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Case report

Non-visualizable stent-occlusion after treatment of a fusiform PCA-aneurysm–a case report☆,☆☆

Michael Städt, MD, Markus Holtmannspötter, MD, Florian Eff, MD, Heinz Voit-Höhne, MD*

Institute of Radiology und Neuroradiology, Paracelsus Medical University, Nuremberg South Hospital, Germany

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ABSTRACT

We report the case of a 17-year-old woman with extensive subarachnoidal hemorrhage due to a ruptured fusiform aneurysm of the right PCA (posterior cerebral artery). Endovascular treatment was successfully performed using a LVIS-EVO-Stent (Microvention Incorporation, Tustin, USA) as well as several coils. Short-term angiographic follow-up demonstrated extensive aneurysm progression and dilatation of the coil package, the stent could no longer be visualized and was not passable. Despite excellent distal vascular perfusion, a non-visible stent occlusion was suspected and subsequent occlusion of the patent artery was performed. We conclude that rapid progression of fusiform aneurysms after stent-assisted coiling may lead to expansion of the coil packages and non-assessability of the stent. Even with excellent distal perfusion, a stent-occlusion should be suspected in these cases. Therefore, we suggest short-term angiographic follow-up, especially after deploying multiple coil packages in fusiform aneurysms.

Introduction

The endovascular approach to fusiform aneurysms is nowadays widely accepted, especially in cases of acute rupture [1–3]. Treatment options include advanced deployment techniques such as the stent-assisted coiling. In this procedure, a microcatheter tip is placed in the aneurysm and a stent is deployed over the aneurysm. Afterwards, coil packages are delivered through the microcatheter to occlude the aneurysm. This method has shown high occlusion rates, since it provides significant scaffolding and can minimize the risk of parent artery occlusion [4,5,6,7]. In addition, the risk of coil prolapse into the main vessel is kept to a minimum. Though this technique is mainly used for aneurysms with a neck, that is saccular aneurysms, it can also be applied in fusiform aneurysms [2,9,8]. Common complications include stent migration and perforation as well as dissection and thromboembolic events [6]. We add a novel technical complication of an invisible stent occlusion due to closely packed coil packages in a fusiform aneurysm.

☆ Competing interest: None

☆☆ The authors declare that the manuscript has not been previously published. The case report was written in accordance with the ethical standards laid down in the 1964 declaration of Helsinki and its later amendments.

* Corresponding author.
E-mail address: michael.staedt@klinikum-nuernberg.de (M. Städt).

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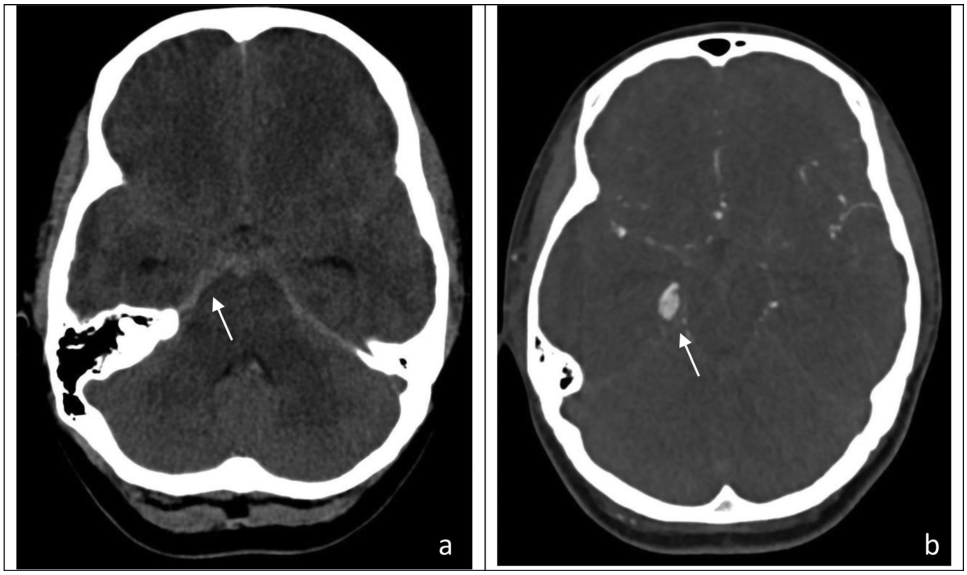

Fig. 1 – Initial CT-diagnostics. Axial NECT (A) and CTA (B) slices. NECT reveals hyperdensities in the basal cisterns in keeping with SAB. CTA demonstrates a large fusiform aneurysm of the right PCA.

