

# Outcome and late functional results after anastomotic leakage following mesorectal excision for rectal cancer

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**Background:** Few studies have evaluated the long-term functional outcome after anastomotic leakage in the treatment of rectal cancer.

**Methods:** Between 1993 and 1998, 147 patients were admitted with resectable rectal carcinoma, and 92 underwent low anterior resection (LAR). Seventeen patients (18 per cent) developed clinical anastomotic leakage. The functional outcome of 11 of 12 patients, in whom the stoma was subsequently closed and bowel continuity was restored without stricture, was compared with that of 11 matched patients who had undergone LAR without leakage. Anorectal manovolumetry and symptom scoring on visual analogue scales were done 12–48 months after stoma closure.

**Results:** Nine patients made an uneventful recovery after the initial treatment of anastomotic leakage. Eight developed serious septic complications, four of whom had a pelvic abscess, but there was no death. Five patients had chronic complications that precluded closure of the stoma. Patients who had experienced leakage showed reduced neorectal capacity (120 versus 180 ml;  $P=0.04$ ), more evacuation problems ( $P=0.02$ ), and a trend towards more faecal urgency ( $P=0.09$ ) and incontinence ( $P=0.06$ ) than control patients.

**Conclusion:** Stoma closure was not possible in five of 17 patients who had experienced anastomotic leakage. Patients who had the stoma closed had impaired long-term anorectal function compared with control patients without leakage.

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## Introduction

Anastomotic leakage is the most significant early complication after rectal resection with a stapled anastomosis. Since the introduction of mesorectal excision as the standard treatment of rectal cancer in this hospital in 1993, a greater proportion of patients has had sphincter-saving operations than before and more patients have a low anastomosis. As a consequence the frequency of anastomotic leakage has increased. Leakage may cause serious early morbidity, and also death, and may affect the long-term outcome and functional result. Several aspects of anastomotic leakage have been studied extensively<sup>1–15</sup>, but few series have considered late functional outcome<sup>16</sup>. Most studies have reported only whether or not closure of the stoma was possible<sup>2,5,6,9,12</sup>.

The aim of this study was to review the profile of early postoperative complications after the introduction of mesorectal excision in this department and to evaluate the

long-term functional results in patients with anastomotic leakage.

## Patients and methods

During a 5-year period (1993–1998), 199 patients were admitted with rectal cancer at or below 15 cm from the anal verge; low anterior resection (LAR) was performed in 92 patients (Table 1). The standard operative technique included total mesorectal excision in patients with tumours in the lower and mid rectum, and partial mesorectal excision with transection of the mesorectum at least 5 cm distal to the tumour in patients with cancer of the upper rectum. In the majority of patients the ascending branch of the left colic artery was preserved and the sigmoid colon was used for the anastomosis, which was constructed by a double-stapling technique. A defunctioning stoma was constructed as preferred by the surgeon, in most cases because of a low

**Table 1** Operations performed in 199 patients admitted with rectal cancer

	No. of patients
Low anterior resection	92
Abdominoperineal resection	44
Hartmann procedure	8
Local resection	3
Total no. of rectal resections	147

anastomosis. Details of the primary operation performed are given in *Table 2*.

All relevant data from the operation, postoperative course and follow-up examinations at 3 months and every 6 months thereafter were recorded prospectively. Follow-up included endoscopy in all cases and rectal radiography if leakage was suspected.

In 17 patients (18 per cent) who developed clinical signs of anastomotic leakage, the diagnosis was confirmed by radiography ( $n = 14$ ), late endoscopy ( $n = 1$ ), the occurrence of rectovaginal fistula ( $n = 1$ ) or emergency laparotomy ( $n = 1$ ). There were nine women and eight men in this group with a median age of 70 (range 45–80) years. The anastomoses were located 3–10 (median 5) cm above the anal verge. Histopathological examination showed tumour stage pT<sub>4</sub> in one, pT<sub>3</sub> in ten and pT<sub>2</sub> or pT<sub>1</sub> in six patients; four patients had lymph node metastasis (Dukes' C).

For evaluation of long-term results, 11 of 12 patients treated successfully for leakage, in whom bowel continuity was restored and there was no evidence of marked stricture formation, were compared with 11 patients who had undergone LAR without any sign of anastomotic leakage. The two groups were closely matched (*Table 3*).

Anal manometry was performed 12–48 months after closure of the stoma, using a stationary pull-through technique with the patient in the left lateral position. A water-perfused 4-mm catheter with four side holes was withdrawn in increments of 0.5 cm through the anal canal, and the side hole pressures were recorded on a PC Polygraph HR<sup>®</sup>, version 5.06 C2, series P 1775, with software Polygram for DOS (Medtronic Functional Diagnostics, Skovlunde, Denmark). The median value of maximum resting pressures recorded in each channel during pull-through was calculated. The procedure was then repeated and the maximum pressure increase during squeeze effort was recorded at each station. The median value of these pressures was calculated and defined as the maximum squeeze pressure.

