

AMSER Case of the Month

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22 year-old-male presenting with syncopal episodes

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Patient Presentation

- **HPI:** 22-year-old male presenting due to increasing frequency of syncopal episodes with loss of consciousness. He endorses headaches and lightheadedness. Reports leg shaking upon waking from syncopal episodes.
 - Otherwise, review of systems is negative
 - Physical examination is negative
- **PMHx:** none
- **PSHx:** none
- **Medications:** none
- **Social Hx:** grew up in rural setting in Chiquimula, Guatemala where pig farming was prevalent, came to US 3 years ago

Pertinent Labs

- **Complete Blood Cell Count:**
 - WBC: **15.2 x 10³ / microliter**, Hgb 15.7, Hct 45.4, Plt 351
 - Neutrophil % (%): **80.7**, Lymph % **11.5**, Imm Gran %: **0.5**
 - MCV 30.4, RDW 12.6
- **BMP:**
 - Na 138, K **3.2**, Cl 102, BUN 13, Cr 0.83, Glu 112
 - Anion gap 8
 - Ca 9.9
 - PO4 82

Abnormal values

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variant 2: Presyncope or syncope. Low probability of cardiovascular etiology based on history, physical examination, and ECG findings. Initial imaging.

| Procedure | Appropriateness Category | Relative Radiation Level |
|--|--------------------------|--------------------------|
| Radiography chest | May Be Appropriate | ⊕ |
| CT head with IV contrast | Usually Not Appropriate | ⊕⊕⊕ |
| CT head without and with IV contrast | Usually Not Appropriate | ⊕⊕⊕ |
| CT head without IV contrast | Usually Not Appropriate | ⊕⊕⊕ |
| CT heart function and morphology with IV contrast | Usually Not Appropriate | ⊕⊕⊕⊕ |
| CTA chest with IV contrast | Usually Not Appropriate | ⊕⊕⊕ |
| CTA coronary arteries with IV contrast | Usually Not Appropriate | ⊕⊕⊕ |
| MRI head without and with IV contrast | Usually Not Appropriate | ○ |
| MRI head without IV contrast | Usually Not Appropriate | ○ |
| MRI heart function and morphology without and with IV contrast | Usually Not Appropriate | ○ |
| MRI heart function and morphology without IV contrast | Usually Not Appropriate | ○ |
| SPECT or SPECT/CT MPI rest and stress | Usually Not Appropriate | ⊕⊕⊕⊕ |
| SPECT or SPECT/CT MPI rest only | Usually Not Appropriate | ⊕⊕⊕ |
| SPECT or SPECT/CT MPI stress only | Usually Not Appropriate | ⊕⊕⊕ |
| US duplex Doppler carotid | Usually Not Appropriate | ○ |
| US echocardiography transesophageal | Usually Not Appropriate | ○ |
| US echocardiography transthoracic resting | Usually Not Appropriate | ○ |
| US echocardiography transthoracic stress | Usually Not Appropriate | ○ |

At first glance, it would seem that the patient's primary presenting symptom was syncope. In this scenario, imaging of the head would not be an appropriate step.

However, given the history of leg shaking upon waking from syncopal events in a healthy, young patient without a cardiac history, the ER clinician astutely surmised that the patient's syncopal episodes were actually due to *seizure activity*.

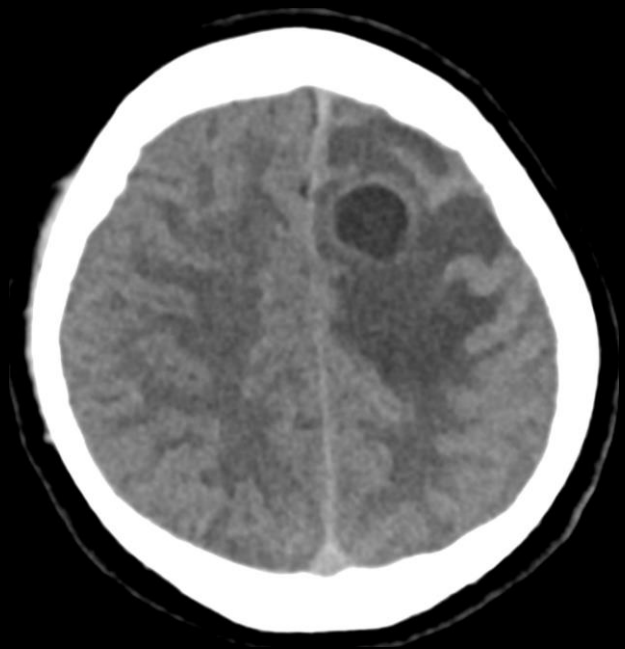
Select the applicable ACR Appropriateness Criteria

Variant 1: New-onset seizure. Unrelated to trauma. Initial imaging.

