Neuroimaging Highlight

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Tension Pneumocephalus - The Mount Fuji Sign

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A 69-year-old female presented to the emergency department after becoming unresponsive at home following a progressive decrease in her level of consciousness (LOC) (See Figure 1). An urgent computerized tomography (CT) scan of the head demonstrated large bilateral chronic subdural hematomas (SDH's). Due to the resulting mass effect she was brought urgently to the operating room where the SDH's were evacuated via anterior and posterior burr holes placed bilaterally. No complications were encountered during the procedure. Prior to skin closure bilateral subdural catheters were placed in the posterior burr hole sites and left under closed suction.

Her immediate post-operative neurological exam demonstrated significant improvement in her LOC. Over the course of the next two hours, however, her LOC deteriorated dramatically. A repeat CT scan was obtained (See Figure 2), demonstrating a significant accumulation of subdural air in a pattern known as the "Mount Fuji" sign; thusly named because it resembles the silhouette of the famous Mount Fuji Volcano in Japan.

The presence of the Mount Fiji sign helps distinguish between pathologic subdural air causing mass effect (i.e. tension pneumocephalus) from subdural air normally observed after SDH evacuation (i.e. nontension pneumocephalus).[1,2] It is important to differentiate the two, as a true tension pneumocephalus can be a neurosurgical emergency and should always be considered if a patient deteriorates after evacuation of a SDH. The classic appearance of the Mount Fiji sign on CT is bilateral compression, peaking, and separation of the frontal lobes.[1-3] The "peaked" appearance of the frontal lobes is thought to be caused by intact bridging veins draining into the superior sagital sinus (See Figure 3).[3,4]

Tension pneumocephalus occurs in 2.5% to 16% of patients following evacuation of a chronic subdural hematoma.[1,2] It has been reported to occur in a variety of situations including, but not limited to: 1) posterior fossa surgery in the sitting position, 2) use

Figure 1: *Uninfused axial CT scan demonstrating bilateral mixed density subdural collections consistent with acute on chronic subdural hematomas.*

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Figure 2: *Uninfused axial CT scan following drainage of bilateral chronic subdural hematomas demonstrating bilateral tension pneumocephalus, also known as the "Mount Fuji" sign. The presence of interhemispheric air and effacement of the ventricular system suggests the air is under pressure.*

of an indwelling cerebrospinal drainage device, 3) trauma, and 4) chronic SDH drainage.[5] The exact mechanism in the development of tension pneumocephalus following SDH evacuation is unclear, but may involve a one-way ball and valve mechanism in which failure of the cerebral mantle to expand following SDH drainage creates a negative pressure gradient that draws air from the surgical wound to the area of unexpanded brain.

In the case of our patient we returned urgently to the operating room. Immediately upon opening the skin incisions an audible flow of air was noted that confirmed the presence of tension pneumocephalus. We repositioned the original catheters in addition to inserting two additional subdural catheters in the anterior incision sites. Following this procedure the patient's LOC returned to normal and she was discharged home three days later at her previous level of functioning.

References

1. Michel SJ. The Mount Fuji sign. Radiology 2004; 232(2): 449-450.
2. Ishiwata Y, Fujitsu K, Sekino T, et al. Subdural tension pneumocephalus following surgery for chronic subdural hematoma. J Neurosurg 1988; 68(1): 58-61.
3. Heckmann JG, Ganslandt O. The Mount Fuji sign. N Engl J Med 2004; 350(18): 1881.
4. Pop PM, Thompson JR, Zinke DE, Hasso AN, Hinshaw DB. Tension pneumocephalus. J Comput Assist Tomogr 1982; 6(5): 894-901.
5. Monajati A, Cotanch WW. Subdural tension pneumocephalus following surgery. J Comput Assist Tomogr 1982; 6(5): 902-906.

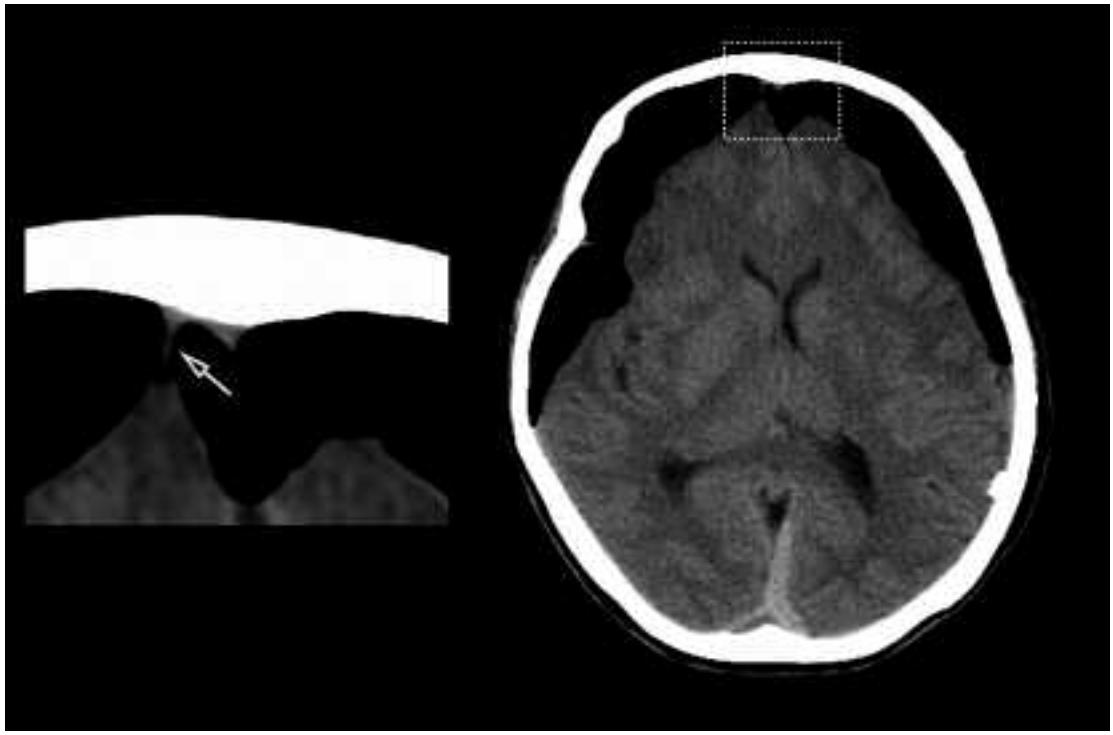

Figure 3: *Uninfused axial CT scan demonstrating bilateral tension pneumocephalus. Note the presence of a bridging vein in the right frontal region (see inset).*