Changes in Profile and Colorectal Cancer Stage over 15 Years in Puerto Rico

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Introduction: The stage of a malignant tumor defines how advanced the malignant process is at the time of diagnosis. In many clinical scenarios it is an indirect measurement of the efficacy of screening interventions used for early detection. We have evaluated changes in the tumor-node-metastasis (TNM) stage of colorectal cancer across a 15-year period.

Methods: This was a retrospective study in which all patients who underwent colorectal cancer surgery at the HIMA San Pablo Medical Center in 1988–1990 (period 1) and 2002–2004 (period 2) had their pathological report examined. The TNM stage for all patients was examined by using standard criteria.

Results: A total of 285 patients were evaluated: 108 in period 1 and 177 in period 2. The number of patients >71 years of age who underwent colon surgery increased (33% vs 46%). An increase in patients with stage one colon cancer was observed in period 2 (30% vs 10%) with a corresponding decrease in stage 2 and 3 (59% vs 83%).

Conclusion: The pathologic and demographic profile of patients with colorectal cancer has changed over 15 years. Patients with colon cancer are younger and have an earlier stage of disease with a decrease in lymph node involvement. Patients with rectal cancer were older and more likely to be men. (*Ethn Dis*. 2008;18[Suppl 2]:S2-128–S2-131)

Key Words: Colon Cancer, Rectal Cancer, Screening, TNM Staging

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Introduction

Establishing the stage of a malignant tumor can define the prognosis of individual patients and aid in the choice of appropriate therapeutic modalities. The value of any staging system is to establish a survival advantage of individual patients at the time of diagnosis by instituting appropriate therapy. In this study, we evaluated changes in the age, sex, and cancer stage patients with colorectal cancer at two different time intervals.

The staging of colorectal tumors has undergone significant changes between the two time periods we aim to study. A number of tumor-related characteristics are used to define the individual stage of malignant tumors. These include the site of the primary lesion, size, and extent of growth, histological type, and histological grade. When variables are combined, the prognostic ability is significantly enhanced.

Since the description of the first practical staging system by Dukes,[1] staging systems have evolved. The availability of different staging systems to classify tumor presentation across time makes a direct comparison of a cohort of patients difficult because of differences in the definition of the variables used in each staging system[2,3]. Thus proper comparison of any cohort of colorectal cancer patients across time makes it necessary to recompute the stage of tumor with a uniform system.[4,12]

During the last 15 years, the introduction of aggressive screening interventions—fecal occult blood testing and direct colonic visualization—have played an important role in the earlier detection of colorectal cancer. In addition, the introduction of colorectal surgery as a certified subspecialty may have changed the nature and extent of surgical specimens available for staging.[6,13–15] Both of these factors may modify the presenting stage of patients with colorectal cancer.[5,16] We believe that if screening has become more effective, colorectal tumors would have been down-staged after 15 years.[7]

In this study, we examined the stage of the malignant process in a cohort of patients who underwent colorectal surgery in the San Pablo Medical Center in 1988–1990 and 2002–2004. We evaluate differences in the tumor-node-metastasis (TNM) stage presentation of colorectal cancer, along with the age and sex of patients at the time of the surgical intervention.

Materials and Methods

Study Population

We evaluated all patients who underwent colorectal cancer surgery during 1988–1990 (period 1) and 2002–2004 (period 2) in the San Pablo Medical Center Hospital in Bayamón, Puerto Rico. A total of 286 pathology records that met the inclusion criteria for the study were included for analysis. Patients were excluded if a surgical excision was not performed. Surgical resection was defined as a procedure in which the primary tumor and draining lymph nodes were removed and reported by the pathologist. Each worksheet was assigned a specific number for purposes of confidentiality and for internal control. The worksheet included the pathological record number in order to allow future access to the report in the future if necessary. All patients

were stratified and restaged using the TNM staging system.[9] This normalization of the stage allowed us to compare the stages of patients across the time period examined. The TNM staging system compartmentalizes carcinomas according to the depth of invasion of the primary tumor, the absence or presence of regional lymph node metastases, and the absence or presence of distant metastases.[9]

We have stratified and compared our study cohorts by using the following variables: age at presentation, sex, type of surgeon (general vs colorectal surgeon), and stage at presentation. In addition we analyzed colon and rectal cancer as separate entities, considering that in many cases preoperative radiotherapy is used to downstage rectal cancer patients.[10] We also evaluated the number of regional lymph nodes examined in the surgical specimen. These have been stratified the following way: group 0: no nodules removed, group I: 1–3 nodules removed, group II: 4–9 nodules removed, and group III >10 nodules removed. This study was evaluated and approved by our institutional review board.

