Reducing the incidence and managing the consequences of anastomotic leakage after rectal resection

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Anastomotic dehiscence is a serious, life-threatening complication of any rectal anastomosis and may be associated with an increased risk of local cancer recurrence. The leak rate following low anterior resection is in the region of 10% as reported in the recent randomised Dutch rectal cancer trial. Although accurate prediction of risk is impossible, certain factors are known to influence leak rates. There is an inverse relationship between the height of the anastomosis from the anal verge and the leak rate, with the lower anastomoses carrying the highest risk. Proximal defunctioning by a loop stoma mitigates the consequences of leakage and probably reduces, but does not abolish, the risk. There is little difference in rates of dehiscence between stapled and sutured colorectal anastomoses. A short colon pouch may reduce the chance of leakage. The highest risks are in unprotected anastomoses less than 5 cm from the anal verge in men who smoke and/or drink excessively, particularly if they have received pre-operative chemotherapy or chemo-radiotherapy. A high index of suspicion is required in detecting the early non-specific signs of a leak and urgent surgical intervention is usually required to avert a life-threatening situation. Faecal diversion should be regarded as the optimal safety measure to reduce the consequences of leakage and to manage leakage of an unprotected anastomosis.

Key words: anastomotic leakage, rectal, resection

INTRODUCTION

Anastomotic leakage is one of the most feared and serious early complications following any intestinal anastomosis with the highest risks after oesophageal and rectal surgery. The consequences continue to pose major clinical problems with a high mortality, major morbidity and prolonged hospital stays. The reported clinical leakage rate after anterior resection varies from 3% to 21% with most cases requiring emergency surgery. Furthermore, postoperative mortality associated with anastomotic complications ranges from 6% to 22% and accounts for approximately one third of all deaths following colorectal surgery.

With the advent of stapling devices and their increasing use to fashion low rectal anastomoses, low anterior resection with preservation of the anal sphincter has become the preferred surgical option for mid and low rectal cancers. In recent years, more emphasis has been placed on the oncological importance of the circumferential resection margin and distal mesorectal spread of tumour and this has resulted in the widespread adoption of total mesorectal excision (TME) as popularised by Heald et al. TME is now widely accepted as the optimal technique in the resection of rectal cancer. The low local recurrence rate and improved survival strongly support the necessity to remove the entire mesorectum to achieve complete tumour clearance in cancers of the middle and lower rectum. However, the consequent low anastomosis may be a significant risk factor increasing anastomotic leak rate, in particular when compared to the alternative procedure of an abdomino-perineal excision which, by definition, carries no risk of leakage. It is difficult to be precise as to the exact cause of leakage, although a combination of anatomical inaccessibility, a less than optimal blood supply, a tightly closed anal sphincter below an ultra-low anastomosis and an infected pelvic haematoma are likely to be contributory.

The additional use of preoperative radiotherapy has been a justifiable concern as a possible risk factor for leakage. A recent report from Sweden of 3316 patients who had an anterior resection between 1995 and 1999 reported that preoperative radiotherapy increased the leak rate from 7% in those who had no radiotherapy to 12%. However they did not differentiate between long and short course radiotherapy. They also reported that males had a
leak rate of 10% compared to 7% in females. Interestingly there appeared to be a possible difference between the two circular staplers used with one having a leak rate of 11% compared to 7% in the other\(^2\). The overall leak rate in this large series was 9%.

However, in the Dutch study which randomised 1861 patients to either preoperative short course (5 days) radiotherapy combined with TME, or TME alone, the authors found no significant difference in anastomotic dehiscence\(^2\) with a leak rate of 12% in patients who had TME alone compared with 11% in those who had radiotherapy and surgery. On analysis it appears that more patients who had radiotherapy had a temporary stoma which may have accounted for the lower apparent leak rate in this group.

It is likely that long-course radiotherapy and chemo-radiotherapy may increase the risk of leakage and anecdotal reports suggest a leak rate in excess of 20% in unprotected low anastomoses.

