

Long-Term Outcomes of Stereotactic Radiosurgery (SRS) for Brain Metastases from Lung Cancer in the Era of Immunotherapy

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Abstract

Objective: To report long-term survival (OS), rate of local failure (LF), and rate of radionecrosis (RN) for lung cancer patients with brain metastases receiving SRS in the era of immunotherapy in a community hospital. To examine the relationship between demographic, clinical factors that affect those outcomes.

Methods: Thirty-three consecutive patients with 122 cerebral metastases from lung cancer treated with SRS between 2015 and 2017 were reviewed on this IRB-approved study. No patient was treated with upfront whole brain radiation. OS was estimated using Kaplan-Meier (KM) analysis and log-rank statistics. Radiation dose to the brain was summated across all courses using MIM software to explore volume/dose effects on outcome. LF and RN were assessed using gadolinium enhanced MRI. Most patients with RN were documented pathologically or with brain PET/CT.

Results: Median age at first course was 64 years (range 45-68). 67% were female with a median of 2 metastases (range 1-32) treated with a median of 2 courses (range 1-14). Median cumulative clinical tumor volume (CTV) was 1.83 cc (range 0.11-33.32). Median dose of 20 Gy in 1 fraction (range 15-27 Gy/1-5 fractions) was prescribed to CTV+1mm with median isodose of 63% and median collimator size of 10 mm (range 5-30). Cumulative median volume of brain receiving 10, 12 and 14 Gy were 10.66 cc (range 0.77-280.13), 8.39 cc (range 0.57-223.88), and 6.7 cc (range 0.44-182.92), respectively. 90.1% of patients received chemotherapy (90.1%), 63.6% received immunotherapy and 13.3% received targeted therapy. Whole brain radiotherapy (WBRT) was used for salvage in 1 patient. Median OS was 23.9 months (range 5.76-87.36). Estimates of OS at 1, 2, and 3 years were 75.8%, 51.5%, 48.4%, respectively. 2-year survival was significantly longer for patients with higher overall brain doses with 91.7% if >9cc received 14Gy compared with 63.2% for <9cc (p=0.01). 2/122 (1.6%) of metastases in 2 patients had LF at 9 and 19.6 months post-treatment. One patient had resection and postop bed SRS as treatment, surviving 5 years following LF. The second patient with LF died 9 months following LF but survived 7.3 years following initial SRS for brain metastases. 11/122 (9.0%) of metastases in 8 patients developed RN at a median 25.1 months (range 9.0-82.0) post-treatment. 8 metastases with RN were asymptomatic and did not require treatment. Of the eight patients alive at last FU (range 9.2-85.2), 1 had brain only failure, 1 had distant only failure, and 2 had combined failure. The remaining 4 patients were free of disease at last FU.

Conclusion: Three-year OS of over 40% is expected for patients with brain metastases from lung cancer eligible for SRS alone in the era of immunotherapy. Patients who lived longer required multiple courses of SRS for new brain metastases that increased the total dose to brain (V14) without increased toxicity.