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02) Normal Tissue Radiomic Feature Kinetics in Oropharyngeal Cancers Treated with Image-Guided Radiation Therapy: Assessment of Parotid Glands Textural Changes on Daily Non-contrast CT

A Rao, Houston, TX; H Elhalawani, MD, MSc; A S Mohamed, MD, MSc; A Kanwar; A dursteler, BA; C D Rock; et al. (ARUppore@mdanderson.org)

PURPOSE

Parotid gland irradiation is a major risk factor for xerostomia in patients undergoing RT for head and neck cancers. We hypothesize that texture analysis allows for quantization of changes in parotid gland structure.

METHOD AND MATERIALS

Twenty-eight patients undergoing RT for OPC cancer with daily CT-on-rails imaging were included. Xerostomia status at 6 months post-treatment was retrieved. A total of 437 scans were analyzed. Ipsilateral parotid glands were contoured on baseline CT and propagated to daily CT images using deformable vector fields generated for IGRT until mid-treatment time point. A total of 145 radiomic features were selected from the categories: intensity direct, neighborhood intensity difference (NID), grey-level co-occurrence matrix (GLCM), grey-level run length (GLRL) and shape and analyzed using IBEX. Spearman correlation (after adjusting for dose) was used to reduce the 145 features to 5 features based on a cutoff of 0.7. These features included: 'LocalEntropyStd', 'LocalStdStd', 'Compactness2', 'Volume' and 'Contrast'. These were then used to build and evaluate three distinct types of models (1) using only the baseline (BL) value of the radiomic feature, (2) the ratio between the mid-treatment value of the radiomics feature to its initial value, at BL, and (3) a functional principal component analysis (PCA) model that leverages the structure of the temporal trajectory in the evolution of the radiomic feature from BL to mid-treatment.

RESULTS

28 predominantly male patients diagnosed with locally advanced OPC who received concurrent chemoradiation constituted our cohort. Average mean RT dose to ipsilateral parotid at mid-treatment was 18.19 Gy. At 6 months, xerostomia outcome was: minimal or mild (70.4%) vs moderate-severe (29.6%).

The corresponding AUCs and CIs for predictive models 1, 2 and 3 were 0.6 (95% CI: 0.38-0.82), 0.65 (95 %CI: 0.43-0.86) and 0.72 (95% CI: 0.52-0.91) (Figure 1). This suggests that the functional approach yields a superior ROC compared to using either the baseline radiomics feature or using the delta ratio between the mid and initial time points.

CONCLUSION

Textural kinetic trajectories from consequential intra-treatment CT scans can predict for subsequent early and late radiation-induced toxicities

CLINICAL RELEVANCE/APPLICATION

Radiomics presents a novel way to leverage additional information from routine imaging studies in radiation oncology towards adaptive radiation treatment.

FIGURE (OPTIONAL)

Uploaded Image

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