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CT of Venous Angiomas of the Brain

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Venous angiomas are very uncommon vascular malformations of the brain, which traditionally are described as having no arterial component [1]. Recently, however, both their rarity [2] and their lack of enlarged arterial feeders [3] have been questioned. The angiographic appearance of venous angiomas has been well described and usually is quite specific [4–8]. Computed tomography (CT), on the other hand, has been considered nonspecific for venous angiomas, necessitating angiography to confirm the diagnosis [6–9]. Two cases of venous angioma of the brain are presented to demonstrate that the diagnosis can be established with a high degree of certainty by CT alone in some instances. High-quality CT scanning during the first passage of an intravenous bolus of contrast material is capable of imaging the converging medullary veins which, in many venous angiomas, are considerably larger than normal medullary veins.

Case Reports

Case 1

A 62-year-old man being evaluated for cerebrovascular disease underwent CT scanning on a General Electric CT/T 8800 unit after intravenous infusion of 300 ml of Hypaque diatrizoate sodium 25%. An enhancing, linear structure was seen extending from the deep white matter of the right frontal lobe to the surface along the convexity (fig. 1A). This was believed to represent the draining vein of a venous angioma. Within 5 min after the original scan, the deep end of the presumably abnormal vein was precisely localized by several CT sections of 5 mm thickness. An intravenous bolus of 25 ml of Renografin-60 was administered rapidly, and a repeat CT scan was obtained at the predetermined level immediately after the injection. A 10 mm slice thickness was selected in the hope of including much of the suspected angioma within the slice. The resulting image clearly delineated several dilated medullary veins converging on the previously imaged dominant draining vein (fig. 1B). Cerebral angiography (fig. 1C) provided corroboration of the CT findings.

Case 2

A 22-year-old woman had a 3 month history of progressive headache and lethargy with recent onset of bilateral sixth nerve

palsies, limitation of upward gaze, and other features of a tectal-midbrain compression syndrome. Initial CT at another hospital had revealed obstructive hydrocephalus due to a mass in the pineal region. It also showed a contrast-enhancing linear density along the left cerebellar hemisphere, suspected of being a venous angioma. CT was repeated at the Shands Teaching Hospital after intravenous infusion of 300 ml of Hypaque 25%, using a slice thickness of 6 mm on a Philips 310 scanner (fig. 2A). The deep end of the major draining vein was localized as in the preceding case, and an intravenous bolus of 25 ml of Renografin-60 was administered for a repeat scan. The 9-mm-thick slice defined the feeding radicals of the venous angioma (fig. 2B), which subsequently was demonstrated clearly by cerebral angiography performed for evaluation of the pineal mass (fig. 2C).

Discussion

The usual angiographic presentation of a cerebral venous angioma is a single transcerebral draining vein fed by a group of converging, dilated medullary veins. The transcerebral vein most often empties into a superficial cortical vein, but sometimes drains into the deep venous system. The absence of enlarged arteries of supply, of any capillary blush, and of arteriovenous shunting has been noteworthy in most reported cases [4–8], except in cases 2 and 3 of Michels et al. [6], which demonstrated somewhat early filling of the angioma. Other exceptions to this general pattern include the demonstration of abnormal arteries of supply [3, 10], a blush in the capillary phase [3, 7, 9], and opacification of the abnormal veins before the venous phase [3, 9].

The CT descriptions of venous angiomas fall into two groups. The first is simple visualization of the enhanced transcerebral vein without associated findings [6, 8, 11]. The second, almost as common as the first, includes a focus of attenuation greater than that of adjacent brain on the unenhanced sections and a nondescript enhancement of that focus after intravascular contrast administration [6–8, 11]. In one reported case [8] the CT attenuation values of the lesion before contrast enhancement were sufficiently high to prove the presence of calcium.