Case report

A 17-year-old-female, previously healthy patient was found soporific and transferred to the emergency department of our hospital. NECT revealed extensive subarachnoidal hemorrhage in the basal cisterns and the parietooccipital sulci as well as incipient hydrocephalus. Subsequent CTA revealed a large, fusiform aneurysm (1,2 × 1,2 × 2 cm) of the right posterior cerebral artery in the P1/2-segment (Fig. 1). The patient was intubated, external liquor drainage was performed, and emergency endovascular treatment was initiated.

After right femoral arterial puncture, an 8-French (F)-Neuronmax-catheter and a 5F-vertebral-catheter were inserted via a guidewire and a 9-French-sheath. After probing the left vertebral artery, the Neuronmax-catheter and a 6F-Sofia-catheter were advanced to the atlas loop; 3D-rotational-angiography was performed. Although the aneurysm was distal and large, primary endovascular occlusion of the main artery was discarded due to the patient's age. Instead, a Headway-17-microcatheter and a portal-wire were inserted and the P3/4 segment was carefully probed. An Echelon-10-microcatheter was placed in the aneurysmal lumen. Stent-assisted coiling was then performed: in retraction of the Headway-17-catheter, the LVIS-EVO (3 × 32) stent was released and 20 non-coated coils were delivered into the aneurysmal lumen.

The aneurysm was completely occluded in the final control and the patent artery showed antegrade perfusion (Fig. 2). Follow-up CT scans revealed an ischemic demarcation in the right parietal lobe, probably of thromboembolic origin.

A ventriculoperitoneal shunt had to be placed due to persistent hydrocephalus, but the patient showed no major neurological deficits in the further clinical course. An angiographic follow-up was performed 9 days after the initial treatment and demonstrated a completely occluded aneurysm with antegrade perfused stent.

Given the unusual aneurysm configuration and localization, angiographic follow-up was advanced to 3 months, rather than 6 months as is our routine practice. Surprisingly, a progression of the aneurysm with extensive dilatation of the coil package was revealed (Fig. 3).

This necessitated rapid retreatment. The PCA should still be preserved, therefore the placement of a flow diverter through the stent was planned. Again, access via the right groin was chosen; this time, after placement of an 8 -F-Neuronmax-sheath in the distal left vertebral artery, a 5F-Sofia-catheter was advanced. Despite the use of multiple wires and microcatheters including a Sceptor-balloon and exhaustion of all technical possibilities, the aneurysm could not be passed. Due to the densely packed coils, the stent could not be adequately visualized in multiple planes and even in 3D-rotational views (Fig. 4).

Thus, a nonvisible stent occlusion had to be suspected. Since angiography showed excellent collateralization of the vessel territory mainly through the posterior choroidal artery, the patent artery proximal to the aneurysm was now sacrificed and occluded with a total of 6 coils. Subsequent CT scans showed no signs of ischemia, and the patient was clinically symptom-free.

The patient could be discharged in symptom-free condition nine days later, follow-up imaging at intervals was agreed upon.

