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A Comprehensive Review of MR Imaging Changes Following Radiosurgery to 500 Brain Metastases.

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Abstract

BACKGROUND AND PURPOSE: Stereotactic radiosurgery is known to control 85%-95% of intracranial metastatic lesions during a median survival of 6-8 months. However, with the advent of newer systemic cancer therapies, survival is improving; this change mandates a longitudinal quantitative analysis of the radiographic response of brain metastases to radiosurgery.

MATERIALS AND METHODS: MR imaging of 516 metastases in 120 patients treated with GK-SRS from June 2006 to December 2009 was retrospectively reviewed. Lesion volume at initial treatment and each follow-up was calculated by using the following formula: length × width × height / 2. Volume changes were correlated with patient demographics, histopathology, and radiation treatment variables.

RESULTS: Thirty-two percent of lesions increased in volume following radiosurgery. Clinically, this translated into 54% of patients having ≥1 of their lesions increase in size. This increase begins at 6 weeks and can last beyond 15 months' post-SRS. Male sex ($P = .002$), mean voxel dose <37 Gy ($P = .009$), and initial treatment volume >500 mm³ ($P < .001$) are associated with posttreatment increases in tumor size. Median survival following radiosurgery was 9.5 months for patients with all lesions exhibiting stable/decreased volumes, >18.4 months for patients with all lesions exhibiting increased volumes, and 16.4 months for patients with mixed lesional responses.

CONCLUSIONS: Most metastatic lesions are stable or smaller in size during the first 36 months post-SRS. However, a transient increase in volume is seen in approximately one-third of lesions. Sex, treatment dose, initial lesion size, and histopathology all correlate with variations in lesion volume post-SRS. The longer the patient survives, the more likely an increase in lesion size will be seen on follow-up imaging.

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