Low-Grade Diffuse Astrocytoma

- Well-differentiated but infiltrating neoplasm, slow growth pattern
- Primary brain tumor of astrocytic origin with intrinsic tendency for malignant progression, degeneration into anaplastic astrocytoma (AA)
- WHO grade II

Clinical issues

- Seizure is most common presenting feature
- Majority occur between ages of 20-45 years, mean: 34 years
- Median survival: 6-10 years
- Increased survival: Young age, gross total resection
- More favorable prognosis: *IDH1*(+), *ARTX*(+), MGMT(+)

Clinical issues

- Represents 25-30% of gliomas in adults
- 10-15% of all astrocytomas
- 2nd most common astrocytoma of childhood (pilocytic is 1st)
- Treatment
  - Surgical resection is primary treatment
  - Usually adjuvant chemotherapy and XRT at time of recurrence or progression

Prognosis

- Patients rarely succumb to spread of low-grade tumor
- Median survival: 6-10 years
- Inherent tendency for malignant progression to AA and GBM = major cause of mortality
- Recurrent disease associated with malignant degeneration in 50-75% of cases
- Malignant progression tends to occur following mean interval of 4-5 years
- Increased survival: Young age, gross total resection
- Radiation therapy in patients with subtotal resection improves survival
- More favorable prognosis: *IDH1*(+), *ARTX*(+), MGMT(+)
- Prognosis worse for pontine, better for medullary tumors (especially dorsally exophytic)

