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Abstract

Tumor Control and Survival in Patients with Ten or More Brain Metastases Treated with Stereotactic Radiosurgery: A Retrospective Analysis

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Objectives: To assess tumor control and survival in patients who were treated with stereotactic radiosurgery (SRS) for 10 or more metastatic brain tumors.

Methods: Patients treated with SRS for 10 or more total brain metastases at this institution between March 2014 and April 2018 were retrospectively identified. Patient records were reviewed for clinical follow-up data, and post-treatment magnetic resonance imaging (MRI) studies were used to assess tumor control. For tumor control studies, patients were separated into two groups: those who received treatment for 10 or more synchronous metastases and those who received several treatments for 10 or more metachronous lesions. Tumor control was then assessed at intervals of three, six, and nine months. Overall survival was calculated from the first SRS treatment date. The Kaplan-Meier method was used to fit survival curves for the data, and log-rank and Cox proportional-hazards regression were employed to analyze the influence of age, sex, primary tumor histology, number of metastases treated, total tumor volume treated, brain volumes treated with 12 Gy (V12 Gy), and prior whole-brain radiation therapy (WBRT).

Results: Fifty-five patients were treated for 10 or more total brain metastases with SRS. The median patient age was 61.4 years, with patients ranging from 15.2 to 89.6 years. On average, patients were treated for a total of 17.5 metastases, with a median of 10 metastases treated per encounter. Forty patients received synchronous treatment, while 15 patients received metachronous treatment. Overall tumor volume treated ranged from 0.3167 cm3 to 54.86 cm3. Median overall survival was 10.9 months. NSCLC was the dominant primary tumor (47%), while breast cancer (22%) and melanoma (16%) were the next most common. Eight patients (14%) had prior WBRT, and ten patients (18%) required post-SRS WBRT. Cox proportional-hazards analysis revealed a significant association between patients receiving larger brain volumes irradiated with 12 Gy and decreased overall survival (p=0.0406); however, significance was lost on multivariate analysis. Among patients who received synchronous treatment for 10 or more metastases, the median percentage of tumors controlled was 100%, 91%, and 82% at 3, 6, and 9 months, respectively. Among patients who received metachronous treatment for 10 or more metastases, the median percentage of tumors controlled after each SRS encounter was 100% at all three time points.

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Conclusions: SRS can be used to treat patients with 10 or more total brain metastases with an expectation of tumor control and overall survival that is equivalent to that reported for patients with four or fewer tumors. Development of new metastases leading to repeat SRS is not associated with worsened tumor control or survival. Survival may be adversely affected in patients having a higher volume of normal brain irradiated.