If the angiographic demonstration of a cluster of enlarged medullary veins draining centripetally into a large transcort-

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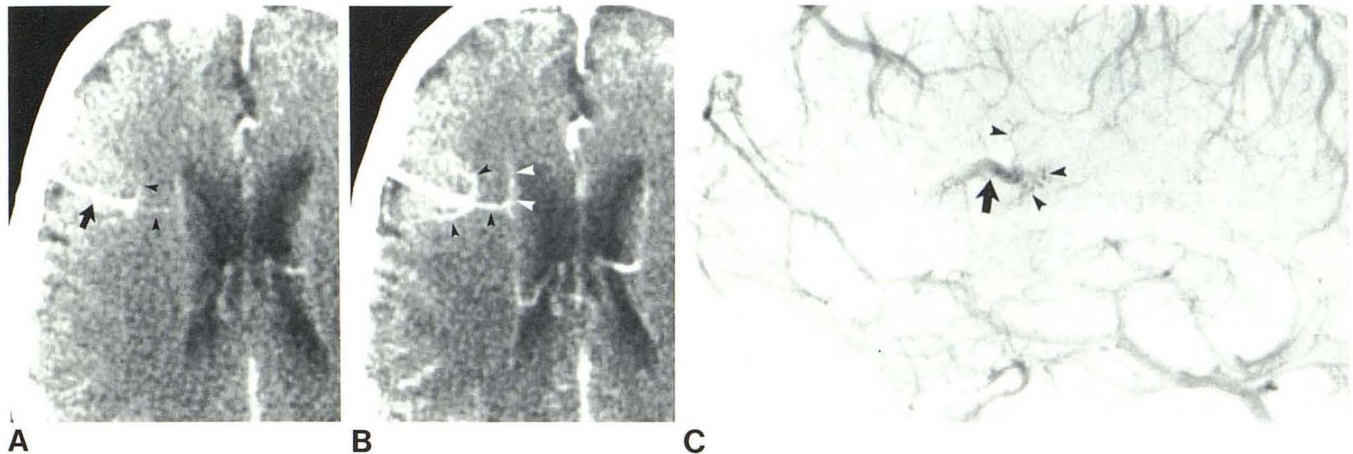
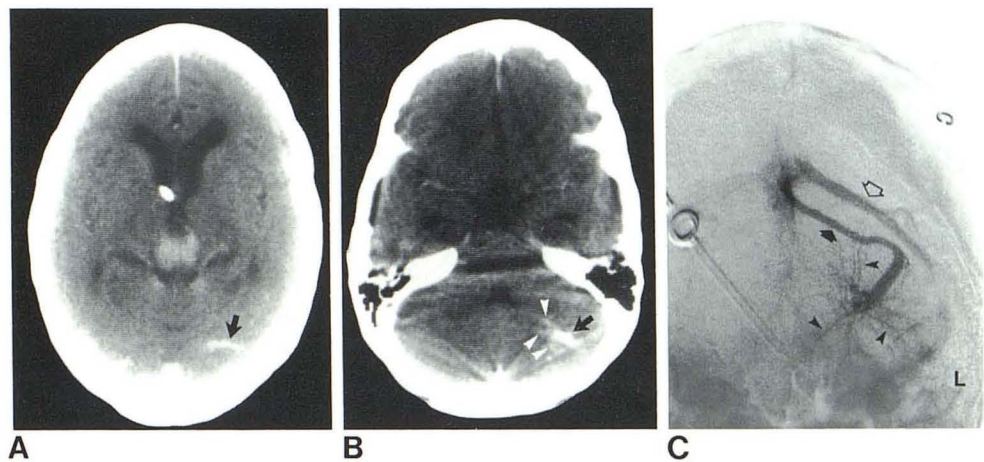


Fig. 1.—Case 1. **A**, CT scan through upper part of lateral ventricles after intravenous infusion of contrast medium. Transcerebral vein (*arrow*) extends from white matter to convexity surface of frontal lobe. Faint suggestion of tributaries (*arrowheads*). **B**, CT at same level less than 10 min later, immediately after bolus injection of contrast material. Converging, enlarged med-

ullary tributaries (*black arrowheads*), one of which communicates with a longitudinal caudate vein (*white arrowheads*). **C**, Right common carotid angiogram, lateral view, venous phase. Transcerebral draining vein (*arrow*) and medullary tributaries (*arrowheads*).

