

Emily Pinto-Wong, HMSIV

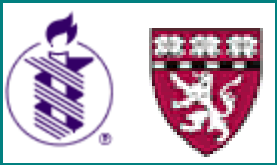
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September 2005

# Imaging Two Viral Encephalitides

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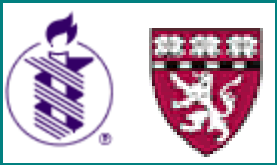
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# Outline of the Presentation

1. Index Patient #1
2. Brief discussion of HSV Encephalitis
3. Index Patient #2
4. Brief discussion of EEE Encephalitis
5. Take-home points

BONUS – Two Anatomy Break-Aways!



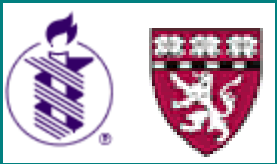
## Index Patient #1: Mr. B, a 22 year old previously healthy man.

### History:

- Flu-like illness 3 weeks prior to presentation.
- Woke up with nausea and vomiting.
- That night, smelled an unusual odor and had a seizure.
- Negative head CT at local hospital.
- Re-presented after second seizure. Transferred to BIDMC.

### Physical Exam:

- Febrile
- Confused, unable to answer questions coherently
- Speech is aphasic with neologisms
- Rest of neurological exam is unremarkable



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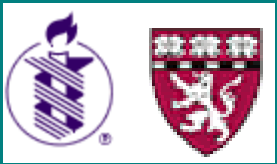
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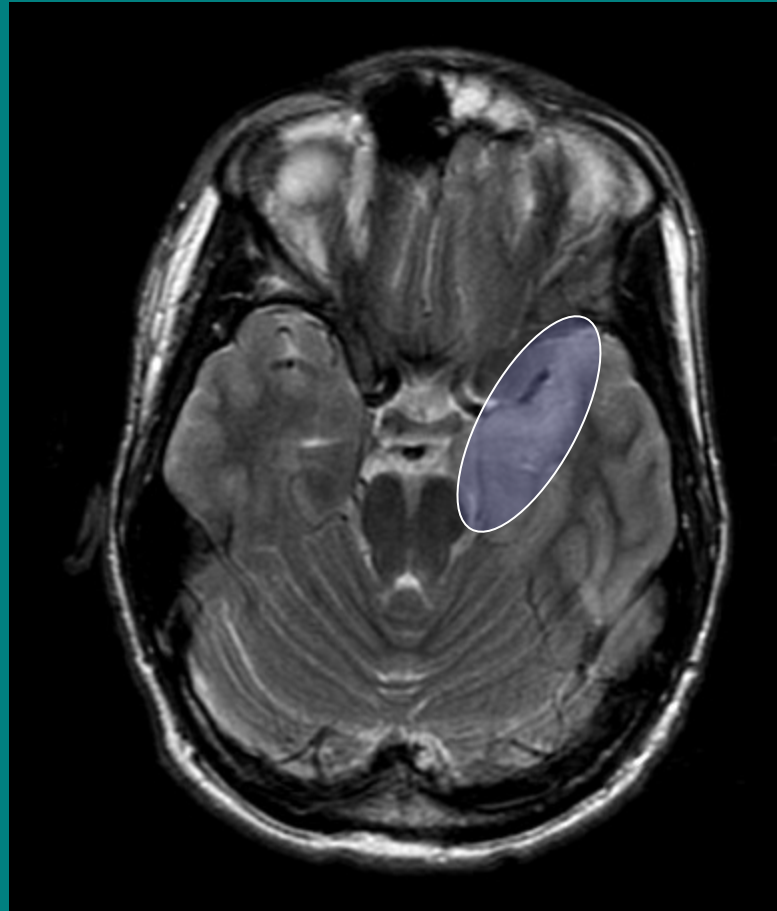
## Index Patient #1: Mr. B, a 22 year old previously healthy man.

### Lumbar puncture showed:

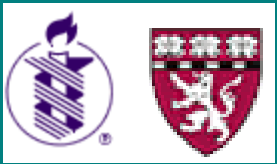
- White Blood Cells: 675 (75%L, 11%PMN)
- Red Blood Cells: 16
- Protein: 51.3 mg/dL (slightly high)
- Glucose: 81mg/dL (normal)
- Negative gram stain



