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Case Report: Thrombosis of a ruptured fusiform basilar apex aneurysm after stenting and selective coiling

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Keywords

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Introduction

Large fusiform and dissecting type intracranial aneurysms represent a challenge to both endovascular as well as microsurgical treatment approaches. Those involving the upper basilar artery and basilar apex represent a particular challenge. In many cases these aneurysms are not amenable to intravascular coiling without occluding the parent vessel. Clip reconstructions of such aneurysms are technically difficult, and are also associated with a high probability of morbidity and mortality. We present an interesting case involving a ruptured fusiform aneurysm of the basilar apex.

Case report

A 41-year-old woman presented to the emergency department after being found unresponsive at home. Neurologic exam revealed that she was extensor posturing with a fixed and dilated pupil on the left and sluggishly reactive pupil on the right. Non-contrast computed tomography (CT) of the head showed diffuse subarachnoid hemorrhage and hydrocephalus. CT angiography of the head as well as digital subtraction angiography showed a 15 mm × 12 mm × 10 mm aneurysm of the basilar apex (Figure 1). The origin of both P1 segments of the posterior cerebral arteries (PCA) appeared to arise from the aneurysm. In addition, both superior cerebellar arteries (SCA) appeared to arise from the base of the aneurysm. Due to the complexity of the aneurysm, as well as the patient's poor neurological grade, no early attempts to treat the aneurysm were undertaken. An external ventricular drain was placed and the patient was admitted for supportive care in the intensive care unit.

Over the course of 3 weeks the patient began to improve neurologically to the point where she was wakeful and following commands. Neurological exam revealed left oculomotor nerve (CN III) palsy and right-sided hemiparesis. Repeat angiography was performed 21 days after her initial hemorrhage (Figure 2). This demonstrated a 3 mm × 3 mm × 2.5 mm bleb projecting anteriorly from the fusiform aneurysm, which was not previously seen. A stent assisted coiling technique with Y-configuration was planned. An Enterprise Stent (Cordis Neurovascular, Warren, NJ) was placed from the mid-basilar artery to the left proximal P2 PCA. The second stent to complete the Y-configuration could not be safely placed secondary to the acute angle of the right P1 from the basilar apex. Three Guglielmi detachable coils (GDC) were deployed into the bleb in an attempt to provide some protection from rerupture (Figure 3). A second embolization attempt was planned in 4–6 weeks to allow for additional neurologic recovery and stent stabilization and healing. She was discharged from the hospital to a rehabilitation facility.

Six weeks from her discharge she presented to the emergency department with new complaints of balance difficulty and slurred speech. CT of the head showed a thrombus in the basilar apex (Figure 4). Cerebral angiography showed that the basilar artery apex aneurysm was no longer opacified and was thrombosed (Figure 5). The basilar artery and stent were both patent but intraluminal filling defects were present. The patient was restarted on her antiplatelet agents that had been inadvertently stopped at rehabilitation. She developed no major new deficits as a result of her new infarcts, and had a mild right hemiparesis with 4/5 strength as well as the left CN III palsy. A second follow-up cerebral angio-

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gram approximately 6 months from her initial hemorrhage demonstrated stable occlusion (Figure 6).

Discussion

Although endovascular coiling has become accepted as an equivalent, and in some cases, the preferred modality for the treatment of intracranial aneurysms [1–2], the technique is not without its limitations [3–4]. Aneurysms that are large, wide-necked, and nonsaccular present a challenge to endoluminal coiling techniques. The Cerebral Aneurysm Rerupture After Treatment Study [5] illustrated that although the overall risk of rebleeding after coiling was low (1.3 rehemorrhages per 100 person-years) the risk of rebleeding increased with decreasing levels of aneurysm occlusion (0.6 compared to 15 rehemorrhages per 100 person-years). Therefore, in cases with aneurysms that do not provide favorable circumstances via coiling for complete angiographic occlusion other treatment modalities must be explored. The aneurysm in our patient is complex not only due to its size but also the rapid enlargement with extended bleb formation in a matter of 3 weeks. The mechanism behind bleb formation is complex and dependent on wall shear stress (WSS) [6]. These blebs are unstable and at risk for rupture required immediate treatment once the patient is medically stable [6]. Some authors have hypothesized that endovascular stents may be used as monotherapy in the treatment of aneurysms [6–9]. Massoud *et al* illustrated the significant flow redirection with a disruption of the aneurysm inflow zone using stents across the necks of experimental sidewall aneurysms in a swine model [10]. Stents have also been described to help facilitate the healing and occlusion of intracranial dissecting type aneurysms [11]. Fiorella *et al* also reported on a series using the Neuroform Stent (Boston Scientific, Natick, MA) for uncoilable intradural pseudoaneurysms [12]. In addition, combined approaches using stent-assisted coiling have been well described [13–18].

