Vertebral Dissecting Aneurysm Treated with Wingspan Stent Deployment and Detachable Coils

A Technical Note

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Summary

We describe the first documented endovascular treatment of vertebral dissecting aneurysm using a Wingspan stent and detachable coils.

A 54-year-old man presented with a nonruptured vertebral dissecting aneurysm. Because of the dissecting nature of the vertebral aneurysms, a 3x15-mm Wingspan stent was placed in the left vertebral artery. One month later, several detachable coils were introduced into the aneurysm. Six-month follow-up angiogram confirmed the obliteration. Vertebral dissecting aneurysm can be treated with Wingspan stent placement and detachable coils.

Introduction

Recent reports involving patients with intracranial aneurysms who were treated with coronary balloon-expandable stents, Neuroform stents and Leo stents have shown promising results^{2-11,13-18,20-24}. Wingspan stent is a novel, self-expanding, nitinol stent, which has been used to treat refractory intracranial atherosclerotic stenoses^{1,12,19}. To our knowledge, there have been no reports of treatment using a combination of self-expanding Wingspan stent system and detachable coils for the management of intracranial aneurysms. In the case described herein, a Wingspan stent was deployed in the left vertebral artery across the dissecting aneurysm. Successful coiling of the aneurysm

was performed with a microcatheter positioned through the struts within the stent.

Description of the Technique

A 54-year-old man presented with dizziness. His blood pressure was 125/84 mmHg and heart rate was 76 bpm. MR imaging of the brain disclosed a partially thrombosed mass on the left side of the brainstem (Figure 1A). Conventional angiography (Figure 1B,C) showed a 6-mm dissecting aneurysm of the left vertebral artery. Because of the nonrupture and dissecting nature of the aneurysm, we decided to place a stent before coil deployment. The patient was administered daily doses of clopidogrel 75 mg and aspirin 100 mg orally before the procedure. Systemic heparinization was achieved with heparin 5000U bolus followed by 1000U of heparin every hour and the patient was conscious during the procedure. After the placement of a 6F guiding catheter (Envoy; Cordis Endovascular, Miami Lakes, FL, USA) within the cervical segment of the left vertebral artery, a digital subtraction roadmap was made, an Echelon10 microcatheter (M.T.I-ev3, Irvine, CA, USA) was advanced over a Silverspeed14 microwire (M.T.I-ev3, Irvine, CA, USA) beyond the targeted landing zone for the stent and into the left posterior cerebral artery (Figure 1D). The Echelon10 microcatheter was then exchanged over a 300-cm Transend Floppy (Boston Scientific, Natick, MA, USA) 0.014-inch microwire. A

Figure 1 A) Axial T1-weighted MRI scan after gadolinium administration showing a partially thrombosed mass on the left side of the medulla. Left vertebral angiograms, lateral view (B) showing a dissecting aneurysm distal to the posterior inferior cerebellar artery origin. C) Anteroposterior angiographic image showing the exchange wire in the left posterior cerebral artery. D) Unsubtracted image in working projection demonstrating a 3x15-mm Wingspan stent in place across the aneurysm neck demarcated by two sets of four radiopaque markers at the proximal and distal ends of the stent (arrows).

3x15-mm stent (Wingspan, Boston Scientific Corp., USA) was navigated over an exchange wire with use of digital road map technique and was deployed in the left vertebral artery across the aneurysm (Figure 1E). Control angiography demonstrated excellent stent placement across the face of the aneurysm (Figure 1F). One month later, control angiography revealed that the aneurysm was still opacified. Endovascular treatment was performed with the patient under general anesthesia with use of right common femoral artery approach. The Echelon10 catheter was reintroduced over a Synchro-0.014 inch wire and manipulated into the aneurysm for coil embolization (Figure 2A). No difficulty was experienced crossing through the struts of the stent. Control angiography demonstrated progressive occlusion of the aneurysm. Embolization coils used included the Microvention Embolic System (Microvention, Inc., Aliso Viejo, CA, USA) (Figure 2B-E). Because the aneurysm was not ruptured, it was occluded incompletely. After the procedure, heparinization was continued for 24 hours to maintain partial thromboplastin time in the range of 60-70 seconds. The common femoral sheath was left in position for 24 hours and then removed, with

hemostasis achieved by direct compression over the arteriotomy site. After systemic heparinization was discontinued, subcutaneous injection of low molecular weight heparin was given for two days. Antiplatelet agents (clopidogrel 75 mg and aspirin 100 mg daily) were administered transorally for six weeks. At six weeks, clopidogrel was discontinued, and aspirin was maintained indefinitely. Five days after the stenting procedure, CT scanning demonstrated the subarachnoid hemorrhage had been absorbed and the patient was discharged. Six-month follow-up angiograms (Figure 3) confirmed the obliteration and the patient had complete neurologic recovery and has returned to work.

