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Case Report

Traumatic temporal bone fracture with middle ear effusion: A case report ☆,☆☆

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ABSTRACT

Temporal bone fracture is a relatively rare but significant complication of traumatic head injury. We present a rare and unique case of traumatic temporal bone fracture with middle ear effusion, in a 76-year-old woman, following a fall. Physical examination on presentation was remarkable for a superficial scalp hematoma in the occipital region, without any focal neurological deficits. An initial non-contrast head CT revealed a large posterior scalp hematoma and subtle changes suggestive of artifact vs. hemorrhage within the right temporal lobe. Over two days, she developed a worsening headache, with new hearing impairment and reduced right sided bone-conduction on auditory testing. A repeat head CT confirmed a right hemorrhagic temporal lobe contusion as well as a right mastoid and middle ear effusion. A dedicated temporal bone CT scan was performed, which revealed an acute longitudinal fracture through the right mastoid bone without extension into the middle ear cavity. She was evaluated by neurosurgery, managed symptomatically, and observed closely. Her neurological status remained stable, and she was discharged with planned outpatient follow-up with her primary care provider and the consulting neurosurgeon. This case illustrates sequalae of traumatic temporal bone fracture, as well as the value of clinical history and heightened clinical concern for an occult, easily overlooked region during imaging.

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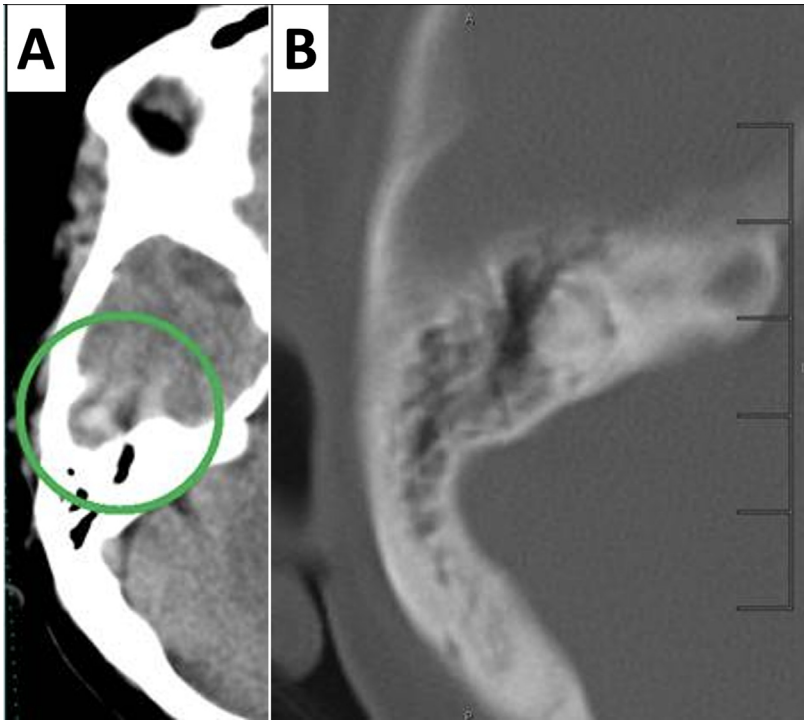

Fig. 1 – (A) Axial soft tissue window initial head CT day 1. (B) Axial edge enhanced bone window head CT day 1.

Background

Temporal bone fracture is a relatively rare but significant complication of traumatic head injury. The likelihood of injury to the temporal bone is dependent upon the nature of trauma and the magnitude of delivered force. Notably, a tremendous amount of force is required to fracture the bone, with most cases occurring due to high velocity trauma [1]. Common causes include motor vehicle accidents, falls, motorcycle crashes, and assault [2]. Surrounding structures, such as the mastoid cells, play a role in absorbing part of the kinetic energy from the temporal bone following head trauma [3]. We present a rare and unique case of headache and hearing loss that illustrates sequalae of traumatic temporal bone fracture, as well as the value of clinical history and heightened clinical concern for an occult, easily overlooked region during imaging.

Case presentation

A 76-year-old woman presented to the emergency room with a chief complaint of a lightheadedness and a feeling of "passing out." The patient was in her usual state of health until the morning of presentation, when she experienced the sudden onset of lightheadedness resulting in a syncopal episode. She awoke from the episode having fallen on the floor, with pain in the back of her head. She endorsed nausea and multiple episodes of non-bloody non-bilious emesis upon awakening. She denied any antecedent fevers, chills, palpitations, chest pain, diaphoresis, shortness of breath or abdominal pain. Her medical history was significant for hypertension and diabetes.

