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**PURPOSE:** RTOG 0933 demonstrated benefits to memory following HA-WBRT, supporting the hypothesis of hippocampal radiosensitivity and associated memory specificity. However, some patients demonstrated cognitive decline, suggesting mechanisms outside hippocampal radiosensitivity playing a role. WMI has been implicated in RT-induced cognitive decline. This secondary analysis explored the relationship between pre-treatment WMI and memory following HA-WBRT. METHODS AND MATERIALS: 113 patients received HA-WBRT. Standardized cognitive assessments were performed at baseline, 2, 4, and 6 months. The primary endpoint was Hopkins Verbal Learning Test Delayed Recall (HVLT-DR) at 4 mos. Secondary endpoints included HVLT Total Recall (HVLT-TR) and Recognition (HVLT-Recog). Of 113 patients, 34 underwent pre-treatment and 4-month post-treatment HVLT testing and pre-treatment post-contrast volumetric T1 and axial T2/FLAIR MRI. Volumetric analysis of metastatic disease burden and disease-unrelated WMI was conducted on the pre-treatment MRI. Correlational analyses were performed examining the relationship between pre-treatment WMI and HVLT outcomes following HA-WBRT. RESULTS: Correlation was found between larger volumes of pre-treatment WMI and decline in HVLT-Recog (r=.54, p< .05) and a correlational trend was observed between larger volume of pre-treatment WMI and decline in HVLT-DR (r=.31, p=.08). Patients with higher pre-treatment disease burden experienced a greater magnitude of stability or positive shift in HVLT-recall and –delayed recall following HA-WBRT. (r=-.36 and r=-.36, p's < .05), compared to the magnitude of stability/positive shift in those with lesser disease burden. CONCLUSION: In patients receiving HA-WBRT, pre-treatment-WMI predicts memory decline, suggesting white matter integrity pre-treatment contributes to the pathogenesis of post-WBRT cognitive toxicity independent of hippocampal stem cell radiosensitivity. Less decline or improvement in HVLT following HA-WBRT for patients with higher pre-treatment intracranial metastatic burden supports the importance of WBRT-induced intracranial control on cognition. These imaging biomarkers for cognitive toxicity will be further explored on NRG CC001 and CC003, phase III trials of WBRT with or without HA.

### RADI-05. FRACTIONATED TREATMENT OF BRAIN METASTASES WITH GAMMA KNIFE ICON

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PURPOSE/OBJECTIVE(S): Stereotactic radiosurgery with Gamma Knife is a common treatment modality for patients with brain metastasis. The Gamma Knife ICON allows for immobilization with an aquaplast mask, permitting fractionated treatments. We describe one of the first experiences utilizing this technique with brain metastasis and evaluate outcomes. MATERIALS/METHODS: From June 2017 to November 2018, 29 patients with 43 separate intracranial lesions were treated with fractionated stereotactic radiotherapy using the gamma knife ICON at a single institution. Patients received between 20–30 Gy in 3–5 fractions with no margin over the course of 5 to 23 days. Local control was physician assessed. Local failure over time was modeled using cumulative incidence; lesions were censored at last radiographic follow up. RESULTS: Median tumor volume and prescription isodose was 7.7 $cm^3$ (range 0.3–43.9) and 50% (range 40–65), respectively. Median radiographic follow-up was 7 months and median survival was 9 months. Radiation necrosis occurred in 3/3 patients treated with 27 Gy in 3 fractions, one requiring therapeutic resection. Incidence of local failure for all treated lesions was 9% at 1 year. Tumor volume >7 $cm^3$ was associated with local failure on univariate analysis (p=0.025). 100% (2/2) lesions treated with 20 Gy in 5 fractions developed local recurrence. CONCLUSION: Fractionated stereotactic radiotherapy with the Gamma Knife ICON provides excellent local control for small and large brain metastases with minimal toxicity. Tumors >7 $cm^3$ should receive at least 30 Gy in 5 fractions for optimal control. Treatment with 27 Gy in 3 fractions appears to have high rates of treatment related toxicity and should be avoided.

