IGKRF Retrospective Study: Repeat Stereotactic Radiosurgery for Arteriovenous Malformation

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Abstract

The generally accepted goal of SRS for AVMs is complete obliteration without associated adverse radiation effects (ARE). Total obliteration rates vary from 70 to 80% within 5 years of an initial SRS procedure.\(^1,2,5,7,9,11\) Total obliteration that is confirmed by angiography appears to reduce the cumulative lifetime risk of hemorrhage to approximately 1%, in comparison to an annual hemorrhage risk that varies from 1 to 4%.\(^10\) Whether partial obliteration of AVMs after SRS affects the delayed risk of bleeding remains unclear.\(^6,9,10,14\) Approximately three years after SRS, patients with residual AVMs are reevaluated to assess whether additional salvage management options (e.g., surgical resection, embolization, and/or repeated SRS) are warranted.\(^3,12,13,15\) Several studies have shown that approximately 60 to 70% of patients with incomplete obliteration of AVMs after initial SRS achieve total obliteration after repeat SRS.\(^5,8,16\)

In our previous retrospective study (N=105)\(^4\), the total obliteration by angiography after repeat SRS was 26% at 3 years, 58% at 4 years, 63% at 5 years, and 66% at 10 years. Factors associated with a higher rate of AVM obliteration were smaller residual AVM target volume (p=0.038), and \(\geq 50\%\) of volume reduction after the initial procedure (p=0.014).\(^4\) The cumulative actuarial rates of new AVM hemorrhage after repeat SRS were 1.9% at 1 year, 8.1% at 2 years, 10.1% at 3 years, 10.1% at 5 years, and 22.4% at 10 years, which translate to annual hemorrhage rates of 4.05% and 1.79% of patients developing new post-repeat-SRS bleeds/yr for years 0-2 and 2-10 following repeat SRS. Factors associated with a higher risk of hemorrhage after repeat SRS were a larger number of a prior hemorrhages (p=0.008), larger AVM target volume (p=0.002), initial AVM volume reduction < 50% (p=0.034), and a higher Pollock-Flickinger score (p=0.010). Symptomatic adverse radiation effect (ARE) developed in five patients (4.7%) after initial SRS and ten patients (9.5%) after repeat SRS. Prior embolization (p=0.022) and higher Spetzler-Martin grade (p=0.004) were significantly associated with higher rates of ARE.

The purpose of this multi-center project is to evaluate factors associated with total obliteration, risks of bleeding, adverse radiation effects (AREs), and delayed cyst formation in patients with incomplete obliteration of AVMs which were treated by repeat SRS.

References