

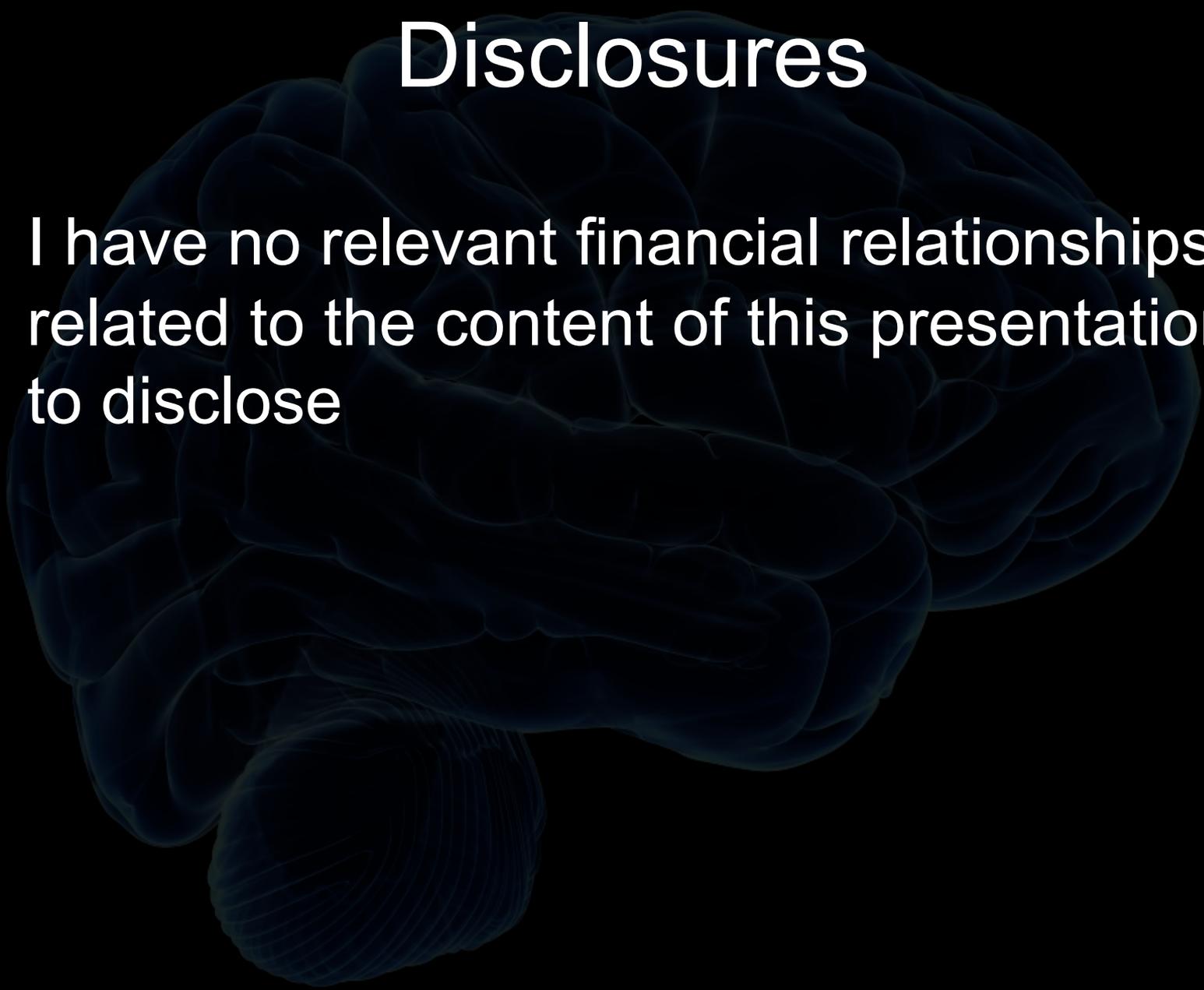


# **When Negative Imaging and Cultures Fool The Clinician**

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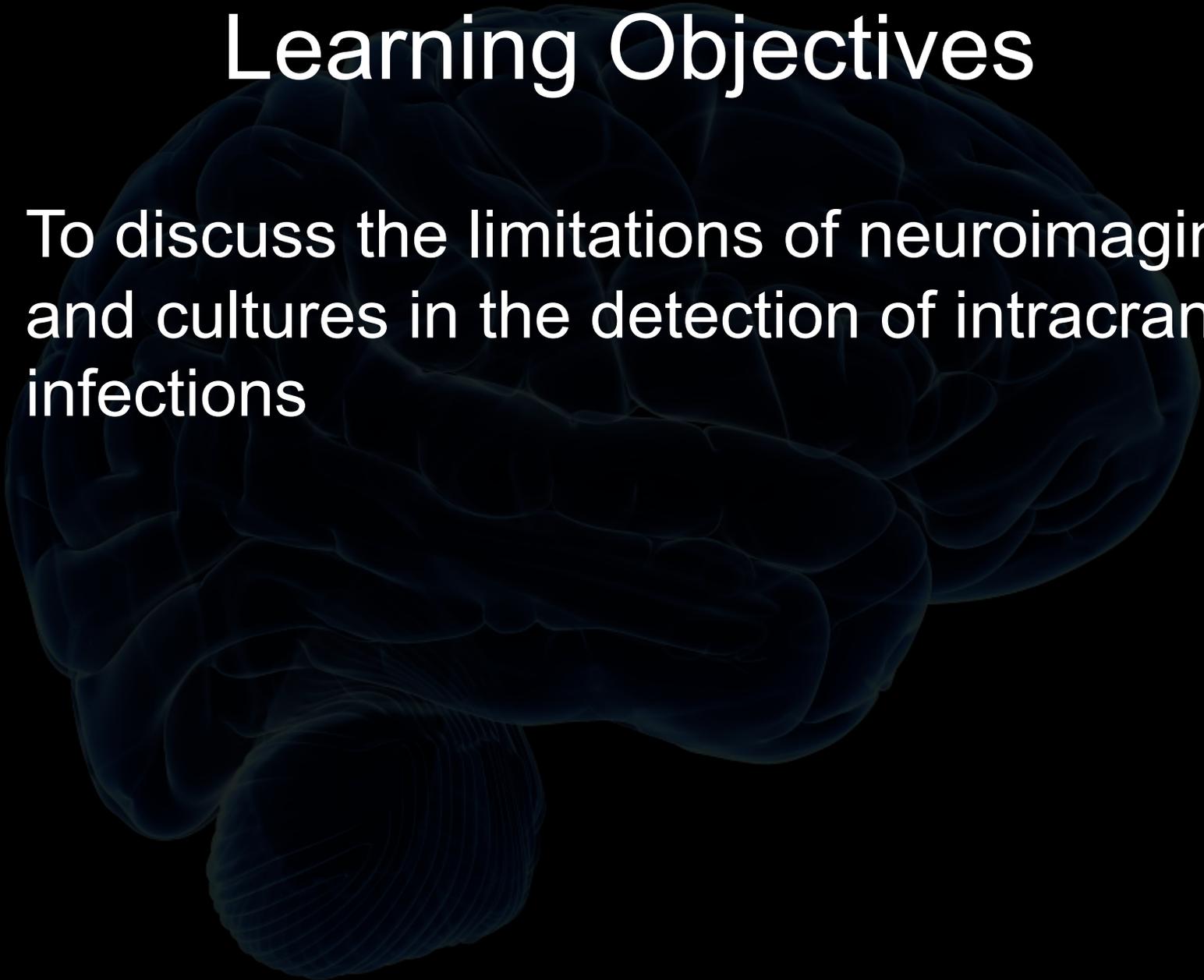
# Disclosures



