
Neuroimaging Highlight

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Pediatric Traumatic Retroclival Epidural Hematoma

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A previously healthy ten-year-old girl was involved in a high speed motor vehicle accident (MVA) in which she was the belted front-seat passenger. The patient's teeth marks on the dashboard were evidence of a high-velocity impact. Her Glasgow Coma Score on scene was 13, and she was amnesic for the event. She was subsequently transported to the emergency room in full spinal precautions; on arrival she was hemodynamically stable with a Glasgow Coma Score of 14, complaining of neck and jaw pain. Neurological examination revealed impaired abduction of the right eye, with no other focal deficits. She had oral lacerations and bruising over the mandibles bilaterally.

Computed tomogram (CT) scan of the head was initially interpreted as normal, but on closer inspection demonstrated a 4mm retroclival hematoma (Figure 1). Sagittal CT through the upper cervical spine revealed the hematoma was epidural, bounded by the spheno-occipital synchondrosis superiorly and by the mid-body of the axis inferiorly (Figure 2). The odontoid was retroflexed (Figure 2). Bilateral mandibular fractures were also uncovered on facial imaging.

The patient was admitted for close neurological monitoring. A magnetic resonance image (MRI) scan of the head and cervical spine were acquired the next morning, confirming an acute retroclival epidural hematoma, with disruption of the apical ligament of the axis and dissection of the tectorial membrane from the clivus by hematoma (Figure 3). There was no evidence of brainstem or spinal cord compression. Angiography revealed no traumatic arterial dissections.

Traumatic retroclival epidural hematoma is a rare entity, diagnosed almost exclusively in the pediatric population¹⁻¹⁰. Thought to be caused by sudden hyperflexion or hyperextension at the craniovertebral junction (CVJ), it virtually always occurs in conjunction with high-speed MVA, classically presenting with bilateral cranial nerve (CN) VI palsies, variable quadriparesis, and occasionally with lower cranial nerve palsies^{8,10}. While the hematoma may accompany a fracture of the clivus, it more commonly results from ligamentous injury: a high fulcrum of neck motion—created by a large head relative to the cervical spine—and spinal hypermobility in children preferentially injures the tectorial membrane as well as the apical and alar

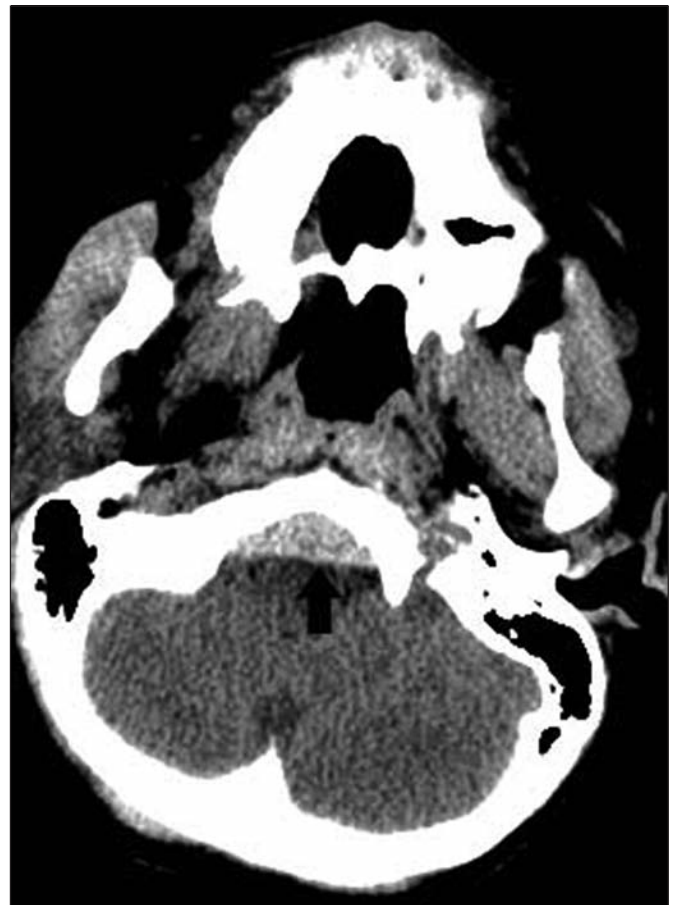


Figure 1: Axial CT image at the level of the clivus demonstrating a well-defined hyperdense collection anterior to the brainstem, consistent with a retroclival epidural hematoma.

