AMSER Case of the Month December 2022

23-year-old male presents with fever and altered mental status.

Jaimie Fan, MS4
Cooper Medical School of Rowan University

Mary Woodruff, DO, PGY3
Cooper University Hospital

Rahul Garg, MD
Cooper University Hospital

Patient Presentation

- HPI: A 23-year-old male presented to the emergency department (ED) with drug intoxication, altered mental status, and fever. 8 days prior, he had presented to the ED with a 6-day history of head, neck, and back pain & vomiting, but he had left against medical advice, without treatment.
- Past medical history: Untreated Hepatitis C, Opioid use disorder.
- Past surgical history: None.
- Family history: Noncontributory.
- Social history: IV fentanyl use.

Pertinent Labs

- HIV: negative
- Complete Blood Count:
  - White Blood Cells: 19.16 x 10^3/microliter (normal: 4 x 10^3 /microliter to 11 x 10^3 /microliter)
- Basic Metabolic Panel:
  - Na^+: 127 (normal: 135-145 mmol/L)
  - Cl^-: 85 (normal: 96-108 mmol/L)

What Imaging Should We Order?

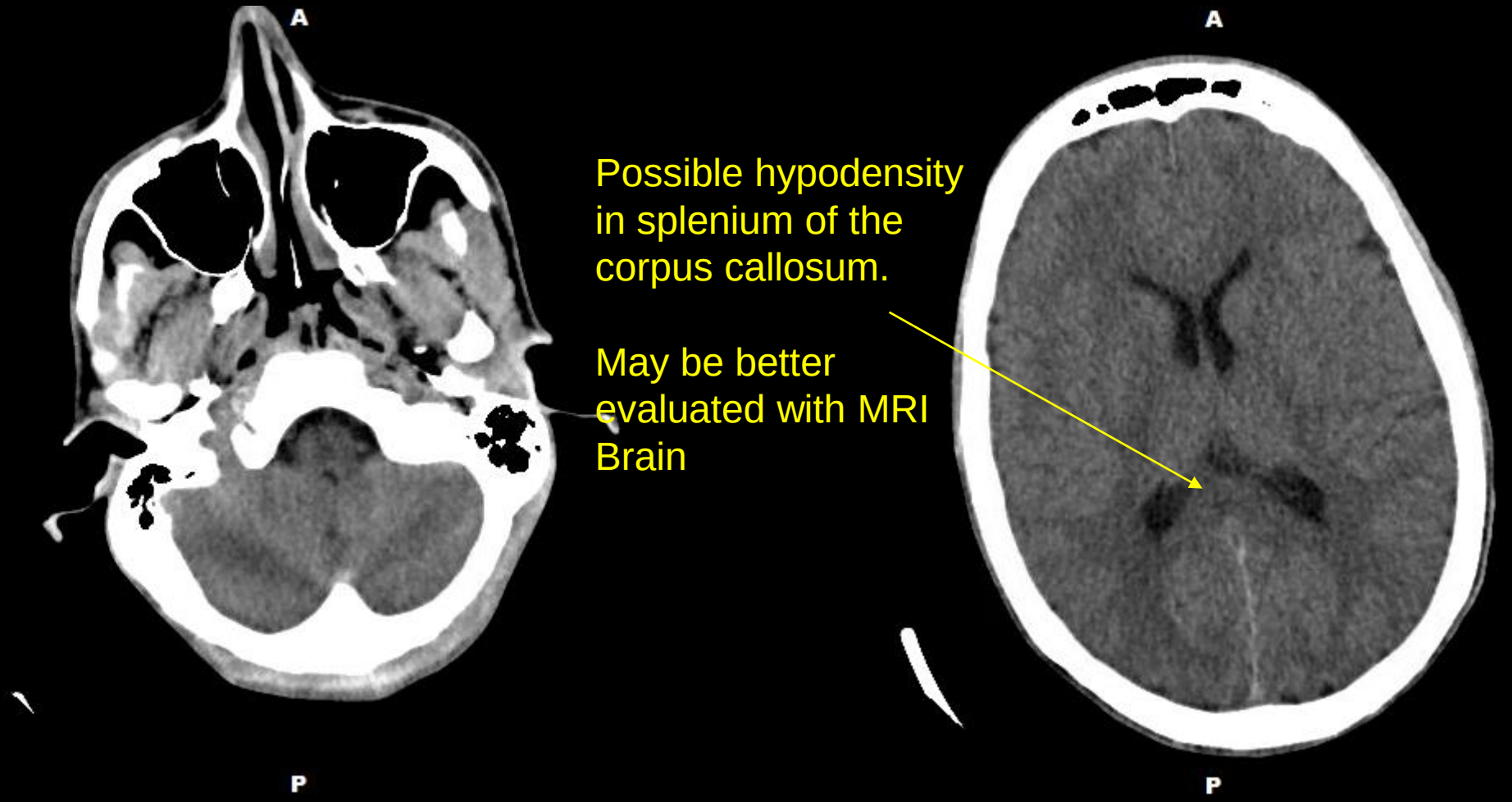
Select the applicable ACR Appropriateness Criteria

Scenario	Procedure	Adult RRL	Peds RRL	Appropriateness Category	
Mental status change, CNS infection suspected	CT head without IV contrast	1-10 mSv ☢☢☢	0.3-3 mSv [ped] ☢☢☢	Usually appropriate	🟢
	MRI head without IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate	🟢
	MRI head without and with IV contrast	0 mSv O	0 mSv [ped] O	May be appropriate	🟡
	CT head without and with IV contrast	1-10 mSv ☢☢☢	3-10 mSv [ped] ☢☢☢☢	May be appropriate	🟡
	CT head with IV contrast	1-10 mSv ☢☢☢	0.3-3 mSv [ped] ☢☢☢	Usually not appropriate	🔴

This imaging modality was ordered by the ED physician.

