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

Junjie Zhen, Shaoqun Li, Lei Wen, Zhangrui Peng, Mingyao Lai, Cheng Zhou, and Linbo Cai; Guangdong Sanjiu Brain Hospital, Guangzhou, China

OBJECTIVE: To study whether the neurocognitive functions were affected 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 assessment results. The related factors were analyzed with univariate and multivariate analysis. RESULTS: 53 out of 172 patients (30.8%) were identified with cognitive impairments by physical examination. The assessment with neurocognitive scales revealed that there were 148 cases of cognitive impairment (86.0%) and 24 cases of normal cognition (14.0%). Kappa=0.025, indicating that the difference between neurocognitive assessment results and physical examination was significant. The univariate analysis on the factors related to neurocognitive impairment revealed that the risk 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 education, 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. CONCLUSION: Patients with brain metastases were found 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.

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

Leigh Swartz, Heidi Egloff, Aki Morikawa, and Catherine Van Poznak; University of Michigan, Ann Arbor, MI, USA

BACKGROUND: Approximately 5% of all patients with breast cancer develop 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 prompted this review of clinical practice. The primary objective is to determine 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 records dated 11/30/2012 to 11/30/2018 using ICD 9 and 10 codes for breast cancer (C50.912, C50.911, C50.919, 174.9, 175.9) and for brain metastases (C79.31, D49.6, D43.2, 198.3, 239.6). Eligibility criteria were: age ≥ 18, BCBM, UM pathology confirmation of breast cancer, CNS imaging at time of diagnosis performed or reviewed at UM, and UM consultation with medical oncology, radiation oncology, neuro-oncology, neurosurgery, or neurology within 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 32 of 87 subjects 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 documentation of driving recommendations. Other than seizure activity, 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.

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

Min Zhang[1], Geoffrey Young[1], Huai Chen[2], Lei Qin[1], Xinhua Cao[1], Xian Wu[3], and Xiaoyin Xu[1]; [1]Brigham and Women's Hospital, Boston, MA, USA, [2]Department of Radiology, First Affiliated Hospital of Guangzhou Medical University, Guangzhou, Guangdong, China, [3]Tsinghua University, Beijing, China

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. Accurate 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 challenging 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 randomly separated the cases into training, validation, and test sets for developing 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 sequentially process each slice of an axial brain MRI to find abnormal hyperintensity that may correspond to a brain metastasis and, second, applying a random under sampling boost (RUSBoost) classification method to reduce the false positive metastases. RESULTS: The computational pipeline was tested on real brain images. A sensitivity of 97.28% and false positive rate of 36.25 per scan over the images were achieved by using the proposed method. CONCLUSION: Our results demonstrated the deep learning-based method can detect metastases in very challenging cases and can serve as CAD tool to help radiologists interpret brain MRIs in a time-constrained environment.

OTHR-14. TREATMENT MONITORING OF IMMUNOTHERAPY AND TARGETED THERAPY USING FET PET IN PATIENTS WITH MELANOMA AND LUNG CANCER BRAIN METASTASES: INITIAL EXPERIENCES

Norbert Galldiks[1], Diana Abdulla[1], Matthias Scheffler[1], Viola Schweinsberg[1], Max Schlaak[2], Nicole Kreuzberg[1], Jenny Landsberg[3], Philipp Lohmann[4], Garry Ceccon[1], Jan-Michael Werner[1], Eren Celik[1], Maximilian Ruge[1], Martin Kocher[4], Simone Marnitz[1], Gereon Fink[4], Karl-Josef Langen[4], Juergen Wolf[1], and Cornelia Mauch[1];; [1]University Hospital Cologne, Cologne, Germany, [2]University of Munich, Munich, Germany, [3]University of Bonn, Bonn, Germany, [4]Inst. of Neuroscience and Medicine (INM-3, -4, -5), Research Center Juelich, Juelich, Germany,

BACKGROUND: Due to the lack of specificity of contrast-enhanced (CE) MRI, both the response assessment and differentiation of progression from pseudoprogression (PsP) following immunotherapy using checkpoint inhibitors (ICI) or targeted therapy (TT) may be challenging, especially when ICI or TT is applied in combination with radiotherapy (RT). Here, we evaluated the value of amino acid PET using O-(2-[^{18}F]fluoroethyl)-L-tyrosine (FET) as a problem-solving tool in comparison to CE-MRI in patients with brain metastases (BM) secondary to malignant melanoma (MM) and NSCLC. METHODS: We retrospectively identified 31 patients with 74 BM secondary to MM (n=20 with 42 BM) and NSCLC (n=11 with 32 BM) who underwent 52 FET-PET scans during the course of disease. All patients had RT prior to ICI or TT initiation (61%) or RT concurrent to ICI or TT (39%). In 13 patients, FET-PET was performed for treatment response assessment of ICI or TT using baseline and follow-up scans (median time between scans, 4.2 months). In the remaining 18 patients, FET-PET was used for the differentiation of progression from PsP related to RT plus ICI or TT. In all BM, metabolic activity on FET-PET was evaluated by calculation of tumor/brain ratios. FET-PET imaging findings were compared to CE-MRI and correlated to the clinical follow-up or neuropathological findings after neuroimaging. RESULTS: In 4 of 13 patients (31%), FET-PET provided additional information for treatment response evaluation beyond the information provided by CE-MRI alone. Furthermore, responding patients on FET-PET had a median stable clinical follow-up of 10 months. In 10 of 18 patients (56%) with CE-MRI findings suggesting progression, FET-PET detected PsP. In 9 of these 10 patients, PsP was confirmed by a median stable clinical follow-up of 11 months. CONCLUSIONS: FET-PET may add valuable information for treatment monitoring in individual BM patients undergoing RT in combination with ICI or TT.

OTHR-15. PATIENTS WITH LIMITED STAGE SMALL CELL LUNG CANCER THAT RECUR WITH ISOLATED BRAIN METASTASES HAVE PROLONGED SURVIVAL

Bryan Bonder, Fatemeh Ardeshir Larijani, Afshin Dowlati, and Lisa Rogers; University Hospitals, Cleveland, OH, USA

INTRODUCTION: Small cell lung cancer (SCLC) frequently metastasizes to the brain. In patients with limited-stage disease (disease confined to one radiation portal), the incidence of brain metastasis after 3 years is 50–60%. We reviewed patients with SCLC and hypothesized that isolated brain recurrence has a unique natural history. METHODS: 471 adult SCLC patients seen at University Hospitals Case Medical Center from 1998 to 2014 were screened. Patients were separated by those with isolated brain metastases and those with other patterns of metastasis. Demographic data including age, race, sex, smoking history and clinical data such as TNM classification, stage, treatment, and time to relapse and death were collected. Median overall survival (mOS) and progression free survival (mPFS) were compared using log-rank tests and Kaplan-Meier plots were constructed. In a separate cohort of metastatic SCLC we examined differences in next generation sequencing (NGS) of targeted