Analysis of the Quality of Prostate Implants Using Dose Volume Histograms and Homogeneity Indexes

In this work, we assessed the quality of prostate brachytherapy by calculating post implant 3D dose distributions. For 40 patients who underwent prostate brachytherapy using I125 or Pd103 and ultrasound-based treatment preplanning, CT scans were done prior to implant, 1-day, 7-day, and 28-day post implant. The prostate, rectum and bladder were contoured on all scans. Post treatment dose distributions were generated using FOCUS brachytherapy planning software. Dose calculation was based on TG43 formalism that included anisotropy of the sources. The minimum peripheral dose of 144Gy for I125 and 115Gy for Pd103 was chosen. DVHs for target, rectum, and bladder were analyzed for all patients using the conformity and uniformity quantifiers (CT-based TVR1 and TVR2, dose homogeneity indexes, DHI1, DHI2, and DNR, dose coverage indexes, rectal and bladder doses). All these indexes are described in the literature. The average TVR1, TVR2, and target coverage index were 1.98, 2.13, and 1.04 respectively. The average DVH1, DHI2, and DNR were 0.468, 0.399, and 0.531 respectively. All of these values were within the limits of published report based on the centralized multiinstitutional postimplant analysis. This study differs from the similar studies reported by other institutions in that the analysis was based on the sequential post implant 3-D dose distributions. Therefore, our values reflect evolution of the indexes with time. Results of this study may lead to improved methodology of prostate brachytherapy.