

The past decade has witnessed a renaissance in understanding the nature of prostate movement over the course of radiotherapy. Studies have demonstrated that this movement is anisotropic, and of significant magnitude to cause concern for the delivery of conformal radiotherapy. Studies characterizing the time course of prostate movement have indicated population trends, however significant individual variances hint at difficulty in prospectively predicting prostate position.

In order to address these concerns and improve the precision of prostate radiotherapy, a number of approaches have been developed. These include the placement of stents in the prostate to reproduce position via pressure exerted on the anterior rectal wall, as well as variations of prone or supine positioning with recommended states of bladder filling for treatment. Such attempts seek to reproduce prostate position relative to other pelvic anatomy, but do not resolve the position of the prostate in the treatment room (due to the added variance in patient position).

Recently, a few techniques have been investigated to localize the prostate daily, in order to permit prostate positioning based on the location of the “target of the day”. These techniques include radiographic localization of markers placed around the prostate as well as ultrasound localization of the prostate. Developments in tomotherapy imaging as well as cone beam reconstruction may lead to daily volumetric imaging of the prostate.

This talk will focus primarily on the details of systems associated with prostate localization and setup adjustment via radiographic imaging of implanted fiducials. The components of a prototype system integrated with a computerized table expanded to include tilt and roll adjustment capability will be discussed. The operating parameters of this system, including speed and final precision, will be summarized. Finally, overviews of other systems based on ultrasound as well as tomography from other institutions will be presented.