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M91. Radiomics-based decision support for pediatric medulloblastoma risk stratification on multi-parametric MRI

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BACKGROUND: Medulloblastoma (MB) is the most common pediatric brain malignancy. Accurate risk stratification is crucial for prescribing appropriate therapy. However, current risk stratification into standard or high-risk groups is limited in scope and does not accurately address the unique biological behavior of each specific tumor, with approximately 30% of children diagnosed with MB suffering from treatment failure. We developed a radiomic tool to more accurately risk stratify children with MB.

METHODS: We collected 1.5T/3T MRI (Siemens, Philips, or GE scanners) and clinical data from 80 patients with MB treated at Children’s Healthcare of Atlanta. Radiomic features that quantify textural heterogeneity including first and second order statistics, Haralick’s features from Gray Level Co-occurrence Matrices, and CoLiAge were extracted from tumor volumes segmented by a board-certified radiologist from multi-parametric MRI data including Apparent Diffusion Coefficient (ADC), T2, and post-contrast T1 sequences. Continuous survival models were built using the Cox proportional hazard method with 70% of the data for progression free survival (PFS) and overall survival (OS) using the 5 most predictive features obtained by univariate analysis after removing correlated features within the training data.

RESULTS: We developed three models with T1, T2, and ADC separately to evaluate predictive power of radiomic signatures. Three models for
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predicting MB OS delivered Harrel's concordance indices (C-index) of 0.72 and 0.61 (T1); 0.70 and 0.65 (T2); and 0.80 and 0.76 (ADC) for training and test, respectively. C-indices for PFS were 0.70 and 0.69 (T1); 0.73 and 0.67 (T2); and 0.63 and 0.61 (ADC). CONCLUSIONS: Our preliminary results show the feasibility and efficacy of our approach for predicting MB OS and PFS. Future studies will build an integrated model combining T1,T2, ADC, and other clinical information for predicting MB OS and PFS using a large multi-center validation cohort.