AbstractID: 1786 Title: IMRT versus conformal 3-D planning for prostate cancer: Comparison of biological model calculations of NTCP and TCP

Treatment plans from inverse-planned IMRT often feature greater target inhomogeneity than conventional 3D treatment. This raises the issue of comparative biological effectiveness of IMRT and conformal 3D. To study the question, clinical treatment plans used for 32 IMRT prostate cancer patients were compared with conventional plans for the same patients using institutional protocols for conformal 3D. Both local-field irradiation (LFI, 22 cases) and extended-field irradiation (EFI, 10 cases) which included pelvic lymph nodes were considered. Normal tissue complication probability (NTCP) was calculated using the Lyman-Kutcher-Burman (LKB) model with Emami parameters, and tumor control probability (TCP) was calculated in the linear-quadratic (LQ) model with several choices for α and α/β, reflecting current data-fitting phenomenology. Mean target dose (74.7 Gy) was the same for LFI-IMRT and for LFI-3D. Fractionation differences introduced to compensate for IMRT target dose inhomogeneity by prescribing 2 Gy as the minimum daily dose resulted in higher TCP for IMRT. For EFI-IMRT target dose was the same, but EFI-3D dose was ~ 4.5% less, due to lower patient tolerance of EFI-3D. The lower dose for EFI-3D resulted in lower TCP for 3D. Despite higher target dose, EFI-IMRT showed significantly lower NTCP values than EFI-3D for rectum, bladder and bowel. For LFI, NTCP was significantly lower only for rectum, although the trend of lower NTCP was seen for all organs at risk. Treatment margins differed slightly for LFI, mainly due to static field arrangement, but were ~ 2 - 5 mm smaller for EFI-IMRT than for EFI-3D.