

The value and significance of the limited barium enema examination following restorative resection for carcinoma of the rectum

N I MARKHAM MS FRCS

Clinical Research Fellow and Honorary Senior Surgical Registrar

R A GREATOREX MA BDS FRCS

Senior Surgical Registrar

W G EVERETT MCh FRCS

Consultant Surgeon

Addenbrooke's Hospital, Cambridge

Key words: RECTAL CARCINOMA; LEAKING ANASTOMOSIS; PELVIC RECURRENCE

Summary

The results of limited barium enema examinations from a consecutive series of 143 patients who underwent restorative resections for carcinoma of the rectum were studied. An assessment was made of the value of the investigation both in terms of clinical management decisions and also to see whether radiologically detected anastomotic leakage was associated with a higher incidence of tumour recurrence. A study was also made of the incidence of leakage with respect to tumour size, length of the distal resection margin, Dukes' grading and histological differentiation.

Results showed that there was a greater incidence of tumour recurrence following anastomoses which leaked, although due to small numbers the figures did not reach statistical significance. There was no relationship between tumour size, grade, differentiation, or length of the distal resection margin, and radiological leakage. We consider that the limited ten day barium enema examination does not contribute significantly to surgical management of these patients, except to define the extent of a leak and in the assessment of new anastomotic techniques. However, we suggest that a larger series may demonstrate a statistically significant increase in pelvic recurrence in patients who developed leakage from the anastomosis. This could dramatically alter the application of the postoperative limited barium enema.

Introduction

Following restorative anterior resection of the rectum, many surgeons perform a limited barium enema examination after approximately ten days to check the integrity of the anastomosis (1-3). Experiments in animals have shown that the bursting strength of anastomoses rises considerably on the 7th postoperative day (4) and experience in humans has demonstrated that barium examination on the 9th or 10th postoperative day is safe and without complication (3). A significant and clinical

detectable leak would usually result in either the fashioning of a defunctioning colostomy if one did not already exist, or the delayed closure of any pre-existing colostomy. Whilst only clinically significant leaks are really relevant in terms of patient management (5), such examinations are essential for trials to assess anastomotic healing, since the number of clinically detected leaks is usually small and their diagnosis otherwise imprecise. No studies to date have reported whether postoperative leaks, clinically evident or not, have a bearing upon long-term prognosis, in particular the development of pelvic recurrence, and whether a leak is more likely with more invasive and less well differentiated tumours, shorter distal resection margins or bigger tumours.

We have retrospectively reviewed a consecutive series of 143 hand sutured anterior resections all performed by one surgeon (WGE). All but seven of these had limited barium enema examinations performed on or about the tenth postoperative day. We recorded the incidence of radiological leaks, however small, comparing the rates in those without recurrence, those with recurrence and also those in the latter group where recurrence occurred in the pelvis. Follow-up ranged from 24 months to 15 years.

Leakage rates were also assessed with respect to size of tumour, the length of the distal resection margin, the Dukes' grading and the histological differentiation. The data was analysed to answer the following questions:

- 1 Does the result of the limited barium enema examination influence clinical management?
- 2 Is radiological leakage associated with a higher pelvic and/or total recurrence rate?
- 3 Is a leak more likely with big tumours, short distal resection margins, more invasive or less well differentiated tumours?

Patients and methods

One hundred and forty three consecutive restorative anterior resections were performed by the same surgeon between 1969 and 1983 at Addenbrooke's Hospital,

Cambridge. Following mobilisation of the growth the rectum was clamped and washed out with a 1:500 solution of mercury perchloride. All anastomoses were hand sutured using a single layer of interrupted 2/0 Supramid. Limited barium enema examinations were performed on or about the tenth postoperative day in all but seven of these patients. This left 136 patients for analysis who were retrospectively reviewed at between 24 months and 15 years. We noted the following parameters:

- 1 Formation of defunctioning colostomy at the time of or prior to the anterior resection.
- 2 Formation of a defunctioning colostomy at a subsequent operation.
- 3 Time of closure of colostomy.
- 4 Presence of radiological leak at the ten day limited barium enema examination.
- 5 Incidence of recurrent disease, both generally and locally in the pelvis.
- 6 Size of tumour (maximum dimension of the tumour in the fixed specimen).
- 7 Length of the distal resection margin (fixed specimen).
- 8 Dukes' grading (Astler-Coller modification of the Dukes-Kirklin classification).
- 9 Histological differentiation (Broder's classification).

In the group of 136 patients, the tumour size was not recorded in ten patients, the length of the distal resection margin in three, and the Broder's classification in two others. Documentation was otherwise complete.

Results

Fifty nine of the 136 patients had a leak demonstrated on limited barium enema examinations (43%).

Of the 136 patients, 86 were free of recurrent disease at the time of review whilst 50 had developed further disease, in 12 cases this being local disease in the pelvis. The radiological leak rate in the no recurrence group was 33/86 (38%), whilst in the recurrence group it was 26/50 (52%). In the twelve patients who developed pelvic recurrent disease, eight had had a leak (66%) (Table 1).

