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Technical note

A novel proximal end stenting technique for assisting embolization of a complex true posterior communicating aneurysm

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ABSTRACT

Stent-assisted coiling has been widely used for endovascular treatment in recent years with satisfying clinical outcomes. The implantation of a stent using the regular approach, however, may not be safe or effective for certain aneurysms with complex structures. In this study, we report a novel stenting technique utilizing the proximal end of the stent for assisting embolization of a wide-neck irregular true posterior communicating aneurysm. This new method is a potential treatment strategy for wide-neck aneurysms located at the origin of a tortuous and thin vessel.

1. Introduction

A posterior communicating artery aneurysm (PcomA) is the most common type of internal carotid artery (ICA) aneurysm. Among these, true PcomA is a rare variation in which the aneurysm originates solely from the posterior communicating (PCOM) artery. Moreover, it is often associated with a fetal-type PCOM [1–3]. Endovascular treatment may not be safe or effective if the embolization coils endanger the patency of the parent PCOM artery.

In this study, we report an extremely difficult case of wide-necked, fetal-type true PcomA, which was located at the origin of a thin and tortuous PCOM artery. A novel stenting technique that utilized the proximal end of the stent to partially protect the aneurysm neck was used to assist the coil embolization. The course of this aneurysm was followed-up and is reported here.

2. Case presentation

A 51-year-old woman was admitted to our institution for sudden onset of a severe headache. Her blood pressure was 161/93 mmHg, she had nuchal rigidity, and her Hunt–Hess grade was 2. CT scan diagnosis from a local hospital indicated a subarachnoid haemorrhage. No other medical history was known. A full cerebral angiographic evaluation at our institution revealed an aneurysm located at the origin of the right fetal posterior cerebral artery (PCA). The aneurysm consisted of two parallel cone-shaped daughter sacs of different sizes. The daughter sac at the proximal end was 1.5 mm tall, and the aneurysm at the distal end was 3.8 mm tall. The total aneurysm neck was 5.4 mm wide. As shown in Figure 1, this fetal PCA was extremely tortuous. Endovascular treatment was requested by the patient because of the expectation of better quality of life post-surgery.

3. Treatment

The endovascular surgery was performed under general anesthesia. The guiding catheter (6 French; Envoy; Codman, Miami Lakes, FL, USA) was superselectively navigated to the petrous segment of the right ICA. Then, a micro-catheter (Prowler Select Plus; Codman) was advanced over a microwire to the right middle cerebral artery (Fig. 2). Next, the micro-wire was retracted and an Enterprise stent (4.5 × 14 mm, Codman and Shurtleff, Raynham, MA, USA) was released. The proximal flared end of the stent was adjusted so it was positioned at the origin of the fetal PCA, that is, the location of the aneurysm neck. The proximal-end of the stent protruded into the fetal PCA and covered part of the aneurysm neck. Before releasing the stent, we confirmed the position of the flared end of the stent and its protection of the aneurysm neck with DynaCT reconstruction (Siemens AG, Munich, Germany;

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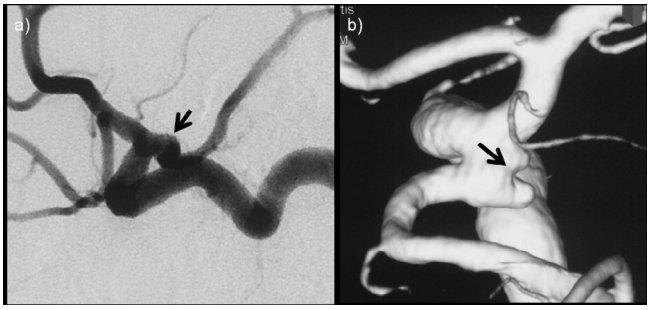

Fig. 1. Imaging of the posterior communicating artery aneurysm in (a) two-dimensional digital subtraction angiography images and (b) three-dimensional reconstructed vessels. The aneurysm is indicated with black arrows.

Fig. 3). Then, we used the double micro-catheter technique to perform coiling. Two micro-catheters were steam-shaped to adapt to the vessel curvature along the path to the aneurysms and were advanced through the stent strut to the two daughter sacs. Axium 3 mm/4 cm (Covidien, Dublin, Ireland), Hypersoft 2 mm/4 cm, 1 mm/3 cm, 1 mm/2 cm, and 1.5 mm/2 cm (MicroVention, Tustin, CA, USA) coils were then sequentially inserted into the two daughter sacs. After coil embolization, we confirmed the stent position and the embolization outcome using DynaCT reconstruction (Fig. 4). Post-procedural angiography indicated the complete embolization of the aneurysm, with the embolization outcome graded at Raymond II. The parent vessel remained patent after the procedure.

Full anticoagulation was induced after femoral artery puncture throughout the entire endovascular procedure. The patient recovered well and did not develop neurological deficits. The modified Rankin Scale (mRS) score at discharge was 0. At the 3 month and 9 month follow-up examinations, the mRS score remained 0, and an angiographic examination indicated that the aneurysm was stable.

