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Strictureplasty for large bowel stenosis in Crohn's disease: quality of life after surgical therapy

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Abstract The aim of surgical therapy in Crohn's disease is to improve quality of life. Surgery does not provide cure with radical resection of inflamed bowel. Therefore strictureplasty has become a useful bowel-preserving surgical technique in the treatment of small-bowel stenosis. To preserve functional bowel we extended the indication of this surgical technique to strictures in large bowel. The aim of this retrospective study was to define the efficacy of strictureplasty and resection in patients with obstructive Crohn's disease of the colon. The results were evaluated in terms of postoperative complications, surgical recurrence, and quality of life. The charts of 58 patients with Crohn's colitis were analyzed retrospectively. Patients were either treated by strictureplasty or resection. Quality of life was evaluated in follow-up examinations using the In-

flammatory Bowel Disease Questionnaire. The incidence of postoperative surgical recurrence was 36% in those treated by strictureplasty and 24% in those treated by resection (ns). Postoperative morbidity was 16.1% in the former and 22.3% in the latter. There was no significant difference between the groups in quality of life measures (177 versus 182 points). Strictureplasty in Crohn's colitis is a valuable surgical technique which results in low recurrence rates and in surgical outcome comparable to that in resection without sacrificing functional large bowel length. In our study quality of life after strictureplasty was comparable with quality of life after resection.

Keywords Crohn's disease · Large bowel · Quality of life · Strictureplasty · Resection

Introduction

The majority of patients with Crohn's disease require surgery at least once in their life [1]. Numerous disease patterns and complications significantly impair the individual quality of life. Surgery in Crohn's disease has improved considerably due to better knowledge of the course and natural history of this disease. Surgery is performed for complications of the disease or for failure of medical therapy. The beneficial effects of operation must be considered in the context that the patient carries a substantial risk for recurrent disease and for reoperation. Therefore bowel-preserving surgery, which includes re-

sections strictly limited to stenotic segments and strictureplasties, is the treatment of choice, thus avoiding extensive bowel resections. Since the experience with strictureplasty for strictures of the small bowel is favorable [2, 3, 4, 5, 6, 7, 8], we decided to expand the indication for this organ-preserving procedure to patients with strictures of the colon due to Crohn's disease.

Primary Crohn's disease of the colon occurs in about 27% of patients. The traditional treatment of Crohn's disease of the colon consists of ileostomy alone, total proctocolectomy with ileostomy, subtotal colectomy with ileostomy, and segmental resection [9]. Very few studies take into account that loss of colonic function

may have negative effects such as electrolyte imbalance, fluid loss, increased stool frequency, and incontinence for liquid stools [10, 11, 12, 13, 14, 15, 16]. The rationale for strictureplasty in the colon is to maintain colonic function, because additional surgical procedures may be required in the future due to recurrence of the disease. Quality of life is an important endpoint in assessing the impact of disease and its treatment in patients with Crohn's disease. The results of surgery are measured in recurrence rates not only but also in health perception and function, physical, social, and emotional performance. This multidimensional construct of quality of life can be assessed using the Inflammatory Bowel Disease Questionnaire (IBDQ) [17, 18, 19].

Therefore the aim of this study was to assess surgical results, recurrence rates, and to evaluate quality of life in patients with Crohn's colitis treated by strictureplasty or resection.

Material and methods

Patient characteristics

Between January 1987 and December 1996 257 surgical interventions were performed on 165 patients with Crohn's disease. During this period 58 patients with Crohn's colitis who were no longer responsive to medical treatment were referred to our institution. We performed 67 laparotomies on patients with stenosis or stenotic fistulae of the large bowel and treated a total of 75 strictures. We retrospectively reviewed the charts and surgical results of these patients. The majority of patients had had previous surgery for complications of Crohn's disease before referral to our institution.

