AbstractID: 8335 Title: Equivalent Uniform Dose Optimization: A Step Closer to Dose-Guided and Adaptive Radiation Therapy?

Purpose: To investigate whether IMRT optimization based on generalized Equivalent Uniform Dose[1] (gEUD) objectives can compensate for and further reduce the additional doses to organs at risk (OAR) when MV CBCT is used for daily IGRT method. One of the ultimate goals of CBCT is the adaptation to changes of patient shape and treatment volumes during the treatment course. Performing frequent CBCT, such as daily setup IGRT, delivers additional dose to the treatment volume which needs to be accounted for and possibly be optimized upon.

Methods and Materials: Three IMRT plans for H&N were prepared. The first plan was based on dose-volume (DV) objectives set by the physician. Then, an additional CBCT beam, simulated as an arc of 200°, was added to the plan to investigate the dose increase to all the volumes of interest. To decrease the dose to OARs, a second plan was devised using the same DV objectives, but incorporating the dose from CBCT[2]. Finally, a third plan that included the CBCT was produced, based on gEUD[1], to attempt further reduction of dose to OARs while maintaining similar target volume coverage.

Results: The gEUD-based optimization produced a superior plan that not only accounted for the additional dose that the CBCT deposited to the treatment volume, but further reduced the dose to the OARs compared to the DV-based plans. In other words, gEUD-based optimization reduced the lower doses to the sensitive tissues further than DV-based optimization.

Conclusions: gEUD-based optimization can easily provide a "dose adaptation" to allow the introduction of CBCT in routine clinical practice and eventually allow for dose guidance and adaptive radiation therapy that will demand complex dose sculpting for the volumes of interest.

[1]Mihailidis D, *et al*. Med Phys. 34(abstract), 2653 (2007).
[2]Miften M, *et al*. Med. Phys. 34, 3760 (2007).