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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 (toxoplasma), 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



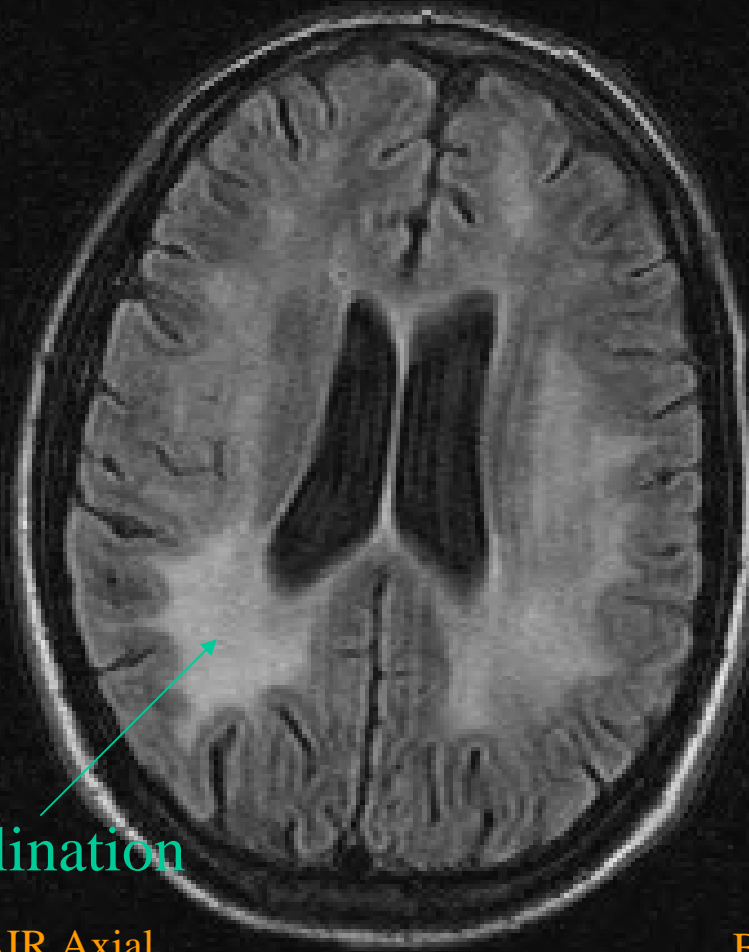
PML

- 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



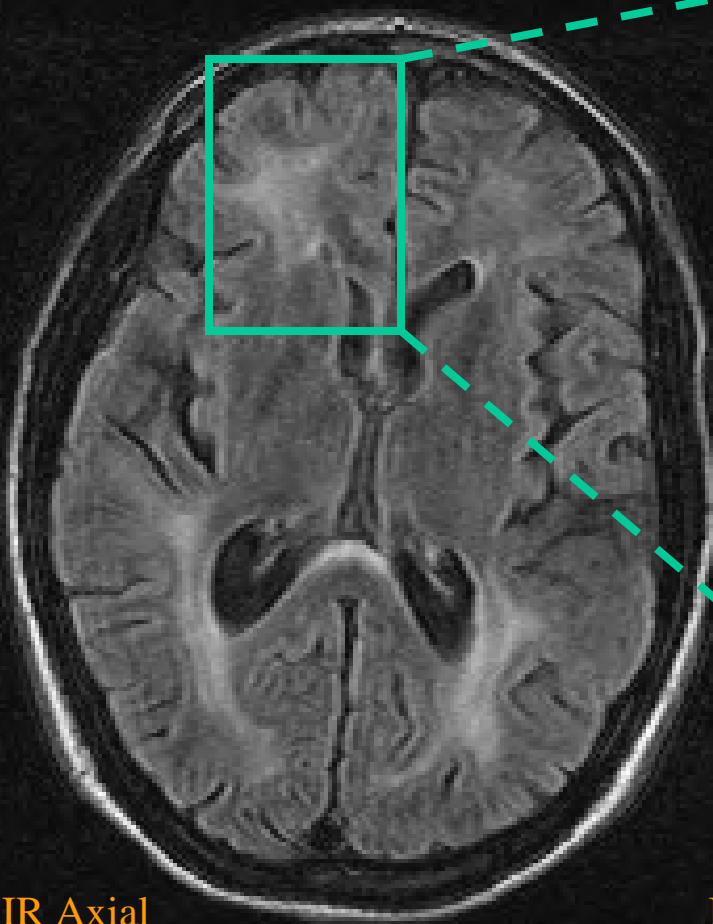
Radiologic findings in PML

- 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

BIDMC