The patients were divided into two groups. Group A consisted of 29 patients (11 men, 18 women), treated by strictureplasty (35 strictureplasties, 31 laparotomies). Group B consisted of 35 patients (16 men, 19 women), treated by resection (40 resections, 36 laparotomies) (Table 1). The mean age at first diagnosis of Crohn's disease was 24.6 years in group A and 22 years in group B. The first surgical procedure for complications of Crohn's disease was performed at age 26.5 years in group A and 30.7 years in group B. The mean duration between first diagnosis of Crohn's disease and the first surgical procedure was 24.7 months in group A and 46.7 months in group B. The mean age of patients at the time of surgical therapy in the study period was 33.8 years (group A) and 36.6 years (group B).

Ten stenotic segments carried fistulas to other parts of the bowel and were treated by strictureplasty. Fistulae were excised, and the stricture was treated by strictureplasty. Six patients had

undergone strictureplasty and resection in various segments of large bowel and are therefore listed in both groups. Sites of surgery within the large bowel were noted exactly in the operative reports. Therefore it was possible to distinguish between the sites of surgery during follow-up. All stenotic parts of the bowel were treated. Diseased but nonstenotic segments were not treated surgically.

In assessing quality of life only patients having received either strictureplasty or resection were allocated to either group. Surgical recurrence of stricture was defined as recurrence requiring surgical intervention determined by individual site of recurrence within the patients large bowel. Recurrence of stricture was considered orthotopic (within 20 cm of previous stricture) or heterotopic (any other site in the same bowel segment). Thus recurrence for each site was assessed separately. All patients received perioperative antibiotics and standard prophylactic therapy (sulfasalazine and prednisone) for at least 6 months to prevent recurrent disease post-operatively. Individual patients received additional medication during follow-up. We evaluated the interval between procedures, complication rates, duration of surgery, mean hospital stay, sites of stricture, and indications for surgery.

Operative technique

The patients were prepared for surgery according to the protocol at our institution. Operations were performed by two surgeons (J.R.I., M.D.). After a midline laparotomy a complete exploration of the abdominal cavity secured the site of disease. The type of operation performed was determined perioperatively by the surgeon. There was a trend toward strictureplasty in shorter stenoses. Limited resection had to be applied in patients with extensive disease. Strictureplasty of short stenosis was performed according to Heineke-Mikulicz and that for longer stenotic segments according to Finney. We also used the Finney technique for very long stenotic segments, which resulted in "colonic pouch formation" in some patients. Absorbable suture material (Vicryl, Ethicon Norderstedt, Germany) was used in a one-layer single stitch technique.

The indications for surgery in group A were: symptomatic strictures and obstruction in 80.7%, fistulas in 16.1%, and abscesses in 3.2%; The corresponding proportions in group B were: 77.8%, 11.1%, and 8.3%, with an additional 2.8% due to therapy-resistant pain (Table 2). All strictures accounting for our study were large bowel strictures. The strictureplasty sites were generally the sigmoid colon and anastomotic strictures. The resection sites were equally distributed throughout the large bowel. Strictures occurred in isolated large bowel disease in 19.4% of cases treated by strictureplasty and in 39% of those treated by resection. Additional involvement of the ileum was found in 32.3% of group A patients and 25% of group B patients, and simultaneous involvement of large and small bowel in 48.4% of cases in group A and in 36.1% of those in group B. Five patients required colectomy to finally control the disease (pancolitis; Table 3).

Table 1 Patient characteristics^a

	Strictureplasty (n=29)	Resection (n=35)
Strictures/stenotic fistulae in large bowel (n)	35	40
Laparotomies (n)	31	36
Men:women (n)	11:18	16:19
Previous surgery (patients=n)	16	24
Age at diagnosis of Crohn's disease (years)	24.6±9.6	22.0±10.1
Age at time of first surgery (years)	26.5±9.6	30.7±11.3
Interval until first surgery (months)	24.8±39.6	46.7±49.2
Age at first surgery in the study period (years)	33.8±10.4	36.6±11.8

^a Six patients received both strictureplasty and resection and are included in both groups

