Cureus

Impact of Concurrent Immunotherapy and Treatment Delays in the Management of Intact Brain Metastases with Stereotactic Radiosurgery

Open Access
Abstract
Published 02/11/2022

Justin Leu [1] , Christopher Mendez [2] , Jonathan Lischalk [3] , Todd Carpenter [3] , David Ebling [4] , Jonathan Haas [5] , Matthew Witten [3] , Marissa Barbaro [6] , Lee Tessler [7] , Michael Repka [3]

1. Radiation Oncology, Stony Brook University, Stony Brook, USA 2. Radiation Oncology, Perlmutter Cancer Center at NYU Langone, Mineola, USA 3. Radiation Oncology, Perlmutter Cancer Center, NYU Langone Long Island, Mineola, USA 4. Radiation Oncology, NYU Langone - Long Island School of Medicine, Mineola, USA 5. Radiation Oncology, Perlmutter Cancer Center at Nyu Winthrop Radiation Oncology, Mineola, USA 6. Neurology, NYU Langone - Long Island School of Medicine, Mineola, USA 7. Neurosurgery, NYU Langone - Long Island School of Medicine, Mineola, USA

Corresponding author: Justin Leu, mcrepka@gmail.com

Categories: Radiation Oncology
Keywords: radionecrosis, stereotactic radiosurgery, brain metastases

How to cite this abstract
Leu J, Mendez C, Lischalk J, et al. (February 11, 2022) Impact of Concurrent Immunotherapy and Treatment Delays in the Management of Intact Brain Metastases with Stereotactic Radiosurgery. Cureus 14(2): a732

Abstract

Objective: Brain metastases are the most common intracranial tumor diagnosed in adults, with an incidence that far outpaces that of primary malignant brain tumors. In patients treated with stereotactic radiosurgery (SRS), the incidence of post-treatment radionecrosis appears to be rising, which has been attributed to improved patient survival as well as novel systemic treatments. The impacts of concomitant immunotherapy and the interval between diagnosis and treatment on patient outcomes are unknown; we hypothesize that these factors may influence rates of radionecrosis and local failure.

Methods: This single institution retrospective review consisted of patients who received single or multi-fraction SRS for intact brain metastases. Exclusion criteria included neurosurgical resection prior to treatment and treatment of non-malignant histologies or primary CNS malignancies. A history of previous whole brain radiotherapy (WBRT) or SRS was allowed. Late toxicity was scored according to the NCI-CTCAE 5.0. Concurrent immunotherapy was defined as treatment given within 14 days of SRS. Treatment response was scored according to the Response Assessment in Neuro-Oncology Criteria for brain metastases (RANO-BM). Regional failure was defined as development of one or more new brain metastases at an untreated site. Binary logistic regression was employed to identify statistically significant predictors of radionecrosis and local failure.

Results: A total of 61 evaluable patients with 151 individual brain metastases were identified who underwent SRS treatment between December 8, 2014 and April 26, 2021. The median follow-up time was 381 days for the entire cohort (range 56 - 2,319) and 381 days for living patients (range 114 - 1,702). The majority of treated metastases were non-small cell lung cancer (NSCLC, 56.3%), with breast cancer comprising the second most common diagnosis (13.9%). The median maximum axial dimension at the time of diagnostic MRI was 8.0 mm (range 2.0 - 44.0), while the median number of fractions was 1 (range 1 - 5). Overall, radionecrosis was identified in 25.2% of treated lesions (39.5% G1, 47.4% G2, 7.9% G3). Increasing length of time between diagnosis of brain metastases and treatment (median 33 days, range 9 - 345) had a non-significant impact on local control, incidence of radionecrosis, regional failure, or overall survival. On univariate analysis, increasing lesion size (OR 1.05, 95% CI 1.02 - 1.10, p = 0.024) and a history of prior whole brain radiotherapy (OR 5.53, 95% CI 1.82 - 16.82, p = 0.003) were associated with higher rates of radionecrosis and each of these factors remained predictive on multivariable analysis. While patients who received concurrent immunotherapy did not experience higher rates of radionecrosis, concomitant therapy was associated with lower rates of local failure (4.8% vs 14.7%, OR 0.29, 95% CI 0.09 - 0.98, p = 0.047) with no difference in rates of distant brain failure (51.4% vs. 48.6%, p = 0.399).

Conclusion: In patients treated with SRS for intact brain metastases, poorer outcomes due to delays from diagnosis to treatment could not be reliably demonstrated. However, this study adds to the growing body of literature indicating the safety of concurrent immunotherapy and suggests a potentially synergistic effect of the combined modalities. Further research is warranted to better identify strategies to mitigate development of radionecrosis, particularly given the relatively high overall incidence observed in this cohort.