Findings (unlabeled)

Findings (labeled)



Possible hypodensity in splenium of the corpus callosum.

May be better evaluated with MRI Brain

Interval Lumbar Puncture

- **Opening pressure:** 38 cm H_2O (normal: <20 cm H_20)
- **Appearance:** clear and colorless
- **Corrected nucleated cells:** 461/microliter (normal: 0-5)
  - **Elevated granulocytes:** 26% (normal: 0-6%)
- **Red blood cells:** 4/microliter (normal: <1)
- **Glucose:** 30 (normal: 40-75 mg/dL)
- **Protein:** 67 (normal: 15-45 mg/dL)
- **Microbiology:** Cryptococcal antigen positive

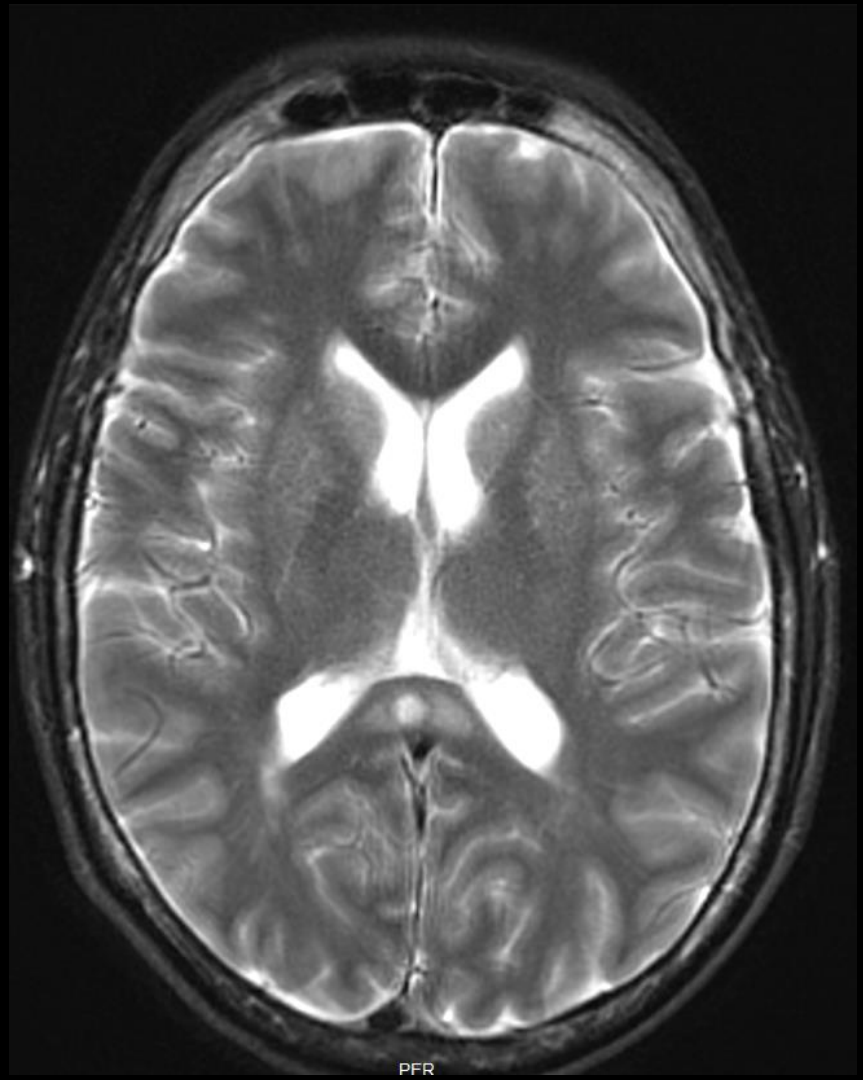
- **Diagnosis:** Cryptococcal Meningitis

Select the applicable ACR Appropriateness Criteria

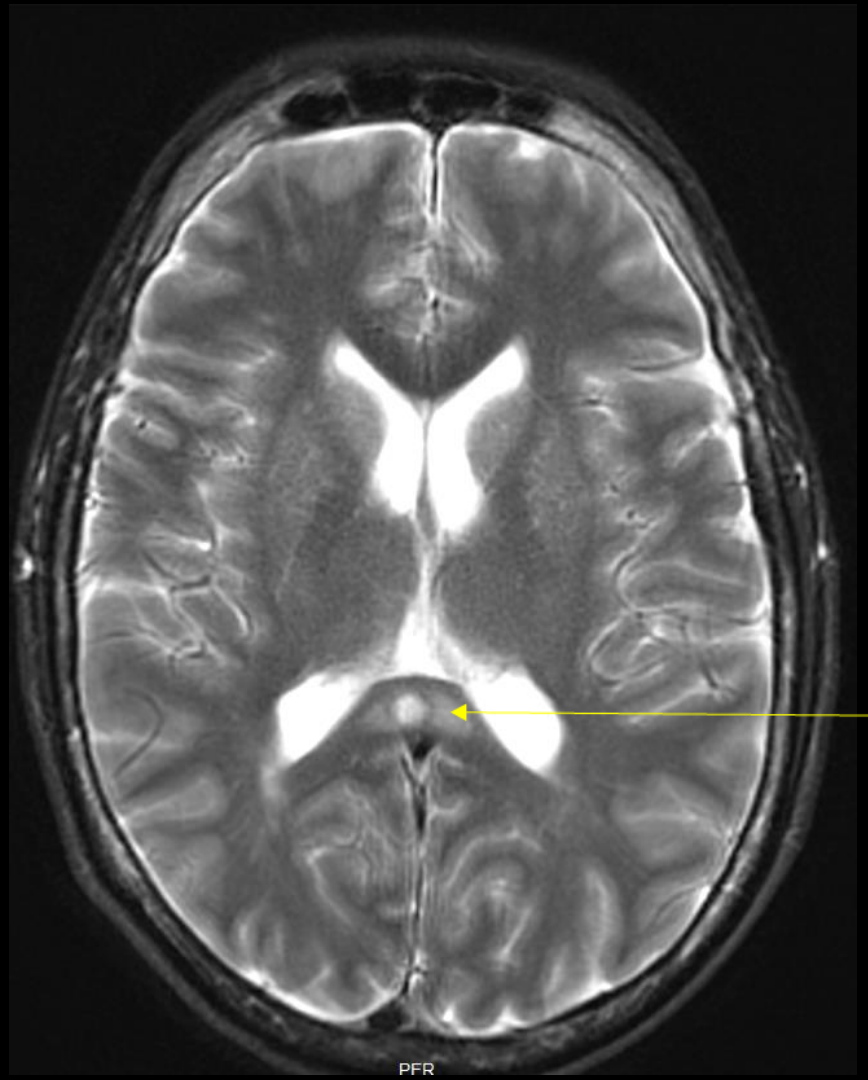
Scenario	Procedure	Adult RRL	Peds RRL	Appropriateness Category	
Mental status change, known CNS infection	CT head without IV contrast	1-10 mSv ☢☢☢	0.3-3 mSv [ped] ☢☢☢	Usually appropriate	●
	MRI head without IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate	●
	MRI head without and with IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate	●
	CT head without and with IV contrast	1-10 mSv ☢☢☢	3-10 mSv [ped] ☢☢☢☢	May be appropriate	●
	CT head with IV contrast	1-10 mSv ☢☢☢	0.3-3 mSv [ped] ☢☢☢	May be appropriate	●