Demyelination



From <http://www-medlib.med.utah.edu/WebPath/webpath.html>



HIV Encephalitis

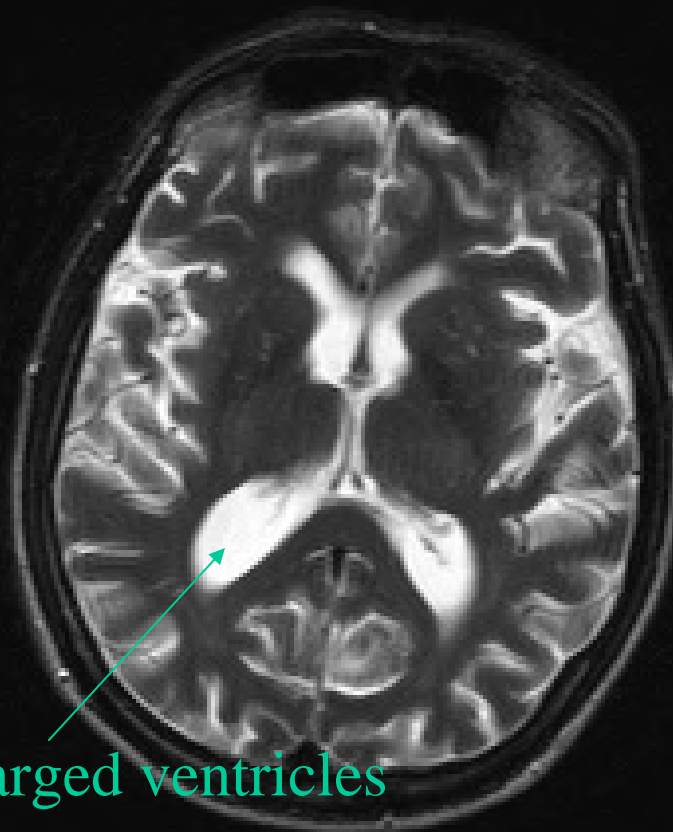
- 80% of AIDS pts have immunocytologic evidence of HIV in brain
- imaging shows nonspecific changes:
 - global **atrophy** with **deep** white matter changes
 - symmetrical, diffuse disease
 - can distinguish from PML because does not involve just the subcortical white matter



