

# Salvage surgery after failure of endoscopic balloon dilatation versus surgery first for ileocolonic anastomotic stricture due to recurrent Crohn's disease

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**Background:** Both surgical resection and endoscopic balloon dilatation are treatment options for ileocolonic anastomotic stricture caused by recurrent Crohn's disease unresponsive to medications. Perioperative outcomes of salvage surgery owing to failed endoscopic balloon dilatation in comparison with performing surgery first for the same indication are unclear.

**Methods:** An analysis of a prospectively maintained Crohn's disease database was carried out to compare perioperative outcomes of patients who had surgery for failure of endoscopic balloon dilatation with outcomes in patients who underwent resection first for ileocolonic anastomotic stricture caused by recurrent Crohn's disease between 1997 and 2013.

**Results:** Of 194 patients, 114 (58.8 per cent) underwent surgery without previous endoscopic balloon dilatation. The remaining 80 patients had salvage surgery after one or more endoscopic balloon dilatations during a median treatment span of 14.5 months. Patients in the salvage surgery group had a significantly shorter length of anastomotic stricture ( $P < 0.001$ ). Salvage surgery was associated with increased rates of stoma formation ( $P = 0.030$ ), overall surgical-site infection (SSI) ( $P = 0.025$ ) and organ/space SSI ( $P = 0.030$ ). In multivariable analysis, preoperative endoscopic balloon dilatation was independently associated with both postoperative SSI (odds ratio 3.16, 95 per cent c.i. 1.01 to 9.84;  $P = 0.048$ ) and stoma diversion (odds ratio 3.33, 1.14 to 9.78;  $P = 0.028$ ).

**Conclusion:** Salvage surgery after failure of endoscopic balloon dilatation is associated with increased adverse outcomes in comparison with surgery first. This should be discussed with patients being considered for endoscopic balloon dilatation for ileocolonic anastomotic stricture due to recurrent Crohn's disease.

Presented to a meeting of the American Society of Colon and Rectal Surgeons, Boston, Massachusetts, USA, May/June 2015

Paper accepted 23 June 2015

Published online 27 August 2015 in Wiley Online Library (www.bjs.co.uk). DOI: 10.1002/bjs.9906

## Introduction

Crohn's disease is an inflammatory bowel disease characterized by chronic, transmural, recurrent inflammation in the entire gastrointestinal tract<sup>1,2</sup>. Fibrosis and strictures are common presentations of Crohn's disease and can result in bowel obstruction requiring resection<sup>1,3,4</sup>.

Following ileocolonic resection, recurrence of Crohn's disease at the anastomosis or in the neoterminal ileum may also lead to stricture. Current treatment options for ileocolonic anastomotic stricture caused by Crohn's disease include medical therapy alone when assuming a prevalently

inflammatory component, endoscopic balloon dilatation and surgical management<sup>5-8</sup>. Endoscopic balloon dilatation is considered an acceptable treatment option for short and isolated Crohn's disease-related strictures, such as ileocolonic anastomotic stricture, which are accessible using conventional colonoscopy<sup>9,10</sup>. Although its efficacy and safety in this setting has been demonstrated in recent years<sup>11-14</sup>, endoscopic balloon dilatation is also associated with a high rate of recurrent stricture requiring repeated dilatation<sup>15,16</sup>, which may ultimately escalate to salvage surgical resection<sup>12-14,17-19</sup>. A number of reports<sup>14,18,20-23</sup>, with follow-up periods ranging from 1.25 to 5.8 years,

have shown that 23–42 per cent of patients ultimately require salvage surgical resection. Despite the selective use of endoscopic balloon dilatation and dramatic advancements in medical management, it is apparent that surgical management remains inevitable for at least a subset of patients with ileocolonic anastomotic stricture caused by recurrent Crohn's disease who are initially treated by endoscopic balloon dilatation.

There are limited data regarding perioperative outcomes of salvage surgical intervention following failure of endoscopic balloon dilatation for this specific indication. In particular, it is unclear whether patients treated selectively with surgery first for ileocolonic anastomotic stricture have improved outcomes compared with those who undergo surgery only after failure of endoscopic balloon dilatation. The aim of this study was to compare postoperative outcomes of patients undergoing salvage surgery *versus* surgery first for ileocolonic anastomotic stricture, and to provide evidence to direct decision-making in patient management.