This imaging modality was ordered by the primary care team

Findings: (unlabeled)



Findings: (labeled)

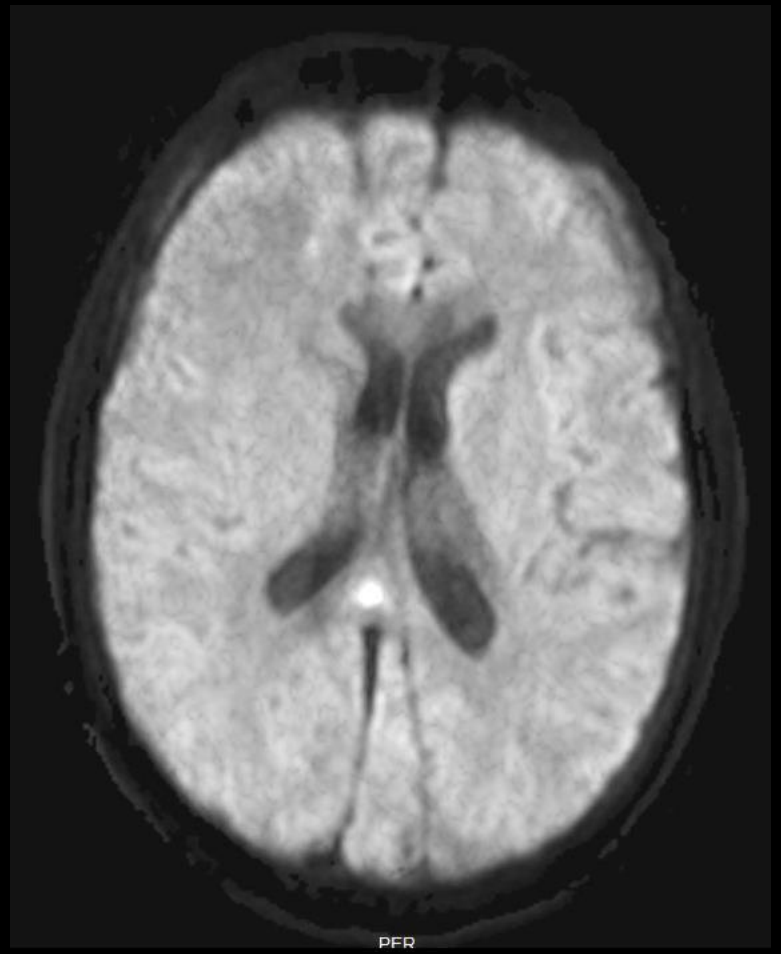


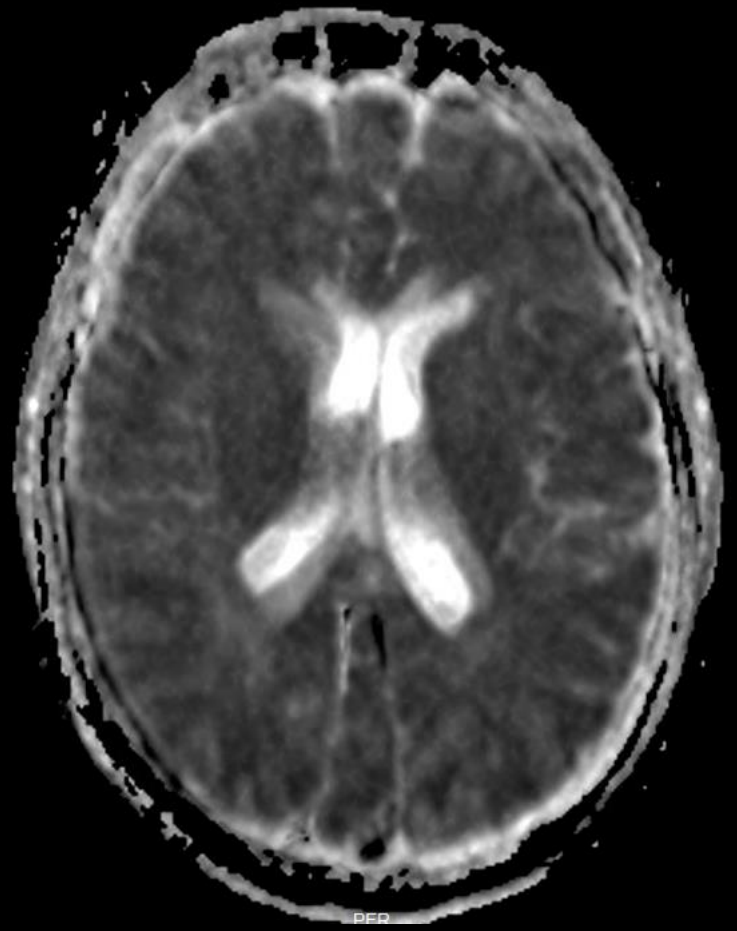
- Round 0.7 cm T2 hyper-intense lesion with surrounding edema in splenium of the corpus callosum
- Differential considerations would include abscess or lymphoma. Recommend further characterization with contrast-enhanced MRI.

