Dose-response relationships to candidate ROIs were similar for the two questionnaires.

Author Disclosure: S.R. Grant: None. M. Kamal: None. A.S. Mohamed: Research Grant: National Institutes of Health (NIH)/National Institute for Dental and Craniofacial Research (1R01DE025248-01/R56DE025248-01) and NIH/NCI Early Phase Clinical Trials in Imaging and Image-Guided Interventions Program (1R01CA218148-01). J. Zaveri: None. M.P. Barrow: None. G.B. Gunn: MD Anderson Cancer Center - Proton Therapy. S. Lai: Research Grant; National Institutes of Health (NIH)/National Institute for Dental and Craniofacial Research (1R01DE025248-01/R56DE025248-01) and NIH/NCI Early Phase Clinical Trials in Imaging and Image-Guided Interventions Program (1R01CA218148-01). J.S. Lewin: None. D.I. Rosenthal: None. X.S. Wang: None. C.D. Fuller: Research Grant; National Institutes of Health, National Science Foundation, Elekta AB, National Institutes of Health. Grant funding; Elekta AB. Honoraria; Nederlandse Organisatie voor Wetenschappelijk Onderzoek, Elekta AB, National Institutes of Health. Grant funding; Elekta AB. Travel Expenses; Elekta AB, Nederlandse Organisatie voor Wetenschappelijk Onderzoek.

K.A. Hutcheson: Research Grant; National Institutes of Health (NIH)/National Institute for Dental and Craniofacial Research (1R01DE025248-01/R56DE025248-01) and NIH/NCI Early Phase Clinical Trials in Imaging and Image-Guided Interventions Program (1R01CA218148-01). This work is directly supported by the Andrew Sabin Family Foundation and the Charles and D. Barrow Foundation.

**MO_7_2520**

**Phase II Prospective Trial to Assess the Feasibility and Efficacy of Dynamic 24Gy Single Dose Ablative Stereotactic Radiation Therapy in Oligometastatic Human Cancer**

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**Purpose/Objective(s):** Studies of Single Dose Radiotherapy (SDRT) of Oligometastatic (OM) lesions reported a steep dose-dependent increase of OM ablation within a narrow range of 18-24Gy, rendering >90% ablation at 24Gy, reflecting a unique biological mechanism of SDRT. The present study was designed to define the ablative efficacy and limitations of 24Gy SDRT in a group of consecutive patients with clinical presentations of OM disease. A secondary endpoint was to assess the impact of OM ablation on the timing and rate of conversion of the OM state into polymetastatic (PM) dissemination.

**Materials/Methods:** Between November 2011 and September 2016, 155 consecutive eligible patients with extra-cranial ≤5 OM PET/CT detectable lesions were recruited to this Phase II study. The primary aim was to treat all detected lesions with SDRT at a PTV prescription dose of 24Gy. However, lesions adjacent to serial normal tissue structures, where SDRT was deemed unfeasible, were diverted to a hypofractionated regimen of 3 x 9Gy SBRT. Local relapse free survival (LRFS) and freedom from PM dissemination (PFMFS) were assessed at 3, 6 and every 6 months thereafter until patient demise or inability to be assessed. Local response was exclusively assessed by metabolic PET/CT imaging according to the PERCIST criteria. Detectable lesions were characterized in terms of GTV volume, location, and metabolic parameters (SUVMmax). PET/CT scans were also used to determine the timing of PM dissemination.

**Results:** At a median follow-up of 21 months (range, 3-60) OM lesions treated with SDRT showed an actuarial 5-year LRFS of 92.3% compared to 34.4% for SBRT (p <0.0001). Tumor size, type, OM target organ, or adjuvant systemic therapy did not significantly affect LRFS following SDRT. PM conversion, defined as PET/CT first evidence of concomitant ≥6 OM lesions, was not affected by treatment regimen, exhibiting actuarial 4-year PMFS of 44% in the 109 patients at risk treated by SDRT alone vs. 57.2% in the 46 patients receiving SBRT (p =0.9). A univariate analysis disclosed two factors impacting PMFS, namely, the total overall tumor burden at initial referral and the intensity of its highest SUVMmax 18F-FDG metabolic signal. A bivariate analysis revealed a favorable prognostic group of patients with an initial low tumor burden of <14.8cc and a low SUVMax signal of <6.5, who exhibited a 5-year actuarial PMFS of 89.4%, compared to 46.3% in a bivariate presentation of a low tumor burden of <14.8cc and a concomitant high SUVMax of ≥6.5 (p =0.0001).