Table 2 Indications for surgery

	Strictureplasty (n=31 laparotomies)		Resection (n=36 laparotomies)	
	n	%	n	%
Stricture in large bowel	24	77.4	26	72.2
Fistula	5	16.1	4	11.1
Ileus	1	3.2	2	5.6
Inflammatory mass	1	3.2	3	8.3
Emergency procedures	0	–	0	–
Persistent pain	0	–	1	2.8

Table 3 Site of surgery

	Strictureplasty (n=35)		Resection (n=40)	
	n	%	n	%
Ileocecal junction	5	14.2	3	7.5
Ascending colon	2	5.7	2	5
Transverse colon	3	8.6	3	7.5
Descending colon	3	8.6	6	15
Sigmoid colon	9	25.7	4	10
Rectum	3	8.6	4	10
Anastomotic strictures	9	25.7	12	30
Colectomy	0	0	5	12.5

Quality of life

To assess quality of life the 32-item IBDQ was used, evaluating general activity of daily living, specific intestinal function, such as bowel habits and abdominal pain, as well as social performance, personal interactions, and emotional status [17, 19]. The IBDQ was proven to be valid and reliable assessment tool of therapeutic efficacy in a multicenter trial by Irvine et al. in 1994 [18]. In our outpatient clinic the disease-specific quality of life questionnaire was assessed in both groups. Responses were reported on a 7-point Likert scale (7 denoting not a problem, and 1 denoting a very severe problem). Possible scores range from 32 to 224, with a higher score indicating better quality of life. Four “dimensional scores” cluster items under bowel (e.g., loose stools, abdominal pain), systemic (fatigue, altered sleep pattern), social (work attendance, need to cancel social events), and emotional headings (angry, depressed, irritable) were examined.

Statistical analysis

The principal criteria for assessment were (a) improvement in the patient’s quality of life and (b) occurrence of surgical recurrence. Secondary criteria were the postoperative mortality and morbidity rates. The results of parametric data are expressed as means. Non-parametric data are expressed as medians. Statistical significance was determined using Student’s *t* test, Wilcoxon’s rank test, or the χ^2 test, as appropriate. The level of significance was set at $P<0.05$.

Results

Postoperative morbidity and mortality

There was no hospital mortality. The mean hospital stay was 17 days in the strictureplasty group and 17.3 days in

the resection group, including a maximum of two preoperative days. The mean duration of surgery in the strictureplasty group (135±53) was significantly shorter than in the resection group (174±70 min; $P=0.0162$). The need for blood transfusion occurred in 12.9% in group A and in 22.2% in group B. A postoperative stay in the intensive care unit was required after 6.5% of the surgical procedures in group A and after 8.3% in group B. Postoperative morbidity was 16.1% in group A and 22.3% in group B (Table 4).

Two relaparotomies were necessary in the strictureplasty group. One patient required relaparotomy due to an obstruction caused by adhesions on postoperative day 7. Another patient required relaparotomy (postoperative day 9) due to a leak from a strictureplasty site in the ileum. Three relaparotomies were necessary in the resection group, one due to a liver hematoma with perforation (postoperative day 4) and the second due to strangulation of bowel segments by adhesions (postoperative day 3). The third patient developed an anastomotic leakage (ileoascendostomy) and a fistula to the bladder. All of these complications were managed successfully, and further postoperative courses were uneventful.

Recurrences

Median follow-up was 70 months in group A (strictureplasty) and 70.5 months in group B (resection). Recurrence was observed in nine patients (36%) in group A and in seven (24%) of those in group B. In group A there was one recurrence in six cases, two in two cases, and more than three in one case; in group B there was one in two cases, two in three cases, and three in two cases. The mean period between the first operation in our study and the first recurrence was 16±14 months in group A and 34±19 months in group B ($P=0.0002$). The mean period between the first and second recurrences was 36±22 months in group A and 26±24 months in group B (n.s.; Table 5). The mean interval between recurrences in the one patient in group A with more than three courses of recurrent disease was 11 months. The recurrence was usually orthotopic (11/17 in group A, 10/14 in group B; n.s.); Heterotopic recurrence was infrequent (Table 6).