T2 Fat Saturated Axial Blade

AMSER

Findings: (unlabeled)



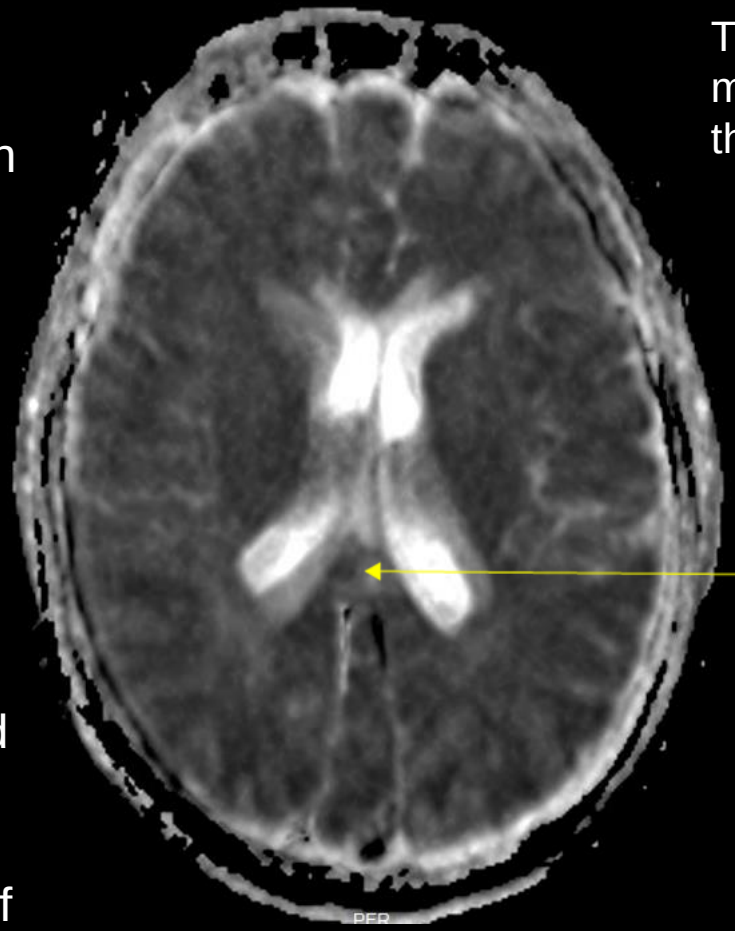


Findings: (labeled)

Bright on Diffusion

DWI

This lesion in the splenium of the corpus callosum demonstrates restricted diffusion. This is most concerning for an abscess given the clinical history. Differential considerations include, acute ischemic infarction, axonal injury, various toxic/metabolic processes such as Marchiafava Bignami disease, lymphoma, and cytotoxic lesions of the corpus callosum (CLOCs) in the setting of seizures. Need contrast enhanced MRI.



Dark on ADC

ADC

There is some motion artifact in these images.

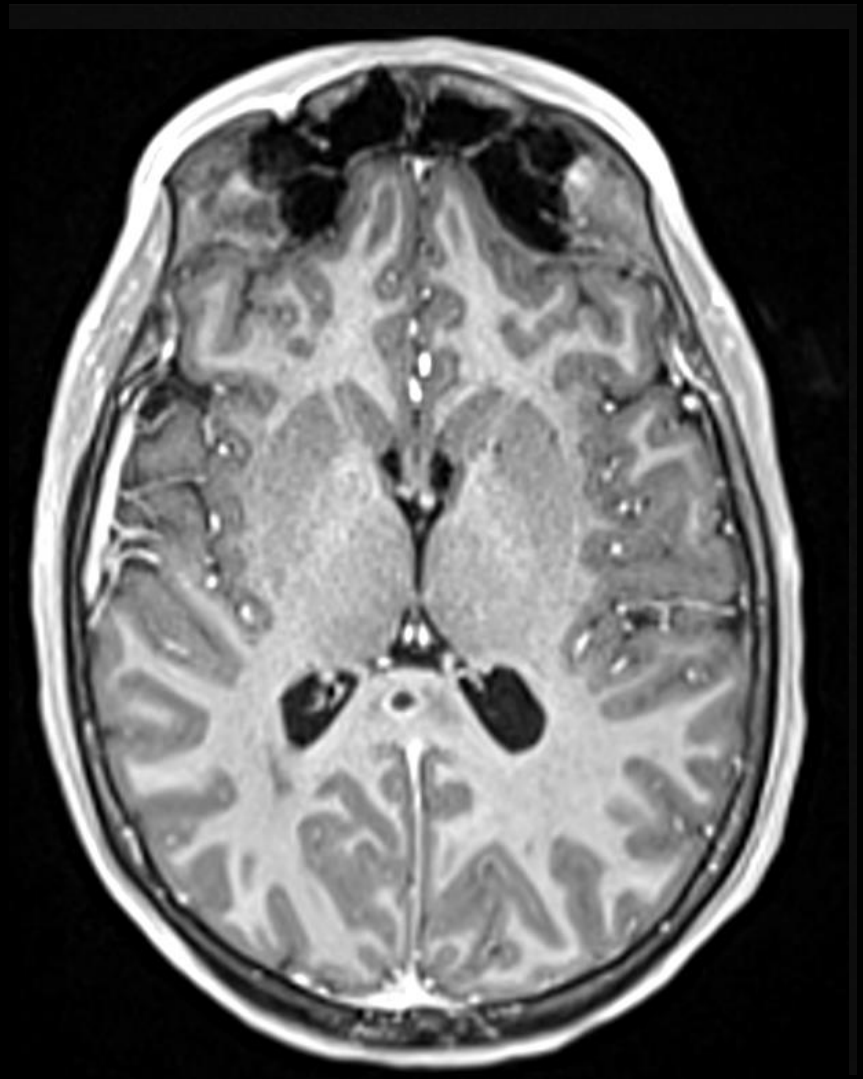
Select the applicable ACR Appropriateness Criteria

