AbstractID: 9620 Title: Image guided brachytherapy for HDR Prostate treatment: Pre-treatment verification using conebeam imaging to determine catheter displacement

Purpose

High dose rate (HDR) brachytherapy for prostate utilizes flexible implanted catheters for treatment delivery. Catheters are inserted under ultrasound guidance and treatment planning performed on subsequent CT images. There is potential for catheter displacement to occur prior to treatment delivery which could adversely effect dose delivery. This study investigates the efficacy of performing kV cone beam imaging prior to treatment to verify catheter displacement.

Materials and Methods:

Fifteen patients undergoing HDR prostate brachytherapy were planned using CT images following catheter insertion with Nucletron PLATO (v14.3.2). Prior to treatment a cone beam image dataset was obtained using an isocentric mobile c-arm (Siemens ARCADIS 3D Orbic) within the OR. If catheters were displaced then the Radiation Oncologist would re-adjust them prior to treatment delivery. To show the impact on dose coverage to the prostate the cone beam images were co-registered with the planning CT. Dose distributions were generated on the conebeam dataset.

Results:

In 12 of the 15 patients, catheter displacments exceeding 0.5 cm were observed and required adjustment prior to treatment. An inferior catheter displacement between 0.5 and 1.0 cm can result in a decrease of 12% in the prostate coverage. Catheter displacements exceeding 1.0 cm dramatic underdosing of the prostate is observed. Three patients had catheter shifts of 3cm and larger as determined from cone beam imaging prior to treatment, clearly demonstrating the need of a quality insurance method of catheter placement before treatment is performed.

Conclusions:

It is shown that between the time of planning and treatment; catheter movement within the patient can be significant. Cone beam imaging prior to treatment delivery has been shown to provide precise imaging to determine catheter displacement. Cone beam imaging time using an isocentric C-arm is sufficiently short enough (~ 2 minutes) so as to make this a viable quality assurance tool.