

# Surgical Results in 657 Patients with Colorectal Cancer

MATTI J. TURUNEN, M.D., PEKKA PELTOKALLIO, M.D.

Turunen MJ, Peltokallio P. Surgical results in 657 patients with colorectal cancer. *Dis Colon Rectum* 1983;26:606-612.

Six hundred fifty-seven patients with colorectal cancer who were operated upon at the Second Department of Surgery, Helsinki University Central Hospital during the period 1966 to 1975 had a 40.5 per cent crude five-year survival rate and 54.2 per cent relative (corrected) rate. The survival rates of patients with Dukes' A lesions were 80.7 per cent, Dukes' B, 61.6 per cent, Dukes' C, 40.4 per cent, and Dukes' D, 2.7 per cent. One hundred two patients (15.5 per cent) underwent emergency operations; 91 were occlusive cancers, eight were perforations and three were cancer bleedings. The operative mortality for the whole series was 6.5 per cent (4.7 per cent in elective and 16.7 per cent in emergency operations). A definite improvement of the five-year survival rates could be seen in both the colonic and rectal cancer series. This was due to earlier detection of the disease, reflecting a decreasing number of palliative operations.

Patients at high risk for colorectal cancer (inflammatory bowel disease, inherited intestinal polyposis, cancer family syndrome, multiple colorectal cancers, and neoplastic polyps) might benefit from more effective cancer surveillance and prophylactic surgery to find and treat cancers in earlier stages, to prevent recurrences, and to facilitate follow-up.

The controversial findings on postoperative adjuvant therapy presented in this study indicate the need for further controlled studies to define the patients who really benefit from it. [Key words: Cancer, colorectal; Neoplasms, staging of; five-year survival; Patients, high-risk; follow-up study]

IN CONTRAST WITH THE SITUATION in many developed Western countries, Finns have a relatively low risk of getting colorectal cancer. This is also true with respect to other Scandinavian countries, whose cultures closely resemble that in Finland. The low incidence of colorectal cancer has been explained by the differences in diet. Finns consume many cereal products, and dairy products form their main source of fat and protein, whereas these are supplied in the form of meat in Denmark and the U.S., where there is a high risk of getting colorectal cancer.<sup>1,2</sup>

The incidence of colorectal cancer in Finland has, however, doubled during the last two decades, and it is the

*From the Second Department of Surgery,  
Helsinki University Central Hospital,  
Helsinki, Finland*

most frequent malignancy of the gastrointestinal tract.<sup>3-5</sup> This increase in incidence has coincided with a constant slow decrease in the incidence of gastric cancer, which has also been noticed in several other countries. Among Finnish women, colorectal cancer has become the second most frequent type of malignancy, second only to breast cancer. Among Finnish men, it is the fourth most frequent malignancy with only lung, prostatic, and gastric cancers occurring more widely.

This work was undertaken because of the increasing importance of colorectal cancer as the most frequent malignancy of the alimentary tract in Finland. It reports the surgical results of a ten-year study of a colorectal cancer series at the Second Department of Surgery, Helsinki University Central Hospital. The possibilities for improving the prognosis in colorectal cancer in the future are discussed.

## Material and Methods

The material consists of 657 patients (350 females and 307 males) who were operated upon for colorectal adenocarcinoma during the period, January 1, 1966, to December 31, 1975, at the Second Department of Surgery, Helsinki University Central Hospital. All information concerning initial symptoms, diagnostic delay, site of the cancer, type of operation, primary complications, postoperative therapy, and subsequent survival, was recorded. Also, information concerning previous family history of colorectal cancer, or the patient malignancies other than colorectal cancer, was noted.

The pathologic diagnosis of the primary tumor was available for every patient in the series. Based on the histology available, the tumors could be arranged according to a modified Dukes' classification.<sup>6,7</sup>

The site distribution of the tumors within the colon and rectum is demonstrated in Fig. 1. Cancers located within 15 cm of the pectinate line were considered as

Received for publication November 15, 1982.

Supported by a grant from the Finnish Cancer Society, Helsinki, Finland.

Address correspondence and reprint requests to Dr. Turunen: Second Department of Surgery, Helsinki University Central Hospital, Haartmaninkatu 4, 00290 Helsinki 29, Finland.

