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Dosimetric Evaluation of MV Portal Imaging Methods for Localization of the Prostate During 3D Conformal Radiotherapy

This study was done to determine the dosimetric consequences to the PTV and rectum of different portal image guided methods to localize prostate patients with gold markers during 3D conformal radiotherapy. Three treatment plans were generated for five patients illustrative of three treatment scenarios A) a 6-field treatment (RL/LL/LAO/LPO/RAO/RPO) where weekly portal image dose was ignored, B) the same plan as scenario A that included daily portal dose was cumulated for an initial and verification images and C) treatment plan for a 7-field method (AP/RL/LL/LAO/LPO/RAO/RPO) that included using 6 MU from the AP and RL treatment fields to generate positioning images. Dosimetry from each of these was compared for dose distributions, max and average dose to the PTV and rectum. Comparisons of the scenario A to B indicated mean dose differences on the order of 10% to the PTV with the former being greater. Average rectal doses were comparable between the two plans but hot spots were (~10% greater) seen with the inclusion of portal dose. In contrast, the 7-field plan demonstrated comparable dosimetry to the plan for scenario A. Differences were on the order of <1% for the PTV and ≤2.5% to the rectum due to differences in the number of beams, beam orientations and beam weighting. Inclusion of the dose accumulated from daily portal imaging can significantly increase the dose to the patient and should be accounted for. Positioning using daily MV portal images can be done using a 7-field treatment plan where an AP and a LAT field with 6 MU can result in treatments that are dosimetrically comparable to a traditional six field treatment.