Neuroglial Cyst

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Abstract

Neuroglial cysts are congenital unilocular benign intraparenchymal cysts lined by a glial wall with an epithelial lining. The lining cells produce CSF-like fluid, so these cysts may grow very slowly. They typically present as an incidental finding on imaging obtained for another reason. Over time, they may become symptomatic if they grow large enough to exert mass effect on intracranial structures. When present, symptoms may include headaches or seizures. Depending on the cyst's location, patients may display cognitive or behavioral changes, neurological deficits such as weakness, sensory loss, visual disturbance, hemiparesis or coordination problems, or hydrocephalus if the enlarging cyst obstructs CSF pathways. In this asymptomatic patient, no surgical intervention is planned.

Keywords: central nervous system, brain, cystic

Case Summary

A preteen immunocompetent child presented with a headache following a fall while bouncing on a bed. There was no loss of consciousness, no evidence of seizure, no headache or fever, or other relevant symptoms. The patient was seen in the emergency department. A head CT was performed.

Imaging Findings

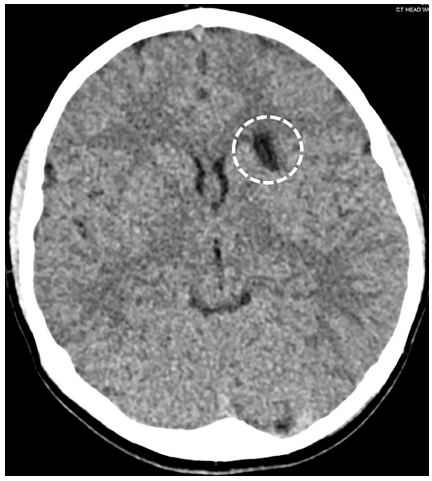
The head CT (Figure 1) demonstrated a hypoattenuating intraparenchymal cyst in the left frontal lobe deep white matter with a well-defined border. MRI was then obtained, including sequences optimized for morphologic evaluation (T1, T2, FLAIR, and diffusion-weighted images). A PROPELLER fat saturation T2 sequence was included to reduce motion artifact and improve anatomic localization. In the absence of equivocal findings, spectroscopy and images with contrast were not obtained. On MRI, the cyst was hypointense on T1 FLAIR and T1 BRAVO sequences (Figure 2). It was also hypointense with a border of high signal on T2 FLAIR (Figure 3), localized to the lateral margin of the left caudate nucleus in the deep white matter of the frontal lobe on the PROPELLER sequence (Figure 3C). The cyst content showed facilitated diffusion (low signal) on diffusion-weighted images (Figure 4).

Diagnosis

Neuroglial cyst.

Differential considerations for intracranial cysts in childhood include intraventricular lesions such as arachnoid cyst, porencephalic cyst, ependymal/glioependymal cyst, and epidermoid cyst.

Figure 1. A nonenhanced axial CT image demonstrating a thin-walled intra-axial cystic structure (within the circle) just lateral to the left caudate nucleus.



Cystic infections include pyogenic or fungal abscesses, tuberculoma, and cystic parasitic infections such as neurocysticercosis. Intracranial intraparenchymal cystic malignancies may include metastases, typically from lung, breast, melanoma, or renal cell carcinoma, or primary brain malignancy such as glioblastoma or medulloblastoma.

Benign intraparenchymal cystic lesions may include dilated vascular space (Virchow-Robin space), chronic lacunar

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Figure 2. (A) A sagittal MR T1 BRAVO image demonstrateing low signal within the intra-axial cyst in the frontal lobe (arrow). (B) Noncontrast enhanced T1 FLAIR axial MRI locates this lesion just lateral to the left caudate nucleus (arrow).

