Lumbar Radiculopathy

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Learning Objectives

- Comprehend and practice concepts of “Evidence-based and patient-centered health care” in order to provide high quality patient care.
Learning Objectives

- Implement the scientific method and integrate the use of an evaluation protocol practiced by contemporary chiropractic physician specialists in orthopedics and neuromusculoskeletal medicine.
Learning Objectives

- Perform neuromusculoskeletal evaluation procedures and record the objective findings in order to make an assessment/diagnosis of lumbar radiculopathy.
“Diagnosis is the key to successful treatment!”
Lumbar Disc Herniation

- ICD 9 722.2
- Displacement of intervertebral disc, site unspecified, without myelopathy
Lumbar Radiculopathy

Radicular pain often extends below the knee in the affected dermatome.
Definition of Orthopedic Test

- A provocative maneuver (most often) using stretching, compressing, and contracting to duplicate the pain and identify the involved tissues.
Low Back Pain Spinal Pain and Tissue Identification

- Neural
  - Nerve root
  - Spinal cord
- Zygapophyseal joint
  - Capsule
  - Nerve
- Ligament
- Muscle
- Osseous
North American Spine Society: Evidence-Based Clinical Guidelines for Multidisciplinary Spine Care

Clinical Guidelines for Diagnosis and Treatment of Lumbar Disc Herniation with Radiculopathy
Disclaimer

- This clinical guideline should not be construed as including all proper methods of care or excluding of other acceptable methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding any specific procedure or treatment is to be made by the physician and patient in light of all circumstances presented by the patient and the needs and resources particular to the locality or institution.
Lumbar Disc Herniation with Radiculopathy

- Localized displacement of disc material beyond the normal margins of the intervertebral disc space resulting in pain, weakness or numbness in a myotomal or dermatomal distribution.
Natural History of Lumbar Radiculopathy

The majority of patients will improve independent of treatment. Disc herniations will often shrink/regress over time.
Diagnosis and Imaging

In the assessment of diagnostic tests, both accuracy and the effect of testing on the outcome should be considered.
Accuracy of a Diagnostic Test

Refers to the ability of the examination to detect and characterize pathologic processes.

From "Physical Examination of the Spine and Extremities" by Stanley Hoppenfeld
Sensitivity refers to the proportion of patients with the target disorder who will have a positive test.
Specificity refers to the proportion of patients without the target disorder who will have a negative test.
Tests that have a high sensitivity and negative test outcomes effectively rule out the disease.
Accuracy
Sensitivity and Specificity

Tests that have a high specificity and positive test outcomes effectively rule in the disease.
Positive Predictive Value (PPV)
Negative Predictive Value (NPV)

Performance of a test in a given population can also be stated in terms of positive and negative predictive value, which depends directly on the prevalence of disease in the tested population.
Lumbar Spine Pain

Lower back pain occurs most often between ages 30 and 50

Low Back Pain Fact Sheet.
NIH/NINDS
Herniated disks are most common in patients between 20 and 50 years.

Predictive Values and Patient Populations

One of the purposes of a history and physical examination is to increase the prevalence of disease in patients sent for advanced imaging/testing or offered surgery.
Case Presentation

- Your patient presents with a posterior lateral herniated lumbar disc at the level of L5-S1, which is located medial to the nerve root of S1. The neurological exam demonstrates motor, sensory and DTR deficits. There are no signs of an upper motor lesion.
Learning Task

- Form groups of 3-4
- Select spokesperson
- Write putative SOAP notes for the patient described in this case presentation.
- Present and defend your SOAP notes
The gold standard in the diagnosis of lumbar disc herniation is surgery; however, when assessing the validity of subjective complaints or physical examination findings, use of cross-sectional imaging as a gold standard may be considered an acceptable substitute.
Cross-sectional Imaging

- Any technique that produces an image in the form of a plane through the body with the structures cut across.

