

AMSER Case of the Month

November 2020

28-year-old male with acute head trauma



Olivia Hallas, OMS IV, Lake Erie College of Osteopathic Medicine

Matthew Wrench, DO PGY-4, Allegheny Health Network

Tyson Tragon, MD, Allegheny Health Network

Matthew Hartman, MD, Allegheny Health Network



Patient Presentation

- **HPI:** 28-year-old male presents to the Emergency Department via Life Flight as a Level 2 Trauma after being hit in the head with a baseball bat. Patient was found altered and is unable to participate in evaluation. He complains of head pain.
- **PMHx:** Polysubstance abuse
- **Vitals:** BP 145/54, HR 73, Temp 36.9 °C (98.4 °F), RR 17

Pertinent Physical Exam Findings

- Constitutional:
 - Young male lying in bed screaming that his head is hurting.
- HEENT:
 - Blood in the left external auditory canal.
 - Head appears normocephalic and atraumatic
- Eyes
 - Pupils: Equal, round, and reactive to light.
- Cardiovascular:
 - Rate and Rhythm: Normal.
 - Heart sounds: Normal. No murmur. No friction rub. No gallop.
- Pulmonary:
 - Effort: Normal. No respiratory distress.
 - Breath sounds: Normal. No wheezing or rales.
- Abdominal:
 - General: Soft. Non distended. Non tender. No guarding or rebound.
- Neurological:
 - Mental Status: Alert. **Disoriented.**

What Imaging Should We Order?

ACR Appropriateness Criteria

Variant 3: Major blunt trauma. Hemodynamically stable. Suspected facial injury. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT maxillofacial without IV contrast	Usually Appropriate	☼☼
CT head without IV contrast	Usually Appropriate	☼☼☼
Radiography trauma series	Usually Appropriate	☼☼☼
CT whole body with IV contrast	May Be Appropriate (Disagreement)	☼☼☼☼
CT whole body without IV contrast	May Be Appropriate	☼☼☼☼
CT head with IV contrast	Usually Not Appropriate	☼☼☼
CT head without and with IV contrast	Usually Not Appropriate	☼☼☼
CT maxillofacial with IV contrast	Usually Not Appropriate	☼☼
CT maxillofacial without and with IV contrast	Usually Not Appropriate	☼☼☼

