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Complications and mortality following stoma formation

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ABSTRACT

INTRODUCTION As stoma formation is thought to be declining, we performed a study to evaluate the rate of stoma formation and the impact on stoma complication rates, together with risk factors for complications.

PATIENTS AND METHODS Stoma incidence, individual complications and mortality rates were retrieved from a stoma nurse database of 345 stomas created over an 8-year period.

RESULTS Stoma formation increased over the study period, although the incidence of complications declined. Stoma complications were more frequently seen in emergency surgery. A significant association between stoma complications and mortality was identified.

CONCLUSIONS Age of patient, urgency of surgery and diagnosis were associated with high levels of morbidity and mortality. Stomas are often formed in frail patients unsuitable for anastomosis formation, which may explain the high mortality in ostomy patients.

KEYWORDS

Stomas – Postoperative complications – Mortality

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The annual incidence of stoma formation in England is 20,800,[1] although recent literature would suggest that this figure is unnecessarily high. The management of obstructing left-sided colorectal cancer has changed in recent times, with increased use of on-table lavage with primary resection and anastomosis[2,3] and colorectal stenting[4] to avoid stoma formation. Sphincter preserving surgery for rectal cancer should also reduce permanent stoma rates.[5]

Persistently high morbidity and mortality rates associated with stoma creation and reversal are behind attempts to reduce their formation. Long-term complication rates of 58% in colostomies[6] and up to 76% in ileostomies[7] have been reported. It is also recognised that around 15% of temporary stomas created at the time of anterior resection become permanent.[8]

There has been much recent work examining risk factors for mortality in colorectal cancer surgery,[9] such as ASA grade and age, but whether the presence of a stoma affects mortality has not been previously examined. Studies have addressed the mortality following stoma reversal (0–4%),[10] but the literature is scant when stoma creation is concerned.

We have examined whether the incidence of stoma formation is declining in the practice of a typical district general hospital, and investigated the prevalent morbidity and mortality associated with stoma creation, together with their risk factors.

Patients and Methods

All patients undergoing colostomy or ileostomy formation (elective and emergency) from January 1992 to December 2000 were identified. Data were collected from patient records maintained prospectively by the stomatherapy department, supported by information from operation notes and patient case records. Complications recorded were necrosis, prolapse, peristomal infection or abscess, retraction, stenosis, parastomal hernia, fistula and malignant change at the stoma site. Complications not included were skin excoriation and laparotomy wound problems.

Operations were performed by one of seven consultant general surgeons or their registrars, three of whom had a declared interest in coloproctology. Patients undergoing bowel resection without stoma formation were not studied.

Statistical analysis

Results are expressed as the mean (SD) unless otherwise stated. Statistical analysis was performed using SPSS®

Table 1 Patient characteristics

Sex ratio (M:F)	191:154
Age (years)*	68 (17–94)
Elective:emergency ratio	7:3
Colostomies	257
End	210 (82%)
Loop	47 (18%)
Sigmoid loop	24 (51% of loop colostomy)
Transverse loop	23 (49% of loop colostomy)
Ileostomies	88
End	44 (50%)
Loop	44 (50%)
Indication for surgery	
Carcinoma	226 (66%)
Diverticular disease	52 (15%)
Inflammatory bowel disease	38 (11%)
Peri-anal sepsis/other	29 (8%)

*Values are median (range).

software (SPSS, Chicago, IL, USA). The chi-squared test was used for comparison of proportions and the Mann-Whitney test used for non-parametric comparisons. Kaplan-Meier survival curves were used to analyse differences in mortality, and the log rank test to determine differences. Statistical significance was defined as $P < 0.05$.

Results

In all, 345 stomas were created in 320 patients (see Table 1 for demographic data). Most stomas were raised under elective circumstances (70%). The majority of stomas were end-colostomy type. Carcinoma of the colon or rectum was the commonest indication for stoma formation, followed by diverticular disease. Hartmann's procedure was the commonest operation performed resulting in a stoma (27%).

Complications occurred in 93 stoma operations (25%). The most frequent colostomy-associated complications were parastomal hernia and retraction, whilst hernia, retraction and small bowel obstruction were the commonest ileostomy related problems (Fig. 1).