## Index Patient #1: MRI – T2 weighted



Hyperintense signal  
in left anterior/medial  
temporal lobe



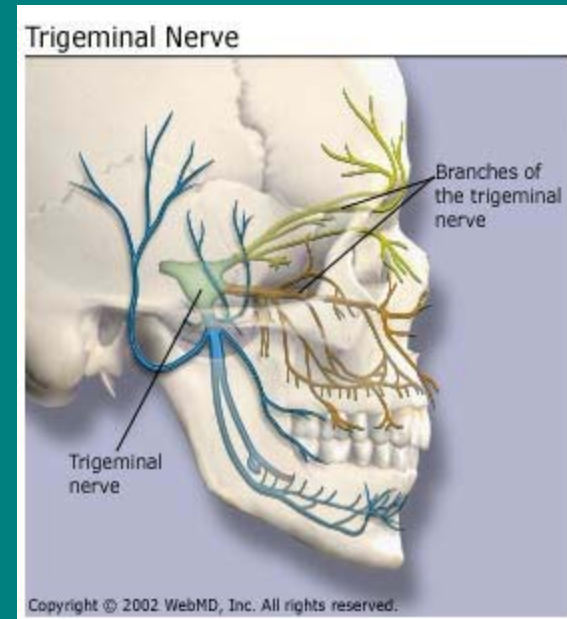
# HSV Encephalitis

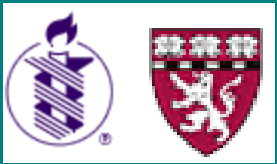
## Epidemiology:

- The most common cause of fatal sporadic encephalitis in the United States.
- Occurs in all age groups: 10% of cases are newborns

## Pathophysiology:

- In newborns can be HSV1 or HSV2
- In all others, it is caused by HSV1.
- 2/3 of all cases occur after oral herpes episode, with retrograde infection of the brain via the trigeminal nerve.
- Results in a focal encephalitis with progressive cerebral edema and necrosis.





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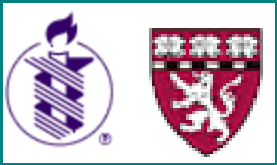
# HSV Encephalitis

## Clinical Course

- Rapid onset of fever, headache, seizure, focal neurological signs, impaired consciousness
- 70% fatality in untreated cases
- CSF typically shows a lymphocytic pleocytosis, red blood cells, high protein, normal glucose.

## Treatment

- Always consider this diagnosis early and treat empirically.
- IV Acyclovir should be administered early.
- Even with early treatment there is a mortality rate of 20-30%, with only 38-56% recovering normal neurological function.



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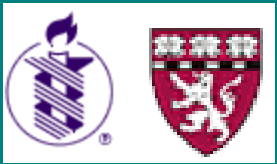
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# Imaging HSV Encephalitis

- Temporal lobe lesions, primarily unilateral.
- CT has only 50% sensitivity early in the disease. Early CT findings are associated with poor prognosis.
- MRI is the most sensitive and specific modality for HSV encephalitis, demonstrating temporal lobe T2 and FLAIR hyperintensity.
- SPECT brain perfusion scans show accumulation of radiotracer in the affected temporal lobe. This result has high specificity for HSV encephalitis.





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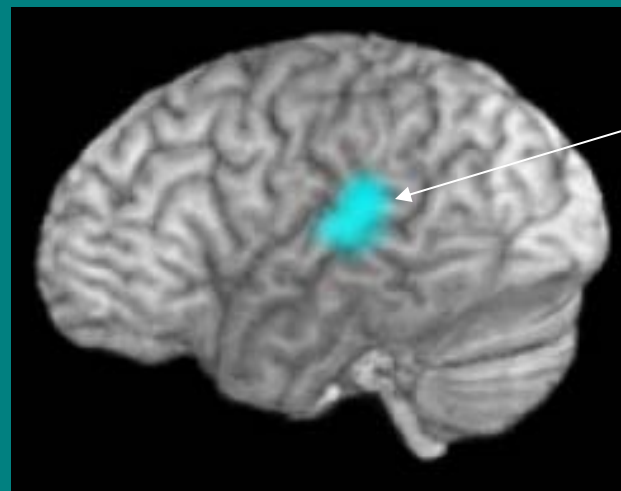
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## Remember the Temporal Lobe in HSV Encephalitis

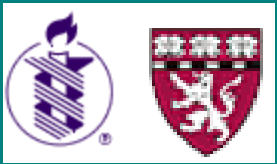
The majority of patients demonstrate focal deficits localizing to the involved temporal lobe.

Symptoms indicating language center involvement include dysphasia, aphasia, diminished comprehension, paraphasic spontaneous speech.



