

AbstractID: 12938 Title: Dosimetric comparison of Iridium-192, Ytterbium-169, and Thulium-170 sources for HDR prostate brachytherapy

Purpose: Recent studies have identified that among different available radioactive isotopes, the dose characteristics and shielding properties of Ytterbium-169 and Thulium-170 sources can very well suit HDR brachytherapy needs. Based on the available studies of these new sources, the purpose of this work is to compare the dose distributions obtained with the specially designed Yb-169 and Tm-170 brachytherapy sources with standard Ir-192 clinical dose distribution.

Materials and methods: Ten patients having prostate volumes ranging from 17 to 92 cm³ were studied retrospectively. Original treatment of these patients involved 16 catheters and an Ir-192 source. Dose distributions for all ten plans with each new source are optimized with an objective to achieve the best distribution, but with also an emphasis on ensuring that coverage is equivalent to the original Ir-192 source plan.

Results: The descriptive statistical analysis showed that the mean differences for average prostate V100 with Yb-169 and Tm-170 are significantly higher compared with Ir-192. There are no statistical differences in D90 values for any of the paired three sources. The mean differences for Urethra V120, Rectum V75, and Bladder V75 values with Ir-192 are significantly higher than Yb-169 and Tm-170. The overall patterns of dosimetric results are similar for nine out of the ten patients. Also, the Bladder V75, and Rectum V75 values for each patient are similar with all three sources but there is a wide range among the patients.

Conclusion: All the three sources satisfied the clinical standard RTOG criteria to provide good PTV coverage for the prescription dose as well as maintaining the same dose to the target volume (D90). This study shows the possibility that the Tm-170 and Yb-169 sources can be used as a replacement for Ir-192 source in HDR units.

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