Abstract ID: 18352    Title: CT Textures Can Be Predictive for Tumor Shrinkage

Purpose: To determine if NSCLC GTV CT textures can be predictive for tumor shrinkage after proton therapy with concurrent chemotherapy.

Methods: Simulation and weekly 4DCTs were obtained from 25 patients with locally advanced NSCLC treated by proton therapy at a 74 Gy dose level with concurrent chemotherapy. In-house deformable image registration software based on the demons algorithm propagated the physician-generated planning GTV onto each weekly image set. GTV soft tissue volumes were then extracted from CT images by in-house software which pruned out voxels below a cutoff HU threshold. Patients whose normalized end-treatment pruned GTV was less than the group median were classified as 'strong responders.' The remaining patients were classified as 'weak responders.' For each pruned GTV, the MaZda texture analysis software generated quantitative 3D texture features based on the image histogram, absolute gradient, co-occurrence matrix, and run-length matrix. Using the Fisher coefficient, a subset of these texture features that were relevant to distinguishing the two response groups was obtained. In-house software and MaZda were then used to perform neural network data classification with leave-one-out cross-validation based on this texture feature subset. The true positive rate (TPR), false positive rate (FPR), classification accuracy, and one-sided p-values were recorded.

Results: Six classification models were tested. Each model had a unique combination of feature extraction and analysis parameters. Taking 'strong responders' to be the 'positive' class, the average TPR was 0.66 (0.60 - 0.75), the average FPR was 0.36 (0.31 - 0.40), the average classification accuracy was 64.8% (60.0% - 68.0%), and the average one-sided p-value was 0.118 (0.055 - 0.215).

Conclusions: There is some evidence showing that NSCLC GTV CT textures can be predictive for tumor shrinkage after proton therapy. Further work should be done to include more patients, texture metrics, and data analysis techniques.

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