Tech Coloproctol (2016) 20:287–292
DOI 10.1007/s10151-016-1440-8

ORIGINAL ARTICLE

Clinical recurrence and re-resection rates after extensive vs. segmental colectomy in Crohn's colitis: a retrospective cohort study

M. Handler[1] · I. Dotan[2] · J. M. Klausner[1] · H. Yanai[2] · E. Neeman[1] · H. Tulchinsky[1]

Received: 19 October 2015 / Accepted: 23 January 2016 / Published online: 17 February 2016

Abstract
Background The aim of the present study was to document long-term clinical recurrence and re-resection rates of segmental and extended colectomy in patients with Crohn's colitis and to identify risk factors causing recurrence.
Methods Records of patients with isolated colonic Crohn's disease who underwent colectomy between 1995 and 2013 and were followed at our medical center were identified. Data on age at diagnosis, gender, smoking, disease location at diagnosis, perianal and rectal disease, indication for surgery, preoperative disease duration, type of operation, primary anastomosis at first operation, length of resected specimen, recurrence of symptoms, postoperative medication, reoperation, and total follow-up time were retrieved.
Results Thirty-five suitable patients (18 segmental colectomy, 17 extensive colectomy; 17 males; mean age at operation 36.6 years) were identified. Mean age at primary operation was 36 years. The mean preoperative disease duration was 121 months. Postoperative medical treatment was needed in 10 (56 %) patients undergoing segmental colectomy and in 16 (94 %) of those undergoing extensive colectomy ($p = 0.01$). There was longer reoperation-free survival in the segmental colectomy patient group ($p = 0.02$) and also a trend toward longer symptom-free survival compared to the extensive colectomy patient group ($p = 0.105$). There was no correlation between the length of resected bowel and recurrence. Patients operated on at a younger age did not have a higher rate of recurrence of symptoms. Shorter disease duration, smoking, and male gender were risk factors for clinical recurrence.
Conclusions Segmental resection with primary anastomosis can be safely performed in patients with limited Crohn's colitis with reasonable clinical recurrence rates.

Keywords Crohn's colitis · Colectomy · Recurrence

Introduction

Crohn's colitis (CC) involves the colon and the rectum. The distal colon is most commonly involved; however, any part of the colon may be affected [1]. About 25 % of patients have relative rectal or rectosigmoid sparing, with microscopic inflammation affecting the entire colon in 25 % of these cases. In an epidemiologic study of Crohn's disease (CD) in Stockholm carried out from 1955 to 1989, the incidence of pure colonic disease at the time of diagnosis increased from 14 to 32 % during the 35-year study period [2]. CC cannot be cured by medical or surgical therapy, but remission can be maintained. Although medical management has evolved considerably, patients still require surgery as disease progresses, and complications occur [3]. Surgery in CC represents one of the most debated issues in CD patients, and wide discrepancies are

This study was performed in partial fulfillment of the M.D. thesis requirements of Miriel Handler at the Sackler Faculty of Medicine, Tel Aviv University.
This study was accepted as a poster presentation in 10th Congress of ECCO February 18–21, 2015 Barcelona, Spain.

✉ H. Tulchinsky
hagitt@tlvmc.gov.il

[1] Colorectal Unit, Division of Surgery, Affiliated to the Sackler Faculty of Medicine, Tel-Aviv Medical Center, Tel-Aviv University, 6 Weizman Street, 6423906 Tel-Aviv, Israel

[2] IBD Center, Department of Gastroenterology and Liver Diseases, Tel-Aviv Medical Center, Affiliated to the Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel

observed among expert inflammatory bowel disease (IBD) surgeons [4]. Surgery may include segmental colectomy, subtotal colectomy, total abdominal colectomy, and proctocolectomy. The type of surgery may potentially be influenced by the severity and extent of the disease.

The aim of this study was to examine the disease-free survival and reoperation-free interval in CC patients undergoing either limited or extensive resections and to identify risk factors associated with postoperative clinical recurrence.

Materials and methods

We reviewed the medical records of all patients with CD who were followed at the Tel Aviv Medical Center between 1995 and 2013. Only patients with a pathological diagnosis of isolated CC who were operated on at our center during those years were eligible. Patients with disease isolated to the terminal ileum and cecum or small bowel were excluded, as were those who underwent ileocecectomy, surgery for gastrointestinal (GI) malignancy, or any surgical procedure less than 1 year prior to study initiation. The minimal follow-up period was set at 1 year. Relevant demographic and clinical data were retrieved retrospectively from computerized medical records and archived patient files, and they were merged into a computerized database. Patients were contacted by telephone to complete necessary medical information.

