


# Highly selective diversion with proactive leakage management after low anterior resection for rectal cancer

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## Introduction

Routine creation of a diverting stoma after low anterior resection (LAR) for rectal cancer with primary anastomosis is standard practice worldwide. This is based on a meta-analysis<sup>1</sup> showing that a diverting stoma significantly reduces clinical anastomotic leakage and reoperation rates, although with no effect on mortality. However, occult and late leakages, stoma-related interventions, and all the other disadvantages of a diverting stoma are often not fully taken into account. Creation of a diverting stoma can result in complications in over half of patients<sup>2</sup>, and closure of diverting stomas is not without risk, with morbidity and mortality rates of 17.3 and 0.4 respectively in a meta-analysis<sup>3</sup>. Avoiding a stoma appears to be important to patients, with a perceived similar importance to not having complications or being cured of cancer<sup>4</sup>. Therefore, faecal diversion in LAR for rectal cancer is increasingly being debated.

This study took place in a tertiary referral centre in the Netherlands, which shifted from routine to highly selective faecal diversion after LAR for rectal cancer<sup>5</sup>. This updated case series of highly selective faecal diversions evaluated the postoperative course and proportion of patients with a functional anastomosis at 1 year.

## Methods and results

Detailed methods for this study are provided in [Appendix S1](#). LAR with anastomosis was performed in 99 patients, with a mean age of 62 years, of whom 67 were men, and mean BMI was 25 kg/m<sup>2</sup>; 49 per cent underwent neoadjuvant therapy ([Table S1](#)). Five patients had a pre-existing loop colostomy owing to previous obstruction. During LAR, two loop colostomies were closed and six new loop ileostomies were created. Stoma creation was needed because of an ultralow handsewn anastomosis (3) or failure of the stapling device (1), and routinely in the early transition period (2). In total, nine patients had a diverting stoma after LAR ([Fig. 1](#))

## Anastomotic leakage

Anastomotic leakage occurred in 16 patients (16 per cent) after a median interval of 6 (i.q.r. 3–13) days ([Fig. S1](#)). Fourteen leaks were diagnosed within 30 days. Treatment of anastomotic leakage is described in [Table S2](#). Two patients were treated with antibiotics, of whom one had a primary stoma. A secondary stoma was constructed in 12 patients. Ten patients underwent endoscopic vacuum therapy, followed by transanal closure of the anastomotic defect in nine. A new anastomosis was constructed after further mobilization of the afferent colon in three patients.

The diverting stoma was closed within 1 year in 10 patients with leakage. Salvage intersphincteric resection of the anastomosis with end-colostomy and omentoplasty was performed in four patients because of anastomotic fistula (2) or large persisting leak (2), controlling pelvic sepsis in three patients. At end of follow-up, three patients had a chronic presacral sinus, of whom two still had a diverted anastomosis. Total median duration of hospital stay was 6 (i.q.r. 5–12) days. One patient died 184 days after surgery from suicide (not related to pelvic sepsis).

## One-year functional anastomosis and stoma-related outcomes

The proportion of patients with a functional anastomosis at 1 year was 86 of 94 (91 per cent) ([Table 1](#) and [Fig. 2](#)). A total of 75 patients (76 per cent) never had a stoma at any time during the 1-year postoperative period. Four patients had a permanent colostomy related to anastomotic leakage, one because of local recurrence, and one patient for pain and low anterior resection symptoms.

## Discussion

This single-centre cohort study evaluated the outcomes of an institutional protocol of highly selective faecal diversion with proactive diagnosis and management of anastomotic leakage after LAR for rectal cancer. Following an initial report of 40 patients, in this extended experience in 99 patients, 91 per cent of patients