As a further evolution of endovascular tools, the Pipeline embolization device (PED) (Chestnut Medical Technologies, Inc., Menlo Park, CA) was developed as a flexible, microcatheter-delivered, self-expanding, endovascular “stent-like” construct engineered specifically for the treatment of cerebral aneurysms. Using a rabbit aneurysm model, Kallmes *et al* illustrated an 88% rate of complete- or near-complete occlusion with this device [19]. These stents have a higher metal surface area 30–35% when compared to existing intracranial stents (6.5–9% for self-expanding and 12–16% for balloon mounted stents [19]. More recently, Lylyk *et al* reported their experience with the PED and showed complete occlu-

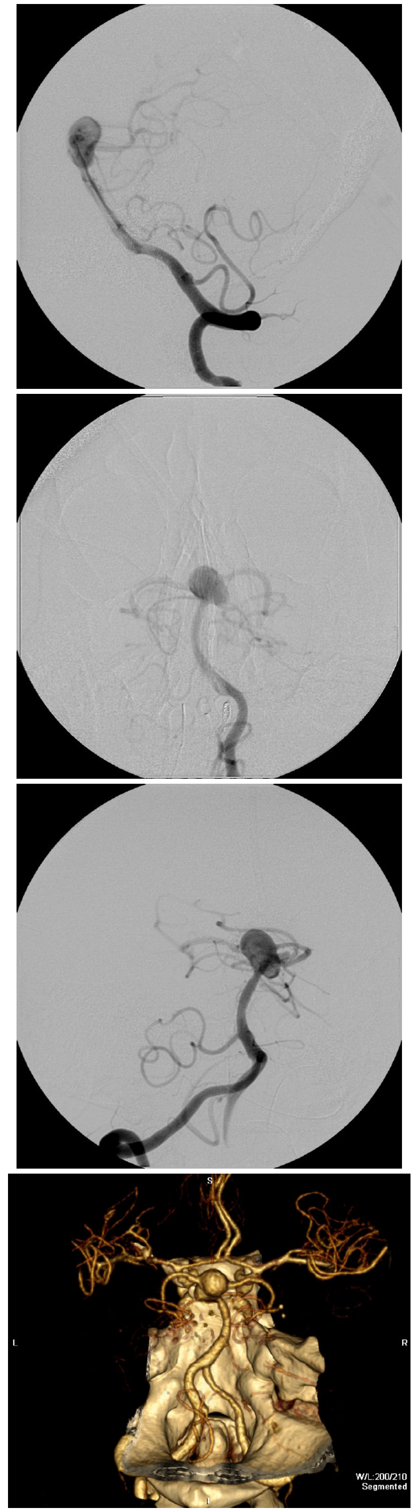

Figure 1. a Digital subtraction angiography sagittal view. b Anterior-posterior view. c Oblique view. d CTA 3-D reconstruction.

Figure 2. Oblique view illustrating a bleb not previously seen.

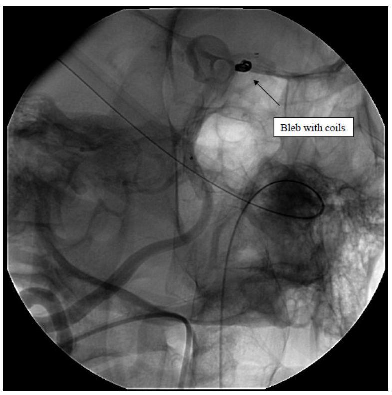

Figure 3. Oblique view post-coiling and stent placement with digital subtraction.

