grading. DKI-based model predictions were significantly correlated with progression-free survival.

IMG-15. PEDIATRIC GLIOBLASTOMAS CONTRAST ENHANCEMENT PATTERN IS PREDICTIVE OF SURVIVAL

Zsila Sadighi, Halyna Pokhylevych, Maria Gule-Monroe, Melissa Chen, Greg Fuller, Stephen Gruschkus, David Sandberg, Susan McGovern, Mary Frances McAleer, Wafik Zaky, Soumen Khatua, and Jason Johnson; The University of Texas MD Anderson Cancer Center, Houston, TX, USA

BACKGROUND: Pediatric GBMs are rare, accounting for 3% of all pediatric CNS tumors. Despite advances in treatment, the outcomes for pediatric glioblastomas (GBM) have not significantly improved. Research suggests a link between enhancement patterns and survival in adult patients with glial tumors. We sought to study this relationship in a cohort of pediatric GBMs. METHODS: A radiology database was searched for cases < 22 years, pathology proven brain glioblastoma, and pre-surgical MR imaging available for review. Based on pre-treatment, T1-contrast enhanced MR images, size, and contrast enhancement patterns were characterized as focal, diffuse, or ring-like. The extent of resection was assessed by comparing pre- and post-surgery T2 hyperintensity and contrast enhancement. RESULTS: 64 eligible patients (age 2-21y, 14.6 + 5.4) were identified. The majority of lesions demonstrated enhancement on gadolinium-enhanced T1 imaging. (n=58/64; 90%). The lesions were categorized into six (9.4%) cases with focal enhancement, 37 (57.8%) cases with diffuse enhancement, and 15 (23.4%) with ring-like enhancement. Patients who received GTR/subtotal resection (STR) and had focal-enhanced GBMs had a significantly longer progression-free survival (PFS) – 14.1 months (p = 0.0308), comparing to diffuse and ring-like enhancing glioblastomas which had respectively 13.9 and 5.5 months of PFS. DISCUSSION: Our data suggests that the contrast enhancement pattern is a significant prognostic factor for survival in pediatric GBM. Patients with GTR/STR who had focal-enhancing GBMs had a significantly longer progression-free survival (p=0.03) comparing to other enhancement patterns.

IMG-16. WHOLE TUMOR DIFFUSION KURTOSIS IMAGING ANALYSIS FOR DISCRIMINATING PEDIATRIC POSTERIOR FOSSA TUMORS: ACCURACY AND REPEATABILITY

Ioan Paul Voicu[1], Antonio Napolitano[1], Alessia Carboni[1], Massimo Caulo[2], Andrea Carai[1], Maria Vinci[1], Evelina Miele[1], Sabrina Rossi[1], Antonella Cacchione[1], Sabina Vennarini[3], Elisabetta Ferretti[4], Angela Mastronuzzi[1], Paolo Tomà[1], and Giovanna Stefania Colafati[1]; [1]Bambino Gesù Children's Hospital, Rome, Italy, [2]Institute for Advanced Biomedical Technologies-ITAB, Chieti, Italy, [3]Santa Chiara Hospital, Trento, Italy. [4]University "La Sapienza", Rome, Italy

PURPOSE: Diffusion kurtosis imaging (DKI) has not yet been tested for pediatric brain tumors. Estimating diffusion values from whole-tumor based (VOI) segmentations may improve diffusion measurement repeatability compared to conventional region-of-interest (ROI) approaches. Our purpose was to compare repeatability between ROI and VOI DKI-derived diffusion measurements and to assess VOI-based DKI accuracy in discriminating among pediatric posterior fossa tumors. MATERIALS AND METHODS: We retrospectively analyzed 34 children (19 M, 15F, mean age 7.48 years) with posterior fossa tumors who underwent preoperative 3T MRI including DKI. For each patient, two neuroradiologists independently segmented the whole solid tumor (VOI), the area of maximum tumor diameter and a smallROI.Inter-observer variability was assessed with coefficient of variation (COV) and Bland-Altman plots. VOI-based DKI metrics accuracy in discriminating among tumor histology and for tumor grading were assessed with MANOVA and ROC analyses respectively. Correlation between grading accuracy and inter-observer variability was assessed with Spearman's rho. RESULTS: Tumor histology included medulloblastoma (15), pilocytic astrocytoma (14) and ependymoma (5). VOI-based measurements presented lower variability than ROI-based measurements across all DKI metrics. DKI-derived metrics could accurately discriminate between tumor subtypes (Pillai's trace: p<0.001) and were accurate for tumor grading (AUCs of 0.919, 0.986, 0.996, 0.842 and 0.926 for RK, MK, AK, FA and MD respectively). VOI-based COV was significantly correlated to AUC values (R=-0.900, p<0.037). CONCLUSIONS: DKI-derived metrics are useful for pediatric posterior fossa tumor discrimination and grading. VOI-based diffusion measurements present improved repeatability compared to ROI-based measurements and are significantly correlated to diagnostic accuracy.

