

Double-Wire Technique for Giant Cerebral Aneurysms

Distal artery navigation for stenting giant cerebral aneurysms, aided by the double-wire technique.

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Giant cerebral aneurysms, which are defined by a dome diameter that is > 25 mm, are formidable lesions due to their natural history and the difficulties of treating them. The annual rupture risk of these lesions is significantly higher than that of nongiant aneurysms (6% in 60 giant aneurysms, as noted in a study by the International Study of Unruptured Intracranial Aneurysms investigators).¹ Therefore, despite the complication risks of both open and endovascular repair, treatment is required. Most open surgical series carry morbidity rates of at least 20% and mortality rates of 6% or greater.²

Indications for endovascular treatment have included acute rupture, comorbidities that increase the risk of surgery, and endovascularly favorable morphological features for preserving the parent vessel. Both endovascular and open repair of giant aneurysms can be complicated by vision deficits; delayed posttreatment deficits can occur after endovascular treatment due to continued mass effect.³ Parkinson et al published a review of the available literature through 2006 on endovascular giant aneurysm treatment; this includes 19 giant aneurysms that were treated with a stent-assisted technique.²

The addition of stenting to endovascular repair techniques is important for protection of parent vessels in giant aneurysms. The necks of giant aneurysms are often wide, and individual coils or the mass of an embolized aneurysm can occlude the parent artery; stents reduce the risk of unintended occlusion. Stent-assisted endovascular treatment carries acceptable morbidity and mortality rates for large and giant aneurysms in comparison to open surgery.⁴⁻⁶

Although effective, stent placement can be challenging in giant cerebral aneurysms. Navigating a catheter through a giant aneurysm and into the distal artery can be jeopardized by the architecture of the aneurysm. In this article, we present such a case, in which we used a

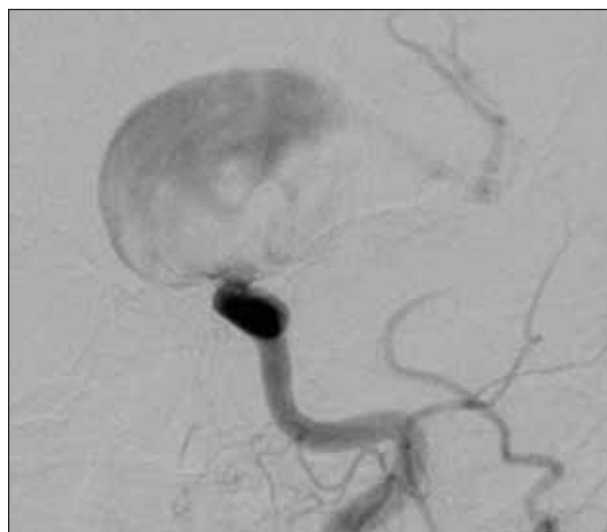


Figure 1. The left internal cerebral artery giant aneurysm is shown in the anteroposterior view with contrast circulating in the dome.

double-wire technique to advance the stent-deploying catheter into an artery distal to the aneurysm.

CASE REPORT

A 64-year-old woman with obesity, hypertension, hyperlipidemia, and diabetes presented with double and “filmy” vision. Computed tomographic angiography revealed a giant aneurysm originating from the left internal carotid artery. In preparation for endovascular repair with stenting, the patient took 325 mg of aspirin and 75 mg of clopidogrel for 5 days leading up to the procedure.

The patient was brought to the operating room and was placed under general anesthesia. Neuromonitoring with electroencephalography and somatosensory-evoked potentials was performed throughout the case. After placing a 6-F sheath in the femoral artery, the