Figure 4. Axial non-contrast head CT illustrating thrombus involving basilar apex with coils visible.

sion in 56%, 93%, and 95% of aneurysms at 3, 6, and 12 months, respectively [20]. The stent promotes thrombosis by remodeling the inflow and subsequent outflow

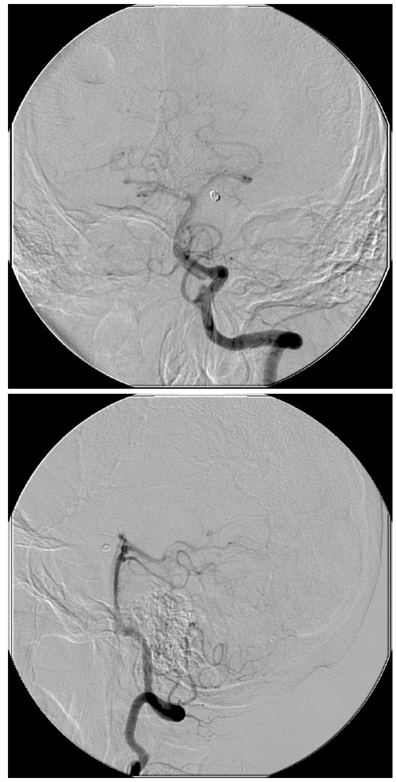

Figure 5. Right vertebral injection illustrating disappearance of basilar apex aneurysm with patent basilar artery.

from the aneurysm cavity, while maintaining patency through the parent vessel and stent.

The complete occlusion of this complex aneurysm by an essentially failed endovascular stent assisted coiling attempt was unexpected. Incomplete endovascular occlusions should not be recommended or performed in lieu of other feasible definitive strategies. At the time, the decision was made not to pursue clip reconstruction due to the patient's poor clinical status as well as the high chance of associated morbidity [21]. However, it is interesting that placement of a single Enterprise stent and incomplete coiling led to such a remarkable and favorable complete occlusion of this aneurysm. The original goal was to place a Y-stent configuration across the basilar apex into the bilateral P1 segments. However, due to the vessel tortuosity the stent could only be placed across one of the P1 segments. In addition, there was a suspicion that the bleb that had appeared on the second angiogram was what had likely ruptured. Selective coiling of this bleb was performed in the hopes of protecting the patient from rerupture. Overall, this was admittedly a subtotal treatment result; however, it was hoped that this would buy time to allow for the stent

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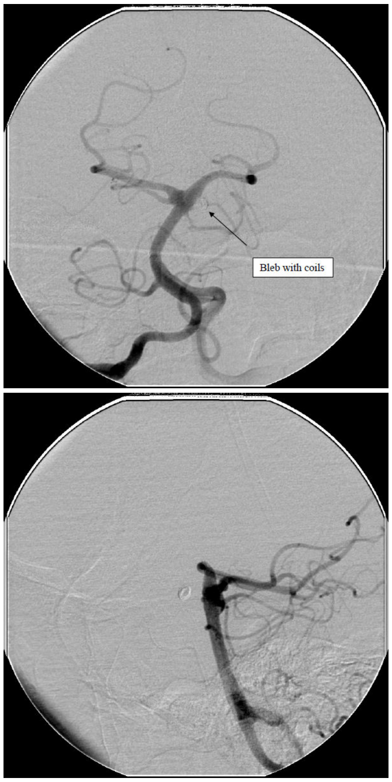

Figure 6. AP view and Sagittal view.

healing in place to facilitate another attempt to stent across the other P1 to complete the Y-configuration. Single P-1 stent placement can at times achieve aneurysm occlusion but is unpredictable and double stent placement in a Y-configuration is recommended [20]. The unexpected result was that the whole aneurysm thrombosed. The favorable treatment response is most likely due to stasis and flow redirection as observed earlier [20]. Lack of antiplatelet therapy also promoted the thrombosis and lays emphasis on need for antiplatelet therapy to prevent thrombosis and ischemia. Spontaneous thrombosis of cerebral aneurysms is not an uncommon entity and has been reported and discussed by many authors [22–26] although the exact incidence is not well described. This case is unique in that it involves a large aneurysm involving the entire basilar quadrification with complete occlusion after selective stenting and coiling with preservation of the SCA and PCA. This treatment result has proven to be stable after two follow-up cerebral angiograms spanning 6 months but long-term follow-up will be required. We feel that if faced with another case like the one described, we will attempt to place a Y-configuration stent in both P1 segments and coiling of the aneurysm as well as the bleb.

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