Racial Disparities in Rectal Cancer Treatment

A Population-Based Analysis

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Hypothesis: We hypothesized that there are significant racial disparities in delivery of care to rectal cancer patients. We examined differential surgical and radiation treatment for these patients and determined whether blacks were less likely than whites to undergo sphincter-sparing procedures, which are associated with a higher quality of life than sphincter-ablating procedures.

Design: Cross-sectional cohort study.

Patients and Setting: The Surveillance Epidemiology and End Results database provided population-based data for rectal cancer patients who were diagnosed between 1988 and 1999, were older than 35 years, and had no prior colorectal or other pelvic cancer.

Main Outcome Measures: Using logistic regression, we compared receipt and type of surgical therapy and radiation therapy, controlling for age, sex, year, geography, stage, and anatomic location.

Results: Among 52864 patients, 3851 were black and 44010 were white. Blacks were younger than whites and had more advanced disease ($P<.001$). Among patients who underwent operation, rates of sphincter-ablating procedure were 37% for whites and 43% for blacks (adjusted odds ratio [AOR], 1.42; 95% confidence interval [CI], 1.23-1.65). Moreover, 53% of whites and 56% of blacks received no radiation therapy for stage II to III disease (AOR, 1.30; 95% CI, 1.15-1.47).

Conclusions: Blacks with rectal cancer were diagnosed at a younger age and more advanced disease stage than whites, implying a need for more aggressive screening. After adjusting for stage and other covariates, surgical and radiation treatment also differed along racial lines. Our data suggest that treatment disparities may contribute to differences in outcome among racial/ethnic groups with rectal cancer, and they highlight the need for improving access to state-of-the-art surgical care for minority patients with rectal cancer.

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With a projected incidence of 135,000 cases this year, colorectal cancer is the third most common malignancy diagnosed in the United States and is the second leading cause of cancer mortality. Recently, there has been an overall decline in the incidence of and mortality from colorectal cancer. However, black patients have not enjoyed the same decline. From 1992 to 1998, the annual decrease in death rate for white males was 2.1% compared with 0.9% for black males; similarly, the annual decrease in death rate for white females was 1.9% compared with 0.6% for black females.

Two broad hypotheses could explain these outcome discrepancies. Blacks may be physiologically vulnerable and experience a more aggressive disease course. Alternatively, the higher rate of socioeconomic disadvantage among blacks as a group may render their medical care different from that of whites. No evidence to date indicates that colorectal cancer itself behaves differently between the races; studies controlling for stage at diagnosis and those with standardized treatment protocols describe virtually identical outcomes for blacks and whites. Conversely, lower socioeconomic status in patients with colorectal cancer is significantly associated with worse outcomes. Taken together, these findings suggest that the possibility of disparities in medical care as a potential influence on outcomes merits further investigation.

See Invited Critique at end of article

Although colon and rectal cancer are combined in most large databases and are histologically identical, their dif-
fferent anatomic features and behavior necessitate different treatment options and standards of care. Rectal cancer is of particular interest because, while complete resection remains the basis of treatment, the type of operation performed and the preservation of normal bowel continuity are closely associated with posttreatment morbidity, quality of care, and quality of life.  

For example, an abdominoperineal resection, which is sphincter ablating and therefore includes a permanent colostomy, is unavoidable in some circumstances. However, surgeons operating on higher volumes of patients with rectal cancer have been shown to perform a lower proportion of abdominoperineal resections and to have better overall and disease-free survival rates.  

These data suggest that practice volume is associated with the use of sphincter-preserving surgery as well as optimal disease control.

Furthermore, the 1990 National Institutes of Health Consensus Conference recommended radiation therapy as the standard of care for regional control of stage II and III rectal cancer, although it is not recommended for colon cancer. Increasingly, neoadjuvant radiation therapy is used as an alternative to postoperative radiation therapy because it allows preoperative downstaging of disease, which facilitates sphincter preservation and offers a favorable toxicity profile.

We investigated racial variation in the performance of sphincter-sparing procedures for patients with stage II and III rectal cancer who underwent operation. We also studied race and delivery of any surgical treatment, the type of operation, neoadjuvant radiation therapy, and any radiation therapy to these patients, with implications for quality of care.

