Cervical Disc Herniations

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Disclosures

- No Relevant Financial Disclosures
Clinical Question

• What are the appropriate treatment options for cervical disc herniations in adults?
Background

• A significant number of sports related injuries involved the spine and prevalent among these are cervical and lumbar disc herniations.

• Degenerative changes of the cervical spine are ubiquitous in the adult population
  – Natural consequence of aging
  – Often asymptomatic until injury
  – Very common over age of 40
3 Clinical Syndromes

- Axial Neck Pain
- Cervical Radiculopathy
- Cervical Myelopathy
3 Clinical Syndromes

• Axial Neck Pain

• Cervical Radiculopathy *

• Cervical Myelopathy

Acute Cervical Disc Herniation
Axial neck pain

- Etiology:
  - Sprains and strains
  - Muscular/ligamentous imbalance related to poor posture, faulty ergonomics, muscle fatigue or stress
  - Degenerative disc or facet joints, spondylosis (subaxial)
  - C1-C2 degenerative/inflammatory conditions (suboccipital)
Axial neck pain

• Clinical presentation:
  – Pain along posterior neck/trapezius muscles without radiation to the extremity
  – Pain may refer along paraspinal muscles of neck to occiput or to shoulder and periscapular region (also seen with lower cervical radiculopathy)
  – stiffness
Axial neck pain

• Typically responds to nonsurgical treatment
• Often resolves spontaneously
• Axial neck pain from cervical spondylosis
  – 3 months nonoperative treatment
  – 78 % total symptoms relief or improved
  – 22 % not improved
  – (Depalma, Clin Orthop Rel Res, 1965)
Axial neck pain

- Surgery
  - Chronic neck pain failing 6-12 months nonoperative treatment
  - Mixed results
  - Patient selection challenging
    - Pain generators?
    - Number of involved levels?
    - Advanced studies/discogram?
    - Psychosocial considerations?
  - ACDF (standard), disc replacement
Cervical Myelopathy

- More commonly seen secondary to advanced cervical spondylosis with resulting stenosis and spinal cord compression (Cervical spondylotic myelopathy)
- Can occur in setting of cervical disc herniation due to spinal cord compression and significant cervical stenosis.
Cervical Myelopathy

- Results in spinal cord dysfunction leading to:
  - Upper extremity sensory impairment, weakness, loss of FMS function, clumsiness of hands, difficulty grasping objects
  - Clumsy, unsteady gait, difficulties with balance, loss of proprioception, lower extremity weakness
  - Severely affected individuals can be quadriparetic or quadriplegic
Cervical Myelopathy

• Natural history
  – 5 % rapid onset followed by long periods of remission
  – 20 % gradual decline in function without periods of remission
  – 75 % stepwise deterioration in function followed by episodic periods of remission.
  – (Clark and Robinson, 1956)
Cervical Myelopathy

• Physical exam
  – hyperreflexia
  – pathologic reflexes (Hoffman reflex, inverted radial reflex, Babinski sign)
  – clonus
  – difficulty with gait
  – Various patterns of sensory disturbances and patterns of weakness
Cervical Myelopathy

• Treatment is surgical
• Goals
  – Decompress spinal cord, prevent further functional decline
  – Stabilize spinal column
  – Restablish normal sagittal alignment
• disc herniation $\rightarrow$ ACDF
• Anterior discectomy or corpectomy and fusion, posterior laminectomy and fusion, posterior laminoplasty for CSM
Cervical Radiculopathy

- Result of cervical nerve root compression/impingement from:
  1. Soft disc herniation posterolateral or intraforaminal
  2. Disc bulging with osteophyte spurring (uncovertebral) in setting of degenerative disc disease (also associated with facet overgrowth and foraminal narrowing)
Cervical Radiculopathy

- Patient presentation:
  - Neck pain and referred/radiating symptoms in a specific dermatomal distribution in the upper extremity (frequently unilateral)
    - Sharp pain, burning, tingling sensations
  - Difficult time finding comfortable position
  - Sometimes present with head cocked to opposite side or arm elevated overhead (shoulder abduction sign)
  - Subjective numbness or weakness common
Cervical Radiculopathy

- Patient presentation:
- May be associated motor or sensory loss corresponding to the nerve root involved
- Reflex activity may be diminished
- + Spurling maneuver
Cervical Radiculopathy

- Patient presentation:
- Review of 736 patients with cervical radiculopathy
  - 95% arm pain
  - 85% sensory deficits
  - 79% neck pain
  - 71% reflex deficit
  - 68% motor deficit
  - 52% scapular pain
  - 17% anterior chest pain
  - 9% headaches
  - 6% anterior chest + arm pain
  - 1% left sided chest + arm pain
  - (Henderson, Neurosurgery, 1983)