TABLE 1 Analysis of the leakage rates in 136 patients after anterior resection

Patients	Leaks	No leaks
No Recurrence (n = 86)	33 (38%)	53 (62%)
Total Recurrence (n = 50)	26 (52%)	24 (48%)
Local Recurrence (n = 12)	8 (67%)	4 (33%)

Defunctioning colostomies were fashioned at the time of tumour resection in 81 of the 136 patients analysed (60%). Forty two of these were in the no recurrence group and 39 in the recurrence group. Of the 12 patients who developed a pelvic recurrence, eight had had primary defunctioning colostomies. Only one patient in the whole group of 136 required a secondary defunctioning colostomy for a leak detected clinically as well as radiologically, but neither this nor any other patient required local surgery to the anastomosis to establish complete healing. All colostomies in the 82 patients were closed within three months.

Table II shows the results of leakage rates with respect to the average lengths of the distal resection margins. Of the 136 patients, three (all of whom had recurrent disease) did not have data for this parameter. The group

TABLE II Table comparing the mean length of the distal resection (+/- 1 standard deviation) in 133 patients with and without anastomotic leaks

	Leaks (n = 57)	No leaks (n = 76)
Recurrence (n = 47)	2.97 cm (+/-1.33)	2.63 cm (+/-1.59)
No Recurrence Mean	2.74 cm (+/-1.98) 2.86 cm	2.20 cm (+/-1.11) 2.33 cm

who leaked had a slightly longer average distal resection margin, but this was not statistically significant.

Fig. 1 shows the results of the leakage rates analysed by tumour size (maximum dimension of the tumour in the fixed surgical specimen). There was no correlation between tumour size and anastomotic leakage.

Fig. 2 shows analysis of leakage rates with respect to Dukes' classification. These figures show that the more advanced tumours are not associated with higher leakage rates.

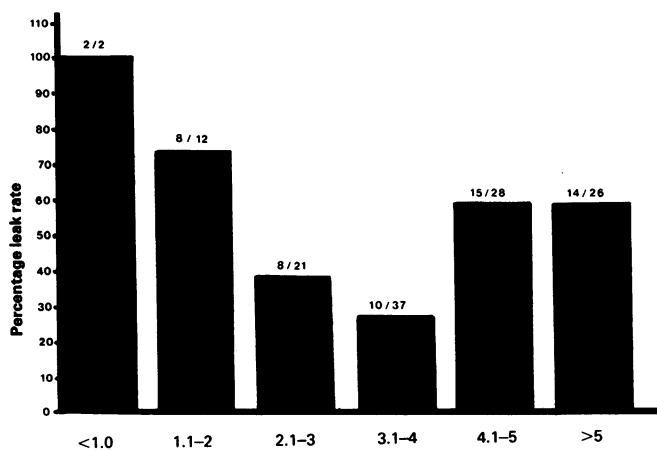


FIG. 1. Analysis of anastomotic leak rate with respect to the size of the resected tumour (cm).

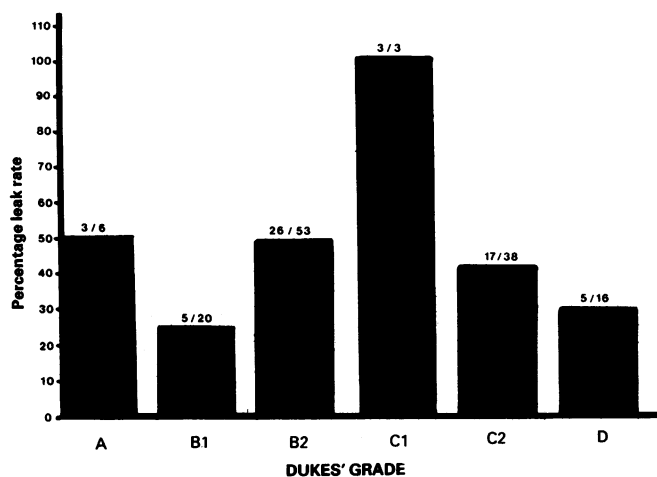


FIG. 2. Analysis of anastomotic leak rate with respect to the Dukes' grade of the resected tumour.

Fig. 3 shows analysis of the leakage rates with respect to tumour differentiation (Broder's classification). This data was not available in two of the 136 patients. Results also show no significant difference in leakage rates between the groups.