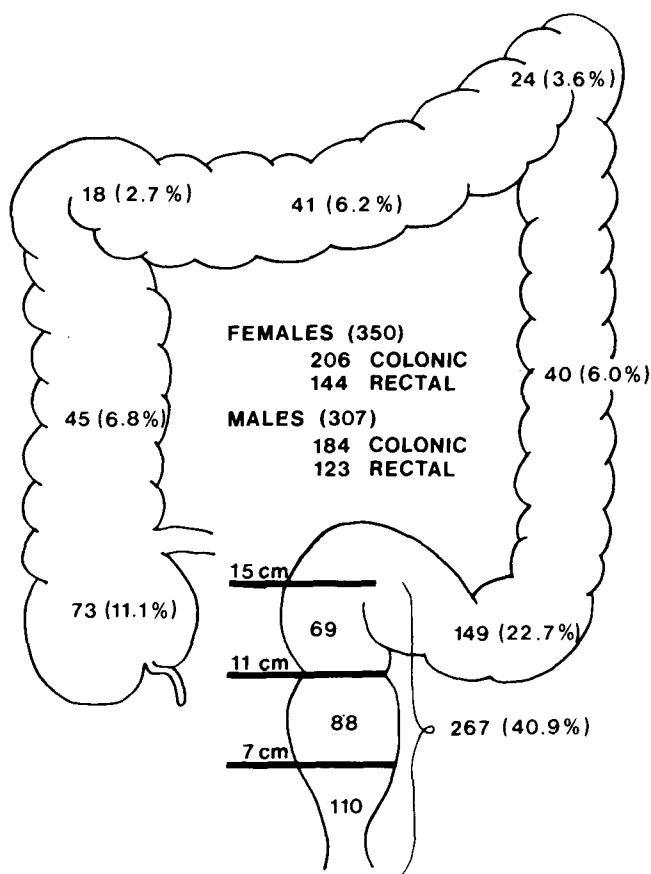


FIG. 1. Distribution of tumors within the colorectal area.

rectal. Twenty-four point six per cent of the tumors were in the right hemicolon, 34.5 per cent in the left hemicolon, and 40.9 per cent in the rectum.

Patients with multiple synchronous colorectal cancers were classified according to the most advanced cancer.

Every patient was traced, so the follow-up rate was 100 per cent. The survival rate was expressed as the crude five-year rate but, for the whole series, the relative survival rate was also calculated.<sup>8,9</sup> After surgery and recovery, the patients were followed up for at least five years; thus the study was continued until the end of December 1980.

Operative mortality denotes deaths within 30 days after surgery. The operative mortality was included in the crude and the relative survival rates.

In the statistical analyses of the data the chi-squared test was used.

TABLE 1. Crude and Relative Five-year Survival Rates for the Series by Extent of Disease (Modified Dukes' Classification)

Dukes' Stage	Patients	Five-year Survival Rate		
		Per Cent	Crude (%)	Relative (%)
A	166	25.3	80.7 ± 6.1	102.0 ± 7.8
B	146	22.2	61.6 ± 8.1	85.4 ± 11.2
C	87	13.2	40.4 ± 10.5	51.9 ± 13.5
D	258	39.3	2.7 ± 2.0	3.7 ± 2.7

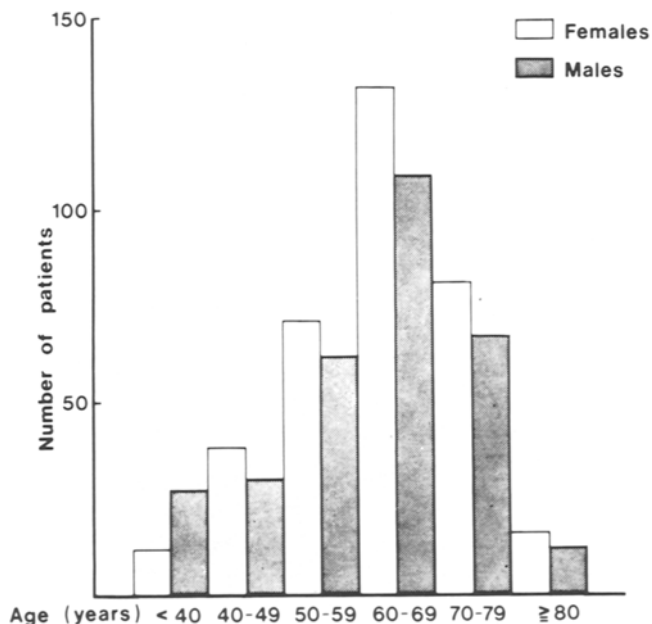


FIG. 2. Age and sex incidence in 657 patients with colorectal cancer.

