

Factors Influencing Survival with Complete Obstruction and Free Perforation of Colorectal Cancers*

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INTESTINAL OBSTRUCTION and perforation are frequent complications of colorectal cancers. The reported frequencies of obstructing carcinomas range from 7.9 to 24.5 per cent.^{1, 7, 8, 11, 12, 17, 18} For perforated cancers they range from 2.6 to 9.4 per cent.^{3, 6, 8, 10, 14, 22} Most investigators have also reported lower survival rates when these complications occur. For obstructing carcinomas, survival rates range from 11.5 to 33 per cent, and for perforating cancers from 12 to 25 per cent. Operative mortality is also higher, ranging from 12.7 to 33 per cent in cases of obstructing cancer and from 18 to 80 per cent in cases of perforation.^{3-5, 8, 12-14, 17, 19, 20}

A review of 26 years' experience in the management of patients with obstruction and perforation of the colon due to carcinoma at Hôpital Notre-Dame, Montréal, is reported. We try, in the present paper, to identify the factors responsible for the very poor prognosis in complete obstruction and free perforation of colorectal cancers. As we are comparing these complicated cancers with a larger group of uncomplicated cancers, our results are analyzed by the chi-square test.

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Clinical Material

In Hôpital Notre-Dame, Montréal, from 1942 through 1968, inclusive, 1,482 patients with carcinoma of the colon and rectum were diagnosed, treated and followed. All records were reviewed personally by the author. Only three patients were lost during the five-year follow-up period. All patients had histologic confirmation of their diagnosis. Twenty-one general surgeons were responsible for the treatment of these patients. Patients who had received prior therapy elsewhere, those who refused any form of treatment, and those in whose cases histologic confirmation of the diagnosis was not established were excluded.

Of our 1,482 patients, 193 (13 per cent) had complete obstruction or free perforation of the large bowel due to carcinoma: 127 patients (8.6 per cent) had complete obstruction of the bowel and 66 (4.45 per cent) had free perforation. Thirty patients with intestinal perforation had complete obstruction of the large bowel also.

Colon and Rectal Cancer with Obstruction

One hundred twenty-seven patients (8.6 per cent) were admitted to the hospital with complete obstruction of the large bowel due to carcinoma. In all cases the

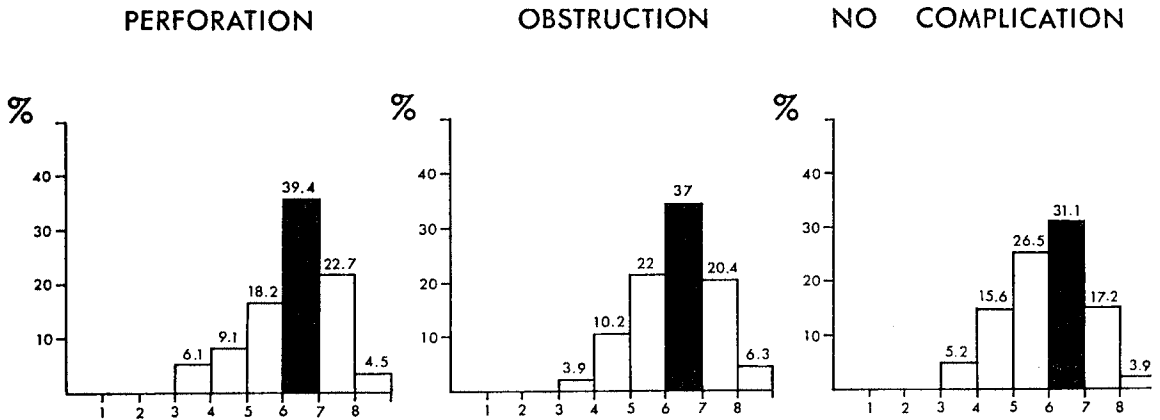


FIG. 1. Age distribution. Abscissa, decades of life.

diagnosis of complete obstruction was based upon clinical, radiologic and pathologic evaluation. All patients with partial obstruction of the bowel were excluded from the study because of the difficulty in evaluating the importance of the partial obstruction.

