Usage of Stent-Assisted Coiling Technique with Atlas Stent for Middle Cerebral Artery Aneurysm with Branch Originating from Aneurysm Sac

Kamil Zeleňák1, Jana Zeleňáková2, Branislav Kolarovszki3, Ema Kantorová2, and Július Deriggo3

1Department of Radiology, Comenius University, Slovakia
2Department of Neurology, Comenius University, Slovakia
3Department of Neurosurgery, Comenius University, Slovakia

Abstract

Treatment of bifurcation intracranial aneurysms is technically challenging. Sometimes it is necessary to pass a microcatheter through the aneurysm sac to navigate the microcatheter to a branch originating from the aneurysm sac. A 56-year-old male patient was treated for an incidental middle cerebral artery aneurysm. One branch originated from the medial part of the aneurysm sac, therefore stent-assisted coiling technique with an Atlas stent was used for endovascular treatment. After placement of the stent into the M2 branch, the loop of the microcatheter located in the aneurysm sac was pulled back and the microcatheter was straightened and finally the stent was deployed carefully from the M2 segment across the aneurysm sac into the M1 segment of the left middle cerebral artery. Immediately after placement of the stent the microcatheter was positioned easily through the implanted stent by crossing technique and coiling of the intracranial aneurysm was performed in the same session. No reperfusion was found on the 12-month follow-up magnetic resonance angiogram, and no clinical problem occurred during this period.

ABBREVIATIONS

MCA: Middle Cerebral Artery; ASA: Acetylsalicylic Acid; IUs: International Units; SAC: Stent-Assisted Coiling; MRA: Magnetic Resonance Angiography; TOF: Time of Flight; ICA: Internal Carotid Artery

INTRODUCTION

Thanks to technical improvement of the material used for endovascular treatment of intracranial aneurysms, it is possible to treat technically and geometrically increasingly difficult types of intracranial aneurysms. One of the most difficult situations for endovascular treatment is a bifurcation aneurysm with the origin of one branch from the aneurysm sac. Navigation of a microcatheter to the branch originating from the medial wall of the MCA aneurysm is quite difficult. Passing through the aneurysm sac is one of the riskiest steps of the procedure. Implantation of current flexible and low-profile stents is very useful for protecting such a branch of an intracranial aneurysm.

CASE PRESENTATION

A 56-year-old male patient was treated for an incidental middle cerebral artery aneurysm. The aneurysm was diagnosed by magnetic resonance imaging after headache attack. The patient had no neurological deficit and preferred endovascular treatment of the aneurysm. One branch originated from the medial part of the aneurysm sac (Figure 1), therefore stent-assisted coiling technique with an Atlas stent was used for endovascular treatment, to keep this branch patent.

The patient used 75 mg of clopidogrel and 100 mg of ASA daily for one week. Prior to the procedure, the patient was tested for clopidogrel and acetylsalicylic acid resistance. No resistance was confirmed.

The procedure was performed under general anesthetic. A 6F introducer was placed via the right common femoral artery using the Seldinger technique. Three thousand IUs of heparin were administered to the patient intra-arterially as a bolus at the beginning of the procedure. The left common carotid artery
was catheterized using a diagnostic catheter and the introducer was changed for a long one (6F IVA ST 80 cm; BALT), which was positioned in the left common carotid artery. The guiding catheter (Envoy 6F MPD 90 cm; JNJ), which was flushed with saline, was placed in the left internal carotid artery. Nimodipine (1 mg/hour) was injected intravenously during the procedure to prevent vasospasms, as along with heparin (1000 IU/hour).

An angiogram of the left internal carotid artery confirmed a left MCA bifurcation aneurysm of irregular shape with a diameter of 8 × 7 mm and laterocaudal direction and neck diameter of 3 mm. A caudal M2 branch originated from the medial side of the aneurysm sac (Figure 2). The microcatheter (Excelsior SL-10/J; Stryker) was navigated to the caudal M2 branch of the left MCA by microguidewire (Hybrid 008.J; BALT). The microguidewire was withdrawn and a low-profile stent (Atlas 4.5 x 30 mm; Stryker) was delivered to the left MCA (Figure 3). After placement of the stent into the M2 branch, the loop of the microcatheter located in the aneurysm sac was pulled back and the microcatheter was straightened and finally the stent was deployed carefully from the M2 segment across the aneurysm sac into the M1 segment of the left middle cerebral artery. Immediately after placement of the stent the microcatheter (Excelsior SL-10/45; Stryker) was positioned easily through the implanted stent by crossing technique and coiling of the intracranial aneurysm was performed in the same session. Eight coils (Target 360 Soft; Stryker) with total lengths of 126 cm were used for coiling of the aneurysm sac (Figure 4). The hemostasis at the puncture site was achieved using a closure device (CELT ACD 6F; Vasorum). The procedure took 58 minutes. Administration of nimodipine and heparin continued in the mentioned doses for the next 24 hours. Dual antiplatelet therapy (75 mg of clopidogrel + 100 mg of ASA) was recommended for the next 3 months followed by monotherapy (100 mg of ASA) for a long time. No reperfusion was found on the 12-month follow-up MRA (Figure 5), and no clinical problem occurred during this period.

**DISCUSSION**

Usually pure endovascular coiling is only suitable for a relatively small group of MCA aneurysms. In the ISAT study this group of aneurysms was underrepresented (participating centers included a total of only between 1 and 14% of MCA aneurysms) [1]. Stent-assisted coiling technique can be used to keep the branches patent in the case of bifurcation aneurysms. Different stents and stent implantation techniques can be used, including Y-stent technique. In a silicone block model of a patient-specific asymmetric bifurcation aneurysm, kissing- and crossing-Y stenting, using closed-cell stents, showed the strongest reduction of flow velocity in the aneurysm and a redirection of the impingement flow [2]. But open-cell design stents have flow effect too [3]. According to the results of a recent meta-analysis, compared to coiling, SAC technique had advantages in terms of the angiographic occlusion rate during follow-up, the progressive thrombosis rate and a reduction in the recurrence rate [4]. The Atlas stent is a new generation of Neuroform stent, which is very flexible and can be delivered to a very tortuous vessel anatomy (Figure 3). Thanks to its low profile, the stent can be implanted via a microcatheter dedicated to coil implantation. Therefore the stent can also be implanted into the branch originating from the aneurysm sac relatively easily. The loop of the microcatheter in the aneurysm sac can be straightened after delivery of the stent to the branch, prior to the deployment of the stent, thanks to the placement of the stent to the microcatheter, because delivered stent makes distal part of the microcatheter stiffer.

Another option is deployment of the stent in two steps. Firstly, the distal part of the stent is deployed, followed by pulling back the microcatheter loop in the aneurysm sac and finally deployment of the proximal part of the stent. The open-cell structure of the stent is helpful in preventing stent migration during the microcatheter pulling back maneuver. The hybrid structure of the Atlas stent seems to be useful for crossing the stent with the microcatheter too.

Another option in the treatment of an MCA bifurcation aneurysm by endovascular technique is extrasacular flow-divertier implantation [5], or an intrasacular flow-disrupter, but longer angiographic follow-ups are needed.

**ACKNOWLEDGEMENTS**

This work was supported by the project “PACS system in
Research and Development,” ITMS code: 26210120004, co-financed from EU sources (ERDF).

REFERENCES


Cite this article