The patients were divided into two groups according to the type of their primary surgery, i.e., extensive surgery (total/subtotal colectomy, proctocolectomy) or a segmental colectomy. The assessed parameters that were collected included demographics, smoking habits, diagnosis date, disease location at diagnosis, extent of disease (based on preoperative radiologic or endoscopic as well as intraoperative findings), disease duration (time interval between diagnosis and first operation), perianal and rectal disease at diagnosis, indication for surgery, date and type of surgery, primary anastomosis at first operation, operation for restoration of GI continuity, length of resected specimen, date of symptom recurrence, use of medication after surgery, date and type of surgery for clinical recurrence, and the disease status at last follow-up. Recurrence of disease was evaluated by clinical parameters.

The study was approved by the Institutional Helsinki Committee.

Statistical analysis

Continuous parameters are presented as median and range or means and standard deviation. Comparison of the clinical and demographic parameters between the two groups was performed with the unpaired *t* test, the Mann–Whitney test, and the Chi-square test as appropriate. The statistical significance of associations between continuous parameters was calculated using Fisher's exact test. Comparison of overall survival between the groups was performed using the log-rank test and displayed as Kaplan–Meier curves. A p value of <0.05 was considered significant. All statistical analyses were performed using StatView 3.0 for Windows (SAS Institute Inc., Cary, NC, USA).

Results

A total of 291 patients with CD were identified and 256 of them were excluded: 123 who did not undergo surgery, 56 who underwent ileocecectomy, 54 whose pathological examination excluded CC, 8 who were operated on in other medical centers, 8 who were operated on due to concomitant neoplasm of the GI tract, 4 who had incomplete medical records, 2 who were operated on for other GI pathologies, and 1 who was lost to follow-up. The records of the 35 suitable patients comprised our study cohort.

The study patients included 17 males (49 %) and 18 females (51 %) with a mean age at disease onset of 26 years (range 9–61 years) and a mean age at primary operation of 36 years (range 16–72 years). The mean preoperative disease duration was 121 months (range 2–447 months). Nineteen (54 %) patients had segmental colitis, 13 (37 %) had pancolitis, and disease location was not specified in one patient (3 %). Sixteen patients (46 %) had perianal involvement and 10 patients (29 %) also had rectal involvement prior to primary surgery. All patients had surgery on an elective basis and underwent open surgical procedures, with the indications being refractory disease (51 %), colonic stricture (20 %), and fistulous disease with (11 %) or without (17 %) an intra-abdominal abscess. Eighteen patients (51 %) underwent segmental colectomy: 12 (67 %) right colectomy, 4 (22 %) left colectomy, and 2 (11 %) sigmoidectomy. Seventeen (49 %) patients had extensive surgery: 16 (94 %) underwent subtotal or total colectomy and 1 (6 %) total proctocolectomy.

Table 1 lists the demographic and clinical parameters of the patients in each group. Patients in the extensive surgery group showed more widespread colonic disease at diagnosis ($p = 0.003$) and a longer length of resected specimen at primary surgery (59 and 28 cm, respectively, $p < 0.0001$). Fifteen patients had CD involving the surgical margins, 10 in the extensive colectomy group and 5 in the segmental colectomy group. There was no correlation between involved resection margins and disease recurrence. Eighteen patients underwent primary anastomosis at first operation, 12 (67 %) in the segmental colectomy

Table 1 Patient characteristics

	Segmental colectomy ($n = 18$) n (%)	Extensive colectomy ($n = 17$) n (%)	p value
Gender			0.31
Male	7 (39)	10 (59)	
Female	11 (61)	7 (41)	
Mean age at disease onset, years (range)	29 (11–61)	24 (10–51)	0.13
Smoking	4 (22)	3 (18)	0.69
Disease location			0.003
Left colon	5 (28)	2 (12)	
Right colon	10 (56)	2 (12)	
Pancolitis	1 (6)	12 (71)	
Perianal disease	6 (33)	10 (59)	0.18
Rectal disease	3 (17)	7 (41)	0.08
Indication for surgery			0.13
Refractory disease	8 (44)	11 (65)	
Colonic stricture	5 (28)	2 (12)	
Septic complications	5 (28)	4 (23)	
Mean preoperative disease duration months (range)	111 (2–240)	132 (6–447)	0.46
Primary anastomosis at operation	12 (67)	6 (35)	0.013

