

AbstractID: 8455 Title: Dose-mass-histogram (DMH) vs. dose-volume histogram (DVH) in predicting lung complications

Purpose: In radiotherapy for breast cancer, it is very important to estimate the expected lung complications. In this study, it is examined whether the Dose Mass Histogram (DMH) concept can be better associated with the expected lung complications than the widely used Dose Volume Histogram (DVH) concept.

Material and Methods: The problem was investigated theoretically by applying two hypothetical dose distributions (Gaussian and Semi-Gaussian shaped) on two lungs of uniform and varying densities. Furthermore, a group of breast cancer patients was used to clinically quantify the difference between DVHs and DMHs. These patients were treated with resection and irradiation with two tangential fields. The influence of the deviation between DVHs and DMHs on the clinical endpoint of radiation pneumonitis is estimated by using the Relative Seriality and LKB models. The biological equivalent of the corresponding difference in their mean doses was estimated by the Biologically Effective Uniform Dose (BEUD) and Equivalent Uniform Dose (EUD) concepts, respectively.

Results: The relation of the DVHs and DMHs varies depending on the underlying cell density distribution and the applied dose distribution. The range of their deviation in terms of expected clinical outcome was large both for the theoretical and the clinical studies. For the group of patients, according to the DVH, lung receives 9.82 Gy, whereas according to the DMH it receives 8.06 Gy (1.76 Gy difference). Interpreting these figures in terms of lung response, DVH gives 0.30% probability for lung complications compared to 0.10% given by DMH for the Relative Seriality model. Similarly, for the LKB model the corresponding values are 2.62% and 1.85%, respectively.

Conclusions: Concluding, the expected lung complications appear to be overestimated when using the DVH concept, whereas the effectiveness of the dose distribution is closer related to the radiation effects when using the DMH concept.