The effect of inspiration on airway dimensions measured in CT images from the Danish Lung Cancer Screening Trial

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FWMH and EI both showed statistically significantly lower values using IR instead of standard FBP (FWMH: B30/30=111.3 vs. 92.1; B50/50=167.6 vs. 115; B70/70=197.8 vs. 137.5; EI: B30/30=4.8 vs. 2.8; B50/50=11.3 vs. 5.8; B70/70=20 vs. 6.6). There was a significant lower variation between the different kernels using IR when compared to FBP. Image noise was reduced by 27% when compared to FBP.

Conclusion: Variation of quantitative emphysema chest CT parameters between different reconstruction kernels is significantly reduced with IR when compared to FBP and may increase the robustness for therapy planning.

B-0161 14:09 Assessing pulmonary perfusion in emphysema: automated quantification of perfused blood volume in dual-energy CTPA
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Purpose: To determine whether automated quantification of lung perfused blood volume (PVB) in dual-energy computed tomography pulmonary angiography (DE-CTPA) can be used to assess the severity and regional distribution of pulmonary hypoperfusion in emphysema.

Methods and Materials: We retrospectively analysed 40 consecutive patients (mean age 67 ± 13 years) with pulmonary emphysema, no cardiopulmonary comorbidities and a DE-CTPA negative for pulmonary embolism. Automated quantification of global and regional pulmonary PVB was performed using the syngo dual-energy application (Siemens Healthcare). We further quantified the global and regional percentage of voxels with a CT density <−900 HU. Emphysema severity was rated visually and pulmonary function tests were obtained by chart review.

Results: Global pulmonary PVB showed a moderate but highly significant negative correlation with residual volume (RV) in % of predicted RV (r=0.62, p<0.002, n=23) and a positive correlation with forced expiratory volume in 1 second (FEV1) in % of predicted FEV1 (r=0.67, p<0.001, n=23). Global PVB values strongly correlated with diffusing lung capacity for carbon monoxide (DLCO, r=0.80, p<0.001, n=15). Pulmonary PVB values decreased with visual emphysema severity (r=−0.46, p=0.003, n=40). Moderate negative correlations were found between global PVB values and parenchymal hypodensity in a per-patient (r=0.63, p<0.001, n=40) and per-region analyses (r=0.62, p<0.001, n=40).

Conclusion: DE-CTPA allows simultaneous assessment of lung morphology, parenchymal density and pulmonary PVB. In patients with pulmonary emphysema, automated quantification of pulmonary PVB in DE-CTPA can be used for a quick, reader-independent estimation of global and regional pulmonary perfusion, which correlates with pulmonary function tests.


B-0162 14:18 Densitometry on MDCT in cystic fibrosis: radiological evidence for emphysema
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Purpose: The present study was conducted to employ computational densitometry based on multi-detector computed tomography (MDCT) of the chest to characterise and quantify emphysema in cystic fibrosis (CF), identical to its routine clinical application in chronic-obstructive pulmonary disease (COPD). Results were validated against pulmonary function testing (PFT, i.e. forced expiratory volume in 1 s percent predicted [FEV1%], residual volume [RV] and total lung capacity [TLC]). Patients may have emphysema in CF (rs=0.67, p<0.001), starting at 13a.

Results and Conclusions: Mean LV was 4681 ml in CF and 3967 ml in NORMAL (n.s). Significant EV was found in CF (mean 457 ml) compared to NORMAL (78 ml) (p<0.005). Median EI was elevated to 7% in CF patients, but 1% in NORMAL. EI correlated well with FEV1% in CF (rs=0.55) and NORMAL (rs=0.67), but with RV (rs=0.69), and RV/TLC (rs=0.47) in CF only (p<0.05). Importantly, EI increased markedly with age in CF (rs=0.67, p<0.001), starting at 13a.

Conclusion: Our results indicate the development of progressive emphysema in chronic CF, which should be considered for new therapeutic approaches. Densitometry may introduce new quantitative and prognostic parameters into severity assessment of CF lung disease.