

A Major Pitfall to Avoid: Retroclival Hematoma due to Odontoid Fracture

Sudhir Datar · David Daniels · Eelco F. M. Wijdicks

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Abstract

Background Retroclival hematoma (RCH) is a rare occurrence. The hemorrhage is usually small and hidden and can be easily missed on CT scan. Here, we report the association of a RCH with an odontoid fracture.

Methods Case report and review of the literature.

Results We describe a case of a 75-year-old man with a history of squamous cell carcinoma of the tongue base, treated with chemo-radiation. He was on warfarin for atrial fibrillation. He presented to the hospital 6 weeks after falling from standing height, with headache, neck pain, and stiffness. Clinical examination did not show any focal neurologic deficits. INR measured 4 days before admission was 6.0, but therapeutic at 2.4 on the day of admission. CT scan of the head showed a RCH. CT angiogram of the neck unexpectedly showed a type II odontoid fracture with instability of the upper cervical spine and extension of the hematoma to the upper cervical spine. Anticoagulation was reversed with factor IX complex (Bebulin). He underwent C1–C2 fusion without any complications. The immediate post-operative period was unremarkable. Unfortunately, he succumbed to airway obstruction due to mucus plugging 14 days into hospitalization.

Conclusions In the appropriate clinical setting, when a RCH is found, further imaging should be considered to rule out fracture of the cervical spine. Odontoid fractures can

lead to compression of the spinal cord or lower medulla. To prevent neurologic injury and subsequent complications, prompt recognition of type II odontoid fracture should lead to immediate spine stabilization.

Keywords Retroclival hematoma · Odontoid fracture · Retroclival hemorrhage · Elderly · Fall · Cervical spine fracture · Anticoagulation

Introduction

Retroclival hematomas (RCH) are a rare occurrence with most cases reported in the pediatric population [1–9] after traumatic brain injury. There have been few cases reported in adults [10–13]. RCH in adults has been described in association with pituitary apoplexy [13], anticoagulant therapy [12], trauma [11], and decompressive craniotomy for cerebellar infarction [14]. A RCH is usually small and hidden and can be easily missed on CT scan. This could have major consequences and we report the association with an odontoid fracture.

Methods

We present here a case report and review of the literature.

Results

We describe a case of a 75-year-old man with past medical history of squamous cell carcinoma of the tongue base, treated in 2009 with radiation and chemotherapy. He was on warfarin for atrial fibrillation. About 6 weeks before admission to the hospital, he fell down from standing height

S. Datar (✉) · E. F. M. Wijdicks
Department of Neurology, Mayo Clinic, Rochester, MN, USA
e-mail: datar.sudhir@mayo.edu

E. F. M. Wijdicks
e-mail: wijde@mayo.edu

D. Daniels
Department of Neurosurgery, Mayo Clinic,
Rochester, MN, USA

and hit his head after tripping on a rug. There was a brief period of loss of consciousness. He did not experience any neurologic symptoms and he did not seek medical attention at that time. Following that episode, he started experiencing headache, neck pain, and stiffness. He came to the emergency room 6 weeks after his fall, when his pain became progressively worse. Clinical examination showed limited tongue protrusion and jaw opening due to his previous history of tongue carcinoma. Motor examination was unremarkable. Other than a mild large fiber neuropathy in his feet from diabetes, he did not have any sensory deficits. He had neck tenderness and pain on motion in all directions along with restricted range of motion. INR measured 4 days before admission was 6.0, but therapeutic at 2.4 on the day of admission. CT scan of the head without contrast showed a RCH anterior to the pons and medulla (Fig. 1) without any mass effect on the brain stem. It was best visualized on sagittal sections. The inferior margin of the hematoma was not visible on the CT scan of the head. Further work-up with a CT angiogram of the head and neck did not show any vascular malformation/vasculopathy, but it unexpectedly showed an unstable type II odontoid fracture (Fig. 2) with extension of the hematoma through his upper cervical spine (Fig. 3). A cervical collar was immediately applied. Neurosurgery was consulted for further management and his anticoagulation was reversed with factor IX complex (Bebulin). He was taken to the operating room on day 3 for surgical stabilization of his odontoid fracture.