Wernicke's Area

Illustration from:  
<http://www.biologydaily.com/biology/upload/9/9f/WernickesAreaSmall.png>



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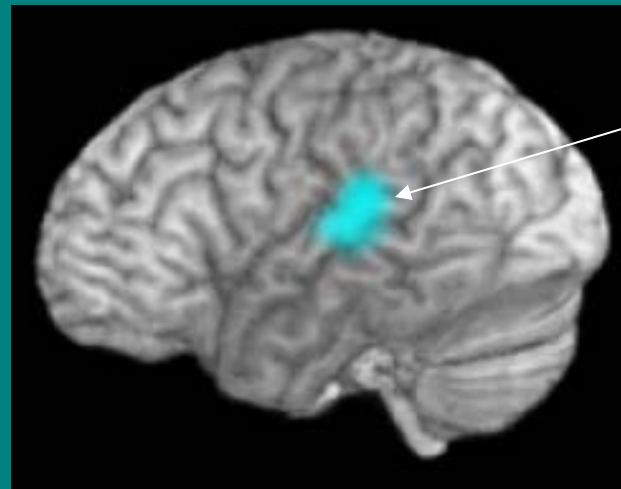
## Remember the Temporal Lobe in HSV Encephalitis

Language Symptoms in Mr. B, Index Patient #1:

Expressive and receptive aphasia. Episodes of speaking gibberish.

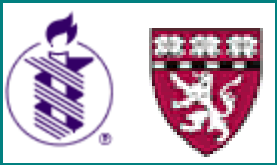
When asked to write "I love chocolate" he wrote "I tool like."

When asked to write "My name is Brian" he wrote "My name closet."



Wernicke's Area

Illustration from:  
<http://www.biologydaily.com/biology/upload/9/9f/WernickesAreaSmall.png>



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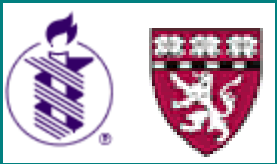
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## Index Patient #1: Hospital Course

On hospital day 6, Mr. B developed severe frontal headaches that did not resolve with symptomatic treatment.

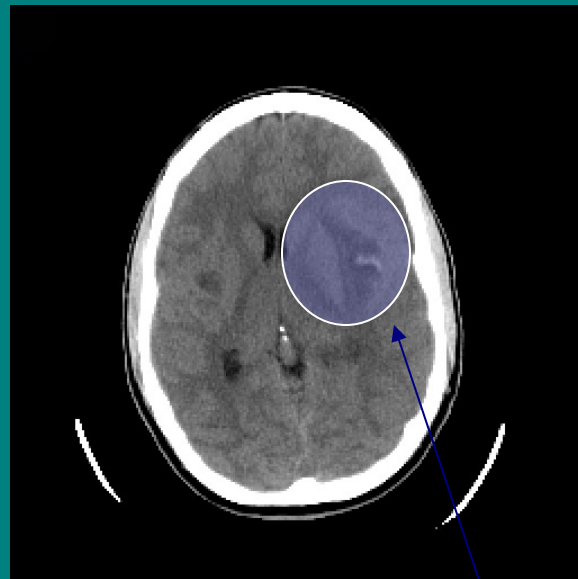
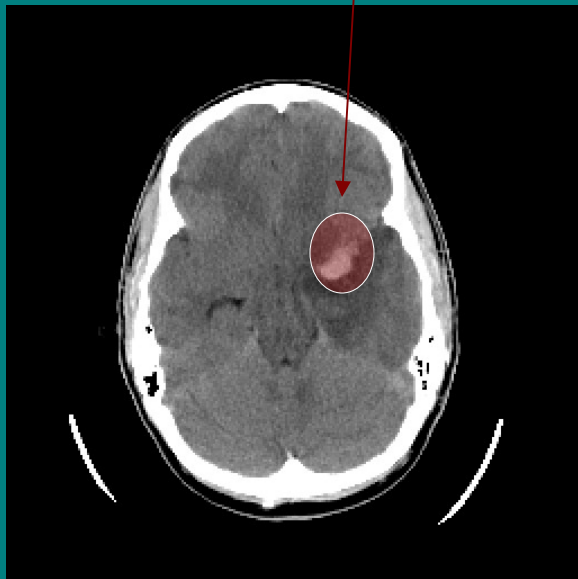
A urgent head CT was obtained.



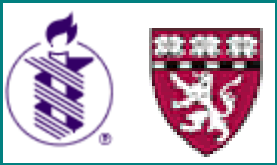
# Index Patient #1: Head CT – HD 6

intraparenchymal hemorrhage in left anterior temporal and left frontal lobes

Mass effect with compression of left lateral ventricle



surrounding low attenuation parenchyma consistent with edema



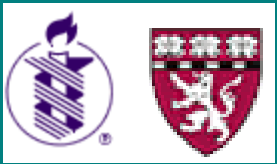
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## Index Patient #1: Hospital Course

Because of evidence of intraparenchymal hemorrhage, An MRA was obtained to evaluate the great vessels.