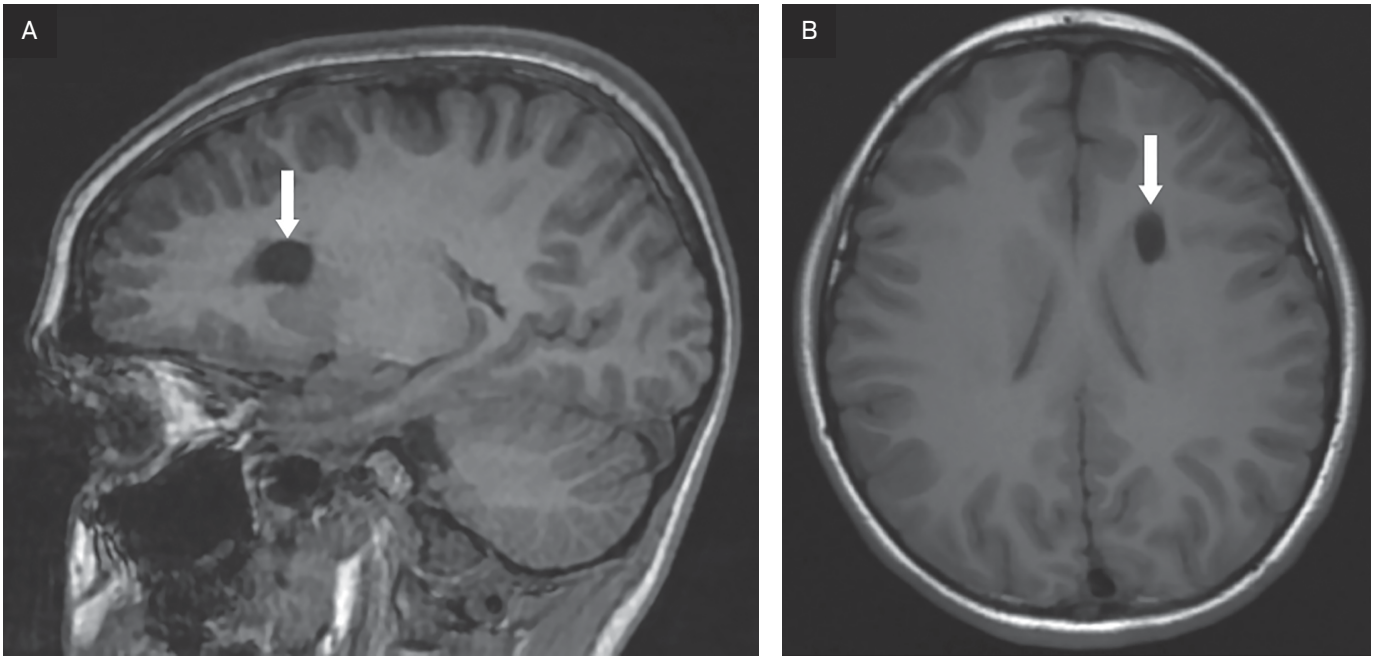
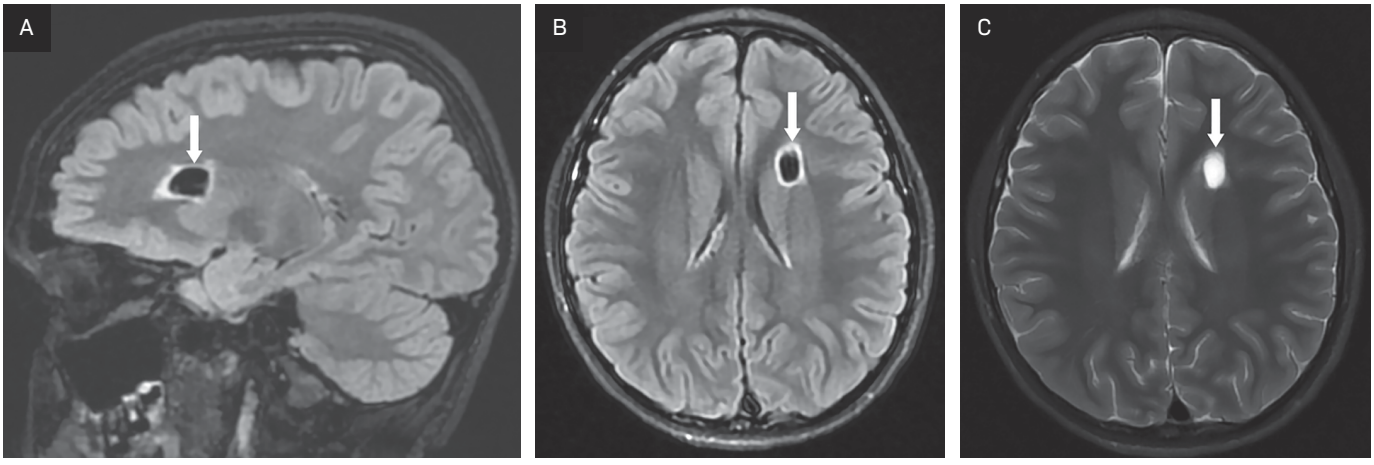


Figure 3. On noncontrast enhanced (A) sagittal and (B) axial T2 FLAIR MRI, the lesion contents are fully suppressed, like CSF, with a border of high-signal (arrow). (C) Noncontrast enhanced T2 PROPELLER fat saturation axial MRI demonstrating normal CSF-like T2 hyperintensity of the cyst contents.



