NY, USA, [6]Vanderbilt University Medical Center, Nashville, TN, USA, [7]Washington University School of Medicine, St. Louis, MO, USA, [8]Lucile Packard Children's Hospital at Stanford University, Palo Alto, CA, USA, [9]Nicklaus Children's Hospital, Miami, FL, USA, [10]McGill University, Montreal, Canada, [11]Children's National Health System, Washington DC, USA, [12]Johns Hopkins University School of Medicine, Baltimore, MD, USA, [13]Johns Hopkins All Children's Hospital, St. Petersburg, FL, USA, [14]Children's Mercy Hospital, Kansas City, MO, USA, [15]Arnold Palmer Hospital, Orlando, FL, USA, [16]Emory University School of Medicine, Atlanta, GA, USA, [17]Seattle Children's Hospital, Seattle, WA, USA, [18]Nationwide Children's Hospital, Columbus, OH, USA, [19]Children's Hospital Los Angeles, Los Angeles, CA, USA

METHODS: Through the Advancing Treatment for Pediatric Craniopharyngioma (ATPC) consortium we accumulated preoperative MRIs and tumor RNA for 50 unique ACP patients. MRIs were assessed quantitatively for 28 different features and analyzed using Multiple Factor Analysis (MFA) and optimal clustering was determined via maximization of Bayesian Information Criterion (BIC). Following bulk RNAseq, differential expression and pathway enrichment were performed using standard methodologies (i.e., DESeq2 and GSEA). RESULTS: MRI features were well represented in the first 3 dimensions of MFA (variance explained=67.32%); specifically tumor/cyst size, ventricular size, and cyst fluid diffusivity. Using this three-way axis, we identified 3 patient subgroups. Transcriptional differences between these subgroups indicated one group was enriched for DNA damage response and MYC related pathways, one group enriched for SHH, and one group enriched for WNT/β-catenin and EMT-related pathways. CONCLUSION: This preliminary work suggests that there may be unique gene expression variants within ACP, which may be identified preoperatively using easily quantifiable MRI parameters. These radiogenomic signatures could provide prognostic information and/or guidance in the selection of antitumor therapies for children with ACP.

RARE-12. VASCULOPATHY IN PEDIATRIC CRANIOPHARYNGIOMA PATIENTS TREATED WITH SURGERY AND RADIOTHERAPY

John Lucas[1], David LeVine[2], Yousef Ismael[1], Chi-Yang Hsu[2], Kaleb Darrow[2], Austin Faught[2], Vadim Moskvin[2], Fakhriddin Pilepesov[2], Noah Sabin[2], Frederick Boop[2], Paul Klimo[1], Lucas Elijovich[2], and Thomas Merchant[2]; [1]St. Jude Children's Research Hospital, Memphis, TN, USA, [2]University of TN Health Sciences Center, Memphis, TN, USA

PURPOSE: As much as 40% of pediatric brain tumor patients will experience varied levels of Vasculopathy (VS), however few predictive factors have been described. Here we describe the type and timing of VS and explore the relationship between treatment modality and the timing, location, and distribution of VS. METHODS: 94 pediatric Craniopharyngioma patients underwent surgery and proton radiotherapy. Pre- and post-treatment imaging, cumulative physical and biological proton dose maps, clinical characteristics, and measures of dyslipidemia were evaluated. MR and MRAs were evaluated for pre- and post-radiotherapy VS (type, workup, location, and severity). VS events were segmented and described according to their normal brain region, and vascular territory. RESULTS: 47 patients were found to have 154 confirmed VS of varying severity with a median time to event of 3.41 years 95% CI 3.08–3.88. 22% (N=21) of patients had ≥1 pre-existing instances of VS and 26.6% (N=25) had a dyslipidemia at diagnosis. Forty-six (48.9%) patients had evidence of VS post-RT with 9.5% (N=9) being clinically significant. Aspirin was recommended in 10.6% (N=10) patients. Only 4 (4.2%) patients required revascularization. Clinical characteristics were not predictive of VS. An increased frequency of VS were observed along the operative corridor and high-dose radiotherapy field. CONCLUSIONS: VS often precedes radiotherapy necessitating appropriate baseline imaging. Surgery type and extent are interrelated to the risk for radiotherapy-induced VS. While the spatial radiotherapy dose distribution approximated most vascular injury events, it was not all-inclusive. Spatial modeling of biological and physical dose may offer insights into therapy related vascular injury.

RARE-13. INFLAMMATORY MYOFIBROBLASTIC TUMOR MIMICKING DESMOPLASTIC INFANTILE GANGLIOGLIOMA (DIG) OF THE TEMPORAL LOBE

Ibrahim Abukhiran[1], Gino Bardi Lora[2], Patricia Kirby[1], Julia Shelton[2], Joel Shilyanski[2], Saul Wilson[1], Aaron Bossler[1], Yutaka Sato[2], Amani Bashir[1], and Mariko Sato[2]; [1]University of Iowa, Iowa City, Iowa, USA, [2]Stead Family Children's Hospital University of Iowa, Iowa City, Iowa, USA

