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PROGNOSTIC FACTORS IN PATIENTS WITH COLORECTAL CARCINOMA: THE SIGNIFICANCE OF LARGE BOWEL OBSTRUCTION

By
El-Arini A., MD., Shelbaya E., MD.**, El-Badawy A., MD.***, Abo-Sedira M., MD****
*Surgery Dept., Faculty of Medicine, Minoufiya University, **Surgery Dept., Faculty of Medicine, Menya University, ***Surgery Dept., National Cancer Institute, Cairo University

Background: *Management of obstructing colorectal cancers has been a challenging clinical problem for surgeons. Little is known of the reasons for the dismal survival. The aim of this study is to clarify significant risk factors related to the development of obstruction and to identify determinants of survival.*
Patients and Methods: *Over a 5-year interval from April 1997 through April 2002, 63 consecutive patients with colorectal carcinoma were surgically treated. Patients undergoing surgery for malignant colorectal obstruction (n= 28) were compared with those undergoing elective surgical treatment (n= 35). Case notes were prospectively collected for information on demographic, clinical, operative, and pathologic variables; as well as follow-up for the detection of local recurrence or distant metastasis. A univariate and multivariate Cox proportional hazards model were then constructed to compare both groups and to examine the effects of these variables on survival.*
Results: *The most common site of obstruction was the sigmoid colon (32.1%). Curative resection was possible in 45 patients [14 obstructed (50%) and 31 non-obstructed (88.6%), P= 0.0007]. Anastomatic leakage occurred in 5 [3 obstructed (14.3%) and 2 non-obstructed (5.7%), P= 0.56] and operative deaths occurred in 9 [6 obstructed (21.4%) and 3 non-obstructed (8.4%), P= 0.68]. Multivariate analysis of factors related to an obstructing tumour were patient's age and Dukes' stage. Median follow-up period was 44.5 months. Local recurrence occurred after curative resection in 9 patients [4 obstructed (28.5%) and 5 non-obstructed (16.1%), P= 0.42] and metastatic disease in 11 [5 obstructed (35.7%) and 6 non-obstructed (19.3%), P= 0.28]. The overall 5-year survival rates were 52% [30% obstructed and 68% non-obstructed, P=0.001]. Multivariate analysis showed that tumour perforation, histologic grade, curative resection, tumour location and tumour fixity were the significant determinants of survival.*
Conclusion: *Multivariate analysis of risk factors predicting the development of obstruction were: patient's age and Dukes' stage. Whereas, multivariate analysis of significant variables related to survival were: tumour perforation, histologic grade, curative resection, tumour location and tumour fixity. Large bowel obstruction was a factor which did not influence the prognosis significantly.*

Keywords: colorectal neoplasms, obstruction, surgical management, prognosis

INTRODUCTION

Acute bowel obstruction occurs in 7-47 percent of patients with colorectal cancer [1] and is associated with a considerably higher postoperative mortality rate than in those without obstruction [2]. In addition to its effect on postoperative mortality, bowel obstruction may influence the outcome of affected patients who survive the postoperative period [3], even when those undergoing palliative surgery are excluded from analysis [4]. However, little is known of the reasons for the dismal survival and of failure patterns after potentially curative treatment [5].

It remains an open question whether or not the presence of large bowel obstruction significantly influences the prognosis in patients with colorectal carcinoma [6], and whether conventional prognostic indicators are applicable to patients with obstruction, or whether they can identify individuals at high risk of tumour recurrence and death [7].

AIM OF THE WORK

The aim of the work is to report the results of a prospective study in a consecutive patients with colorectal carcinoma who presented with or without obstruction. To clarify significant risk factors related to an obstructing tumour. To identify determinants of survival and to assess whether any difference exists in patterns of recurrence between obstructing and non-obstructing tumours.