**Results**

Of the 657 patients in the material, there were 350 females (mean age 62.2 ± 12.4 years) and 307 males (mean age 60.5 ± 11.8 years). The mean age for the whole series was 61.4 ± 12.2 years. Females predominated over males in the incidence of both colonic and rectal cancers (Fig. 2). The initial symptoms of colorectal cancer in decreasing order of frequency were: change in bowel habits (24 per cent), abdominal pain (22 per cent), blood in the stools (21 per cent), anemia (14 per cent), and loss of weight (12 per cent). The median diagnostic delay (patient and doctor delay) was 10.6 months; 12.4 months for the right hemicolon, 9.6 months for the left hemicolon, and 10.4 months for the rectum.

Table 1 lists the crude and relative survival rates for the whole series for the stages of the modified Dukes' classification. The crude five-year survival rate for the entire series was 40.5 ± 3.8 per cent and the relative survival rate 54.2 ± 5.1 per cent. The crude five-year survival rates for the whole series and for the four modified Dukes' subgroups are given in Fig. 3. Patients younger than 50 years had a considerably better five-year survival rate and operative mortality rate than those over 50 years old (Table 2).

There were 28 (4.3 per cent) cases of multiple colorectal cancers, 18 of which were synchronous and 10 metachronous. The crude five-year survival rate for multiple cancers was 54 per cent (45 per cent for synchronous and 70 per cent for metachronous cancers). Prophylactic colectomy or proctocolectomy was not used in patients with multiple synchronous colorectal cancers.

There were 41 (6.2 per cent) patients having additional benign neoplastic polyps associated with a single cancer.

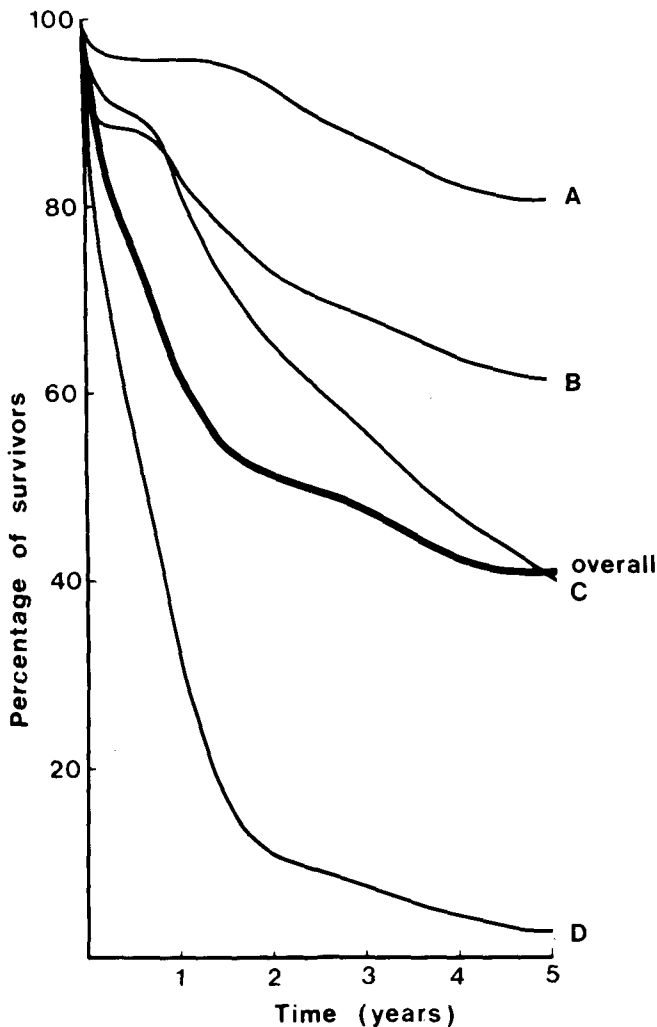


FIG. 3. Crude five-year survival rates for the series and for the four modified Dukes' subgroups.

There were nine patients (1.4 per cent), mean age 44 years (range 22 to 62 years), whose cancers originated from inherited intestinal polyposis. Cancer was the first sign of inherited polyposis in all of our nine patients. Those six patients (0.9 per cent) with cancers from ulcerative colitis had a mean interval of 14.2 years (range from 7 to 26 years) between the first attack of colitis and the detection of cancer (Table 3).