This imaging modality was ordered by the ER physician

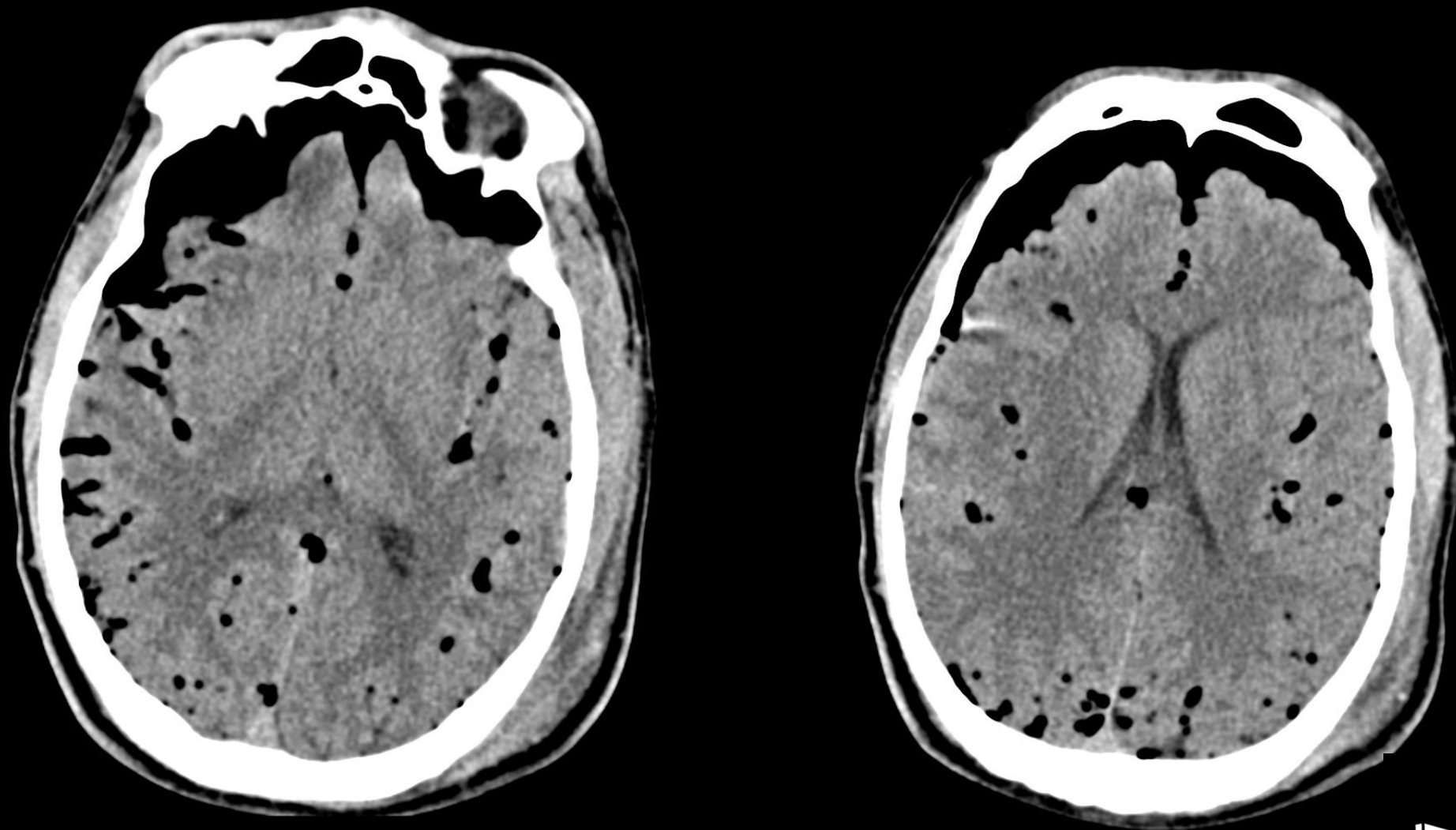
CT Scout View (unlabeled)



CT Scout View (labeled)