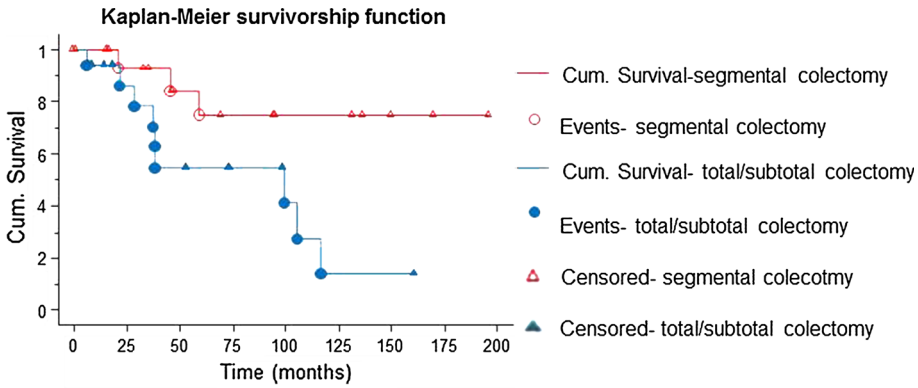

Fig. 1 Survival plot. Time to re-resection for segmental colectomy and extensive colectomy patients. *Cum* cumulative

group and 6 (35 %) in the extensive surgery group. One patient had an anastomotic leak (5.5 %) that was treated conservatively. Seven out of 17 patients who had a stoma underwent delayed operation for restoration of continuity: one in the segmental colectomy group and 6 in the extensive surgery group. At the end of the study period, 10 of the 35 patients (29 %) had a stoma, 5/17 (29 %) after segmental colectomy, and 5/18 (25 %) after subtotal colectomy.

Postoperative prophylactic treatment was not routinely used and only 4 patients were given thiopurines. Twenty-six (74 %) patients had recurrence of symptoms after primary surgery: 15 (88 %) in the extensive surgery group and 11 (61 %) in the segmental colectomy group ($p = 0.105$). Medical treatment, mainly thiopurines, for symptom recurrence was given to 94 % of the patients in the extensive surgery group and to 56 % of patients in the segmental colectomy group ($p = 0.012$). Thirteen (50 %) patients underwent reoperation, 10 in the extensive colectomy group and 3 in the segmental colectomy group. Patients in the segmental colectomy group had significantly longer reoperation-free survival ($p = 0.024$, Fig. 1) and a trend toward longer symptom-free survival ($p = 0.105$, Fig. 2). Importantly, there was no significant correlation between the length of resected specimen at the primary surgery and symptom-free survival ($r = -2.19$, $p = 0.32$) or reoperation-free survival ($r = -0.01$, $p = 0.997$).

Further statistical analysis revealed that males had a shorter mean symptom-free survival after surgery compared to females (12 ± 7 and 47 ± 12 months, respectively)

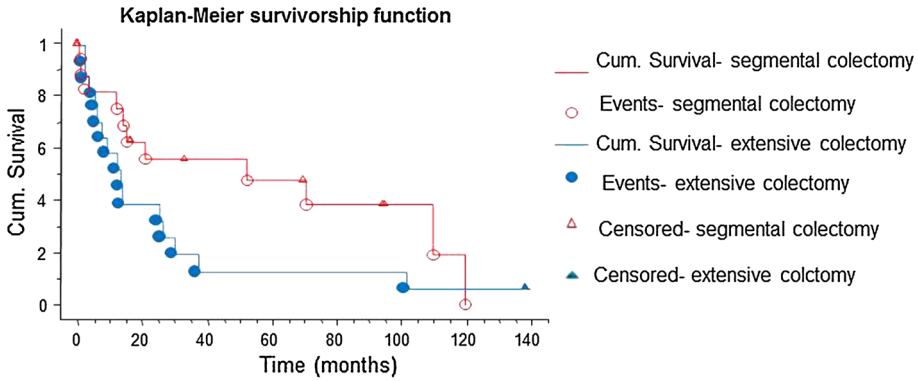

Fig. 2 Survival plot. Time to recurrent symptoms for segmental colectomy and extensive colectomy patients. *Cum* cumulative

