Craniotomy for Concurrent Anterior Communicating Artery Aneurysm Clipping and Middle Cranial Fossa Tumor Resection: Case Report and Systematic Literature Review

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Abstract

There are no clear guidelines for treatment of unruptured intracranial aneurysms in the setting of other concurrent intracranial pathologies like tumors. Here we present a case of simultaneous anterior communicating artery (AcomA) aneurysm clipping and middle cranial fossa meningioma resection. We also conduct a systematic review of the literature to describe indications and outcomes related to concurrent surgical treatments.

Introduction

- The estimated prevalence of incidentally discovered intracranial aneurysms ranges from 1-5% of the population.[1,2]
- To date, there have been no clinical trials examining differences in outcomes of unruptured intracranial aneurysms (UIAs) between treatment modalities such as endovascular coiling or open microsurgical clipping.
- Treatment decisions of UIAs have largely been guided by individual considerations of the patient's age, aneurysm size, and location.[3]
- **Objective**: Here we present a case of a flow-induced anterior communicating artery (AcomA) aneurysm due to congenital absence of the left internal carotid artery (ICA) that was incidentally discovered during workup for a meningioma. The aneurysm was treated by microsurgical clipping during the same operation for tumor resection given their anatomical proximity. We conducted a systematic review of the PubMed database to characterize other treatment approaches for concurrent intracranial aneurysms and tumors (**Table 1**).

Case Presentation

- A 46-year-old black female presented to the emergency department for a three-week history of painless right eye swelling without any changes in vision. Exam showed right eye proptosis and mechanical diplopia, while the neurological exam was otherwise unremarkable.
- A computed tomography (CT) scan of the head showed a mass in the anterior and middle cranial fossa which was concerning for a tumor. A subsequent CT angiography (CTA) showed congenital absence of the left ICA, as well as a 2.8 x 3.0 mm saccular aneurysm arising from the AcomA **(Figure 1)**. Magnetic resonance imaging (MRI) showed that the mass lesion was in the sellar/suprasellar region, with involvement in the right cavernous sinus and extension into the orbit and Meckel's Cave **(Figure 2).**
- A pterional approach was used. The intradural tumor was debulked around the intradural/extracavernous ICA. The tumor was not extensively debulked into the cavernous sinus to preserve the unilateral ICA. A curved clip was then used to completely occlude the AcomA aneurysm. The patient was discharged on POD2 with no neurological deficits.

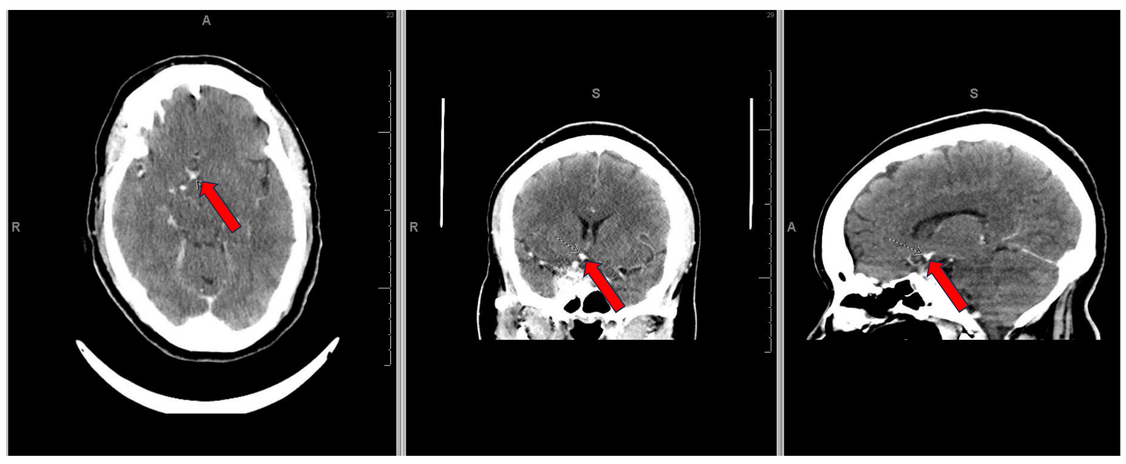

Figure 1: (Left to Right) Axial, coronal and sagittal CTAs demonstrating a flow induced AcomA aneurysm

