AbstractID: 5652 Title: Quantification of Respiration-induced Dosimetric Impact on Liver for Abdominal Radiotherapy

Purpose: To quantify the dosimetric impact of respiratory motion on liver dose for IMRT abdominal radiotherapy based on 4D CT imaging

Method and Materials: 4D-CT images of a patient with klatskin tumor were acquired on a GE CT scanner during free-breathing. Respiratory information was recorded using the Varian RPM system. The images were sorted retrospectively into ten respiratory phases. For each phase-binned 4D data set, manual contours for liver were delineated. The Corvus inverse planning system (NOMOS Inc.) was used to generate optimized treatment plans. Two kinds of image registration methods, feature-based iterative closest point (ICP) rigid image registration and normalized mutual information (NMI) non-rigid image registration method, were implemented to transform each of the ten phases to a reference phase. The reference phase was the end of expiration (50%phase). A composite 4D-DVH, which accounts for respiratory induced voxel motion, was subsequently calculated using equal weighting for each respiratory phase. A dose of 45Gy to the target was prescribed. The treatment plan was optimized to provide a minimum of 95% isodose coverage for PTV.

Results: Variation of liver dose throughout each of the 10 calculated phases was within 5%. 4D effective DVH showed reduced volume coverage up to 18% for the same dose. In the high dose region of the liver DVH, the dose was less for the NMI algorithm as compared to the ICP algorithm.

Conclusions: Two kinds of image registration methods have been implemented to derive 4D effective DVHs for an abdominal patient. In this study we found that respiratory-induced motion does not produce a significant alteration of the liver DVH between the 10 phases. However, the 4D effective DVH method shows that the liver received less dose.