Purpose:

The objective of this work is to determine if dose homogeneity (HI) and conformity indexes (CI) in addition to already existing dose volume histogram objectives can be used to reduce dose to normal tissue while maintaining target objectives and improve planning consistency. These values are currently used in stereotactic radiosurgery and can be applied to high dose rate (HDR) brachytherapy planning.

Methods and Materials:

A typical prostate isodose distribution and DVH is shown in Figure 1. For this study twenty prostate HDR brachytherapy plans were reviewed to determine prostate V100 (%), prostate V150 (%), prostate V100 (cc), 100% isodose volume (cc). These parameters are demonstrated in Figure 2.

These factors were used to calculate the initial HI and CI. The plans were then optimized with the addition of a normal tissue ring structure (Figure 3) with a planning objective. These values were used to calculate the initial HI and CI. The plans were then optimized with the addition of a normal tissue ring structure (Figure 3) with a planning objective.

Results:

The objective for the normal tissue structure was to deliver ≤ 80% of the reference dose to a cc volume with a midlevel priority. DVH results were evaluated and HI and CI calculated for the re-optimized plans. The default planning objectives used for this project are shown in Figure 4.

The mean target coverage, mean HI, mean CI, paired t test and p value are shown in Table 1.

Conclusions:

Although we have no data to support the clinical significance at this time we plan to use HI and CI as additional plan evaluation tools. This study has shown that the primary planning objectives can be met while narrowing the range of observed HI and CI. This improved planning consistency may then be enhanced by incremental improvement of the HI and CI values. Optimum HI and CI values for this technique are not yet determined. The data presented represents typical prostate HDR brachytherapy plans in our clinic and can be used by others to evaluate their planning programs.

References:


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