

# Repeat Radiosurgery for Incompletely Obliterated Cerebral Arteriovenous Malformations: A Systematic Review

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## Introduction

Radiosurgery is an accepted treatment modality for arteriovenous malformations (AVMs) located in eloquent cortex or deep brain structures. For residual or persistent lesions, repeated radiosurgery can be considered if sufficient time has passed to allow for a full appreciation of treatment effects, usually at least 3 years. Herein, we perform a systematic review of repeated radiosurgery for cerebral AVMs with an emphasis on lesion obliteration rates and complications.

## Methods

A systematic review was performed in accordance with PRISMA guidelines. References for this review were identified by searches of MEDLINE, Web of Science, and Google Scholar for relevant articles using the search terms "repeat\* radiosurgery arteriovenous malformation" and "repeat\* radiosurgery AVM", where \* is a truncation character that retrieves all word endings.

## Results

A total of 14 studies, comprising 733 patients, meeting review criteria were included. For series that reported target dose at both first and repeat treatments, the weighted means were 19.42 Gy and 19.06 Gy, respectively. The nidus size reduction between first and repeat treatments ranged from 29.7% to 65.9%, with a weighted mean reduction of 61.6%. The mean and median obliteration rate for the repeat radiosurgery treatments were 61% (95% CI: 51.9% - 71.7%) and 61.5%, respectively. The median follow up following radiosurgery ranged from 19.5 to 80 months. Time to complete obliteration after the repeat treatment ranged from 21 to 40.8 months. The consistent reported complications of repeated radiosurgery for AVM included hemorrhage (7.6%) and radiation-induced changes (RIC) (7.4%).

## Conclusions

Repeat radiosurgery can be used to treat incompletely obliterated AVMs with an obliteration rate of 61%. Complications are related to treatment effect latency (hemorrhage risk), as well as radiation-induced changes. Repeat radiosurgery can be performed at three years following the initial treatment, allowing for full realization of treatment effects.

## Learning Objectives

- Repeat radiosurgery for AVM is relatively safe with 61% rate of complete obliteration.
- Repeat radiosurgery can be performed at 3 years following the initial treatment.

## References

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