# Anaplastic Astrocytoma

*Last Updated: April 27, 2021*

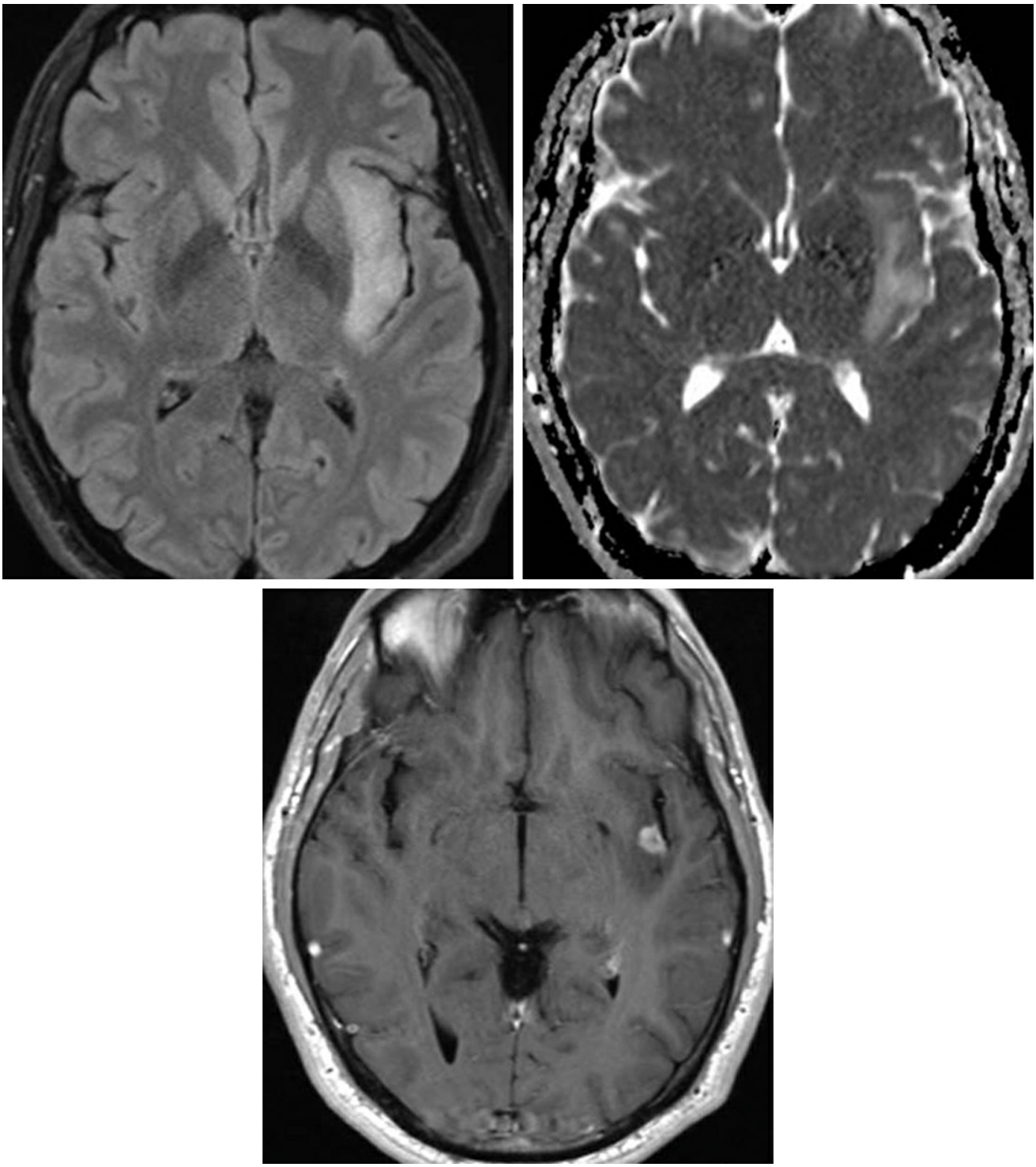
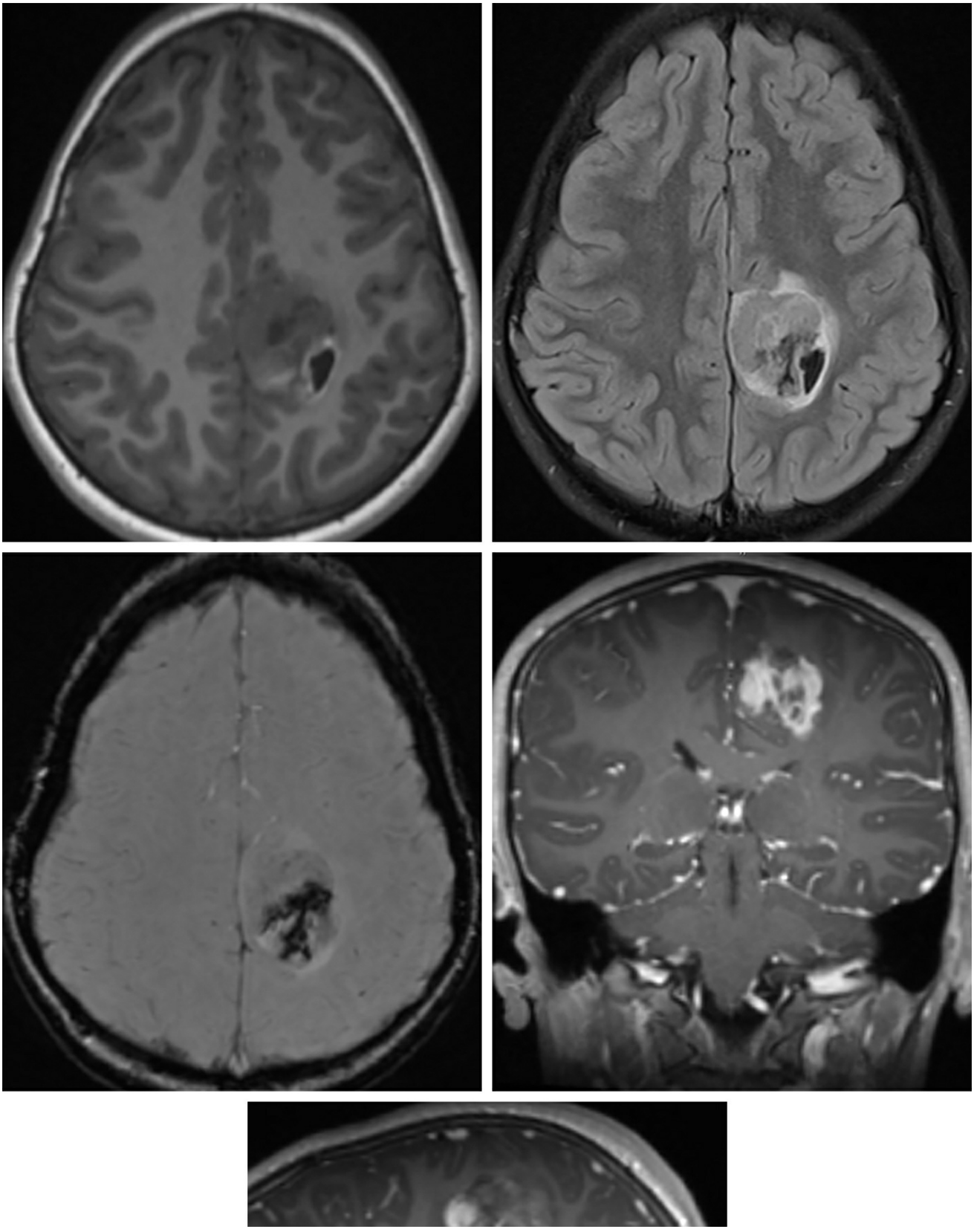


