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Ipsilateral Motor Deficit Resulting from a Subdural Hematoma and a Kernohan Notch

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A Kernohan notch (compression of the cerebral peduncle against the tentorial edge by a contralateral mass, producing ipsilateral hemiplegia or hemiparesis) is usually seen in patients with an advanced brain tumor or severe head injury. We report a case of apparently minor head trauma with clinical and MR findings of a Kernohan notch.

Case Report

A 25-year-old male graduate student was found wandering the halls near his laboratory, appearing confused and having difficulty walking. The patient was taken to the emergency room, where he reported feelings of weakness. He was oriented to person, place, and time. Examination revealed right ptosis and third nerve palsy with a normal pupil, right hemiparesis including the face, and a positive right Babinski reflex. No external signs of trauma were present.

CT examination demonstrated an 8-mm-thick right frontoparietal acute subdural hematoma producing a 7-mm shift of the septum pellucidum toward the left (Fig. 1A). There was suggestion of only minimal right transtentorial herniation (Fig. 1B). An angiogram revealed no underlying vascular lesion. Because of the paradoxical finding of right-sided hemiparesis with ipsilateral subdural hematoma, the decision to operate was difficult; however, a craniotomy was performed and the hematoma evacuated. A postoperative MR study was performed to look for additional traumatic lesions that may have been missed on the CT scan. This demonstrated two punctate areas of increased signal on T2-weighted images in the right frontal and parietal lobes and a residual right-sided subdural hematoma (Fig. 1C). Examination of the brainstem revealed an area of abnormally increased signal along the lateral margin of the left cerebral peduncle (Fig. 1D). A T1-weighted coronal image showed an area of decreased signal intensity in the left cerebral peduncle, as well as a residual right and a very small left subdural hematoma (Fig. 1E). Following surgery, the patient's right-sided weakness gradually improved, and after 11 days he was discharged with mild residual right-sided weakness. The patient could not remember the events just prior to his hospitalization, and the cause of his head trauma was never determined.

Discussion

Compression of a cerebral peduncle against the free edge of the tentorium caused by a contralateral mass was first described at the Mayo Clinic by Kernohan and Woltman in 1928 [1]. Gross and microscopic evaluation of 276 brain specimens of patients with primary brain tumors demonstrated 34 cases of compression of the contralateral cerebral peduncle against the free edge of the tentorium. This produced visible notching of the anterolateral cerebral peduncle, with underlying tissue destruction, and provided an explanation for ipsilateral hemiplegia (false localizing sign) in patients with advanced brain tumors. Although most commonly seen in this setting, a Kernohan notch may also occur with severe head trauma, with mass effect from edema or hemorrhage producing compression of the contralateral cerebral peduncle.

This case is unusual in that a small subdural hematoma produced ipsilateral hemiparesis and partial third nerve palsy in an otherwise awake and ambulatory, albeit somewhat confused, patient. It is possible that this lesion represented a direct or primary brainstem injury, and the finding of additional supratentorial lesions on MR might support this hypothesis [2]. However, the location would be atypical for a direct brainstem contusion, which tends to occur posterolaterally in the midbrain and upper pons [2-4]. A diffuse axonal or so-called shearing injury would also be unlikely without producing a more profound neurologic deficit. The location of the midbrain lesion is typical of a Kernohan notch, which usually occurs anterolaterally [1, 5]. The lack of a significant trauma history also makes secondary injury appear more likely.

We can only speculate why such a seemingly small subdural hematoma produced enough shift for contralateral cerebral peduncle compression. The patient is young, without brain substance loss, and a small subdural hematoma would produce more shift than in an elderly individual with larger subarachnoid spaces. Additionally, this patient may have a developmentally narrow tentorial incisura, requiring relatively

