

AbstractID: 6852 Title: TCP and NTCP variation with the percentage of prostate treatment fractions delivered under Image Guidance

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Purpose: In image guided radiotherapy, a treatment course for prostate cancer often consists of a mix of initial IGRT and conventional 3DCRT/IMRT fractions. This study examines how the number of IGRT fractions impacts the TCP and rectal NTCP.

Method and Material:

We simulated a standard six-field prostate XRT technique consisting of a total of 76 Gy over 38 daily fractions. Dose distribution within the pelvic region for a simulated patient were calculated using Theraplan® plus for a margin of 5 and 10 mm corresponding IGRT and 3DCRT respectively. The dose distributions for two plans were then exported to Matlab 6.5 for radiobiological simulation.

In the simulation, the prostate shifts were sampled from our shift database using Monte Carlo technique. Overall dose distribution to CTV and Rectum was obtained by summing fractional dose voxels over 38 fractions. A Poisson model coupled with linear-quadratic model was used to calculate TCP while Lyman model was used to calculate the rectal complication. A moderate value of 3.1 Gy for α/β was applied for both prostate and rectum.

Results: 2000 treatment courses were simulated for possible number of IGRT fractions from 0 to 38. TCP and NTCP were subsequently calculated. Our simulation suggests that rectal complication is continually improved with the increasing IGRT fractions. However, TCP is optimized only when 7-10 IGRT fractions are applied as an adaptive measure.

Conclusion: The number of IGRT fractions is a variable which can impact TCP, NTCP, and throughput. This simulation shows that the use of 7 imaged/repositioned fractions as an IGRT technique can safely allow dose escalation of 4 Gy to the prostate while imaging and repositioning all fractions can reduce rectal complication by up to 50% compared to treatment without image guidance.