AMSER Case of the Month
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Complicated Headache with Fever

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Patient Presentation

CC: 30yr old female who was transferred from an outside hospital for a week of headache, fever, chills, nausea, vomiting, blurry vision, photophobia, and 3 days of L side facial pain, crossed eyes, episodes of vertigo, but no otorrhea

PMH: L side ear infection with purulent otorrhea treated with PO antibiotics in 2017, MVA in 2004 with head and L4/L5 injury

PSH/SH/FH: Not contributory

Meds: vancomycin, metronidazole, ceftriaxone started at the outside hospital

Vitals: T 36.8, PR 64, RR 14, BP 147/84, SpO2 98% on RA

PE: alert and oriented to time, person and place, equal, round and reactive pupils, CN1-12 grossly intact except R CN6 palsy, 5/5 bilateral UE and LE strength

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Pertinent Labs

- WBC $14x10^3$ with
  - Neutrophils 80%
  - Lymphocytes 12.1%
- Hb 10.3, HCT 30.4, PLT 437
- PT 15.6 PTT 35
- LP
  - Glucose 71
  - Protein 44
  - Lymphocytes 3
  - Neutrophils 80

Differential Dx Prior to Imaging

- Empyema
- Abscess
- Meningitis
- Encephalitis
- Intracranial hemorrhage
- Metastatic tumor
- Primary brain tumor

What Imaging Should We Order?

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ACR Appropriateness Criteria for Headache

Clinical Condition: Headache

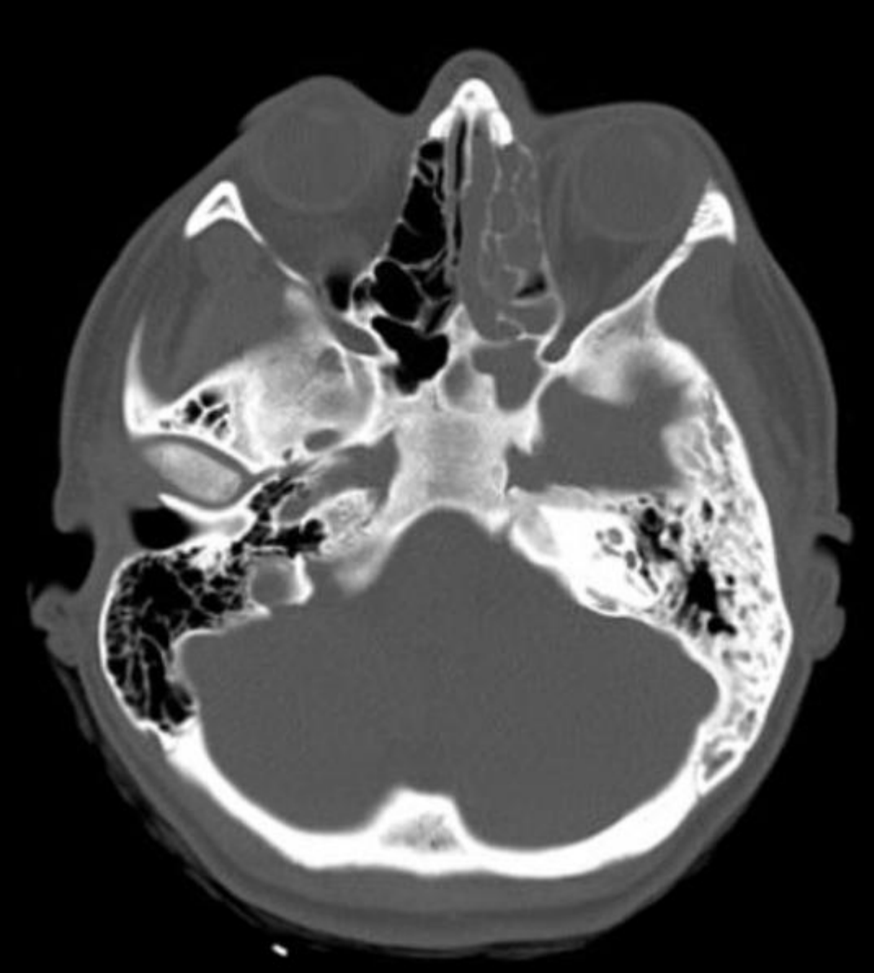
Variant 7: Headache, suspected intracranial complication of sinusitis and/or mastoiditis. (See the ACR Appropriateness Criteria® on "Sinonasal Disease")

