

AbstractID: 3595 Title: Is High-Dose Rate (HDR) “better than” and Low-Dose Rate (LDR) Prostate Brachytherapy? A Dosimetric Study Using Retrospective Data.

Purpose:

To compare high-dose rate (HDR) and low-dose rate (LDR permanent seeds) prostate brachytherapy using dosimetric parameters.

Method and Materials:

From January 2003 to August 2004, 102 HDR prostate implants were planned on the Nucletron PLATO Brachytherapy with subsequent treatment using Nucletron afterloader (I^{192} stepping source). During this time period, 72 LDR implants were pre-planned on Varian Variseed Brachytherapy with subsequent treatment using I^{125} seeds (a combination of loose and stranded seeds). The HDR implants were forward planned using a combination of manual dwell time adjustments and graphical optimization on patient CT images. The LDR implants were pre-planned based on ultrasound images and post-implant dosimetry was assessed at one month from CT. For this study, post-plans were analyzed using Nucletron PLATO Brachytherapy Seeds. Parameters used for comparison included: Conformal index (COIN), Homogeneity Index (HI), Natural Dose Ratio (NDR) as well as volume and dose coverage indices. Maximum dose contribution to critical structures was reported.

Results:

Our results show the V100 for HDR with a mean of 96.1% is higher than LDR (post-plan) with a mean of 81.8% ($p < 0.001$). Conformal Index for HDR was 0.701 compared to LDR pre-plan (COIN=0.627, $p < 0.001$) and post-plan (0.534, $p < 0.001$). The homogeneity index showed a significant difference between techniques (HDR HI=0.628, LDR pre-plan HI=0.518, HI post-plan HI=0.425). The Natural Dose Ratio did not show a large difference (HDR NDR=1.025, LDR pre-plan NDR=1.041, LDR post-plan NDR=0.915).

Conclusion:

It has been shown high-dose rate brachytherapy for prostate treatment delivers a more conformal and uniform dose throughout the target than low-dose rate permanent seeds. The dose contribution to the rectum and urethra is much less with high-dose rate than low-dose rate. Dose contribution to the target can be tailored using existing optimization routines and newer algorithms for inverse planning that will make the planning procedure simpler.