Cervical Angina
<table>
<thead>
<tr>
<th>Root</th>
<th>Symptoms</th>
<th>Affected Motor Function</th>
<th>Reflex</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>Posterior occipital headaches, temporal pain</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>C3</td>
<td>Occipital headache, retro-orbital or retroauricular pain</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>C4</td>
<td>Base of neck, trapezial pain</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>C5</td>
<td>Lateral arm pain</td>
<td>Deltoid</td>
<td>Biceps</td>
</tr>
<tr>
<td>C6</td>
<td>Radial forearm pain, pain in the thumb and index fingers</td>
<td>Biceps, wrist extension</td>
<td>Brachioradialis</td>
</tr>
<tr>
<td>C7</td>
<td>Middle finger pain</td>
<td>Triceps, wrist flexion</td>
<td>Triceps</td>
</tr>
<tr>
<td>C8</td>
<td>Pain in the ring and little fingers</td>
<td>Finger flexors</td>
<td>—</td>
</tr>
<tr>
<td>T1</td>
<td>Ulnar forearm pain</td>
<td>Hand intrinsic</td>
<td>—</td>
</tr>
</tbody>
</table>

— = no reflex associated

Difficult to differentiate from axial neck pain in setting of DDD
Cervical Radiculopathy

- Radiographic evaluation
  - Plain x-rays may reveal decreased disc height or osteophyte formation
  - Advanced imaging obtained in patient not responding to nonoperative treatment or with severe symptoms
Cervical Radiculopathy

- Advanced Radiographic evaluation
  - MRI
    - Current standard, noninvasive, no radiation, good at identifying disc herniations (central and foraminal), quality of intervertebral disc, spinal cord signal abnormalities or lesions
Cervical Radiculopathy

• Advanced Radiographic evaluation
  – CT Myelogram
  • If MRI contraindicated, invasive, radiation, may be better at detecting foraminal stenosis and whether nerve root compression is from hard (osteophyte/spurring) vs soft (HNP) etiology
Nonoperative Management

• Cervical Collar
  – Diminish inflammation around irritated nerve root
  – Diminish muscle spasm
  – Nighttime collar may maintain proper alignment to diminish nighttime postural symptoms

• No significant benefit in reducing the duration or severity of symptoms (radiculopathy) (Naylor, Br J Rheum, 1991)

• Long term use associated with muscle atrophy (limit to less than 2 weeks)
Nonoperative Management

• Medication
  – NSAIDS
  – Muscle Relaxants
  – Narcotics
  – Oral Steroids
    • Often administered as medrol taper
    • Excellent anecdotal results for acutely diminishing intensity of severe radicular pain
    • No long term benefit in altering the natural history has been shown
Nonoperative Management

• Physical Therapy
  – Commonly prescribed after initial period of rest and acute pain has resolved
  – Has not been shown to alter the natural history of cervical radiculopathy (Levine, JAAOS, 1996 and Tan Orthop Clin North Am, 1992)

• Cervical Manipulation
  – Short term benefits for axial neck pain
  – Should not be performed in patient with cord compression or myelopathy due to risk of catastrophic injury (complication rate 5-10 per 10 million)
  – No solid evidence supporting clinical effectiveness
Nonoperative Management

- Cervical traction
  - Anecdotally found to temporarily relieve symptoms of axial neck pain or radiculopathy
  - Failed to show long term benefits
  - Avoid in myelopathy or cord compression to avoid stretching already compromised spinal cord
Nonoperative Management

• Cervical steroid injections
  – Cervical epidurals
  – Selective nerve root blocks
    • Specific targeting of problematic roots, diagnostic information obtained for surgical planning

• Number of retrospective and prospective studies demonstrating 50-80% good to excellent results for short term relief in cervical radiculopathy
  – Lack control groups
  – Natural history favors resolution of symptoms with time
Surgical Management

• Indications:
  – Significant pain that fails to respond to nonsurgical treatment
  – Severe or progressive neurologic deficit

Options:
  – Anterior cervical decompression and fusion (ACDF)
  – Posterior laminoforaminotomy
  – Cervical disc replacement
Surgical Management

• ACDF

• Advantages

  – Allows direct visualization and removal of lesions causing radiculopathy (disc herniation, uncovertebral spur) without neural retraction
  
  – Anterior bone graft allows opening of neuroforamen and indirect decompression of nerve root
  
  – Fusion may provide relief of neck pain associated with disc degeneration/spondylosis
Surgical Management

- ACDF
- Advantages
  - Low infection and wound complication rates
  - Cosmetic scar
  - Minimal perioperative pain – little muscle dissection
  - Numerous studies documenting good outcomes and effectiveness for relief of radicular and neck pain
Surgical Management

• ACDF

• Disadvantages
  – Swallowing and speech complications due to retraction of esophagus and laryngeal nerves
  – Risk of pseudarthrosis
  – Adjacent Segment Disease
Surgical Management

