

# Clinical Features of Colorectal Cancer Detected by the National Cancer Screening Program

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**Purpose:** Since 2004, the National Cancer Screening Program of Korea has included colorectal cancer screening based on primary screening with the fecal occult blood test (FOBT). We report on the clinical features of colorectal cancer detected by the National Cancer Screening Program.

**Methods:** We retrospectively analyzed 577 patients who underwent elective surgery for colorectal cancer at the Seoul National University Hospital between January 2008 and December 2009. We compared the clinical features of colorectal cancers detected by the National Cancer Screening Program (NCSP group) with those of the control group in terms of age, gender, preoperative symptom, location of the tumor, surgical technique and tumor-node-metastasis (TNM) stage.

**Results:** Age, gender, location of the tumor and operation types were not different between the two groups. The proportion of asymptomatic patients was significantly higher in the NCSP group than it was in the control group (86.5% vs. 20.0%;  $P < 0.001$ ). The proportion of less invasive lesions (T1 or T2) was significantly higher in the NCSP group (46.3% vs. 27.7%;  $P = 0.002$ ). The pathologic stages of the colorectal cancers in the NCSP group were I, 40.3%; II, 17.9%; III, 40.3% and IV, 1.5% whereas in the control group, they were I, 20.8%; II, 32.9%; III, 34.9% and IV, 11.4%. The proportion of stage I cancer was significantly higher in the NCSP group than in the control group (40.3% vs. 20.8%;  $P = 0.006$ ).

**Conclusion:** Our study demonstrates the FOBT in the NCSP is effective in early detection of colorectal cancer.

**Keywords:** FOBT; National Cancer Screening Program

## INTRODUCTION

According to the National Cancer Registry Data reported by the National Cancer Information Center, colorectal cancer (CRC) occurs in 33 persons out of 100 thousand in Korea and ranks third following stomach cancer and thyroid cancer in terms of the incidence rate, and its incidence rate is currently skyrocketing [1-4]. In addition, although the five-year survival rate for colorectal cancer occurring from 2003 to 2007 has been recorded as 68.7%, the survival rate has dropped sharply

with the progression of stages as the rates of stage I and stage IV cancer are over 90% and less than 5%, respectively. Therefore, to reduce the mortality rate caused by colorectal cancer, early detection is a prerequisite [4-6]. Screening tests for early detection of colorectal cancer are the fecal occult blood test (FOBT), sigmoidoscopy, colonoscopy, and double-contrast barium enema, and a large-scale case control study using FOBT revealed that the mortality rate due to colorectal cancer was decreased by 16% in the group participating in the screening [7-10].

In Korea, the "Cancer Control Plan for the Next 10 Years" was implemented in 1996, and the second-term "Cancer Control Plan for the Next 10 Years" has been operating since 2006. As a plan of action, the National Cancer Screening Program (NCSP) has been ongoing since 1999, and the program has included CRC screening since 2004. For this, medical aid recipients and national health insurance beneficiaries older than 50 years take the FOBT every year, and when the result is positive, they take confirmative tests, 'colonoscopy' or 'double-contrast barium enema' [11] (Fig. 1). To date, however, data on

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improved screening and survival rates due to the FOBT have not been reported. Therefore, this study investigated the clinical characteristics of colorectal cancer detected by the FOBT performed in the NCSP to provide basic data on screening of colorectal cancer and to help to decide future directions for the NCSP.

## METHODS

From January 2008 to December 2009, 588 patients underwent elective surgery for CRC at Seoul National University Hospital. We excluded 11 patients who had undergone surgery due to colorectal cancer or who had been diagnosed with familial adenomatous polyposis or hereditary non-polyposis colorectal cancer; the remaining 577 patients were included for analysis. We divided these patients into two groups; the NCSP group (n = 67) whose CRCs were diagnosed by using the NCSP, and the control group (n = 510). Demographic and clinicopathologic characteristics of the patients were compared between the groups. All statistical analyses were conducted with SPSS ver. 17.0 (SPSS Inc., Chicago, IL, USA) for Windows, and the chi-squared test or the independent sample t-test was utilized. A P-value of less than 0.05 was considered to be statistically significant.

