

Abstract

Cancer of the prostate is the second most common cancer among American males. The prostate is small gland, located in the pelvis, posterior to the bladder and anterior/inferior to the rectum. Due to this location when irradiating the prostate the normal tissue organs at risk are the bladder and rectum. Negative effects seen when these structures are irradiated can include; bladder stricture, dysuria, hematuria, diarrhea, rectal bleeding, and proctitis.

In order to eliminate or reduce these negative effects more precise and accurate treatment techniques have been employed. Intensity Modulated Radiation Therapy (IMRT) has been successful in achieving greater precision when irradiating the prostate. IMRT has increased precision while sparing dose to the organs at risk (OAR) of the bladder and rectum allowing for current dose recommendations to be in excess of 75 Gray (Gy). Improvements in accuracy have been most notably achieved with the use of computerized tomography (CT) for treatment planning as well as treatment machine base cone beam CT (CBCT) used for alignment.

The function of the bladder and rectum can cause either to be more or less full, thus changing these structures volume. Improvements have been made in both precision and accuracy however, volume based adjustments to daily treatments have not been evaluated. This project aims to use a paired sample case control study design to link daily changes in volumes to the need for re-optimization for that patient's treatment. Daily volumes to the target (prostate and/or seminal vessels and/or lymph nodes) and the organs at risk (OAR) of the bladder and rectum will be compared to those from planning. Using the current location, volume, and density of these organs, a more accurate estimation of absorbed daily dose by treatment planning software may result.

The results illustrate re-contouring of the bladder and rectum, using daily CBCT, will indicate a change in volume, thus suggesting a change in the dose delivered to these OAR. While, re-optimization was indicated to account for dose changes in OAR, of larger concern, re-optimization was also indicated to account for dose changes in the PTV.