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Partially thrombosed distal anterior cerebral artery aneurysm mimicking a brain tumor in a child

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Case Report

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Abstract

Partially thrombosed intracranial aneurysms may resemble neoplasms when only a small lumen remains patent and the thrombosed sac becomes the dominant mass. A 10-year-old boy with remote closed head trauma was found to have a progressively enlarging midline cystic-solid lesion. Computed tomography angiography and digital subtraction angiography demonstrated a partially thrombosed aneurysm arising from a terminal branch of the left A3 segment. Serial imaging showed enlargement of both the thrombosed sac and the posterior cystic component. Because occlusion of the residual lumen alone would not relieve the mass effect, we used a left anterior interhemispheric approach for vascular control and decompression. After proximal and distal control, the sac was opened, the organized thrombus was removed, and the cystic component was fenestrated. The aneurysm was then resected without reconstruction because the main pericallosal trunk remained intact. Postoperative imaging confirmed complete resection, decompression, and preserved distal anterior cerebral artery circulation. The patient had no new neurological deficit. In a child with a tumor-like midline lesion, vascular imaging should precede biopsy. The treatment plan should account for the thrombosed and cystic components as well as the patent lumen.

Introduction

Intracranial aneurysms are uncommon in children and differ from adult aneurysms in presentation, morphology, and cause [4, 10]. Trauma-related lesions may appear years after injury, and progressive thrombosis can produce a heterogeneous cystic-solid mass that resembles a tumor [2, 6, 8]. Misdiagnosis creates a risk of biopsy or tumor-directed surgery without vascular control. In addition, treatment confined to the residual lumen may leave the compressive thrombosed sac unchanged. We report a partially thrombosed distal anterior cerebral artery (ACA) aneurysm in a child, with emphasis on its evolution on serial imaging and the reasons for choosing decompressive microsurgery.

Case report

A 10-year-old boy with a history of remote closed head trauma was evaluated for a progressively enlarging midline cystic-solid intracranial lesion. Serial computed tomography and magnetic resonance imaging showed enlargement of the lesion and increasing compression of the anterior cingulate region and genu of the corpus callosum (Fig. 1). The differential diagnosis included a hemorrhagic neoplasm, cavernous malformation, and partially thrombosed aneurysm. Computed tomography angiography and digital subtraction angiography subsequently identified an aneurysm arising from a terminal branch of the left A3 segment, with extensive intraluminal thrombosis (Fig. 2). The interval after trauma suggested a traumatic origin, although the causal relationship could not be proven.

Most of the mass consisted of organized thrombus and an enlarging posterior cystic component. Treating only the patent lumen was therefore unlikely to provide prompt decompression. Microsurgery

was chosen to obtain vascular control, remove the mass, fenestrate the cystic component, and obtain tissue for histopathological examination during the same procedure.

The patient was placed supine, with the head fixed in a Mayfield clamp and mildly flexed. Neuronavigation and continuous motor- and somatosensory-evoked potential monitoring were used. Through a left frontal craniotomy, the anterior interhemispheric fissure was opened under high magnification. Bridging veins were preserved and fixed retraction was avoided. The left pericallosal artery was identified proximal to the lesion before the aneurysm was manipulated (Fig. 3A).

Temporary clips provided proximal and distal control (Fig. 3B). Indocyanine green angiography showed flow in the preserved pericallosal circulation and no opacification of the sac; micro-Doppler ultrasonography likewise detected no flow within it (Fig. 3C). Puncture with a 21-gauge needle produced no backflow (Fig. 3D). The sac was opened, and organized thrombus was removed piecemeal. The posterior cystic component was then fenestrated (Fig. 3E). After the distal outflow branch had been identified, it was coagulated and divided. The involved terminal parent branch was divided immediately proximal to the aneurysm, allowing complete resection (Fig. 3F). The main pericallosal trunk remained intact, so reconstruction was unnecessary. Neurophysiological signals remained stable.

Histopathological examination showed vascular wall thickening, calcification, and organized intraluminal thrombus. Immunohistochemistry demonstrated endothelial and smooth-muscle elements, with a low Ki-67 labeling index (Fig. 4A-H). Postoperative imaging confirmed complete resection, decompression of the cystic component, and preserved distal ACA circulation (Fig. 4I-P). The headache resolved, and no new weakness, akinetic mutism, or other frontal lobe deficit was present at discharge. Long-term clinical and vascular imaging follow-up was recommended [3, 5].

