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Factors affecting morbidity, mortality and survival in patients undergoing surgery for rectal cancer in a district general hospital

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ABSTRACT

INTRODUCTION This is a review of elective rectal cancer surgery during 1993–1999 at a single district general hospital to investigate the variables that affected the care of these patients.

PATIENTS AND METHODS A retrospective study of patients presenting with rectal adenocarcinoma to a district general hospital where total mesorectal excision was practiced over a 7-year period was performed to identify factors associated with complications, death and disease recurrence.

RESULTS Sixty-one patients developed a total of 89 complications and 30-day mortality was 8.3%. Overall, 81% of all resections and 86% of potentially curative resections were free of tumour at the circumferential resection margin. A positive circumferential resection margin and 30-day mortality were both associated with increased postoperative blood transfusion volume. Twenty-nine recurrences were detected during the follow-up period (mean, 21.7 months) and circumferential margin involvement by tumour, Dukes' stage, pre-operative functional status (ASA grade) and length of hospital stay correlated with disease-free survival.

CONCLUSIONS Surgical outcomes in lower volume hospitals are comparable with those reported by larger centres.

KEYWORDS

Colorectal cancer – Morbidity – Mortality – Complications – Prognosis

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Cancer of the large bowel is the second commonest cause of cancer death in the West,[1] and 40% of tumours occur in the rectum.[2] Surgery is the definitive treatment for rectal cancer, and rectal excision technique is of the highest significance.[3–5] Critical outcome measurements such as curative resection, postoperative mortality and local recurrence rates have been shown to vary greatly between surgeons.[6] The technique of total mesorectal excision (TME), now widely adopted, can result in a dramatic reduction in local recurrence and involvement of the circumferential resection margin (CRM) has been shown to be closely related to local recurrence and survival rates.[7–9] Most published results of TME in the UK have come from established centres with great experience of the procedure.[3,4,10,11] The majority of patients with rectal cancer are, however, treated in a district general hospital by general surgeons with an interest in coloproctology, colorectal nurse specialists, radiologists, and visiting oncologists and radiotherapists in a local cancer unit.[12,13] It is often difficult to compare the results of colorectal surgery carried out by individual surgeons or units as differences in case mix[14] and surgical expertise[15] confound the data in addition to variability in histopathology reporting and follow-up protocols.[16] CRM status has been suggested as an immediate indicator of the quality of rectal surgery for the smaller volume units practicing TME who may lack the resources for detailed clinical audit.[9] A positive CRM may, however, reflect a more advanced or challenging tumour rather than inadequate surgical clearance;[17] therefore, more detailed data collection may be necessary to give a balanced view of the quality of rectal cancer surgery in a district general hospital setting. A historical review of elective rectal cancer surgery 1993–1999 at a single district general hospital where the practice of TME has been routine was carried out to investigate the variables that affected the care of patients with rectal cancer.

Patients and Methods

Data were collected in a retrospective audit of the case notes of patients operated upon in Dewsbury and District Hospital between 1993 and 1999. Patient's age, route of admission, American Society of Anesthesia (ASA) grade,[18] operating surgeon, operative procedure performed and surgeon's operation note, pre-, intra- and postoperative blood requirements were obtained. Dukes' system was used to stage the resected specimens.[19] Postoperative complications, admission to the intensive care unit and in-hospital deaths were recorded. Out-patient records were used to define the disease-free period following surgery, overall survival and the site of recurrence and date of death where applicable.

Surgical procedures were carried out by four consultant general surgeons or supervised non-consultant staff. Of procedures, 81% were performed by two general surgeons with a sub-speciality interest in coloproctology (JEL and PJL). Pre-operative staging was carried out according to standardised protocols, and comprised assessment of primary tumour extension and perirectal lymph nodes with pelvic CT and abdominal CT and chest radiography to detect distant metastases. Eleven (6.5%) patients with fixed tumours underwent pelvic radiotherapy as the primary treatment modality and 23 patients (19% of those undergoing potentially curative resections) with positive circumferential resection margins following surgery underwent adjuvant pelvic irradiation. Seventy-nine (47%) patients with node-positive or R2 disease were referred to the oncology service for consideration of 5-fluorouracil-based adjuvant chemotherapy. All surgeons practiced total mesorectal excision, defined as sharp dissection of the mesorectum within the intact mesorectal fascia to a level at least 5 cm below the tumour. Pre-operative anaemia was corrected with adequate transfusion and following pre-operative bowel preparation, patients underwent a laparotomy with excision of the rectum with draining lymph nodes. A circular stapled anastomosis was carried out in all cases where continuity was restored, with a defunctioning proximal stoma when appropriate. Faecal diversion or diagnostic procedures were carried out when attempted resection was deemed inappropriate once a laparotomy or laparoscopy had been performed. One endo-anal resection and one panproctocolectomy for synchronous rectal and colonic tumours were performed. Intra-operative blood transfusion was recorded, as was the surgeon's opinion on whether the operation was potentially curative. Pathological examination routinely included assessment of the circumferential resection margin, which was regarded as positive if tumour was present at or within 1 mm of the cut surface.

