Highly Consistent Dosimetry with Prospectively Planned Image Guided High-Dose-Rate (HDR)Intensity Modulated Prostate Brachytherapy

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Purpose
To evaluate the dosimetric consistency of prospectively planned image guided high-dose-rate (HDR) intensity modulated prostate brachytherapy implants.

Introduction
- There are two methods of delivering internal radiation to the prostate gland: low-dose-rate prostate brachytherapy (LDR-BT) and high-dose-rate brachytherapy (HDR-BT).
- Post-implant dosimetry correlates with outcome and toxicity.
- Even in the hands of experienced practitioners, the reported dosimetry for LDR-BT is variable, and suboptimal implants have been shown to less effective than high quality procedures.
- In contrast, there is little uncertainty in HDR-BT dosimetry because the treatment plan is optimized before the radiation source is introduced.
- With prospectively planned HDR-BT, we hypothesized that there would be less variability in dosimetric outcomes.

Methods and Materials
- Cumulative dose volume histograms for 208 consecutively treated HDR-BT implants were analyzed.
- Patients (n=104) were treated with either monotherapy (HDR alone) to a dose of 43.6 Gy delivered in 7.25 Gy fractions or combined therapy to a dose of 24 Gy delivered in 6 Gy fractions followed by 39.6 Gy EBRT. All patients received two HDR-BT implants (n=208).
- Planning was based on CT imaging and the target volume (CTV) included the prostate and proximal seminal vesicles, with a 5mm margin.
- Dosimetric parameters analyzed for the CTV were: D90, V90, V100, V150, and V200.
- Dose to organs at risk (OARs) including the urethra, bladder, and rectum were evaluated by the close to 0.1cc, 1cc, and 2cc of each organ.

Results
- CTV Dosimetry by Prostate Volume
- Comparison of D90 (%) Values from HDR and LDR Literature

Conclusions
- Prospectively planned high-dose-rate (HDR) prostate brachytherapy achieves consistently high target coverage, good dose homogeneity, and low organ at risk doses over a wide range of prostate volumes.
- In comparison to dosimetric values reported in low-dose-rate (LDR) literature, HDR appears to offer more consistent, high quality dosimetry.