Atrophy due to HIV encephalitis in a 42 yo AIDS patient

Patient 2

MR T2 Axial



Enlarged ventricles
for age

BIDMC



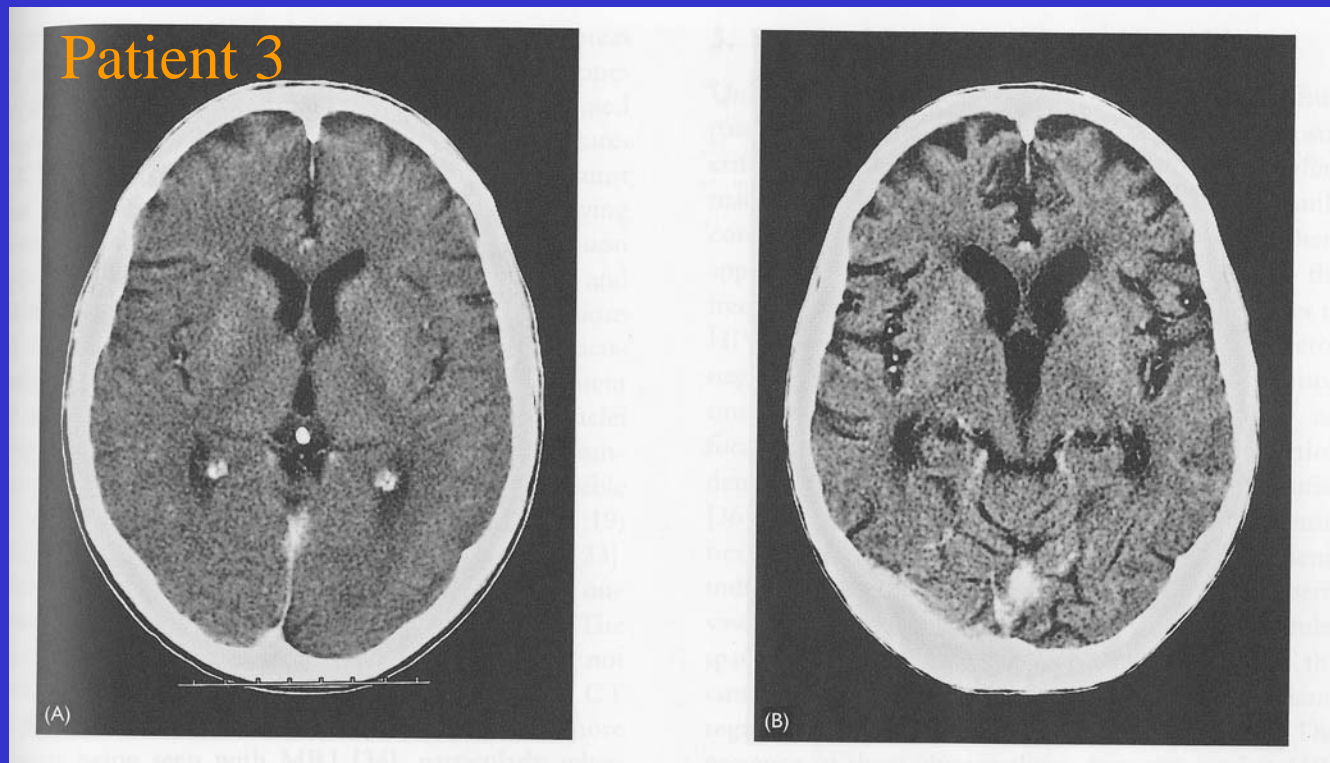
Atrophy

- 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



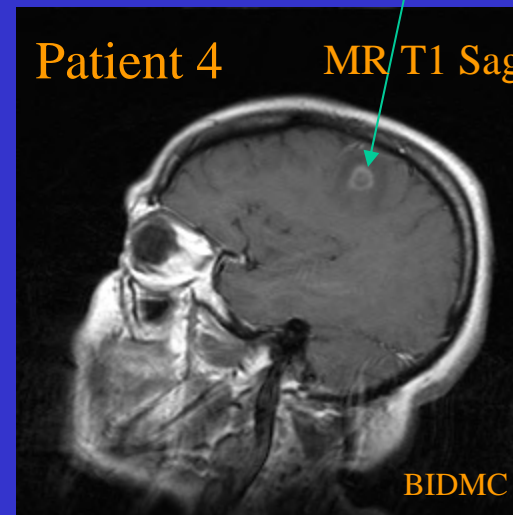
Toxoplasmosis

- 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

