

# Staged Y-shaped Stent Assisted Coil Embolization in a Wide-Neck Basilar Tip Aneurysm: Case Report

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A 67-year-old male presented with a subarachnoid hemorrhage and was found to have a basilar artery (BA) tip aneurysm, which was incorporated to both posterior cerebral arteries (PCAs). First, he was treated with the single stent, which was deployed from P1 segment of the right PCA to BA, and coil embolization was done. Follow-up angiogram at 18 months revealed coil compaction of the aneurysm. Therefore, we accomplished the Y-configured dual stent assisted coil embolization. Follow-up angiogram at 30 months revealed no recanalization of aneurysm and patent blood flow of both PCAs. In conclusion, staged Y-shaped stents assisted coil embolization is an alternative treatment option in a wide-neck basilar tip aneurysm decreasing the extent of coil compaction of aneurysm and preserving an incorporated vessel.

**Key Words :** Wide-neck aneurysm; Basilar tip; Intracranial stent; Coil embolization; Y-stenting

Wide-necked bifurcation aneurysms are challenging to treat with endovascular embolization. Balloon remodeling and stent-assisted coil embolization have been increasingly available therapeutic strategy in the treatment of these complex lesions (1–3). To our knowledge, there are a few papers that wide-necked basilar bifurcation aneurysms were treated with the Y-configured dual stent assisted coil embolization (4–6). But all patients were unruptured or recanalized after coil embolization in initial subarachnoid hemorrhage. In our case, a single stent was deployed from P1 segment of posterior cerebral artery (PCA) to basilar

artery (BA) and then coil embolization was performed. After coil compaction occurred, second stent was deployed from contralateral P1 segment to BA and detachable coils were placed into the aneurysm via microcatheter through the interstices of two stents. We report a successful staged Y-configured stents-assisted coil embolization.

## CASE REPORT

A 67-year-old man presented with sudden severe headache and drowsy mentality. Brain CT angiogram showed the thick subarachnoid hemorrhage (Fisher grade III) in basal/ pre-pontine cistern and basilar tip aneurysm (Fig. 1A). Selective vertebral artery (VA) angiogram revealed the wide-necked aneurysm of basilar tip, which was 10 × 9 mm in size, incorporated the origins of both PCA (Fig. 1B). To achieve the obliteration of ruptured aneurysm and preserve the patent blood flow of both PCA, we decided to perform stent-assisted coil embolization. First, the treatment strategy was to deploy two Neuroform stents (Boston

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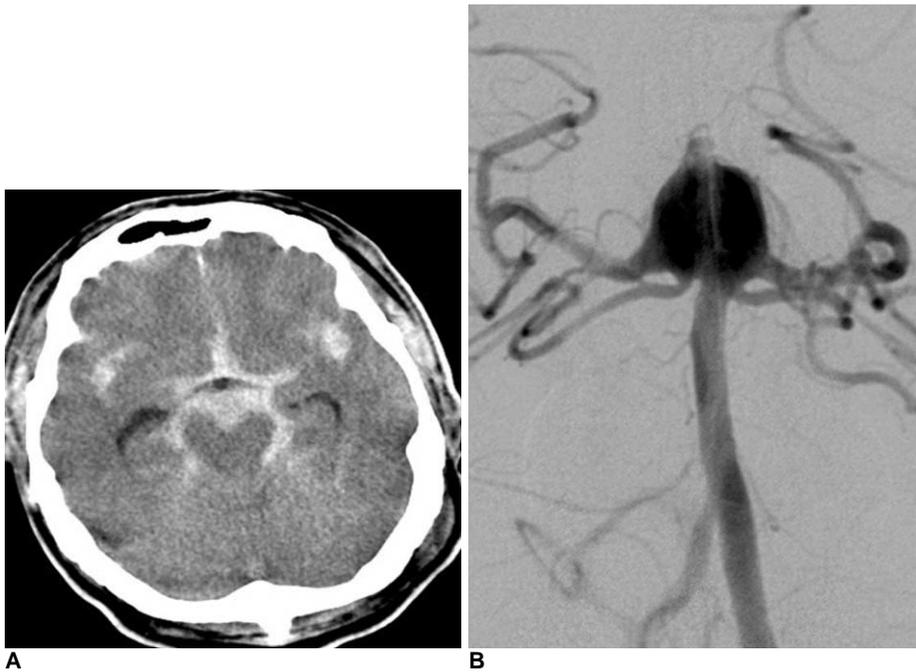
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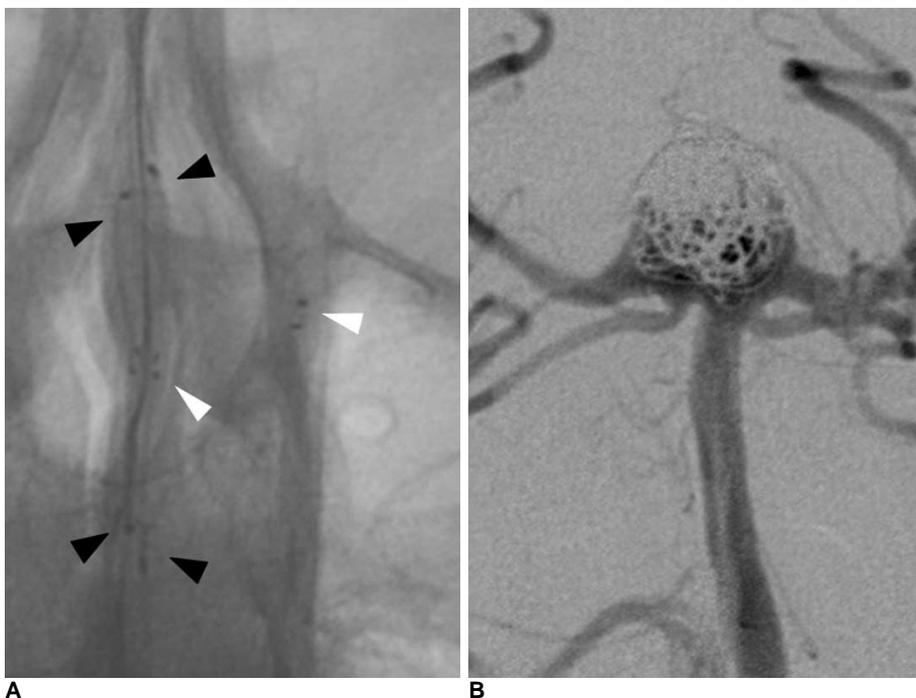
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Scientific/Target, Fremont, USA) in a Y-configuration before coil embolization of the aneurysm. Because anticoagulation therapy might induce the hemorrhagic complication in our patient, simultaneous Y-configured overlapping stent increase the thromboembolic risk. Considering these factors, we decided to perform the single stent, which was deployed from P1 segment of PCA to BA, and partial coil embolization for decreasing the rupture risk of the aneurysm. Under general

