

## Is a drain necessary after colonic anastomosis?

**C D Johnson** MChir FRCS    **P M Lamont** MD FRCS    **N Orr** MChir FRCS    **M Lennox** FRCS  
*Departments of Surgery, Westminster Hospital, Queen Mary's Hospital, Roehampton and Colchester General Hospital*

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### Summary

To date, there have been no clinical investigations of the usefulness of drains following colonic anastomosis in elective operations. We report a prospective study in which 49 patients were randomized to have a corrugated silastic drain (Portex) placed next to the colonic anastomosis. These patients were compared with a control group of 57 patients who had no drain. The two groups were similar in age, sex, diagnosis and site of anastomosis. There was no difference in outcome between the two groups. Anastomotic leakage occurred in six patients in each group. Wound infections were noted in 10 patients in each group. Two patients with a drain and one patient without a drain died from leakage at the anastomosis. This study provides no evidence to support the use of a corrugated drain after anastomosis of the colon.

### Introduction

Surgical tradition teaches that a drain should be left adjacent to a colonic anastomosis, in order to minimize the untoward effects of leakage from the anastomosis, and perhaps to reduce the likelihood of this event. It is said that drainage of the anastomosis may avoid a peri-anastomotic haematoma or fluid collection and that these predispose to dehiscence<sup>1</sup>.

There is no prospective clinical study comparing the results of drainage or non-drainage of colonic anastomoses. In a retrospective study, Berliner *et al.* found that drainage of the anastomosis increased morbidity, leakage rate and mortality<sup>2</sup>. There is also experimental evidence that drainage of colonic anastomoses leads to a higher leakage rate and more deaths from peritonitis, than does no drainage<sup>3-5</sup>.

In a comparison of different types of drain placed adjacent to a colonic anastomosis, Smith *et al.* found that amongst rats with drained anastomoses those with a silastic drain had the lowest rate of leakage (7 of 28), but in controls with no drain there was a leak in only 2 of 28 animals<sup>6</sup>.

Drains may promote anastomotic leakage by preventing the formation of adhesions between the omentum and ischaemic areas of the anastomosis. Such omental revascularization can prevent necrosis and subsequent leakage<sup>6</sup>. These experimental findings have not been tested in a randomized clinical trial before now, although Goligher<sup>1</sup> mentions a pilot study to compare drain with no drain, which failed to demonstrate any value of drainage.

Another proposed mechanism by which anastomotic dehiscence may occur is that a collection of blood or fluid adjacent to the anastomosis may discharge into the lumen through the suture line<sup>7</sup>. Drains may be placed in an attempt to prevent such a collection.

The present study was designed to compare two groups of patients who were randomized to have a drain placed next to the anastomosis or to have no drain, in order to determine whether drainage of the anastomosis has any impact on the clinical outcome.

### Method

Patients operated on by the authors, or under the care of the consultant surgeon with whom they were working, were included in the trial. All patients who had an elective colonic anastomosis were randomized to a drainage group or to a non-drainage group. Randomization was determined according to the patient's year of birth (those born in an odd year were allocated to the drainage group). After formation of the anastomosis, the anastomotic line was wrapped with omentum, and a corrugated silastic (Portex) drain was placed adjacent to the wrapped anastomosis if this was indicated by the randomization. The drain was brought out through a stab incision separate from the main abdominal wound.

Prior to elective surgery, bowel preparation was with osmotic and irritant laxatives and a low residue diet. All patients received broad spectrum antibiotics intravenously on induction of anaesthesia and for at least 16 hours postoperatively.

Postoperatively the wounds were inspected daily by one of the authors for signs of infection. Wound infection was defined as discharge of pus or infected fluid from the wound. All wound discharges were cultured. The number of days when a temperature greater than 37.5°C occurred was noted and all infective and other complications of the surgical procedure were recorded. Anastomotic leakage was defined on clinical criteria: discharge of gas or faeces from a drain site or wound, intrabdominal leakage confirmed at laparotomy or autopsy, or signs of pelvic sepsis, with a palpable defect in the anastomosis. Four patients died; all had a postmortem examination.

The corrugated drain was removed on the surgeon's instruction when the volume of fluid was 25-50 ml per 24 h.

Complication rates in the two groups were compared using the Chi square test.

