Roundtable Spine Discussion

Neck Pain

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Disclosures

• Daniel Hutton: Speaker/Teaching for Nuvasine
• Victor Lin: None
• James Kassube: None
Case Study

- 48y/o Caucasian female acute lifting-pulling injury with left upper trapezius/neck pain with radiation into shoulder/deltoid and down anterolateral arm to elbow.
- No complaints of weakness or numbness, no changes in bladder/bowel function.
- PMHx: Negative.
- SHx: Works in library x 15 years, lifting/carrying books, pushing/pulling book cart.
Case Study

• Physical Examination
Case Study

Differential Diagnosis

• Structural
  – Muscle strain
    • upper trapezius, periscapular, rotator cuff
  – Cervical Spondylosis
  – Cervical Strain and Sprain
  – Osteoarthritis
  – Thoracic Outlet Syndrome
  – Neoplasm
  – Spinal Deformity
    • Klippel-Feil Syndrome
    • Postlaminectomy instability
    • Adjacent level degeneration
    • Cervical Kyphosis (chin on chest)

• Neurological
  – upper trunk brachial plexopathy, cervical (disc)
  – Brachial Neuritis
  – Complex Regional Pain Syndrome
  – Cervical Myofascial Syndrome

• Trauma
  – Compression Fracture
  – Burst Fracture
  – Ligamentous injury

• Infectious
  – Diskitis
  – Osteomyelitis

• Autoimmune/Metabolic
  – Fibromyalgia
  – Paraneoplastic syndromes (brachial plexopathy)
  – Paget Disease
  – Inflammatory Arthridites
    • Rheumatoid
    • Psoriatic

• Soft Tissue
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- Cervical disc bulge rare in acute trauma. Typically repetitive.
- Disc Bulges are seen in asymptomatic adult (>40y/o) population 50-60% of time (Lumbar Spine) and (20% Cervical Spine) according to some studies.
  - Radiculopathy without pain is possible if DRG not involved.
  - Chemical irritation can also cause symptoms. Nucleus pulposus leakage from disc bulge/protrusion vs. herniation.
  - Direct compression of adjacent nerve root, either in lateral recess (nerve root below involved level, less common) or neuroforaminal outlet (nerve root at involved level, 70%)
  - In C-spine C6-7 most common.
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- Internal disc disruption (IDD) or annular tears are present in 30% of asymptomatic population, and are evolution of degenerative disc disease and possible precursors to bulges/herniations. Nociceptors rare in this part of disc, except on extreme periphery.

- If painful DDD/IDD is typically vague/diffuse and axial. Provocative discography may have a role, but it is highly patient subjective/doctor-dependent.
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Exam:

- Spurling maneuver: The patient's neck is extended, laterally bent, and held down and performed in the seated position. It is designed to elicit radicular symptoms. A positive test finding is reproduction of radicular symptoms distal to the neck. A positive test finding has shown a sensitivity of 40-60% and specificity of 92-100%.

- Shoulder abduction sign: Active abduction of symptomatic arm, placing the patient’s hand on head, is performed in the seated position. Positive test finding is relief or reduction of ipsilateral cervical radicular symptoms. Sensitivity is 43-50%, and specificity is 80-100%.
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Exam

• Neck distraction test: The examiner grasps the patient’s head under occiput and chin and applies an axial traction force. It is performed in the supine position with an approximate traction force of 10-15 Kg. Positive test finding is relief or reduction of cervical radicular symptoms. Sensitivity is 40-43%, and specificity is 100%.

• Cervical dermatome/myotome/reflexes exam.
  – Trying to distinguish radiculopathy from plexopathy/peripheral mononeuropathy if radiating symptoms

• Shoulder exam: Posture, ROM, strength testing, periscapular assessment, impingement/drop arm, speed and o’brien
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Exam

Pearls:

• Some studies suggest that radicular pain may not follow dermatomes (thermatomes and dynatomes which map radicular distribution to heat and mechanical intervention of nerve root, respectively).

