ISSN 1220-8841 (Print)
ISSN 2344-4959 (Online)

ROMANIAN
NEUROSURGERY

Vol. XXXVIII | No. 4 December 2024

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DOI: 10.33962/roneuro-2024-161

Romanian Neurosurgery (2024) XXXVIII (4): pp. 378-381
DOI: 10.33962/roneuro-2024-161
www.journals.lapub.co.uk/index.php/roneurosurgery

Stent assisted coil embolization for post-surgical ruptured recurrence of anterior communicating aneurysm

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ABSTRACT

Cerebral aneurysm recurrences after previous surgical clipping are associated with an important risk of growth and rupture. These lesions can be difficult to manage by either a classical microsurgical approach or endosaccular coiling. The advanced endovascular technique can be considered as a treatment option for these recurred aneurysms. Aneurysm coil occlusion and endoluminal parent vessel reconstruction with intracranial stent may be an ideal method for treating these recurrences by avoiding reoperative surgery or intraprocedural aneurysm rupture with aneurysm access. Stent-assisted coil embolization can be a safe and efficacious treatment approach for recurrent ACom region aneurysms after previously surgical clipping.

Keywords
post-surgical aneurysm recurrence, stent assisted coiling technique

INTRODUCTION

The anterior communicating complex is the most prevalent site for aneurysm formation, comprising up to 25-40% [2,5,7] of all intracranial aneurysms. Due to the arterial anatomy and hemodynamic flow patterns, the anterior communicating artery (ACoA) aneurysms display a higher rate of rupture in comparison to other sites, thus being responsible for debilitating conditions and increased mortality. Even though surgical clipping aims to achieve complete obliteration of the aneurysm sac and neck, aneurysm remnant or recurrence have been reported in literature. To prevent severe neurological deficits and potentially fatal consequences of a new bleeding episode, neuroimaging follow-ups and prompt re-treatment are crucial. Endovascular therapies have proved to be an efficacious method of choice in such cases considering the scar adhesions after surgical clipping and the important structures surrounding the anterior communicating complex [1.3.4].

In this paper, we present a clinical situation of a ruptured recurrence of ACoA aneurysm which required embolization after initially surgically clipped. Post-surgical aneurysms evolution associated with morphological complications, evaluation and management of residual and recurrent intracranial aneurysms are discussed.

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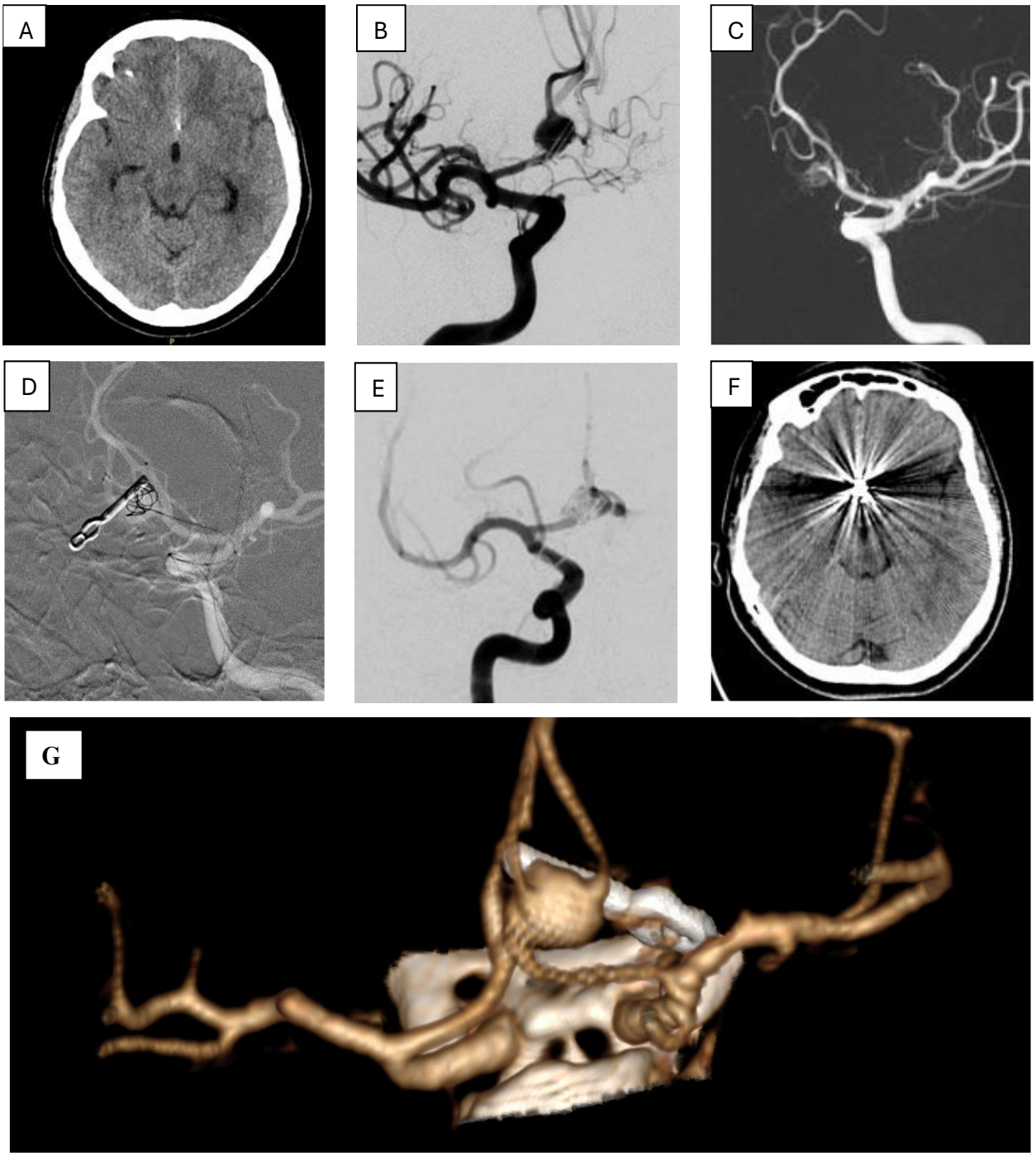
ISSN online 2344-4959
© Romanian Society of Neurosurgery