METHODS

SETTING

The National Cancer Institute–funded Surveillance Epidemiology and End Results (SEER) Cancer Incidence Database is an anonymous nationwide population-based database in the public domain. During the era of interest, SEER drew from 11 cancer registries that covered approximately 14% of the US population, with oversampling of racial and ethnic minorities. Case ascertainment for SEER began in 1973 in Atlanta, Detroit, Hawaii, New Mexico, San Francisco–Oakland, Seattle–Puget Sound, and Utah, and has been expanded to include Los Angeles and San Jose–Monterey since 1992. The registries collect data, including patient demographics, primary tumor site, morphologic characteristics, stage at diagnosis, first course of treatment, and follow-up for vital status. The ascertainment of radiation therapy use in SEER is considered high for rectal cancer, with 94% concordance with radiation therapy claims in Medicare. Similarly, data agreement for resection of colorectal cancer between SEER and Medicare claims has also been excellent, with $\kappa$ values from 0.78 to 0.84. Owing to removal of all patient identifiers and the public availability of the data, this study was approved as exempt from full institutional review board consideration.

SUBJECTS

Data were collected for all patients diagnosed as having rectal cancer and entered into the SEER database between 1988 and 1999. Patients were excluded from analysis if they had a prior diagnosis of colon or rectal cancer, a prior diagnosis of cancer requiring irradiation or surgery in the pelvis (the entire lower urinary tract, female organs, male organs, and anus), or were younger than 35 years at the time of diagnosis.

VARIABLES

We examined race as a primary predictor variable and performed analyses based on black vs white race. Main outcome variables included the proportion of patients undergoing any surgical treatment, the proportion of patients undergoing a sphincter-sparing procedure vs abdominoperineal resection, the delivery of any radiation treatment, and the delivery of neoadjuvant irradiation. Covariates included age, sex, the American Joint Committee on Cancer stage of disease, year of diagnosis, location in the rectum or rectosigmoid, and the SEER site of entry.

STATISTICAL ANALYSIS

We compared racial differences in age at diagnosis and stage of disease using the $\chi^2$ test for trend. We examined the treatment provided to patients of different race with stage II and III disease, using $\chi^2$ analyses to calculate the unadjusted odds ratio (OR) and multiple logistic regression methods to determine the OR and 95% confidence interval (CI), controlling for main effects of the covariates. Rates and proportions were calculated for categorical data, and means and SEs were calculated for continuous data. Sample size calculations for $\kappa=.05$ and power=0.9 revealed that a 3% or greater difference in treatment rate could be determined with minimum samples of 1040 and 12730. Statistical analyses were performed with STATA version 7 software (Statacorp, College Station, Tex).

RESULTS

Between 1988 and 1999, 56940 patients with rectal cancer were entered into the SEER database. After applying exclusion criteria, 52864 patients remained (Table 1). Blacks (n=3851) with rectal cancer were younger than whites (n=44010) at the time of diagnosis (age, mean±SD, 64±12 years and 69±12 years, respectively; test for trend, $P<.001$). The SEER site of entry varied markedly among patients of different race (Table 2), with most blacks entered in Detroit (33%), Los Angeles (23%), Atlanta (15%), and San Francisco–Oakland (15%).

Although nearly all patients underwent some surgical treatment, the type of operation differed along racial lines (Table 3). Among patients with stage II and III disease, 4% of whites and 6% of blacks had no operation (adjusted OR [AOR], 1.30; 95% CI, 1.12-1.95). Among patients who underwent surgical treatment, 37% of whites and 43% of blacks underwent abdominoperineal resection (a sphincter-ablating procedure) (AOR, 1.42; 95% CI, 1.23-1.65).

Table 4 presents a comparison of adjuvant treatment by race among patients with stage II and III disease. Fifty-three percent of whites and 56% of blacks received no radiation therapy (AOR, 1.30; 95% CI, 1.15-1.47). Rates of neoadjuvant radiation therapy delivered were 7% for both groups.
Racially disparate incidence and outcomes among cancer patients have become well-established phenomena cited by a number of databases and studies.\(^2^9\) A later stage at diagnosis, potentially resulting from a lower rate of screening, has been identified as one etiologic factor.\(^2^6\) We found that disease was detected in blacks at a significantly younger age and more advanced stage compared with whites, reaffirming previous findings that more targeted or more effective screening could improve outcomes among these patients.\(^2^6,^2^7\)