The median age of the patients with obstruction was 62.5 years. The youngest was 31 years old and the oldest, 83 years old. Most of the patients were between 60 and 70 years of age (Fig. 1). There were 72 men (56.7 per cent) and 55 women (43.3 per cent). Family histories of cancer were found in the records of 25 patients (19.7 per cent).

TABLE I. *Surgical Operations on 127 Patients with Obstructing Colorectal Carcinoma*

Colostomy or cecostomy	43
Ileotransversostomy	6
Laparotomy and biopsy	3
With preliminary colostomy:	
Abdominoperineal resection	1
Left hemicolectomy or sigmoidectomy	39
Without preliminary colostomy:	
Abdominoperineal resection	2
Right hemicolectomy	5
Left hemicolectomy or sigmoidectomy	21
Mickulicz's resection	7
TOTAL	127

The locations of the carcinomas that produced obstruction are shown in Figure 2. In ten patients (7.8 per cent), the cancer was located in the right colon, in 22 (17.3 per cent), in the transverse colon and splenic flexure, in 80 (63 per cent), in the descending and sigmoid colon, and in 12 (9.4 per cent), in the rectum. The exact sites of the primary lesions in three cases (2.3 per cent) are unknown, the lesions being too extensive. A cancer in another organ, either before or after the occurrence of cancer of the colon was found in 10 patients. None of the 127 patients had a second cancer of the colon.

Sixty-seven patients (52.7 per cent) had symptoms for 0 to two months before diagnosis, twenty-two patients (17.3 per cent) had symptoms for two to six months, and sixteen patients (12.5 per cent), for 6 to 12 months. There were nine patients (7 per cent) with symptoms for 12 to 18 months and 10 (7.8 per cent), for 18 months or more (Fig. 4). The durations of symptoms in three cases (2.3 per cent) are unknown.

All 127 patients had surgical operations, the majority having emergency procedures: 49 (38.5 per cent) had either a colostomy or a bypass procedure, 3 (2.3 per cent), a simple laparotomy with biopsy. Sixty-one patients (48 per cent) had curative

resections with or without preliminary colostomies for left colonic cancer. Palliative resections were performed in 14 cases (11 per cent) (Table 1). Operability (number of patients operated upon, regardless of the type of operation¹ was 100 per cent (127 patients).

Duke's staging¹ was used here instead of the Turnbull modification. Stage A means that the lesion does not penetrate the wall of the colon; nodes are not invaded. In stage B, the lesion penetrates the wall of the colon; nodes were not invaded. In stage C, the lesions are associated with nodal invasion but there are no distant metastases. When a lesion is reported as stage D, distant metastases are present, *e.g.*, in the liver or lung, or diffuse peritoneal spread. In the cases of carcinoma with obstruction we found only eight patients (6.3 per cent) with stage A lesions. The carcinomas of 38 patients (29.9 per cent) were classified as stage B, those of 31 (24.4 per cent) as stage C, and those of 50 (39.3 per cent) as stage D. Nearly 40 per cent of the patients with obstruction by colorectal cancers were therefore incurable (Table 2).

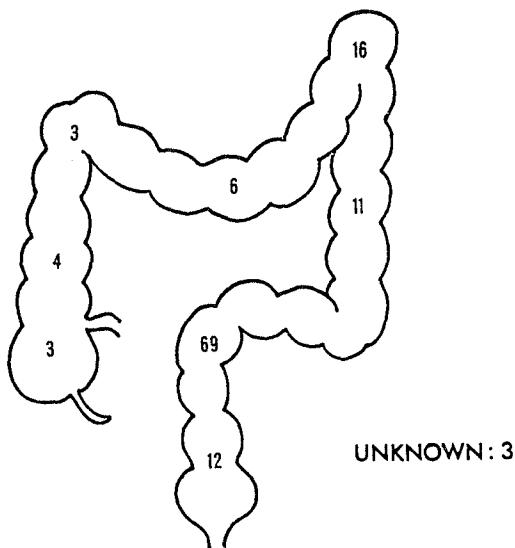


FIG. 2. Sites of obstructing carcinomas.

The crude survival rates for patients with large-bowel obstruction are given in Table 3 according to the stages of the lesions. The over-all five-year survival rate was 21.3 per cent (27 patients). For patients with Duke's A, B and C lesions, the crude survival rate was 35.1 per cent (27 patients). None of the patients who had a Dukes' D lesion survived five years.