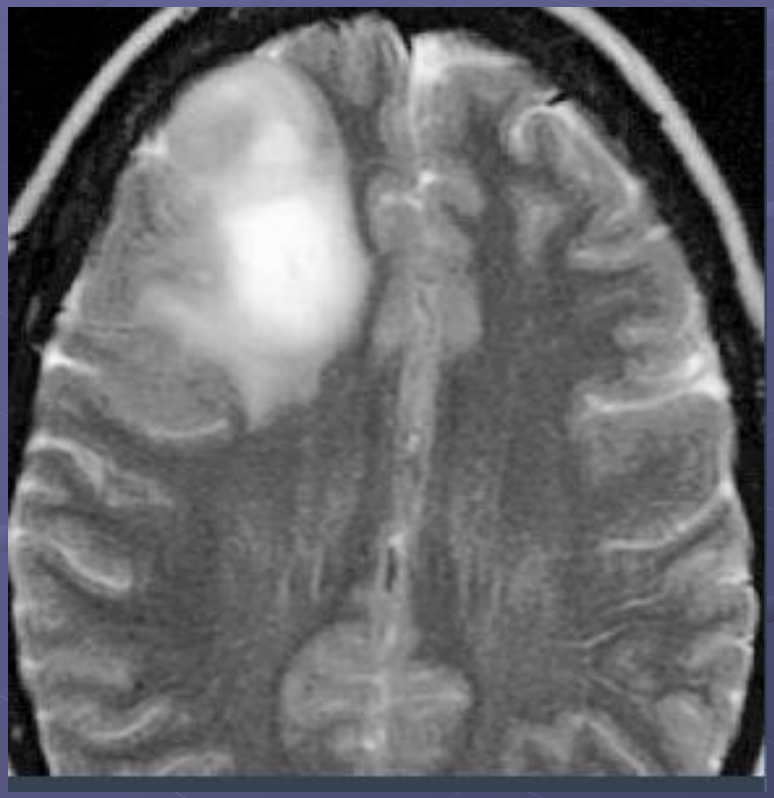
Histologic variants

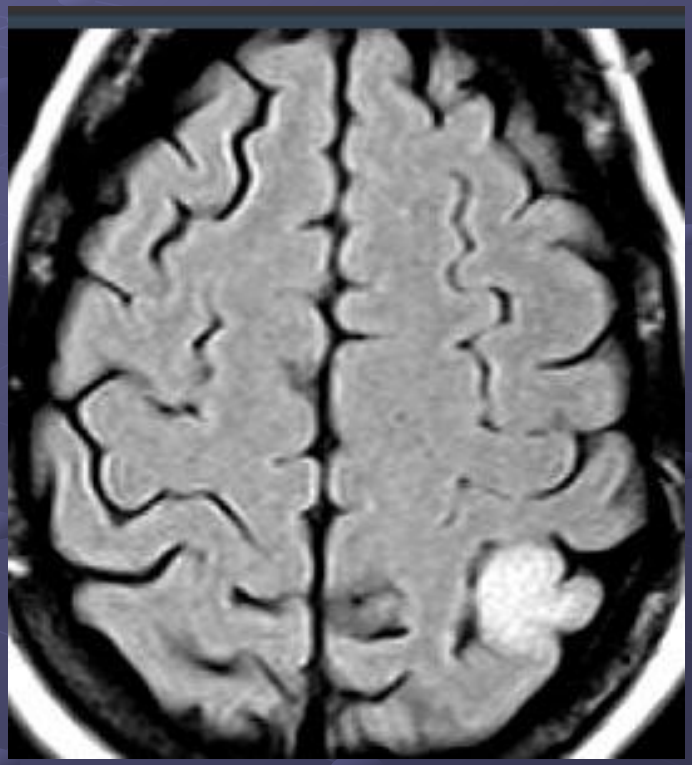
- Fibrillary (most frequent)
- Gemistocytic (most likely to progress to AA, GBM)
- Protoplasmic (rare)

Imaging Findings

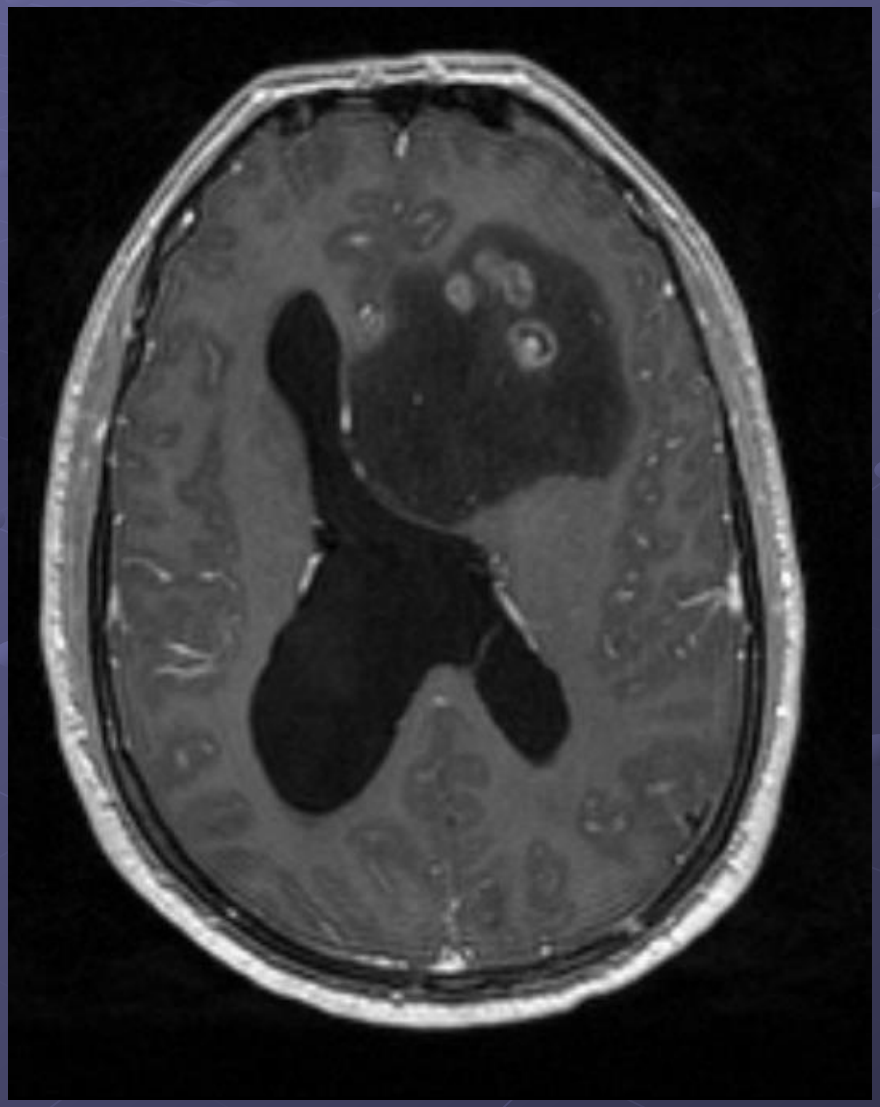
- Best diagnostic clue: Focal or diffuse nonenhancing white matter (WM) mass
- Cerebral hemispheres, supratentorial 2/3
- May appear circumscribed on imaging but isn't; tumor cells typically found beyond imaged signal abnormality!
- 20% involve deep gray matter structures: Thalamus and basal ganglia

