Elimination of a cirsoid aneurysm of the scalp by direct percutaneous embolization with thrombogenic coils

Case report

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Cirsoid aneurysms of the scalp are notoriously difficult lesions to manage. The authors report a patient in whom a large traumatic cirsoid aneurysm of the scalp was eliminated using a combined neurosurgical and interventional neuroradiological approach. Transarterial embolization was utilized to reduce arterial blood supply to the fistula. Thrombogenic Gianturco spring coils were then introduced via direct percutaneous puncture of the aneurysm. The aneurysm thrombosed and the multiple tortuous scalp vessels disappeared. One month after embolization, a small area of skin necrosis over the aneurysm necessitated surgical excision of the lesion. The thrombosed aneurysm was easily resected with minimal blood loss. Percutaneous embolization with thrombogenic coils in this case was a safe and effective ablative technique.

KEY WORDS - cirsoid aneurysm • thrombogenic coils • embolization • arteriovenous malformation • scalp • arteriovenous fistula

Cirsoid aneurysms of the scalp are rare lesions infrequently encountered by the neurosurgeon. The majority occur as congenital anomalies, although about 10% to 20% develop following penetrating or nonpenetrating trauma to the scalp. Patients usually present with a pulsatile disfiguring scalp mass which can be extensive and grotesque. Other presenting symptoms include headache, pulsatile tinnitus, and hemorrhage from the lesion following minor head trauma. A cirsoid aneurysm develops as a result of abnormal connections between arteries and veins with subsequent dilatation of vascular channels and aneurysm formation. This lesion is really an arteriovenous fistula and previously has been described as an arteriovenous aneurysm, aneurysm by anastomosis, racemose aneurysm, pulsating angioma, aneurysmal varix, and plexiform angioma.

The term “cirsoid aneurysm” is used because this lesion resembles a varix; the derivation of cirsoid is from the Greek word kirsos, or varix. In fact, the earliest description of a cirsoid aneurysm has been traced to Greek mythology and the story of the Gorgon’s head. According to legend, the Gorgons were three winged monsters with large teeth, brazen claws, and snake-like hair. The most famous of the Gorgon monsters was Medusa, a daughter of the sea god Phorcys and his sister-wife Ceto. Medusa was originally a beautiful maiden whose fair hair was transformed into hissing serpents by Athena, goddess of wisdom, when it was learned that Medusa had desecrated one of the goddess’ temples through a sexual indiscretion with Poseidon. Medusa became a hideous monster whose head had the power of turning all those who looked at her to stone. She was ultimately slain by the clever Perseus who swept down wearing the winged shoes of Hermes. Perseus approached with eyes averted, seeing only Medusa’s reflection in a shield provided by Athena, and cut off her head.

Like Perseus, the surgeon tangling with a cirsoid aneurysm of the scalp must have a carefully thought-out plan. Cirsoid aneurysms often parasitize a large blood supply and may be troublesome to eradicate. Complete surgical removal can be difficult and the surgeon is sometimes forced to change plans from total to subtotal excision because of complicated vascular anatomy and massive intraoperative hemorrhage.
EmboliZation of a cirsoid aneurysm of the scalp

The authors report a case in which a large cirsoid aneurysm of the scalp was partially embolized with intra-arterial Ivalon (polyvinyl alcohol) particles, silk suture material, and platinum coils. This was followed by a percutaneous injection of Gianturco coils directly into the aneurysm. The malformation was completely thrombosed and easily excised.

Case Report

This 29-year-old Vietnamese man presented with a large, disfiguring, pulsatile scalp mass. Fifteen years earlier he had sustained a scalp contusion when he dove into a river and struck his head on the corner of a submerged board. One year after trauma, the patient noted a small midline pulsatile lump at the site of his previous scalp injury. The mass gradually increased in size and the patient was progressively bothered by a loud bruit heard in both ears. He ultimately sought medical attention because of this mass as well as numerous unsightly tortuous veins in his forehead.

Examination. Physical examination revealed a 3 × 4-cm pulsatile scalp mass, 1.5 cm in height. The mass was located just over the coronal suture a few millimeters to the left of the bregma. It was quite tense and the overlying skin was extremely thin. A loud bruit was auscultated. Both superficial temporal arteries (STA’s) were tortuous and prominent. Large dilated tortuous veins drained the mass and extended down over the scalp and forehead. There was no evidence of congestive heart failure. The remainder of the physical examination was normal.

Angiography performed at another hospital via bilateral common carotid artery injections revealed an arteriovenous fistula feeding a large cirsoid aneurysm (Fig. 1). The fistula was fed by both STA’s. There was no supply from the internal carotid arteries. The patient was referred to the New England Medical Center for treatment.

