AbstractID: 8744 Title: Planned target dose vs. delivered target dose for prostate IMRT treatment

Purpose:
Inter-fraction motion and deformation of a tumor target may result in an altered dose distribution delivered during radiotherapy than planned. On-board cone-beam CT (CBCT) imaging was used to study the dose delivered throughout the treatment course to a prostate cancer patient treated with IMRT.

Method and Materials:
IMRT planning was performed using conventional planning CT. During treatment the patient was positioned using reference skin markers and subsequently adjusted using image guidance based on implanted gold seeds in the prostate. CBCT images were taken weekly from a Varian Trilogy throughout a seven-week treatment period and the targets and organs at risk were re-contoured by oncologists. The original IMRT plan was applied to volumetric CBCT using both the treatment position with and without image guidance. Dose-volume histograms (DVHs) were calculated.

Results:
Analysis of DVHs indicates that there is significant variability in the dose delivered to the target region due to inaccuracy of patient positioning and deformation of target contours. The minimum dose to 98% of the prostate PTV calculated without image guidance ranges from 49 to 84% (average 67%), whereas with image guidance the minimum dose ranges from 84 to 99% (average 92%). Bladder and rectal doses with and without image guidance depend on variation in bowel distention and bladder filling.

Conclusion:
This study provides information of the actual integrated dose that the patient received throughout the entire course. It also suggests that deformations of the PTV due to changing bladder and rectum content are dosimetrically significant such that patient setup achieved using fiducial markers may not be sufficient to ensure adequate dose coverage of the PTV. Additionally, an increased dose to organs at risk such as rectum and bladder may be prevented with this emerging technique.

Conflict of Interest:
The research is partially supported by a Varian research grant.