AbstractID: 4853 Title: Planning Study of Intensity-Modulated and 3D Conformal Radiotherapy of Whole Pelvis Including Inguinal Lymphatics: Radiobiological Considerations for Designing New Fractionation Schemes

Purpose: To examine the possibility of using “simultaneous integrated boost” intensity-modulated radiotherapy (SIB-IMRT), for the management of pelvic malignancies, with potential clinical advantage for simultaneous delivery of high doses to the primary disease and lower doses to the subclinical disease or electively treated regions.

Method and Materials: For this study, a sample patient diagnosed with anal cancer was randomly selected from our database. Four treatment plans were developed: (1) the 3D conformal plan for initial pelvis/inguinal node irradiation and subsequent conventional 3D boost to the primary tumor, (2) conventional 3D initial pelvis/inguinal node irradiation and subsequent IMRT boost plan, (3) Two-phase IMRT plan for initial pelvis/inguinal node irradiation and subsequent IMRT boost plan, (4) A single-phase SIB-IMRT plan to deliver simultaneous boost. DVHs for the target volumes were transformed into equivalent uniform dose (EUD) using the LQ model to evaluate relative merits of these plans using tumor control probability (TCP), and normal tissue complication probability (NTCP) for normal tissues.

Results: We have found that dose distributions for SIB-IMRT are similar in conformality to dose distributions when IMRT is divided into a large-field phase and a boost phase. As shown in Fig. 1(a-d), both techniques produce significantly superior dose distributions compared to those obtained with 3DCRT as well as to dose distributions obtained using conventional beams for the large-field phase followed by IMRT boost phase. We also found that normal tissues outside the target volume receive significantly lower dose due to higher dose conformality of IMRT plans (Table 1).

Conclusions: SIB-IMRT offers unique ability to produce highly conformal dose distributions with better sparing of organs at risk, with more efficient delivery, and shorter treatment duration. This new modality also facilitates the prospect of dose escalation to highly advanced tumors for better radiobiological effectiveness potentially leading to improved outcome.