

## Role of strictureplasty in surgical treatment of Crohn's disease

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**Background.** The aim of this study was to review early and late results of strictureplasty for patients affected by Crohn's disease. **Methods.** We reviewed 103 patients with obstructive Crohn's disease undergoing 293 strictureplasties (Heineke-Mikulicz, 235; Finney, 22; Jaboulay, 35; side-to-side isoperistaltic strictureplasty, 1). Mean age at surgery was 31.4 years. Forty-four patients had at least one previous surgery, and synchronous other surgical procedures were performed in 62 patients. For 41 patients with strictureplasty alone, 154 strictureplasties were done. The site and number of strictures treated by strictureplasty were as follows: duodenum (2), small intestine (265), ileocecal region (6), colon (4), recurrence at previous anastomosis (11), and recurrence at previous strictureplasty (5). The mean number of strictureplasties per patient was 2.8. Reoperation has been used as the definitive endpoint for recurrence, and the long-term outcome of strictureplasty was examined. **Results.** There was no operative mortality. Septic complications related to strictureplasty developed in 4 patients and reoperation was needed in 2 patients (1.9%). Mean duration of follow-up was 80.3 months. For all patients, the 5- and 10-year reoperation rate was 45.0% and 61.9%, respectively. Forty-five patients (43.7%) required further operation for recurrence, of whom 21 patients (20.4%) had recurrence at the site of strictureplasty, which was resticture in 14 patients and perforating disease in 7 patients. Perforating disease for recurrence was more frequent at the site treated by the Finney or Jaboulay procedure compared with Heineke-Mikulicz. **Conclusions.** It is considered that, in the long term, strictureplasty is safe and useful for preserving the intestine in the surgical treatment of Crohn's disease if strictures are carefully selected.

**Key words:** obstructive Crohn's disease, strictureplasty, long-term outcome

### Introduction

Crohn's disease is a chronic panintestinal disease. The disease's frequent recurrence, even after an operation that has completely excised the macroscopic lesions, poses the problem of repeated resections, which may lead to short bowel syndrome. Strictureplasty for Crohn's disease was initially introduced by Lee and Papaioannou<sup>1</sup> to avoid massive resections in patients affected with multiple strictures. There have been several reports on the safety and efficacy of strictureplasty for Crohn's disease.<sup>2-5</sup> Strictureplasty has become an established surgical option in the management of obstructive Crohn's disease. However, in many previous reports the follow-up is not sufficient for examination and there are several remaining questions.<sup>6</sup> In the present study, we reviewed the long-term outcome of strictureplasty for Crohn's disease in a large number of patients.

### Patients and methods

Between 1989 and 2002, 103 patients (78 men, 25 women) of mean age 31.4 years (range, 16–62 years) underwent a total of 293 strictureplasty procedures. The mean duration of Crohn's disease at operation was 114.0 months (range, 7–324 months). Eighteen patients were receiving corticosteroids before surgery. Fifty-nine patients (57.3%) underwent initial surgery. Eighty patients were operated upon for stricture and the others were accompanied by perforating disease. Sixty-two patients (60.2%) received strictureplasty with synchronous other surgical procedures, bowel resection in 54 patients and exclusion bypass in 8 (Table 1). The

**Table 1.** Patient characteristics

Mean age at operation	31.4	(range, 16–62) years
Male/female ratio	3.12	(78/25)
Duration of Crohn's disease	114.0	(range, 7–324) months
Corticosteroids received before surgery	18	(17.5%)
Previous operation		
Number of operations		
0	59	(57.3%)
1	27	(26.2)
2	13	(12.6)
$\geq 3$	4	(3.9)
Synchronous surgical procedures		
Strictureplasty alone	41	(39.8%)
Concomitant resection	54	(52.4)
Concomitant exclusion bypass	8	(7.8)

**Table 2.** Operative details

	Number of patients (%)
Number of strictureplasties	
One site	42 (40.8)
2–4	45 (43.7)
5–9	12 (11.7)
$\geq 10$	4 (3.9)
Site of strictureplasty	
Duodenum	2 (1.9)
Small bowel	86 (83.5)
Ileocecal region	6 (5.8)
Colon	4 (3.9)
Anastomotic site	11 (10.7)
Strictureplasty site	2 (1.9)
Procedure of strictureplasty	
Heineke–Mikulicz	83 (80.6) [235 sites]
Finney	18 (17.4) [22 sites]
Jaboulay	28 (26.2) [35 sites]
Side-to-side isoperistaltic	1 (0.97) [1 sites]

principal indications for strictureplasty were obstructive symptoms and the presence of a localized stricture at operation. Follow-up was performed by personal interview, blood tests, and contrast examination of the small bowel. We used reoperation for recurrence as our definitive endpoint. The site that required reoperation was ultimately decided by the macroscopic findings at the time of operation.