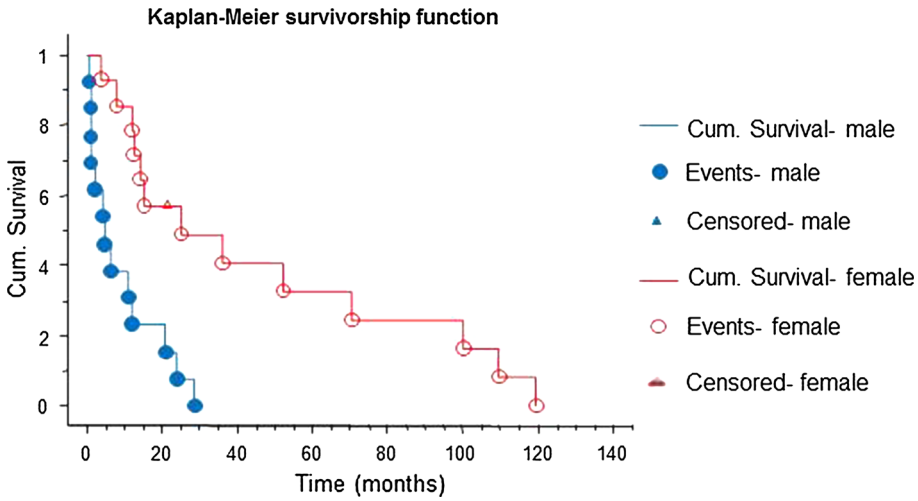

Fig. 3 Survival plot. Time to recurrent symptoms by gender

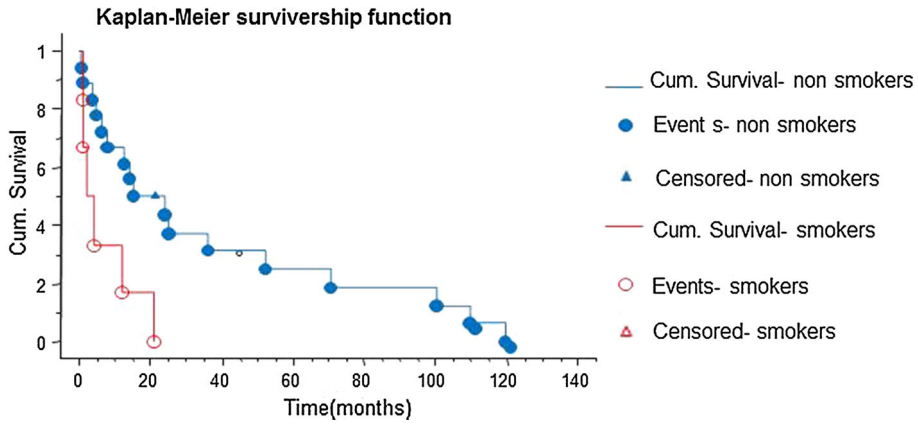

Fig. 4 Survival plot. Time to recurrent symptoms by smoking status

($p = 0.0007$, Fig. 3) and showed a trend toward more frequently receiving medical treatment after surgery ($p = 0.08$). Smokers exhibited a shorter mean symptom-free survival compared to non-smokers (7 ± 3 and 37 ± 10 months, respectively) ($p = 0.009$, Fig. 4). A shorter disease duration correlated with shorter symptom-free survival ($r = 0.45$, $p = 0.018$), but not with reoperation-free survival ($r = 0.36$, $p = 0.92$), or with the use of medication after surgery ($p = 0.574$). Furthermore, the presence of both perianal disease and rectal involvement prior to surgical intervention had no effect on symptom recurrence ($p = 0.66$ and $p = 0.79$, respectively) and re-resection rates ($p = 0.88$ and $p = 0.215$, respectively). Finally, younger age at primary surgery had no effect on symptom recurrence or on the need for additional surgery ($p = 0.731$).

Discussion

Any part of the colon may be affected by CD and to a different extent [1, 5]. Patients with CC who come to surgery comprise about 25 % of all patients with large bowel involvement requiring resection [6]. In our study, 54 % of the patients had segmental colonic involvement at diagnosis and 37 % had pancolitis. Similarly, Lapidus et al. [5] described the clinical course of 507 patients with CC in a 35-year follow-up study. They reported that 40 % of the patients presented with segmental involvement and 31 % with total colonic involvement.

The various operative approaches for CC include segmental colectomy, subtotal colectomy, total abdominal colectomy with or without immediate restoration of intestinal continuity, and proctocolectomy with or without sphincter preservation [7]. Segmental colectomy is advocated for patients with disease that is limited to one or a few segments while the rest of the colon appears to be normal [8–10]. Our results indicate that segmental colectomy with primary anastomosis can also be safely performed in these patients. Two-thirds of our patients had a primary anastomosis, and an additional 6 % underwent delayed surgery for restoration of GI continuity.