### Results

Forty-nine patients were allocated to the drainage group, 57 patients received no drain. The age, sex, diagnosis and type of operation were not different between the two groups (Table 1). In the drained group, six colorectal and one ileocolic anastomoses were stapled. Corresponding figures in the no drain group were three colorectal and two ileocolic stapled anastomoses. One patient was excluded: after a right

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Table 1. Characteristics of patients undergoing colonic anastomosis

	Drain	No drain
<i>n</i>	49	57
Age (years): mean (SD)	64.1 (15.3)	69.4 (9.2)
Sex ratio (M : F)	20 : 29	29 : 28
Diagnosis:		
Adenocarcinoma	31	37
Diverticular disease	8	12
Crohn's disease	3	3
Caecal adenoma		2
Carcinoma of stomach	1	1
Caecal diverticulitis	1	1
Caecal volvulus	1	
Benign colonic ulcer	1	
Radiation stricture	1	
Rectovaginal fistula	1	
Ischaemic perforation of colon	1	
Perforated ileal leiomyosarcoma	1	
Type of anastomosis:		
Ileo-colic	15	23
Colo-rectal	26	26
High	15	15
Low	11	11
Proximal colostomy	5	7
Colo-colic	7	6
Colo-anal	1	
Ileo-rectal		2

hemicolectomy for carcinoma of the caecum with liver metastases in a man aged 66 years, the surgeon chose to insert a drain, although randomization was to 'no drainage'. This patient died in the postoperative period, from intestinal obstruction and hepatic secondaries. Two patients in each group were wrongly randomized. No complications arose in these four patients, and they are included.

In patients with a drain, this was removed after a median of three days (range 1-8).

Postoperative pyrexia was noted in 29 drained patients and in 33 patients without a drain. The pyrexia was present for more than two days in 10 of 49 drained patients and 14 of 57 undrained patients. These differences were not significant. The complications are itemized in Table 2. There was no

Table 2. Complications of colonic anastomosis

	Drain	No drain
<i>n</i>	49	57
Wound infection	10	10
Anastomotic leak	6	6
Intra-abdominal sepsis (apart from leakage)	0	1
Other	3	5
Death	2	1

difference between the two groups in leakage rate, sepsis rates or other complications. Intra-abdominal sepsis occurred in one patient with no drain, who developed a subphrenic abscess. One patient developed a subcutaneous abscess at the drain site. The miscellaneous complications included urinary tract infection with epididymitis in one patient, burst abdomen in one patient, deep venous thrombosis in two patients and chest infection in three patients.

The overall incidence of anastomotic dehiscence was 11% after exclusion of one technical error, which occurred in the 'no drain' group. At operation to close a Hartmann's colostomy, the anastomosis was formed with a circular stapling gun, and part of the posterior vaginal wall was included in the staple line. The patient developed a recto-vaginal fistula, with no evidence of intra-abdominal leakage.

Complications were more frequently observed after anastomosis between the colon and rectum than in other sites. Of those patients who had a drain, 10 of 26 with colorectal anastomosis developed a complication, including seven wound infections (27%) and five anastomotic dehiscences (19%). In those patients without a drain, nine of 26 with a colorectal anastomosis developed complications, including one wound infection (4%) and four anastomotic dehiscences (15%), in addition to the stapled rectovaginal fistula mentioned above.

There were 22 anastomoses below the peritoneal reflection, 11 with a drain and 11 without. Three anastomotic leaks occurred in each group, including the accidental colo-vaginal fistula in the 'no drain' group. Details of the remaining patients who developed anastomotic leakage are shown in Table 3.

Complication rates varied with different surgeons from 13 to 33%. These rates include all complications,

Table 3. Clinical details of patients who developed anastomotic leakage

Age	Anastomosis	Defunctioning colostomy	Drain removal	Leak	Fistula wound	Fistula drain	Fistula vagina	Peritonitis	Reoperation	Death
54	CC <sup>(1)</sup>	-	NA	20	+	NA	NA	-	-	-
85	IR <sup>(2)</sup>	-	NA	6	-	NA	NA	-	-	+
67	CR	-	NA	24	-	NA	+	-	-	-
56	CR	-	NA	18	-	NA	NA	+	+	-
77	CR <sup>(3)</sup>	-	NA	3	-	NA	NA	+	+	-
70	CR	-	NA	7	-	NA	NA	+	+	-
78	CR	-	2	5	+	-	-	+	+	-
82	CR	-	3	10	+	-	-	-	-	+
77	CR	+	3	4	-	-	-	+	-	+
71	CR	-	3	6	-	+	NA	-	-	-
71	CC	-	7	4	-	+	NA	-	-	-
69	IC	-	3	6	-	-	NA	+	+	-

IC ileocolic; CC colocolic; CR colorectal; IR ileorectal. Figures give number of days after operation. +Present; -absent; NA not applicable. All patients had colorectal carcinoma, except (1) carcinoma stomach; (2) idiopathic megacolon; (3) diverticular disease.

major and minor. There was no obvious correlation with experience.

