AbstractID: 14280 Title: Voxel size effect on Dose Mass Histograms of head and neck-IMRT Monte Carlo treatments

Purpose: Previous studies [1] demonstrated that Dose Volume Histogram (DMH) is a better parameter than DVH for evaluating treatment plans calculated by Monte Carlo (MC) simulations that may have large statistical uncertainties in low-density regions such as air cavities and lung tissues. On other hand, it has been showed [2] that the voxel size may affect the dose distributions calculated by MC for head and neck region. In the present work we asses the voxel size effect on DMH for head and neck MC treatments.

Method and Materials: Four IMRT head and neck cases were included in this study.
MC patient simulation phantoms of different voxel sizes (2-9mm), were built from the same patient CT data. The EGS4 based MCSIM code and photon source models for 6 MV beams were used to calculate the isodose distributions, DVH and DMHs for both, PTV and critical structures.

Results: Our results show significant differences between the DMHs calculated in the simulation phantoms of different voxel sizes (2-9mm). The effect is more significant for critical structures (up to 10%). DMH is more sensitive than DVH to the voxel size effect, however the accurate calculation of the DMH requires significantly less CPU time than the calculation of DVH.

Conclusion: Our results suggest that 2 mm voxels should be used for the calculation of DMHs for head and neck for accurate treatment evaluation. Since the voxel size effect reduces the abiltiy of DMH to properly validate the plan, it may have a negative impact on the treatment outcome.

1- G. Mora' et al. Using DMH for validation of head and neck IMRT – MC treatments. Second Worshop of EWG-MCTP. Outubro 2009. Cardif. UK.
2 - G. Mora et al. .Effect of dose grid resolution on MC photon beam dose calculations. Rad&Onc 61, S27 (2001).