Pilocytic Astrocytoma

Last Updated: May 4, 2021

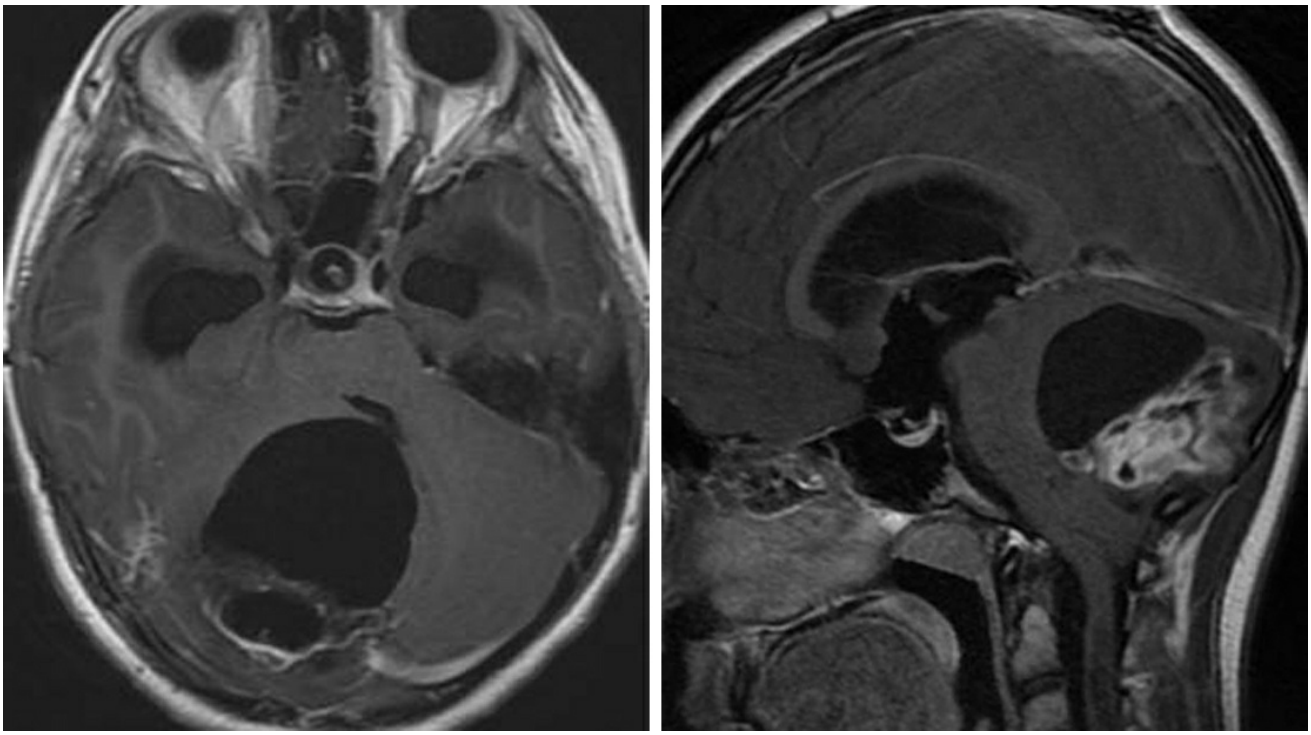

Figure 1: This posterior fossa PA has a large cyst with an adjacent mass (nodule). (Left) Axial image showing that this patient's cystic tumor is compressing and deviating the fourth ventricle, resulting in hydrocephalus. (Right) Sagittal postcontrast T1-weighted image showing the sometimes very heterogeneous enhancement apparent in the solid portion of the lesion that belies its underlying low-grade histology.

