Opportunistic Infections of the CNS in Patients with AIDS

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Patient Encounter

- HD is a previously healthy 32 y.o. man who presents to ED with progressive decline in mental status, N/V, decreased PO intake, and severe unremitting headache for the past three days.

- The differential diagnosis is broad, so what do you do in the ED?
Patient Encounter

- Physical Exam – Afebrile, VS within normal limits
  Physical exam otherwise unremarkable
- Neurological Exam – HD is somnolent,
  A&O to person only with dysmetria, gait instability, ? of L facial droop
- Toxicology Screen – no toxins
- CBC – showed WBC of 3.0 with Hct of 39.9
- Electrolytes – within normal limits
Patient Encounter

- Lumbar Puncture showed **31 WBC’s/uL**, and **621 RBC’s/uL** in 3rd vial. On Gram Stain, no microorganisms seen

- What imaging would you recommend?
Portable CXR

No evidence of consolidation or active infection

Image from BIDMC PACS
Our Patient – Axial CT

Multiple high-attenuation lesions spread throughout both hemispheres representing hemorrhagic foci.

Areas of edema surrounding the lesions.
Our Patient – Axial MR

Both T1 and T2 scans show multiple hyper-intense lesions scattered throughout the cortex.
Our Patient - Workup

- Anti-HIV antibodies were found in the patient’s serum
- CD4 count was found to be 53 and the viral load later found to be >100,000 copies/mL
- Anti-toxoplasma IgG antibodies were subsequently found confirming the diagnosis of Toxoplasmosis
- HD was subsequently admitted to BIDMC where his condition rapidly improved on anti/protozoal medications and supportive care
Toxoplasmosis

- Most common CNS infection in patients with AIDS
- Caused by the organism *Toxoplasma Gondii* a protozoa that colonizes up to 15% of people
- 30% chance of reactivation when CD4 count <100
- Feline required for *Toxoplasma* lifecycle
Our Patient – Treatment and F/U

- HD was empirically treated with Pyrimethamine, Sulfadiazine, and Leukovorin for suspected Toxo
- He improved somewhat but had a recurrence of acute MS change on the floor
- Rapid treatment with Mannitol and Dexamethasone averted possible uncal herniation
- HD has since markedly improved and is currently on HAART with an undetectable viral load and CD4 > 100
Patient #2 - Toxoplasmosis

Characteristic Findings

Ring enhancing lesions on MRI with surrounding edema

Evidence of mass effect, but no herniation

Image courtesy of S. Reddy, MD
Other Opportunistic Infections of the CNS
CNS Opportunistic Infections

Overview

<table>
<thead>
<tr>
<th>Mass Effect</th>
<th>No Mass Effect</th>
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<tbody>
<tr>
<td>• <em>Toxoplasma Gondii</em></td>
<td>• Progressive Multifocal Leukoencephalopathy</td>
</tr>
<tr>
<td>• AIDS-related CNS lymphoma</td>
<td>• HIV encephalopathy</td>
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<tr>
<td>• CMV</td>
<td>• <em>Cryptococcus Neoformans</em></td>
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<tr>
<td>• TB</td>
<td></td>
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<tr>
<td>• Fungal infections</td>
<td></td>
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<tr>
<td>• Neurosyphilis</td>
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CNS Opportunistic Infections

Overview

CT/MRI

- Mass Effect
  - Herniation?
    - Steroids/Open Decompression
    - Toxo Serology
- No Mass Effect
  - Lumbar Puncture for Diagnosis
    - Biopsy
    - Specific Rx

Adapted from Demeter, L. www.utdol.com
CNS Opportunistic Infections

Overview

<table>
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<tr>
<th>CD4 Count</th>
<th>CNS Pathology</th>
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<tbody>
<tr>
<td>&gt;500 cells/uL</td>
<td>CNS neoplasms (likely unrelated to HIV disease)</td>
</tr>
<tr>
<td>&lt;200 cells/uL</td>
<td>TB, HSV</td>
</tr>
<tr>
<td>&lt;100 cells/uL</td>
<td>Toxoplasmosis, Cryptococcus, CMV, PML, Fungi</td>
</tr>
</tbody>
</table>
AIDS-related CNS Lymphoma

- Nearly 100% of lesions are EBV positive by PCR
- Typically have some mass effect
- Difficult to differentiate from Toxoplasmosis

Image reproduced from www.utdol.com
Toxo or CNS Lymphoma?

- Nuclear Imaging with FDG-PET shows areas of increased metabolic activity

- Suggestive of lymphoma vs. Toxoplasmosis

HIV Encephalopathy

- Primary infection of neural cells with HIV, which have tropism for CNS

Which causes...

- Cortical and subcortical atrophy
- Ventricular enlargement
- Widening of the Sulci

Image reproduced from www.utdol.com
HSV Encephalitis

- Increased risk in immunosuppressed hosts
- Predilection for medial temporal lobe
- Destruction mediated by virus and host immune response

Image courtesy of S. Reddy, MD
Progressive Multifocal Leukoencephalopathy

- Rare demyelinating disease caused by DNA Papovirus (a.k.a. polyomavirus)
- Route of transmission unclear
- 1%-4% of AIDS patients will develop PML if left untreated
- In one trial, 81% of patients with focal brain lesions without mass effect had PML
Progressive Multifocal Leukoencephalopathy

Characteristic Findings

Diffuse hyperintensities within the white matter with relative sparing of gray matter and no evidence of mass effect
Cryptococcal Meningoencephalitis

- AIDS defining illness in 40-60% of patients
- Diagnosed with Lumbar Puncture
- Indolent course with symptoms of fever, malaise, and headache

Image reproduced from www.utdol.com
Prophylaxis

Opportunistic Infection

- Toxoplasmosis
- CMV
- HSV
- Cryptococcus

Prophylaxis

- TMP/SMX (doubles for PCP prophylaxis)
- Gancyclovir
- Acyclovir
- Azoles (Fluconazole)
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