Prevalence of and Risk Factors for Morbidity After Elective Left Colectomy

Cancer vs Noncomplicated Diverticular Disease

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Hypothesis: Independent risk factors for postoperative morbidity after colectomy are most likely linked to disease characteristics.

Design: Retrospective analysis.

Setting: Twenty-eight centers of the French Federation for Surgical Research.

Patients: In total, 1721 patients (1230 with colon cancer [CC] and 491 with diverticular disease [DD]) from a databank of 7 prospective, multisite, randomized trials on colorectal resection.

Intervention: Elective left colectomy via laparotomy.

Main Outcome Measures: Preoperative and intraoperative risk factors for postoperative morbidity.

Results: Overall postoperative morbidity was higher in CC than in DD (32.4% vs 30.3%) but the difference was not statistically significant ($P=.40$). Two independent risk factors for morbidity in CC were antecedent heart failure (odds ratio [OR], 3.00; 95% confidence interval [CI], 1.42-6.32) ($P=.003$) and bothersome intraluminal fecal matter (2.08; 1.42-3.06) ($P=.001$). Three independent risk factors for morbidity in DD were at least 10% weight loss (OR, 2.06; 95% CI, 1.25-3.40) ($P=.004$), body mass index (calculated as weight in kilograms divided by height in meters squared) exceeding 30 (2.05; 1.15-3.66) ($P=.02$), and left hemicolectomy (vs left segmental colectomy) (2.01; 1.19-3.40) ($P=.009$).

Conclusions: Patients undergoing elective left colectomy for CC or for DD constitute 2 distinct populations with completely different risk factors for morbidity, which should be addressed differently. Improving colonic cleanliness (by antiseptic enema) may reduce morbidity in CC. In DD, morbidity may be reduced by appropriate preoperative nutritive support (by immunonutrition), even in patients with obesity, and by preference of left segmental colectomy over left hemicolectomy. By decreasing morbidity, mortality should be lowered as well, especially when reoperation becomes necessary.

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LEFT-SIDED COLON CANCER (CC) and sigmoid diverticular disease (DD) are the 2 most frequent indications for elective left colectomy.[1] Overall morbidity after open colectomy ranges from 28% to 39% for CC[2-4] and from 9% to 53.8% for DD.[5-8] Mortality ranges from 1% to 5.7% in CC[2,3] and from 0% to 1.2% in DD.[5-8] Elective left colectomies for CC vs those for DD are rarely individualized as such[9,10] or compared[5,6] and are usually analyzed together or with other diseases[1,3,11] or mixed with emergency surgery procedures.[2,3,12-17] Postoperative morbidity has rarely been described as a risk factor for early or late postoperative mortality overall or in colorectal surgery for cancer.[14] Because morbidity is higher than mortality in colorectal resections, it is easier to determine the risk factors for morbidity.[18] According to Katz,[19] all factors preceding fatal outcomes should be analyzed in studies on risk factors. Prediction of a rare event, such as mortality, is difficult in specialized hospitals, where death is uncommon. Therefore, future predictive models for elective colectomy should probably focus on morbidity and long-term survival rather than on in-hospital mortality.[20] Lowering morbidity should lead to decreased mortality.

However, a limiting factor has been the variability of classifications used in the literature, as in other disciplines.[21] In this study based on a prospective and multicenter databank of colorectal resections, we chose to use the classification by Horan et al,[22] with the objectives to compare the prevalences of postoperative morbidity in CC vs DD managed using the same type

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Table 1. Significant ($P<.05$) Differences in Preoperative, Intraoperative, and Postoperative Risk Factors Among Patients Undergoing Elective Left Colectomy for Colon Cancer (CC) vs Diverticular Disease (DD)[a]