PATIENTS AND METHODS

Over a 5-year interval from April 1997 through April 2002, 63 consecutive patients with colorectal carcinoma were prospectively operated at the Surgical Oncology Unit, Minoufiya University; Department of Surgery, National Cancer Institute, Cairo University and the Department of Surgery, Menya University. All operations were performed and followed-up under the responsibility of the authors. In this prospective study, patients undergoing surgery for malignant colorectal obstruction were compared with those undergoing elective surgical treatment. The diagnosis of obstruction was based on clinical, radiologic, and operative criteria as suggested by Fielding [8]. Site distribution of the primaries was defined as follows: the right colon included the caecum, ascending colon, hepatic flexure, and transverse colon; the left colon included the splenic flexure, descending colon and sigmoid colon; the rectum included the rectosigmoid junction and rectum. The clinical variables included age at operation, sex, presentation (obstructing or non-obstructing), and associated pre-morbid conditions (insulin-treated diabetes mellitus, chronic respiratory or cardiovascular disease). Operative variables included the presence or absence of tumour fixity or perforation, the type of operation performed (primary or staged resection, diverting colostomy or bypass), the type of anastomosis (immediate, delayed, or no anastomosis), the curability of the operation (curative or palliative). Patients were considered to have undergone curative resection, if there was no evidence of residual or metastatic disease at operation and if the margins of the resection specimen were free of tumour on microscopic examination. Reasons to palliate were locally advanced tumours, distant unresectable metastases, advanced age, and haemodynamic instability during laparotomy. Primary resection included removal of the obstructing cancer at the first operation, not necessarily with an immediate anastomosis. Staged resection included removal of the cancer at a later operation than the first where decompression, usually by a loop colostomy, had been performed. The pathological variables included tumour stage according to the modified Astler-Coller Dukes' staging system, with stage D indicating tumours with distant metastasis, either by lymphatic or haematogenous spread [9]. Tumour grade was classified as well, moderately, and poorly differentiated adenocarcinomas according to Morson and Sobin[10]. Type of histology was described as mucinous or non-mucinous according to Connelly et al.[11].

Postoperative complications were recorded in surviving patients as medical complications (cardiac, respiratory, and others) and surgical complications (anastomotic leakage, intra-abdominal sepsis, postoperative haemorrhage and wound infection). Hospital stay was defined as the total time spent in hospital for the course of treatment to be completed. For both primary and staged resection subsequent admissions for re-establishment of intestinal continuity or closure of colostomy have been included. Hospital mortality included all deaths in hospital during the admission.

Adjuvant treatment in the form of chemotherapy and/or radiotherapy was performed whenever indicated. Survivors were followed by the authors at regular intervals, every three months during the first postoperative year, every four months during the second year, twice a year thereafter until death or the end of the follow-up. During follow-up a diagnosis of local recurrence was made in the case of cancer recurrence at the anastomosis, in the abdominal wall, or in the drain site, and a diagnosis of metastatic disease was made in the case of hepatic, peritoneal, or extra-abdominal recurrence of cancer, with or without local recurrence in the group of patients undergoing surgery for cure. To detect recurrence, clinical examination, tumour markers, chest x-ray, lower endoscopy, abdominal and pelvic ultrasonography and/or CT scan with or without needle biopsy were used as well as laparotomy when indicated.

The statistical analysis was done using an IBM compatible computer and STATISTICA for MS Windows 98 statistical package. Statistical analysis was done according to Ingelfinger et al.[12], and Knapp and Miller[13]. Descriptive statistics was presented as means ± standard deviations, median and number and percentage (frequency distributions). The influence of study variables on survival was first examined in univariate analysis, using the Kaplan-Meier Method, and log rank tests of significance [14]. A multivariate Cox proportional hazards model was then constructed to examine simultaneously, the effects of these variables on survival [15]. In addition, a stepwise logistic regression analysis was performed in order to clarify significant risk factors related to an obstructing tumour. Other statistical analyses were performed using student's test and the chi-square test. Significance level of 0.05 and 0.01 was used throughout all statistical tests within this study. Tabulation and graphical presentation were done according to Knapp and Miller [13]

RESULTS

Among the 63 patients included in the study, 28(44.4%) had obstructing cancers, and 35(55.6%) had non-obstructing cancers. The exact sites of tumours are listed in (Table 1). The most common site of obstruction was the sigmoid colon, which accounted for (32.1%), while the rectum and rectosigmoid had the lowest risk of obstruction (10.7%). There was a higher risk of obstruction associated with tumour in the colon compared with tumours in the rectum, but the difference was not significant. The probability that left-sided tumours would cause obstruction was not significant when compared with probability that right-sided tumours would cause obstruction (P= 0.56). However, our patient sample is too small to predict this with confidence.