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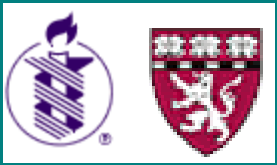
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## Index Patient #1: Normal MR Angiogram



PACS BIDMC

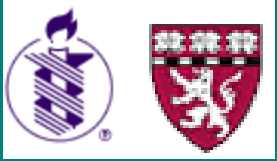


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# Anatomy Break-Away

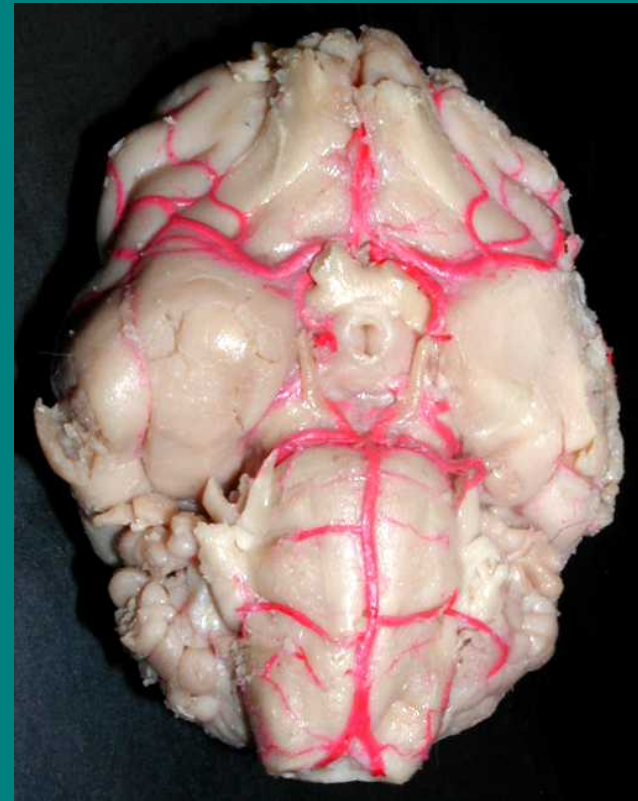


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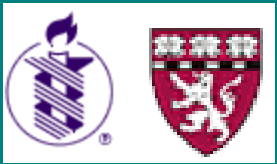
# Circle of Willis – complete in this case?



No posterior communicating arteries

<http://www.biology.clc.uc.edu/fankhauser> 16



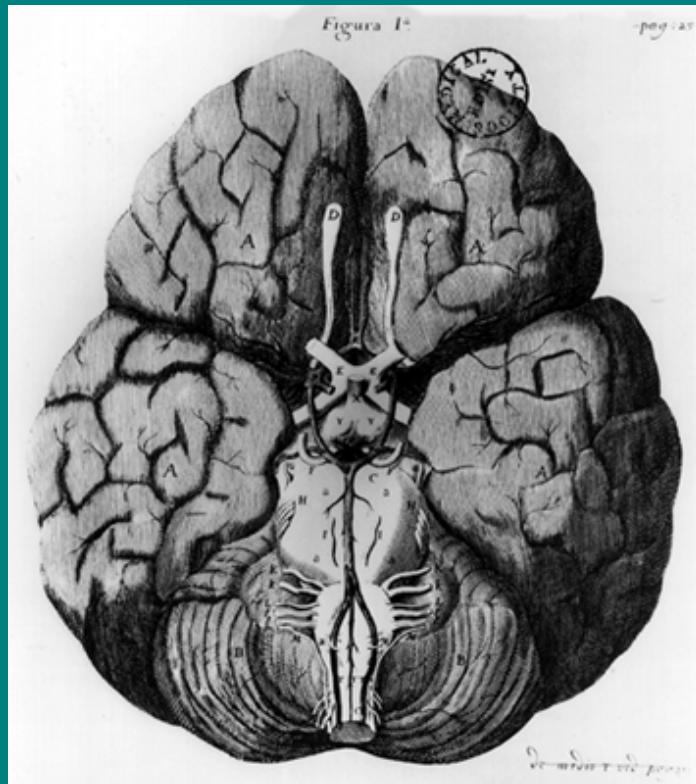


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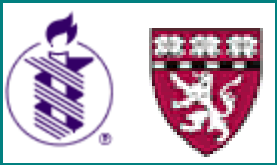
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Remember, the “Circle” of Willis is complete in only 1/3 of people.



An illustration made for Dr. Willis by Sir Christopher Wren.



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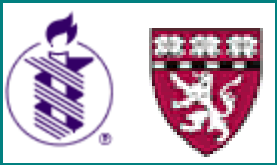
## Back to our index patient's hospital course

HSV PCR returned positive.

A course of IV acyclovir was completed.

After a complicated hospital course, Mr. B was discharged. He had persistent anomic aphasia.

He pursued an intensive outpatient course of speech and occupational therapy.