To examine the effect of race on disparate outcomes in more detail, we investigated the delivery of care to blacks vs whites, using a national population-based database. We chose to examine the experience of patients with rectal cancer specifically because the standard of care has been changing during the past 12 years. Surgical therapy has gradually shifted to a dominance of sphincter-sparing operations (resulting in bowel continuity) over sphincter-ablating procedures (resulting in permanent ileostomy).\(^1^1\) The shift toward sphincter-sparing procedures most likely results from several studies that have indicated similar or improved outcomes\(^1^1,^2^8\) and a perceived improvement in quality of life.\(^1^0,^2^0,^3^1\) In a review of 17 studies that compared physical, psychological, social, and sexual function, Sprangers et al\(^2^6\) noted that patients who have undergone sphincter-sparing procedures and those with permanent colostomies frequently experienced diarrhea and some impairment of social and sexual functioning. However, patients with ostomies consistently reported increased psychological distress, restrictions in social functioning, and impairment in sexual function compared with those without ostomies.

After controlling for stage of disease at diagnosis, we identified the type of operation performed as the most notably divergent outcome between blacks and whites. Among patients undergoing either a sphincter-sparing operation or an abdominoperineal resection, the adjusted odds of having a permanent colostomy were 42% greater for blacks than whites. Although our data do not allow us to establish a precise mechanism for this discrepancy, controlling for age, sex, stage of disease, geographic region, year of diagnosis, and even approximate tumor site (“rectum” vs “rectosigmoid”) only increased the odds of a more invasive sphincter-ablating procedure among blacks. To our knowledge, racial variation in treatment pertaining to quality of life issues among patients with rectal cancer has not been addressed previously,\(^3^2\) although one may presume that the desire for intestinal continuity traverses racial barriers.

### Table 1. Demographics and Cancer Stage of 1988-1999 SEER Rectal Cancer Cases by Race

<table>
<thead>
<tr>
<th>Age,†‡ y</th>
<th>White,* N (%)</th>
<th>Black,* N (%)</th>
<th>Other N (%)</th>
<th>Unknown N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-49</td>
<td>3369 (8)</td>
<td>525 (14)</td>
<td>581</td>
<td>59</td>
</tr>
<tr>
<td>50-64</td>
<td>11755 (27)</td>
<td>1337 (35)</td>
<td>1466</td>
<td>110</td>
</tr>
<tr>
<td>65-79</td>
<td>20293 (46)</td>
<td>1537 (40)</td>
<td>2017</td>
<td>108</td>
</tr>
<tr>
<td>≥80</td>
<td>8593 (20)</td>
<td>452 (12)</td>
<td>625</td>
<td>37</td>
</tr>
</tbody>
</table>

### Table 2. Geographic Distribution of 1988-1999 SEER Rectal Cancer Cases by Race

<table>
<thead>
<tr>
<th>Geographic Region</th>
<th>White,* N (%)</th>
<th>Black,* N (%)</th>
<th>Other, N (%)</th>
<th>Unknown, N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco–Oakland</td>
<td>4969 (11)</td>
<td>559 (15)</td>
<td>990</td>
<td>92</td>
</tr>
<tr>
<td>Connecticut</td>
<td>6964 (16)</td>
<td>300 (8)</td>
<td>62</td>
<td>13</td>
</tr>
<tr>
<td>Detroit</td>
<td>6056 (14)</td>
<td>1253 (33)</td>
<td>56</td>
<td>22</td>
</tr>
<tr>
<td>Hawaii</td>
<td>475 (1)</td>
<td>13 (0)</td>
<td>1749</td>
<td>31</td>
</tr>
<tr>
<td>Iowa</td>
<td>6145 (14)</td>
<td>44 (1)</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>New Mexico</td>
<td>2058 (5)</td>
<td>30 (1)</td>
<td>81</td>
<td>0</td>
</tr>
<tr>
<td>Seattle</td>
<td>5290 (12)</td>
<td>119 (3)</td>
<td>277</td>
<td>23</td>
</tr>
<tr>
<td>Utah</td>
<td>1918 (4)</td>
<td>8 (0)</td>
<td>37</td>
<td>0</td>
</tr>
<tr>
<td>Atlanta</td>
<td>2005 (5)</td>
<td>595 (15)</td>
<td>54</td>
<td>8</td>
</tr>
<tr>
<td>San Jose–Monterey</td>
<td>1708 (4)</td>
<td>34 (1)</td>
<td>298</td>
<td>40</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>6422 (15)</td>
<td>896 (23)</td>
<td>1069</td>
<td>79</td>
</tr>
</tbody>
</table>