Scenario	Procedure	Adult RRL	Peds RRL	Appropriateness Category	
Mental status change, known CNS infection	CT head without IV contrast	1-10 mSv ☢☢☢	0.3-3 mSv [ped] ☢☢☢	Usually appropriate	●
	MRI head without IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate	●
	MRI head without and with IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate	●
	CT head without and with IV contrast	1-10 mSv ☢☢☢	3-10 mSv [ped] ☢☢☢☢	May be appropriate	●
	CT head with IV contrast	1-10 mSv ☢☢☢	0.3-3 mSv [ped] ☢☢☢	May be appropriate	●

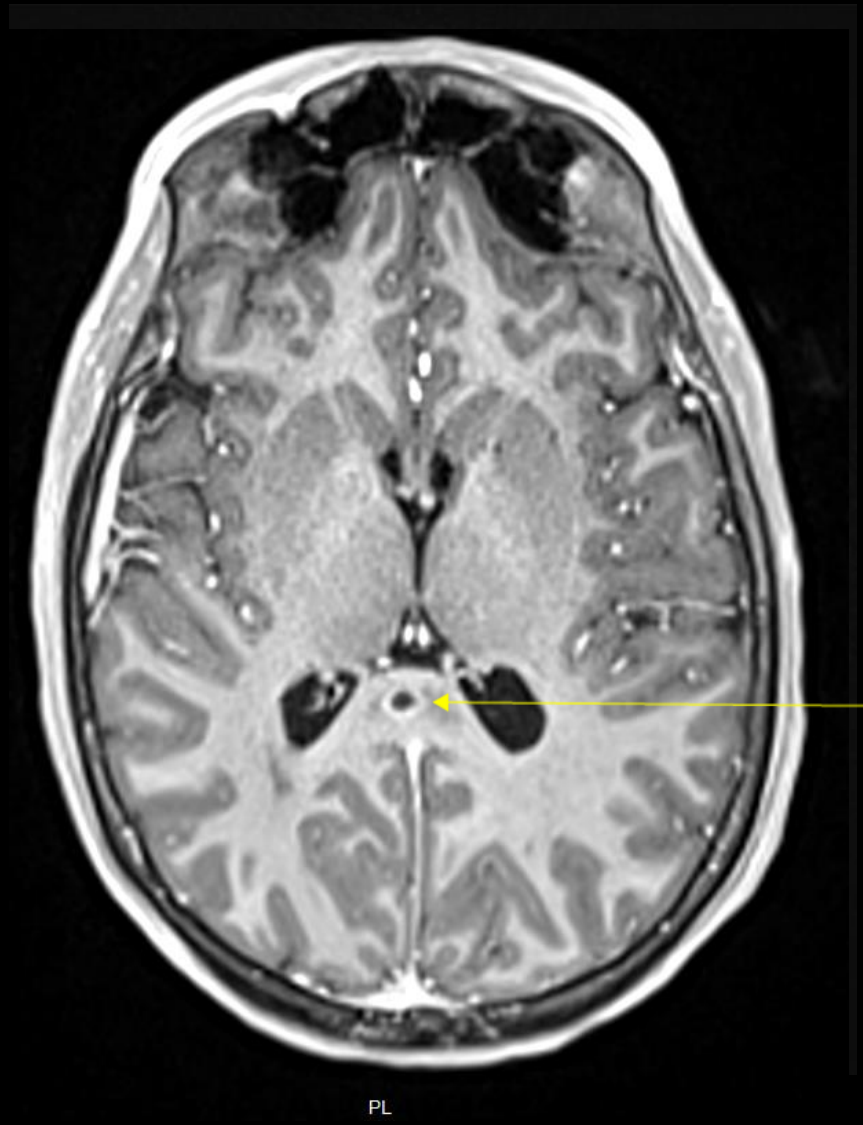
This imaging modality was ordered by primary care team.

AMSER

Findings: (unlabeled)



Findings: (labeled)



