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Abstract

Stereotactic Radiotherapy for Brain Metastases from Non-Small Cell Lung Cancer: Clinical outcomes from the multi-institutional RSSearch Database

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Objectives: Stereotactic radiosurgery (SRS) is commonly used for brain metastasis from Non-Small Cell Lung Cancer (NSCLC). Randomized controlled trials commonly include multiple histologies and outcomes specific for the most common primary tumor metastatic to the brain - NSCLC are from smaller and single institution studies. The aim of this study is to analyze the outcomes for SRS and factors affecting it from a real world, large multi- institutional perspective.

Methods: The RSSearch Patient Registry was searched for patients with non-small cell lung cancer (NSCLC) with brain metastases that received stereotactic radiotherapy. We identified 812 patients with 1328 brain metastases treated with stereotactic radiotherapy between 2007 and 2019 treated at 20 institutions worldwide. Demographics (age, sex), prior treatment (Surgery, Prior WBRT and systemic therapy), number and volume of treated lesions, number of fractions and radiosurgery dose were the variables analyzed for clinical outcomes (Overall Survival).

Results: The median follow-up was 11 months (range 1 - 138 months). Fifty four percent were female and 46% male; the median age at time of SRS treatment was 65 years (range 57-94 years) and the median Karnofsky Performance Score (KPS) was 70% (range 30 - 100%). Forty-five percent of patients received no prior treatment, 14% of patients had completed surgery, 20% had received external beam radiation therapy, and 16% received chemotherapy prior to SRS. The majority of patients (n=523) had one lesion, 159 patients had 2 lesions, 43 patients had 3 lesions, 29 patients had 4 lesions, 6 patients had 5 lesions, and 14 patients had greater than 5 lesions. The median lesion volume was 2.75 cc (range 0.01 - 780 cc) and the cumulative lesion volume was 5.5 cc (range 0.01 - 1686 cc). The median dose was 22 Gy (range 12 - 60 Gy) delivered in one fraction (range 1 - 5 fractions). The median overall survival (OS) was 9 months. One-year OS was 41% and 2-year OS was 25%. OS was improved for younger patients with median OS of 11 months for patients < 65 years compared to 9 months for patients = 65 years (p

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= 0.0011). OS was improved for patients with higher baseline KPS, with median OS of 12 months for KPS = 70 compared to 7 months for KPS < 70 ($p < 0.0001$). The number of lesions (1-4 vs 5+ lesions), lesion volume (as a continuous variable), dose or single vs multi-fraction was not predictive for OS. Prior treatment was associated with OS. Patients who had undergone surgery prior to SRS (n= 114; median tumor volume of 11 cc and cumulative tumor volume of 13.78 cc) had a median OS of 18 months. Patients who received prior external beam radiation to the brain had median OS of 9 months. Patients who received chemotherapy had median OS of 11 months and patients who had no prior treatment had a median OS of 8 months.

Conclusions: This study of large real-world practice of SRS for brain metastasis from NSCLC reaffirms the prognostic significance of age and KPS for overall survival. However, number of metastasis and volume of brain metastasis and number of fractions was not prognostic unlike other studies. Despite larger tumor volumes surgical resection prior to SRS provided significant survival advantage. While toxicity data is lacking, this large study provides some clarity on outcomes for SRS for brain metastasis form NSCLC in the real world.