Discussion

Fusiform aneurysms derive from various, complex entities and their treatment is usually challenging. They are very of-

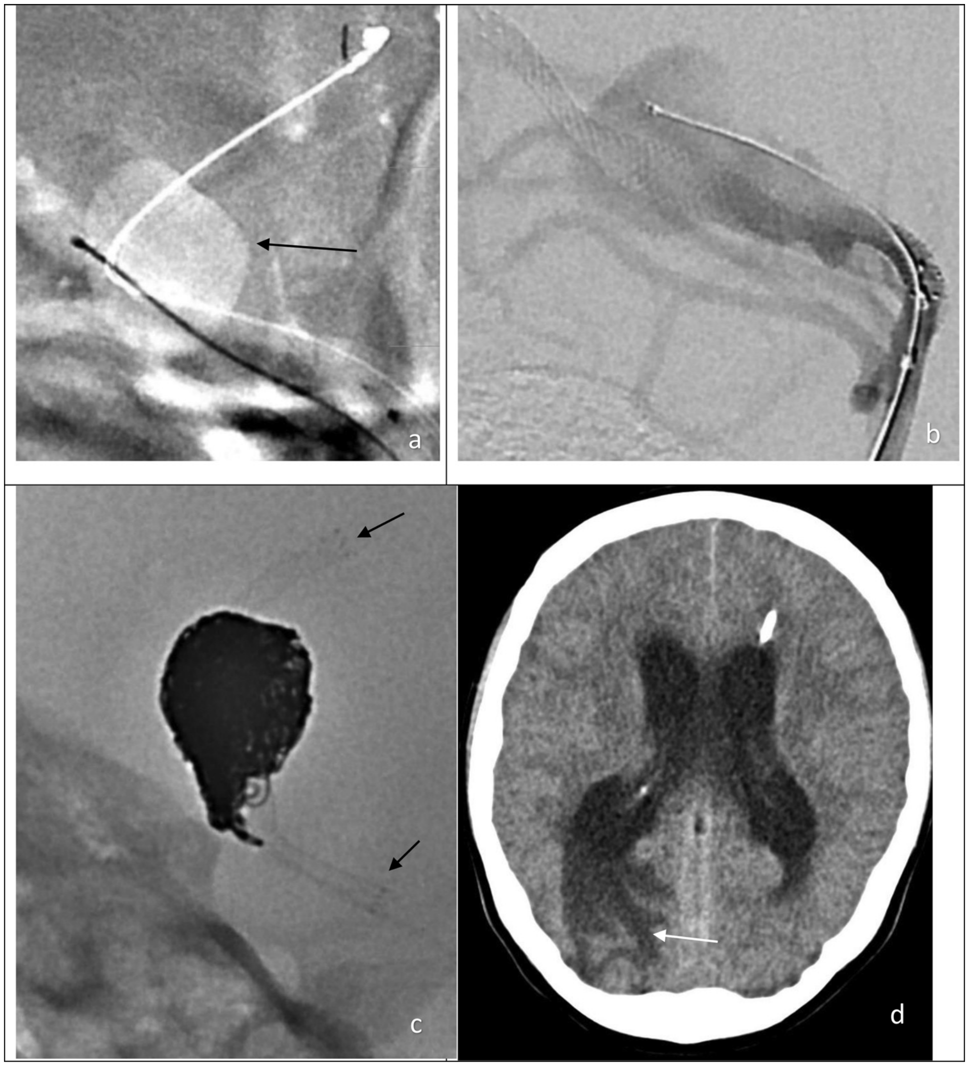

Fig. 2 – Initial endovascular treatment. DSA imaging during endovascular treatment (A–C), postinterventional CT (D). The tip of the microcatheters were placed both distally and within the opacified aneurysm (black arrow, a). The stent was placed over the aneurysm while the other microcatheter was kept inside the aneurysm (image B). Multiple Coils were detached in the aneurysm and the microcatheter was pulled. The stent is clearly visible (black arrows, image C). Postinterventional NECT shows an area of ischemic infarction in the posterior territory on the right side (white arrow).

ten not amenable to surgery and the overall complication rate is significantly increased [9]. But recent innovations in endovascular treatment such as the flow-diverter provide new, solid options with fewer risks. However, this is only the second choice for acute ruptures because immediate aneurysm closure is rarely possible and the complication rate is increased [10]. That is why stent-assisted coiling was the treatment of choice in our case.

The technique of stent assisted coil jailing in a ruptures fusiform aneurysm was firstly published in 1999 by Higashida et al [11]. It is nowadays particularly applied for the treatment of small intracranial aneurysms but studies have shown successful treatment and long-term outcomes of fusiform aneurysms [2,9,12] as in our case.

