



# Outcomes of a Modern Treatment Approach: Endoscopic Endonasal and Transmaxillary Resection for Advanced Juvenile Nasopharyngeal Angiofibroma

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## Introduction

Advanced juvenile nasopharyngeal angiofibroma (JNA) has historically been resected via open transfacial and transcranial approaches. More recently, endoscopic endonasal/transmaxillary surgery (EES) has emerged as a safe and effective alternative.

## Objective

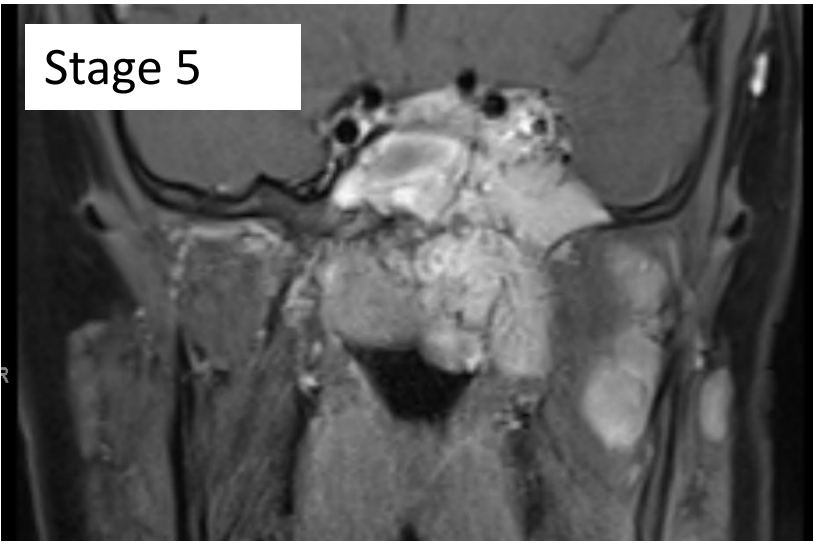
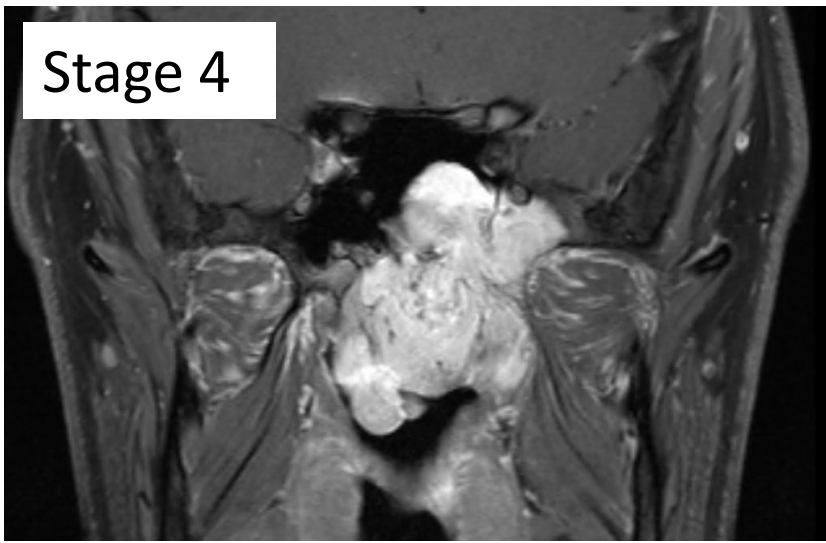