Discussion

A partially thrombosed aneurysm can be mistaken for a neoplasm because the non-opacified portion may account for most of the lesion. In this case, serial CT and MRI documented enlargement of both the thrombosed sac and the posterior cystic component. A focal vascular component prompted CTA and DSA before definitive surgery, which avoided unplanned entry into a vascular lesion and allowed early proximal control.

Erol et al. recently reported an 11-year-old boy with remote head trauma and a giant cystic-solid frontal lesion that was initially considered a tumor; its vascular nature was recognized during surgery, and a right pericallosal pseudoaneurysm was subsequently treated by coil embolization [1]. The present case differs in three practical respects. The lesion was followed on serial imaging, the diagnosis was established angiographically before definitive surgery, and the treatment goal included immediate removal of organized thrombus and decompression of an enlarging cystic component. Its contribution lies less in the tumor-like appearance itself than in showing how the distribution of mass effect and branch anatomy influenced treatment.

Endovascular occlusion or parent-vessel trapping remains appropriate for selected distal ACA aneurysms [7, 9]. Here, the residual lumen represented only part of the lesion, and embolization alone would not have promptly relieved the mass effect. The aneurysm arose from a terminal A3 branch rather than the main pericallosal trunk, allowing resection without bypass after proximal and distal control. This does not imply that microsurgery is generally preferable. A lesion involving the main ACA trunk or a branch supplying functional tissue may require reconstruction or an endovascular strategy.

Conclusion

A partially thrombosed distal ACA aneurysm should remain in the differential diagnosis of an enlarging midline mass in a child, especially after head trauma. CTA or DSA before biopsy can prevent hazardous tumor-directed surgery. When a terminal-branch lesion contains a large thrombosed or cystic component, planned microsurgical exclusion and decompression may address both the vascular lesion and its mass effect.

Abbreviations

ACA, anterior cerebral artery; CTA, computed tomography angiography; DSA, digital subtraction angiography; ICG, indocyanine green; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging.

Declarations

Author Contributions

Xiaowen Wang(XWW): Conceptualization, investigation, surgery, data collection, and writing—original draft. Priscilla Way Yun(PWY): Data collection, literature review, and writing—review and editing. Xiaojia Liu (PXL): histopathological preparation. Wei Zhu (WZ): surgical procedure and intraoperative assistance. Kun Song(KS): Conceptualization, surgery, supervision, and writing—review and editing. Tianming Qiu(TMQ): Conceptualization, surgery, supervision, and writing—review and editing. All authors reviewed and approved the final manuscript.

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Conflict of Interest

The authors declare no competing interests.

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Competing interests: The authors declare no competing interests.

Data availability: Data supporting this case report are available from the corresponding author on reasonable request, subject to patient confidentiality and institutional requirements.

References

1. Erol A, Karagöz C, Ay LA, Çınar C, Bolat E (2026) Delayed presentation of a pediatric giant traumatic pseudoaneurysm mimicking a brain tumor: a case report. Childs Nerv Syst 42:225. https://doi.org/10.1007/s00381-026-07321-w. PMID: 42162442
2. Gallari G, Chibbaro S, Perra G (1997) Traumatic aneurysms of the pericallosal artery in children. Case report. J Neurosurg Sci 41:189–193
3. Ghali MGZ et al (2018) Pediatric intracranial aneurysms: considerations and recommendations for follow-up imaging. World Neurosurg 109:418–431
4. Hubbard ZS et al (2024) Infantile traumatic pericallosal aneurysm: illustrative case. J Neurosurg Case Lessons 7(11)
5. Jian BJ et al (2010) Pediatric intracranial aneurysms. Neurosurg Clin N Am 21:491–501
6. Roccatagliata L et al (2010) Partially thrombosed intracranial aneurysms: symptoms, evolution, and therapeutic management. Acta Neurochir (Wien) 152:2133–2142
7. Sim SY, Shin YS, Yoon SH (2008) Endovascular internal trapping of traumatic pericallosal pseudoaneurysm with hydrogel-coated self-expandable coil in a child: a case report. Surg Neurol 69:418–422
8. Tabibkhooei A, Abolmaali M, Ebrahimnia F (2020) Fountain sign, a basic finding toward the diagnosis of partially thrombosed giant aneurysm: a challenging case and literature review. Asian J Neurosurg 15:1096–1101
9. Tonetti DA, Casillo SM, Jankowitz BT (2021) Telescoping flow diverters for a pediatric fusiform distal anterior cerebral artery aneurysm: technical case report. Childs Nerv Syst 37:999–1002
10. Xu R et al (2021) Epidemiology and outcomes of pediatric intracranial aneurysms: comparison with an adult population in a 30-year prospective database. J Neurosurg Pediatr 28:685–694