**DEFUNCTIONING STOMAS**

Proximal faecal diversion by loop ileostomy or colostomy, whilst not abolishing leakage, mitigates, and may prevent the serious consequences\(^2\). The routine use of a covering stoma remains controversial, largely due to a lack of adequate controlled trials. Despite this controversy, most would agree that defunctioning of selective is optimal if prediction of leakage were possible. In reality, accurate prediction of leakage is impossible although one may identify certain individuals who are at increased risk. Thus, factors influencing leak rates are worthy of evaluation and when risks are high or when dehiscence has occurred, faecal diversion can avert a life-threatening situation. The main determinant of leakage in rectal cancer surgery appears to be the height of the anastomosis above the anal verge, although some argue that this is less important than the absence of proximal diversion in low anastomoses\(^2\). Law et al found in a prospective study in 196 patients with rectal cancer from 3 to 12 cm from the anal verge treated by anterior resection with TME, that a diverting stoma and male gender were the only significant factors affecting anastomotic leakage\(^2\). Palkastie et al reported a similar combined clinical and radiological leak rate in 38 patients undergoing low anterior resection, half of whom were randomised to receive a defunctioning colostomy\(^2\). However, they found a 50% reduction in the clinical leak rate (16% in those patients with a defunctioning colostomy compared to 32% in patients without a stoma), and although this difference was not statistically significant due to the small numbers in the trial, they argue that routine faecal diversion should be undertaken given the not-infrequent poor outcome in those patients who do experience an anastomotic dehiscence. A comparable study by Graffner\(^2\) came to the opposite conclusion, considering that faecal diversion was unnecessary, mainly because of the high incidence of anastomotic stricture in those patients who were defunctioned (36% in defunctioned group compared to 8% in non-defunctioned group). However, both these studies were conducted on very small patient numbers, namely 38 patients\(^2\) and 50 patients\(^2\) respectively. To date these are the only two randomised prospective studies, though a further study is currently in progress in Sweden.

Although surgical technique undoubtedly matters\(^2\), other factors, in particular smoking and excessive alcohol use\(^2\) may also increase the risk of leakage. The pelvis should be considered a high risk zone for the development of a haematoma which, in juxtaposition to a colorectal anastomosis, may result in pelvic sepsis rupturing through the anastomosis. We routinely use a local suction drain in the pelvis following TME which is removed at 48 hours after surgery. Prolonged use of antibiotics is of doubtful benefit and our unit policy recommends prophylactic dosage only.

**STAPLED VERSUS HANDSEWN ANASTOMOSES**

As previously outlined the single most important risk factor for leakage is height of the anastomosis from the anal verge\(^2,3,13\). The lower the anastomosis (particularly below 6 cm) the higher the risks. Risks appear similar and related to height whether suturing or mechanical stapling is employed, although there is an apparent trend towards reduced leakage in the stapled low anastomosis\(^2\). However, MacRae and McLeod, in their meta-analysis of 13 randomised controlled trials assessing hand-sewn and stapled colon and rectal anastomoses, found no difference in leak rate between the groups\(^2\). In a recent Cochran review of 9 trials involving 1233 patients, there was insufficient evidence to demonstrate any superiority of stapled over handsewn techniques in colorectal anastomoses, regardless of the level of the anastomosis\(^2\). Modifications in stapling techniques such as double\(^2\) or triple\(^2\) stapling do not appear to have adversely affected outcome. In 1994, we reported a series of 219 patients with a stapled low anastomosis\(^1\). There were 24 (11%) major leaks with peritonitis or pelvic collection and 14 (6.4%) radiological leaks. All major leaks and 13/14 radiological leaks, occurred in patients with an anastomosis less than 6 cm from the anal verge. Similarly, in 1014 stapled rectal anastomoses\(^3\), the leak rate after low rectal stapling (within 7 cm of the anal verge) was 7.7% compared with 1% for high stapling (p < 0.001). Rutler and colleagues analysed variables associated with leakage in 272 consecutively anastomoses. The overall leak rate was 13%, and was 6.5 times higher in the 131 anastomoses situated < 5 cm from the anal verge, and 2.7 times higher in men. Lopez-Kostner et al\(^4\) showed that there was a stepwise increase in leak rate as anastomoses are constructed nearer to the anal verge. In 819 patients with rectal or sigmoid cancers, the leak rate was 1/214 (0.14%) when the anastomosis was above 15 cm, 12/219 (5.4%) when it was 10-15 cm from the anal verge and 22/260 (8.4%) when <10 cm from the anal verge.