In the current study, as in other retrospective studies reporting on the outcome of surgery for CC, disease characteristics of patients who had extensive colectomy differ from those of patients who had segmental colectomy [11, 12]. Patients who underwent subtotal or total colectomy had more severe and extensive colonic disease and therefore were actually not eligible for segmental resection. Due to the extent of disease and their general condition, only 35 % of those patients had a primary anastomosis at initial operation. An additional 35 % underwent subsequent surgery for restoration of GI continuity. The relatively high rate of patients with stoma derives from the existence of rectal disease in half of the patients not undergoing primary anastomosis, and severe pancolitis in the remaining half. Clinical disease recurrence and re-resection rates appeared to be higher in the extensive colectomy group, again suggesting that these patients had more severe colitis. The patients who underwent segmental colectomy had longer reoperation-free survival and a trend toward longer symptom-free survival.

There is a controversy in the literature regarding clinical recurrence and re-resection rates after segmental colectomy and colectomy with an ileorectal anastomosis, probably because of the different groups of patients that were studied. Some authors reported that segmental resection for CC has low recurrence rates and therefore is justified [8, 11, 13]. Bernell et al. [8] reported a reduced cumulative 10-year risk of symptomatic recurrence for segmental colectomy (47 %) in comparison with colectomy with an ileorectal anastomosis (58 %). Polle et al. [11] reported 91 patients who underwent segmental or subtotal resection for colorectal CD. Of the 68 patients who had segmental resection, 13 (19 %) finally underwent total proctocolectomy, compared with 7/23 (30 %) patients whose first operation was subtotal colectomy. A meta-analysis conducted by Tekkis et al. [14] showed no significant difference in clinical recurrence rates between total colectomy with anastomosis and segmental colectomy. On the other hand, various papers have demonstrated that the risk of early clinical recurrence in the remaining large bowel and reoperation after segmental colectomy is increased compared with total colectomy and ileorectal anastomosis [10, 12]. Andersson et al. [10] reported an overall 10-year re-resection rate after subtotal colectomy compared with segmental resection in 41 and 55 % of cases, respectively. Prabhakar et al. [15] reported that after 14 years of follow-up, 59 % of the patients who had undergone a segmental colectomy developed recurrent disease which was mostly colorectal, with 44 % requiring either repeat surgery or prolonged medical therapy. It is important to emphasize that prophylactic treatment with immunomodulators and/or biologics should be considered in all CC patients after surgery. Moreover, rescue treatment with biologics should be given, if there are no contraindications, to patients with rectal disease after extensive colectomy and to patients with colonic recurrence postsegmental colectomy before considering diversion, recolectomy and/or proctectomy [16].

The present study analyzed the risk factors for clinical recurrence and re-resection rates with regard to surgery for CC. Interestingly, and as previously noted in the literature [17], the extent of resected specimens does not seem to be associated with long-term postsurgical outcomes. Younger age at diagnosis was not associated with higher rates of recurrence of symptoms, or with the need to undergo additional surgery. This finding is partially contradictory to previous reports in which a younger age at diagnosis was associated with an increased risk of clinical recurrence and re-resection, thus indicating a more aggressive form of the disease [18, 19]. Nevertheless, we observed that both a shorter disease duration and smoking increased the risk of symptomatic recurrence, as had been previously described [20, 21]. Additionally, male gender was associated with a higher clinical recurrence rate, a finding that was not previously reported by others. Polle et al. [11] reported 91 patients who had an initial segmental colonic resection for CC and noted that recurrence was more frequent in women.

Potential limitations of this study are its retrospective design Data on Crohn's Disease Activity Index, and endoscopic recurrence was unobtainable. Bias in

compliance and surveillance was dealt with by personally contacting patients who were lost to follow-up in order to complete gaps in necessary medical information. Since our institution is a tertiary medical center, there is a selection bias toward more difficult patients along the CC spectrum, although this would equally affect all the study patients. Similarly to previous studies, our study results are mainly limited by the relatively small number of patients included due to disease characteristics and demographics.

Conclusions

Our results support the view that segmental resection should be considered in patients with limited CC, with reasonable clinical recurrence and re-resection rates. Male gender, shorter disease duration, and smoking were associated with an increased risk of clinical recurrence. Larger cohort studies are needed in order to determine postoperative recurrence rates and the necessity of additional medical and surgical care.