- CT
- MRI
- PET
- SPECT scanning
- Ultrasonography
Computerized Tomography Scan

CT and MRI demonstrate the structure of and blood flow to and from organs,
Magnetic Resonance Imaging

Lateral MRI of Lumbar Spine with minor disc bulges and a black L-5 Disc

Normal Discs with whitish center which indicates healthy hydration

Black L-5 Disc which indicates loss of hydration and thus a diseased disc

Very slight disc bulges
A PET scan is an imaging test that uses a radioactive substance called a tracer to look for disease in the body. A PET scan shows how organs and tissues are working.
Single Photon Emission Computed Tomography (SPECT)

Tomographic imaging of local metabolic and physiological functions in tissues. The image is formed by a computer synthesis of data that is transmitted by single gamma photons emitted by radionuclides administered to the patient.
Ultrasonography

Sagittal spinal ultrasound showing lipoma of the filum terminale (arrow).
Discussion

- Do you refer every patient that you suspect with a suspected lumbar disc herniation and radiculopathy for surgery and/or a cross-sectional imaging study?

- Please explain your protocol and rationale in writing and then verbally.
Diagnosis and Treatment of Lumbar Disc Herniation with Radiculopathy

What history and physical examination findings are consistent with the diagnosis of lumbar disc herniation with radiculopathy?
Physical Examination
Grade A Recommendation

- Motor and Sensory testing
- Straight leg raise
- Lasègue sign
- Crossed Lasègue Sign

Good evidence for or against recommending intervention
Three-Part Peripheral Nervous System Examination

- Sensory
- Motor
- Deep Tendon Reflex (DTR)
Straight Leg Raise Test
Lasegue Sign

SLR reproduces the pain
Lower affected lower extremity 15 degrees and pain is eliminated
or
Flex knee and hip to 90%
Extend knee
Sign is present if the pain is reproduced
Crossed Lasegue Sign
(Well-Leg-Raising Test)

- Straight leg raising and dorsiflexion of the foot are performed on the asymptomatic side of a sciatic patient (radiculopathy).
- Pain production in symptomatic lower extremity indicates sign is present.
Jenson Study

- Prospective case series calculating the positive predictive value and negative predictive value of sensory and motor abnormalities as signs of the level of a lower lumbar disc herniation.

Jenson Study

- All 52 consecutive patients included in the study had a disc herniation diagnosed by myelogram and confirmed at surgery.

Physical Examination
Sensory testing of dermatomes

Sensory abnormalities found in 54% of patients with herniated disc.

L4-5 herniation and L5 dermatome deficit
PPV 76%
NPV 55%

L5-S1 herniation and S1 dermatome deficit
PPV 50%
NPV 62%

Physical Examination

Motor testing of myotomes

Motor weakness was found in 54% of patients.
Paresis of dorsiflexion of the foot as a sign of HNP at L4-5
PPV 69%
NPV 47%
Paresis of 4 lateral toes as a sign of HNP L4-5
PPV 76%
NPV 51%

Sensory and Motor Testing

- Level 1 diagnostic evidence that sensory and motor testing of a patient with a suspected lumbar disc herniation and radiculopathy can provide specific clues to the level of disc herniation, but are not very sensitive in determining the exact level.

Kortelainen Study

- Prospective case series evaluating the reliability of the clinical diagnosis of level of ruptured disc and the utility of lumbar myelography of gaining further information.

- All 403 patients had lumbar disc herniation diagnosed by myelogram and confirmed at surgery.
Kortelainen Study

- L5 pain projection 79% reliable and 86% with extensor hallucis longus (EHL) weakness.
- S1 pain projection 56% reliable and raised to 80% with Achilles DTR deficit and raised to 86% with sensory deficit.
- Myelography was accurate 90.8% with 3.7% false + rate and 5.5% false - rate.
Kortelainen Study

- Cough impulse test + with 74% of patients with disc herniation.
- A SLR + more often with lower lumbar herniations than upper lumbar spine.
- Projected pain localized 93% of cases and most symptom localizing level of herniation.
Kortelainen Study

- Achilles reflex was of value in diagnosis of L5-S1 herniation when associated with pain projection and sensory deficit of S1
- Patellar reflex had no value in diagnosis of lower lumbar lesions.
- EHL weakness due to L4-5 lesion 70% of cases even with S1 pain projection.
Kortelainen Study

- Study provides Level 1 diagnostic evidence that physical examination, including subjective and objective findings such as + SLR, sensory and motor testing, in a patient with a suspected lumbar disc herniation and radiculopathy can provide specific clues to the level of disc herniation.