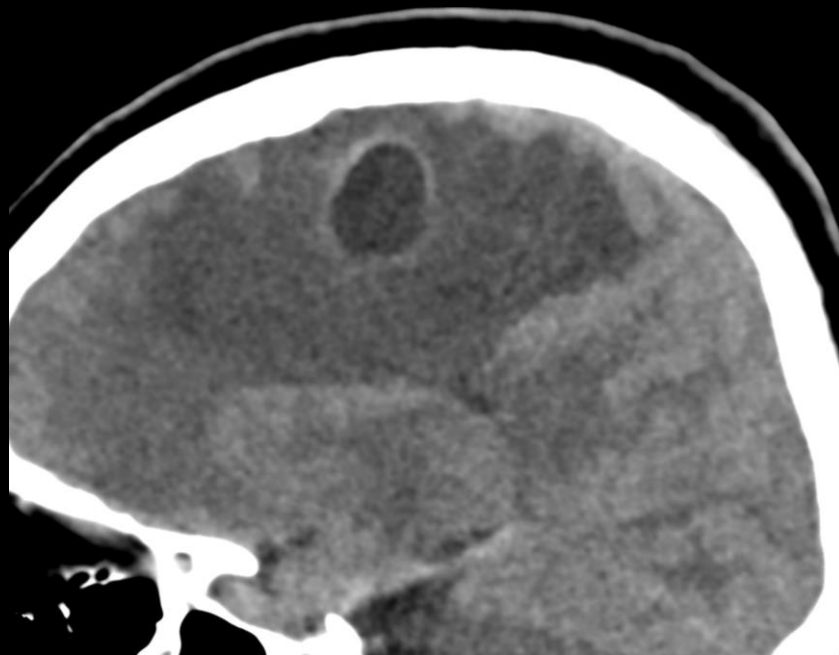
| Procedure | Appropriateness Category | Relative Radiation Level |
|--|--------------------------|--------------------------|
| CT head without IV contrast | Usually Appropriate | ☼☼☼ |
| MRI head without IV contrast | Usually Appropriate | ○ |
| MRI head without and with IV contrast | May Be Appropriate | ○ |
| CT head with IV contrast | Usually Not Appropriate | ☼☼☼ |
| CT head without and with IV contrast | Usually Not Appropriate | ☼☼☼ |
| FDG-PET/CT brain | Usually Not Appropriate | ☼☼☼ |
| MEG | Usually Not Appropriate | ○ |
| MRI functional (fMRI) head without IV contrast | Usually Not Appropriate | ○ |
| HMPAO SPECT or SPECT/CT brain ictal and interictal | Usually Not Appropriate | ☼☼☼ |

Given concern for seizure activity, this was the imaging modality ordered by the ER physician

Findings (unlabeled)

