Spontaneous regression of a cerebral arteriovenous malformation in a child with hereditary hemorrhagic telangiectasia

Case report

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Patients with hereditary hemorrhagic telangiectasia (HHT) are at risk for the development of cerebral arteriovenous malformations (AVMs). The authors report a case of a spontaneously regressing cerebral AVM in a patient with HHT. The lesion was diagnosed on the basis of findings on screening magnetic resonance imaging and regressed completely before any treatment was undertaken. The spontaneous regression of cerebral AVMs is a rare and poorly understood phenomenon. Only one other instance of spontaneous regression of a cerebral AVM in a patient with HHT has been reported in the literature. The authors compare angiographic and clinical features in previously reported cases of spontaneous regression of cerebral AVMs with those in the present case to determine the characteristics common to this phenomenon.

KEY WORDS • arteriovenous malformation • hereditary hemorrhagic telangiectasia • Osler-Weber-Rendu syndrome • spontaneous regression • pediatric neurosurgery

HEREDITARY hemorrhagic telangiectasia, also known as Osler-Weber-Rendu syndrome, is an autosomal-dominant disorder characterized by mucocutaneous telangiectasia, recurrent epistaxis, and visceral AVMs. Although only 2% of cerebral AVMs are associated with HHT, 5 to 10% of patients with HHT harbor a cerebral AVM. Spontaneous regression of a cerebral AVM, although well recognized, is a rare phenomenon with a reported incidence of 0.5 to 1.3%. Most case reports have focused on sporadic AVMs; only one previous report contains a description of the regression of a small AVM in an adult patient with HHT.

Case Report

History and Examination. This 4-year-old girl with an extensive family history of HHT was referred to our institution for embolization of a posterior fossa AVM. Her mother had harbored a pulmonary arteriovenous fistula, which was treated successfully, and suffered from mucocutaneous telangiectasia and recurrent epistaxis. The patient’s aunt had been treated for a spinal AVM. In addition, multiple cerebral AVMs had been diagnosed in the patient’s 2-year-old sister, who unfortunately died of subarachnoid hemorrhage before any treatment could be performed.

The patient’s perinatal history was unremarkable. According to her medical records, she had achieved normal developmental milestones, and her head circumference was within the normal range. She had no history of significant epistaxis or mucocutaneous telangiectasia, and had not suffered any adverse neurological event.

When she was 2 years of age, the patient underwent screening MR imaging of her brain at another institution. The MR images revealed a relatively small AVM involving the right side of the cerebellum adjacent to the midline (Fig. 1). The MR angiograms demonstrated that this lesion was supplied by a single feeding vessel branching from the posterior inferior cerebellar artery. The AVM drained into the straight sinus via the inferior vermian vein (Fig. 1C and D).

Workup Prior to Scheduled Surgery. Twenty-one months later the child was referred to our institution for embolization of the AVM. Conventional diagnostic catheter angiog-
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...raphy, performed before the scheduled embolization procedure, revealed that the lesion had completely vanished (Fig. 2). There was no evidence of additional lesions in other parts of her brain.

**Follow-up Examination.** Follow-up MR imaging and MR angiography performed 3 months later confirmed that the AVM no longer existed (Fig. 3).

**Discussion**

Cerebral AVMs associated with HHT are often characterized by multiplicity, small size, cortical location, and the presence of a single draining vein. A metaanalysis of reported case series has shown that among patients with HHT and cerebral AVMs, 50% have multiple lesions, in contrast to the 1 to 3% incidence rate of multiple lesions reported in patients with sporadic AVMs. A cortical location for these lesions (reported incidence 89–100%) is another common observation in patients with HHT. The percentage of micro-AVMs (nidus diameter < 1 cm) is particularly high in patients with HHT compared with that in patients with sporadic lesions. In one case series, the majority of AVMs in patients with HHT were reportedly supplied by a single terminal branch of either the anterior, middle, or posterior cerebral artery (comparable to a single-hole fistula); in fact, these angiographic features are highly suggestive of the presence of HHT. Because telangiectasia and epistaxis are unusual in early life, presentation with a hemorrhaging AVM may be the first indication of HHT in children. Brain AVMs in patients with HHT often follow a more benign natural course than sporadic lesions. The bleeding risk in HHT-associated lesions has been reported to be as low as 0.36 to 0.56% per year. Although authors of recent reports suggest that the rate of hemorrhage in this group is in the range of 1 to 2%, the majority opinion is that the risk of bleeding in patients with HHT is lower than...
the risk in patients harboring sporadic lesions. In addition, functional outcome after bleeding in patients with HHT is generally better than that in patients with hemorrhaging related to sporadic lesions.\cite{10}

In our review of the literature we found that the majority of spontaneously regressing AVMs share the following characteristics: small size, the presence of a single draining vein, and an initial presentation with AVM bleeding.\cite{1,4,9,13,14} Some authors have also suggested that AVMs in superficial locations have a greater tendency to regress spontaneously than more deep-seated AVMs.\cite{13} The lesion in our patient was indeed small, it had a single draining vein and a superficial location. A major difference in our patient, however, was that the AVM was diagnosed at a screening examination rather than after presentation with a hemorrhage.

The underlying mechanism of AVM regression is still unclear, although several theories have been postulated. One of the most consistent and frequently proposed hypotheses is the presence of a mass effect generated by an intracerebral hematoma and/or edema on the nidus of the AVM, which subsequently leads to thrombosis.\cite{5,10} Alternatively, thrombosis of the dominant or sole draining vein has been posited as a more important factor.\cite{1,9,16} This opinion is supported by the observation that the majority of AVMs possess a single draining vein. Even if the arterial feeding vessels are occluded, angiogenesis will provide the fistulous component with collateral arteries if the shunt remains patent.\cite{2} Thus, the venous segment must be thrombosed before complete occlusion can occur. Other proposed etiological factors include occlusion by atherosclerosis,\cite{3} kinking of the feeding vessels,\cite{4} thromboembolism, systemic coagulation disorder, a dynamic disturbance in the blood flow after surgery, and other endothelial changes in feeding or draining veins due to turbulent flow.\cite{5,6} Specifically in patients with HHT, it has been suggested that the gene mutation related to this condition may lead to instability of the AVM and hence to its spontaneous obliteration.\cite{4}

In our patient, no clinical or neurological event occurred between the discovery of the AVM and its regression; it is therefore unlikely that any episode of hemorrhaging or acute thrombosis facilitated the regression of the lesion. We believe that some other mechanism, not yet well understood, must have caused the spontaneous thrombosis in our patient.

Conclusions

Both sporadic lesions and AVMs related to HHT can regress spontaneously. Characteristics predictive of AVM regression in patients with HHT are similar to those in patients with sporadic lesions and include small size, the presence of a single draining vein and a superficial location, and hemorrhaging at presentation. All these factors, except the last, were manifested in our patient. Despite identification of predictors of spontaneous regression, the specific pathophysiology of this phenomenon remains unclear.

References

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