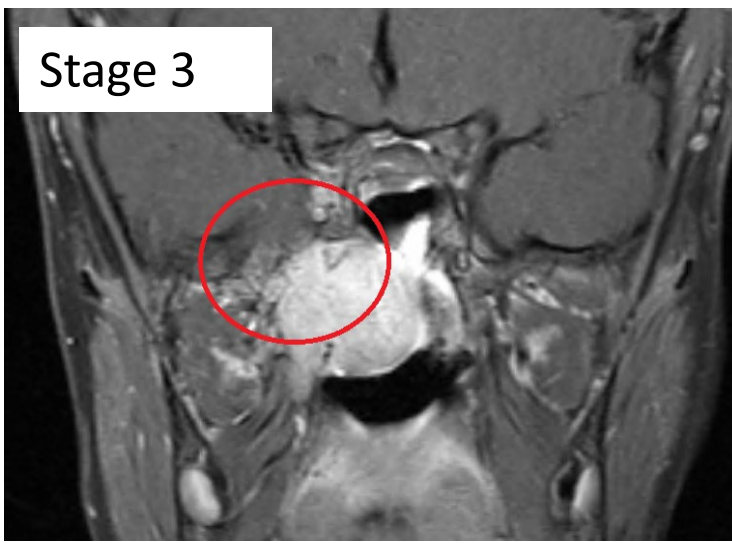
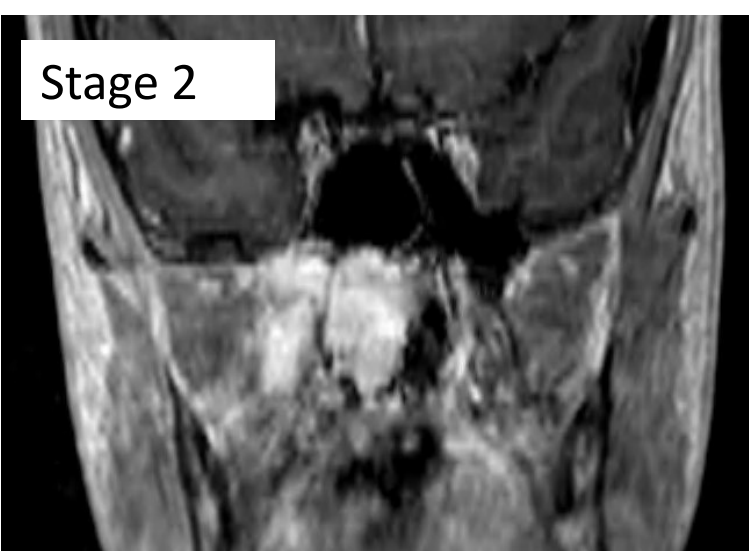
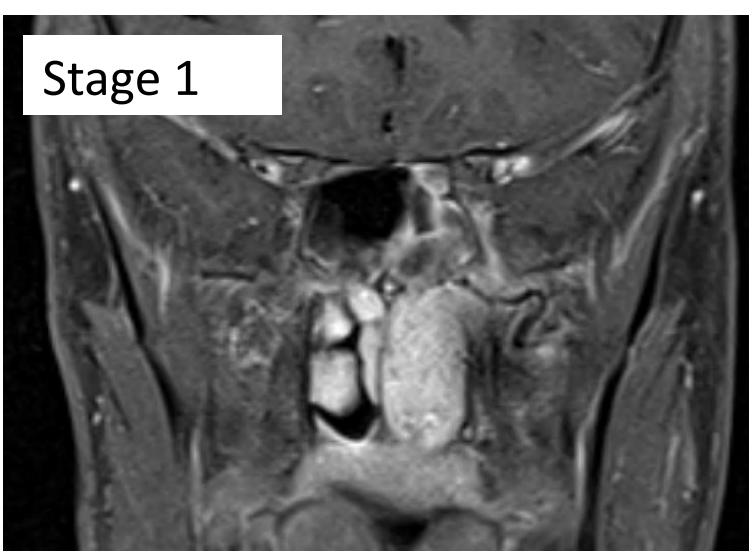
To report our experience treating JNA with EES at a single large pediatric tertiary referral center and answer these two questions:  
1. Is EEA+TMS effective for advanced stage tumors?  
2. What are its limitations?

## Methods

- Retrospective review of patients treated with EES for JNA between 2009-2022.
- Advanced stage was defined as UPMC stage III, IV, or V.
- Patients were excluded if they were 19 years of age or older at the time of presentation.

