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Using the Barrel Technique with the LVIS Jr (Low-profile Visualized Intraluminal Support) Stent to Treat a Wide Neck MCA Bifurcation Aneurysm

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Abstract

The treatment of wide-neck bifurcation cerebral aneurysms is challenging especially if at least one of the arteries arise from an obtuse angle. These wide-neck bifurcation aneurysms are difficult to treat with the usual balloon and stent assisted coiling, including Y stenting or double-barrel stent techniques [1, 2]. Other available options include using current devices with the waffle cone or double waffle cone techniques [3, 4]. Novel devices that are in development include intrasaccular devices and the barrel bifurcation vascular reconstruction device (Covidien) [5, 6, 7]. We report the use of a novel barrel technique using the LVIS (low-profile visualized intraluminal support) Jr stent for the treatment of a wide-neck bifurcation aneurysm.

Keywords

LVIS; wide neck aneurysm; bifurcation aneurysm; middle cerebral artery aneurysm

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Case Presentation

Our patient had a history of mechanical fall which resulted in a CT angiography demonstrating a right middle cerebral artery bifurcation lobulated saccular aneurysm. The cerebral angiogram demonstrated a right middle cerebral artery bifurcation 8.4 mm × 6.0 mm × 7.5 mm lobular aneurysm with an 8.3 mm neck. The parent vessel had an afferent diameter of 2.7 mm and efferent diameter of 2.7 mm. A superior right M2 branch originated directly from the aneurysm neck at an obtuse angle having a vessel diameter of 1.8 mm. (Figs. 1, 2)

Figure 1. Wide-neck lobulated MCA bifurcation aneurysm with superior M2 branch at obtuse angle.

Initial attempt was made for balloon-assisted coiling with a Scepter XC 4 mm × 11 mm balloon catheter. However, the balloon provided minimal coverage of the frontal superior M2 origin. Therefore, stent-assisted coiling was performed with a jailed Echelon 10 microcatheter within the aneurysm, and a LVIS Jr. 3.5 mm × 23 mm stent through the Scepter balloon catheter. While deploying the stent, we applied intermittent forward tension resulting in widening, or barreling, of the stent across the aneurysm neck, providing a buttress for the frontal superior M2 ostium. (Figs. 3, 4) That is, we were able to expand a segment of the LVIS Jr. into the aneur-

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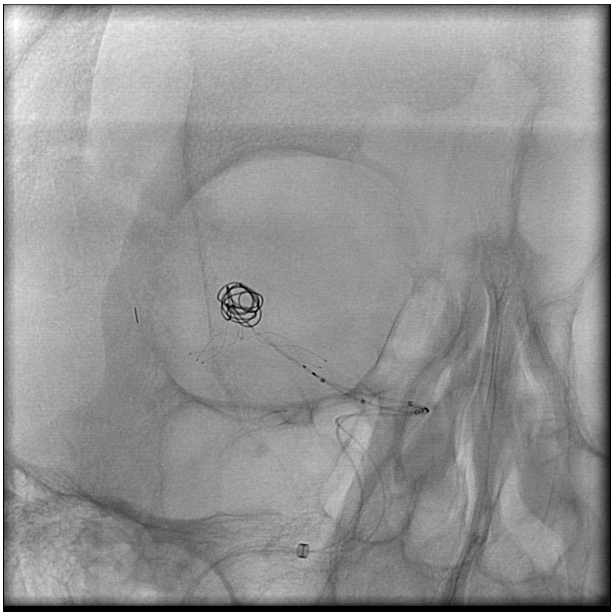

Figure 5. Fully deployed LVIS Jr stent with mid segment expanded across aneurysm neck.

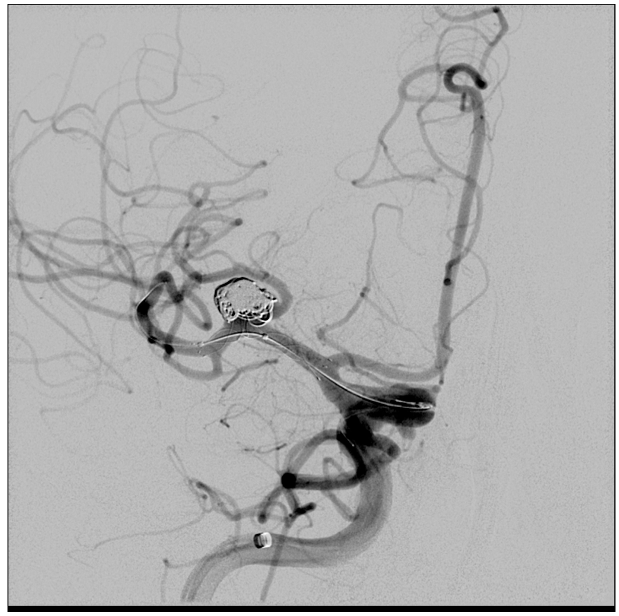

Figure 6. Fully deployed LVIS Jr stent with mid segment expanded across aneurysm neck and good stent approximation to parent vessel wall.