Demographic and pathologic variables are shown in (Table 2). The mean age of the obstructing group was significantly higher than that of the non-obstructing group (P= 0.0005). Sex and the prevalence of pre-morbid conditions were not significantly different between the two groups. Pathological variables were not possible for 4 patients (6.3%) of the obstructing group because they did not undergo a resection. By univariate analysis the chance of obstruction was increased by older age (P= 0.0005), advanced stage (P= 0.01), mucinous type of histology (P= 0.01), worsening grade (P= 0.01), and nodal involvement (P= 0.05).

(Table 3) revealed the significant risk factors related to an obstructing tumour determined by multivariate logistic regression analysis. The following clinical and pathologic variables were subjected to multivariate analysis: age, sex, location, pre-morbid conditions, Dukes' stage, tumour grade, histologic type, and nodal involvement. The factors found to be significant in predicting the development of obstruction were: Patient's age (P= 0.001) and Dukes stage (P= 0.04).

Operative variables are shown in (Table 4). Curative resection was possible in 45 patients (71.4%) of the whole series, 14(50%) in the obstructing group and 31 (88.6%) in the non-obstructing group (P= 0.0007). There was an increased risk of tumour perforation in the former group (21.4%) versus the latter group (2.8%) (P= 0.01). Similarly, there was an increased risk of tumour fixity for the obstructing group (28.6%) compared to (2.8%) of the non-obstructing group (P= 0.003).

The types of operations performed are listed in (Table 5). Primary resection was possible in 56 patients (88.8%) of the whole series. Twenty-one patients (75%) in the obstructing group and 35(100%) in the non-obstructing group. Of the 56 patients with primary resection, primary anastomoses were performed in 48 patients (85.7%), 17(60.7%) in the former group and 31(88.6%) in the latter group. Staged resection was performed in three (10.7%) patients in the obstructing group who had substantial co-morbidity or haemodynamic instability during the operation. Bypass operation (n=2), and proximal diversion colostomy (n=2) were performed in the obstructing group because of tumour fixity or terminal malignancy.

The postoperative outcome is shown in (Table 6). Among patients with obstruction, anastomotic leakage developed in 3 of 21 primary resection (14.3%), two of them required reoperations to take down the anastomosis and to clear the peritoneal contamination. Two anastomatic leaks (5.7%) occurred in the non-obstructed group. None of them required operative treatment for leakage. Wound infection after surgery, intra-abdominal sepsis-defined as not secondary to an anastomotic leak, and chest complications were commoner in the obstructing group. Overall, there was no significant difference in morbidity between the two groups (P= 0.71). There were 6(21.4%) operative deaths in the obstructing group and 3(8.4%) in the non-obstructing group (P= 0.68). Postoperative stay was longer for the obstructing group and more patients required Intensive Care Unit (P=0.002). Median hospital stay was longer after resection without anastomosis and after staged resection than after primary resection and immediate anastomosis (P= 0.04).

Survival data were incomplete for 6 patients who were lost to follow-up at 32, 11, 14, 27, 36, and 16 months, respectively. The mean length of follow-up period was 38.4±5.6 (median 44.5, range: 1-60) months. Adjuvant treatment was used in 21 patients (33.3%) in the whole series, 12 patients (42.8%) in the obstructing and 9 patients (25.7%) in the non-obstructing groups (P= 0.56). The overall local recurrence rate after curative resection was 28.5% (4 of 14) and 16.1% (5 of 31) for the obstructing and non-obstructing groups, respectively (P= 0.42). The average time to local recurrence was 7.1 and 9.6 months, respectively. Metastatic recurrence rate after curative resection was 35.7% (5 of 14) for the former group and 19.3% (6 of 31) for the later group (P= 0.28). The average time to distant metastasis was 16.7 and 19.3 months, respectively. In addition, local recurrence was simultaneously diagnosed in association with distant metastases in 14.2% (2 of 14) in the obstructing group and 9.6% (3 of 31) in the non-obstructing group (P= 0.64).

(Fig. 1) revealed a 5-year survival rate of 52% for the whole series. (Fig. 2) revealed a significant difference in the overall survival between both groups. The 5-year survival rate for the obstructing group was 30% and for the non-obstructing group was 68% (P= <0.001). (Fig. 3) revealed the 5-year survival rates after curative resection, 45.7% for the former group and 72% for the latter group (P= >0.05).