Table 4 Hospital course and surgical complications

	Strictureplasty (<i>n</i> =31 laparotomies)	Resection (<i>n</i> =36 laparotomies)	<i>P</i>
Mean hospital stay (days) ^a	17.0±9.7	17.3±12.2	n.s.
Duration of surgery (min)	135.7±53	173.9±70	0.0162
Patients with perioperative blood transfusion (<i>n</i>)	4 (12.9%)	8 (22.2%)	n.s.
ICU stay (<i>n</i>)	2 (6.5%)	3 (8.3%)	n.s.
Postoperative hemorrhage (<i>n</i>) ^b	0	2 (5.6%)	n.s.
Wound infection (<i>n</i>)	2 (6.5%)	2 (5.6%)	n.s.
Ileus (<i>n</i>)	0	1 (2.8%)	n.s.
Pneumothorax (<i>n</i>)	1 (3.2%)	0	n.s.
Bowel obstruction (<i>n</i>)	1 (3.2%)	1 (2.8%)	n.s.
Liver hematoma (<i>n</i>)	0	1 (2.8%)	n.s.
Fistula/leak (<i>n</i>)	1 (3.2%)	1 (2.8%)	n.s.
Postoperative morbidity (<i>n</i>)	5 (16.1%)	8 (22.3%)	n.s.
Mortality (30 days)	0	0	

^a Postoperative hospital stay, including a maximum of 2 days preoperatively

^b Transfusion of more than 2 blood units

Table 5 Surgical recurrence of disease; complete follow-up for recurrent disease was available for 25 of 29 patients (86%) in the strictureplasty group and 29 of 36 (80%) in the resection group

	Strictureplasty (<i>n</i> =25 patients)	Resection (<i>n</i> =29 patients)	<i>P</i>
Patients with recurrence (<i>n</i>)	9 (36%)	7 (24%)	n.s.
One recurrence (<i>n</i>)	6 (24%)	2 (7%)	n.s.
Two recurrences (<i>n</i>)	2 (8%)	3 (10%)	n.s.
Three recurrences (<i>n</i>)	0	2 (7%)	n.s.
More than three recurrences	1 (4%)	0	n.s.
Mean interval to recurrence (months)			
To 1st recurrence	16 (±14)	34 (±19)	0.0002
From 1st to 2nd recurrence	36 (±22)	26 (±24)	n.s.
From 2nd to 3rd recurrence	0	24	–
To further recurrences (mean interval)	11	0	–

Table 6 Location of recurrent disease (no. of patients); nine patients in the strictureplasty group and seven patients in the resection group experienced recurrence at all, three patients in the strictureplasty group and five patients in the resection group had more than one recurrence (*orthotopic* within 20 cm of the site of previous surgery)

	Strictureplasty (<i>n</i> =25 patients)	Resection (<i>n</i> =29 patients)
Primary recurrence sites	9	7
Orthotopic	5	6
Heterotopic	2	1
Small bowel	2	0
Further recurrence sites	3	5
Orthotopic	6	4
Heterotopic	2	2
Small bowel	0	1
Total number of recurrences	17	14

Table 7 Quality of life, evaluated with the Inflammatory Bowel Disease Questionnaire score; complete follow-up data were available in 17 of 29 patients in the strictureplasty group and in 25 of 35 patients in the resection group

	Strictureplasty (<i>n</i> =17)	Resection (<i>n</i> =25)	<i>P</i>
	Median (range)	Median (range)	
Bowel symptoms (7–70 points)	50 (33–68)	53 (37–70)	n.s.
Systemic symptoms (5–35 points)	24 (12–35)	27 (15–35)	n.s.
Emotional function (12–84 points)	69 (37–84)	69 (31–84)	n.s.
Social function (5–35 points)	34 (6–35)	33 (11–35)	n.s.
Total score points/maximum points	177/224	182/224	n.s.
Median follow-up (months)	70	70.5	–
Surgery rated as success	88%	84%	n.s.
Ability to work	47%	52%	n.s.