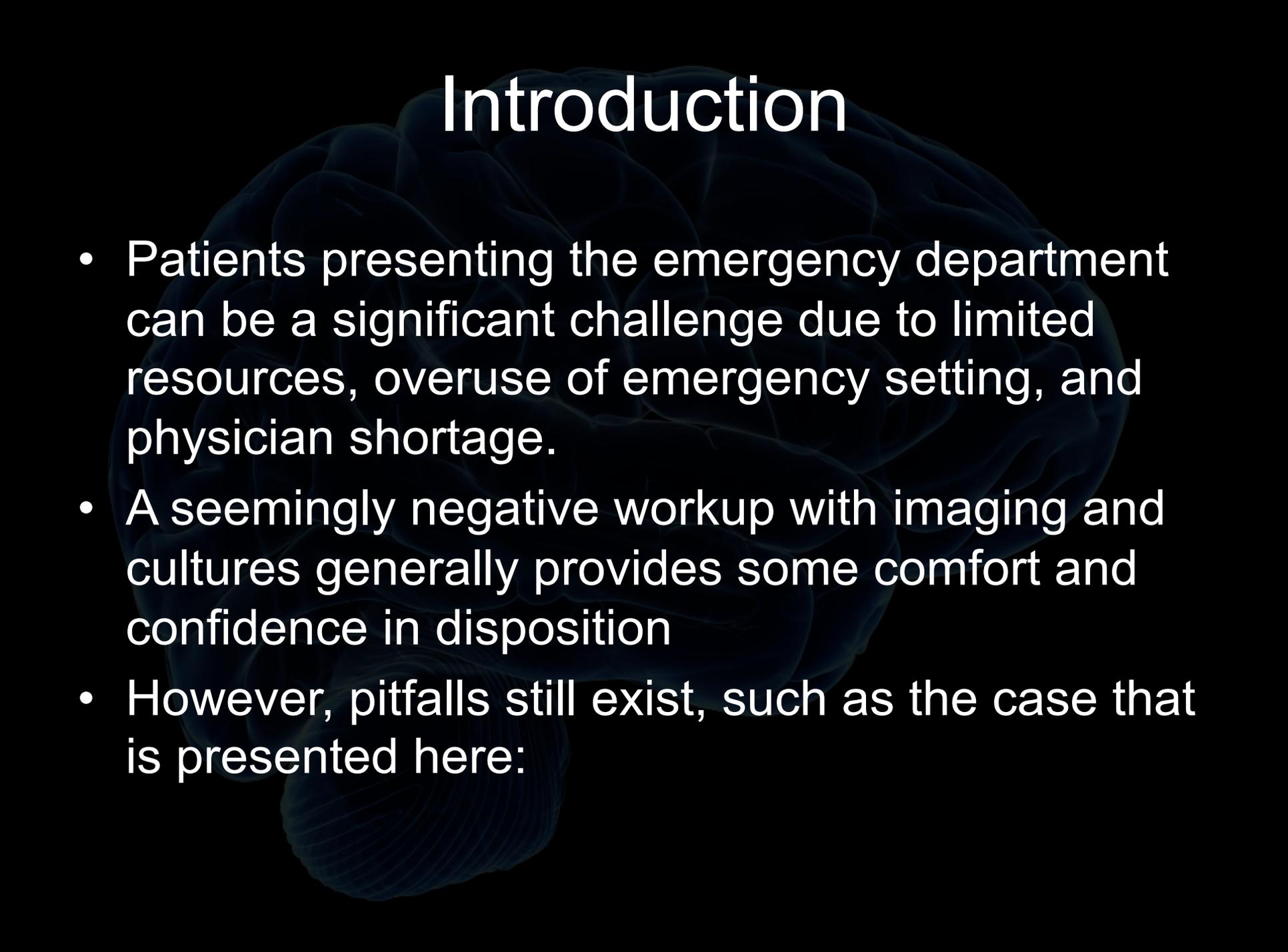
- I have no relevant financial relationships related to the content of this presentation to disclose

# Learning Objectives

- To discuss the limitations of neuroimaging and cultures in the detection of intracranial infections

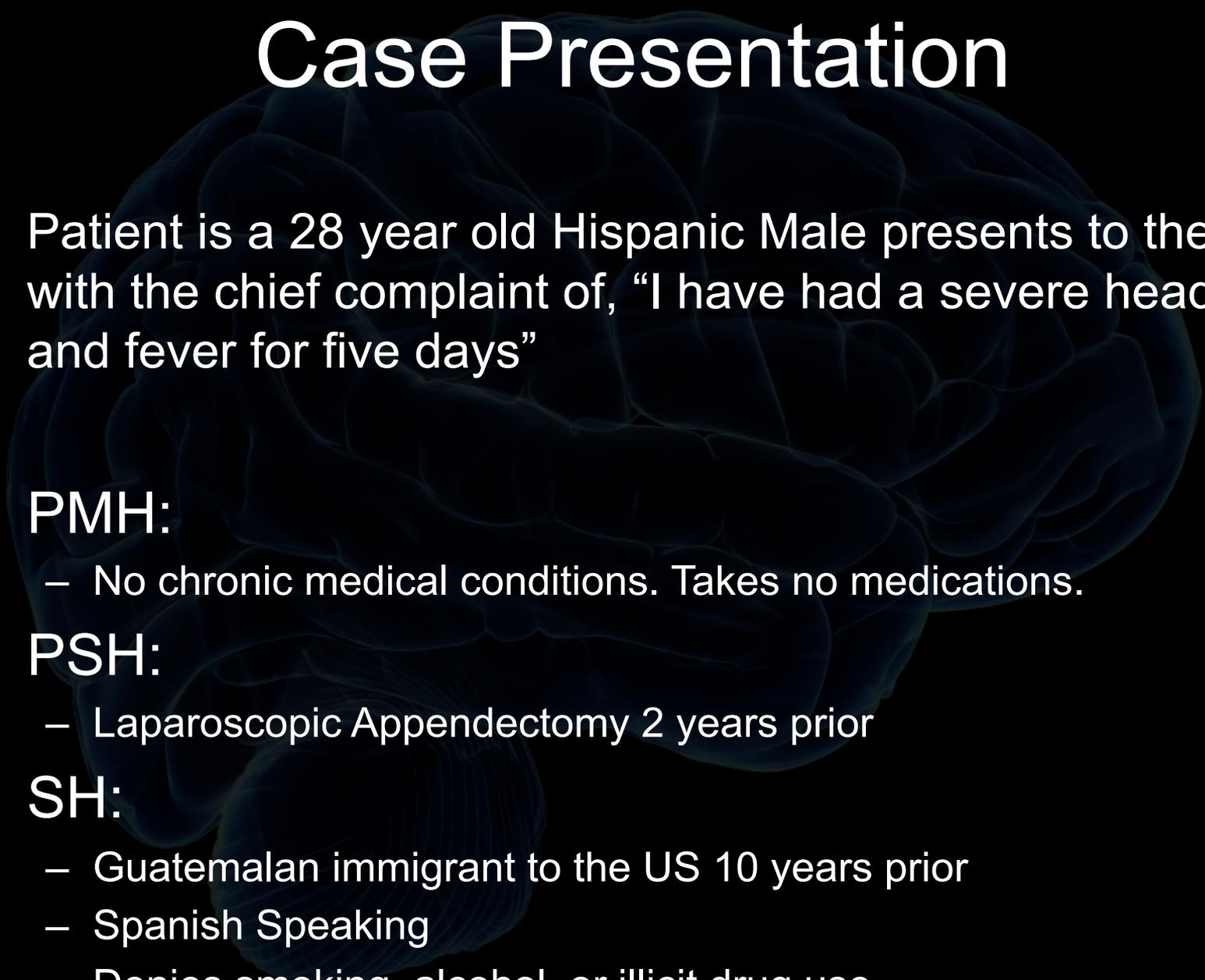


# Introduction



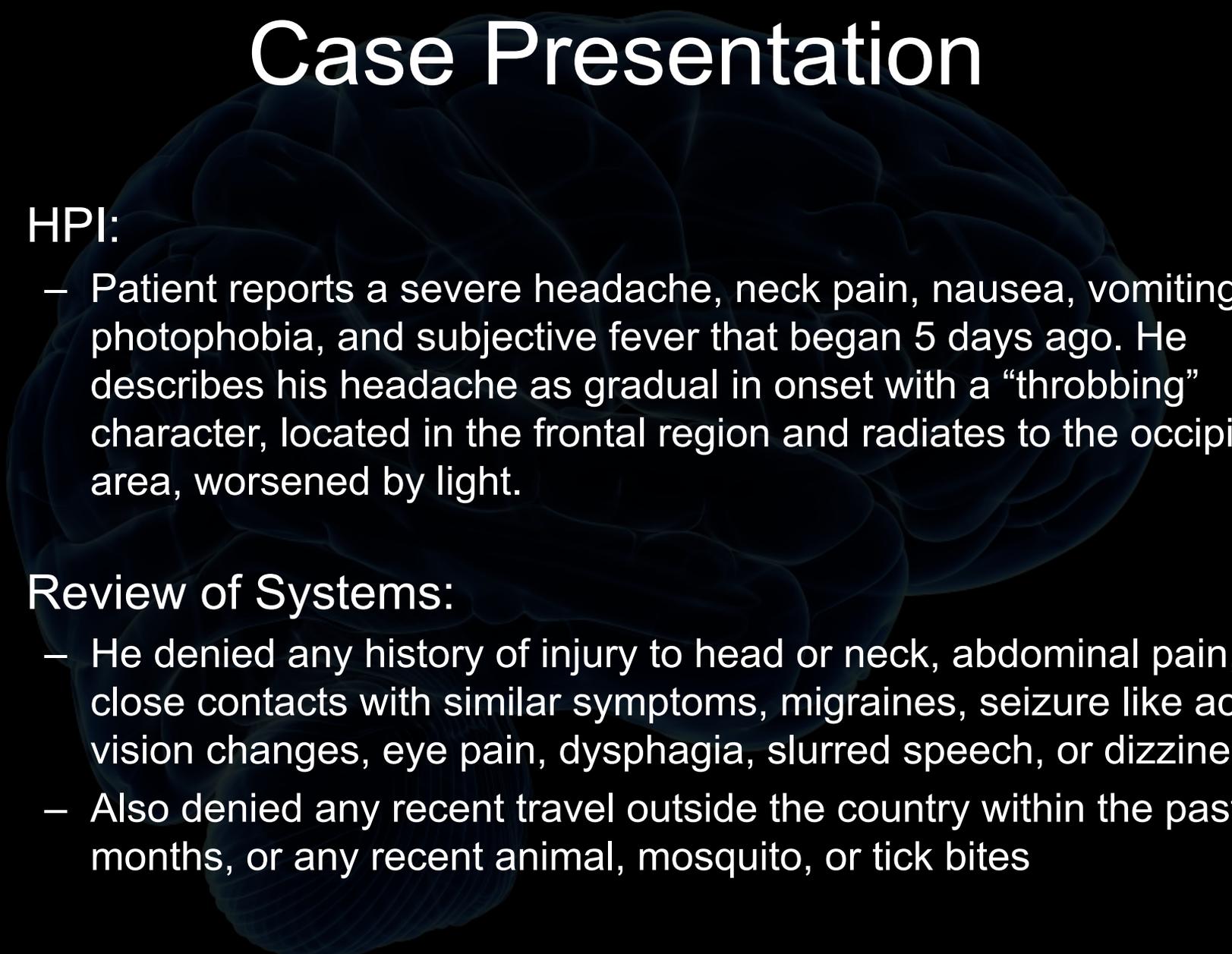
- Patients presenting the emergency department can be a significant challenge due to limited resources, overuse of emergency setting, and physician shortage.
- A seemingly negative workup with imaging and cultures generally provides some comfort and confidence in disposition
- However, pitfalls still exist, such as the case that is presented here:

# Case Presentation



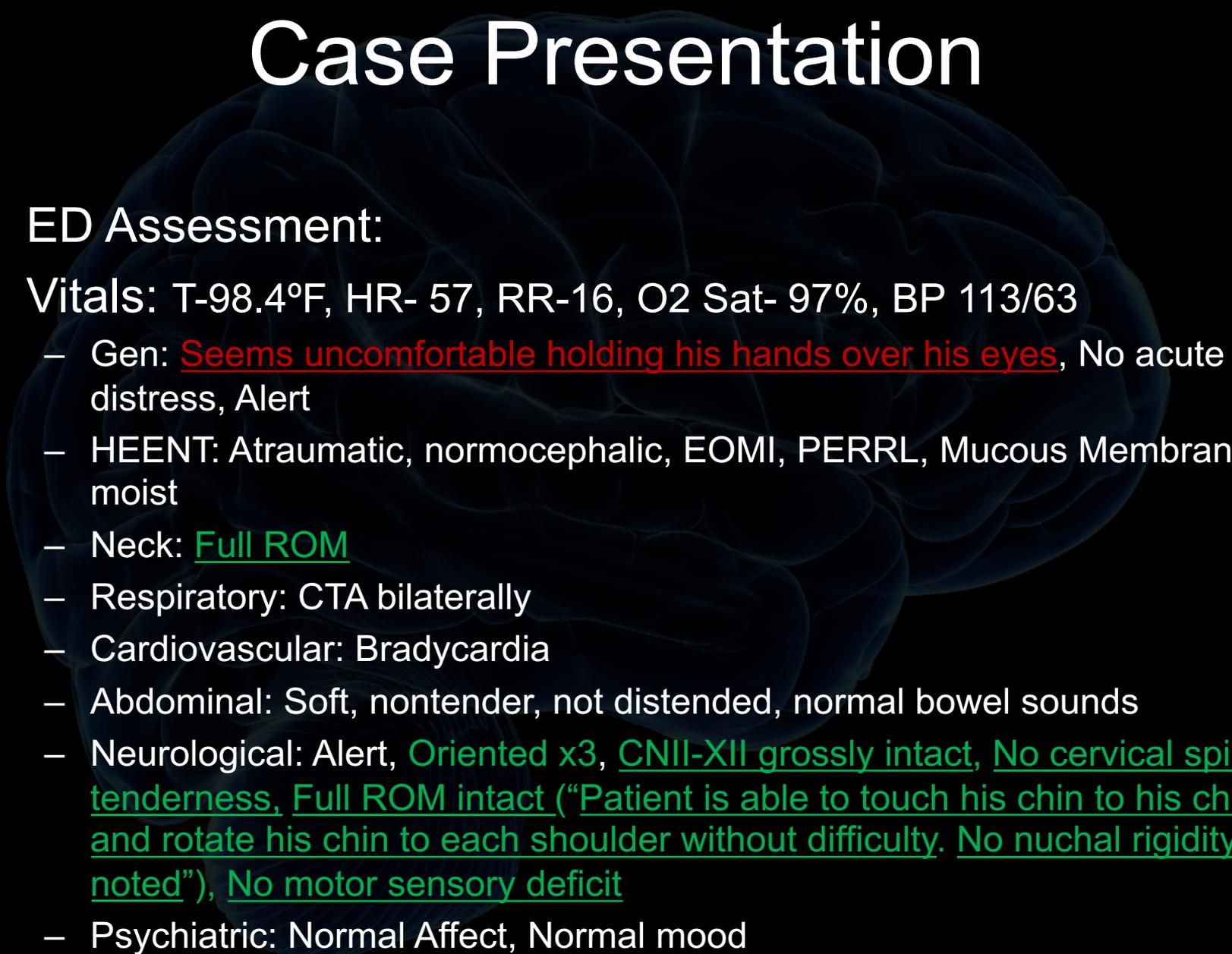
- Patient is a 28 year old Hispanic Male presents to the ED with the chief complaint of, “I have had a severe headache and fever for five days”
- **PMH:**
  - No chronic medical conditions. Takes no medications.
- **PSH:**
  - Laparoscopic Appendectomy 2 years prior
- **SH:**
  - Guatemalan immigrant to the US 10 years prior
  - Spanish Speaking
  - Denies smoking, alcohol, or illicit drug use

# Case Presentation



- HPI:
  - Patient reports a severe headache, neck pain, nausea, vomiting, photophobia, and subjective fever that began 5 days ago. He describes his headache as gradual in onset with a “throbbing” character, located in the frontal region and radiates to the occipital area, worsened by light.
- Review of Systems:
  - He denied any history of injury to head or neck, abdominal pain, close contacts with similar symptoms, migraines, seizure like activity, vision changes, eye pain, dysphagia, slurred speech, or dizziness.
  - Also denied any recent travel outside the country within the past 6 months, or any recent animal, mosquito, or tick bites

# Case Presentation



- ED Assessment:
- Vitals: T-98.4°F, HR- 57, RR-16, O2 Sat- 97%, BP 113/63
  - Gen: Seems uncomfortable holding his hands over his eyes, No acute distress, Alert
  - HEENT: Atraumatic, normocephalic, EOMI, PERRL, Mucous Membranes moist
  - Neck: Full ROM
  - Respiratory: CTA bilaterally
  - Cardiovascular: Bradycardia
  - Abdominal: Soft, nontender, not distended, normal bowel sounds
  - Neurological: Alert, Oriented x3, CNII-XII grossly intact, No cervical spine tenderness, Full ROM intact (“Patient is able to touch his chin to his chest and rotate his chin to each shoulder without difficulty. No nuchal rigidity noted”), No motor sensory deficit
  - Psychiatric: Normal Affect, Normal mood

# Workup

- Labs:

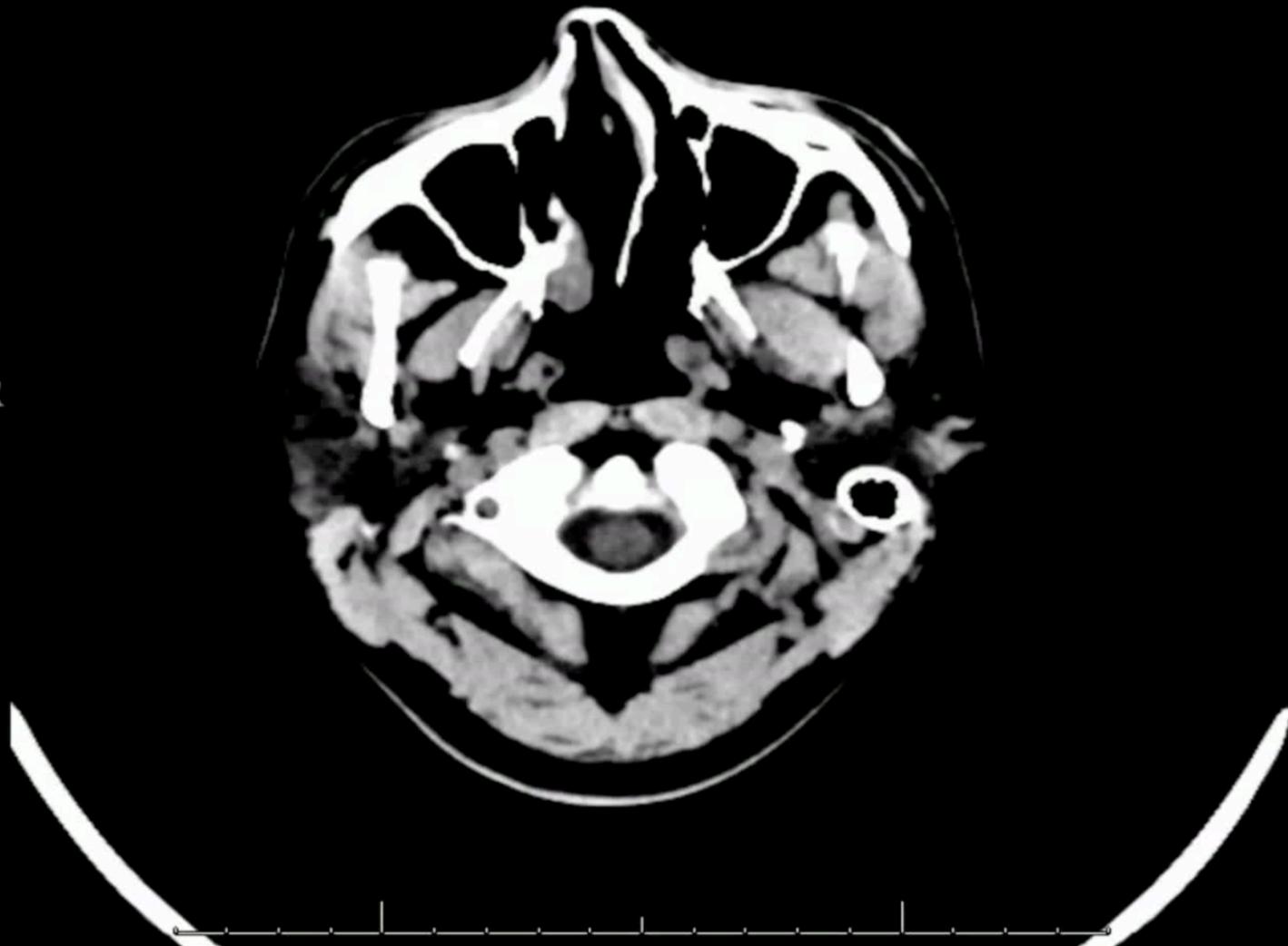
## CBC

## BMP

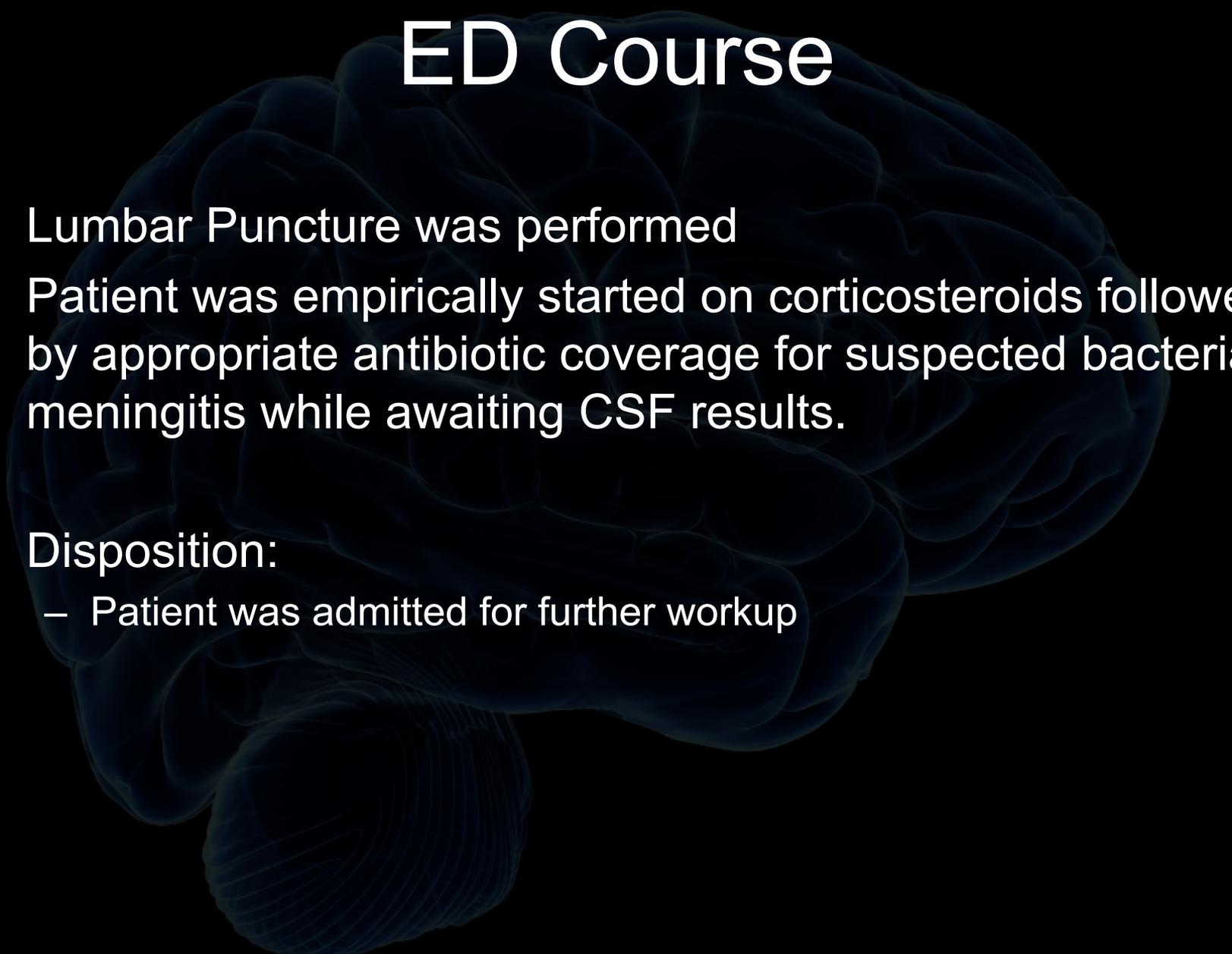
Hematology		Chemistry	
WBC	13.2 H	Sodium	134
RBC	4.79	Potassium	4.1
Hgb	13.7	Chloride	96 L
Hct	41.6	Carbon Dioxide	26
MCV	86.8	Anion Gap	16.1
MCH	28.6	BUN	10
MCHC	32.9	Creatinine	0.7
RDW Coeff of Var	13.5	Estim Creat Clear Calc	87.00
Plt Count	477 H	Estimated GFR	> 60
MPV	8.5 L	Glucose	109
Platelet Comment		Calcium	9.3
Neut % (Auto)	84.3 H	Total Bilirubin	
Lymph % (Auto)	8.6 L	AST	
Mono % (Auto)	6.4	ALT	
Eos % (Auto)	0.1 L	Alkaline Phosphatase	
Baso % (Auto)	0.2	Total Protein	
Neutrophils % (Manual)	Not Reportable	Albumin	
Lymphocytes % (Manual)		Plasma Lactate	1.2

A

R



# ED Course



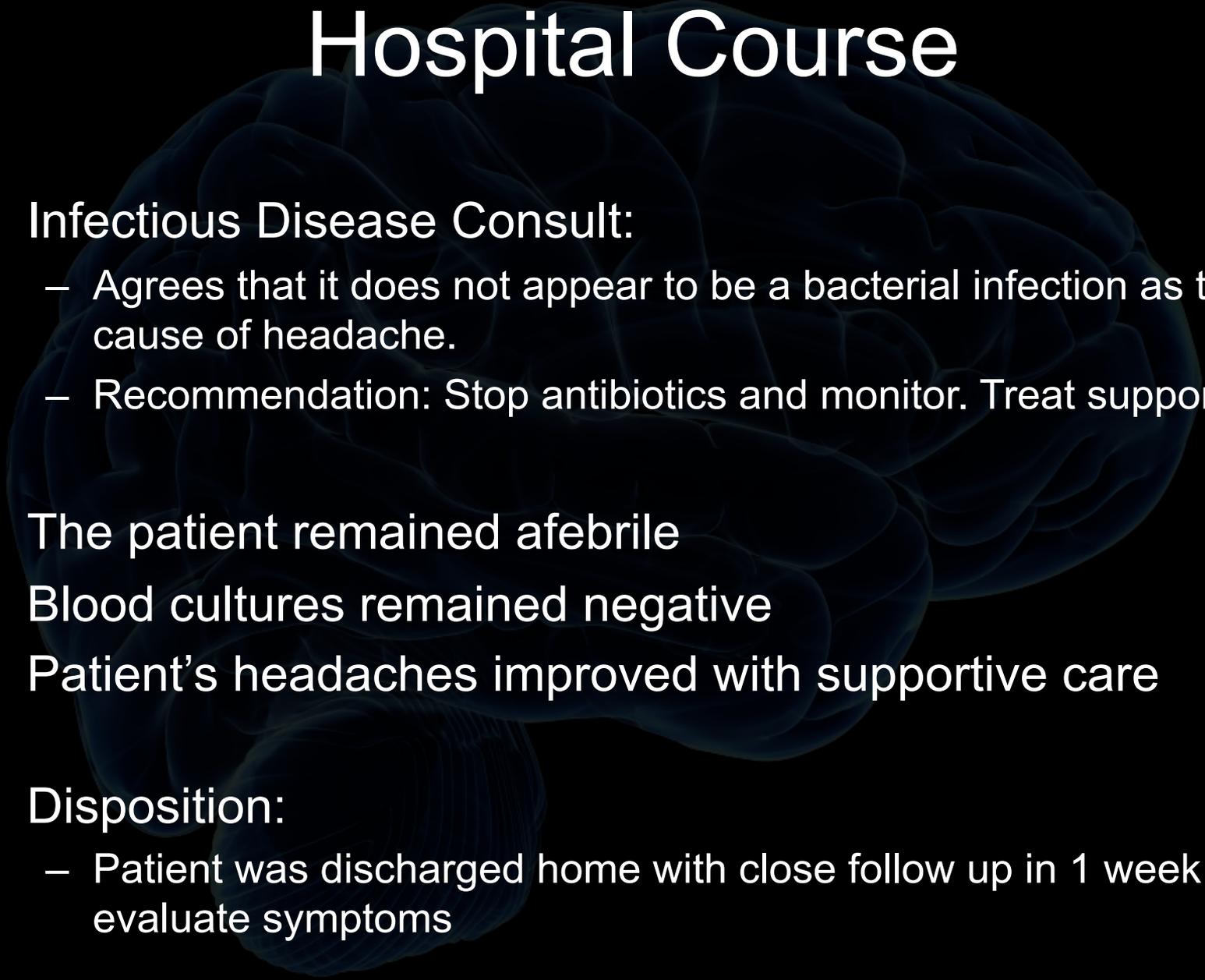
- Lumbar Puncture was performed
- Patient was empirically started on corticosteroids followed by appropriate antibiotic coverage for suspected bacterial meningitis while awaiting CSF results.
- Disposition:
  - Patient was admitted for further workup

