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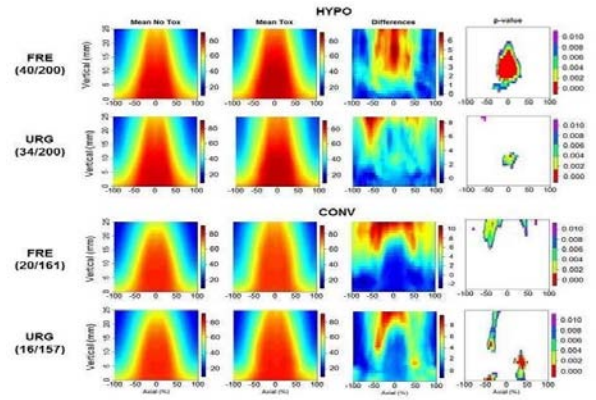

Conclusion: The method of DSMS analysis allowed to assess new local-dose descriptors that might be better correlated with tox and promises to find important applications in investigating urinary tox. The incorporation of the found local dose predictors into multi-variable models including clinical predictors is currently in progress.

OC-0261

CT Image biomarkers improve the prediction of xerostomia and sticky saliva

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Purpose or Objective: Current models for the prediction of xerostomia and sticky saliva after radiotherapy (RT) are based on clinical and dosimetric information. Our hypothesis is that such models can be improved by the addition of patient-specific characteristics, quantified in CT image biomarkers (IBMs). The aim of this study is to improve the performance of prediction models for patient-rated moderate-to-severe xerostomia (Xer*12m*) and sticky saliva (STIC*12m*) 12 months after radiotherapy with the addition of these IBMs obtained from CT images before the start of RT.

Material and Methods: Head and neck cancer patients were primarily treated with RT alone or in combination with systemic treatment. The patient rated complications were prospectively collected (EORTC QLQ-H&N35).The potential CT IBMs represent geometric (20), CT intensity (24) and pattern characteristics (88) of the CT-image of the parotid (PG) and submandibular (SG) glands. Furthermore, Xer*baseline*, tumour, patient characteristics and mean doses to contra- and ipsi-lateral PG and SG were considered.Variables were preselected by omitting the least prognostic variable if inter-variable correlation was larger than 0.80. Lasso regularisation was used to create multivariable logistic regression models with and without IBMs to predict patient rated moderate-to-severe Xer*12m* and Stic*12m*. A repeated 10-fold cross validation was used to determine the optimal regularization term lambda. The final models were internally validated by testing the models on bootstrapped data.

Results: Of the 254 patients with follow-up information at 12 months, 100 (39%) and 62 (24%) had moderate-severe xerostomia and sticky saliva, respectively. Pre-selection of variables resulted in a selection of 26 variables for XER*12m* and 28 variables for STIC*12m*. For xerostomia, the lasso regularization selected in addition to mean contra-lateral PG dose and Xer*baseline* , the image biomarker "Short Run Emphasis" (SRE). This CT IBM quantifies the occurrence of short lengths of CT intensity repetitions and thereby indicates the homogeneity of the parotid tissue. For sticky saliva, the IBM maximum CT intensity of the submandibular gland was selected in addition to STIC*baseline* and mean dose to SGs. The maximum intensity of the SG was related with the intra-vascular contrast in the artery or vein supplying the SG.

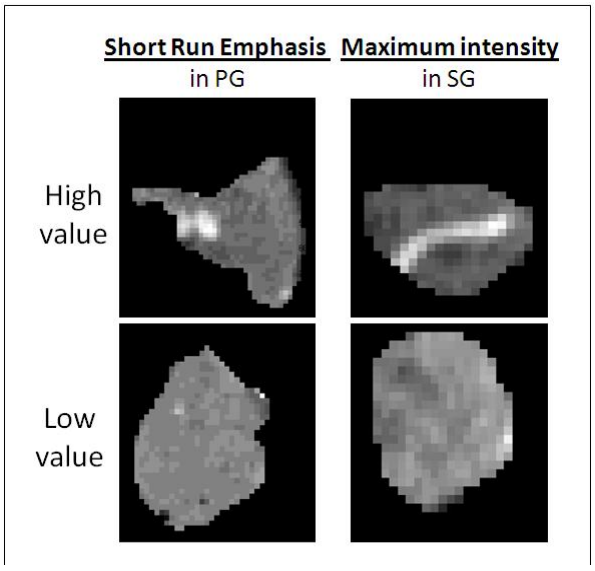
For the prediction of both Xer*12m* and STIC*12m*, the addition of the multivariable selected CT-IBMs improved the performance measures significantly compared to the models that were based on dose and baseline complaints only (table 1). The models were stable when internally validated.

Table 1. Model Performance of models prediction Xer_{12m} and $Stic_{12m}$ with and without CT IBMs

	Xerostomia		Sticky saliva	
	No IBM model	IBM model	No IBM model	IBM model
Log-Likelihood-ratio test (p-value)	-	0.02	-	0.006
Discrimination Slope	0.18	0.20	0.13	0.16
AUC	0.74	0.76	0.73	0.75
AUC bootstrapped	0.74	0.76	0.73	0.74

Xerostomia model : *(1) mean dose to contra lateral PG (2) $Xer_{baseline}$ (3. IBM) Short Run Emphasis (SRE)*
Sticky saliva model : *(1) $Stic_{baseline}$ (2) mean doseto SGs (3. IBM) Maximum CT intensity*

Conclusion: Prediction of XER*12m* and STIC*12m* could be improved with CT derived IBMs. The IBM associated with XER*12m*, "short run emphasis", might be a measure of non functional fatty parotid tissue. The STIC*12m* IBM, maximum intensity was related with the submandibular vascularization. Both predictive IBMs might be independent measures of radiosensitivity of the PG and SG.



OC-0262

Comparison of machine-learning methods for predictive radiomic models in locally advanced HNSCC

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