We used the relatively new LVIS-EVO stent on the market. This stent not only has some properties of a flow-diverter but is also highly visible under fluoroscopy. In addition, it covers a high surface area with a low porosity. Therefore, we decided to use this stent in our patient in the acute phase, especially since studies have demonstrated good occlusion rates with a low risk of complications. [8,13,14].

Due to the fusiform configuration and the young age of the patient, we brought forward the control from 6 months to 3 months - and fortunately were able to detect the aneurysm progression early. To our knowledge, there are still no guidelines when an angiographic follow-up control is necessary. However, we strongly advocate short-term controls for fusiform aneurysms due to the complex treatment process [2,9,15].

In the re-treatment, the stent could not be passed despite exhaustion of all technical possibilities and was not sufficiently visible despite multiple projections and 3D rotations.

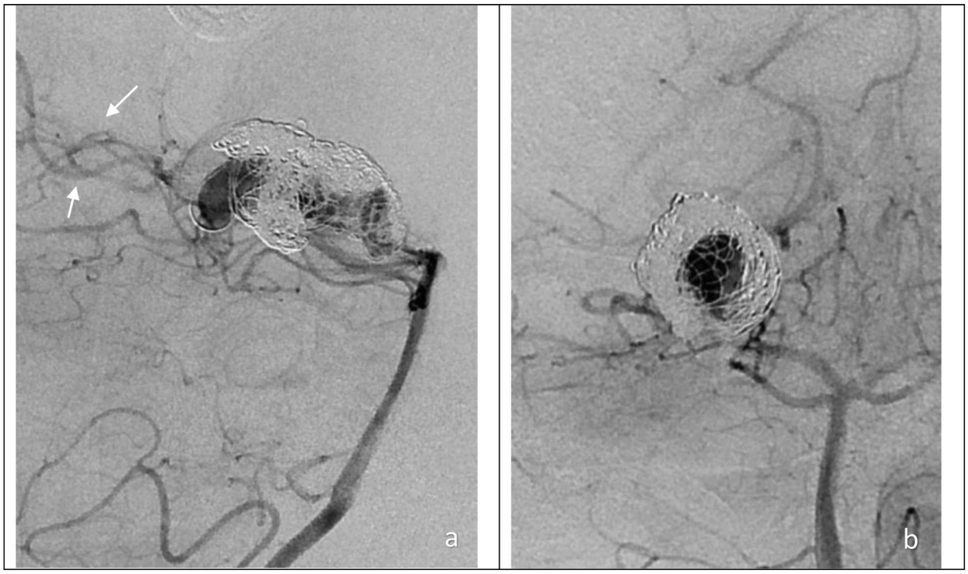

Fig. 3 – Short term angiographic control three months after treatment. DSA follow-up images. Angiography (A,B) reveals progression of the aneurysm with extensive dilatation of the coil packages. Therefore the stent is not clearly visible, but distal vascular branches can be visualized (white arrow).

We assume that dilatation of the coil packs obscured the stent and prevented more accurate assessment. Ultimately, a stent occlusion that could not be visualized on angiography had to be suspected. Differentially, a progression of the aneurysm due to inflammation could not be completely excluded, but was very unlikely [16]. To the best of our knowledge, this is a novel technical complication not previously described in the literature.

It poses additional challenges for the interventionalist, since the possibility of stent occlusion and modification of the treatment plan has to be considered. In addition, the technical difficulty of the intervention and its risk profile changes. In the case of our patient, the only treatment possibility consisted of coil embolization of the parent artery. Fortunately, an excellent collateral supply remained and the patient was symptom-free after the intervention.

Conclusion

Although fusiform aneurysms can be treated adequately with the “jailing-technique”, it should be considered that the lumen of the aneurysm may potentially no longer be visually assessable. In such cases, we recommend short-term angiographic follow-up to detect possible complications such as aneurysm progression at an early stage.

