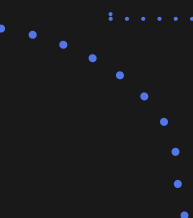




Os Odontoideum: do not touch lesion or surgical necessity?



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Teaching Points

- Define os odontoideum, review current understanding of congenital versus post-traumatic etiology, and discuss how clinical symptoms influence management decisions.
- Review multimodality imaging of os odontoideum, highlighting features of atlantoaxial instability, risk-related findings, and associated structural anomalies.
- Outline management strategies of os odontoideum from observation to surgical fusion, emphasizing the role of imaging in decision-making and long-term follow-up.

Background

- Os odontoideum is a rare anomaly of the 2nd cervical vertebrae
 - **Prevalence:** 0.7–1.0% ¹⁻³
- **Etiology:** congenital or post-traumatic ^{1, 3}
 - Multicenter cohort study = 27% with identified trauma history ³
- **Presentation:** asymptomatic or symptomatic (neck pain (60% of symptomatic cases), myelopathy, vertebrobasilar symptoms, and/or acute neurologic decline ^{1, 3, 4}

Key Anatomic Issue

- Os odontoideum presents as a well-corticated ossicle superior to the C2 vertebral body
 - Must be differentiated from persistent ossiculum terminale and type 2 odontoid fracture ^{1, 3}
 - Typically located below the transverse band of the cruciform ligament¹⁻³
 - Can lead to instability of dens with respect to C2

Subtypes

- **Orthotopic:** ossicle in the normal position of odontoid process²
 - Aligned with C1, but not fused to C2
- **Dystopic:** ossicle displaced superiorly and posteriorly, near the base of the occipital bone²
 - Further from C2, with higher likelihood of instability



Figure 1. Sagittal T2-weighted MRI demonstrated fluid signal beneath a dystopic os odontoideum with cord edema due to the displaced os odontoideum.

Imaging Findings

- **Radiograph:** preferred initial imaging modality
 - AP, lateral, open mouth odontoid views
 - Demonstrates corticated ossicle superior to a hypoplastic odontoid process.
 - Flexion-extension to evaluate for instability
 - Atlantodental interval >5 mm and/ or abnormal translation/ angulation on flexion-extension suggesting instability ^{1, 5}



Figure 2. Lateral radiograph of the cervical spine demonstrating os odontoideum, characterized by a well-corticated ossicle separated from the body of C2.

Imaging Findings

- **MRI:** neurologic symptoms or suspicion of cord compression
 - Space available for cord ≤ 13 mm associated with 7.8-fold increased risk of neurological deficit ^{1, 2, 6}
 - Hypertrophy of C1 anterior arch is suggestive of chronic instability ²
 - Can help to detect associated myelomalacia, soft tissue thickening, and anomalies (Chiari malformation, basilar invagination) ^{1, 2, 6}



Figure 3. Sagittal T1-weighted MRI demonstrating os odontoideum (arrow) separate from the body of C2 without evidence of cord compression.

Imaging Findings

- **CT:** aids in differentiating from fracture and persistent ossiculum terminale & to evaluate pre-surgical bony anatomy ^{2, 6}
 - Features like "jigsaw sign" may support a congenital etiology ⁶

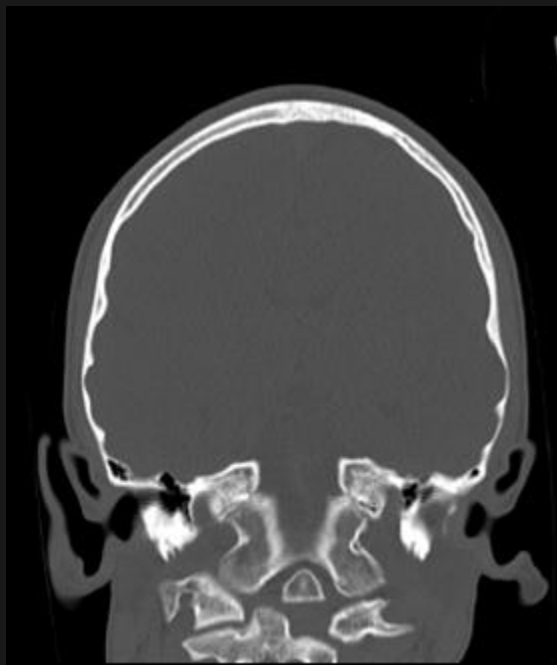


Figure 4. Coronal CT of a 14-year-old male with base of the C2 vertebral body translated to the right with respect to the os odontoideum with abnormal articulation with the C1 lateral mass.



Figure 5. Coronal CT of the cervical spine on the same patient obtained 2 hours after CT of the head (left), now showing the base of the C2 vertebral body to be translated left of the os odontoideum. Patient underwent subsequent surgical fixation.

Management

- **Observation** (~30% cases): asymptomatic without instability
 - In a multicenter pediatric study, 6% of originally stable developed symptoms/ instability requiring surgery ¹
- **Surgery** (~70% cases): symptomatic, instability
 - Often posterior cervical fixation or fusion
 - Complications in 30% of cases, including nonunion (17%), new neurological deficits (6%), and need for revision (13%) ^{1, 3}



Figure 6. Lateral radiograph of the cervical spine status post surgical fixation for os odontoideum.

Monitoring

- **Asymptomatic & Stable:** clinical evaluation and XRs
 - Every 6–12 months for first 2–3 years, then annually if stable^{1, 2, 6}
 - MRI indicated if new symptoms develop
- **Postoperative:** confirm fusion/ fixation and monitor for complications
 - At 3, 6, and 12 months postoperatively, then annually if stable^{1, 3}

Conclusion

- Os odontoideum is a rare, but potentially serious C2 anomaly.
- Imaging is key for diagnosis, risk assessment, and management decisions.
- Observation is reasonable if stable and asymptomatic, while surgery is preferred if the patient has symptoms or findings suggestive of instability.
- Long-term imaging follow up is essential, regardless of approach.

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