

PAPERS AND ORIGINALS

Large-bowel obstruction caused by cancer: a prospective study

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Summary and conclusions

Patients with obstructing large-bowel cancer may be treated by primary tumour resection or the conventional staged tumour resection, and a prospective study comparing these two treatments was carried out. The post-operative outcome in 174 patients (of whom 90 underwent primary and 47 staged tumour resection) showed that the overall mortality was similar in both groups but that the duration of hospital stay in patients who underwent primary tumour resection was half that of those who underwent staged tumour resection. The mortality for primary tumour resection, however, was unexpectedly high for lesions proximal to the splenic flexure and unexpectedly low for lesions distal to this point. Of patients with distal tumours in whom a staged resection was planned, 35% died after a loop colostomy. The most striking result was that the ratio of postoperative death for trainee surgeons compared with fully trained surgeons was 3:1.

It is concluded that patients with large-bowel cancer who present with intestinal obstruction should be treated by a fully trained surgeon and that immediate resection of the tumour should be considered for every patient.

Introduction

The treatment of patients with large-bowel obstruction caused by tumour is currently changing slowly. Formerly nearly all such lesions, particularly on the left side of the colon, were treated by bypass procedure or a defunctioning stoma, and tumour resection was deferred for an indefinite period. Using an ileocolic bypass procedure for an obstructing right colonic

lesion, though standard teaching in the 'forties, now seems illogical to most surgeons, and immediate tumour resection by a right hemicolectomy has become established practice. An extension of this approach has been advocated for lesions up to and including the splenic flexure¹ and even beyond²; the safety of the method has possibly been increased by preliminary operative decompression of the obstructed segment.³ Despite these views, doubt remains about the best treatment for obstructing tumours not managed by conventional or extended right hemicolectomy; the two contending operations are staged tumour resection (the conventional method most recently advocated by Irvin and Greaney⁴) and primary tumour resection (the candidate method most recently supported by Valerio and Jones⁵).

One way of comparing these procedures might be to study the results of retrospective surveys so as to formulate a hypothesis on the relative success of one or other treatment and to follow this by a prospective randomised trial. Interpreting results from retrospective surveys, however, is usually difficult, because the group in which a delayed (staged) resection has been planned is often depleted by those patients who had a colostomy and then died before a second operation could be carried out and those in whom the second laparotomy has shown the tumour to have become unresectable. Furthermore, prospective study by formal randomised trial is also subject to difficulty: the definition of obstruction is not agreed; there are usually only few patients per surgeon; and surgeon-related prognostic variables⁶ are present. Accordingly, it is more appropriate first to undertake a prospective study that simply documents the presentation, treatment, and outcome of treatment to investigate the hypothesis that immediate tumour resection is no less favourable in postoperative outcome than staged tumour resection, and we present such a study.

The hypothesis that one operative method is comparable with another is best tested when surgeons consider that both operations are possible. This, however, rarely occurs; the two most important factors that determine how patients are selected for either primary or staged resection seem to be the clinical state of the patient (whether or not he is judged fit to undergo what is thought to be a more severe procedure) and the surgeon's self-assessment of his competence. Thus, for example, a patient in "poor condition" who is to be operated on by a surgeon in training might be more likely to be submitted to a staged

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procedure; the severity of his illness may yet make him more likely to die, despite the minor nature of the surgery. Therefore in this study we have not assumed that the primary and staged resection groups were random subsamples of the population with intestinal obstruction. It follows that conventional statistical comparisons, which assume selection without bias, are inappropriate.

Patients and methods

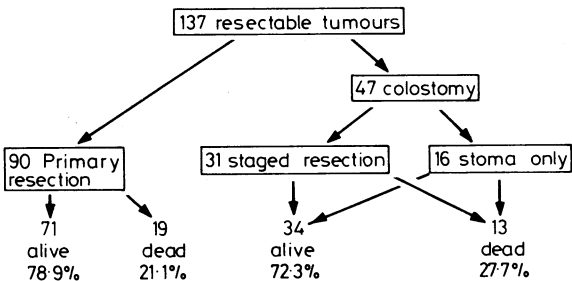
Sixty-three surgeons agreed to take part in a prospective study, and the records of all patients with large-bowel cancer under their care in a 15-month period during 1976-7 were collated by specially trained research personnel. Out of 932 patients, 174 had large-bowel obstruction at first laparotomy. A precise definition of intestinal obstruction is elusive but includes the symptoms of constipation, pain, and vomiting; the signs of abdominal distension and abnormal gaseous distension of the gut shown by radiography; and the laparotomy findings of proximal bowel distension and oedema. Patients with simple loading of the proximal colon with faeces unresponsive to bowel preparation were not included in this study.

The results described are those of the treatment of the presenting condition and include all the operations required to achieve an end result, whether this was a stoma, a normal faecal pathway, or death. The end-point for outcome was the patient's discharge from hospital; postoperative mortality is described in terms of patient management rather than time and is defined as deaths occurring while the patients were undergoing treatment in hospital. The results are reported in two parts. Firstly, we give the overall figures describing the outcome of patient treatment in the two groups and, secondly, the data are subdivided according to the site of the tumour, so that the different clinical issues may be discussed separately.

