Rescue stenting after artery occlusion as a complication of an intrasaccular device–assisted coiling embolization: illustrative case

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BACKGROUND  Endovascular embolization of wide-necked aneurysms can be challenging. The development of intrasaccular devices like the Contour has enabled us to approach these aneurysms effectively by reducing recanalization rates and eliminating the need for dual antiplatelet therapy, which is particularly beneficial in the case of ruptured aneurysms. Although complications from using these devices are rare, it is crucial to address them properly. In this case, the authors highlight how to manage artery thrombosis caused by device protrusion during aneurysm embolization.

OBSERVATIONS  This report describes a complication in a male patient with a ruptured anterior communicating artery wide-necked aneurysm. Following Contour-assisted coiling of the aneurysm, a realignment of the detachable apex of the device occluded the A2 segment of the right anterior cerebral artery. After the failure of intra-arterial and intravenous tirofiban infusion as well as mechanical thrombectomy, a self-expanding open-cell stent was deployed in the involved vessel, achieving successful reperfusion.

LESSONS  The Contour device has a detachable zone that can cause occlusion of the parent vessel after deployment. The use of a stent as a rescue maneuver may be useful if reperfusion of the vessel cannot be achieved through other methods such as aspiration or full-dose antiplatelet therapy.

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KEYWORDS  rescue; stenting; intrasaccular; device; thrombosis

Wide-necked aneurysms represent a real challenge when trying to perform endovascular embolization. The introduction of novel intrasaccular devices like the Contour (Cerus Endovascular, Inc.) enables us to approach these aneurysms more effectively in terms of low recanalization ratios and eliminating the need for dual antiplatelet therapy, which is particularly beneficial in the case of ruptured aneurysms. Because of the device’s recent introduction, few reports have been published about possible complications and how to deal with them. For this reason, we consider this case of special interest to explain how to face an artery thrombosis due to protrusion of the device during aneurysm embolization.

Illustrative Case

A male patient in his early 30s was admitted to our institution for a 24-hour history of severe headache and dizziness without evidence of neurological deficit. The Glasgow Coma Scale score was 15 points, and the Hunt and Hess grade was 1. Baseline head computed tomography (CT) revealed an interhemispheric subarachnoid hemorrhage (SAH) corresponding to grade 1 on the modified Fisher scale (Fig. 1). The size of the ventricles was normal. CT angiography (CTA) and digital subtraction angiography (DSA) showed an anterior communicating aneurysm next to the A2 segment of the right anterior cerebral artery (ACA). Aneurysm morphology was irregular (with 3 lobulations), and the dimensions resulted in a dome height of 6 mm, a width of 5 mm, and a neck of 5 mm. The A1 segment of the right ACA was hypoplastic, so both frontal vascular territories depended on the left ACA. The angulation between the A1 segment of the left ACA and the A2 segment of the right ACA artery was less than 90°, with implications for treatment. The endovascular approach was chosen after a consensus between the neurosurgery and interventional neuroradiology teams.
Femoral access was obtained using an 8-Fr femoral sheath. Then, a guiding sheath (Neuronmax 0.088, Penumbra, Inc.) was positioned at the distal cervical segment of the left internal carotid artery. Initially, the plan was to perform balloon-assisted coiling utilizing a 4–11 mm Scepter XC balloon catheter (Microvention, Inc.) and an Excelsior SL-10 microcatheter (Stryker). However, safe catheterization of the A2 segment of the right ACA with the balloon catheter was not possible because of the pronounced arterial angulation, resulting in repeated herniation of the balloon into the aneurysm.

Thus, Contour-assisted coiling was performed instead. A Phenom-21 microcatheter (Medtronic Neurovascular) and an Excelsior SL-10 microcatheter were used. Previously, an intravenous lysine acetylsalicylate (900 mg) infusion was administered. The size of the Contour was chosen based on the diameter of the aneurysm (neck and width), following instructions provided by the commercial company that distributes the device. In our case, a Contour of 9 mm was deployed through the Phenom-21 microcatheter. The coiling was performed using 5 Optima Helical-10 coils with sizes of 5 mm × 8 cm, 4 mm × 6 cm, 3 mm × 6 cm, 3 mm × 4 cm, and 2 mm × 6 cm. After deploying the first coil, intravenous heparin sodium (5000 IU) was administered. Successful aneurysm embolization was achieved, with a packing density of 20% according to the Oculus Imaging Angiosuite calculator (Fig. 2).

Following deployment of the final coil, subsequent DSA revealed a platelet aggregate near the detachment site of the Contour device. This progressed to complete thrombosis in the neck of the aneurysm and the right ACA. The time elapsed between Contour deployment and arterial occlusion was approximately 15 minutes.