Figures

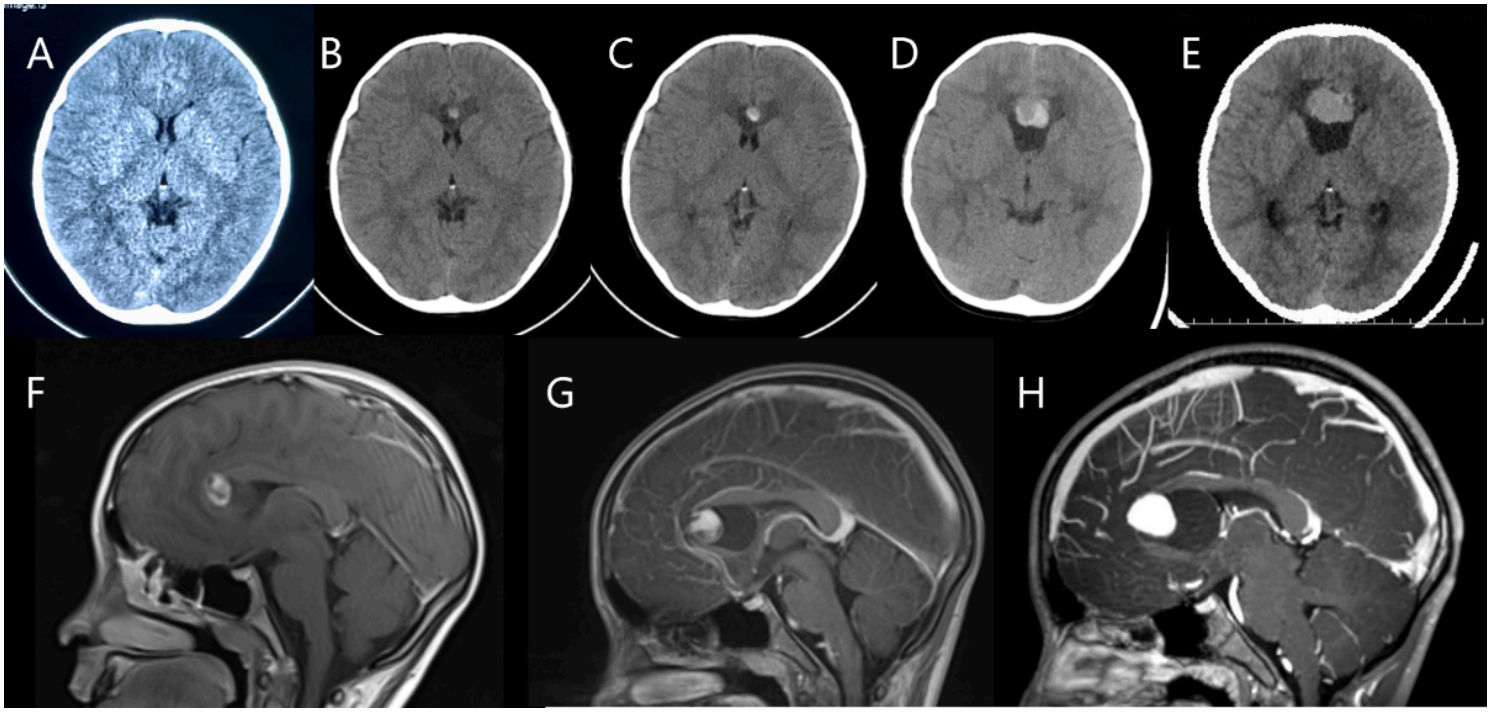


Figure 1

Serial CT and MRI showing progressive enlargement of the midline lesion. (A) Non-contrast CT 4 years earlier shows no lesion. (B-E) Serial CT obtained 4 months before presentation and at subsequent monthly examinations shows enlargement of the aneurysmal component from 6 × 6 mm to 20.7 × 27.7 mm. (F-H) Sagittal contrast-enhanced T1-weighted MRI shows enlargement of the aneurysmal component (12 × 15 mm, 15 × 15 mm, and 15 × 19 mm) and posterior cystic component (11 × 13 mm, 15 × 21 mm, and 25.9 × 38.4 mm).

