The mesorectum in rectal cancer surgery—the clue to pelvic recurrence?

Five cases are described where minute foci of adenocarcinoma have been demonstrated in the mesorectum several centimetres distal to the apparent lower edge of a rectal cancer. In 2 of these there was no other evidence of lymphatic spread of the tumour. In orthodox anterior resection much of this tissue remains in the pelvis, and it is suggested that these foci might lead to suture-line or pelvic recurrence. Total excision of the mesorectum has, therefore, been carried out as a part of over 100 consecutive anterior resections. Fifty of these, which were classified as ‘curative’ or ‘conceivably curative’ operations, have now been followed for over 2 years with no pelvic or staple-line recurrence.

Operative and histological methods

A full length abdominal incision was made from the xiphisternum to the pubis. The plane surrounding the left half of the colon was developed extensively with careful preservation of the autonomic nerve plexuses. Under direct vision with sharp scissors dissection this plane was extended down into the pelvis around the rectum, the tumour and particularly around the fatty mesorectum as far as the point of emergence of the anorectum from the levator gutter. Great efforts were made to avoid digital extraction of the tumour on the grounds that this could tear veins or split into tumour planes. The pelvic fascia and the autonomic nerve plexuses were preserved by pursuing the lipoma-like outer surface of the mesorectum except in the immediate vicinity of the tumour. In most cases the correct plane was avascular except where it was crossed by the lateral rectal vessels which could simply be cut and packed with a small gauze swab. Only occasionally did they require ligation after the tumour was removed. The inferior mesenteric artery was ligated 1 cm from the aorta and the vein separately 1 cm from the splenic vein. The proximal lymphatic clearance was thus ‘radical’ though not to the extreme of a ‘pre-aortic strip’. The anorectum was then cross-clamped beyond the tumour if this was possible, or the anus, the levators, a small rectal reservoir and as much as possible of the nerve plexuses have been preserved.

Line of excision includes mesorectum

Site of tumour deposits in Case 6

Fig. 1. The suggested plane of excision is shown diagrammatically by the dashed line. The remnant from Case 6 which contained an isolated microscopic deposit is indicated by the arrow.

Frozen section during surgery for checking mural clearance

In poorly differentiated tumours or those with less than 2 cm distal clearance the main specimen was sent for frozen section examination of the distal margin of the muscle tube. In some cases a thin slice of rectal margin would fit on one chuck and in others 2 blocks were required. The ‘doughnut’ was examined by paraffin wax section later and was regarded as an absolute minimum extra safety margin over and above a report of a ‘clear edge’ on the main specimen.

Antibacterials

Every patient in our own unit received pre- and perioperative cephalorin or cephamandole and metronidazole.

Wash-outs during surgery

These were performed with water in every case immediately after the rectum was cross-clamped.

Histopathological methods

The specimens were opened and placed in formalin and the sizes of the tumour and the distal margin were measured after fixation—they were not stretched out. For histological examination the following routine was followed.

One block was taken at the site of maximal extension through the wall. One block was taken from the distal edge of the specimen and 3-4 tangential blocks from the mesenteric edge for assessment of vascular invasion (4, 5). A longitudinal block was taken through the lower edge of the tumour and the adjacent (apparently uninvolved) wall. As many lymph nodes as possible were dissected out of the specimen and examined.
Fig. 2. A 3 mm node from cut surface of mesorectum after orthodox anterior resection (Case 1).

Fig. 3. Second anterior resection specimen from a patient with a posterior 'suture-line' recurrence (Case 2).

Fig. 4. Intact mucosa over the tumour deposit (Case 2).

Recently 3 blocks from the apparently normal distal mesorectum were examined histologically in relevant cases and in 4 patients tumour was identified in the lower mesorectum (Cases 3–6). In Case 6 the deposit was only identified after examination of multiple sections cut at levels through the block. Multiple levels are not examined routinely in negative cases but on this occasion there was a lymphocytic infiltrate around and within the walls of blood vessels and lymphatics which may be a useful pointer to the likely presence of extramural venous or lymphatic infiltration in the adjacent tissue. This method is now being used more frequently to examine the apparently normal mesorectal tissue.

Case reports

Case 1: A woman of 49 years underwent conventional anterior resection for a carcinoma at 8 cm in 1973. Careful histological examination of the bowel showed no distal spread of tumour, but a single unremarkable lymph node (3 mm in diameter) on the surface of the divided mesorectum approximately 3 cm below the tumour edge revealed a tiny focus of tumour within it (Fig. 2).

If it had not been for this discovery the tumour would have been classified as a moderately differentiated Dukes' B lesion with slight extrarectal spread and vascular invasion. After discussion between the authors, the case was converted to an abdominoperineal excision though no further tumour was found. She progressed well for 6 years until a terminal phase when bony secondaries led to her death. No recurrence of pelvic disease was ever detected clinically but we postulate that the lymphatic micrometastasis could well have led to local recurrent tumour if it remained. Whether or not this is true, the case illustrates the potential of rectal cancer for distal lymphatic spread in the absence of intramural spread.