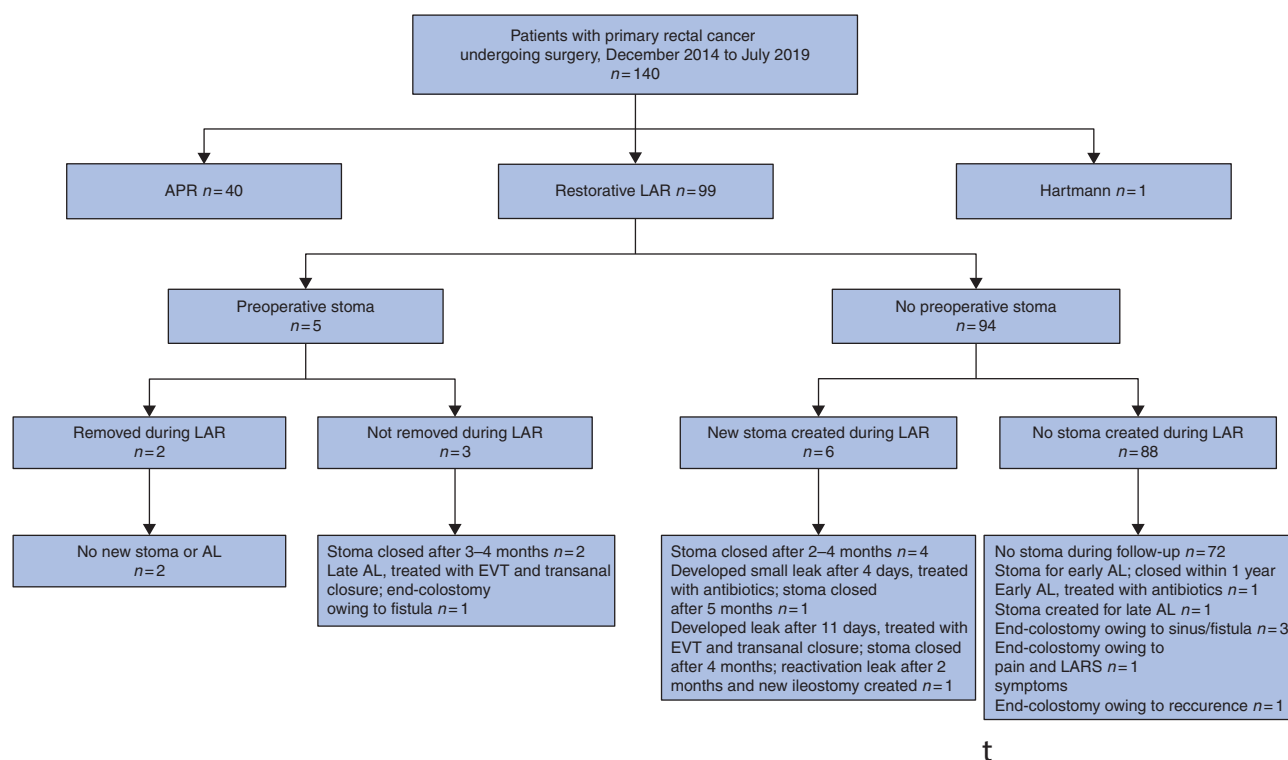


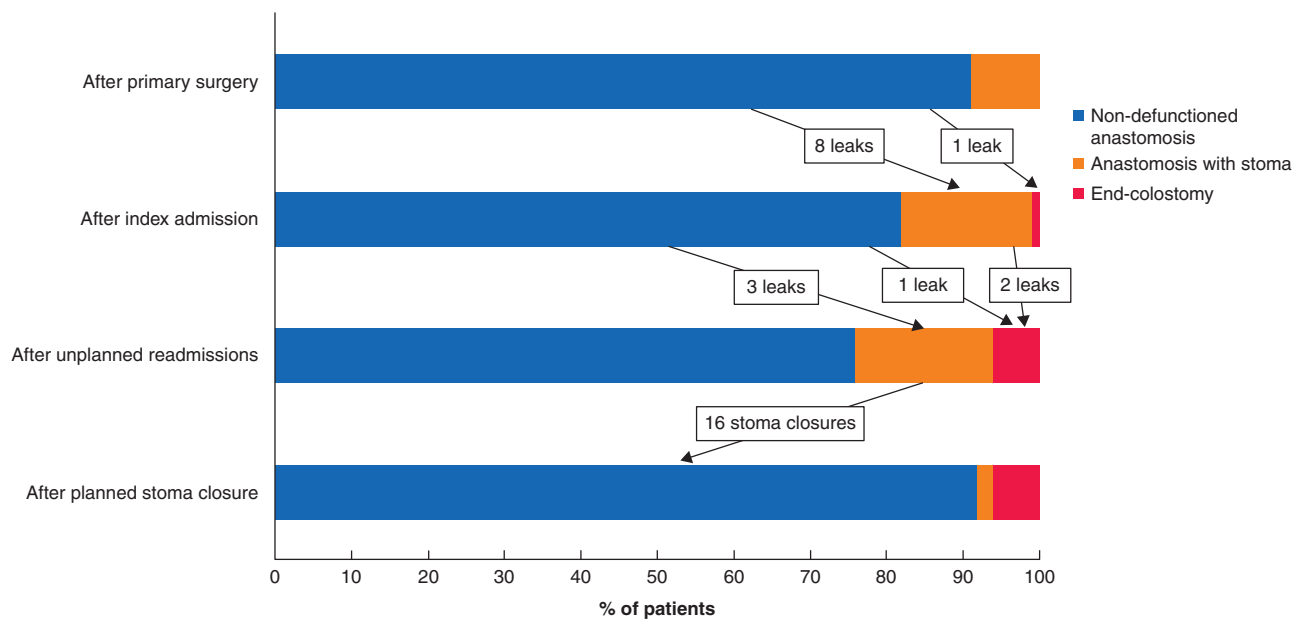
Fig. 1 Study flow chart

APR, abdominoperineal resection; LAR, low anterior resection; AL, anastomotic leak; EVT, endoscopic vacuum therapy; LARS, low anterior resection syndrome.

