Laparoscopic subtotal colectomy for medically refractory ulcerative colitis: the time has come

Dana A. Telem · Anthony J. Vine · Garry Swain ·
Celia M. Divino · Barry Salky · Adrian J. Greenstein ·
Michael Harris · L. Brian Katz

Abstract

Purpose To evaluate laparoscopic versus open subtotal colectomy (STC) in patients with ulcerative colitis (UC) requiring urgent or emergent operative intervention.

Methods A retrospective review was performed of 90 patients with medically refractory UC who underwent STC with end ileostomy at The Mount Sinai Medical Center from 2002 to 2007. Patients with toxic megacolon were excluded. Univariate analysis was conducted by unpaired Student t-test and chi-square test. Results are presented as mean ± 95% confidence interval.

Results Ninety patients underwent STC, 29 by laparoscopic and 61 by open approach. In patients undergoing laparoscopic versus open STC, intraoperative blood loss was decreased (130.4 ± 38.4 vs. 201.4 ± 43.2 ml, $p < 0.05$) and operative time prolonged (216.4 ± 20.2 vs. 169.9 ± 14.4 min, $p < 0.01$). In the absence of postoperative complication, hospital length of stay (4.5 ± 0.7 vs. 6 ± 1.3 days, $p < 0.001$) was shorter in laparoscopic versus open group. No mortalities occurred. Overall morbidity, 30-day readmission, and reoperation were equivalent regardless of operative approach. Wound complications were absent in the laparoscopic group compared with 21.4% in the open group ($p < 0.01$). Follow-up at a mean of 36 months demonstrated no difference in restoration of gastrointestinal continuity.

Conclusion Laparoscopic STC confers the benefits of improved cosmesis, reduced intraoperative blood loss, negligible wound complications, and shorter hospital stay.

D. A. Telem · A. J. Vine · G. Swain · C. M. Divino ·
B. Salky · A. J. Greenstein · M. Harris · L. B. Katz (✉)
Department of Surgery, The Mount Sinai Medical Center,
1010 Fifth Avenue, New York, NY 10128, USA
e-mail: lester.katz@mountsinai.org

Laparoscopy is a feasible and safe alternative to open STC in patients with UC refractory to medical therapy requiring urgent or emergent operation.

Ulcerative colitis (UC) is an inflammatory disorder limited to the colon, with rectal involvement in >95% of patients [1]. The annual incidence of UC is reported at 10–12 cases per 100,000 population, with bimodal age distribution. UC peaks in patients aged 15–25 years and again in those 55–65 years of age [2]. The pathogenesis of UC has yet to be well defined. Proposed mechanisms range from autoimmune and immune-mediated phenomena to genetic or environmental predisposition [3–5].

The natural course of UC varies. While some patients remain relatively asymptomatic, others present with disease manifestations requiring operative intervention [6, 7]. Operative indications include failure of immunosuppressive therapy, toxic megacolon, colonic perforation, evidence of carcinoma or dysplasia, and systemic complications from immunosuppressants [8, 9]. When operative intervention is warranted for disease refractory to immunosuppressive therapy, colectomy with subsequent completion proctectomy is curative.

Operative intervention depends upon surgical indication and surgeon preference. Initial interventions range from temporizing measures such as subtotal colectomy (STC) with end ileostomy to one-stage restorative procedures. In the setting of fulminant or severe colitis, STC is recommended. While several prospective studies have demonstrated laparoscopic STC to be a safe alternative to

laparotomy in patients with IBD, few have assessed its utility in the urgent or emergent setting [10–13]. The purpose of this study is to establish the safety and efficacy of laparoscopic STC in UC patients with medically refractory disease requiring urgent or emergent operative intervention.

Patients and methods

Following approval by The Mount Sinai Medical School Institutional Review Board, a retrospective chart review was performed of 90 consecutive patients with medically refractory UC undergoing subtotal colectomy with end ileostomy from January 1, 2002 to December 31, 2007. Patients were identified from an administrative database by cross-matching ICD-9 diagnosis codes for ulcerative colitis (556.0–556.9) with ICD-9 (45.8) and CPT-4 (44150–44160 and 44210–44212) surgical procedure codes for open and laparoscopic subtotal or total abdominal colectomy. Diagnosis of ulcerative colitis was confirmed by patient history and pathologic specimen report.