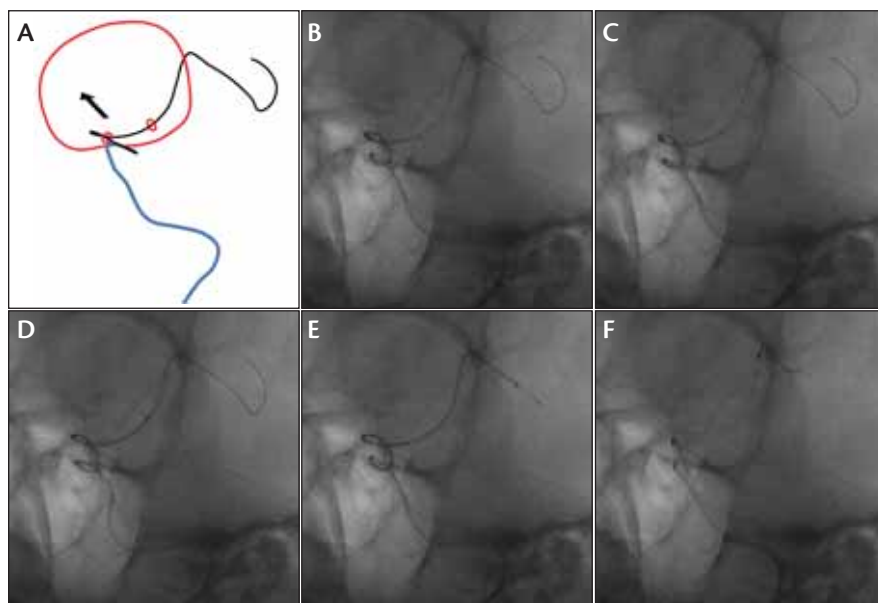


Figure 2. The double-wire technique. This illustration shows the aneurysm (red) with the entry and exit points of the parent vessel, which is the supraclinoid internal carotid artery. The microcatheter (blue) is resting in the cavernous internal carotid artery outside of the aneurysm. The Synchro² wire (black) reaches the distal middle cerebral artery in this illustration. The arrow denotes the direction of prolapse into the aneurysm when the microcatheter is advanced over the single wire (A). The Transend wire is passed through the aneurysm guided by the microcatheter (B). The Transend wire navigates the distal artery (C). The microcatheter advances over both wires (D). The microcatheter reaches its maximum distal purchase over the Synchro² wire (E). The Neuroform EZ stent is deployed (F).

patient was given heparin to maintain an activated clotting time > 250 seconds. The left internal carotid artery was catheterized, and digital subtraction angiography showed a giant left intracranial internal carotid artery aneurysm (Figure 1). The parent vessel entrance and exit from the aneurysm produced a sharp angle.

Using a Neuro Renegade Hi-Flo microcatheter (Boston Scientific Corporation, Natick, MA) and Synchro² standard guidewire (Boston Scientific Corporation), we were able to access the aneurysm dome. The guidewire was passed through the aneurysm lumen and distal parent vessel into the middle cerebral artery. Despite this lengthy distal purchase, the microcatheter buckled into the aneurysm dome when advanced over a single, flexible guidewire.

Because the inner diameter of the Renegade catheter is 0.027 inch and the diameter of the Synchro² wire is 0.014 inch, a Transend 0.010-inch wire (Boston Scientific Corporation) could be passed through the catheter parallel to the Synchro² wire. The 0.027-inch delivery catheter served as a conduit for two guidewires. The second wire was advanced into the distal artery using the Renegade-Synchro² complex for support. Then, the Renegade catheter was passed distally with the support

of both wires without buckling into the dome. Positioning of the microcatheter before inserting the second wire is an important nuance to the technique. The catheter is advanced as far as possible along the first wire without buckling; this aims the second wire in a favorable direction to enter the distal artery (Figure 2).

After distal access was obtained with the catheter, a Neuroform EZ 4.5- X 30-mm stent (Boston Scientific Corporation) was placed across the broad neck of the aneurysm (Figure 3). A mass of Axium (ev3 Inc., Plymouth MN), Matrix (Boston Scientific Corporation), and GDC (Boston Scientific Corporation) coils was deployed into the aneurysm sac for final aneurysm repair. An Enterprise 22-mm stent (Codman Neurovascular, Codman, a Johnson & Johnson Company, Raynham, MA) was placed inside of the existing

stent for additional scaffolding of the parent artery. There were no procedural complications (Figure 4).

