AbstractID: 10159 Title: Semi-Automatic Respiratory Motion Correction for Liver CT Perfusion

Purpose: To develop and validate a semi-automatic algorithm for correcting respiratory motion in a free breathing dynamic CT scan for perfusion imaging. **Method and Materials:** The CT perfusion protocol allowed the patients to breath freely, imaging two adjacent 4 cm volumes of liver alternatingly using the axial shuttle mode. Each 4 cm section was imaged 40 times during 2 minutes with 30-40 ml of contrast agent injected at a rate of 4 ml/s beginning approximately 10 seconds into the scan. A semi-automatic algorithm has been implemented to sort the reconstructed CT images. One reference image from each 4 cm section is selected and several 40x40 voxels regions of interest are placed around the edge of the liver to create a binary mask. Every image in the scan was then filtered with the binary mask and cross-correlated with the reference image - with the maximum correlation coefficient indicating the best match. The method was first validated using a motion phantom with both sinusoidal and irregular breathing patterns. The method has also been applied to15 patient scans - with manual sorting based on contour matching being the gold standard. **Results:** For the sinusoidal motion phantom, the algorithm reproduced the predicted period and amplitude. In the phantom study with irregular breathing-pattern the algorithm matched the manual sorting within ±1.25 mm. The automatic algorithm matched the gold standard within ±2.5 mm in 91% of all images in patient scans. In patient-scans with detected peak-to-peak breathing amplitude of 15 mm or less the algorithm matched the manual sorting within ±2.5 mm in 93% of cases. **Conclusions:** The semi-automatic respiratory motion correction algorithm has been validated in motion phantom scans and 15 patient-scans. The algorithm improved sorting efficiency significantly, reducing a typical sorting time from 2 hours to less than 6 minutes per patient.