Effective delivery of radiation to the clinical target (CTV) can be achieved by incorporating feedback information of patient geometry during the course of treatment. To do so, an adaptive process has been implemented in our clinic for the treatment of prostate adenocarcinoma. In this process, setup error and internal target motion of the individual patient were measured during the first four to six days of treatment using an electronic portal imaging device (EPID) and a CT scanner. The measured data was then transferred to a prediction model to generate a confidence-limited planning target volume (cl-PTV). The individual treatment plan was modified within the second week of treatment and applied to the rest of the treatment course. The plan modification includes (1) the transformation of the initial planning CT image according to the systematic setup error, (2) the designation of new beam apertures to cover the cl-PTV with the prescribed dose, and (3) the generation of beam's eye view images for the new prescription images. The first twenty patients treated accordingly to this adaptive process will also be monitored using bi-weekly CT scans after the plan modification to test the confidence of the prediction model. To date, 7 patients have been included in this study. Differences in the initial PTVs and cl-PTVs were quantified to study the impact of the adaptive process on prostate treatment. The advantage of the adaptive treatment process was also evaluated by examining dose distribution in the clinical target.

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