Quality of life

Quality of life could be analyzed in 17 of 29 patients in the group A (57%; median follow-up 70 months) and in 25 of 35 patients in group B (71%; median follow-up 70.5 months). The groups did not differ significantly in any of the four headings of the IBDQ. The overall median score was 177/224 in group A, and 182/224 in group B. Only 47% of patients in group A were able to work, and 52% in group B. An overwhelming majority of the patients evaluated surgical therapy as a personal success (88% in group A, 84% in group B; Table 7).

Discussion

The long-term prognosis of patients with Crohn's disease is characterized by high relapse rates. Intractability of the disease is the major indication for surgery. The high probability of recurrence and the fact that there is no definitive cure for Crohn's disease, either by surgical or by medical options, is the background for treatment strategies, which try to preserve bowel length and seek to minimize clinical symptoms for a prolonged period of time. Strictureplasty is a tool for preserving functional bowel and for effectively relieving the common symptoms of the disease in the small bowel. In this study we found that it can serve the same purpose in Crohn's disease of the colon.

The rate of primary involvement of large bowel is about 27%, that for ileocolic involvement 41%, and that for involvement of small bowel 28% [20, 21]. In our study the involvement of the ileocolic area at the time of entering the study was comparatively low (17.3% in group A, 10% in group B). This is because many patients had already had surgery before entering the study.

In the group A (strictureplasty) there were more patients with simultaneous small and large bowel disease (48.4% vs. 36.1%) and ileocecal disease (32.3% vs. 25%), while in group B (resection) there was a prevalence of isolated colonic disease (38.9% vs. 19.4%). This may explain the shorter intervals to recurrence in the strictureplasty group and a sign of a more chronic relapsing course of the disease in group A [22, 23, 24, 25].

The cumulative risk of patients with involvement of the colon to undergo colonic surgery is 40–50% within 5 years, and the risk for complete loss of the colon is 14.5% within 10 years [23, 24]. In 12.5% of our group B patients the colon was completely removed. Patients with colonic disease have a reported 45% rate of recurrence requiring another operation [9]. In 31% of our group A patients and 17.5% of our group B patients there was recurrent disease requiring surgery in our study.

Since the introduction of strictureplasty [2] many authors have reported encouraging results with the use of

strictureplasty in small bowel as an alternative to resection and anastomosis [3, 4, 5, 28]. Although inflamed bowel persists by using the strictureplasty technique, there is no higher rate of recurrence in Crohn's disease [4]. We confirmed this for Crohn's disease of the large bowel in our study, since the number of patients who developed recurrent disease did not differ between the two groups. The interval to repeated surgery in the strictureplasty group was significantly shorter. These results may be explained by a varying course of the disease in the different groups [25, 29, 30, 31], but since our study is retrospective this remains unconfirmed. In patients with isolated large bowel Crohn's disease resection may cure the disease because it removes the focus of the disease. Negative consequences of removal of the whole large bowel must be considered in the long term, such as electrolyte disturbances, fluid loss, stool frequency, and incontinence. Possible recurrence in another part of the bowel must be considered and preservation of bowel in general may be valuable if the disease progresses and extends to the small bowel.

The overall surgical postoperative complication rates of 16.1% in group A and 22.3% in group B, with only two and three relaparotomies in the early postoperative period, is similar to those in other recent reports [1, 32,]. No perioperative deaths were seen in this study. Recent reports have shown mortality rates ranging from 0–2% [1, 32, 34]. In our study suture line dehiscence occurred in two cases. One was not related to anastomosis in the large bowel but to a simultaneous procedure in the small bowel; the other one was a complication at an anastomosis with fistula to the bladder. These two insufficiencies do not indicate a higher frequency of leaks in large bowel Crohn's disease treated by strictureplasty or resection.