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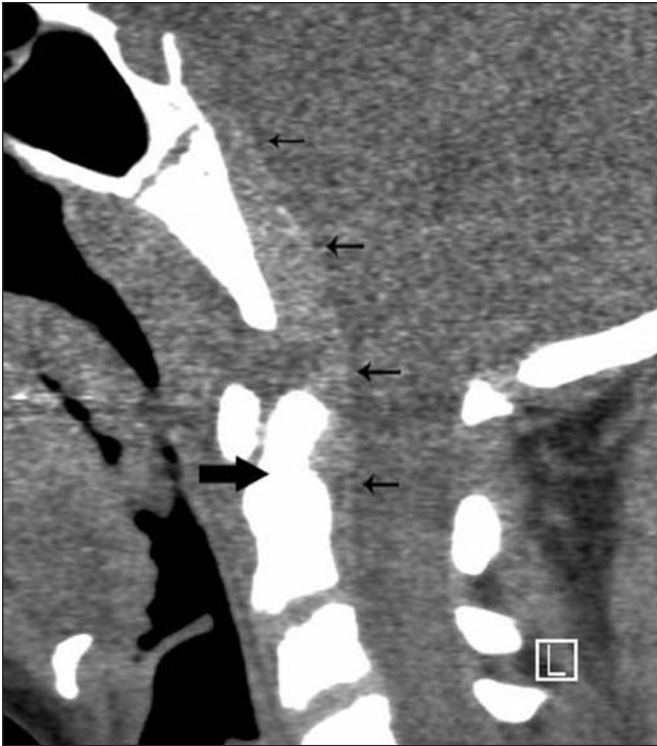


Figure 2: Mid-sagittal CT image of the clivus and upper cervical spine. A retroclival epidural hematoma is clearly demonstrated (small arrows), bounded by the spheno-occipital synchondrosis superiorly and by the mid-body of the axis inferiorly. Note the retroflexed odontoid process of C2 (large black arrow).

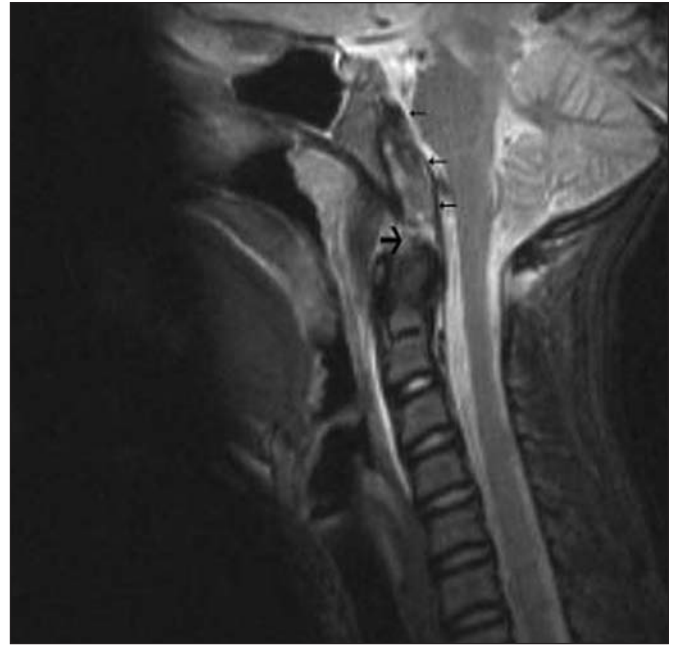


Figure 3: Mid-sagittal T2-weighted MRI image of the upper cervical spine. The tectorial membrane and apical ligament of the axis (large black arrow) have been dissected from their underlying bony attachments by the retroclival epidural hematoma (small arrows).