Risk Factor	No. (%) CC (n=1230)	No. (%) DD (n=491)	*P* Value
Preoperative			
Age, y			
<60	261 (21.2)	185 **(37.7)**	.001
60-74	634 **(51.5)**	230 (46.8)	
≥75	335 **(27.2)**	76 (15.5)	
Male sex	700 **(56.9)**	223 (45.4)	<.001
BMI >30	96 (7.8)	57 **(11.6)**	.02
Ascites	169 **(13.7)**	33 (6.7)	.001
Hepatic cirrhosis	33 **(2.7)**	3 (0.6)	.01
Anemia	97 **(7.9)**	14 (2.9)	.008
Chronic respiratory failure	117 **(9.5)**	29 (5.9)	.02
Antecedent heart failure	78 **(6.3)**	17 (3.5)	.02
Factors impairing healing	68 **(5.5)**	14 (2.9)	.02
Type of enema			
Povidone-iodine	845 (68.7)	388 **(79.0)**	<.001
Sodium hypochlorite	171 (13.9)	74 (15.1)	
Other, water or saline	214 **(17.4)**	29 (5.9)	
Colonic stricture	813 **(66.1)**	180 (36.7)	<.001
Intraoperative			
Sepsis	294 (23.9)	158 **(32.2)**	.001
Bothersome intraluminal fecal matter	224 **(18.2)**	63 (12.8)	.01
Type of colorectal anastomosis			
Handsewn	910 (74.0)	394 **(80.2)**	.007
Mechanical	320 **(26.0)**	97 (19.8)	
Site of anastomosis			
Colocolonic	269 **(22.0)**	31 (6.3)	<.001
Colorectal			
Supraperitoneal	675 (54.9)	443 **(90.2)**	
Infraperitoneal	286 **(23.3)**	17 (3.5)	
Dukes classification[b]			
A	406 (33.0)	NA	NA
B	238 (19.3)	NA	NA
C	398 (32.4)	NA	NA
Postoperative			
Mortality	44 **(3.6)**	3 (0.6)	.002
Incisional surgical site morbidity	53 (4.3)	35 **(7.1)**	.02
Extrasurgical site morbidity	288 **(23.4)**	90 (18.3)	.03

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); NA, not applicable.
[a] Boldface indicates the higher percentage between the 2 diseases.
[b] Values do not sum to heading total because of missing data.

of resection (ie, left colectomy), as well as to identify through multivariable analysis the risk factors for morbidity. Highlighted were factors on which the surgeon can act preventively to decrease morbidity.[18,23]

METHODS

ELIGIBILITY CRITERIA

Among 2605 patients originating from 28 centers of the French Federation for Surgical Research and included in 7 previously reported studies,[24-30] the medical records and similar prospectively recorded clinical data forms of 1721 patients undergoing elective left colectomy for CC (1230 [71.5%]) or DD (491 [28.5%]) were analyzed (**Table 1**). Of 7 randomized studies published between 1993 and 1999, three studies[24-26] detailed antibiotic prophylaxis, 2 studies[27,28] were related to the type of colorectal anastomosis (handsewn vs mechanical), and 1 study each concerned omentoplasty[29] and abdominal drainage.[30] Three studies[25,27,28] among 613 patients evaluated left colectomy only, while the other 4 studies[24,26,29,30] evaluated all types of colectomy.

All patients were at least 18 years old and underwent elective laparotomy. Anastomosis was performed immediately in all cases and could be protected with omentoplasty or with a temporary colostomy or ileostomy.

DEFINITIONS

Diverticular disease was located mainly in the sigmoid colon and could be associated with DD in the left descending colon, rectosigmoid juncture, or both. Only patients undergoing elective colectomy were included. All patients had at least 1 previous flare of DD (Hinchey stage I or II[31]) that resolved favorably by medical treatment, with the last flare of acute DD having resolved at least 1½ months before the operation. No patient had Hinchey stage III or IV diverticulitis, as such patients underwent emergency operation during the study period.