Since strictureplasty of the colon thus seems to be a safe and effective treatment, patients with chronic frequently relapsing disease treated with strictureplasty will be at a lower risk for complete loss of the colon. It has been suggested that active disease, left in situ with strictureplasty, may have long-term deleterious effects. This hypothesis has not been confirmed either in our own study or in others [1, 22, 23, 24]. No advantages of disease-free resection margins in Crohn's disease have been reported [6, 35]. Therefore anastomosis/strictureplasty can also be performed in macroscopically inflamed areas of bowel [24, 28]. Especially after strictureplasty there is no higher rate of local recurrence of disease [36].

Several studies have suggested an increased risk for adenocarcinoma in Crohn's disease, and the possibility for the development of carcinoma of the large bowel in this chronic inflammatory disease has been discussed [37, 38]. Dysplasia as a precancerous lesion has been less intensively studied in Crohn's disease as opposed to chronic ulcerative colitis. Dysplasia or cancer is found in up to 6% of patients with Crohn's colitis [39]. However, the question remains unanswered as to whether leaving diseased bowel

behind, treated by strictureplasty, increases the incidence of colorectal carcinoma. There is some indication that the relief of obstruction by strictureplasty may actually lessen the activity of disease within the affected segment [36]. Due to these findings surveillance examinations seem to be wise in patients with extensive and relapsing Crohn's colitis of long duration [40, 41, 42]. An aggressive resectional approach, however, is definitely not warranted.

However, in addition to the technical aspects and recurrence data of the strictureplasty, quality of life after surgical therapy is the most important issue for the patient. It is important to remember that quality of life is determined not only by recurrence requiring reoperation but also by the need of medical treatment [24, 43]. The goal of our study was to determine whether quality of life can be improved in patients treated with strictureplasty or resection. The IBDQ is a valid and reliable tool that reflects important changes in the health status of patients with Crohn's disease. It is correlated with other indices for disease activity and showed the ability to detect clinical changes over time [18, 19, 44]. Because of the retrospective design of this study we had no baseline evaluation of quality of life. The results, however, indicate that there is no difference in quality of life measures by the IBDQ between the strictureplasty and resection groups postoperatively. Unfortunately, we lost patients to follow-up, which might increase a potential type II error. The nonrandomized retrospective design of the study may to some extent have limited the comparison basis of the two groups.

Since the goal of surgery in Crohn's disease is to correct the complications of disease and to relieve symp-

toms not controlled by medical therapy, most patients regard surgical treatment, as in our study, to be successful [45]. Quality of life has not yet been evaluated comparing strictureplasty and resection for Crohn's colitis. In this study we found no statistical difference in quality of life scores evaluated by the IBDQ. However, we can speculate that there might be an advantage for strictureplasty in the long term because valuable functional large bowel is preserved in patients requiring multiple surgical procedures. This may prevent known late complications of extensive large bowel resections, such as electrolyte disturbances, fluid loss, and incontinence. Therefore, if both resection and strictureplasty are effective and safe and improve quality of life in patients with strictures of Crohn's colitis, why do we favor strictureplasty? Since local recurrence is not more frequent after strictureplasty than after resection, potentially functional large bowel is scarified during resection. Especially in patients with a multifocal and relapsing course of disease preservation of colonic length seems useful to avoid ending up with a colectomy. Only very few patients with isolated Crohn's colitis are cured by colectomy. The remaining patients are either be burdened by an ileostomy, an ileoanal, or ileorectal pouch anastomosis with the negative effects of large bowel loss.

We therefore propose strictureplasty particularly in those patients with obstructional symptoms, in whom multiple relatively short colonic segments are involved. In our experience, strictureplasty is a safe and effective alternative to solitary or multiple resections for multifocal and localized stenotic large bowel segments.