There were 21 patients (3.2 per cent), mean age 48 years (range from 19 to 64 years), with a positive family history for colorectal cancer (Table 3). Four of these patients (19

TABLE 2. Five-year Survival Rate and Operative Mortality of Patients Under and Over 50 Years of Age

Stage	110 Patients (< 50 years)		547 Patients (> 50 years)	
	Patients Per Cent	5-Year Survival	Patients Per Cent	5-Year Survival
Dukes' A	(27)	93.3	(25)	78.5
B	(19)	71.4	(23)	60.0
C	(19)	61.9	(12)	33.3
D	(35)	2.6	(40)	2.7
<u>Total survival</u>		<u>51.8</u>		<u>38.2</u>
<u>Operative mortality</u>		<u>1.8+</u>		<u>7.5</u>

+p < 0.05

per cent) had multiple colorectal cancers (one synchronous and three metachronous cancers). Two of the three patients with metachronous cancers did not survive five years, indicating that prophylactic colectomy or proctocolectomy would have saved them if performed at the time of operation for the primary cancer.

Forty-seven patients (7.2 per cent) had 57 malignant tumors other than colorectal cancer diagnosed either before or after detection of the colorectal tumor. The most frequent cancer sites were endometrium (17 patients), breast (6 patients), bladder and prostate (7 patients), and skin (10 patients). Endometrial and breast cancers (6.6 per cent of women) were all diagnosed before the colorectal cancer was detected, and the subsequent five-year survival rate for these patients was 30.5 per cent.

The incidence of emergency surgery in this material was 15.5 per cent (102 patients). Of these, 91 (13.9 per cent) were colorectal obstructions (includes five simultaneous perforations), eight (1.2 per cent) were perforations, and three (0.4 per cent) cancer bleedings. The operative mortality in emergency operations was 16.7 per cent. There were eight additional perforations in the patients operated upon electively.

Five-hundred fifty-five patients (84.5 per cent) were operated on electively. In 132 (23.7 per cent) of these, the tumor was located in the right hemicolon, in 172 (30.9 per cent), in the left hemicolon, and in 251 (45.2 per cent), in the rectum. Two-hundred twelve patients (38.2 per cent) undergoing elective operations had 241 primary postoperative complications, but the rest of the patients (61.8 per cent) recovered without complications. Sixty-four per

TABLE 3. Incidence, Extent of Disease and Five-year Survival Rate in Inherited Intestinal Polyposis, Ulcerative Colitis and "Cancer Family" Patients

Precancerous disease	No. of Patients	Incidence, Per Cent	Dukes' stage				Crude 5-Year Survival Rate, Per Cent
			A	B	C	D	
Inherited intestinal polyposis	9	1.4	2	3	1	3	55.6
Ulcerative colitis	6	0.9	3	1	—	2	50.0
"Cancer family" patients	21	3.2	5	4	5	7	57.0

TABLE 4. *Complications and Associated Operative Mortality in Elective Colorectal Surgery*

Location of Tumor	Complication		Operative Mortality		
	Mode	Number of Patients	Number of Patients	Per Cent	
<u>Colon</u>	Circulorespiratory	22	7	32	
	Anast. leakage	8	3	38	
	Stress ulcer	3	3	100	
	Others	54	—	—	
	Wound infections	(25)			
	Wound ruptures	(7)			
	Stomal complications	(8)			
	Post op. ileus	(5)			
	Urinary infections	(8)			
	Post op. hemorrh.	(1)			
	(3 died of disseminated disease)				
	<u>Rectum</u>	Circulorespiratory	19	6	32
		Anast. leakage	4	2	50
		Post op. hemorrh.	2	1	50
Post op. pancreatitis		1	1	100	
Others		129	—	—	
Wound infections					
- abdominal		(29)			
- perineal		(47)			
Wound ruptures		(19)			
Stomal complications		(12)			
Post op. ileus		(8)			
Urinary infections		(14)			

