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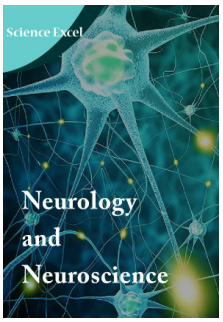
Review Article



Proximal Aneurysm of the Anterior Cerebral Artery: Case Report and Literature Review

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Abstract

Introduction: *Aneurysms of the proximal segment (A1) of the anterior cerebral artery (ACA) are rare, accounting for approximately 1% of intracranial aneurysms. Associated vascular anomalies, such as fenestration, complicate diagnosis and treatment, requiring careful planning.* ***Case Report:*** *A 51-year-old woman presented with sudden onset headache. Angio-MRI and digital subtraction angiography revealed a saccular aneurysm measuring 16 x 10 mm in the left A1 segment of the ACA, associated with a fenestrated artery. Due to the complex anatomy and risk of perforator artery damage, micro-surgical clipping via the pterional approach was chosen. The patient had a favorable outcome, with early discharge and no permanent deficits.* ***Discussion:*** *A1 aneurysms are challenging due to their proximity to critical structures and anatomical variations. Despite the current trend toward endovascular approaches, open surgery remains preferable in cases with a high risk of complications.* ***Conclusion:*** *Treatment of A1 segment aneurysms should be individualized. In complex cases, the microsurgical approach combined with advanced imaging techniques provides good outcomes and greater safety in managing these rare lesions.*

Introduction

Aneurysms located in the anterior cerebral artery (ACA) are relatively rare, accounting for approximately 1% of all intracranial aneurysms [1]. Although more common in the distal region (A2 segment), aneurysms of the proximal segment (A1), also called the pre-communicating segment, are significantly less frequent and present specific diagnostic and therapeutic challenges [2,3]. The occurrence of aneurysms in the A1 segment is often associated with vascular malformations such as fenestration, hypoplasia, and duplication of the artery, which further complicates management. Recent advances in diagnostic techniques, such as angio-MRI, digital subtraction angiography, and 3D angiotomography with reconstruction and fingerprinting, have enabled more precise therapeutic planning for these rare cases [4].

This article describes the case of a patient with a large aneurysm located in the A1 segment of the ACA, discussing the treatment strategies applied and addressing the anatomical implications, surgical challenges, and current therapeutic options based on the latest evidence [5]. The literature review highlights the importance of detailed evaluation and a multidisciplinary approach in managing these rare aneurysms [6].

Case Report

A 51-year-old female patient sought medical attention due to a sudden onset severe headache. Physical examination revealed no neurological deficits. The initial CT scan was inconclusive, but angio-MRI revealed a saccular vascular lesion in the left optic-carotid cistern, initially suggesting an aneurysm of the left internal carotid artery. Digital subtraction angiography confirmed the presence of an aneurysm in the proximal segment of the ACA (A1) on the left, associated with a fenestrated A1 artery.

3D angio-CT provided a detailed reconstruction of the anatomy, facilitating surgical planning. The aneurysm, unruptured, measured 16 x 10 mm and was located in the left A1 segment, with an anterior projection (Figure 1).

Angiography also revealed dominance of the right A1 segment, with the large anterior communicating artery filling the A2 segment on the non-dominant side (Figure 2).

Given the anatomical complexity and the location of the lesion, the multidisciplinary team opted for open surgical intervention, as endovascular occlusion was considered risky due to the proximity of perforator arteries and the inability to effectively occlude the

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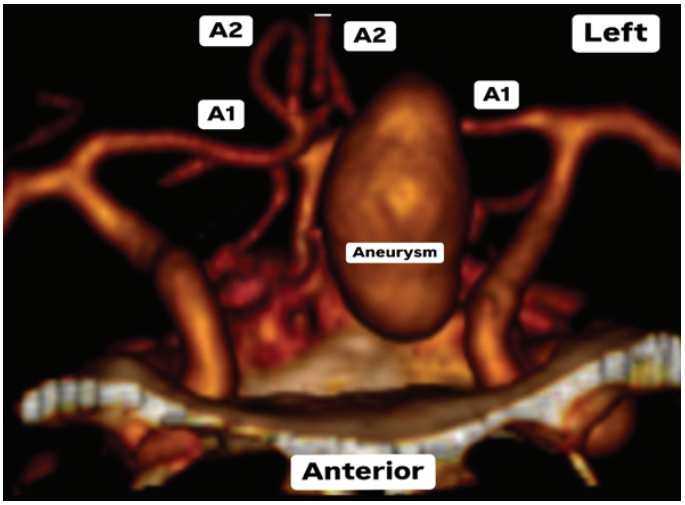

Figure 1. *3D reconstruction from angio-CT, anteroposterior view, showing a large aneurysm in the proximal segment of the anterior cerebral artery.*

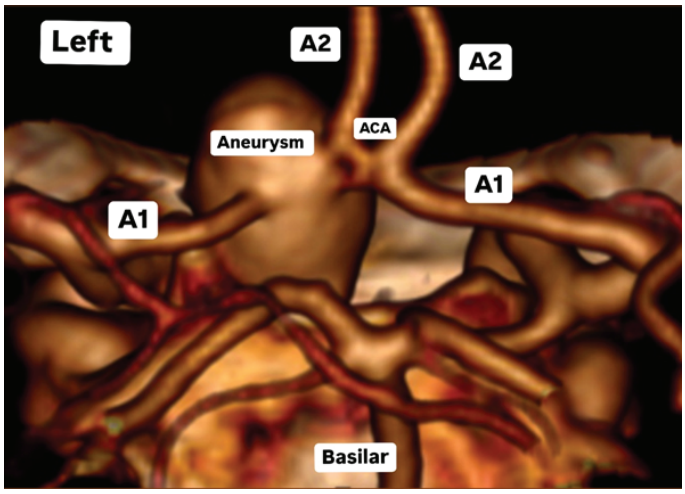

Figure 2. *3D reconstruction from angio-CT, posteroanterior view, showing a large aneurysm in the proximal segment of the anterior cerebral artery with fenestrations, and a large anterior communicating artery filling both A2 segments.*

aneurysm without compromising distal circulation.

