

Gamma Knife Radiosurgery for Patients with Unruptured Arteriovenous Malformations Dale Ding MD; Chun-Po Yen MD; Zhiyuan Xu MD; Robert M. Starke MD MSc; Jason P. Sheehan MD PhD FACS University of Virginia Health System



Introduction

The appropriate management of unruptured arteriovenous malformations (AVMs) remains the subject of controversy. In the present study, we evaluate the radiographic and clinical outcomes of Gamma Knife Radiosurgery (GKRS) for a large cohort of patients with unruptured AVMs.

Methods

From a prospective database of 1204 AVM patients treated with GKRS at the University of Virginia from 1989 to 2009, we identified 444 patients with unruptured AVMs prior to treatment. The mean age was 36.9 years and 50% were male. The most common presenting symptoms were seizure (46.8%), headache (27.7%) and focal neurological deficit (11.9%). AVM characteristics were mean nidus volume was 4.2 cc, 13.5% deep location, and 44.4% at least Spetzler-Martin grade III. They were treated with GKRS using a median prescription dose of 20 Gy. Univariate and multivariate Cox regression analyses were used to determine risk factors associated with obliteration, post-GKRS hemorrhage, radiationinduced changes and post-GKRS cyst formation.

Results

The mean radiographic and clinical follow-ups were 75.5 85.5 months, respectively. The cumulative obliteration rate was 61.9% and the post-GKRS annual hemorrhage rate was 1.6% until and if obliteration occurred. Radiation-induced changes were symptomatic in 13.1% and permanent in 2.0% of patients. Statistically significant independent positive predictors of obliteration were no pre-GKRS embolization (P<0.001), increased prescription dose (P<0.001), single draining vein (P<0.001), radiographic presence of radiation-induced changes (P=0.004) and lower Spetzler-Martin grade (P=0.016). Increased volume and higher Pittsburgh radiosurgery-based arteriovenous malformation (AVM) score were predictors of post-GKRS hemorrhage in the univariate but not in the multivariate analysis. Clinical deterioration occurred in 30 patients (6.8%) and was significantly more common in patients who had post-GKRS hemorrhage than in patients who did not (P=0.018).

Conclusions

GKRS afforded a reasonable chance of obliteration in unruptured AVMs. However, the benefits of successful obliteration must be weighed against the risk of post-GKRS hemorrhage and permanent clinical morbidity.

Learning Objectives

By the conclusion of this session, participants should be able to:

1) Describe the importance of Gamma Knife Radiosurgery as a therapeutic modality for unruptured arteriovenous malformations

2) Discuss, in small groups the patient, arteriovenous malformation and treatment characteristics which predict obliteration, hemorrhage, radiation-induced changes and cyst formation following radiosurgery

3) Identify an effective treatment for unruptured arteriovenous malformations.

References

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