TABLE 5. *Elective Surgical Procedures and Operative Mortality*

Location of Tumor	Procedure	Number of Patients	Operative Mortality	
			Number of Patients	Per Cent
<u>Colon</u>	Right hemicolectomy	98	5	5
	Sigmoid resection	68	3	4
	Left hemicolectomy	49	3	6
	Palliative prox. colostomy	17	2	12
	Bypass	16	2	13
	Laparotomy (biopsy)	5	1	20
	Others	41	—	—
	Tumor resection	(20)		
	Hartmann procedure	(11)		
	Proctocolectomy	(7)		
	Colectomy	(3)		
<u>Rectum</u>	Miles operation	136	4	3
	Anterior resection	50	2	4
	Sigmoidostomy	35	3	9
	Hartmann procedure	10	1	10
	Others	16	—	—
	Palliative prox. colostomy (various)	(8)		
	Proctocolectomy	(4)		
	Local excision	(3)		
Laparotomy & biopsy	(1)			

cent of the complications were in association with rectal surgery, compared with 16 per cent and 20 per cent for right and left surgery of the hemicolon, respectively. The complications associated with rectal surgery, however, were mostly not serious, and the serious complications of elective surgery were quite evenly distributed between the colon and rectum. The circulorespiratory complications resulted in 13 operative deaths and anastomotic leakage in five deaths after elective surgery. The incidence of anastomosis leakage was 4.9 per cent and 18.5 per cent in all and in the emergency operations, respectively. The mortality rate for anastomotic leakage was 41 per cent. Stress ulcers and postoperative pancreatitis resulted in a very poor prognosis. The wound infection rate for colonic cancer was 8.2 per cent, compared with 11.4 per cent for rectal cancer for the abdominal wounds and 32.9 per cent for the perineal wounds (Table 4). The most frequent surgical procedure (resection and anastomosis) had an operative mortality of less than 6 per cent. Palliative operations had the highest operative mortality figures (Table 5). The overall operative mortality rate in elective operations was 4.7 per cent. The corresponding figure for the series was 6.5 per cent. The resectability rate for the series was 83.1 per cent.

Of the operative deaths (43 patients), 17 died after emergency operations and 26 after elective operations. The mean age of these patients was 70.5 years and only four patients (9.3 per cent) were younger than the mean age for the series. Of those who were more than 80 years old, 10 died within 30 days, signifying a 36 per cent operative mortality rate in this age group. Patients dying postoperatively did not differ from the rest of the series with regard to Dukes' classification, indicating that the extent of the disease correlated less with operative mortality than with older patients' concomitant diseases and their general vulnerability to surgery.

Table 6 shows that patients with cancers in the splenic flexure had the lowest survival rate, the highest operative mortality rate, and the highest rate of emergency operations. The last feature was statistically significantly high ( $p < 0.05$ ).

Table 7 presents the colonic and rectal cancer data for the first and last five-year periods. Only in the operative mortality of rectal cancers is a negative development noticed.

There were 109 (16.6 per cent) patients, 67 colonic, and 42 rectal cancer patients, who were given either chemotherapy, radiation, or immunotherapy separately or in combination, mainly as palliative treatment postoperatively. Six of 77 Dukes' stage D patients, who were treated with postoperative therapy, survived five years, whereas only one of the stage D patients who had no postoperative therapy survived (181 patients) (Table 8). Twenty-five of the patients who were given postoperative treatment (9

TABLE 6. Five-year Survival, Operative Mortality, and Incidence of Emergency Operations in Different Regions of the Large Bowel in the Colorectal Cancer Series

	5-Year Survival, Per Cent	Operative Mortality Per Cent	Incidence of Emergency Operations Per Cent
Caecum	41	6.8	17.8
Ascending colon	56	6.7	2.2
Hepatic flexure	33	5.6	22.2
Transverse colon	46	9.8	24.4
Splenic flexure	29	16.7	41.7+
Descending colon	40	12.5	30.0++
Sigmoid colon	39	4.7	22.8
Rectal cancer:			
11-15 cm	38	7.2	7.2
7-11 cm	42	5.7	8.0
0-7 cm	41	3.6	2.7
mean	40.5	6.5	15.5

+  $p < 0.01$ ; ++  $p < 0.05$

Dukes' B, 12 Dukes' C, and 4 Dukes' D patients) fulfilled the criteria for postoperative adjuvant therapy and had a five-year survival rate of 48 per cent which is slightly better than the 44 per cent survival rate calculated for patients in the same stage but without any postoperative treatment. Although such comparison between the groups is not vigorous because the therapy groups were not randomized, it gives some information on the correlation.

### Discussion

In contrast with the rather constant five-year survival rates for colorectal cancer patients in many countries during the last two decades, a continued improving trend has been noticed in Finland, where results are now comparable with those reported in large series from abroad.<sup>10</sup> This favorable development is a consequence of earlier detection of disease, as also reflected in the decreasing frequency of palliative surgery.

