AMSER Case of the Month
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41 y/o male presenting with neck pain s/p fall.

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Patient Presentation

- **HPI:** Patient is a 41 y/o M who presents to the ED with neck pain.
  - 3 weeks ago he was playing basketball and fell to his left side. He subsequently experienced moderate left lower neck pain, without sensory changes, weakness or gait instability.
  - Since that event, he reports neck pain that is 4/10 in severity, significant neck stiffness and reduced ROM, and chronic mild LUE weakness, especially with abduction and flexion.
  - This chronic pain/discomfort prompted the patient to present to the ED.
Patient Presentation

• In the ED he denies dysphagia, dyspnea, increased weakness, paresthesia, numbness, or bowel/bladder incontinence. He also denies any more recent trauma.

• He was then admitted to the neurosurgery floor for further work-up and management.
Patient Presentation

- **PMH:** Ankylosing spondylitis (AS)
- **Medications:** Etanercept (50 mg/mL, 1 mL injection subcutaneously, once weekly) and Oxycodone-acetaminophen (5-325 mg PO q8h PRN)
- **Surgical Hx:** Non-contributory.
- **Family Hx:** Non-contributory.
- **Social Hx:** Never-smoker. Drinks 1-2 alcoholic drinks per week.
Physical Exam

• **Vitals:** BP 137/72 | Pulse 53 | Temp 98.4 °F (Oral) | Resp 16 | SpO2 100% on RA | BMI 31 kg/m2

• **Neuro:** A&O x 3;
  - Cranial Nerves: PERRL, EOMI, sensation intact V1-V3, no facial droop, hearing intact and equal b/l, tongue midline, palate elevation, shoulder shrug 5/5
  - Motor:
    - Upper extremities:
      - Right: deltoid 5/5, biceps 5/5, triceps 5/5, wrist extension 5/5, grip 5/5
      - Left: deltoid 4+/5, biceps 4+/5 (NEXUS Criteria positive), triceps 5/5, wrist extension 5/5, grip 5/5
    - Lower extremities:
      - Right: hip flexion 5/5, knee extension 5/5, knee flexion 5/5, dorsiflexion 5/5, plantar flexion 5/5
      - Left: hip flexion 5/5, knee extension 5/5, knee flexion 5/5, dorsiflexion 5/5, plantar flexion 5/5
  - Reflexes 2+ throughout, neg. Hoffman's, neg. Babinski
  - Sensation intact bilaterally
  - Neg. pronator drift
What Imaging Should We Order?
### ACR Appropriateness Criteria

**Variant 2:** Age greater than or equal to 16 years. Suspected acute cervical spine blunt trauma. Imaging indicated by NEXUS or CCR clinical criteria. Initial imaging.

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<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
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<tbody>
<tr>
<td>CT cervical spine without IV contrast</td>
<td>Usually Appropriate</td>
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<tr>
<td>Radiography cervical spine</td>
<td>May Be Appropriate</td>
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<td>Arteriography cervicocerebral</td>
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<td>CT myelography cervical spine</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>CTA head and neck with IV contrast</td>
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<td>MRA neck without and with IV contrast</td>
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This imaging modality was ordered by the neurosurgeon.
Imaging Findings (unlabeled)

CT Spine w/o contrast
Imaging Findings (labeled)

- Cervical spine straightening, multilevel flowing thin syndesmophytes, and facet fusion along the entire length of the cervical spine, consistent with pt’s h/o AS.

- Nondisplaced transverse fracture through vertebral level C7 (red arrow).

- No associated vertebral body height loss or retropulsion of the posterior vertebral body cortex.
ACR Appropriateness Criteria

Variant 1:
Acute onset myelopathy. Initial imaging.

