

AbstractID: 5168 Title: Bladder Dose Distribution in Cylindrical Brachytherapy Treatment

Objective:

This work compares the characteristics of dose volume histogram (DVH) and dose surface area histogram (DSH) analysis of contoured bladder volumes in HDR vaginal cylinder brachytherapy.

Method and Materials:

CT scans were obtained on 20 patients with gynecological cancer who received in total 74 fractions of high dose rate brachytherapy treatment to the vaginal cuff, with the vaginal cylinder in situ. As part of an IRB approved study, the patients' bladder filling status was intentionally different for each fraction. The bladder was manually contoured for each treatment fraction including any fluid filling the bladder. The 3D bladder structure was reconstructed and its surface was extracted and represented with a triangular mesh. The dwell locations of the HDR source were identified for each fraction. Dose to each point on bladder was calculated according to the treatment plans.

Results:

The mean and standard deviation of volume (154.4 ± 153.9 in cc) and the surface area (184.4 ± 91.8 in cm^2) of the bladder varied with filling status. The bladder filling has caused more variation in DSH than in DVH in the high dose region. The average dose for the most irradiated volume D2cc was $70\% \pm 18\%$ of the prescribed dose. The average surface area receiving D2cc was 11.6 ± 2.0 in cm^2 , or $7.5 \pm 3.1\%$ of the total surface area compared to $2.4 \pm 1.8\%$ of the bladder volume. DSH is a smooth function with larger variation than DVH for doses over 70% of prescription.

Conclusion:

The nature of the bladder suggests that the surface area is a more realistic way of describing bladder. While both DVH and DSH may quantify the high dose region, surface area is more sensitive. As such DSH may offer a better correlation to clinical outcome.