TABLE 2. Dukes' Staging

	Patients with Perforation		Patients with Obstruction		Patients without Complication	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Stage A	0	0	8	6.3	257	19.9
	$\chi^2 = 16.239$ $P < 0.001$ Very significant		$\chi^2 = 14.137$ $P < 0.001$ Very significant			
Stage B	26	39.4	38	29.9	356	27.6
	$\chi^2 = 4.301$ $P < 0.05$ Significant		$\chi^2 = 0.305$ $P > 0.10$ Nonsignificant			
Stage C	16	24.2	31	24.4	289	22.4
	$\chi^2 = 0.119$ $P > 0.1$ Nonsignificant		$\chi^2 = 0.261$ $P > 0.10$ Nonsignificant			
Stage D	24	36.4	50	39.3	387	30
	$\chi^2 = 1.194$ $P > 0.10$ Nonsignificant		$\chi^2 = 4.733$ $P < 0.05$ Significant			

TABLE 3. *Crude Survival Rates*

	Patients with Perforation		Patients with Obstruction		Patients without Complication	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Stage A	0	0	2	25	179	69.6
Stage B	4	15.4	16	42.1	166	46.6
Stage C	1	6.7	9	29	65	22.4
Stage D	0	0	0	0	4	1.04
TOTAL	5	7.6	27	21.3	414	32.1
χ^2 P	17.7 < 0.001 Significant		6.35 < 0.025 Significant			
TOTAL Stages A, B, C	5	12.2	27	35.1	410	45.4
χ^2 P	17.557 > 0.001 Very significant		3.07 < 0.1 Nonsignificant			

The corrected survival rate¹ (which excludes operative deaths, deaths from intercurrent disease, patients in whose cases resection for cure was not performed, and those lost during a five-year follow-up period) is given in Table 4. The corrected survival rate was 50.9 per cent (27 patients).

Colon and Rectal Cancer with Free Perforation

In this 27-year study, 66 patients (4.45 per cent) had perforations of the colon due to carcinoma. All had symptoms of localized or generalized peritonitis. Minor perforations closed by the abdominal wall or

by a neighboring viscus, without abscess, are excluded. All 66 patients had free perforations of their cancers with abscess or generalized peritonitis.

The age range of these patients was 33 to 84 years, with a median of 61.6 years. Most of the patients with perforation were 60 to 70 years of age (Fig. 1). There were 36 men (54.5 per cent) and 30 women (45.4 per cent). Family histories of cancer were found in the records of six patients (9.1 per cent). The locations of cancers with perforation are shown in Fig. 3. Twelve (18.1 per cent) were located in the right colon, eight (12.1 per cent), in the transverse colon and splenic flexure, 41

TABLE 4. *Corrected Survival Rates*

	Patients with Perforation		Patients with Obstruction		Patients without Complication	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Stage A	0	0	2	50	176	82.2
Stage B	4	66.7	16	53.3	163	59.2
Stage C	1	25	9	47.4	65	32.8
TOTAL	5	50	27	50.9	404	58.8
χ^2 P	0.315 > 0.1 Nonsignificant		1.251 > 0.1 Nonsignificant			

(62.1 per cent), in the descending and sigmoid colon, and five (7.6 per cent), in the rectum. Perforation supervened at the site of the tumor in all cases except nine patients in which the perforation occurred above it: there were five ruptures of the cecum, one of the ascending colon, two of the descending colon, and one of the sigmoid colon. In all cases but one the diastatic perforation caused generalized peritonitis. Thirty patients of the 66 patients with perforation of their carcinomas also had complete obstruction of the bowel. We did not find any patient with multiple colonic cancers in this group. Two patients had, during their lives, second cancers in other organs.

Study of the durations of symptoms before diagnosis showed that 29 (43.9 per cent) patients had symptoms for two months or less. Of the remaining patients, 11 (16.7 per cent) had symptoms for two to six months, eight (12.1 per cent), for 6 to 12 months, six (9.1 per cent), for 12 to 18 months, and three (4.5 per cent) for more than 18 months (Fig. 4). The durations of symptoms in nine cases (13.6 per cent) are unknown.

