



# Proximal Shift of Colorectal Cancer Along With Aging

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## Abstract

**This study reviewed 1059 patients with colorectal cancers (CRCs) to evaluate the age-related changes in the clinicopathologic features, according to the gender. The presence of concomitant adenoma was the only independent age-related factor in men ( $P = .0044$ ), whereas the presence of right-sided CRC was the only one in women ( $P < .0001$ ). The results suggest the oncologic background difference between men and women among the elderly.**

**Introduction:** Although several reports have documented the increased incidence of right-sided colorectal cancer (CRC) in the elderly, especially in women, the gender-specific, age-related changes in the characteristics of CRCs, especially related to the cancer localization, have not been fully investigated. This study evaluated the age-related changes in the clinicopathologic features of CRCs, according to the gender. **Materials and Methods:** A total of 1059 consecutive patients with CRCs who were admitted to the authors' surgical department between February 2005 and June 2012 were retrospectively reviewed. The patients were divided into male ( $n = 632$ ) and female ( $n = 427$ ) groups and then according to the age group, and the correlation between the age group and the other clinicopathologic features was analyzed by univariate and multivariate analysis. **Results:** The number of concomitant adenomas found was significantly increased along with increasing age in men, and the presence of concomitant adenoma was the only independent age-related factor of male CRC in the multivariate analysis ( $P = .0044$ ). In contrast, in women, the location of the CRC progressively shifted to the right side (proximal colon) with increasing age, and the presence of right-sided CRC was the only independent factor of female CRC in the multivariate analysis ( $P < .0001$ ). **Conclusion:** There was a significant gender-specific difference in the age-related changes in the characteristics of CRC. Increasing the number of concomitant adenomas and the shift of CRC localization to the proximal colon were the gender-specific characteristics of male and female CRC, respectively.

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## Introduction

Colorectal cancer (CRC) is the third most commonly diagnosed cancer in men and the second in women.<sup>1</sup> Given that the incidence of CRC is known to increase with increasing age,<sup>2-4</sup> understanding the age-related changes in the clinicopathologic features of CRCs is very important for the implementation of age-related preventive/therapeutic measures.

Presently, it is reported that CRCs in the elderly have (1) a higher incidence of proximal (right-sided) location, especially in women, (2) a higher incidence of poorly differentiated adenocarcinoma, (3) a relatively low metastasis rate, and (4) a higher incidence of multiple tumors.<sup>5-7</sup> Although several reports have documented the characteristics of CRCs in the elderly, to the best of the authors' knowledge, gender-specific, age-related changes in the characteristics of CRCs, especially focusing on the detailed cancer localization, have not been fully investigated. The present study aimed to clarify the gender-specific, age-related changes in the clinicopathologic features of CRCs.

## Materials and Methods

### Samples

A total of 1059 consecutive patients with CRC who were admitted to the Department of Surgical Oncology at the University

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## Proximal Shift of CRC With Aging

of Tokyo Hospital between February 2005 and June 2012 were retrospectively reviewed. Among them, 1036 patients received surgery. Patients diagnosed with ulcerative colitis, familial adenomatous polyposis, or hereditary nonpolyposis colorectal cancer were excluded from the study. Clinical and histopathologic features of

patients and tumors were obtained from the records of patients and were analyzed based on the TNM classification of malignant tumors of the Union for International Cancer Control (UICC, seventh edition).<sup>8</sup> Most of the cases (about 90%) received preoperative colonoscopy, and those with obstructive CRC received either intraoperative colonoscopy or total colonoscopy within a year postoperatively. Of the 1059 patients analyzed, 98 had 2 or more primary CRCs. In these cases, the histopathologic features of the dominant lesion, which was defined as the largest or the deepest, were analyzed. The numbers of concomitant adenomas 5 mm or larger in diameter were also assessed. All patients received informed consent and agreed to participate in this study, which was approved by the ethical committee of the University of Tokyo.

