

AbstractID: 11360 Title: Impact of proper bladder and rectum delineation in the evaluation of the effectiveness of IMRT in prostate cancer radiotherapy

Purpose

This study compares and evaluates different bladder and rectum delineation approaches using IMRT plans for prostate cases. A more comprehensive treatment plan evaluation can be performed using the biologically effective uniform dose (BEUD) together with the complication-free tumor control probability (P_+).

Materials and Methods

A single physician outlined the prostate planning target volume (PTV), rectum, bladder and femoral heads of 10 consecutive prostate patients. IMRT treatment plans were created with the Pinnacle treatment planning system (TPS). Two different bladder and rectum delineation approaches were examined. In the first approach the whole volume of bladder and rectum were delineated, whereas in the second approach, the delineation included only the volume of the organs lying in the range of 2 margins around the PTV. In the second case, the DVHs were normalized to their volume (2std normalized) and to the volume of the whole organ (2std relative to whole).

Results

At the optimum dose levels of the dose distributions using the whole volume of bladder and rectum, 2 std relative to the whole volume and 2 std normalized, respectively, the P_+ is 67.7%, 51.2% and 32.7% for a $BEUD_{PTV}$ of 86.7 Gy, respectively. The respective total control probabilities, P_B are 89.0%, 82.4% and 82.4% whereas the corresponding total complication probabilities, P_I are 21.3%, 31.2% and 49.7%. More specifically, the response probabilities of the different tissues are 89.0%, 82.4% and 82.4% for the PTV, 0.0%, 0.0% and 0.01% for bladder and 21.3%, 31.2% and 49.7% for rectum. At the initially prescribed dose level (mean dose to the PTV = 79.4 Gy) the P_I values become 6.7%, 12.4% and 27.8%.

Conclusions

The expected radiation induced bladder and rectum complications using different delineation approaches, should be estimated using appropriate dose-response parameters, which should have been determined from studies of similar organ delineation methodology.