CASE REPORT

Transfundal stent placement for treatment of complex basilar tip aneurysm: technical note

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Accepted 1 August 2014

SUMMARY

We describe a case where a complex unruptured basilar tip aneurysm was treated with a unique method of stent-assisted coil embolization. The aneurysm was considered to have a complex anatomy since both the left posterior cerebral artery and left superior cerebellar artery originated from the dome of the aneurysm. Also, the right posterior cerebral artery was incorporated in the aneurysm neck and needed to be protected prior to coil embolization. This case describes placement of a stent across the span of the aneurysm fundus in order to preserve the two branches arising from it, and the aneurysm dome was coiled without any complication. Using modifications of existing strategies for stent-assisted coil embolization, the aneurysm was treated without any complications and all of the vessels at risk were preserved.

BACKGROUND

The number and types of intracranial aneurysms that are amenable to endovascular treatment have grown steadily with the introduction of balloon and stent assistance. The accepted indications for stent-assisted coil embolization include a wide neck or involvement of a large branch from the aneurysm neck.^{1–4} The main purpose of the stent is to protect an artery from coil occlusion while secondary goals include flow diversion or vascular remodeling.^{2–4} Intentional intra-aneurysmal stent placement is rare.

CASE PRESENTATION

A 62-year-old woman presented with acute onset of vertigo. Her past medical history included uncontrolled hypertension, hyperlipidemia, and smoking (40 pack-years). Her neurological examination was normal and she was ultimately diagnosed with benign paroxysmal positional vertigo. However, non-contrast CT of the head showed a hyperdensity at the basilar apex without hemorrhage. Subsequent CT angiography followed by digital subtraction angiography showed an 11 mm×7 mm basilar tip aneurysm. The aneurysm had a wide neck from which the right posterior cerebral artery (PCA) originated. Additionally, the left PCA and left superior cerebellar artery (SCA) arose from opposite surfaces of the fundus of the aneurysm ([figure 1](#)). We decided that treatment of this aneurysm was indicated given its size, location, and the patient's poorly controlled risk factors for aneurysm rupture. Any safe treatment required preservation of the right PCA and the left SCA. Although the left PCA also arose from the aneurysm fundus, loss of its

origin would likely be tolerated due to retrograde filling from the posterior communicating artery (PCoA). We believed that both clipping and endovascular therapies carried similar deficiencies—namely, loss of the left SCA or incomplete aneurysm treatment. We considered a flow diverting stent, but this was not a viable option because a thalamoperforator injury was a risk and there would still be persistent flow and filling of the aneurysm from the PCoA. The microsurgical open technique included subtotal clipping in order to preserve patency of the SCA, otherwise an attempt for a complete clipping could be done with a superficial temporal artery–SCA bypass. We therefore chose an endovascular construct that took advantage of the left PCoA, providing a route to the PCA.

TREATMENT

The aneurysm treatment was performed in two stages with the patient under general anesthesia. Aspirin and clopidogrel were initiated 1 week prior to the first stage. The first stage involved puncturing both common femoral arteries and positioning a 5 Fr diagnostic catheter in the right vertebral artery (VA) and a 6 Fr sheath (Cook Shuttle; Cook Medical, Bloomington, Indiana, USA) in the left common carotid artery. An intermediate 6 Fr guide catheter (Sophia; Microvention, Tustin, California, USA) was then navigated into the cavernous segment of the left internal carotid artery (ICA). Simultaneous angiography of the left ICA and right VA was performed to visualize the route from the left PCoA to the left PCA. Under roadmap guidance, a large microcatheter (Prowler Select Plus; Cordis, Miami Lakes, Florida, USA) was advanced over a microwire into the left PCoA. From there we navigated the microcatheter into the left P1 segment, crossed the fundus of the aneurysm, and advanced it into the left SCA ([figure 2](#)). The microwire was removed and a 4.5 mm×28 mm Enterprise stent (Cordis) was placed from the left SCA across the aneurysm into the left PCA. The patient tolerated the procedure well and was discharged the next day.