TYPE AND EXTENT OF RESECTION

Left colectomy was categorized as left hemicolectomy or as left segmental colectomy. Left hemicolectomy was defined as removal of the left third of the transverse colon (including the splenic flexure), descending colon, and sigmoid colon (possibly including the colorectal juncture), followed by colocolonic, supraperitoneal, or infraperitoneal colorectal anastomosis. Left segmental colectomy included superior, sigmoidectomy, and anterior resection. Superior segmental colectomy was defined as removal of the left third or half of the transverse colon and the descending colon, followed by transversosigmoidostomy. Sigmoidectomy was defined as removal of the sigmoid colon (possibly including the colorectal juncture), followed by colocolonic or supraperitoneal colorectal anastomosis. Anterior resection was defined as removal of the sigmoid colon and upper rectum, followed by infraperitoneal colorectostomy.[32]

Postoperative morbidity was defined according to the Centers for Disease Control and Prevention classification by Horan et al,[22] with some modifications. Overall postoperative morbidity was modified to include extrasurgical site morbidity, and surgical site morbidity was categorized as incisional surgical site morbidity or organ space surgical site morbidity.

Incisional surgical site morbidity was subdivided. Subgroups were (1) infective complications (surgical site abscess with spontaneously or surgically evacuated pus, overt or covert incisional surgical site disruption, and incisional hernia) and (2) noninfective complications, such as hematoma and hemorrhage, requiring reoperation.

Organ space surgical site morbidity possibly requiring reoperation was subdivided. Subgroups were (1) infective complications, such as intra-abdominal abscess, localized or generalized peritonitis, and anastomotic leakage, and (2) noninfective complications, such as deep hematoma or bleeding.

Anastomotic leakage could be latent and discovered only through routine gastrografin contrast enema performed on or around day 8 after surgery.[32] Anastomotic leakage could also be patent, associated with 1 or more of the aforementioned infective general complications, egress of pus or fecal matter

through the drains, or discovery of leakage by radiological investigation, reoperation, or autopsy.

NONELIGIBILITY CRITERIA

Patients younger than 18 years were excluded from the study. Also excluded were patients undergoing (1) laparoscopic colonic resection; (2) other types of resection (right, right transverse, subtotal, or total colectomy); (3) resection without anastomosis (Hartmann procedure, double-barreled colostomy, or abdominoperineal amputation); (4) operations without resection, such as diverting stoma or restoration of intestinal continuity (stoma closure or Hartmann reversal); (5) colonic resection for chronic inflammatory disease (Crohn disease, ulcerative colitis, or other types of colitis); or (6) emergency operation.

SURGICAL PREPARATION

All patients had oral mechanical bowel preparation and enema. They also received parenteral antibiotic prophylaxis at anesthesia induction.

RISK FACTORS STUDIED

Risk factors were assessed among all patients. From each patient's medical record, the following 34 variables were culled prospectively:

Fifteen variables were preoperative. These included (1) age; (2) sex; (3) obesity (defined as body mass index [BMI, calculated as weight in kilograms divided by height in meters squared] exceeding 30); (4) weight loss (≥10% of usual body weight)[33]; (5) ascites; (6) hepatic cirrhosis; (7) anemia (hemoglobin level, <12.0 g/dL [to convert hemoglobin level to grams per liter, multiply by 10.0]); (8) chronic respiratory failure (defined as functional signs and Pa_{O_2} <65 mm Hg); (9) antecedent heart failure (defined as functional signs and left ventricular systolic or diastolic dysfunction); (10) factors impairing healing (corticosteroid therapy, chemotherapy <6 months before surgery, or abdominopelvic radiation therapy); (11) type of routine antibiotic prophylaxis (ceftriaxone sodium–imidazole salicylate, piperacillin sodium, amoxicillin sodium–clavulanic acid, or other); (12) oral mechanical bowel preparation with senna, polyethylene glycol, or other laxative; (13) type of enema (povidone-iodine, sodium hypochlorite, or other [water or saline]); (14) degree of stricture according to whether the adult-size scope passed the stenosis or whether the stenosis exceeded two-thirds the diameter of the lumen; and (15) center effect.