anesthesia, a 6F Envoy catheter (Cordis Neurovascular, Miami Lakes, USA) was placed in the right-sided proximal VA via the right femoral artery. An SL-10 microcatheter (Boston Scientific, Natick, USA) was manipulated over a 200cm Synchro 0.014 inch guidewire (Boston Scientific, Natick, USA) beyond the targeted landing zone for the stent and into a distal branch of the parent vessel. Exchanged over a 300 cm Transend Floppy (Boston Scientific, Natick, USA)



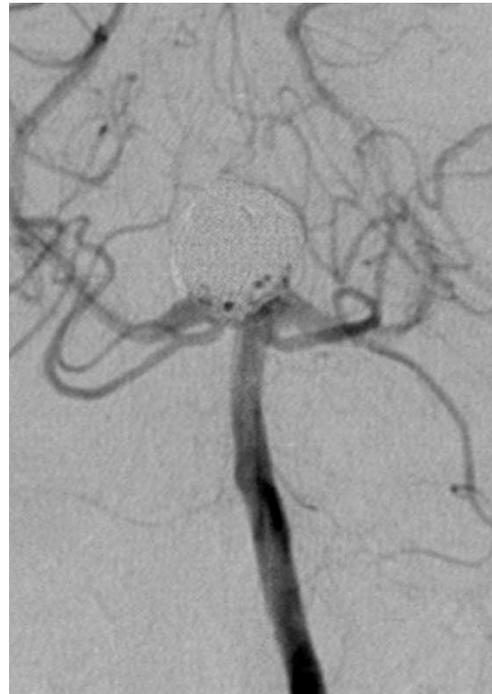
**Fig. 1.** (A) Preoperative Computed Tomography (CT) showing diffuse subarachnoid hemorrhage in the basal cistern, prepontine cistern, and both sylvian fissures, (B) Anteroposterior projection of the left vertebro-basilar artery demonstrating the wide-necked (10 × 9 mm in size) basilar tip aneurysm involving both PCA at aneurysm base.