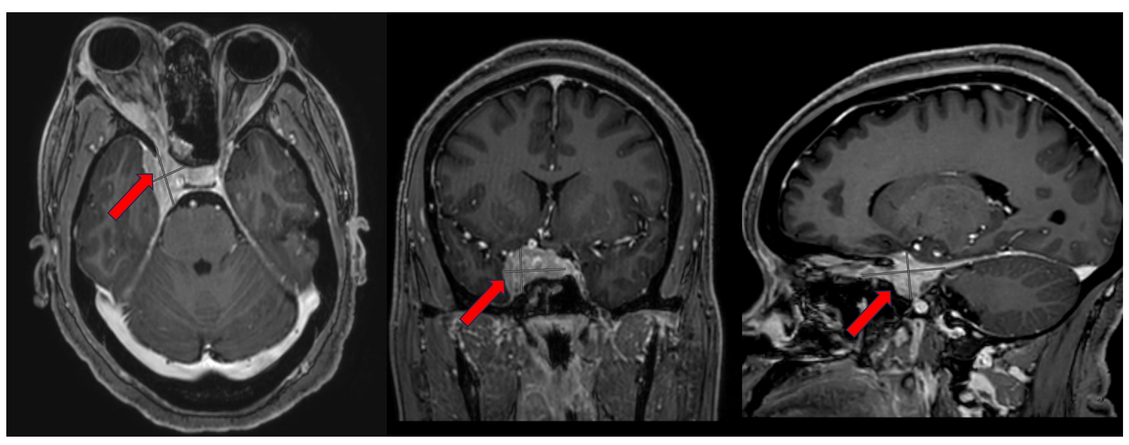

Figure 2: (Left to Right) Axial, coronal, and sagittal T1 MRIs demonstrating a right mass lesion with extension into the orbit, sella, and cavernous sinus. The mass lesion incased the unilateral intracavernous ICA.

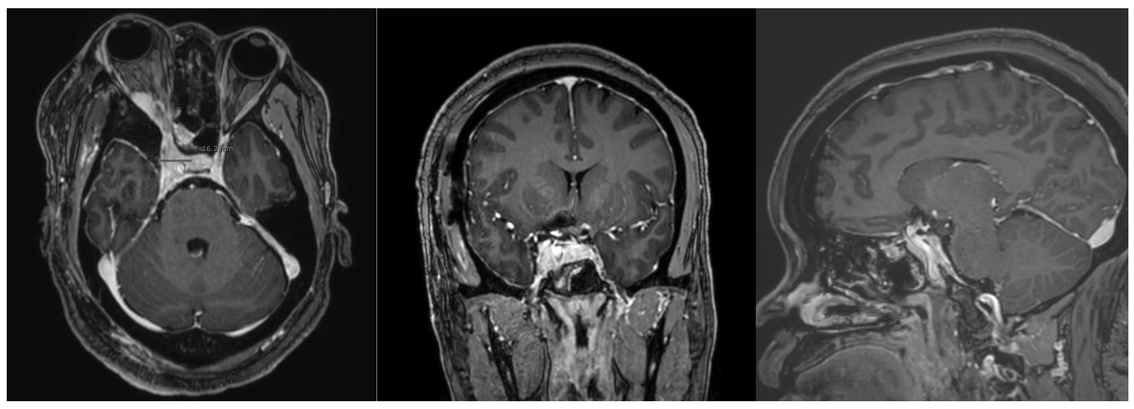

Figure 3: (Left to right) Axial, coronal, and sagittal T1 MRIs taken post-operatively. The images demonstrate extracavernous removal and debulking of the tumor. Pathology revealed a Grade 1 meningioma.

Literature Review

- **20** articles were found to meet inclusion criteria, for a total of **23 cases**
- **16** cases where aneurysm and tumor were identified preoperatively and intentionally treated simultaneously
- **Five** cases where incidental tumors were found during aneurysm clipping
- **Two** cases where incidental aneurysms were found during surgery
- **One** aneurysm initially failed endovascular treatment
- **All** cases had complete aneurysm occlusion and no mass-lesions related symptoms after surgery