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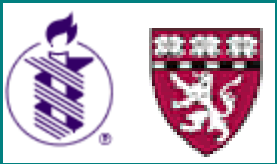
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## Index Patient #1: 2<sup>nd</sup> Hospitalization

Two months later, Mr. B re-presented to the hospital after a partial complex seizure.

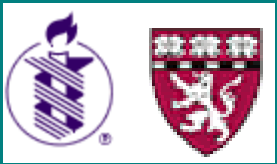
Another MRI was obtained.



## Index Patient #1: MRI – T2 weighted



Worsening of T2 signal hyperintensity in left insular cortex, the contiguous posterior/inferior aspect of the left frontal lobe, and a substantial portion of the left temporal lobe.



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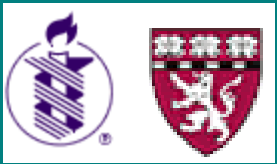
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## Index Patient #1: second hospital course

IV Acyclovir was re-started until HSV PCR results were confirmed to be negative.

Anti-epileptic medications were increased.

Patient was discharged for continued rehabilitation. Today, he continues to have residual anommic aphasia and plans to re-start work gradually.

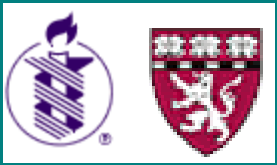


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# A second patient with viral encephalitis



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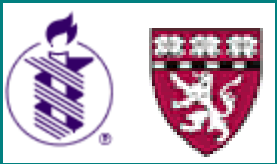
## Index Patient #2:

Ms. L, a previously healthy 20 year old woman who was transferred to BIDMC for management of encephalitis.

Presented with fever, headache and seizure.

On arrival at BIDMC she was minimally responsive.

CSF showed wbc 988, rbc 45, protein 167, glucose 80.

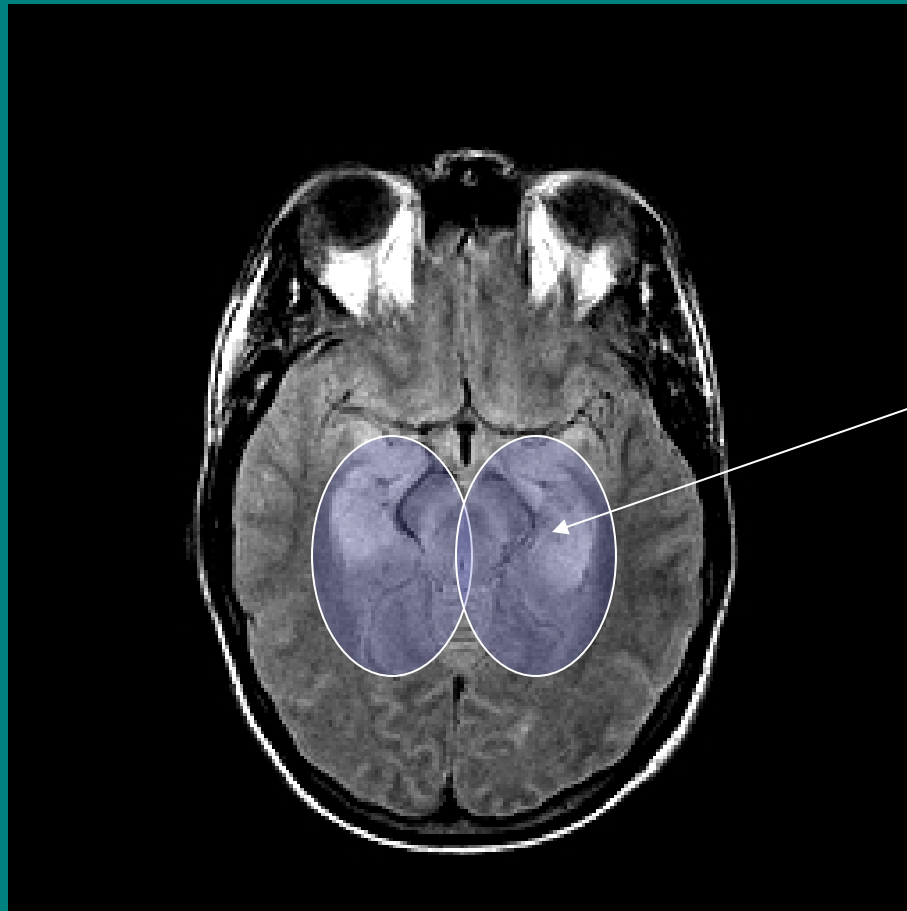


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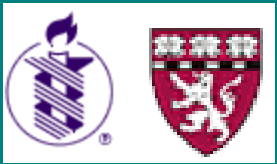
## Index Patient #2: MRI – FLAIR



Bilateral  
temporal lobe  
signal  
hyperintensity

PACS – BIDMC, courtesy of Dr.Appignani





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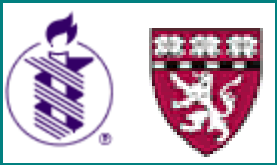
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## Index Patient #2: MRI – T2 weighted

Increased signal in  
bilateral basal  
ganglia.



