Hospital Procedure Volume and Teaching Status Do Not Influence Treatment and Outcome Measures of Rectal Cancer Surgery in a Large General Population

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A clear benefit of increased hospital procedure volume or teaching hospital status on outcomes of rectal cancer surgery has yet to be shown. Few have examined treatment differences that may lead to varying outcomes. This study assessed the impact of hospital procedure volume and teaching status on both treatment and outcome measures of rectal cancer surgery in a large general population. Data were obtained for 1072 incident cases of rectal adenocarcinoma diagnosed in 1990 from Ontario, Canada, and treated with a major resection. Hospitals were classified by teaching status and procedure volume. Pathology reports were examined for 418 procedures. Abdominoperineal resections accounted for 31.0% of all procedures. There were no clinically significant differences in treatment measures, operative mortality, and long-term survival among the hospital groups according to both univariate and multivariate analyses. In conclusion, the absence of a hospital volume or teaching status effect on treatment and outcome measures suggests that for rectal cancer surgery in Ontario, centralization of procedures into high-volume or teaching centers is unlikely to improve surgical quality. (J GASTROINTEST SURG 2000;4:324-330.)

KEY WORDS: Rectal neoplasm, outcomes, database

A clear benefit has yet to be shown for increased volume or teaching status in terms of outcomes of rectal cancer surgery.7-13 This study examined these relationships in Ontario, Canada—something that had not been done previously in a large general population. We created treatment measures to look for actual treatment differences among hospital groups in Ontario, and considered the potential role of treatment and outcome measures in quality initiatives.

METHODS

Data Source and Inclusion Criteria

The Ontario Cancer Registry collects data on all cancer cases in the province of Ontario, Canada (population 10.2 million). Relevant variables were abstracted from the Registry including patient age, sex, comorbidity, discharge status (alive or dead), long-
term survival (alive, dead, or lost to follow-up), and hospital affiliation (teaching or nonteaching institution). We defined a major resection for rectal cancer as abdominoperineal resection (APR) or low anterior resection (LAR), if linked to a diagnosis of colon or rectal cancer (Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures [CCP] codes 604 or 605, respectively), linked to International Classification of Diseases, Clinical Modification Ninth Revision (ICD-9) diagnosis codes 153 or 154, respectively). The inclusion of colon cancer if linked to a rectal procedure ensured the capture of high rectal lesions.

All incident cases of colorectal cancer diagnosed in calendar year 1990 were selected for analysis if they satisfied the preceding link, had no other cancer diagnosis, had histologic findings consistent with adenocarcinoma, underwent resection within 60 days of diagnosis, and if the patient was 20 years of age or more. Year 1990 was chosen because survival data were available only into year 1996. The 60-day window was designed to examine the usual standard of care in the province—there were only 54 major resections past our 60-day window. The administrative database lacked details on the presence of metastatic disease, use of adjuvant therapy, incidence of local tumor recurrence, and cancer-related mortality.

Pathology Reports

We reviewed pathology reports for 418 of our 1072 cases—resource limitations precluded the examination of all reports. An attempt was made to examine every APR report since we were interested in sphincter preservation as a treatment measure. Close examination of 344 of a potential 352 APR reports indicated that 20 cases were procedure LAR for a false APR rate of 5.8%. Appropriate coding adjustments were made resulting in the review of 324 APRs and 94 LARs; the original 74 LAR reports were selected using a random sample process. Tumor variables abstracted included size, grade, depth of wall invasion, margin status, lymph node status, number of lymph nodes reported, and distance between the tumor edge and distal resection margin.

Treatment and Outcome Measures

Treatment measures examined included number of sphincter-removing procedures (APR rate), number of lymph nodes assessed, anal verge–tumor distance (for APRs), and distal margin–tumor distance (for LARs). These measures considered two important aspects of rectal cancer surgery—sphincter preservation and an adequate oncologic resection. Provision of an APR, and thus loss of the anal sphincter, is ostensibly a function of tumor distance from the anal verge; tumors located 5 cm or more from the verge usually can be removed and the proximal bowel reanastomosed to the distal rectum or anal canal. Also, work done prior to 1990 by various investigators supports the need for thorough dissection of the mesorectum—the lymph node–bearing portion of the rectum—and a minimal 2 cm distal resection margin. Outcomes chosen included operative mortality and long-term overall survival. Operative mortality was any in-hospital death during the index admission and was not limited to 30 days. (The database used is highly accurate and complete when coding operative mortality and long-term survival.)

Analysis

The database did not include surgeon-specific data, and analyses were limited to the hospital level. Prior to assessing them for treatment or outcome differences, individual hospitals were placed into low-volume (11 or less), medium-volume (12 to 17), or high-volume (18 or more) groups based on the number of major resections performed during the study period, and into teaching (i.e., involved with the training of physicians) or nonteaching institutions. Volume cutoffs created three evenly sized groups; this combined the need for statistical stability and clinical relevance. Where appropriate, chi-square, Kruskal-Wallis, or Wilcoxon two-sample testing measured for differences among the groups in patient and tumor variables and in treatment and outcome measures.

Logistic regression models analyzed operative mortality, whereas proportional hazards models assessed long-term survival. All models included the explanatory variables of hospital volume, hospital teaching status, and patient age, sex, and comorbidity score. The Deyo et al. validated modification of a comorbidity index for the ICD-9-CM database was used to define comorbidity. Radiotherapy services in Ontario are centrally controlled and delivered at one of only nine regional cancer centers. Therefore registration at a regional cancer center within 120 days of diagnosis was considered a proxy of advanced disease and included in the survival models. Twenty-three cases registered at a regional cancer center prior to surgery were excluded—possible very advanced tumors treated with neoadjuvant therapy. A separate survival model for the 418 cases with reviewed pathology also incorporated nodal status and depth of wall invasion.

A number of sensitivity analyses for our regression models tested the robustness of our results. First, volume cutoffs were varied by one to three procedures in all directions. In addition, we created very low-