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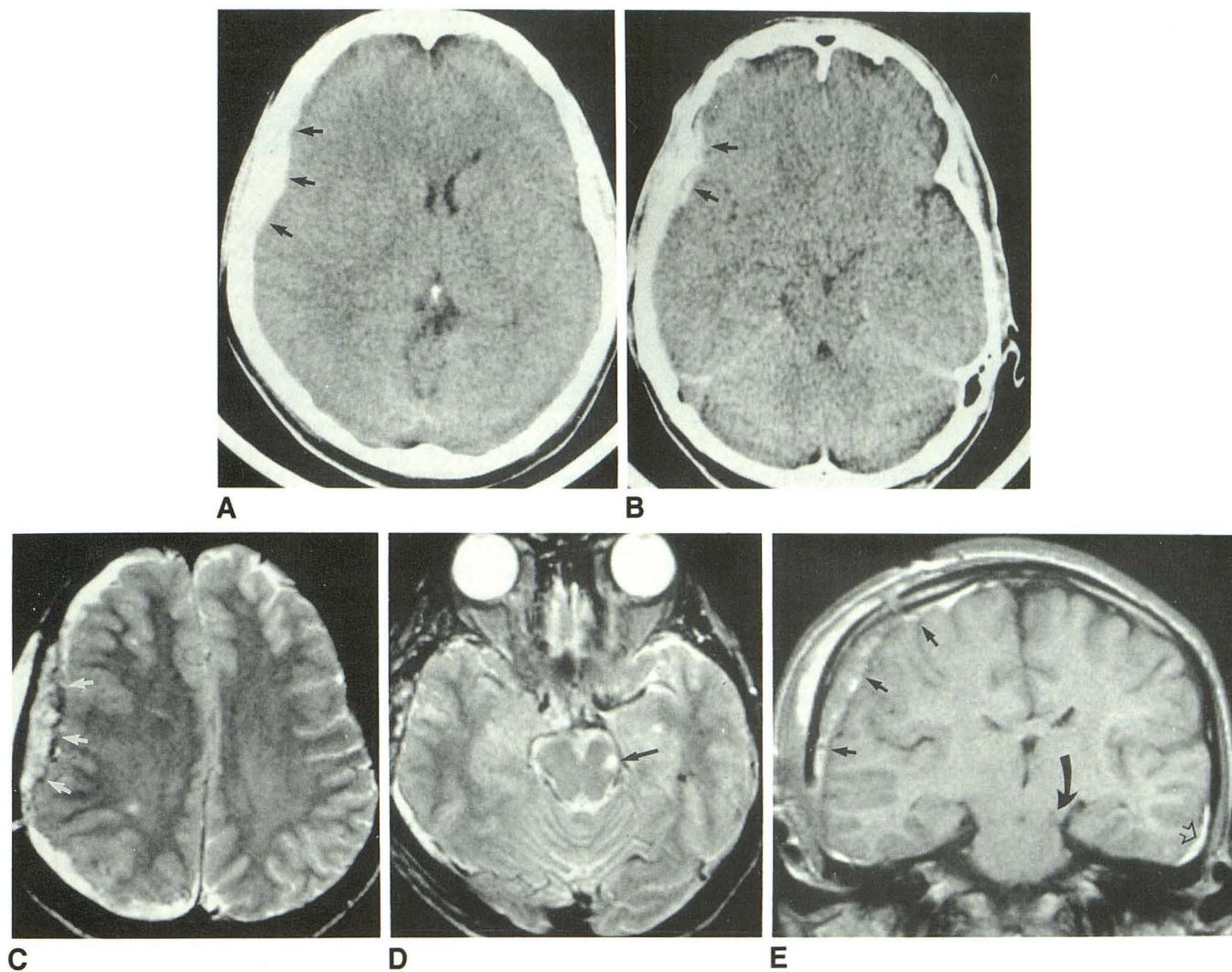


Fig. 1.—25-year-old man who presented with difficulty walking, weakness, right ptosis, and third nerve palsy.
 A, CT scan shows right frontoparietal subdural hematoma producing midline shift to the left (arrows).
 B, CT scan at lower cut than A shows subdural hematoma (arrows) with normal-appearing cerebral peduncles.
 C, Axial T2-weighted (2000/120) MR image shows residual (postoperative) subdural hematoma (arrows), as well as punctate lesion in right parietal white matter.
 D, MR image at lower cut than C clearly shows lesion in left cerebral peduncle (arrow).
 E, Coronal T1-weighted (500/20) MR image shows relationship between hypointense lesion (curved arrow) and tentorial edge. Right-sided (straight arrows) and small left-sided (open arrow) subdural hematomas are also seen.

little lateral displacement of the brainstem to produce compression of the opposite cerebral peduncle.

In summary, we report a case of compression of the brainstem against the tentorium opposite a small hematoma causing ipsilateral hemiparesis. This finding was not visible on CT but was clearly demonstrated on MR. Because of the lesion's location, its association with contralateral subdural hematoma, the lack of clinical evidence of significant shearing injury, and the patient's good symptomatic response to subdural hematoma evacuation, we believe that the peduncular lesion seen on MR is a Kernohan notch.

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