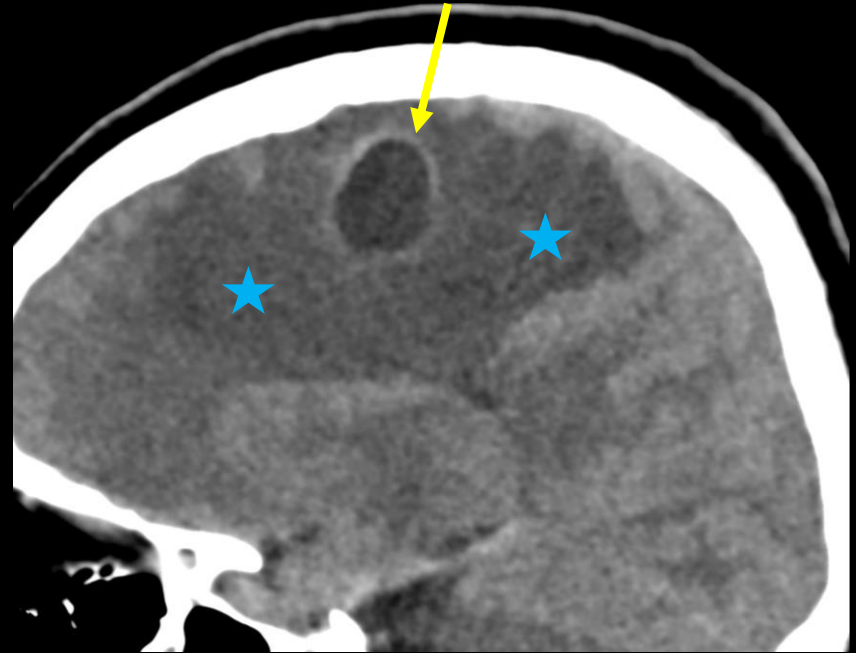
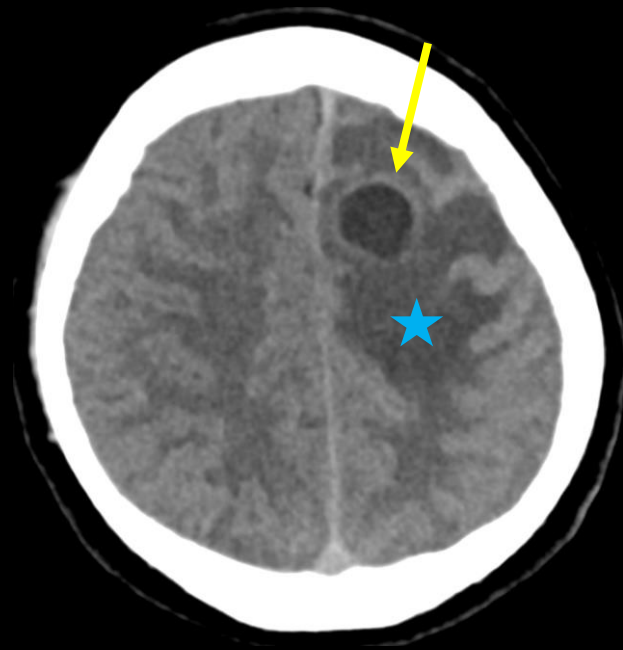


Axial CT head noncontrast



Sagittal CT head noncontrast

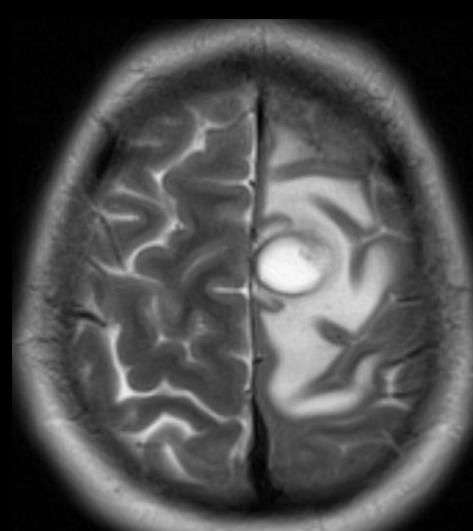
Findings (labeled)



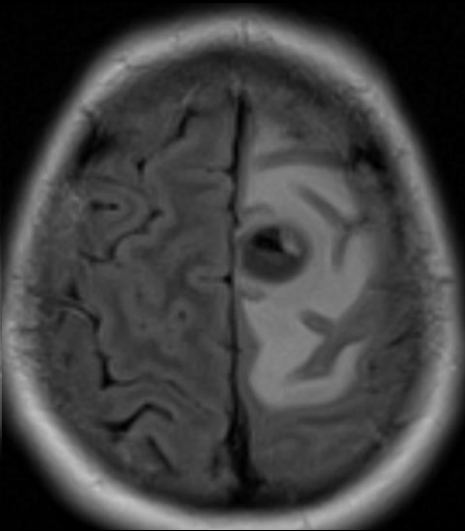
Axial and sagittal CT of the head shows a **cystic lesion** in the gray-white matter junction in the left frontal lobe with significant surrounding **vasogenic edema**

Given findings on CT head, MRI with/without contrast was performed for further characterization of the lesion