Poiraudeau Study

- A prospective case series including 78 consecutive patients with 43 confirmed cases of lumbar disc herniation (MRI, CT or myelogram), evaluating the reliability, sensitivity, specificity, positive predictive value and negative predictive value for the diagnosis radiculopathy associated with disc herniation (Bell test, hyperextension test, Lasegue and Crossed Leg Signs)
Bell test

- This test was performed with the patient in the standing position. The test was positive when the examiner reproduced or exacerbated the usual radicular pain by pressure applied with the thumb between the spinous processes L4 and L5 or between L5 and S1, or in the near corresponding paraspinal area. When the manoeuvre reproduced only lumbar pain, it was considered negative.
Hyperextension Test

This was performed with the patient standing. The trunk was mobilized passively and slowly over the full range of extension with the knees in extension. The test was positive if the sciatica was reproduced or worsened. If the manoeuvre was interrupted because of lumbar pain, it was considered negative.
Lasègue's sign

This was investigated with the patient supine. The leg affected with sciatica was slowly raised passively, with the patient relaxed and the knee in full extension. Elevation was stopped when the patient began to feel pain. The sign was positive only if sciatica was reproduced or exacerbated. If the manoeuvre was interrupted because of lumbar pain or hamstring stiffness, it was considered negative. When the test was positive, the angle of elevation was recorded using a goniometer. No limiting angle was defined.
Crossed Lasègue's sign

This was performed in the same conditions as the Lasegue Sign but the contralateral leg was passively raised. The sign was positive only if sciatica was reproduced or exacerbated. No limiting angle was defined.
Lasegue sign best sensitivity (0.77-0.83)

Crossed leg sign best specificity (0.74-0.89)

Positive Predictive Values of all four were fair (0.55-0.69)

Negative Predictive Values were weak to fair (0.45-0.63)

[http://rheumatology.oxfordjournals.org/content/40/4/460.long](http://rheumatology.oxfordjournals.org/content/40/4/460.long)
History and Physical Examination References


History and Physical Examination

References


http://www.spine.org/Documents/LumbarDiscHerniation.pdf
Knowledge...

- Knowledge enhances awareness, which improves the potential for accurate diagnosis...
“Diagnosis is the key to successful treatment!”
Suggested Readings


Clinical Picture

Please describe what type of specialized tests might be indicated with lumbar radiculopathy due to discopathy.
Clinical Picture

- What type of range of motion changes would you expect with lumbar radiculopathy due to discopathy?
Minor’s Sign

- List will vary with medial vs. lateral discopathy
Clinical Picture

- If a patient presented with leg pain below the knee, a level pelvis, and scoliosis, would you suspect discopathy?
- Why?
Vanzetti's Sign

- In sciatica the pelvis is always horizontal in spite of scoliosis, but in other lesions with scoliosis the pelvis is inclined. (pelvic obliquity)
Antalgic Lean Sign

“Antalgia Sign”

- Painful discopathy causes listing in order to reduce mechanical nerve root pain.
Antalgic Lean Sign

- Lateral disc protrusion produces a contralateral list
- Medial disc protrusion produces an ipsilateral list
Antalgia Sign

- Medial protrusion presents with antalgic list to the painful side of lesion
- Lateral protrusion presents with antalgic list opposite the side of painful lesion
- Central disc lesion presents with flexed antalgic list
Well-Leg-Raising
SLR of unaffected limb presents

1. Increased pain with a medial protrusion due to the compression of the nerve root
2. Decreased pain with lateral protrusion due to pulling away of the nerve root from the protrusion
Kemp’s Test

- May be performed in either a standing or sitting position
- A positive test involves radicular pain
Kemp’s

- Oblique bending toward symptomatic side increases pain with a lateral protrusion
- Oblique bending away from symptomatic side increases pain with a medial protrusion
Kemp’s Test
Assessment

- Intervertebral nerve root encroachment
- Muscular strain
- Ligamentous sprain
- Pericapsular inflammation
Kemp’s Test

- Once again, the opposite side is tested with increased pain with a medial disc protrusion
- Remember modus operandi or MO (medial opposite)
Differentiate Lateral Disc from Medial Disc Protrusion

- Antalgic lean or antalgia sign
- Fajersztajn’s or Well Leg Test
- Kemp’s test
Disc Injuries