At the time of presentation to the emergency department, the patient's vital signs were within normal limits. Physical examination was remarkable for a superficial scalp hematoma in the occipital region, without any focal neurological deficits. Laboratory diagnostics only revealed a mildly elevated creatinine (0.88 mg/dL; reference range 0.50-0.80 mg/dL). High sensitivity troponin-I was within normal limits and testing for COVID-19 returned negative. Twelve-lead EKG revealed normal sinus rhythm, without changes suggestive of acute myocardial ischemia or arrythmia. A CT scan of the head without contrast revealed a large posterior scalp hematoma and subtle changes suggestive of artifact vs. hemorrhage within the right temporal lobe (Fig. 1, green circle). She was evaluated by neurosurgery and localized management with ice and pressure in the recumbent position was recommended. Anticoagulant and antiplatelet medications were held and the patient was admitted to the hospital for further management and serial monitoring of possible intracranial hemorrhage.

On hospital day 2, the patient complained of a worsening headache, with new hearing impairment. Otoscope examination revealed clean external ear canals bilaterally. Weber and Rinne testing demonstrated reduced bone-conduction on the right. A repeat CT scan of the head without contrast confirmed a right hemorrhagic temporal lobe contusion (Fig. 2A, red circle) and also revealed a right mastoid and middle ear effusion (Fig. 2B, red diamond). Given corroborating history of her recent trauma, a dedicated temporal bone CT scan was performed, which revealed an acute longitudinal fracture through the right mastoid bone without extension into the middle ear

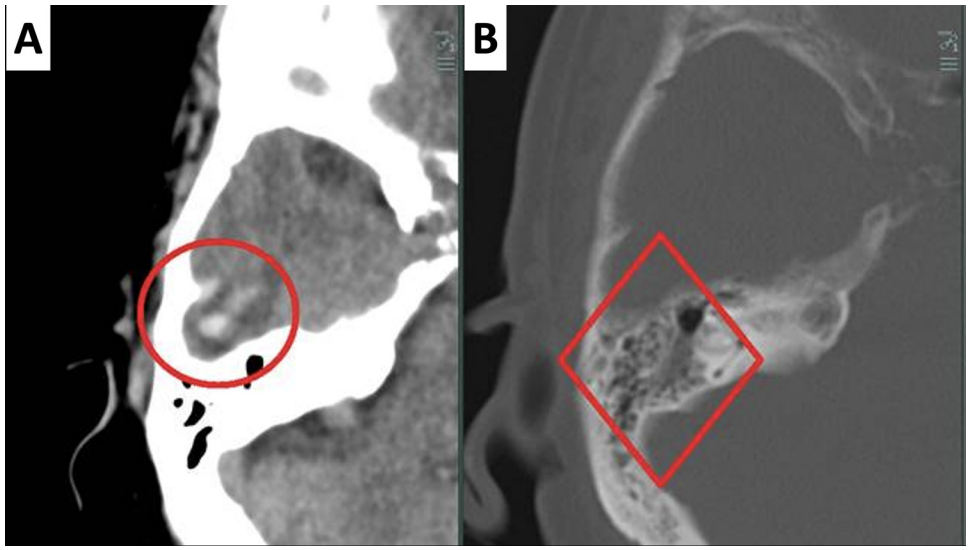

Fig. 2 – (A) Axial soft tissue window head CT day 2. (B) Axial edge enhanced bone window head CT day 2.

