Progressive enlargement of a previously coiled posterior inferior cerebellar artery

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Abstract

Multidisciplinary treatment of cerebral aneurysms includes endovascular coiling and open neurosurgical clipping techniques, however our understanding of long-term outcomes after coiling of large cerebral aneurysms remains limited. We present a case involving the development of a previously coiled posterior inferior cerebellar artery (PICA) aneurysm in a 64-year-old man with lesion enlargement and symptomatic mass effect. CT angiogram demonstrated a 3.9×2.6×2.4-cm partially thrombosed aneurysm adjacent to the left vertebral artery. The patient underwent resection to relieve the compressive effect. We discuss the efficacy of endovascular coiling and surgical clipping in this case as well as review the relevant literature.
Introduction

Endovascular coiling is a primary treatment method for intracerebral aneurysms. Although rates of procedural complications and short-term rates of rehemorrhage and recurrence appear favorable, our understanding of the long-term clinical course of large treated aneurysms remains limited (Molyneux et al. 2005). Here, we discuss the development of a previously coiled posterior inferior cerebellar artery (PICA) aneurysm into an enlarged lesion with symptomatic posterior fossa mass effect.

Case Report

A 64-year-old man presented after an unwitnessed fall with 3 months of worsening right ataxia and dysmetria. The patient had undergone endovascular coiling of a 10-mm left PICA aneurysm without mass effect 1 year earlier at an outside institution (Fig. 1). CT angiography at our institution demonstrated a 3.9×2.6×2.4-cm mass adjacent to the left vertebral artery, without contrast filling (Fig. 2). On presentation, MRI showed thrombus of various ages, hydrocephalus, and rightward displacement of the brainstem (Fig. 3). Cerebral angiography demonstrated a distal tonsillar-segment PICA aneurysm, with slight neck filling and coil compaction (Fig. 4).

A midline posterior fossa craniotomy and C1 laminectomy were performed, with temporary clipping of the left PICA and a large central thrombectomy to relieve posterior fossa mass effect (Fig. 5), followed by dissection around the aneurysm capsule. Permanent clips were placed to trap the aneurysm along the left PICA and distal flow was seen by Doppler.

The patient had satisfactory postoperative imaging (Fig. 6) and an uncomplicated postoperative course. He had mild ataxia and dysmetria on discharge but noted overall
improvement in his balance and ambulation. At 6-month follow-up, he was walking independently with occasional use of a walker.

This single case report is exempt from Institutional Review Board approval.

Discussion

Although most common in the cavernous and supraclinoid internal carotid artery and the middle cerebral arteries, large intracranial aneurysms may originate anywhere with significant risk of rupture (Santos et al. 2013). Large aneurysms can mimic tumors and cause clinical symptoms as a result of the mass effect despite endovascular or surgical treatment (Kim & Ko 2012). Recanalization with aneurysm recurrence or enlargement of a partially thrombosed and coil-containing aneurysmal mass is also possible after incomplete treatment (Lee et al. 1999).

Surgical treatment of large cerebral aneurysm has shown good outcomes in 70–80% of cases (Nanda et al. 2014; Sughrue et al. 2011), but use of endovascular coiling has grown for large aneurysms. A recent study evaluated endovascular coiling in 334 cases of aneurysms ≥10 mm, with conventional, stent-assisted, balloon-assisted coiling and parent vessel occlusion (Chalouhi et al. 2014). The results demonstrated a 10.5% complication rate, a 33% retreatment rate, and good outcomes in 92%. Large aneurysm size, poor Hunt/Hess grade, and new or recurrent hemorrhage predicted poor outcomes. The flow-diverting Pipeline combined with coil embolization has also been suggested for treatment for these complicated lesions (Chalouhi et al. 2013; Siddiqui et al. 2012); however, data regarding its efficacy are limited.

Koivisto et al. (Koivisto et al. 2000) randomized patients to either surgical clipping or endovascular coiling. They observed a 10.2% absolute difference in outcome at 1 year, with aneurysm size predicting poor prognosis. The large International Subarachnoid Aneurysm Trial
showed the risk of re-hemorrhage after endovascular coiling was 2.5% in the first year after
treatment and 0.2%/year thereafter (mean follow-up 4 years) (Molyneux et al. 2002a; Molyneux
et al. 2002b; Molyneux et al. 2005). There was no significant difference in relative risk of death
or disability between endovascular coiling and surgical clipping of aneurysms with lumens ≥11
mm. The re-hemorrhage rate from the Cerebral Aneurysm Rerupture After Treatment study was
associated with the degree of aneurysmal occlusion: 1.1% for complete occlusion, 2.9% for 91–
99% occlusion, 5.9% for 70–90% occlusion, and 17.6% for <70% occlusion (Johnston et al.
2008). Aneurysm size did not significantly correlate with re-hemorrhage rate or occlusion status
at follow-up.

