Angiographic demonstration of a cerebral venous angioma

Case report

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This patient presented with a cerebral venous angioma in which the angiographic findings were suggestive of a malignant brain tumor; the true nature of this lesion was documented at surgery. The diagnostic features of this case are discussed.

KEY WORDS • vascular malformation • cerebral venous angioma • angiography

ANGIOGRAPHIC differentiation of an arteriovenous malformation from malignant glioma will permit accurate diagnosis from the cerebral angiogram alone in most instances. We recently examined a patient with venous angioma of the brain with confusing angiographic features. A review of the literature reveals only a few instances of venous angioma demonstrated by angiography.

Case Report

This 23-year-old woman had had headaches for the past 5 years. Ten weeks before admission, the headaches increased in severity and began localizing in the right frontal region; during that time she complained of decreased memory.

Examination. Neurological examination showed only slightly decreased strength and sensation on the left. An electroencephalogram revealed some generalized paroxysmal activity suggestive of epilepsy. Radionuclide cerebral angiogram demonstrated a focus of abnormally increased activity deep within the right hemisphere during the arterial phase which cleared late in the venous phase (Fig. 1). A static scan immediately following angiography was normal. The combination of increased activity on the radionuclide cerebral angiogram with a normal static scan was interpreted as highly suggestive of aneurysm or arteriovenous malformation.

A right carotid angiogram (Fig. 2) showed a lesion in the white matter of the right frontal lobe immediately above the roof of the lateral ventricle. The abnormal area was first identified as a diffuse blush, measuring 3.5 cm in diameter. There were no hypertrophic arterial trunks or arteriovenous shunting present. The lesion drained into enlarged, parallel, medullary veins which converged at the roof of the lateral ventricle; the entire le-
Cerebral venous angioma

Fig. 1. Radionuclide cerebral angiogram demonstrating increased activity deep within the right hemisphere during the capillary and venous phases.

Discussion

Angiography of arteriovenous malformations (AVM's) shows that they are composed of dilated arteries and veins with gross shunts between them; histologically they contain abnormal, hyalinized vessels which are "neither artery or vein," in addition to arteries and veins.

In contrast, no abnormal arteries or arteriovenous shunts were seen at angiography in the present case. Microscopically, the lesion was composed of numerous thin-walled vessels separated by normal brain parenchyma that conform to McCormick's description of venous angiomas.

The current case represents a venous angioma and not an AVM, since it contains no arterial elements and the arteries in the brain substance surrounding the lesion are normal. This explains why no abnormal arteries were seen at angiography and why no arteriovenous shunts were demonstrated. In the absence of angiographic evidence for arteriovenous shunting, the red color noted at surgery of the thin-walled vein draining the angioma is difficult to explain. It may be that this red color reflects decreased percent oxy-
Fig. 3. At surgery, the large vein demonstrated at angiography was noted to rise from within the frontal lobe (smaller arrow) and drain into the superior sagittal sinus (larger arrow).

gen extraction due to the relatively increased blood volume within this lesion as demonstrated by the blush at angiography.

Courville described a series of 22 cerebral vascular malformations which fulfilled the criteria of venous angiomas, dispelling the belief that these lesions are rare. Despite this, we can find only a few instances in which a venous angioma was detected by angiography. Noran mentioned that the venous angioma is characteristically pyramidal, the apex of the pyramid being at the ventricle. Courville stated that these lesions are rarely multiple and that "one sometimes finds a large vascular channel of uniform diameter passing from the subcortical lesion directly through the cerebral or cerebellar cortex to the superficial meningeal veins. Such a venous shunt must serve as a bypass to evacuate the venous blood from the cluster of anomalous veins to the exterior." This combination of descriptions is demonstrated in the current case, in which the angiograms first showed a "blush" without evidence of arteriovenous fistula. Multiple parallel vessels were then seen draining this area toward the ventricular roof in an inverted pyramid configuration; these veins appeared to be dilated medullary veins. Then a single large vessel drained the lesion from the confluence of these veins (the apex of the pyramid at the ventricular roof) to the superior sagittal sinus (Fig. 2).

It is interesting to note that the diagnosis of "vascular malformation" was made at the time of the radionuclide cerebral angiogram and static brain scan (Fig. 1). The primary reason for that interpretation was that to our knowledge, no convincing case has been reported in which a malignant brain tumor has demonstrated increased flow on the radionuclide angiogram together with a normal static brain scan.

At cerebral angiography, the demonstration of clear spaces separating abnormal vessels located primarily within the white matter is characteristic of brain tumor. However, the venous drainage of a tumor in this location classically should be predominantly by way of the subependymal veins of the lateral ventricle and to the deep venous system, rather than through a single vein to the superficial venous system. An enlarged draining vein as was seen in this lesion can be seen in an AVM or malignant tumor, but these lesions would not demonstrate enlarged medullary veins without concomitant arteriovenous shunting. The absence of a mass effect in a lesion 3.5 cm in diameter is atypical for a malignant tumor, although possible. Noran states that "venous angioma is not an expansile tumor; rather it replaces the tissue of the
involved area." Of course, the presence of a hematoma secondary to this lesion could create a mass effect, but intracranial hemorrhage secondary to this lesion is distinctly rare.2

With newer advances in neuroradiology, including direct magnification and subtraction techniques, smaller venous angiomas may be picked up which have previously not been demonstrable by angiography. This lesion is not rare.2 Such small lesions would almost certainly not be demonstrated on the radionuclide cerebral angiogram and therefore the potential triad of increased activity on the radionuclide angiogram, normal static brain scan, and angiographic findings described above would not be useful.

In a previously reported venous angioma demonstrated at angiography,8 the findings were “an irregularly shaped area containing abnormal vessels of small size fairly evenly distributed in the parasagittal white matter. In the late arterial phase, filling of these small vessels had begun in the more superficial portion of the lesion. In the late arterial phase, there was filling of an enlarged vein in the white matter medial to the lesion and of a single connecting superficial vein draining to the superior sagittal sinus.” Moreover, a second lesion which did not fill was demonstrated by its large mass effect in the temporal lobe. At autopsy, a large hematoma destroyed most of the temporal lobe, and several venous angiomas were found in the brain, including a large venous angioma corresponding to the lesion filled at angiography.8 The cataclysmic clinical presentation, multiplicity of lesions, and the presence of arteriovenous shunting separate this from our case. Courville states that most of these lesions are single and rarely bleed,2 as in the present case. Moreover, the combination of angiographic findings described in our case should separate this lesion from an AVM or malignant tumor, whereas the presence of arteriovenous shunting could well confuse the diagnosis.

The angiographic picture of a white matter lesion with the characteristics described in this case should be consistent with a venous angioma. The presence of a mass effect is dependent on hemorrhage of the lesion, which would be unusual as it apparently is rare for these lesions to bleed.

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References


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