A Case of Large Broad-necked Aneurysm at the Posterior Communicating Artery Treated with T-stent Technique

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Objective: We examined the usefulness of the T-stent technique for a large broad-necked aneurysm at the internal carotid (IC) posterior communicating artery (P-com) bifurcation.

Case Presentation: A 73-year-old female. Detailed examination for cerebral infarction indicated an unruptured cerebral aneurysm. As a fetal-type P-com artery was detected in the aneurysmal dome, coiling with a stent-balloon technique was performed. Finally, embolization using the T-stent technique, in which a stent inserted into the P-com was connected to the side of an IC artery stent, was successful, facilitating the preservation of the P-com.

Conclusion: The T-stent technique, in which stents are not overlapped, may be useful for performing safe, accurate embolization of large broad-necked aneurysms with branching vessels.

Keywords ▶ posterior communicating aneurysm, embolization, T-stent, balloon assist

Introduction

Recently, various catheter-, coil-, balloon-, or stent-assisted techniques for cerebral aneurysms have been presented, facilitating device-assisted coil embolization with the maintenance of primary/branching vessel blood flow.1,2 In particular, highly advanced methods have been developed by combining various techniques, such as the stent and balloon,3 Y-configuration,4,5 and kissing Y-configuration6 techniques, to treat broad-necked aneurysms.7 Concerning posterior communicating artery (P-com) aneurysms, a method to insert a stent from the internal carotid (IC) artery into the P-com8 and another method to protect the P-com alone using a stent9 have been reported. In this study, we report a patient with an unruptured cerebral aneurysm at the IC artery P-com bifurcation in whom the T-stent technique facilitated coil embolization, and introduce the details and precautions of this procedure.

Case Presentation

Patient: A 73-year-old female.
Medical history: Chronic rheumatoid arthritis, allergic rhinitis, and cerebral infarction.
Present illness: Cerebral infarction occurred in 2015. Brain MRA revealed a large aneurysm at the right IC-P-com bifurcation and a small aneurysm at the left anterior cerebral artery. Endovascular treatment was indicated for the large IC-P-com aneurysm, and two antiplatelet drugs (aspirin at 100 mg, clopidogrel at 75 mg) were orally administered from 1 week prior to endovascular treatment.
Imaging findings: An unruptured aneurysm at the right IC-P-com bifurcation with the P-com branching from the dome was detected. This is measuring 15.9 mm in maximum diameter and 11 mm in height (Fig. 1). The fetal-type P-com was no communication with vertebra-basilar system.
Therapeutic strategies: As the aneurysmal neck on the IC artery side was wide, a stent-assisted technique was selected. To preserve the fetal-type P-com, a balloon catheter was inserted for assistance. For balloon assistance, a Scepter XC (Terumo, Tokyo, Japan) was selected so that a stent might be inserted, considering coil prolapse or protrusion into the P-com related to insufficient protection with a
balloon. Intra-aneurysmal embolization was performed with the double catheter technique, which were the jail and the trans-cell catheters.

Course of endovascular treatment: Under general anesthesia, an 8 Fr long sheath inserted into the right femoral artery. Heparin at 5000 units was intra-arterially injected to maintain an intraoperative activated clotting time (ACT) of ≥200 seconds. The guide catheter was navigated into the right cervical IC artery. Initially, an Excelsior SL-10 pre-shaped J (Stryker, Klamazoo, MI, USA) was rounded in the aneurysm, and deeply inserted into the P-com. A Scepter XC measuring 4 × 11 mm was guided using the exchange method. To relieve intra-aneurysmal deflection, the dilated Scepter XC was inserted using the balloon anchor technique so that it might pass through the shortest route, considering injury of P-com perforators (Figs. 2A and 2B). Subsequently, the Excelsior SL-10 pre-shaped J was inserted into the aneurysm, and Prowler Select Plus (Codman Neurovascular) was guided to the middle cerebral artery. An Enterprise vascular reconstruction device (VRD) 2 measuring 4 × 30 mm (Johnson & Johnson, Raynham, Miami, FL, USA) was deployed from the middle cerebral artery to the paraclinoid region of the IC artery. Subsequently, an Excelsior SL-10 STR (Stryker) was guided into the aneurysm through the mesh of the Enterprise VRD2 using the trans-cell method, and coil embolization was started using the double catheter method (Figs. 2C and 2D). Under the balloon assist technique with the Scepter XC, coils, Target XL 360 SOFT 10 mm × 40 cm (Stryker), were inserted through respective catheters for frame formation. Coil embolization was performed, but finally balloon deflation led to coil protrusion. Therefore, we considered permanent P-com preservation difficult, and selected neck-bridge with an LVIS Jr. (Microvention, Tustin, CA, USA). For T-configuration stenting, an LVIS Jr. measuring 2.5 × 13 mm was guided through the wire lumen of the Scepter XC, while carefully regulating the position so that flare on the proximal side might not interfere with the Enterprise VRD2 (Fig. 3). After confirming favorable P-com blood flow by angiography, the procedure was completed (Fig. 4).

