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Coil Embolization of an Acutely Ruptured Saccular Aneurysm

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Acutely ruptured intracerebral berry aneurysms are usually treated by surgical clipping. In some instances, however, an endovascular approach to aneurysm obliteration may be considered. Since the pioneering work of Serbinenko [1] and Shcheglov (paper presented at the annual meeting of the ASNR, March 1989), there has been encouraging progress in the endovascular treatment of intracranial berry aneurysms by detachable balloon occlusion. Indications include aneurysms that cannot be surgically clipped, those with high surgical risk, those in inaccessible sites (e.g., cavernous carotid artery), and patients who are poor surgical candidates because of underlying medical conditions [2]. Detachable balloon occlusion is suitable for selected aneurysms but may be ineffective in the acute stages of rupture. There have been few reports of endovascular treatment of acutely ruptured aneurysms and none in which the aneurysm was actively leaking. We have successfully treated a patient with an acutely ruptured berry aneurysm by placing platinum microcoils within the aneurysm after balloon occlusion failed. Long-term follow-up angiography has shown continued complete obliteration of the aneurysm. These preliminary results suggest that platinum microcoil occlusion may be an appropriate therapy for certain acutely ruptured intracranial berry aneurysms.

Case Report

A 28-year-old man presented with major subarachnoid hemorrhage. Soon after admission to the emergency room, he experienced a grand mal seizure and became unresponsive. CT showed massive subarachnoid hemorrhage with a large clot in the cavum septum pellucidum. At the time of angiography he was grade IV on the Hunt and Hess scale. Four-vessel cerebral angiography revealed a 5 × 5 mm aneurysm of the anterior communicating artery, filling preferentially from the left carotid artery. During angiography, contrast material extravasated from the aneurysm into the patients' hematoma (Fig. 1A). Neurosurgical clipping was deemed too risky given the patient's neurologic status and the active extravasation of contrast material. It was decided to perform immediate emergent occlusion of the aneurysm by an endovascular approach.

A detachable silicone balloon (Interventional Therapeutics Corp., So. San Francisco, CA) was placed within the aneurysm. It was permanently inflated with 2-hydroxyethyl methylacrylate (HEMA). Postocclusion angiography demonstrated complete occlusion of the aneurysm and preservation of both anterior cerebral arteries. Angiography performed 2 days later showed that the balloon had ruptured through the dome of the aneurysm and migrated superiorly into the surrounding hematoma above the aneurysm (Figs. 1B and 1C). The aneurysm was then catheterized with a .018 Tracker catheter (Target Therapeutics, San Jose, CA). Two platinum microcoils (Target Therapeutics) were delivered into the aneurysm via this catheter. Angiography after coil placement showed almost complete obliteration of the aneurysm (Figs. 1C and 1D). When angiography performed 3 days later showed continued partial filling of the aneurysm, a third platinum coil was placed in the aneurysm. Angiography performed immediately after the procedure and follow-up angiography performed 3 days later demonstrated complete occlusion of the aneurysm. The patient slowly recovered from his comatose state. Angiographic follow-up at 10 months showed complete obliteration of the aneurysm with patency of all major cerebral arteries (Figs. 1F and 1G). Except for short-term memory deficit, neurologic function appeared to be normal.

Discussion

In 1974 Serbinenko [1] pioneered the use of microcatheters and balloons to access major intracerebral blood vessels. Shcheglov (ASNR meeting, March 1989) has performed a large number of balloon occlusions of saccular aneurysms of the cerebral arteries. The indications for balloon therapy have generally limited the procedure to patients with aneurysms unsuitable for conventional neurosurgical therapy. In this country, endovascular treatment has usually been reserved for giant aneurysms [2]. Acutely ruptured berry aneurysms generally have not been treated via this approach.

Problems encountered with intraaneurysmal balloon therapy have included balloon migration, expansion of the aneurysm by the dilating balloon, balloon rupture, and inability to navigate balloons into the aneurysm sac [2]. In addition, an acutely ruptured aneurysm, presents significant difficulties for treatment with intraaneurysmal balloons. The acutely rup-

