Impact of preoperative weight loss and body composition changes on postoperative outcome in surgery for inflammatory bowel disease

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SUMMARY One hundred and twenty seven patients undergoing elective surgery for inflammatory bowel disease were divided into three groups according to their preoperative ideal body weight (<80%, 80-90%, and >90%). The groups were well matched in respect of age, sex, corticosteroid therapy, pre-existing sepsis, peroperative antimicrobial chemotherapy, and resection site. None received peroperative nutritional support. The postoperative outcome was similar in each of the three nutritional groups including the incidence of postoperative sepsis, duration of hospital stay, and mortality. Serial peroperative changes in weight, fat, and muscle bulk were assessed by anthropometric measurements in 21 of these patients. The deficits in weight, fat, and muscle bulk were similar at 10 and 21 days postoperatively in the three groups. At 84 days those malnourished preoperatively had recovered their nutritional status faster than the well nourished patients. We conclude that in these patients undergoing elective resection for inflammatory bowel disease preoperative weight loss did not adversely affect the postoperative outcome.

It is uncertain whether preoperative weight loss, which is common in surgical patients¹ and particularly so in patients with inflammatory bowel disease,² adversely affects the postoperative outcome. Evidence for an adverse effect includes epidemiological data derived mainly from children in the developing countries where malnutrition is associated with an increased risk of sepsis.³⁻⁵ Laboratory studies in protein depleted animals suggest that they are susceptible to bacterial infections⁶ and also have impaired strength of surgical anastomoses.⁷ The controversy has been examined in man by a number of workers who have provided preoperative nutritional support and assessed the postoperative outcome. Preoperative nutritional support improved the postoperative outcome in some studies,^{8,9} but not in others.^{10,11} We have approached the problem differently in this study by examining the postoperative morbidity in a consecutive series of patients with inflammatory bowel disease undergoing elective surgery for resection grouped according to their preoperative ideal body weight. The peroperative changes in

weight, fat, and muscle bulk have been assessed by detailed anthropometric measurement¹²⁻¹⁶ in 21 of these patients.

Methods

PATIENTS

One hundred and twenty seven consecutive patients undergoing elective surgical resection for inflammatory bowel disease (Crohn's disease n=112, ulcerative colitis n=15) between 1974 and 1980 whose wounds were closed by primary suture were studied. They were allocated to one of three nutritional groups according to their preoperative ideal body weight, corrected for height, sex, and age¹⁴ (<80%, 80-90%, and >90% of ideal body weight) and a proforma was completed for each patient which included details of age, sex, site of disease, nature of the surgical resection, corticosteroid therapy, pre-existing sepsis, and peroperative antimicrobial chemotherapy. The postoperative outcome was monitored for evidence of wound sepsis, abscess, and septicaemia. Minor sepsis was defined as localised pus in the incision with little systemic disturbance. Major sepsis was defined as a wound or abdominal abscess

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discharging pus either spontaneously or after surgical drainage with severe constitutional symptoms and clinical bacteraemia.

The peroperative changes in weight, fat, and protein were determined by serial anthropometric studies in 21 of these patients whose protein status preoperatively was measured by expressing arm muscle circumference as a percentage of their standard arm muscle circumference for age and sex. The proportion of body weight as fat (% fat) was derived from the mean of three measurements of mid-non-dominant triceps skinfold thickness.¹⁵ Muscle bulk was estimated by measuring arm muscle circumference.¹⁶ The postoperative changes in weight, muscle mass, and percentage fat were expressed as a percent change from their preoperative value in each patient.

The mean percentage change in muscle mass, fat, and weight were derived for the patients in each of the three nutritional groups at 10, 21, and 84 days postoperatively. Anthropometric measurements were all carried out by one observer (CSH). The mean difference between duplicate measurements of skinfold thickness were 3.2% and for duplicate measurements of arm muscle circumference 1.3%.

STATISTICAL ANALYSIS

Statistical analysis was by Student's *t* tests and regression analysis.

Results

OVERALL

The three nutritional groups were well matched in respect of the preoperative variables which might affect the postoperative outcome including age, sex, nature of surgical resection, and the incidence of pre-existing sepsis and peroperative corticosteroid therapy. Well nourished patients had a marginally

higher incidence of peroperative antimicrobial chemotherapy (Table 1).