Fig. 2.—Case 2. **A**, CT scan through superior cerebellum. Enhancing vessel (*arrow*) on upper surface of left cerebellar hemisphere. This was followed on serial sections from deep within lower part of left hemisphere to surface laterally, then across upper surface to straight sinus. Enhancing mass in pineal region is obvious. **B**, After bolus administration of contrast material. Tributary veins (*arrowheads*) are imaged as they enter major vein (*arrow*). **C**, Left vertebral angiogram, Towne projection, venous phase. Many converging tributaries (*arrowheads*); major draining vein (*solid arrow*); left transverse sinus (*open arrow*).



ical vein is diagnostic of a "typical" venous angioma, then the CT demonstration of the same structures, as illustrated here, should be equally diagnostic. However, the differential diagnosis merits further discussion.

Vascular hamartomas with a remarkable angiographic resemblance to venous angiomas have been described with the diagnosis of telangiectases and cavernous hemangiomas. Telangiectases of the cerebellum have been found in patients with coexistent cavernous hemangiomas of the brainstem [12, 13]. This combination has been stated to occur in the cerebrum as well [14]. Judging from the illustrations, the telangiectatic portions of the combined posterior fossa lesions are angiographically indistinguishable from venous angiomas. Similarly, Lilliequist's [15] first and third cases of cavernous hemangioma feature dilated veins converging on a larger vein, which passed through the cerebral substance en route to a superficial or subependymal vein. Those cases also exhibited a capillary blush and early filling of the abnormal veins, features that have been reported with

venous angiomas. We wonder if Lilliequist's first and third reported cases are the supratentorial counterparts of the combined telangiectases and cavernous hemangiomas of the hindbrain or if one or both represent venous angiomas. Pathologic verification of those lesions was incomplete.

The angiographically demonstrable venous pathology in these telangiectases and cavernous angiomas would be expected to produce bolus-enhanced CT images with the same characteristics as the venous angiomas reported here. Admittedly, this could lead to diagnostic confusion in rare instances. However, the associated cavernous portion of the lesion should be evident on a high-quality unenhanced CT scan as a focus of high attenuation, a consistent finding in reported cavernous hemangiomas studied by CT. Some cavernous hemangiomas further reveal themselves through contrast enhancement [16–18].

The venous angiomas in these patients can be distinguished from the common arteriovenous malformation (AVM) by the convergence of medullary veins from various

directions and by the presence of normal brain parenchyma between them, features not present in the AVM. Confusion with a neoplasm should not occur; any neoplasm with arteriovenous shunting sufficient to dilate a draining vein presumably would be demonstrated by contrast-enhanced CT.

The overlapping angiographic and CT findings in some of the various "cryptic" vascular hamartomas of the brain give some support to the concept of a spectrum of such lesions in some patients, with cases of combined lesions or lesions not clearly classifiable as venous angiomas, cavernous hemangiomas, telangiectases, or arteriovenous malformations. This concept has been suggested both in reference to arteriovenous malformations and venous angiomas [3, 14] and in reference to cavernous hemangiomas and telangiectases [14, 19]. Some of these extremely uncommon lesions which defy precise categorization are likely to be difficult to diagnose precisely by any radiographic modality. However, as experience is gained with CT scanning of cryptic vascular hamartomas, we anticipate that the CT findings in these cases will prove to be highly specific for a venous angioma.

The foregoing statement assumes adherence to the methods described above for precise localization of the lesion and scanning during the first passage of a bolus of contrast. In case 1 the transcerebral draining vein was located fortuitously in the scanning plane throughout its length, but this usually will not occur. Careful attention must be directed to localizing that vein's origin, where the converging medullary veins can be imaged concurrently with the passage of the contrast bolus.

A possible alternative approach would employ a larger, mechanically injected bolus of contrast material and a dynamic scanning sequence with the table indexing the general region of suspected angioma through the radiographic field, as outlined by Cohen et al. [20] for the sellar/parasellar area. However, we believe that the rapid bolus/single slice method is a more expedient method of evaluating these lesions and that it will provide better visualization of medullary veins by avoiding the shorter scanning times necessary with the dynamic mode. These considerations must be weighed against the presumably higher intravascular concentrations of contrast media achievable with a mechanical injector.

