AbstractID: 5023 Title: Can current prostate IMRT be further improved with immersive virtual reality simulation?

Purpose: To further optimize beam orientations for axial 7-field prostate IMRT plans with enhanced geometric volume analysis utilizing an immersive virtual reality simulation, a software which enhances the visualization of simulation using 3D stereo-scopic data projection.

Materials and Method: Eight prostate IMRT cases were selected, in which 7 beams were equi-spaced in the axial plane, for a supine patient. D_{95} of PTV was normalized to 45.0Gy, the dose used for the initial treatment course. Beam geometry was then further optimized using an immersive virtual reality simulation tool – RTStar (provided by the U. Hull, UK). Consequently, with the exception of the AP field, all beam projections were rotated more anteriorly. Viewing through the most posterior beams, only 50% of overlap between PTV and the rectum was observed. In addition, two anterior oblique beams were tilted off the axial plane, 20º inferiorly, to clear the bladder. Use of the 3D stereo-scopic viewing eliminated risk of collision with the patient. Comparable IMRT plans were then calculated with similar modulation intensity level and number of MLC segments.

Results: A better dose homogeneity of PTV was indicated by 1.9% reduction in global maximal dose ($p<0.01$), and 1.3% reduction of dose value in 5% high dose region of PTV ($p=0.02$). Some rectal dose improvement was suggested with a 2.3% lowered hot spot with 10cc rectum enclosure ($p=0.04$). The bladder mean dose and the high dose value involving in 30cc bladder were reduced by 12.9% ($p<0.01$) and 3.9% ($p=0.02$) respectively.

Conclusions: Immersive virtual reality simulation benefited the process in optimizing the beams used in this study. A deliverable, non-coplanar beam arrangement improved dose homogeneity of PTV, dose sparing to the bladder and reduced high rectal dose in prostate IMRT.

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