

# AMSER Case of the Month

## November 2025

56 yo presenting with confusion and lateral rectus muscle weakness.

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# Patient Presentation

- A 56 yo with a history of intermittent confusion and fatigue for several days. Experienced a recent fall but denies head trauma. Denies any blurriness or acute vision changes, headaches, extremity weakness and paresthesia.
- Vital signs showed elevated blood pressure, but otherwise WNL.
- Neurological exam demonstrated intermittent confusion, ophthalmoplegia, and limited lateral gaze bilaterally. Vertical and horizontal nystagmus and mild ataxia on finger-nose bilaterally were also appreciated.
- Labs showed a Vitamin B1 of 87 nmol/L (70-180 nmol/L).

What Imaging Should We Order?

# Select the applicable ACR Appropriateness Criteria

## Variant 2:

Adult. Focal neurologic deficit. Clinically suspected acute ischemic stroke. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI head without IV contrast	Usually Appropriate	0
CT head without IV contrast	Usually Appropriate	☼☼☼
CTA head with IV contrast	Usually Appropriate	☼☼☼
CTA neck with IV contrast	Usually Appropriate	☼☼☼
US duplex Doppler carotid artery	May Be Appropriate	0
MRA head without IV contrast	May Be Appropriate	0
MRA neck without and with IV contrast	May Be Appropriate	0
MRA neck without IV contrast	May Be Appropriate	0
MRI head perfusion with IV contrast	May Be Appropriate	0
CT head perfusion with IV contrast	May Be Appropriate	☼☼☼
US duplex Doppler transcranial	Usually Not Appropriate	0

