AbstractID: 13568 Title: Oblique needle based Low Dose Rate prostate brachytherapy (LDRPB) using 3D trans-rectal ultrasound (TRUS) and Robotic Assistance

Purpose: To validate the dosimetric benefits of Low Dose Rate Prostate Brachytherapy (LDPB) plans using oblique (angled) needles delivered using robotic guidance in overcoming pubic arch interference (PAI) for large prostates.

Methods and Materials: Five patient 3D Trans-rectal Ultra Sound (TRUS) images that showed a maximum pubic arch interference of <= 1 cm and a prostate volume of < 50 cc were selected. The prostate contours were artificially enlarged to 60 cc while keeping the pubic arches constant. The following three different types of plans were manually created for each 60 cc prostate: parallel needle template based, parallel needle non template based, and oblique needle non template based. Oblique plans were created by adapting the parallel needle non template plans, which were adapted from parallel needle template plans. ESTRO prescription dose volume histogram (DVH) index guidelines for LDRPB were used except that this study employed a more rigorous requirement of keeping the prostatic urethral dose to less than 120% of the 145 Gy prescription dose.

Results: One sided t-tests between the three different types of plans were computed for the recommended DVH indices. At the 1% significance level, a better DVH index for each organ (PTV, Urethra, and Rectum) was observed for oblique plans. For parallel non template plans, however, only a change in PTV V100 was significant with a P-value = 0.012.

Conclusions: The oblique plans conferred a significant benefit over the template plans, overcoming pubic arch interference. The parallel needle methods are not able to provide adequate PTV dose coverage for large prostates (60cc) with pubic arch interference. Phantom studies mimicking the prostate and pubic arch of patient images are underway. The feasibility of delivering oblique plans using 3D TRUS and robotic guidance will be reported.