Purpose: The tomotherapy MVCT images should in theory allow offline adaptive treatment monitoring by recalculation of the dose on each day's image and summation over the entire treatment course. However, Instabilities in the MVCT-beam can cause shifts in the calculated doses because of shifts in the HU-calibration (Duchateau et al,2010 Phys. Med. Biol. 55). This work presents an approach with a patient specific HU-calibration for breast patients.
Methods: For 20 Breast patients irradiated on tomotherapy (15x2.8Gy) the daily delivered dose was calculated and summed over the entire treatment using a) the standard HU-calibration of the MVCT(taken biweekly), b) a generic curve per patient generated by measuring the HU of breast, muscle, lung, bone and fat tissue, resulting in 15 different calibration curves/patient and c)an average for each patient of all "daily" curves. The total dose was calculated on the breast, contralateral breast, long and heart tissue and compared.
Results: The generated patient-specific HUcalibration curves show a large inter-patient variation with shifts of up to 50HU for the breast. Also noise levels varied up to 30%. Using the standard HU-calibration showed shifts of dose that were on average 1.3-1.5 times higher for the breast region and 1.2x higher for the organs-at-risk as opposed to a patient specific curve. No significant difference could be found between
methods (b) and (c).
Conclusions: Using the MVCT images to calculate the actual delivered dose for breast patients on tomotherapy the HU-calibration for the MVCT is crucial to interpret the results. Using the standard calibration method can introduce large errors, even on phantoms (Duchateau et al,2010 Phys. Med. Biol. 55) This study shows that using a patient specific curve generated out of the MVCT data can solve this problem without introducing extra calibrations on phantom