

Case Report

# “Shelf Technique” in braided stent (Leo Baby) in wide-necked intracranial aneurysm

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## ABSTRACT

A 42-year-old female presented with sudden onset severe headache without loss of consciousness 4 days back. Non-contrast computed tomography scan of the brain showed subarachnoid hemorrhage, and angiography showed a wide-necked aneurysm in the right middle cerebral artery (MCA) bifurcation, incorporating the superior division of right M2 MCA and another small aneurysm in the inferior division of right M2 MCA. Because of the wide-necked ruptured aneurysm and another in the inferior division of right M2 MCA, braided stent-assisted coiling (Leo baby) with shelving was done to protect both the aneurysms and to protect the superior branch of M2 MCA. The patient tolerated the procedure well and had an uneventful recovery. In this report, we have also reviewed and discussed the challenges, advantages, and disadvantages of the newly discovered shelving technique with a braided stent for wide-necked bifurcation aneurysms.

**Keywords:** Shelf technique, Braided stent, Wide-necked bifurcation aneurysm

## INTRODUCTION

Wide-necked bifurcation aneurysms (WNBA) are usually challenging to treat due to the prolapse of the coil into the parent vessel, especially when one branch vessel is found embedded within the aneurysm or there is an obtuse angle between the parent vessel and the aneurysm.<sup>[1]</sup> In such scenarios, a single-stent or double-stent technique with Y configuration or flow diverters or intra-aneurysmal flow disrupters can be used to preserve the parent vessel. Multiple studies have shown a lower rate of complication and better clinical and angiographic results with the double-stent (Y-stenting) technique for WNBA. However, Y-stenting is challenging, and multiple complications can be associated with the procedure and needs expertise.<sup>[2]</sup> Braided stents having flexible closed-cell design can be used for stent-assisted coiling (SAC) where the size of the cells varies when force is given along the direction of the stent.<sup>[3]</sup> This mutable property of these braided stents creates a “shelf” for supporting the coils in WNBA, thus avoiding Y-stenting. Herein, we report a case of the wide-necked right middle cerebral artery (MCA) bifurcation aneurysm and another small inferior division aneurysm successfully managed with a braided stent (Leo baby) with shelf technique.

## CASE REPORT

A 42-year-old female presented with sudden onset severe headache without loss of consciousness 4 days back. Moderate headache persisted with nuchal rigidity (Hunt and Hess Grade 2 and WFNS 1). On examination, the patient was E4V5M6, moving all four limbs (power was 5/5 on all four limbs). With these clinical features, an aneurysmal subarachnoid was considered.

Non-contrast computed tomography scan of the brain showed subarachnoid hemorrhage in the right Sylvian fissure (modified Fisher's Grade 1). An magnetic resonance imaging of brain with magnetic resonance angiography showed a wide-necked aneurysm in the right MCA bifurcation and another smaller aneurysm in the inferior division of the right M2 MCA digital subtraction angiography showed wide-necked aneurysm in the right MCA bifurcation, incorporating the superior division of right M2 MCA and small aneurysm in the inferior division of right M2 MCA.

Because of a wide-necked ruptured aneurysm at MCA bifurcation involving the superior division of right M2 MCA and a small aneurysm in the inferior division of right M2 MCA, braided SAC with shelving was planned

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for the protection of both the aneurysms. Loading dose of antiplatelets (aspirin 300 mg and ticagrelor 180 mg) was loaded 2 h before the procedure. After guide placement in the right internal carotid artery, a braided stent (Leo baby 2.5 × 30 mm) was deployed entirely along with the smaller aneurysm and partially deployed across the MCA bifurcation aneurysm covering the neck. Coiling was done in the MCA bifurcation aneurysm and by intermittent forward pushing of the stent with microcatheter across the aneurysm neck until a shelf (3/4<sup>th</sup> of aneurysm neck) was made across the neck of the aneurysm to get the Leo baby stent overexpanded simultaneously to preserve the ostium of the superior branch arising through the aneurysm and get protection from the coil mass and then standard release of the stent was done in proximal M1 MCA [Figure 1a-f]. Leo baby was deployed across the aneurysms after the complete occlusion of the aneurysm with the coils. Post-procedure angiogram showed complete exclusion of the right MCA bifurcation aneurysm and stasis within a small aneurysm in the inferior division of the right M2 MCA.

