

Case Reports & Case Series

Recanalization and rupture of a brain aneurysm completely occluded with a LEO stent nine years ago

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ARTICLE INFO

Keywords:

Brain fusiform aneurysm
Flow diverter
Recanalization

ABSTRACT

We describe what is to our knowledge the first case of aneurysm regrowth and rupture after the nine years, of a complete occlusion of an aneurysm of the left middle cerebral treated of Leo Plus Stent.

1. Introduction

In this case report, we describe what is to our knowledge, the first case of aneurysm regrowth and rupture nine years after complete occlusion of an aneurysm of the left middle cerebral artery treated with a LEO stent.

Is a 52-year-old man was referred to our hospital for a partially thrombosed fusiform large aneurysm of the sphenoidal segment (M1) of the left middle cerebral artery

(MCA). The aneurysm was diagnosed after the patient had undergone magnetic resonance imaging (MRI) at another institution because of acute-onset aphasia and right hemiparesis. The patient's medical and family history was unremarkable, except that he smoked two packet of cigarettes per day. MRI examination revealed a partially thrombosed left MCA aneurysm and a subacute infarction in the left MCA territory (lenticulostriate branches). A digital subtraction angiography (DSA) was performed which showed presence of a large fusiform aneurysm (1.7 × 1.5 × 1.4 cm) that extended over the M1 segment of the left MCA (Fig. 1A).

The patient gave his informed consent. Ethics approval was not required for these case reports. The patient was pre-treated for three days with aspirin 325 mgr/day and plavix 75 mgr/day. A Leo stent 3,5 X 25 mm (Balt extrusion, Montmorency, France)

was deployed easily in M1 over the neck of the aneurysm in a satisfactory position (Fig. 1B). The patient was maintained on daily aspirin (200mgrs) and clopidogrel (75 mg) for 3 months after stenting, after which the patient switched to a single antiplatelet agent (aspirin

100 mg) daily.

The patient was discharged from hospital 7 days after treatment with no neurological deficit. A 6-month follow-up angiogram revealed almost complete occlusion of the aneurysm and patency of the left MCA (Fig. 2A). 1-year follow-up angiogram confirmed complete thrombosis of the fusiform aneurysm with preservation of parent vessel patency (Fig. 2B).

The subsequent angiographic and MRI follow-ups at 2, 4 and 6 years (Fig. 3A, 3B, 3C) showed complete occlusion of the aneurysm. The patient continues with his normal life, without performing any further clinical or radiological control. Despite counseling, the patient continued to smoke during the follow-up period.

At 9 year after treatment, the patient presented with intense headache. TOF-MRA revealed recanalization and growth of the aneurysm with perilesional edema (Fig. 4A, 4B). Diffusion weighted imaging did not show any ischemic lesion. Thus it was planned to treat the aneurysm with a flow diverter device inside the stent. At 24 h the aneurysm ruptured and the patient died fatally.

2. Discuss

Leo stent (Balt Extrusion, Montmorency, France) is self-expanding closed-cell stents produced by braiding individual strands of nitinol onto a mandrel. Leo stents have a relatively small pore size (cell size of approximately 0.9 mm) that gives a higher metal coverage ratio compared with other self-expandable stents, allowing a certain grade of flow-diverting hemodynamic effect similar to those provided by

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<https://doi.org/10.1016/j.inat.2021.101231>

Received 18 January 2021; Received in revised form 9 March 2021; Accepted 18 April 2021

Available online 25 April 2021

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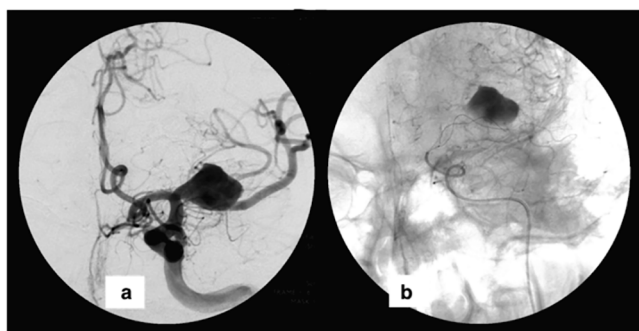


Fig. 1. (A) AP angiogram demonstrating a large 20 mm × 24 mm × 22 mm (width × depth × height) left M1 aneurysm. (B) AP Procedural angiogram showing a Leo stent (3.5 mm × 25 mm) place, with good aneurysm neck coverage.

conventional flow-diverter devices, both on the aneurysm and covered side branches and perforators [1].