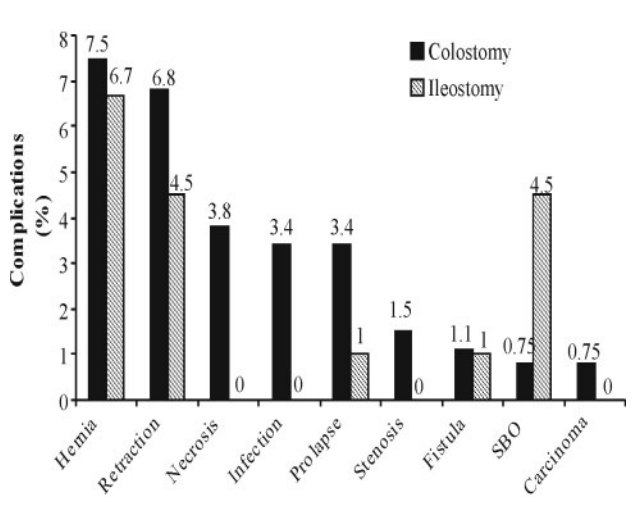

Figure 1 Specific complications of colostomies and ileostomies.

Factors influencing complication rates

Loop colostomy had the highest complication rate (38%), whilst end-ileostomy had the lowest (16%; $\chi^2 = 5.7$, 1d.f.; $P = 0.02$). Although there was a seemingly large difference in complication incidence between defunctioning loop colostomy and loop ileostomy (38% versus 20%) this was not significant ($\chi^2 = 3.47$, 1d.f.; $P = 0.06$).

The most prevalent end-colostomy complications were parastomal hernia (9.5%) and retraction (8%). Prolapse occurred in 13% of loop colostomies, which increased to 17% in the transverse-loop colostomy group (Table 2). Retraction was the most frequent end-ileostomy complication (7%), and parastomal hernia was the most common loop ileostomy complication (9%).

Although the incidence of stomas was seen to increase, the complication rate decreased over time (Fig. 2). Advanced age was not significantly associated with complication occurrence (mean age of patients with complications 65.7 years [SD 14.5 years]; mean age with no complications 65.4 years [SD 14.1 years]; $P = 0.7$, Mann Whitney test).

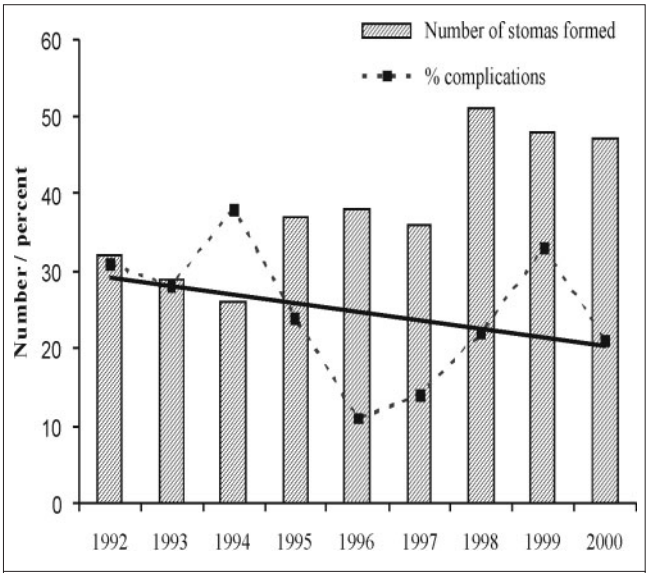

Figure 2 Incidence of stoma formation 1992–2000 (filled bars); and complications as percentage of stomas formed. Black line indicates trend in complication rates ($r^2 = 0.12$).

Table 2 Analysis of specific complications for each stoma type

	End colostomy (n = 210)	Loop colostomy (n = 47)	Loop transverse colostomy (n = 23)	End ileostomy (n = 44)	Loop ileostomy (n = 44)
Necrosis	9 (4)	1 (2)	1 (4)	0	0
Local sepsis	6 (3)	3 (6)	3 (13)	0	0
Retraction	16 (8)	2 (4)	2 (9)	3 (7)	1 (2)
Stenosis	4 (2)	0	0	0	0
Prolapse	3 (1.4)*	6 (13)	4 (17.4)*	0	1 (2)
Hernia	20 (9.5)	3 (6)	0	2 (4.5)	4 (9)
Fistula	2 (1)	1 (2)	1 (4)	1 (2)	0
Small bowel obstruction	2 (1)	0	0	1 (2)	3 (7)
Carcinoma	3 (1.4)	0	0	0	0
Peristomal abscess	1 (0.5)	2 (4)	0	0	0

Values are number (%); *χ^2 = 23.1, 3 d.f.; P = 0.0001.

Thirty-four stomas developing complications required revisional surgery (36%) – 27 of these were colostomy and 7 ileostomy (χ^2 = 0.01, 1d.f.; P = 0.91).

