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Case Report

Stent-Assisted Coil Embolization of a Recurrent Anterior Communicating Artery Aneurysm Following Previous Wrapping: Technical Notes

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Abstract

Background: Recurrent anterior communicating artery (Acomm) aneurysms pose significant challenges in management because of their complex anatomy and the repair around the previous treatment. This case report seeks to elucidate the technical points involved in coiling for a recurrent Acomm aneurysm after failed clipping and wrapping 15 years previously.

Case Summary: An elderly male had an Acomm aneurysm wrapped after failed clipping 15years ago and presented on referral for a follow-up MRA which showed an enlargement of the aneurysm, a hypoplastic left A1, a 2.0 mm right A1, and a 1.3 mm left A2. To preserve flow to the left A2, a Neuroform Atlas stent was placed from the left A2 to the right A1 and using the jailing technique, the aneurysm was coiled. A repeat DSA on table showed a well-positioned coil mass in the aneurysm and there were no intra-procedural complications.

Discussion: Despite the small size of the left A2, we were able to successfully deploy a 3.0x20 mm stent into it, without intra- or post-procedural complications as also attested to by other authors.

Conclusion: Appropriate stent size is important in preventing some intra-procedural complications such as in-stent thrombosis. This report shows that careful case selection in situations of limitation of stent sizes can still produce excellent results.

Keywords: Recurrent Acomm Aneurysm; Stent-Assisted Coiling; Neuroform Atlas; In-Stent Thrombosis

Introduction

The endovascular management of cerebral aneurysms started in 1974 with the use of coils by Serbinenko [1]. Since that time, the endovascular route has revolutionized the management of cerebral aneurysms, as supported by findings from the International Subarachnoid Aneurysm Trial [ISAT]. It is now recommended as the first line of management even in ruptured cerebral aneurysms, as per recent guidelines in the management of intracranial aneurysms [2].

Anterior communicating artery (ACoA) aneurysms make up to 30% of all intracranial aneurysms, and their management poses significant challenges because of their complex anatomy and risk of recurrence following initial treatment [3,4]. Depending on the characteristics of the aneurysm, an endovascular approach or microsurgical clipping could be the initial treatment. When there is a recurrence, either of these methods could be used if considered favorable. In some instances of large or giant aneurysms considered unsuitable for coiling or clipping, wrapping/coating of the aneurysm has been used [1].

This case report presents a situation in which an ACoA aneurysm was scheduled for clipping; however, wrapping was performed as clipping could not be achieved. Following the aneurysm's enlargement on follow-up, endovascular treatment, using stent-assisted coiling, was pursued with a favorable outcome.

This report aims to elucidate the technical points involved in Endovascular coiling for an AcoA aneurysm after failed clipping and aneurysm wrapping.

Case Presentation

A 76-year-old male with an ACoA aneurysm had surgery in another hospital in 2009 - clipping was attempted but failed; hence wrapping was done. He was referred to our institution for a follow-up MRA, which showed an enlargement of the aneurysm.

Pre-Procedure

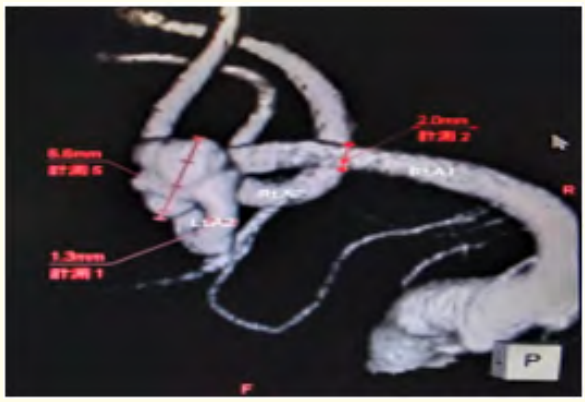

Figure 1: MRA showing cerebral aneurysm.

MRA findings: Hypoplastic Left A1, Right A1 measuring 2.0 mm, Enlargement of the ACoA complex measuring 6.6 mm, and Left A2 measuring 1.3 mm.

To preserve flow to the left A2, we planned for a stent-assisted coiling, with stent placement from the left A2 to the right A1. See the images below.

Procedure

After informed consent was obtained, he was prepped for the procedure under GA. The right femoral artery was punctured using a single-wall needle under real-time ultrasound guidance. An 8Fr 25cm sheath was inserted. A coaxial assembly comprising an 8Fr Optimo, 90 cm balloon guiding catheter (Tokay Medical Systems), and glide wire was introduced through the femoral sheath to select the distal right cervical ICA segment. ACT was measured and periodically monitored during the procedure. Intravenous heparin was administered.