Leo stents have been successfully used as stent monotherapy, especially for distal and complex small aneurysms. The first experience of flow-diverter treatment with Leostents monotherapy was described by Pumar et al [2], reporting 75% complete occlusion after treatment of 20 intracranial fusiform aneurysms. Aydin et al [3] and Canazzo et al [4] reported 73% and 70% complete occlusion respectively. In none of these series was recanalization evident in the follow-ups at one year.

Endovascular therapy is now the first-line treatment for the majority of cases of cerebral aneurysms. However, rates of aneurysm

recanalization vary over a wide range from 17% to 90%. depending on various factors including treatment-related factors, initial [5,6] incomplete occlusion, stent-assisted coiling, and utilization of flow diversion devices that have been demonstrated to impact on aneurysm recanalization rates. Given the risk of recanalization, assessment of aneurysm recurrence is critical following endovascular treatment.

Compared with traditional embolization techniques, flow diverters have proved to be at least as safe, and provide adequate and stable occlusion in the long term [7,8].

Occlusion rates of > 85%–90% at 6–12 months after PED placement have been reported in major series in the literature with low retreatment rates [7,8]. According to our knowledge no study in the literature has reported growth of an aneurysm after on-label PED use alone. Lang et al [9] report of recurrence rapid regrowth at nine months, of a supraclinoid blister aneurysm, after a 6-months angiogram demonstrating complete occlusion after successful treatment with two flow diverting pipeline embolization devices (PED) deployed in a telescoping fashion. Chen et al [10], report aneurysm regrowth at 10 months, treated with two overlapping PED, after treatment with two overlapping PED, the initial follow-up angiography, at 4 months, showed near-complete occlusion. Trivelato et al [11], report recanalization at 9 months of an aneurysm totally occluded on the control angiography at 6 months, after treatment treated with a PED and coils. Zhan et al [12], report a rare case of recurrence, at 2 year angiographic follow-up, of a large intracavernous aneurysm after angiography proved complete occlusion at 6 months, treated by a combination of a Tubridge flow diverter and coils, and balloon angioplasty.

In our case, we believe that hemodynamic stress of unknown origin

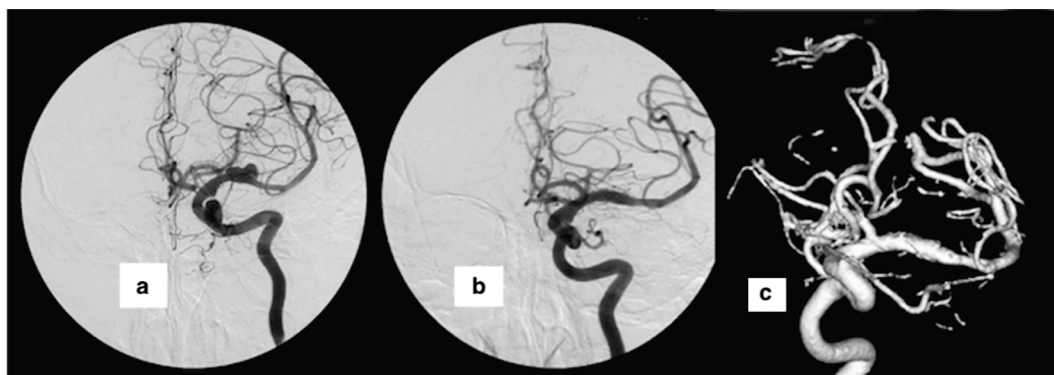


Fig. 2. (A) 6-month follow-up AP angiogram showing decrease in the size of the aneurysm. (B) 1-year follow-up AP angiogram and 3D angiogram (C) confirmed complete thrombosis of the fusiform aneurysm with preservation of patency of the parent vessel.

