



# Surgical recurrence in Crohn's disease: a comparison between different types of bowel resections

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## Abstract

**Purpose** To compare recurrence frequency and location between different types of bowel resections in Crohn's disease patients.

**Methods** This was a retrospective study of consecutive patients undergoing bowel resection for Crohn's disease between 2006 and 2016. Type of primary operation was recorded and grouped as ileocolic resection, small bowel resection, segmental colon resection with colocolic anastomosis or colorectal anastomosis, colectomy with ileorectal anastomosis, or end stoma operation. Binary logistic regression was used to compare surgical recurrence frequency between groups. We also investigated how Crohn's disease location at reoperations was related to the primary bowel resection type.

**Results** Altogether, 218 patients with a median follow-up of 4.7 years were included in our study. Reoperation was performed in 42 (19.3%) patients. The risk of reoperation using the ileocolic resection group as reference was the following: small bowel resection (odds ratio (OR) 2.95, 95% confidence interval (CI) 1.01–8.66;  $P = 0.049$ ), segmental colon resection with colocolic or colorectal anastomosis (OR 6.20, 95% CI 2.04–18.87;  $P = 0.001$ ), colectomy with ileorectal anastomosis (OR 26.57, 95% CI 2.59–273.01;  $P = 0.006$ ), and end stoma operation (OR 4.62, 95% CI 1.90–11.26;  $P = 0.001$ ). In case of surgical recurrence, the reoperation type and location correlated with the primary bowel resection type.

**Conclusions** Reoperation frequency in Crohn's disease is lower after ileocolic resection than after other types of bowel resections. Surgical recurrence in Crohn's disease tends to maintain the disease location of the primary operation. One third of Crohn's patients undergoing an end stoma operation will still need new bowel resections due to recurrence.

**Keywords** Crohn's disease · Reoperation · Recurrence · Ileocolic resection · Bowel resection

## Introduction

Crohn's disease (CD) is a chronic bowel disease with periods of aggravation and amelioration. In addition to primary medical treatment, the majority of the patients will require surgical treatment and more than half will require reoperations [1–3]. The reoperation rate due to recurrence in the anastomosis has been previously described as 3.5 to 6.5% at 5 years after ileocecal resection [4, 5]. In a review article of population-based studies, smoking, previous bowel resection, penetrating behavior, and presence of perianal disease were described as risk factors for postoperative recurrence in CD [6]. Recurrence

may occur not only in the anastomosis but also elsewhere in the bowel after ileocecal resection or other types of bowel resections [7].

The aim of our study was to determine the surgical recurrence frequency after different types of bowel resections in CD patients. We also investigated how CD location at reoperations was related to the primary bowel resection type.

## Material and methods

We retrospectively reviewed the medical records of 249 consecutive patients undergoing operation due to CD in a single reference colorectal unit between 2006 and 2016. For patients undergoing multiple operations during the study period, the first procedure was recorded as the primary operation. In case of simultaneous multiple bowel resections, the resection of the most affected bowel segment was chosen as the primary operation type. Thirty-one patients were excluded due to lack of

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follow-up information (10 patients), indeterminate colitis as final histopathological diagnosis (6 patients), and performance of only stricturoplasty, perianal procedures, or stoma-related procedures without bowel resection during the study period (15 patients).

Patient demographics, smoking status, presence of previous CD operations, presence of abscess or fistula before the primary operation, type and date of the primary bowel resection, Crohn's medication after the primary operation, and reoperation type and date were collected and entered into an SPSS database.

In this study, a reoperation was defined as the need for a new bowel resection due to recurrent disease. Perianal procedures or stoma-fixing procedures alone were not recorded as reoperations, neither operations for postoperative complications. The decision to perform a reoperation was made by a colorectal surgeon in collaboration with a gastroenterologist or by a surgeon alone in emergency cases.

CD primary operation was grouped according to the type of operation performed as follows: ileocolic resection, small bowel resection, segmental colon resection with colocolic anastomosis or left colon resection with colorectal anastomosis, colectomy with ileorectal anastomosis, and end stoma operation. The end stoma operation group included patients undergoing proctocolectomy or colectomy with end ileostomy and also patients undergoing segmental colon resection or proctectomy with end colostomy. Binary logistic regression was used to compare surgical recurrence frequency between groups.  $P < 0.05$  was considered significant. Fisher's exact

test concerning surgical recurrence frequency was performed between jejunal and ileal resection subgroups in the small bowel resection group and between end ileostomy and end colostomy subgroups in the end stoma operation group.