Nineteen variables were intraoperative. These included (1) sepsis (infected tumor, abscess, or both) discovered during surgery; (2) extent of colectomy (left hemicolectomy vs left segmental colectomy); (3) degree of colonic and rectal cleanliness, judged by the operating surgeon in the proximal and distal intestinal segments and defined as 0 (no fecal matter), + (small amounts of fecal matter not bothersome to the surgeon), or ++ (fecal matter bothersome to the surgeon)[34]; (4) intraoperative fecal soiling induced by the surgeon during resection; (5) degree of intraoperative contamination (soiling by fecal matter or infected material), evaluated by the operating surgeon as nil, moderate, or massive; (6) the presence of visceral metastasis; (7) curative or palliative resection in the case of cancer; (8) type of colorectal anastomosis (handsewn vs mechanical); (9) interrupted or continuous handsewn suturing; (10) absorbable or nonabsorbable suture ligature; (11) circular or linear mechanical suturing; (12) clamping of 1 or 2 intestinal segments; (13) site of anastomosis (colocolonic vs colorectal); (14) supraperitoneal vs infraperitoneal location for colorectal site of anastomosis; (15) placement of an intraperitoneal drain; (16) testing for air tightness; (17) omentoplasty; (18) use of a protective stoma; and (19) Dukes classification (for patients with cancer).

END POINTS

The main outcome measure was morbidity. This was expressed as the number of patients with 1 or more complications occurring during the hospital stay or within 30 days following discharge.[35]

STATISTICAL ANALYSIS

Data were culled and analyzed using commercially available software (SPSS, version 15.0; SPSS, Inc, Chicago, Illinois). Univariate analysis was performed on all risk factors using the χ^2 and Fisher exact tests for qualitative variables and using the *t* test for quantitative variables, as appropriate. When the distribution was not gaussian, the Mann-Whitney test was used. All variables with $P \leq .15$ were entered into multivariable step-by-step analysis using nonconditional logistic regression analysis.[19] Maximal likelihood was expressed by odds ratio (OR), with 95% confidence interval (CI).

RESULTS

PREVALENCE OF MORTALITY AND OVERALL POSTOPERATIVE MORBIDITY

Mortality in elective left colectomy was low among patients with CC (Table 1). Mortality was very low among patients with DD.

Overall postoperative morbidity was higher in CC than in DD (32.4% vs 30.3%), but the difference was not statistically significant ($P = .40$) (Table 1). Extrasurgical site morbidity was statistically significantly higher in CC than in DD. In contrast, statistically significantly more incisional surgical site morbidity occurred in DD. No statistically significant differences were found in organ space surgical site morbidity between CC vs DD, including anastomotic leakage (5.5% [68 of 1230] vs 4.7% [23 of 491]), reoperation (5.7% [70 of 1230] vs 3.7% [18 of 491]), and intra-abdominal abscess or localized or generalized peritonitis (3.4% [42 of 1230] vs 2.6% [13 of 491]).

COMPARISON OF PATIENTS WITH CC vs DD

Marked differences were found between the 2 populations(Table 1). Compared with patients having DD, statistically significantly more patients having CC were older and male and had anemia, ascites, hepatic cirrhosis, chronic respiratory failure, antecedent heart failure, factors impairing wound healing, colonic stricture, bothersome intraluminal fecal matter, mechanical type of anastomosis, and colocolonic and infraperitoneal sites of anastomoses. In contrast, statistically significantly more patients with DD had BMI exceeding 30, povidone-iodine type of enema, and intraoperative sepsis. No statistically significant differences were found between the 2 study groups in the other preoperative intraoperative and postoperative variables evaluated.