The incidence and sites of postoperative sepsis was similar in the three groups (Table 2). There were no postoperative deaths. The incidence of postoperative sepsis was similar to that recorded in previous studies.¹⁶ There was no significant difference in the duration of hospital stay in the three nutritional groups.

SMALL BOWEL RESECTIONS

The 89 patients undergoing small bowel resection ($\pm$ the adjacent colon) were also well matched in respect of preoperative variables which might affect the postoperative outcome. The postoperative sepsis rates were similar in each group and were not increased in the severely malnourished patients (Table 3).

ANTHROPOMETRIC DATA

The clinical details of the 21 patients with Crohn's disease whose nutritional status was assessed serially is shown in Table 4. These patients were allocated into nutritional groups according to their preoperative body weight expressed as a percentage ideal body weight. The protein status for each group was also defined by measuring each individual's arm muscle circumference and expressing it as a percentage standard for age and sex. The mean percentage standards for each nutritional group was measured and showed that those malnourished as defined by % ideal body weight were also protein malnourished (Table 4).

The average age of the malnourished group (<80% ideal body weight) was higher than the other groups but they were well matched in all other respects.

Postoperative sepsis was uncommon and there were two episodes of major sepsis. The mean overall

Table 1 Preoperative variables: all patients grouped according to ideal body weight (IBW)

	% Ideal body weight			All
	<80	80-90	>90	
Crohn's disease	37	30	45	112
Ulcerative colitis	1	8	6	15
Mean % IBW	70.9 $\pm$ 6.0	84.6 $\pm$ 3.3	104.8 $\pm$ 13.8	88.6 $\pm$ 17.2
Men	14	16	20	50
Women	24	22	31	77
Mean age (yr)	32.4	37.5	40.0	37
Pre-existing sepsis	8	10	12	30 (24%)
Peroperative corticosteroid therapy	24	22	27	73 (57%)
Peroperative antimicrobial therapy	21	16	31	68 (53%)
Resection of small bowel and colon	27	25	37	89
Colectomy + ileorectal anastomosis	8	4	4	16
Panproctocolectomy	3	9	10	22

Table 2 Sepsis after surgical resection: all patients

% Ideal body weight	Patients (no)	Sepsis			Duration of hospital stay (days)
		Minor	Major	None	
<80	38	4 (10.5%)	6 (16%)	28 (74%)	21.1±13.4
80-90	38	3 (8%)	5 (13%)	30 (79%)	20.3±13.2
>90	51	6 (12%)	7 (14%)	38 (74%)	16.6±7.4
Total	127	13 (10%)	18 (14%)	96 (76%)	19.1±11.3

There was no significant difference between duration of hospital stay in the three groups.

duration of hospital stay in each group is shown in Table 4. The malnourished patients (<80% ideal body weight) without complications had a mean postoperative stay of 14.8±4.6 days compared with 10.7±3.4 days in the well nourished group, but the differences were not statistically significant.

The mean duration of hospital stay was 28±10.1 days (range 14-38 days) in those patients with postoperative complications which was significantly longer than those without complications ($p=0.01$; Student's t test). There was no correlation between nutritional status (% ideal body weight) and duration of hospital stay ($r=-0.29$, $t=1.13$, NS).

The analysis of the postoperative changes in weight and its components (% fat and muscle mass) with the patients grouped according to their preoperative ideal body weight is shown in the Figure a,b,c. Weight loss was similar in the three groups at 10 and 21 days (Fig. a). At 84 days the severely malnourished gained more weight (+8.5%) when compared with the well nourished (-1.1%).

The changes in percentage body fat (% fat) were similar to the weight changes in the postoperative period (Fig. b). At 84 days, however, the poorly nourished patients (<80% ideal body weight) had a mean gain of 33.9% from their preoperative fat status compared with the intermediate group (80-

90% ideal body weight) who had gained 15.9%. The well nourished (>90% ideal body weight) had a mean loss of 4.4% from their preoperative status.

