Effect of Associated Arterial Aneurysms on Outcomes After Stereotactic Radiosurgery for Intracranial Arteriovenous Malformations: A Matched Cohort Study

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Introduction

Approximately 10-30% of intracranial arteriovenous malformations (AVM) harbor AVM-associated arterial aneurysms (AAA). The presence of an AAA has been found to significantly increase an untreated AVM's hemorrhage risk. Prior studies have also shown AVMs with patent AAAs to have higher hemorrhage rates after treatment with stereotactic radiosurgery (SRS). However, the effect of AAAs on AVM SRS outcomes remains incompletely understood. Therefore, the aim of this retrospective, matched cohort study is to determine the effect of AAAs on outcomes after SRS for AVMs.

Methods

We evaluated an institutional database of AVMs treated with Gamma Knife SRS from 1989 to 2013. The AVMs with AAAs cohort was matched, in a 1:2 ratio based on patient characteristics, AVM features, and SRS treatment parameters, to the AVMs without AAAs cohort. Statistical analyses were performed to determine predictors of outcomes after SRS.

Results

The AVMs with AAAs cohort comprised 51 patients, and the AVMs without AAAs cohort comprised 102 patients.

In the AVMs with AAAs cohort, obliteration was achieved in 67%; the annual post-SRS hemorrhage rate was 3.3%; and the rates of radiologically evident, symptomatic, and permanent radiation-induced changes were 28%, 4%, and 0%, respectively.

In the AVMs without AAAs cohort, obliteration was achieved in 70%; the annual post-SRS hemorrhage rate was 2.0%; and the rates of radiologically evident, symptomatic, and permanent radiation-induced changes were 35%, 8%, and 1%, respectively.

The presence of an AAA was not significantly associated with obliteration (P=0.293), post-SRS hemorrhage (P=0.209), or RIC (P=0.323).

Conclusions

Our study failed to identify a significant difference between the SRS outcomes of AVMs with and without patent AAAs. These findings may support a more conservative stance for embolization prior to SRS for AVMs with AAAs.

Learning Objectives

By the conclusion of this session, participants should be able to 1) Describe the importance of AAAs in AVMs undergoing treatment with SRS, 2) Discuss, in small groups the effect of AAAs on outcomes after SRS for AVMs, and 3) Identify an effective treatment for AVMs with AAAs.

References

1. Ding D, Xu Z, Starke RM, et al. Radiosurgery for Cerebral Arteriovenous Malformations with Associated Arterial Aneurysms. World Neurosurg. Mar 2016;87:77-90.

2. Kano H, Kondziolka D, Flickinger JC, et al. Aneurysms increase the risk of rebleeding after stereotactic radiosurgery for hemorrhagic arteriovenous malformations. Stroke. Oct 2012;43(10):2586-2591.