**LEAKAGE AND LOCAL RECURRENT**

It has been proposed that anastomotic leakage, irrespective of the technique used for the anastomosis, may predispose to tumour recurrence, particularly local recurrence. Explanations cited for this relate to the possibility
of clinical or sub-clinical leakage influencing cancer recurrence. The results of the West of Scotland randomised controlled trial examining the recurrence of colorectal cancer after sutured and stapled large bowel anastomosis are interesting\textsuperscript{39}. In all, 294 patients undergoing potentially curative resection for colorectal cancer were randomly allocated to have sutured (n = 142) or stapled (n = 152) anastomosis. The mean (s.e.m) incidence of tumour recurrence at 24 months follow-up was 29.4 (4.4) percent after suturing and 19.1 (3.9) percent after stapling (p = 0.05). The corresponding rates for cancer-specific mortality at 24 months were 22.3 (4.1) and 10.9 (3.0) percent respectively (p < 0.01). The investigators concluded that in colorectal cancer surgery, stapled anastomosis may be associated with a reduction in the incidence of recurrence and mortality rate by as much as 50%. It is difficult to explain such a large difference in outcome and the authors made the following suggestion based on their previous demonstration that sutured colorectal anastomosis had a higher incidence of radiological leakage compared with stapled anastomosis\textsuperscript{39}. They hypothesised that clinical or sub-clinical anastomotic leaks might be associated with a higher incidence of tumour recurrence\textsuperscript{39}. The clinical leak rate was similar in their two randomised groups\textsuperscript{39}, however the majority did not have contrast radiological assessment of the anastomosis. However, they hypothesized that the radiological leak rate might be higher after suturing and that this might influence cancer recurrence. One might postulate that recurrence could be due to occult minor sepsis, release of inflammatory cytokines and a resultant attenuation of local anti-tumour immunity although the argument is tenuous and unproven. A recent report appears to support a link between leakage and an increased thirty day mortality, increased local recurrence and a reduction in five year survival\textsuperscript{32}. Of 1834 patients who had curative surgery with an anastomosis, the rates in the leak group compared to the non-leak group were: thirty day mortality 18.3% versus 3.5% (p < 0.05); local recurrence rates 18.3% versus 9.8% (p < 0.018) and five year survival 55% versus 60% (not significant)\textsuperscript{32}.

**SUBSPECIALISATION IN COLORECTAL SURGERY**

Subspecialisation in colorectal surgery has resulted in improvement of practically all outcome parameters in rectal cancer surgery with the exception of leakage. The previous standard operation for low rectal cancer was an abdominoperineal excision (APE) with permanent end colostomy. This completely avoided leakage, but left the patient with a permanent stoma and commonly, a problematic perineal wound.

Anterior resection with reconstruction by ever-lower colorectal and coloanal anastomoses is being performed increasingly. The impact of subspecialisation on rectal cancer management, measured by the proportion treated by APE, has been reported by Warsi and colleagues\textsuperscript{34}. While 72% of patients with rectal cancer underwent APE in 1991, this had fallen dramatically to only 19% in 1997 in their unit. Thus, the numbers of individuals at risk of leakage has increased substantially. Furthermore, the proportion of very low anastomoses also increases.

**SHORT COLON POUCH**

The functional benefits from a short colon J pouch are now generally accepted. An interesting observation in a randomised study of straight versus colon J pouch to anal anastomosis was a significant reduction in the clinical leak rate in the pouch group (2% versus 15% for straight, p < 0.003)\textsuperscript{30}. Our current preferred stapling technique is triple stapling\textsuperscript{37}, whereby a linear staple line is applied below the tumour to seal the lower end of the cancer specimen to avoid spillage. A second staple line is applied across the washed rectal stump prior to per-anal circular stapling. Our recent experience with more than 100 consecutive rectal cancers treated using triple stapling and a 5 cm colon J pouch has resulted in a combined clinical and radiological leak rate of 6%, a considerable improvement on our earlier reports\textsuperscript{3}. This low leak rate has been obtained despite more than 90% of all rectal cancer patients undergoing sphincter-saving procedures. The benefits of a pouch in reducing leakage may be a combination of a better blood supply at the apex of the pouch, the bulk effect of the pouch filling the pelvis and the necessity to fully mobilise the splenic flexure to obtain sufficient length. We have previously documented that the leak rate doubled when the sigmoid was utilised for the anastomosis compared with descending colon (31% vs. 15%, p < 0.04)\textsuperscript{3}.