This study was ordered by the Emergency Medicine physician

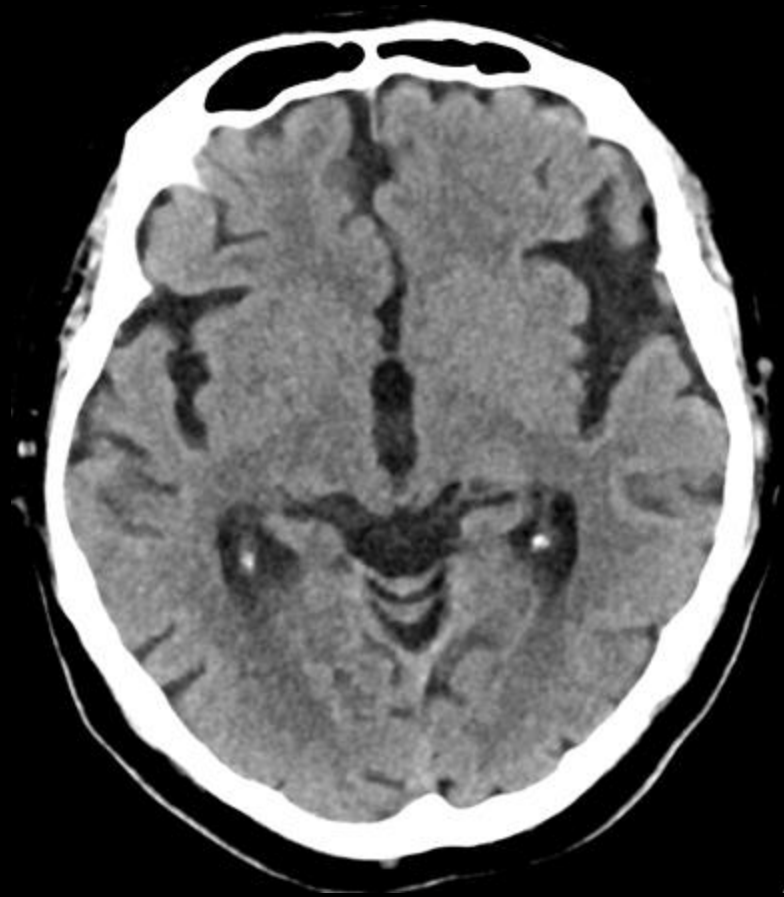


# Findings (unlabeled)

Axial unenhanced CT



Axial unenhanced CT

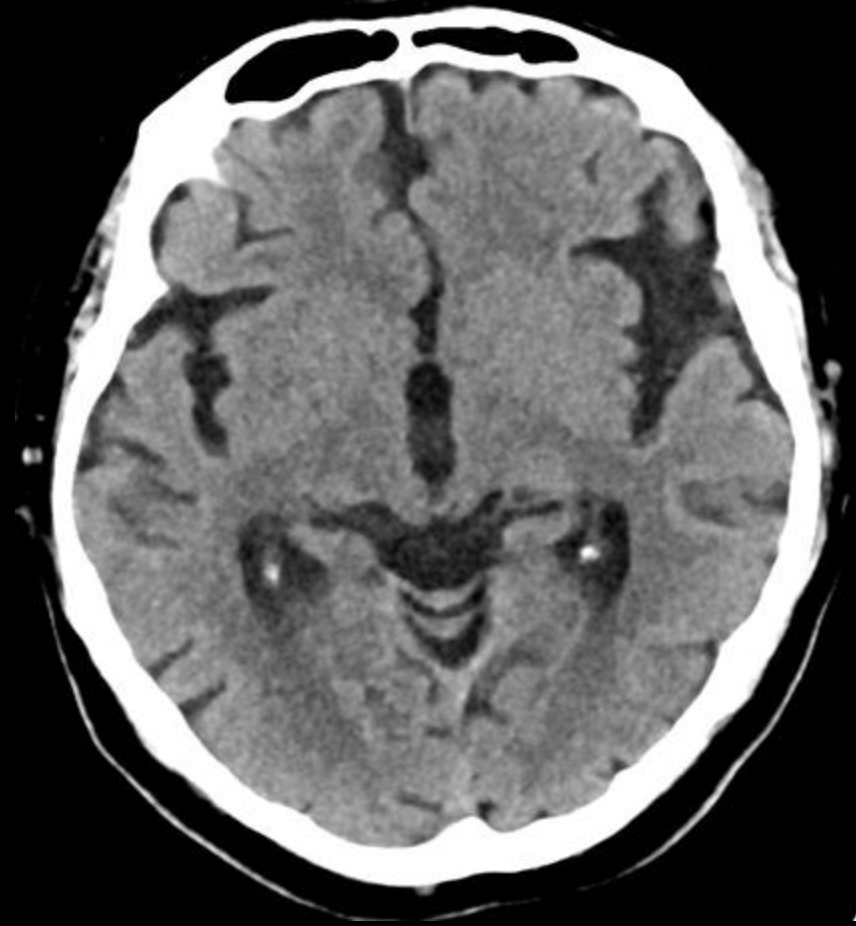


# Findings (labeled)

Axial unenhanced CT



Axial unenhanced CT



No acute findings on CT.

# Select the applicable ACR Appropriateness Criteria

**Variant 2:** Adult. Focal neurologic deficit. Clinically suspected acute ischemic stroke. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI head without IV contrast	Usually Appropriate	0
CT head without IV contrast	Usually Appropriate	⊕⊕⊕
CTA head with IV contrast	Usually Appropriate	⊕⊕⊕
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US duplex Doppler transcranial	Usually Not Appropriate	0

