

AbstractID: 10497 Title: Comparison of Target Dose Inhomogeneity for Four Different Techniques of Breast Cancer Treatment

Purpose: To evaluate target dose inhomogeneity for four different breast cancer treatment techniques. **Method and Materials:** External beam radiotherapy (EBRT) was performed for 12 patients each using either whole or 3D conformal partial breast irradiation (WBI or PBI), 19 patients with high dose rate (HDR) MammoSite® brachytherapy and 13 patients with Contura® multi-lumen applicator. The PTV_EVAL volume was defined by following NSABP B-39/RTOG 0413 for PBI, MammoSite® and Contura® while retrospectively delineated for WBI. The differential dose volume histogram was evaluated using mean dose (Dm) and most probable dose (Dmp) relative to prescribed dose (Dpr) and root mean square deviation (RMSD). The biologically effective dose (BED) accounting for non-uniform dose distribution was computed. Generalized equivalent uniform dose (gEUD) was calculated together with dose homogeneity index (DHI) and conformal index (COIN). **Results:** Compared to EBRT, the target received higher dose with HDR (Dm: 143% vs. 101%, Dmp: 111% vs. 101%) which increased BED values (77 Gy vs. 73 Gy for fibrosis, 56 Gy vs. 47 Gy for erythema, and 63 Gy vs. 57 Gy for breast carcinoma, respectively) and dose inhomogeneity (RMSD: 12.1 vs. 1.8). Due to steeper dose fall-off, HDR plans were more conformal than EBRT (COIN: 0.84 vs. 0.45). Compared to MammoSite®, Contura® yielded slightly higher dose (BED difference < 0.5 Gy and 0.3 Gy higher in gEUD) which increased DHI by 5% and COIN by 1%. The PBI had large inter-patient variability of BED values (2-8 times > others) and the smallest BED and gEUD values. The WBI had large inter-patient variability of gEUD values (14 times > others) due to cold spots. **Conclusion:** Despite greater inhomogeneity, HDR plans have higher target dose conformality and are less patient-specific than EBRT plans. However, based on the biological and dosimetric data, the four different techniques are clinically comparable.