## RESULTS

### Age and gender

The mean age of the 577 subjects was  $61.6 \pm 11.4$  years (range, 22 to 91 years), and the mean age of the NCSP group was significantly higher than that of the control group ( $64.5 \pm 6.6$  years [range, 50 to 80 years] vs.  $61.2 \pm 11.8$  years [range, 22 to 91 years], respectively,  $P = 0.001$ ). Of the total subjects, 356 (61.7%) and 221 (38.3%) were males and females, respectively, for a ratio of 1.6:1. The male-to-female ratios of the NCSP group and the control group were 1.9:1, with 44 (65.7%) males and 23 (34.3%) females, and 1.6:1, with 312 (61.2%) males and 198 (38.8%) females, respectively, and this difference was not statistically significant ( $P = 0.477$ ) (Table 1).

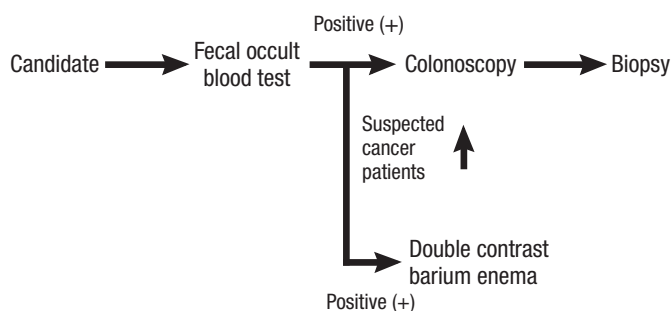


Fig. 1. Colorectal cancer screening procedure.

### Preoperative symptoms

In the NCSP group, as preoperative symptoms, no symptoms, hematochezia, abdominal pain, change of bowel habit and dyspepsia were found in 58 (86.5%), 5 (7.5%), 2 (3%), 1 (1.5%) and 1 (1.5%) cases, respectively. In the control group, hematochezia, changes of bowel habit, no symptoms, abdominal pain, dyspepsia and other symptoms were found in 183 (35.9%), 105 (20.6%), 102 (20.0%), 85 (16.6%), 11 (2.2%) and 24 (4.7%) cases, respectively. Asymptomatic patients accounted for the largest portion in the NCSP group while hematochezia was the main symptom in the control group ( $P < 0.001$ ).

### Location of tumors

The location of the tumor was classified as the ascending colon, the transverse colon, the descending colon, the sigmoid colon and the rectum. For the NCSP group, the tumors were located in the ascending colon, the transverse colon, the descending colon, the sigmoid colon and the rectum in 14 (20.9%), 3 (4.5%), 1 (1.5%), 22 (32.8%) and 27 (40.3%) patients, respectively, so rectal cancer was observed most frequently. For the control group, the tumors were located in the ascending colon, the transverse colon, the descending colon, the sigmoid colon and the rectum in 70 (13.7%), 46 (9.0%), 10 (2.0%), 159 (31.2%) and 225 (44.1%) patients, respectively. The distributions were not significantly different between the two groups ( $P = 0.400$ ).

### Surgical treatments

In both the NCSP group and the control group, a low anterior resection was conducted most frequently, and the surgical treatments of the two groups did not show any statistically significant difference ( $P = 0.069$ ) (Table 2).

### Histopathologic staging (TNM staging)

The rates of T1 and T2 cancers were relatively higher in the NCSP group (46.3%) than in the control group (27.7%), and the rate of stage I was also higher in the NCSP group (40.3%) than in the control group (20.8%). The rate of N0 cancer in the NCSP group was higher than that in the control group, but the difference was not statistically significant (Table 3).

## DISCUSSION

Cancer screening for persons aged 50 and over through the

Table 1. Distribution of age and gender

	NCSP group (n = 67)	Control group (n = 510)	P-value
Mean age (yr)	64.48 ( $\pm 6.60$ )	61.19 ( $\pm 11.88$ )	<0.01
Male:Female (%)	44:23 (65.7:34.3)	312:198 (61.2:38.8)	0.477

NCSP, National Cancer Screening Program.