**Conclusion:** The present study validates the efficacy of 24Gy SDRT in permanently ablating OM disease. Furthermore, the use of PET/CT in initial treatment planning and in periodic post-SDRT follow-up evaluations discloses the dynamics of PM dissemination, and enables characterization of a subgroup of OM patients that exhibit a low incidence of PM conversion and an actuarial 89% tumor-free survival at 5 years after SDRT, likely providing an opportunity to define in future studies the elusive OM phenotype.


**MO_7_2521**

**A Single-Centre Prospective Assessment of Mask Versus Frame Fixation during Gamma Knife Treatment for Brain Metastases**

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**Purpose/Objective(s):** The recently introduced stereotactic radiosurgery (SRS) offers traditional frame-based as well as a frameless thermoplastic mask fixation combined with cone beam CT (CBCT)-based image-guide, automatic positional delivery correction and infra-red based high-definition motion management (HDMM). Here we report outcomes of a prospective non-randomized study on mask fixation (MF) compared to frame fixation (FF) for stereotactic radiosurgery treatment of brain metastases.

**Materials/Methods:** Between January 2015 and October 2016 we prospectively enrolled patients with brain metastases and indication for primary radiosurgery. The decision FF or MF was made on a case-by-case basis, whereas factors taken into account included patients’ preference, proximity of critical structures, V12 and treatment time. All treatment doses were prescribed to the 50% isodose line. In case of mask fixation a circumferential PTV-margin of 1mm was applied. After treatment, all patients underwent quarterly MRI scans and clinical follow-ups. Primary outcome was local control rate, assessed by RANO criteria and, if required MRI perfusion scans or 18FET-PET-CT. Secondary endpoints were progression free survival (PFS), overall survival (OS) and the incidence of radionecrosis.

**Results:** A total of 76 patients were enrolled with a total of 197 lesions. Seventeen patients with 28 lesions received MF and 59 patients with 169 lesions received FF. One hundred eighty-seven lesions were treated with stereotactic radiosurgery (SRS) and 10 with fractionated stereotactic radiotherapy (FSRT) (1 lesion with MF and 9 lesions with FF) in up to 3 fractions. The median total dose was 22 Gy in both the MF (range: 16-24 Gy) and FF (range: 10-30 Gy) group. Demographics and histology were balanced. Median follow-up was 9.3 months. There was no significant difference in local failure rate (HR: 0.27; 95% CI: 0.07-1.11; p=0.07) with no local failure occurring in the MF cohort and 11 local failures with FF. No differences were observed between the groups for OS (median: not reached vs. 16.9 months; HR: 1.03; 95% CI: 0.42-2.59; p=0.94) and PFS (median: 6.9 vs. 8.4 months; HR: 1.00; 95% CI: 0.45-2.21; p=0.99). No radionecrosis occurred in the MF cohort compared to 3 cases with FF (p =0.86).

**Conclusion:** Thermoplastic mask fixation compared to frame fixation during stereotactic radiosurgery treatment for brain metastases does not result in inferior local control, systemic PFS, OS or increased rates of radionecrosis in this non-randomized study with selected patients.
MO_7_2522
Safety of Tumor Treating Fields and Concomitant Radiation Therapy for Newly Diagnosed Glioblastoma in a Pilot Study

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Purpose/Objective(s): Tumor Treating Fields (TTFields) are a non-invasive, loco-regional, anti-mitotic treatment based on low intensity alternating electric fields. Efficacy of TTFields in newly diagnosed glioblastoma (nGBM) has been shown in the EF14 study of TTFields plus maintenance temozolomide (TMZ) (Stupp R., et al., JAMA 2017). TTFields/TMZ showed significant survival improvement versus TMZ alone (HR, 0.63; p<0.001). Preclinical data show that TTFields increase proportion of glioma cells undergoing cellular death following radiotherapy (RT) by inhibiting DNA-damage repair through the homologous recombination pathway. This suggests that TTFields may have a radiosensitizing effect. The current study was the first to test TTFields concomitant to RT in nGBM patients.