This study was subsequently ordered

# Findings (unlabeled)

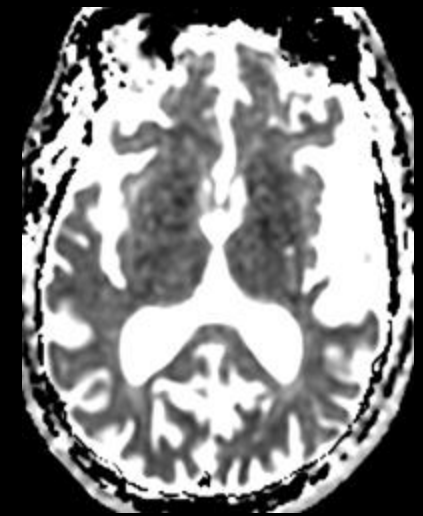
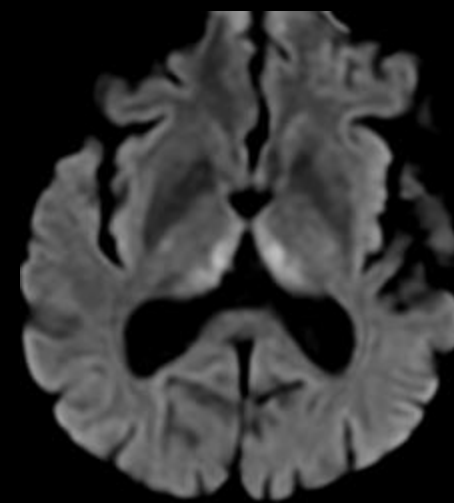
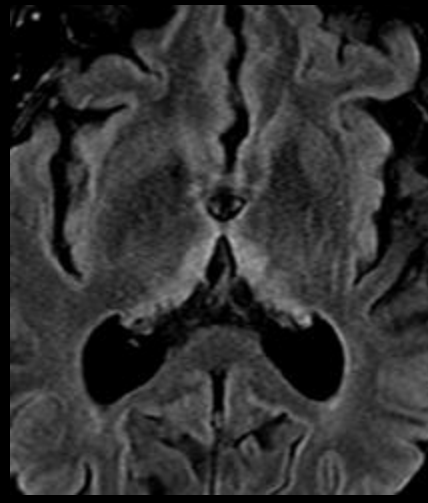
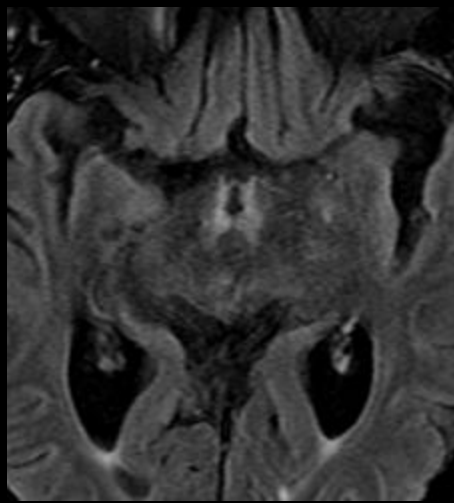
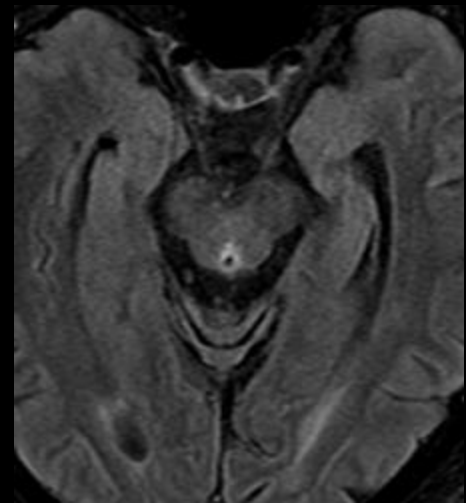
T2 FLAIR

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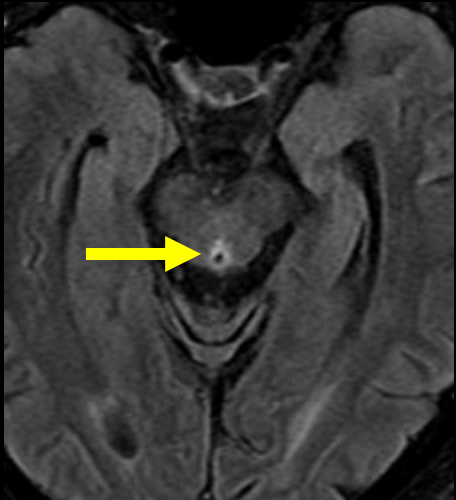
DWI