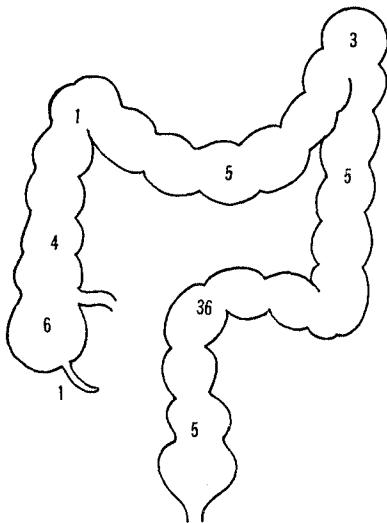


FIG. 3. Sites of perforating carcinomas.

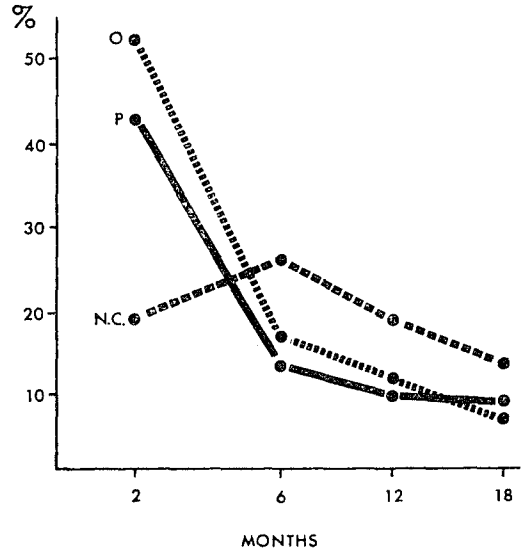


FIG. 4. Duration of symptoms.

Seven patients (10.6 per cent) were not operated on, because the disease was too far advanced. Thirty-three patients (50 per cent) had colostomies or bypass procedures, and 11 (16.7 per cent), laparotomy with biopsy. Only 11 patients (16.7 per cent) had resections for cure, and four (6.1 per cent), palliative resections (Table 5).

The operability in patients with perforated cancers was 89.4 per cent (59 patients). Dukes' staging in this group of patients shows a complete absence of stage A lesions. Twenty-six patients (39.4 per cent) were classified as stage B, 16 (24.2 per cent), as stage C, and 24 (36.4 per cent), as stage D. Thus, nearly 40 per cent of patients were incurable at the time of perforation (Table 2).

The resectability rate was low: only 15 patients (25.4 per cent) had resection of their cancers: 11 for cure and four for palliation. Table 6 shows resectability according to the stages of the lesions. All patients were followed for at least five years. Two died of intercurrent disease during the five-year follow-up period.

Operative mortality was 35.1 per cent for stage A, B and C lesions; it was 50 per cent

TABLE 5. *Surgical Operations on 66 Patients with Perforating Colorectal Carcinoma*

Colostomy or cecostomy	31
Laparotomy and biopsy	10
Appendectomy and drainage	1
With preliminary colostomy:	
Left hemicolectomy or sigmoidectomy	4
Without preliminary colostomy:	
Right hemicolectomy	4
Left hemicolectomy	4
Mickulicz's resection	5
No operation	7
TOTAL	66

for stage D lesions. The crude survival rates for patients who had perforated cancers are given in Table 3 according to the stages of the lesions. The overall crude survival rate was only 7.6 per cent (5 patients), and if we consider only patients with stage B and C lesions, it was 12.2 per cent (5 patients). The corrected survival rate is shown in Table 4. For all cases it was 50 per cent (5 patients).

The association of perforation and obstruction in a colorectal cancer was found in 30 patients. The results were very poor in these cases. The operability rate was only 83.3 per cent (25 patients). The overall resectability rate was only 20 per cent (five patients), and for stage B and C lesions it was 17.6 per cent (three patients). Operative mortality was very high, being 47.1 per cent (eight patients) for patients

with stage B and C lesions, and 62.5 per cent (five cases) for patients with stage D lesions. None of these patients survived five years.