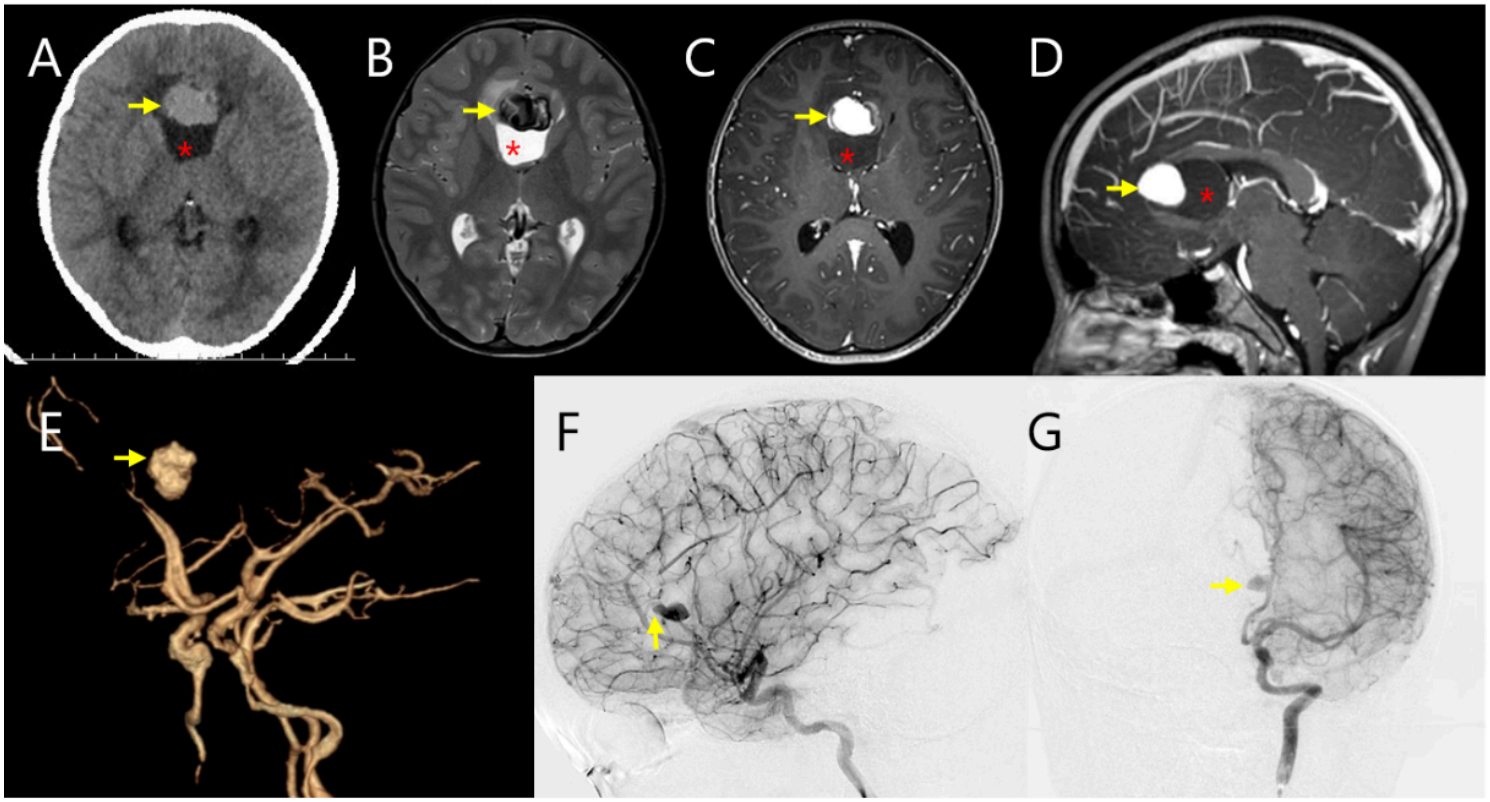


Figure 2

Preoperative imaging. (A) CT angiography shows the left distal ACA aneurysm. (B) Axial T2-weighted MRI and (C, D) axial and sagittal contrast-enhanced T1-weighted MRI show the partially thrombosed aneurysmal component (yellow arrow) and posterior cystic component (red asterisk). (E) Three-dimensional angiography and (F, G) digital subtraction angiography define the patent lumen and its relationship to the left A3 segment.