Inflammatory myofibroblastic tumor (IMT) is a mesenchymal neoplasm composed of fascicles of myofibroblastic spindle cells in a background of prominent inflammatory infiltrate. It is categorized as 'intermediate, rarely metastasizing' in the World Health Organization classification of tumors of soft tissue and bone. We present a novel case of concurrent brain and lung tumor with diagnosis of TFG-ROS1-rearranged IMT in a 14 year old female patient, in which targeted next-generation sequencing became a powerful tool for detection of genomic alterations in both lung and brain tumors. At age 9, the patient's lung mass was incidentally found and investigated for various infectious diseases with negative result. At age 14, she presented with seizure and was noted to have a stable size lung mass and a left temporal lobe tumor. The left temporal lobe tumor showed a desmoplastic spindle cell neoplasm involving the meninges and cerebral cortex and Desmoplastic Infantile Ganglioglioma (DIG) was considered one of differentials. Subsequently, her right lung mass was resected and showed a similar spindle cell neoplasm with a background of dense fibrosis and chronic inflammation, consistent with Inflammatory Myofibroblastic Tumor. Molecular microdissection revealed that both tumors shares TFG-ROS1 fusion which is associated with (t(3;6) (q12;q22)), thus it is strongly suggestive that two tumors arose from the same origin. No predisposition syndrome was identified.

RARE-14. DEVELOPMENT OF ANAPLASTIC ASTROCYTOMA AS A THIRD MALIGNANCY IN A PEDIATRIC PATIENT WITH CONSTITUTIONAL MISMATCH REPAIR DEFICIENCY (CMMRD): A CASE REPORT AND EVALUATION OF TUMOR GENOMICS IDENTIFYING BIALLELIC *MSH6* MUTATIONS

Erin Wright, Alexis Judd, Jennifer Stanke, Sarah Rush, and Daniel Pettee; Akron Children's Hospital, Akron, OH, USA

Congenital mismatch repair deficiency (CMMRD) is a pediatric cancer predisposition syndrome secondary to biallelic mutations in mismatch repair genes including *MLH1, MSH2, MSH6*, and *PMS2*. Due to the resulting lack of repair mechanisms, these patients develop a high intracellular mutational burden and have a high risk of development of multiple malignancies at a young age. Similar to patients with Lynch Syndrome (monoallelic mutations in MMR genes), these patients are at risk for development of central nervous system (CNS) tumors including high grade gliomas. Forty-eight percent of patients with CMMRD are diagnosed with a CNS malignancy. In this interesting case, a patient developed three metachronous malignancies prior to the age of 13, including Burkitt lymphoma, T-Cell lymphoma and anaplastic astrocytoma. Genomic analysis revealed a high mutational burden in his initial tumors, with multiple oncogenic mutations, as well as a previously unreported germline compound heterozygous *MSH6* E744fs*12 and R248fs*8 alteration. He received a gross total resection of the tumor which in previous studies has been shown to have the highest impact on survival. Surgery was followed by radiation and ongoing treatment with an immune checkpoint inhibitor with stable disease at 6 months. The purpose of this case report is to describe the interesting presentation of CMMRD and discuss the previously unreported biallelic *MSH6* mutations.

RARE-15. EARLY PSEUDOPROGRESSION POST-RADIATION IN PAEDIATRIC HIGH-GRADE GLIOMA PATIENTS WITH CONSTITUTIONAL MISMATCH REPAIR DEFICIENCY: TWO CASE REPORTS FROM A SINGLE CENTRE

Ay-Jiuan Teng[1,2], Breege Gilmartin[3], Marty Campbell[1], Kanika Bhatia[1], Greg Wheeler[4], Michael Sullivan[1,5], Jordan Hansford[1,5], and Dong-Anh Khuong-Quang[1,6]; [1]Children's Cancer Centre, The Royal Children's Hospital, Parkville, Melbourne, VIC, Australia, [2]Sarawak General Hospital, Kuching, Sarawak, Malaysia, [3]Medical Imaging, The Royal Children's Hospital, Parkville, Melbourne, VIC, Australia, [4]Radiation Therapy Centre, Peter MacCallum Cancer Centre, Melbourne, VIC, Australia, [5]Department of Paediatrics, University of Melbourne, Melbourne, VIC, Australia, [6]Cancer Research, Peter MacCallum Cancer Centre, Parkville, Melbourne, VIC, Australia

BACKGROUND: Constitutional Mismatch Repair Deficiency (CMMRD) is a cancer predisposition syndrome caused by biallelic mutations in the mismatch repair pathway, and high-grade glioma (HGG) constitute the most prevalent brain tumours. Pseudoprogression alludes to radiological changes that mimic tumour progression, but are in fact due to other causes such as therapy related inflammation. It can occur as early as three months post treatment. To our knowledge, its characteristics in CMMRD patients has not been reported. METHODS: We retrospectively identified seven patients with CMMRD and history of HGG at The Royal Children's Hospital, Melbourne from 2005 to 2019. Our objective was to review the characteristics of pseudoprogression in this cohort. RESULTS: Out of the seven patients, two with constitutional loss of PMS2 demonstrated evidence of pseudoprogression. Patient 1 presented at 16 years old with a cerebellar anaplastic astrocytoma. She developed clinical and radiological progression within two weeks of starting radiotherapy, persisting up to four months after completion. However, six months post radiation she improved without intervention and the tumour remains stable five years post therapy. Patient 2 presented at 17 years old with a midbrain anaplastic astrocytoma, and showed signs of progression four weeks after completion of radiotherapy. She was then treated with Bevacizumab, an anti-VEGFA antibody with remarkable response. She subsequently received Nivolumab, a checkpoint inhibitor with ongoing stable disease for four