AbstractID: 8949 Title: Helical Tomotherapy Patient Specific Quality Assurance in an Anthropomorphic Phantom

Purpose: The purpose of this study was to evaluate the dosimetric accuracy of a helical tomotherapy system using an anthropomorphic RANDO phantom for patient-specific QA. The results of this study will allow a benchmark to be established for dosimetric accuracy in heterogeneous materials.
Method and Materials: Patient-specific IMRT dosimetric verification was performed for 24 patients using a male RANDO Phantom. Treatment plans were created using the Hi-Art TomoTherapy treatment planning and delivery system. The phantom was placed in the Vac-Lok bag with radiographic film placed in a transverse plane between two of the phantom slices. The films were scanned and analyzed using both the Tomotherapy IMRT QA and the RIT dosimetry software. Horizontal profiles, vertical profiles, Gamma pass/fail analysis, and Gamma histograms were calculated for each test case. The reproducibility of the film was tested for both a prostate and lung case.
Results: On average, the lung patients had 27.2% of the pixels exceeding gamma, while the prostate patients had 14.7%. For the prostate test cases, only two of the films had greater than 20% of the pixels exceeding the gamma threshold, while only four of the lung test cases were below the 20% pixel threshold. The reproducibility of film dosimetry found that the standard deviation for the number of pixels exceeding the gamma threshold was 3.9%.
Conclusion: In this study, an anthropomorphic RANDO phantom was used to evaluate the doses calculated by a helical tomotherapy system. The dosimetric agreement between calculated and measured was worse than published results in homogenous phantoms, especially for target volumes located in the lung. Further investigation will be needed to determine if these errors are due to film response at heterogeneous tissue interfaces or from actual dose calculation errors.