The crude five-year survival rate for both the colonic and rectal cancers, especially in the last five-year period (1971 to 1975), shows improved figures compared with those previously reported from Finland.<sup>11-13</sup>

The overall crude five-year survival rate for our whole series, 40.5 per cent, is comparable with figures ranging from 37 to 44 per cent reported elsewhere previously.<sup>14-18</sup>

The survival rate for patients under 50 years of age was considerably better in our study than the rate for patients over 50 years old. The same has also been reported recently by others.<sup>19</sup> The difference between these two age groups was especially significant when operative mortality was used as the index.

Two out of five patients had a major or minor complication. Major complications accounted for one-quarter of all complications, and of these almost half were fatal.

TABLE 7. Operative Mortality (Total and in Elective Operations), Resectability, Number of Palliative Surgery (Dukes' C + D), and Five-year Survival Rate in Colonic and Rectal Cancer for Patients Presenting in the Periods 1966-1970 and 1971-1975

	Colonic Cancer		Rectal Cancer	
	1966-1970 (173 Patients)	1971-1975 (217 Patients)	1966-1970 (99 Patients)	1971-1975 (168 Patients)
Operative mortality (total)	7.4	7.4	4.0	6.2
Operative mortality (in elective operations)	5.7	2.7	2.9	5.1
Resectability	81.9	86.7	75.2	84.4
Number subjected to palliative surgery (Dukes' C + D)	63.0	48.0	63.0	41.0
5-year survival rate	35.0	46.0	33.0	42.0

Rectal surgery was responsible for the majority of all complications, but they were not serious, in the main, and did not lead to mortality. The serious complications were quite evenly divided between colon and rectum. The perineal infection rate after rectal excision was especially high compared to that previously reported,<sup>20</sup> but the rate of abdominal wound infections was comparable with previous reports.<sup>15,21</sup> Respiratory and cardiac complications were the most frequent of the major ones, which parallels previous reports.<sup>15,21</sup> The incidence of anastomotic leakage in our series and in the emergency operations was very much the same as reported previously, likewise was the very high mortality rate associated with this complication stated previously.<sup>15,21</sup>

The figures for operative mortality in our colonic and rectal cancer data were worse than those reported previously from Finland. It must be remembered, however, that previously reported figures are for curative surgery only as compared with the overall figures in our study.<sup>11,13,22</sup> The operative mortality rate depends clearly on age, being only 1.8 per cent of those under 50 years of age and increasing to 36 per cent of those over 80 years.

The incidence of multiple colorectal cancers in our series is located between the incidences of 2 and 6.5 per cent reported in large series.<sup>23,24</sup> The crude five-year survival rate of patients with multiple cancers was better than that of the entire series and agrees with that reported previously by Copeland *et al.*<sup>25</sup> The corresponding figure for metachronous multiple cancers was 70 per cent,

which is still considerably higher, and might reflect an effective follow-up system.

The incidence of neoplastic benign polyps associated with single cancers was much less than that reported, but may be explained by the low incidence of polyps found among populations with low risk of colorectal cancer.<sup>10,26</sup> Colorectal cancer patients with associated neoplastic polyps be at a higher risk for future metachronous cancers, and should be followed up more carefully.<sup>26</sup> A more aggressive attitude to these precancerous lesions in cancer prevention which may decrease colorectal cancer incidence in the future.<sup>27,28</sup>

The five-year survival rates for cancers originating from ulcerative colitis and inherited intestinal polyposis were better than those of the whole series, thus differing from previous reports as far as colitis is concerned.<sup>29,30</sup> This better prognosis might be explained by the relatively early detection of the disease, although cancer was the first sign of inherited polyposes for all of the nine patients. To be able to perform prophylactic surgery in these groups requires great need of interest and resources in the follow-up of inflammatory bowel disease and the family studies of inherited colorectal diseases to have cancer diagnosed and operated upon even earlier.