**Figure 1: (Top Left) Axial FLAIR demonstrates a left insular infiltrative lesion involving the cortex and white matter. This anaplastic astrocytoma is fairly circumscribed, a less common characteristic in these higher grade**

lesions. (Top Right) ADC demonstrates no appreciable dark restricted diffusion in this lesion to suggest hypercellularity. (Bottom) Axial T1WI postcontrast shows a small round area of enhancement in the superficial insula, a feature more typical of higher grade glioma. If the T2/FLAIR hyperintensity surrounding this lesion spared the cortex, the enhancing lesion may be more easily mistaken for metastasis with surrounding vasogenic edema.



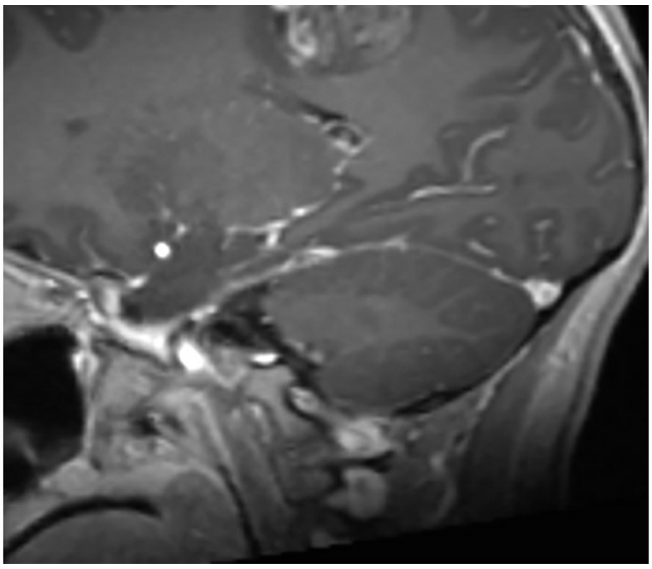


**Figure 2: The medial left frontoparietal complex-appearing anaplastic astrocytoma in this patient demonstrates low T1 signal intensity (top left) and FLAIR hyperintensity (top right) with a mixed-signal hemorrhagic component at its posterolateral aspect. Black signal on the susceptibility-weighted imaging (middle left) also reflect this hemorrhage. The tumor also has a heterogeneous enhancement pattern (middle right, coronal; bottom row, sagittal) that is more typical of higher-grade adult primary brain tumors than of grade II tumors.**

## BASIC DESCRIPTION

- Infiltrating malignant astrocytoma with ill-defined tumor margins and extensive edema

## PATHOLOGY

- WHO grade III
- Usually develops from malignant degeneration of low-grade astrocytoma (WHO grade II)
- Commonly dedifferentiates into glioblastoma (GBM) (~50%) within 2 years
- Focal or diffuse anaplasia, highly proliferative
- Increased cellularity and nuclear atypia; usually no necrosis or microvascular proliferation

## CLINICAL FEATURES

All ages affected (fourth and fifth decades of life most common)

- Slight male gender predilection
- Median survival 2–3 years
    - Better prognosis with younger age, gross total resection, absence of enhancement, KI-67 index ≤5.1%, and IDH1- or MGMT-positive genetics
- Presenting symptoms dependent on tumor location
    - Seizures, headaches, behavioral changes, clinical deterioration in patients with known low-grade astrocytoma
- Treatment: resection, chemotherapy (temozolomide), radiation

## IMAGING

- General
    - Ill-defined, infiltrating white matter mass
        - Location in frontal and temporal lobes most common; brainstem and spinal cord uncommon
        - Infiltrates beyond apparent imaging tumor margins
        - Expansion and involvement of adjacent cortex common
    - Variable enhancement
        - Usually nonenhancing, but patchy or nodular enhancement may be present
    - Cysts and hemorrhage are uncommon features
    - Spreads along white matter tracts, but may spread via cerebrospinal fluid (CSF), leptomeninges, and ependyma
- CT
    - Hypodense, ill-defined white matter mass
    - Hemorrhage and calcification uncommon features
    - Usually does not enhance on contrast-enhanced CT, but may show focal or patchy enhancement
        - Ring enhancement suggests progression to GBM

- MRI
    - T1WI: isointense to hypointense
    - T2WI: heterogeneously hyperintense; presence of flow voids suggests vascular proliferation and progression to GBM
    - FLAIR: heterogeneously hyperintense
    - DWI: usually no diffusion restriction
    - T1WI+C: usually no enhancement; may show patchy or nodular enhancement
    - MRS/MR perfusion: decreased NAA, increased Cho/Cr ratio, increased relative cerebral blood volume (rCBV) compared with low-grade astrocytomas, although usually less than GBMs
    - Diffusion tensor imaging (DTI) may assist in surgical planning

## IMAGING RECOMMENDATIONS

- MRI with contrast; MR spectroscopy (MRS), MR perfusion, functional MRI, and DTI are useful adjuncts

For more information, please see the corresponding chapter in Radiopaedia.

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