To recanalize the artery, a slow infusion of tirofiban (0.3 mg) was administered via a microcatheter and a 1-mL syringe, but it proved ineffective. Thereafter, mechanical thrombectomy was performed using a 3MAX reperfusion catheter (Penumbra, Inc.), but successful recanalization was not achieved even after 6 attempts. During the thrombectomy, it was noted that the aspiration catheter made contact with the Contour apex, allowing the passage of contrast to the A2 segment of the right ACA. This observation led us to conclude that occlusion of the artery might have been caused by displacement of the device due to the coil mass (Fig. 3).

The A2 segment of the right ACA was then accessed using an Asahi Chikai 0.014 microwire and an Excelsior SL-10 microcatheter. The presence of the Contour and coils facilitated the catheterization process by preventing the microcatheter from herniating into the aneurysm. Following this, a 3–24 mm Neuroform Atlas stent (Stryker) was deployed from the A2 segment of the right ACA to the A1 segment of the left ACA. The stent's radial force successfully displaced the detachable apex and restored flow in the artery (Fig. 4). An intravenous infusion of tirofiban at a dose of 0.15 μg/kg/minute was then administered for a duration of 16 hours. A head CT was performed in the angiography room, showing stability of the radiological features after the intervention (SAH, Fisher grade 1). Afterward, the patient was extubated in the same room, without any evidence of focal neurological deficits.

Subsequently, a head CT was carried out 12 hours later, which showed similar previous findings and no evidence of cerebral infarctions. A loading dose of clopidogrel (300 mg) and aspirin (100 mg)
was initiated 4 hours before the end of the tirofiban perfusion. Then, a daily double antiplatelet therapy with aspirin (100 mg) and clopidogrel (75 mg) was introduced for 6 months. A 1-week follow-up head CT and CTA showed perfusion of the Willis circle with no signs of ischemia. The SAH was mostly resolved. The patient was discharged from the hospital 2 weeks after the procedure with no symptoms.

Discussion

Observations

Intrasaccular flow disruptors, such as the Woven EndoBridge (WEB; Microvention, Inc.) and Contour, have been developed in recent years for the treatment of wide-necked aneurysms. These devices have demonstrated high efficacy rates in achieving aneurysm occlusion and reducing the occurrence of recanalization. For instance, the Contour device has shown a complete occlusion rate ranging from 55% to 75%, while the rate of adequate occlusion, including neck remnants, is approximately 90% according to several studies.

Contour-assisted coiling is a novel embolization technique that aims to expedite the process of complete aneurysm occlusion. In published case series, it has proven to be a safe and effective technique for the treatment of ruptured or unruptured aneurysms with a wide neck or bifurcation locations.

The reported complications are infrequent, with thromboembolic events being the most common. Displacement or protrusion of the device into the parent branch has also been reported, resulting in arterial occlusion. This type of complication has been documented more frequently with the WEB device, leading to the need for stent deployment. In the case of the Contour, possible causes may be attributed to an inappropriate size of the device, mass effect of the intrasaccular coils, and unfavorable anatomy.

We have documented a case with intraprocedural arterial occlusion secondary to a protrusion of the Contour device by the coil mass that could be solved with the deployment of a stent. With this report, we intend to set out a feasible alternative solution to deal with this undesirable situation.

Lessons

The complications of treating aneurysms with the Contour device include displacement of the device and arterial thrombosis. An auto-expandable stent deployment in the affected artery appears to be feasible for managing this type of complication. Further multicenter and prospective studies are required to determine the frequency and underlying causes of these complications, as well as the use of stents as a rescue technique for thrombosis caused by device displacement.

References


FIG. 3. Left ICA injection angiography (A) showed complete occlusion of the aneurysm. The detachable apex of the Contour is protruding and closing the A2 segment of the right ACA. After trying intravenous thrombolysis, we decided to introduce a 3MAX aspiration catheter (red arrow, B). Pushing the catheter against the apex of the device restored flow through the occluded vessel (yellow arrow, B). However, after withdrawing the catheter, the artery tended to reocclude (blue arrow, C). Contralateral ICA angiography (D) showed the right hypoplastic A1 segment and a slow pass of contrast through the A2 segment (green arrow). This situation led us to think about a focal problem at the neck of the aneurysm.

FIG. 4. A: Using the Contour as a supporting point, we were able to catheterize the occluded vessel. B and C: Posteriorly, a Neuroform Atlas stent was deployed from the A2 segment of the right ACA to the A1 segment of the left ACA. Angiography confirmed a well-positioned, expanded, and permeable stent (B, red arrow). D: The final angiography showed a satisfactory embolization of the aneurysm (yellow arrow) with patency of both ACAs.


**Disclosures**

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

**Author Contributions**

Conception and design: all authors. Acquisition of data: Gallo-Pineda, Hidalgo-Barranco. Analysis and interpretation of data: Gallo-Pineda, Fernández-Gómez. Drafting of the article: Gallo-Pineda, Fernández-Gómez. Critically revising the article: Gallo-Pineda, Fernández-Gómez. Reviewed submitted version of the manuscript: Gallo-Pineda, Hidalgo-Barranco. Approved the final version of the manuscript on behalf of all authors: Gallo-Pineda. Study supervision: Fernández-Gómez.

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