Patients with a cancer family syndrome lack warning signals such as polyps in inherited polyposis and are thus more difficult to recognize. Colorectal cancer in previous generations should lead the surgeon to decide on prophylactic colectomy or proctocolectomy, which would facili-

TABLE 8. Site of Cancer, Type of Operation, Postoperative Therapy, and Survival Time of Dukes' Stage D Patients Surviving at Least Five Years

Sex	Age	Site of Tumor	Dissemination	Operative treatment	Postoperative treatment	Survival
F	63	Cecum	Solit. liver metast.	Right hemicolectomy, wedge res. of liver metast.	Immunotherapy	> 10 years
M	47	Cecum	Bladder metast.	Right hemicolectomy, bladder res.	Immunotherapy	Died at 6 yrs 6 mo
F	63	Splenic flexure	Spleen & tail of pancreas	Left hemicolectomy, splenect., res. of tail of pancreas	—	Died at 5 yrs 10 mo
M	56	Sigmoid	Solitary liver metast.	Sigmoid. Resection, wedge res. of liver	5-Fluorouracil (5-FU)	Died at 5 yrs 1 mo
M	63	Rectal	Fixed tumor in pelvis	Biopsy & sigmoidostomy	Radiation & 5-FU	> 10 yrs
M	66	Rectal	Prostatic infiltration	Miles operation, res. of prostate	Radiation & 5-FU	Died at 5 yrs 2 mo
M	75	Rectal	Liver metast.	Miles operation	5-FU	Died at 5 yrs 8 mo

tate the follow-up and lessen the fear of the relatively frequent tendency of metachronous cancers.<sup>31</sup>

Patients with certain malignancies are known to have some predisposition to colorectal cancer.<sup>32</sup> Those female patients in our series having prior endometrial or breast cancers and developing colorectal cancer had a five-year survival rate of 30 per cent, indicating a need for routine colorectal cancer screening among female patients with these malignancies.

In a recent report it was found beneficial to screen high-risk patients, since cancers were detected earlier and the survival figures were better.<sup>33</sup>

There was a 2.7 per cent crude five-year survival rate for patients with stage D cancers in our series, which is less than the 5.0 per cent and 7.0 per cent reported, but more than in many large series having no survivors in stage D.<sup>18,34,35</sup> Most of the stage D survivors in our series had postoperative therapy, showing some evidence of the postulation of improved survival after advanced surgery combined with postoperative adjuvant therapy.<sup>36-39</sup> Those few patients in our series who were given postoperative adjuvant therapy had a slightly higher five-year survival rate than those in the same stage but without such treatment. The role of postoperative adjuvant therapy in order to improve patient prognosis is still controversial and needs further controlled multicenter trials to fully assess its benefits.

Further improvement in the prognosis of colorectal cancer patients in the future presupposes new, more accurate methods for early detection of cancer, a strict surveillance of high-risk patients, and adequate application of postoperative treatment.