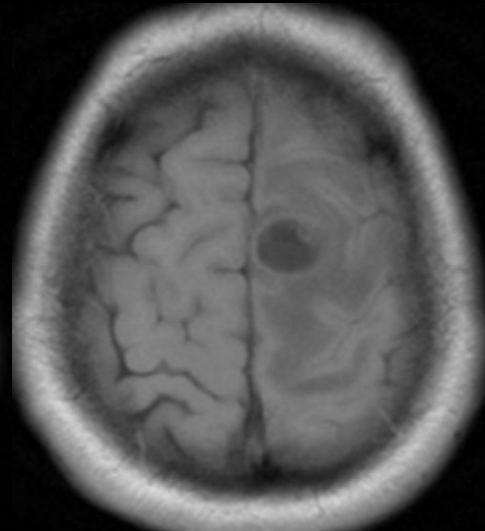
Findings (unlabeled)



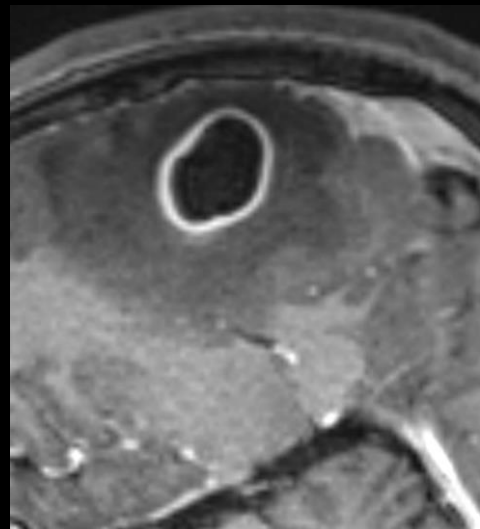
Axial T2



Axial FLAIR



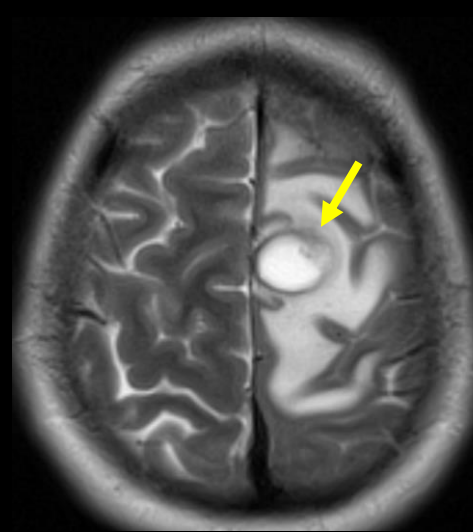
Axial T1



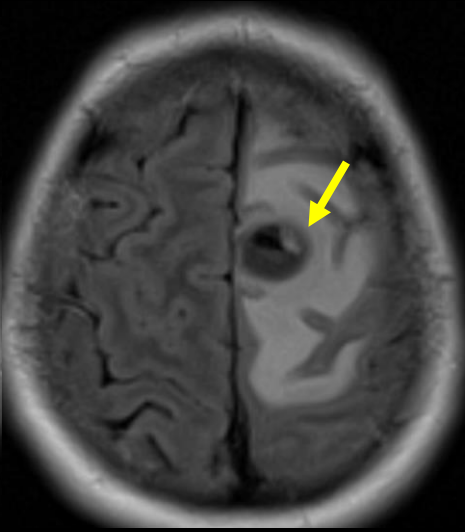
Sagittal T1 post

Sagittal CT head noncontrast

Findings (labeled)



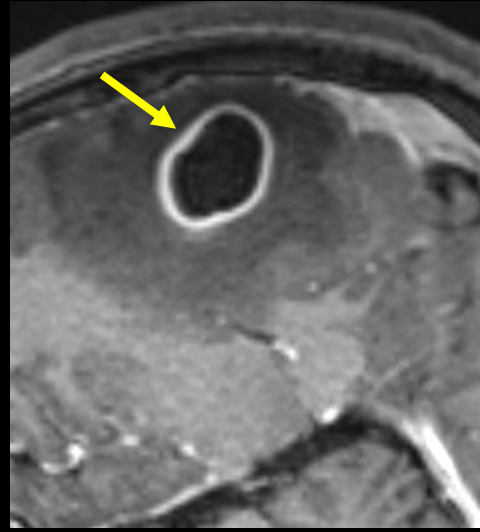
Axial T2



Axial FLAIR



Axial T1



Sagittal T1 post

Complex cystic lesion with peripheral enhancement. Along the lateral aspect of the cyst, there is a nodular component (arrow) which appears as a slight asymmetric area of prominent enhancement on the sagittal post contrast image.