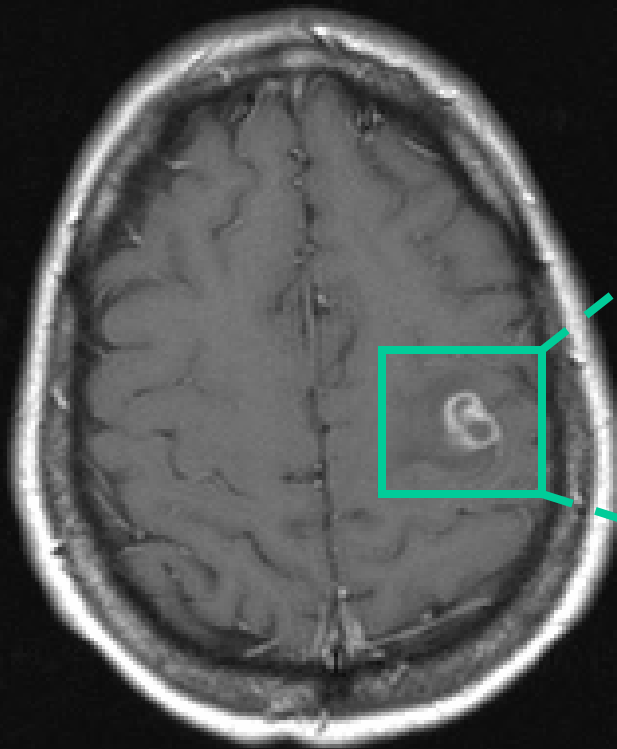


- on MRI, can see more **ring-enhancing lesions**, usually hyperintense



Toxo: Radiologic correlation with pathology

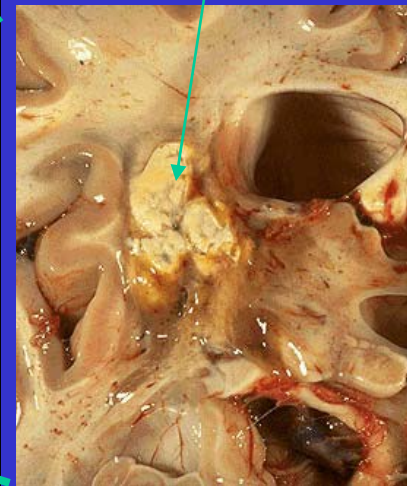
Patient 4



MR T1 Axial

BIDMC

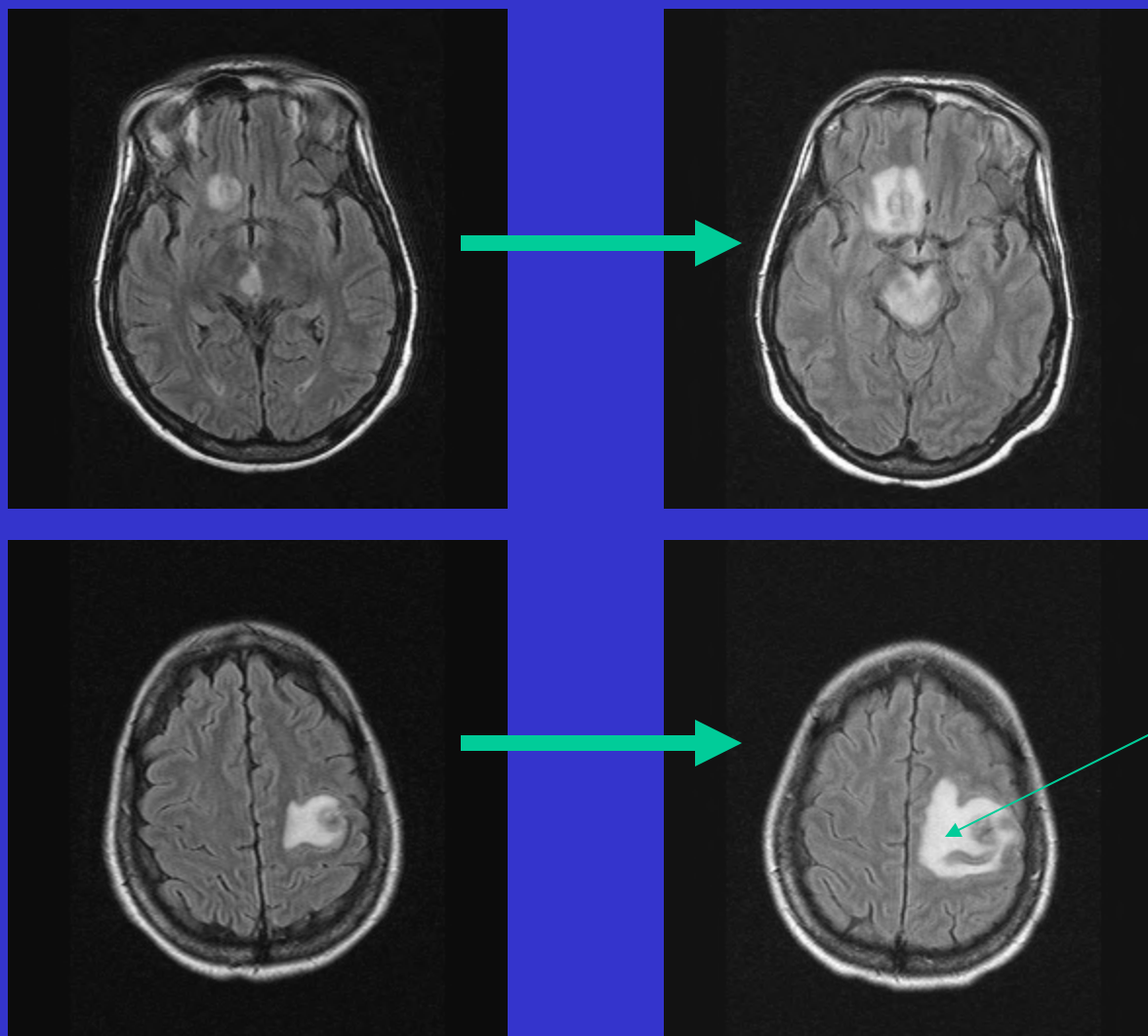
Another patient with
toxoplasma abscess at autopsy



