AbstractID: 8474 Title: Interpretation of dosimetric results in terms of expected treatment outcome when optimizing treatment plans using different methods of regularizing dose inhomogeneity

Purpose: Regularization techniques for determining the optimal dose distribution have been proposed because the dose distributions produced by different IMRT treatment planning optimization algorithms are highly non-uniform in the target volume. In the present work, an analysis is made about the relation of the DVH gradient and the dose to the PTV and normal tissues.

Material and Methods: In this study, two head & neck and prostate cancer cases treated with IMRT were employed. Three different dose distributions were obtained by using a dose-based optimization technique, an EUD-based optimization without regularization of non-uniformity and an EUD-based optimization using a variational regularization technique. The clinical effectiveness of the three dose distributions was investigated by using the complication-free tumor control probability, P_+ and the biologically effective uniform dose.

Results: In the head & neck case, for the dose-based optimization, the P_+ value is 32.9%, the total control probability P_B is 79.6% and the total complication probability P_I is 49.0%. For the EUD-based no-reg optimization, the P_+ value is 56.4%, the P_B value is 71.9% and the P_I value is 15.5%. For the EUD-based reg optimization, the P_+ value is 67.3%, the P_B value is 87.4% and the P_I value is 20.1%. In the prostate case, for the dose-based optimization, the P_+ value is 94.8%, the P_B value is 97.8% and the P_I value is 3.0%. For the EUD-based no-reg optimization, the P_+ value is 86.0%, the P_B value is 97.3% and the P_I value is 11.3%. For the EUD-based reg optimization, the P_+ value is 95.3%, the P_B value is 98.4% and the P_I value is 3.1%.

Conclusions: The radiobiological comparison shows that the EUD-based optimization with regularization gives better results than the EUD-based optimization without regularization and dose-based optimization in both clinical cases, which indicates better clinical effectiveness.