

AbstractID: 14306 Title: Texture changes on Hartley-transformed MRI images as an early indicator of treatment response in Glioblastoma Multiforme

Purpose: To compute image texture metrics on T1-weighted MR images to quantify early response to radiation treatment in patient with glioblastoma multiforme (GBM) and study their potential to predict for six month clinical progression free survival (6moPFS) and 12 month overall survival (12moOS).

Methods: Contrast-enhanced T1-weighted spoiled gradient-echo MR images of 27 patients were acquired pre-, during (week 6) and 1 month after radiation therapy, and tumor volumes were manually delineated. Haralick texture features were computed within each ROI from the power map of localized Hartley-transformed MR images. Relative changes of twelve Haralick features with respect to the pre-treatment image were determined. An ROC analysis was performed to quantify the ability of the Hartley-based feature changes to predict for clinical outcomes. This novel approach was compared to the ROC analysis using the conventional texture features obtained directly from the images, as well as to the traditional classifiers tumor volume and tumor diameter.

Results: The Hartley-transform based Sum-mean and Variance texture feature changes at week 6 during RT demonstrated the best ability to predict for 12moOS (AUC = 0.86, maximum accuracy 95%) with only one misclassified patient. The corresponding accuracy using tumor volume was inferior (70.8%). The prediction of 6moPFS outcome was inferior to 12moOS (77.3% for Sum-mean, 72.7% for Variance, and 72.7% for tumor volume). For all cases maximum tumor diameter was least predictive (AUC = 0.59, 69.6% for 12moOS). In addition, the feature changes computed at week six during RT performed generally better than the corresponding changes one month post treatment (81.8% for 12moOS and 83.3% for 6moPFS using the Variance feature).

Conclusions: The change of Hartley-transform based Sum-mean and Variance features between pre-treatment and the week 6 time point are promising early surrogates of clinical outcomes in patients with GBM.