From <http://www-medlib.med.utah.edu/WebPath/webpath.html>



Toxo lesions progressed in 1 wk in pt unable to tolerate Rx

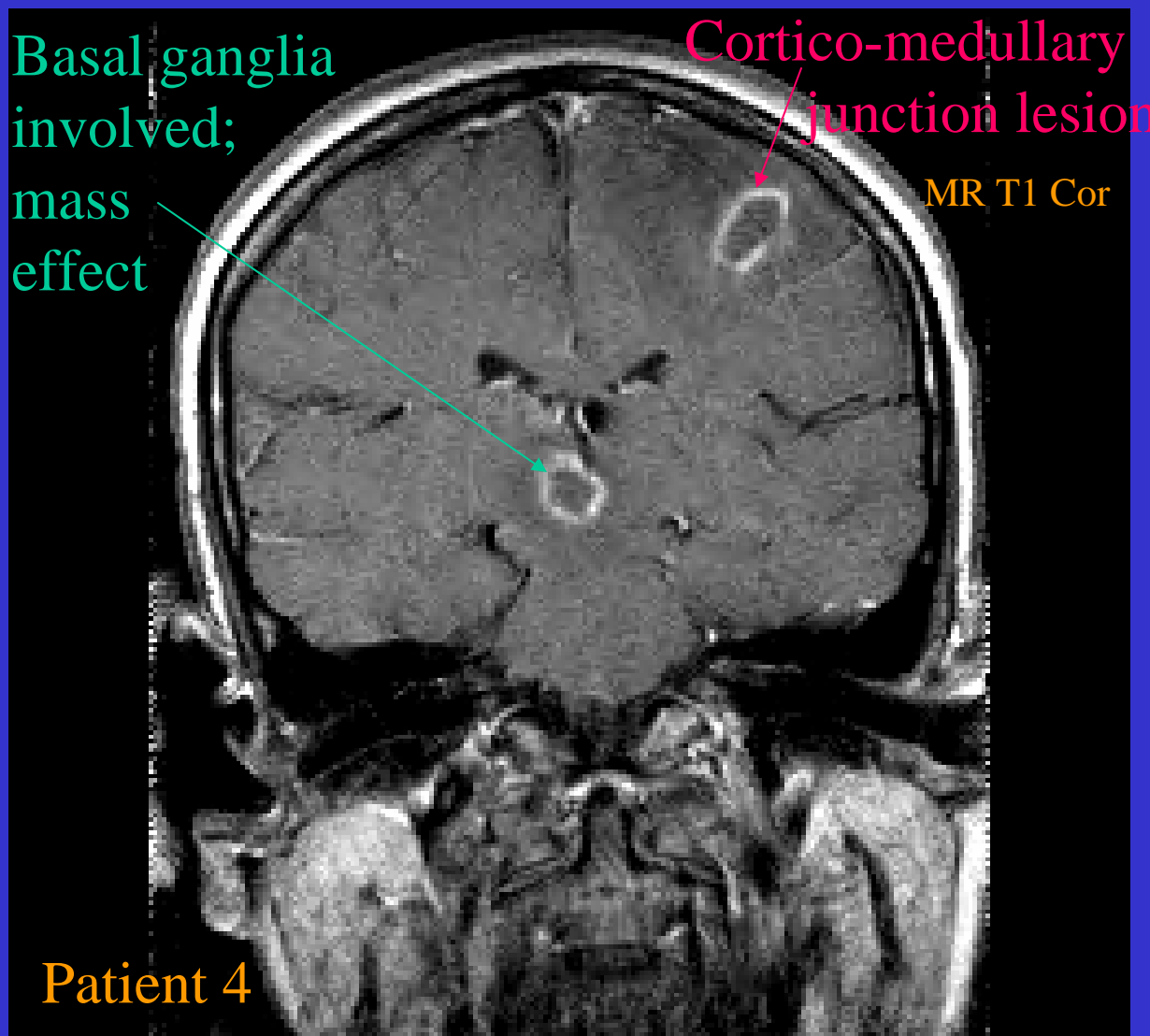


Increasing
edema on
MR FLAIR

All images are Patient 4 from BIDMC; MR FLAIR Axial



Typical features of toxo: multiple lesions





Lymphoma

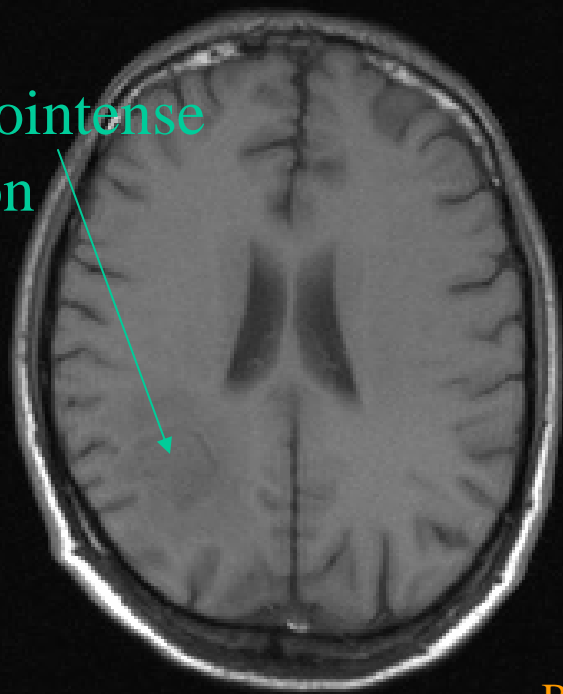
- Monoclonal EBV+ tumor
- Presents with HA, behavioral change, usually no focal neuro deficit
- Primary CNS lymphoma is important to detect because it is usually sensitive to XRT
- 75% of untreated pts die in 4-6 wks



