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Case Report

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Management and Follow-Up of a Distal PCA Aneurysm: A Case Report of Initial Success and Subsequent Challenges

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ABSTRACT

Posterior Cerebral Artery (PCA) aneurysms, rare intracranial anomalies, present significant treatment challenges due to their complex anatomy and proximity to delicate structures, with an occurrence rate of about 0.7-2.2%. These aneurysms affect a younger population, averaging 38 years, compared to 50-60 years for other intracranial aneurysms. This location has a higher incidence of giant aneurysms (23% versus 3–5% elsewhere), and 80% of cases develop Subarachnoid Hemorrhage (SAH). Wide neck PCA aneurysms are challenging to treat and are less suitable for coiling or surgical clipping, requiring additional endovascular devices or complete artery occlusion for full aneurysm exclusion. This case underscores the complexities of distal PCA aneurysms and emphasizes the benefits of endovascular devices like flow diverter stents and parent artery occlusion, as PCA preservation is not critical in distal aneurysms.

Keywords:

Posterior Cerebral Artery (PCA), Aneurysm, Endovascular coiling, Hydrocephalus, Angiography, Magnetic Resonance Imaging (MRI).

Introduction

Posterior Cerebral Artery (PCA) aneurysms are rare and account for less than 2% of all intracranial aneurysms [1,2].

Clinicians categorize PCA aneurysms into distinct segments Pre-communicating (P1), Post-communicating (P2), Quadrigeminal (P3), and Calcarine (P4). P1 supplies vital structures, including the thalamus and midbrain, while P2 wraps over the midbrain and tentorium cerebelli. P3 harbors significant structures like the brainstem and cranial nerves (III-IV) and arterio-venous structures [3], and P4 culminates in the calcarine sulcus [4].

The PCA divides into proximal and distal segments. The proximal segment includes P1 and P2 whereas the distal segment includes P3 and P4.

Endovascular intervention is considered as first line treatment of PCA aneurysm because of lower mortality and morbidity rate in comparison with surgical clipping especially in posterior circulation aneurysm. Approximately 8-15% of aneurysms occur in the posterior circulation and exhibit greater risk of rupturing compared to aneurysms in the anterior circulation. PCA aneurysms are located deep within the brain and are surrounded by vulnerable structures such as the brainstem, cranial nerve (III-IV), arterial and venous structures. The surgical approach is considered risky and less safe [5]. A wide-neck aneurysm is defined as one with a dome-to-neck ratio less than 2. These aneurysms present challenges in treatment and are less suitable for standalone coiling or surgical clipping when compared to aneurysms with narrower necks [6,7].

We present a case report of a wide neck P2-P3 segment aneurysm.

Case Presentation

History and examination

The 39-year-old male presented to neurosurgery OPD with complaints of persistent left-sided headaches for a year, on and off generalized weakness and vomiting for 6 months and loss of consciousness and left eye pain for 2 days. He was hypertensive and non-compliant with medications.

Clinical evaluation revealed intact extra ocular movements. No motor deficit. Furthermore, he was referred to the ophthalmology department for further assessment. He was advised for urgent brain MRI and baseline investigations.

MRI disclosed a round extra axial lesion in the left ambient cistern, causing a mass effect over the midbrain and obliterating the Sylvius aqueduct resulting in mild hydrocephalus. An aneurysm was present arising from the left P3 segment of left PCA measuring 4.8 × 5.1mm, accompanied by hematoma measuring 2.2 × 2.1 × 2.2 cm (AP × TS × LS) in the ambient cistern on left side (Figure 1). He was recommended for angiography

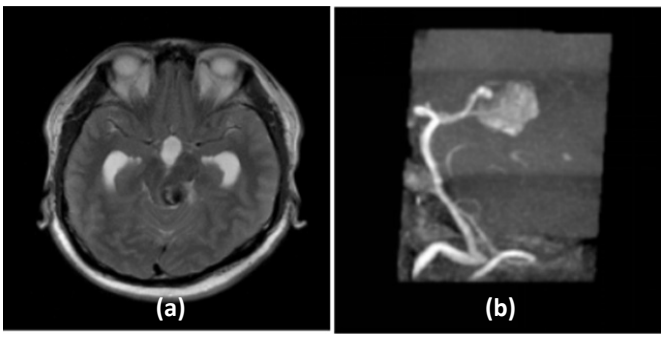

Figure 1: a): MRI T2 wieghted axial sections of Brain shows partially thrombused aneurysm arising from the left posterior cerebral artery causing compression effect over the ventricular system resulting in moderate hydrocephalus and CSF seepage; **b):** MRA which shows an aneurysm arising from the left posterior cerebral artery.

for further management. Diagnosis of PCA aneurysm with hematoma resulting in hydrocephalus was established.