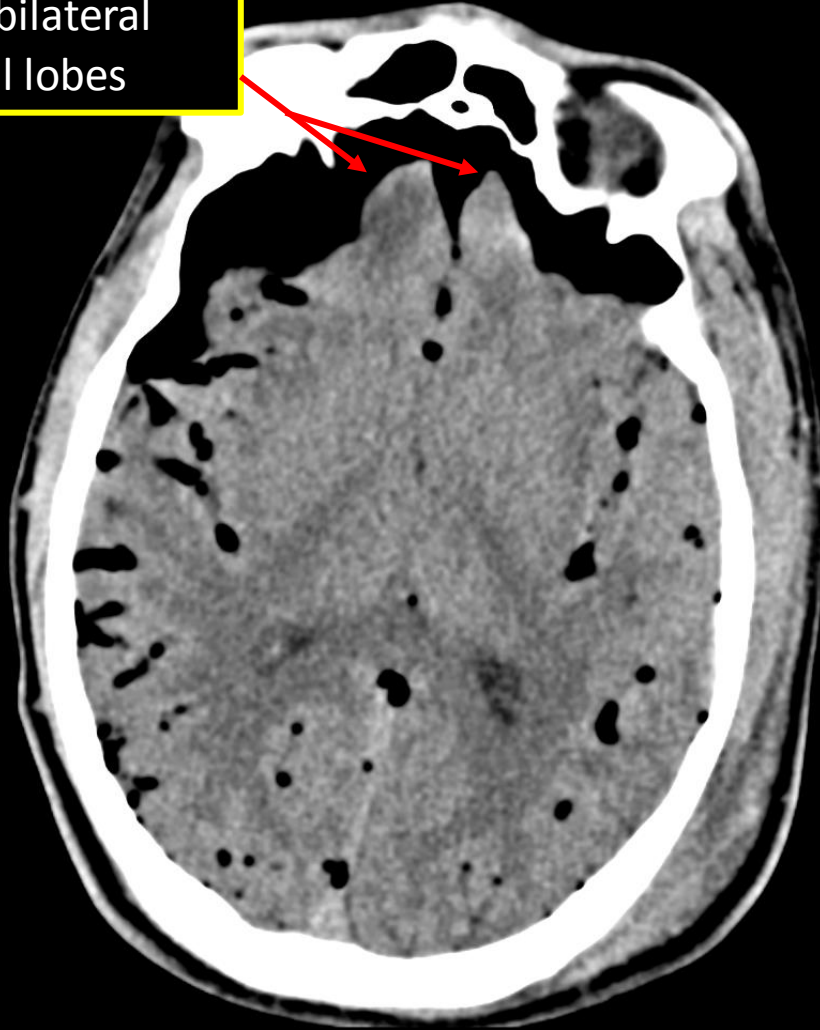


CT Head (unlabeled)

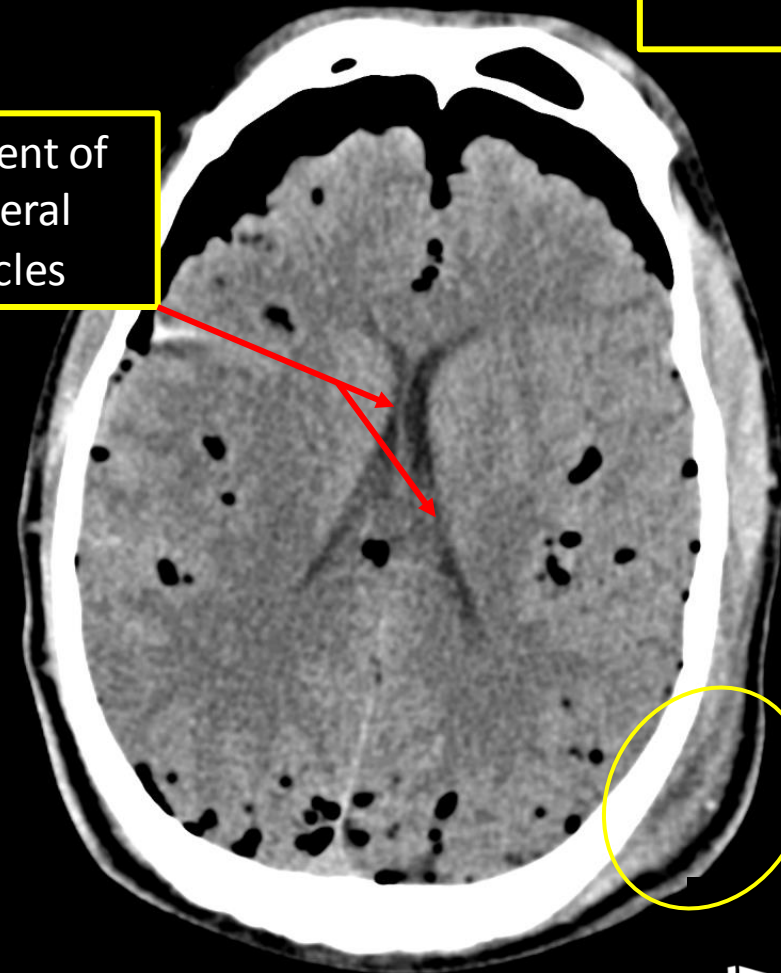


CT Head (labeled)