Rectal volumetry was performed after manometry. A Zinetics<sup>®</sup> natural rubber latex anorectal balloon (Zinetics Medical, Salt Lake City, Utah, USA) was placed in the distal

**Table 2** Operative details in 92 patients who underwent low anterior resection

	Total	Leakage
Low anterior resection	92	17 (18)
Defunctioning stoma	29	5 (17)
No defunctioning stoma	63	12 (19)
Total mesorectal excision	47	13 (28)
Partial mesorectal excision	45	4 (9)
End-to-end anastomosis	78	14 (18)
Side-to-end without reservoir	11	2 (18)
Colonic pouch	3	1 (33)

Values in parentheses are percentages

**Table 3** Comparison of patients who developed anastomotic leakage and control patients

	Leakage ( $n = 11$ )	Controls ( $n = 11$ )
Sex ratio (M:F)	4:7	7:4
Age (years)*	60 (45–77)	65 (44–73)
Tumour height (cm)*	9 (5–15)	11 (6–15)
Anastomosis level (cm)*	5 (3–9)	6 (3–9)
Total mesorectal excision	7	6
Partial mesorectal excision	4	5
End-to-end anastomosis	8	7
Side-to-end without reservoir	2	3
Colonic pouch	1	1
Time from operation or stoma closure (months)*	24 (12–60)	12 (12–24)

\*Values are median (range)

rectum and inflated with air in 10-ml increments. The volumes for initial sensation, urge to defaecate and the maximum tolerable volume were recorded.

The patients graded their symptoms and defaecatory function (urgency of defaecation, pain during defaecation, continence, ability to expel stool and feeling of complete evacuation) on 100-mm long visual analogue scales, in which a value of 100 represented normal function (absence of symptom). The questionnaires were completed together with the physician to avoid misunderstandings.

For evaluation of the results, patients with and without leakage were compared using the Mann–Whitney *U* test for statistical analysis. Two-sided  $P < 0.05$  was accepted as significant. Data were collected and stored in a database (Microsoft Access<sup>®</sup> version 2.0; Microsoft Corporation, Redmond, Washington, USA) and all statistical analyses were performed with the Statistical Package for Social Sciences version 8.0 (SPSS, Chicago, Illinois, USA).

The study was performed according to the Helsinki declaration and approved by the regional ethics research committee. Informed consent was given by the patients.

**Table 4** Anal and neorectal manovolumetry results in patients with and without anastomotic leakage after low anterior resection

	Leakage (n=11)	Controls (n=11)	P*
Resting pressure (mmHg)	52 (43–82)	59 (30–90)	0.75
Squeeze pressure (mmHg)	105 (65–150)	115 (30–190)	0.81
Initial sensation (ml)	25 (20–50)	44 (10–100)	0.13
Urge to defaecate (ml)	70 (40–110)	100 (50–280)	0.07
Maximum tolerable volume (ml)	120 (70–230)	180 (80–280)	0.04
Bowel movements (per day)	2.5 (0.5–4)	2.5 (0.5–3)	0.33

Values are median (range). \*Mann–Whitney *U* test

## Results

Fourteen patients (15 per cent) had clinical signs of leakage during the hospital stay, and the diagnosis was established 2–12 (median 7) days after operation. Two patients developed severe peritonitis (day 2 and 6) whereas nine patients had only vague abdominal symptoms. Vaginal discharge was the only symptom in one and rectal bleeding the only symptom in two patients. Three patients (3 per cent) had no clinical signs of leakage during the hospital stay. Symptoms of rectovaginal fistula in one and anal discharge in the other two occurred 3–4 weeks after operation and the diagnosis was then confirmed.

Eleven patients were reoperated. Laparotomy with drainage and construction of a diverting stoma was performed in eight, and a Hartmann procedure in three patients. Five patients who had a diverting stoma at the primary operation were not reoperated, nor was one patient without a diverting stoma who had minor symptoms.

After the initial treatment of anastomotic leakage, eight patients developed serious septic complications and four required a second reoperation owing to the development of a pelvic abscess, but there was no death. Nine patients made an uneventful recovery. The hospital stay ranged from 19 to 104 (median 39) days.

After discharge from hospital, five patients had chronic anal discharge due to an infected perirectal cavity, two patients after a Hartmann procedure and three patients after reoperation with drainage. One patient also had local tumour recurrence and stricture. The discharge finally subsided in one patient, whereas it persisted and precluded closure of the diverting stoma in four patients. In addition, one patient with an uneventful recovery after a Hartmann procedure had a permanent stoma. Thus, five patients required a permanent stoma because of the anastomotic leakage. Three patients had a persisting perirectal cavity without discharge and two had a moderate anastomotic

**Table 5** Anal and neorectal function in patients with and without anastomotic leakage after low anterior resection

	Leakage (n=11)	Controls (n=11)	P*
Ability to defer defaecation	50 (5–100)	86 (10–100)	0.09
Ability to expel stool	73 (14–97)	82 (7–100)	0.40
Feeling of complete evacuation	30 (5–75)	66 (4–100)	0.02
Painful defaecation	95 (73–100)	94 (5–100)	0.18
Incontinence	80 (45–100)	93 (50–100)	0.06

Values are median (range) symptom score on visual analogue scale.