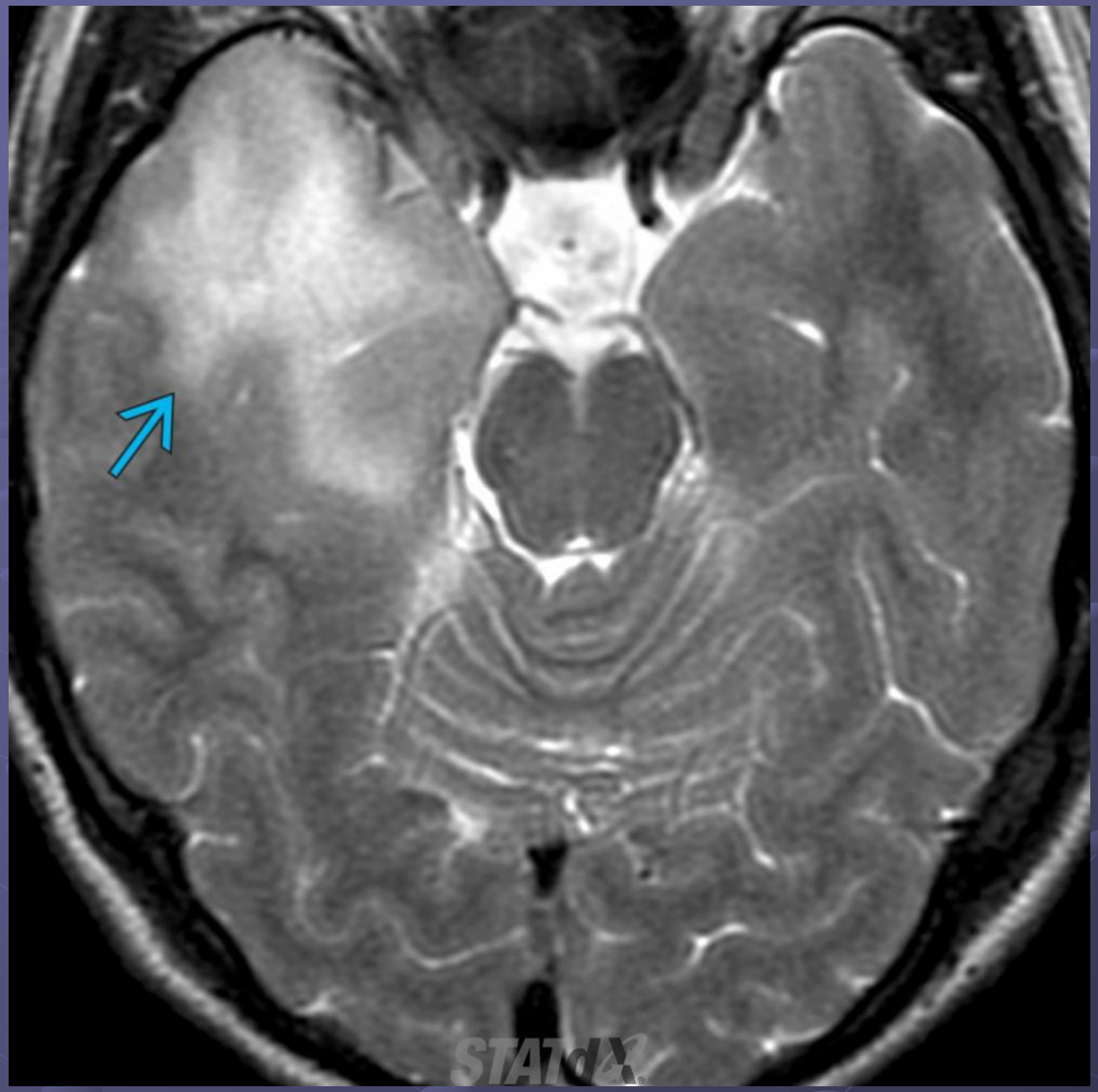
Low Grade Glioma



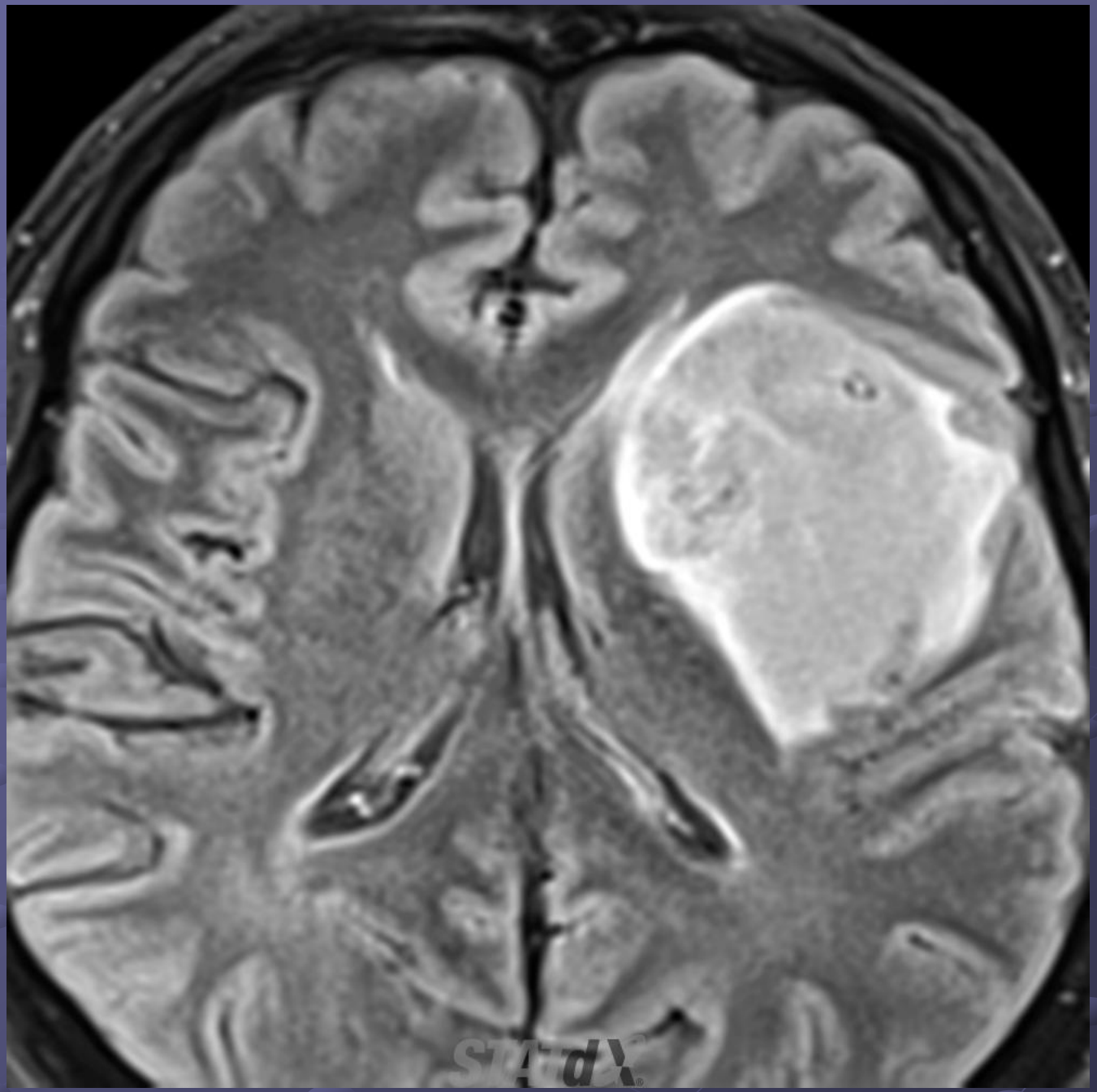


Astrocytoma

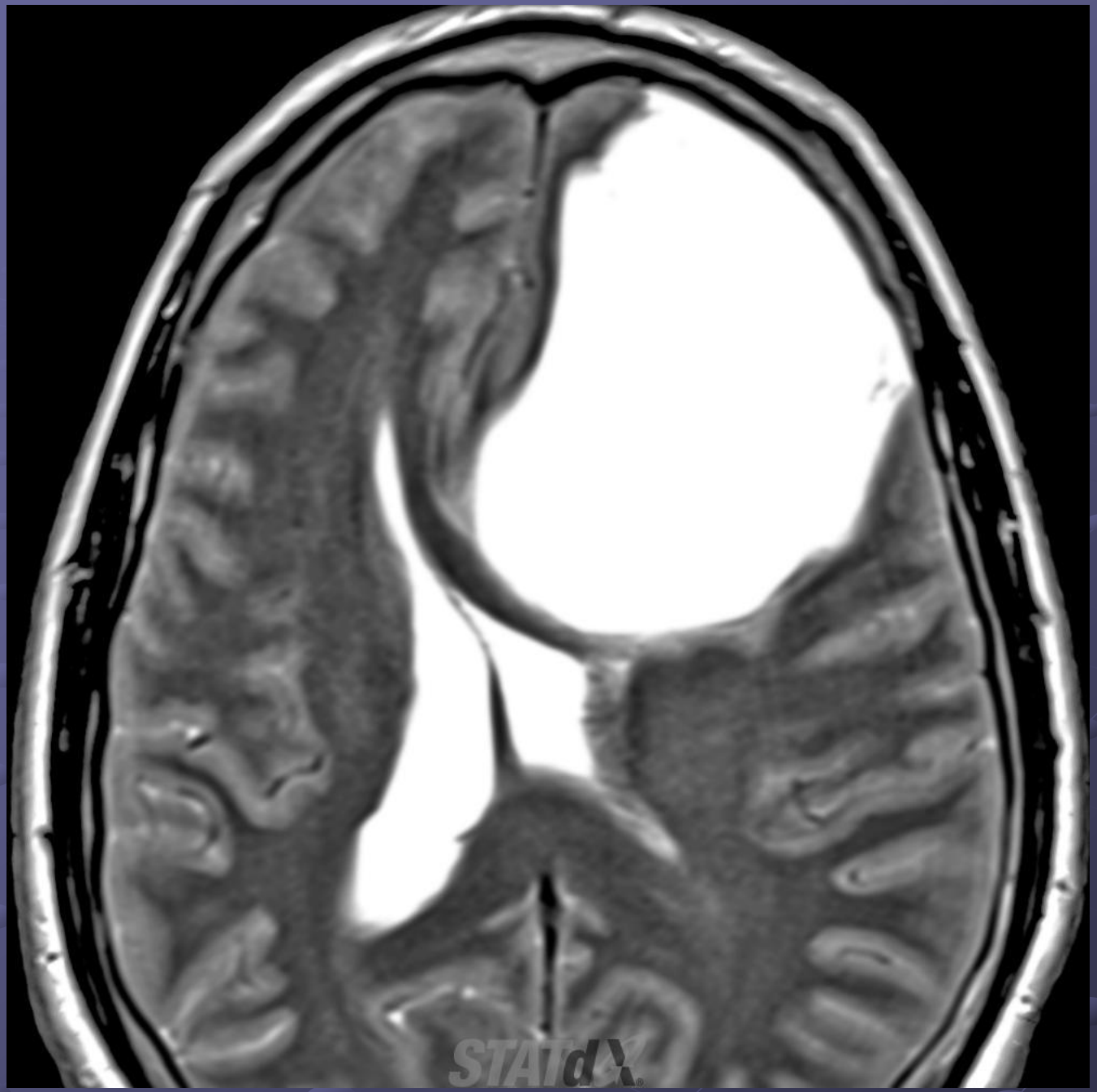




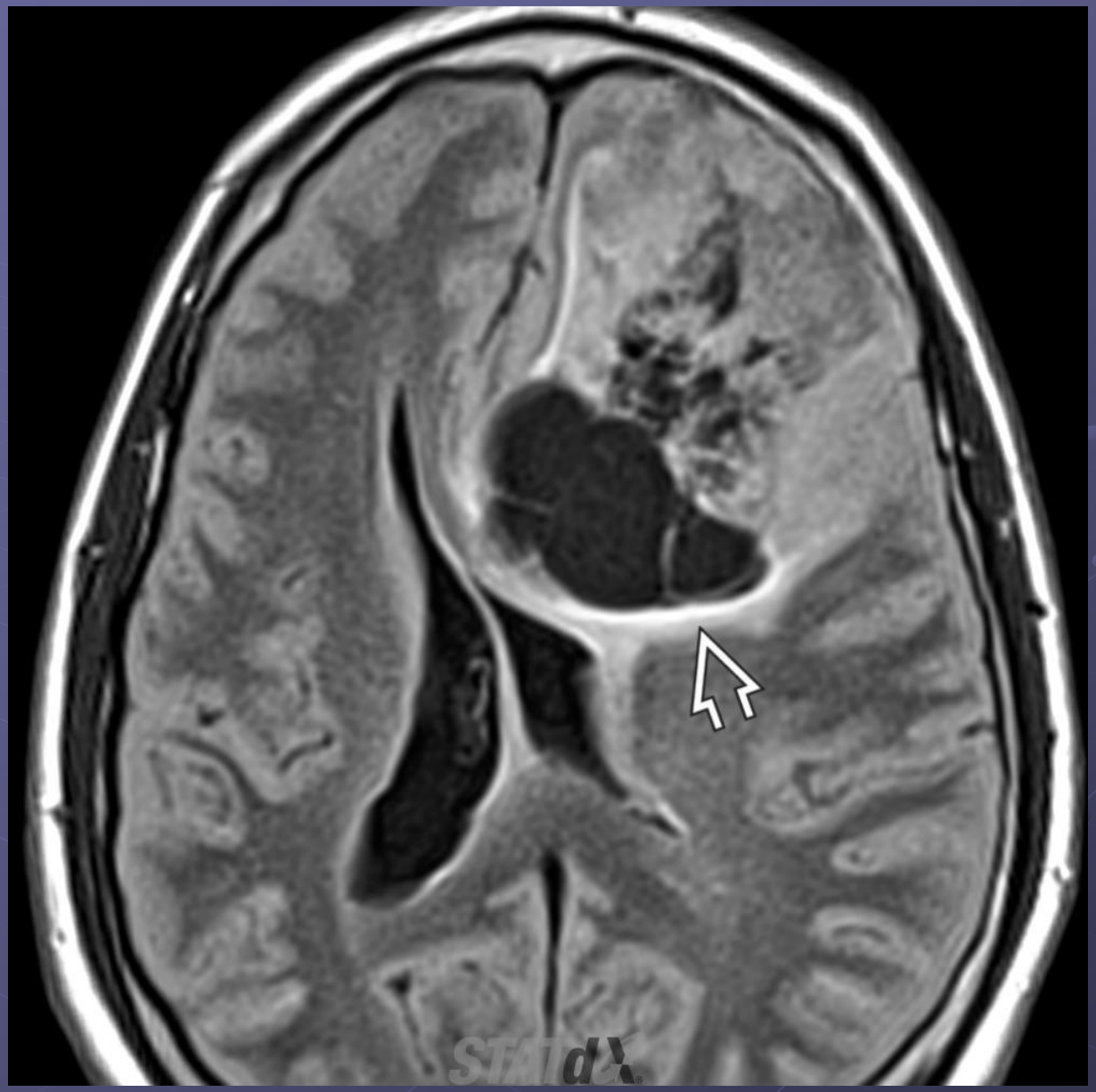
Axial T2 MR image in a 34-year-old man with seizures shows a hyperintense infiltrative mass (cyan solid arrow) centered in the right temporal lobe white matter with extension to the overlying cortex. No enhancement was present on contrast-enhanced images. WHO grade II astrocytoma was diagnosed at resection.



