Herniated Disc Disease: Diagnostics

Background

1. Definition
    - Extension of disc material beyond annulus fibrosus
        - +/- extension lateral to posterior longitudinal ligament and spinal column
        - May or may not impinge upon nerve roots, thecal sac or spinal cord [6]

Pathophysiology

1. Pathology
    - Usually preceded by degenerative changes within disc
    - Age-related decr in ability of proteoglycans to aggregate within disc
        - Leads to decreased disc hydration
    - Tears of annulus fibrosus allow herniation of nucleus pulposus
    - Herniation can be contained by posterior longitudinal ligament or protrude as a free ligament
    - Pain
        - Result of direct pressure by herniated disc on nerve roots or
        - Induced by breakdown products from nucleus pulposus
2. Incidence/prevalence
    - Approx. 4% of patients with acute low back pain
    - Approx. 30% of MRIs of asymptomatic pts reveal disc herniations
    - Peak incidence between 35-45 yo
3. Risk factors
    - Smoking: risk factor for disc degeneration and herniation
    - Family hx
    - Trauma
4. Morbidity/mortality
    - **Red flag** Cauda equina syndrome
        - Bladder/bowel incontinence, perianal numbness, bilateral neurological deficits
        - Requires immediate surgical treatment within 48 hrs [10]
    - Radiculopathy/Sciatica
        - Often resulting from spinal nerve root compression eg, L4-L5; L5-S1
    - Rule out pelvic nerve compression (piriformis syndrome)

Diagnostics

1. History
    - Back pain, sciatica, paresthesia, pseudoclaudication (radiating lower-leg pain after walking, relieved by rest)
    - Symptoms may worsen with cough, sneezing, Valsalva, prolonged rest

- Frequently pain begins suddenly after an inciting movement (eg, bending and lifting a heavy object)

2. Physical exam
    - Overview
        - 90% of disc herniations occur at L4-5 and L5-S1
        - Central or paracentral disc herniations commonly affect nerve root below disc
            - eg, S1 root if L5-S1 central herniation
        - Lateral disc herniations affect the nerve root at level of disc
            - eg, L5 root if L5-S1 herniation
    - Straight-leg raising test (SLR)
        - Perform by slowly flexing the hip of pt lying supine, leg extended
        - Once hip is flexed to ROM of hamstrings, relax flexion slightly and dorsiflex foot
        - Positive if sciatica Sx (L5-S2 nerve roots) reproducible at elevation of less than 60 deg
            - Pain will radiate below knee
        - Do not confuse w/ pain of hamstring stretching
        - SLR more specific if pain in contralateral lower limb
            - Ipsilateral SLR; Sx occur w/ flexion of symptomatic leg (greater sensitivity; SS:80/40)
            - Contralateral test; Sx occur w/ flexion of contralateral leg (greater specificity; SS:20/90)
    - Femoral-nerve stretch test
        - Slowly extend hip of prone pt w/ knee flexed
        - Positive if radicular symptoms (L3-L4 nerve roots) reproduce when pt's knee flexed while hip slightly extended
    - Neurosensory exam
        - L4 nerve root involvement
            - Pain/paresthesia in anterolateral thigh, antr knee/leg, dorsal-medial foot
            - Decr leg extension, ankle dorsiflexion
            - Decr or absent patellar tendon reflex
        - L5 nerve root involvement
            - Pain/paresthesia in lateral thigh/knee, anterolateral leg, dorsal and plantar foot
            - Decr ankle dorsiflexion, toe extension
        - S1 nerve root involvement
            - Pain/paresthesia in posterolateral thigh/leg, lateral foot
            - Decr leg flexion, ankle plantarflexion, and toe flexion
            - Decr or absent Achilles tendon reflex
3. Diagnostic testing
    - Dx is generally made on Hx/phys exam
    - Imaging [4]
        - Plain film x-ray; poor soft tissue visualization can detect bony abnormalities useful in trauma, arthritic changes, spondylolisthesis

        - CT
            - Better than plain film focused on bone abnormalities
        - MRI
            - Gold standard for soft tissue imaging
            - Shows disc herniation well
        - Myelography
            - Falling out of favor, left to spine specialists for localization of lesions
        - EMG
            - Assists in localization of lesions in presence of radicular Sx
        - Bone scan of limited value
    - Testing to
        - Rule out neoplasia
        - Hx of cancer, wt loss, night pain
        - CBC, CRP, ESR
        - Rule out infection
        - Fever, chills, sweats, night pain
    - Diagnose if radiculopathy continues after 4 wk of conservative Tx or worsens
    - MRI
        - Preferred study if radicular Sx present
        - Perform if "red flag" Sx present

