

Dosimetric Comparison of Cesium-131 and Palladium-103 for Permanent Prostate Brachytherapy

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Purpose/Objective

To evaluate the dosimetric differences in treatment planning between Cesium-131 and Palladium-103 in permanent prostate brachytherapy using Post Implant Dosimetry.

Introduction

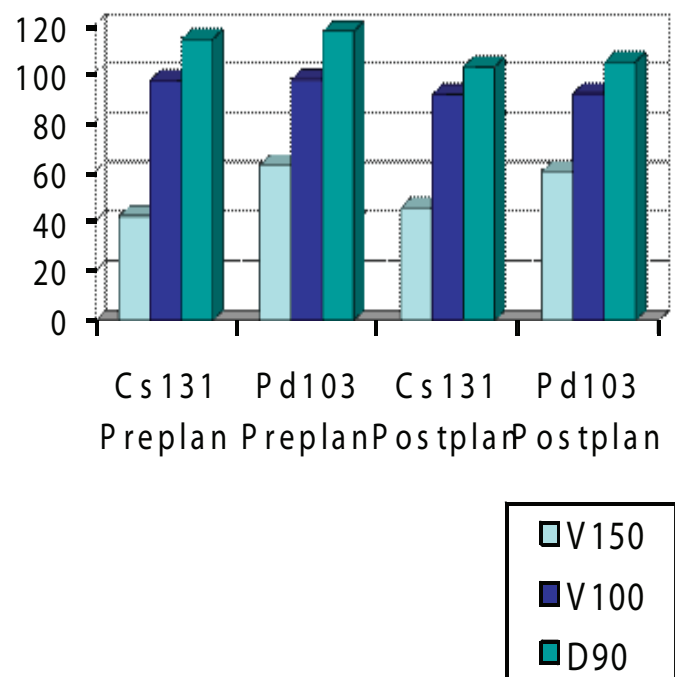
Post-implant dosimetric evaluation has become an increasingly important means of measuring and documenting the quality of permanent prostate brachytherapy implants. A new radioisotope, Cesium-131 (Cs-131), has recently been added to the sources - Iodine-125 and Palladium-103 - available for prostate brachytherapy. The physical properties of Cs-131, namely energy (30 keV) and half-life (10 days) differ somewhat from other available sources. The dosimetric implications of these differences in physical properties among all available isotopes have yet to be fully characterized. This study represents an attempt to quantify dosimetric outcomes using post-plan dosimetry data following Cs-131 and Palladium-103 (Pd-103) following therapeutic implantation.

Materials & Methods

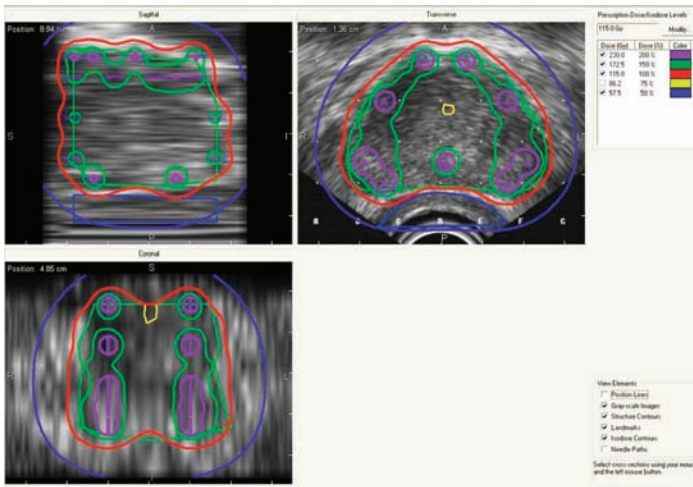
Pre- and post-implant dosimetry data were prospectively collected from consecutive patients undergoing permanent brachytherapy for biopsy-proven carcinoma of the prostate with Cs-131 (n=30) and Pd-103 (n=30). All planning was performed by a single dosimetrist. Dosimetric data collected included V150, V100, V90, V80, D90, R100, and U10. Number of seeds, number of needles, and prostate volumes were also collected. Post-implant dosimetry was based on CT study at 20 days post-brachytherapy. Independent sample t-test was employed to detect significant differences across all collected variables. All treatment plans were independently checked and verified by an outside consulting physics group.