Successful stabilization and alignment of the cervical spine were accomplished through a posterior C1–C2 fusion using the standard Harms technique and iliac bone grafting. Surgery was without any complications and his neck pain improved. He spent some time in the intensive care unit under careful monitoring and was subsequently transferred

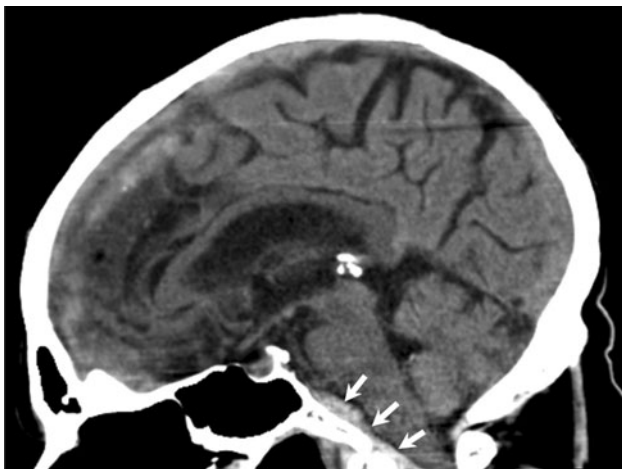


Fig. 1 Sagittal CT image of the head without contrast shows retroclival hematoma, most likely in the epidural space, anterior to the pons, medulla, and cervicomedullary junction (arrows)

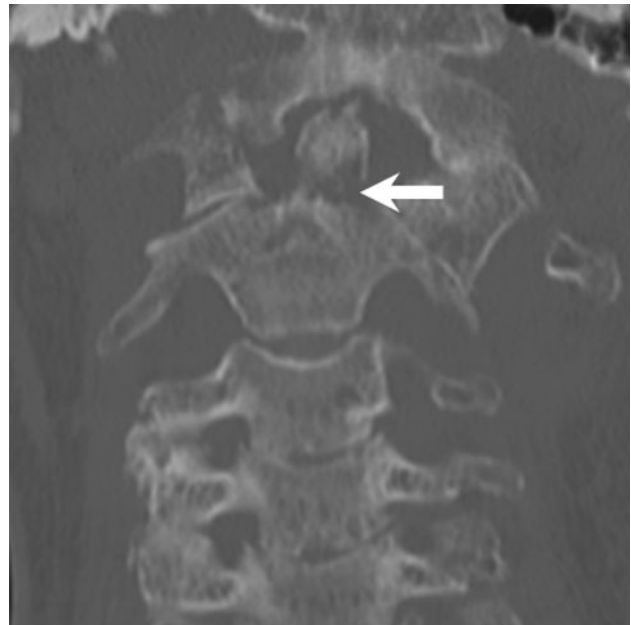


Fig. 2 Coronal CT of the cervical spine shows type II fracture of the odontoid process (arrow)

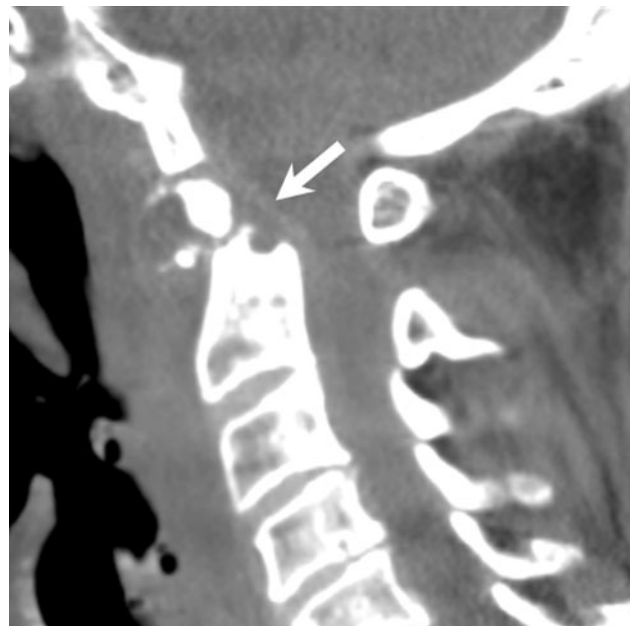


Fig. 3 Sagittal CT of the cervical spine shows extension of the hemorrhage into the upper cervical spine (arrow)

to the floor where he continued to recover. Unfortunately, 14 days into his hospitalization and very close to discharge, he went into respiratory distress from mucus plugging. Intubation was unsuccessful despite multiple attempts due to his history of tongue carcinoma and previous radiation. Given his multiple comorbidities and clearly expressed wishes, he was transitioned to palliative care. He passed away that morning.

Conclusions

This case serves to point out an association between a RCH and upper cervical fracture. Small collections of blood in a patient on anticoagulation may be dismissed as expected under the circumstances and interpreted as insignificant. In other cases, they can go unnoticed as beam-hardening artifacts which are very common in this region. It cannot be determined with certainty that the hematoma was caused by the fracture. The sensitivity/specificity of a retroclival hemorrhage being diagnostic of cervical fracture is currently unknown due to the paucity of available data. Our patient's clinical presentation of neck pain and tenderness after a fall warranted a neck imaging study even without the presence of the hematoma. However, he was awake and was thus able to complain of neck pain. There may be another patient who may have an altered state of consciousness due to any reason and would then be unable to complain of any neck pain or stiffness. In such a scenario, knowing this association is of value as one can then obtain imaging of the cervical spine to ensure stability. Endotracheal intubation may be necessary in such patients for airway protection, and ruling out a fracture before neck manipulation would be very important.