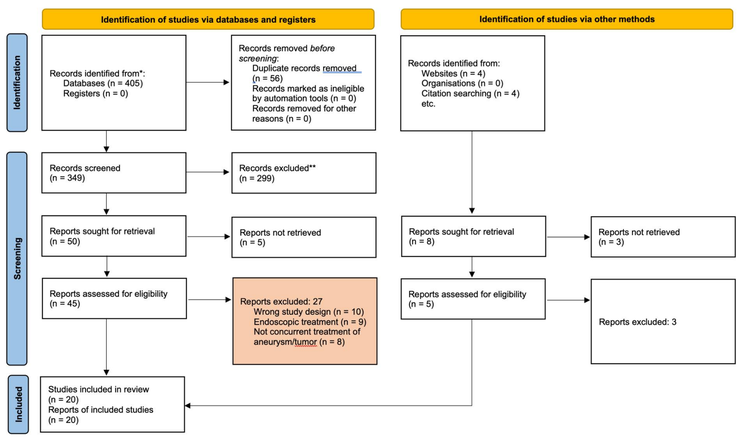

Figure 4: PRISMA flowchart diagram of the systematic review results

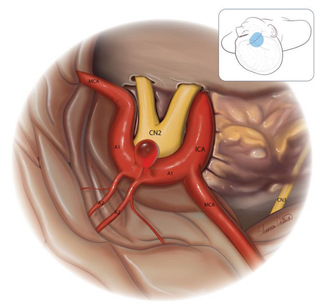

Figure 5: Illustration showing aneurysm and tumor

Study	Age (years)	Sex	Presenting Symptom	Tumor Type	Aneurysm Location	Both Lesions Known Prior to Surgery?
Aljuboori et al., 2020[9]	56	F	HA; Convulsions	Met. Lung cancer	L. ACA	Y
Wei et al., 2022[10]	38	M	HA	Meningioma	AcomA	Y
Bulsara et al., 2007[11]	73	M	HA; Blurred vision	Pituitary adenoma	AcomA	Y
Abbas & Boutarbach, 2024[12]	36	M	HA	Meningioma	AcomA	Y
Wu et al., 2021[13]	52	F	HA; R. visual changes	Meningioma	BL. Ophthalmic ICA	Y
Berger et al., 2016[14]	70	F	Incidental findings	Meningioma	L. MCA Bifurcation	Y
Onyia et al., 2023[15]	48	F	HA; L. ptosis	Meningioma	L. PcomA	Y
Xu et al., 2015[16]	49	M	SAH/Rupture	Pituitary adenoma	AcomA	Y
Yang et al., 2005[17]	53	F	Galactorrhea	Pituitary adenoma	L. Cavernous ICA	Y
Meguins et al., 2017[18]	65	F	SAH/Rupture	Meningioma	Azygos ACA	Y
Ogino et al., 1999[19]	70	F	SAH/Rupture	Meningioma	AcomA inside tumor	Y
Qian et al., 2019[20]	41	M	R. vision loss	Craniopharyngioma	AcomA	N (incidental aneurysm)
Hughes et al., 2015[21]	47	F	TN s/p radiosurgery	Schwannoma	BL. AICA	N (incidental aneurysm)
Javalkar et al., 2009[22]	70	F	SAH/Rupture	Meningioma	PcomA	Y
Javalkar et al., 2009[22]	63	F	SAH/Rupture	Meningioma	AcomA	N (incidental tumor)
Javalkar et al., 2009[22]	61	F	SAH/Rupture	Meningioma	PcomA	N (incidental tumor)
Mondragon-Soto et al., 2022[23]	55	F	R ptosis; BL. vision loss	Pituitary adenoma	BL. Clinoidal ICA	Y
Kanamori et al., 2013[24]	64	F	SAH/Rupture	Meningioma	L. ICA/PcomA	Y
Song et al., 2014[25]	31	F	SAH/Rupture	Pituitary adenoma	R. PcomA	N (incidental tumor)
Futami et al., 1992[26]	26	F	HA	Lipoma	R. MCA bifurcation	Y
Zhou et al., 2017[27]	53	M	SAH/Rupture	Meningioma	L. PcomA ruptured; R. clinoidal ICA	N (incidental tumor)
Waqas et al., 2015[28]	60	F	SAH/Rupture	Meningioma	L. ICA	N (incidental tumor)
Current Case	46	F	R. ptosis; diplopia	Meningioma	AcomA	Y
Summary	51 (mean age)	17/23 (74%) F	10/23 (43%) SAH	14/23 meningioma (61%)	8/23 AcomA (35%)	16/23 (70%) both lesions known before surgery

Table 1: Literature review detailing 23 cases of intracranial aneurysms and tumors treated concurrently

Conclusions

- The prevalence of coexisting intracranial aneurysms and tumors was documented as less than 0.3% in a series of 24,000 patients, with meningiomas being the most strongly associated.[7,8]
- A systematic review of the literature revealed 22 other cases of successful tumor resection and surgical treatment of an aneurysm.
- No treatment algorithms for concurrent meningiomas and intracranial aneurysms have been proposed, with most cases emphasizing anatomical relationships and indications for open aneurysm treatment.
- **Our findings suggest that in the setting of concurrent intracranial tumors and aneurysms in proximity, both pathologies can be safely and effectively treated surgically with an optimal craniotomy window.**

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