AbstractID: 8909 Title: Efficacy of Virtual Reality Simulation for Noncoplanar Prostate IMRT - a Peek of Future RTP System

Purpose: To evaluate the efficacy of virtual reality simulation for noncoplanar prostate IMRT optimization process.
Materials and Method: 14 prostate IMRT cases, randomly selected from current clinic, were re-simulated using a pioneer virtual reality simulation (VRS) system for noncoplanar beam arrangement. Using 3D stereoscopic technology, the VRS system displays the virtual treatment environment on a DTI™ real 3D LCD screen without aid of gaggles. With the virtual patient loaded to the screen, one can simulate the treatment by realistically manipulating the gantry and table. An optimal beam projection is suggested when the inclusion of vital organ was reduced in the volumetric beam eye-view. When exploring a noncoplanar beam position, the anti-collision function effectively alerted the mechanical limitations. In comparing with original seven evenly-spread coplanar beams, in the resultant new setting all beams were rotated more anteriorly, while two anterior oblique beams were tilted 20-30º inferiorly. All IMRT plans were calculated with similar modulated intensity level and number of segments. To standardize the endpoint for comparison, PTV D_{95} was normalized to 45 Gy.
Results: VRS created non-coplanar beam arrangements were proved clinically to be deliverable beam arrangement without risk of collision. Dose homogeneity in new plans were improved, indicated by 2.2% reduction in global maximal dose and 2.0% in high dose tail (D_5) of PTV. Enhancement of rectal dose sparing was suggested by 5.7% and 3.7% lower values for rD_{mean} and rD_{10cc} respectively. Less inclusion of bladder in BEV of the two anterior noncoplanar oblique beams translated a 14% and 5.1% reduction in bladder mean dose and bD_{30cc} respectively.
Conclusions: The VRS effectively concluded deliverable noncoplanar beam arrangements for prostate IMRT with resultant improvement of dose characteristics. Further development of VRS may present future RTPS.