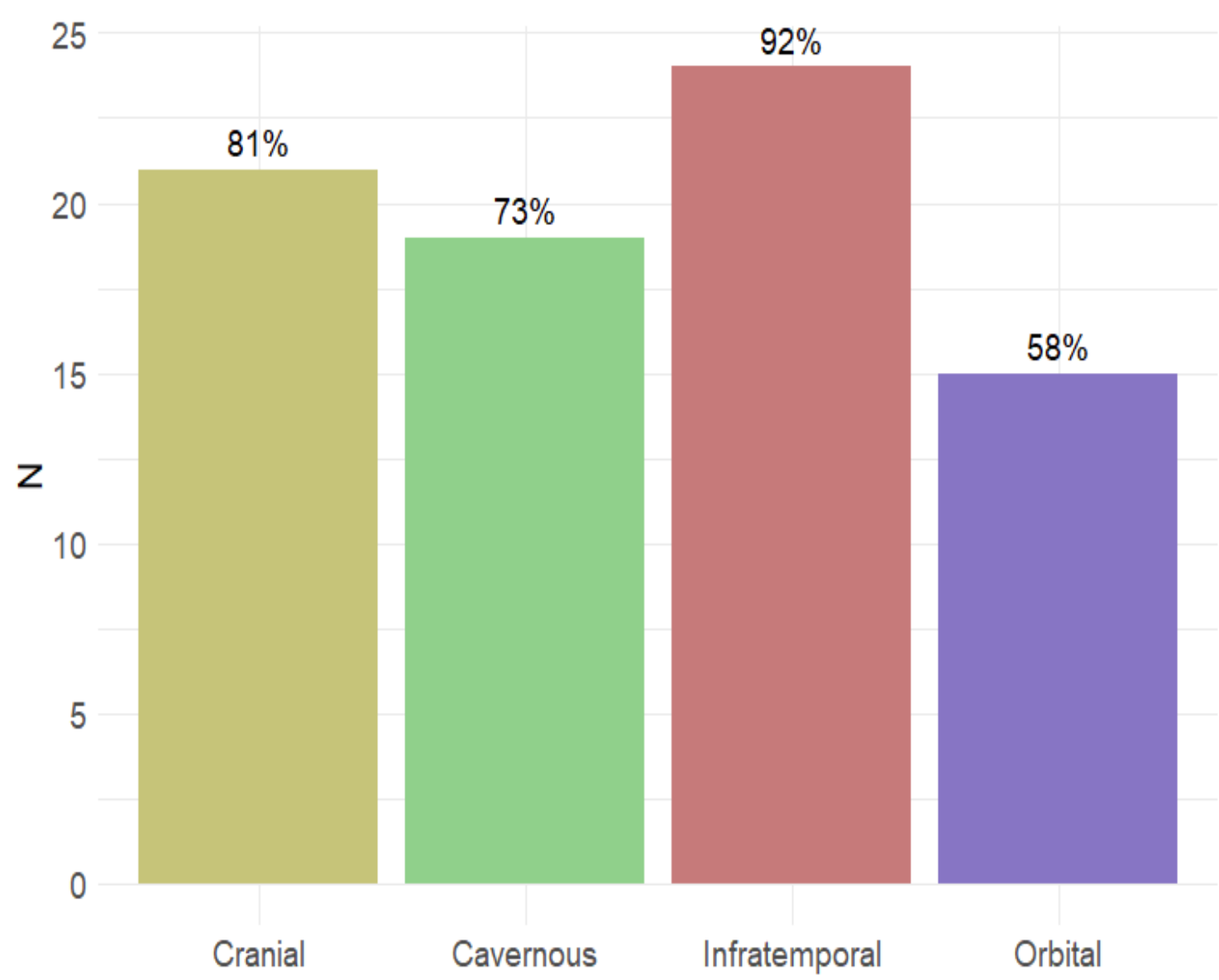
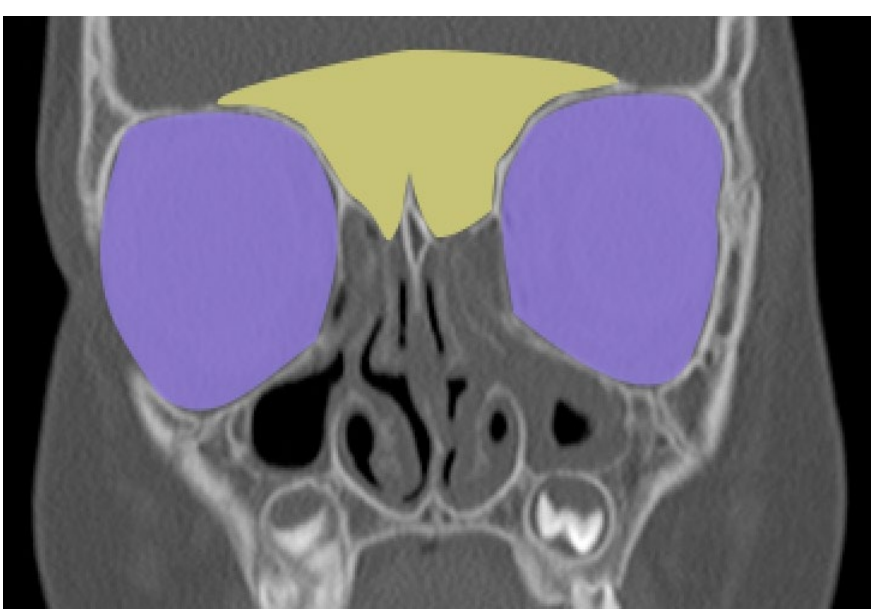