## Methods

After Institutional Review Board approval, a prospectively collected Crohn's disease database was scrutinized. Data on consecutive patients with either radiographically and/or endoscopically confirmed ileocolonic anastomotic stricture due to recurrent Crohn's disease between 1997 and 2013 were reviewed. Both patients undergoing surgery first and those having surgery after failure of endoscopic balloon dilatation were included. Patients with perforating disease or concomitant active disease elsewhere in the gastrointestinal tract were excluded. With respect to the procedures undertaken, ileocolonic resections were performed using open or laparoscopic techniques as described previously<sup>24</sup>. The decision to create an additional stoma diversion at the time of ileocolonic resection for ileocolonic anastomotic stricture due to Crohn's disease was left to the discretion of the individual surgeon. Possible reasons for stoma creation included a long, complex surgical procedure, intraoperative contamination, malnutrition and/or synchronous use of biological medications<sup>25</sup>. The technique of endoscopic balloon dilatation performed in the authors' institution and contraindications to endoscopic balloon dilatation have been described previously<sup>22,26</sup>.

## Data collection

Variables collected included demographic data such as age, duration of the disease since diagnosis, sex, body mass index (BMI), extraintestinal manifestation, family history of inflammatory bowel disease (IBD), smoking history and perianal disease. In addition, perioperative information

including interval between surgery and the initial onset of obstructive symptom due to recurrent Crohn's disease, length of stricture, use of laparoscopic surgery, urgent surgery, estimated blood loss, stoma creation, stapled *versus* handsewn anastomosis, anastomotic configuration (end-to-end, end-to-side, side-to-end, side-to-side), preoperative use of medications (anti-inflammatory agents, steroids, immunomodulators and biologicals) and postoperative morbidity was obtained. The number of endoscopic balloon dilatations before surgery was also included. Preoperative steroid use was defined as corticosteroids administered in the month before surgery. Preoperative immunomodulator use was defined as azathioprine or 6-mercaptopurine administration in the 2 months before surgery, and preoperative biological use was defined as at least one infusion of a biological medication in the 12 weeks preceding surgery. Elective surgery was defined as an operation performed for a patient on the day of admission. Conversely, urgent surgery was defined as either an operation performed in a patient already admitted to the hospital owing to failure of any non-operative treatments (medical management or endoscopic balloon dilatation) or an operation owing to acute complications resulting from endoscopic balloon dilatation.

## Outcomes of interest

The main outcomes of the study were postoperative complications (within 30 days of surgery or during the same hospital stay), requirement for stoma creation as part of the operative procedure, reoperations and readmissions. Specific postoperative complications included anastomotic leak, small bowel obstruction, ileus, sepsis, thromboembolic events, dehydration, surgical-site infection (SSI), urinary tract infection and urinary retention. Ileus was defined as the absence of bowel function on postoperative day 5 or the need for insertion of a nasogastric tube for abdominal distension, nausea or vomiting in the absence of clinical or radiographic signs of mechanical bowel obstruction<sup>27</sup>. Small bowel obstruction was defined as the presence of obstructive intestinal symptoms associated with radiographic findings consistent with mechanical intestinal obstruction<sup>28,29</sup>.

## Statistical analysis

Quantitative variables are described as mean(s.d.) or median (i.q.r.) values.  $\chi^2$  and Fisher's exact tests were used to examine differences between groups for categorical variables. Student's *t* test or Mann-Whitney *U* test was used to compare groups for continuous variables, depending on the distribution. Statistical analysis was performed using