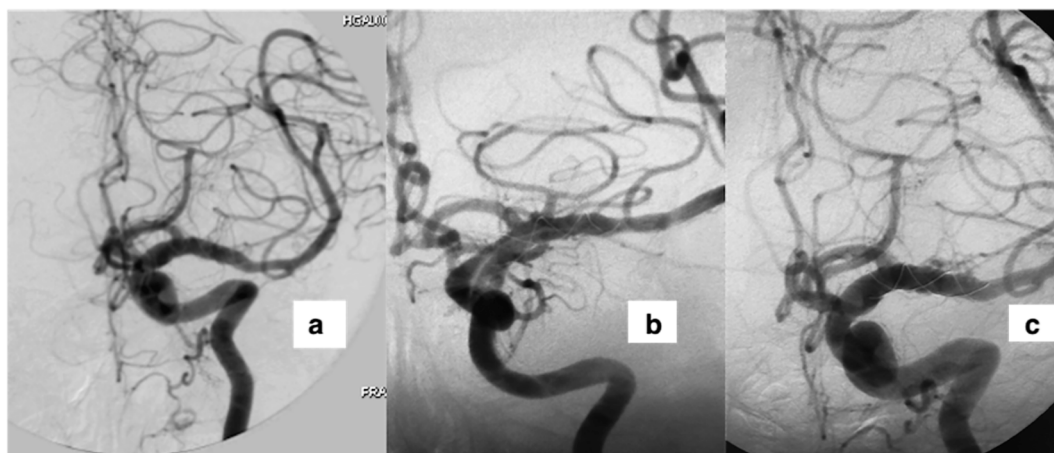


Fig. 3. 2-year follow-up AP angiogram (A), 4-year follow-up AP angiogram (B), 6-year follow-up AP angiogram (C) showed a complete occlusion of the aneurysm.

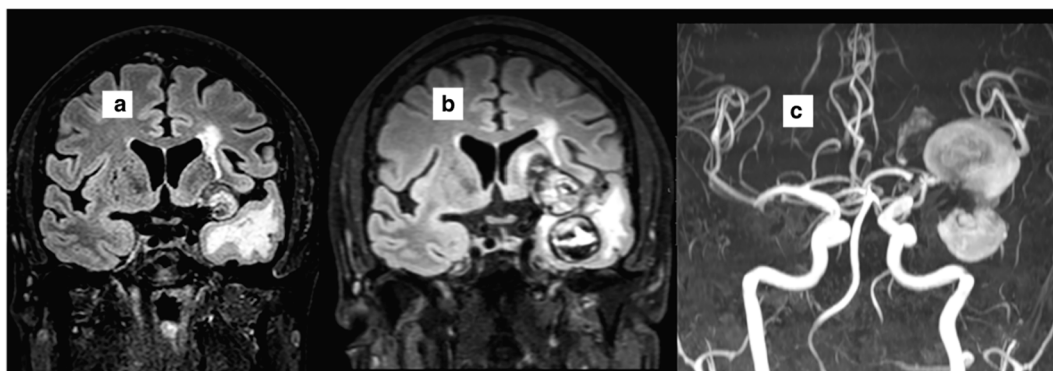


Fig. 4. (A, B, C) At nine years TOF-MRA revealed recanalization and growth of the aneurysm with perilesional edema.

at the lesion site, could have played a key role in the morphological changes

The mechanism of recanalization is poorly understood. The organization and liquefaction of the thrombus and subsequent intrathrombotic dissection by blood flow could be one possible explanation. Collagen replacement of the fibrin matrix, the potential for angiogenesis and the generation of microvessels that may cause recanalization exists. Another mechanism that could explain the recurrent filling could be the demands of the perforators create inflow into the aneurysm through small neointimal defects. Nevertheless, a lenticulostriate artery arising from the M1 aneurysm was not identified. In our case, we believe that hemodynamic stress of unknown origin at the lesion site, could have played a key role in the morphological changes

The patient smoked, throughout the follow-up, two packet of cigarettes per day. Smoking is a known risk factor of aneurysm development and may be associated with aneurysm regrowth following endovascular embolization. Smoking may preclude vessel remodeling and aneurysm sac clotting in the setting of flow diversion through its effects on vascular flow and collagen synthesis. In our case given the rarity of aneurysm regrowth after flow diversion, its risk factors may be difficult to identify.

In general, there is no universally agreed upon timetable for imaging and clinical follow-up of treated aneurysms. We performed a typical follow-up regimen, imaging study at 3 to 6 months followed by a second study at 12 to 24 months, and again at 3- years concluding 5-years posttreatment, because data examining aneurysm recurrence beyond the 5-year mark were scarce.

In conclusion, although majority of recurrences occur within the first year after treatment, the recanalization at 9-year after complete occlusion of our case suggests that longer follow-up should be considered in certain types of high-risk aneurysms.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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