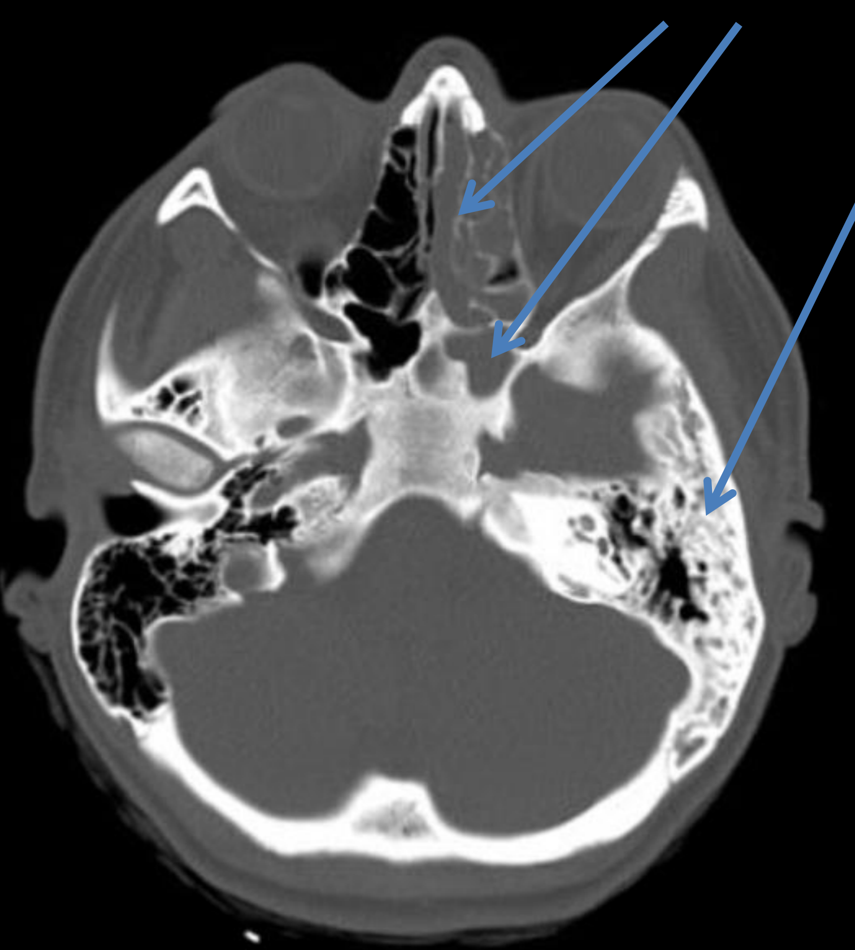
Radiologic Procedure	Rating	Comments	RRL*
MRI head without and with IV contrast	8		O
MRI head without IV contrast	6		O
CT head without IV contrast	6		☢☢☢
CT head without and with IV contrast	6		☢☢☢
CT head with IV contrast	5		☢☢☢

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate — *Relative Radiation Level

This imaging modality was ordered by the ER physician

What do you see on CT Head image without contrast?