A pterional craniotomy was performed with exposure of the Sylvian fissure and a trans-Sylvian/subfrontal approach, allowing adequate visualization of the involved arteries (Figure 3).

During surgery, intraoperative Doppler evaluation demonstrated satisfactory distal flow after aneurysm occlusion. The patient recovered well, being discharged three days later, with only a mild complaint of memory loss, which resolved in the following weeks. This case illustrates the importance of the microsurgical approach for complex A1 segment aneurysms, with post-operative 3D angio-CT imaging showing aneurysm clipping and preservation of other anterior circulation vessels (Figure 4).

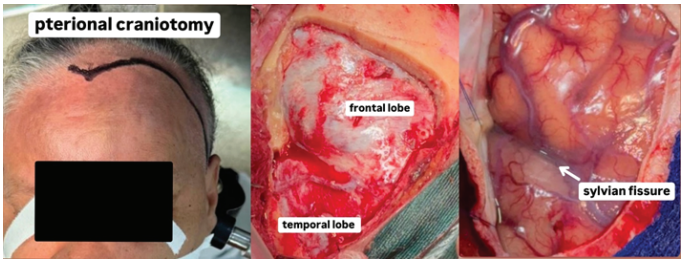

Figure 3. *Images highlighting the pterional approach, showing the frontal and temporal lobes with exposure of the Sylvian fissure.*

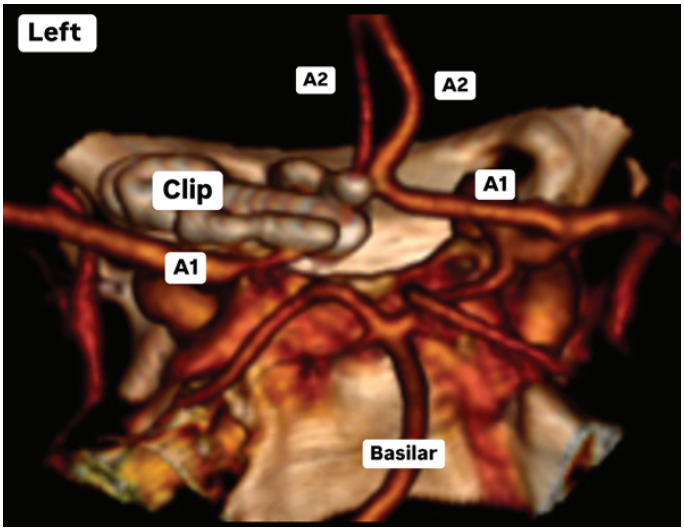

Figure 4. *3D reconstruction from postoperative angio-CT, posteroanterior view, showing aneurysm clipping and bilateral preservation of flow in the A2 segments of the anterior cerebral artery.*

Discussion

Aneurysms located in the A1 segment of the ACA are extremely rare, with an incidence ranging from 0.5% to 1.8% of all intracranial aneurysms [7,8]. Studies show that these aneurysms are often small (<10 mm), but cases of large aneurysms, such as the one described in this article, are also documented [9].

The vascular anatomy of the A1 segment can be highly variable. The presence of anomalies such as artery fenestration, observed in this case, has significant implications for diagnosis and treatment choice [10,11]. Fenestration can increase the risk of aneurysm rupture due to turbulent flow, raising the likelihood of surgical complications [12].

The A1 segment of the ACA is in close proximity to several perforator arteries that supply essential brain structures, such as the corpus callosum, septum pellucidum, and basal ganglia [13]. Damage to these arteries can result in severe neurological deficits, such as hemiplegia and aphasia. Thus, preserving these arteries is crucial to minimize risks [14].

The treatment of aneurysms in the A1 segment is challenging due to the anatomical complexity and risk of compromising distal cerebral flow [15]. The main options include open surgery with clipping, endovascular approaches with coils or stents, and

in more complex cases, microsurgical bypass [16,17]. Studies indicate that endovascular occlusion may be risky in the presence of vascular anomalies, with bypass being a viable alternative when microsurgical clipping is not possible [18,19]. Advanced imaging technologies have facilitated surgical planning and preservation of perforator arteries [20].

Comparing surgical and endovascular methods, studies suggest that open surgery, although more invasive, may be the best option for A1 segment aneurysms, especially in the presence of vascular anomalies that increase the risk of endovascular treatment. The therapeutic decision should be based on aneurysm morphology, the patient's clinical condition, and the experience of the medical team [21,22].

Conclusion

The treatment of aneurysms in the A1 segment of the ACA requires a careful multidisciplinary approach and detailed anatomical evaluation. The case presented illustrates the complexity of managing these rare aneurysms and underscores the importance of advanced imaging techniques in surgical planning. The choice of the most appropriate therapeutic strategy should be individualized, considering the risks and benefits of both surgical and endovascular approaches. Future studies may help refine criteria for selecting the most suitable treatment and improving clinical outcomes for patients with this rare condition.

Conflict of Interests

The authors have no conflict of interests to declare

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