Routine postoperative care did not involve contrast examination of the anastomosis; however, contrast enemas were preformed where clinically indicated. Follow-up was available on all patients, who were reviewed at 3-month intervals for at least the first 2 years after resection. Logistic regression was used to investigate associations between adverse events and potential risk factors and the log-rank test was used to test for differences in survival distributions.

Table 1 ASA grade of patients undergoing general anaesthesia

ASA grade	Number	%
1	5	3.0
2	75	44.6
3	55	32.7
4	33	19.6

Results

A total of 168 patients presenting to Dewsbury and District Hospital between 1 January 1993 and 31 December 1999 with a histologically confirmed diagnosis of rectal adenocarcinoma underwent surgical treatment and were included in the study. The management of these patients was supervised by four consultant general surgeons, two of whom had a specific interest in colorectal surgery. The mean age of the patients was 69.4 years (range, 33–92 years), and 85% were admitted electively; the remaining 15% presenting acutely with bleeding or obstructive symptoms. The mean length of stay was 24.3 days (range, 2–81 days). The ASA grade was recorded by the consultant anaesthetist preoperatively (Table 1). Patients with tumours too close to the anal margin to be certain of complete cancer excision with sphincter preservation underwent abdomino-perineal resection (APR) and patients with very low anastomoses were given a proximal defunctioning colostomy or ileostomy (Table 2). Postoperative complications occurred in 36.3% of patients

Table 2 Operative procedures performed

Procedure	Number	%
Anterior resection	82	48.8
APR	57	33.9
Hartmann's procedure	10	6.0
Endo-anal resection	2	1.2
Defunctioning stoma	9	5.4
Laparoscopy	2	1.2
EUA	2	1.2
Laparotomy only	3	1.8
Panproctocolectomy	1	0.6

Table 3 Complications leading to a delayed discharge

Complication	Number
Respiratory tract infection	15
Ileus	12
Dysrhythmia	12
Anastamotic leak	8
Urinary retention	8
Abdominal collection	7
TPN	7
Wound dehiscence*	6
Mechanical obstruction	5
Wound infection	4
UTI	2
PE	2
DVT	1

Several patients had more than one complication.*Wound breakdown to fascial layer only. No patient required operative repair.

(Table 3) and 30-day mortality was 8.3%. In-hospital mortality, however, totalled 12.5% due to the longer term palliative care of patients with disseminated colorectal malignancy where no alternative accommodation was available. Dukes' stages B and C disease predominated (Table 4). Pre-operative correction of anaemia was required by 9.5% of patients (median, 2 units; range, 1–14 units) and intra-operative transfusion (median, 2 units; range, 0–8 units) and postoperative transfusion (median, 0 units; range, 1–9 units) were combined to derive blood requirements during and after surgery and total blood transfusion requirements (median, 3 units; range, 0–18 units). Eighteen patients, including four planned admissions, were admitted to the intensive care unit in the postoperative period. Excluding deaths from advanced malignancy, cardiorespiratory complications (13) accounted for the majority of in-hospital deaths, with fatal septic (2) and vascular (1) events uncommon. Logistic regression demonstrated that a palliative surgical procedure, postoperative complications, ICU admission, advanced age and postoperative blood requirements were associated with in-hospital death (Table 5).

Following the exclusion of 31 patients with liver metastases and a further 17 patients with incurable local disease, 120 patients underwent resections in which no macroscopic disease remained *in situ* at the end of the procedure. This group, representing patients with potentially surgically curable disease, was further analysed for factors associated with morbidity and recurrence. Using regression analysis, factors that correlated significantly with length of stay were postoperative complications ($P < 0.0001$), age ($P < 0.05$), Dukes' stage ($P < 0.05$) and combined intra- and postoperative blood requirements ($P < 0.05$).

Table 4 Dukes' stage of resected carcinomas

Dukes' stage	Number	%
A	31	18.9
B	54	32.9
C	48	29.3
D	31	18.9

Four patients undergoing transanal excision and EUA and biopsy only were not fully staged.

ICU admission was associated with postoperative blood transfusion volume ($P < 0.01$) and advanced Dukes' stage ($P < 0.01$). Postoperative complications were associated with intra- and postoperative blood requirement ($P < 0.01$) and Dukes' stage ($P < 0.05$).

Surgeons' assessment of the adequacy of the margin of surgical excision was 86% correct when compared to histological examination of the CRM. Tumour clearance was overestimated more commonly than underestimated by a ratio of 5:1. Of circumferential resection margins, 19% were involved by tumour. This comprised 14% of potentially curative resections and 38% of palliative resections. CRM positivity was commoner in locally advanced tumours, with rates of 0%, 2%, 14%, and 23% for disease stages A, B, C1 and C2, respectively. Incomplete local resection was associated with greater blood loss as a positive CRM was associated with significantly higher postoperative ($P < 0.01$) and total ($P < 0.05$) blood transfusion requirements.