Acknowledgments Esther Eshkol is thanked for editorial assistance.

Compliance with ethical standards

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

Ethical approval The study was approved by the local ethics committee.

Informed consent Patients informed consent are not relevant due to the retrospective nature of the study.

References

1. Friedman S, Blumberg RS (2012) Inflammatory bowel disease. In: Longo DL, Kasper DL, Jameson JL, Fauci AS, Hauser SL, Loscalzo J (eds) Harrison's principles of internal medicine. McGraw-Hill Companies Inc., New York, pp 2477–2495
2. Lapidus A, Bernell O, Hellers G, Persson PG, Löfberg R (1997) Incidence of Crohn's disease in Stockholm County 1955–1989. Gut 41:480–486
3. Hanauer SB, Sandborn W (2001) Management of Crohn's disease in adults. Am J Gastroenterol 96:635–643
4. Pellino G, Selvaggi F, Ghezzi G, Corona D, Riegler G, Delaini GG (2015) A think tank of the Italian society of colorectal surgery (SICCR) on the surgical treatment of inflammatory bowel disease using the Delphi method: Crohn's disease. Tech Coloproctol 19:639–651
5. Lapidus A, Bernell O, Hellers G, Lofberg R (1998) Clinical course of colorectal Crohn's disease: a 35-year follow-up study of 507 patients. Gastroenterology 114:1151–1160
6. Longo WE, Ballantyne GH, Cahow CE (1988) Treatment of Crohn's colitis. Segmental or total colectomy? Arch Surg 123:588–590
7. Tulchinsky H, Rabau M (2013) Reoperative surgery in colonic Crohn's disease. In: Zbar AP, Madoff RD, Wexner SD (eds) Reconstructive surgery of the rectum, anus and perineum. Springer, London, pp 237–246
8. Bernell O, Lapidus A, Hellers G (2002) Recurrence after colectomy in Crohn's colitis. Dis Colon Rectum 44:647–654; discussion 654
9. Goligher JC (1988) Surgical treatment of Crohn's disease affecting mainly or entirely the large bowel. World J Surg 12:186–190
10. Andersson P, Olaison G, Hallbook O, Sjodahl R (2002) Segmental resection or subtotal colectomy in Crohn's colitis? Dis Colon Rectum 45:47–53
11. Polle SW, Slors JF, Weverling GJ, Gouma DJ, Hommes DW, Bemelman WA (2005) Recurrence after segmental resection for colonic Crohn's disease. Br J Surg 92:1143–1149
12. Fichera A, McCormack R, Rubin MA, Hurst RD, Michelassi F (2005) Long-term outcome of surgically treated Crohn's colitis: a prospective study. Dis Colon Rectum 48:963–969
13. Tjandra JJ, Fazio VW (1992) Surgery for Crohn's colitis. Int Surg 77:9–14
14. Tekkis PP, Purkayastha S, Lanitis S et al (2006) A comparison of segmental vs subtotal/total colectomy for colonic Crohn's disease: a meta-analysis. Colorectal Dis 8:82–90
15. Prabhakar LP, Laramee C, Nelson H, Dozois RR (1997) Avoiding a stoma: role for segmental or abdominal colectomy in Crohn's colitis. Dis Colon Rectum 40:71–78
16. Sciaudone G, Pellino G, Riegler G, Selvaggi F (2011) Infliximab in drug-naïve patients with failed ileorectal anastomosis for Crohn's disease: A new chance for sparing the rectum? Eur Surg Res 46:163–168
17. Raab Y, Bergstrom R, Ejerblad S, Graf W, Pahlman L (1996) Factor influencing recurrence in Crohn's disease. An analysis of consecutive series of 353 patients treated with primary surgery. Dis Colon Rectum 39:918–925
18. Lock MR, Fazio VW, Farmer RG, Jagelman DG, Lavery IC, Weakley FL (1981) Proximal recurrence and the fate of the rectum following excisional surgery for Crohn's disease of the large bowel. Ann Surg 194:754–760
19. Stalhgren LH, Ferguson LK (1961) The results of surgical treatment of chronic regional enteritis. JAMA 175:986–989
20. Cottone M, Rosselli M, Orlando A et al (1994) Smoking habits and recurrence in Crohn's disease. Gastroenterology 106:643–648
21. Sachar DB, Wolfson DM, Greenstein AJ, Goldberg J, Styczynski R, Janowitz HD (1983) Risk factors of postoperative recurrence of Crohn's disease. Gastroenterology 85:917–921