Emergency surgery

All complications (except small bowel obstruction) were more common in emergency surgery than elective surgery (Fig. 3); however, the difference in complications was significant only for necrosis (P = 0.005).

Disease and complications

Table 3 shows the influence of disease and presentation on complication rates. Necrosis was significantly more common following emergency cancer surgery than elective, yet all other complications were seen with similar frequency. In diverticular disease, however, necrosis was more common after elective surgery, as was hernia formation. Overall, significantly more complications were seen after elective surgery for diverticular disease than for elective cancer surgery.

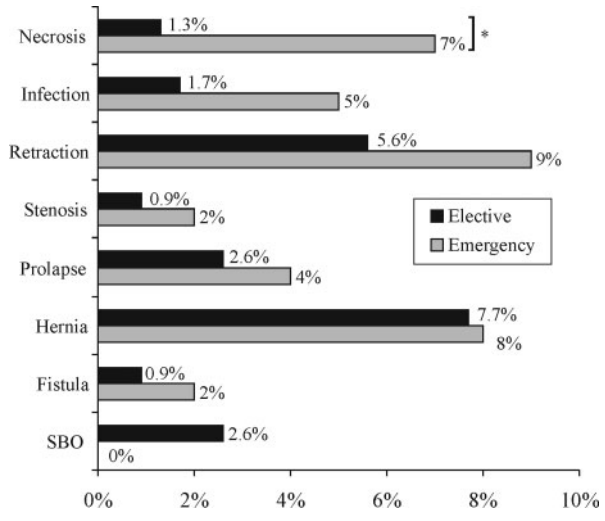

Figure 3 Elective and emergency complications (*χ^2 = 7.84, 1 d.f.; P = 0.005).

Table 3 Analysis of urgency of surgery and pathology on specific complications

	Elective cancer surgery (n = 185)	Emergency cancer surgery (n = 29)	Elective diver. disease (n = 6)	Emergency diver. disease (n = 39)
Necrosis	2 (1)[a]	4 (13.8)[a]	1 (16.7)[b]	0 (0)[b]
Local sepsis	4 (2.2)	2 (6.9)	0 (0)	3 (7.7)
Retraction	9 (4.9)	2 (6.9)	1 (16.7)	3 (7.7)
Stenosis	2 (1.1)	1 (3.4)	0 (0)	1 (2.6)
Prolapse	6 (3.2)	0 (0)	0 (0)	1 (2.6)
Hernia	15 (8.1)	2 (6.9)	2 (33)[c]	2 (5.1)[c]
Fistula	0 (0)	0 (0)	0 (0)	1 (2.6)
Small bowel obstruction	6 (3.2)	0 (0)	0 (0)	0 (0)
Carcinoma	2 (1.1)	1 (3.4)	0 (0)	0 (0)
Peristomal abscess	1 (0.5)	0 (0)	0 (0)	0 (0)
Total	**47 (25)[d]**	**12 (41)**	**4 (67)[d]**	**11 (28)**

Values are number (%). diver. = diverticular
[a]χ^2 = 14.9, 1d.f.; P = 0.003.
[b]χ^2 = 6.65, 1d.f.; P = 0.01.
[c]χ^2 = 5.1, 1d.f.; P = 0.02.
[d]χ^2 = 5.1, 1d.f.; P = 0.025.

Mortality

During the 8-year study period, 164 patients (47%) died. The mean age of those who died was significantly greater than those who survived the study period (70.4 years [SD 11.3 years] versus 60.2 years [SD 15.2 years]; $P = 0.0001$). Of the 164 deaths, 101 patients died within 1 year of surgery (62%) and 63 died later than 1 year.

A greater proportion of emergency patients died earlier than elective patients. At 6 months after surgery, significantly more emergency patients had died compared to elective (24% versus 12%; $\chi^2 = 7.17$, 1 d.f.; $P = 0.007$). As seen in Figure 4, the survival curve for emergency cases is steep up to 1 year after surgery, after which it plateaus. The curve for elective cases is less steep, but crosses the emergency curve at 2 years. However, there was no significant overall survival difference.

A higher incidence of mortality was seen in those patients who developed stoma-specific complications (40% mortality with complication; 14% with no complication; $\chi^2 = 27.2$, 1d.f.; $P = 0.0001$). Of patients with stoma necrosis, 70% died ($\chi^2 = 3.81$, 1 d.f.; $P = 0.05$). Four of these patients died within 30 days of surgery (57%), the remainder died more than 6 months after surgery.

