Two Pediatric Cases of Amebic Meningoencephalitis

Jordan Eisner BA[4], Natasha Nakra MD[2], Jimmy L Huynh MD[3], Arzu Ozturk MD[3], Shannon N Liang MD[1], Trishna Kantamneni MD[1]
Department Of Neurology[1], Department of Pediatrics[2], Department of Radiology[3], UC Davis SOM[4]

Background

Granulomatous Amebic Encephalitis:
- Caused by *Balamuthia mandrillaris* or *Acanthamoeba sp.*
- Subacute or chronic course
- May start with otitis media, cutaneous lesions, or rhinitis
- Soil borne with no seasonal affinity

Primary Amebic Encephalitis:
- Caused by *Naegleria fowleri*
- Acute fulminant course
- Typically occurs in the summer months following exposure to warm freshwater

Presentation:
- Vague constitutional and neurological symptoms such as:
  - Fever
  - Chills
  - Vomiting
  - Altered mental status
  - Ataxia

Mortality: >90%

Case 1: 3-year-old previously health boy

- **Day 3 of Illness:** Telehealth visit for fevers and foul-smelling urine
- **Day 7 of Illness:** Presented to outside hospital with fever, ataxia, nystagmus
- **Day 8 of Illness:** Empiric antibiotics and anti-TB regime started
- **Day 11 of Illness:** Patient's mental status and neurological exam abruptly declined
- **Day 16 of Illness:** *Balamuthia mandrillaris* diagnosis confirmed by mcfDNA of blood and mNGS of CSF; Treatment initiated
- **Day 36 of Illness:** Patient passed away

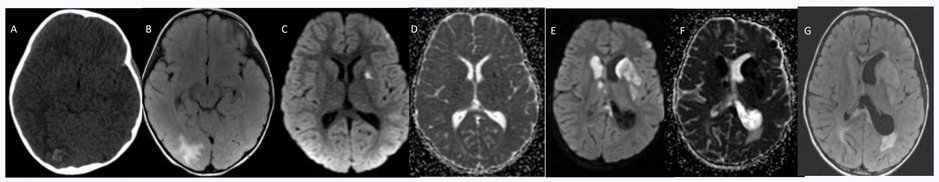
Case 2: 7-year-old previously health boy with a history of swimming in a freshwater lake in summer

- **Day 3 of Illness:** Presented with headache, nausea, intractable vomiting, gait instability and neck pain
- **Day 3 of Illness:** Empiric antimicrobial and anti-epileptic treatment started
- **Day 4 of Illness:** Left pupil fixed and dilated; No vestibulo-ocular reflexes; No movement to noxious stim in 3 of 4 extremities
- **Day 6 of Illness:** Treatment for *Naegleria fowleri* infection started
- **Day 8 of Illness:** *Naegleri fowleri* diagnosis confirmed by mcfDNA of blood and CSF specific PCR
- **Day 10 of Illness:** Patient passed away

Pertinent Labs

Case 1:

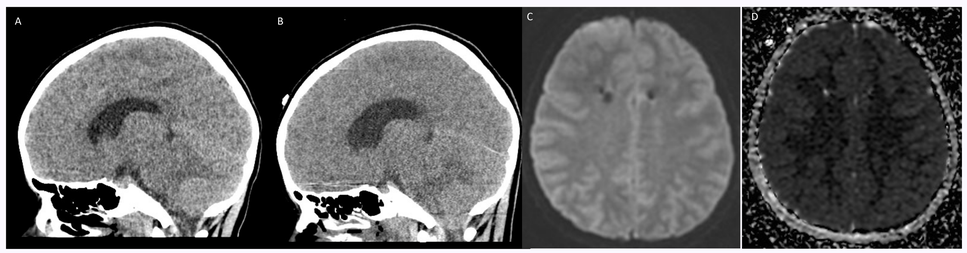
CSF:
- Lymphocytic pleocytosis
- Elevated protein
- Severe hypoglycorrhachia



Case 1: Initial CT head (A) with right occipital hemorrhagic lesion, follow up MRI brain with T2 Flair signal changes in the right occipital region (B) and scattered multi-territorial acute infarcts on the left on DWI (C) and ADC (D). MRI Brain DWI (E) and ADC (F) images from day 22 of illness showing bilateral thalamic, caudate and bilateral parenchymal infarcts along with progressive hydrocephalus

Case 2:
Blood:
- Elevated WBC
- Hyponatremia
- Elevated anion gap

CSF:
- Lymphocytic pleocytosis
- Elevated protein
- Normal glucose



Case 2: Initial normal CT head (A) compared to 12 hours later (B) shows diffusely increased cerebral edema. Follow up MRI Brain DWI (C) and ADC (D) on day 4 of illness demonstrates extensive white matter restricted diffusion.

Discussion

- We suspect that our first patient's presentation with discolored and foul-smelling urine may reflect amebic spread to the urinary tract
- Our case of *B. mandrillaris* had the expected CSF abnormalities for amebic encephalitis
  - Lymphocytic pleocytosis
  - Elevated protein (peaked at 913 mg/dl)
  - Persistent hypoglycorrhachia
- Our case of *N. fowleri* did not have characteristic CSF findings
  - Glucose remained normal
- Typically, *N. fowleri* presents with a lower CSF glucose than *B. mandrillaris* – our cases show the opposite findings
- Although imaging findings are non-specific, the dominant picture of Case 1 was rapidly progressive vasculitis, similar to other cases reported in the literature.
- DNA Next generation sequencing (DNA NGS) testing of the blood was used to diagnose both patients
  - Advantages of DNA NGS include:
    - Non-invasive (saved our patient from having a brain biopsy)
    - 48-hour turnaround time
    - Can identify several pathogens
- We recommend Microbial cell free DNA (mcfDNA) and Metagenomic NGS (mNGS) testing of blood and CSF when the common pathogens for meningoencephalitis have been ruled out.