A proximal stoma does not abolish leakage but may mitigate the consequence. All surgeons recognise that proximal defunctioning is sometimes necessary and occasionally essential, either to prevent or deal with the consequences of leakage. In 1994, we reported that clinical, but not overall leakage was significantly higher in those patients without a covering stoma (18% versus 8%). Dehni et al reported a series of 258 consecutive patients with rectal cancer who underwent either colon pouch anal anastomosis (CPAA) or low colorectal anastomosis (LCRA)\textsuperscript{31}. There was a clinical leak rate of 17% in the LCRA group without a stoma, compared with 6% in a similar group with a defunctioning stoma. In the CPAA group (all defunctioned), the leak rate was 4.9%. They concluded that patients with a low colorectal anastomosis, without a proximal defunctioning stoma, were more likely to suffer a clinical leak (p < 0.01), peritonitis (p < 0.001) and require emergency re-operation (p < 0.006).

**RECOGNITION AND MANAGEMENT OF ANASTOMOTIC LEAKAGE**

Early detection of an anastomotic dehiscence involves a high index of suspicion. In our series, leaks were detected at 3-24 days (mean 10 days). The usual presentation is unexplained pyrexia, often with tachycardia. Some may present with symptoms and signs simulating an acute cardiopulmonary event. Abdominal signs are initially absent in the extraperitoneal anastomosis. Undoubtedly some leaks form an abscess and rupture into the lumen with resolution. Many progress to a pelvic abscess and then rupture into the peritoneal cavity with generalised...
peritonitis. At this stage, the patient is usually grossly septic and will succumb unless action is swift and effective. Prior to peritonitis, early detection is possible by careful clinical monitoring together with a water-soluble contrast enema in suspected cases. Contrast CT, if readily available may have advantages over a water soluble enema as any significant collection can also be identified and possibly treated by interventional radiological techniques. Rectal palpation may detect a defect and a collection in the lower anastomosis.

Our approach to management of a leak is immediate surgery once the patient has been stabilized. Time is of the essence and anaesthetic delay should be avoided as few patients with faecal leakage can be made much fitter prior to definitive surgical treatment. We perform a laparotomy with pelvic peritoneal lavage and fashion a defunctioning stoma. The distal bowel is washed out to optimise defunctioning. A large silicone drain is placed in the pelvis, the defect in the anastomosis is inspected personally and enlarged as necessary to provide free drainage. In most series, the mortality and outcome following major leakage is poor. In our previously reported experience, 3/24 patients with a major dehiscence died, only 9 of 21 survivors had the stoma eventually closed with good functional results, 2 had poor functional results and 10 patients were left with a permanent stoma.1

CONCLUSION

Anastomotic dehiscence is the most serious early complication in colorectal and coloanal anastomosis. Analysis of most large series suggests a leak rate in the region of 10% when the anastomosis is within 6 cm of the anal verge. It is possible to predict patients at higher risk of anastomotic leakage and thus selectively defunction those particular patients. The risk of leakage is increased the nearer the anastomosis is to the anal canal, male patients, and patients who have had preoperative radiotherapy or chemotherapy. Smoking and alcohol, together with obesity, malnutrition and cardiovascular disease have also been reported to increase the risk of anastomotic dehiscence. All these factors should be taken into consideration when a low rectal anastomosis is performed. It is not possible, however, to predict with certainty the outcome for any individual. All surgeons will encounter an occasional unexpected leak in what was felt to be a virtually risk-free anastomosis and most will have a patient who has succumbed as a result. Our current practice is to consider defunctioning all low anastomoses following total meso rectal excision. We routinely defunction patients who have had preoperative long course radiotherapy or chemoradiotherapy, those with an air-leak on testing and patients in which there has been technical difficulties such as major blood loss. If conditions are optimal a stoma may be omitted, though we usually insert a per-anally positioned soft silicone stent. We believe that per-anal decompression may be a safe non-invasive temporary "defunctioning" and preliminary results suggest bio-equivalence.2

It is generally accepted that the lower the anastomosis, the higher the risk. A defunctioning stoma mitigates, and may even abolish, the serious consequences of a leak and should be considered for all high risk cases (6 cm from anal verge). A high index of suspicion together with appropriate radiological investigation will result in early recognition prior to life-threatening sepsis and allow timely intervention. Reports of the demise of temporary defunctioning of the low anastomosis are premature and judicious use of faecal diversion should never be regarded as "surgical weakness".

REFERENCES


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