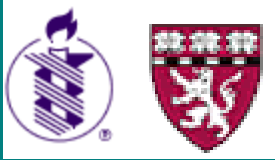


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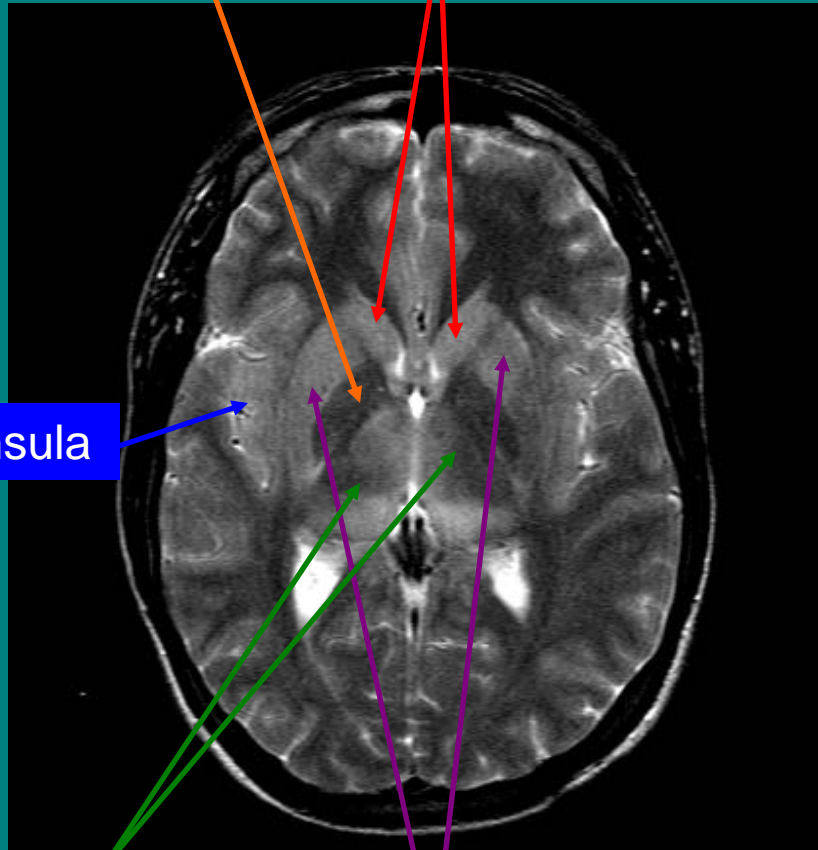
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# Anatomy Break-Away