# Hospital Course

- CSF Results:

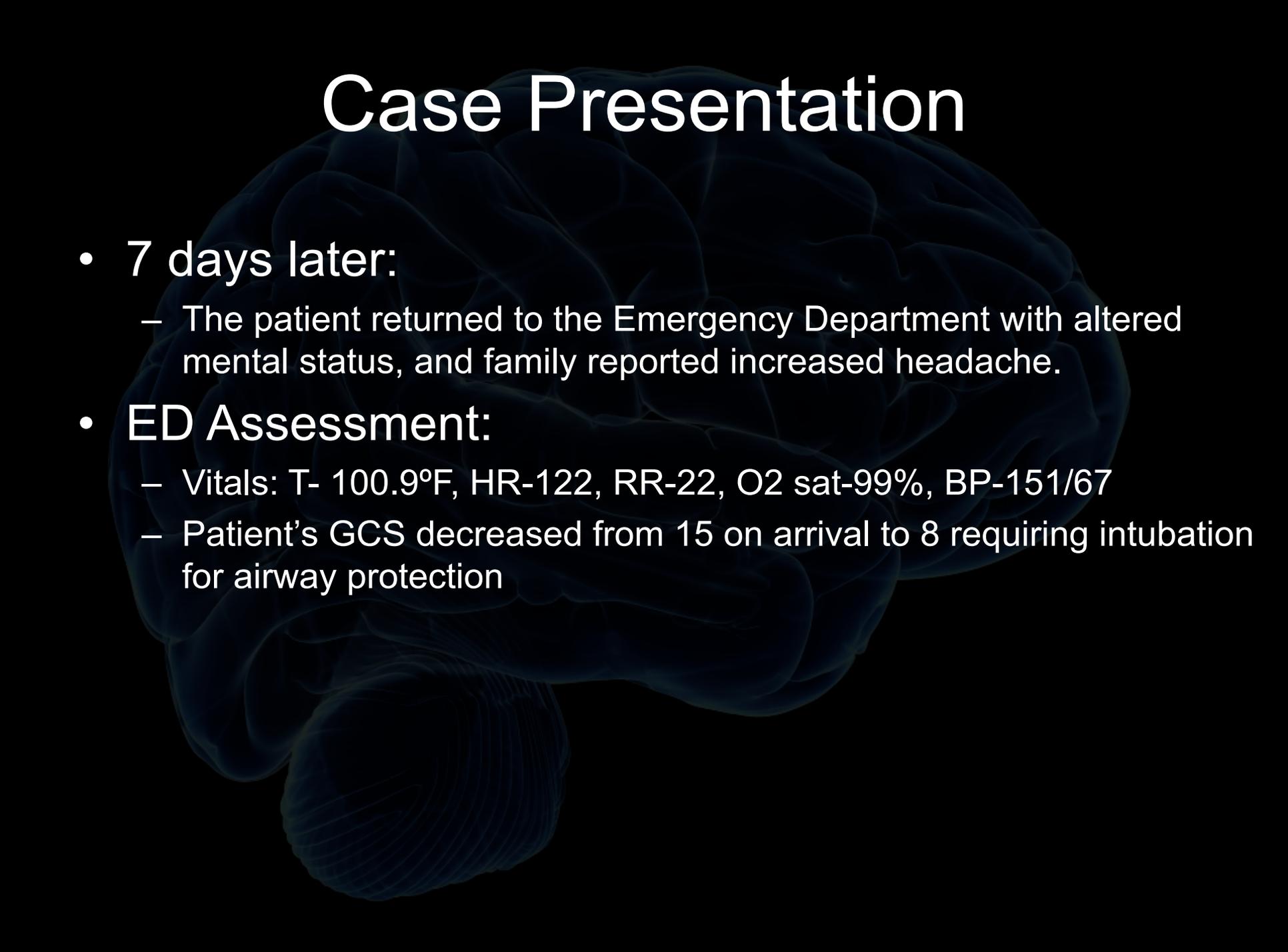
- Other Body Source	
CSF Appearance	Clear and colorless
CSF WBC	46.000 H* 
CSF RBC	0
CSF Protein (2)	45
CSF Mononuclear Cells	45.6 L
CSF Granulocytes	54.4 H
CSF Glucose	56
CSF VDRL	Nonreactive 
CSF Lyme Disease DNA	Not detected 
CSF C.neoform/gat PCR	Negative
CSF Cryptococcus Ag	Cancelled
CSF CMV DNA (PCR)	Negative
CSF Enterovirus (PCR)	Negative
CSF E. coli K1 (PCR)	Negative
CSF H. influenzae (PCR)	Negative
CSF HSV I (PCR)	Negative
CSF HSV II (PCR)	Negative
CSF HHV 6 (PCR)	Negative
CSF L.monocytogenes PCR	Negative
CSF N. meningitidis PCR	Negative
CSF Parechovirus (PCR)	Negative
CSF S. agalactiae (PCR)	Negative
CSF S. pneumoniae (PCR)	Negative
CSF VZV (PCR)	Negative
CSF West Nile RNA	Not detected 
- Serology	
Lyme Specimen Source	Csf
HIV 1&2 Antibody	Negative 

# Hospital Course



- Infectious Disease Consult:
  - Agrees that it does not appear to be a bacterial infection as the cause of headache.
  - Recommendation: Stop antibiotics and monitor. Treat supportively.
- The patient remained afebrile
- Blood cultures remained negative
- Patient's headaches improved with supportive care
- Disposition:
  - Patient was discharged home with close follow up in 1 week to re-evaluate symptoms

# Case Presentation



- 7 days later:
  - The patient returned to the Emergency Department with altered mental status, and family reported increased headache.
- ED Assessment:
  - Vitals: T- 100.9°F, HR-122, RR-22, O2 sat-99%, BP-151/67
  - Patient's GCS decreased from 15 on arrival to 8 requiring intubation for airway protection

# Workup

- Labs:

## CBC

- Hematology	
WBC	20.7 H
RBC	4.88
Hgb	13.9
Hct	41.8
MCV	85.7
MCH	28.5
MCHC	33.3
RDW Coeff of Var	13.6
Plt Count	507 H
MPV	8.3 L
Platelet Comment	
Neut % (Auto)	Not Reportable
Lymph % (Auto)	Not Reportable
Mono % (Auto)	Not Reportable
Eos % (Auto)	Not Reportable
Baso % (Auto)	Not Reportable
Total Counted	100
Neutrophils % (Manual)	91.0 H

## CMP

- Chemistry	
Sodium	134
Potassium	4.2
Chloride	98
Carbon Dioxide	18
Anion Gap	22.2 H
BUN	8 L
Creatinine	0.6 L
Estim Creat Clear Calc	106.70
Estimated GFR	> 60
Glucose	153 H
Calcium	9.7
Total Bilirubin	0.5
AST	69 H
ALT	216 H
Alkaline Phosphatase	225 H
Total Protein	7.8
Albumin	4.4
Plasma Lactate	7.8 H