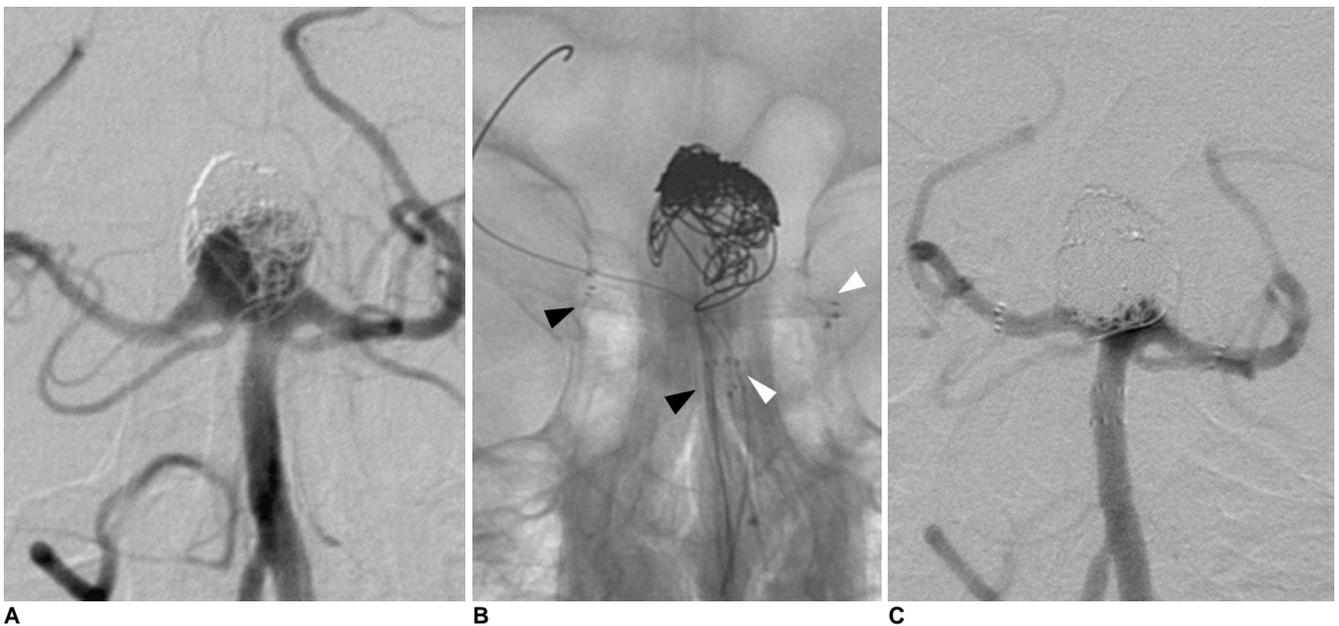
**Fig. 2.** (A) Anteroposterior projection of the digital subtraction angiogram revealing the double catheter (black arrowheads) into the aneurysm and Neuroform-3 stent (white arrowheads) deployed from BA to left PCA, (B) A control angiogram showing the partial embolization of aneurysm with patent distal blood flow of BA and both PCA.

0.014 inch exchange guidewire, the Neuroform-3 stent (Boston Scientific, Target, Fremont, USA) the delivery system was then advanced over the wire, positioned from P1 segment of PCA to BA. A second guiding catheter via the left femoral artery was placed within left-sided proximal VA for coil embolization. Using double catheter technique, the SL-10 and prowler 14 (Cordis Endovascular Systems, Miami, USA) microcatheter were manipulated into the aneurysm over a 200 cm, 0.014 inch Synchro guidewire through the stent strut (Fig. 2A), and aneurysm was partially coiled covering the rupture point and without the compromise of right PCA. A control angiogram revealed correct positioning of the stent with patent distal blood flow of BA and both PCA (Fig. 2B). The patient was moved to the neurosurgical intensive care unit for monitoring and started to receive anticoagulation or antiplatelet medication. At discharge, the patient had a modified Rankin scale score (mRS) of 0. Follow-up angiogram at 18 months revealed recanalization of the BA aneurysm (Fig. 3A). Because of the wide neck extending into the right PCA, Y-configured dual stent-assisted embolization was the preferred treatment. The patient was administered with aspirin (100 mg/d) and clopidogrel (75 mg/d) for 4 days before the procedure. Intraprocedural heparinization was monitored with a target activated clotting time between 250 to 300 seconds. The second overlapping Neuroform-3 stent was navigated through the interstices of the initial stent

with the distal end in the contralateral PCA and the proximal portion overlapping the first stent in the BA (Fig. 3B). Coils were delivered through a microcatheter, which was navigated through the proximal true lumen of the stents and exiting through the interstices into the aneurysm. Final angiography



**Fig. 4.** Follow-up angiogram at 30 months showing complete occlusion of the aneurysm and patent blood flow of both PCA.