Axial FLAIR MR shows a relatively homogeneous hyperintense mass with mild local mass effect, typical of a WHO grade II diffuse astrocytoma. These infiltrative tumors may be focal or diffuse. Fibrillary astrocytoma is the most frequent histologic variant.



Axial T2WI MR shows a large, hyperintense frontal lobe mass with significant mass effect in this young man with seizures. Protoplasmic astrocytoma, WHO grade II, was found at resection.



Axial FLAIR MR in the same patient shows the mass to be heterogeneous with minimal surrounding vasogenic edema (white open arrow). Protoplasmic astrocytoma is a rare variant of diffuse astrocytoma. Mucoid degeneration and microcyst formation are common. The frontotemporal region is a classic location.

DDX:

- **Anaplastic astrocytoma (AA)**
  - Hemispheric WM lesion, usually nonenhancing
  - Focal or diffuse mass
  - May be indistinguishable without biopsy
- **Ischemia**
  - Vascular territory (MCA, ACA, PCA), acute onset
  - Diffusion restriction (acute/early subacute)
  - Often wedge-shaped, involves GM & WM
- **Cerebritis**
  - Edema, patchy enhancement characteristic
  - Usually shows restricted diffusion
  - Typically more acute onset

DDX:

- **Oligodendroglioma**
  - Cortically-based mass with variable enhancement
  - Ca++ common
  - May be indistinguishable
- **Herpes encephalitis**
  - Confined to limbic system, temporal lobes
  - Hemorrhage and enhancement common
  - Acute onset
- **Status epilepticus**
  - Active seizures may cause signal abnormalities and enhancement
  - Clinical history of seizures