Conclusion: The extraction of iodine concentration maps from injected DECT scan was achieved to evaluate the differential function of lungs and kidneys. Therefore, our DECT analysis tool provides functional information in addition to the high resolution DECT images. Further improvement in the analysis tool will include advanced algorithms to perform segmentation and 3D model to address functionality according to specific sections of an organ. Further work will also incorporate the functional information to radiation oncology treatment planning decisions to eventually spare further functional tissue and reduce the toxicity.

OC-0418
Cluster analysis of DCE MRI reveals tumor subregions related to relapse of cervical cancers
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Purpose or Objective: Solid tumors are known to be heterogeneous, often consisting of regions with different treatment response. Early detection of treatment resistant regions can improve patient prognosis, by enabling implementation of adaptive treatment strategies. In this study, K-means clustering was used to group voxels in dynamic contrast enhanced (DCE) MR images of cervical cancer tumors. The aims were to explore the intratumor heterogeneity in the MRI parameters and investigate whether any of the clusters reflected treatment resistant regions.

Material and Methods: Eighty-one patients with locally advanced cervical cancer treated with chemoradiation therapy underwent pre-treatment DCE MRI. The resulting image time series were fitted to two pharmacokinetic models, the Tofts model (Ktrans and ve) and the Brix model (ABrix, kep and kef). K-means clustering was used to cluster similar voxels based on the pharmacokinetic parameter maps or the relative signal increase (RSI) time series. The association between clusters and treatment outcome (progression-free survival, locoregional control or metastasis-free survival), was evaluated using the volume fraction of each cluster or the spatial distribution of the cluster.

Results: We identified three voxel clusters based on the Tofts parameters, all significantly related treatment outcome. One voxel cluster based on the Brix model was significantly linked to progression-free survival and metastatic relapse. Two RSI based cluster were significantly related to all types of treatment outcome.

Conclusion: Based on either pharmacokinetic parameter maps or relative signal increase time series, we were able to group the voxels into cluster that were associated with treatment outcome. With the exception of one cluster, the spatial distribution rather than the volume fraction of each cluster was significant.

OC-0419
Association between pathology and texture features of multi parametric MRI of the prostate
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Purpose or Objective: The aim of this study was to find a correlation between multiparametric (mp) MRI derived quantitative imaging parameters (textural features) and pathological verified tumor occurrence. Textural feature analysis (TFA) as a method for quantifying the spatial distribution of intensities in images has already shown promising results in the field of diagnostic oncology and also as biomarker for treatment response.

Material and Methods: 25 prostate cancer patients which underwent prostatectomy were investigated in this study. Multiparametric MRI were collected prior to the surgical procedure. Along with T2 weighted images, dynamic-contrast-enhanced (DCE-MRI) (KTrans, AUC) and diffusion-weighted MRI (DW-MRI) with its estimated apparent diffusion coefficient (ADC) were recorded. The resected prostate was axial cut in slices of 3-4 mm thickness and the tumor was tagged by a pathologist. On the T2 images delineation of the central gland (CG) and the peripheral zone (PZ) was performed by two physicians. Additional, the prostate was divided into 22 geometrical substructures following the PIRADS classification. Hence, the tagged tumor area on the pathological slices could be assigned to the respective substructure on the MRI where it was scored into distinct levels according to the volume covered by malignant tissue. For each geometrical substructure texture analysis was performed using gray level co-occurrence matrix (GLCM). Additional to the textual parameters also histogram based information (gray value) was investigated. The large amount of information created by the TFA was analyzed with principal component analysis (PCA). For each image modality, the 23 textural parameters were compressed into two principal components, which explained most of the variation found in the data. Prior to analysis, each variable was mean centered and also scaled to unit variance.

Results: The TFA showed a significant difference between substructures in the CG and PZ. A correlation was found between the pathological findings and the texture of the ADC map as shown in fig 1a, where the larger dots represent substructures with confirmed tumor occurrence. For the other investigated modalities the correlation was weaker or absent. Based on the score plot (fig 1a) ROC curves were calculated (fig1b) resulting in an AUC of 0.789 for ADC considering the highest tumor scores only.