Intrafraction motion assessment in SBRT for prostate cancer: a prospective study

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The plan robustness analysis function in CERR (Computational Environment for Radiotherapy Research, Washington University) was used to simulate the DVH uncertainty with measured systematic and random shifts. PTV coverage and dose ranges were evaluated for a set of Organs At Risk (Figure 4).

Results

Transient excursions, typically within 20 seconds duration, and drifts of the prostate gland were observed during treatment. Spatial displacements > 11 mm in the cranial-caudal direction were identified in 1 patient, > 4 mm in the cranial-caudal and anterior-posterior directions in 3 patients, < 4 mm in the remaining patients. Evaluated CTV-to-PTV margins are shown in Table 1. Concerning robustness plan analysis, more than 98% of PTV is covered by 95% of prescription dose. The mean values of the DVH uncertainty ranges (upper/lower range bound with respect to the planned dose) is (+1.5% - 2%) and (+2.7% -13.1%) at V95% for rectum and at V98% for bladder respectively.

Conclusions

This prospective study suggests: a) intrafraction motion impact on treatment margins should be considered; b) variation in DVH analysis for bladder and rectum are not negligible. Therefore target repositioning or beam-gating techniques should be considered in the therapy execution protocol.

References