Conclusion:
DIL and NL prostate median ADC exhibit good intra-scanner repeatability. Systematic inter-scanner differences, which are larger for NL than DIL, may be explained by the DW signal's dependence on microstructural properties and sequence parameters[7]. Within DIL, ADC tends to decrease as tumour area fraction increases. This work contributes to the validation of DW-MRI on MR-Linacs.
Keywords: Imaging biomarkers, validation, prostate cancer

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3639

Mini-Oral

Predicting recurrence in head and neck cancer using new threshold vs feature behavior curves from 18F-FDG PET/CT images

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Purpose/Objective:
Head and neck cancer (HNC) presents high prevalence with high recurrence rates after radiotherapy [1]. Identifying biomarkers for recurrence prediction is crucial to improve patient outcome and personalize the treatment. ^{18}F-FDG PET/CT imaging provides valuable metabolic and anatomic information, with standardized uptake value (SUV) features showing potential for prognosis [2], with relatively good performance [3]. This study explores the extraction and analysis of new SUV-based features extracted from the characterization of feature vs threshold curves to increase recurrence prediction.

Material/Methods:
232 HNC patients (stage III and IV), aged between 18 and 75y, who underwent ^{18}F-FDG PET/CT prior to radiotherapy were included. State-of-the-art SUV-intensity-based features: SUV Mean, SUV peak, Metabolic Tumor Volume (MTV), Total Lesion Glycolysis (TLG) and Histogram-based [3] were extracted at various threshold levels (1872 features). Then, three different features sets (FS) were obtained as follows: i) **FS1**: After inter-feature correlation correction to exclude highly correlated features (threshold at r>0.8) (139 features); ii) **FS2**: After Dimensionality Reduction with Principal Component Analysis (PCA), to retain maximum variance (119 features) and iii) **FS3**: Computed by characterization of the Threshold Feature Curve (TFC) (123 features). The TFCs were obtained by plotting the variation of each of the seven intensity-based features with respect to the SUV threshold value as shown in Figure 1. The TFC reflects simultaneously spatial spread and heterogeneity of the feature within the tumor, thus enabling characterization of tumoral metabolic behavior in a clinically interpretable way.

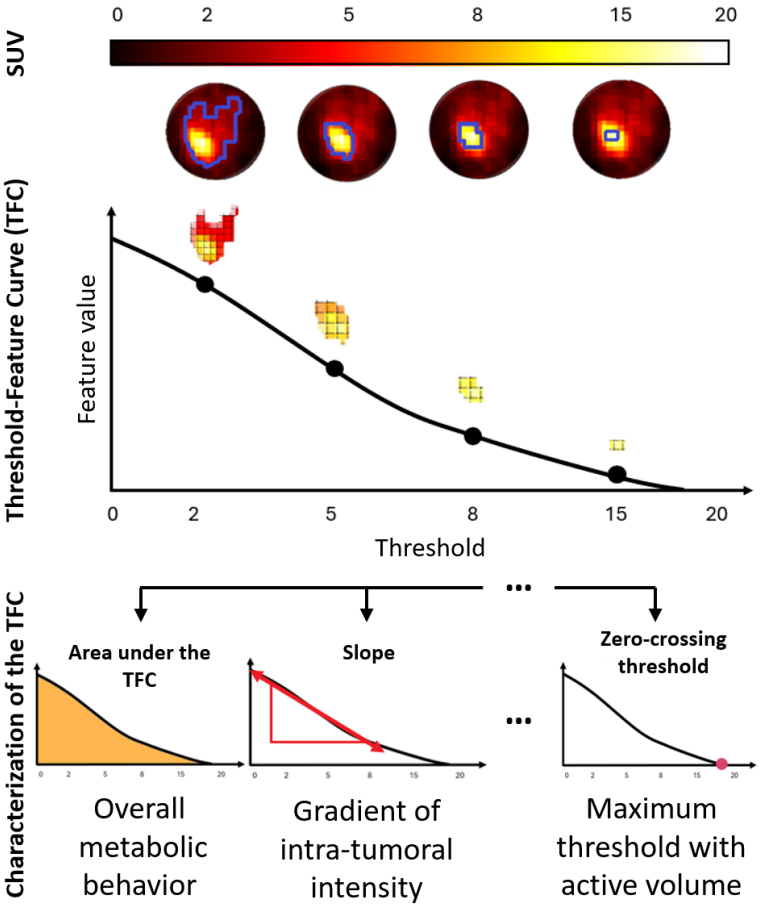

Figure 1. Extraction of Threshold-Feature Curves (TFC) and its characterization to obtain FS3

Multicollinearity across features was tested using the condition number method [4]. Highly colinear features were discarded to ensure independence. Univariate Cox proportional hazards method was then performed for feature selection. Three predictive models, namely Random Survival Forests (RSF), XGboosting survival and survival Support Vector Machine (SVM) were built with FS1, FS2 and FS3, and compared with the Concordance Index (C-index). The three models were tested using k-fold cross-validation (100 folds).

Results:

The best predictive model is RSF with FS3, which achieved a C-index of **0.70±0.07** in predicting recurrence as observed in Table 1. Results are significantly better ($p<0.001$) than any other combination of features and predictive models.

TABLE I. C-index for every set of features and every prediction method used. The best results (**in bold**) were achieved by using the proposed Features (FS3: TFC) together with Random Survival Forests (RSF). Results are significantly better ($p<0.001$) than any other combination of features and predictive models. (SVM = Support Vector Machine).

Dataset	RSF	XGBoost	SVM
FS1: Classical intensity-based	0.64±0.08	0.63±0.08	0.51±0.08
FS2: PCA	0.60±0.08***	0.55±0.07	0.47±0.09
FS3: TFC	**0.70±0.07*** **	0.62±0.10	0.59±0.07

Conclusion:
The integration of new features extracted from the TFC provided a novel approach for recurrence prediction in HNC. Those features are clinically interpretable since every curve's descriptor can be directly associated to a tumoral behavior. The model proposed through RSF and feature selection techniques shows promising results for a future application in personalized treatment planning.

Keywords: Head and Neck Cancer,Recurrence prediction,PET/CT

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3661

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Radiomics for Therapeutic Planning in Laryngeal Cancer: Predicting Cartilage Invasion on Preoperative CT

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Purpose/Objective:
An accurate preoperative evaluation of cartilage invasion is essential for the proper staging of laryngeal squamous cell carcinoma (LSCC), as full-thickness invasion of the thyroid or cricoid cartilage defines T4 disease, which typically necessitates more aggressive therapeutic approaches and significantly reduces the feasibility of laryngeal preservation[1,2,3]. However, traditional radiological techniques often face limitations in reliably detecting cartilage invasion[4]. This study aims to develop and validate a radiomics-based predictive model to improve the accuracy of preoperative staging.