Discussion

The Wingspan stent system is intended for use in the treatment of intracranial atherosclerotic stenosis. The stent system comprises a self-expanding nitinol stent preloaded in a delivery catheter and a separately packaged Gateway PTA balloon catheter (Figure 3). The balloon catheter is used to predilate the stenotic lesion; the stent is then deployed across the lesion, further remodeling the target vessel to maintain

Figure 2 One month after stent deployment. A) An Echelon10 catheter was reintroduced and manipulated into the aneurysm for coil embolization (arrow) under roadmapping. Note proximal and distal markers of the stent can be seen (arrowheads). B) A detachable coils was introduced through the microcatheter via the strut of the stent. C) Fluoroscopic image showing the coil mass (arrowheads) and the stent (arrows) in place after endovascular occlusion of the aneurysm. Post-treatment angiogram, working projection (D) shows >70% occlusion of the aneurysm and a small residual neck. Angiograms of left vertebral injection at 6-month follow-up, anteroposterior (E) projections, confirmed the obliteration of the aneurysm.

luminal patency. The Wingspan stent system was available in five diameters (2.5 to 4.5 mm) and three lengths (9, 15, and 20 mm). Size selection was based on the native diameter of the target vessel (fully expanded stent diameter was 0.5 to 1.0 mm greater than the labeled diameter) and length of the aneurysm neck (deployed stent to extend at least 5 mm on either side of the lesion). The stent delivery catheter was a 3.5F, coaxial, over-the-wire catheter with segments of varying stiffness and a nominal working length of 135 mm. The outer body of the delivery catheter was hydrophilically coated, and the distal end of the inner shaft had a soft, atraumatic tip for trackability. An integrated rotating hemostasis valve permanently attached to the proximal end of the outer body allowed continuous heparinized saline flush and provided a hemostatic seal around the inner body. The stent was constrained by the outer body shaft before deployment. The recommended Gateway balloon diameter (when inflated at the nominal pressure of 6 atm) was 80% of the native vessel diameter. The undersizing of the PTA balloon was intended to restrict the barotrauma to the plaque while minimizing intimal damage to the native parent vessel.

Although it is intended for treatment of intracranial atherosclerotic stenosis, use of Wingspan stent is approved for the intracerebral arteries. Recently an article was published on the use of Wingspan stent in the treatment of 40 wide-neck intracranial aneurysms²⁵. The treatment paradigm for the self-expanding Wingspan stent system is designed to offer several advantages. First, the undersizing of the angioplasty balloon confines the remodeling force to the aneurysm. Second, the nitinol stent is a more flexible stent and is designed to reach distal locations through tortuous anatomy. Third, the self-expanding stent facilitates sizing as well as conformability in curved and tapered vessels (anterior and posterior circulations). Wingspan is designed to conform to vessels that vary in diameter across the length of the stent. Finally, the Wingspan stent provides a force of <0.1 atm

Figure 3 Illustration of the Wingspan stent.

at deployment, thus reducing trauma to the vessel and the risk of vessel rupture. Previous studies provide the context for understanding the potential risks and benefits of intracranial angioplasty and stenting with the Wingspan stent system compared with antithrombotic therapy. The favorable event rates in the Wingspan-treated patient cohort compared with other published series is more compelling, considering that at baseline, the Wingspan patients had higher incidences of hypertension, diabetes, and stroke as the qualifying event, as well as a higher degree of mean stenosis of the affected artery. There were no instances of symptomatic

restenosis in the Wingspan patients. These results indicate that the Wingspan stent system not only can be used to treat ischemic events but also may have contributed to assist coil embolization of cerebral aneurysms.

Conclusions

The case reported herein provides evidence demonstrating the safety of the Wingspan stent system when used as an endovascular therapy in cerebral aneurysm. This procedure may provide the neurointerventionist with another option for dissecting cerebral aneurysms.

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