may enable deferring radiotherapy (RT) in select patients. The purpose of this study was to describe the radiographic response of newly diagnosed BM to osimertinib with or without stereotactic radiosurgery or whole brain radiotherapy, to identify parameters that may guide early versus delayed salvage RT. METHODS: In this single-institution retrospective study, 35 patients with 186 newly diagnosed BM started on osimertinib between 2014 and 2020 were reviewed. BM with tumor volume ≥ 0.1 cm³ were included in the volumetric analyses (N=106 BM). Survival was estimated with the Kaplan-Meier method, and univariable analysis was performed using log-rank tests. Cox proportional hazards were used for multivariable analyses for local control (LC), distant brain failure (DBF), and overall survival (OS) for BM treated with osimertinib and RT. RESULTS: Of the 35 patients, 23 (66%) received osimertinib alone. Median follow-up was 29 months. The 1- and 2-year LC rates were 94% and 86%. The 1- and 2-year OS rates were 89% and 66%. Median time to DBF was 24 months. Patients treated with osimertinib and RT were more likely to have a significant radiographic volumetric response at early follow-up (<4 weeks) than patients treated with osimertinib alone (median volumetric response of ~80% vs. <41%, p<0.05). On per lesion analysis, early volumetric response of ≥ 80% was associated with improved LC (3-year LC 98% vs 72%, p<0.04). CONCLUSIONS: The combination of osimertinib and CNS RT is associated with greater early volumetric response in patients with EGFR-positive NSCLC compared to osimertinib alone. BM with significant initial radiographic response remain well-controlled in the long term. Patients whose BM demonstrate limited initial volumetric response may benefit from targeted RT to provide long term control.

**FINAL CATEGORY: NEUROIMAGING**

**NEIM-01**

**INCIDENCE AND DIAGNOSTIC TECHNIQUES FOR LEFTOMENINGEAL DISEASE IN PATIENTS WITH BRAIN METASTASIS**

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**BACKGROUND:** Leptomeningeal disease (LMD) is malignant infiltration of the pia mater and cerebrospinal fluid (CSF) space. LMD carries a poor prognosis with median survival of a few months. Annually, 110,000 patients in the United States are diagnosed with LMD. The incidence is increasing as a result of improvements in cancer interception and recognition that LMD is a late sequela of some malignancies. Definitive diagnosis of LMD is made by CSF cytology and/or spine MRI, although neither tool shows robust sensitivity. The diagnostic challenges for LMD have led to a lack of uniformity in the diagnostic approach. METHODS: A systematic chart review of brain metastasis patients was conducted at Froedtert Hospital between 2019-2021. Information on primary cancer, LMD suspicion, work up, confirmation, treatment, and survival were collected and analyzed. RESULTS: Among 151 patients with brain metastasis, 86 were suspected and 29 were confirmed to have LMD. Of the confirmed patients, the most common primary cancers were lung (n=8, 27.6%) and breast (n=8, 27.6%). Most patients (n=24, 82.8%) underwent both LP and MRI. LMD was confirmed by positive cytology in a minority of cases (n=9, 31%), with most patients being confirmed by positive MRI or clinical findings alone (n=20, 69%). All LPs had over 10 mL of CSF sent to analysis. A median of 2 LPs were required before a positive cytology confirmed the diagnosis. Due to small sample size, no statistical analysis was made to correlate positive LP with primary cancer sites. CONCLUSION: Less than one third of cancer patients with confirmed LMD have positive cytology, despite the majority (>80%) of them undergoing LP. The discordance between diagnostic interception and confirmatory results is expected considering the low sensitivity of LPs; however, it highlights the need for more precise diagnostic tools, and development of a data-based strategy for LMD confirmation.