A recent report from the Barrow Ruptured Aneurysm Trial included 238 patients
assigned to clip occlusion and 233 to coil embolization, with analysis of cases as intent-to-treat
(Spetzler et al. 2013). At 3-year follow-up, the risk of poor outcome was not significantly
different between the groups (35.8% vs. 30%), but aneurysm obliteration, rate of aneurysm
recurrence, and rate of retreatment were significantly better in the clipping group, which held
until year 3. Overall, this study demonstrated better efficacy of aneurysm clipping with reduction
of re-hemorrhage and retreatment risk as compared with endovascular coiling.

Conclusion

In the case of large and giant PICA aneurysms, although endovascular coiling may be
effective for initial occlusion of the aneurysm, the resulting mass effect of the thrombosed
aneurysmal and coil mass on the adjacent brainstem and cerebellum may ultimately make
surgical clipping a safer treatment option.
References


**Figure 1:** Initial angiography of PICA aneurysm. Anterior/posterior (A, B) and lateral (C, D) images of a left PICA aneurysm are shown at time of first treatment, 1 year prior to representation with mass effect.
Figure 2: Preoperative CTA imaging of giant PICA aneurysm. Preoperative axial (A), coronal (B), and sagittal (C) CTA studies show a large posterior fossa lesion with coil artifact. The arteries of posterior and anterior circulation are patent, and the aneurysmal mass appears to arise from the left PICA. (D) Delayed phase CTA axial images show some rim enhancement circumscribing the lesion.
Figure 3: Preoperative MRI imaging of giant PICA aneurysm. (A) Preoperative T1-weighted MR imaging shows a heterogenous, isointense and hypointense mass measuring $3.9 \times 2.6 \times 2.4$ cm. Perilesional mass effect is noted on the fourth ventricle, brainstem, and adjacent cerebellum. Mild global parenchymal volume loss is seen. (B) Preoperative T2-weighted imaging shows a
hypointense rim and layering T2 hypointensity representing hemosiderin deposition. Significant vasogenic edema is seen in the left pons and cerebellar hemisphere. The fourth ventricle is effaced and displaced laterally, and transependymal cerebrospinal fluid flow was observed in the lateral and third ventricles (not shown). Susceptibility artifact in the inferior margin of the lesion relates to aneurysm coiling. (C) Preoperative gradient recalled echo sequences show mixed layer hemorrhage within the aneurysm cavity. (D) Preoperative T1-weighted imaging with contrast agent shows no lesion enhancement, suggesting an absence of disruption in the blood-brain barrier along with minor aneurysm filling.
Figure 4: Preoperative angiography of giant PICA aneurysm. Anteroposterior (A) and lateral (B) scout films show the location of the previously placed coils. (C) A preoperative lateral cerebral angiography view of a left vertebral artery injection shows good filling of the left PICA as the first major branch with some filling of the aneurysm neck and proximal dome. The aneurysm coil mass is seen compacted in the remainder of the aneurysmal mass. The distal PICA is patent and shows anastomosis to the left anterior inferior communicating. (D) Left
orthogonal view with a left vertebral artery injection again shows filling of the left PICA and proximal aneurysm.
Figure 5: Intraoperative images of resection of a recurrent giant PICA aneurysm treated previously with endovascular coiling. A midline posterior fossa craniotomy with C1 laminectomy was used. (A) View from operating microscope (cranial left) identifying the partially thrombosed aneurysmal mass, hemosiderin stained cerebellum, and brainstem. (B) A temporary vascular clip was initially on the left PICA proximal to the aneurysm and the initial microdissection of the aneurysmal nidus was performed with central debulking of the mass. (C) Partial removal of the
aneurysm fibrotic capsule was completed. (D) Removal of aneurysmal coil mass was performed.

After resection, flow was evaluated by Doppler probe.
**Figure 6:** Postoperative imaging of reconstructed giant PICA aneurysm. Post-operative (A) and one-month follow-up (B) axial CT of the head shows removal of the aneurysmal mass with no acute intracranial hemorrhage or edema.