

Gamma Knife Radiosurgery for the Treatment of Spetzler-Martin Grade III Arteriovenous Malformations

Dale Ding MD; Chun-Po Yen MD; Robert M. Starke MD MSc; Zhiyuan Xu MD; Jason P. Sheehan MD PhD FACS

University of Virginia, Department of Neurological Surgery, Charlottesville, VA



Introduction

Due to the Spetzler-Martin grading scale’s composition, grade III AVMs are the most heterogeneous being comprised of four distinct lesion subtypes. We report our experience with radiosurgery for a large cohort of grade III AVMs.

Methods

From 1989 to 2009, all patients with Spetzler-Martin grade III treated with Gamma Knife radiosurgery at the University of Virginia were identified. After excluding patients with less than 2 years of radiologic follow-up except those with evidence of complete obliteration, 398 patients harboring grade III AVMs were analyzed. The most common presenting symptoms were hemorrhage (59%), seizure (20%), and headache (10%). The median AVM volume was 2.8 cc, and the median prescription dose was 20 Gy. The median radiologic and clinical follow-up intervals were 54 and 68 months, respectively.

Results

Complete AVM obliteration following radiosurgery was observed in 69% of grade III AVMs at a median time of 46 months. The obliteration rate was higher in ruptured AVMs than unruptured ones (P<0.001). Additionally, the obliteration rate for grade III AVMs with small size (<3 cm), deep venous drainage, and located in eloquent cortex was higher than for the other subtypes (P<0.001). Pre-radiosurgery AVM rupture (P=0.016), no pre-radiosurgery embolization (P=0.003), increased prescription dose (P<0.001), fewer isocenters (P=0.006) and single draining vein (P=0.018) were independent predictors of obliteration. The annual risk of post-radiosurgery hemorrhage during the latency period was 1.7%. Two patients (0.5%) died of hemorrhage during the radiosurgical latency period. The rates of symptomatic and permanent radiation-induced changes (RIC) were 12% and 4%, respectively. No pre-radiosurgery AVM rupture (P<0.001) and single draining vein (P<0.001) were independent predictors of RIC.

Conclusions

Radiosurgery for Spetzler-Martin grade III AVMs yields relatively high rates of obliteration with low a rate of adverse procedural events. Small and ruptured lesions are more likely to obliterate after radiosurgery than large and unruptured ones.

Learning Objectives

By the conclusion of this session, participants should be able to 1) Describe the outcomes of Gamma Knife radiosurgery as a treatment approach for Spetzler-Martin grade III arteriovenous malformations, 2) Discuss, in small groups the patient, arteriovenous malformation and treatment characteristics which predict obliteration and radiation-induced changes following radiosurgery, and 3) Identify an effective treatment for grade III arteriovenous malformations.

References

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