### References

- MacLennan R, Jensen OM, Masbech J, et al. Dietary fibre, transit-time, faecal bacteria, steroids, and colon cancer in two Scandinavian populations. *Lancet* 1977;2:207-11.
- Reddy BS, Hedges A, Laakso K, Wynder EL. Fecal constituents of a high-risk Finnish population for the development of large bowel cancer. *Cancer Letters* 1978;4:217-22.
- Teppo L, Hakama M, Hakulinen T, Lehtonen M, Saxen E. Cancer in Finland 1953-1970: Incidence, mortality and prevalence. *Acta Pathol Microbiol Scand[A]* 1975;Suppl 252:1-79.
- Finnish Cancer Registry. Cancer Incidence in Finland 1958. 1963;No III.
- Finnish Cancer Registry. Cancer Incidence in Finland 1977. 1981;No XXII.
- Dukes CE. The classification of cancer of the rectum. *J Pathol Bacteriol* 1932;35:323-32.
- Turnbull RB, Kyle K, Watson F, Spratt J. Cancer of the colon: the influence of the no-touch-isolation technic on survival rates. *Ann Surg* 1967;166:420-5.
- Ederer F, Axtell LM, Cutler SJ. The relative survival rate: a statistical methodology. National Cancer Inst., Monograph 1971; No. 6:101-21.
- Finnish Official Statistics VIA;142, 1980, Helsinki, Finland.
- Morson BC. Genesis of colorectal cancer. *Clin Gastroenterol* 1976;5:505-25.
- Peltokallio P. Carcinoma of the colon. *Acta Chir Scand* 1965;Suppl 350:74.
- Husa A. Carcinoma of the rectum. *Ann Chir Gynaecol* 1970;Suppl 171:36.
- Juusela E. Carcinoma of the rectum. A clinical study based on 256 patients. *Ann Chir Gynaecol* 1972;Suppl 181:26.
- Deschenes L, Fabia J, Douville Y, Dufour C. Survival in colorectal cancer. *Can J Surg* 1978;21:254-6.
- Najem AZ, Hennessey M, Malfitan RC, Cheung NK, Hodson RW. Colon and rectal carcinoma: clinical experience. *Am J Surg* 1977;134:583-8.
- O'Grady JF, Fitzgerald P, McMullin JP. Cancer of the colon and rectum. *J Irish Med Assoc* 1977;70:17-20.
- Peloquin AB. Symposium on carcinoma of colon and rectum. I. Results of standard surgical treatment of colon and rectal carcinoma. *Can J Surg* 1978;21:39-42.
- Alarcon J, Greenwood GR. Adenocarcinoma of the colon and rectum: a review of surgical treatment in 302 patients. *Dis Colon Rectum* 1979;22:35-9.
- Gardner B, Dotan J, Shaikh J, et al. The influence of age upon the survival of adult patients with carcinoma of the colon. *Surg Gynecol Obstet* 1981;153:366-8.
- Altmeier WA, Culbertson WR, Alexander JW, Sutorius D, Bossert J. Primary closure and healing of the perineal wound in abdominoperineal resection for carcinoma. *Am J Surg* 1974;127:215-9.
- Theile DE, Cohen JR, Holt J, Davis NC. Mortality and complications of large-bowel resections for carcinoma. *Aust NZ J Surg* 1979;49:62-6.
- Seiro V, Turunen M. Results of treatment of rectal carcinoma: 297 cases treated in 1949-60. *Acta Chir Scand* 1961;122:438-44.
- Ekelund GR, Phil B. Multiple carcinomas of the colon and rectum. *Cancer* 1974;33:1630-4.
- Travieso CR, Knoepp LF, Hanley PH. Multiple adenocarcinoma of the colon and rectum. *Dis Colon Rectum* 1972;15:1-6.
- Copeland EM, Jones RS, Miller LD. Multiple colon neoplasms. *Arch Surg* 1969;98:141-3.
- Bussey HJR, Wallace MH, Morson BC. Metachronous carcinoma of the large bowel and intestinal polypes. *Proc R Soc Med* 1967;60:208-10.
- Christiansen J, Kirkegaard P, Ibsen J. Prognosis after treatment of villous adenomas of the colon and rectum. *Ann Surg* 1979; 189:404-8.
- Takolander RJ. Villous papilloma of the colon and rectum. Part II. A follow-up study of 213 patients. *Ann Chir Gynaecol* 1975;64:265-74.
- Lennard-Jones JE, Morson BC, Ritchie JK, Shove DC, Williams CB. Cancer in colitis: assessment of the individual risk by clinical and histological criteria. *Gastroenterology* 1977;73:1280-9.
- Cook MG, Goligher JC. Carcinoma and epithelial dysplasia complicating ulcerative colitis. *Gastroenterology* 1975;68:1127-36.
- Lynch HT, Lynch PM. The cancer family syndrome: a pragmatic basis for syndrome identification. *Dis Colon Rectum* 1979;22: 106-10.
- Schottenfeld D, Berg JW, Vitsky B. Incidence of multiple primary cancers. II. Index cancers arising in the stomach and cancer digestive system. *J Natl Cancer Inst* 1969;43:77-86.
- Thompson JS, Pearlman N. Cancer of the colon and rectum in high-risk patients. *Dis Colon Rectum* 1982;25:461-3.
- Hight D, Kjartansson S, Barillas AE. Importance of early diagnosis in the treatment of carcinoma of the colon and rectum. *Am J Surg* 1973;125:304-7.
- Floyd CE, Stirling CT, Cohn I. Cancer of the colon and rectum and anus: review of 1687 cases. *Ann Surg* 1966;163:829-37.
- Wanebo HJ, Semoglou F, Attiyeh F, Stearns MJ. Surgical treatment of patients with primary operable colorectal cancer and synchronous liver metastases. *Am J Surg* 1978;135:81-4.
- Mavligit GM, Cutterman IU, Malahy MA, et al. Adjuvant immunotherapy and chemoimmunotherapy in colorectal cancer (Dukes' class C). *Cancer* 1977;40:2726-30.
- Rider WD. Radiotherapy of colorectal cancer. *Can J Surg* 1978;21:218-20.
- Klaassen DJ. Chemotherapy of colorectal cancer. *Can J Surg* 1978;21:218-20.