The patient returned 4 weeks later after allowing the stent to endothelialize to reduce the risk of disrupting its position during any attempts at coiling. In the second stage, a 6 Fr guide catheter was positioned into the right VA. A 4 mm×30 mm Neuroform EZ stent (Boston Scientific, Natick, Massachusetts, USA) was placed from the right P1 segment into the distal basilar artery. After removal of the delivery microcatheter, a small microcatheter

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To cite: Vasquez C,
Hubbard M, Jagadeesan BD,
et al. *BMJ Case Rep*
Published online: [please
include Day Month Year]
doi:10.1136/bcr-2014-
011288

Figure 1 (A) Initial cerebral angiogram, anteroposterior view, showing a complex basilar tip aneurysm with the left posterior cerebral artery and left superior cerebellar artery originating from the fundus. (B) Illustration of the same basilar tip aneurysm. (C) Lateral view showing the course of the left posterior communicating artery.

(Headway Duo; Microvention) was advanced over a microwire through the Neuroform stent into the aneurysm dome. We then proceeded with coil placement through this microcatheter. Fluoroscopy showed the coils circumventing the transfundal stent, resulting in progressive occlusion of the aneurysm and preservation of both PCAs and the left SCA (figure 3). The patient tolerated the procedure well without any neurological deficits. She was discharged on the first postoperative day.

DISCUSSION

This case describes placement of a stent across the span of an aneurysm in order to preserve the two branches arising from its fundus. The size of the PCoA was sufficient to navigate a stent retrograde into the left PCA, cross the aneurysm fundus, and place the distal stent into the left SCA. With the origins of both arteries now protected, we proceeded with coil embolization with preservation of both vessels. As the complexity of the

morphology of the aneurysm increases, the complexity of the endovascular treatment tends to increase. Established yet uncommon endovascular constructs for complex basilar bifurcation aneurysms include Y-stent placement and stent placement across the entire aneurysm neck from PCA to PCA. The latter technique requires a suitable PCoA in order to navigate the stent retrograde into the PCA.^{3 5-7} Intentional intra-aneurysmal stent placement is rare; the 'waffle cone' technique has been reported to protect multiple arteries arising from the aneurysm neck. This technique involves placement of a stent partially within the aneurysm and partially within the parent artery. The flaring of the distal stent into the fundus of the aneurysm may then prevent coil herniation into the aneurysm neck.⁸

An alternative endovascular treatment was stent placement from the basilar artery into the left SCA, leaving the left PCA origin unprotected. Following coil occlusion of the aneurysm, the PCA would fill retrograde from the PCoA, probably without any clinical consequence. However, a stent would still be

Figure 2 (A) Cerebral angiogram, anteroposterior view, of the microcatheter's trajectory from the internal carotid artery (ICA) to the left superior cerebellar artery (SCA) using the posterior communicating artery (PCoA) as the bridging route. (B) Illustration of the trajectory from the ICA through the PCoA into the posterior cerebral artery (PCA), across the fundus of the aneurysm and ending in the left SCA. (C) Illustration of first stent placement from the left PCA, through the aneurysm fundus into the left SCA. (D) Lateral view of the microcatheter from the left ICA to the left SCA passing through the PCoA.

necessary from the basilar artery to the right PCA, resulting in a Y-stent configuration. Additionally, the acute angle between the basilar artery and the left SCA origin would have made a stent placement very challenging. Open surgery would also have been difficult. Direct clipping would probably have occluded the left SCA or would have left a neck remnant. Ultimately, we chose the present approach because of its ability to preserve all the involved branches. To our knowledge, this is the first report of stent placement across the fundus of an intracranial aneurysm leading to successful treatment of the lesion. Follow-up angiographic and clinical evaluation will be necessary to determine patency of the involved arteries and stability of the aneurysm.^{5 9}

Learning points

- ▶ Stent placement across the span of the aneurysm fundus is feasible in selected cases where conventional techniques are inadequate.
- ▶ This technique requires suitable vascular anatomy to navigate the stent retrograde from the PCoA into the PCA.
- ▶ Coil embolization was performed after placement of the transfundal stent with preservation of both the left PCA and left SCA.

Figure 3 (A) Cerebral angiogram, anteroposterior view, of final construct showing the location of the first stent from the left posterior cerebral artery (PCA) to the left superior cerebellar artery (SCA), a second stent from the right PCA to the basilar artery and coils in the dome of the aneurysm. (B) Illustration of the final construct preserving the right PCA, left PCA and left SCA, with coils occluding the complex aneurysm. (C) Lateral view of the final construct.

Contributors CV prepared the manuscript and figures and performed the literature research. MH performed literature research and prepared the manuscript. BDJ prepared and edited the manuscript. RPT prepared and edited the manuscript and provided the concept design.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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