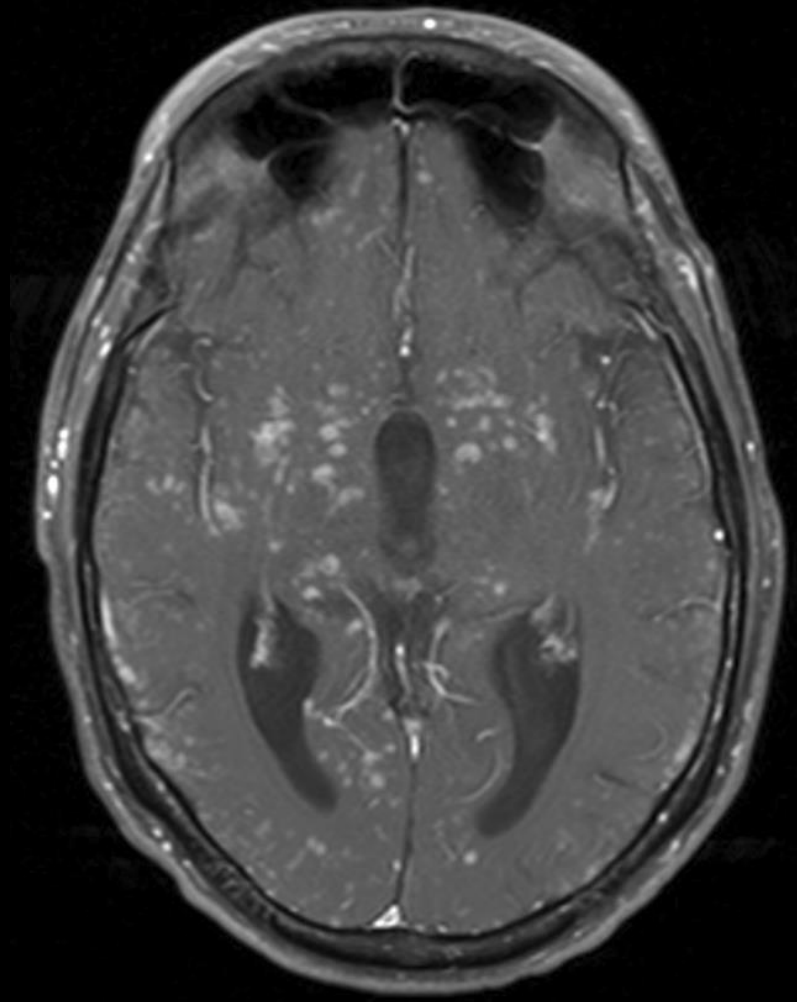
Round 0.7 cm ring-enhancing lesion in splenium of the corpus callosum, most likely representing an abscess.

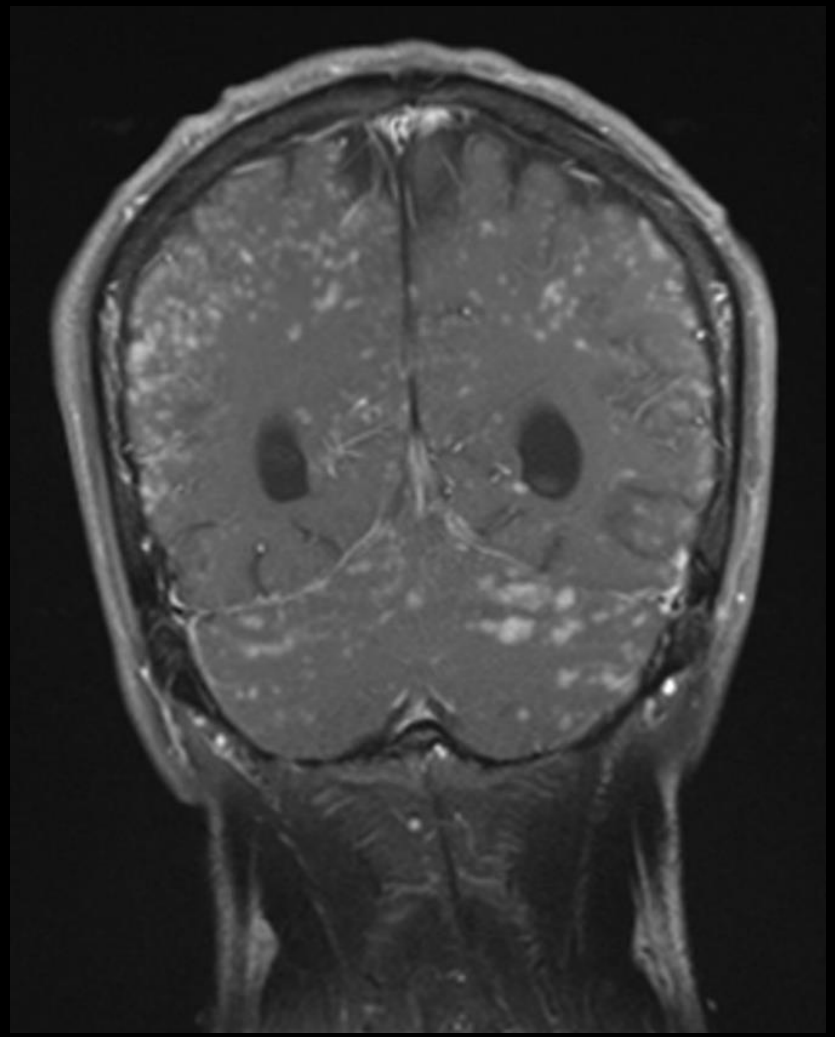
3D Axial T1 MP RAGE with Contrast

Recommend follow-up MRI to monitor for resolution.