Treatment

Urgent placement of VP shunt was done to relieve hydrocephalus followed by cerebral aneurysm coiling. The angiogram showed a wide neck aneurysm measuring 5.3 × 5.0 × 4.7 mm (APX ASX) at the junction of P2 and P3 with neck measuring 3mm (Figure 2). Embolization was done using detachable coils. There were two branches arising from the neck of the aneurysm; in order to save flow into these branches the neck of the aneurysm was left. Patient was discharged with no postoperative complaints.

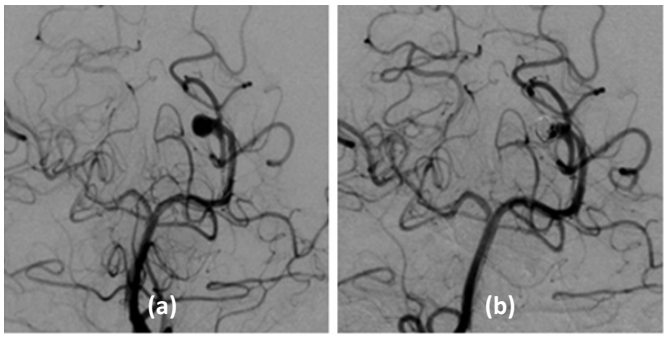

Figure 2: a): Pre-embolization image showing wide neck aneurysm arising from the junction of P2 and P3 segment of left posterior cerebral artery.; **b):** Detachable coils deployed in the dome of the aneurysm. Post coiling angiogram showed mild residual neck of the aneurysm.

Patient came 3 months after the aneurysm coiling with a complaint of persistent headache. CT scan brain plain was performed which showed complete resolution of hematoma. So cerebral angiography was performed which showed adequately placed coils however there is an increase in the size of residual neck of the aneurysm measuring 3.5mm width x 3.4 mm in length (Figure 3). Further follow up cerebral angiography after one year shows further increase in size of the aneurysm (Figure 4). However, patients did not have any active complaints or motor deficit at present. He was further advised for endovascular coiling or flow diverter.

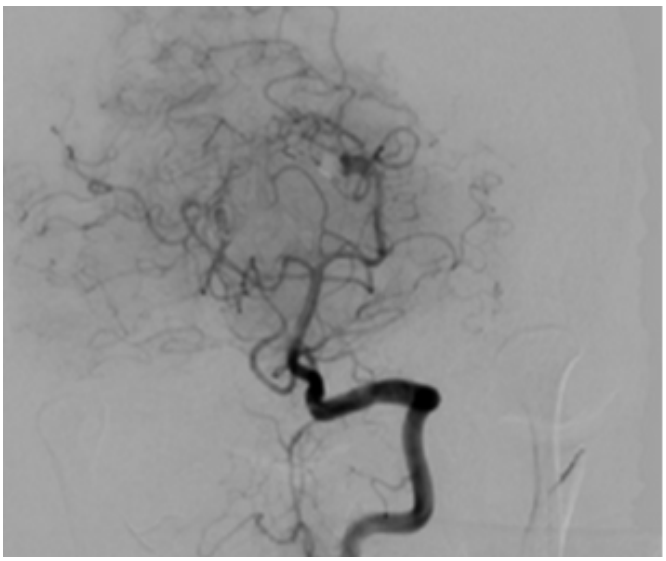

Figure 3: Follow-up angiography after 3 months shows coils in the dome of the aneurysm arising from left posterior cerebral artery at junction of P2 and P3. The neck measures 3.5mm × 3.4mm in Anteroposterior (AP) and transverse dimensions.