Internal Capsule

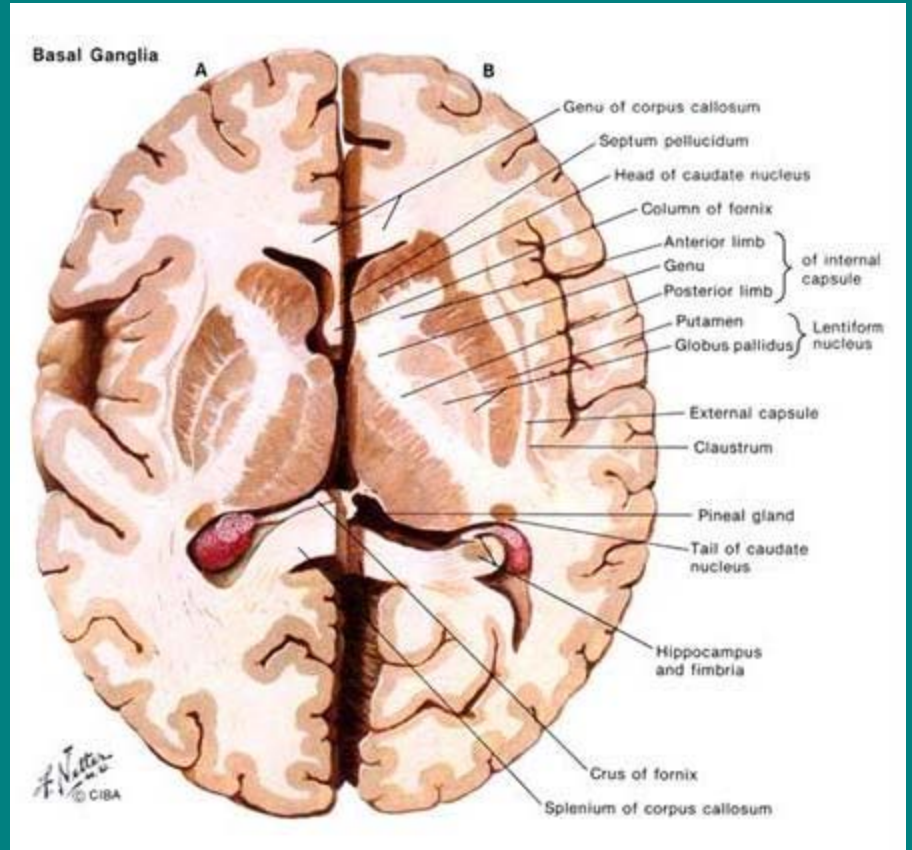
Heads of Caudate Nuclei



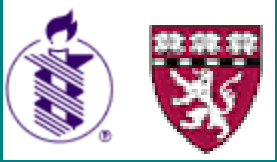
Insula

Thalamus

Globus Pallidum and Putamen



[http://www.bobschuster.com/news\\_basal.html](http://www.bobschuster.com/news_basal.html)



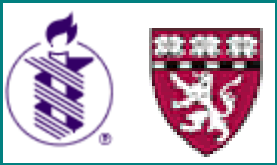
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These findings and clinical information were concerning for Eastern Equine Encephalitis.

Treatment for EEE is supportive care.



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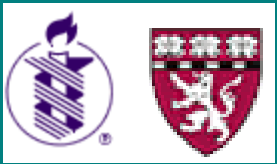
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## Index Patient #2: Hospital Course

On Hospital Day 3, Ms. L's pupils were noted to be fixed and dilated. There was concern for increased intracranial pressure.

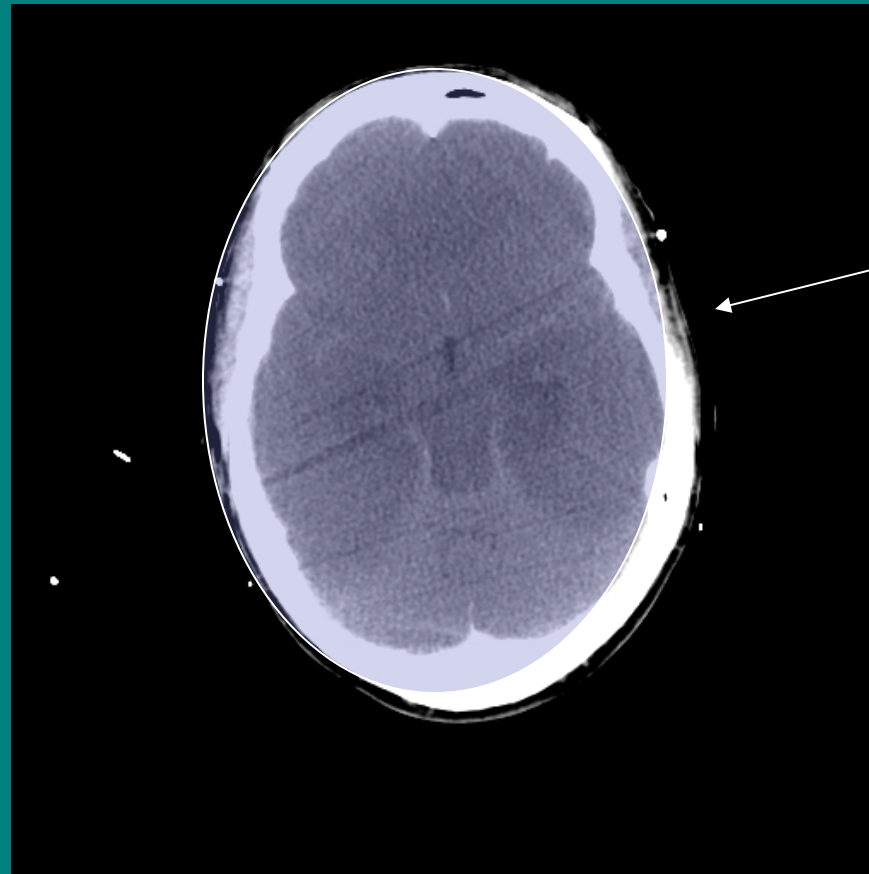
An urgent head CT was obtained.



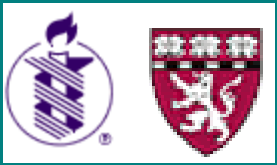
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## Index Patient #2: Urgent Head CT



Obliteration of sulci and loss of gray/white matter differentiation.



