pain persists even after weeks or months of conservative treatment. A doctor might present surgery as an option.

Differential Diagnosis

- Lumbar:
  - Lumbosacral Disc Injuries
  - Thoracic Disc Injuries
  - Thoracic Bursitis
  - Anorectal trauma
  - Herniating strain
  - Lumbar scoliosis
  - Diabetic amyotrophy
  - Peripheral neuropathy (acute, bilateral, axillary)
  - Sciatica
  - Dislocation of the hip
  - Hip arthroplasty
  - Sciatica
  - Lateral femoral cutaneous neuropathy (nervegia paresthetica)
  - Spinal stenosis
  - Cauda equina syndrome
  - Simultaneous disorder
  - Lumbar SCD syndrome
  - Femoral syndrome

References

[References provided as a hyperlink to an external source or as a list of bibliographic entries.]

Lumbar Spine Institute. www.lumbar.com

Thoracic Spine Institute. www.thoracicspineinstitute.com
Symptoms of Radiculopathy

- Numbness, tingling, or pain in the arm or leg due to compression of a nerve root.
- Weakness or muscle atrophy in the arm or leg.
- Difficulty with fine motor tasks or weakness in the hands or feet.
- Changes in sensation, such as pain, paresthesias, or temperature changes.

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Radiculopathy

- Cervical radiculopathy is the clinical description of pain and neurological symptoms resulting from any type of condition that irritates a nerve in the cervical spine (neck).
- Cervical nerves exit the cervical spine (neck) at each level, C1 - C7, (nerves in the neck exit above the designated vertebral level at all levels except the last one; C8 exit below C7 vertebra) and then branch out to supply muscles that enable the shoulders, arms, hands and fingers to function. They also carry sensory fibers to the skin and muscles that provide sensation.
- When any nerve root in the cervical spine is irritated through compression or inflammation, the symptoms can radiate along that nerve’s pathway into the arm and hand. The patient’s specific cervical radiculopathy symptoms will depend primarily on which nerve is affected. The symptoms may also be referred to as radicular pain.

Definition Ref #1

- What Is Cervical Radiculopathy?
- Cervical radiculopathy is the damage or disturbance of nerve function that results if one of the nerve roots near the cervical vertebrae is compressed. Damage to nerve roots in the cervical area can cause pain and the loss of sensation in different parts of the upper extremities, depending on where the damaged roots are located.
- Causes of Cervical Radiculopathy
- The main symptom of cervical radiculopathy is pain that spreads into the arm, neck, chest, upper back and/or shoulders. A person with radiculopathy may experience muscle weakness and/or numbness or tingling in fingers or hands. Others may include lack of coordination, especially in the hands.
Cervical Radiculopathy C5-C8
-Spine health ref rad2

- Cervical radiculopathy symptoms differ depending on which nerve is affected. For example, if the nerve root that runs above the C5 vertebra is affected, a physician will use the term “C5 radiculopathy.”
- While any patient’s specific symptoms can vary widely, the following are common descriptions for the types and symptoms of cervical radiculopathy:
  - C5 radiculopathy can cause pain and/or weakness in the shoulders and upper arms. Frequently, it may cause discomfort around the shoulder blades. This rarely causes numbness or tingling.
  - C6 radiculopathy (one of the most common), causes pain and/or weakness along the length of the arm, including the biceps (in the muscles in front of the upper arm), wrists, and the thumb and index finger.
  - C7 radiculopathy (the most common) causes pain and/or weakness from the neck to the hand and can include the triceps (the muscles on the back of the upper arm) and the middle finger.
  - C8 radiculopathy causes pain from the neck to the hand. Patients may experience weakness in handgrip, and pain and numbness can radiate along the inner side of the arm, ring, and little fingers.

Exn
Cervical Radiculopathy Clinical Presentation
Author: Gerard A Malanga, MD; Chief Editor: Sherwin SW Ho, MD more... Medscape.com

- Deep tendon reflexes—ref. They properly induce reflexes, because the reflexes occur after a muscle is stretched. The most common reflexes in the upper extremities at the elbow are the biceps (C5), triceps (C6), and brachioradialis (C7). The most common reflexes in the lower extremities are the patellar (L2) and ankle (S1).
- The sensory examination is performed by tapping the dorsal aspect of the inner aspect of the hand. It is a C5-C7 reflex.
- The sensory test is performed by tapping the inner elbow or the inner aspect of the hand. The test is done to indicate the presence of an upper or lower motor neuron disease. This is also a C5-C7 test.
- The deep tendon reflexes of the lower extremities are elicited by tapping the Achilles tendon or the patellar tendon. If the reflexes are not normal, the cause may be a peripheral neuropathy or a spinal cord lesion.
- The nerve root reflexes are performed by tapping the ulnar nerve at the elbow. The test is done to identify a cervical spine lesion.
- The sensory examination is performed by tapping the dorsal aspect of the inner aspect of the hand. It is a C5-C7 reflex.
- The sensory test is performed by tapping the inner elbow or the inner aspect of the hand. The test is done to indicate the presence of an upper or lower motor neuron disease. This is also a C5-C7 test.

Treatment of Radiculopathy ref #1

- Treatments of Cervical Radiculopathy
  - Cervical radiculopathy may be treated with a combination of pain medications such as corticosteroids (powerful anti-inflammatory drugs) or non-steroidal pain medication like ibuprofen (Motrin or Aleve) and physical therapy. Steroids may be prescribed either orally or injected epidurally into the space above the dura, which is the membrane that surrounds the spinal cord.
  - Physical therapy might include gentle cervical traction and mobilization, exercises, and other modalities to reduce pain. If significant compression on the nerve exists to the extent that motor weakness results, surgery may be necessary to relieve the pressure.

Cervical Radiculopathy Exam
- more hints
  - Increased pain with internal bending away from the affected side can result from increased displacement of a herniated disc onto a nerve root, whereas ipsilateral pain suggests impingement of a nerve root at the site of the neural foramen.
  - Palpation—tenderness is usually noted along the cervical paraspinal muscles, and it is usually more pronounced along the ipsilateral side of the affected nerve root.
  - Muscle tenderness may be present along the muscles where the symptoms are referred (eg, medial scapula, prosternal area, lateral epicondyle).
  - Associated hypertension or spasm on palpation in these painful muscles may occur.
  - Lachman et al showed that cervical radiculopathy is associated with increased tender spots (both trigger and tender points) on the side of the radiculopathy, with a predilection toward the muscles innervated by the involved nerve root. This study revealed that not only pain but also tenderness, may be referred in radiculopathy.
  - Motor Manual muscle testing is an important aspect of determining an affected nerve root level on physical examination. Perform manual muscle testing to detect subtle weakness in a myotomal distribution.
  - Place the limb of the affected side in the antigonit position and apply resistance proximal to the next distal joint. For example, to test the extensor carpi ulnaris muscle, have the patient's forearm in full pronation and resting on a table or supported. The patient is then instructed to extend the hand and deviate it toward the ulnar side, while the examiner applies resistance against the dorsum of the fifth metacarpal bone.