### Table 3. Comparison of Surgical Treatment by Race Among Patients With Stage II and III Rectal Cancer

<table>
<thead>
<tr>
<th>Operation</th>
<th>Any Operation</th>
<th>Unadjusted OR</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>96 * 4</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Black</td>
<td>94 * 6</td>
<td>1.50</td>
<td>1.30 (1.12-1.95)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operation</th>
<th>Any Operation</th>
<th>Unadjusted OR</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>63 * 37</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Black</td>
<td>57 * 43</td>
<td>1.29</td>
<td>1.42 (1.23-1.65)</td>
</tr>
</tbody>
</table>
While most patients of both races underwent some surgical procedure for rectal cancer, after adjusting for stage, surgical therapy was less likely to be provided to blacks than whites. Two similar reports from national databases indicate that, among the less severely ill, black inpatients with colorectal cancer are treated less aggressively than whites.33,34 These published data suggest that the less aggressive surgical care cannot be explained wholly by clinical data. Furthermore, studies of standardized adjuvant therapy protocols describe similar or identical treatment efficacy for blacks and whites.6,7 Thus, among patients with colorectal cancer, differences in provision of surgical and adjuvant care do not appear to be based wholly on biological predicates, such as comorbid disease.

We also specifically investigated rectal cancer treatment because radiation therapy has been increasingly accepted as the standard of care for stage II and III rectal cancer since the 1990 National Institutes of Health consensus conference on adjuvant therapy for colon and rectal cancer.17 Neoadjuvant radiation therapy provides the added benefit of tumor shrinkage, potentially allowing a sphincter-sparing procedure to be performed on patients with more distal tumors.11,30 Among stage II and III patients, we found that any radiation therapy was less likely to be delivered to blacks than whites. We were surprised to find that less than 50% of patients overall underwent radiation treatment. Using a linked SEER-Medicare database, Schrag and colleagues documented slightly higher rates of radiation treatment among patients older than 65 years, but these were insured patients assessed between 1992 and 1996, and those with local excision or rectosigmoid disease were excluded. Our decision to include patients diagnosed as having rectosigmoid cancer was based on the highly variable anatomic transition of rectum to sigmoid colon and would tend to bias our results toward the null hypothesis.

A recent publication examining the treatment of rectal and rectosigmoid cancer patients in California between 1994 and 1996 noted that only 44% of patients with stage II disease and 60% of patients with stage III disease received some adjuvant therapy.36 However, these patients experienced wide variation in treatment regimens that could not be wholly explained by clinical data. Our finding that an even smaller proportion of patients received the recommended treatment on the national level likely reflects regional differences in the diffusion of standardized care.

Neoadjuvant radiation therapy, which can facilitate sphincter preservation and may be a marker for increased expertise in rectal cancer care,11,28 was delivered more equivalently but to only 7% of patients overall. As neoadjuvant radiation therapy is more widely performed in the future, monitoring its delivery may provide further insights into whether race-based variations in care are narrowing.

This study has several limitations. Using the SEER database limited our ability to assess the effect of potentially important confounders, including some tumor-related features, patient comorbidities and preferences, provider and hospital system characteristics, and socioeconomic variables. Future investigations using linked databases will allow us to account for many of these potential confounders. Additionally, we did not have detailed information regarding technical issues, such as precise location of the tumor in the rectum, which may influence the type of procedure performed. However, while previous studies suggest that blacks have a higher incidence of proximal colon cancer,11,34 there is no evidence to suggest that blacks have a higher incidence of distal rectal cancer than whites. Furthermore, we found a relatively increased proportion of women among black patients with rectal cancer, and the female pelvis renders a sphincter-preserving operation more technically feasible.

Despite these limitations, we found evidence of consistent racial disparities in the receipt of established treatment regimens for rectal cancer. The differences extended most markedly to the disparate rates of sphincter-ablating operations, which mandate permanent colostomy, and may have a profound effect on self-image and quality of life. We also identified discrepancies in the application of recommended surgical and radiation therapy, which have been consistently shown to enhance survival.17,28 Further studies are warranted to investigate the relationships among race, treatment, and, ultimately, survival, controlling for patient- and provider-related variables. These findings further underscore the need for surgeons, oncologists, and health care policy makers to intensify their efforts to deliver state-of-the-art combined modality rectal cancer therapy to all patients.

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