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FIGURE 1



A 29-year-old woman presents to the ED with a 12-hour history of severe headache. On physical examination, she does not exhibit any focal neurologic deficits. A noncontrast CT examination of the head is performed. Figure 1 is an axial image from that examination.

**What is your diagnosis?**

**Which additional imaging examination would you perform to confirm the diagnosis?**

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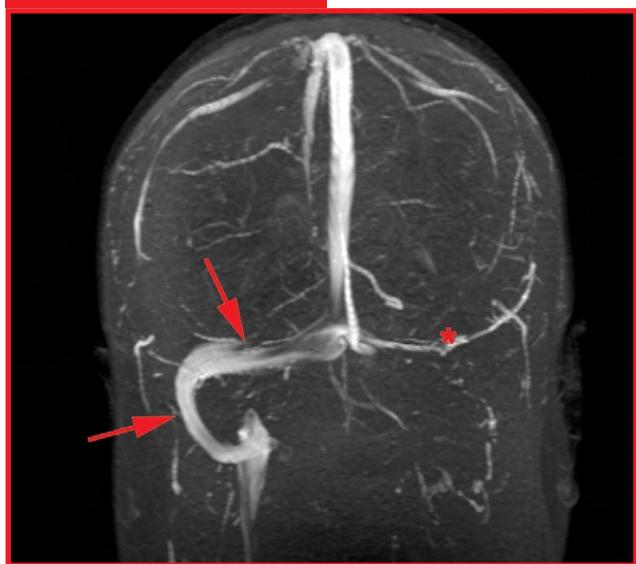
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## ANSWER

FIGURE 2



FIGURE 3



The axial noncontrast CT image demonstrates increased density in the expected location of the left transverse venous sinus (red arrow, Figure 2). This is a nonspecific finding, with a differential diagnosis including cerebral venous sinus thrombosis (CVST), an elevated hematocrit level, and extreme dehydration. Hemorrhage in the subarachnoid or subdural spaces adjacent to the venous sinus may also mimic increased density within the sinus.

In this patient, evaluation of the contiguous CT slices excluded subarachnoid and subdural hemorrhage, and her laboratory values excluded dehydration and increased hematocrit. Therefore, CVST was suspected.

Although thrombus was apparent on this patient's CT examination, noncontrast CT is not a sensitive test for CVST, with positive findings apparent in only 25% of cases.<sup>1</sup> Therefore, when CVST is suspected, further imaging should be performed. It is possible to use contrast-enhanced CT, in which the thrombus is visualized as a filling defect of the affected venous sinuses. The "empty delta sign," representing contrast in collateral spaces surrounding the thrombus, is a characteristic finding in approximately 30% of patients who have positive contrast-enhanced CT examinations.<sup>1</sup> However, when available, MRI is the imaging examination of choice, due to its multiplanar imaging capability and ability to directly reveal both anatomic findings (eg, thrombus) and physiologic information (eg, lack of flow). Magnetic resonance venography (MRV) images, both non-contrast (Figure 3) and contrast enhanced (Figure 4), demonstrate normal flow with no filling defect within the right transverse and superior sagittal sinuses (red arrows). On the left, the transverse and sagittal sinuses are not visualized due to the presence of thrombus and lack of flow. Note that there is a smaller cortical vein present (red asterisks), which should not be confused with the absent sinus. While MRV is adequate for the diagnosis of CVST, an MRI examination of the brain is typically done at the same time to evaluate for associated parenchymal abnormalities such as edema, ischemia, and hemorrhage, which may be present in up to 57% of patients.<sup>1</sup>

CVST is a rare cause of infarct, accounting for less than 1% of all strokes.<sup>2</sup> It affects a younger population than does the more common arterial stroke: In a large multicenter study, the mean age of affected patients was 39.1 years.<sup>3</sup> It is three times more common in women than men.<sup>3</sup> Risk factors include oral contraceptive use, genetic clotting abnormalities, malignancy, infection, trauma, and inflammatory bowel disease. At least one risk fac-

tor is identified in up to 88% of cases.<sup>3</sup> Clinically, patients most commonly present with headache but may also demonstrate focal neurologic deficits, signs of increased intracranial pressure (nausea, visual disturbances, and papilledema), or seizure.<sup>1-3</sup> Despite the high association of hemorrhage with CVST, treatment is typically with systemic anticoagulation.

The patient was admitted and started on anticoagulation. Her symptoms resolved, and she was discharged with orders for oral anticoagulation. Of note, her oral contraceptive regimen, which she had begun 1 week before presentation, was stopped. **EM**

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2. Fischer C, Goldstein J, Edlow J. Cerebral venous sinus thrombosis in the emergency department: retrospective analysis of 17 cases and review of the literature. *J Emerg Med*. 2010;38(2):140-147.
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**FIGURE 4**