Peritonitis associated with perforation of a colorectal carcinoma seems to affect the prognosis adversely. Our 66 patients with perforation of their cancers can be divided into three groups: Group I, localized abscess, 27 patients (40.9 per cent). Group II, very large abscess involving the entire pelvis or one quadrant of the abdomen, 11 patients (16.7 per cent). Group III, generalized peritonitis, 28 patients (42.4 per cent). The operative mortality rates for the three groups were 33.3 per cent, 10 and 63.6 per cent, respectively. The crude survival rates were 0 for Groups II and III and 18.5 per cent for Group I (five patients).

Colonic and Rectal Cancer with Obstruction or Perforation According to the Decades of Treatment

The patients in our study with obstruction or perforation of colorectal cancers were treated between 1942 and 1968. Three decades (1942-51, 1952-61, and 1962-68) could be studied to determine whether the results obtained remained the same or improved as time went by.

In cases of colorectal carcinoma with complete obstruction, the resectability rate

TABLE 6. *Resectability*

	Patients with Perforation		Patients with Obstruction		Patients without Complication	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Stage A	0	0	7	87.5	248	96.5
Stage B	6	26.1	31	81.5	321	90.4
Stage C	5	35.7	23	74.1	219	76.6
Stage D	4	18.2	14	28	121	35.4
TOTAL	15	25.4	75	59	909	73.3
χ^2	62.884		11.601			
P	< 0.001		< 0.001			
	Very significant		Very significant			

TABLE 7. *Colorectal Carcinoma with Obstruction*

	Patients Treated 1942-51		Patients Treated 1952-61		Patients Treated 1962-68		Chi-square Test
	Number	Per Cent	Number	Per Cent	Number	Per Cent	
Resectability	13	50	28	53.8	34	69.4	$\chi^2 = 3.629$ $P < 0.1$ Nonsignificant
Operative mortality Stages A, B, C	4	26.7	8	25	2	6.7	$\chi^2 = 4.4$ $P < .05$ Significant
Stage D	3	27.3	5	25	5	26.3	$\chi^2 = .021$ $P > 0.1$ Nonsignificant
Crude A, B, C survival rate	4	26.7	7	21.8	16	53.3	$\chi^2 = 7.307$ $P < 0.01$ Significant

increased from 50 per cent in the first period to 69.4 per cent in the last. Operative mortality for stage A, B, and C lesions was lower in the third period (6.7 per cent) than in the first (26.7 per cent). The crude survival rate for stage A, B, and C lesions was 26.7 per cent the first period and 53.3 per cent during the last (Table 7).

In patients with perforation of colorectal carcinomas, the resectability rate increased from 4.8 per cent in the first period to 39.1 per cent in the last. Operative mortality improved, being lower for the

third period than for the first, 22.2 and 53.8 per cent, respectively. The crude survival rate for stage B and C lesions was 0 during the first period and 21 per cent during the last. These results are given in Table 8.

Discussion

A lower crude survival rate was found in patients with obstructed or perforated cancers of the colon. Indeed, the crude survival rates of patients with perforated carcinomas were 12.2 per cent (stage B and C) and 7.6 per cent (stage B, C, and D).

TABLE 8. *Colorectal Carcinoma with Perforation*

	Patients Treated 1942-51		Patients Treated 1952-61		Patients Treated 1962-68		Chi-square Test
	Number	Per Cent	Number	Per Cent	Number	Per Cent	
Resectability	1	4.8	5	33.3	9	39.1	$\chi^2 = 7.502$ $P < 0.01$ Significant
Operative mortality Stages B, C	7	53.8	2	33.3	4	22.2	$\chi^2 = 3.323$ $P < 0.1$ Nonsignificant
Stage D	5	62.5	4	44.4	2	40	$\chi^2 = .811$ $P > .1$ Nonsignificant
Crude B, C survival rate	0	0	1	12.5	4	21	$\chi^2 = 3.337$ $P < .10$ Nonsignificant

TABLE 9. Operability

	Patients with Perforation		Patients with Obstruction		Patients without Complication	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Treated by surgical operation	59	89.4	127	100	1,240	96.2
χ^2		7.338		5.001		
P		< 0.01		< 0.05		
		Significant		Significant		

In patients with obstructed carcinomas, they were 35.1 per cent (for stage A, B and C lesions, Table 3) and 21.3 per cent for all stages. In patients without complications, these crude survival rates were 45.4 per cent (stage A, B and C) and 32.1 per cent (all stages). These data confirmed what we found in most reports on the subject.^{2, 3, 5, 7, 8, 11, 12, 14-17, 19}

Many factors can be held responsible for this lower survival rate. Age and sex distribution of the patients, longer duration of symptoms, lower operability and resectability rates, more advanced stages of the lesion, and higher operative mortality, are all factors to be taken into consideration.

