AbstractID: 6520 Title: Conformal Prostate Treatment – a closer look at dose delivery uncertainty and adaptive options

Purpose:

To evaluate uncertainties in Tomotherapy conformal prostate treatment due to inter-fraction organ variation. On board MVCT images were evaluated for reconstruction, comparing planned dose and delivered dose. Clinical feasibility of a closed feed back process for image guided adaptive process was studied.

Method and Materials:

Five prostate patients were randomly chosen for this study. The positional variations of inter-fraction organ motion for each treatment fraction were systematically monitored and characterized using onboard MVCT images. Rectum and bladder were re-contoured on MVCT images after each treatment and delivered dose was reconstructed using a sinogram that was generated during kVCT based treatment planning optimization. Reconstructed doses were compared with treatment planning doses for individual organs through dose volume histograms.

Results:

MVCT images were shown to be useful for dose reconstruction purposes. Three patients' treatment delivery showed large dose delivery variations for individual treatment fractions. Rectal doses were significantly higher (10-50%) due to large changes in rectal volume. Bladder dose varied less compared to rectal dose. However, two patients' delivered dose was close to planned dose.

Conclusions:

The current report describes an adaptive process for Tomotherapy prostate radiation treatment. Re-planning with dose differences will ultimately allow one to adjust for any dose variation (in order to correct for under dosing or overdosing). However, at this point, re-contouring, re-planning, and verification of quality assurance are very labor intensive and require strategies for offline patient specific adaptive treatment. One may, however, sum dose differences for all fractions to evaluate actual total dose delivery. In the future, the development of automatic adaptive processes may pave the way for true closed loop intervention.