• However, sensory disturbance (dermatomes), reflexes, and weakness (myotomes) remain important.
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• Work Up:
• Studies:
  – Consider arthritis panel
  – Consider infection workup (disceitis, epidural abscess, vertebral osteomyelitis)
    • CBC, ESR, C-Reactive Protein
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Imaging

– Radiographs
  • Plain cervical spine radiographs are used to evaluate chronic degenerative changes, metastatic disease, infection, spinal deformity, and stability.
  • Cervical spine trauma films use 7 views, including anteroposterior (AP), lateral, bilateral oblique, open-mouth, flexion, and extension.
  • Flexion-extension views identify subluxations or cervical spine instability.
  • Open-mouth views evaluate the odontoid process and C1-C2 stability.
  • AP views identify tumors, osteophytes, and fractures.
  • Lateral views assess stability and spondylosis (ie, spurring, disc space narrowing).
  • Oblique views reveal DDD, as well as foraminal encroachment by uncovertebral or Z-joint osteophytes.
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Imaging

• CT
  – CT scans delineate cervical spine fracture and are used extensively in trauma cases.
  – Helical or spiral CT scanning generates an infinite number of images after data acquisition, providing more information for detailed fracture evaluation than does conventional CT scanning

• CT Myelography
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Imaging

• MRI
  – MRI remains the imaging modality of choice to evaluate cervical HNP, due to its low morbidity.\[8, 19\]
  – Newer MRI pulse sequences and higher field magnets provide faster and more detailed imaging.
  – Unfortunately, some sequences (eg, spin echo) depict pathology larger than actual size and obscure other abnormalities. Other disadvantages include expense, inability of claustrophobic patients to tolerate the procedure, dependence on patient cooperation to minimize artifact, high false-positive rate, and insensitivity compared with CT scanning in evaluating bony structures.
  – Furthermore, MRI appears inferior in differentiating cervical disc prolapse (ie, soft cervical disc) from spondylitic osteophytic compression (ie, hard cervical disc).
  – Contraindications to MRI include patients with embedded metallic objects, such as pacemakers, surgical clips, spinal cord stimulators, or prosthetic heart valves that may be dislodged by MRI magnets.
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EMG/NCS

- Electrodiagnostic studies continue to be standard for evaluating neurologic function of the cervical spine. Advantages of these tests include limited expense and low morbidity.
- Nerve conduction studies (NCSs) and electromyography (EMG) studies provide physiologic assessment of cervical nerve root and peripheral nerve function.
- Needle EMG can detect acute, subacute, and chronic radicular features if motor nerve fiber pathology exists.

• A diagnosis of radiculopathy is apparent when needle EMG reveals abnormal spontaneous potentials and/or certain changes in motor unit action potentials, in 2 or more muscles innervated by the same nerve root but by different peripheral nerves. Ideally, EMG abnormalities also should be demonstrated in the paraspinal muscles to confirm the diagnosis of radiculopathy
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EMG/NCV

• In a study by Dillingham et al, cervical radiculopathy may be identified as much as 100% of the time using preset muscle screens. If positive findings are found in 1-2 muscle(s) in such screen, this result is positive. [21]

• When paraspinal muscles were one of the screening muscles, 5 muscle screens identified 90-98% of radiculopathies, 6 muscle screens identified 94-99%, and 7 muscle screens identified 96-100%. When paraspinal muscles were not part of the screen, 8 distal limb muscles recognized 92-95% of radiculopathies. An 8 muscle screen that excludes the cervical paraspinal muscles is a valuable tool to help diagnose radiculopathy in those patients with prior history of cervical spinal laminectomy.

• A compound motor action potential amplitude drop of 50% or more indicates significant axonal loss. This assessment is made via NCS of motor axons.
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EMG/NCV

• NCS/EMG is especially helpful in differentiating cervical radiculopathy from confounding neuropathic conditions (eg, ulnar nerve entrapment, carpal tunnel syndrome, peripheral neuropathy, plexopathy).

• Unfortunately, cervical radiculopathies involving exclusively sensory axons (ie, without involvement of motor axons) rarely are detected by electrodiagnostic studies, which is a shortcoming of this diagnostic modality. In addition, routine motor NCSs do not evaluate the C6 and C7 nerve roots, which are most commonly involved, or the levels above.

• Unlike needle EMG (which involves intramuscular evaluation and is a well-accepted diagnostic test), surface EMG generally is not considered to have an accepted role in the diagnosis of radiculopathy.
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Evoked Potentials

• Somatosensory evoked potentials (SEPs) evaluate sensory conduction peripherally and centrally.