One cannot attach importance to the age of the patient. Indeed, obstruction and perforation of colorectal cancers occur with maximum frequency between 60 and 70 years of age. In the same age group we found the greatest number of patients with uncomplicated cancers of the colon or rectum (Fig. 1). Sex also does not play an important part. Of patients who had obstructing carcinomas, 72 were men (56.7 per cent) and 55 were women (43.3 per cent). Of patients with uncomplicated carcinomas, 614 were men (47.6 per cent), and 675 were women (52.4 per cent) ($\chi^2 = 3.799$, $P < 0.1$. Difference not significant). Of patients who had perforating carcinomas, 36 were men (54.5 per cent), and 30 were women (45.5 per cent) ($\chi^2 = 1.202$, $P > 0.1$. Difference not significant).

The duration of symptoms was not significant (Fig. 4). The duration of symptoms was longer with uncomplicated lesions than with obstruction and perforation. On the contrary, it seems that the complications of obstructing or perforating carcinomas are sometimes the first manifestations of the disease. Indeed, 43.9 per cent of patients with perforation of their cancers and 52.7 of patients with obstruction had symptoms for less than two months before diagnosis. When we considered the percentage of patients having symptoms for more than six months, we found only 25.7 per cent for perforated carcinomas and 27.3 per cent for obstructing carcinomas, compared with 44.4 per cent for uncomplicated carcinomas (Fig. 4). This confirms the data given by Glenn and McSherry⁸ regarding the duration of symptoms.

Operability rates in the three groups were significantly different (Table 9): 89.4 per cent of patients with perforated cancers, 100 per cent of those with obstructing cancers, and 96.2 per cent (1240/1289) of those with uncomplicated cancers were treated by surgical operation. These differences are significant but have an unfavorable influence on prognosis only in cases of perforation, where the operability rate was clearly lower ($\chi^2 = 7.338$, $P < 0.01$, significant) than that for noncomplicated cancers.

Resectability also seems to be influenced by the presence or absence of complica-

TABLE 10. Operative Mortality

	Patients with Perforation		Patients with Obstruction		Patients without Complication	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Stages A, B, C	13	35.1	14	18.2	68	7.6
	$\chi^2 = 34.119$ $P > 0.001$ Very significant		$\chi^2 = 10.363$ $P < 0.005$ Significant			
Stage D	11	50	13	26	40	11.7
	$\chi^2 = 25.72$ $P > 0.001$ Very significant		$\chi^2 = 7.634$ $P < 0.01$ Significant			

tions. Resectability was 25.4 per cent in cases of perforation, 59 per cent in cases of obstruction, and 73.3 per cent in cases of uncomplicated carcinomas (Table 6). The chi-square test shows highly significant differences.

A study of the stage of the lesions when complications intervene also shows a lower proportion of stage A lesions in cases of obstruction and perforation. Completely absent in cases of cancer with perforation, stage A lesions were present in only 6.3 per cent of carcinomas with obstruction, while 19.9 per cent (257) of the patients who had uncomplicated cancers had stage A lesions. There was also a significant difference in the proportion of stage B lesions in carcinomas with perforation: 39.4 per cent were stage B lesions, while in uncomplicated carcinomas we found only 27.6 per cent. There was little difference in the proportion of patients with stage C lesions whether complicated or not. For stage D lesions, however, a significant difference was found in patients who had carcinomas with obstruction; 39.3 per cent of their lesions were classified stage D. Only 30 per cent (387 patients) who had uncomplicated carcinomas had stage D lesions. In patients with perforated carcinomas, there was a difference in the percentage of stage D lesions (36.4 per cent); but this difference was not statistically significant (Table 2).

