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Primary and Repeat Linac Radiosurgery for Cerebral Arteriovenous Malformations in Pediatric Population

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Abstract

Objectives. To evaluate response rates and toxicity of the treatment in patients under 18 years old treated with stereotactic radiosurgery or hypofractionated stereotactic radiotherapy for arteriovenous malformations (AVMs) of the brain.

Methods. A group of 30 patients aged 5 - 18 years (mean age 13.8, median 14) treated between 2002 and 2017 with a linear accelerator equipped with a micromultileaf collimator or with the CyberKnife system. There were 4 Spetzler-Martin grade I, 8 grade II, 11 grade III, and 6 grade IV lesions. In the group treated with single dose there were 3 patients in each of grade I-III groups. Hypofractionated treatment was applied in 1, 5, 8, and 6 patients with AVM of grade I-IV, respectively. Four patients were irradiated for the second time 5-7 years after the initial treatment. All of them were followed-up for at least one year after the second treatment. The doses applied varied between 16 and 20 Gy for single fraction treatment or 16-24 Gy delivered in 2-3 fractions.

Results. Actuarial total obliteration rates were 35%, 42%, 56% and 85% at 2, 3, 5 and 7 years respectively. Actuarial response rates (total and partial obliteration) were 43%, 55%, 66% and 92% at 2, 3, 5 and 7 years respectively. Actuarial 5-year total obliteration rates in patients with grade I and II AVMs and grade II and IV AVMs were 72% and 32%, respectively. No significant difference in outcome between single-fraction and fractionated treatment was found. No bleeding was recorded during follow up. In 6 patients MR imaging abnormalities (in one symptomatic) were recorded. In two patients new epileptic seizures occurred (currently they are fits-free), in another two we observed
aggravation of preexisting hemiparesis (in both after the second treatment).

Conclusions. Linac-based radiosurgery for pediatric AVMs provides satisfactory outcome. In case of large or involving critical organs lesions, application of fractionated treatment can be considered without jeopardizing the outcome. Repeat treatment is feasible but associated with increased risk of side effects.

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