Therapy poses challenges as it is unclear if the biology and prognosis of pediatric *IDH*-mutant gliomas are identical to adults. METHODS: We performed an IRB approved, systematic retrospective search for *IDH*-mutant gliomas in the Dana-Farber Cancer Institute/Boston Children's Hospital database between 2009–2018, analyzing incidence, demographics, histology, co-occurring genetic alterations and outcome. RESULTS: We identified 575 patients with glioma, ages 0–21 years. Of these, 394 underwent biopsy/resection (0–9 years:n=204; 10–21 years:n=190), with 294 genetic testing. Fifteen of 294 tumors (5%) were *IDH1*-mutant. Among patients 0–9 years and 10–21 years, 1/156 (0.6%) and 14/138 (10%) had *IDH1*-mutant tumors, respectively. Among patients 10–21 year old, 13/115 low-grade gliomas were *IDH1*-mutant (11%). High-grade gliomas accounted for the remaining 23, with one *IDH1*-mutant glioma (4%). Most common co-occurring genetic alterations for diffuse astrocytoma (n=12) were *TP53* (n=9) and *ATRX* (n=2). Three patients with *IDH1*-mutant oligodendrogliomas had 1p/19q deletion. Eleven *IDH1*-mutant patients were evaluable for outcomes with median follow-up of five years. Five-year radiation-free, progression-free and overall survival for patients with low-grade histology were 76% and 100%, respectively. One patient with high-grade glioma recurred 1.2 years after upfront chemo-radiation and died soon after recurrence. CONCLUSION: *IDH*-mutant gliomas comprise a small proportion of pediatric gliomas. Incidence rate is higher in the second decade of life. Comparative analyses between pediatric *IDH*-mutant gliomas and adult historical cohorts are currently underway, evaluating outcomes, radiation therapy and frequency of malignant transformation.

LGG-04. A PHASE II RE-TREATMENT STUDY OF SELUMETINIB FOR RECURRENT OR PROGRESSIVE PEDIATRIC LOW-GRADE GLIOMA (PLGG): A PEDIATRIC BRAIN TUMOR CONSORTIUM (PBTC) STUDY

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The PBTC conducted a re-treatment study (NCT01089101) evaluating selumetinib (AZD6244, ARRY-142886), a MEK I/II inhibitor, in children with recurrent/progressive pLGG. Eligible patients must have previously enrolled on PBTC-029 or PBTC-029B and progressed after coming off treatment with selumetinib. Patients must have maintained stable disease (SD) for ≥12 courses or had a sustained radiographic response (partial or complete) during their first exposure to selumetinib. Thirty-five eligible patients (median age: 13.11 years [range 7.96–25.33]) were enrolled, 57% of whom had optic pathway or hypothalamic target lesions. At the time of submission, median duration of treatment was 18 courses (range 2–48) and 21 subjects remained on therapy. Best responses reported to date are 6/35 (17%) partial response, 22/35 (63%) SD and 7/35 (20%) progressive disease with a 2-year progression-free survival of 75.7 + 8.3%, which met the design parameters for success. The most common attributable toxicities were grade 1 diarrhea, elevated AST, hypoalbuminemia, elevated CPK, maculo-papular rash, fatigue, paronychia, ALT elevation, acneiform rash and grade 2 CPK elevation. Rare grade 3 toxicities included CPK elevation (3), lymphopenia (2), paronychia (2) and ALT elevation (2). There was only one grade 4 CPK elevation. Five patients (14%) required dose reductions due to toxicity. There does not appear to be a notable difference in toxicities observed during initial selumetinib therapy versus re-treatment. In pLGG that has recurred/progressed following treatment with selumetinib, re-treatment with selumetinib appears to be effective with 80% of patients again achieving response or prolonged stable disease. Long-term follow-up is ongoing.