## Results

### Operative details

Operative details are shown in Table 2. Strictures were identified by palpation or passage via enterotomy of a 20-Fr. balloon catheter (20 mm diameter). For 103 patients, strictureplasty was performed for 293 strictures, and the mean number of strictureplasties at one operation was 2.8 (range, 1–16). The location of strictureplasty was the duodenum in 2 patients, the

small bowel in 86, the ileocecal region in 6, the colon in 4, the previous anastomotic site in 11, and the previous strictureplasty site in 2.

The Heineke–Mikulicz method of strictureplasty was performed on 235 short strictures under 5 cm. For long strictures, more than 5 cm, and short strictures with marked thickening of the adjacent intestine, the Finney or Jaboulay method of strictureplasty was indicated (57 strictures, 2–10 cm). Side-to-side isoperistaltic strictureplasty, introduced as a new technique for long strictures by Michelassi in 1996,<sup>7</sup> demonstrated a good outcome after surgery.<sup>8</sup> In our experience this procedure was performed for one patient with a widely diseased small bowel and indicated a long stricture at 40 cm with synchronous ileocecal resection.

The anastomosis was repaired by handsewn one-layer interrupted sutures.

### Early postoperative results

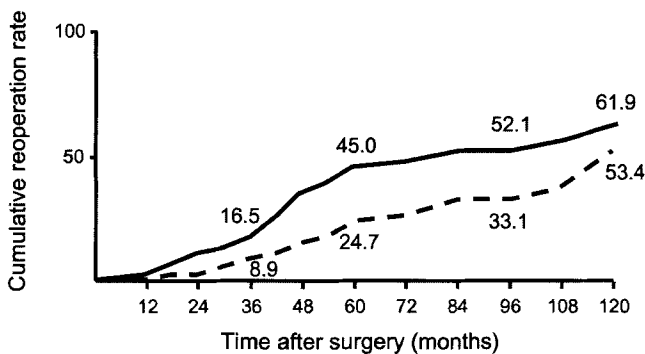
Postoperative complications are listed in Table 3. There was no mortality. Complications related to the site of strictureplasty occurred in six patients. Septic complications were indicated in four patients, and two patients required further operation for septic complication with evidence of leak. The remaining patients who had any postoperative complications were successfully managed by conservative treatment.

### Long-term results

Abdominal obstructive symptoms were relieved in all but 3 patients (97.1%) at 6 months after strictureplasty. Of 18 patients who received corticosteroids before surgery, only 1 patient required these 6 months after strictureplasty. As an indication of nutritional status, the mean level of body mass index increased to 20.15 after surgery compared with 18.68 before surgery. The mean duration of follow-up was 80.3 months (range, 12–

**Table 3.** Postoperative complications

	Number of patients (%)
Mortality	0
Septic complication (abscess/fistula/leak)	4 (3.9) [2 required reoperation]
Prolonged ileus	2 (1.4)
Nonstrictureplasty related	
Anastomotic leak	3 (2.9)
Intraabdominal hemorrhage	1 (1.0)
Anastomotic stenosis	1 (1.0)

**Fig. 1.** Cumulative reoperation rate after strictureplasty: *solid line*, total reoperation rate; *broken line*, strictureplasty site-related reoperation rate

187 months). The cumulative reoperation rate at 5 and 10 years was 45.0% and 61.9%, respectively. In our series, 45 patients (43.7%) required reoperation for recurrence of disease, and 21 patients (20.4%) had the recurrence on the site of strictureplasty. The reoperation rate related to recurrence at the site of strictureplasty was 24.7% at 5 years and 53.4% at 10 years (Fig. 1, Table 4).

According to the data of recurrence related to the strictureplasty site, 14 patients required reoperation for restriction and 7 patients for perforating disease. For strictures treated by the Finney or Jaboulay method of strictureplasty, 6 (50%) of 12 patients with recurrence had perforating disease, and 2 (14.3%) of 14 patients had perforating disease at the strictures treated by the Heineke–Mikulicz method (Table 5). Concerning the location of strictureplasty, the outcome was worse at the ileocecal region than at other sites (Table 6). One patient who underwent side-to-side isoperistaltic strictureplasty had no recurrence by 39 months after surgery. No complications of carcinoma were found in the present study.

