

## The Utility of Pre-Operative Tumor Embolization for Petroclival Meningiomas for Surgical Resection, Outcomes, and Recurrence Rates

Joshua William Osbun MD; Philip Tatman BS; Peter A. Chiarelli MD; Lalgam N. Sekhar MD, FACS; Basavaraj Ghodke MD; Danial K. Hallam MD, MSc; Manuel Ferreira MD, PhD; Louis J. Kim MD  
Department of Neurological Surgery, University of Washington, Seattle, WA



### Introduction

Meningiomas of the petroclival region are rare and difficult to treat skull base lesions. They commonly derive blood supply from the meningohypophyseal trunk (MHT) of the cavernous ICA or neurovascular braches of the ascending pharyngeal artery. Pre-operative embolization can ease the resection by reducing blood loss and softening the tumor. We present our series of pre-operative embolization for petroclival meningiomas.

### Methods

A database of 95 petroclival meningiomas surgically resected at our institution from 2000-2013 was retrospectively reviewed. 69 patients underwent pre-operative angiogram with the goal of embolization. Data was collected on angiographic finding and efficacy of embolization, complications, and surgical outcomes

Arterial Feeder	Angiography (n)	Embolized (%n)
MHT	46	38 (83%)
Ascending Phayngeal	15	10 (67%)
Middle Meningeal	18	12 (67%)
ILT	6	4 (67%)
Occipital Artery	4	3 (75%)
Internal Maxillary Artery	3	1 (33%)
Ophthalmic Artery	3	0 (0%)
ICA Other	3	0 (0%)
Vertebral Artery	2	1 (50%)

### Results

Of the tumors undergoing angiography, 66 were WHO Grade I, and 3 were WHO Grade II. 55 of 69 tumors (80%) were embolized with polyvinyl alcohol (PVA) particles. There were 39 tumors (56%) with ICA feeders, 8 with ECA feeders (12%) and 22 tumors with both ECA and ICA feeders (32%). Of the most commons feeding vessels, 38/46 (83%) MHT feeders, 10/15 (67%) ascending pharyngeal arteries, 12/18 (67%) middle meningeal arteries were embolized, with partial tumor embolization in 43 cases (78%) and complete embolization in 12 cases (22%). There were no adverse events such as inadvertent embolization, stroke or intracranial hemorrhage. Embolization was aborted when feeders collateralized with the IAC or ophthalmic artery or the vessel was unsuccessfully catheterized. Chi-squared univariate analysis was not significant ( $p=.329$ ) for the effect of embolization on recurrence; however, trivariate Cox regression analysis demonstrated that when controlling for gross total resection and adjuvant radiotherapy, embolized tumors were less likely to recur (Hazard Ratio .549) during average follow-up of 31.8 months in age, sex and tumor size matched groups.

### Conclusions

### Learning Objectives

By the conclusion of this session, participants should be able to discuss the importance of pre-operative embolization and identify the pitfalls of endovascular embolization in presence of dangerous collaterals, discuss in small groups how understanding angiographic anatomy can effect embolization and surgical success, and understand how embolization can potentially effect the long-term risk of tumor recurrence.

### References

1. Bendszus M, Monoranu CM, Schutz A, Nolte I, Vince GH, Solymosi L. Neurologic complications after particle embolization of intracranial meningiomas. *AJNR*. American journal of neuroradiology. Jun-Jul 2005;26(6):1413-1419.
2. Borg A, Ekanayake J, Mair R, et al. Preoperative Particle and Glue Embolization of Meningiomas: Indications, Results and Lessons Learned from 117 Consecutive Patients. *Neurosurgery*. Feb 25 2013.
3. Carli DF, Sluzewski M, Beute GN, van Rooij WJ. Complications of particle embolization of meningiomas: frequency, risk factors, and outcome. *AJNR*. American journal of neuroradiology. Jan 2010;31(1):152-154.
4. Law-ye B, Clarencon F, Sourour NA, et al. Risks of presurgical embolization of feeding arteries in 137 intracranial meningeal tumors. *Acta neurochirurgica*. Apr 2013;155(4):707-714.
5. Nania A, Granata F, Vinci S, et al. Necrosis Score, Surgical Time, and Transfused Blood Volume in Patients Treated with Preoperative Embolization of Intracranial Meningiomas. Analysis of a Single-Centre Experience and a Review of Literature. *Clinical neuroradiology*. Mar 24 2013.
6. Sluzewski M, van Rooij WJ, Lohle PN, Beute GN, Peluso JP. Embolization of meningiomas: comparison of safety between calibrated microspheres and polyvinyl-alcohol particles as embolic agents. *AJNR*. American journal of neuroradiology. Apr

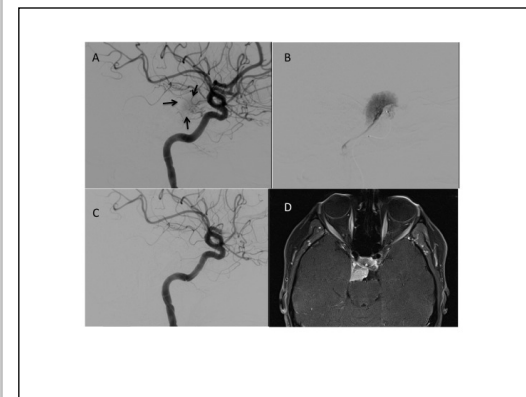


Figure 1: (A) Right Internal Carotid Injection demonstrates vascular blush from a tumor fed by the right meningohypophyseal trunk (arrows). (B) Superselective catheterization of the right meningohypophyseal trunk demonstrating a tumor blush. (C) Right internal carotid artery injection status post embolization demonstrates obliteration of the tumor's vascular supply. (D) Axial T1 weighted MR with gadolinium demonstrating petroclival mass.