ADC

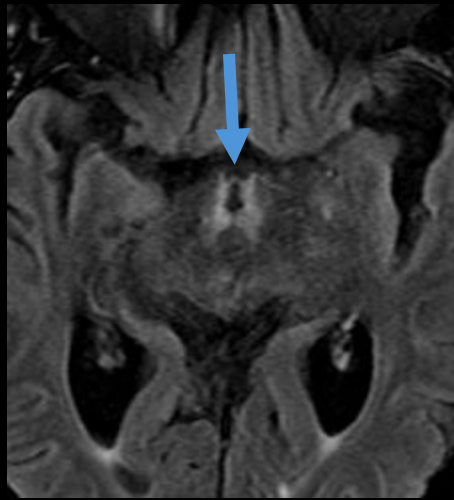


# Findings (unlabeled)

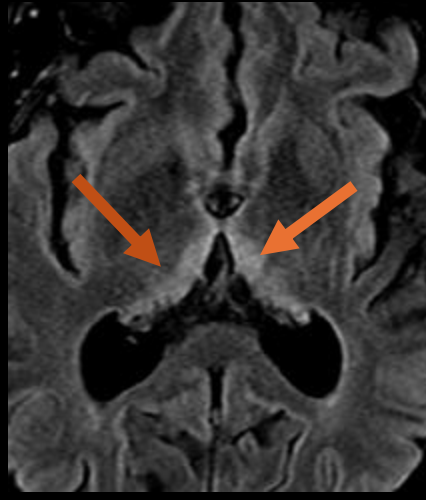
T2 FLAIR



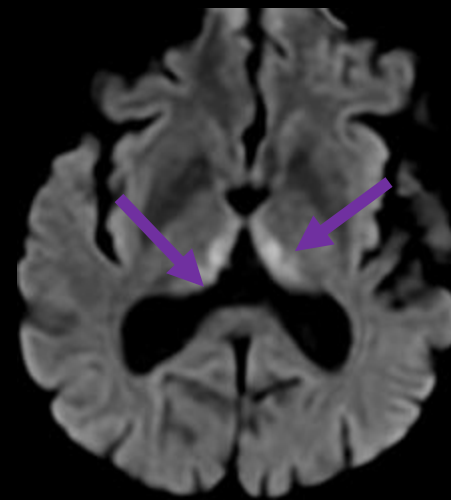
T2 FLAIR



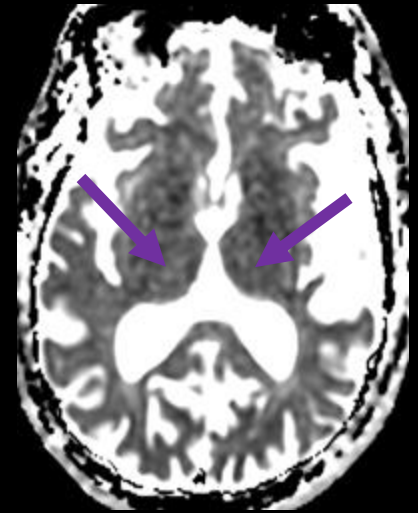
T2 FLAIR



DWI



