Results: Texture parameters were computed in the three perfusion maps and their 3D wavelet transforms, which resulted in 945 texture features defined for each of the two tumor sites. The discretization of images using set number of bins and setintervals gave the similar number of stable texture parameters (Table 1). 40 parameters were correlated with tumor volume. Potentially standardizable factors introduced more variability into texture features than non-standardizable. The highest variability was observed for pixel size. It caused instability in about 80% of parameters for both HN and lung tumors. Ten parameters were found to bestable in both HN and lung for potentially non-standardizable factors after thecorrection for inter-parameters correlations:

- BF: entropy, sum entropy, LHH low gray-level size emphasis
- MTT: long size low gray-level emphasis
- BV: difference entropy, coarseness, long size high gray-level emphasis, HLH information measure of correlation 2, LLL covariance, LLLaverage.

Table 1. Studied CT perfusion calculation parameters and image discretization. Set of the reference parameters is underlined.

CTP parameters	Type	Levels		Unstable parameters HN [%]	Unstable parameters lung [%]
		HN	lung		
Image discretization (fixed number of bins)	Potentially standardizable factors	16, 32, 64		42	40
Image discretization (fixed intervals)		Blood volume and blood flow: 0.5%, 1%, 2% Mean transit time: 5%, 10%, 20%		41	43
Hounsfield unit (HU) intervals for exclusion of non-soft tissue from the analysis		lower threshold: -20 HU	lower threshold: -450 HU; -400 HU; -350 HU; -200 HU; -250 HU; -200 HU; -150 HU	33	26
		upper threshold: 120 HU; 140 HU; 160 HU; 180 HU; 200 HU; 220 HU; 240 HU	upper threshold: 200 HU		
Voxel size [mm³]		1x1x5; 2x2x5; 3x3x5; 4x4x5; 5x5x5	1x1x3; 2x2x3; 3x3x3; 4x4x3; 5x5x3	88	82
Artery contouring (AIF)	Non-standardizable factors	Perfusion maps calculated on 5 different contours of artery		29	27
Noise threshold in perfusion maps calculation		10%, 12%, 14%, 16%, 18%, 20%, 22%, 24%, 26%, 28%, 30%		31	15

Conclusion: The set of stable texture parameters in CTP was identified. Pixel size, image discretization and HU intervals have to be standardized to build a reliable prediction models based on CTP texture analysis.

EP-1864

A 18FDG-PET texture analysis study on early stage Hodgkin Lymphoma patient outcome prediction

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Purpose or Objective: The aim of the study was to employ texture analysis to predict early stage Hodgkin Lymphoma (HL) patients' outcome after chemotherapy and to give a quantitative description of HL characteristics. Predicting an early cancer's response to chemotherapy could enhance clinical care management by enabling the personalization of treatment plans based on predicted outcome.

Material and Methods: We reviewed medical records of patients with early stage HL diagnosed between January 2012 and December 2014 treated with standard combined modality therapy. 24 pre-treatment PET scans of the patients, acquired with a GE discovery STE, were selected for the analysis. A local nuclear medicine physician, blinded for the clinical outcome and interim PET (iPET) results, reviewed all PET scans. Volume of Interests (VOIs) were segmented employing cubes of volume 27 cm3 and 64 cm3 and centering them on the highest metabolic active mediastinic area. Texture analysis (TA) was applied through CGITA open source software and TA features correspondence with iPET results was assessed. Furthermore, we segmented isolated lymphnodes with a 40% of SUVmax isocontour algorithm. Each lymphnode was analyzed with TA as a "stand-alone patient" in order to increase the number of observations. TA features correspondence with iPET outcome of each lymphnode was assessed. Kruskall Wallis non-parametric test was employed to select most predictive features. Features, which showed prognostic power (or patient stratification ability), were employed to build Receiver Operating Curve (ROC) in order to score their sensibility and specificity.

Results: After iPET revision, 17 patiets were considered disease free after 2 cycles of ABVD whereas the remaining 7 patients had a positive iPET. Results obtained employing the 27 cm3 cubes showed that 4 features are able to predict iPET response with statistical significance ($p<0.02$) and a high efficiency up to 85% employing "uniformity feature". Using 64 cm3 cubes, we were able to isolate a feature named short zone emphasis, which has a discrimination sensibility of 100% with specificity 65% and indicates for ABVD resistant tumors the presence of short active zone in the surrounding of the mediastinic region highest metabolic active area. Lymphnode analysis showed that 5 out of 74 TA features could separate iPET responders and non-responders patients with statistical significance ($p<0.01$). In particular, "coarseness" feature has a discrimination efficiency of 73% (sensibility 77% and specificity 70%). Patients with lymphnodes that appear coarser have a higher probability of being positive at iPET.

Conclusion: In this work we presented a method to predict early stage HL patient outcome and to quantitatively describe tumor morphology combining textural features. This method requires further validation in larger prospective study.

EP-1865

DCE-CT lung tumour and aorta enhancement: is it an appropriate input vessel for kinetic modelling?

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Purpose or Objective: Dynamic contrast-enhanced Computed Tomography (DCE-CT) is a quantitative imaging modality to characterize heterogeneity in tumour vascularization. Problems in DCE-CT kinetic modelling have been reported due to lung tumour enhancement arriving prior to aortal enhancement. Studies have attempted to correct the issue by shifting the enhancement curve in time, segmenting different input vessels and/or dual-input kinetic modelling. The purpose of this project was to develop a methodology for a detailed spatio-temporal analysis of the heterogeneous lung tumour enhancement for the purpose of applying different input vessels in kinetic modelling.

Material and Methods: Nine patients with non-small cell lung cancer (NSCLC) received DCE-CT scans (Siemens Definition Flash) prior to radiation therapy using shuttle mode acquisition with a longitudinal FOV of 13 cm. The DCE-CT scans were first motion corrected (Siemens VPCT) and subsequently, the primary lung tumour was contoured by a radiation oncologist. Using an in-house model, tumour and aorta time attenuation curves were analysed by gamma-variate function fitting. The arrival time of the contrast agent was estimated by a threshold of 1% of the maximum enhancement of the fit. To determine the percentage of tumour enhancement prior and after aortic enhancement, the arrival times of the gamma-variate fit of the tumour and aorta were compared. Tumour voxels were considered acausal if the arrival time was greater than 2 s before the