Operation. On May 24, 1989, the patient underwent right common femoral artery catheterization in the angiography suite. A No. 5.5 French vascular sheath was advanced into the artery by the Seldinger technique. The sheath was connected to a continuous heparinized saline drip (heparin, 1000 U/liter normal saline at 30 ml/hr). Under fluoroscopic visualization, a No. 5 French Berenstein catheter was used to selectively cannulate the left STA. After digital subtraction angiography confirmed the presence of an arteriovenous fistula and cirsoid aneurysm, successive embolization with 300- to 500-μ Ivalon particles, 700- to 1000-μ Ivalon particles, and 4 × 1-mm Gelfoam pledgers failed to show blood flow to the aneurysm. A Tracker 18 catheter* was then selectively positioned into the bifurcation of the STA coaxially through the Berenstein catheter. The STA was then embolized with three 0.015 in. × 4 mm × 2-cm helix platinum coils, four 0.018 in. × 1-cm straight Hilal coils, and multiple 3-0 silk sutures cut to 2 cm lengths.† This completely obliterated flow in the proximal left STA although collaterization of the anterior division of the STA via an orbital branch was noted on the postembolization arteriogram. Following this, the right STA was selectively catheterized by the same Tracker 18 coaxial catheter system. The right STA was embolized with four 0.015 in. × 4 mm × 2-

*Tracker 18 catheter manufactured by Target Therapeutics, Inc., Santa Monica, California.
†Helix platinum coils manufactured by Target Therapeutics, Inc., Santa Monica, California; Hilal coils manufactured by Cook, Inc., Bloomington, Indiana.
angiography demonstrated complete obliteration of the lesion (Fig. 3). The patient was discharged on the 3rd postoperative day.

One month later, the patient developed a small area of skin breakdown over the aneurysm. A 3 × 3-mm area of granulation tissue protruded through the skin. There was no evidence of infection. On June 28, 1989, the patient underwent excision of the scalp cirsoid aneurysm and arteriovenous fistula through a small elliptical coronal incision. The aneurysm was found to be completely occluded with coils and thrombus. Blood loss was minimal. The galea was undermined and scored and the scalp was closed in a single layer. The postoperative course was smooth and the incision healed nicely.

Discussion

Cirsoid aneurysms of the scalp occur infrequently and can be difficult to remove. Since the early 1800's, numerous reports of cirsoid aneurysms have appeared in the literature. Initial attempts at ligation of feeding arteries proved ineffective. Ligation of feeding vessels followed by resection of the lesion has occasionally met with success. Other reported treatments include radiation therapy, electrothrombosis, scalp tourniquet, scalp compression with pads and springs, direct injection with alcohol, and embolization. Embolization has been reported with various substances including muscle, lead pellets, silicone spheres, silicone balloons, wool coils, Ivalon, and Pantopaque-saturated Gelfoam pledgets.

Multiple treatment schemes have been described and, as yet, no standard form of therapy exists. Direct surgical excision risks severe intraoperative blood loss. Embolization followed by excision has been successful, although the embolizing agents have varied. Because these lesions often have a large high-flow arteriovenous fistula associated with the aneurysm, the emboli must be large or passage of the emboli into the pulmonary circulation can be expected.

In the present case, intra-arterial embolization was performed first to slow blood flow to the fistula and reduce the chance of hemorrhage during subsequent direct percutaneous puncture of the aneurysm. Initial embolization with Ivalon and Gelfoam strips did not slow blood flow to the fistula; however, blood flow to the malformation decreased substantially after platinum helix coils and straight Hilal coils were placed in the STA's bilaterally. After the platinum coils were placed, short pieces of 3-0 silk suture material were injected through the Tracker 18 catheter to entangle the platinum coils and further promote thrombosis.

Percutaneous embolization of Gianturco coils into a cirsoid aneurysm of the scalp is technically easy. In the present case we employed helix coils with a progressively decreasing diameter (5 mm, 3 mm, then 2 mm). Larger helix coils were placed initially to prevent inadvertent washout into the venous outflow tracts. Exces-
Embolization of a cirrhotic aneurysm of the scalp

Fig. 3. Preoperative (left) and postoperative (right) right external carotid artery angiograms, lateral projection. Note absence of filling of the aneurysm with complete obliteration of the lesion (small arrows). Helix platinum coils can be seen in the proximal superficial temporal artery (large arrow).

Plug venous occlusion prior to thrombosis of the fistula can result in uncontrolled hemorrhage. Furthermore, it is easier to push smaller helix coils out of the angiocath as the capacity of the cirrhotic aneurysm becomes progressively occupied with thrombus and coils placed earlier. Intraoperative digital subtraction angiography allows continued evaluation of the progress of the embolization. We believe that thrombus fills the aneurysm and propagates back into the fistula, thus obliterating the nidus of the abnormality. Embolization in this case continued until no further coils could be placed into the aneurysm. In spite of our strategy, a few coils passed out of the aneurysm and lodged in draining veins a few centimeters away (Fig. 4). No coils passed into the pulmonary circulation. The aneurysm did not decrease in size after embolization, but became firm without pulsations or a thrill.

Cirrhotic aneurysms of the scalp may or may not parasitize the intracranial circulation. In the case reported here, the blood supply came solely from the external carotid artery. Once angiography verified obliteration of the fistula, our initial plan was to follow the patient without excising the lesion. If the fistula were to reopen, it could easily be embolized again with little risk to the intracranial circulation. However, the lesion was easily excised after a small focus of granulation tissue began protruding through the skin. Although recurrence of a cirrhotic aneurysm of the scalp has been reported as late as 18 years after excision,18 we believe our patient is cured of his condition.

Percutaneous placement of thrombogenic coils is a simple and effective way to produce thrombosis of cirrhotic aneurysms of the scalp. Transvascular intraarterial embolization can be helpful in slowing blood flow to these fistula prior to direct percutaneous puncture. If necessary, operative removal of the lesions can then be performed easily with minimal risk.

References

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