IMG-17. RADIOMICS CHARACTERIZATION OF FOUR PEDIATRIC BRAIN TUMOR SUBTYPES IN PDX MOUSE MODELS

Natalie Serkova, Marina Stukova, Samuel Henehan, Jenna Steiner, Angela Pierce, Andrea Griesinger, Bethany Veo, Irina Alimova, Sujatha Venkataraman, Adam Green, Nathan Dahl, Nicholas Foreman, and Rajeev Vibhakar; University of Colorado Anschutz Medical Campus, Aurora, CO, USA

BACKGROUND: Previously, we have reported on the development of advanced magnetic resonance imaging (MRI) protocols for mouse brain tumors. The goal of this follow-up pre-clinical study was to develop a machine-learning MRI classifier (radiomics) for four subtypes of childhood brain tumor in patient-derived xenograft (PDX) mice. METHODS: MRI scans on orthotopic medulloblastoma, ependymoma, ATRT and DIPG PDX (each n=12 animals) were performed on the animal 9.4 Tesla scanner with an in-plane resolution of 47 microns. Image segmentation, as well as shape and texture based radiomics descriptors were modeled using a modified COLIAGE software for tumor classification and to characterize tumor habitat of each tumor subtype. RESULTS: The mean tumor volumes were 11.2 mm^3. Each MRI scan was segmented into three regions: (i) well defined tumor (including distant metastases); (ii) peritumoral edema; (iii) tumor necrosis. 360 radiomics features (capturing co-occurrence, grey-level dependence and directional gradients) were obtained for each region. The model classified four subtypes with high accuracy while achieving sufficient segmentation accuracy despite the small lesion size. A subset of fourteen tumoral, six peritumoral and five distant MRI radiomics features were found to be predictive of the tumor sub-type (p=0.0017) independently of tumor anatomical location. CONCLUSIONS: MRI protocols followed by radiomics feature analysis discriminated among specific radiological features for four distinct orthotopic PDX models: medulloblastomas exhibit low ADC values, high angiogenesis and cortical metastases as compared to ependymomas (high levels of edema and olfactory bulb metastases), ATRT (the highest level of necrosis) and DIPG (highest T2 signal intensities and spinal metastases).

IMG-18. ASSESSMENT OF SUSPECTED DISEASE PROGRESSION USING MULTIPARAMETRIC 18F-CHOLINE PET/MRI IN CHILDHOOD AND TEENAGE-YOUNG ADULT GLIOMAS

Valentina Ferrazzoli, Ananth Shankar, Julia Cockle, Christine Tang, Ahmed Al-khayfawee, Benjamin Thomas, Anna Barnes, Jamshed Bomanji, Francesco Fraioli, and Harpreet Hyare; UCLH, London, United Kingdom

OBJECTIVES: Evaluation of post-treatment glioma burden remains a significant challenge in children, teenagers and young adults (TYA). The aim of this study was to evaluate the utility of ChoPET/MRI for evaluation of suspected disease progression in childhood and TYA gliomas. METHODS: 27 patients (mean age 14 years, range 6–21 years) with suspected glioma disease progression were evaluated with ChoPET/MRI (n=59). Relative cerebral blood volume (rCBV), apparent diffusion coefficient (ADC) and maximum standardised uptake values (SUV_{max}) in enhancing (enh) and non-enhancing (ne) tumour and normal-appearing white matter (wm) were calculated ($rCBV_{enh}$, $rCBV_{ne}$, $rCBV_{wm}$, ADC_{enh}, ADC_{ne}, ADC_{wm}, SUV_{enh}, SUV_{ne}, SUV_{wm}). 2 blinded radiologists scored tumour probability (1 = unlikely; 5 = definitely). Sensitivity and specificity calculated with gold standard histopathology or clinical follow-up. RESULTS: Accuracy for the detection of residual/recurrent tumour on conventional MRI was 96.3% (91.7% ≤14 years, 100% ≥15 years) and ChoPET was 73.1% (66.7% ≤14 years, 80.0% ≥15 years). Lack of agreement was observed in 9/27 patients, with ChoPET superior to MRI in 1 case of a posterior fossa tumour. Tumour component analysis demonstrated significantly higher SUV_{enh} and SUV_{ne} than SUV_{wm} (SUV_{enh}: p<0.001; SUV_{ne}: p=0.004, equivalent to results were observed for ADV and rCBV (ADC_{enh}, ADC_{ne}: p<0.001 vs ADC_{wm}; $rCBV_{enh}$, $rCBV_{ne}$: p<0.001 vs $rCBV_{wm}$). CONCLUSIONS: MRI is more sensitive than ChoPET in the evaluation of suspected disease progression in TYA gliomas. However, quanititative ChoPET is able to detect enhancing and non-enhancing tumour and may be helpful in evaluating posterior fossa disease where MRI is equivocal.

IMG-19. RADIOMICS AND SUPERVISED DEEP LEARNING TO PREDICT MOLECULAR SUBGROUPS IN MEDULLOBLASTOMA BASED ON WHOLE TUMOR VOLUME LABELING: A SINGLE CENTER MULTIPARAMETRIC MR ANALYSIS

Ioan Paul Voicu[1], Piero Chiacchiaretta[2], Massimo Caulo[2], Evelina Miele[1], Alessia Carboni[1], Andrea Carai[1], Francesca Diomedi-Camassei[1], Sabrina Rossi[1], Antonella Cacchione[1], Giada Del Baldo[1], Elisabetta Ferretti[3], Angela Mastronuzzi[1], Paolo Tomà[1], and Giovanna Stefania Colafati[1]; [1]Bambino Gesù Children's Hospital, Rome, Italy, [2]Institute for Advanced Biomedical Technologies-ITAB, Chieti, Italy, [3]University "La Sapienza", Rome, Italy

PURPOSE: Medulloblastoma (MB) is a complex pathology. Four molecular subgroups have been unveiled (Wingless-WNT, Sonic Hedgehog-SHH, Group 3-G3 and Group 4-G4), characterized by significant differences in patient clinical outcome. We investigated the utility of a radiomic analysis to predict molecular subgroups in patients with MB. MATERIALS