Sagittal CT head noncontrast

Differential Diagnosis: Ring enhancing lesions: MAGIC DR

M: Metastases

A: Abscess

G: Glioblastoma

I: Inflammatory

C: Contusion

D: Demyelinating disease

R: Resolving hematoma, radiation necrosis

Differential Diagnosis: Narrowing down the differential

M: Metastases - Possible singular metastasis but unlikely in a young, healthy patient without prior history of known cancer

A: Abscess - Possible but atypical for immunocompetent patient without history of foreign travel

G: Glioblastoma – Unlikely given GM/WM junction w/o GM infiltration

I: Inflammatory Possible!!

C: Contusion - No hx of trauma and not hyperdense on CT

D: Demyelinating disease - Tumefactive MS classically has an incomplete ring of enhancement and much less edema

R: Resolving hematoma, radiation necrosis - Wrong history

Final Dx:

Neurocysticercosis

Characteristic Image Findings

CT: cystic lesions present and correspond with tissue infection stage in the cortical-juxtacortical junction, basal ganglia, cerebellum, midbrain, cisterns or ventricular system

- Noncystic:
 - Non-visible
- Vesicular:
 - 10-20 mm cyst with fluid attenuation
 - Thin and smooth cyst wall
 - Minimal edema or enhancement
 - Scolex present
- Colloidal vesicular:
 - Possible cyst hyperattenuation
 - Pericystic enhancement
 - Possible edema
- Granular nodular:
 - Increased edema
 - Thicker ring enhancement
- Calcified nodular:
 - Hyperattenuating calcific nodules
 - No edema
 - No enhancement

Characteristic Image Findings

MRI: parenchymal lesions - cysts present based on stage of infection

- Noncystic:
 - Non-visible
- Vesicular:
 - Cyst signal similar to CSF
 - Defined thin cyst wall
 - Scolex present
 - T1: Iso or hypointense
 - T2: Iso to hyperintense
- Colloidal vesicular:
 - T1/T2: hyperintense
 - Thick and hypointense cyst wall
- Granular nodular:
 - Increased edema
 - Thicker ring enhancement
- Calcified nodular:
 - Hypointense nodules
 - No edema
 - No enhancement

Case Discussion

Epidemiology:

- Neurocysticercosis is a preventable disease of parasitic origin. It is caused by the infection of the brain by larvae cysts of the pork tapeworm.
- Transmission occurs primarily through the ingestion of parasitic eggs present in the feces of individuals with an intestinal tapeworm infection.
- Neurocysticercosis is the most prevalent infection of the brain globally, and it is the leading cause of adult-onset epilepsy globally.
- Clinically, neurocysticercosis presents with a host of symptoms, including but not limited to: seizures, cerebral edema, and focal neurological deficits.

Case Discussion

Management:

- In the management of neurocysticercosis, the following treatments are commonly employed:
 - Decadron, a steroid medication, is often utilized to address cerebral edema
 - Keppra, a medication used to control seizures may also be prescribed
 - Antiepileptic therapy are sometimes indicated

Treatment:

- The definitive treatment for neurocysticercosis is an antiparasitic therapy with Albendazole administered over a period of 10 days after the patient's discharge. It is also recommended to follow up with the National Institutes of Health (NIH) Infectious Disease clinic.
- The patient was discharged in a stable condition, with a scheduled follow-up appointment and a repeat MRI of the brain. At the time, surgery was not deemed necessary.

References:

Del Brutto OH, Rajshekhar V, White AC Jr, Tsang VC, Nash TE, Takayanagui OM, et al. Proposed diagnostic criteria for neurocysticercosis. *Neurology*. 2001 Oct 9;57(7):1497-501.

Rajshekhar V, Del Brutto OH, Reed S, White A Jr. Neurocysticercosis. *Lancet*. 2006 Apr 22;367(9518):547-56.

García HH, Gonzalez AE, Evans CAW. Neurocysticercosis: a major cause of seizures worldwide. *CNS Drugs*. 2006;20(10): 849-64.

Martinez-Hernandez E, Escobar A, Zavala-Garcia B, Garduño-Espinosa J, Martin-Marquez B. Clinical manifestations and diagnosis of neurocysticercosis. *Neurologia*. 2012 Nov-Dec;27(10):570-7.

Kamerkar S, Prabhakar S, Verma A, Santosh V. Neurocysticercosis: a review. *J Neurol Sci*. 2014 Apr 15;340(1-2):48-54.