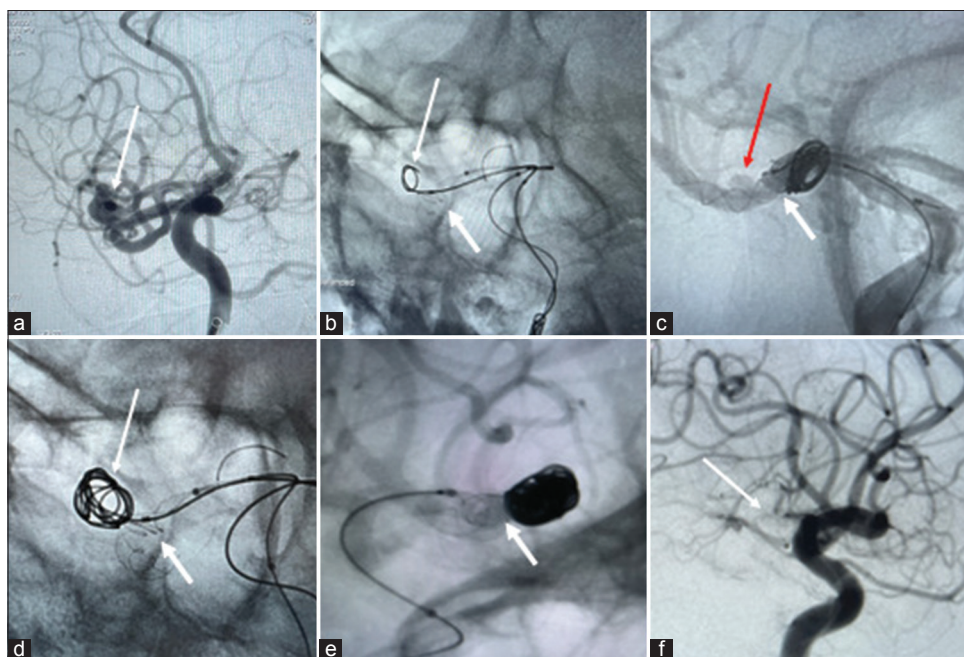
On the same day, the patient was extubated in the intensive care unit. She was E4V5M6, moving all four limbs, and had no fresh onset neurodeficits. Power in all four limbs was 5/5. She was discharged in the post-operative period on day 3 with antiplatelets.

## DISCUSSION

We report the case of WBNA at right MCA bifurcation treated using braided stent (Leo baby) by “shelf technique.” This shelf technique depends on the mutability of the closed-cell design braided stents such as Leo baby and LVIS Jr., where these stents can expand to a diameter larger than the maximum known as unconstrained diameter, creating a “shelf.” Similar to this property, Leo baby is a self-expandable closed-cell designed braided stent having a smaller strut (0.9 mm) and can change its cell size during deployment.

Neuroform is known to have kinking during deployment along the curvature<sup>[4]</sup> and thus carries the risk of cell tangling within them by this “shelving,” especially at acute branching angles. Enterprise is a non-braided stent (closed-cell) which does not have the mutable properties such as braided stents and is unable to achieve adequate buttressing to prevent prolapse of coil for SAC of WNBA.<sup>[1]</sup>

Thus, this “shelf” technique avoids technically challenging Y-stenting at WNBA, which includes microcatheter navigation difficulty through the struts into the contralateral branch artery, kinking at acute angle branching, displacement of the first stent during the second stent deployment, and higher risk of thromboembolism.<sup>[5]</sup> Once the neurointerventionists become familiar with this “shelf”



**Figure 1:** Digital subtraction angiography (DSA) image showed the shelving with coiling of the aneurysm DSA image (a) showed the right middle cerebral artery (MCA) bifurcation aneurysm (long white arrow). DSA image (b-e) showed shelving of the Leo baby stent (thick short arrow) with coiling of the bifurcation aneurysm (long white arrow). The note is made of a smaller distal aneurysm at the inferior division of the right M2 MCA (red arrow). DSA image post-procedure (f) showed complete exclusion of the bifurcation aneurysm (long white arrow) with patent arteries.

technique, then WNBA can be managed with braided stents to preserve the branch artery with relative ease.

A similar novel “shelf” technique was done previously using Lvis junior stent in one case series of eight patients. They achieved better short-term clinical and angiographic outcomes, thus avoiding Y-stenting.<sup>[1]</sup>

Other treatment modalities for WNBA can be flow diverters and intra-aneurysmal flow disrupters.<sup>[1]</sup> Although flow diverters for MCA bifurcation aneurysm are an option, a study found that complete occlusion was observed in 63% of patients, and procedure-related morbidity can be high up to 21% in their series. Intra-aneurysmal flow diversion woven endobridge (WEB) showed adequate occlusion in 84% of patients and low morbidity of 1.3% for WBNA in the WEBCAST trial. Still, procedure cost is high and long-term data are not available. Hence, “shelf technique” using a single braided stent can be an alternative option for WBNA.

## CONCLUSION

“Shelf” technique with braided stents can be a feasible and safe technique for treating WBNA. This technique can avoid Y-stenting at intracranial WBNA. Higher metal coverage of these braided stents provides additional flow diversion, which can prevent rupture in the other contiguous aneurysms.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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