## Results

Altogether, 218 patients undergoing bowel resection due to CD were included in the study and followed up for detection of reoperation. The median follow-up time was 4.7 years (range 0.3–10.5 years). An additional operation together with the primary operation was performed in 12 (5.5%) patients and consisted of one ileocolic resection, two proximal small bowel resections, six ileal resections, two sigmoid resections, and one extirpation of the rectum. Reoperation was needed in 42 (19.3%) patients. Recurrence was preoperatively diagnosed clinically in five (2.3%) patients, endoscopically in 27 (12.4%) patients, and radiologically in 10 (4.6%) patients. Recurrence manifested as stenosis in 22 (52.4%) patients, fistula in 11 (26.2%) patients, abscess formation in four (9.5%) patients, and inflammation only in five (11.9%) patients.

Patient characteristics by operation type are shown in Table 1. Reoperation frequency was 14 (10.1%) for ileocolic resection, 6 (25.0%) for small bowel resection, 7 (41.2%) for segmental colon resection with colocolic or colorectal anastomosis, 3 (75.0%) for colectomy with ileorectal anastomosis, and 12 (34.3%) for end stoma operation (Table 2). The

**Table 1** Patient characteristics according to the primary operation type

	Ileocolic resection	Small bowel resection	Segmental colon resection with colocolic or colorectal anastomosis	Colectomy with ileorectal anastomosis	End stoma operation
Total $n = 218$	$n = 138$	$n = 24$	$n = 17$	$n = 4$	$n = 35$
Age at primary operation	39.3 (14.8–82.7)	35.4 (18.6–70.1)	33.1 (18.1–54.1)	25.6 (17.7–74.1)	44.3 (22.9–71.3)
Male	82 (59.4)	13 (54.2)	10 (58.8)	2 (50.0)	11 (31.4)
Time from diagnosis to primary operation	5.6 (0–41.9)	6.1 (0–21.9)	12.0 (0.8–19.9)	14.5 (4–17.7)	16.6 (0–32.3)
Previous surgery	47 (34.1)	8 (33.3)	4 (23.5)	2 (50.0)	26 (74.4)
Smoker <sup>a</sup>	67 (54.0)	12 (60.0)	6 (46.2)	1 (50.0)	13 (44.8)
Open approach	100 (72.5)	19 (79.2)	15 (88.2)	3 (75.0)	34 (97.1)
Preoperative abscess	29 (21.0)	3 (12.5)	1 (5.9)	0	8 (22.9)
Preoperative fistula	38 (27.5)	4 (16.7)	0	0	10 (28.6)
Preoperative terminal ileum CD	132 (95.7)	9 (37.5)	8 (47.1)	1 (25.0)	18 (51.4)
Preoperative small bowel CD	40 (29.0)	23 (95.8)	2 (11.8)	1 (25.0)	8 (22.9)
Preoperative colon CD	52 (37.7)	3 (12.5)	17 (100.0)	4 (100.0)	35 (100.0)
Preoperative perineal CD	28 (20.3)	3 (12.5)	9 (52.9)	2 (50.0)	22 (62.9)
Postoperative CD medication	128 (92.8)	22 (91.7)	17 (100.0)	3 (75.0)	20 (57.1)
Postoperative biological medication	31 (22.5)	9 (37.5)	6 (35.3)	1 (25.0)	3 (8.6)

CD Crohn's disease; categorical data frequencies are described as absolute number and proportion (%), continuous data are described as median in years (range)

<sup>a</sup>Data not available for all patients

**Table 2** Surgical recurrence according to the primary operation type

	Ileocolic resection	Small bowel resection	Segmental colon resection with colocolic or colorectal anastomosis	Colectomy with ileorectal anastomosis	End stoma operation
Total <i>n</i> = 218	<i>n</i> = 138	<i>n</i> = 24	<i>n</i> = 17	<i>n</i> = 4	<i>n</i> = 35
Surgical recurrence	14 (10.1)	6 (25.0)	7 (41.2)	3 (75.0)	12 (34.3)
Time from primary operation to reoperation	2.1 (0.3–9.5)	5.0 (2.0–9.5)	2.5 (1.3–5.1)	5.3 (2.0–5.5)	1.9 (0.3–7.8)
Time from primary operation till the end of the follow-up	4.3 (0.3–10.8)	6.4 (0.7–10.5)	5.3 (1.2–10.7)	6.3 (3.5–10.4)	4.2 (0.4–10.5)

