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2117

Facility and Individual-Level Factors Contribute to Racial Disparities in Heart Dose Among Breast Radiotherapy Patients

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Purpose/Objective(s): Racial disparities in breast cancer presentation (stage/subtype), baseline cardiac risk, and access to care highlight the need to quantify and address predictors of racial variation in heart dose among women who receive radiotherapy (RT). We sought to explore factors that contribute to heart dose, including intrinsic patient factors and facility level factors.

Materials/Methods: We queried a statewide consortium database to examine racial differences in mean heart dose among women treated with whole breast RT at 25 institutions. We generated separate models of heart dose based on disease laterality and receipt of conventional (CWBI) versus accelerated whole breast irradiation (AWBI). We included demographic, disease, and treatment characteristics expected to affect heart dose, as well as facility type. We created a model with only patient-level characteristics followed by a multi-level model to account for clustering within facilities.

Results: Among 9042 women in the analytic sample, estimated mean heart doses (Gy) were: 1.74 for left-sided AWBI, 1.60 for left-sided CWBI, 0.61 for right-sided AWBI and 0.66 for right-sided CWBI. On patient-level multivariable analysis, race was an independent predictor of higher heart dose for women with left-sided disease: Black patients receiving ABWI or CWBI and Asian patients receiving AWBI had higher heart doses than White women. Higher heart dose was also associated with separation, breast volume, inclusion of internal mammary nodes, use of intensity modulated RT, supine positioning, dose to 50% of the breast volume, treatment at an academic center, decreasing obesity, decreasing comorbidities, absence of deep inhalation breath hold, and earlier treatment year. Multilevel modeling revealed that 22-30% of the variability in heart dose was attributed to patient clustering within facilities. Multilevel models suggest that heart dose is elevated for Black and most Asian (v. White) patients, with average increase between 3-13% and 6-22%, respectively, and statistically significant ($p<0.02$) depending upon laterality and fractionation. Multilevel modeling uncovered disparities for Black and Asian right-sided AWBI patients that were not observed in patient-level models.

Conclusion: Mean heart doses were higher for Black and Asian women in this sample, even when accounting for relevant patient-level factors. Accounting for treatment facility decreased, but did not eliminate this disparity for left-sided disease and uncovered disparities for right-sided disease. These findings suggest that disparities in heart dose may be influenced by patient factors and the facilities at which women obtain care. Further research is needed to clarify whether disparities for Black and Asian women are due to unmeasured, unmodifiable anatomic or clinical factors versus modifiable individual or system-level factors.

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2118

Hybrid-VMAT for Post-Operative Breast Cancer Including Regional Lymph Nodes: The Advantage of Dosimetric Data and Safety of Toxicities

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Purpose/Objective(s): To improve the homogeneity and conformity of the irradiation dose for post-operative breast cancer including regional lymph nodes, we planned the Hybrid VMAT which was combined conventional tangential field mainly for chest wall and VMAT mainly for supraclavicular area and marginal zone. In this study, we investigate the comparison of dosimetric impact between traditional 3DCRT and Hybrid VMAT, and also observed toxicities following Hybrid VMAT irradiation.

Materials/Methods: Seventy patients indicated for Hybrid VMAT irradiation between October 2016 and December 2017 were eligible. Target delineation was referred clinical data and RTOG breast cancer atlas. Prescribed dose was 50Gy/25 fractions. For the dosimetric impact, traditional 3DCRT and Hybrid VMAT plans were compared in each patient with respect to following parameters: homogeneity index (HI) and conformity index (CI) of PTV, and irradiation dose to OAR (lung and heart). The toxicities such as dermatitis, esophagitis, pneumonitis, and lymphatic edema were followed up regularly using CTCAEv4.0.

Results: The characteristic of 70 patients were 35 patients of left side and 35 patients of right side, and 19 patients of post breast-conserving surgery and 51 patients of post mastectomy. The median follow up was 319 days. For the dosimetric impact, the HI and CI of PTV were significantly improved in Hybrid VMAT plan compared with in traditional 3DCRT plan (HI: 0.15 ± 0.07 in Hybrid VMAT vs.0.41 ± 0.19 in 3DCRT, $p<0.001$, CI: 1.61 ± 0.44 in Hybrid VMAT vs.2.10 ± 0.56 in 3DCRT, $p<0.001$). The mean irradiated ipsilateral lung dose was not difference in both plans (12.0 ± 2.4 Gy in Hybrid VMAT vs.11.8 ± 2.8 Gy in 3DCRT, $p<0.533$). The mean irradiated contralateral lung dose was very low in both plans (1.3 ± 0.6 Gy in Hybrid VMAT vs.0.3 ± 0.2 Gy in 3DCRT, $p<0.001$). The mean irradiated heart dose for only left side patients was almost the same in both plans (28.0 ± 15.0 Gy in Hybrid VMAT vs. 28.0 ± 15.1 Gy in 3DCRT, $p<0.01$). For the toxicity, Grade 1-2 acute dermatitis and esophagitis occurred in 39 patients (56%) and 11 patients (16%), respectively. There were no patients who were occurred ≧Grade 3 acute toxicity, ≧Grade 2 pneumonitis and ≧Grade 2 lymphedema during following up.

Conclusion: Hybrid VMAT for post-operative breast cancer including regional lymph nodes was reasonable technique which was able to improve the homogeneity and conformity of the irradiation dose to PTV while keeping the irradiation dose to OAR. In addition, Hybrid VMAT was proved to be safe technique in the evaluation of the toxicity.

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2119

Factors Associated with Patient-Reported and Physician-Assessed Acute Toxicity after Hypofractionated Breast Radiotherapy, a Report from a Large Multi-Center Cohort Study

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