Trauma is a common cause of RCH as noted in most of the pediatric cases in which hemorrhage was found in the setting of severe trauma, most commonly a motor vehicle accident. It is not a well-known occurrence in adults. This may be because children have a high fulcrum of cervical motion at the craniocervical junction, making it more susceptible to trauma than adults [1]. Injuries reported in these cases include atlanto-occipital dislocation, C1–C2 dislocation, longitudinal clivus fracture, and avulsion fracture of the left occipital condyle among others [15]. Many cases had hyper-extension injury with some cases suffering from hyperflexion injury.

In adults, in addition to trauma [11], RCH has been described in association with other causes. Calli and colleagues described retroclival hemorrhage as a complication of posterior fossa decompressive surgery for the management of acute cerebellar infarction [14]. Serial MRI scans documented the hemorrhage. Goodman and colleagues described RCH in association with pituitary apoplexy. A 62-year-old male presented with acute onset of nausea, vomiting, and headache. MR imaging showed an enlarged sella and a hemorrhagic sellar and suprasellar mass elevating the chiasm. MRA demonstrated the presence of RCH appearing as a bright signal anterior to the basilar artery [16]. The patient's mild chiasmatic syndrome improved after transsphenoidal resection of the tumor.

Cranial nerve palsies are also described with RCH. In cases of traumatic RCH, it cannot be known with certainty that the palsy is not a direct effect of the trauma, rather than being a manifestation of the hematoma.

Guilloton et al. describe RCH associated with anticoagulant therapy in a 78-year-old woman, who presented with an isolated left external ophthalmoplegia. She had spontaneous neurologic resolution [17].

Thunderclap headache can be caused by a variety of causes which include subarachnoid hemorrhage, migraine, cerebral venous sinus thrombosis [18], pituitary apoplexy [19], carotid or vertebral dissection [20], and intracranial hypotension caused by a spontaneous spinal CSF leak [21]. Spontaneous retroclival hemorrhage has been reported to present as a thunderclap headache by Schievink et al. The described patient did not have any other neurologic manifestations [10].

In most cases, treatment is dictated by underlying injuries as most cases of RCH are traumatic in origin. The hematoma is rarely large enough to cause compression of the brain stem and warrant evacuation. This may be due to the fact that unlike supratentorial epidural hematomas which originate from an arterial source, venous bleeding likely plays a major role in cases of RCH involving trauma. The mechanism of hemorrhage is not clear, but it has been suggested that anterior or posterior dislocation of the odontoid process with rupture of the transverse ligament of the atlas and stripping of the tectorial membrane from the clivus causes venous bleeding [22]. These patients are usually monitored in the intensive care unit secondary to their underlying injuries and to ensure stability of the hemorrhage given the critical location. Albeit rare, expansion of retroclival subdural hemorrhage with mass effect on the brainstem and cranial nerves, needing surgical evacuation, has been reported [11].

CT scan may miss a small amount of blood due to beam-hardening artifacts in the posterior fossa. Although not routinely performed, in the appropriate clinical setting, sagittal views should be obtained, which when combined with axial views may help exclude artifacts. MRI is not an indispensable imaging modality in this setting; however, it images the posterior fossa better than the CT scan. We did not perform MRI scan in our patient as that would not have changed the management. But, it can be considered if the location of the hemorrhage cannot be clearly defined based on CT scan as, sometimes, RCH can be confused with subarachnoid hemorrhage [23].

In general, osteoligamentous injuries at the craniocervical junction are suggestive of high-energy trauma [3]. In our patient—albeit on anticoagulation—the unstable fracture occurred from a standing height fall. However, it was enough to result in a fracture of the odontoid process with resultant instability of the spine. In the elderly, degenerative changes and osteopenia might contribute to upper cervical spine injury in response to low-energy trauma [24]. In the appropriate clinical setting, when a RCH is found, further imaging should be considered to rule out

fracture of the cervical spine. Upper cervical spine fractures can lead to compression of the spinal cord or lower medulla, leading to sensory-motor deficits at and below the level of compression, sphincter dysfunction, and respiratory failure from paralysis of diaphragm. Type II odontoid fractures have a higher mortality and risk of cardiopulmonary complications in the presence of neurologic deficits [25]. Thus, to prevent neurologic injury and subsequent complications, recognition of the fracture should lead to immediate spine stabilization.

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