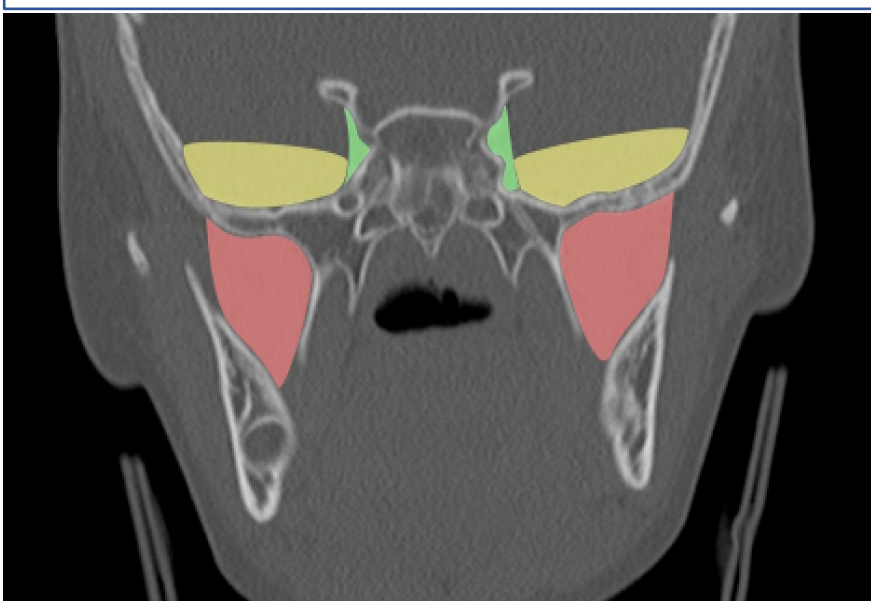
UPMC Staging System for Angiofibroma:

- Stage I: Involves the nasal cavity and medial pterygopalatine fossa.
- Stage II: Extends to the paranasal sinuses and lateral pterygopalatine fossa, with no residual vascularity.
- Stage III: Includes skull base erosion, orbit, and infratemporal fossa, with no residual vascularity.
- Stage IV: Involves skull base erosion, orbit, and infratemporal fossa, but with residual vascularity.
- Stage V: Represents intracranial extension with residual vascularity, further classified into medial (M) or lateral (L) extension.



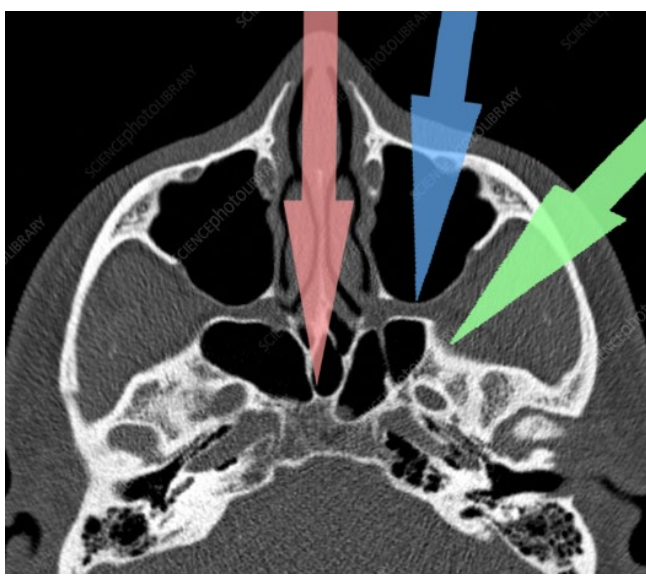
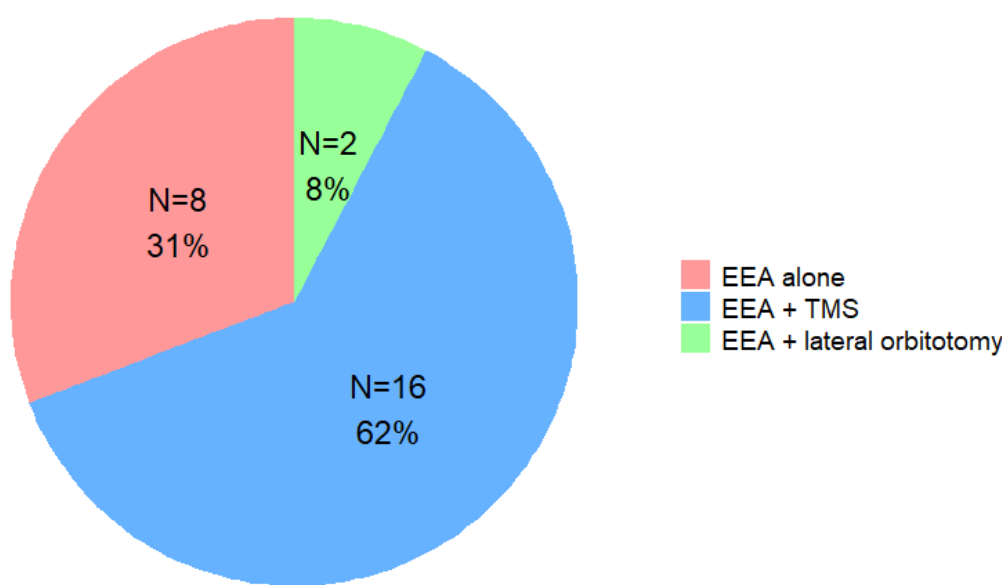
## Results

Twenty-six patients were included. All were male with a median age of 14.1 years (range 7.5-16.7). Most tumors were UPMC stage V (n=20, 77%) with lesser proportions of stage III (n=4, 15%) and IV (n=2, 8%). Median tumor volume was 67 cm<sup>3</sup> (range 5.2-250). All patients underwent preoperative endovascular embolization. Intraoperative blood loss (median, range) was 1.5L (750mL-16L). Despite a predominance of tumors with significant intracranial extension (n=21, 81%), infratemporal fossa (n=24, 96%), cavernous sinus (n=19, 76%), and orbit (n=15, 60%) involvement, all were successfully resected primarily with EES. Staging of surgery was required in 6 patients due to intraoperative blood loss.