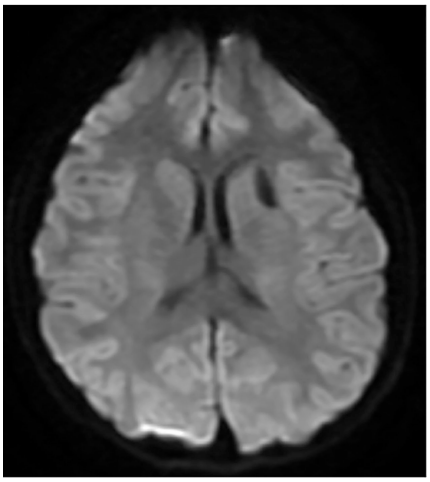
infarct, choroidal fissure cyst, and choroid plexus cyst.

Discussion

Neuroglial cysts (also known as glioependymal or neuroepithelial cysts) are benign congenital unilocular cystic lesions representing sequestration of neural tube embryonic elements lined by glial cells, usually located within the white matter of the frontal lobes, that may fill slowly with CSF-like fluid.[1] They demonstrate CSF-like characteristics without contrast enhancement. They are rare, accounting for fewer than 1% of intracranial cystic lesions. While they are usually slow-growing and, as in this case, typically asymptomatic, instances of symptomatic enlargement as early as infancy have been reported.[1] Despite being congenital lesions, their usual very slow growth means most symptomatic neuroglial cysts are not found until adulthood. There is no certain gender ratio, likely because the limited primary literature is usually case reports or small series.

To differentiate an intracranial cyst, the most helpful features are location and MR characteristics.[2] Position may be intraparenchymal, intraventricular, or extra-axial. For example, the

Figure 4. Noncontrast enhanced diffusion-weighted axial MRI showing nonrestriction of the cyst contents.



intraparenchymal position of this cyst speaks against intraventricular lesions. On T1-weighted MRI, the fluid within the cyst is hypointense. This implies that the cyst fluid does not contain secretory proteins or blood products. On T2 sequences, there is a border of high signal. However, absence of restricted diffusion, which would be characterized as bright signal within the cyst on diffusion-weighted images, and absence of thickened septae within the cyst, speak against an epidermoid lesion.

Intracranial intraparenchymal cysts may be infectious, malignant, or benign.[3,4] Intraparenchymal abscesses often demonstrate central necrosis and peripheral edema,[5] which are absent in this case. Unlike the lesion here, intracranial malignancies are usually symptomatic and are all characterized on imaging with significant solid components, thick walls, and are often associated with mass effect and significant surrounding vasogenic edema. Metastases may present as ring-enhancing lesions with central necrosis.[6]

Benign intraparenchymal cysts, which develop within the brain tissue itself, are characterized by a lack of neoplastic potential and are often asymptomatic unless they grow large enough to exert mass effect on surrounding brain tissue. Neuroglial cysts may be difficult to differentiate from ependymal cysts. Ependymal cysts are rare cystic lesions arising by embryonic sequestration of tissue from the neuroectoderm in the lateral ventricles. They are also thin-walled and CSF-like. They differ in their lining. A definite diagnosis can be achieved with histologic examination of the cyst lining.[7] Neuroglial cysts are lined by a glial wall and an epithelial lining of a single layer of cells that rest on GFAP-positive neuroglial tissue while ependymal cysts are lined by simple nonciliated cuboidal epithelium. Neuroglial cysts have an RNA profile that demonstrates upregulated expression of sodium transporters and aquaporin channels.[8]

Neuroglial cysts may be treated by conservative observation or surgical intervention. Surgical interventions may include neuroendoscopic fenestration, aspiration, or shunting, and are usually reserved for large symptomatic cysts, especially those that demonstrate mass effect.[9]

Conclusion

Neuroglial cysts are congenital unilocular benign intraparenchymal cysts lined by a glial wall with an epithelial lining. The lining cells produce CSF-like fluid, so these cysts may grow very slowly. They typically present as an incidental finding on imaging obtained for another reason. Over time, they may become symptomatic if they grow large enough to exert mass effect on intracranial structures. When present, symptoms may include headaches or seizures. Depending on the cyst's location, patients may display cognitive or behavioral changes, neurological deficits such as weakness, sensory loss, visual disturbance, hemiparesis or coordination problems, or hydrocephalus if the enlarging cyst obstructs CSF pathways. In this asymptomatic patient, no surgical intervention is planned.

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