Radiosurgery for Intracranial Aneurysm

In view of the differential natural history, and mortality profile of distal aneurysms from saccular aneurysms on the circle of Willis, it remains imperative to analyze the obliteration rate of an aneurysm after radiosurgery. With the current evidence, it cannot be concluded if radiosurgery actually helps an aneurysmal obliteration with direct impact. Until autopsy studies provide pathological evidence and natural history takes a favorable turn under the influence of radiosurgery, the question of its efficacy would loom large. Hopefully, in the coming times, it would be exciting to know the role of radiosurgery as a primary or adjunctive treatment option in the management of this difficult entity ¹⁾.

A series of 3 patients (35-60 years old) with bleeding distal aneurysm not associated with AVM who underwent radiosurgery by gamma knife is reported. One isocentre centralized over the aneurysm was used; peripheral dose 24-28.8 Gy was applied. Control angiography 20-36 months after gamma knife surgery (GKS) demonstrated the obliteration of both the aneurysm and the feeding artery, without deterioration of the neurological symptoms. This case series implies that GKS might serve as a safe mini-invasive technique in the treatment of selected distal aneurysms²⁾.

The aim of a study was to determine the efficacy of GKRS treatment in a saccular aneurysm animal model.

Aneurysms were surgically produced using an elastase-induced aneurysm model in the right common carotid artery of 10 New Zealand white rabbits. Following initial observation for 4 years, each rabbit aneurysm was treated with a conformal GKRS isodose of 25 Gy to the 50% margin. Longitudinal MRI studies obtained over 2 years and terminal measures obtained at multiple time points were used to track aneurysm size and shape index modifications.

Aneurysms did not rupture or involute during the observation period. Whole aneurysm and blood volume averages decreased with a linear trend, at rates of 1.7% and 1.6% per month, respectively, over 24 months. Aneurysm wall percent volume increased linearly at a rate of 0.3% per month, indicating a relative thickening of the aneurysm wall during occlusion. Nonsphericity of the average volume, aspect ratio, and the isoperimetric ratio of whole aneurysm volume all remained constant. Histopathological samples demonstrated a progressive reduction in aneurysm size and wall thickening, with subintimal fibrosis. Consistent shape indices demonstrate stable aneurysm patency and maintenance of minimal rupture risk following treatment.

Data indicate that GKRS targeted to saccular aneurysms is associated with histopathological changes and linear reduction of aneurysm size over time. The results suggest that GKRS may be a viable, minimally invasive treatment option for intracranial aneurysm obliteration ³⁾.

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