All operations were performed at The Mount Sinai Medical Center. Laparoscopic procedures were performed by four dedicated laparoscopic surgeons who specialize in inflammatory bowel disease (IBD). All laparoscopic procedures were performed by medial to lateral approach. Specimen extraction was either via the newly created stoma site or by a small Pfannenstiel incision. No hand ports were used (Fig. 1). Open subtotal colectomy was performed by two surgeons, both with dedicated IBD practices and mean 25-year experience. For laparotomy, dissection was carried out lateral to medial and incision size was minimized. Minors, patients with Crohn's disease or indeterminate colitis, patients with toxic megacolon, and patients undergoing subtotal colectomy for colonic dysplasia or neoplasm were excluded from the study.

Preoperative patient demographics, medical and social history, operative indication, and operative record were reviewed. Indications for emergent STC included: failed intensive medical therapy while hospitalized or fulminant colitis. Urgent procedures were performed for failure of outpatient immunomodulatory therapy. Hospital course, length of stay (LOS), and postoperative morbidity and mortality were recorded. Major morbidity was defined as a life-threatening complication, readmission or reoperation within 30 days of surgery. Patient outcome at a mean of 36 months assessing restoration of gastrointestinal continuity was assessed. Univariate analysis was conducted by unpaired Student t-test with two-tailed distribution for quantitative variables and chi-square test for categorical variables. P values of less than 0.05 for associations were considered to indicate statistical significance. Prism 4.0
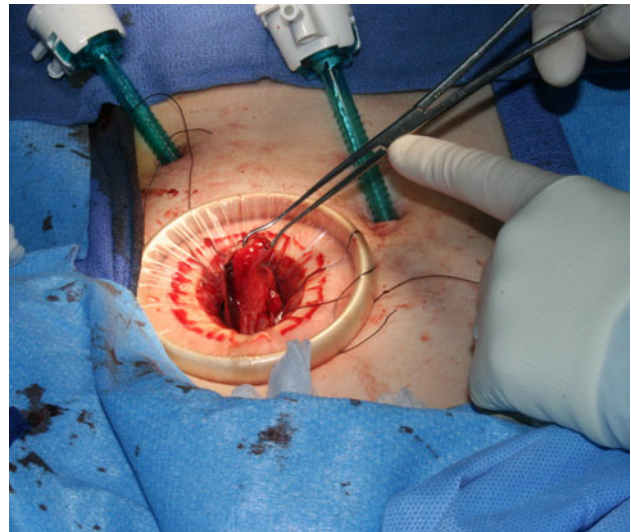

Fig. 1 Specimen extraction via the newly created stoma site

statistical software (April 2003, San Diego, CA) was used for all analyses.

Preoperative bowel preparation, use of ureteral stents, closed suction drains, and method of operation were at the discretion of the individual surgeon. Patients met discharge requirements when they were afebrile for greater than 24 h, tolerated oral diet, had ileostomy function, and achieved adequate pain control on oral pain medication.

Results

Since 2002, 90 patients underwent STC for UC refractory to medical therapy. Sixty-one (66%) patients underwent laparotomy and 29 (34%) underwent laparoscopic procedures. On assessment of patient populations, no difference in age, gender, comorbidity, preoperative American Society of Anesthesiologists (ASA) score, use of preoperative corticosteroids or acuity of presentation was demonstrated (Table 1).

Intraoperative assessment demonstrated that patients undergoing uncomplicated laparoscopic STC had decreased intraoperative blood loss (130.4 ± 38.4 vs. 201.4 ± 43.2 ml, $p < 0.05$) and longer operative times (216.4 ± 20.2 vs. 169.9 ± 14.4 min, $p < 0.01$) versus open STC. Two (7%) patients in the laparoscopic group required open conversion secondary to adhesions. No difference in intraoperative complications was demonstrated. One patient in the open STC group had intraoperative complication of splenic injury requiring splenectomy (Table 2).