**Table 1** Patient characteristics

	Surgery first (n = 114)	Salvage surgery (n = 80)	P¶
Age (years)*	46.1(13.6)	44.0(13.2)	0.268#
Sex ratio (M:F)	50:64	39:41	0.559
Body mass index (kg/m <sup>2</sup> )*‡	23.7(5.1)	25.2(5.6)	0.078#
Smoking history			0.095
Never	38 (33.3)	39 (49)	
Former	33 (28.9)	19 (24)	
Current	43 (37.7)	22 (28)	
Family history of IBD	26 (22.8)	22 (28)	0.501
Duration of disease (years)*§	16.9(11.4)	18.5(11.1)	0.335#
Extraintestinal manifestations	11 (9.6)	12 (15)	0.268
Perianal disease	15 (13.2)	13 (16)	0.68
Time from obstructive symptoms to surgery (months)†	3.0 (1.0–6.8)	14.5 (6.0–36)	< 0.001**
Age at initial surgery (years)*	34.5(9.6)	39.6(13.2)	0.083#
Indication for initial surgery			0.728
No response to medical treatment	42 (36.8)	31 (39)	
Fibrosis/stricturing	39 (34.2)	30 (38)	
Penetrating disease	33 (28.9)	19 (24)	
Laparoscopy for initial surgery	13 (11.4)	8 (10)	0.818
Stapled anastomosis of initial surgery	81 (71.1)	62 (78)	0.327
Anastomotic configuration of initial surgery			0.157
End-to-end	29 (25.4)	15 (19)	
End-to-side or side-to-end	36 (31.6)	36 (45)	
Side-to-side	49 (43.0)	29 (36)	

Values in parentheses are percentages unless indicated otherwise; values are \*mean(s.d.) and †median (i.q.r.). ‡Data available for 109 patients in the surgery-first and 80 in the salvage surgery group. §Data available for 106 patients in the surgery-first and 80 in salvage surgery group. IBD, inflammatory bowel disease. ¶ $\chi^2$  test, except #Student's *t* test and \*\*Mann–Whitney *U* test.

SAS® 9.3 software (SAS Institute, Cary, North Carolina, USA);  $P < 0.050$  was considered statistically significant for all analyses. Univariable analysis was performed to identify potential variables associated with postoperative SSI and stoma diversion, including the duration of obstructive symptoms, length of stricture, age, disease duration, BMI, number of anastomoses, estimated blood loss, preoperative endoscopic balloon dilatation, sex, smoking status, laparoscopic surgery, perianal disease, urgent surgery, stapled anastomosis, anastomotic configuration, preoperative use of biologicals, preoperative steroids and preoperative use of immunosuppressive agents. The multivariable model was constructed by including variables that were statistically significant in the univariable analysis as well as those that the authors believed to be clinically important although not statistically significant (BMI, current smoking and preoperative use of steroids).

## Results

Some 114 patients underwent surgery without previous endoscopic balloon dilatation, and 80 required salvage surgery owing to failure of at least one endoscopic balloon dilatation, including those operated on for acute perforation following endoscopic balloon dilatation or inability to complete endoscopic balloon dilatation. A

further 122 patients had successful endoscopic balloon dilatation with or without synchronous medical management during the same time interval, and were excluded from the present study. The reasons for proceeding selectively to surgery with no attempt at endoscopic balloon dilatation were a combination of factors such as individual surgeon's preference, patient's preference and stricture characteristics (longer single stricture or multiple strictures, all of which were located at the level of the ileocolonic anastomosis). The mean(s.d.) patient age at the time of surgery was 45.2(13.4) years and mean duration of disease from the time of diagnosis was 17.5(11.3) years for the whole patient cohort; these variables were comparable between the two groups (Table 1). The median interval from the onset of obstructive symptoms to salvage surgery was 14.5 months *versus* 3.0 months in the surgery-first group ( $P < 0.001$ ). There were no other statistically significant differences between the groups with regard to age, disease duration, sex, smoking history, rates of synchronous perianal disease, presence of extraintestinal manifestations or family history of IBD. In addition, clinical characteristics of initial surgery, including age at first operation, indication for surgical intervention, type of operation (open *versus* laparoscopic), stapled anastomosis and anastomotic configuration were comparable between the two groups (Table 1).