Extrusion

Disc extrusion is a focal herniation contained by the posterior longitudinal ligament that extends into the spinal canal.
Sequestered disc is a free fragment that has broken off or through the annular peripheral fibers in the vertebral canal (prolapsed).
Lumbar Disc Degeneration

Disc degeneration may remain asymptomatic for years...
Disc degeneration may be associated with changes within the disc itself, which may produce pain.
Degenerative Disc Degeneration
Mechanical Instability

Disc degeneration may give rise to mechanical instability that renders the spine vulnerable to trauma.
Once you make the diagnosis of lumbar discopathy, what is your next clinical step?
Consultation with Patient Discopathy

- It is essential that you first make an accurate diagnosis of discopathy and then discuss the diagnosis and treatment with the patient prior to manipulation...
You are the chiropractic physician of the future...

- Mastering the diagnosis and treatment of these neuromusculoskeletal conditions will determine your success in school, clinic, and throughout your career as a chiropractic physician.
Lumbar Spondylosis  
Osseous and Discal Involvement

- Degenerative changes in discs and joints
- Bony overgrowths or spur formations, which are osteophytes
Osteophytes located predominantly at the anterior, lateral, and, less commonly, posterior aspects of the superior and inferior margins of vertebral bodies.
Lumbar Spondylosis

- Lumbar Osteophytosis
- Osteochondrosis
- Degenerative Joint Disease
- Vertebral Osteophytosis
Figure 3. Sample of radiological features observable in NHANES II x-rays. Clockwise from upper left: disc space narrowing, osteophytes, fusion/biconcavity, Schmorl’s nodes, dislocation.
Lumbar Spondylosis
Past teleologically misleading names

- Spondylarthropathy
- Osteoarthritis
- Spondylitis

Examples of Disc Problems
- Normal Disc
- Degenerated Disc
- Bulging Disc
- Herniated Disc
- Thinning Disc
- Disc Degeneration with Osteophyte Formation
Causes of Lumbar Spondylosis

1. “Sprung back” hyperflexion injury
2. “Kissing spines” hyperextension injury
3. Capsular and ligamentous sprain injuries
   “Facet joint degeneration” or
   “zygapophyseal joint imbrication”
Spondylolysis with Spondylolisthesis

- Separation at pars interarticularis
- Anterior slippage of superior vertebral body on inferior body
Meyerding’s Classification of Spondylolisthesis

- Grade 1 = 0-25%
- Grade 2 = 26-50%
- Grade 3 = 51-75%
- Grade 4 = 76%-100%
Anterolisthesis

- Spondylolisthesis
  1. Degenerative (L4-L5 level)
  2. Spondylolysis or Isthmic spondylolisthesis
  3. Congenital cause by inadequate development of the L5-S1 facet complexes
Lumbar Central Canal Stenosis
Structural Causes

1. Osseous: inferior facet arthrosis
2. Discogenic: central disc herniation
3. Ligamentous: ligamentum flavum buckling in degenerative spinal disease
Lumbar Central Canal Stenosis

- Neurogenic claudication with pain upon walking
- Feel like legs are “giving way”
- Temperature changes and weakness in legs
- Night pain
- Sciatic tension signs are present
Lateral Spinal Canal Recess Stenosis

- Degenerative joint disease
- Encroachment of nerve root in canal
- Nerve root entrapment
Lateral Spinal Canal Recess Stenosis Neurogenic Pain

- Intermittent episodes of pain in the hips, buttocks, or posterior thigh
- Pain referred to foot or toes
- Sensorial deficits in calf are common
IVD or Space Occupying Lesion
Milgram’s Test

- Positive with either intrathecal or extrathecal pathology
Milgram’s Test
Assessment for IVD or Space-Occupying Lesion

- Patient able to hold for 30 seconds rules out intrathecal pathology
Positive Milgram’s Test

- Indicates intrathecal or extrathecal pathology
- The test is positive if the patient experiences low back pain
Intrathecal Pathology

- Intrathecal pathology may involve a spinal tumor.
Extrathecal Pathology

- Extrathecal pathology may involve a herniated disc or space occupying lesion
Key to Success

“Diagnosis is the key to successful treatment!”
Final Comments

- Perform a competent evaluation
- Properly assess your patient
- Educate your patient
- Provide high quality care
- Be kind…