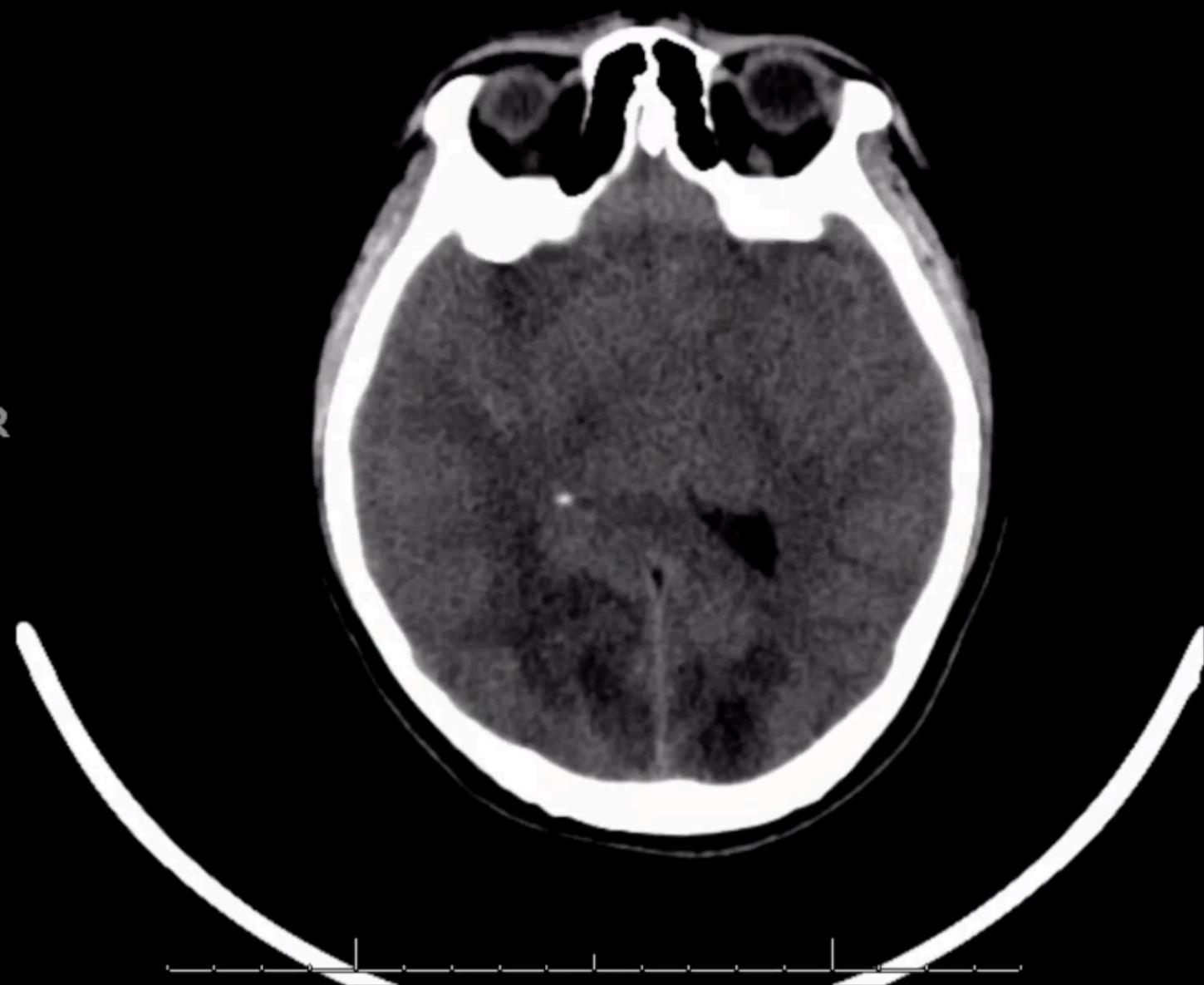
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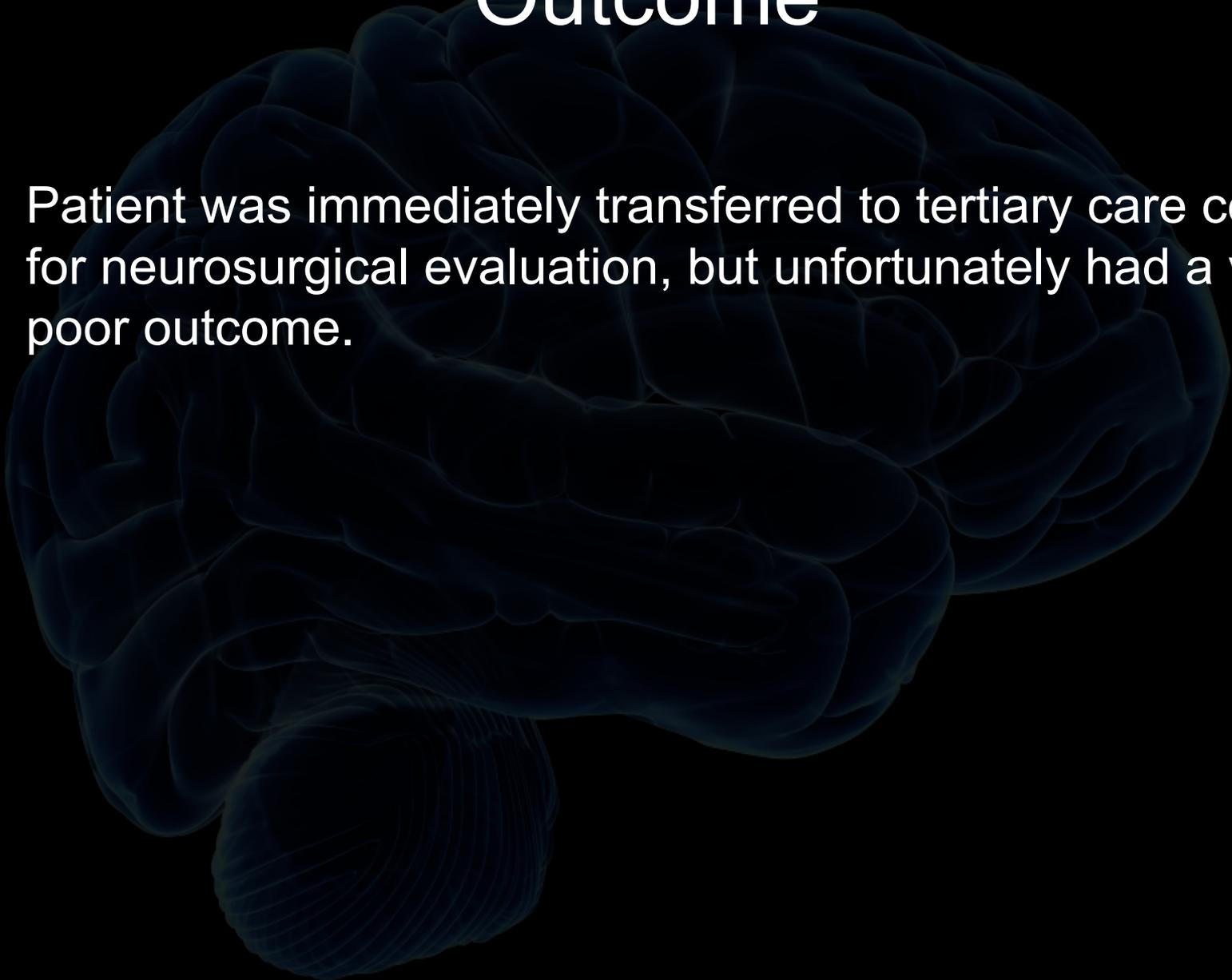
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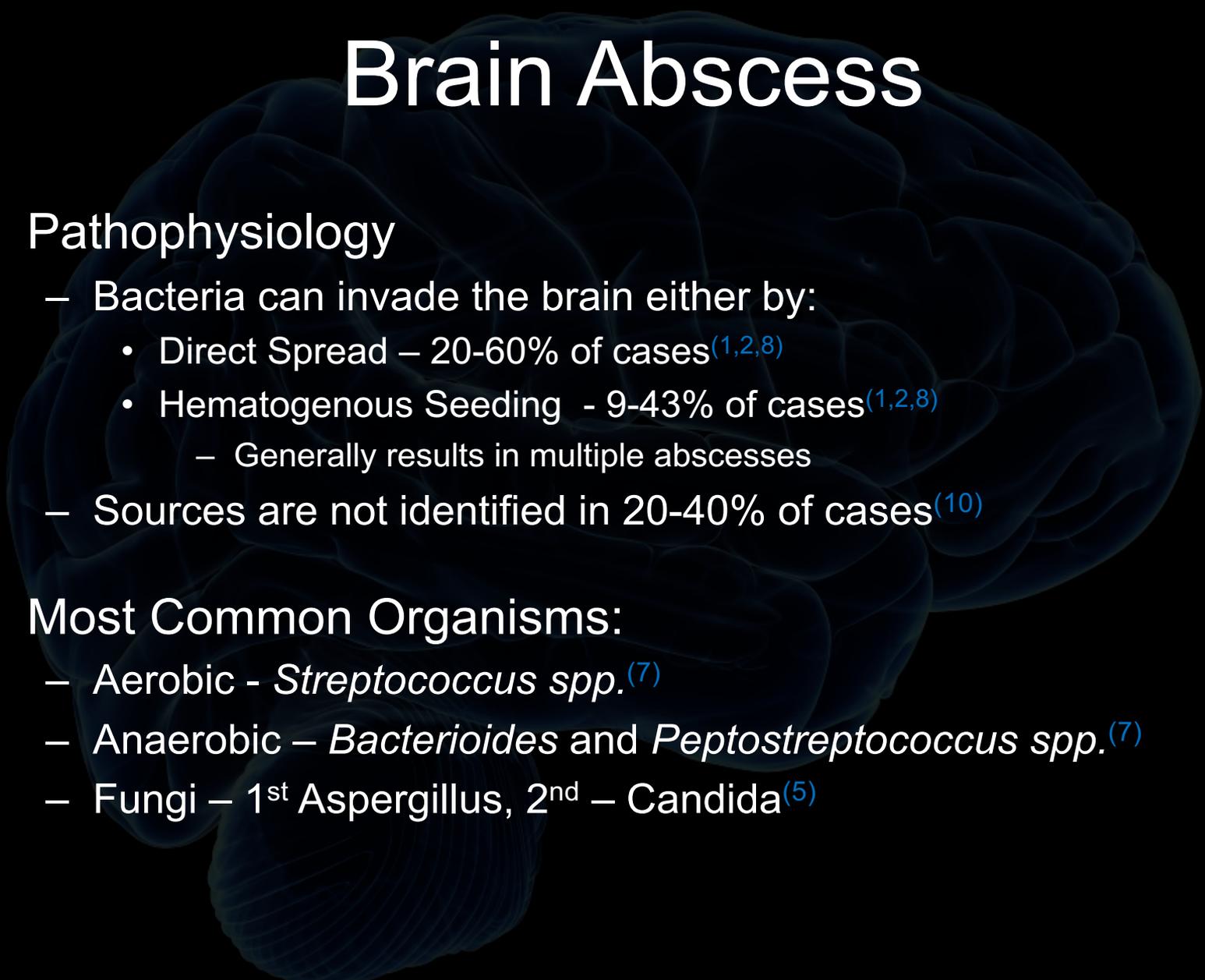


# Outcome

- Patient was immediately transferred to tertiary care center for neurosurgical evaluation, but unfortunately had a very poor outcome.