References

1. Michelassi F, Balestracci T, Chappell R, Block GE (1991) Primary and recurrent Crohn's disease. Experience with 1379 patients. *Ann Surg* 214:230-240
2. Lee EC, Papaioannou N (1982) Minimal surgery for chronic obstruction in patients with extensive or universal Crohn's disease. *Ann R Coll Surg Engl* 64:229-233
3. Pace BW, Bank S, Leslie W (1984) Strictureplasty: an alternative in the surgical treatment of Crohn's disease. *Arch Surg* 119:861-862
4. Alexander-Williams J, Haynes IG (1985) Conservative operations for Crohn's disease of the small bowel. *World J Surg* 9:945-951
5. Alexander-Williams J (1984) Conservative non-resection operations for Crohn's disease. In: Najarian JS, Delaney JP (eds) *Advances in gastrointestinal surgery*. Year Book Medical Publisher, Chicago, pp 329-336
6. Fazio VW, Marchetti F, Curch M, et al (1996) Effect of resection margins on the recurrence of Crohn's disease in the small bowel. A randomized controlled trial. *Ann Surg* 224:563-573
7. Fazio VW, Galandiuk S (1985) Strictureplasty in diffuse Crohn's jejunoileitis. *Dis Colon Rectum* 28:512-518
8. Kendall GP, Wawley PR, Nicholls RJ, Lennard-Jones JE (1986) Strictureplasty: a good operation for small bowel Crohn's disease? *Dis Colon Rectum* 29:312-316
9. Fazio VW, Wu JS (1997) Surgical therapy for Crohn's disease of the colon and rectum. *Surg Clin North Am* 77:197-210
10. Radice E, Nelson H, Devine RM, et al (1998) Ileal pouch-anal anastomosis in patients with colorectal cancer. Long term functional and oncologic outcomes. *Dis Colon Rectum* 41:11-17
11. Jimmo B, Hyman NH (1998) Is ileal pouch-anal anastomosis really the procedure of choice for patients with ulcerative colitis? *Dis Colon Rectum* 41:41-45
12. Koehler LW, Pemberton JA, Zinsmeister AR, Kelly KA (1991) Quality of life after proctocolectomy: a comparison of Brooke ileostomy, Kock pouch and ileal pouch-anal anastomosis. *Gastroenterology* 101:679-684
13. McLead RS, Churchill DN, Lock AM, et al (1991) Quality of life of patients with ulcerative colitis preoperatively and postoperatively. *Gastroenterology* 101:1307-1313
14. Lindemann W, Honig A, Feifel G, Ecker KW (1998) Surgical treatment of Crohn disease based on the inflammatory pattern. *Zentralbl Chir* 123:344-351
15. Okamoto T, Kusunoki M, Kusuhara K, Yamamura T, Utsunomiya J (1995) Water and electrolyte balance after ileal J pouch-anal anastomosis in ulcerative colitis and familial adenomatous polyposis. *Int J Colorectal Dis* 10:33-38

