Stent Graft Placement for the Treatment of Giant Aneurysm at the Proximal Cavernous Internal Carotid Artery

A Case Report

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Introduction

Cavernous giant aneurysm is a challenging lesion for both surgical and endovascular treatments. Using a skull base technique, some cavernous internal carotid artery (ICA) aneurysms are directly clipped.

However, larger aneurysms frequently lead to adverse effects during and after the operation. Endovascular treatment of cavernous ICA aneurysm consists of endosaccular coil placement and permanent ICA occlusion with or without EC-IC bypass^{1,2,3}. Endosaccular occlusion of giant aneurysm has been proven less efficient because of coil compaction and/or re-growth of aneurysm.

We report a case of giant cavernous ICA aneurysm treated with stent graft placement.

Case Report

A 44-year-old female developed diplopia about six months prior to admission. She visited an ophthalmologist and was diagnosed with left abducens nerve palsy. Cerebral angiography showed a giant internal cerebral artery (ICA) aneurysm located at the junction between the petrous and cavernous segments. The aneurysm was 30 mm x 20 mm x 23 mm in size, and occupied the left sphenoid sinus and part

of the left cavernous sinus. The cavernous segment of ICA was deviated upward and was slightly compressed by the aneurysm. Treatment was indicated because the patient was symptomatic and fatal epistaxis was expected to occur after rupture of the aneurysm.

Prior to the treatment, balloon test occlusion (BTO) was performed to examine whether the affected ICA could be permanently occluded. The patient was able to tolerate the twenty-minute temporary balloon occlusion of the affected ICA. The permanent occlusion of the left ICA could be safely performed. Because the patient was relatively young, a delayed effect from the occlusion in the unilateral ICA might occur later in life. Because of the possibility of these delayed adverse effects after parent artery occlusion, preservation of the left ICA was desired.

Stent insertion was then used to treat this aneurysm. When placed at the neck of an aneurysm, the stent was considered to alter the blood flow in the aneurysm and to promote thrombosis inside the aneurysm. First, two bare coronary stents (s670) were overlaid at the neck of the aneurysm. Blood flow inside the aneurysm became stagnant, but thrombosis was not observed inside the aneurysm. The same angiographical result was observed at one-month follow up. Insertion of a covered stent

Figure 1 Anteroposterior (A) and lateral (B) views of left carotid angiogram, showing giant cavernous aneurysm (pre-treatment).

Figure 2 Angiogram after bare stent placement (two s670 stents). Flow inside the aneurysm became stagnant.

was decided as the next treatment for the aneurysm.

Seven Fr sheath (Shuttle, Cook) was inserted at the right femoral artery under local anesthesia and was navigated to the left ICA using a coaxial technique. Another catheter (6 Fr Envoy MPD, Cordis) was coaxially inserted in the guide catheter and was positioned at proximal petrous ICA. The tip of a microguidewire (Choice PT, extra-support) was curved into a J-shape to pass inside the previously deployed bare stents, and was advanced intracranially. The stent graft (GraftMaster, 4.0 mm x 19 mm) used was a PTFE (polytetrafluoroethylene)-covered stent. This stent graft consists of two coaxially aligned stainless-steel stents that sandwich the PTFE membrane.

The stent graft was navigated at the neck of the aneurysm along the microguidewire. However, the stent graft did not go beyond the previously deployed bare stents. By using a buddy-wire technique with another microguidewire, the stent graft reached two millimeters proximal to the distal end of the aneurysm neck. The stent graft was then deployed. The neck of the aneurysm was not completely covered by the

stent. Angiography showed stagnant flow inside the aneurysm and the contrast medium was left in place late at the venous phase. Follow-up angiography, one week later, demonstrated almost complete occlusion of the aneurysm except for small remnants. Follow up angiography, five months later, demonstrated complete occlusion of the aneurysm. No in-stent stenosis was observed. Upward deviation of cavernous ICA was also restored. Her symptom (left abducens nerve palsy) was slightly improved.

Discussion

The natural history of giant cavernous internal carotid aneurysms is not good. Direct surgery or endovascular modalities are employed to treat these lesions. Direct surgery consists of neck clipping or carotid artery occlusion with or without high-flow bypass^{1,2,3}.

However, both of these treatments carry a substantial risk². Acute and delayed occlusion of the bypass graft is reported^{4,5}. Balloon test occlusion of the affected carotid artery is necessary to determine whether permanent occlusion can be safely performed. False negative results could be shown by balloon test occlusion^{6,7}. De novo aneurysm formation is also reported after safe occlusion of ipsilateral internal carotid artery^{6,7}. Because of these reasons, we performed stent graft placement to treat the aneurysm.

The carotid artery was preserved while the aneurysm was treated with this procedure. Stent graft placement to treat giant and fusiform aneurysm was previously reported^{8,9,10}. The feasibility and safety of PTFE-covered stent are also demonstrated^{11,12}. As the follow-up angiography shows, mass effect is reduced after stent graft insertion. There is no thromboembolic complication after the stent insertion.

Conclusions

We reported a case of giant cavernous internal carotid artery aneurysm treated with stent graft. Aneurysm was safely and effectively treated with stent graft, while the parent artery was preserved. Mass reduction of the aneurysm was obtained. Stent graft placement could be an alternative treatment for giant cavernous carotid aneurysm.

Figure 3 Angiogram after stent graft placement. Because stent graft did not completely cover the aneurysm neck, delayed filling of contrast medium was observed inside the aneurysm.

Figure 4 Angiogram, five months after stent graft placement. Complete occlusion was demonstrated. Configuration of carotid siphon was also restored because of reduction of aneurysm volume.

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