Enterprise Deployment Through PulseRider To Treat Anterior Communicating Artery Aneurysm Recurrence

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Key words
- Bifurcation
- Cerebral aneurysm
- Enterprise
- PulseRider
- Recanalization
- Stent

Abbreviations and Acronyms
ACoA: Anterior communicating artery
DSA: Digital subtraction angiography
ICA: Internal carotid artery

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BACKGROUND: **PulseRider (Pulsar Vascular, Los Gatos, California, USA) is a new endovascular device designed to treat wide-neck bifurcation intracranial aneurysms. Deployment of a stent through a PulseRider to treat an aneurysm's recurrence has never been described before.**

CASE DESCRIPTION: **We report the case of a 55-year-old man who underwent coiling of an 8-mm anterior communicating artery aneurysm with assistance of a PulseRider neck reconstruction device. The 6-month digital subtraction angiography control showed aneurysm recurrence, so we deployed an Enterprise 2 closed-cell stent (Codman, Miami Lakes, Florida, USA) in the A1-A2 segment passing across the previously implanted PulseRider. Enterprise correctly expanded and allowed for adequate coiling of the aneurysm.**

CONCLUSION: **An Enterprise stent can be safely opened through a PulseRider in order to treat aneurysm recurrence.**

INTRODUCTION

Wide-neck bifurcation aneurysms are still a matter of debate; with the advent of new endovascular tools, though, many wide-necked aneurysms can be managed by an endovascular approach.[1]

The PulseRider (Pulsar Vascular, Los Gatos, California, USA) is a novel device intended for use in the treatment of intracranial aneurysms arising at vascular bifurcations. The device is a fully retrievable, self-expanding, nitinol implant that is delivered through a 0.021″ microcatheter.[2] The distal end of the device is an arch with open leaflets designed to bridge the aneurysm neck and provide scaffolding during coiling. In order to fit the anatomy of the bifurcation vessels, PulseRider is available in both "T" and "Y" configurations and in different diameters and lengths.[2] The device must be deployed across the neck of the aneurysm, and leaflet position can be extra-aneurysm, intra-aneurysmal, or partially intra-aneurysmal.

The few retrospective studies about PulseRider showed a complete occlusion rate (Raymond-Roy score I[3]) at 6 months' digital subtraction angiography (DSA) of 60.6%–90%.[2,4] Postprocedural neurologic events are documented in 24%–33%[2,5] with permanent neurologic deficits in 5.3%–8.8%.[1,2] Only 1 case of recurrence is described.[1]

Feasibility of opening a stent through the limbs of the PulseRider for the treatment of an aneurysm recanalization is not reported in the literature.

CASE DESCRIPTION

A 55-year-old man was admitted to our hospital because of sudden, persistent, and severe headache for 24 hours; he had no history of headache. Consciousness was normal, and he had no focal neurologic signs. Medical history was notable for hepatitis C virus infection. Social history was notable for smoking (20 cigarettes/day) and occasional alcohol use. There was no family history of aneurysms or vascular diseases.

The patient underwent nonenhanced brain computed tomography showing no signs of subarachnoid hemorrhage; the computed tomography angiogram showed an 8-mm wide-necked anterior communicating artery (ACoA) aneurysm that needed to be treated given the presenting symptoms. Lumbar puncture was not performed. Given the classical clinical findings, sentinel headache was diagnosed.

We performed a diagnostic DSA showing an 8-mm ACoA aneurysm with a wide neck (6 mm) involving the great part of the ACoA, cranially and ventrally directed, with a complex shape and a basal lobe on the medial side (Figure 1A).

Because of sentinel headache, urgent treatment of the aneurysm was decided in order to prevent bleeding. Under general anesthesia, after bilateral femoral access, 6-French guiding catheters were placed in both internal carotid arteries (ICAs). In our center, we use bilateral access in all ACoA embolization if A1 segments are patents, in order to have better control of the anterior cerebral arteries in case of unilateral spasm or thrombosis. We considered it more appropriate to place the PulseRider from the left A1 because it was more anatomically suitable. After catheterization of the aneurysm with a Prowler Select Plus 45-degree microcatheter (Codman, Raynham, Massachusetts, USA), we deployed a 2.7- to

