Abstracts

OTH-09. IDENTIFYING EPIDEMIC SIGNATURES IN LUNG ADENOCARCINOMAS THAT PREDICT DEVELOPMENT OF BRAIN METASTASIS

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INTRODUCTION: Metastases are the most common adult brain tumor with half spreading from lung cancers and they reduce median overall survival by 16 months. There are no known patient-specific predictors of brain metastasis. Epigenetic signatures predict disease recurrence in other cancers and identifying brain metastasis methylation-based signatures may allow for treatment approaches to high-risk patients that prevent their development. METHODS: In 207 lung adenocarcinomas, multivariate Cox time to brain metastasis analyses including clinically-relevant variables (lung tumor size and TNM nodal score) along with significant covariates on univariate analyses were performed. DNA was extracted from 142 of these tumors and profiled on the Illumina Infinium EPIC array. A general-ized boosted regression classification model used differentially methylated CpG sites significantly predicting time to brain metastasis in a 70% training cohort Cox analysis (p<0.05). Resulting methylation-based risk scores were compared to size and nodal status in a multivariate analysis of the independent 30% testing cohort. RESULTS: Of 207 patients with 72 brain metastatic events, tumor size (HR=1.5, 95% CI 1.1–2.0, p=0.011), N status (N3 vs. N0, HR=9.9, 95% CI 3.1–31, p=0.0001), EGFR status (HR=0.4, 95% CI 0.2–0.8, p=0.014), and age (HR=0.7, 95% CI 0.5–1.0, p=0.039) independently predicted their development. Multivariable-based risk scores significantly predicted time to brain metastasis in a univariate analysis of the testing cohort (p=0.03). A multivariate analysis of testing cohort patients identified methylation score as the only independent predictor of brain met-astases (HR=8.5, 95% CI 1.3–57, p=0.038) accounting for tumor size and N score. CONCLUSIONS: Genome-wide DNA methylation signatures predict brain metastasis development in lung adenocarcinomas independent of lung tumor size and TNM nodal stages. Identification of these clinical factors may be used to determine patient-specific brain metastasis risk values to guide patient counseling, extent of treatment, and screening.

OTH-10. THE NATIONAL DISTRIBUTION OF NEWLY-DIAGNOSED BRAIN METASTASES IN ADULTS VARIES WIDELY BY PATIENT DEMOGRAPHICS

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INTRODUCTION: Metastases are oft-cited as comprising approximately half of all adult intracranial neoplasms, and their national com-position remains unclear. METHODS: The patient demographics and histologic distribution of newly-diagnosed brain metastasis (BM) patients aged > 18yo without a prior history of cancer (2010–2013) were evaluated using the National Cancer Database, which comprises > 70% of all newly-diagnosed patients in the U.S. RESULTS: Patient demographics were compared to a newly-diagnosed BM between 2010–2015. The most common sites of brain metastases overall were lung (82% of metastatic cases), breast (41%), melanoma (32%), kidney (29%), and colorectal (18%). The overall 1-year and 2-year survival for all BMs were 34% and 27%, respectively. The distribution of primary sites for newly-diagnosed BMs varied by sex, age, and race. Compared to males, more females had BMs from breast (8.4% versus 0.8%) and fewer had BMs from kidney (1.9% versus 3.8%), melanoma (1.9% versus 4.5%), and esophagus (0.3% versus 2.0%). In young adults, particularly those 20–29yo, BMs were more likely from melanoma, genitourinary (in males), and soft tissue than adults in middle and advanced age. Lung carcinomas comprised fewer BMs in Hispanics (66%) compared to Whites (82%), Blacks (83%), and Asian/Pacific Islanders (85%). BMs from kidney and genitourinary primaries were higher in Hispanics (7.5% and 2.4% of BMs, respectively) than in Whites (2.6% and 0.3%, respectively), Blacks (1.8% and 0.1%, respectively), and Asian/Pacific Islanders (2.6% and 0.2%, respectively). Melanoma was more frequent in Whites (3.8% of BMs) and Hispanics (2.5%) compared to Blacks (0.3%) and Asian/Pacific Islanders (0.6%). CONCLUSION: Our results indicate the national distribution of newly-diagnosed BMs and investigate how the distribution varies by pa-tient demographics.

