

# Perinidal High T2 MRI Signal as a Predictor of Eventual Nidus Obliteration Following Stereotactic Radiosurgery of Brain AVMs

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## Abstract

**Objectives:** A variety of radiological findings, attributed to radiation-induced tissue changes, are observed within and adjacent to the nidus of AVMs after stereotactic radiosurgery (SRS). The purpose of the study is to correlate the post-radiosurgery appearance of MRI perinidal T2 hyperintensity signal with eventual angiographic obliteration of AVM nidus in response to radiosurgery treatment.

**Methods:** This retrospective study was conducted on 62 patients with brain AVMs who received photon radiosurgery treatments, using either a Linac-based technique at the Alexandria Linac Radiosurgery Center in Egypt (21 patients/AVMs) or a Gamma unit-based technique at the Koto Memorial Gamma Knife Center in Japan (41 patients/AVMs). All patients included in the study had serial clinical and radiological follow ups for =2 years after radiosurgery treatments.

**Results:** In the combined study series of 62 patients/AVMs treated with photon SRS, the follow up MRIs revealed that 50 (80.6 %) AVMs showed non-visualized nidus and 12 (19.4 %) AVMs showed decreased nidus size. Radiation-induced changes (RICs), defined as appearance of perinidal T2 hyperintensities in post-SRS MRIs, occurred in 34 (54.8%) patients. Of the 35 patients with available follow up angiographic studies, 30 (85.7 %) AVMs demonstrated complete nidus obliteration at a mean of 36 months (range 8-66 months) after radiosurgery treatment. Of the 30 AVMs with both MRI evidence of non-visualized nidus and angiographic verification of complete nidus obliteration, 20 (66.7 %) AVMs were associated with prior MRI evidence of appearance of perinidal T2 hyperintensity signal on an average of 12 months (range 6-45 months) after radiosurgery. Of the 5 AVMs with both MRI evidence of decreased nidus size and angiographic verification of partial nidus obliteration, 4 (80 %) AVMs showed perinidal T2 hyperintensity signal on post-SRS follow up MRIs. Lower Spetzler-Martin grade ( $p = 0.013$ ), smaller AVM volume ( $p = 0.017$ ), and appearance of post-SRS perinidal T2 hyperintensity signal ( $p = 0.007$ ) were the statistically significant independent predictors of AVM obliteration. The appearance of perinidal T2 hyperintensity signal in the post-radiosurgery MRIs had a sensitivity of 66.7%, a specificity of 20%, and an overall accuracy of 60% in predicting the eventual obliteration of the AVM nidus.

**Conclusions:** The present study findings might help to refine the current understanding of the mechanisms underlying the radiation-induced tissue changes following AVM radiosurgery. The

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### Abstract

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appearance of perinidal high T2 signal in the follow up MRIs after radiosurgery would be a valuable indicator of the AVM response to radiosurgery treatment, namely the eventual angiographic obliteration of AVM nidus.