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CLINICAL INVESTIGATION **Breast**

DISPARITIES IN THE USE OF RADIATION THERAPY IN PATIENTS WITH LOCAL-REGIONALLY ADVANCED BREAST CANCER

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Background: Radiation therapy (RT) is indicated for the treatment of local-regionally advanced breast cancer (BCa).

Hypothesis: We hypothesized that black and Hispanic patients with local-regionally advanced BCa would receive lower rates of RT than their white counterparts.

Methods: The Surveillance Epidemiology and End Results database was used to identify white, black, Hispanic, and Asian patients with invasive BCa and ≥10 metastatic lymph nodes diagnosed between 1988 and 2005. Univariate and multivariate logistic regression evaluated the relationship of race/ethnicity with use of RT. Multivariate models stratified for those undergoing mastectomy or lumpectomy.

Results: Entry criteria were met by 12,653 patients. Approximately half of the patients did not receive RT. Most patients were white (72%); the remainder were Hispanic (10.4%), black (10.3%), and Asian (7.3%). On univariate analysis, Hispanics (odd ratio [OR] 0.89; 95% confidence interval [CI], 0.79–1.00) and blacks (OR 0.79; 95% CI, 0.70–0.89) were less likely to receive RT than whites. On multivariate analysis, blacks (OR 0.76; 95% CI, 0.67–0.86) and Hispanics (OR 0.80; 95% CI, 0.70–0.90) were less likely than whites to receive RT. Disparities persisted for blacks (OR 0.74; 95% CI, 0.64–0.85) and Hispanics (OR 0.77; 95% CI, 0.67–0.89) who received mastectomy, but not for those who received lumpectomy.

Conclusions: Many patients with local-regionally advanced BCa do not receive RT. Blacks and Hispanics were less likely than whites to receive RT. This disparity was noted predominately in patients who received mastectomy. Future efforts at improving rates of RT are warranted. Efforts at eliminating racial/ethnic disparities should focus on black and Hispanic candidates for postmastectomy RT. © 2010 Elsevier Inc.

Breast cancer, Advanced, Radiation, Disparities, Race, Ethnicity.

INTRODUCTION

Radiation therapy (RT) is indicated for the treatment of local-regionally advanced breast cancer (BCa), regardless of the surgical therapy provided. Current recommendations warrant the use of adjuvant RT for all cases of breast conservation (1, 2). The use of postmastectomy radiation (PMRT) is more controversial. A meta-analysis by the Early Breast Cancer Trialists' Collaborative Group demonstrated improved local control with PMRT but no significant difference in 10-year overall survival (3). Later studies using improved radiation techniques demonstrated that the cardiac-related mortality of PMRT was offset by decreased breast cancer mortality (4). A randomized trial by the Danish Breast Cancer Cooperative Group (5) demonstrated an overall survival advantage with PMRT + adjuvant chemotherapy vs. adjuvant chemotherapy alone (relative risk [RR] 0.71; 95% confidence interval [CI], 0.62–0.82, $p < 0.001$). Similarly, the British Columbia Cancer Agency (6) showed a significant breast cancer specific survival advantage (RR 0.71, $p = 0.05$) and a trend toward improved overall survival ($p = 0.07$) for patients receiving PMRT + chemotherapy vs. chemotherapy alone. This advantage was noted in patients with ≥4 positive lymph nodes, but not in those with 1–3 positive lymph nodes ($p = 0.06$) (6). Ten years after their review in 1995, the Early Breast Cancer Trialists' Collaborative Group reported results in accordance with the Danish and Canadian groups. Node-positive patients undergoing PMRT had improved BCa-specific and overall survival at 15 years (2). On these grounds, PMRT is warranted for patients at high risk for local recurrence, including those with tumors involving the chest

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wall or ≥4 metastatic lymph nodes. Adherence to RT guidelines improves overall and disease-specific survival and has been used as a surrogate marker of quality BCa care (7).

Racial/ethnic disparities in treatment, including RT, are well-documented for early-stage breast cancer (8–14) but are less clear for local-regionally advanced disease. On the basis of racial/ethnic disparities noted in the treatment of other malignancies (14–16), we hypothesized that black and Hispanic patients with American Joint Committee on Cancer (AJCC) Stage IIIC (≥10 metastatic lymph nodes) BCa would receive lower rates of RT than their white counterparts.

METHODS AND MATERIALS

The Surveillance Epidemiology and End Results (SEER) database of the National Cancer Institute was used to identify all white, black, Hispanic, and Asian patients with AJCC Stage IIIC (≥10 metastatic lymph nodes) invasive ductal carcinoma (IDC), lobular carcinoma (ILC), or mixed ductal/lobular carcinoma (MDLC) of the breast diagnosed between 1988 and 2005. SEER collects cancer incidence and survival data from 17 population-based cancer registries representing 26% of the U.S. population. Current SEER registries consist of the states of Connecticut, Hawaii, Iowa, Kentucky, Louisiana, New Jersey, New Mexico, and Utah; the metropolitan areas of Atlanta, Detroit, San Francisco-Oakland, Seattle-Puget Sound, and San Jose-Monterey; and the Alaska Native Tumor Registry, rural Georgia, Greater California, and Los Angeles County. SEER registries routinely collect data on patient demographics, primary tumor site, tumor morphology, stage at diagnosis, and first course of treatment.