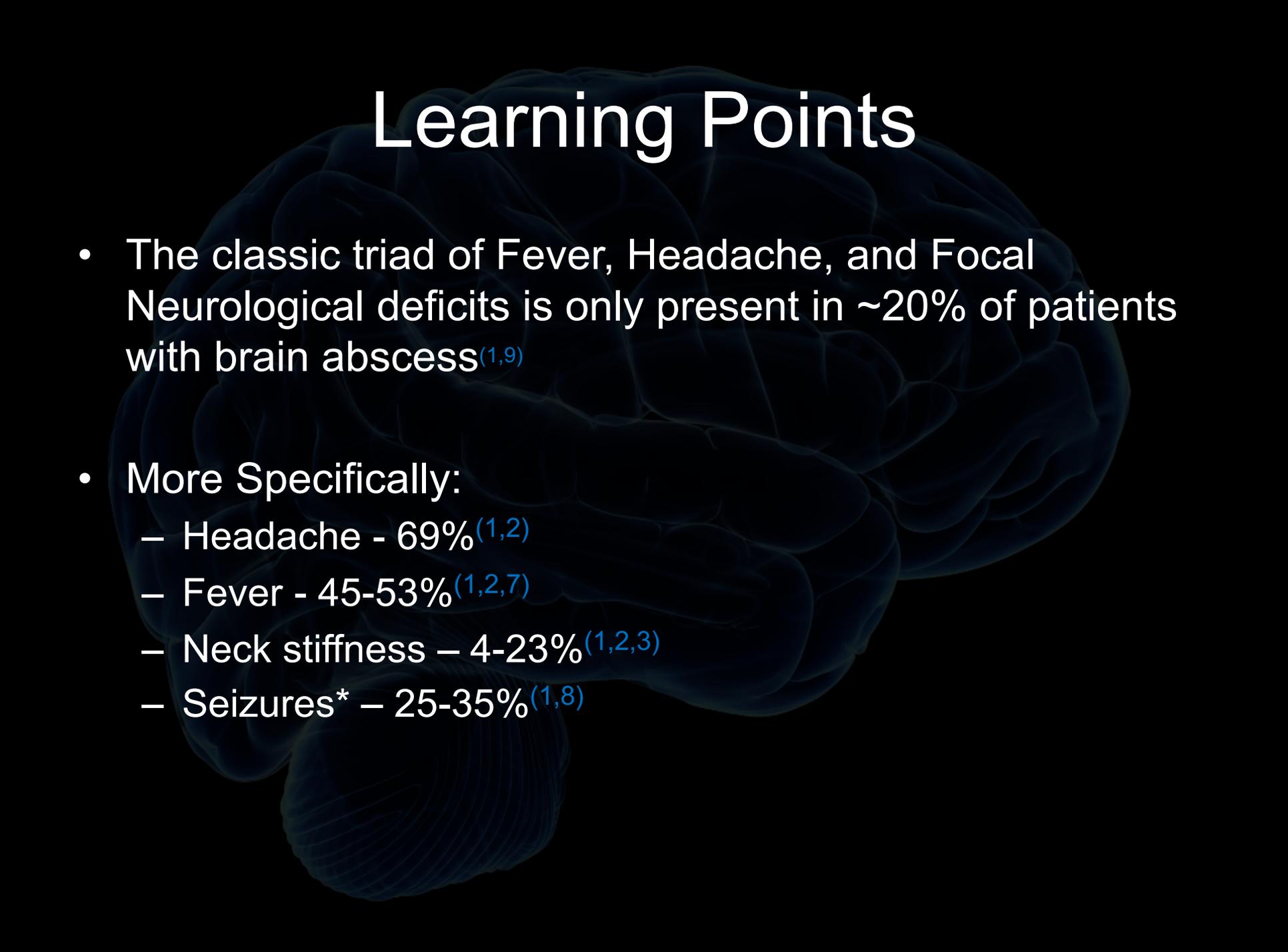


# Brain Abscess



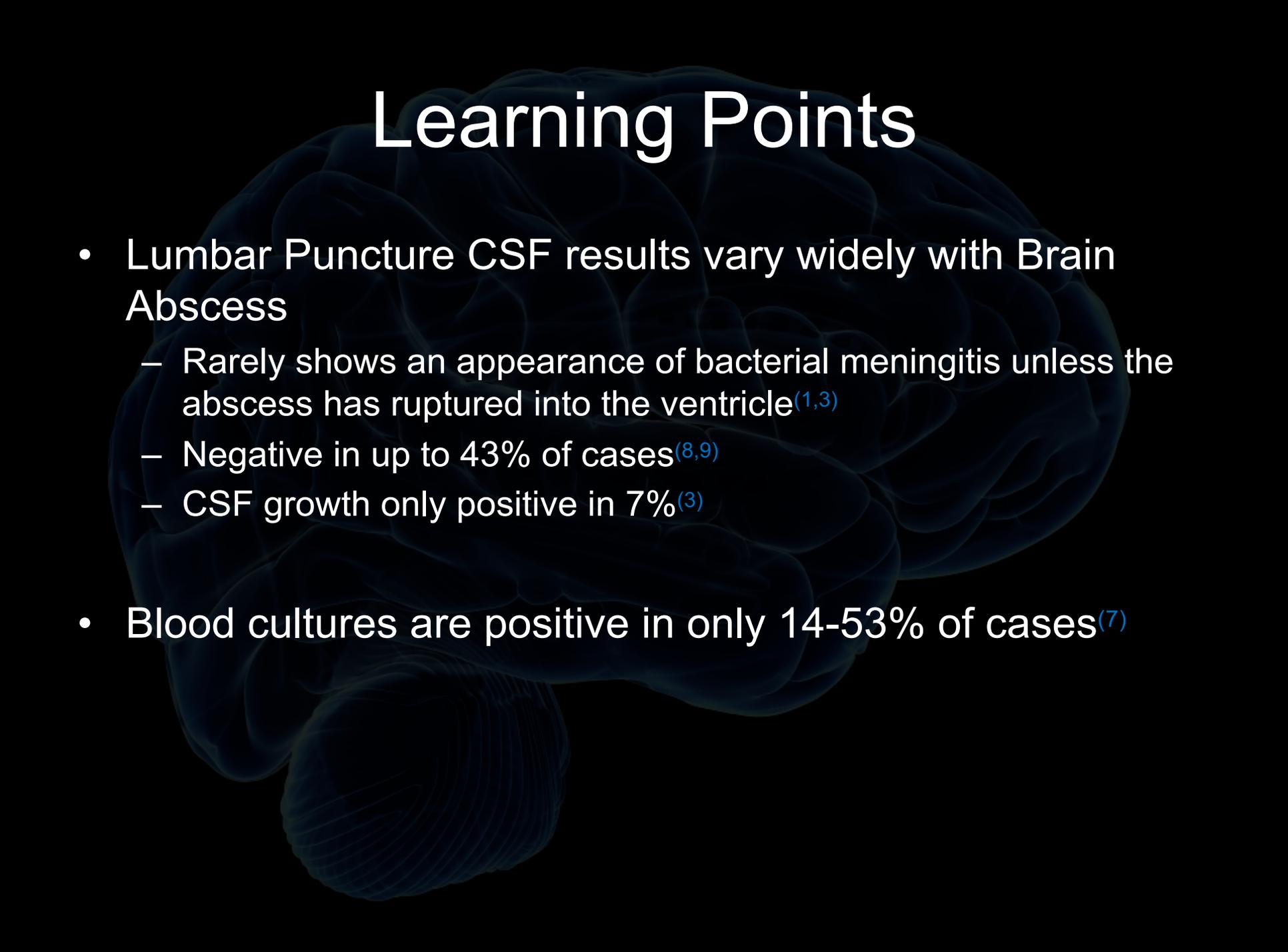
- Pathophysiology
  - Bacteria can invade the brain either by:
    - Direct Spread – 20-60% of cases<sup>(1,2,8)</sup>
    - Hematogenous Seeding - 9-43% of cases<sup>(1,2,8)</sup>
      - Generally results in multiple abscesses
  - Sources are not identified in 20-40% of cases<sup>(10)</sup>
- Most Common Organisms:
  - Aerobic - *Streptococcus spp.*<sup>(7)</sup>
  - Anaerobic – *Bacterioides* and *Peptostreptococcus spp.*<sup>(7)</sup>
  - Fungi – 1<sup>st</sup> *Aspergillus*, 2<sup>nd</sup> – *Candida*<sup>(5)</sup>