(Table 7) revealed analysis of the 5-year survival rates with clinical, pathological, and operative variables. On univariate analysis the overall survival was directly influenced by the following predictive factors: Dukes' stage (P= 0.001), tumour grade (P= 0.001), curability (P= 0.001), tumour fixity (P= 0.001), tumour perforation (p= 0.001), histologic type (P= 0.003), lymph node involvement (P= 0.04), age (P= 0.03), tumour location (P= 0.04), and obstruction (P= 0.04). The univariate predictors of poor survival, which remained significant when submitted to a Cox proportional hazards model are shown in (Table 8): tumour perforation (P= 0.0007), Dukes' stage (P= 0.001), tumour grade (P= 0.001), curative resection (P= 0.001), tumour location (P= 0.01), and tumour fixity (P= 0.02) were the most significant predictors of survival. Large bowel obstruction was a factor which did not influence the prognosis significantly on multivariate analysis (P= 0.50).

Table (1): ***Sites of tumours***

Site	*Obstruction*				*P-value*
	Present (n= 28)		*Absent (n= 35)*		
Right side					
Caecum	5	(17.9)	4	(11.4)	0.59
Ascending colon	2	(7.1)	3	(8.6)	
Hepatic flexure	3	(10.7)	2	(5.7)	
Transverse colon	2	(7.1)	7	(20)	
Total	12	(42.8)	16	(45.7)	
Left side					
Splenic flexure	3	(10.7)	3	(8.6)	0.77
Descending colon	1	(3.6)	2	(5.7)	
Sigmoid colon	9	(32.2)	6	(17.2)	
Total	13	(46.5)	11	(31.5)	
Rectum					
Rectosigmoid	2	(7.1)	4	(11.4)	0.88
Rectum	1	(3.6)	4	(11.4)	
Total	3	(10.7)	8	(22.8)	

Table (2): ***Demographic and pathologic variables***

Variables	Obstruction				P-value
	Present (n= 28)		Absent (n= 35)		
Mean age (years)	56.2 ± 9.4		47.1 ± 10.1		0.0005
Sex					
Male	19	(67.8)	20	(57.1)	0.38
Female	9	(32.1)	15	(42.8)	
Pre-morbid conditions					
Present	6	(21.4)	7	(20)	0.88
Absent	22	(78.6)	28	(80)	
Dukes stage*					
A	0	(0)	3	(8.6)	
B	7	(29.2)	18	(51.4)	0.01
C	9	(37.5)	12	(34.3)	
D	8	(33.3)	2	(5.7)	
Tumour grade*					
Well	1	(4.1)	5	(14.3)	0.01
Moderate	4	(16.7)	16	(45.7)	
Poor	19	(79.2)	14	(40)	
Histology*					
Non-mucinous	15	(62.5)	31	(88.6)	0.01
Mucinous	9	(37.5)	4	(11.4)	
Lymph node status*					
Negative	8	(33.3)	22	(62.8)	0.05
Positive	16	(57.2)	13	(37.2)	

Values in parentheses are percentages

* Pathological variables were not possible for 4 patients (6.3%) of the obstructing group because they did not undergo a resection.

Table (3): ***Significant risk factors related to an obstructing tumour: Multivariate regression analysis***

Variables	*Beta*	*Standard error*	*P value*
Age	0.476	0.122	0.001
Dukes stage	0.249	0.123	0.048

Table (4): ***Operative variables***

Variables	*Obstruction*		*P-value*
	Present (n= 28)	*Absent (n= 35)*	
Curability			
Curative	14 (50)	31 (88.6)	0.0007
Palliative	14 (50)	4 (11.4)	
Tumour perforation			
Present	6 (21.4)	1 (2.8)	0.01
Absent	22 (78.6)	34 (97.2)	
Tumour fixity			
Mobile	20 (71.4)	34 (97.2)	0.003
Fixed	8 (28.6)	1 (2.8)	