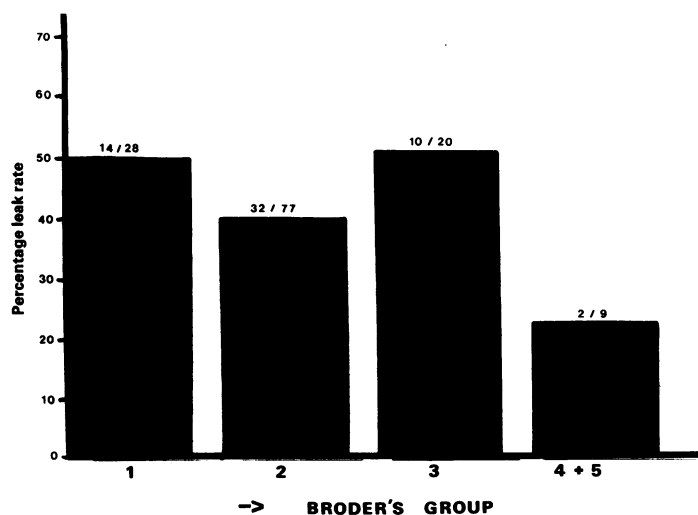


FIG. 3. Analysis of anastomotic leak rate with respect to Broder's histological classification of the resected tumour.

Discussion

A limited barium enema examination is a well established technique for determining the integrity of anastomoses after restorative resection of the rectum (1,2). The procedure is advocated as safe and free from any significant complications (3). There is a significant and understandable difference between the incidence of clinical as compared to radiological leak rates, which perhaps implies that radiological examination is not a procedure which influences any particular clinical decision but is only useful as a tool for assessing true anastomotic integrity in the proper analysis of new anastomotic techniques (5,6). As such we would agree with the findings of Shorthouse *et al.* (5).

We have shown that as well as being useful as a research tool, a radiological leak is associated with a

greater subsequent recurrence rate, both generally, and locally in the pelvis. However, these results do not achieve statistical significance. Were greater numbers involved, statistical significance may well have been achieved.

We have also shown that there is no association between the size, grade, or differentiation of the resected tumour, nor with the length of the distal resection margin, and radiologically demonstrated anastomotic leaks.

We suggest that there may well be a relationship between anastomotic leakage and local pelvic recurrence. The reason for such an association is uncertain. It is possible that residual tumour may impair anastomotic healing. Alternatively, the association may simply be related to the level of the tumour resected since both anastomotic leakage and local recurrence are commoner with low tumours. Whatever the explanation, if such a relationship exists the limited barium enema would assume an increased importance in identifying patients at risk of developing local pelvic recurrence.

We would like to express our thanks to the staff of the Department of Radiology, Addenbrooke's Hospital, Cambridge for their helpful co-operation.

References

- 1 Everett WG. A comparison of one-layer techniques for colorectal anastomosis. *Br J Surg* 1975;62:239-42.
- 2 Matheson NA, Irving AD. Single layer anastomosis after rectosigmoid resection. *Br J Surg* 1975;62:239-42.
- 3 Everett WG. Safety of contrast enemas in assessing the integrity of large bowel anastomoses. *Br J Surg* 1983;70:307.
- 4 Everett WG. Suture materials in general surgery. *Progr Surg* 1980;8:14-37.
- 5 Shorthouse AJ, Bartrum CI, Evers AA, Thomson JPS. *Br J Surg* 1982;69:714-7.
- 6 Goligher JC, Lee PWG, Simpkins KC *et al.* A controlled comparison of one- and two-layer techniques of suture for high and low colorectal anastomosis. *Br J Surg* 1977;64:609-14.

Notes on books

Examination of the Back by John K Patterson and Loic Burn. 127 pages, illustrated. MTP Press, Lancaster. £14.95.

Back pain is a major clinical problem. In the United Kingdom there are some ninety thousand individuals away from work each day with back problems. The economic consequences are truly staggering. This slim volume written by two senior members of the British Association of Manipulative Medicine describes in detail how the back should be examined and assessed when patients present with back pain.

Selective Antibiotic Use in Respiratory Illness by M T Everett. 210 pages, illustrated. MTP Press, Lancaster. £24.95.

The purpose of this book is to clarify the use of antibiotics in the management of the common respiratory illnesses seen in general practice. The concept of selective antibiotic use acknowledges that respiratory illness may have multiple causes, some viral and some bacterial. Non-antibiotic management is discussed where relevant.

Liver Failure edited by Roger Williams. 230 pages, illustrated. Churchill Livingstone, Edinburgh. £24.

Hepatology is now recognised specialty and no-one has contributed more to this specialty in the United Kingdom than the editor of this volume which brings together important areas of clinical work and research that has taken place during the last ten to fifteen years. Only one chapter is of direct interest to surgeons, namely that on the management of acute variceal bleeding. Those surgeons with a special interest in the liver, however, may find other parts of the book of interest.

Arthroscopic Shoulder Anatomy: Pathologic and Surgical Implications by David A Detrisac and Lanny L Johnson. 157 pages, illustrated. Slack, New Jersey. £52.20.

Arthroscopy of the knee joint is now well established and widely used. Endoscopic assessment of the shoulder joint, however, is a relatively new technique. By performing over 200 detailed dissections of the shoulder joint the authors of this book have correlated the anatomy with the arthroscopic appearances both normal and pathological. Numerous high quality photographs illustrate the text and there is no doubt that the volume will interest all orthopaedic surgeons who use endoscopic techniques.