Categorical data frequencies are described as absolute number and proportion (%), continuous data are described as median in years (range)

ileocolic resection group had the lowest reoperation frequency. The risk of reoperation in each group was calculated by binary logistic regression using the ileocolic resection group as reference and was the following: OR 2.95 (95% CI 1.01–8.66;  $P = 0.049$ ) for small bowel resection, OR 6.20 (95% CI 2.04–18.87;  $P = 0.001$ ) for segmental colon resection with colocolic or colorectal anastomosis, OR 26.57 (95% CI 2.59–273.01;  $P = 0.006$ ) for colectomy with ileorectal anastomosis, and OR 4.62 (95% CI 1.90–11.26;  $P = 0.001$ ) for end stoma operation. Thus, all other bowel resection groups had a significantly higher risk of reoperation than that of the ileocolic resection group. The surgical recurrence frequency did not differ significantly between jejunal resection (3 of 8 patients, 37.5%) patients and ileal resection (4 of 19 patients, 21.1%) patients in the small bowel resection group ( $P = 0.33$ ). No difference was observed between end ileostomy (5 of 15 patients, 33.3%) and end colostomy (7 of 20 patients, 35.0%) patients in the end stoma operation group ( $P = 0.60$ ).

Regarding the location of CD at reoperations (Fig. 1), we observed that most ileocolic resection patients needed a new ileocolic resection, most small bowel resection patients needed a new small bowel resection, and most segmental colon resection with colocolic or colorectal anastomosis patients needed a new colon resection, proctectomy, or both.

In the ileocolic resection group, one patient had a small bowel resection as reoperation and three patients had colon resections as reoperations. One of these three patients did not have colonic CD diagnosed before the primary operation. The patient with reoperation in the small bowel had small bowel CD previously.

Both the small bowel resection and the segmental colon resection with colocolic or colorectal anastomosis groups had one case of reoperation in the ileocolic location; these patients had concomitant terminal ileum CD diagnosed before the primary operation.

In the colectomy with ileorectal anastomosis group, two patients with rectal involvement had proctectomy and end ileostomy as reoperation and one patient had rectal resection with re-anastomosis.

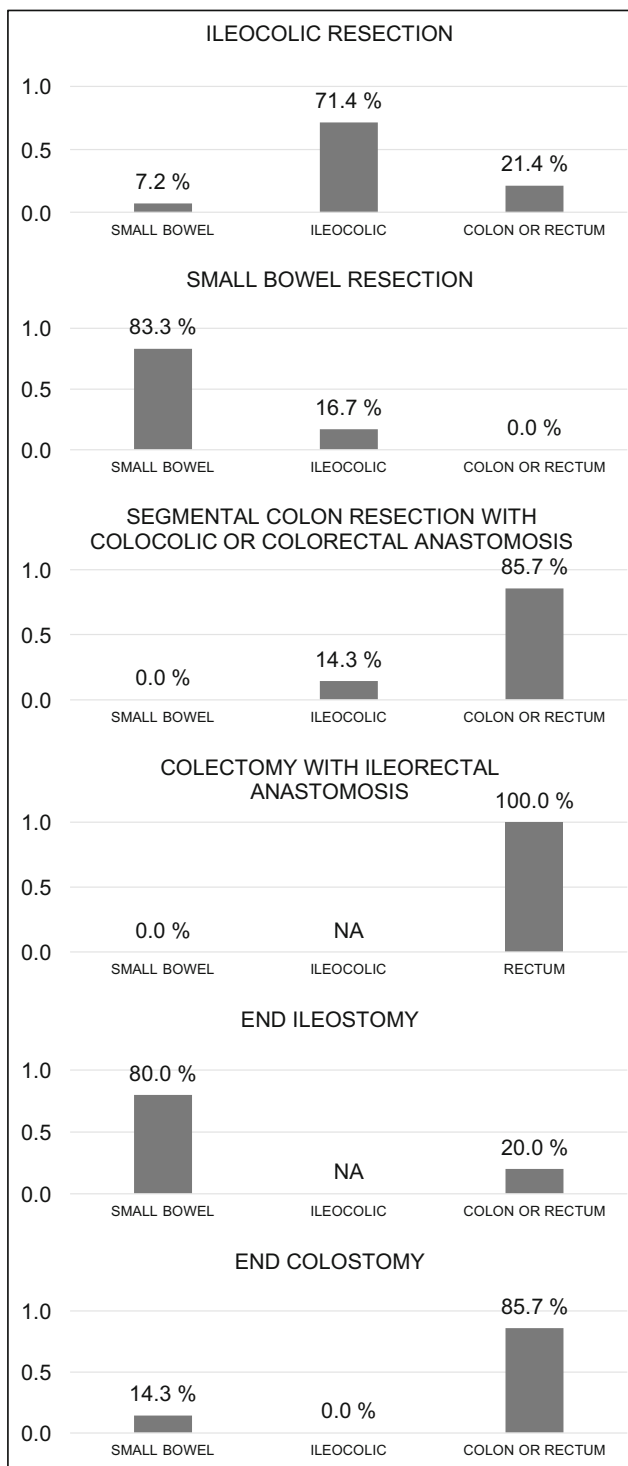
In the end stoma group, five patients with end ileostomy performed in the primary operation had recurrence in the small bowel, but three out of these five patients did not have small bowel CD diagnosed before the primary operation. Furthermore, in the end stoma group, seven patients with end colostomy performed in the primary operation had recurrence in the colon.