A 3D reconstruction angiography was performed to delineate the anterior communicating aneurysm better and used to obtain working projections for the aneurysm treatment.

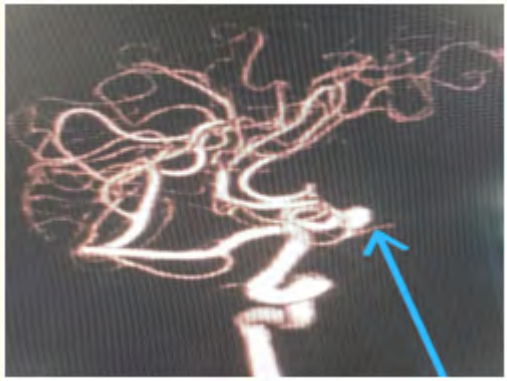

Figure 2: Pre-treatment 3D imaging.

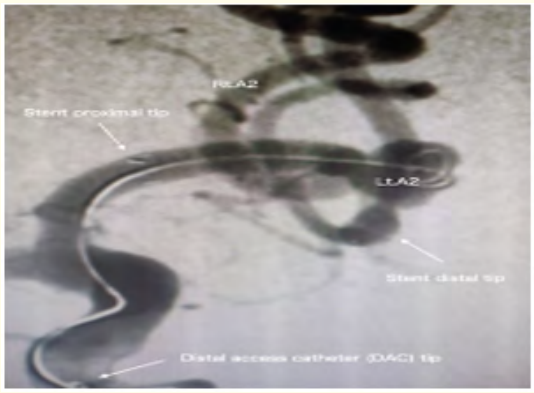

Figure 3: Digital subtraction angiography (DSA) at start of coiling.

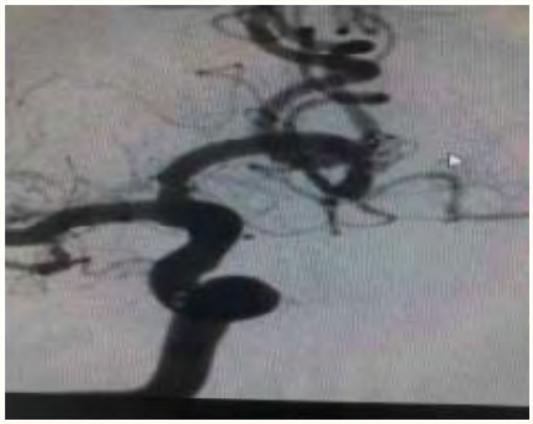

Figure 4: DSA at end of coiling.

A co-axial assembly of AXS Vecta 71, 125cm distal access catheter was gently advanced and navigated to the right cavernous ICA segment under roadmap guidance. Next, two separate SL-10 straight microcatheters were telescoped through the intermediate catheter, one into the left A2 for the stent and the other into the aneurysm dome for the coils.

Next, Neuroform Atlas 3.0 mm x 20 mm was introduced and deployed across the neck of the aneurysm, extending from the left A2 to the right A1 segment. The stent was carefully deployed under fluoroscopic guidance, jailing the SL-10 catheter in the aneurysm. After deployment, a repeat angiogram demonstrated adequate opening of the stent and maintained antegrade perfusion through the A2 segments.

At this point, we proceeded to coil the aneurysm through the SL-10 microcatheter, which was stably positioned within the aneurysm using a Target XL 360 soft 4 mm x 8mm, Target 360 ULTRA 3.5 mm x 8 mm, and Avenir 2 mm x 3 mm. These were deployed in sequence under continuous fluoroscopic guidance (Figure 3).

A final angiogram showed a well-positioned coil mass in the aneurysm, appropriate position, and expansion of the stent, with antegrade flow through the A1 and bilateral A2 segments without narrowing. (Figure 4). The catheters were withdrawn, and hemostasis was secured to the groin with a closure device. The procedure was well tolerated. No intra-procedural complications were noted.

A standard institutional antiplatelet regimen was followed.

Outcome

No post-procedural thromboembolic complications were encountered. And the patient has remained stable post-procedure. A post-treatment MRA done before discharge (as per institutional protocol), showed a reduction in aneurysm size (Figure 5). He is scheduled to have a 6-month post-procedure MRA; this will be followed by a yearly MRA for the next 5 years to monitor aneurysm size post-treatment.