**Table 2** Perioperative variables

	Surgery first (n = 114)	Salvage surgery (n = 80)	P#
Preoperative use of medications			
Biologicals	22 (19.3)	21 (26)	0.293
Steroids	54 (47.4)	48 (60)	0.108
Immunomodulators	18 (15.8)	17 (21)	0.348
Length of stricture ± inflammatory segment (cm)*†	10.9(6.6)	4.1(2.2)	<0.001††
Urgent surgery‡	7 (6.1)	6 (8)	0.775**
Laparoscopic surgery	26 (22.8)	17 (21)	0.862
Estimated blood loss (ml)*	210(206)	221(209)	0.784††
Stapled anastomosis	88 (77.2)	58 (73)	0.501
Anastomotic configuration§			0.681
End-to-end	24 (21.1)	14 (18)	
End-to-side/side-to-end	53 (46.5)	32 (40)	
Side-to-side	37 (32.5)	31 (39)	
Stoma diversion¶	7 (6.1)	13 (16)	0.030

Values in parentheses are percentages unless indicated otherwise; \*values are mean(s.d.). †Data available for 83 patients in the surgery-first and 79 in the salvage group. ‡Five of six patients in the salvage group had urgent surgery owing to bowel perforation complicating endoscopic balloon dilatation. §Information on configuration was missing for three patients in the salvage surgery group. ¶Diverting loop ileostomy in 19 of 20 patients, all of which were subsequently taken down; one patient had end ileostomy associated with completion total proctocolectomy resulting from rapid postoperative recurrence at the ileocolonic anastomosis. # $\chi^2$  test, except \*\*Fisher's exact test and ††Student's *t* test.

Perioperative data are shown in *Table 2*. Patients treated with salvage surgery had a statistically significantly shorter length of stricture than patients who had surgery first ( $P < 0.001$ ). However, there were no differences between the groups with respect to preoperative medication use, estimated blood loss, laparoscopic surgery, stapled *versus* handsewn anastomosis, anastomotic configuration or need for urgent surgery.

### Postoperative short-term outcome

Thirty-day morbidity, rates of reoperation, duration of hospital stay and readmission rates are shown in *Table 3*. A total of 61 patients (31.4 per cent) experienced at least one complication within the same hospital stay or the first 30 postoperative days. Rates of readmission and reoperation were 10.3 and 3.1 per cent respectively. The mean(s.d.) duration of hospital stay for all patients combined was 7.9(5.0) days. Patients in the salvage surgery group suffered a significantly increased rate of overall SSI ( $P = 0.025$ ) owing to an increased rate of organ/space SSI. Two patients who underwent surgery first and one who had salvage surgery suffered an SSI requiring surgical reintervention.

Fifty-two patients had one or two dilatations before salvage surgery, and 28 had three or more (*Table 4*). Patients

**Table 3** Postoperative outcomes

	Surgery first (n = 114)	Salvage surgery (n = 80)	P†
Reoperation	5 (4.4)	1 (1)	0.412
Overall morbidity	33 (28.9)	28 (35)	0.443‡
Anastomotic leak	2 (1.8)	2 (3)	0.999
Surgical-site infection			
Overall	6 (5.3)	12 (15)	0.025‡
Superficial	3 (2.6)	3 (4)	0.687
Organ/space	3 (2.6)	9 (11)	0.030
Small bowel obstruction	5 (4.4)	0 (0)	0.079
Ileus	21 (18.4)	17 (21)	0.715‡
Thromboembolism	2 (1.8)	1 (1)	0.999
Dehydration	1 (0.9)	3 (4)	0.308
Urinary tract infection	2 (1.8)	5 (6)	0.127
Urinary retention	0 (0)	1 (1)	0.412
Duration of hospital stay (days)*	7.7(4.5)	8.3(5.6)	0.394§
Readmission	12 (10.5)	8 (10)	0.999

Values in parentheses are percentages unless indicated otherwise; \*values are mean(s.d.). †Fisher's exact test, except ‡ $\chi^2$  test and §Student's *t* test.

undergoing three or more dilatations had an increased incidence of stoma creation and of overall and organ/space SSI compared with patients in the surgery-first group.