\*Mann–Whitney *U* test

stricture necessitating dilatation; the stoma was closed in these patients.

Stoma closure was possible in 11 patients and was performed 3–22 (median 8) months after the primary operation. These patients and one patient observed without a diverting stoma were candidates for evaluation of late anorectal function. Eleven patients were examined; one elderly patient was excluded. The results of anorectal manovolumetry are presented in *Table 4*. Anal sphincter pressures in patients who had experienced leakage were no different from those in controls. However, these patients had a significantly lower maximum tolerable neorectal volume than controls. Patients who had anastomotic leakage experienced greater problems with complete evacuation, and a trend towards more urgency and faecal incontinence than controls (*Table 5*).

Four of five patients who had a defunctioning stoma at the primary operation had obvious signs of leakage during the hospital stay, whereas one patient had later onset of symptoms. All of these patients were observed initially without reoperation. Two developed serious septic complications, one of whom was reoperated 6 weeks after operation with conversion to a Hartmann procedure. Stoma closure was possible in only two patients in this group, whose late functional results were no better than those in patients without a primary defunctioning stoma.

## Discussion

The most important findings in the present study were that one-third of the patients with anastomotic leakage required a permanent stoma owing to long-term complications that precluded closure, and that the functional results in patients who had a defunctioning stoma closed were inferior to those experienced by patients without anastomotic leakage.

Several studies have shown that closure of the stoma is not possible in 20–63 per cent of patients who experience

anastomotic leakage following anterior resection<sup>2,5,6,9,12,16</sup>. A literature search has revealed only one previous study that evaluated long-term functional results in patients with anastomotic leakage and subsequent closure of the stoma. Hallböök and Sjö Dahl<sup>16</sup> found a reduction in neorectal reservoir function in patients with previous leakage compared with that in controls without leakage, reflected in impaired anorectal function. Frequent bowel movements, urgency of defaecation and faecal incontinence were more pronounced in patients who had experienced an anastomotic leak. The present study confirms that neorectal capacity is reduced after leakage, most probably owing to failure of healing by first intention with granulation tissue formation and consequent fibrosis<sup>17</sup>. None of the patients who had a stoma closed had a permanent stricture, but scarring and fibrosis probably resulted in a non-compliant neorectum with reduced capacity and motility. In this series neorectal capacity was measured using a rubber balloon. This type of balloon may expand in a longitudinal sausage-like fashion in a stiff fibrotic distal bowel and possibly give a falsely high volume. The true neorectal capacity might have been lower than was measured. Anal sphincter function was preserved, in keeping with observations by Hallböök and Sjö Dahl<sup>16</sup>.

The main functional problem, reported by a majority of the patients, was inability to evacuate the bowel completely. The patients also experienced some degree of faecal urgency. Incontinence was not a major problem, but a few patients reported occasional incontinence to gas and loose stool. A significant difference in symptom scores was found only for evacuation problems; however, the number of patients was small.

Long-term results were evaluated at least 12 months after stoma closure in all patients. Functional results usually improve substantially during the first year after stoma closure and might improve even after the first year. The observation time was longer in the leakage group than the control group (Table 3) and, if the results improved after 12 months, the differences between the two groups might have been larger than those found.

Contrary to what is generally thought, a defunctioning stoma at the primary operation did not reduce the complications of anastomotic leakage. In this small series, the frequency of septic complications was the same, and the late functional results were no better than those in patients without a protective stoma. The initial consequences of leakage in defunctioned patients are usually less since such patients rarely need immediate reoperation, but larger studies are needed to investigate whether they really have a better long-term result than patients who are not defunctioned primarily.

The question arises of whether patients who suffer anastomotic leakage would do better with a permanent stoma. In the authors' experience, despite impaired anorectal function after leakage, most patients nevertheless would prefer intact anal function rather than a stoma. However, before closing a well functioning stoma, it seems logical to perform a physiological examination. If anal sphincter pressures or neorectal capacity are markedly reduced, impaired anorectal function would be expected and possibly such information should be given consideration. However, there are no studies that provide evidence of the predictive value of physiological tests before stoma closure.

In conclusion, anastomotic leakage is a serious complication that results in a permanent stoma in a proportion of patients. When healing of the anastomosis and restoration of bowel continuity is achieved, late anorectal function is impaired compared with that in patients without anastomotic leakage. More and larger studies are needed to evaluate long-term results in subgroups of patients with leakage.

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