

Balancing Act: The Challenge to Diagnose Neck Instability

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Introduction

Atlanto-occipital dissociation injuries are rare but often fatal traumatic injuries to the cranio-cervical junction. Early diagnosis and surgical stabilization are required due to the risk for secondary brainstem injury. We present the case of a patient evaluated in our outpatient physiatry clinic for neck pain after a full ED work-up for cervical spine injury was unrevealing for acute anatomic abnormality. Patient history with subtle physical exam findings were the sole indication that additional emergent MRI imaging was warranted despite previously benign X-rays and CT scans.

Case

A 57-year-old female was adjusting her hat when she heard a **"cracking" sound of her neck**. She subsequently **developed severe headache and bilateral neck pain**, exacerbated by overhead arm movements. She presented to urgent care and subsequently the ED for further evaluation when her pain increased in severity the following day. Cervical X-rays, CT cervical spine and head, CT angiogram head/neck, and MRI head revealed moderate degenerative joint disease in C5-C7 **without evidence of cervical fracture or dislocation, acute intracranial process or mass**.

Nine days after the initial incident, the patient sought care in the outpatient setting when her neck pain remained constant and unresponsive to conservative treatment.

Musculoskeletal exam:

- + tenderness of the right paraspinal muscles/facet joints and upper trapezius/levator scapulae muscles
- UE AROM limited secondary to pain
- Hoffman's, Spurling's and Lhermitte's
- + mild difficulty toe walking with occasional loss of balance**



Gait impairment is the primary symptom of cervical spondylotic myelopathy.

Cervical flexion and extension XR views are required to allow visualization of the atlantodental interval utilized to diagnose atlanto-occipital dissociation injuries.

Imaging (cont.)

Cervical MRI was additionally ordered to investigate the patient's toe walking instability, demonstrating significant edema of the atlantoaxial joint with mild widening of the joint.

Neurosurgical evaluation recommended surgical fusion given the symptomatic nature of the instability, the risk of continued instability, and potential for severe neurologic sequelae from spinal cord injury following minor trauma.



Discussion

- **Gait impairment is the primary symptom of cervical spondylotic myelopathy,¹** suggesting that ligamentous injury and subsequent inflammatory response to trauma in this case generated cord compression.
- **Impaired toe walking as the only neurologic abnormality in atlantoaxial instability is rare but was the key to diagnosis in this case.** Alternative treatment with PT prior to additional imaging would have predisposed the patient to catastrophic complications from atlantoaxial instability.
- The lack of flexion or extension views in the original cervical X-rays and lack of atlantoaxial joint axial MRI prohibited adequate visualization of the atlantodental interval (ADI). **Cervical flexion and extension views allow the image to capture the ADI**, or the horizontal distance between the anterior arch of the atlas and the dens of the axis **used to diagnose atlanto-occipital dissociation injuries**.
 - ADI >3 mm in an adult qualifies for atlantoaxial dislocation²
 - ADI >5 mm meets criteria for atlantoaxial instability and surgical intervention³
- This case highlights the importance of following up any borderline-pathologic neutral radiograph ADIs with further imaging to fully appreciate atlantoaxial instability.

References

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Imaging



Flexion view cervical revealed widening of the atlantodental interval measuring to 4 mm on the neutral view, which increased to 8 mm on the flexion view and reduced to 2 mm on extension view.

Above, the open-mouth odontoid view demonstrates slight (2 mm) left lateral subluxation of the lateral masses of C1 with respect to C2.