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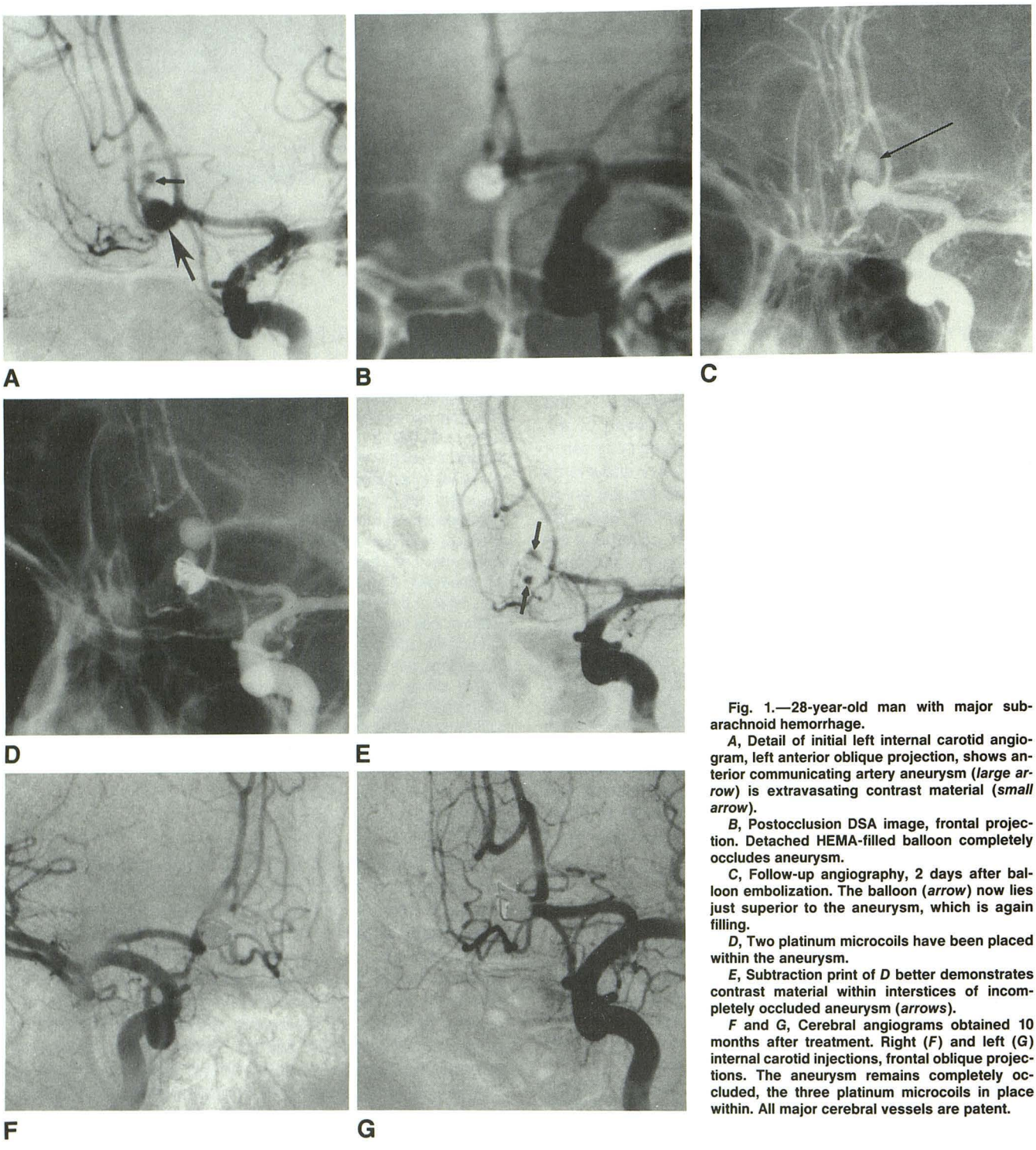

Fig. 1.—28-year-old man with major subarachnoid hemorrhage.

***A*, Detail of initial left internal carotid angiogram, left anterior oblique projection, shows anterior communicating artery aneurysm (*large arrow*) is extravasating contrast material (*small arrow*).**

***B*, Postocclusion DSA image, frontal projection. Detached HEMA-filled balloon completely occludes aneurysm.**

***C*, Follow-up angiography, 2 days after balloon embolization. The balloon (*arrow*) now lies just superior to the aneurysm, which is again filling.**

***D*, Two platinum microcoils have been placed within the aneurysm.**

***E*, Subtraction print of *D* better demonstrates contrast material within interstices of incompletely occluded aneurysm (*arrows*).**

***F* and *G*, Cerebral angiograms obtained 10 months after treatment. Right (*F*) and left (*G*) internal carotid injections, frontal oblique projections. The aneurysm remains completely occluded, the three platinum microcoils in place within. All major cerebral vessels are patent.**

tured aneurysm may have an irregular shape, preventing complete occlusion. The aneurysm wall may not withstand the stress of balloon placement and dilatation. As seen in this case a detachable balloon was placed successfully into an acutely ruptured aneurysm but within 2 days the balloon migrated through the dome of the aneurysm. Platinum coils placed within the aneurysm did not migrate and resulted in complete occlusion.

Small aneurysms present additional problems for balloon occlusion. Their small size makes balloon placement and

exchange of contrast material for polymerizing agents difficult. There have been few previous reports of successful aneurysm occlusion with the use of platinum microcoils. Hilal et al. and Guglielmi et al. (papers presented at the annual meeting of the ASNR, March 1990) and Graves et al. [3] experimented with coils combined with electrothrombosis. Coil placement within an aneurysm may exert less pressure on its walls. In addition, coils may conform better to the shape of an aneurysm. These two factors may decrease the potential for rerupture of the aneurysm. Possible problems with coil embolization include the inability to retrieve a microcoil that is misplaced and the potential for incomplete thrombosis with patent lumen interstices between coil loops.

This case suggests that there may be a role for platinum microcoil embolization in acutely ruptured berry aneurysms, perhaps as a primary method of treatment. Balloon embolization in these situations may be inappropriate or ineffective. Further experience with microcoil embolization is necessary to validate this form of therapy, which has the potential to become an important alternative treatment for such life-threatening aneurysms.

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