### Long-term outcome

The median length of postoperative follow-up was 2 (i.q.r. 0.6–5) years. Seventy-five patients (38.7 per cent) experienced endoscopic recurrence (Rutgeerts score i2 or above)<sup>30</sup> during follow-up. No significant difference was found between patients who had surgery first and those undergoing salvage surgery in terms of endoscopic recurrence: 40 (35.1 per cent) of 114 *versus* 35 (44 per cent) of 80 respectively ( $P = 0.234$ ).

### Risk factors for perioperative adverse outcomes

Univariable analysis indicated that preoperative endoscopic balloon dilatation and preoperative use of biologicals were associated with postoperative SSI, whereas estimated blood loss, preoperative endoscopic balloon dilatation, anastomotic configuration and urgent surgery were associated with stoma diversion. In multivariable analysis, preoperative endoscopic balloon dilatation was independently associated with both postoperative SSI and stoma diversion, whereas preoperative use of biologicals was an additional independent risk factor associated with postoperative SSI, and urgent surgery was an additional independent factor associated with stoma diversion (*Table 5*). There were no statistically significant interactions between preoperative endoscopic balloon dilatation and either preoperative use of biologicals ( $P = 0.879$ ) or urgent surgery ( $P = 0.269$ ).

**Table 4** Subgroup analysis of the association between number of endoscopic balloon dilatations and perioperative outcomes

	Surgery first (n = 114)	1–2 dilatations before salvage surgery (n = 52)	≥ 3 dilatations before salvage surgery (n = 28)	P
Stoma diversion	7 (6.1)	7 (13)	6 (21)	0.031‡; 0.136‡; 0.022§; 0.526¶
Reoperation	5 (4.4)	1 (2)	0 (0)	0.599†
Overall morbidity	33 (28.9)	14 (27)	14 (50)	0.074†
Anastomotic leak	2 (1.8)	2 (4)	0 (0)	0.618†
Surgical-site infection				
Overall	6 (5.3)	6 (12)	6 (21)	0.025‡; 0.195‡; 0.006§; 0.261¶
Superficial	3 (2.6)	1 (2)	2 (7)	0.409†
Organ/space	3 (2.6)	5 (10)	4 (14)	0.020‡; 0.110‡; 0.028§; 0.528¶
Small bowel obstruction	5 (4.4)	0 (0)	0 (0)	0.337†
Ileus	21 (18.4)	10 (19)	7 (25)	0.763†
Thromboembolism	2 (1.8)	0 (0)	1 (4)	0.520†
Dehydration	1 (0.9)	1 (2)	2 (7)	0.073†
Urinary tract infection	2 (1.8)	2 (4)	3 (11)	0.063†
Urinary retention	0 (0)	0 (0)	1 (4)	0.144†
Duration of hospital stay (days)*	7.7(4.5)	7.9(4.9)	9.0(6.7)	0.761‡#; 0.208§#; 0.405¶#
Readmission	12 (10.5)	4 (8)	4 (14)	0.640†

Values in parentheses are percentages unless indicated otherwise; \*values are mean(s.d.). †Comparison among all three groups; ‡surgery first *versus* one or two dilatations before salvage surgery; §surgery first *versus* three or more dilatations before salvage surgery; ¶one or two dilatations *versus* three or more dilatations before salvage surgery ( $\chi^2$  or Fisher's exact test as appropriate, except #Student's *t* test).

**Table 5** Multivariable analysis of adverse postoperative outcomes

	Odds ratio	P
Postoperative SSI		
Preoperative endoscopic balloon dilatation	3.16 (1.01, 9.84)	0.048
Preoperative use of biologicals	3.83 (1.28, 11.42)	0.016
Body mass index	1.05 (0.96, 1.14)	0.308
Current smoking	1.68 (0.57, 4.94)	0.349
Preoperative use of steroids	1.55 (0.51, 4.67)	0.439
Stoma diversion		
Preoperative endoscopic balloon dilatation	3.33 (1.14, 9.78)	0.028
Urgent surgery	8.36 (2.15, 32.48)	0.002
Body mass index	0.99 (0.90, 1.09)	0.879
Current smoking	0.87 (0.28, 2.67)	0.812
Preoperative use of steroids	1.46 (0.51, 4.19)	0.486

Values in parentheses are 95 per cent c.i. SSI, surgical-site infection.