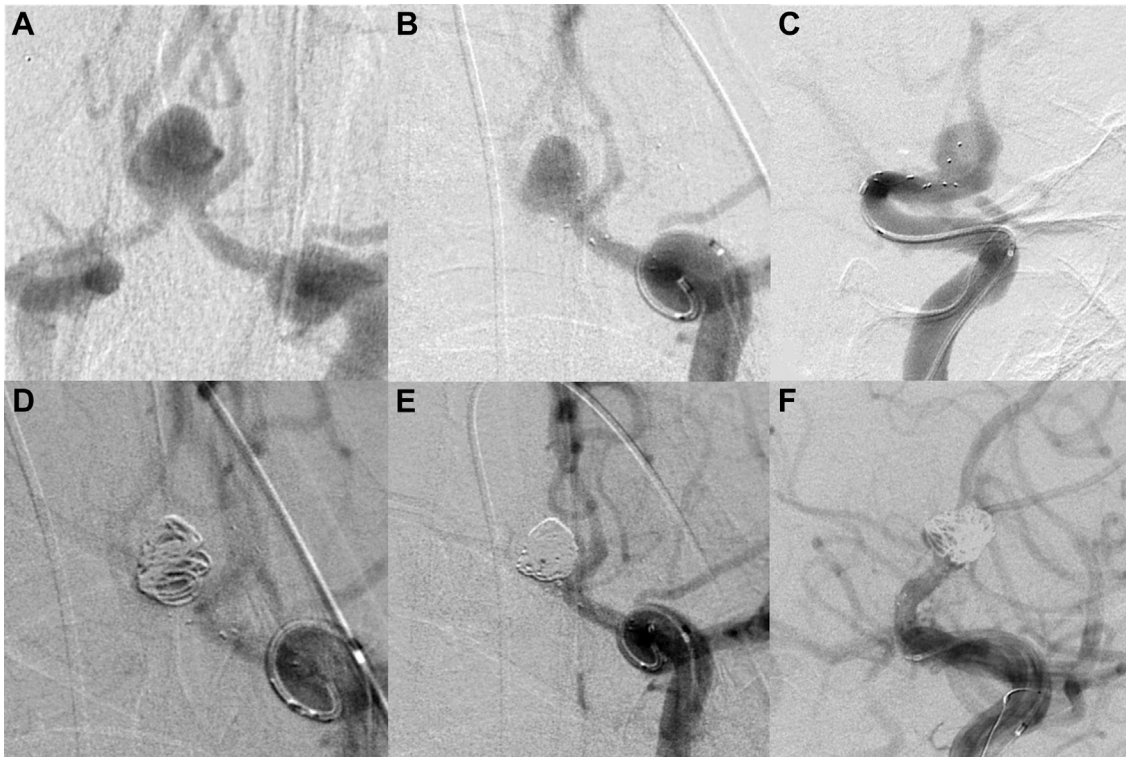

Figure 1. (**A**) Frontal view of the anterior communicating artery (ACoA) aneurysm during left internal carotid artery (ICA) injection and manual compression of right CCA. (**B**) Frontal view during left ICA injection of the release of the PulseRider with its lateral limb inside the aneurysm and its medial limb in ACoA. (**C**) Oblique view during left ICA injection of the release of the PulseRider. (**D**) Frontal view during left ICA injection after deployment of the first coil. (**E**) Frontal view during left ICA injection of the end of the first embolization. (**F**) Oblique view during left ICA injection of the end of the first embolization (note the medial lobe still perfused).

3.5-mm/8.6-mm Y-configured PulseRider that opened with the medial petal in the ACoA out of the aneurysm and the lateral petal into the aneurysm (Figure 1B and C). This position was judged satisfactory. The sac was accessed crossing the PulseRider petals with an Echelon 10 45° microcatheter (Medtronic, Irvine, California, USA) on GT 0.012″ double-angled wire (Terumo, Tokyo, Japan). The aneurysm was embolized with Orbit Galaxy G2 coils (Codman Neurovascular, Miami Lakes, Florida, USA).

After the detachment of the first coil, we noted that the medial petal of the PulseRider could not properly protect the ACoA (Figure 1D). Despite this configuration of the PulseRider, we obtained an adequate occlusion of the aneurysm with only a small residual of the neck (Raymond-Roy II) at the level of the medial lobe (Figure 1E and F). After the detachment of the last coil, we detached the PulseRider.

The patient received heparin 5000 IU intravenous bolus after femoral puncture and continuous intravenous infusion throughout the procedure for a target activated clotting time of 250–300.

We administered clopidogrel 450 mg from the nasogastric tube after PulseRider crossing with the microcatheter and acetylsalicylic acid 500 mg intravenous at the end of coiling. This approach was preferred over administration of dual antiplatelet therapy before the procedure since we were not aware of the technical possibility of stenting across the PulseRider. In case of PulseRider crossing failure we would have performed coiling without stent assistance.

Six-month DSA follow-up showed a 6-mm basal recurrence of the aneurysm with loose coiling of the medial basal lobe. DSA also showed intimal hyperplasia of the medial extrasaccular petal of the PulseRider, determining 50% stenosis at the distal end of the left A1 segment (Figure 2A and B).

We decided to treat the recanalization by stent-assisted coiling. After bilateral femoral access, 6-Fr guiding catheters were placed in both internal carotid arteries. From the right A1 segment we passed through the PulseRider structure with a 0.021″ microcatheter (Prowler Select Plus 45 degrees, Codman Neurovascular) on a GT 0.016″ double-angled wire. We reached the left A2 segment and then released a closed-cell stent (Enterprise 2, 4 × 30 mm, Codman Neurovascular) from left A2 to right A1 (Figure 2C). The Enterprise correctly expanded through the leaflets of the PulseRider, and the markers on