Results

The 174 patients studied were divided into two groups: those patients (137) who, at first laparotomy, had resectable tumours; and those (37) who either had complex problems (tumours arising in patients with mucosal ulcerative colitis, multiple tumours, and uncertain histology) or in whom tumours were considered to be unresectable. The latter group was not considered further.

The figure shows the overall outcome in the 137 patients with resectable tumours. Forty-seven patients underwent colostomy with



Outcome of treatment in patients who had resectable tumours at first operation.

a view to subsequent resection (staged tumour resection group); 31 went on to tumour excision (two deaths occurred, both after complete excision of all macroscopic tumour). The remaining 16 patients, who were all thought to have had resectable tumours at the first laparotomy, failed to complete the planned treatment: 11 died in the postoperative period (nine were thought to have been candidates for "curative" resection and two had disseminated disease but with resectable primary tumours); three underwent a second laparotomy but the tumour was found to be unresectable; and two refused a second procedure. The last five patients all survived to hospital discharge.

Tumours were resected at the first laparotomy in 90 patients (primary tumour resection group). Of the 66 patients who had an immediate bowel anastomosis, 11 (17%) died; anastomosis was deferred to a second operation in the remaining 24 patients, of whom

eight (33%) died. Thus 19 patients (21%) of the 90 in the primary tumour resection group died, of whom 14 had had a complete resection of all macroscopic tumour.

Thus mortality is higher with staged than with primary tumour resection (28% v 21%), but if the groups are assumed to be unbiased subsamples the difference is not significant at the 5% level ($\chi^2=0.74$, $0.5 > P > 0.3$). Table I compares the two groups for age, sex distribution, and grade and stage of the resected tumours; no significant differences were found.

TABLE I—Comparison of patient-related prognostic variables. Figures are numbers (%) of patients

	Primary tumour resection (n = 90)	Staged tumour resection (n = 47)
Mean (\pm SD) age (years)...	70.2 \pm 12.5	68.4 \pm 13.9
Ratio of women: men ..	1:1.27	1:1.4
Historical grade:		
Well differentiated ..	18 (20)	8 (27)
Moderately differentiated ..	47 (53)	16 (50)
Poorly differentiated ..	23 (26)	7 (23)
Local tumour spread:		
Confined to muscle ..	2 (2)	1 (4)
Through muscle ..	69 (77)	24 (78)
Residual tumour ..	17 (19)	6 (18)
"Don't know" ..	2 (2)	0
Lymph-node disease:		
Yes ..	38 (51)	12 (57)
No ..	37 (49)	9 (43)

Eighty-eight of the 137 patients (64%) with large-bowel obstruction were first operated on by trainee surgeons, the remainder being operated on by consultants (table II). The overall mortality was higher for trainees (31%) than for consultant surgeons (12%). With the same caveats as above this difference was significant ($\chi^2=5.85$, $P<0.02$). Table III shows the mortality for each grade of surgeon according to the time of day that the operation was started. The proportion of patients operated on during normal working hours (9 am-5 pm) was similar for both surgeons in training and consultants (29/43 and 38/78 respectively). In contrast, mortality was greater for surgeons in training in all but two time bands.

TABLE II—Comparison of mortality by site of tumour and grade of surgeon. (Figures are numbers of patients dying/total numbers operated on)

Site	No of patients	Primary tumour resection		Staged tumour resection	
		Consultants	Registrars*	Consultants	Registrars*
Right side ..	60	2/23	8/31	0/1	0/5
Splenic flexure ..	24	0/6	6/8	0/1	3/9
Left side ..	53	2/11	1/11	2/7	9/24
Totals ..	—	4/40	15/50	2/9	12/38

*Surgeons in training.

TABLE III—Comparison of time of surgery by grade of surgeon and mortality in cases for which time of surgery was recorded. (Figures are numbers of patients dying/total numbers operated on)

	Primary tumour resection* (n = 77)		Staged tumour resection* (n = 44)	
	Consultants	Registrars*	Consultants	Registrars*
Day (9 am-5 pm) ..	3/23	8/23	1/6	11/15
Evening (5 pm-12) ..	0/10	6/16	1/3	5/17
Night (12-9 am) ..	0/1	0/4	—	1/3
Totals ..	3/34	14/43	2/9	10/35

*Surgeons in training.

The total hospital stay for those patients leaving hospital alive showed that patients who underwent staged tumour resection remained in hospital for about twice as long as those patients in whom the tumour was removed as a primary procedure (median values 26 and 49 days respectively). A similar result was seen for the duration of hospital stay after the first operation (median values 23 and 46 days respectively).

RESULTS ACCORDING TO SITE OF TUMOUR

Only six out of 60 patients with right-sided lesions were treated by staged tumour resection. The mortality (table III) for emergency right hemicolectomy was 10 out of 54 (19%); of these deaths, eight occurred after an operation by a surgeon in training, an association that appears real but fails to reach significance at the 5% level (Fisher's exact probability = 0.08). None of the five patients who underwent staged resection died. The remaining 77 patients were first analysed together, since their conventional treatment would have been staged resection. In fact, 36 underwent primary resection (of whom nine (25%) died) and 41 underwent staged resection (of whom 14 (34%) died). Although statistical evaluation of this difference would be invalid, the figures are such that, for practical purposes, we should accept that they are not different.