Case 2: A man of 71 years who refused abdominoperineal resection was referred with a suture-line recurrence 6 months after conventional anterior resection for a moderately differentiated Dukes' C tumour. He underwent a second (low stapled) anterior resection and died 19 months later of liver metastases with no evidence of pelvic disease. Fig. 3 illustrates the volume of mesorectal tissue which remained after the first operation but was encompassed by the second, and histology (Fig. 4) shows that the bulk of the tumour lay outside the bowel wall with the 'tip of the iceberg' in the submucosa under an intact mucosa. This is the type of suture-line recurrence, arising in perhaps lymphatic vessel or node, which total mesorectal excision aims to prevent.

Cases 3, 4 and 5: The 3 blocks taken from the distal mesorectal tissues are now serial sectioned and in 3 further anterior resection cases tumour has been demonstrated in small lymphatics. In 1 of these cases tumour was present in the first sections examined and would therefore have been detected by routine sectioning. In the other 2 cases tumour was only detected in sections cut from deeper levels and these would, by routine sectioning, have been reported as negative.

Two cases were poorly differentiated. One of these showed several lymph node metastases close to the base of the tumour and the extramural spread in this case was moderate. The other case also showed several lymph nodes involved close to the tumour but the extramural spread was moderate. In Case 3 the tumour, a moderately well-differentiated lesion, had slight extramural spread and only 1 lymph node in the tumour base contained a metastatic deposit. In this case the deposit in the distal mesorectum was over 4 cm from the extramural tumour. In the other 2 cases the deposit in the distal mesorectum was 1–2 cm from the extramural tumour. In none of the 3 cases was a tumour found in the lower gut ring or in the distal rectal wall.
Table I: 65 CONSECUTIVE ANTERIOR RESECTIONS

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<th>Margin (cm)</th>
<th>Curative (n = 50)</th>
<th>Palliative (n = 10)</th>
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Table III: MARGIN (UNSTRETCHED)

- Liver secondaries (n = 4; 8%): 3 dead (6%), 1 alive and well 2 yr after hepatic trisegmentectomy
- Lung/liver/bone: n = 2 (4%)
- Pelvic wall: None
- Suture line: None

Fig. 6. Submucosal deposit in the 'doughnut' correctly predicted the only staple-line recurrence.

Table IV: RECURRENCE OF CANCER IN 50 PATIENTS

- Liver secondaries (n = 4; 8%): 3 dead (6%), 1 alive and well 2 yr after hepatic trisegmentectomy
- Lung/liver/bone: n = 2 (4%)
- Pelvic wall: None
- Suture line: None

Case 6: A 79-year-old man underwent a low stapled anterior resection. A narrow pelvis made total mesorectal excision difficult and a 2 x 1 cm distal remnant was missed in the main dissection but subsequently excised from the 'cul-de-sac' between the anorectal stump and the levator gutter. The main specimen showed a 5 cm Dukes' B tumour with only 0.5 cm extramural extension and neither venous nor lymph node involvement. There were 4 cm of clear bowel margin and 10 nodes had been examined. Later extensive examination of multiple levels through the separate remnant revealed a tumour deposit 0.5 mm in diameter surrounded by lymphocytes, probably lying within a lymphatic vessel. This case is particularly important because this solitary microscopic satellite was 4 cm distal to the apparent lower edge of the tumour.

Follow-up series

Between April 1978 and January 1982, 113 consecutive anterior resections for cancers between 4 and 15 cm from the anal verge have been carried out with total mesorectal excision as described. Abdominoperineal excision has been reserved for tumours extending too close to the anus for mural clearance or safe cross-clamping at surgery; it was rarely performed because of size and fixity within the pelvis. Thus the operation has become our standard procedure for most rectal cancers, accounting for more than 4 out of 5 of the operations performed during this period. Only 2 cases have been rejected for excision of the primary (operability rate 98.2 per cent).

We consider that a 2-year follow-up has some validity in the assessment of locally recurrent disease. Fourteen out of E.S.R. Hughes' 19 cases reported by Hardy (6) occurred within 1 year, and Goligher et al. (7), Tyndal et al. (8) and Morson et al. (9) all emphasize that 80-90 per cent of local recurrences present within 2 years. In this series, in January 1982, 65 operations had been performed more than 2 years previously. Thus 60 operation survivors are available for follow-up (Table I) with a minimum of 2 years, a mean of 3 years and a maximum of 46 months. Ten of these were classified as 'palliative' procedures (Table II) and the remaining 50 were either 'curative' or 'conceivably curative'. The latter description usually reflecting unusual size and fixity within the pelvis.