## Approach

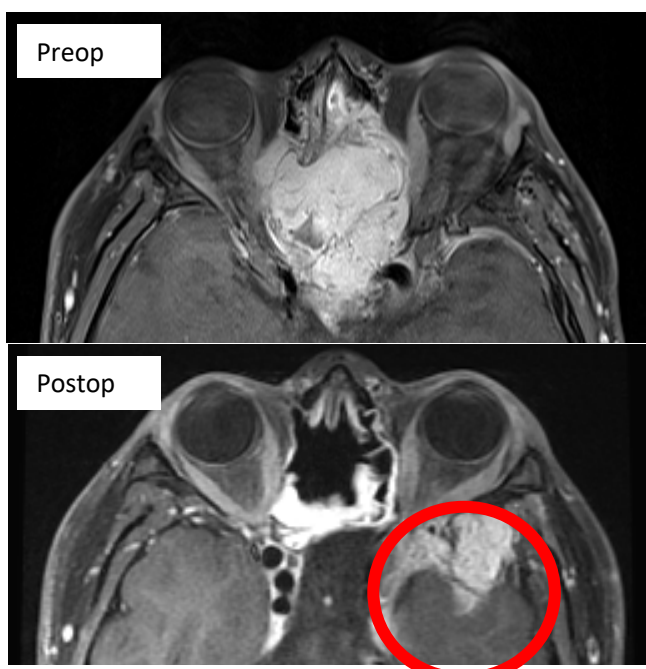
The anterior transmaxillary corridor was used for lateral extension into the infratemporal fossa (n=17, 65%). A lateral orbitotomy (n=1, 7%) and subtemporal craniotomy (n=1, 4%) were required for complete resection of medial sphenoid wing tumor. The rate of gross total resection was 80% (n=20).



## Complications and Residual

Postoperative complications included an embolization-related stroke (n=1, 5%), complete monocular blindness due to central retinal artery occlusion (n=1, 5%), and ICA injury requiring vessel sacrifice (n=1, 5%) without consequence. In 5 patients (19%), there was residual tumor where it was densely adherent to critical neurovascular structures.

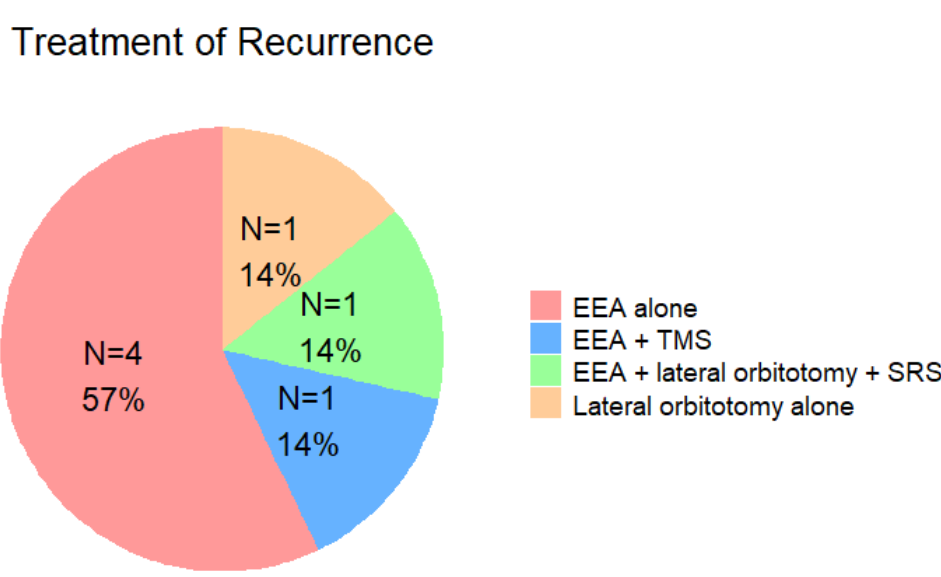
	Inferior orbital fissure	Orbital apex	Cavernous sinus	Lateral sphenoid wing
Patient 1	X	X		
Patient 2	X	X		
Patient 3			X	X
Patient 4		X	X	
Patient 5	X		X	X
Total	3	3	3	2