Further breakdown shows that primary resection for splenic flexure growths resulted in a high mortality (six out of 14; 43%), which is similar to staged resection (three out of 10; 30%); all these nine deaths occurred after an operation undertaken by a surgeon in training (table II). When growths beyond the splenic flexure were considered alone three out of 22 patients (14%) died after a primary resection as compared with 11 out of 31 (35%) in the staged resection group. In both groups the death rate was similar whether consultants or surgeons in training were performing the operation.

Discussion

A pattern of heterogeneity and some unexpected findings emerge from this study. Right-sided colonic obstruction still carries an appreciable mortality, which seems largely confined to surgeons in training. Whether this is because they operate in less favourable circumstances or on less favourable patients or whether technical factors are important is impossible to say. On the left side, where a tentative comparison can be made between immediate and staged resection, mortality remains high for both methods of treatment. This is partly accounted for by the figures for splenic-flexure carcinoma irrespective of the method of treatment, which is to be contrasted with the low mortality for primary resection beyond this point in the colon. Exactly why splenic-flexure carcinoma should be such a hazard is not clear from our data and merits further investigation.

The consistency in outcome of treatment in patients undergoing operation by trainee surgeons (irrespective of the time of day, the nature of the operative procedure, or the site of the tumour) leads to the recommendations that if results are to be improved a fully trained surgeon needs to participate in the decision-making and surgery for these patients and that standards of training in this difficult field need to be raised. The lower mortality when consultants operate may not simply reflect their greater surgical skills (although these are surely important). Other factors may also be important: they have greater clinical judgment for the details of perioperative management; and the presence and interest of a senior surgeon may mobilise staff in other disciplines of similar experience, so that the overall patient treatment becomes better. Finally, the data do not help us to choose between an immediate or delayed bowel anastomosis in those patients undergoing primary tumour resection, and we require more evidence about anastomotic techniques and methods to improve the likelihood of sustained anastomotic integrity.

We have attempted to show that the patients undergoing primary and staged tumour resection are similar, at least in the clinicopathological stage of tumour spread. A more important issue, however, in managing patients with intestinal obstruction is their "degree of sickness." No criteria exist for such an assessment, and we believe that they would be difficult to define because observer variation in interpreting clinical findings would undermine confidence in the consistency of data generated in a multicentre study.

We accept that we cannot draw statistical inferences from these data because the two groups were not drawn at random from a consistent and definable population. We think, however, that conclusions may be drawn about future clinical methods in

managing these patients. Whatever the eventual explanation of the information presented, it seems unreasonable to allow surgeons who are not fully trained to manage patients with large-bowel obstruction without the active support and even physical presence of a consultant surgeon. If this premise is accepted then the principal obstacle to using immediate tumour resection more often for obstructing tumours of the large bowel is removed. Although the mortality of primary tumour resection in this study was still too high, it was no worse than that of staged tumour resection. A future objective here would be for the mortality to come down to about 10-12%, and retrospective evidence exists that the active participation of consultant surgeons makes such a reduction in mortality a realistic goal.^{2 3 6}

The mortality of left-sided lesions treated by traditional technique (staged resection) was unexpectedly high but similar to that in other reports.⁴ Possibly the mortality of staged tumour resection could be brought down appreciably. Nevertheless, the good results of those surgeons who attempt to treat all patients with obstruction by primary tumour resection,^{3 6} and the likelihood of at least halving total hospital stay, plus the possibility of improved long-term survival after this operative policy^{4 7 8} leads us to conclude that patients with large-bowel cancer who present with intestinal obstruction should be treated by a fully trained surgeon and immediate tumour resection should be considered for every patient. Further prospective evaluation of such a policy is our next aim.

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ONE HUNDRED YEARS AGO May I ask the help of your readers in extending a plan which last summer was kindly noticed by yourself? By means of friends in the country, I was enabled to board out, in the cottages of villagers, thirty-three children from this neighbourhood. The average cost of each child was five shillings per week, and the average length of stay three weeks. In some cases, the expense was borne by those who found the homes; but in all cases these watched over the children, and did something to make the holiday a pleasant one. I need hardly say how the health of children, living in so close a neighbourhood as this, improved; how their interest widened; how their powers of enjoyment increased. I would especially urge that the wider adoption of this plan would lighten the strain on the convalescent hospitals, and leave them for the use of those recovering from illness and needing care. For the ailing, pale, and depressed Londoner, the freer life of the cottage would seem to be better than the more routine life of the hospital. Many of your readers, living in country districts within fifty miles of London, must know, or may discover, cottagers who have a vacant bed and the will to welcome a stranger. If they will make the fact known through the London clergy, or the Charity Organisation Society, the plan may be extended without the formation of any special organisation.—SAMUEL A BARNETT, St Jude's Vicarage, Whitechapel. (*British Medical Journal*, 1879.)