Opacification of left ethmoid/superior sphenoid sinus
Opacification of left mastoid

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MR with and without IV contrast

T1 Post Contrast

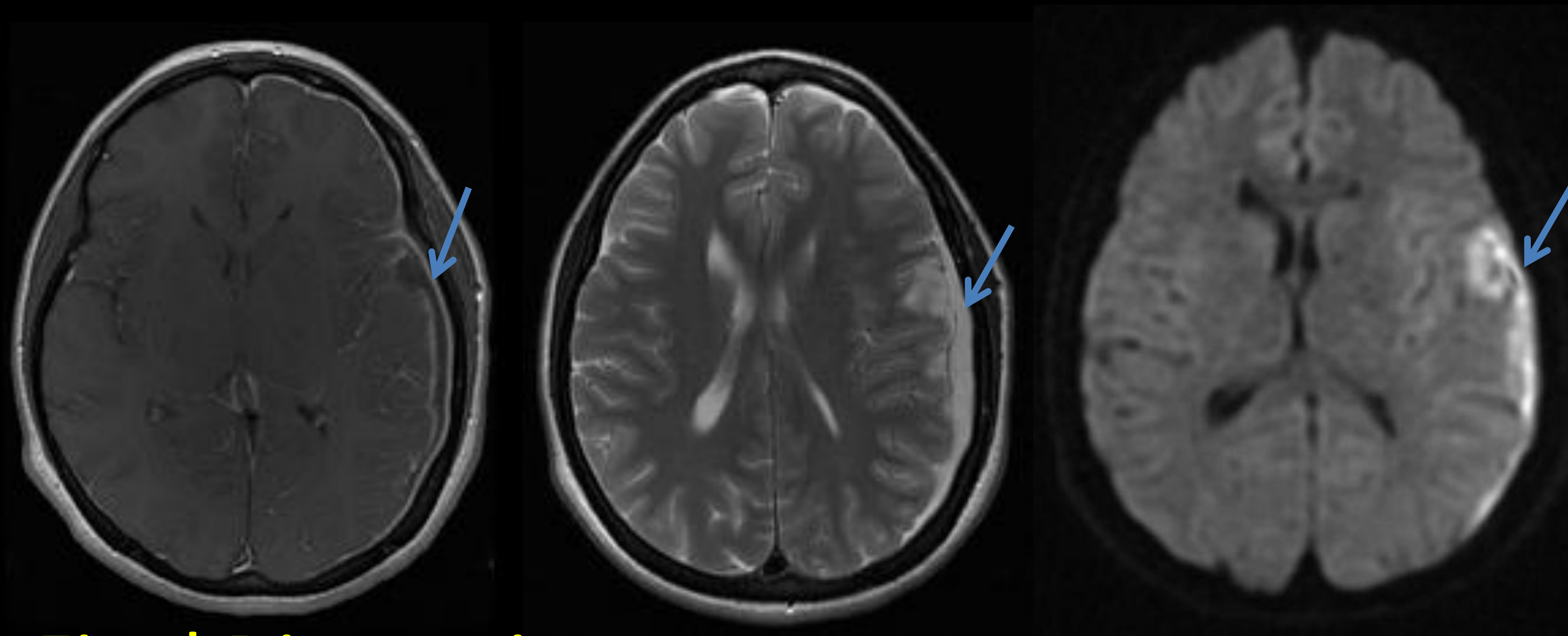
Rim enhancement of the extraaxial fluid collection