Table 2. Univariate Analysis of Preoperative, Intraoperative, and Postoperative Risk Factors for Morbidity After Elective Left Colectomy in Colon Cancer (CC) vs Diverticular Disease (DD)[a]

	No. (%)					
	CC (n=1230)			DD (n=491)		
Risk Factor	No (n=831)	Yes (n=399)	*P* Value	No (n=342)	Yes (n=149)	*P* Value
	Preoperative					
Age, y						
<60	190 (22.9)	71 (17.8)		140 (40.9)	45 (30.2)	
60-74	438 (52.7)	196 (49.1)	**.03**	151 (44.2)	79 (53.0)	**.008**
≥75	203 (24.4)	132 (33.1)		51 (14.9)	25 (16.8)	
Male sex	461 (55.5)	239 (60.0)	**.14**	156 (45.6)	67 (45.0)	.89
≥10% Weight loss	133 (16.0)	64 (16.0)	.98	48 (14.0)	35 (23.5)	**.01**
BMI >30	61 (7.3)	35 (8.8)	.38	32 (9.4)	25 (16.8)	**.08**
Ascites	100 (12.0)	69 (17.3)	**.01**	20 (5.8)	13 (8.7)	**.03**
Hepatic cirrhosis	15 (1.8)	17 (4.3)	**.02**	0	3 (2.0)	.03
Chronic respiratory failure	64 (7.7)	53 (13.3)	**.002**	17 (5.0)	12 (8.1)	.25
Antecedent heart failure	36 (4.3)	42 (10.5)	**.001**	13 (3.8)	4 (2.7)	.53
Factors impairing healing	39 (4.7)	29 (7.3)	**.06**	6 (1.8)	8 (5.4)	**.04**
	Intraoperative					
Left hemicolectomy	125 (15.0)	68 (17.0)	.37	41 (12.0)	31 (20.8)	**.001**
Palliative resection	83 (10.0)	52 (13.0)	**.09**	NA	NA	NA
Bothersome intraluminal fecal matter	118 (14.1)	106 (26.6)	**<.001**	40 (11.7)	23 (15.4)	.20
Sepsis	125 (15.0)	120 (30.1)	**<.001**	103 (30.1)	55 (36.9)	**.14**
Soiling	139 (16.7)	103 (25.8)	**<.001**	49 (14.3)	28 (18.8)	.20

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); NA, not applicable.
[a]Only risk factors with $P \leq .15$ (indicated in boldface) for at least 1 disease are listed.

Table 3. Multivariate Analysis of Preoperative and Intraoperative Independent Risk Factors for Morbidity After Elective Left Colectomy in Colon Cancer (CC) vs Diverticular Disease (DD)

CC (n=1230)		DD (n=491)	
Risk Factor	OR (95% CI)	Risk Factor	OR (95% CI)
Preoperative			
Antecedent heart failure	3.00 (1.42-6.32) (*P*=.003)	≥10% Weight loss	2.06 (1.25-3.40) (*P*=.004)
		BMI >30	2.05 (1.15-3.66) (*P*=.02)
Intraoperative			
Bothersome intraluminal fecal matter	2.08 (1.42-3.06) (*P*=.001)	Left hemicolectomy	2.01 (1.19-3.40) (*P*=.009)

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CI, confidence interval; OR, odds ratio.

RISK FACTORS FOR POSTOPERATIVE MORBIDITY

Univariate Analysis

Univariate analysis identified 14 risk factors with $P < .15$ in one or both study groups (**Table 2**). Eleven risk factors with $P < .15$ were identified in CC; 7 were preoperative (age, male sex, ascites, hepatic cirrhosis, chronic respiratory failure, antecedent heart failure, and factors impairing healing), and 4 were intraoperative (palliative resection, bothersome intraluminal fecal matter, sepsis, and soiling). Seven risk factors with $P < .15$ were identified in DD; 5 were preoperative (age, ≥10% weight loss, BMI >30, ascites, and factors impairing healing), and 2 were intraoperative (left hemicolectomy and sepsis).