## Recurrence

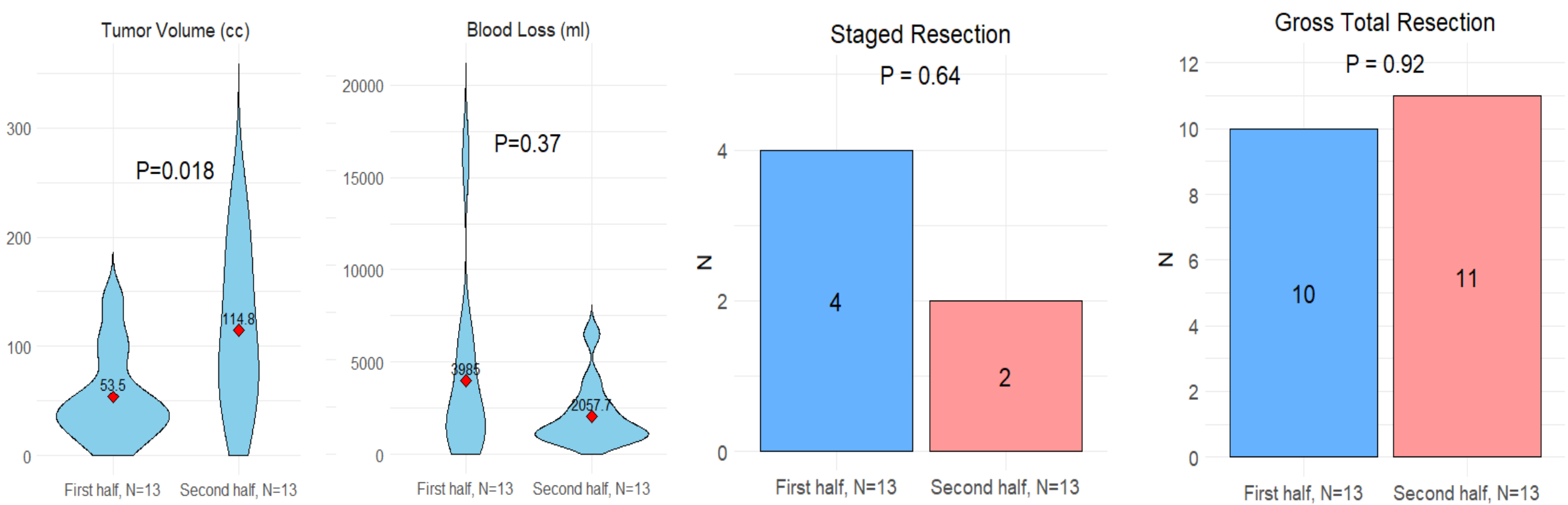
Average follow up was 32 months (range 3-132). Seven patients (27%) suffered recurrence at a median of 10 months postoperatively (range 5-33). Four recurrences were in the setting of growth of residual and three were after GTR. Five recurrences were completely resected via EETS, but two in the medial sphenoid wing required addition of lateral orbitotomy. One patient received stereotactic radiosurgery in addition to EEA and lateral orbitotomy. None received any other form of radiation therapy.

	Cavernous sinus	Infraorbital fissure	Supraorbital fissure	Middle fossa	Infratemporal fossa	Pterygoid
Patient 1	X	X				
Patient 2			X			
Patient 3		X				
Patient 4				X	X	
Patient 5				X	X	
Patient 6						X
Patient 7						X
Total	1	2	1	2	2	2



## Effect of Experience

The 26-patient cohort was split chronologically into two cohorts of equal size. In the second half of our experience, we operated on larger tumors, lost less blood, and resorted less frequently to staging operations. This came at the cost of longer operative times but no change in frequency of gross total resection.



## Conclusions

- EES for JNA is safe and effective; it is suitable for JNAs of all stages.
- EES can be augmented by lateral orbitotomy, when necessary, to avoid infratemporal skull base approach.
- Recurrence is rare after 3 years, making continued surveillance with prior negative scan not necessary.
- Most recurrences can be managed with repeat EE surgery or lateral orbitotomy without RT.

## Contact

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