recurrence in cervical cancer. Weighted PET parameters were less sensitive to the choice of threshold than standard parameters computed through hard-thresholding, all tested threshold TLG and MTV parameters becoming statistically predictive.

PO-0929
Dual Energy CT imaging of tumour vasculature in NSCLC: an intra-patient comparison with DCE-CT
A.J.G. Even1, M. Das2, B. Reymen1, P. Lambin1, W. Van Elmpt1
1Maastricht University Medical Centre, GROW - School for Oncology and Developmental Biology - Department of Radiation Oncology - MAASTRO clinic, Maastricht, The Netherlands
2Maastricht University Medical Centre, Department of Radiology, Maastricht, The Netherlands

Purpose or Objective: Quantification of vasculature is frequently performed by dynamic contrast enhanced CT (DCE-CT) or MRI imaging. However, there are some limitations to this technique: DCE-CT requires a detailed kinetic fitting procedure, a prolonged acquisition time with increased dose to the patient, has a limited FOV and is not easy to implement in clinical routine. Dual Energy CT is an evolving field in CT image analysis that allows quantification of contrast material uptake using a single acquisition, making it easily implementable in a clinical workflow. Therefore we investigated the correlation between the DCE-CT derived vasculature parameters, blood flow and blood volume, with iodine related attenuation measured on a Dual Energy CT scan (either 80/140kVp or 100/140kVp; 70 ml of iodine 300 mg/ml) of the entire thorax and a DCE-CT acquisition (65 ml of iodine 300 mg/ml; 33 frames @ 1.5sec for a total of 50 sec) in a 13 cm FOV centred around the primary tumour. Kinetic analysis was performed using commercial software (Siemens VICTOR) allowing the assessment of blood flow (unit: ml/100ml/min) and blood volume (unit: ml/100ml) in every voxel. Dual Energy CT images were analysed using in-house developed software for iodine contrast quantification. Iodine related attenuation was calculated by subtracting the Hounsfield units of the CT scan acquired at high energy from the scan acquired at low energy. A comparison was performed on 1) the entire tumour and 2) on a sub-volume level, defined by the upper 50% of the volume-of-interest. Correlation on tumour level was assessed by the Pearson correlation coefficient; overlap of sub-volumes with a DICE coefficient.

Results: There was a significant positive correlation between average contrast enhancement on Dual Energy CT and blood flow (r=0.615, p<0.025) and blood volume (average r=0.742, p<0.004) on a patient (i.e. tumour) level. Furthermore, the volumes defined by the highest 50% contrast enhanced uptake and 50% elevated perfusion coincided well (see Figure), with DICE scores of 0.72±0.10 (range 0.58-0.87) and 0.71±0.13 (range 0.50-0.91), for the blood flow and volume, respectively.

Figure: Example of a patient showing a heterogeneous vasculature; the DICE coefficients for this patient, between the Dual Energy CT iodine enhancement and DCE-CT blood flow and blood volume, were respectively 0.87 and 0.91.

Conclusion: We observed high agreement between Dual Energy CT derived iodine enhancement and DCE-CT derived kinetic parameters, both on a tumour and sub-volume level. This may allow wider implementation of vasculature imaging of tumours using the simplified Dual Energy CT acquisition protocol.

PO-0930
PET based response assessment of lung toxicity - assessment of two approaches for dose response
A. Abravan1, I. Skjel Kudsnen2, H. Eide2, A. Helland2, P. Van Luijk2, E. Malinen1
1University of Oslo, Department of Physics, Oslo, Norway
2Oslo University Hospital, Department of Oncology, Oslo, Norway

Purpose or Objective: Patients with lung cancer given external radiotherapy are at risk of radiation induced lung toxicity (RILT). In many studies, mean density changes from CT (in Hounsfield units) have been used as a surrogate for radiation-induced alterations in the lung. However, a combination of mean density changes from CT scans with corresponding standard deviations has been shown to be a more sensitive method. In the current work, we explore whether such a combined approach is feasible for 18F-FDG PET data as well.

Material and Methods: 13 patients with advanced non-small cell lung cancer, participating in a phase II trial on combined radiation and erlotinib therapy, were included. The patients were examined by 18F-FDG-PET/CT at three sessions; prior to, one week into, and six weeks after fractionated radiotherapy (3 Gy × 10). For each patient, lung was delineated in the planning CT images. The RT dose matrix was co-registered with the PET image series. For each PET image series, mean (μ) and standard deviation (σ) map were calculated based on cubes in the lung (3×3×3 voxels) and were further used to quantify local structure (S). The spread in μ and σ was characterized by a local covariance ellipse (in pre-therapy PET series) in a sub-volume of 3×3×3 cubes. The distance of individual cube values to the origin of the ellipse is then calculated using Mahalanobis distance method to form S maps. ΔS and Δμ maps are derived by subtracting pre-therapy maps from maps of mid- and post-therapy. A detection threshold was calculated based on three patients with two sets of pre-therapy PET scans who were not included in the study.

Results: The structure difference maps (ΔS) identified new areas of interest in the lungs of individual patients compared to the mean difference maps (Δμ) (Figure 1 A). On a population level, both ΔS and Δμ were significantly different (P<0.05) from the respective threshold level, irrespective of dose (Figure 1 B). The inter-patient relative variation in ΔS and Δμ were 57% and 88%, respectively, indicating that the ΔS approach yielded less heterogeneous results. 18F-FDG dose response was analyzed up to total dose of 15 Gy by first order linear regression. The relative slopes of the regression lines were 0.036, 0.018, 0.052, and 0.061 for Δμ (mid-pre), ΔS (mid-pre), Δμ(mid-pre), and ΔS (post-pre), respectively. A significant dose response was only seen for the ΔS taken between post and pre-therapy PET.