Anterior communicating artery aneurysm in the setting of cavernous meningioma – operative technique and review of indications

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Abstract

We present a case of a young female with congenitally absent left carotid. She was found to have cavernous meningioma on the right and a flow induced Anterior communicating artery (Acom) aneurysm. We found 22 cases of concurrent aneurysms in the literature. We believe the flow induced nature of the aneurysm required treatment since the aneurysm was accessible from the same surgical approach.

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)** .

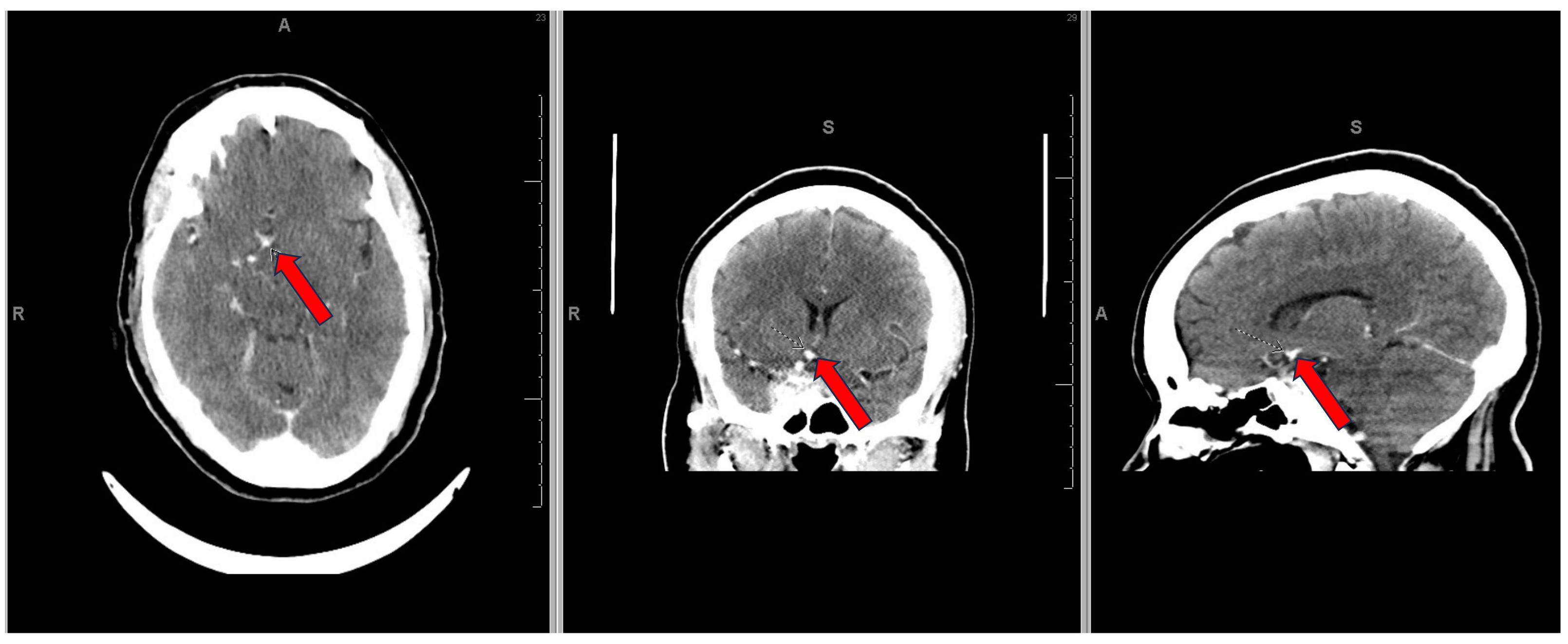

Figure 1: (Left to Right) Axial, coronal and sagittal CTAs demonstrating a flow induced AcomA aneurysm