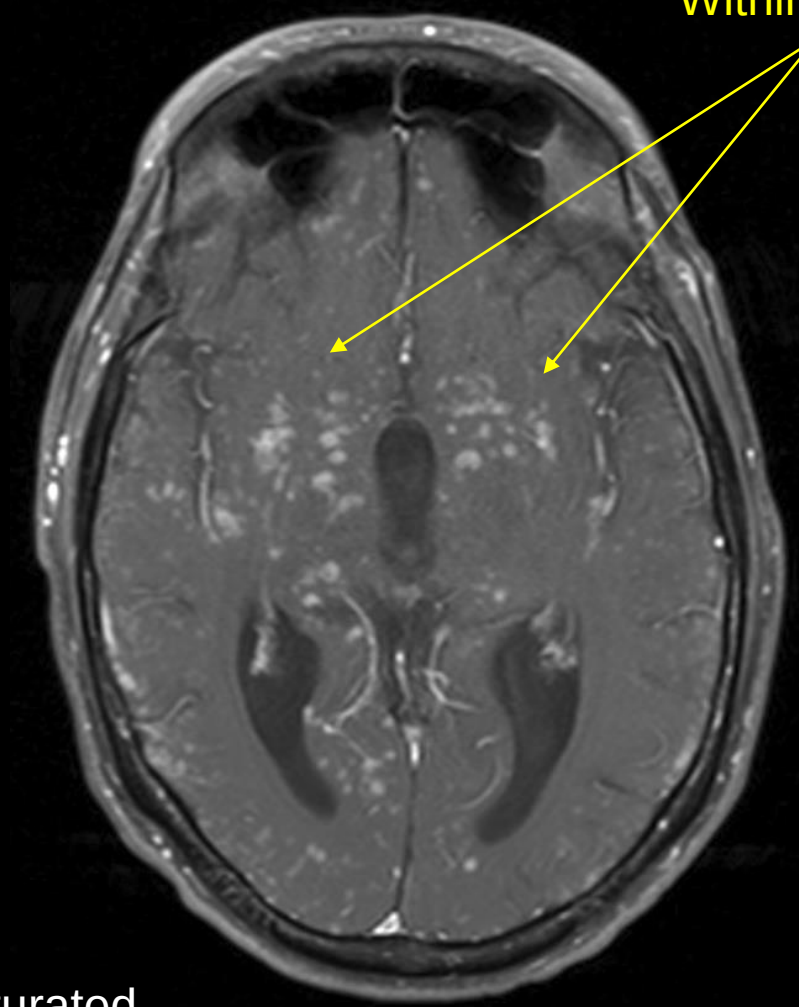
- Interval treatment:
  - **Induction:** IV liposomal Amphotericin and oral Flucytosine x 6 weeks
  - **Consolidation:** high-dose oral Fluconazole x 8 weeks
  - **Maintenance:** subsequently, low-dose oral Fluconazole daily

MRI with Contrast 4 months later (unlabeled)

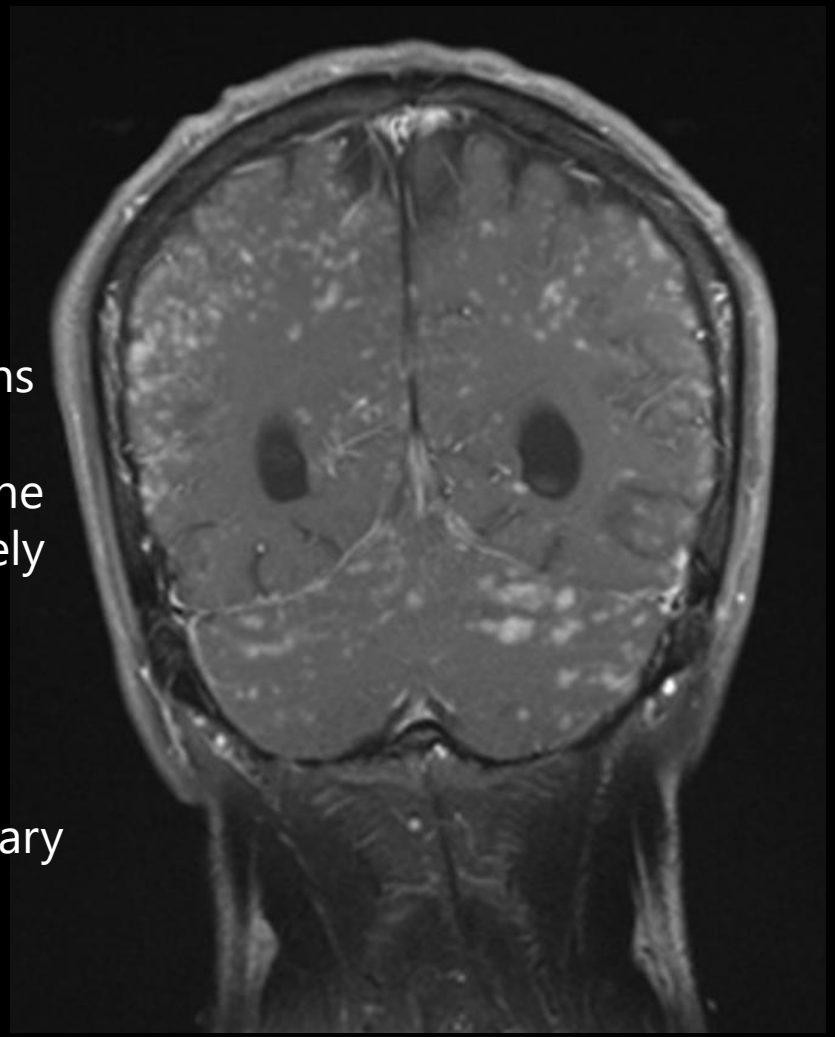




MRI with Contrast 4 months later (labeled)

