Pearls & Oy-sters:

Cerebral venous sinus thrombosis involving a persistent falcine sinus

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PEARLS A persistent falcine sinus has typical imaging characteristics on MRI. Sagittal T2-weighted image shows a vertically oriented flow void extending from the origin of the straight sinus to the superior sagittal sinus. Magnetic resonance venogram (MRV) confirms the presence of persistent falcine sinus with further evaluation of adjacent deep venous drainage.

OY-STERS Cerebral venous sinus thrombosis is an important consideration in pregnant and postpartum women who present with headache or focal neurologic deficits. Although the initial head CT in our case showed a hyperdense lesion, which could be interpreted as acute bleeding, clinical suspicion of venous sinus thrombosis led to the correct diagnosis and appropriate treatment.

The falcine sinus is a persistent embryonic vessel that connects the superior and inferior sagittal sinuses. It typically closes after birth or early in life although it can persist into adulthood. This can be an incidental finding, or associated with other conditions including vein of Galen anomaly, arteriovenous malformation, agenesis of the corpus callosum, osteogenesis imperfecta, acrocephalosyndactyly, and Chiari malformation.^{1,2} Cerebral venous sinus thrombosis in other venous segments has been reported in patients with a persistent falcine sinus³; however, primary falcine sinus thrombosis has not been reported to our knowledge. We report a unique case of a postpartum cerebral venous sinus thrombosis involving a persistent falcine sinus with relevant imaging findings.

CASE REPORT An 18-year-old woman had extensive vaginal bleeding requiring transfusions during delivery of her baby. Five days later, she developed severe headache, described as intermittent throbbing pain in the forehead with thunderclap features. She also had right arm and leg numbness along with the headache. Two days later, she developed diplopia on left lateral gaze. She came to our attention 10 days after the delivery. Her initial examination was notable for left cranial nerve VI palsy and decreased sensation in the right arm and leg in a patchy distribution.

CT showed focal, elliptical hyperdensity parallel to the posterior falx, consistent with hemorrhage (figure, A). On MRI, sagittal T2-weighted imaging deoxyhemoglobin-related hypointensity of the falcine sinus simulated a flow void (figure, B). Diffusion-weighted imaging showed multiple punctate infarcts in the left corona radiata without hemorrhage (figure, C). Gradient recalled echo (GRE) images showed blooming susceptibility effect consistent with thrombosis of the left internal cerebral vein and vein of Galen (figure, D). Falcine sinus thrombosis was confirmed on postcontrast T1-weighted images and contrast-enhanced MRV (figure, E, F). The location of the thrombosed falcine sinus matched the hyperdensity noted on CT. The straight sinus was diminutive and partially thrombosed. Digital subtraction angiography showed no arterial stenosis or spasm. The patient was started on anticoagulation. Her headache and diplopia both improved at discharge.

DISCUSSION Cerebral venous sinus thrombosis is an important consideration in pregnant and postpartum women who present with headache or focal neurologic deficits. Risk factors for postpartum cerebral venous thrombosis (CVT) include caesarean section, dehydration, traumatic delivery, anemia, raised homocysteine concentration, and low CSF pressure.⁴ In our case, the patient had a bleeding complication during delivery, causing dehydration and anemia, which may have played a role. Noncontrast CT scans may be negative, showing clot or signs of infarction in only 30% of the cases. CT venography or MRI with time-of-flight and contrast-enhanced MRV are typically diagnostic.⁵

A persistent falcine sinus has typical imaging characteristics on MRI. Sagittal T2-weighted image shows a vertically oriented flow void extending from the origin of the straight sinus to the superior sagittal sinus. Axial T2-weighted images show an elliptical flow void in the posterior falx. Magnetic resonance venogram confirms the presence of a persistent falcine sinus with further evaluation of adjacent deep venous drainage.⁶ In our case, early subacute thrombus was identified obstructing the falcine sinus (hyperintensity on T1

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(A) CT shows a focal, elliptical hyperdensity parallel to the posterior falx, consistent with hemorrhage. (B) On MRI, sagittal T2-weighted imaging deoxyhemoglobin-related hypointensity of the falcine sinus simulates a flow void. (C) Diffusion-weighted imaging shows multiple punctate infarcts in the left corona radiata. (D) Gradient recalled echo images show blooming susceptibility effect consistent with thrombosis of the left internal cerebral vein and vein of Galen. (E, F) Falcine sinus thrombosis (white arrows) is confirmed on postcontrast T1-weighted images and contrast-enhanced magnetic resonance venogram.

[not shown here], hypointensity on T2, and susceptibility artifact on GRE sequence), further confirmed by MRV. Sagittal T2-weighted sequence showed hypointensity within the sinus, mimicking a flow void (early subacute thrombus phase); however, other sequences confirmed thrombosis. The straight sinus was hypoplastic, a common finding in the presence of a persistent falcine sinus, suggesting the original venous drainage from deep veins was through the persistent falcine sinus to the superior sagittal sinus. Venous sinus thrombosis was extensive involving the left internal cerebral vein, vein of Galen, proximal/mid straight sinus, and persistent falcine sinus. This thrombosis pattern, in the setting of a persistent falcine sinus primarily draining the deep structures, likely resulted in sluggish flow and venous hypertension, producing venous ischemia and diffusion restriction of deep white matter in the left cerebral hemisphere. Given the extent of thrombosis and variant drainage pattern, larger areas of the deep venous drainage system were likely also at risk, making prompt treatment imperative.

A persistent falcine sinus had been thought to be uncommon in adults, although recent studies have estimated prevalence as high as 2%.⁷ They can be easily overlooked if typical imaging findings are not appreciated. Recognition was crucial in this case,

allowing us to understand the degree of venous flow restriction, venous ischemic changes, and brain at risk, and to promptly institute appropriate therapy.

AUTHOR CONTRIBUTIONS

Ikjae Lee: case discussion, image selection, drafting initial manuscript. James Leach: case discussion, image selection and interpretation, revision of the manuscript. Thomas Tomsick: case discussion, image selection and interpretation, revision of the manuscript. Matthew Flaherty: case discussion, revision of the manuscript.

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