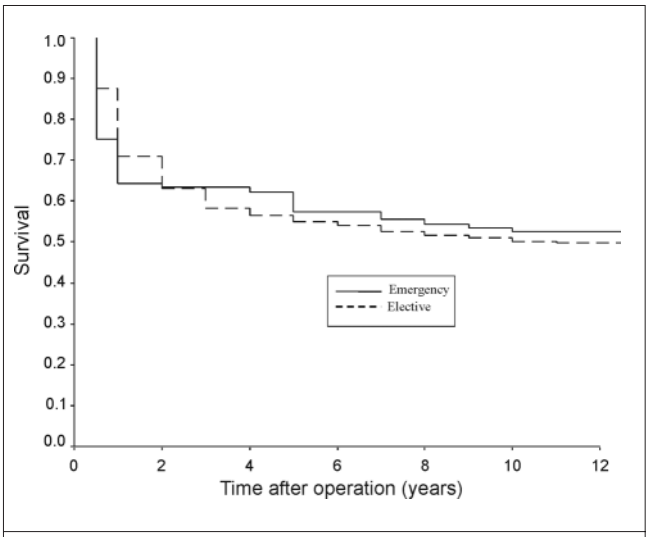

Figure 4 Survival according to circumstances of surgery ($P = 0.94$, log rank test).

Discussion

Alternatives to stoma formation are being increasingly sought, partly because of dissatisfaction with undesirably high complication rates. The high prevalence of complications identified in this study is comparable with those reported by others (reviewed by Shellito[11]). Hernia formation was the most frequent complication, affecting 7.5% of all colostomies. This remains a difficult complication to treat and, so far, no technical factors have been found to prevent hernia occurrence.[12] Although a slight downward trend in overall complication rate was observed during the study period, it is clear that we are no closer to eliminating the problem, a situation worsened by high rates of revision surgery for complications (36%).

When comparing stoma type, the loop ileostomy was found to have a lower complication rate than loop colostomy, albeit not significant. This is consistent with most current trials,[10,13] and adds weight to the recommendation that loop ileostomies are to be favoured over loop colostomies in defunctioning low colorectal anastomoses. Although others[14] have found no difference in complication rate between the two defunctioning stomas, the quality of life in patients with an ileostomy is enhanced over those with a colostomy.[15]

Emergency surgery resulted in a higher stoma complication rate than elective surgery, and a significantly higher early mortality rate. Of considerable interest was the association between complication occurrence and death, with a significantly higher number of deaths seen following stoma-specific complications. Of the complications studied, necrosis was found to be the most significant predictor of subsequent mortality. Our findings are consistent with those by Stothert *et al.*,[16] who reported over 50% morbidity and 18% mortality following emergency surgery resulting in a stoma. The study found that 8% of deaths were attributable to stoma complications; of 4 cases of stoma necrosis following recurrent small bowel infarction, there were 3 deaths.

Although stoma complication is a novel risk factor for mortality, it is acknowledged that other established prognostic indicators held stronger influence. As such, age, urgency of surgery and diagnosis were found to influence morbidity and mortality rates. It is striking that these very factors are out of the surgeon's control, and may explain why improvements in surgical technique alone cannot prevent complications occurring. This argument is consistent with other studies,[16] which suggested that patient factors were responsible for the high morbidity and mortality rates seen in emergency surgery, given no such association with elective surgery.

Being primarily a study of stoma complications, a limitation of our data is that no comparison of mortality rates was made with non-stoma patients. Others have reported higher unadjusted mortality rate in patients with Hartmann's procedure or palliative stomas for malignancy compared with anterior resection.[17] Non-resection of tumour was also associated with high mortality rates. It is likely that patients undergoing primary anastomosis are self-selecting, in that they often have less co-morbid conditions and less advanced stages of malignancy. The absence of healthier controls no doubt contributed to the high overall mortality rate seen in our study of 47%. This effect has been examined in a recent study of left-sided colonic emergencies,[18]

which found that the death rate in patients with stomas was over 3 times higher than those who were anastomosed ($P < 0.0001$). The authors attributed this effect to case selection; those with co-morbidity, peritoneal contamination or high ASA grade were more likely to receive a stoma. Patients with advanced tumour stage and co-morbidities also had significantly higher colostomy rates in a separate study.[19]

Conclusions

It is clear from this study, based in a typical district general hospital serving 200,000 patients, that the complication rate arising from stoma formation remains high. We provide additional evidence that loop ileostomy has advantages as a defunctioning stoma. The association between stoma complications and mortality is notable and warrants further exploration in subsequent studies.

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