**Fig. 3.** (A) Follow-up angiogram at 18 months showing coil compaction of the aneurysm, (B) Digital subtraction angiogram showing the second overlapping stent (black arrowheads) placed through the interstices of the initial stent (white arrowheads) with the distal end in the contralateral PCA. (C) Final angiogram demonstrating the complete obliteration of the aneurysm and patent BA and both PCA.

showed the complete obliteration of the aneurysm and patent BA and both PCA (Fig. 3C). Heparin was administered for 24 hours after the procedure with a partial thromboplastin time (aPTT) goal of 55 to 80 seconds. No complications were noted and the patient was discharged home 1 week. The patient maintained on aspirin 100 mg/d and clopidogrel 75 mg/d after the procedure. Follow-up angiogram at 30 months showed the complete occlusion of the aneurysm and patent blood flow of both PCAs (Fig. 4).

### DISCUSSION

Wide necked basilar tip aneurysms remain challenging surgical or endovascular problems because of the risk to thalamoperforator vessels and encroachment on the PCAs with clip placement. Advanced applications of the Neuroform stent have facilitated the endovascular treatment of complex aneurysms. For wide-necked bifurcation aneurysms, a stent reconstruction of both distal limbs of the bifurcation might result in complete occlusion of the aneurysm and patent blood flow of both distal limbs. Y-stent technique is the most available treatment strategy (1–3). In many instances, however, a single stent can be used to reconstruct wide-necked aneurysms. This procedure often provides adequate support for coiling relatively wide-necked aneurysms. And when a single stent is used, we need not cross the first stent strut to form the Y-configuration, which increases the risk of stent migration or herniation into aneurysm fundus. Actually, the proximal end of the initial stent can be herniated completely into the aneurysm during the attempted delivery of the second device in two patients (6) (Fiorella et al., unpublished observations). And there are three general configurations of bifurcation aneurysms, which are Y-, T-, or arrow configured. Among these classifications, arrow-configuration is the most difficult to deploy the stent as follows; 1) difficult selection using microwire due to severe acute angle of distal parent artery, 2) resistance in its passage through the acute angle beyond the aneurysm and into the distal parent vessel, and 3) the probability of prolepses and herniation into aneurysm (6). In our case, as mentioned above, antiplatelet or anticoagulation was not available because of hemorrhagic complication. We planned that simultaneous Y-configured dual stent cannot be a good treatment option but subsequent Y-configured stent-assisted coil embolization after single stent assisted partial coil embolization can be a treatment option because rupture of aneurysm must be prevented in

acute stage and antiplatelet medication can be applicable beyond hemorrhagic period. And several authors reported that both the coils and stents synergistically increase high-flow resistance into the aneurysm lumen and therefore induce intra-aneurysmal stasis and stabilization (7, 8). Phatouros et al. reported that this procedure may further decrease the risk of future coil compaction (9). Y-configured stents supported coil embolization in the wide necked basilar tip aneurysm allows more complete packing of this lesion as well as prevents coil herniation into the parent vessel. As expected, no rebleeding developed after partial embolization of rupture site and follow-up angiogram at 18 months showed the recanalization of the aneurysm base involving right PCA. At that time, antiplatelet medication prior to the Y-stent coil embolization was available treatment. Complete coil packing was performed by Y-configured stent assisted the coil embolization. Also, flow diversion promotes thrombus formation in the aneurysm and endothelialization of its neck by the overlapping stents. Long term follow-up angiogram at 30 months revealed the near complete occlusion of aneurysm without coil compaction and patent BA and both PCAs.

### CONCLUSION

We suggest that staged Y-configured stent supported coil embolization is an alternative treatment option in a wide-neck basilar tip aneurysm decreasing the extent of coil compaction of aneurysm and preserving incorporated vessel.

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## 기저끝뇌동맥류의 단계적 Y-형 스텐트 지지 코일색전술

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67세 남자환자가 뇌지주막하출혈로 내원하였고 양측 후동맥이 병합되어 있는 광경 기저 끝 뇌동맥류가 있는 것이 발견되었다. 먼저, 우측 후동맥의 P1 segment에서 기저동맥에 걸쳐 단일 스텐트 지지 코일색전술을 시행하였다. 18개월째 시행한 추적 혈관조영술에서 뇌동맥류가 재개통된 것이 관찰되었다. 치료방법으로 Y-형 이중 스텐트 지지 코일색전술을 시행하였다. 30개월째 시행한 추적 혈관조영술에서 뇌동맥류의 재개통은 보이지 않았고 양측 후동맥으로 혈류가 잘 열려 있는 것이 관찰되었다. 결론적으로 광경 기저 끝 뇌동맥류에서 Y-형 스텐트 지지 코일색전술은 뇌동맥류에 병합되어 있는 혈관을 보존하면서 뇌동맥류의 재개통을 줄일 수 있는 대체 치료 방법이라고 생각한다.

**Key Words :** Wide-neck aneurysm; Basilar tip; Intracranial stent; Coil embolization; Y-stenting