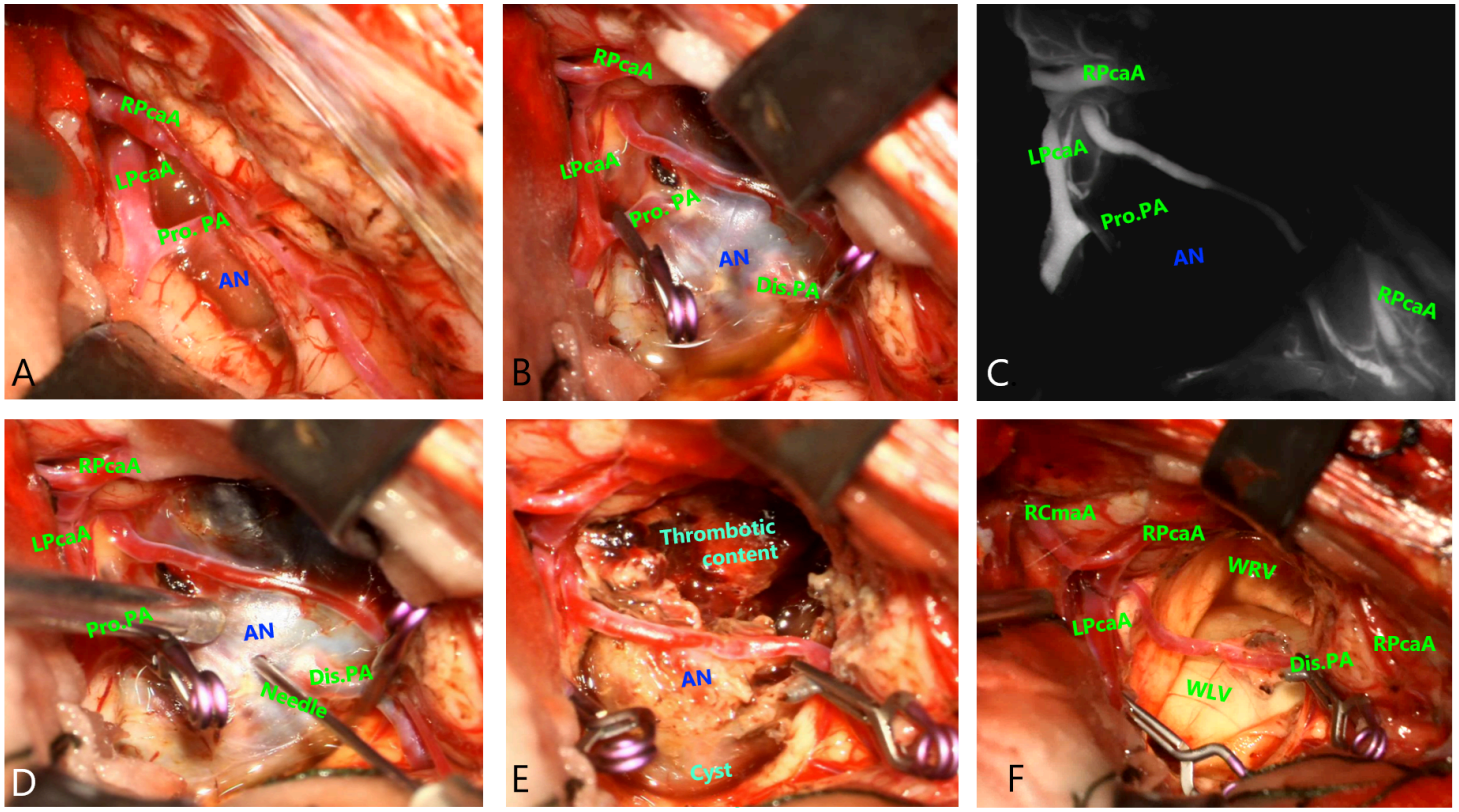


Figure 3

Intraoperative photographs. (A) Interhemispheric exposure of the left and right pericallosal arteries. (B) Proximal and distal vascular control. (C) Indocyanine green angiography shows patency of the preserved pericallosal circulation and no opacification of the aneurysm. (D) Needle puncture confirms absence of backflow. (E) Piecemeal thrombectomy and fenestration of the posterior cystic component. (F) Complete aneurysm resection and decompression. LPcaA, left pericallosal artery; RPcaA, right pericallosal artery; Pro.PA, proximal parent artery; Dis.PA, distal parent artery; RCmaA, right callosomarginal artery; AN, aneurysm; WRV, wall of right ventricle; WLV, wall of left ventricle.