Values in parentheses are percentages

Table (5): ***Surgical treatment in 63 patients operated upon***

Type of operation	*Obstruction*		*Total*
	Present (n= 28)	*Absent (n= 35)*	
Right side			
Right or extended right hemicolectomy	6 (21.4)	10 (28.6)	16(25.4)
Transverse colectomy	2 (7.1)	6 (17.1)	8(12.6)
Resection without anastomosis	2 (7.1)	0 (0)	2(3.2)
Ileocolonic bypass	2 (7.1)	0 (0)	2(3.2)
Left side			
Left hemicolectomy	4 (14.3)	3 (8.6)	7(11.1)
Sigmoidectomy	4 (14.3)	6 (17.1)	10(15.9)
Subtotal colectomy	1 (3.6)	2 (5.8)	3(4.8)
Staged resection	3 (10.7)	0 (0)	3(4.8)
Diverting colostomy	1 (3.6)	0 (0)	1(1.6)
Rectum and rectosigmoid			
Low anterior resection	0 (0)	4 (11.4)	4(6.3)
Abdominoperineal resection	0 (0)	4 (11.4)	4(6.3)
Hartmann's procedure	2 (7.1)	0 (0)	2(3.2)
Diverting colostomy	1 (3.6)	0 (0)	1(1.6)

Table (6): ***Postoperative outcome***

Variables	*Obstruction*				*P-value*
	Present (n= 28)		*Absent (n= 35)*		
Medical complications					
Cardiac	2	(7.1)	2	(5.7)	0.73
Respiratory	3	(10.7)	1	(2.8)	
Others	1	(3.5)	1	(2.8)	
Surgical complications					
Anastomotic leakage	3	(14.3)**	2	(5.7)	0.71
Intra-abdominal sepsis	2	(7.1)	0	(0)	
Post-operative haemorrhage	1	(3.5)	1	(2.8)	
Wound infection	4	(14.3)	2	(5.7)	
Hospital deaths					
Intra-abdominal sepsis	2	(7.1)	1	(2.8)	
Anastomotic leakage	1	(3.5)	1	(2.8)	0.68
Acute myocardial infarction	1	(3.5)	1	(2.8)	
Terminal malignancy	2	(7.1)	0	(0)	
Post-operative ICU* care	14	(50)	5	(14.3)	0.002
Hospital stay (days): median (range)	17	(11-69)	10	(7-34)	0.04

* ICU= Intensive Care Unit
** Anastomotic leakage in the obstructing group occurred in 3 of 21 curative resections (14.3%)

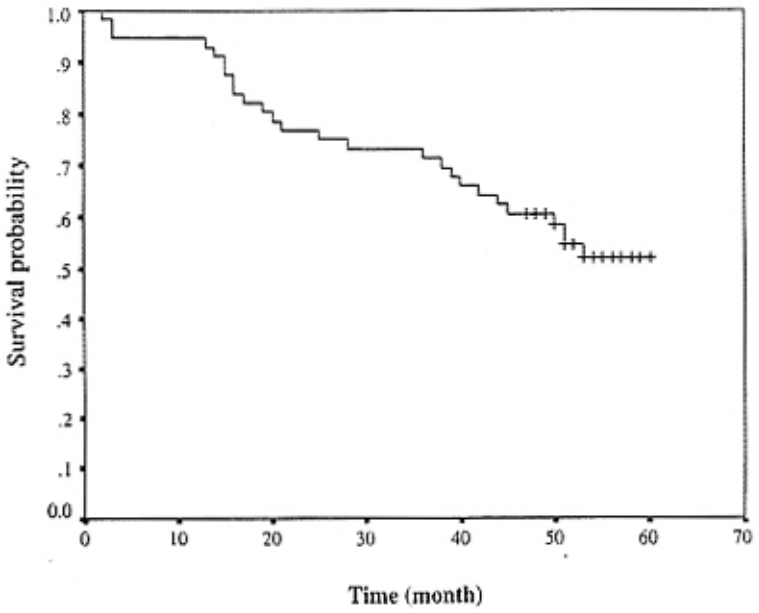

Fig. (1): Overall survival probability of colorectal cancer patients 5-year survival rate (52%)