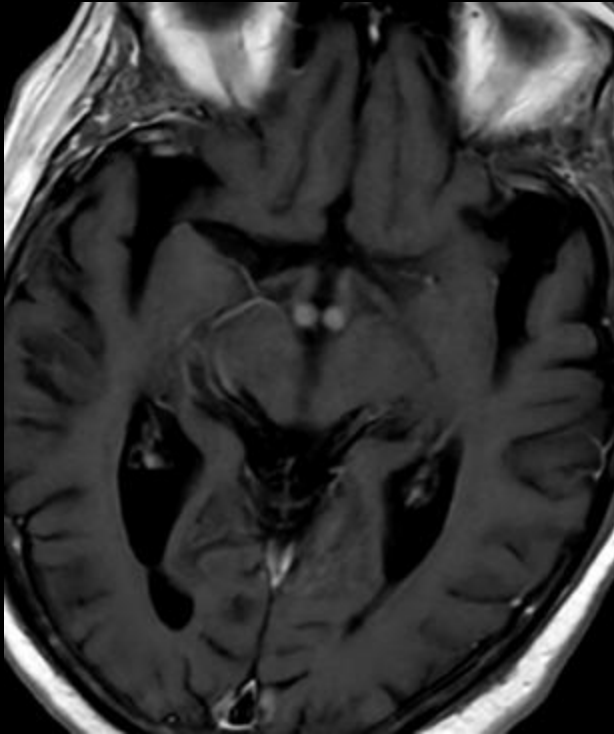
ADC



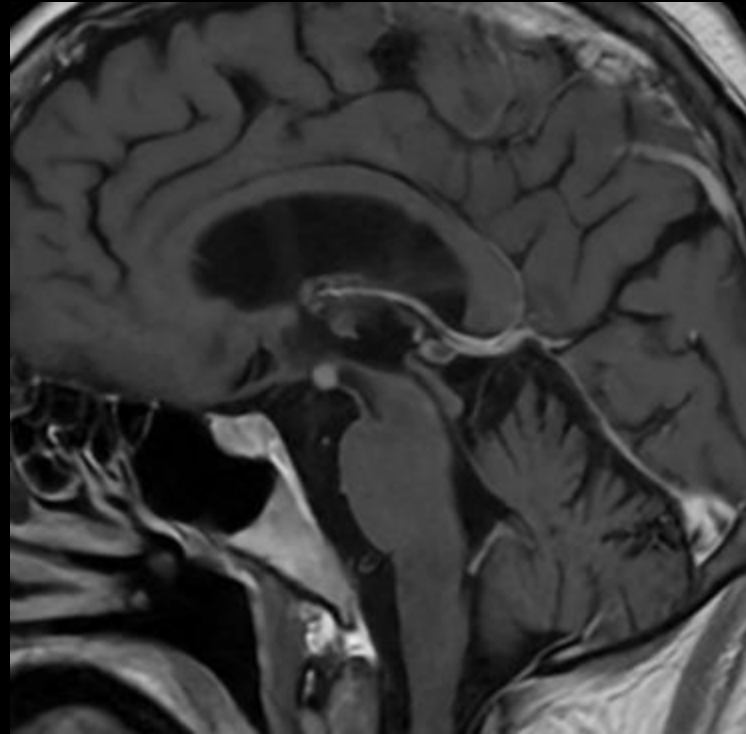
MRI shows T2/FLAIR hyperintensity in the **periaqueductal gray matter**, **mammillary bodies**, and in the **medial thalami** with associated **diffusion restriction**.

