AIDS Manifestations in the CNS

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AIDS in the CNS

- 10-20% of pts with AIDS **present** with neurologic disease
- 40% of AIDS pts will have neurologic involvement in course of disease
- CNS symptoms may indicate overall deterioration
Importance of Imaging

• Identify treatable lesions
• Establish prognosis

… but there is a great deal of overlap in presentation of different diseases

For all AIDS-related lesions, MRI is more sensitive than CT
Types of CNS Disease

- HIV itself

- Neoplasm
  - primary CNS lymphoma
  - metastases

- Opportunistic infection
  - parasitic: toxoplasmosis (toxo), amebiasis
  - mycobacterial: tuberculosis (TB), mycobacterium avium complex (MAC)
  - viral: JC virus (JCV), herpes simplex virus (HSV), cytomegalovirus (CMV)
  - fungal: cryptococcus, aspergillus, candida
Nonfocal Lesions

- PML = Progressive Multifocal Leukoencephalopathy
- HIV encephalitis
- HSV/CMV encephalitis
PML

• caused by JC virus
• infected lymphocytes carry JC virus to brain; virus destroys myelin-producing oligodendrocytes
• typical presentation: CD4<100, focal neuro deficit
Typical findings in PML

Patient 1

demyelination

MR FLAIR Axial BIDMC
Radiologic findings in PML

- demyelination of subcortical fibers at corticomedullary junction
- does not extend into overlying cortex
- often found in frontal, parietal & occipital lobes
PML: Radiologic correlation with pathology

Patient 1

MR FLAIR Axial

From http://www-medlib.med.utah.edu/WebPath/webpath.html
HIV Encephalitis

- 80% of AIDS pts have immunocytologic evidence of HIV in brain
- imaging shows **nonspecific** changes:
  - global **atrophy** with **deep** white matter changes
  - symmetrical, diffuse disease
  - can distinguish from PML because does not involve just the subcortical white matter
Atrophy due to HIV encephalitis in a 42 yo AIDS patient

Patient 2

MR T2 Axial

Enlarged ventricles for age

BIDMC
Atrophy

- Found in 30-80% of AIDS pts at autopsy
- atrophy does correlate with cognitive impairment… but not very closely
- tissue loss develops within specific regions of deep brain, e.g. head of caudate
- cortex develops widened sulci secondary to loss of deeper tissue
Atrophy can progress quickly

These two CT scans were done 18 months apart

From: AIDS Imaging: A Practical Clinical Approach
Focal Lesions

- Toxoplasmosis ★
- Lymphoma ★
- Cryptococcal disease
- Other infections -- TB, syphilis, fungi

★ Most common
Toxoplasmosis

- Parasitic intracellular protozoa
- Usual host is cats
- Presents with median CD4=48, fever, HA, +/- focal neuro findings
Imaging Toxoplasmosis

- found in cerebral hemispheres > brainstem or cerebellum
- typical location: corticomedullary junction, basal ganglia
- on CT, hypodense lesion with edema and ring-enhancement
- on MRI, can see more ring-enhancing lesions, usually hyperintense
Toxo: Radiologic correlation with pathology

Patient 4

Another patient with toxo abscess at autopsy

From http://www-medlib.med.utah.edu/WebPath/webpath.html
Toxo lesions progressed in 1 wk in pt unable to tolerate Rx

Increasing edema on MR FLAIR

All images are Patient 4 from BIDMC; MR FLAIR Axial
Typical features of toxo: multiple lesions

Basal ganglia involved; mass effect

Cortico-medullary junction lesion

MR T1 Cor

Patient 4
Lymphoma

- Monoclonal EBV+ tumor
- Presents with HA, behavioral change, usually no focal neuro deficit
- Primary CNS lymphoma is important to detect because it is usually sensitive to XRT
- 75% of untreated pts die in 4-6 wks
Lymphoma on T1-weighted MRI

Patient 5

Hypointense lesion

T1 pre-contrast

Ring-enhancing lesion

T1 post-contrast
Radiologic findings in lymphoma

- Lesions in hemispheric white matter and periventricular areas
- CT: isodense
- MRI: hypo to isointense on T1, variable intensity on T2
- Lesions ring-enhance on CT and MRI
Lymphoma on T2-weighted MRI

**Hypointense center**

**Surrounding edema**
FLAIR sequence demonstrates edema

Patient 5
Lymphoma: periventricular spread

Subependymal involvement

Ring-enhancing lesion

From: AIDS Imaging: A Practical Clinical Approach
Toxo vs Lymphoma: which ring-enhancing lesion is it?!

**Toxo**
- More common
- Often multiple… but may be single
- More edema
- Basal ganglia & corticomedullary location
- Smaller size

**Lymphoma**
- Less common
- Often single… but may be multiple
- Less edema
- Periventricular location, subependymal involvement
- Large size > 4 cm
Toxo vs. Lymphoma

How can you really tell?
1. Trial of antitoxo Rx, then re-image
2. FDG-PET scan
3. Brain Bx
Summary: AIDS in CNS

Nonfocal
- PML
  - diffuse white matter demyelination
- HIV encephalitis
  - atrophy for age

Focal
- Toxoplasmosis
  - ring-enhancing...
- Lymphoma
  - ring-enhancing...
- Other infections
References


Acknowledgement

Thanks to Dr. Matt Spencer for his help with PACS!
Beverlee Turner for her support and PowerPoint expertise
Larry Barbaras and Ben Crandall our WebMasters