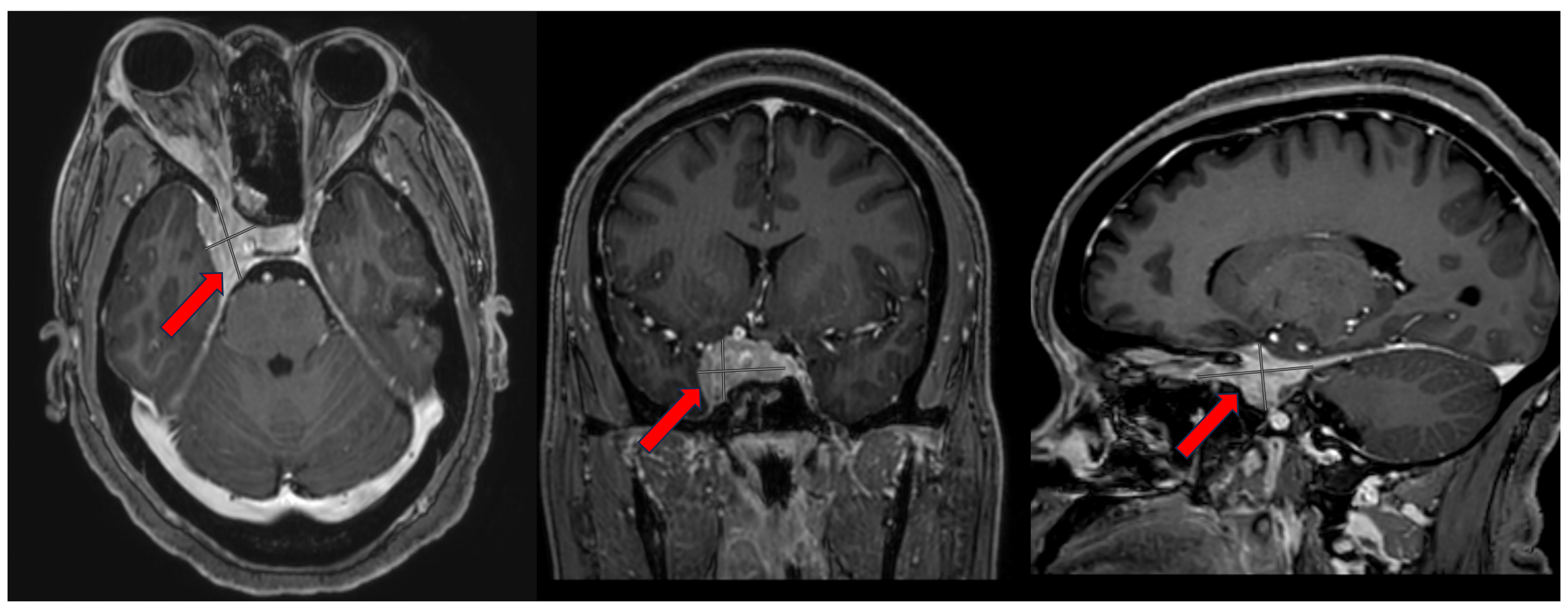

Figure 2: (Left to Right) Axial, coronal, and sagittal T1 MRIs demonstrating a right mass lesion with extension into the orbit, sella, and cavernous sinus. The mass lesion incased the unilateral intracavernous ICA.

Operative Decision-Making

Operative Considerations: Endovascular vs Surgical treatment

1. Flow induced AcomA aneurysm – greater risk of rupture, endovascular coiling may risk occluding/damaging AcomA necessary for contralateral circulation.[3-6]
2. Favorable operative approach – symptomatic mass lesion and flow-induced aneurysm could both be accessed from the same pterional craniotomy
3. Antiplatelet therapy – possibility of future tumor resections/cranial surgeries while managing antiplatelet therapy if aneurysm treated endovascularly

Operative Treatment and Outcome

- Pterional approach was used to access tumor and aneurysm
- Intradural portion of tumor was removed in a piecemeal fashion and gently removed from the intradural/extracavernous ICA and tuberculum sellae
- The tumor was not extensively debulked into the cavernous sinus to safely preserve the unilateral ICA and cranial nerves
- A curved clip was then used to completely occlude the anterior/inferior projecting AcomA aneurysm
- Patient was discharged on POD2 with no neurological deficits

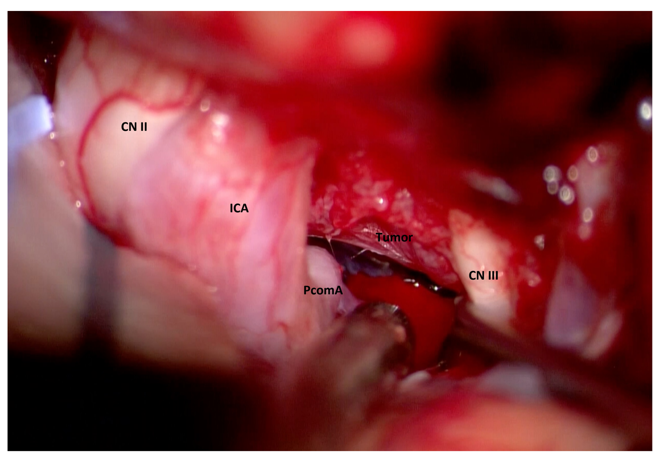

Figure 3: Debulking of tumor around intradural ICA

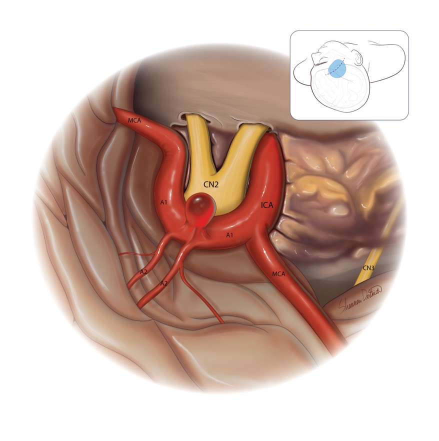

Figure 4: Illustration showing aneurysm and tumor

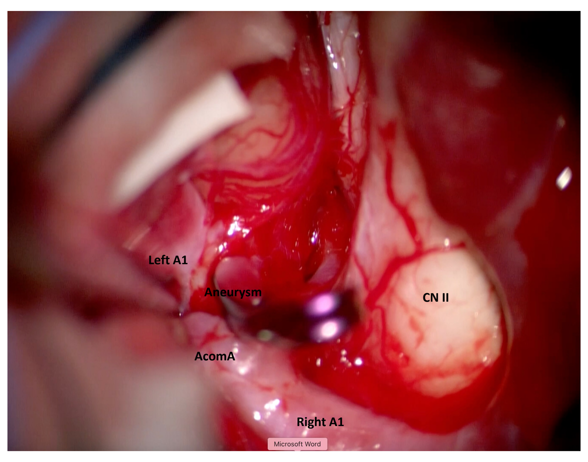

Figure 5: Clipping of the AcomA aneurysm

Literature Review

- Two independent reviewers conducted a systematic review of the PubMed database for articles describing concurrent surgical treatment of intracranial aneurysms and tumors
- **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

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

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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