

Histopathological differences between polyvinyl alcohol and ethylene vinyl alcohol copolymer in pre-operatively embolized glomus jugulare paragangliomas

Björn Herman, MD¹, Mohamed Samy Elhammady, MD², Mohammad Ali Aziz-Sultan, MD², Carmen Gomez, MD³, Fred Telischi, MD¹, and Simon Angeli, MD¹
University of Miami School of Medicine, ¹Department of Otolaryngology, ²Department of Neurosurgery, ³Department of Pathology

CONTACT

Simon Angeli, MD
University of Miami
Miller School of Medicine
Department of Otolaryngology
1120 NW 14th Street, 5th Floor
Miami, FL 33136
Email: sangeli@med.miami.edu
Phone: 305-243-1451

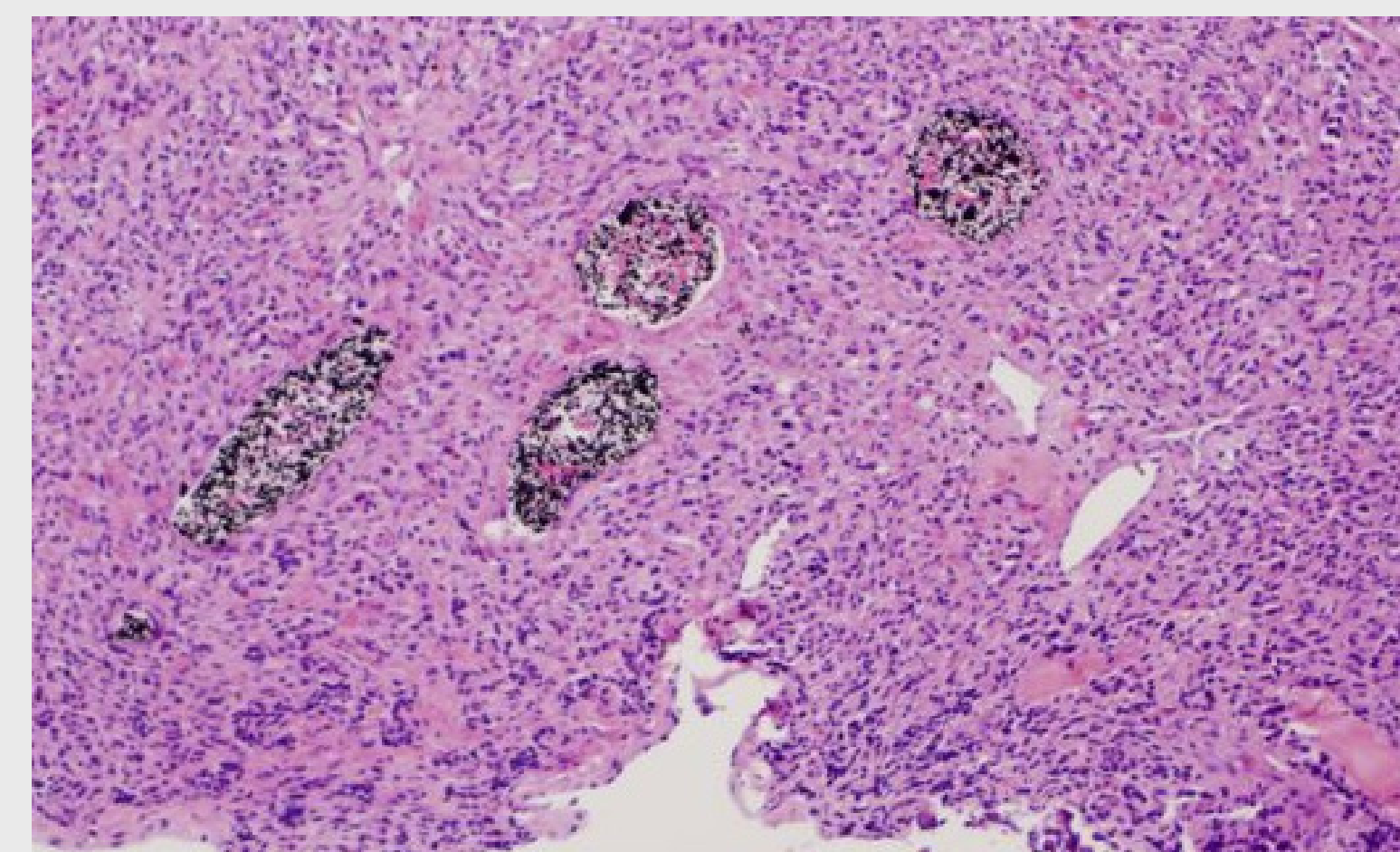
INTRODUCTION

Embolization prior to resection of glomus jugulare tumors has become the standard of care in most institutions. Many different embolic materials have been used, including polyvinyl alcohol (PVA), microcoils, N-butyl cyanoacrylate (NBCA), gelfoam, ethanol, and detachable silicone balloons. Ethylene vinyl alcohol copolymer (EVAC) is a liquid embolic material which has slower precipitation properties, allowing deep penetration within the tumor vasculature. Injection of EVAC may be interrupted several times for assessment of embolization pattern and early recognition of dangerous intracranial anastomoses. An advantage of EVAC over particulate embolics is that it does not require contrast to determine extent of tumor embolization and does not dissipate over time allowing revascularization.¹ **PVA occluded only 30% of vessels (range 5-80%)** in a previous study by Pauw et al.² The objectives of this study are:

- 1) To histopathologically characterize glomus jugulare paragangliomas pre-operatively embolized EVAC
- 2) To describe histopathological differences between glomus jugulare paragangliomas pre-operatively embolized with PVA and EVAC

METHODS AND MATERIALS

This is a cohort study of glomus jugulare paragangliomas pre-operatively embolized with EVAC and subsequently resected at a tertiary care center between 2003 and 2010. The percentage of tumor devascularization was then determined by tracing the pre- and post-embolization tumor blushes using ImageJ software. Patient demographic and clinical data was collected, and histopathological analysis of the pre-operatively embolized tumors was performed by the same pathologist. Histopathological analyses were also compared to those of PVA done by Pauw et al.²



Tumor resected on post-embolization day one. Even small arterioles show total occlusion by EVAC.

RESULTS

Six patients were included in the study, ages 16-66. Percent tumor devascularization ranged from 88.54% to 100% (mean 94.98%). Time between EVAC and resection ranged from 1 day to 2.5 months. Surgical EBL was 150-1000cc (mean 600cc). EVAC has a higher cost per milliliter than PVA.

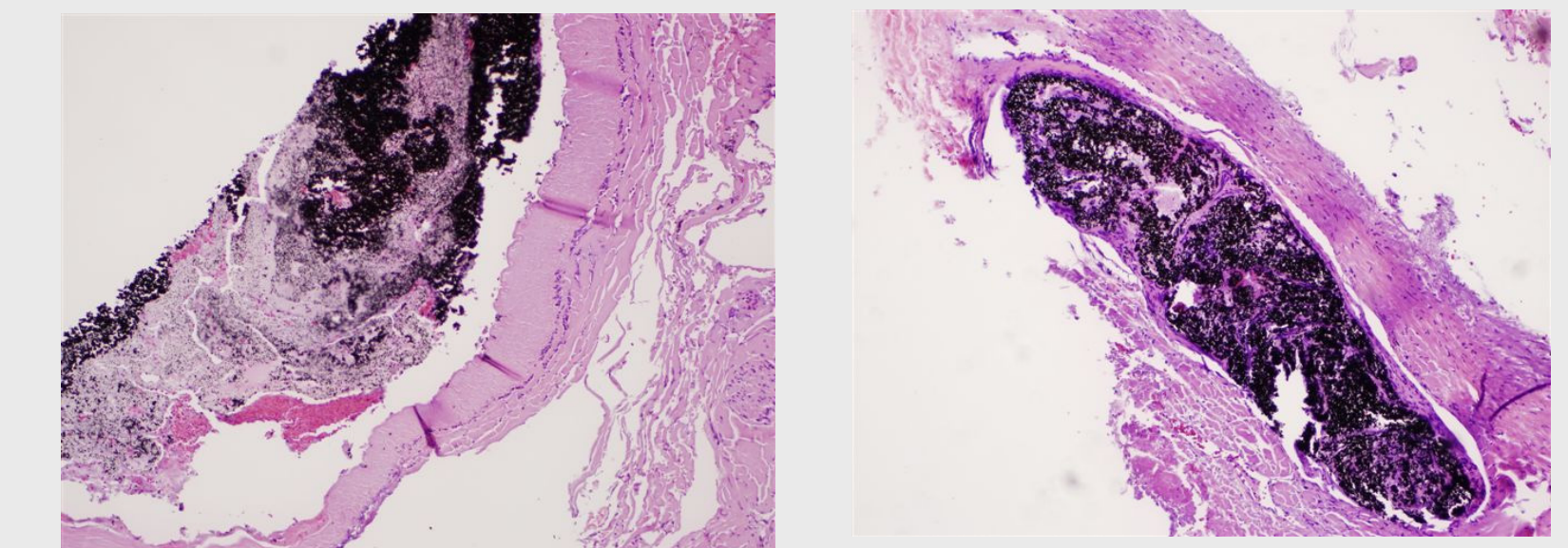
Glomus jugulare paragangliomas embolized with EVAC demonstrated 100% or near 100% occlusion of arterial vessels in most sections by histopathological analysis, whereas in previous studies PVA demonstrated a significantly lower percentage of embolization. Even when resection was performed several months after embolization, there was no revascularization of EVAC embolized vessels, whereas PVA embolized vessels have demonstrated partial revascularization.

In one patient whose tumor was not completely resected after embolization with EVAC, there was no evidence of subsequent growth of the remnant disease, but in another incompletely embolized patient, there was a recurrence of disease.

During surgery, it was noted that in one patient there seemed to be extensive inflammatory reaction and loss of tissue planes, making the dissection significantly more difficult.

CONCLUSION

In our study, histopathological analysis of pre-operatively embolized glomus jugulare paragangliomas indicates that EVAC may provide a more thorough and longer lasting embolic profile than PVA due to its resistance to revascularization of embolized vessels.



Glomus jugulare tumors excised over two months after embolization. Histopathological analysis shows persistent EVAC.

REFERENCES

1. Robinson DH. Vascular Lesions of the Skull Base: Endovascular Prospective for the Otolaryngologist. *Otolaryngol Clin N Am* 2005;38:737-771.
2. Pauw et al. Preoperative Embolization of Paragangliomas (Glomus Tumors) of the Head and Neck: Histopathologic and Clinical Features. *Skull Base Surgery* 1993;3:37-44.