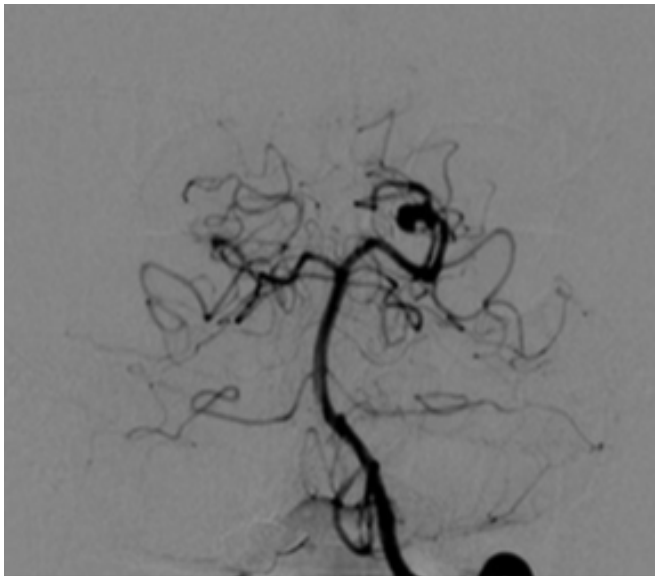

Figure 4: Follow-up angiography after 1-year shows increase size of neck of the aneurysm. Now measures 4.0mm × 4.7mm in Anteroposterior (AP) and transverse dimensions

Discussion

Aneurysms of the Posterior Cerebral Artery (PCA) represent a rare subset of intracranial aneurysms, accounting for approximately 0.7% to 2.2% of all cases. Their management is particularly challenging due to the complex anatomical architecture and the proximity to critical neurovascular structures [2].

With PCA aneurysms, those located proximally are more frequently encountered, whereas distal aneurysms are rare [8].

According to Park et al., the distribution of PCA aneurysms are as follows: 19.0% in the P1 segment, 14.3% at the P1-P2 junction, 47.7% in the P2 segment, and 9.0% at the P2-P3 junction, with the P2 segment being the most frequent site of occurrence [9]. These aneurysms exhibit distinct clinical characteristics, including a predilection for a younger demographic (mean age of 38 years) compared to aneurysms at other intracranial locations (typically 50-60 years). Additionally, they are more likely to present as large or giant aneurysms (approximately 23% of cases, versus 3-5% at other sites) and are frequently associated with Subarachnoid Hemorrhage (SAH) in 80% of cases, although some are incidentally detected without neurological deficits [10].

Wide-necked aneurysms, defined by a dome-to-neck ratio of less than 2, pose significant therapeutic challenges due to their reduced suitability for endovascular coiling or surgical clipping compared to narrow-necked aneurysms [6,11-13]. In the case presented, the patient was diagnosed with a distal aneurysm at the P2-P3 junction. Initial treatment with coiling resulted in a mild residual neck, which subsequently demonstrated progression on follow-up CT angiography.

For aneurysms exhibiting growth, as observed in this case, treatment options include use of additional devices that include selective coiling, with or without stent or balloon assistance such as Flow Diverter Stents (FDS) and Parent Artery Occlusion (PAO). While preserving the patency of the posterior cerebral arteries is critical for proximal aneurysms (P1, P2), this consideration is less relevant for distal aneurysms. However, the treatment of

wide-necked aneurysms remains complex because of the risk of coil protrusion into the parent artery and the potential for recurrence [7,14-16]. Distal aneurysms are typically managed with endovascular coiling, while FDS or PAO reserved for refractory cases, similar to presented case. A 2015 retrospective review from a tertiary care center reported four cases of left-sided P2-P3 aneurysms, three of which were treated with PAO and coiling, while one underwent endovascular coiling alone [9].

In case of residual aneurysm necks or progressive widening on follow-up imaging should receive prompt secondary intervention to achieve complete exclusion and reduce the risk of rupture, as recommended here. However, the patient was lost to follow-up, indicating a recurrent problem in managing rare distal PCA aneurysms in resource-constrained settings: adherence to monitoring methods (e.g., DSA at 6-12 months post-treatment, followed by annual MRA) is critical, despite logistical difficulties. Compliance and long-term results in such cohorts can be improved by multidisciplinary patient education that includes telehealth reminders and streamlined imaging schedules (e.g., CTA if DSA unavailable)[17,18].

Conclusion

Successful treatment could have been achieved with either use of flow diverters or parent artery occlusion in this case. Despite the intricacies posed by the aneurysm's location and the width of its neck, this approach can effectively achieve complete exclusion of the aneurysm. This case underscores the complexities associated with PCA distal aneurysms of posterior cerebral artery, highlights the advantages of utilizing a treatment strategy involving endovascular devices like flow diverter stent and parent artery occlusion (as pca preservation is not necessary in distal aneurysm). It also highlights the importance of follow up and secondary intervention and how the geopolitical factors affect health outcomes, especially for those with serious medical conditions requiring timely intervention.

Conflict of Interest

The authors declared no potential competing interest with respect to the research, authorship and/or publication of this article.

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