The authors declare that the submitted article will not constitute "Redundant Publication”.

Patient consent

The authors declare that the patients written consent has been obtained for the publication of this case.

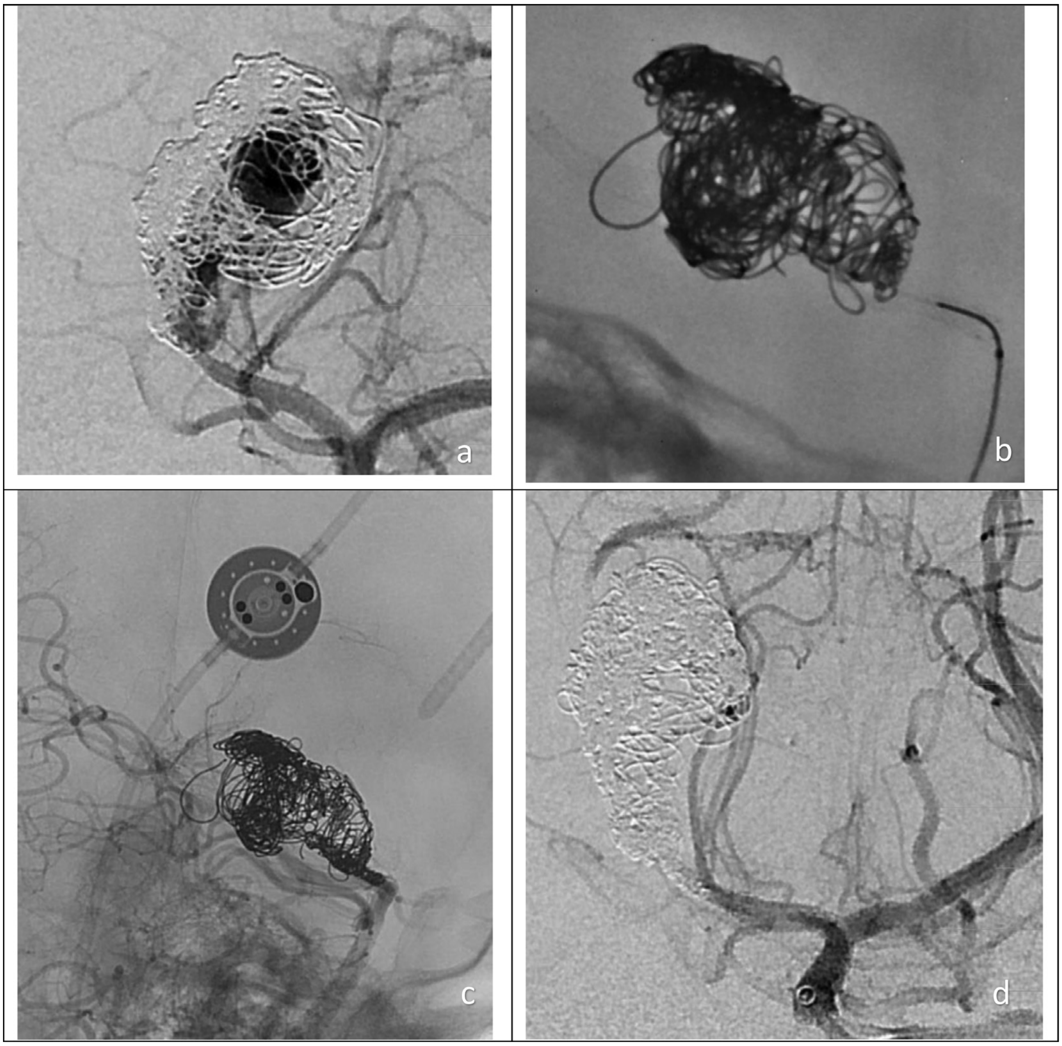

Fig. 4 – Endovascular re-treatment. DSA images during the endovascular re-treatment. The aneurysm lumen and distal vessels were accurately depicted after contrast injection (A,C), but the stent inside the coil packages could nonot be adequately visualized (B). The aneurysm was completely occluded after coiling procedure (D).

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