Overall, there were four deaths (4%). One patient who was excluded from analysis (see above) died from intestinal obstruction. One patient aged 85 had a total colectomy and ileorectal anastomosis without drainage for chronic constipation, recurrent volvulus, and megacolon. Six days postoperatively he became unwell, and died without reoperation. Postmortem examination showed a localized pelvic abscess, with anastomotic dehiscence. In the drainage group, two deaths occurred following anterior resection for carcinoma of the rectum. A 77-year-old woman died of peritonitis four days after operation. The drain had been removed on the third day. Autopsy demonstrated dehiscence of the extraperitoneal anastomosis. An 82-year-old woman died 50 days after operation. The drain had been removed on the third day. Her recovery was complicated by a faecal fistula in the wound and a palpable defect in the anastomosis. Although she had been discharged from hospital, she subsequently died of septic complications.

### Discussion

Prophylactic drainage of all colonic anastomoses is a time honoured surgical tradition. Goligher has questioned whether this is necessary<sup>1</sup>, and a recent textbook of operative surgery, while noting the tradition of drainage, states that it is unnecessary<sup>8</sup>. One of us has already pointed out the lack of evidence to support prophylactic drainage of colonic anastomoses<sup>9</sup>, but there is no prospective clinical study that compares outcome of colonic anastomosis with and without a drain. We have performed a randomized comparison of drainage versus no drainage in patients undergoing colonic anastomosis, and we have been unable to demonstrate any benefit from the prophylactic use of a corrugated silastic drain. There was no difference between our two groups in rates of wound infection, anastomotic leakage, peritonitis, reoperation or death (Table 3).

Leakage rates in this study are higher than some reported by specialist colorectal surgeons, but they are similar to the findings of Fielding *et al.*<sup>10</sup> In that national study of outcome after surgery for large bowel cancer, the clinical leakage rate for colonic anastomosis was 13% overall, and 18% for colorectal anastomosis. The corresponding figures in our study are 11% and 19%. Similarly, Fielding *et al.* noted the same wide variations in complication rates between surgeons, unrelated to surgical experience. Our mortality of 4% is similar to other series<sup>10,11</sup>.

We used clinical criteria to determine anastomotic leakage partly because leaks which are not evident clinically have, by definition, no bearing on the patient's postoperative recovery, and partly because of personal experience of cases in which the radiographic technique might have contributed to anastomotic breakdown.

Each surgeon in this study used his own preferred anastomotic technique. While it has been shown that very low rates of anastomotic leakage can be obtained using the stapling instrument<sup>12</sup>, it is likely that individual surgeons will do better with the technique with which they are most familiar<sup>13</sup>, and most surgeons in this series continue to perform hand-sewn anastomoses. Large series of stapled anastomoses show leakage rates of the order of 10%<sup>14,15</sup>. In all cases after completion of the anastomosis, it was

wrapped with omentum or adjacent pericolic fat, as we believe that this offers additional protection to the suture line<sup>3,6</sup>.

After completion of the anastomosis, the drain was placed to allow the evacuation of any adjacent potential collection of fluid. For this reason, the drain was removed when the volume of fluid had fallen to 25 to 50 ml per 24 h. The drain was not kept in place in order to create a track along which bowel contents might escape if a leak occurred. Nevertheless, one faecal fistula did develop at the site of a drain which had been removed on day three. However, in Table 3, it can be seen that, in patients with a drain, anastomotic dehiscence was equally likely to lead to a fistula *via* the drain, or through the wound, or to cause peritonitis with no fistula. Goligher has also noted that, even in the presence of a drain, leaking faeces may reach the surface by another route<sup>1</sup>.

We did not intend to study the effect of proximal colostomy on colorectal healing. One patient in 12 with a colostomy developed clinical signs of leakage, compared with seven in 40 without a colostomy. These figures must be interpreted with care, as the indications for colostomy were not controlled or recorded.

In conclusion, we have been unable to demonstrate any advantage for the use of a corrugated silastic drain following colonic anastomosis. Although untoward effects of the use of a drain are uncommon, intestinal obstruction, haemorrhage and the introduction of infection may all occur as a direct result of the use of a drain. For this reason we have abandoned routine drainage for all colonic anastomoses and we agree with Robinson<sup>16</sup>, that 'drains must not be considered a substitute for meticulous technique'.

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(Accepted 29 March 1989. Correspondence to CD Johnson, Department of Surgery, F Level, Centre Block, Southampton General Hospital, Tremona Road, Southampton SO9 4XY. PM Lamont is now at the John Radcliffe Hospital, Oxford, and M Lennox is at the Queen Elizabeth II Hospital, Welwyn Garden City.)

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