16. Geoghegan JG, Carton E, O'Shea AM, Astbury K, Sheahan K, O'Donoghue DP, Hyland JM (1998) Crohn's colitis: the fate of the rectum. *Int J Colorectal Dis* 13:256–259
17. Kim WH, Cho YS, Yoo HM, Park IS, Lim JG (1999) Quality of life in Korean patients with inflammatory bowel disease: ulcerative colitis, Crohn's disease and intestinal Behcet's disease. *Int J Colorectal Dis* 14:52–57
18. Irvine EA, Feagan B, Rochon J, et al (1994) Quality of life: a valid and reliable measure of therapeutic efficacy in the treatment inflammatory bowel disease. For the Canadian Crohn's Relapse Prevention Trial. *Gastroenterology* 106:287–296
19. Guyatt GH, Mitchell A, Irvine EJ, et al (1989) A new measure of health status for clinical trials in IBD. *Gastroenterology* 96:804–810
20. Farmer RG, Whelan G, Fazio VW (1985) Long-term follow-up of patients with Crohn's disease: relationship between the clinical pattern and prognosis. *Gastroenterology* 88:1818–1825
21. Farmer RG, Hawk WA, Turnbull RB Jr (1975) Clinical patterns in Crohn's disease: a statistical study of 615 cases. *Gastroenterology* 68:627–635
22. Softly A, Myren J, Clamp SE, et al (1988) Factors affecting recurrence after surgery for Crohn's disease. *Scand J Gastroenterol* 144:31–34
23. Raab Y, Bergstroem R, Ejerblad S, et al (1996) Factors affecting recurrence in Crohn's disease. An analysis of a consecutive series of 353 patients treated with primary surgery. *Dis Colon Rectum* 39:918
24. Post S, Herfarth C, Boehm E, et al (1996) The impact of disease pattern, surgical management, and individual surgeons on the risk for relaparotomy for recurrent Crohn's disease. *Ann Surg* 223:253–260
25. Greenstein AJ, Lachman P, Sachar DB (1988) Perforating and non-perforating indications for repeated operations in Crohn's disease: evidence for two clinical forms. *Gut* 29:588–592
26. Makowiec E, Schmidtke C, Paczulla D, et al (1997) Progression and prognosis of Crohn's colitis. *Z Gastroenterol* 35:7–11
27. Lapidus A, Bernell O, Hellers G, Lofberg R (1998) Clinical course of Crohn's disease: a 35-year follow-up study of 507 patients. *Gastroenterology* 114:1151–1160
28. Fazio VW, Tjandra JJ, Lavery I, et al (1993) Long-term follow-up of strictureplasty in Crohn's disease. *Dis Colon Rectum* 36:355–361
29. Sayfan J, Wilson DA, Allan A, et al (1989) Recurrence after strictureplasty or resection for Crohn's disease. *Br J Surg* 76:335–338
30. De Dombal FT, Burton I, Goligher JC (1971) Recurrence of Crohn's disease after primary excisional surgery. *Gut* 12:519–527
31. Chardavoyne R, Flint GW, Pollack S, Wise L (1986) Factors affecting recurrence following resection for Crohn's disease. *Dis Colon Rectum* 29:495–502
32. Greenstein AJ, Mevers S, Sher L, et al (1981) Surgery and its sequelae in Crohn's colitis and ileocolitis. *Arch Surg* 116:285–288
33. Heimann T, Greenstein AJ, Mechanic L, Aufses AH (1985) Early complications following surgical treatment of Crohn's disease. *Ann Surg* 201:494–498
34. Fasth S, Hellberg R, Hulten L, Magnusson O (1980) Early complications after surgical treatment for Crohn's disease with particular reference for factors affecting their development. *Acta Chir Scand* 146:519–526
35. Borley NR, Mortensen NJ, Jewell DP (1997) Preventing postoperative recurrence of Crohn's disease. *Br J Surg* 84:1493
36. Wolff BG (1998) Factors determining recurrences following surgery for Crohn's disease. *World J Surg* 22:364–369
37. Persson PG, Karlen P, Bernell O, et al (1994) Crohn's disease and cancer: a population based cohort study. *Gastroenterology* 107:1675–1679
38. Fleshman JW (1997) Invited editorial. *Dis Colon Rectum* 40:238–239
39. Rubin PH, Present DH, Chapman ML, et al (1996) Chronic Crohn's colitis: a 7-year experience with screening and surveillance colonoscopy in 113 patients. *Gastroenterology* 110:A1005
40. Itzkowitz SH (1997) Inflammatory bowel disease and cancer. *Gastroenterol Clin North Am* 26:129–139
41. Bachwich DR (1994) Cancer in inflammatory bowel disease. *Med Clin North Am* 78:1399–1412
42. Lewis JD, Deren JJ, Lichtenstein GR (1999) Cancer risk in patients with inflammatory bowel disease. *Gastroenterol Clin North Am* 28:459–477
43. Williams JG, Wong, Rothenberger DA, Goldberg SM (1991) Recurrence of Crohn's disease after resection. *Br J Surg* 78:10–19
44. Mitchell A, Guyatt GH, Singer J, et al (1988) Quality of life in patients with IBD. *J Clin Gastroenterol* 10:306–310
45. Post S, Kunhardt M, Herfarth C (1995) Subjektive Einschätzung von Lebensqualität, Schmerzen und Operationserfolg nach Laparotomien wegen M. Crohn. *Chirurg* 66:800–806