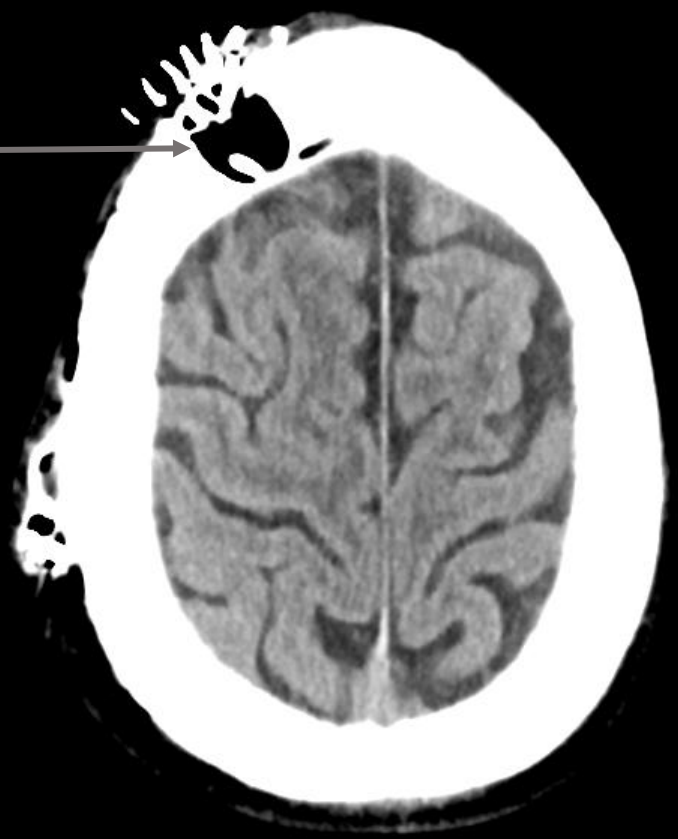


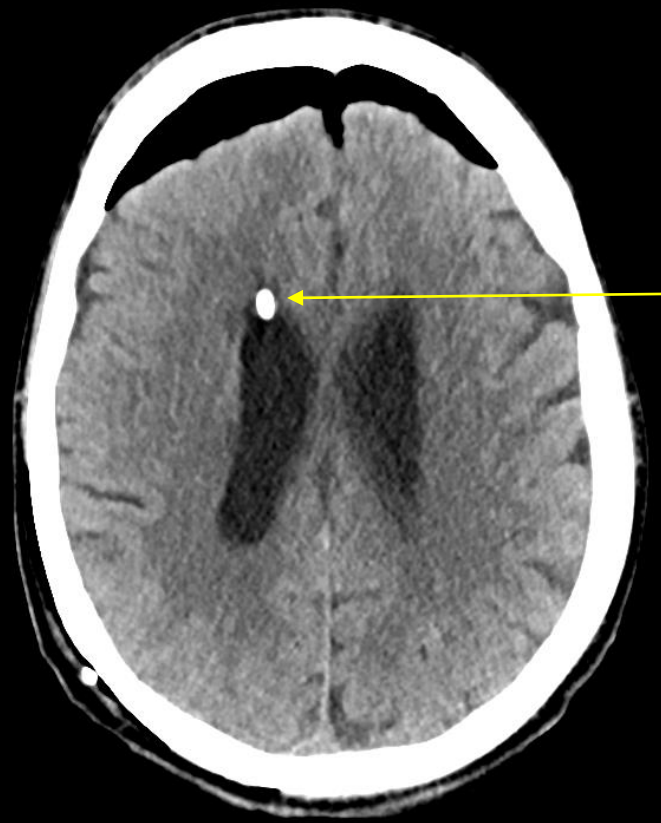
Diffuse interval progression of cryptococcal infection 4 months later with predilection for the basal ganglia, likely representing a combination of meningeal involvement and parenchymal miliary nodules.



T1 Fat Saturated with contrast

Ommaya reservoir and Ventriculoperitoneal shunt placed for intrathecal amphotericin administration and control of intracranial pressure.





CT Head without Contrast

Final Dx:

Non-HIV associated Cryptococcal Meningitis

Case Discussion

- Cryptococcal meningitis
  - Risk factors: Most patients are immunocompromised. Among patients without HIV, risk factors include:
    - immunosuppressive therapy, cancer, solid organ transplant, sarcoidosis, or liver failure.
  - Typical clinical symptoms: headache, lethargy, personality changes, memory loss ~ developing over 2-4 weeks
  - Treatment: antifungal therapy
    - Induction: IV liposomal Amphotericin B and oral Flucytosine daily (2-6 weeks*)
    - Consolidation: High-dose oral fluconazole (8 weeks)
    - Maintenance: Low-dose Fluconazole daily (for 1 year after diagnosis, or longer*)

*Depending on presence of severe neurological complications, radiographic evidence of brain parenchymal involvement, and response to therapy.

Case Discussion

- Radiological findings in cryptococcal meningitis, seen in this patient:
  - Miliary nodules
  - Abscess formation
- Other possible findings in cryptococcal meningitis:
  - Leptomeningeal enhancement (less so in patients who are profoundly immunocompromised)
  - Dilated perivascular spaces merging to form gelatinous pseudocysts
  - Cryptococcomas
    - T1 hypointense
    - T2/Flair hyperintense
  - Choroid plexitis
  - Hydrocephalus

Case Discussion

- Most cases begin to resolve within 4 weeks with appropriate therapy. However, in this patient, we see radiographic brain parenchymal progression of cryptococcal meningitis, peaking in number of lesions at 4 months after diagnosis.
- Radiographic evidence of parenchymal involvement is indication for longer duration of induction and maintenance therapy.
- This case demonstrates the utility of using other ACR appropriate imaging modalities when one is not diagnostic.
  - We started with a non-contrast CT, appropriate for the scenario based on ACR guidelines. However, this only showed a small hypo-density in the splenium of the corpus callosum.
  - Given clinical suspicion of a more significant process occurring in the brain, we followed the patient with contrast enhanced MRI and saw more clearly the extent of disease progression.

References:

ACR Appropriateness Criteria®. Accessed August 12, 2022. https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria

Cheng YC, Ling JF, Chang FC, et al. Radiological manifestations of cryptococcal infection in central nervous system. *J Chin Med Assoc*. 2003;66(1):19-26.

Cryptococcus neoformans: Treatment of meningoencephalitis and disseminated infection in patients without HIV - UpToDate. Accessed August 12, 2022. https://www.uptodate.com/contents/cryptococcus-neoformans-treatment-of-meningoencephalitis-and-disseminated-infection-in-patients-without-hiv?search=cryptococcal%20meningitis&source=search_result&selectedTitle=1~82&usage_type=default&display_rank=1#H2873570208

Greif EF. Cryptococcal meningitis | Radiology Case | Radiopaedia.org. Radiopaedia. doi:10.53347/rID-35505

Park SE, Choi DS, Shin HS, et al. Splenial Lesions of the Corpus Callosum: Disease Spectrum and MRI Findings. *Korean J Radiol*. 2017;18(4):710-721. doi:10.3348/kjr.2017.18.4.710

Weerakkody Y. CNS cryptococcosis | Radiology Reference Article | Radiopaedia.org. Radiopaedia. doi:10.53347/rID-10825