Three risk factors were not retained for multivariable analysis because they are reverse causality factors.[36] These included clamping of 1 or 2 intestinal segments, placement of an intraperitoneal drain, and use of a protective stoma.

Multivariate Analysis

Multivariate analysis identified 2 independent risk factors for morbidity in CC (**Table 3**). These were antecedent heart failure and bothersome intraluminal fecal matter.

Multivariate analysis identified 3 independent risk factors for morbidity in DD (Table 3). These were at least 10% weight loss, BMI exceeding 30, and left hemicolectomy (vs left segmental colectomy).

COMMENT

Despite similar overall morbidity in CC and DD, our study showed that risk factors differ between the 2 diseases. There were 2 risk factors for morbidity in CC (antecedent heart failure and bothersome intraluminal fecal matter) and 3 risk factors in DD (≥10% weight loss, BMI >30, and left hemicolectomy) (Table 3). The 2 patient groups constitute distinct populations (Table 1).

We limited our study to elective surgery because several studies have underscored that emergency colorectal surgery is an independent risk factor for postoperative morbidity[37,38] and mortality.[12,14,37,39] Therefore, inclusion of patients undergoing emergency surgery might mask other factors influencing the postoperative course.

The ratio of the number of left colectomies for CC was 2.6 times more frequent than for DD. This is in accord with previous findings, with ratios ranging from 2.5:1 in one study[12] to 3:1 in another study.[40]

Morbidity rates in CC and DD herein were comparable to rates reported in the literature, ranging from 28% to 39% for CC and from 9% to 53.8% for DD.[2,3,5,8,12] Potential reasons for disparity in complication rates include center effect, retrospective data collection, and variability in definitions of complications.[41] A strength of our study is that it was a multicenter investigation that used prospective culling of variables, with few (if any) missing data. We used the anatomic classification of postoperative complications by Horan et al.[22] In classifications proposed by Clavien et al,[42] Dindo et al,[43] and Dindo and Clavien[44]—based on therapeutic consequences of complications, with their successive (and somewhat inconsistent) modifications[43,44]—some grades combine different degrees of severity of complications (eg, anastomotic leakage and posttransplantation stenosis of the ureter are in the same category). Ideally, the most useful classification might be a combination of anatomic and therapeutic consequences in which complications leading to reintervention are included in each anatomic subset.[22]

Multivariate analysis has not been used consistently in the literature to assess predictive factors for morbidity after colectomy.[3,6,12,45-47] Our multivariate findings are summarized in Table 3.

Antecedent heart failure, found in our study to be an independent risk factor for morbidity in CC, was also associated with morbidity after segmental colon resection[45] irrespective of the initial disease (CC or DD) and in several other studies[3,6,12,45,46] that used multivariate analysis to determine predictive factors of postoperative morbidity after colorectal surgery. These studies underscore the consistent relationship between poor preoperative status of the patient and poor outcome.[12]

Bothersome intraluminal fecal matter occurs because of poor bowel preparation, quantity of matter, and incomplete colonic cleanliness. In the most recent meta-analysis[48] comparing mechanical bowel preparation with no preparation before colorectal surgery, the use of mechanical bowel preparation increased surgical site infections. A possible reason is that oral bowel preparation does not decrease the concentration of germs in the colonic mucosa and is incapable of decreasing infective complications, even when spilled intraperitoneal fecal matter and soiling are minimal.[49] However, the meta-analysis did not include studies on the use of enemas or oral preparations with senna.[50] Enemas with antiseptics such as povidone-iodine[25] rather than sodium hypochlorite[51]—or even tap water (which contains chlorides in France)—can decrease the concentration of germs not only in the feces contained in the colonic lumen but also in the mucosa, even in the case of incomplete oral preparation.[49] Results of at least 1 controlled randomized study[25] suggested that antiseptic enemas decreased infectious morbidity, but this remains to be confirmed by other randomized controlled trials. Additional factors can intervene, including bacterial translocation, germ virulence, accidental fecal soiling, and increased volume or fluidity of fecal matter, such as occurs in the case of preoperative stenosis.[50] In cases of poor bowel preparation, intraoperative lavage can be considered.[52]