**NEIM-02**

**DEVELOPMENT OF A DEEP LEARNING MODEL FOR DISCRIMINATING TRUE PROGRESSION FROM PSEUDOPROGRESSION IN GLOBLASTOMA PATIENTS**

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**INTRODUCTION:** Glioblastomas (GBMs) are highly aggressive tumors. Despite multimodal treatment, its median overall survival ranges between 16 and 20 months. The standard treatment regimen consists of surgical resection followed by concurrent chemoradiotherapy and adjuvant temozolomide. Despite temozolomide's effectiveness, it may cause the clinical challenge of...
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in location among different tumour subtypes can be explained by normative gene expression. Manual segmentation was done on contrast-enhanced T1-weighted MRIs in 31 patients with brain metastases and known primary tumour [breast (n=7), lung (n=14), genitourinary (n=5) and melanoma (n=5)]. Segmented lesions were transformed to template brain space. First, odds-ratio maps were created for each primary tumour subtype. These maps delineate brain regions that were preferentially engaged by each subtype. Consistent with prior literature, odds-ratio maps demonstrated a potential to seed to different brain regions according to primary tumour subtype, e.g. lung - cerebellum, melanoma - frontal and temporal lobes. Next, mapping our lesions on the Allen atlas of normative gene expression, we identified significant (p<0.01) differences in the local expression of certain genes such as LEPROT and IFITPA – related to the spatial pattern of breast, lung, genitourinary, and melanoma. This novel approach integrates angiographic and transcriptomic techniques that could be used towards an improved understanding of neuro-oncologic processes. Crucially, this approach would allow investigators to leverage conventional anatomical images – acquired as part of a patient’s normal clinical course and in the absence of tissue samples – to better understand cancer mechanics. This has potential ramifications for therapeutic decision-making. Large-scale prospective studies are underway.

NEIM-05
FEASIBILITY OF NAVIGATED TRANSCRANIAL MAGNETIC STIMULATION (nTMS) BASED DIFFUSION TENSOR IMAGING (DTI) TRACTOGRAPHY OF MOTOR PATHWAYS IN PATIENTS UNDERGOING STEREOTACTIC RADIOSURGERY: A CROSS-SECTIONAL DOSIMETRIC AND PATIENT OUTCOMES ANALYSIS
Juliana Bronki1, Matthew Muir1,2, Hayley Michener1, Courtney Callbat1, Dennis Mackin1, Drew Mitchell1, Benjamin Train1, Magay Farhat1, Andrew Elliot1, Sujit Prabhu1, Sarah Prinsloo2, Caroline Chung2, 1University of Texas MD Anderson Cancer Center, Houston, TX, USA. 2Baylor College of Medicine, Houston, TX, USA

BACKGROUND: No current dose limitations exist for the motor tracts undergoing stereotactic radiosurgery (SRS) planning for cortical motor tracts. Although nTMS is utilized for functional mapping prior to brain tumor resection, it has not been implemented in SRS planning. OBJECTIVES: To determine the feasibility of performing nTMS-based DTI in patients treated with SRS and examine the relationship between dose to functionally-defined motor tracts and patient outcomes measured by objective hand function testing and patient reported outcomes (PROs). METHODS: 16 patients treated with SRS to a brain metastasis located near anatomically-defined motor tracts were enrolled on an IRB-approved clinical trial. At median follow-up of 5.4m after SRS, patients underwent nTMS testing, brain MRI with DTI, and patient outcomes testing (Pinch Dynamometer, 9-Hole Peg Test), and quality-of-life (QOL) PROs (EQ-5D-5L, MDA-SI-BT). nTMS-seeded DTI tractography was generated (Brainlab iPlan+) and imported into GammaPlan for dosimetric evaluation. RESULTS: Tractographic reconstruction was attempted for 16/16 patients and successful in 7/16 (87.5%). One patient who had prior resection of a lesion in the right pre-central gyrus failed to map in the right hemisphere and was unable to complete functional testing for the affected extremity. Median Dmean was 9.09Gy [0-1.2Gy]. Increased Dmean correlated with deficits in lateral pinch strength (R2=0.76) and 9-Hole Peg testing time (R2=0.61). Increased Dmean correlated with increased MDA-SI-BT interference scores (R2=0.93) and EQ5D-SL score (R2=0.94) indicating worsened QOL. CONCLUSIONS: nTMS testing was feasible and dose to nTMS-defined motor tracts correlated with subjective and objective patient outcomes. Future steps will include characterization of motor tract dose tolerance for SRS.