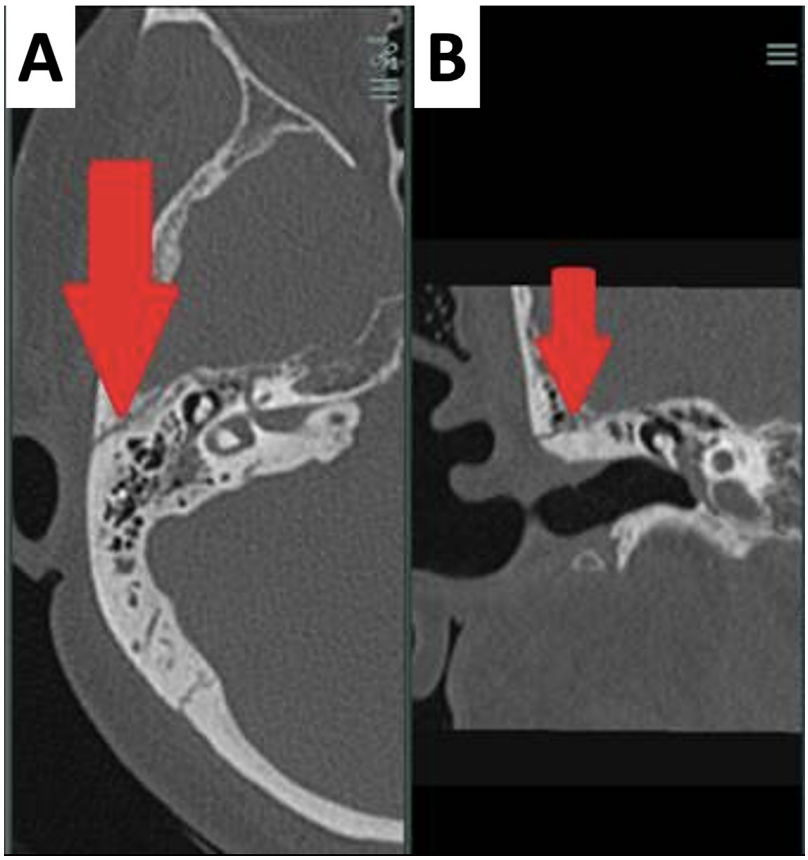

Fig. 3 – (A) Axial enhanced bone window temporal bone CT day 2. (B) Coronal edge enhanced bone window temporal bone CT day 2.

cavity (Fig. 3, red arrows). The ossicular chain was notably intact.

She was re-evaluated by neurosurgery, managed symptomatically, and observed closely. Given the absence of seizures, prophylactic antiepileptic therapy was not initiated. Her neurological status remained stable, and she was discharged with planned outpatient follow-up with her primary care provider and the consulting neurosurgeon.

Discussion

We describe an interesting case of headache and hearing loss secondary to a mastoid fracture resulting in a small temporal lobe hemorrhage and associated middle ear effusion. Our patient presented in the setting of syncope and associated fall, resulting in a scalp hematoma noted on presentation. The evolution of her clinical symptoms and associated radiographic findings during the hospitalization highlights the utility of prompt and appropriate imaging modalities and offers important clinical lessons for team-based patient care.

It has been reported that skull fractures are noted in approximately 4% of patients treated for head trauma, and anywhere from 14% to 22% suffer from temporal bone fractures [4]. A tremendous amount of force is usually required to fracture the temporal bone, owing to its thickness and density [1]. Intimate associations with surrounding structures including the inner ear, facial nerve, vestibulocochlear nerve, tympanic membrane, external auditory canal and large venous structures makes it crucial for these fractures to be identified promptly, and to evaluate for any associated complications [4].

In our patient, the images of the initial head CT were degraded from motion artifact and the axial slices did not register at the same level as the diagnostic follow up cranial and temporal bone CT (at the axial level of the malleolus and incus “ice cream cone”) which demonstrated the fracture. In retrospect the fracture line on the initial CT was not discernable. The density of the temporal bone and petrous ridge are also common sources of beam hardening artifact on CT, which is important to recognize during routine CT interpretation [5]. After hospitalization, with her new symptoms of hearing loss and physical examination findings of reduced right sided bone-conduction, additional imaging was obtained. Given new findings of temporal lobe hemorrhage on the repeat head CT, dedicated CT scan of the temporal bone was obtained, allowing for timely diagnosis of temporal bone fracture. This case illustrates the importance of recognizing associated imaging findings such as the adjacent parenchymal hematoma, and in the appropriate clinical setting with the keen clinical observation of diminished hearing, considering temporal bone fracture as an adjunctive morbidity. This case also highlights that effective communication between consulting providers, specialists and referring providers which provide opportunities to optimize the best care for our patients. Effective communication between the diagnosing radiologist, referring provider and consulting neurosurgeon allowed for timely diagnosis and early management.

REFERENCES

[1] Travis L, Stalnaker R, Melvin J. Impact trauma of the human temporal bone. J Trauma 1977;17(10):761–6.
[2] Ishman SL, Friedland DR. Temporal bone fractures: traditional classification and clinical relevance: temporal bone fractures: traditional classification and clinical relevance. Laryngoscope 2004;114(10):1734–41. doi:10.1097/00005537-200410000-00011.
[3] Ilea A, Butnaru A, Sfrângeu SA, et al. Temporal bone trauma effects on auditory anatomical structures in mastoid obliteration. Eur Arch Otorhinolaryngol 2019;276(2):513–20. doi:10.1007/s00405-018-5227-6.
[4] Saraiya PV, Aygun N. Temporal bone fractures. Emerg Radiol 2009;16(4):255–65. doi:10.1007/s10140-008-0777-3.
[5] Barrett JF, Keat N. Artifacts in CT: recognition and avoidance. Radiographics 2004;24(6):1679–91.