Purpose: We designed and tested a teflon phantom to perform DQA with our newly added SBRT protocol. Our initial testing suffered from artifacts in the scanned images of the phantom. In an attempt to improve the ability of the treatment planning systems to calculate doses in the teflon phantom, we smoothed the images and retested the phantom.
Method and Materials: The teflon phantom was scanned and imported into the treatment planning systems twice. One version was left untouched while the other had been smoothed. Smoothing was performed using a Matlab script and consisted of replacing the varying pixel values of the teflon phantom with an average pixel value. Teflon being a high density material, we needed to determine the correct calibration value to extend the calibration curves in both treatment planning systems. This was done by delivering a cylindrical sample plan and altering the calibration value until the computed dose matched the measured dose. Once calibrated, six patients were replanned and the corresponding DQAs ran. Point dose measurements and film distributions were compared against those computed by both treatment planning systems.
Results: Having removed the artifacts from the images, the variability in the dose differences (Mx/TPS) was significantly reduced. The average error in calculating absolute point doses was reduced from ~1.14% to ~0.3% for HT and decreased from 1.47% to 0.5% for RA. The average γ pass rate increased from ~94.5% to ~96.8% for HT and increased from 93.8% to 98.6% for RA.
Conclusion: Smoothing out the artifacts further improves the treatment planning systems' ability to accurately calculate both point doses and dose distributions in our teflon phantom. The results indicate that DQA of SBRT plans using our high density phantom will be possible with further commissioning.