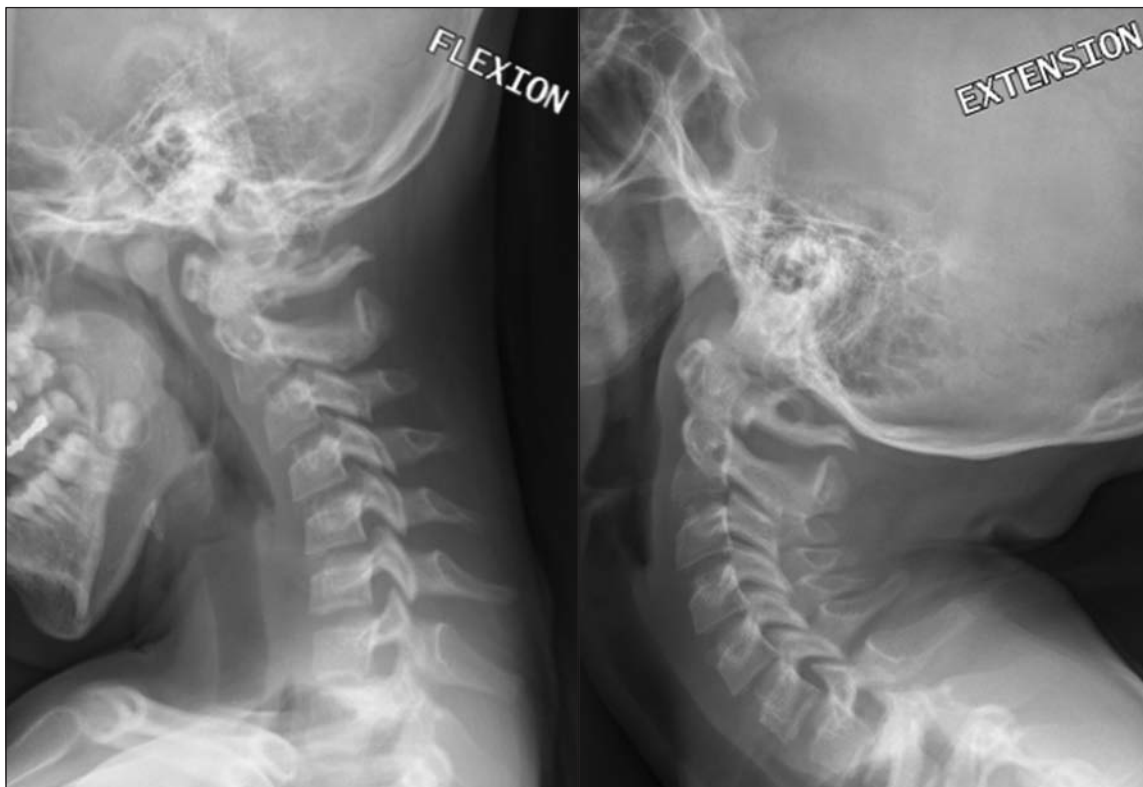


Figure 4: Flexion (a) and extension (b) x-rays completed one month after injury demonstrate stable alignment at the craniocervical junction.

ligaments of the axis^{8,9}. A retroflexed odontoid process, as in our patient, may further predispose to such ligamentous injury⁸. In reported cases with overt CVJ instability, posterior instrumentation has been required.^{3,4} Transoral hematoma evacuation has also been reported in the setting of neurological deterioration⁴. In keeping with the literature, we managed our patient conservatively in a Philadelphia collar for one month, at which time flexion/ extension x-rays demonstrated stable alignment (Figure 4). By two months post injury her right CN VI palsy was almost completely resolved with only minimal impairment of right abduction and associated diplopia. This completely settled by her four month follow-up. Her only persisting complaints have been intermittent headaches.

This case illustrates the importance of a high clinical suspicion for retroclival epidural hematoma in pediatric MVA patients presenting with CN VI palsy or other false localizing signs¹⁰. These hematomas may be missed on axial CT because of bony artifact in the posterior fossa, necessitating sagittally reformatted images or MRI to confirm the diagnosis and document ligamentous disruption⁸. Once diagnosed, the potential for brainstem compression or instability at the CVJ necessitates a period of close observation, though conservative management leads to good recovery in the majority of cases^{8,9}.

REFERENCES

1. Orrison WW, Rogde S, Kinard RE, et al. Clivus epidural hematoma: a case report. *Neurosurgery*. 1986;18:194-6.
2. Kurosu A, Amano K, Kubo O, et al. Clivus epidural hematoma. Case report. *J Neurosurg*. 1990;72:660-2.
3. Papadopoulos SM, Dickman CA, Sonntag VK, Rekate HL, Spetzler RF. Traumatic atlanto-occipital dislocation with survival. *Neurosurgery*. 1991;29:574-9.
4. Marks SM, Paramaraswaren RN, Johnston RA. Transoral evacuation of a clivus extradural hematoma with good recovery. *Br J Neurosurg*. 1997;11:245-7.
5. Mizushima H, Kobayashi N, Sawabe Y, et al. Epidural hematoma of the clivus. Case report. *J Neurosurg*. 1998;88:590-3.
6. Suliman HM, Merx HL, Wesseling P, Van Der Sluijs B, Vos PE, Thijssen HOM. Retroclival extradural hematoma is a magnetic resonance imaging diagnosis. *J Neurotrauma*. 2001;18:1289-93.
7. Yang BP. Traumatic retroclival epidural hematoma in a child. *Pediatr Neurosurg*. 2003;39:339-40.
8. Guillaume DG, Menezes AH. Retroclival hematoma in the pediatric population. Report of two cases and review of the literature. *J Neurosurg*. 2006;105 Suppl 4:321-5.
9. Agrawal D, Cochrane DD. Traumatic retroclival epidural hematoma - a pediatric entity? *Childs Nerv Syst*. 2006;22:670-3.
10. Calisaneller T, Ozdemir O, Altinors N. Posttraumatic acute bilateral abducens nerve palsy in a child. *Childs Nerv Syst*. 2006;22:726-8.