Table 1 Surgical outcomes up to 1 year

	No. of patients with data	Highly selective diversion
<b>Presence of stoma</b>		
Never had a stoma	99	75 (76)
At 6 months	99	11 (11)
At 12 months	94	8 (9)
<b>Anastomotic integrity</b>		
Functioning primary anastomosis at 6 months <sup>†</sup>	99	87 (88)
Functioning redo anastomosis at 6 months	99	1 (1)
Diverted primary anastomosis at 6 months	99	4 (4)
Diverted redo anastomosis at 6 months	99	2 (2)
Primary anastomosis resected until 6 months	99	5 (5)
Functioning primary anastomosis at 12 months	94	83 (88)
Functioning redo anastomosis at 12 months	94	3 (3)
Diverted primary anastomosis at 12 months	94	2 (2)
Diverted redo anastomosis at 12 months	94	0 (0)
Primary anastomosis resected until 12 months	94	6 (6)
<b>Readmissions</b>	99	34 (34)
For ileostomy closure	99	17 (17)
For AL or early postoperative complications	99	15 (15)
For further oncological treatment	99	10 (10)
For high-output stoma	99	1 (1)
<b>Reinterventions related to LAR</b>	99	24 (24)
Ileostomy closure	99	17 (17)
Other (e.g. transanal closure)	99	16 (16)
Endoscopic	99	8 (8)
Radiological	99	5 (5)
<b>Reinterventions for further oncological treatment</b>	99	
Total	99	10 (10)
Surgical	99	9 (9)
Radiological	99	1 (1)
<b>Reintervention for LARS</b>	99	1 (1)
<b>Duration of hospital stay (days)<sup>*</sup></b>		
Index admission for LAR	99	6 (5–7)
During complete follow-up	99	6 (5–12)
<b>Admitted to ICU</b>	99	2 (2)
Total duration of ICU stay per patient (days)	2	2, 2
<b>Postoperative death within 90 days</b>	99	1 (1)

Values in parentheses are percentages unless indicated otherwise; <sup>\*</sup> values are median (i.q.r.). <sup>†</sup> Functioning primary anastomosis was defined as the anastomosis created during total mesorectal excision without faecal diversion. AL, anastomotic leak; LAR, low anterior resection; LARS, low anterior resection syndrome.



**Fig. 2 Patients with a stoma during follow-up**

\*Two end-colostomies were created for a reason other than anastomotic leakage.

had a functioning anastomosis at 1 year, without leakage-related mortality, and with 76 per cent of patients not having a stoma at any time. It should be emphasized that implementation of a strict anastomotic leakage surveillance and management protocol<sup>6</sup> is required to achieve these results.

This study confirms the safety of omitting a diverting stoma compared with previously reported mortality rates in trials randomizing between diverting stoma or not<sup>1</sup>. Thirty-day mortality was even lower in Dutch hospitals with a policy of more selective diversion than in those that practised routine diversion (1.0 versus 2.9 per cent;  $P = 0.02$ )<sup>7</sup>, probably explained by close postoperative observation with immediate intervention to prevent uncontrolled sepsis and failure to rescue.

Similar studies of highly selective faecal diversion are scarce. A Swedish single-centre study<sup>8</sup> described an institutional shift in the opposite direction when similar overall anastomotic leakage rates were found, with a longer total hospital stay after construction of a diverting stoma (7 versus 4 days). In a multicentre study<sup>9</sup>, diverting stomas resulted in similar early leakage rates, a higher late leakage rate, much higher reintervention rates (85 versus 2 per cent), and a higher permanent stoma rate (22 versus 12 per cent) than no faecal diversion. One well known RCT<sup>10</sup> on the role of diverting stoma reported higher leakage rates in the omission group (28.0 versus 10.3 per cent), but comparable long-term stoma rates (16.9 versus 13.8 per cent) after 42 months of follow-up. The long-term stoma rate of 9 per cent in the present study is lower than previously reported when the majority of patients underwent primary faecal diversion<sup>11</sup>.

Creation of a diverting ileostomy can be associated with peri-operative morbidity and readmission, owing to dehydration and obstruction<sup>12</sup>. Furthermore, when bowel continuity is later restored, the presence of a diverting ileostomy has been associated with impaired long-term bowel function<sup>13</sup>. A proactive policy of controlling pelvic sepsis and repairing any leaking anastomosis may preserve neorectal function, if the functional outcomes of rectal cancer surgery are similar to those seen in ileoanal pouch surgery<sup>14</sup>. Another under-reported but clinically relevant problem is stoma-site incisional herniation, which occurs in up to 35

per cent of patients who have temporary faecal diversion, and requires surgical repair in up to two-thirds<sup>15</sup>. A diverting stoma is associated with increased healthcare costs, mainly due to higher reintervention and readmission rates<sup>16</sup>.

There are some limitations to this study. No comparison was made with a control group, but the results can be compared with previously reported results from the same centre for a historical comparison with routine diversion<sup>5</sup>. Patients were operated on by experienced colorectal surgeons in an academic institution, so this study might be subject to sampling bias and may have restricted external validity. Finally, the limitations of the retrospective study design must be acknowledged together with the relatively small sample size.

## Supplementary material

Supplementary material is available at *BJS* online.

## Acknowledgements

K.T. and I.V. contributed equally to this manuscript and share first authorship; R.H. and P.J.T. are joint senior authors.

**Disclosure.** The authors declare no conflict of interest.

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