SECTION EDITOR: BEVERLY P. WOOD, MD

Radiological Case of the Month

Toni M. Petrillo, MD; James D. Fortenberry, MD; C. Robert Chambliss, MD; Kenny C. Nall, MD

A 15-YEAR-OLD African American girl was obtunded after being found in a pool of blood. No history was obtained. Discussion with her family revealed a history of hemoptysis. Evaluation of the hemoptysis included bronchoscopy and computed tomography (CT) of the thorax (**Figure 1** and **Figure 2**). On this presentation she had respiratory distress and decerebrate posturing. Findings from a toxicology screening, coagulation panel, serum electrolyte levels, and complete blood cell count with differential were normal. A brain CT scan was obtained (**Figure 3**), and the patient was given mannitol, dexamethasone, and treated with hyperventilation. She was transported to a pediatric facility and admitted to the pediatric intensive care unit. She remained comatose with flexion posturing to deep pain. The pupils were initially equal and reactive to light, but she developed hypertension and fixed dilated pupils within 6 hours of arrival. Repeated CT scan of the brain showed multiple infarctions and uncal herniation. She met brain death examination criteria and mechanical ventilation was discontinued.

From the Department of Pediatrics, Division of Critical Care, Emory University School of Medicine, Atlanta, Ga (Dr Petrillo); Division of Pediatric Critical Care, Children's Healthcare of Atlanta at Egleston (Drs Fortenberry and Chambliss); and Division of Pulmonary Medicine, Columbus Clinic, Columbus, Ga (Dr Nall).

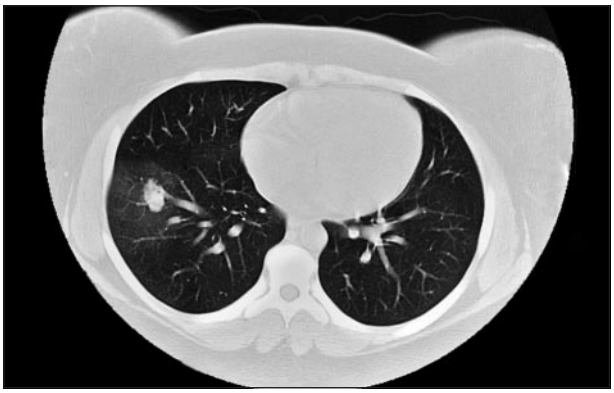

Figure 1.

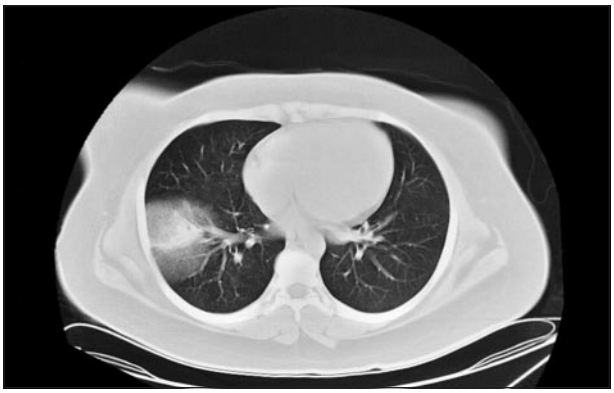

Figure 2.

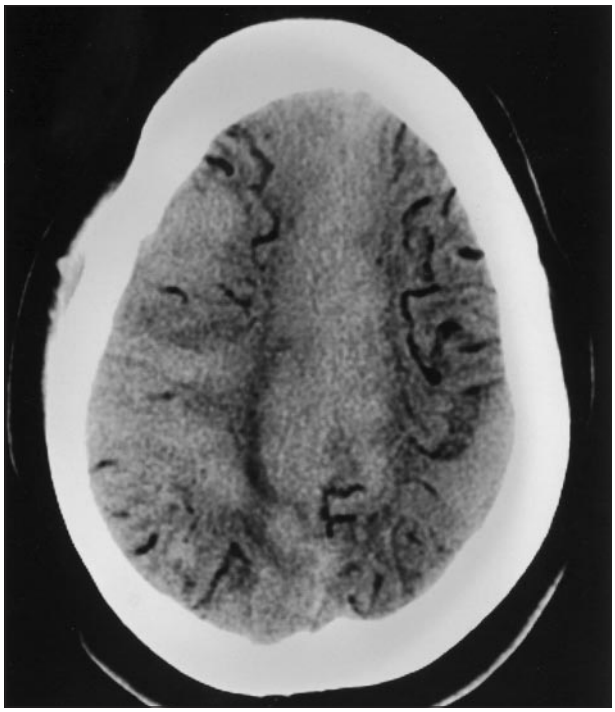

Figure 3.