Differential Diagnosis

1. Key differential diagnoses
    - Muscular pain/strain
    - Spinal fracture
    - Spinal stenosis
    - Cauda equina syndrome [10]
2. Extensive differential diagnoses
    - Ligamentous pain/strain
    - Spondylolisthesis
    - Neoplasia
    - Infection

Therapeutics

Acute Treatment

1. Conservative Tx for up to 6 wk
    - Analgesics for pain
        - NSAIDs on scheduled doses preferred [15]
        - Acetaminophen: 1,000 mg q 3-4 hr
        - Ibuprofen: 600 to 800 mg q 6-8 hr
        - Naproxen: 500 mg q 12 hr

        - Acetaminophen with codeine (30 mg or 60 mg) q 4-6 hr for more severe pain
        - There is no consistent evidence that NSAIDs are more effective than acetaminophen
    - Avoid short-acting narcotics for chronic pain (eg, oxycodone, hydrocodone) or muscle relaxers/benzodiazepines [11]
        - High risk for dependency
        - If necessary, limited time only
        - Allows time for more definitive treatment (eg, surgery)
2. Chronic pain assoc w/ nonsurgical candidate and radiculopathy
    - Consider chronic pain mgmt referral
    - Medication mgmt
        - NMDA receptor blocker
        - Long-acting narcotics/opioids
        - Nerve block/injections
        - TCAs [2]
        - Lidocaine patches
        - Antiepileptic medications (pt specific)
        - Muscle relaxants (pt specific)
            - May be helpful if severe back spasm
            - Limit use to 2-7 d unless chronic spasm
        - Epidural corticosteroid injections (pt specific)
            - Relief of acute pain and some long-term relief
            - Highly variable response rate
            - Overall role unclear
    - Topical heat wraps
    - Safe/effective for reduction of pain and disability in first wk after acute musculoskeletal low back pain
3. Manipulation or exercise therapy
    - Spinal manipulation, targeted physical exercises, back school, or physical therapy [13]
    - Directed at relief of disc compression
    - Include soft tissue, stretching, and high-velocity low amplitude of low-velocity/indirect Tx
    - Avoid "high velocity high amplitude" manipulation in presence of neurologic Sx; potential risk of worsening condition [3]
4. Activity
    - Early return to normal activities improves outcomes
    - Bed rest for no longer than 2 days [12]
5. Acupuncture if no other safe alt exist [12]
    - Short-term pain relief for patients with chronic low back pain [7]

Surgical Treatment

1. Small minority of pt require surgery

- In absence of severe/progressive weakness or cauda equina syndrome, surgery is an option if
  - Pt has impaired quality of life
  - Has not responded to conservative Tx [5]

2. Surgical interventions for disc herniation
   - Spinal fusion [14]
   - Microdiscectomy/Open discectomy [14]
   - Disc replacement
     - 70-80% surgical success rate
     - Reoperation rate 10%
     - Residual low back pain and recurrent herniation are major postop complications
   - Randomized trials between discectomy and conservative Tx show
     - Better Sx control w/ surgery at 1 yr postop
     - Mixed results at 4-5 yr
     - No difference at 10 yr [8]
   - Cauda equina
     - Significant improvement in recovery of sensory and motor function if pt receives surg within 48 hr of onset of Sx

Follow-Up

1. Return to office in 4 wk
   - Pain resolution
     - Discontinue medications
     - Encourage regular exercise, wt loss, back muscle reconditioning
   - Pain persists (failed 4 wk conservative tx)
     - Refer to neurosurgeon or orthopedic surgeon
     - MRI
2. Seek urgent neurosurgical or orthopedic consultation if
   - Progressive neurologic deficit
   - Signs of cauda equina syndrome

Prognosis

1. Approx. 90% of pts recover in 3-4 wk w/ conservative Tx alone
2. Recurrences common
   - 40% in 6 mo
3. Natural Hx of herniated disc dz
   - With radicular symptoms may be somewhat less favorable than w/o
   - Improvement is the norm w/ conservative Tx
   - Sx improvement typically slower if radicular Sx present
   - Up to a third of pt show improvement within 2 wk
     - 75% usually show improvement within 3 mo
   - Among those who seek specialty care, approx 15% undergo surgical intervention within 6 mo

    - About 10% of pt undergo surgery
    - Regression of the herniated disc occurs in approximately 2/3 of all pts
    - Prognosis is good in a majority of cases [9]
4. Patients w/ intractable pain who are not surgical candidates or fail surgical intervention may need referral to physician w/ expertise in chronic pain mgmt

Prevention

1. Preventive measures
    - Wt loss
    - Regular exercise [17]
    - Back physical therapy [16]
    - Smoking cessation
    - Other healthy lifestyle modifications
    - Workplace ergonomics
2. Not recommended
    - Back school [11]
    - Lumbar supports/back belts [11]

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