Clinical follow-up was obtained on all patients following discharge (mean, 21.7 months; range, 1–78 months) with

Table 5 Logistic regression analysis of factors associated with in-hospital deaths

Factor	Significance (*P*)
Age	0.003
Admission route	NS
ASA	NS
Palliative/curative status	0.017
Intra-operative transfusion	NS
Postoperative transfusion	0.025
Total transfusion	NS
ICU admission	< 0.0001
Dukes' stage	NS
Complications	< 0.001

NS, not significant.

Table 6 Recurrence pattern following potentially curative resection of rectal carcinoma

Site of recurrence	Number
Liver	15
Pelvis	11
Lung	2
Para-aortic nodes	1
Axillary node	1
Anastomosis	1

Thirty-one metastatic rectal cancer recurrences occurred in 29 patients as in two cases synchronous lesions were detected in two sites.

the number of whole months calculated from discharge to the last clinic visit or the diagnosis of disease recurrence or death. Twenty-nine patients presented with recurrent disease at one or more site (Table 6), and local recurrence following rectal excision was 8%. Circumferential margin status had a significant effect upon disease-free survival ($P < 0.001$), as did Dukes' stage ($P < 0.01$), ASA grade ($P < 0.05$) and length of hospital stay ($P < 0.05$). The adverse effect of CRM positivity was reflected in significantly increased risk of both local ($P < 0.001$) and systemic ($P < 0.05$) recurrence (Fig. 1). The opinion of the surgeon regarding the potentially curative or likely palliative intent of the procedure was not independently significant. There were 21 deaths from rectal cancer in the group during the follow-up period and cancer-specific survival again correlated strongly with circumferential

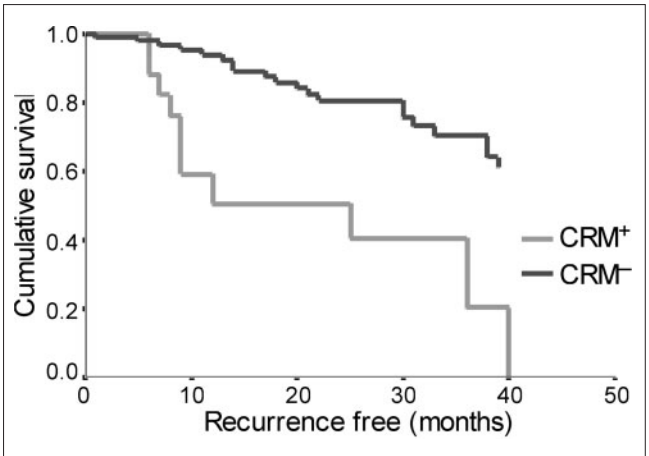

Figure 1 Survival curves demonstrating time to recurrence for patients undergoing potentially curative procedures where tumour was present to within 1 mm of the circumferential resection margin (CRM^+) and those with completely excised tumours (CRM^-).

margin status ($P < 0.001$), and in addition with length of hospital stay ($P < 0.05$).

Discussion

Most patients with rectal cancer will be treated in their local cancer unit[15] and the provision of high quality care for patients with common cancers in their local district general hospital is expected. Rectal cancer, however, remains a test of the capabilities of the colorectal surgeon, and technical competence to perform pelvic dissection is important if sexual function is to be preserved, complications are to be prevented and local recurrence minimised.[2,3,4,11] The 30-day mortality in this series (8.3%) is in keeping with previous audits of UK colorectal cancer surgery,[20] but the higher rate of overall in-patient mortality appears to be due to difficulty in finding appropriate care for patients with end-stage disseminated cancer. Crude mortality data regarding colorectal cancer resection should be interpreted with caution, however, and can be misleading unless the physiological condition of the patients and the surgical practice of the unit are assessed using a validated scoring system such as POSSUM.[21] The correlation between ICU admission, the development of complications and in-hospital death with postoperative blood transfusion volume is interesting and it seems most likely that difficult pelvic resections, with consequent increased blood loss may have lead to a stormy postoperative course and an adverse outcome in some cases. Positive circumferential margins were also commoner in patients requiring greater transfusions, again suggesting that in some difficult cases locally advanced tumours prevented complete resection. However, the opinion of the operating surgeon may not be useful in predicting which resections are potentially curative as only histological evidence of resection margin involvement by tumour was independently significant in predicting recurrence, emphasising the need to perform radical pelvic surgery in all cases where possible.

A histologically confirmed positive circumferential margin is highly predictive of both pelvic and distant recurrence and death from rectal cancer as previously described,[9,11] a finding that offers re-assurance that the local pathological assessment of these specimens has been thorough. The low rate of CRM involvement achieved (19%) is comparable with that recently reported by specialist colorectal surgeons at a local teaching centre in an audit of approximately the same period, and is substantially lower than that obtained by the non-specialist surgeons at that institution.[9]

Conclusions

The rigorous practice of TME, careful pathological assessment of resected specimens and close attention to detail can

lead to patient outcomes in hospitals with lower patient numbers comparable with the best centres. The management of rectal cancer is rapidly evolving, and patients at Dewsbury and District Hospital are continuing to be recruited into the MRC CRO7 trial of the place of neo-adjuvant radiotherapy in the treatment of mobile rectal cancers. We hope to continue to audit our practice and to continue to evaluate this and other developments in the multimodality treatment of rectal cancer.

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