Correlation of a Transabdominal Ultrasound System and Implanted Marker Seeds for Prostate Localization

Accurate localization is crucial with conformal therapy and IMRT, especially as we try to escalate target doses. Localization is of particular concern for target areas such as prostate, which are subject to motion due to bladder and rectal filling. Much work has been done to establish an easy method of prostate localization. We have implemented a new technique that uses daily transabdominal ultrasound along with CT contours to localize the prostate. This study evaluates the accuracy of the ultrasound alignment relative to the prostate location on orthogonal portal films. Marker seeds were placed in the prostates of six patients undergoing radiotherapy. The expected locations of the seeds were determined from the treatment planning CT. Patients were setup for treatment based on skin marks with minimal immobilization. The ultrasound device was then used to align the patient so the prostate was in the correct location relative to the contours of the treatment plan. After alignment, orthogonal portal films were taken to determine the actual prostate location relative to the expected location. The root mean squared values of the median difference for each patient were LAT 1.59 mm, AP 2.55 mm, and SI 4.78 mm. These results indicate that it is possible to localize the prostate to within 5-mm accuracy using a transabdominal ultrasound system. The greatest difference in location was in the superior/inferior direction and was attributed to uncertainty of CT anatomy at the bladder and prostate interface as well as to CT resolution.