**Table 2.** Distribution of surgical treatment

	NCSP group (n = 67)	Control group (n = 510)	P-value
Surgical treatment	Right hemicolectomy (16, 23.9)	Right hemicolectomy (104, 20.4)	0.069
	Left hemicolectomy (1, 1.5)	Left hemicolectomy (18, 3.5)	
	Anterior resection (22, 32.8)	Anterior resection (135, 26.5)	
	LAR (23, 34.3)	LAR (67, 32.7)	
	ULAR (4, 6.0)	ULAR (57, 11.2)	
	Subtotal colectomy (1, 1.5)	Others <sup>a</sup> (29, 5.7)	

Values are presented as number, %.

LAR, low anterior resection; ULAR, ultralow anterior resection.

<sup>a</sup>Subtotal colectomy, 6; total colectomy, 4; abdominoperineal resection, 5; Hartmann's operation, 3; stomy, 7 (colostomy, 5; ileostomy, 2); transanal excision, 4.

**Table 3.** Distribution of histopathologic stage (TNM stage)

	NCSP group (n = 67)	Control group (n = 510)	P-value
T-stage			0.002
T1	16 (23.9)	56 (11.2)	
T2	15 (22.4)	82 (16.5)	
T3	33 (49.2)	312 (62.7)	
T4	3 (4.5)	48 (9.6)	
N-stage			0.077
N0	40 (59.7)	293 (57.5)	
N1	22 (32.8)	123 (24.1)	
N2	5 (7.5)	83 (16.3)	
Nx	0 (0)	11 (2.1)	
M-stage			0.009
M0	66 (98.5)	452 (88.6)	
M1	1 (1.5)	58 (11.4)	
TNM-stage			0.006
I	27 (40.3)	106 (20.8)	
II	12 (17.9)	168 (32.9)	
III	27 (40.3)	178 (34.9)	
IV	1 (1.5)	58 (11.4)	

Values are presented as number (%).

NCSP, National Cancer Screening Program; TNM, tumor-node-metastasis.

FOBT, sigmoidoscopy, colonoscopy and double-contrast barium enema is well known to be important because early detection of CRC can improve the survival and the quality of life of patients [12]. Out of the screening tests, the FOBT is effective, cheap and less invasive [13]. However, while the FOBT produces no complications and is cheap and simple, additional tests are necessary due to its low sensitivity, low positive predictive value, and high false positive rate [14-16]. In addition, the National Polyp Study in the US reported that when persons who were normal in colonoscopy or whose polyps were removed by using a polypectomy were followed for six years, the incidence rate of CRC was reduced by 76-90% [17]. Thus, applying colonoscopy to all examinees can enhance detection rate; nevertheless, its use is limited to an additional test for persons with abnormal results on the FOBT because it is relatively expensive, can lead

to serious complications, such as colonic perforation, although it is rarely found, provokes discomfort in examinees and requires skilled endoscopy specialists, who are not available in sufficient numbers [13, 18, 19].

In this study, while the rates of T1 and T2 cancers and stage I cancer were relatively higher in the NCSP group than in the control group, the rate of stage IV cancer in the NCSP group (only one patient, 1.5%) was relatively low compared to that in the control group. Paimela et al. [20] also reported that the rates of stage I and II cancers were higher in the FOBT screening group (52%) than in the control group (38%) in their study conducted with around 100 thousand subjects from 2004 to 2006. That meant that CRC was detected earlier in the FOBT screening group than in the control group. This study found no significant difference in N staging between the two groups, and the reason is thought to be the small number of subjects.

The patients of the NCSP group (64.5 years) were observed to be older than those of the control group (61.6 years). That was considered to be because the recipients of the National Cancer Screening Program were over 50 years of age and did not include young patients.

This study is limited in demonstrating the exact effects of the screening because of the possibility of including patients who had undergone CRC screening outside the tract of the NCSP in the control group and including symptomatic patients at the time of screening in the NCSP group. However, because only few data on the CRC screening using the FOBT performed as a part of the NCSP are available, the results of this study are meaningful as basic data. Moreover, the finding that the rate of detection of cancer in its early stage was significantly higher in the national cancer screening group than in the control group carries an important meaning.

The CRC patients whose tumors were detected through the National Cancer Screening Program by using the FOBT showed a higher proportion of early stage lesions, which implies that the current National Cancer Screening Program in Korea contributes to early detection of colorectal cancer.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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