Of the 50 curative or conceivably curative patients, 8 were in Dukes' stage A, 32 in stage B and 10 in stage C. 9 had good differentiation, 31 had average and 10 had poor. Table III shows that 31 out of the 50 had margins along the muscle tube with a length of 3 cm or less (unstretched). The average tumour height above the anal verge was 8.9 cm and the anastomotic height 5.4 cm. Thus the tumours are somewhat lower than the previously published anterior resection series, including 29 with a sigmoidoscopic height of 8 cm or less and 35 which we consider would formerly have received abdominoperineal excisions.

Results

Four of the patients have died of unconnected causes. Only 3 have died of cancer, and 2 others are alive with metastatic disease (Table IV). Thus only 10 per cent of the patients have so far developed metastases and careful examination of the pelvic wall has revealed no clinical evidence of disease on the suture-line or the pelvic wall. Nine out of 10 of the palliative cases have died and 3 of these had evidence of pelvic disease at their death. One died of uraemia after an operation leaving obvious tumour on the pelvic wall. A second died of generalized disease after an operation where the tumour had ruptured. A third died of generalized disease also manifesting a staple-line recurrence. This had been predicted because a focus of tumour had been observed in a submucosal lymphatic in the 'doughnut' (Fig. 6). No further surgery had been attempted because 17 out of 19 nodes were involved and because the patient refused colostomy.

Discussion

There are good reasons for suspecting that distal spread of rectal cancer is often initially confined, as in these cases, to the mesorectal tissues. First, local suture-line recurrences are most commonly found posteriorly and only from tumours of the rectum rather than the colon (6) with the highest incidence in the lowest tumours (9). It is only in these that lymphatic tissue is likely to be left behind in the region of anastomosis, which might also explain why the pull-through operation seemed immune to suture-line recurrence in Hardy's series (6) where the mesorectum is likely to be excised to make the pullthrough possible. Secondly, the initial tumour is almost invariably a Dukes' C lesion with evident lymphatic deposits (Case 2) (9).

None of these observations can readily be explained if implantation or direct intramural spread were the basis for the recurrence. Recent work by Rosenburg (10) suggest that desquamated cells are seldom a viable source of implantation which is probably rather an uncommon event, although the wash-out is properly established on bacteriological grounds and may also guard against implantation. Significant spread along the muscle tube is also uncommon, except in poorly differentiated lesions (11) and it is interesting that rectal stump
recurrence was seldom seen after Hartmann’s operation (12). Our experience confirms that the 5 cm margin may probably be safely reduced to 2 cm in differentiated lesions and monitored by frozen section in doubtful cases. The only suture-line recurrence in this series was in a palliative case and was correctly predicted by histological examination of the ‘doughnut’ (Fig. 6). Intramural spread is in our opinion, therefore, less dangerous and less common than distal microscopic lymphatic spread within the mesorectum (such as Cases 1, 3–6) which could not possibly have been detected before or during surgery, or even (as in Cases 1 and 6) suspected after routine histological examination.

These findings seem somewhat at variance with Goligher and Dukes’ (7) low figure of 6–9 per cent for distal lymphatic spread with only 2 per cent beyond 2 cm. Node sampling, however, would miss tiny vessel deposits such as in Case 6, and Gilchrist (13) demonstrated that the incidence of node involvement rises to an astonishing two-thirds in ‘curative’ and 100 per cent in ‘palliative’ cases if sufficient time is spent looking for it. Thus there is plentiful circumstantial evidence that the doctrine of preferential upward spread should no longer be accepted as the entirely safe dictum that it has in the past.

This complete ‘emptying’ of the pelvis has not, however, been without problems: we have, despite considerable stapling experience, been unable to eliminate anastomotic leakage completely (14). For anastomoses below 6 cm our clinical leakage rate has been 13 per cent and this figure rises to 18 per cent if X-ray detected sinuses are included. It is a reasonable hypothesis that the large cavity created by total mesorectal excision may contribute to this problem by encouraging perianastomotic or posterior collections which point into the lumen centres and about 40 per cent in general surgical practice’.

The selection policy has been to exclude no cases where excision may contribute to this problem by encouraging perianastomotic or posterior collections which point into the lumen centres and about 40 per cent in general surgical practice’.

It is precisely from consideration of surgical technique that the idea of total mesorectal excision developed—its division is bloody but the plane around it is avascular and it is surgically possible to encompass it without undue difficulty. It leads to a clean muscle tube which is suitable for a purse-string, and if care is taken, the pelvic fascia and autonomic nerves can often be preserved outside it and a small anorectal remnant retained to provide reasonable function. We suggest that complete removal of the mesorectum encompasses the most dangerous and prevalent field of spread and its excision is as logical as that of any mesentry in close proximity to a cancer.

Acknowledgement
This work was supported by a grant from Whittaker Life Sciences.

References