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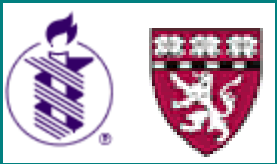
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## Index Patient #2: Hospital Course:

- These findings indicated diffuse brain edema.
- Burr holes were drilled.
- Intracranial pressure was increased.
- Electrolyte abnormalities worsened and patient's condition continued to decline.

Ms. L died on hospital day 3.



# EEE Encephalitis



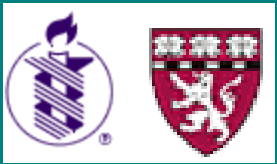
## Epidemiology

- Eastern equine encephalitis virus in the *Togaviridae* family
- Small sporadic outbreaks occur yearly in August and September along the Atlantic and Gulf Coasts.
- Transmitted by the *Culiseta melanura* mosquito

## Clinical Course

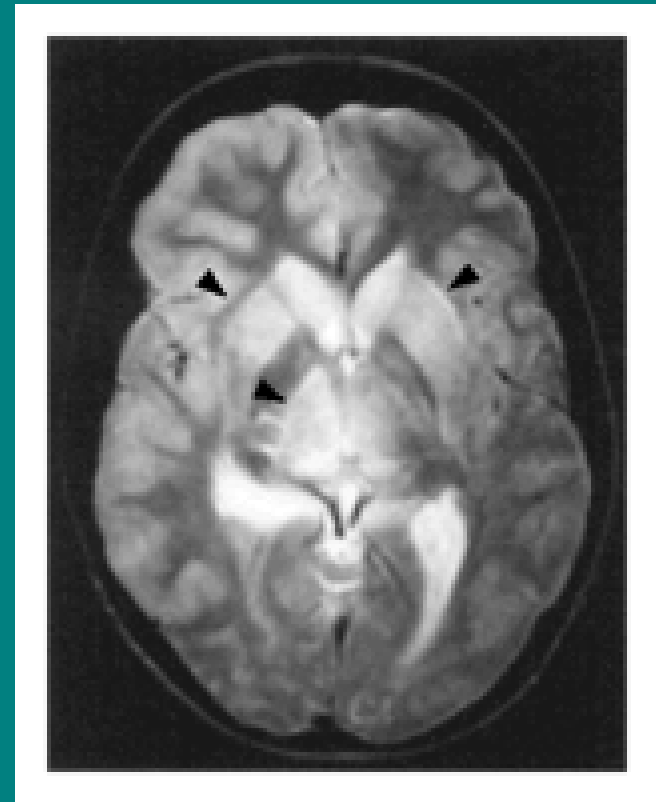
- Prodrome begins 1 week after mosquito bite with fever, headache, nausea and vomiting.
- Only 2% of infected adults and 6% of infected children develop encephalitis.
- Condition deteriorates rapidly once neurological symptoms (seizures, cranial nerve palsies) begin.
- 90% of patients with encephalitis become stuporous or comatose.
- Mortality is at least 30%.



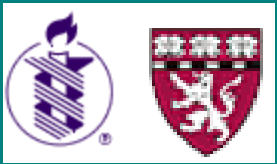


## Imaging EEE Encephalitis

- Magnetic resonance imaging is more sensitive than computed tomography.
- Both are often abnormal early in the course.
- Focal lesions are common in the basal ganglia (71%) , thalami (71%), and brain stem (43%).
- Cortical lesions, meningeal enhancement, and periventricular white-matter changes are less common.



Deresiewicz et al. 336 (26): 1867,  
Figure 1 June 26, 1997



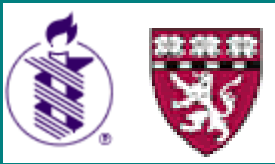
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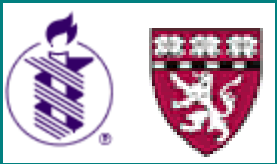
## Take-home points on imaging viral encephalitides

- HSV encephalitis is common and has a high fatality and morbidity. Your patients will benefit if you think of this disease early and treat with acyclovir whenever there is suspicion.
- MRI is the most sensitive modality for detecting HSV and EEE encephalitis.
- Look for unilateral temporal hyperintensity in HSV encephalitis.
- Look for basal ganglia, thalamic and brain stem hyperintensity in EEE encephalitis.
- Remember that HSV lesions can undergo necrosis, with subsequent intraparenchymal hemorrhage.
- Remember that HSV lesions can evolve radiologically even after the CSF is sterile.



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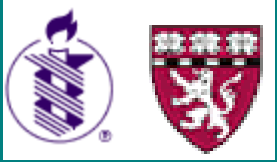
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## Acknowledgements:

Dr. Gillian Lieberman

Dr. Barbara Appignani

Yonatan Grad

Pamela Lepkowski

Larry Barbaras