

AbstractID: 8377 Title: A Dosimetric Comparison of Simultaneous Integrated Breast Radiotherapy Utilizing 3D Conformal, IMRT or Tomotherapy Technique

Purpose:

The dosimetric characteristics of simultaneous integrated boost (SIB) breast radiotherapy techniques utilizing 3D-conformal (3DSIB), linac-based intensity modulation (IMRT) and Tomotherapy (TOMO) were compared. The SIB techniques were compared to conventional whole breast irradiation (WBI).

Methods and Materials:

Fifteen patients were included in the study. The SIB treatments (3DSIB, IMRT and TOMO) delivered 45Gy(25x1.8Gy) to the whole breast minus the boost bed, PTV(Breast-Boost), and concurrently delivered 60Gy(25x2.4Gy) to the tumor bed, PTV(Boost). The WBI treatment delivered 45Gy(25x1.8Gy) the whole breast, PTV(Breast), followed by 20Gy(10x2Gy) to PTV(Boost). The WBI and SIB treatment were planned to deliver equivalent dose to the targets. Statistical significance between dosimetric parameters was determined using Wilcoxon signed-ranks. The dosimetric data were compiled to form population dose volume histograms which display the mean value and 1σ uncertainty. Dose homogeneity was quantified by the parameter $D_{95\%-5\%}$, representing the percent difference in dose covering 95% of the target minus the dose covering 5% of the target.

Results:

Using the $D_{95\%-5\%}$ parameter the PTV(Breast-Boost) volume received a more homogeneous dose using TOMO(14.3%) compared to 3DSIB(25.1%), IMRT(27.1%) and WBI(44.7%). The PTV(Boost) volume received a more homogeneous dose using non-intensity modulated techniques, WBI(6.9%) and 3DSIB(7.0%), compared to IMRT(11.6%) and TOMO(12.0%). The mean percent volume of ipsilateral lung that received ≥ 20 Gy was smaller using IMRT(15.8%) compared to 3DSIB(17.7%), TOMO(17.1%) and WBI(19.0%). For left-sided breast cancer patients, the mean percent volume of heart that received ≥ 35 Gy was less for intensity modulated SIB techniques, IMRT(0.1%) and TOMO(0.2%), than 3DSIB(4.4%), and WBI(6.2%). The contralateral breast received a smaller mean dose using IMRT(0.39Gy) compared to WBI(0.81Gy), 3DSIB(0.67Gy) and TOMO(1.28Gy).

Conclusion:

SIB techniques delivered a more homogenous dose to the PTV(Breast-Boost) volume, while non-intensity modulated techniques delivered a more homogeneous dose to the PTV(Boost) volume. Intensity modulated SIB techniques (IMRT and TOMO) decreased the heart dose relative to 3DSIB.