Statistical Analysis

For purposes of analysis we separated colon cancer from rectal cancer. A descriptive analysis was performed by using SPSS 14.0 (SPSS, Inc., Chicago, Ill). In order to determine the association between the different variables, the χ^2 test of independence was used.

RESULTS

A total of 286 patients met the inclusion criteria, 109 in period 1 and 177 in period 2. The median age was 68 years in the first period and 66 years in the second period. We stratified and compared the age of patients at presentation: ≤54 years of age, 55–70 years , and ≥71 years . In Tables 1 and 2 we present a comparison of age, sex, and type of surgeon performing the procedure in both periods.

Table 1. Colon cancer

	Age *n* (%)	Sex	Surgeon
Period 1		**Period 1**	**Period 1**
≤54 years	10 (14.7%)	Males	General
55–70 years	27 (39.7%)	32 (47.1%)	57 (83.8%)
≥71 years	31 (45.6%)	Females	Colorectal
		36 (52.9%)	6 (8.8%)
Period 2		**Period 2**	**Period 2**
≤54 years	18 (13.5%)	Males	General
55–70 years	71 (53.4%)	62 (46.6%)	45 (33.8%)
≥71 years	44 (33.1%)	Females	Colorectal
		71 (53.4%)	87 (65.4%)
	P= .101	*P* =.953	*P* = .011

The sex distribution for colon cancer was similar in both periods, but for rectal cancer more men were seen in the second period (60% vs 77.3%) (*P*=.087).

We evaluated the training of the surgeon on record for all patients in both periods (Table 1 and 2). As anticipated, more procedures were performed by colorectal surgeons in the second period for colon cancer (65.4% vs 8.8%) (*P*=.011) and for rectal cancer (75% vs 22%). In the second period, colorectal surgeons were more likely to operate on patients with a lower stage of disease than were general surgeons (Table 3).

We compared and analyzed the presenting pathological stage of colon and rectal cancer between the two periods of time. More patients presented with earlier-stage disease in the second period (Table 3), although no differences were seen in patients with stage 4 cancer. As shown in Table 3, similar trends were observed for rectal cancer, with a decrease in patients with stages 2 and 3; nevertheless, the use of preoperative radiotherapy was prevalent in our community during the second period, which may have downstaged patients with rectal tumors.

We analyzed the presence or absence of positive lymph nodes as a function of the period of time, the age of the patient, and sex (Table 4). In the first period, 52.9% of patients had at least one positive lymph node as compared to 38.5% in the second period (*P*=.076). This finding was not observed in patients with rectal tumors. Younger patients (<70 years) were observed to have a higher percent of positive lymph nodes in both colon and rectal tumors (44% and 36% vs 39.1% and 28.6%) (*P*=.436 and .620). In colon cancer,

Table 2. Rectal cancer

	Age *n* (%)	Sex	Surgeon
Period 1		**Period 1**	**Period 1**
≤54 years	8 (19.5%)	Males	General
55–70 years	15 (36.6%)	24 (60.0%)	29 (70.7%)
≥71 years	18 (43.9%)	Females	Colorectal
		16 (40.0%)	9 (22%)
Period 2		**Period 2**	**Period 2**
≤54 years	5 (11.4%)	Males	General
55–70 years	20 (45.5%)	34 (77.3%)	11 (25%)
≥71 years	19 (43.2%)	Females	Colorectal
		10 (22.7%)	33 (75%)
	P =.514	*P* =.087	*P* =.315

Table 3. Type of surgeon vs colon and rectal cancer tumor-node-metastasis (TNM) stage

	TNM staging	Colorectal surgeon	General surgeon	*P* value
Colon: Period 1				.303‡
Stage0	1(1.5%)	0	1(1.8%)	
Stage1	7(10.4%)	2(33.3%)	4(7.1%)	
Stage2	33(49.3%)	2(33.3%)	27(48.2%)	
Stage3	22(32.8%)	1(16.7%)	21(37.5%)	
Stage4	4(6%)	1(16.7%)	3(5.4%)	
Colon: Period 2				.011+
Stage0	2(1.5%)	2(2.3%)	0	
Stage1	40(30.1%)	35(40.2%)	5(11.1%)	
Stage2	47(35.3%)	23(26.4%)	24(53.3%)	
Stage3	32(24.1%)	18(20.7%)	13(28.9%)	
Stage4	12(9%)	9(10.3%)	3(6.7%)	
	P=.024*			
Rectal: Period 1				.908‡
Stage0	0	0	0	
Stage1	4(9.8%)	1(11.1%)	3(10.3%)	
Stage2	24(58.5%)	4(44.4%)	18(62.1%)	
Stage3	12(29.3%)	4(44.4%)	7(24.1%)	
Stage4	1(2.4%)	0	1(3.4%)	
Rectal: Period 2				.315‡
Stage0	1(2.3%)	1(3%)	0	
Stage1	11(25%)	10(30.3%)	1(9.1%)	
Stage2	21(47.7%)	15(45.5%)	6(54.5%)	
Stage3	8(18.2%)	6(18.2%)	2(18.2%)	
Stage4	3(6.8%)	1(3%)	2(18.2%)	
	P=.187†			