The air causes significant mass effect on the bilateral frontal lobes



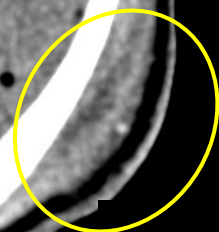
Extensive intracranial air



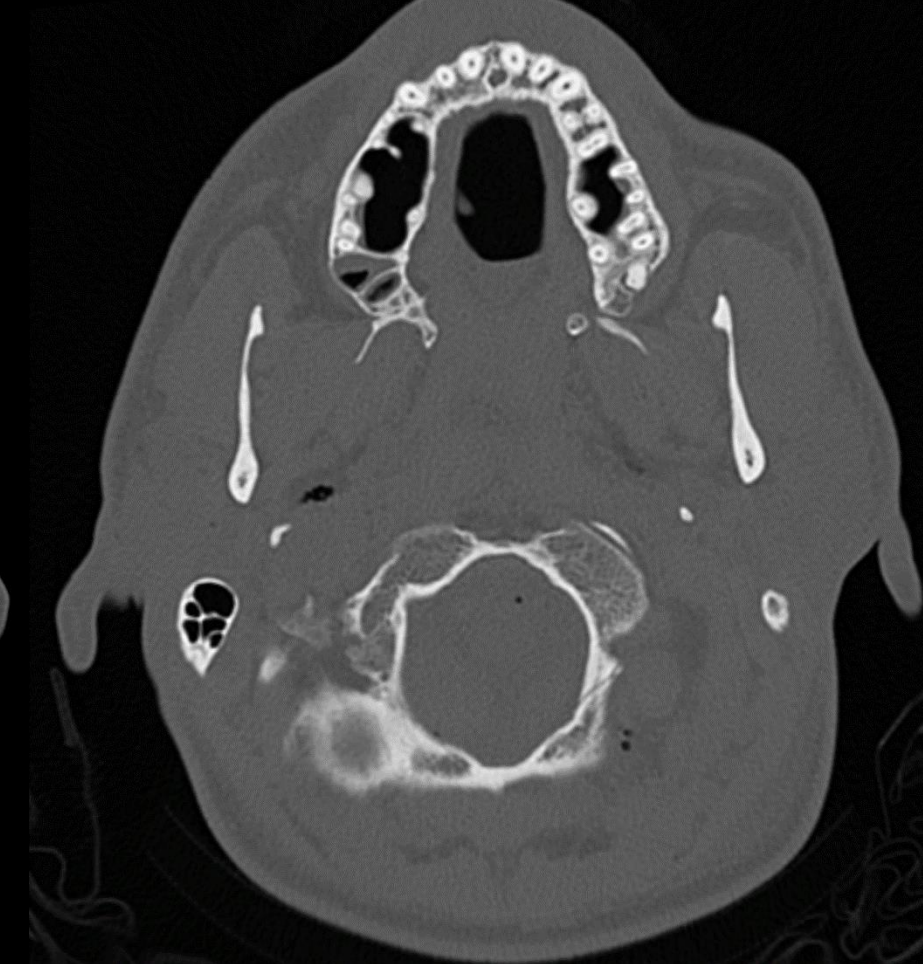
Effacement of the lateral ventricles

Q: Where did this air come from?

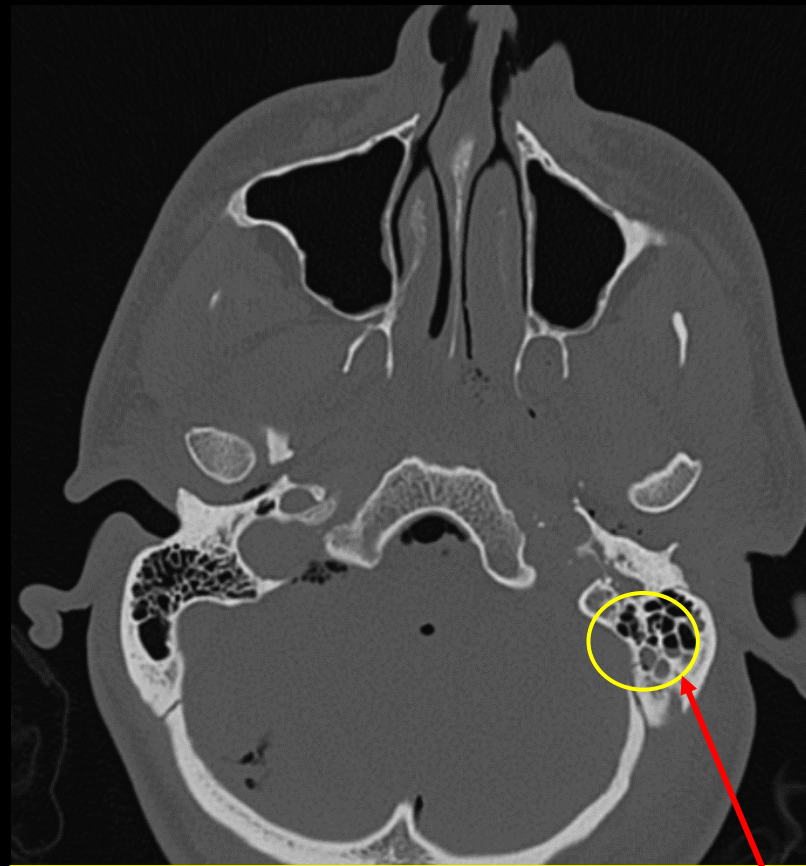
Hint: Remember mechanism of injury and what may lie under the scalp soft tissue swelling (yellow circle)