Materials/Methods: Patients with nGBM (n=10, KPS ≥70) enrolled in this single-arm trial between April and December 2017 had all recovered from maximal debulking surgery or biopsy. Patients started TTFields prior to or at the time of RT, and were on stable or decreasing doses of corticosteroids for 7 days pre-enrollment. TTFields (200 kHz) were delivered 18 hours/day with daily removal of the transducer arrays during RT delivery. TMZ (75 mg/m² daily) was given for 6 weeks and RT at a total dose of 60 Gy. The primary endpoint was safety of the combined therapies. Results: Median age was 59 (range 42-71 years), median KPS was 90 (range 80-100) and 8 (80%) of patients were male. Five patients (50%) underwent gross total resection while 6 had biopsy only. Median dose of RT was 60 Gy (range 52-60 Gy). Six patients (60%) reported adverse events (AEs) to-date. The most common AE was TTFields-related skin toxicity, reported in 4 (40%) patients. These were not severe. All other AEs occurred in a single patient possibly due to underlying disease or chemotherapy. Two serious AEs were reported — seizures and general deterioration, assessed as unrelated to TTFields. Conclusion: TTFields-related skin toxicity (40%) in this study was similar to that reported for the 466 patients treated with TTFields in the phase III study (52%), where patients started TTFields > 4 weeks after RT. No other TTFields-related toxicities were reported, nor was there an increase in RT- or TMZ-related toxicities from combining TTFields with RT or TMZ. TTFields show a high safety profile when combined with other therapies in nGBM.


MO_7_2523
Dose-Volume Histogram (DVH) Patterns within the Salivary Glands and Clinical Parameters Predict Xerostomia in Head and Neck Cancer (HNC) Patients, from Injury to Recovery

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Purpose/Objective(s): NCI-CTCAE-graded xerostomia is routinely captured in our analytic database demonstrating that its maximum severity and prevalence occurs within 18 mos after RT (injury), with the prevalence decreasing (recovery) where a lower rate of decreasing prevalence can be observed thereafter. Studies have indicated that the spatial distribution of radiation to the salivary glands differentially affects the risk of xerostomia. We sought to characterize the spatial dosimetry to the salivary glands and the oral cavity as it related to the risk of maximum xerostomia injury and its recovery as defined above while controlling for clinical parameters.

Materials/Methods: HNC patients treated from 2007 to 2017 in our institution with CTCAE graded xerostomia available for at least 18 mos of follow-up were evaluated. Patients with moderate to severe xerostomia (CTCAE grade ≥ 2) before RT were excluded. 22 spatial zones were geometrically created from the parotid glands (PG), submandibular glands (SMG) and oral cavity (OC) for each patient. DVH features (D10-D90) for each zone as well as clinical parameters were used to predict xerostomia injury (CTCAE grade ≥ 2) within 18 mos post-RT, and recovery (grade decrease to < 2) after 18 mos of follow-up. Results: A total of 217 HNC patients were identified with 146 developing moderate to severe xerostomia (CTCAE grade ≥ 2) within 18 mos of follow-up. The dataset was randomly split into a training and test dataset at the ratio of 7:3 for each outcome. Ridge logistic regression with 10-fold cross-validation was applied to predict xerostomia injury and recovery respectively in the training datasets. The critical zones associated xerostomia injury was the medial inferior portion of the ipsilateral PG (relative to the primary tumor) and the superior portion of the ipsilateral PG for recovery. The dose — recovery pattern was significantly influenced by the low - dose bath (D80-D90) across the superior portion of ipsilateral PG. The area under the receiver operating characteristic curve (AUC) was 0.78 and 0.74 for xerostomia injury and recovery respectively in validation datasets. The AUC for injury and recovery are 0.72 and 0.70 respectively in test datasets.

Conclusion: Our data science methodology demonstrated that different spatial-dose patterns for xerostomia injury vs. recovery and highlighted the strength of this analytic technique along with the importance of assessing xerostomia during follow-up. These observations if validated provide insights into new strategies for RT de-intensification. This work was supported by the Radiation Oncology Institute.


MO_7_2524
A Retrospective Study of 3D-CRT/IMRT and Concomitant Intra-arterial Chemotherapy for Maxillary Sinus Carcinoma

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Purpose/Objective(s): Maxillary sinus carcinoma is treated with multidisciplinary approach, and a good candidate for radiation with concomitant intra-arterial chemotherapy at an advanced stage because of its close vicinity to the critical structures. However, due to its rarity of the disease, there have been a limited number of reports relating to the treatment outcomes. The purpose of the study was to evaluate the effectiveness of 3D-CRT/IMRT and concurrent intra-arterial chemotherapy for maxillary sinus carcinoma.