Lymphoma on T1-weighted MRI

Patient 5

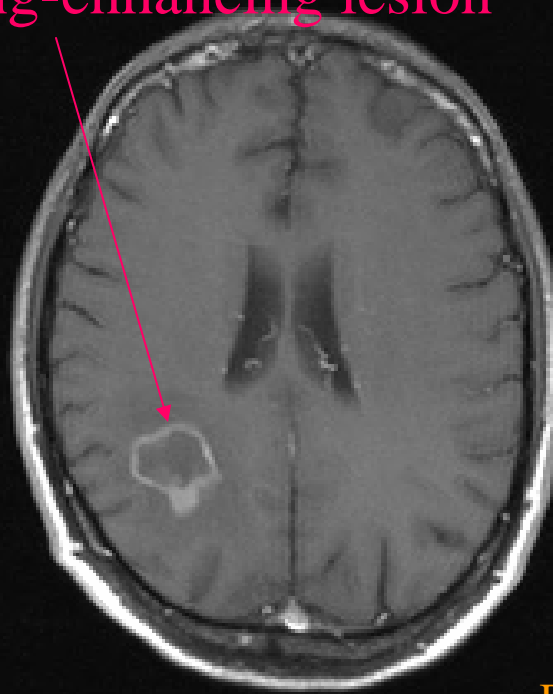
Hypointense
lesion



BIDMC

T1 pre-contrast

Ring-enhancing lesion



BIDMC

T1 post-contrast

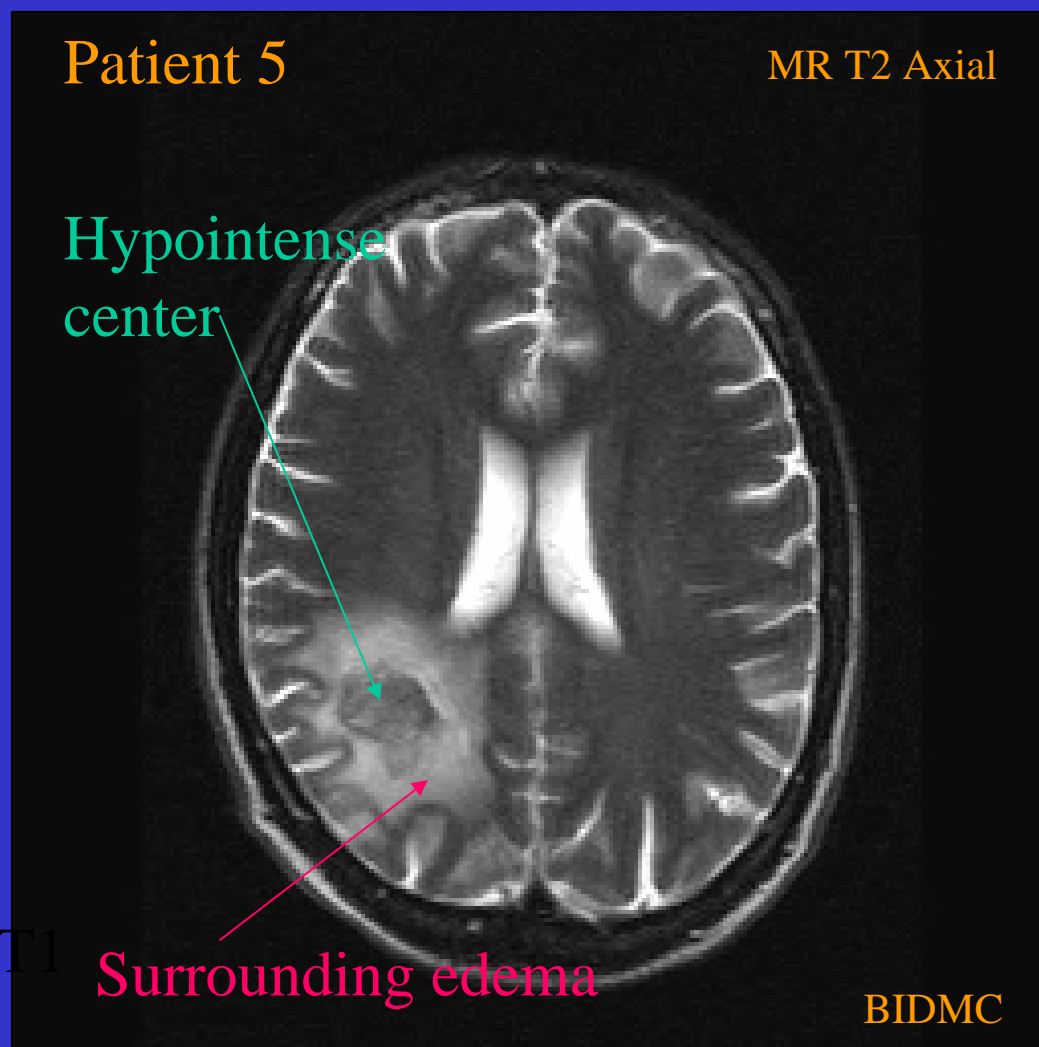


Radiologic findings in lymphoma

- 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