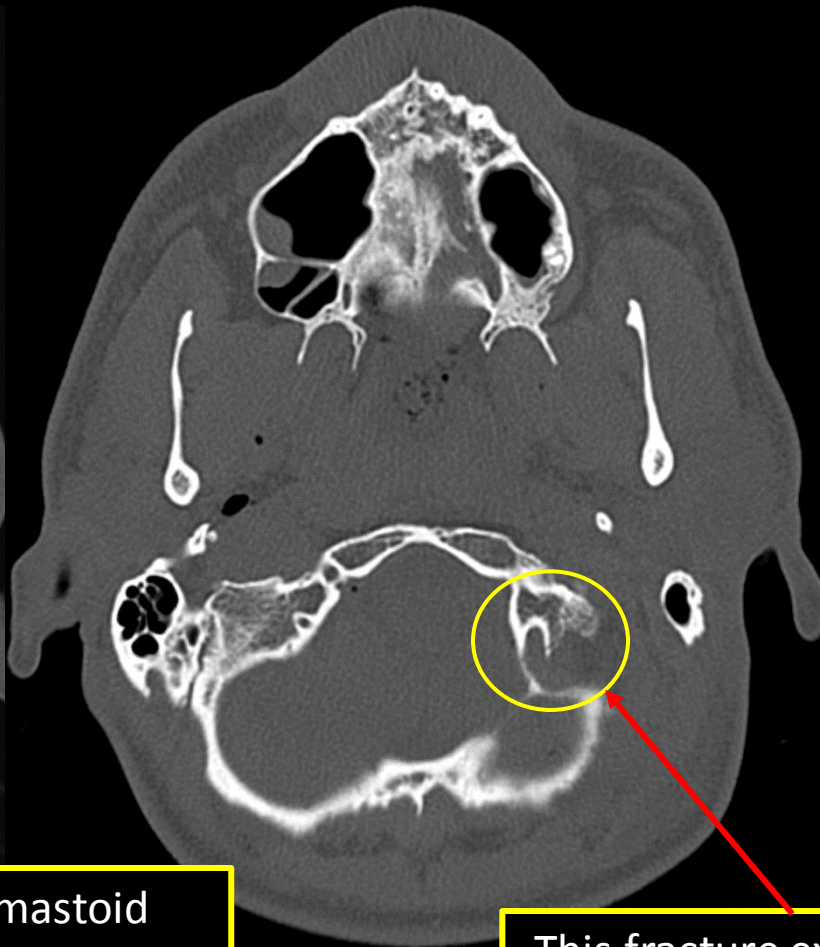
CT Head (unlabeled)