OTH-11. TUMOR RELATED IMPAIRMENTS OF NEUROCOGNITIVE FUNCTIONS IN PATIENTS WITH BRAIN METASTASES

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OBJECTIVE: To study whether the neurocognitive functions were af-fected by brain metastases in patients, and what are the potential risk factors. METHODS: A total of 172 patients with brain metastases were retrospectively analyzed. Prior to radiotherapy of brain metastases, the neurocognitive function was evaluated by a wide range of tests including MOCA, VFT, HVLT-R, TMT-A, TMT-B and TOL. Kappa test was used to analyze the consistency of physical examination and neurocognitive assess-ment results. The related factors were analyzed by logistic regression multivariate analysis. RESULTS: 53 out of 172 patients (30.8%) were identified with cognitive impairments by physical examination. The assess-ment with neurocognitive scales revealed that there were 148 cases of cognitive impairment (86.0%) of 172 cases of normal cognitive impairment by physical examination. Kappa=0.025, indicating that the difference between neurocognitive as-sessment results and physical examination was significant. The univariate analysis on the factors related to neurocognitive impairment revealed that the factors that may affect the neurocognitive functions included age, KPS, m-GPA score, RPA classification, whether the original tumor was under control, with or without brain metastases. After adjusting for edu-cation, the multivariate analysis showed that age≥45 years old, KPS≥70, RPA classification ≥2 and m-GPA score < 3 were independent risk factors for neurocognitive impairment. The primary objective is to clarify the risk factors that may affect the neurocognitive function were to have various degrees of neurocognitive impairment prior to radiotherapy. The neurocognitive functions of patients can be more precisely evaluated by a comprehensive scale assessment. Age, KPS, RPA classification and m-GPA score are the main factors associated with neurocognitive impairment.

OTH-12. DRIVING RECOMMENDATIONS IN PATIENTS WITH NEWLY DIAGNOSED BREAST CANCER BRAIN METASTASES

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BACKGROUND: Approximately 5% of all patients with breast cancer de-velop breast cancer brain metastases (BCBM). Medical and legal guidance on health conditions associated with driving may vary by state. The paucity of data to guide clinicians’ recommendations on driving in the setting of BCBM is concerning. This review of clinical pathways and regulations highlights the frequency of provider-documented driving recommendations with secondary objectives to define associated clinical factors. METHODS: University of Michigan’s (UM) DataDirect tool retrospectively searched databases dated 1/1/2012 to 11/1/2018 for BMs and UM consultation with medical oncology, radiation oncology, neuro-oncology, neurosurgery, or pathology in 4 weeks of BCBM diagnosis. Chart abstraction included clinical and demographic factors for descriptive analysis. RESULTS: Only 87 of the 188 identified subjects (46%) met eligibility criteria. The most common exclusions were non-breast cancer brain lesion (n=40), neither UM imaging nor pathology (n=23) and no intra-parenchymal brain metastases (n=22). Of the 87 eligible subjects, 21 (24%) had documented recommendations against driving. Five of the 7 subjects with documented seizure history within 4 weeks of diagnosis also had documented recommendations against driving. There were no significant effects on anti-epileptics of which 13 had documented driving recommendations. CONCLUSIONS: The minority of patients (24%) with newly diagnosed BCBM had a documented recommendation against driving. Seizure activity was strongly associated with driving recommendations. With the few data points, general parameters regarding the safety of driving with newly diagnosed BCBM are not well defined. Prospective study is indicated to provide data supported recommendations regarding driving with BCBM.

OTH-13. A DEEP LEARNING APPROACH TO DETECT CANCER METASTASES TO THE BRAIN IN MRI

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BACKGROUND AND OBJECTIVE: Brain metastases have been found to account for one-fourth of all cancer metastases seen in clinics. Magnetic resonance imaging (MRI) is widely used for detecting brain metastases. Accu-rate detection of the brain metastases is critical to design radiotherapy to treat the cancer and monitor their progression or response to the therapy and prognosis. However, finding metastases on brain MRI is very challeng-ing as many metastases are small and manifest as objects of weak contrast on the images. In this work we present a deep learning approach integrated with a classification scheme to detect cancer metastases to the brain on MRI. MATERIALS AND METHODS: We retrospectively extracted 101 metastases patients, equal to 1535 metastases on 10192 slices of images in a total of 336 scans from our PACS and manually marked the lesions on T1-weighted contrast enhanced MRI as the ground-truth. We then newly pre-processed the cases to rectify the validation set for better training and optimizing the deep learning neural network. We designed a 2-step computer-aided detection (CAD) pipeline by first applying a fast region-based convolutional neural network method (R-CNN) to sequen-tially process each slice of an axial brain MRI to find abnormal hyper-intensity that may correspond to a brain metastasis and, second, applying a

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