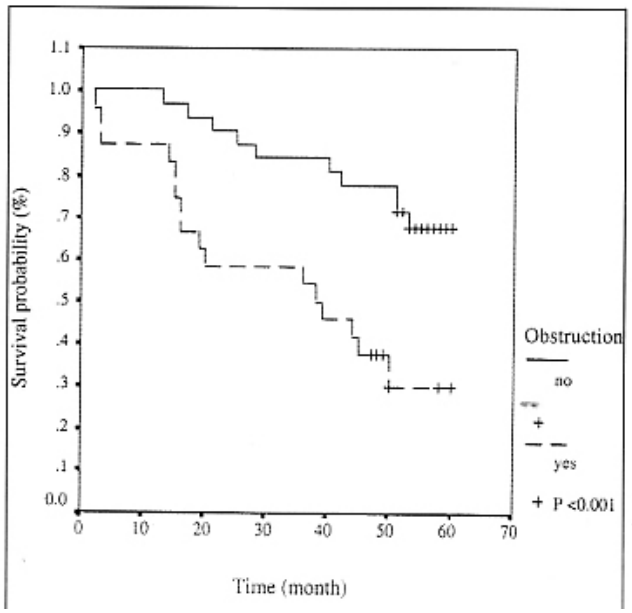

Fig. (2): Survival probability of colorectal cancer patients in relation to intestinal obstruction 5-year survival rates 30% vs 68%)

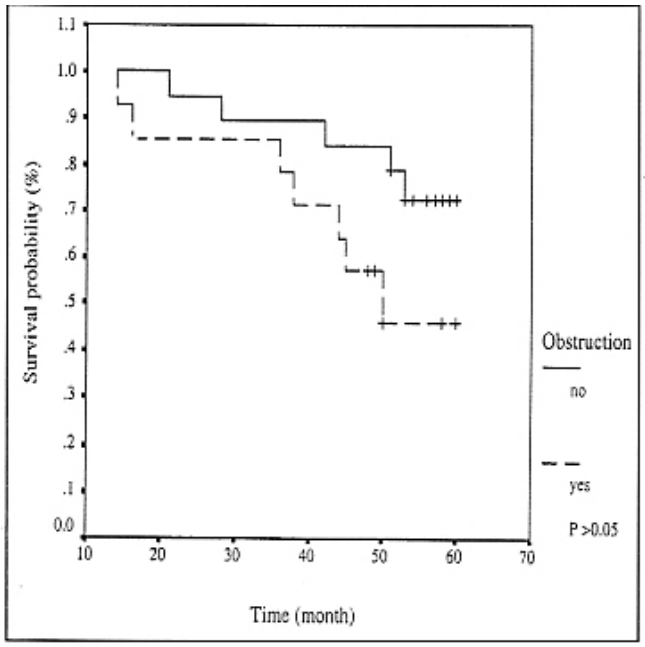

Fig. (3): Survival probability of colorectal cancer patients with curative resection in relation to intestinal obstruction 5-year survival rates (45.7% vs. 72%)

Table (7): ***Five-year survival rates according to various prognostic factors in patients with colorectal cancer***

Variables	*5-year survival %*	*P-value*
Age		
<50	72.8	0.03
50-70	60.2	
>70	0	
Sex		
Male	61.6	0.65
Female	68.2	
Presentation		
Obstructing	49.8	0.04
Non-obstructing	75.2	
Pre-morbid conditions		
Present	74.8	0.4
Absent	61.6	
Location		
Right colon	65.6	0.04
Left colon	76.4	
Rectum	31.5	
Dukes' stage		
A+B	95	0.001
C	48.9	
D	0	
Tumour Grade		
Well+moderate	96	0.001
Poor	36.4	
Histology		
Non-mucinous	81.4	0.003
Mucinous	16.8	
Lymph node status		
Negative	81.1	0.004
Positive	34.1	
Fixity		
Mobile	73.5	0.001
Fixed	7.4	
Perforation		
Present	0	0.001
Absent	69.8	
Curability		
Curative	85.5	0.001
Palliative	0	

Table (8): ***Significant risk factors related to survival: Multivariate Cox regression analysis***

Variables	*Beta*	*Standard error*	*P value*
Tumor perforation	3.980	1.183	0.0007
Dukes' stage	2.428	0.653	0.001
Curability	2.543	0.790	0.001
Grade	2.198	0.682	0.001
Location	0.663	0.282	0.018
Tumor fixity	1.585	0.711	0.025

DISCUSSION

In recent years considerable evidence has accumulated, indicating that colorectal obstruction carry a worse outlook in several aspects than do non-obstructing lesions[16]. The proportion of obstructed patients in our series is quite high (44%). However, this value falls within the range of published series[17,18]. Previous studies have found that obstruction tended to occur in the older age groups[5,7]. Our study confirmed the observation (P= 0.0002). Tumour stages in obstructing cancers were reported to be higher compared with those in non-obstructing cancers[7,19,4]. In the present study, significantly more advanced (Dukes D), was noted in the obstructing group (P= 0.01). It may be that the time required to cause an obstruction might be responsible for the delay in diagnosis of obstructive cancer, resulting in advanced stages at diagnosis.