**Table 1 Patient Characteristics**

Patient Characteristics	n	(%)
Number	1059	(100)
Mean Age (Years) ± SD	66.2 ± 11.1	
Gender		
Male	632	(59.7)
Female	427	(40.3)
Number of Cancers		
≥4	6	(0.6)
3	13	(1.2)
2	79	(7.5)
1	961	(90.7)
Number of Concomitant Adenomas		
≥3	64	(6.0)
2	82	(7.7)
1	194	(18.3)
0	719	(67.9)
<b>Characteristics of Cancers</b>		
Tumor Location		
Appendix/cecum	73	(6.9)
Ascending colon	130	(12.3)
Transverse colon	85	(8.0)
Descending colon	38	(3.6)
Sigmoid colon	329	(31.1)
Rectum	404	(38.1)
Tumor Depth <sup>a</sup>		
Tis-T2	353	(33.6)
T3-4	698	(66.4)
Histologic Type		
Well/moderate	989	(93.4)
Others	70	(6.6)
Regional Lymph Node Metastasis		
Absent	657	(62.0)
Present	402	(38.0)
Distant Metastasis		
Absent	908	(85.7)
Present	151	(14.3)
Lymphatic Involvement		
Absent	732	(71.1)
Present	297	(28.9)
Venous Involvement		
Absent	329	(32.0)
Present	700	(68.0)

Abbreviation: Tis = tumor in situ.

<sup>a</sup>TNM classification of malignant tumors, seventh edition, according to the UICC (Union for International Cancer Control).

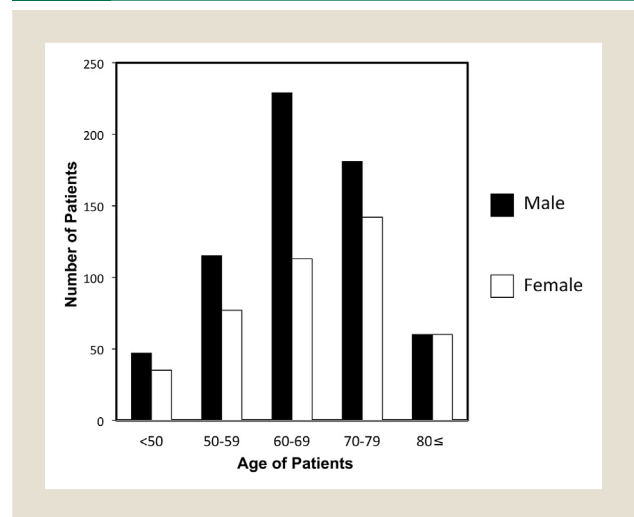
### Statistical Analysis

Univariate analysis of the correlation between patient age and clinicopathologic variables was assessed by using both parametric and nonparametric methods. Univariate analysis for tumor depth (Tis-T2, T3-T4), histologic type (well/moderate, others), regional lymph node metastasis, distant metastasis, lymphatic involvement, and venous involvement were carried out by the parametric method using the unpaired Student *t* test. The ordered variables, such as tumor location, the number of cancerous lesions, and the number of concomitant adenomas, were analyzed by the nonparametric method using the Spearman rank correlation coefficient. Significant variables affecting patient age were assessed by multivariate analysis using a logistic regression model. All analyses were performed with JMP, version 11.0 (SAS Institute Inc), and a 2-sided value of *P* < .05 was regarded as statistically significant.

### Results

The general features of the patients are shown in Table 1. The patient age ranged from 28 to 93 years (mean age, 66.2 ± 11.1 years). Of 1059 patients included, 632 (59.7%) were male and 427 (40.3%) were female. The number of male and female patients in

**Figure 1** Number of Men and Women in Each Age Group. The Female-to-Male Ratio Increases With Increasing Patient Age, and This Tendency Was More Prominent in the Population Older Than 70 Years



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