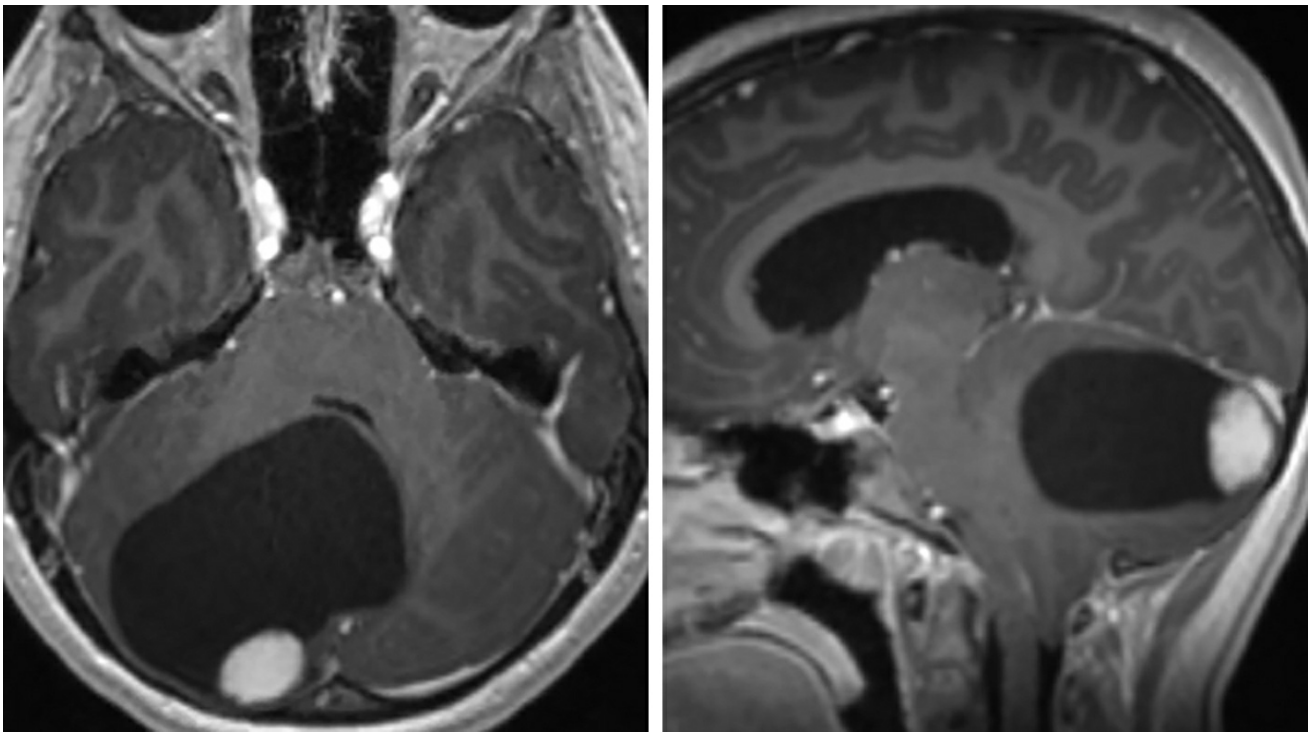

Figure 2: Axial (left) and sagittal (right) postcontrast T1-weighted images demonstrate a cystic lesion with a brightly enhancing mural nodule/mass. This appearance is very typical for juvenile PAs but must be distinguished from the similar-appearing hemangioblastoma when in the posterior fossa, particularly when in older children and young adults.

BASIC DESCRIPTION

- Slow-growing, well-circumscribed tumor arising from astrocytic precursors
- Most common pediatric primary intracranial neoplasm

PATHOLOGY

- WHO grade I
- Biphasic pattern of astrocytes (Rosenthal fibers and multipolar cells)
- Syndromic or sporadic
    - Optic nerve/chiasm pilocytic astrocytomas (PAs) associated with neurofibromatosis type 1

CLINICAL FEATURES

- Patients aged 5 to 15 years most common

- No gender predilection
- Overall good prognosis
    - 10-year survival, >90%
- Common presenting signs/symptoms
    - Headaches, nausea, vomiting, ataxia, seizures, visual loss if optic pathways involved
- Treatment
    - Cerebellar: tumor resection; adjuvant chemoradiation is rarely recommended, as residual tumors rarely grow and may even regress spontaneously
    - Optic pathway: slow-growing tumors often monitored without treatment; tumor debulking, radiation, and/or chemotherapy for symptomatic or rapidly enlarging tumors

IMAGING

- General
    - Usually well-circumscribed cerebellar hemispheric lesion but can also be supratentorial
        - Mass effect, effacement of fourth ventricle common
    - May arise from optic nerve, optic chiasm, or hypothalamus
    - Minimal surrounding edema
    - Most often cystic mass with mural nodule but can be completely solid, particularly in older patients
- CT
    - Mixed solid-cystic mass with minimal surrounding edema
        - Solid component isodense to hypodense to gray matter
    - Can have calcification; hemorrhage uncommon
    - Strong mural nodular enhancement on contrast-enhanced CT images
    - Nonenhancing cystic component, but may show cyst wall enhancement
        - Contrast accumulation in cystic component on delayed images

- MRI
  - T1WI
    - Cyst: isointense to hyperintense to cerebrospinal fluid but hypointense to parenchyma
    - Solid: isointense to hypointense to gray matter
  - T2WI
    - Cyst: hyperintense to brain parenchyma
    - Solid: usually hyperintense to parenchyma
    - Hyperintense optic pathway lesions
  - FLAIR: hyperintense solid and cystic components
  - DWI: typically no diffusion restriction
  - T1WI+C: enhancing solid component ± cyst wall enhancement; can show optic pathway enhancement
  - MRS: aggressive features; elevated choline and lactate, decreased NAA

IMAGING RECOMMENDATIONS

- MRI with contrast

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

Contributor: Rachel Seltman, MD

DOI: https://doi.org/10.18791/nsatlas.v1.03.01.31

REFERENCES

Collins VP, Jones DTW, Giannini C. Pilocytic astrocytoma: pathology, molecular mechanisms and markers. *Acta Neuropathol* 2015;129:775–788. doi.org/10.1007/s00401-015-1410-7.

Fernandez C, Figarella-Branger D, Girard N, et al. Pilocytic astrocytomas in children: prognostic factors—a retrospective study of 80 cases.

Neurosurgery 2003;53:544–553, discussion 554–555. doi.org/10.1227/01.NEU.0000079330.01541.6E.

Fisher PG, Tihan T, Goldthwaite PT, et al. Outcome analysis of childhood low-grade astrocytomas. *Pediatr Blood Cancer* 2008;51:245–250. doi.org/10.1002/pbc.21563.

Hwang JH, Egnaczyk GF, Ballard E, et al. Proton MR spectroscopic characteristics of pediatric pilocytic astrocytomas. *AJNR Am J Neuroradiol* 1998;19:535–540.

Koeller KK, Rushing EJ. From the archives of the AFIP: pilocytic astrocytoma: radiologic-pathologic correlation. *Radiographics* 2004;24:1693–1708. doi.org/10.1148/rg.246045146.

Lee YY, Van Tassel P, Bruner JM, et al. Juvenile pilocytic astrocytomas: CT and MR characteristics. *AJR Am J Roentgenol* 1989;152:1263–1270. doi.org/10.2214/ajr.152.6.1263.

Louis DN, Ohgaki H, Wiestler OD, et al. The 2007 WHO classification of tumours of the central nervous system. *Acta Neuropathol* 2007;114:547. doi.org/10.1007/s00401-007-0243-4.

Osborn AG, Salzman KL, Jhaveri MD. *Diagnostic Imaging* (3rd ed). Elsevier, Philadelphia, PA; 2016.