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The role of dynamic susceptibility contrast perfusion- weighted MRI in the estimation of IDH mutation in gliomas.

Sotirios Bisdas, Eser Sanverdi, Carole Sudre, Diana Roettger, Sebastian Brandner, Vasileios Katsaros; University College London, London, United Kingdom; IAG, London, United Kingdom

Background: The presence of mutation in the encoding gene of isocitrate-dehydrogenase (IDH) has been defined as a molecular biomarker in the diagnosis and differentiation of gliomas. Dynamic Susceptibility Contrast Perfusion- Weighted Imaging (DSC - PWI) is a relatively recently established technique for gliomas staging and its diagnostic accuracy may benefit when using sophisticated image analysis algorithms. In this study, we aimed to investigate whether DSC - PWI, enhanced by texture analysis and machine learning, can stratify gliomas according to their IDH mutation status. **Methods:** 208 patients (F/ M: 84 / 119, median age: 47 [range 21-81 years]) from a multicenter setting, who have been immunohistopathologically diagnosed with gliomas (IDH positive / negative: 98 / 105) were prospectively included in our study. The raw data from DSC - PWI was processed on a dedicated workstation, using a fully adaptive Bayesian method, to create leakage-corrected relative cerebral blood volume (rCBV) maps. Tumours were manually segmented and registered to rCBV maps. rCBV maps were used to generate distribution and rotational invariant Haralick texture features over the tumour mask. The predictive power of the extracted features in differentiating between IDH status was assessed in a 2-fold cross-validation setting of 1000 iterations using support vector machine and multinomial ordinal regression, respectively. **Results:** Overall sensitivity and specificity rates for the rCBV for IDH stratification were 68% and 81%, respectively. All except one of the ten classical histogram statistics and 12 texture features appeared significantly different across mutation status ($p < 0.05$) when using non-parametric Wilcoxon test. In the case of the classification across grading, the same features led to a distance error (difference between the real and predicted grade) inferior or equal to 1 in 88.6 % of the cases and an exact prediction in 57.2% of cases. **Conclusions:** Preliminary results are promising in the differentiation of gliomas with DSC- PWI on the basis of IDH mutation status, especially regarding the high specificity rates obtained using features from rCBV data.