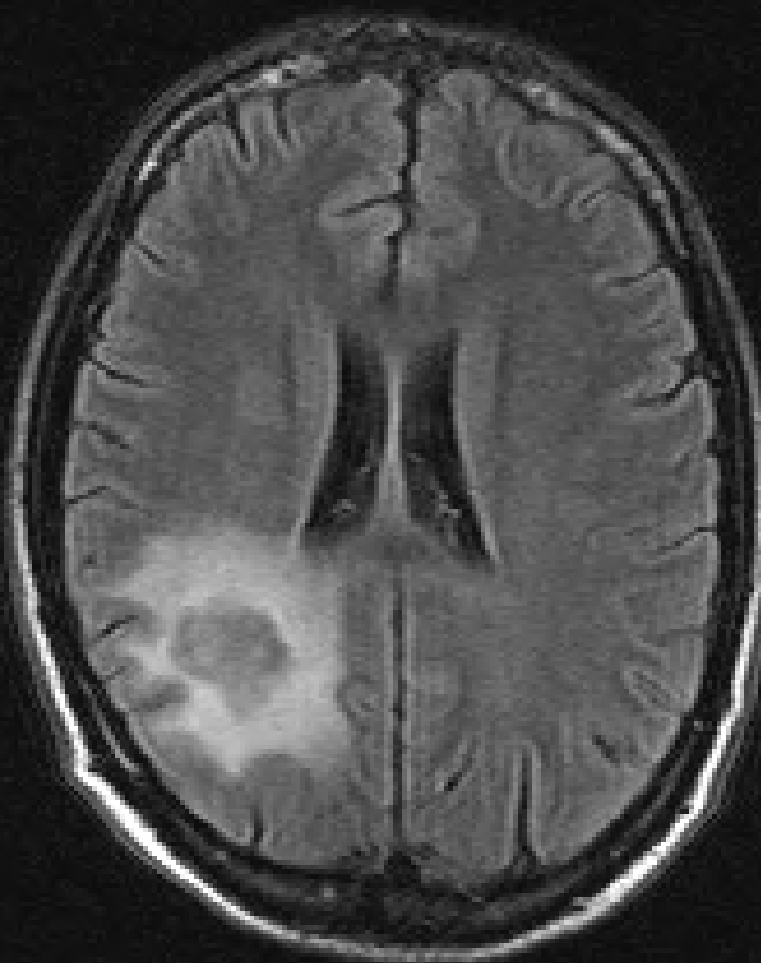
Lymphoma on T2-weighted MRI





FLAIR sequence demonstrates edema

Patient 5

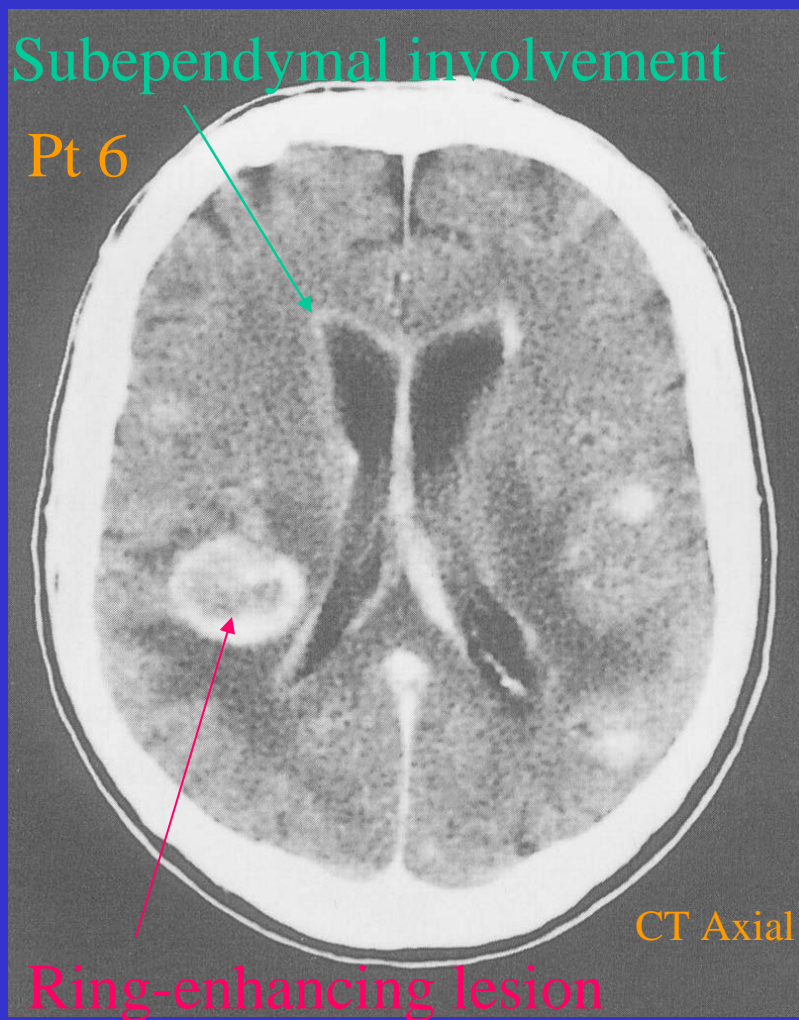


MR FLAIR Axial

BIDMC



Lymphoma: periventricular spread



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