## Discussion

This study shows that patients requiring salvage surgery after failure of endoscopic balloon dilatation for ileocolonic anastomotic stricture have an increased incidence of stoma diversion and postoperative SSI compared with those having early surgical intervention, especially when three or more dilatations have been performed. In particular, previous endoscopic balloon dilatation was an independent risk factor for both postoperative SSI and faecal diversion.

The present data add significantly to the scant body of literature comparing early surgery and endoscopic balloon dilatation in the treatment of ileocolonic anastomotic stricture due to recurrent Crohn's disease<sup>31</sup>, as numerous reports on endoscopic balloon dilatation for Crohn's disease suffer from lack of a comparison group<sup>13</sup>. Intentional exclusion of penetrating disease and locations other than ileocolonic anastomosis in the present study resulted in two groups that were homogeneous with respect to the majority of patient and disease characteristics, apart from

the interval between onset of obstructive symptoms and surgery, and length of the Crohn's stricture. With respect to the interval between symptoms and surgery, the difference reflects the ability of endoscopic balloon dilatation to delay surgery, in agreement with previous reports<sup>12–14,18,21</sup>. In particular, when assessing results from several series that evaluated endoscopic balloon dilatation as an alternative to surgery, Thienpont and colleagues<sup>14</sup> reported a mean interval to surgery owing to failure of endoscopic balloon dilatation of 15 months after the index endoscopic balloon dilatation, which is similar to the median delay of 14.5 months from the time of obstructive symptoms to salvage surgery in the present study. With respect to length of the Crohn's stricture, it might be argued that a more ideal comparison group would be patients having surgery for strictures of comparable length to those treated with endoscopic balloon dilatation<sup>13</sup>, which in the present authors' institutional practice, as well as in other reports, includes only strictures shorter than 4–5 cm<sup>12,14,32</sup>. Such a strict selection criterion would have further reduced the sample size, potentially resulting in more extensive inflammation and therefore more complex operations in the comparison group. Despite this potential bias against the surgery-first group, the present results indicate that perioperative outcomes were still significantly better for these patients than for those having salvage surgery following failure of endoscopic balloon dilatation, providing further corroboration for the benefit of early surgery.

The present study indicates that endoscopic balloon dilatation and use of biological medications, rather than any other demographic, disease- or treatment-related variables<sup>33–37</sup>, were truly independent factors associated with SSI, with no detectable statistical interaction. The

adverse effect of biologicals is not surprising and reflects previous data from the authors' unit<sup>25</sup>. However, the individual effect of endoscopic balloon dilatation on the development of SSI remains more difficult to explain if conceived of simply as the result of stretching of the bowel wall in the course of pneumatic dilatation. A possible unifying explanation for the effect on SSI of these two factors might be that continued non-operative treatment can lead to progressive clinical deterioration, ultimately affecting the patient's status at the time of surgery. In the absence of specific data on these particular metrics, this assumption remains speculative. However, it is notable that, although the difference in medication use between the groups was not statistically significant, patients undergoing salvage endoscopic balloon dilatation did have a numerically increased use of both steroids and immunomodulators, as well as biologicals. Similarly, the significant association between endoscopic balloon dilatation and stoma creation at the time of salvage surgery is also less intuitive than the association between stoma creation and urgent surgery, and might depend in part on the subset of patients who required urgent surgery as a result of acute endoscopic balloon dilatation-related complications. However, endoscopic dilatation complications led to urgent surgery in five of 13 patients, although no statistical interaction was found between preoperative endoscopic balloon dilatation and urgent surgery. This suggests that, in the remaining eight patients, endoscopic balloon dilatation might be a marker of a more difficult operative field in a patient operated on multiple times, or of poor nutrition and immunosuppression, all of which might lead the surgeon to consider adding a stoma diversion.