• Lower limb SEPs involving tibial and peroneal nerves, which assess spinal cord conduction, are more sensitive in diagnosing myelopathy than are upper limb median and ulnar SEPs.

• Dermatomal evoked potentials have been used to detect cervical radiculopathy but are of questionable value.
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Pearl:

• In the purely clinical setting, if there is an absence of neurological deficit imaging should be deferred unless conservative management fails or pain is so excruciating that imaging helps resolve clinical decision-making (e.g. high-risk opioids).
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Treatment

• Physical Therapy: Passive Modalities (superficial heat), Traction, Postural Training, Strengthening, Ergonomics/Biomechanical Education
• Medications: NSAIDs, oral corticosteroids, norepinephrine boosters (nortriptyline, tizanidine, venlafaxine, Cymbalta, Savella), GABA boosters (gabapentin, Lyrica), muscle relaxers (cyclobenzaprine), opioids/adrenergic combos (tramadol, Nucynta), opioids/partial agonists (buprenorphine), sleepers (buproprion), anti-PTSD (prazosin).
• Acupuncture!
• Neurocognitive behavioral therapy. Relaxation/meditation. Stress/anxiety management. PTSD management.
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Pearls:

• Normalizing sleep associated with decreased pain. Avoiding sedative-hypnotics that decrease restorative sleep.
• Understanding and validating importance of physical therapy. Knowing what options there are (e.g. McKenzie approach → Butler), and monitoring that different approaches are tried if initial efforts fail.
  – Conservative treatment can work. (Michigan data.)
• Monitoring concomitant psychological/psychiatric comorbidities
Neck Pain – ESI (efficacy)

• Few studies and lack of randomized control studies limit the interpretation

• NASS
  – Fair evidence showing 60-70% improvement (both short and long term)
  – Level “B” evidence to suggest the use of cervical ESI in treatment of disc herniation's, foraminal stenosis, and central stenosis
Neck Pain – ESI (purpose)

• Purposes
  – Dx: Identify an affected area
  – Tx: Reduce pain
    • Decrease swelling
    • Decrease inflammation
    • Decrease chemically mediated irritation
Neck Pain - ESI

Transforaminal

Intralaminar
Neck Pain – ESI (When)

- If there is evidence to suggest radiculopathy
- After conservative treatment has failed
  - Relative rest
  - Ice/heat
  - Physical therapy
  - Chiropractic manipulations
  - Acupuncture
  - Massage
  - Behavior & work place modifications
  - Medications
Neck Pain – ESI (risks)

- Bleeding
- Infection
- Allergic reaction
- Vasosagbal response
- Headache
- Transient weakness
- Nerve damage
- Seizure
Neck Pain – ESI (risks)

• Avoid doing the injection in the first place
• Fluoroscopy & DS
• Technique
• Separate the injectate
• Choice of steroid
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• Surgery

• Indications:
  – Neck pain???
    • Not really
  – Radiculopathy
  – Myelopathy
  – Instability
  – Deformity
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Surgery

• Types of surgery
  – Anterior
    • ACDF
    • Corpectomy
    • Arthroplasty
  – Posterior
    • Laminectomy/Foramintomy
    • Posterior fusion
    • Laminoplasty
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- ACDF

- Arthroplasty
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• Cervical Corpectomy

• Cervical Laminoplasty
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• Cervical foraminotomy

• Posterior Fusion
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Surgical Considerations

• Adjacent Segment Degeneration
  – Vigorously debated
  – Symptomatic degeneration adjacent to a fusion
  – Boden, et al. found that 57% of asymptomatic pts > 60 yrs have degenerative findings on MRI
  • Presence of symptoms was not predictive future low back pain (Borenstein, et al.)

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• Adjacent Segment Degeneration (cont.)
  – Hilibrand, et al. followed patients for 10 years after ACDF.
    • Found 3%/year incidence of clinically relevant adjacent segment degeneration and 25.6% at 10 years
    • Lower incidence with multilevel ACDF
    • Concluded that ASD is related to natural history rather than fusion
  – Total disk replacement (Arthroplasty)?
    • No long term data yet
    • Preliminary reports suggest similar ROM at adjacent levels to ANDF