Results

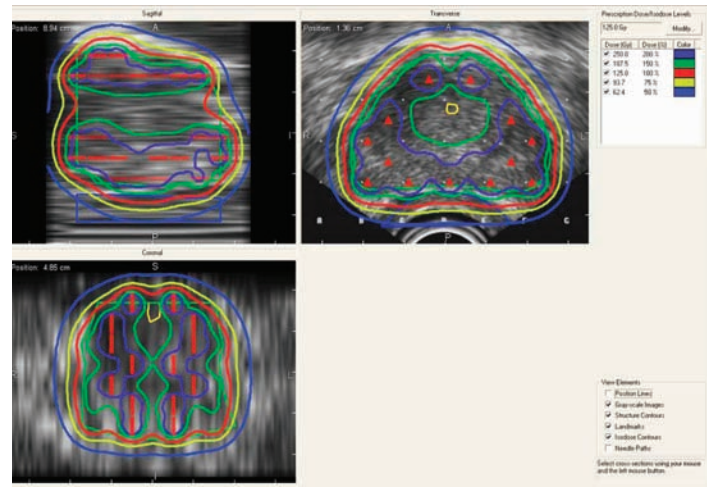
Significant differences were noted in V150 in both pre- and post-plans. Pre- and post-plan V150 for the Pd-103 group were 62.9 and 60.3, respectively; V150 for the Cs-131 group were 42.3 and 45.6. The post-implant V150 for the Pd-103 group was 32.2% greater than for the Cs-131 group ($p < 0.0005$). Post-implant D90s were not significantly different between the two groups: 104.6 (Pd-103) versus 102.6 (Cs-131), $p = 0.5$. No other post-implant dosimetric variable exhibited significant difference.



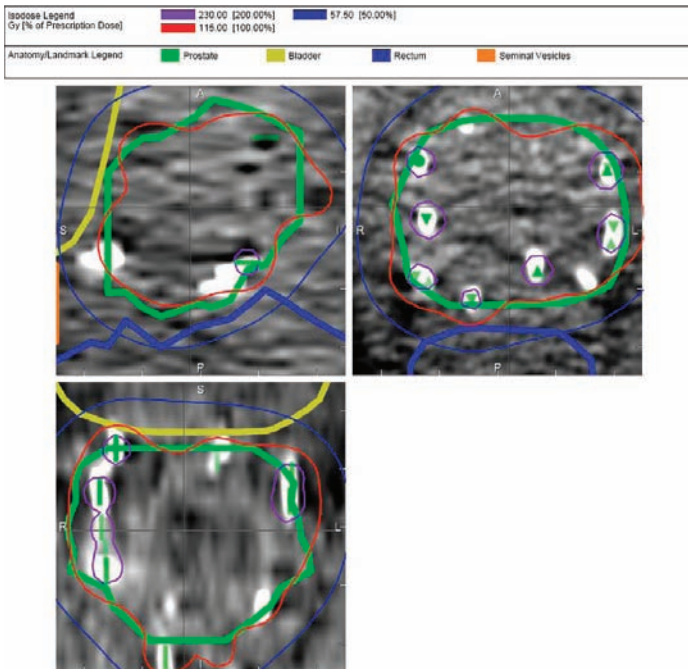
Cesium-131 Pre Plan



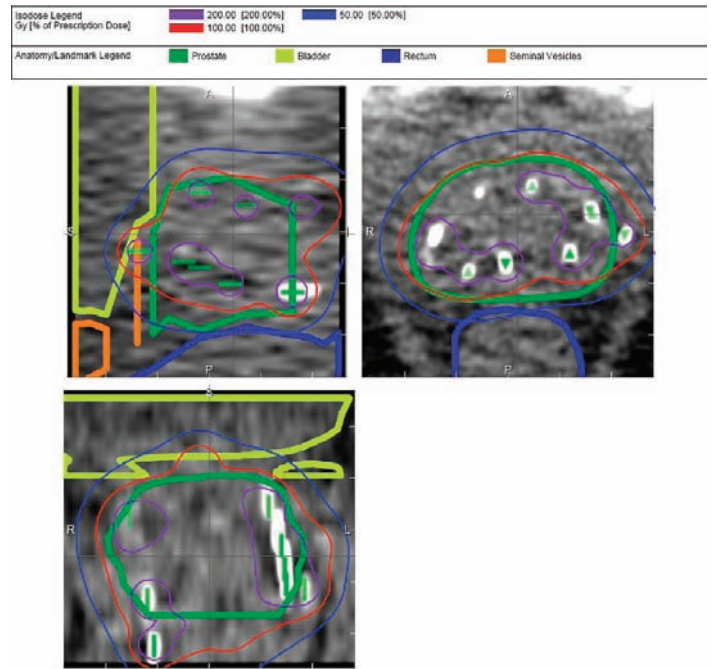
Palladium-103 Pre Plan



Cesium-131 Post Plan



Palladium-103 Post Plan



Conclusions

Given its greater average energy relative to Pd-103 (30 keV versus 21 keV), it may be possible to deliver a more homogenous implant - as measured by V150 - with Cs-131 than with Pd-103 with essentially equivalent gland coverage as measured by D90.