First published
December 2024 by
London Academic Publishing
www.lapub.co.uk

CASE REPORT

A 37-year-old woman was admitted to our hospital due to frontoparietal headache, nausea, diplopia, generalized tonico-clonic seizures and right hemiparesis. The patient had a history of microsurgical clipping for an ACoA aneurysm 13 years before, arterial hypertension with regular treatment and depressive syndrome.



Figures. A – Diagnostic CT scan showing a mild subarachnoid hemorrhage; **B** – Right ICA DSA that exposes an ACoA aneurysm, a clip on the top of the aneurysm dome and a triplicate A2 segments; **C** – Left ICA negative DSA which highlights the anatomical separation of the left A1 and A2 segments fromthe aneurysm; **D** –Intraprocedural left ICA negative DSA with right A1-A2 stent, microcatheter in the middle A2 segment originating from the aneurysm and a microcatheter in the aneurysm sac for coil insertin; **E** – Right ICA DSA showing the complete angiographic occlusion of the aneurysm; **F** – Post interventional CT scan. **G** – 3D Angio-CT showing the relation of the aneurysm and trefurcatian A2.

Native cerebral CT showed a mild subarachnoid hemorrhage in the interhemispheric fissure and basal cisterns. Computed tomographic (CT) angiography with three-dimensional reconstruction depicted a recurrent, dysplastic ACoA aneurysm associated with A2 segment trifurcation and metallic clip at the distal end of the dome from the previous surgery. The three arterial branches arose from the aneurysmal neck which had a large diameter of 6 mm. No magnetic resonance imaging (MRI) was performed, because its compatibility with the surgical clip was unknown.

Subtraction catheter cerebral angiography confirmed the diagnosis: ruptured ACoA aneurysm associated with triplicate A2 segments. Due to the ACA anatomical variant and the complex aneurysm morphology which involved bilateral A2 segments and the possible complications of a new craniotomy, endovascular treatment under general anesthesia was decided.