Patients were divided according to whether RT was given. Patients with distant metastases were excluded. Further exclusions were made if the use of RT was unknown, or if race/ethnicity was other than white, black, Hispanic, or Asian. We compared differences among racial/ethnic groups using analysis of variance for continuous variables and chi-square testing for categorical variables and proportions.

Univariate logistic regression was used to evaluate the relationship of race/ethnicity with the use of RT using white patients as the referent population. Odds ratios (OR) are reported with associated 95% confidence intervals (CI). Differences were considered significant at $p \leq 0.05$.

Three multivariate logistic regression models were constructed. The first model included all patients. Using RT as the outcome variable, we controlled for race, age, sex, tumor size, estrogen receptor (ER) and progesterone receptor (PR) status, and type of surgery. White patients were the referent population. Because significant interactions were noted between the type of surgery and RT use, two additional multivariate models were constructed that stratified patients based on whether they received lumpectomy or mastectomy. Analyses were conducted using STATA version 10 (StataCorp, College Station, TX).

RESULTS

Patient characteristics

Of 15,895 patients with local-regionally advanced BCa identified in the SEER registry, 12,653 met entry criteria. Patient characteristics, tumor factors, and RT status are included in Table 1. Briefly, the mean age of study patients was 57 years (range, 21–97 years). Less than 1% ($n = 115$) of patients were men. Tumor histology was IDC, ILC, or MDLC for 75.3%, 14.5%, and 10.2% of patients, respectively. Approximately half of the patients received RT, and half did not. The majority of patients were white (n = 9,102, 72%). The remainder were Hispanic (n = 1,318, 10.4%), black (n = 1,305, 10.3%), and Asian ($n = 928$, 7.3%). Patient characteristics, tumor factors, and RT status according to patient race/ethnicity are included in Table 1.

Univariate analysis

Only Asians demonstrated an odds of receiving RT that was not significantly different (OR 1.09; 95% CI, 0.95–1.24; $p = 0.23$) from whites (Table 2). Both Hispanics (OR 0.89; 95% CI, 0.79–1.00; $p = 0.05$) and blacks (OR 0.79; 95% CI, 0.70–0.89; $p < 0.001$) were less likely to receive radiation than whites.

Multivariate analysis

The first multivariate logistic regression model encompassed all patients and is summarized in Table 3A. Briefly, use of RT was more likely in ILC (OR 1.28; 95% CI, 1.15–1.43, $p < 0.001$), and among patients receiving lumpectomy as surgical treatment (OR 1.98; 95% CI, 1.79–2.18; $p < 0.001$). Conversely, use of RT was less likely with advancing age (OR 0.98; 95% CI, 0.98–0.98; $p < 0.001$), ER-negative tumors (OR 0.83; 95% CI, 0.73–0.94; $p = 0.003$), PR equivocal tumors (OR 0.57; 95% CI, 0.33–0.96; $p = 0.04$), and in black (OR 0.76; 95% CI, 0.67–0.86; $p < 0.001$) and Hispanic (OR 0.80; 95% CI, 0.70–0.90; $p < 0.001$) patients.

The second multivariate logistic regression model stratified for patients who underwent mastectomy. Results are summarized in Table 3B. Once again, use of RT was more likely in patients with ILC (OR 1.28; 95% CI, 1.13–1.44; $p < 0.001$). Additionally, patients with increasing tumor size displayed a borderline statistically significant likelihood of receiving RT (OR 1.00; 95% CI, 1.00–1.00, $p = 0.03$). A decreased likelihood of receiving RT was seen with advancing age (OR 0.98; 95% CI, 0.98–0.98; $p < 0.001$), ER-negative tumors (OR 0.74; 95% CI, 0.65–0.86; $p < 0.001$), and in black (OR 0.74; 95% CI, 0.64–0.85; $p < 0.001$) and Hispanic (OR 0.77; 95% CI, 0.67–0.89; $p < 0.001$) patients.

The third multivariate logistic regression model stratified for patients who underwent lumpectomy. Results are summarized in Table 3C. Use of RT was more likely in ER-negative tumors (OR 1.32; 95% CI, 1.00–1.75; $p = 0.05$). Increasing tumor size was associated with a decreased likelihood of receiving RT (OR 0.99; 95% CI, 0.99–1.00; $p < 0.001$). No differences in receipt of RT were noted based on race/ethnicity in this patient subpopulation.

DISCUSSION

Health care disparities exist. In particular, racial/ethnic minority populations have worse access to care and poorer quality of care for a wide range of conditions than their white