T2

Extraaxial fluid collection along the left temporal lobe

DWI

Restricted diffusion



Final Diagnosis

Left sphenoid/ethmoid sinusitis, mastoiditis and left temporal subdural empyema

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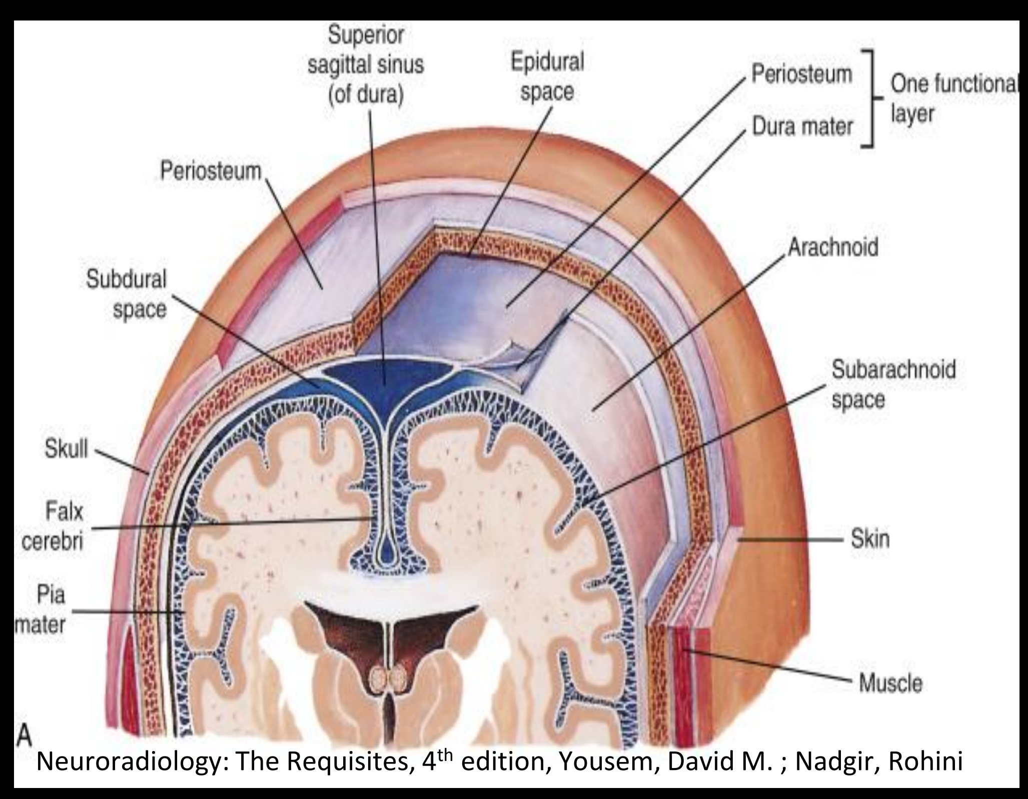
Pathophysiology of Subdural Empyema

- Epidemiology
  - Accounts for 20-30% of intracranial infections; others include brain abscess and epidural empyema
- Etiology
  - Bacterial infections gain access to the subdural space by direct extension of frontal sinusitis, mastoiditis, otitis media or most commonly retrograde thrombophlebitis of communicating veins
  - Posttraumatic infection of hematoma
  - Postoperative infection of a craniotomy cavity
- Pathology features
  - Infected CSF collections **within the subdural space** due to **disruption of arachnoid meningeal barrier** along the convexity and/or parafalcine and paratentorial regions of the brain
- Complications
  - Cortical vein thrombosis

Radiology-Anatomy Correlation



Neuroradiology: The Requisites, 4th edition, Yousem, David M. ; Nadgir, Rohini

Subdural pathology (e.g. empyema or hematoma) : **concave** mass lesion on CT or MR
Epidural pathology: **convex** mass lesion on CT or MR

Various Subdural Pathologies

- Subdural **effusions**: sterile collection of fluid in subdural space
- Subdural **empyema**: purulent infection in subdural space
- Subdural **hygroma**: collection of fluid with similar characteristics to CSF with high protein contents
- Subdural **hematoma**: hemorrhage into subdural space
- **Subdural empyema** commonly requires surgical managements (burr holes or craniotomy)
- **Empiric antibiotics** regimens include vancomycin, metronidazole, plus one of cefotaxime, ceftriaxone, ceftazidime or cefepime

References

- “Neurologic complications of bacterial meningitis in adults” by Sexton DJ, Uptodate.com
- “Subdural empyema”, Sharma R and Gaillard F *et al*, Radiopaedia.org
- Ciobanu AM, Rosca T, Vladescu CT, Tihoan C, Popa MC, Boer MC, et al. Frontal epidural empyema (Pott's puffy tumor) associated with Mycoplasma and depression. Rom J Morphol Embryol. 2014;55(3 Suppl):1203-7.
- Dolan RW, Chowdhury K. Diagnosis and treatment of intracranial complications of paranasal sinus infections. J Oral Maxillofac Surg. 1995;53(9):1080-7.
- Niehaus MT, Krape KN, Quinn SM, Kane BG. Frontal sinusitis complicated by a brain abscess and subdural empyema. Radiol Case Rep. 2018;13(2):456-9.