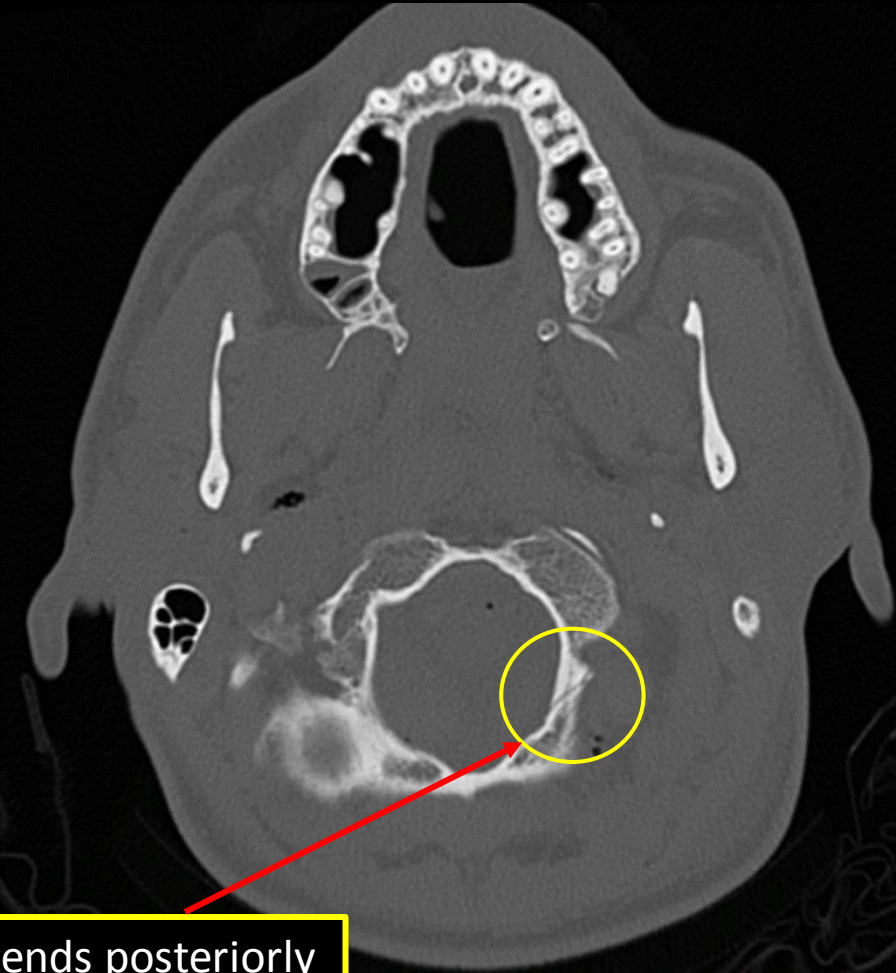
CT Head (labeled)



Nondisplaced fracture involving the mastoid segment of the left temporal bone. This was contiguous with a non-displaced fracture of the squamous temporal bone (not pictured).



This fracture extends posteriorly to involve the left occipital bone and left foramen magnum.



Final Dx:

Pneumocephalus secondary to left temporal bone fracture

Pearl:

If you see pneumocephalus on conventional head CT but cannot find a calvarial fracture, look to the temporal bone and consider recommending dedicated temporal bone CT!

Pneumocephalus

- Etiology
 - Trauma
 - Surgical instrumentation
 - Infection
 - Barotrauma
- Symptoms
 - Often Asymptomatic
 - Patients report splashing sounds in their head
 - *bruit hydro aérique*
- Complications
 - Can rarely lead to life-threatening tension pneumocephalus

