AbstractID: 8898 Title: Dosimetric Impact of Beam Energy and Number of Photon Fields on Prostate Dose Distributions: Inverse Planning and Validation Study

Purpose: To examine the quality of various IMRT techniques based on treatment plans that utilize different photon beam energies and beam arrangements for radiotherapy of prostate carcinomas.

Method and Materials: For this study, a sample patient diagnosed with prostate cancer was selected. The patient underwent computerized tomography (CT) scans for inverse planning. These CT images were used to outline the planning target volume (PTV) and several organs at risk (OAR) including bladder, rectum, and femurs for defining dose constraints during the inverse planning process. Using the Pinnacle^3 planning system (V. 8.0d), 5- and 7-field IMRT plans were generated using (a) 6 MV, (b) 10 MV, and (c) 15 MV photons. These six plans were scored using dose-volume-histograms (DVH) to infer quality index parameters, namely, dose uniformity and conformity in the PTV, dose to OAR, and integral dose in the irradiated normal tissue. Each IMRT beam of the selected treatment plan was transferred on to a homogeneous flat phantom for planar-dose calculations at 10-cm depth. These planar dose distributions were measured using MapCHECK and film dosimetry to superimpose on the planned dose distributions for comparison.

Results: Our planning studies have shown that: (1) 5-F vs. 7-F IMRT plans for all beam energies predict less doses to the normal tissue surrounding the prostate target volume below 3500 cGy level, (2) As expected, superior dose distributions are achieved with all IMRT techniques for all photon beam energies in the 6-15 MV range, (3) Dose uniformity compares fairly well between 106.5 and 108.3% for all plans irrespective of photon energy and beam arrangements. Detailed dosimetric differences between plans will be discussed.

Conclusions: We have successfully performed an inverse planning study to examine the effect of photon beam energy and the number of these beams on the quality of IMRT plans to treat prostate patients.