## Discussion

Our study analyzed CD surgical recurrence frequency after different bowel resections. We observed that the surgical recurrence frequency is lowest after ileocolic resection. This finding differs from that of another study, which concluded that recurrence frequency is higher in ileocolic resection than in other types of resections [8]. This previous study diagnosed recurrence based on endoscopic or radiological findings. Ileocolic resection is the most common and the most studied resection in CD. A reoperation frequency of 15.8% at a mean follow-up of 8.4 years was previously described in a consecutive cohort of patients with ileocolic resection in Austria [9]. This finding is comparable to our results, where 10.1% of the patients had surgical recurrence after ileocolic resection at a median follow-up of 4.3 years. The majority of the surgical recurrences (71.4%) were in the proximity of the anastomosis and required a new ileocolic resection. Previous studies also concluded that surgical recurrence after ileocolic resection is more common in the anastomosis [9, 10]. Colonic or rectal surgical recurrence frequency was 21.4% in our patients undergoing ileocolic resection, which is similar to the colonic recurrence described by the Austrian study (21.9%) [9].

Patients undergoing small bowel resection as the primary operation had reoperation in the small bowel in 83.3% of the cases, mostly maintaining the location of CD.

We observed a reoperation frequency of 41.2% in the segmental colon resection with colocolic or colorectal anastomosis group. This is not much different from the re-resection frequency described earlier (33%) in a study evaluating



**Fig. 1** Location of recurrence by primary operation type. NA, not applicable

recurrence after segmental colon resections for CD patients [11]. The reoperation was performed in the colon or rectum in 85.7% of the patients that had previously undergone segmental colon resection with colocolic or colorectal anastomosis as the primary operation. Thus, CD location was also

maintained in this group of patients, which is consistent with previous studies that concluded that the anatomic location of CD is usually stable during the course of the disease [7, 12].

The reoperation frequency after segmental colon resection (41.2%) in our cohort suggests that segmental resection is recommended as the first choice in localized CD colitis. Other studies comparing segmental resection with subtotal colectomy in CD colitis also support segmental resection, as no significant differences in the reoperation rates were observed [13–17]. Furthermore, the functional outcome regarding anorectal function was significantly better after segmental resection [15].

The reoperation rate after definitive stoma is considerably underestimated. A recent study described a 38% surgical recurrence rate at a median follow-up of 2.4 years [18]. We observed a similar reoperation frequency (34.3%) with the need for repeat bowel resection after an end stoma operation. Postoperative medication to prevent disease recurrence should possibly be more aggressive in this group of patients. According to our results, even patients without previous small bowel CD may develop recurrence in the small bowel after colectomy or proctocolectomy combined with end ileostomy.

Our results demonstrate the importance of postoperative follow-up after any type of bowel resection and may suggest that more aggressive postoperative medication is needed after non-ileocolic bowel resections; although there is only limited data to suggest that biological treatment prevents recurrence or reduces proctectomy risk.

We conclude that surgical recurrence in CD patients is lower after ileocolic resections than after other types of bowel resections. Most recurrences in the ileocolic resection group occur in the proximity of the anastomosis. Surgical recurrence in CD tends to maintain the disease location of the primary operation. After an end stoma operation, CD is not under control and about one third of the patients receiving an end stoma will need a new bowel resection within 5 years.

### Compliance with ethical standards

All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration comparable ethical standards. For this type of study formal consent is not required.

**Conflict of interest** The authors declare that they have no conflict of interest.

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