* Differences between Periods and stages of colon cancer.
† Differences between periods and stages of rectal cancer.
‡ Differences between general vs. colo-rectal surgeon per period.

males were more often found with positive lymph nodes than females (49.4% vs 36.7%) (*P*=.86). This later finding was not observed in rectal tumors. Although not statistically significant, the data suggest trends in the demographic profile of the patients who underwent the surgical resection and should be further evaluated with a greater number of patients.

CONCLUSIONS

More colon cancer surgeries were performed at our institution in 2000–2004 than in 1988–1990, perhaps because of an increase in colorectal cancer screening. The fact that more patients presented with lower-stage colon cancer in the second period supports this hypothesis. Nevertheless, the number of rectal tumors was similar in both periods. This finding is perplexing, since more effective screening practices, which include fecal occult blood testing and flexible sigmoidoscopy, should lead to an increase in the detection of rectal tumors compared with colon tumors.[8,18] An additional point is that several reports suggests that the location of primary colonic tumors are shifting towards the right side of the colon. Our data is consistent with this if rectal tumors are excluded from the analysis.[17]

We observed a tendency toward an increase in the number of younger patients undergoing surgery for both colon and rectal cancer. This tendency was more pronounced in patients aged 55–70 years for colon cancer, but it did not reach significance. No significant differences in the gender distribution

Table 4. Analysis of positive lymph nodes compared to period, age, and sex

	Colon cancer	*P* value	Rectal cancer	*P* value
Period 1	52.9%	.076	34.6%	.982
Period 2	38.5%		34.9%	
Age				
≤70 years old	44%	.436	36%	.620
≥71 years old	39.1%		28.6%	
Sex				.867
Males	49.4%	.086	35.4%	
Females	36.7%		33.3%	

between the two periods were observed for colon cancer or rectal cancer. This finding may indicate that screening interventions are available and implemented in both sexes, arguing against the existence of a healthcare disparity on the basis of sex.[19] Nevertheless, in absolute numbers, more men than women had rectal cancer diagnosed in period 2. A plausible explanation may be related to an increase in digital rectal examinations related to the availability of the prostatic antigen blood test(PSA) during the second period. The presence of marginally abnormal PSA test was available and frequently used during the second period of our study. Abnormal PSA tests could have led to an increased in the frequency of DRE, which would have led to increased detection of rectal cancer. Additional studies should determine whether the availability of the prostate-specific antigen test as a routine part of the male exam is contributing to an increase in digital rectal examination

With the introduction of colorectal surgery as a subspecialty in our hospital, we expected to see an increase in the number of earlier-stage patients, as these would be referred to colorectal surgeons for intervention. In patients with colon cancer, we found an increase of 56.6% in the referral to colorectal surgeons in the second period as hypothesized. This was accompanied by a decrease in the number of patients being managed by general surgeons. A similar finding was observed among patients with rectal cancer. Both findings were accompanied by an expected increase in the numbers of patients with earlier-stage tumors, particularly those in which a colorectal surgeon were involved. We believe that one of the reasons general surgeons are faced with patients having a more advanced stage of disease may be related to an increase exposure of these surgeons to situations in which more emergent interventions are required. Emergent situations include events such as colonic obstructions or patients presenting with more painful or symptomatic disease. The general finding of our study, nevertheless, is that the presenting tumor stage for both colon and rectal cancer in the second period represented an earlier tumor-node-metastasis stage as compared to the first period of time.

In this study we also analyzed the presence and number of positive lymph nodes removed during the cancer surgery. A decrease in the percent of positive lymph nodes was seen during the second period for colon cancer patients but no difference in patients with rectal cancer. We also observed a higher percentage of positive lymph nodes in patients <70 years of age for both colon and rectal cancer. Finally, males were more frequently seen with positive lymph nodes than females, which may mean that males are being screened for cancer at a more advanced stage of disease.

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