Pneumocephalus

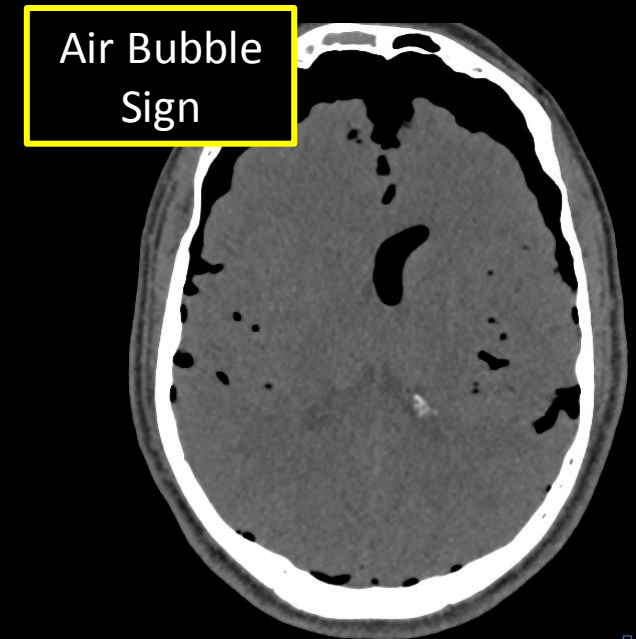
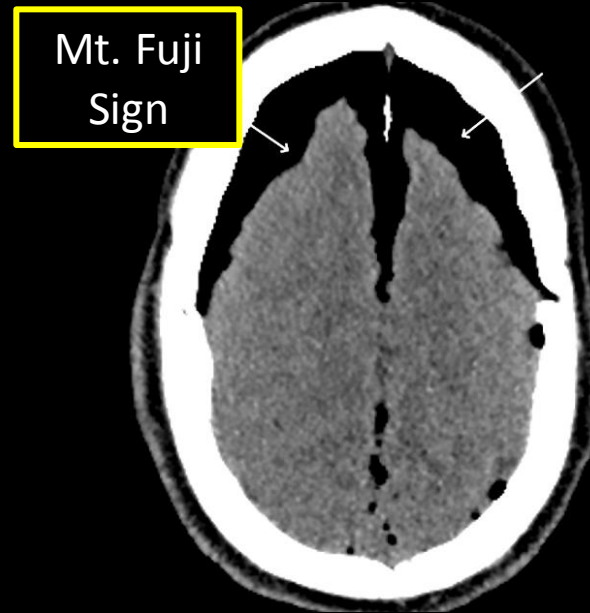
- Treatment
 - Conservative management
 - bed rest, prophylactic antibiotics, and Trendelenburg bed positioning
 - Surgical
 - if conservative management fails
 - if tension pneumocephalus develops

Pneumocephalus Radiographic Findings

- Key feature is intracranial air
 - X-Ray
 - Air appears black
 - CT
 - HU: -1000HU (use lung window to differentiate from fat)
 - MRI
 - Air is hypointense on all sequences

Identifying Tension Pneumocephalus

- Life-threatening complication of pneumocephalus
 - Brain creates ball-valve mechanism
 - Air enters the brain, but brain parenchyma blocks air from escaping, creates a one-way valve
- Radiographic features
 - Peaking sign, aka Mount Fuji sign
 - Air compresses frontal lobes
 - Air bubble sign
 - Air bubbles in subarachnoid space



Identifying Tension Pneumocephalus



=



Mount Fuji Sign

Mount Fuji

References:

- Albert, A., Allbright, R., Nichols, T., Farley, E., & Vijayakumar, S. (2017, November 26). Pneumocephalus after the Treatment of an Inoperable Superior Sulcus Tumor with Chemoradiation. Retrieved September 17, 2020, from <https://www.hindawi.com/journals/crionm/2017/3016517/>
- Choudhary, G. (n.d.). Tension pneumocephalus: Radiology Reference Article. Retrieved September 17, 2020, from <https://radiopaedia.org/articles/tension-pneumocephalus?lang=us>
- O-Dat. (2020, April 28). 12 Interesting Facts About Mt. Fuji That Will Make Your Visit Even Better! Retrieved September 17, 2020, from https://wow-j.com/en/Allguides/other/tips_manners/00917_en/
- Weerakkody, Y. (n.d.). Pneumocephalus: Radiology Reference Article. Retrieved September 17, 2020, from <https://radiopaedia.org/articles/pneumocephalus?lang=us>
- Yoon, S., Oh, G., Lee, S., Lee, B., Chun, J., & Yu, I. (2008, June). Pneumocephalus in patients with orthostatic headache. Retrieved September 17, 2020, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2686872/>