Denouement and Discussion

Cerebral Air Embolism in Hereditary Hemorrhagic Telangiectasia (Osler-Weber-Rendu Disease)

Figure 1. Pulmonary arteriovenous malformation.

Figure 2. Pulmonary hemorrhage.

Figure 3 Initial computed tomography of the brain demonstrating diffuse pneumocephaly with edema and mass effect without hemorrhage.

Osler-Weber-Rendu disease (OWR), or hereditary hemorrhagic telangiectasia, is an autosomal dominant disorder involving vascular structures throughout the body. The incidence of OWR is estimated at 1 to 2 per 100000.[1] The classic triad consists of telangiectasias, epistaxis, and previous familial history. Because of variable penetrance, a family history of OWR may be absent. This patient's mother and grandfather had a history of recurrent gastrointestinal bleeding, and the mother required frequent blood transfusions. The underlying pathologic abnormality of OWR is a combination of insufficient smooth muscle contractile elements, endothelial cell junction defects, and perivascular connective tissue weakness.[1] These defects give rise to telangiectasias, arteriovenous malformations (AVMs), and aneurysms. Two gene defects have been linked to OWR. The defect involves the endoglin gene located on chromosome 9, which is often associated with pulmonary and cerebral AVMs.[2]

A defect located on the *ALK1* gene on chromosome 12 has also been reported.[3] Epistaxis is often an initial presenting manifestation. Cutaneous telangiectasias may not manifest until the second or third decade of life. Aneurysms and AVMs may affect multiple organs. Lesions of the gastrointestinal tract manifest as painless bleeding.[1] Fibrovascular infiltration of the liver can cause hepatomegaly, and left-to-right shunting through fistulas may cause high-output congestive heart failure.[4]

This patient's prior hemoptysis was associated with a pulmonary AVM; these are found in 5% to 15% of patients affected with OWR.[4] Most often these fistulas remain stable or gradually expand over decades.[1] Treatment for pulmonary AVMs or fistulas is surgical excision, embolization, or ligation, and is reserved for those fistulas or AVMs that are expanding or symptomatic. A cerebral air embolism can occur from a pulmonary AVM,[5] leading rapidly to progressive cerebral edema, uncal herniation, and death. Other more common neurologic complications of OWR-associated AVMs include septic microemboli, producing an abscess or meningitis, and vascular malformations of the brain and spinal cord.[4] Patients may develop headaches or transient ischemic attacks.

Although patients with OWR can have repeated episodes of hemorrhage, the lifespan is neither inevitably reduced nor is quality of life impaired.[1] Treatment is supportive, including iron therapy for chronic anemia. Frequent transfusions, surgical resection, embolization, or irradiation may be necessary for repeated bleeding or life-threatening AVMs. The use of hormonal therapy (mostly oral estrogens) has been reported for severe cases of recurrent epistaxis and for recurrent gastrointestinal bleeding.[6,7]

Accepted for publication November 3, 1999.

Reprints: Toni M. Petrillo, MD, Children's Healthcare of Atlanta at Egleston, Division of Pediatric Critical Care, 1405 Clifton Rd NE, Atlanta, GA 30322 (e-mail: toni.petrillo@CHOA.org).

REFERENCES

1. Perry WH. Clinical spectrum of hereditary hemorrhagic telangiectasia (Osler-Weber-Rendu disease). *Am J Med*. 1987;82:989-997.
2. Shovlin CL. Characterization of endoglin and identification of novel mutations in hereditary hemorrhagic telangiectasia. *Am J Hum Genet*. 1997;61:68-79.
3. Johnson DW, Berg JN, Baldwin MA, et al. Mutations in activin receptor-like kinase gene in hereditary hemorrhagic telangiectasia type 2. *Nat Genet*. 1996;13:189-195.
4. Guttmacher AE, Marchuk DA, White RI Jr. Hereditary hemorrhagic telangiectasia. *N Engl J Med*. 1995:333:918-924.
5. Stanley IM, Hunter KR. Neurological manifestations of hereditary hemorrhagic teleangiectasia. *BMJ*. 1970;3:688.
6. Custem EV. Estrogen-progesterone treatment of Osler-Weber-Rendu disease. *J Clin Gatroenterol*. 1988;10:676-679.
7. Custem EV. Treatment of bleeding gastrointestinal vascular malformations with estrogen-progesterone. *Lancet*. 1990;335:953-955.