A risk factor herein for morbidity in DD was weight loss (≥10% of usual body weight) (Table 3), which is a sign of malnutrition, as is hypoalbuminemia (albumin level, <3.0 g/dL [to convert albumin level to grams per liter, multiply by 10]).[3,37] Malnutrition has been found to be a risk factor for postoperative morbidity and mortality.[3,12] The 16.9% rate of undernourished patients with DD herein was high and could reflect the severity of initial DD. Adequate workup of a patient's nutritional status is recommended before colectomy for DD. Although this risk factor has been studied mostly in patients with cancer,[33] a systematic short course of preoperative and postoperative immunonutrition could decrease postoperative infective morbidity[53] (incisional surgical site, extrasurgical site, and organ space surgical site infections) and duration of hospital stay.[33]

Obesity as a risk factor is an apparent paradox. In view of the preceding risk factors found, it would be inadvisable for obese patients to lose more than 10% of their body weight before operation. Doubling the dose of antibiotic prophylaxis has been suggested in patients with obesity to reduce infective risk.[54] However, in a recent study[47] of colectomy for cancer based on the American College of Surgeons National Surgical Quality Improvement Project, morbid obesity (BMI ≥35) was a risk factor for increased surgical site infection, dehiscence, pulmonary embolism, and renal failure but not for other complications or for mortality.

Last, left hemicolectomy (vs left segmental colectomy) has previously been found to be an independent predictor of morbidity (notably for surgical site morbidity).[55] Because this operation takes longer to perform than left segmental colectomy, the prolonged operative time may influence morbidity.[12]

The higher incisional surgical site morbidity observed herein for DD (7.2% vs 4.4% for CC, $P = .02$) may be owing to the increased prevalence of obesity among this group.[56] In patients with obesity, laparoscopic colectomy has been touted to decrease the rate of postoperative complications in this setting,[57] with the trade-off being prolonged operative time[57] and a higher rate of conversion to open surgery.[8,58]

Our study excluded patients undergoing laparoscopic colectomy, which was rarely performed for CC in the years

included in this study. Meta-analysis[57] of controlled randomized trials comparing open vs laparoscopic colectomy for cancer demonstrated that the laparoscopic procedure did not lower early or late postoperative mortality or overall postoperative morbidity but decreased incisional surgical site complications. In DD, meta-analysis[59] of observational studies and a recent randomized controlled study[8] showed that laparoscopic colectomy did not lower mortality but decreased overall morbidity and incisional surgical site complications.

Our study has several shortcomings. First, we did not consider surgeon experience or duration of operation, which would have been variable. Second, blood loss and transfusion rates were not tabulated; again, both likely varied among centers. Therefore, the morbidity and mortality observed in our study may be representative of the overall surgical population, not of expert centers. We looked for a center effect, which was not found.

CONCLUSION

Patients undergoing left colectomy for CC or for DD constitute 2 distinct populations, and this should prevail in decision making and therapeutic policies. Unique independent risk factors for morbidity in the 2 diseases should be corrected whenever possible. In CC, povidone-iodine (an antiseptic that acts rapidly, in approximately 15 minutes, by contact) can be used (1) before surgery[49] as an enema or (2) during surgery for on-table lavage in case of fecal overload, as may be seen in stenosis or in colectasis. In DD, morbidity may be improved by providing appropriate preoperative nutritive support, even in patients with obesity, and by preferring left segmental colectomy over left hemicolectomy. When evaluating postoperative results after left colectomy, it seems necessary to separate the outcomes for CC from those for DD and to consider this difference when scoring patients for the use of a protective stoma.

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