AbstractID: 10976 Title: Assessing the dosimetric impact of intra-fraction prostate motion on Step-and-Shoot IMRT plans

Purpose:
To assess the dosimetric impact of intra-fraction prostate motion for step-and-shoot IMRT plans.

Method and Materials:
For step-and-shoot IMRT plans, fluence maps for each segment are exported from the Pinnacle treatment planning system. Each fluence map segment is modified to simulate the effect of prostate motion observed during the simulated delivery. Modified fluence maps are re-imported into Pinnacle for dose calculations. Calculated dose distributions are compared with unmodified fluence maps dose distributions to assess the impact of intra-fraction motion on the dose delivery. Measured Calypso motion tracks for 16 patients (515 tracks) are used. Changes in prostate (4-6 mm margin) and PTV (zero-margin) $D_{95\%}$ are scored for each fraction and for the cumulative simulated delivery.

Results:
Average $D_{95\%}$ changes (± 1SD) in the PTV and prostate are -0.5±1.1% and -0.2±0.5%. Maximum per-fraction $D_{95\%}$ changes are -12.7% and -6.4%. 12% and 4% of all fractions suffered a PTV and prostate $D_{95\%}$ change in excess of 1 percent. Only 2% and 0.2% of all fractions suffered respective changes in excess of 3%.
The patient specific cumulative $D_{95\%}$ changes in the PTV and prostate average -0.15±0.2% and 0.07±0.15%. The maximum cumulative $D_{95\%}$ variations for a single patient are -0.6% and 0.5%. After the delivery of 5 fractions the cumulative $D_{95\%}$ variations for a single patient are -1% and 0.4% for the PTV and prostate.

Conclusion:
Inter-fraction prostate motion has little effect on the dosimetric target coverage for step-and-shoot prostate plans. Very few fractions (2 and 0.2% for the PTV and prostate) suffered $D_{95\%}$ changes in excess of 3%. After the delivery of all fractions the effect on the both the PTV and prostate was negligible.

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