• ACDF Fusion Rates
  – Historically, literature reports rates ranging from 0-20% for 1- or 2-level ACDFs and as high as 50-60% for 3- and 4-level ACDFs
  – More recent studies demonstrate very favorable results
  – 2015 systematic review and meta-analysis:
    – 2.6 % overall rate of pseudarthrosis for 1-, 2-, and 3-level ACDFs after ACDF with plate fixation
    – Shriver, Spine J, 2015
Surgical Management

- **Adjacent segment disease**
  - Cervical fusion may lead to accelerated degeneration of a segment adjacent to a fusion due to increased stress and altered biomechanical forces
  - Adjacent segment degeneration can become symptomatic resulting in neck pain, stenosis, radiculopathy or myelopathy
Surgical Management

• Adjacent segment disease
  – Annual incidence approx 3 %
  – Prevalence approximately 25 % at 10 yr followup
  – (Hilibrand, 1999)
  – Approximately 17% reoperation rate for ASD
  – (Yue 2005, Ishihara 2004)
Surgical Management

• Cervical Disc Replacement
  – Similar decompression of neural elements as ACDF
  – Preserve motion, minimizing risk of adjacent segment disease
Surgical Management

- Cervical Disc Replacement
  - Disadvantages
    - Recurrent stenosis (re-development of osteophytes secondary to continued motion)
    - Segmental kyphosis
    - Mechanical failure of devices over time
Surgical Management

- Cervical Disc Replacement
  Most current studies demonstrate equivalent outcomes at 1 and 2 year followup to ACDF.
  No long term data yet for long term followup, actual impact on adjacent segment disease, and rates of long term mechanical failure.
  Being performed selectively
Surgical Management

• Posterior Laminoforaminotomy
  – Ideal for far lateral or foraminal disc herniation
  – Posterior approach, no destabilization of spine, no fusion required
  – Disadvantages:
    • Possibility for incomplete decompression
    • Does not address disc issues, no foraminal height restoration
    • Recurrence or deterioration or results with time if progressive degeneration occurs
What about athletes?

- Small retrospective series of 16 NFL players with MRI confirmed cervical disc herniations
- Most common presentation was radiculopathy after single traumatic event (9/16)
- 3/16 presented with transient quadraparesis
What about athletes?

- 8/16 treated nonoperatively and returned to sport
  - Normal exam
  - Resolution of symptoms
- 3/16 failed nonsurgical treatment or had spinal cord compression with signal change on MRI and had 1-level ACDF
  - Only 1/3 returned to sport
- 5/16 treated non-op did not return to sport
  - 2 had cord compression but retired rather than have surgery
  - 3 were cleared to return based on improvement but were released by the team
What about athletes?

- Retrospective cohort study of 99 NFL athletes with cervical disc herniations and 2 year followup.
- **operative group:** 38 of 53 (72%) players successfully returned to play for 29 games over a 2.8-year period, which was significantly greater than **nonoperative group:** only 21 of 46 (46%) players successfully returned to the field to play after treatment for 15 games over a 1.5-year period (P < 0.04).
- Defensive backs have poorer prognosis
What about athletes?

- 40 MLB pitchers from 1984 to 2009 with a cervical disk herniation or lumbar disk herniation were identified.
- Cervical disk herniation was identified in 11 pitchers, 8 of which were treated operatively.
- The majority of pitchers with cervical disk herniation (8/11) returned to play at an average of 11.6 months.
- Lumbar disk herniation was identified in 29 pitchers, 20 of which were treated operatively.
- All pitchers with lumbar disk herniation (29/29) returned to play at an average of 7.3 months after diagnosis.
Conclusion

• TOUGHNESS !!
Athletes return to play after cervical disc herniation

• OK to return to play:
  – Known cervical disc herniation, now asymptomatic
  – Previous 1 level ACDF
  – Posterior laminoforaminotomy

• Relative contraindication:
  – Previous 2 level ACDF

• Absolute contraindication
  – Symptomatic disc herniation
  – Spinal cord compression
  – Cervical myelopathy
  – Previous 3 or more level ACDF
Clinical Question

• Based on current literature..
• What are the appropriate treatment options for cervical disc herniations in adults with radiculopathy?
Clinical Question

1. Initial treatment with conservative treatment modalities.
   - Natural history shows good prognosis for resolution of symptoms and good clinical results
   - Options include medications
     - NSAIDS, muscle relaxants, opiates, oral steroids
   - therapy (cervical traction)
   - injections
Clinical Question

• 2. Surgery is an excellent treatment option for patients with severe debilitating pain, progressive weakness, or persistent symptoms despite nonsurgical treatment
  - ACDF (most common)
    • Excellent clinical outcomes with low complication rates
    • Adjacent segment disease
  - Cervical disc replacement
    • Favorable short and intermediate term results equivalent to ACDF
    • Long term results and risks of long term mechanical failure to be determined
  - Posterior laminoforaminotomy
Bibliography

Bibliography