ysm neck, protecting the parent vessel and the bifurcation. Once fully deployed, the stent segments distal and proximal to the aneurysm neck maintained close approximation to the vessel wall measuring 2.8 mm and 2.6 mm, respectively, with the barreled segment expanded to 3.7 mm, or about 0.2 mm more than the unconstrained diameter of the stent. (Figs. 5, 6) We subsequently deployed a single target 3D, three hypersoft 3D, three Axium 3D, and a hypersoft helical coil into the aneurysm. We were able to obtain partial occlusion of the aneurysm with residual neck remnant and preservation of the parents arteries, although coil loops are seen extending across the frontal superior M2 ostium. Figures 7 and 8 are fluoroscopic radiographs of this same technique demonstrated in a silicon simulator.

Discussion

Deployment of the LVIS Jr. stent using the barrel technique can be successfully employed in stent assisted coiling to preserve parent arteries in wide neck bifurcation aneurysms especially when one of the branches arise from an obtuse angle. This is similar to the concept of the barrel bifurcation vascular reconstruction device. The advantage of the LVIS Jr is both the ability to deploy the device through a 0.017 inner diameter catheter and the relatively radiopaque profile. Given that the LVIS Jr is a braided stent, the deployment technique is more involved than laser cut nitinol devices like the

Figure 7. Silicone simulator with partially deployed LVIS Jr stent prior to applying forward tension to barrel the stent across aneurysm neck.

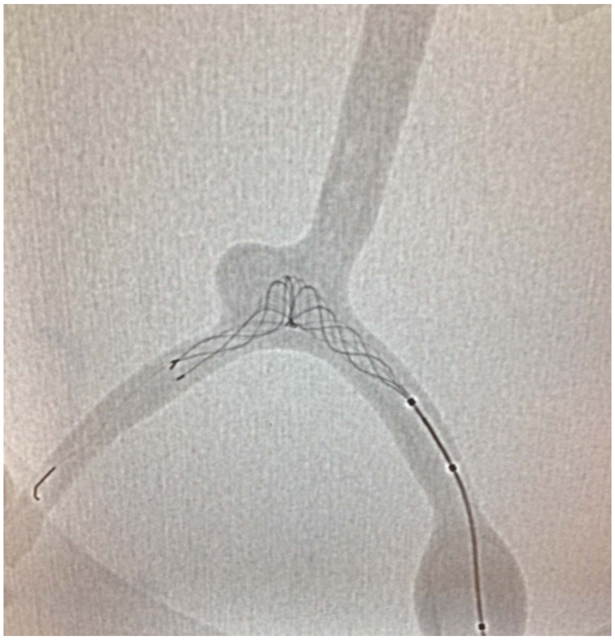

Figure 8. Silicon simulator showing partially deployed LVIS Jr stent with midsegment expanded across aneurysm neck.

Neuroform and Enterprise stents, but allows for expansion or barreling not readily available in the other stents. This barrel technique provides greater neck coverage and reduces the need to select a difficult obtusely arising branch artery. The expansion is limited to 0.2 mm beyond the unconstrained diameter of the stent which are currently available in 3.5 mm, 4.5 mm, and 5.5 mm for LVIS. Furthermore, caution must be used to provide enough adjacent parent artery to anchor the device which should be at least 7 mm on each side, as in this case, which includes the 2 mm flare ends. The expansion is relatively symmetrical and therefore, as demonstrated in this case, may not fully protect the efferent artery beyond the approximate 3.7 mm buttress diameter of the stent. However, the LVIS Jr stent does not require specific alignment of a barrel segment as with the barrel bifurcation vascular reconstruction device, which may make deployment technically easier with the LVIS and LVIS Jr stents.

Conclusion

The treatment of wide-neck bifurcation aneurysm can be treated with LVIS Jr device using a novel barrel technique to provide better stent coverage of the aneurysm neck. This novel technique provides an additional tool for treating these complicated aneurysms.

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