We assume that the medullary veins will be too small for imaging in some patients, thereby precluding a confident CT diagnosis in those cases. A recent review of the literature suggests that among the vascular hamartomas the venous angioma has a low propensity for hemorrhage [19]. It is thus less likely to warrant aggressive treatment such as surgery. But a focus of attenuation greater than that of adjacent normal brain on the unenhanced scan or enhancement of the brain adjacent to the abnormal veins should alert one to

the possibility of a more dangerous lesion and the need for further evaluation by angiography.

REFERENCES

1. McCormick WF. The pathology of vascular ("arteriovenous") malformations. *J Neurosurg* **1966**;24:807-816
2. Sarwar M, McCormick WF. Intracerebral venous angioma. *Arch Neurol* **1978**;35:323-325
3. Wendling LR, Moore JS Jr, Kieffer SA, Goldberg HI, Latchaw RE. Intracerebral venous angioma. *Radiology* **1976**;119:141-147
4. Constans JP, Dilenge D, Vedrenne CL. Angiomas veineux cerebraux. *Neurochirurgie* **1968**;14:641-650
5. Scotti LN, Goldman RL, Rao GR, Heinz ER. Cerebral venous angioma. *Neuroradiology* **1975**;9:125-128
6. Michels LG, Bentson JR, Winter J. Computed tomography of cerebral venous angiomas. *J Comput Assist Tomogr* **1977**;1:149-154
7. Maehara T, Tasaka A. Cerebral venous angioma: computerized tomography and angiographic diagnosis. *Neuroradiology* **1978**;16:296-298
8. Fierstein SB, Pribram HW, Hieshima G. Angiography and computed tomography in the evaluation of cerebral venous malformations. *Neuroradiology* **1979**;17:137-148
9. Moritake K, Handa H, Mori K, Ishikawa M, Morimoto M, Takebe Y. Venous angiomas of the brain. *Surg Neurol* **1980**;14:95-105
10. Wolf PA, Rosman NP, New PFJ. Multiple small cryptic venous angiomas of the brain mimicking cerebral metastases. *Neurology (NY)* **1967**;17:491-501
11. Solomon EH, Bonstelle CT, Modic MT, Kaufman B. Angiographic and computed tomographic correlation in cerebral venous angiomas. *CT* **1980**;4:217-221
12. Roberson GH, Kase CS, Wolpaw ER. Telangiectases and cavernous angiomas of the brainstem: "cryptic" vascular malformations. *Neuroradiology* **1974**;8:83-89
13. Diamond C, Torvik A, Amundsen P. Angiographic diagnosis of telangiectasis with cavernous angioma of the posterior fossa. *Acta Radiol [Diagn] (Stockh)* **1976**;17:281-288
14. Russell DC, Rubenstein LJ. *Pathology of tumours of the nervous system*. Baltimore: Williams & Wilkins, **1977**:127-141
15. Lilliequist B. Angiography in intracerebral cavernous hemangioma. *Neuroradiology* **1975**;9:69-72
16. Bartlett JE, Kishore PRS. Intracranial cavernous angioma. *AJR* **1977**;128:653-656
17. Numaguchi Y, Kishikawa T, Fukui M, et al. Prolonged injection angiography for diagnosing intracranial cavernous hemangiomas. *Radiology* **1979**;131:137-138
18. Pozzati E, Padovani R, Morrone B, Finizio F, Gaist G. Cerebral cavernous angiomas in children. *J Neurosurg* **1980**;53:826-832
19. Vaquero J, Manrique M, Oya S, Cabezudo JM, Bravo G. Calcific telangiectatic hamartomas of the brain. *Surg Neurol* **1980**;13:453-457
20. Cohen WA, Pinto RS, Kricheff II. Dynamic CT scanning for visualization of the parasellar carotid arteries. *AJNR* **1982**;3:185-189, *AJR* **1982**;138:905-909