

AbstractID: 4804 Title: Does IMRT planning increase the effect of systematic patient-beam positioning uncertainties on the rectal DVH compared to conformal planning?

Purpose: The goal of this study is to compare the effect of systematic patient-beam positioning uncertainties on the rectal DVH between IMRT and conformal planning and to validate the use of the dose constraints V95%, V90%, V75% for plan evaluation.

Method and Materials: For a selected prostate case, a 47 segment IMRT plan, with five equally spaced treatment fields, was produced using the XiO treatment planning system (v4.02, CMS, St Louis). Additionally, a further two conformal plans, with three and four treatment fields respectively, were produced using the Addenbrooke's Radiotherapy Planning System (ARPS). In order to simulate the patient-beam positioning for all plans identically, the XiO plan was imported into ARPS. Patient-beam positioning errors were simulated in ARPS by shifting the treatment isocenter by 5 and 10 mm superior, inferior, left, right, anterior and posterior. For every isocenter position the resultant dose distribution and rectal DVH was calculated without altering the beam configuration or beam profiles.

Results: The effects of patient-beam positioning uncertainties are found to be significant when the isocenter is shifted along the A-P direction. The rectal V95% for the unshifted plans was smallest for the IMRT plan. However, a 5mm posterior shift increases the V75% (55.5Gy) by 11.5% for the IMRT plan. This compares with increases of 10.1% and 10.6%, for the 3-field and 4-field plans respectively. In the higher dose region V90% (67Gy) increases by 10.4%, 9.7% and 9.4% for the IMRT, 3-field and 4-field plans respectively.

Conclusion: Rectal DVHs for the IMRT plan seem to be more sensitive to patient-beam positioning uncertainties along the A-P direction in the medium dose region compared to the conformal plans. An acceptable plan, determined using dose constraints can become an unacceptable plan when geometric uncertainties are taken into account.