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This imaging modality was ordered next to rule out disc herniation.
Sagittal T2-weighted MRI
Imaging Findings (labeled)

- Redemonstration of bridging syndesmophytes.
- There is a T1 linear hypointensity that extends through the C7 vertebral body and through the posterior elements, including the pedicles, right facet, and spinous process (red arrows).
- There is a small prevertebral hematoma with associated soft tissue swelling and slight anterior displacement of the esophagus (blue arrow).
Final Dx:

Transverse 3-Column Fracture of the C7 vertebra in a patient with Ankylosing Spondylitis
Final Diagnosis:
Transverse 3-Column Fracture (C7 vertebra)

Case Management
The patient was operated on 4 days after presenting to the ED. He underwent C4-T2 fusion with bilateral lateral mass screws from C4-C6 and pedicle screws at T1-T2.
Case Discussion (Fractures and AS)

- Patients with fused spine disorders such as ankylosing spondylitis (AS), as in this case, and diffuse idiopathic skeletal hyperostosis (DISH) are at increased risk for unstable spinal injuries.
- Patients with AS are at least twice as likely to get vertebral fragility fractures following trauma than those without AS.
- This increased risk of fracture may be due to the increased spinal rigidity or low bone mineral density (BMD) that is seen in AS.
- Fractures usually involve all 3 columns of the spine and, in particular, involve injury to the posterior osteoligamentous components.
Case Discussion (cont.)

• Transverse 3-column fractures are felt to result from shearing forces (distractive-extension or distractive-flexion) with extension or flexion injury of the vertebral body and a distraction injury of the posterior elements.

• In AS, the lower cervical spine is most commonly involved, with the most common type of fracture being an extension fracture (distractive-extension more common than distractive-flexion or compression fractures).

• They most commonly occur with car accidents where the passenger was restrained with only a lap seatbelt (“seat belt injury”). They may also be seen in patients who have fallen, as in this case.
Case Discussion (cont.)

• Transverse 3-column fractures in patients with fused spinal disorders are often overlooked because they can occur with relatively minor trauma and patients can be minimally symptomatic.

• They are unstable fractures and, if unrecognized, may result in neurologic complications and diskovertebral junction disease, including pseudoarthrosis and diskovertebral junction destruction that can mimic infectious spondylodiskitis.

• Acute complications can include spinal deformity, cord involvement, epidural hematoma and vertebral artery injury.
• Even minor trauma or acute pain in a patient with a fused spinal disorder such as AS or DISH should be evaluated with CT, and if neurologic deficit is present, MR should be performed.

• CT is the imaging of choice to visualize fracture details.
  • Findings include:
    • Horizontal fracture through elements of all three columns:
      • Anterior column: anterior longitudinal ligament, anterior 2/3 of the annulus fibrosus (disk) and/or vertebral body
      • Middle column: posterior longitudinal ligament and posterior 1/3 of the annulus fibrosus (disk) and/or vertebral body
      • Posterior column: posterior ligament complex (interspinous and/or flaval ligaments), posterior portion of the neural arch (facets and/or spinous processes)
    • Coronal and sagittal reconstructions - important due to horizontal orientation of the injury and potential for severe deformity in those planes.
Case Discussion (Imaging cont.)

• MRI is useful when assessing for ligamentous and cord injury.
  • Findings may include:
    • Bright T2 signal (edema) surrounding low signal fracture lines
    • Discontinuity of ligaments
    • Injury to the intervertebral disc
    • Spinal cord edema
    • Epidural hematoma

• MRI or CT Angiography can be performed if concern for vertebral artery injury – a known complication of cervical spine injury.
  • Findings may include:
    • Dissection
    • Thrombosis
Case Discussion (Treatment)

- Non-operative treatment (i.e. bracing or orthotics) may be used in patients with stable posterior elements and no neurologic deficits.
  - These patients would need long-term follow-up to monitor for development of spinal deformity.
- Surgical fixation to decompress the spinal cord and stabilize the fracture is indicated in patients with neurologic deficits or damage to the posterior elements.
  - This usually involves posterior +/- anterior fusion of the spine.
References


