MR Imaging Assessment of Cerebral Arteriovenous Malformations after Stereotactic Radiosurgery



Tim O'Connor BS; William A. Friedman MD University of Florida Department of Neurosurgery



### Introduction

Stereotactic radiosurgery is ideal for treating small cerebral arteriovenous malformations that are surgically inaccessible, but the inherent delay of AVM obliteration and the potential of radiosurgical failure necessitate safe and accurate follow-up imaging.

In this study, we aimed to determine the accuracy of an MRI diagnosis of complete thrombosis and identify variables that affect the precision of MRI assessment.



#### Methods

One hundred and twenty patients were reviewed after receiving radiosurgery at the University of Florida from 1990 to 2010. Each patient had an MRI demonstrating AVM obliteration and an angiogram either confirming or denying AVM thrombosis. AVM volume, MRI Tesla strength, and incidence of hemorrhage were documented.



## Results

MR imaging correctly predicted complete AVM obliteration in 82% of patients. Of the remaining 18% that had a false negative MRI, two patients had a draining vein and twenty patients had a draining vein with a residual nidus on angiography.

An analysis of nidus size demonstrated a significant correlation between AVM volume and MRI accuracy in two separate models. In the first model, logistic regression analysis revealed a significant linear relationship between the natural log of AVM volume and the probability of MRI agreement with angiography (p=0.0277). The second model showed significant evidence of a cutoff point in MRI accuracy near an AVM volume of 2.80 cm3, above which MRI agreement with angiography is 90%, and below which MRI agreement falls off sharply to remain roughly constant at 70% (p=0.0107).

There was a trend between MRI year and MRI agreement, but it was not significant (p=0.1020). There was no significant association between tesla strength and MRI agreement.



The probability of an accurate MRI diagnosis of complete thrombosis increases in relation to AVM volume.

# Conclusions

MRI is a useful diagnostic system for assessing AVM obliteration, but its accuracy is inherently linked to the volume it is measuring. Angiography is necessary for final confirmation of obliteration in smaller AVMs. However, the therapeutic benefit of evaluating larger AVMs with angiography is questionable. These results suggest MRI may be able to take on an increasingly independent role in the evaluation of AVM regression.

### References

 Zuccarello, M, McMahon, N. (2010). Arteriovenous malformation. [online image]. Retrieved from http://www.mayfieldclinic.com/PE-AVM.htm
Koenigsberg, RA. (2011). Brain Imaging in Arteriovenous Malformation. [online image]. http://emedicine.medscape.com/article/337220overview#a21

#### Acknowledgments

I would like to thank my research mentor, Dr. Friedman, for this great opportunity and his ongoing help and support. I would also like to recognize Dr. Bova, Dorene Stewart, and the Neurosurgery residents for their assistance and guidance over the summer. Finally, I would like to thank Dr. Schultz and the MSRP for setting this project in motion.