Although use of proximal faecal diversion to prevent postoperative complications in complicated Crohn's disease is now accepted<sup>38–43</sup>, the implications and burden resulting from a potentially avoidable diverting stoma should be taken into account. In addition to the requirement for a further operation to re-establish intestinal continuity, stoma-specific complications such as acute renal failure due to dehydration, skin rash and excoriation, electrolyte imbalance, parastomal hernia, prolapse and retraction can increase readmission rates and adversely affect the patient's quality of life<sup>44–48</sup>.

The present study focused on the adverse effects of salvage surgery following failure of endoscopic balloon dilatation, but it is important to point out that the selection of patients to be included into the study occurred *a posteriori*, by selecting out those patients who did respond well to endoscopic balloon dilatation and who continued to avoid surgery for recurrent Crohn's disease. In this regard, the authors' institutional experience of endoscopic

balloon dilatation for ileocolonic anastomotic stricture due to recurrent Crohn's disease has shown that, after a mean follow-up of 3.9 years, only 36 per cent of patients required salvage surgery, giving a surgery-free rate of 64 per cent<sup>22</sup>. In the largest series on endoscopic balloon dilatation to date, Thienpont and co-workers<sup>14</sup> also reported that only 24 per cent of patients required salvage surgery, and 46 per cent needed further dilatations during a mean 5.8 years of follow-up. Thus, although the present study highlights adverse perioperative outcomes, it is important to emphasize the potential benefits of endoscopic balloon dilatation in a large proportion of patients, which future studies with longer follow-up will need to elucidate, particularly with respect to the number of dilatations that can be performed without compromising perioperative outcomes, should salvage surgery become necessary.

The selection of patients for early surgery *versus* continued endoscopic balloon dilatation thus remains fundamental. In this regard, the above-mentioned institutional experiences of endoscopic balloon dilatation for ileocolonic anastomotic stricture identified three independent factors associated with the requirement for salvage surgery. These were proximal bowel dilatation on radiological imaging, longer interval from the last abdominal surgical procedure and symptomatic stricture at the time of balloon dilatation rather than incidental, solely endoscopic stricture<sup>22</sup>. The present findings further corroborate the authors' view that early surgery should be recommended for patients with these adverse prognosticators, with the expectation that this could lead to decreased rates of postoperative SSI and stoma creation.

In the individual patient with Crohn's-related ileocolonic anastomotic stricture, who might be reluctant to undergo early surgery based on data favouring continued endoscopic balloon dilatation to delay surgical resection, the increased incidence of postoperative SSI and risk of additional stoma diversion at the time of salvage surgery should be included in the discussion of treatment options.

There are several limitations in the present study, primarily its retrospective nature. Although there is close interaction between gastroenterologists and colorectal surgeons in the authors' unit, the decision to undergo endoscopic balloon dilatation *versus* surgery for the individual patient with ileocolonic anastomotic stricture due to recurrent Crohn's disease remains discretionary, and might depend not only on the individual practitioner but also on which practitioner examines the individual patient first. This study could not clarify the intricacies of this complex relationship. Furthermore, it was also difficult to assess retrospectively the specific reasons for stoma diversion in the various patients, as this information could

not be gathered readily from the operative reports alone. In addition, data were not collected on hospital admission and quality of life among patients in whom surgery could be delayed as a result of endoscopic balloon dilatation. It is possible that aversion to surgery may lead to acceptance of poor quality of life with repeated hospital admissions for recrudescence of disease, which might have been prevented by earlier operation.

### Acknowledgements

Y.L. is a visiting research fellow from Department of General Surgery, Jinling Hospital, Medical School of Nanjing University, Nanjing, China. L.S. was supported partially by the Story Garschina Endowed Chair.

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

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### Editor's comments

Despite the limitations of the retrospective design of the study, salvage surgery after multiple endoscopic attempts to dilate ileocolic anastomotic stricture for recurrent Crohn's disease is associated with more adverse events. However, whether undertaking surgery first is superior to endoscopic dilatation remains unanswered as yet. As discussed by the authors in their paper, the majority of patients with ileocolic anastomotic stricture are treated successfully with endoscopic intervention. Endoscopic and medical treatment may be associated with lower complication rates, whereas having surgery first may prevent exposure of the patients to unsuccessful interventions and delay return to normal functioning. In the end, the patient's reported outcome is what really matters.

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