LGG-05. MOLECULAR GUIDED THERAPY FOR A PEDIATRIC LOW GRADE GLIOMA: A CASE REPORT

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Low grade gliomas are the most common type of central nervous system tumors among children. Despite the fact that they are not typically life threatening, low grade gliomas remain a significant clinical challenge. Case Study: Patient is a 4-year-old male who presented at 20 months of age with several weeks of ataxia, emesis, and head tilt. Imaging revealed a right temporal lobe lesion; he was subsequently taken to surgery, where a gross total resection was achieved. Imaging 9 months post resection revealed recurrent disease within the right temporal region with leptomeningeal involvement. Four months later imaging revealed progression of multifocal disease and new growth within the sella. At this time the patient started standard treatment, Carboplatin and Vincristine, per CCG 9952A. Persistent slow progression was observed despite receiving standard therapy. The patient developed a grade 3 reaction to carboplatin, worsening with each subsequent dose. At this time, he was referred to our Precision Genomics Neuro Oncology program for tumor molecular characterization. Somatic tumor testing revealed an ETV6-NTRK3 fusion, at which time standard treatment was stopped, and patient began targeted therapy, Larotrectinib. Imaging was preformed 2 months post start of targeted therapy and revealed interval decrease in size of previously enhancing nodular lesions; findings consistent with treatment response. Disease burden continues to decrease with therapy. This case illustrates a clear benefit of using molecular guided therapy in low grade gliomas.

LGG-06. LONG-TERM OUTCOME OF NEWLY DIAGNOSED LOW GRADE GLIOMA

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INTRODUCTION: Low grade glioma (LGG) is the most common central nervous system (CNS) tumor in children accounted for 30–50%. Regarding benign characteristic of disease, surgical management remains the mainstay of treatment. However, surgical approach is limited in some conditions such as location at brainstem or infiltrative tumor. Chemotherapy and radiation treatments have been included in order to control tumor progression. The 5-years survival rate is approach 90% especially in patients who receive complete resection. However, the outcome of children with LGG in low to middle income is limited. Therefore, the aim of the study was to determine long-term outcome of children with newly diagnosed LGG. METHODS: A retrospective study enrolled children aged <18 years who were newly diagnosed LGG during January 2006- December 2019. Diagnosis of LGG was confirmed by histological findings of grade I and II according to WHO criteria. RESULTS: A total of 40 patients, female to male ratio was 1:1.35 and mean (SD) for age was 6.7 (4.0) years. The most common location was optic chiasmatic pathway (42.5%), followed by suprasellar region (25.0%). Sixty percent of patients received at least partial tumor removal. Chemotherapy and radiation had been used in 70% and 10.0% respectively. The 10-year progression free survival was 74.1±11.4% and overall survival was 96.2±3.8%. SUMMARY: Treatment of Pediatric LGG mainly required surgical management, however, chemotherapy and radiation had been used in progressive disease. The outcome was excellent.

LGG-09. CORRELATING GENETIC SIGNATURE OF PILOMYXOID ASTROCYTOMAS AND PILOCYTIC ASTROCYTOMAS WITH QUALITATIVE AND QUANTITATIVE MR IMAGING CHARACTERISTICS

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PURPOSE: Pilomyxoid astrocytomas are predominantly located in supra-chiasmatic region and are more clinically aggressive than pilocytic astrocytomas, although recent WHO 2016 classification placed them into the grade I/II category. In our study, we describe imaging correlation of PMA to their genetic signature. MATERIALS AND METHODS: We identified 12 pediatric patients with pathologically proven PMA, PA, and PA with myxoid features in an IRB approved study. Three of the tumors had whole exome somatic and germline sequencing. Qualitative MRI characteristics of location, size, enhancement, edema, T2 and T1 intensity, and multifocality were assessed. RESULTS: Among the PMA, 3 cases were found to have *KIAA1549-BRAF* fusion, 1 case *BRAF* V600E mutation, and 2 cases had wildtype *BRAF*. The *BRAF* wildtype tumors had atypical imaging features with intraventricular extension of tumor, involvement of frontal lobe parenchyma and one tumor demonstrating increase in size and development of enhancement at 5 years. Whole exome sequencing of *BRAF* wildtype tumors identified somatic truncation mutations in *NF1* R1534X and R1513X with wildtype germline *NF1* and missense mutations in KMT2C and GLTSCR1. Among PAM, one was *BRAF* wildtype with mutations i *PTCH1* M956V and *PTPN1* (A72V) and demonstrated atypical features of intratumoral hemorrhage on presentation. Among PA, one was positive for *KIAA1549-BRAF*, one was *BRAF* wildtype. CONCLUSIONS: *BRAF* wildtype PMA and PA demonstrate atypical tumor localization and are associated with atypical genetic mutations on whole exome sequencing. On the contrary, presence