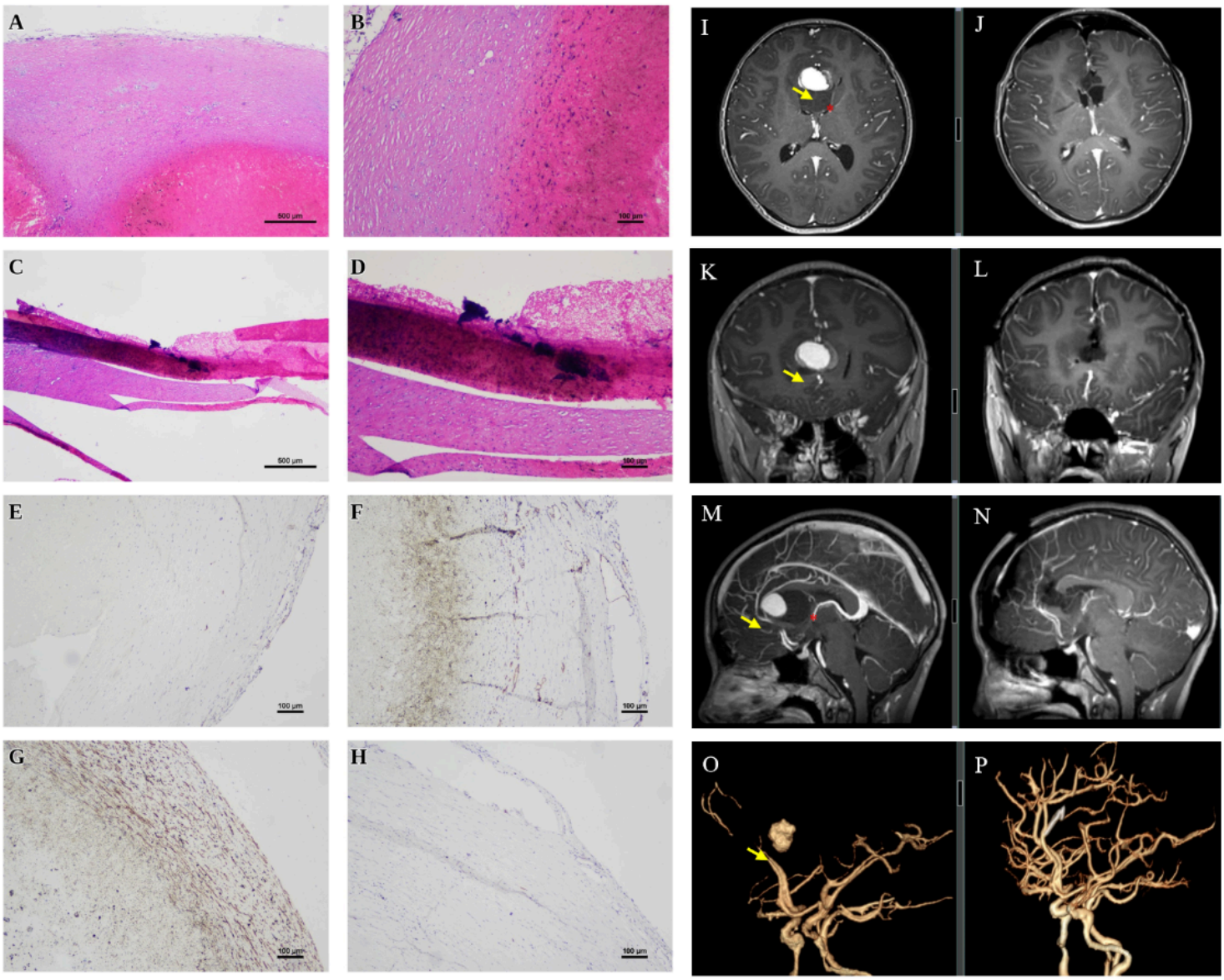


Figure 4

Histopathological findings and preoperative/postoperative imaging. (A, B) Hematoxylin and eosin staining shows focal thickening of the vascular wall. (C, D) Scattered calcification within the wall. (E) CD31 and (F) CD34 immunostaining highlights endothelial cells. (G) Smooth-muscle actin immunostaining highlights the smooth-muscle layer. (H) Ki-67 labeling index is approximately 1%. Scale bars: A and C, 500 μm; B, D-H, 100 μm. Preoperative axial (I), coronal (K), and sagittal (M) contrast-enhanced MRI shows the aneurysm (yellow arrow) and cystic component (asterisk); postoperative images (J, L, N) show resection and decompression. Preoperative three-dimensional CT angiography (O) shows the aneurysm; postoperative imaging (P) confirms resection with preserved distal ACA circulation.