## Discussion

During the course of Crohn's disease, many patients will require surgery for serious complications such as stricture, fistula, and abscess. The concept of minimal surgery for Crohn's disease has found favor because the disease is chronic, potentially panintestinal, and surgically incurable. The procedure of strictureplasty for Crohn's disease, first reported in 1982,<sup>1</sup> has conserved bowel and minimized the risk of developing the iatrogenic short bowel syndrome. Alexander-Williams and Haynes<sup>2</sup> and Fazio et al.<sup>3</sup> were examined to determine suitable strictures, and this procedure was widely indicated. There have several recent reports on the safety and efficacy of strictureplasty in the management of obstructive Crohn's disease. In most previous papers on strictureplasty, however, the follow-up period is relatively short.<sup>4,5,9,10</sup> In the present study, the mean duration of follow-up was 80.3 months' for 64 patients (62.1%), all of whom were carefully followed over 5 years after strictureplasty.

There was no mortality after strictureplasty in this study. The rate of septic complications related to strictureplasty was 3.9%; of these, two cases required further surgery, and the results compared favorably with the cumulative published data of others.<sup>4,5,11</sup>

The long-term benefits of strictureplasty were confirmed by the present study as many patients had continued symptomatic and nutritional improvement. The use of corticosteroids was reduced in most patients postoperatively. Forty-five patients required reoperation for recurrence of disease in the present study. In previous papers, only one author reported reoperation rate in the long term over 5 years after strictureplasty, which was similar to our result.<sup>11</sup>

Selection of sites suitable for strictureplasty is important. The most suitable lesion for strictureplasty has been considered the short fibrotic strictures of small bowel,<sup>1-3</sup> and we had successfully performed strictures less than 5 cm of length by the method of Heineke–Mikulicz. Other procedures of strictureplasty were

**Table 4.** Long-term outcome after strictureplasty

Mean follow-up period	80.3 months (range, 12–187)
Reoperation for recurrence of disease	45 patients (43.7%)
Sites causing reoperation	
Strictureplasty site	7 patients (6.8%)
Strictureplasty site and other sites	14 (13.6%)
Other sites <sup>a</sup>	24 (13.6%)

<sup>a</sup>Other sites: anastomotic recurrence, exacerbation remained in lesion, new lesion

**Table 5.** Reoperation required for strictureplasty site recurrence

	Reason for reoperation	
	Restricture	Perforating disease
Strictureplasty alone	7	5
Concomitant other procedures	7	2
Method:		
Heineke–Mikulicz	12	2
Finney	3 [ICR: 1]	3 [Anastomosis: 1]
Jaboulay	3 [ICR: 1]	3 [ICR: 1 Anastomosis: 1]

ICR, ileocecal region

**Table 6.** Long-term outcome after strictureplasty: location of strictureplasty

Location of strictureplasty	No. of patients	Site-related reoperation	Mean follow-up periods (months)
Duodenum	2	—	87.0
Small bowel	85	18 (21.2%)	81.1
Ileocecal region	6	3 (50.0%)	71.7
Colon	4	—	34.3
Anastomotic site	10	2 (20.0%)	69.4
Strictureplasty site	2	—	43.5

indicated for strictures according to the length and the degree of inflammation. Strictureplasty had also been indicated for strictures of various sites other than small bowel. Isolated strictures of duodenal bulb and previous anastomosis had favorable long-term outcome in the present study, similar to previous papers.<sup>4,12</sup> Six patients received strictureplasties of the Finney or Jaboulay method for ileocecal stricture. The postoperative outcome was worse compared with other sites, and the indication for this site should be carefully selected.<sup>13</sup>

After strictureplasty, several authors reported rare strictureplasty site-specific recurrence.<sup>4,5,6,9,10</sup> However, no previous reports described the site and degree of recurrence after strictureplasty in detail. Actually, it may be difficult to define the exact strictureplasty site in

patients with or without concomitant resection. In this study, we used a metal clip to localize the site of strictureplasty in several patients, and detailed follow-up was performed using the double contrast technique radiologically. Twenty-one of 45 patients who required reoperation for recurrence of disease were found to have recurrence at the strictureplasty site at the time of operation. Restricture of the previous strictureplasty site occurred in 14 patients and perforating disease in 7 patients. In comparing the type of strictureplasty, for strictures treated by the Finney or Jaboulay method, perforating disease occurred more frequently than for those treated by the Heineke–Mikulicz method.

From these results, strictureplasty is an efficacious surgical procedure for obstructive Crohn's disease in

the long term. A higher incidence of strictureplasty site-specific (related) recurrence, compared to other previous reports, was found in our detailed examination of long term outcome after strictureplasty.

### Conclusion

Strictureplasty is a safe and useful surgical procedure for preserving the intestine for obstructive Crohn's disease in the long term. If strictureplasty is performed selectively, it should be indicated as the standard procedure for strictures at various sites with Crohn's disease.

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