# Findings (unlabeled)

Axial T1 with contrast

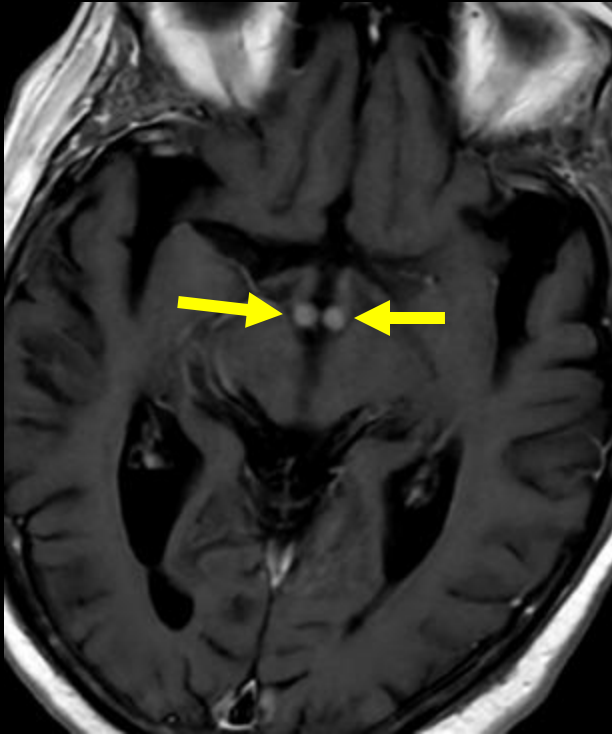


Sag T1 with contrast

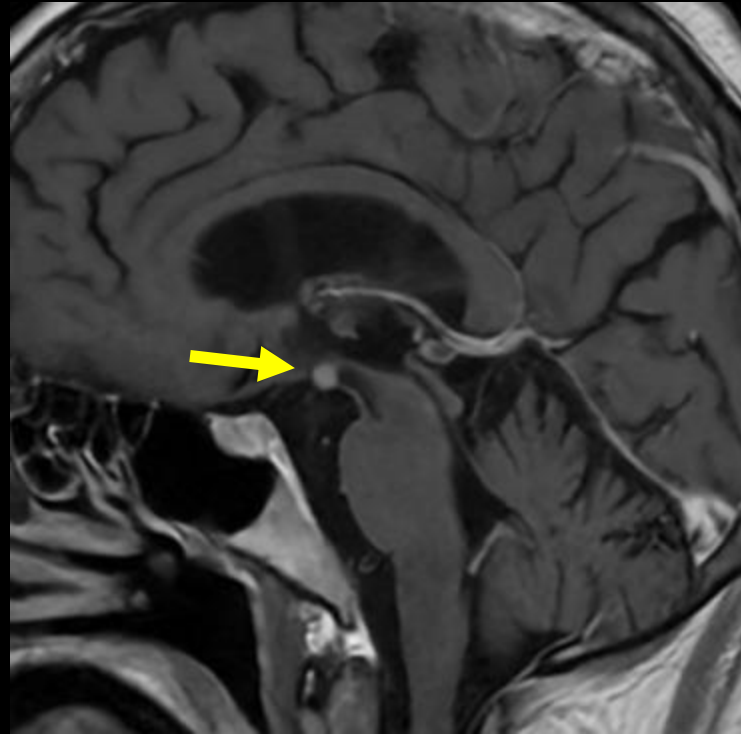


# Findings (labeled)

Axial T1 with contrast



Sag T1 with contrast



Post contrast axial and sagittal images also show **abnormal enhancement of the mammillary bodies**

Final Dx:

Wernicke encephalopathy

# Wernicke Encephalopathy - Discussion

- **Presentation**

- Classically presents acutely with the triad of mental status change, ataxia, and ophthalmoplegia.
- When developing into chronic or permanent form (Korsakoff syndrome), may also experience anterograde amnesia, confabulation and memory loss
- Most common in individuals with chronic alcohol use disorder and severe malnutrition (such as with bariatric surgery, prolonged TPN, or restrictive diets).

- **Pathology**

- The etiology of Wernicke encephalopathy is vitamin B1 (thiamine) deficiency
- Thiamine is a cofactor for several enzymes involved in cerebral energy homeostasis, including oxidative metabolism; therefore, its deficiency may result in neurotoxicity and eventually neuronal cell death if left untreated.
- Wernicke's encephalopathy is a clinical diagnosis and can occur with normal or elevated serum thiamine levels. This is due to transport or utilization defects causing tissue or CNS deficiency that is not always reflected in the blood thiamine level.

# Wernicke Encephalopathy - Discussion

- **Imaging Findings**

- CT

- Frequently no imaging abnormality; hypoattenuation may occasionally be visible in affected locations

- On MRI

- T2/FLAIR – hyperintense signal in the mammillary bodies, medial thalami, periaqueductal grey matter, tectal plate, and/ or dorsal medulla.
    - DWI/ADC - restricted diffusion may occur in the same regions
    - T1 C+ (Gd) - contrast enhancement may occur in the affected regions, often the mammillary bodies

# Wernicke Encephalopathy - Discussion

- **Treatment**

- Intravenous thiamine hydrochloride administration expeditiously (among other vitamins/minerals).
- Correct the underlying cause of thiamine deficiency.
- Treatment does not change if there is normal or elevated thiamine levels, as clinical suspicion and risk factors should drive treatment decisions not serum thiamine levels.

- **Prognosis**

- If left untreated, there is a mortality rate of up to 50% due to coma, shock, and cardiovascular failure
- Repeated episodes of or delayed/incomplete treatment of Wernicke encephalopathy can result to in the progression to Korsakoff syndrome – the same triad of symptoms with the addition of confabulations and permanent memory loss.

# References:

- Zahr, N. M., Kaufman, K. L., & Harper, C. G. (2011). Clinical and pathological features of alcohol-related brain damage. *Nature Reviews. Neurology*, 2011-05, 7(5), 284–294.  
<https://doi.org/10.1038/nrneurol.2011.42>
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- Li, S., & Xing, C. (2025). Wernicke encephalopathy: A mini review of the clinical spectrum, atypical manifestations, and diagnostic challenges. *Frontiers in Neurology*, 16, 1566366.  
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