Treatment of Wide-Neck Bifurcation Aneurysm Using “WEB Device Waffle Cone Technique”

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INTRODUCTION
The endovascular treatment of wide-neck bifurcation aneurysms is continually improving with the advent of new techniques and devices available on the market.

However, treatment remains challenging even when standard adjunctive techniques such as balloon remodeling or stent-assisted coiling are used. Therefore some advanced stenting techniques have been developed, such as Y stent—assisted coiling and waffle cone—assisted coiling. Y stent—assisted coiling consists of the deployment of 2 overlapping stents in both bifurcation branches to reconstruct the neck of the aneurysm and assist coiling. In waffle cone—assisted coiling the terminal aspect of a single stent such as the pCONus (phenox GmbH, Bochum, Germany) or Solitaire AB (Medtronic Neurovascular, Irvine, California, USA) is placed inside the aneurysm to protect the base from coil protrusion during coiling. Both techniques have some drawbacks and can sometimes be difficult to manage from a technical point of view. When braided stents became available, the Y stenting technique reached a new level of maturity. Moreover, a hybrid technique involving coiling after the placement of a stent in 1 bifurcation branch and then placing a second stent inside the aneurysm in a waffle cone fashion has been described in a few cases.

The development in recent years of intrasaccular flow disrupters such as the WEB device (MicroVention Inc., Aliso Viejo, California, USA) offers a new feasible solution for the treatment of wide-neck bifurcation aneurysms. The use of a flow-diverter stent has also been proposed for the treatment of wide-neck bifurcation aneurysms, but currently not all teams agree that this technique is safe, especially in cases of middle cerebral artery bifurcation aneurysms. Herein, we describe a new endovascular technique suitable for intracranial wide-neck bifurcation aneurysms, which combines 2 different techniques: the intrasaccular flow disrupter technique alongside the waffle cone—assisted technique. We have termed this new technique the “WEB device waffle cone technique.”

MATERIALS AND METHODS

Patient Information
We selected this case to be the first treated in this way in our department due to its anatomic particularities. The case consisted of a nonruptured basilar tip aneurysm (Figure 1) in a 30-year-old male, presenting with multiple aneurysms in the anterior circulation. The patient was diagnosed with moyamoya disease at 6 years of age, and the right middle cerebral artery has been consecutively occluded. Due to the particular anatomy of the patient, the known methods of treating wide-neck basilar artery aneurysms as described earlier were evaluated to be unsafe in this case. Firstly, both posterior cerebral arteries (PCAs) were implanted at the neck of the aneurysm and were also of small diameter in the Pr-P2 segments. Secondly, bilateral PCAs were...
not identified on the diagnostic angiogram. To preserve the patency of basilar artery bifurcation, the safest and most effective method of treatment was deemed to be the “WEB device waffle cone technique.”

**Endovascular Technique**

From the right, vertebral artery microcatheterization of the basilar artery and base of the aneurysm was achieved using a Rebar 18 microcatheter (Medtronic). A Solitaire AB 4 × 15 mm stent was deployed but not detached, with the distal part (3–4 mm) inside the aneurysmal sac (Figure 2). From the left, vertebral artery microcatheterization of the basilar artery and base of the aneurysm through the Solitaire AB stent was achieved using a VIA 21 (MicroVention Inc.) microcatheter (Figure 3). The WEB device (11 × 9 mm) was successfully deployed in the aneurysm (see Figures 2 and 3). The first device to be detached was the Solitaire AB stent, and immediately after the WEB device was also detached. A further angiogram (see Figure 2) and vaso-CT (see Figure 3), as well as an angiogram and vaso-CT 24 hours post procedure (see Figure 3), clearly showed that with this technique the aneurysm itself was excluded from the circulation (due to thrombosis) and also that the patency of both PCAs had been preserved. Dual antiplatelet therapy (Ticagrelor administered in two 90-mg doses per day and a single 160-mg dose of aspirin per day) was prescribed for 1 month post procedure, and single antiplatelet therapy (aspirin 160 mg per day) was prescribed for the next 12 months.

**RESULTS**

The procedure was complete, and angiographic occlusion of the aneurysm was achieved 24 hours post treatment, as confirmed by digital subtraction.
angiography (DSA) (see Figure 3). No complications occurred. Both PCAs were patent, and the patient presented normal neurologic status at discharge.

DISCUSSION
The endovascular treatment of wide-neck bifurcation aneurysms can be challenging, despite all the techniques available in the catheterization laboratory. One solution described in the literature as the “waffle cone technique” involves using a Solitaire AB or pCONus® stent placed in the central branch of the bifurcation as a support at neck level for the coiling technique, but this was not suitable in this case due to the particular anatomy of the patient. However, in cases where branches are totally integrated in the neck of the aneurysm, this type of design may not provide sufficient branch protection against occlusion post coiling. Our use of a Solitaire AB stent in this case eliminated this issue, offered a higher level of freedom when placing both devices, and at the same time provided total protection of the origins of both PCAs.

The case reported here was not suitable for Y stenting or deployment of the WEB device alone, due to the small caliber of both PCAs and their origin at neck level. The main advantage of this technique is that both devices have a controlled detachment system, and are fully independent from one another. This allows the operator to verify that bifurcation is preserved, and perform any necessary subsequent readjustments under fluoroscopy before the devices are detached.

The technique we have described may offer a solution in those cases where classical stenting techniques are contraindicated due to complex morphological conditions.

Barrel device (Barrel VRD; Medtronic/Covidien, Irvine, California, USA) is
definitely a feasible device for these types of aneurysms, but our team was afraid to use any type of device inside any posterior cerebral arteries due to their thin caliber. The PulseRider (Pulsar Vascular, San Jose, California, USA) device has strong indication to our aneurysm anatomy, but unfortunately in our public health system it is not reimbursed and not available for the moment. Moreover, we are convinced that both devices Solitaire AB or PulseRider are suitable for “WEB waffle cone technique.” Regarding the concern of directing flow into aneurysm due to stent placement, in our opinion this is a minimal risk due to the large mesh of the Solitaire AB stent.

However, rigorous retrospective clinical evaluation of more cases is required, in order to precisely assess the safety and efficacy of this promising technique in the future.

**REFERENCES**


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**Figure 3.** (A) Noninjected vaso—computed tomography (CT) verifying proper opening of the Solitaire AB stent and also the coaxial middle in-stent positioning of VIA 21/Sequent (B–D) 3D-RoadMap image acquisition during WEB SL 11 × 9 mm deployment. (E) Second injected vaso-CT showing the WEB device deployed but not detached. (F) Third vaso-CT after detachment of the WEB SL 11 × 9 mm. (G) 24-hour postoperative digital subtraction angiography (DSA) showing complete occlusion of the basilar tip aneurysm and also full patency of both posterior cerebral arteries. (H) 3-month postoperative follow-up DSA.


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