and magnetic resonance imaging (MRI) showed a large well-circumscribed mass in his left cerebellum with ventricular dilatation. He referred to our hospital, and an additional MRI revealed diffuse and weak enhancement of gadolinium and low ADC values in mass. Immediately, he underwent total removal of the tumor and ventricular drainage, and his consciousness recovered soon after surgery. The tumor presented high BCOR expression by IHC, but target PCR did not identify exon 15 ITD of *BCOR*. As the previously-reported clinical and imaging features of CNS HGNET-*BCOR* resembled our case, we clinically diagnosed it as a similar phenotype of CNS HGNET-*BCOR* without exon 15 ITD. He received 60 Gy of extended-local irradiation with concomitant temozolomide and discharged without any neurological deficits. Since *BCOR* alterations, including ITD, gene fusions, and mutations, play an oncogenic role in several cancers, the present case might harbor another gene aberration of *BCOR*.

PATH-04. AN ENHANCED AI-DRIVEN PLATFORM FOR PRECISION MOLECULAR BRAIN TUMOR DIANOSTICS

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Tumors of the CNS represent one of the most complex groups of human cancer, with a vast number of different entities occurring across a spectrum of ages and anatomic locations. This heterogeneity makes accurate diagnosis challenging, with the current gold standard relying on multiple subjective elements. We recently proposed a classification algorithm based on tumor DNA methylation profiling as an objective way to assign samples to over 80 distinct molecular classes. Here we present a substantial update to our machine learning-based algorithm, with more than 170 molecular classes now being represented amongst the 5,915 samples in our reference cohort. These new classes include further subclassification of known groups such as medulloblastoma and ependymoma, as well as multiple new molecular entities described here for the first time. A further improvement is the introduction of a more rationally layered output, making use of 'families' of closely-related molecular classes to improve the compatibility with the current WHO classification of CNS tumors. This approach is designed to increase the clinical relevance of the primary output, while also retaining the full information content from the random forest-driven classification. Benchmarking our new algorithm by cross-validation and on an independent validation cohort indicates a retention of the excellent accuracy of diagnosis (error-rate < 4%), with a significant improvement in the proportion of confidently classifiable tumors compared with our previous tool. We believe that this approach, freely accessible through an online web portal, has the potential to enhance diagnostic precision and thereby support clinical care for brain tumor patients.

PATH-05. A CASE OF PILOCYTIC ASTROCYTOMA HARBORING THE FGFR1 GENE MUTATION WITH A PREDOMINANT OLIGODENDROGLIOMA-LIKE COMPONENT

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Pilocytic astrocytomas rarely present with oligodendroglioma-like morphological features, which gives rise to a diagnostic challenge. In this report we present a case of pilocytic astrocytoma harboring the FGFR1 mutation, accompanied with a predominant oligodendroglioma-like component, thus initially diagnosed as oligodendroglioma. A 14-year-old female presented with syncope and simple partial seizure involving her right upper limb. Contrast-enhanced MRI revealed an enhancing lesion with substantial cystic portion and perifocal edema in the left parietal lobe. Open surgery was performed and a gross total resection of the tumor was achieved. On initial histopathological diagnosis, tumor cells with monotonous round nuclei and perinuclear halo predominated with branching capillaries, which were strongly suggestive for oligodendroglioma. Immunohistochemically, IDH1 R132H was negative, and Ki-67 index was around 5%. The patient was thus initially diagnosed as oligodendroglioma, WHO grade II, based on the 2007 WHO classification criteria. However, histopathological re-review revealed a minor astrocytic component with Rosenthal fibers and rare eosinophilic granular bodies, thus the diagnosis was changed as pilocytic astrocytoma. FGFR1 K654E mutation was confirmed by Sanger sequencing. Although she postoperatively developed mild sensory disturbance in her right hands, finger agnosia, and left-right disorientation, her symptoms had gradually improved, and she was discharged on day 17 with a Karnofsky performance status (KPS) of 90 and no cognitive decline. Without any adjuvant therapies, she has remained recurrence-free for 85 months. While the diagnosis of pilocytic astrocytoma with predominant oligodendroglioma-like component can be challenging, analysis of IDH1 and FGFR1 mutations can be beneficial in certain cases.

PATH-06. IMAGE-BASED MACHINE LEARNING CLASSIFIER FOR PEDIATRIC POSTERIOR FOSSA TUMOR HISTOPATHOLOGY

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BACKGROUND: Pediatric posterior fossa (PF) tumors can include astrocytomas, ependymomas, and medulloblastomas, all of which demonstrate unique histopathology. Whole slide image analyses can be time consuming and difficult. Therefore, we used machine learning to create a screenshot-based histopathology image classifier that can distinguish between types of pediatric PF tumors. METHODS: We took 179 histopathology slides from Stanford University, dated from 2008–2019: 87 astrocytomas, 42 ependymomas, and 50 medulloblastomas, per pathology report. Each slide was viewed under a microscope at 20x. Then, a screenshot was taken of the region of interest representative of principal slide pathology, confirmed by a trained neuropathologist. These screenshots were used to train Resnet-18 models pre-trained on the ImageNet dataset and modified to predict three classes. Various models with different hyperparameters were trained using a random hyperparameter search method. Trained models were evaluated using 5-fold cross-validation, assigning 20% of the dataset for validation with each evaluation. Qualitative analysis of model performance was assessed by creating Class Activation Map (CAM) representations of image predictions. RESULTS: The top performing Resnet-18 model achieved a cross-validation F1 of 0.967 on categorizing screenshots of tumor pathology into three types. Qualitative analysis using CAMs indicated the model was able to identify salient distinguishing features of each tumor type. CONCLUSIONS: We present a PF lesion classifier capable of distinguishing between astrocytomas, ependymomas, and medulloblastomas based on a histopathology screenshot. Given its ease of use, this tool has potential as an educational tool in an academic setting.

PATH-07. QUALITY ASSURANCE IN CEREBROSPINAL FLUID CYTOLOGY ASSESSMENT FOR MEDULLOBLASTOMA STAGING LEADS TO POTENTIAL IMPROVED RISK-GROUP ASSESSMENT IN THE PROSPECTIVE MULTICENTER HIT-2000 TRIAL

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BACKGROUND: Cerebrospinal fluid (CSF) dissemination of medulloblastoma (M1 stage) is a high-risk prognostic factor. However, because diagnostic criteria for M1 staging are missing we specified process-related and cytomorphological parameters influencing the predictive value of the CSF status. PATIENTS AND METHODS: CSF samples and cytology reports from 405 medulloblastoma patients of the prospective multicenter trial HIT-2000 were reviewed and related to 5-year progression free survival (5y-PFS). RESULTS: Tumor cells were detected in 237/1073 CSF cytospins. M1-patients and M2/3 patients with radiologically detected metastases showed a worse 5y-PFS than M0 patients (54% and 52% vs. 76%; p=0.01 and p<0.001). Lumbar sampling was more sensitive than ventricular sam-