The significant risk factors related to an obstructing tumour were determined by univariate and multivariate logistic regression analysis. At univariate analysis, the factors found to be significant in predicting the development of obstruction were: patient age, Dukes' stage, histologic grade, mucin-producing tumours and positive lymph node involvement. In addition, the chance of a tumour being fixed or perforated was significantly greater in patients with obstruction. Similar results have been reported in the literature[7,16,4]. At multivariate analysis for risk factors related to an obstructing tumour, only patient's age and Dukes' stage remained in the final multivariate model. Korenaga et al., determined the significant risk factors related to an obstructing tumour by multivariate logistic regression analysis of 113 Japanese patients with colorectal carcinoma, of these 113 patients, 23 (20.4%) had tumours presenting with large bowel obstruction. The significant variables were patient's age, nodal involvement and peritoneal dissemination[6].

As might be anticipated, the most common site of obstruction is the sigmoid colon. This was comparable to other studies[2], although contradicting some others who reported a higher incidence of obstruction with the splenic flexure[5]. In the present study, the site of obstruction was more often in the colon than in the rectum, although this result did not reach statistical significance (P= 0.32) probably because of the small number of patients in the later group. Also, the rarity of obstructing tumours at the rectum in this series (10.7%) is probably due to early local symptoms, which led to early diagnosis. A progressive relative increase in the incidence of proximal-based colon cancers has been noted in recent years[2,4]. Distribution by site was not significantly different between the two groups in accordance with several previous reports[2,4], although contradicting some others[5]. In our series, 42.8% of the obstructions occurred in the right colon and 46.4% in the left colon.

The obstructed cases were treated with slight variation. All of these patients had emergency operations performed on admission to the hospital or shortly thereafter. Primary resection was performed in the treatment of 75% of all obstructing tumours. Curative resection was possible in 50% of the obstructing cancers versus 88.6% in the non-obstructing group (p= 0.0007). This was comparable to other studies[7,1].

The operative mortality attributable to obstruction has ranged from 5 to 23%[4,1]. In our study, operative mortality was 21.4% in the obstructing group versus 8.5% in the non-obstructing group, comparable to most previous reports. A higher operative mortality was noted in patients with obstruction and perforation in agreement with other reports[7,20]. Anastomotic leakage is the most serious surgical complication after resection for colorectal cancer. With adequate bowel preparation and perioperative prophylactic antibiotics, most series reported a low leakage rate after elective surgery for colon cancer[21]. In emergency colonic surgery, the reported leakage rate is much higher and ranged from 4% to 13%[2]. We reported a 10.7% leakage rate in patients undergoing primary resection and anastomosis in the obstructing group, and 5.7% for those with non-obstructing cancers, and this is comparable to other results[5,22].

Our local recurrence rate was similar in both groups for patients undergoing curative resection, 28.5% versus 16.1% (P= 0.42). This was comparable to values of 25 to 42% observed in other large multicenter survey[5,23,24]. Similarly, metastatic recurrence after curative resection was 35.7% and 19.3% for obstructing and non-obstructing groups, respectively (P= 0.28). Distant metastasis tends to be predominantly involving the liver, in accordance with other reports[5,18].

The 5-year survival rates were significantly different between both groups, (30%) for the formal group versus (68%) for the latter group. This agrees well with results from other studies[2,16,4]. Also, after curative resection, patients with obstruction have a smaller survival probability (45.7%) than that of patients with non-obstructing lesions (72%), however, this difference did not reach statistical significant level, in accordance with other reports[2,5].

So far, the survival of patients with obstruction studied by means of multivariate analysis was significantly related to pathologic variables such as tumor stage and tumor grade, and to clinical and operative variables such as tumor perforation, tumor fixity, curative resection, and

tumor location[1]. In our series, obstruction proved to influence survival only at univariate analysis, in accordance with several previous series[25,18] although contradicting some others[5,7,6].

CONCLUSION

The factors found to be significant in predicting the development of obstruction at multivariate analysis were patient's age and Dukes' stage. Whereas, the significant variables related to survival at multivariate analysis were: tumour perforation, Dukes' stage, histologic grade, curative resection, tumour location and tumour fixity. Large bowel obstruction was a factor which did not influence the prognosis significantly.

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