### RADI-06. SINGLE- VERSUS MULTI-FRACTION STEREOTACTIC RADIOSURGERY FOR BRAINSTEM METASTASES

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**BACKGROUND:** For intracranial metastases with planning target volume (PTV) overlap of the brainstem (BSmet), the radiosurgical dose-fractionation that optimizes the therapeutic window is unknown. MATERIALS/METHODS: A retrospective review of brain metastases (BM) with/without BSmets treated with single-fraction stereotactic radiosurgery (SRS) or hypofractionated (2–5 fractions) radiosurgery (HF-SRS) between 2012–2016 was performed. Brainstem biologically effective doses (BED) and single-fraction equivalents of brainstem V10/V12 were calculated using $\alpha/\beta=3$. Characteristics were compared between patients with/without BSmet and between SRS/HF-SRS cohorts using Wilcoxon rank sum, chi-square, or Fisher's exact tests. Radiographic progression (RP) was assessed in patients with post-treatment contrasted MRI and defined as BSmet enlargement regardless of etiology (progression, radionecrosis, indeterminate). Kaplan-Meier estimates were compared between cohorts using log-rank test. RESULTS: 634 SRS/HF-SRS courses were identified, of which 59 (9.3%) treated ≥1 BSmet in 55 patients. BSmets occurred more commonly in patients with >4 BM (31% vs 10%, p< 0.001) and intracranial recurrence (39% vs 20%, p=0.003). BSmets were treated in 1 (22/59; 37%), 2 (1/59; 2%), or 5 (36/59; 61%) fractions. Age, KPS, and primary tumor site were balanced between SRS/HF-SRS cohorts. The HF-SRS cohort had significantly larger BSmet PTV (median 1.39cc vs 0.39cc, p=0.021), marginal dose (median 25Gy vs 15Gy, p< 0.001), brainstem V10 (median 1.60cc vs 0.47cc, p< 0.001), brainstem V12 (median 0.78cc vs 0.06cc, p< 0.001), and mean brainstem BED (median $9.27Gy_3$ vs $6.55Gy_3$, p=0.019). The SRS cohort was more likely to have prior whole brain radiotherapy (50% vs 14%, p=0.005) and restart steroids post-treatment (78% vs 41%, p=0.019). RP occurred in 6/17 vs 2/25 patients in the SRS vs HF-SRS cohorts, respectively (p=0.045). HF-SRS trended to higher freedom from RP (93% vs 74% @12mo; p=0.072). There was no overall survival difference (p=0.36). CONCLUSIONS: HF-SRS was associated with decreased RP and decreased likelihood of restarting steroids despite treating larger BSmets.

### RADI-07. GAMMA KNIFE RADIOSURGERY FOR SMALL CELL LUNG CANCER: PROGNOSTIC FACTORS INCLUDING ADDITIONAL LESIONS IDENTIFIED ON THE DAY OF RADIOSURGERY

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OBJECTIVES: Prophylactic cranial irradiation (PCI) and whole brain radiation (WBRT) are standard of care for intracranial disease in small cell lung cancer (SCLC) patients. We sought to identify predictors of overall survival (OS) in SCLC patients treated with salvage Gamma Knife radiosurgery (GKRS) for brain metastases after prior WBRT or PCI. METHODS: Retrospective analyses were conducted on 26 SCLC patients treated with GKRS at one institution between May 2010 and June 2018. Factors predictive of OS were analyzed using Cox proportional hazards regression and Wilcoxon sum-rank testing. RESULTS: Median follow-up and median OS following GKRS was 6.6 mos (range 0.7–24.2 mos). Median OS was 21.4 mos from initial diagnosis (range 7.3–49.3 mos). Presence of extracranial metastases at the time of GKRS was not significantly associated with median OS after GKRS (5.8 mos for patients with extracranial metastases vs 7.2 mos for patients without, $p$=0.425). Mean number of lesions was 2.7 (range 1–10) on diagnostic brain MRIs and 4.1 (range 1–12) on GKRS planning MRIs. Eleven patients (42%) had the same number of lesions between diagnostic MRI and GKRS MRI, and 15 patients (58%) had additional lesions on the GKRS MRI. Number of lesions treated and total tumor volume were not associated with median OS. Patients who had additional lesions on GKRS MRI compared to diagnostic MRI had lower median OS from initial diagnosis of SCLC (29.9 mos vs 18.1 mos, $p$=0.0182) and a trend toward lower median OS from time of GKRS (7.3 mos vs 4.8 mos, $p$=0.0547) compared to patients who did not have additional lesions. CONCLUSIONS: Finding additional brain metastases on GKRS planning MRIs is associated with decreased OS in SCLC patients treated with salvage GKRS. Presence of extracranial metastases at the time of GKRS and number or total volume of brain metastases were not associated with OS.

### RADI-08. A SURVEY BASED STUDY OF BRAIN METASTASES MANAGEMENT FOR PATIENTS WITH NON-SMALL CELL LUNG CANCERS OR MELANOMA

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**INTRODUCTION:** The standard of care for 1–4 brain metastases (BrM) is stereotactic radiosurgery (SRS), whereas whole brain radiation remains the standard treatment for extensive BrM, and surgical resection is appropriate in certain scenarios. Some newer systemic therapies such as tyrosine kinase inhibitors and immunotherapy have impressive CNS activity and are used by some practitioners either alone or in combination with other modalities as first-line treatment for BrM. We conducted a survey to ascertain current real-world practices for the treatment of BrM from NSCLC and melanoma. OBJECTIVES: Our study aimed to assess practice patterns of oncologists who treat BrM from NSCLC or melanoma. We also investi-