# Learning Points



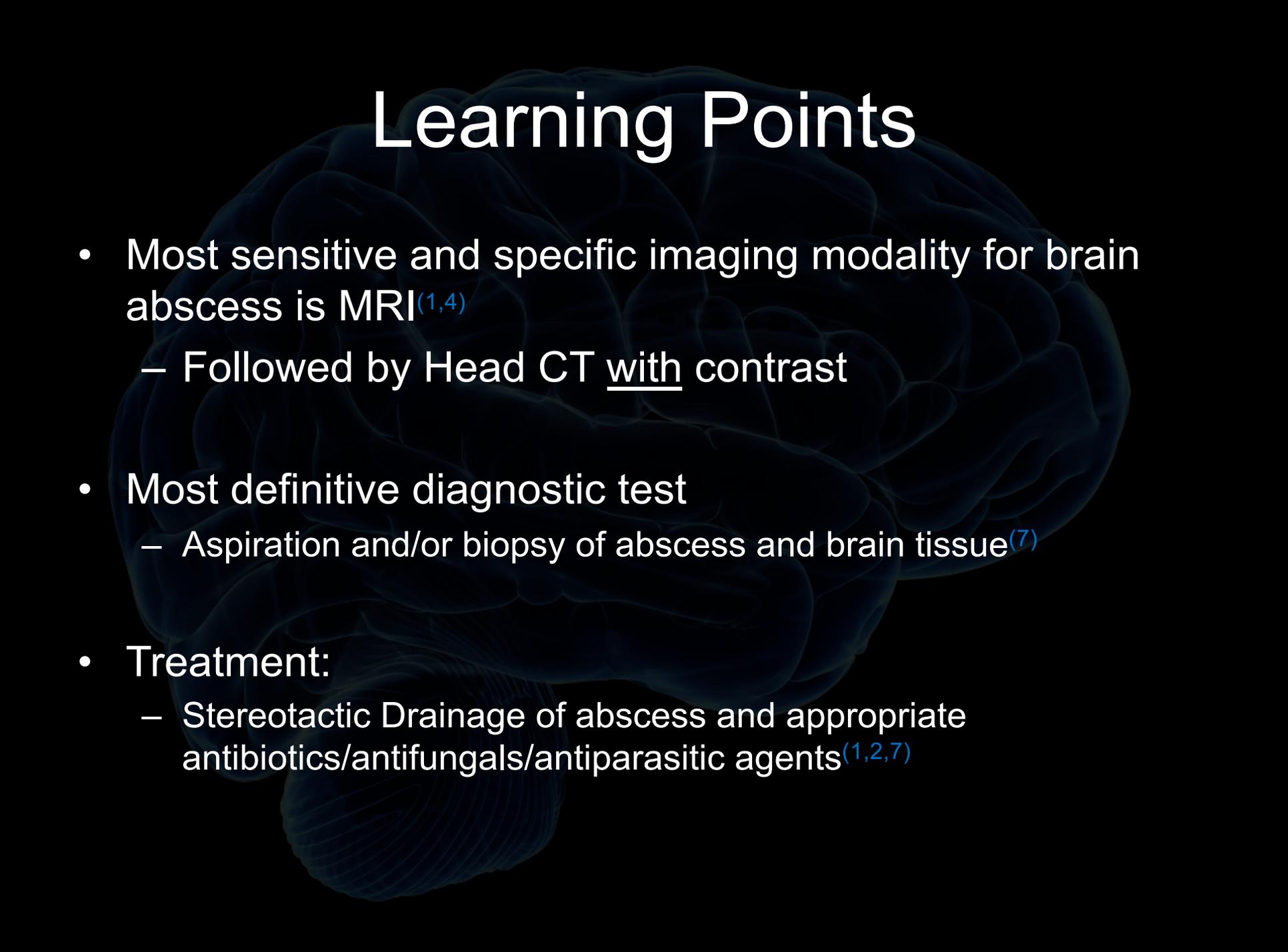
- The classic triad of Fever, Headache, and Focal Neurological deficits is only present in ~20% of patients with brain abscess<sup>(1,9)</sup>
- More Specifically:
  - Headache - 69%<sup>(1,2)</sup>
  - Fever - 45-53%<sup>(1,2,7)</sup>
  - Neck stiffness – 4-23%<sup>(1,2,3)</sup>
  - Seizures\* – 25-35%<sup>(1,8)</sup>

# Learning Points



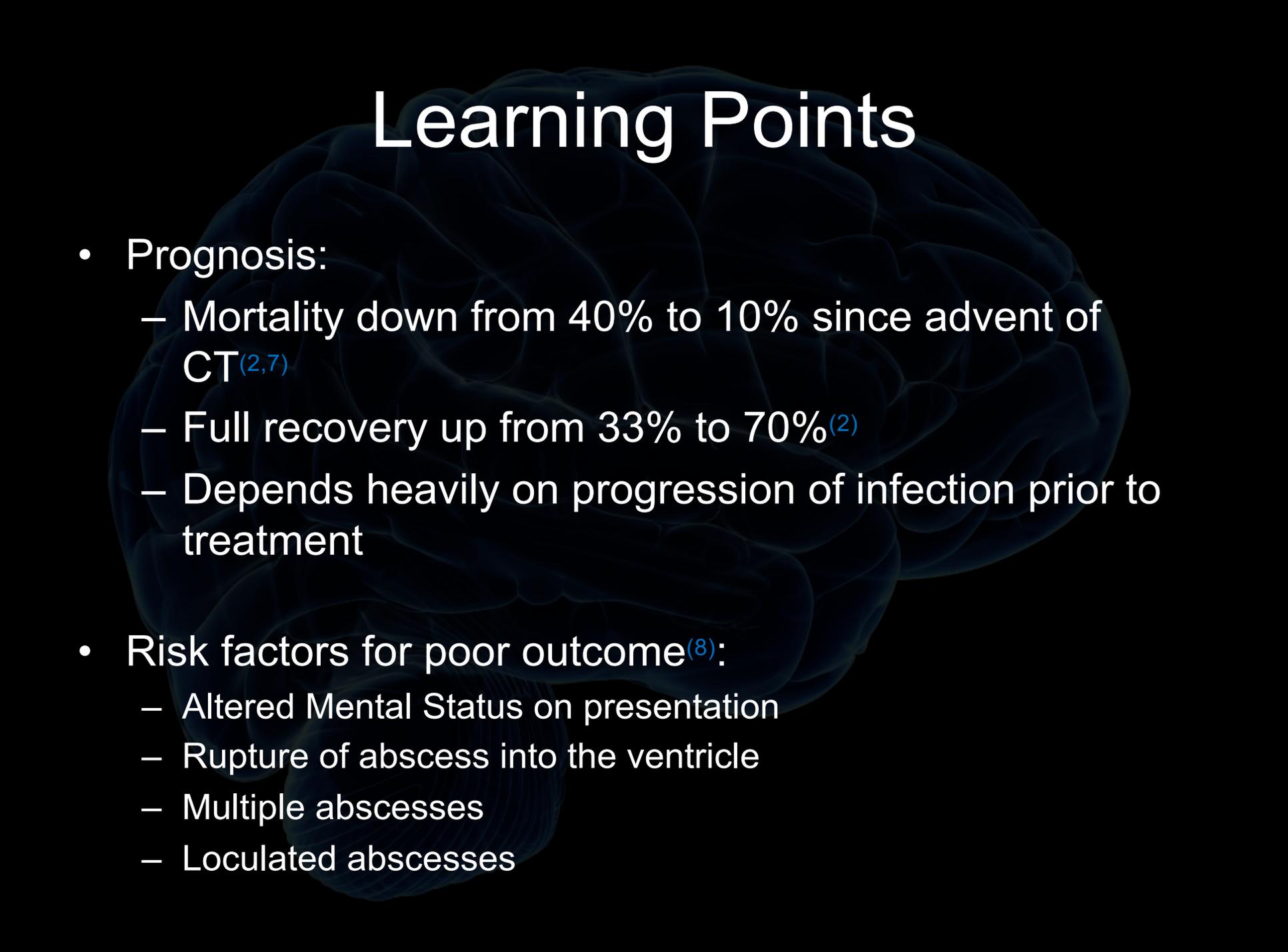
- Lumbar Puncture CSF results vary widely with Brain Abscess
  - Rarely shows an appearance of bacterial meningitis unless the abscess has ruptured into the ventricle<sup>(1,3)</sup>
  - Negative in up to 43% of cases<sup>(8,9)</sup>
  - CSF growth only positive in 7%<sup>(3)</sup>
- Blood cultures are positive in only 14-53% of cases<sup>(7)</sup>

# Learning Points



- Most sensitive and specific imaging modality for brain abscess is MRI<sup>(1,4)</sup>
  - Followed by Head CT with contrast
- Most definitive diagnostic test
  - Aspiration and/or biopsy of abscess and brain tissue<sup>(7)</sup>
- Treatment:
  - Stereotactic Drainage of abscess and appropriate antibiotics/antifungals/antiparasitic agents<sup>(1,2,7)</sup>

# Learning Points



- Prognosis:
  - Mortality down from 40% to 10% since advent of CT<sup>(2,7)</sup>
  - Full recovery up from 33% to 70%<sup>(2)</sup>
  - Depends heavily on progression of infection prior to treatment
- Risk factors for poor outcome<sup>(8)</sup>:
  - Altered Mental Status on presentation
  - Rupture of abscess into the ventricle
  - Multiple abscesses
  - Loculated abscesses

# Discussion

- The patient presenting with a brain abscess can be very challenging for a clinician
- It is important to consider brain abscess as an infectious cause of headache even when the classic triad of Headache, Fever, and Focal Neurological Deficits are absent
- It is also important to understand the limitations of imaging modalities. If there is suspicion for brain abscess, clinicians should have a low threshold to obtain an MRI.
- Lumbar Puncture is often negative in brain abscesses
- Early recognition and treatment is key to survival

# Sources

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# Questions?