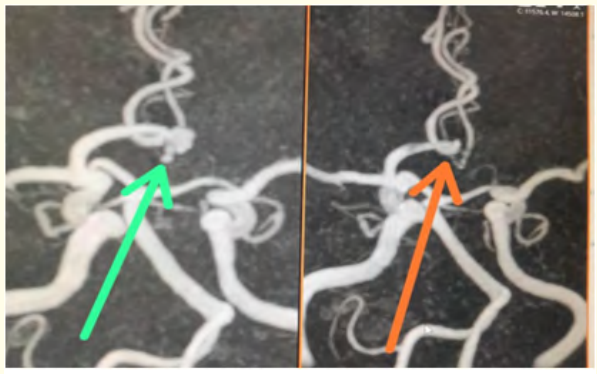

Figure 5: Pre-treatment MRI showing aneurysm (green arrow) and post-treatment MRI (orange arrow).

Discussion

Anterior Communicating Artery (ACoA) aneurysms are the most common intracranial aneurysms based on location. Their management can be technically challenging due to frequent variations in the anatomy of the Anterior Cerebral Artery/ACoA complex, variations in the geometry of the aneurysm itself, and the presence of critical perforators, e.g., the recurrent artery of Heubner [4].

Management options have expanded due to the advent of stent-assisted coiling, flow diverters, and newer devices such as Intra-saccular flow disruption devices, e.g., WEB (woven endo-bridge). However, deciding what treatment option to choose depends on many factors. Patient factors include age, associated co-morbidities, and neurologic conditions. Aneurysm-related factors that must be considered, especially in ACoA aneurysms, include the size of the aneurysm, the size of the neck (including dome-to-neck ratio), the morphology of the aneurysm sac and where its dome is projecting [1,5,6].

Previously, complex aneurysms such as those with no defined necks and with associated parent vessel pathology such as an atherosclerotic artery were considered not suitable for endovascular management or surgical clipping, and so were either wrapped surgically, or trapped and a bypass done [7-9], as was done in this index case. This case had no defined neck; the whole ACoA was enlarged, and the left A1 was hypoplastic. This may have necessitated the surgical wrapping done at the referral hospital. Other reasons for wrapping (or coating) an aneurysm include when many perforators are present, making it unsafe to clip, when the vessel wall is thin and frail, and sometimes to reinforce a clipping that was not perfectly done [10]. Dott's first successful aneurysm wrap was done in 1933, where he performed a muscle wrap of the Middle Cerebral Artery aneurysm.

Deciding on the mode of management in this case was not straightforward. Repeat surgery aimed at clipping was not considered due to the scarring expected following the wrapping many years ago. This is because one of the mechanisms of action of wrapping is by inducing inflammation and eventual scar formation [9]. Therefore in this case, the endovascular route was chosen for stent-assisted coiling. However, the parent vessels were relatively small (right A1 2.0 mm, left A2 1.3 mm). The stents available for stent-assisted coiling are approved for vessels 2.5 mm or more in diameter, e.g., Enterprise (Cerenovus) and Neuroform (Stryker) [11]. When stents are used in small parent arteries, there is the risk of parent artery occlusion or in-stent thrombus formation. Also, these stents are delivered through 0.021 or 0.027-inch microcatheters, which are too large to deliver in small vessels measuring <2 mm in diameter [11,12]. Some studies have shown that it is possible to still deploy these stents in smaller diameter vessels, with the presumable risk of in-stent thrombosis or parent artery occlusion [13,14]. The study by Turk., *et al*. used the Neuroform stent in vessels as small as 1.1mm in diameter. However, newer stents are being produced now that can be deployed through 0.0165 or 0.017-inch microcatheters. These include the Neuroform Atlas (Stryker), the Leo Baby stent, and the LVIS Jr [12,14-16]. In Japan, the Neuroform Atlas, LVIS (Terumo), and Enterprise (Cerenovus) were the stents approved for stent-assisted coiling at the time of this patient's management. The Neuroform Atlas was chosen as the smallest size available at that time. No intra-procedural complications were noted in this case; however, other studies have reported increased intra-procedural in-stent thrombosis [13,14,16]. The same studies also report that these thrombotic events were promptly treated with antithrombotic/thrombolytic agents, e.g., abciximab and intra-arterial tirofiban.

Conclusion

This case report reminds us that every patient and every aneurysm should be managed on a case-by-case basis. We reported this case based on the small size of vessel that needed the stent compared to the available stent size. This may be helpful in low-resource settings if the newer stents are not available, one may be able to accomplish the same result with these stents that are deployed through 0.021 inch microcatheters. However careful case selection must be followed to prevent or minimize post-procedural complications.

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