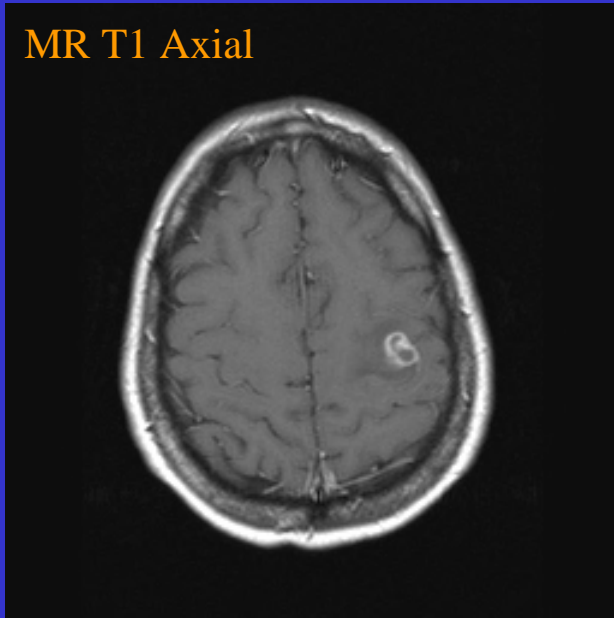
Lymphoma

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

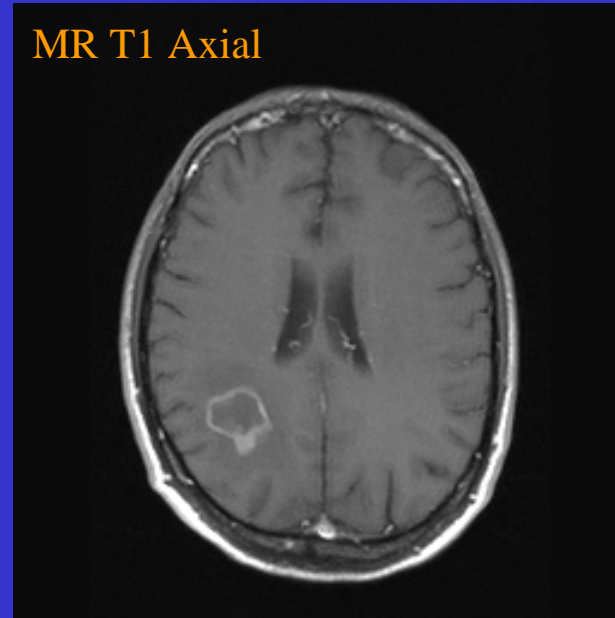


Toxo vs. Lymphoma

MR T1 Axial



MR T1 Axial



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

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