Operative mortality increased when the carcinoma was complicated by obstruction or perforation. For uncomplicated carcinomas, operative mortality rates were 7.6 per cent for stage A, B and C lesions and 11.7 per cent for stage D lesions. These rates increase in cases of obstruction to 18.2 and 26 per cent, respectively, and in cases of perforation to 35.1 and 50 per cent. These differences are highly significant (Table 10).

For carcinomas with obstruction, the lower crude survival rate for stage A, B and C lesions was not statistically significant even though the high percentage of survivors was smaller (35.1 per cent) compared with survivors in the uncomplicated cases with lesions at the same stage (45.4 per cent). For carcinomas with perforation, the crude survival rate for stage A, B and C lesions was only 12.2 per cent, a significant difference (Table 3).

Comparison of the corrected survival rates of the three groups (perforation, obstruction, uncomplicated) does not show any significant difference (Table 4). This is explained by the fact that one excludes from this group all patients who had stage D lesions or nonresected lesions, and operative deaths: these three factors influence survival.

Study of the patients having carcinomas with obstruction according to the decades of treatment shows continual improvement

regarding resectability, operative mortality, and crude survival rate. Nevertheless, statistically speaking, the improvement is retained only for operative mortality (from 26.7 to 6.7 per cent) and for the crude survival rate for A, B and C lesions (from 26.7 to 53.3 per cent) (Table 7). There were significant improvements in the operative mortality rate and in the crude survival rate for stage A, B and C lesions during the three periods studied, for patients having carcinomas with obstruction.

For patients having carcinomas with free perforation, there was a significant improvement in the resectability rate (from 4.8 to 39.1 per cent), but the improvements in operative mortality (from 53.8 to 22.2 per cent) and crude survival rate (B and C lesions) (from 0 to 21 per cent) were not statistically significant (Table 7).

The association of obstruction and perforation seems a very severe complication. The severity of this complication was reported by Glenn and McSherry.⁸ It was also evident in this study. Of these patients, 83.3 per cent were operated on, but only 20 per cent had resections. The operative mortality was very high: 47.1 per cent for stage B and C lesions and 62.5 per cent for stage D lesions. Only three patients (17.6 per cent) had resections for cure. None of them survived five years.

When there is perforation of carcinoma, abscess and peritonitis seem to be responsible, in part, for the less successful results. Indeed, there was no five-year survivor among the patients who had large abscesses or generalized peritonitis. The only five-year survivors (five patients) were in the group with localized abscesses only (27).

Conclusion and Summary

There seems to be four principal factors responsible for the lower crude survival rates of patients whose colorectal

cancers are perforated or obstructed: lower operability rate for carcinoma with perforation, more advanced stage of the lesion, lower resectability rate, and higher operative mortality rate.

Over the years, there have been significant improvements in the operative mortality rate and crude survival rate (stage A, B and C lesions) for patients having carcinoma of the colon with complete obstruction. This improvement cannot be found in the resectability rate.

For patients having carcinoma of the colon with free perforation, even with an improvement in the resectability rate, there was no significant improvement in the mortality rate or the crude survival rate (stage B and C lesions).

The association of obstruction and perforation seems very ominous, since none of the patients with that complication survived five years.

It seems evident that the best way to improve our results when treating carcinomas of the colon and rectum would be through earlier diagnosis, which would prevent the severe complications of obstruction and perforation. Unfortunately, there is, even today, a high rate of complications in cases of colorectal carcinoma. Earlier diagnosis is possible by various means: digital examination, research for occult blood in the stool, rectosigmoidoscopy, and barium-enema studies, especially using the double-contrast technique of Welin,²¹ are at our disposal. For economic reasons, rectosigmoidoscopy and barium-enema studies cannot be used on a large scale. We all hope that new means for earlier detection of colorectal cancer will be found. The discovery of carcinoembryonic antigen by Gold and Freedman⁹ raised hopes, but even today, this test cannot be used on a large scale as a means of early detection. If we had a simple, low-cost test

to detect carcinomas of the colon and rectum earlier, perhaps nine out of 10 patients with colorectal carcinomas could be cured.

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