DISCUSSION

In this case, catheters were guided through giant aneurysms using a double-wire technique. The Renegade catheter has a 0.027-inch inner diameter, while some standard microcatheters have a 0.021-inch inner diameter. The 0.027-inch Renegade allows placement of the open-cell Neuroform stent. These stents offer the potential advantage of decreased flattening, kinking, and migration compared to closed-cell stents.^{7,8} Stent migration in giant aneurysms would be particularly dangerous.

The use of the double-wire technique is not limited to giant aneurysms. We have used this technique to navigate distal tortuous vessels in other aneurysms. It could also be used for acute ischemic stroke catheters, such as the Penumbra catheter (Penumbra, Inc., Alameda, CA). The double-wire technique not only facilitates access but may also be more cost-effective and much faster in this time-sensitive operation than other techniques, including advancement over a second, smaller catheter and microwire in a coaxial fashion.

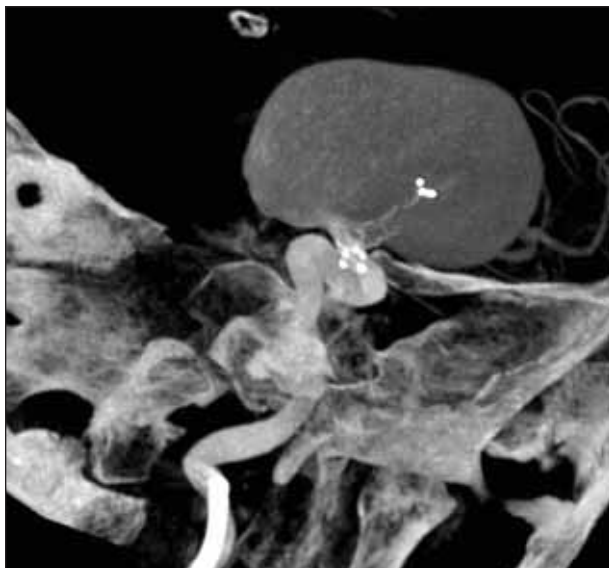


Figure 3. Using three-dimensional spin angiography, an oblique sagittal cut shows the giant aneurysm, deployed stent, and surrounding vascular and bony structures.



Figure 4. Final anteroposterior left internal carotid angiography shows final stent-assisted coil embolization of the giant aneurysm.

GORE® EXCLUDER® AAA Endoprosthesis

INDICATIONS FOR USE: Trunk-Ipsilateral Leg Endoprosthesis and Contralateral Leg Endoprosthesis Components. The GORE® EXCLUDER® AAA Endoprosthesis is intended to exclude the aneurysm from the blood circulation in patients diagnosed with infrarenal abdominal aortic aneurysm (AAA) disease and who have appropriate anatomy as described below: Adequate iliac / femoral access; Infrarenal aortic neck treatment diameter range of 19 – 29 mm and a minimum aortic neck length of 15 mm; Proximal aortic neck angulation $\leq 60^\circ$; Iliac artery treatment diameter range of 8 – 18.5 mm and iliac distal vessel seal zone length of at least 10 mm. **Aortic Extender Endoprosthesis and Iliac Extender Endoprosthesis Components.** The Aortic and Iliac Extender Endoprostheses are intended to be used after deployment of the GORE® EXCLUDER® AAA Endoprosthesis. These extensions are intended to be used when additional length and / or sealing for aneurysmal exclusion is desired. **CONTRAINDICATIONS:** The GORE® EXCLUDER® AAA Endoprosthesis is contraindicated in patients with known sensitivities or allergies to the device materials and patients with a systemic infection who may be at increased risk of endovascular graft infection. Refer to *Instructions for Use* at goremedical.com for a complete description of all warnings, precautions and adverse events. Rx Only



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Optimal endovascular repair of wide-necked, large, and giant aneurysms usually requires stent placement, and failure of stenting can worsen a patient's expected outcome. The double-wire technique is another tool to overcome the barriers to stenting, and it should enable endovascular surgeons to better serve patients. ■

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Andrew Johnson, MD, MS, is with Rush University Medical Center in Chicago, Illinois. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein.

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