4. Discussion

Stent-assisted coiling embolization has been widely used for endovascular treatment of wide-necked intracranial aneurysms.

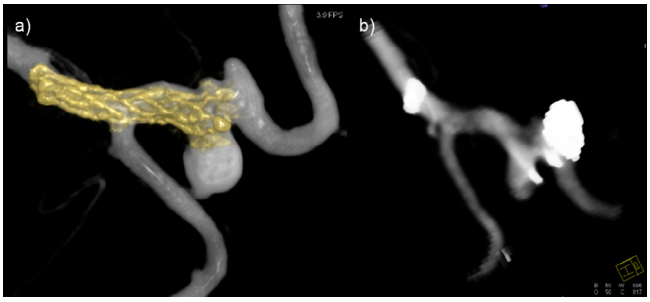

Fig. 3. Final stent release position confirmed before coiling (a) and after coiling (b). One side of the proximal end was observed to rest against the internal carotid artery vessel wall; the other side was open and protruded into the aneurysm. The proximal end of the stent remained open after the coil embolization, as shown in (b). The distal daughter sac was observed to be only partially protected by the stent.

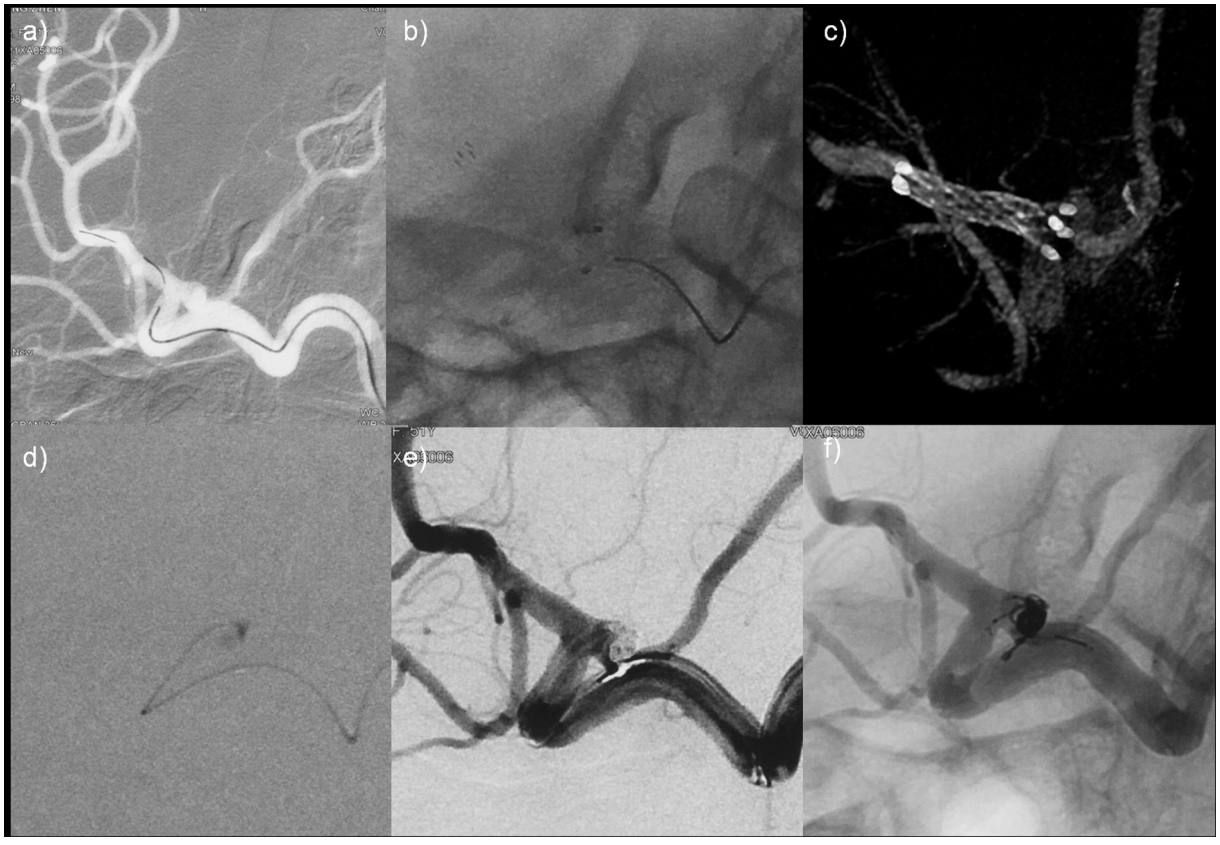

Fig. 2. Illustration of stent implantation and coiling. (a) The catheter was advanced to the right middle cerebral artery, and then (b) the stent was released at the distal internal carotid artery. (c) The configuration of the released stent was confirmed using DynaCT (Siemens AG, Munich, Germany). (d) At the beginning of the coiling procedure, the extent of coiling was examined using (e) subtracted two-dimensional digital subtraction angiography (2D-DSA) images and (f) 2D-DSA images shown in native mode.