The mean changes in muscle mass as measured by arm muscle circumference were small (Fig. c), and similar to the weight changes observed in each group. The severely malnourished patients, however, were slow to reverse their negative deficit of -8% at 10 days and -6% at 21 days. Those who were malnourished (<80% ideal body weight) showed the greatest mean percentage gain in muscle mass (+12%) at 84 days.

Discussion

This study confirms the conclusions of a preliminary study¹⁷ that the extent of preoperative weight loss observed in these patients did not adversely affect the postoperative outcome. In particular we found that preoperative weight loss did not influence the incidence of postoperative sepsis.

The three nutritional groups were well matched in respect of variables which might affect the postoperative outcome by modifying the immune response,¹⁸ though in practice corticosteroid therapy (possibly because of the use of appropriate preoperative antimicrobial chemotherapy) does not seem to adversely affect postoperative sepsis rates.¹⁷⁻²⁰

The data from children in developing countries where malnutrition is associated with severe sepsis⁵ while emphasising the hazards of malnutrition cannot be extrapolated to predict the outcome in previously well nourished adult patients who present with weight loss at the time of surgical treatment for inflammatory bowel disease.

Anthropometric measurements are important in the assessment of protein calorie malnutrition and the measurement of components of weight change in surgical patients.¹³⁻²¹ They are particularly useful in patients with inflammatory bowel disease, where measurement of serum proteins are unreliable for assessing malnutrition as the disease is often associated with protein loss into the bowel lumen.

The patients undergoing anthropometric measurements were divided into three nutritional groups determined by ideal body weight as previously defined.²² These groups corresponded well with protein status as defined by percentage standard arm muscle circumference. The deficits in weight and muscle bulk were similar in all three groups at 10 and 28 days postoperatively and illustrate the metabolic response commonly observed after surgical intervention.

The changes in the individual components by anthropometric measurement were of the same

Table 3 Sepsis after small bowel resection alone

% Ideal body weight	Patients (no)	Sepsis		
		Minor	Major	None
<80	27	3 (11%)	3 Pelvic abscess Wound abscess (2)	21 (78%)
80-90	25	2 (8%)	3 Abdominal abscess Pelvic abscess Perirectal abscess	20 (80%)
>90	37	3 (8%)	4 Wound abscess (3) Abdominal sepsis	30 (81%)
Total	89	8 (9%)	10	71 (80%)

Table 4 Clinical data of the 21 Crohn's patients having serial anthropometric measurements

% Ideal body weight	<80	80–90	>90	Total
Preoperative data				
Mean % IBW	72.1±4.7	84.7±3.7	107.7±11.9	89.2±17
Patients (no)	7	6	8	21
Mean age (range)(yr)	51 (19–73)	37.5 (24–58)	36.3 (11–58)	41.5 (11–73)
Mean AMC (cm)	18.3±1.98	21.9±3.7	22.4±1.6	20.6±3.1
Mean % standards AMC (range)	76.1±6.9 (68–87)	87.1±4.1 (82–93)	98.0±5.1 (93–105)	87.6±10.8 (68–105)
Preoperative sepsis	2	0	1	3
Peroperative corticosteroid therapy	4	2	4	10
Peroperative antimicrobial therapy	7	4	6	17
Postoperative data				
Major sepsis	1	0	1	2
Minor sepsis	0	1	0	1
Other complications	1 (bleeding DU)	1 (pulmonary embolus)	0	2
Those without complications				
Duration of hospital stay (days)	14.8±4.6	13.8±5.2	10.7±3.4	12.8±4.4
Mean % IBW at 84 days	77.6±6.7	89.1±6.1	104±14	92.2±1

Figure a,b,c Postoperative outcome in patients grouped according to their preoperative percentage ideal body weight (% IBW). All changes are expressed as mean percentage change from preoperative value. (a) Weight changes after surgery; (b) changes in % body fat after surgery; (c) changes in muscle bulk after surgery.

order as those described in studies after abdominal surgery.^{23 24}

The severely malnourished patients pre-operatively responded more rapidly in the post-operative period than the well nourished patients. This improvement resulted from an increase in fat and only a modest gain in muscle mass. This contrasts with the well nourished patients who were of similar nutritional status at 84 days post-operatively to their preoperative state.

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