Prior to induction of general anesthesia with orotracheal intubation, the patient was administered a antiplatelet therapy with Aspenter 150mg. The approach was performed through the right femoral access route with a 6F introduction sheath. 5000 IU heparin was injected intravenously immediately after sheath placement. A 6F Envoy guiding catheter (Codman - Johnson & Johnson) was first placed in the right internal carotid artery and multiple digital subtraction angiography (DSA) series were obtained in different degrees of obliquity for the clear exposure of the aneurysm neck and dome. After the three-dimensional reconstruction of the DSA data, the best projection degree showed the aneurysm sac and its neck. Under road-mapping guidance, a Prowler Select Plus Microcatheter (Codman) was advanced over a 0.014 Transend micro-guidewire (Stryker Neurovascular) into the right A2 segment. The first Enterprise 2 (Cerenovus, J&J) stent was deployed at the proper position between the right distal A1 segment and the proximal right A2 segment. Subsequently, the guiding catheter was rerouted in the left internal carotid artery. Two straight Excelsior SL-10 microcatheter were navigated concurrently into the left A2 segment and the aneurysm sac. First, three 0.012" GALAXY G3™ XSFT coils (Cerenovus, J&J) were detached into the aneurysm sac with complete angiographic occlusion. This was immediately followed by a detachment of a Neuroform Atlas stent (Striker) between proximal left A2 segment and distal left A1 segment. Serial DSAs were performed to monitor the occlusion of the aneurysm and to verify the patency of the arterial branches. The microcatheters were gently removed, followed by the guiding catheter and the femoral sheath. Homeostasis of the femoral artery was obtained via prolonged compression. The patient was awakened from general anesthesia and admitted to the neuro-intensive care unit. The next day, the CT control revealed successful endovascular treatment without any other pathological aspects.

Postoperatively, the patient was prescribed dual antiplatelet therapy for 6 months, followed by mono antiplatelet therapy.

Discussions

Exclusion from cerebral circulation by microsurgical clipping of intracranial aneurysms was and may still be considered the standard of care for these vascular lesions. However, residual, recurrent or de-novo aneurysms after this therapeutic technique have been reported in literature series from 1.5 to 8% of patients by postoperative cerebral angiography at various time intervals. The main mechanisms mentioned in the literature for residual or recurrent aneurysms after micro surgical clipping intervention were represented by incomplete clipping due to technical or anatomical difficulties in clip positioning, postoperative aneurysm clips slippage and aneurysm regrowth from residual parts of the lesion[5,8.9].

Even if International subarachnoid aneurysm trials (ISAT) reported zero risks of rebleeding at one year and 2.2% at ten years interval after aneurysm clipping, the percentages are different in the case of incomplete clipping where the risk of rebleeding is estimated to be in the range of 0.8 to 1.8% per year[3,7]. Also, a history of multiple aneurysms was associated with de-novo aneurysm formation on the same arterial segment with the initial clipped aneurysm.

Therapeutic management of recurrent or remnant aneurysms can be especially challenging from both a microsurgical and endovascular perspective. Even if microsurgical clipping re-intervention of aneurysms was considered a viable solution for these clinical situations, technical difficulties represented by scar and adhesions to the implant or to the area of aneurysmal repermeabilization may preclude the positioning of

a new clip by the initial one. Today, technological advancements in the neurointervention field made the endovascular treatment be considered the first option for recurrent or remnant aneurysms. This approach has also remarkably reduced the occurence of seizures, wound healing complications and postoperative pain.

Starting from the previously mentioned aspects and a continuous development of endovascular techniques for occlusion of complex intracranial aneurysms, it was a natural way that endovascular coil embolization became the alternative treatment modality for remnant or recurrent aneurysms. After Fraser et al. reported the results of coil embolization in cases of incompletely clipped aneurysms for the first time in 1994, many subsequent studies have presented the advantages of this technique[2,6,10].

In this article, we demonstrate the successfully use of endovascular technique in the management of recurrent ACom region aneurysms after surgical clipping. Even if endovascular techniques can be considered an ideal means of treatment under these circumstances, a series of inconveniences have been reported, especially for the aneurysms of the anterior communicating complex. Firstly, fluoroscopic visualization of the aneurysm neck related to the origin of the adjacent vessels can be quite difficult because the clip lies across them. Secondly, the neck of the aneurysm crossed by the clip is much more rigid and thus, during the placement of the coil, it may push the coils back with a possible obstruction of the origins of the adjacent vessels. Moreover, the shape of residual aneurysms is frequently complex with a shallow depth, making coil stabilization challenging or even impossible. Providing a reconstructive technique such as stent-assisted coiling rather than simple coiling might improve the stability and durability of the treatment. The stents intended for stent-assisted coiling have a certain flow-diversion effect which allows for parent vessel reconstruction.

Conclusions

After surgical clipping, remnant growth or recurrence of the aneurysm can occur due to a hemodynamic change over the years at the clip site. Follow-up imaging for a long period of time is essential for all patients that underwent surgical clipping. In our experience, endovascular treatment is a good strategy for residual or recurrent aneurysms, but careful evaluation for each particular case is required.

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