Postoperative course: There were no neurological findings. MRA confirmed the P-com (Fig. 4). The oral administration of the two antiplatelet drugs was continued, and the patient was discharged (mRS0).
Fig. 2 (A and B) Enterprise VRD2 (arrow) was deployed after the Scepter XC (double arrow) was inserted into the P-com. (A) working view (B) cone-beam CT stent image. (C and D) A framing coil was placed under the assist technique with stent (Enterprise VRD2: arrow) in the IC artery and balloon catheter (Scepter XC: double arrow) in the P-com (A: lateral view, B: working view). IC: internal carotid; P-com: posterior communicating; VRD: vascular reconstruction device.

Fig. 3 LVIS Jr. was deployed from Scepter XC balloon catheter after the coil packing of the aneurysmal sac (asterisk) (A: working view, B: scheme of the position two stents).
Discussion

P-com aneurysms account for 15.5% of all aneurysms. The annual rupture rate of large aneurysms measuring ≥10 mm in diameter is reportedly 6.12%. Our patient also had a large aneurysm measuring 15.9 mm in diameter, which was one of the multiple aneurysms. So, the treatment was very useful in the point about the ruptured risk. Recently, any assisting devices, such as stents and balloons, have been approved. So, the treatment of the wide-neck aneurysms was enabled. The results of stent-assisted aneurysmal embolization, involving the radical cure and recurrence rates, were favorable, but the risk of stent deformity or deviation in addition to thromboembolic complications increased in patients in whom a crossing Y-stent (combination of two stents) or several stents were inserted. The T-stent technique used has the following merits: there is no stent overlapping, and there is no stent mesh deformity. However, it is technically difficult to establish a position adjacent to the side of one stent so that it may not interfere with the mesh of the other stent, while considering development-related stent shortening. Furthermore, the connecting part corresponds to the stent flare region; therefore, the supporting properties of a coil as a mesh may be reduced. The bladed-stent used in this study, LVIS Jr., can be deployed from a thin catheter measuring 2–3.5 mm in diameter; it is appropriate for insertion into branches. As its characteristics, it was possible to guide LVIS Jr. through the wire-lumen of a Scepter balloon, make it safety. Because that the technique didn't need to change the balloon catheter to the stent delivery catheter. In the present case, this stent was effective as a salvage technique despite the risk of occlusion of P-com blood flow after balloon removal. However, for jack-up-like stenting, it is difficult to confirm the patency of a stent using cone-beam CT. Therefore, development operations must be carefully conducted. No study has reported the long-term results of the T-stent technique; in the future, close follow-up must be continued. However, the T-stent technique with an LVIS Jr. may be useful for preserving the

![Fig. 4](image_url) Postoperative angiograms and MRA show almost complete occlusion of the aneurysm with the patency of the P-com (arrow) (A: lateral view, B: working angle, C: 3D angiogram, D: MRA on postoperative day 1).
neck formation of broad-necked aneurysms directly branching from the aneurysm or branches measuring ≥2 mm in diameter.

When selecting stents for the T-stent technique, a Neuroform EZ (Stryker) and Enterprise VRD2 are available for the primary blood vessel. For penetrating or thin branching vessels, an LVIS and LVIS Jr., which can be guided through a Scepter XC, may be appropriate.

### Conclusion

In this study, safe and favorable coil embolization could be performed by selecting the T-stent technique for a large broad-necked IC-P-com aneurysm, in which it is necessary to maintain fetal-type P-com blood flow. Furthermore, the use of a Scepter XC facilitated the smooth deployment of an LVIS Jr. without catheter replacement. As a T-stent may cause blood flow disorder or thromboembolic complications related to interfere between stents, its position should be carefully determined when inserting it, considering a stent shortening. There is no risk of deformity or deviation in comparison with stents for combination, such as a Y-stent; this method may be useful.

### Disclosure Statement

With respect to this study, there is no conflict of interest to be disclosed for the first author and coauthors.

### References