Perioperative outcome in patients without complications demonstrated decreased hospital LOS for patients undergoing laparoscopic versus open surgery (4.53 ± 0.74 vs. 6 ± 1.32 days, $p < 0.001$). In the presence of postoperative

Table 1 Demographics and medical history of patients with medically refractory UC undergoing open versus laparoscopic STC

Patient demographic and medical history	Open STC ($n = 61$)	Laparoscopic STC ($n = 29$)	P value
Age (years, mean ± 95% CI)	42.6 ± 4.48	39.8 ± 5.62	NS
Gender			
Male	37 (61%)	13 (45%)	NS
Female	24 (39%	16 (55%)	NS
Comorbidity			
Hypertension	5 (8%)	4 (14%)	NS
Coronary artery disease	2 (3%)	2 (7%)	NS
Cardiac arrhythmia	1 (2%)	3 (10%)	NS
Diabetes	6 (10%)	6 (21%)	NS
Primary biliary cirrhosis	1 (2%)	2 (7%)	NS
Chronic obstructive pulmonary disease	1 (2%)	1 (3%)	NS
Deep vein thrombosis	5 (8%)	1 (3%)	NS
Preoperative medication	100%	100%	NS
Corticosteroid	58 (95%)	26 (90%)	NS
Immunomodulatory agents	54 (89%)	24 (83%)	NS
Prior abdominal surgery	3 (5%)	2 (7%)	NS

NS not significant; *CI* confidence interval

Table 2 Intraoperative course of patients with medically refractory UC undergoing open versus laparoscopic STC

Operative course	Open STC ($n = 61$)	Laparoscopic STC ($n = 29$)	P value
ASA score (mean ± 95% CI)	2.5 ± 0.17	2.34 ± 0.23	NS
Intervention			
Urgent	7 (11%)	5 (17%)	NS
Emergent	54 (89%)	24 (83%)	NS
Estimated blood loss (ml, mean ± 95% CI)	201.4 ± 43.2	130.4 ± 38.4	<0.05
Operative time (min, mean ± 95%CI)	169.9 ± 14.4	216.4 ± 20.2	<0.001
Intraoperative complication	1 (2%)	0 (0%)	NS
Splenic injury	1 (2%)	0 (0%)	NS

NS not significant; *CI* confidence interval

complication, LOS was equivalent regardless of operative approach. No mortalities occurred in either group. Seven wound infections and five wound dehiscences occurred in patients who underwent open STC. No wound complications occurred in the laparoscopic group. A trend toward increased postoperative ileus was demonstrated in patients undergoing laparoscopic surgery as compared with open approach (17% vs. 10%, p = not significant, NS). No difference in overall morbidity, 30-day reoperation or readmission was demonstrated by operative approach (Table 3).

Follow-up at a mean of 36 months demonstrated that the percentage of patients who underwent a restorative procedure was equivalent. Of patients undergoing laparoscopic STC, 19 (66%) underwent restorative procedures, 4 (14%) underwent abdominoperineal resection (APR), and 6 (20%) remained with ileostomy. Of patients who underwent open STC, 46 (75%) underwent restorative procedures, 4 (7%) underwent APR, and 11 remained with ileostomy (18%). Patients with postoperative complications, major or minor, were less likely to undergo restorative procedure, regardless of operative approach. Restoration of gastrointestinal continuity in patients who underwent laparoscopic STC without and with postoperative complications was 81% vs. 54% ($p < 0.05$) and for open STC without and with complications was 100% vs. 57% ($p < 0.01$).

Discussion

Initially met with hesitation, laparoscopic surgery has gradually gained acceptance for the treatment of patients with IBD. Many studies demonstrate the laparoscopic approach to be preferable to laparotomy, particularly for patients with Crohn's disease undergoing primary ileocolic resections [14–18]. The utility of laparoscopy for urgent or emergent operative intervention in patients with UC requiring STC is under investigation. Literature remains limited, with most studies including patients with Crohn's or indeterminate colitis, as well as a mix of laparoscopic and hand-assisted approaches [19]. Cima et al. published one of the largest available series on patients with severe colitis secondary to IBD who required emergent versus semi-emergent STC. Although this descriptive study did not compare the laparoscopic group with a control group, it did demonstrate laparoscopic STC to be a safe procedure in

Table 3 Postoperative length of stay, morbidity, and mortality of patients with medically refractory UC undergoing open versus laparoscopic STC

Perioperative outcome	Open STC (n = 61)	Laparoscopic STC (n = 29)	P value
Length of stay without postoperative complication (days, mean ± 95% CI)	6 ± 1.3	4.5 ± 0.7	<0.001
Length of stay with postoperative complication (days, mean ± 95% CI)	14.4 ± 7.5	10.3 ± 6.14	NS
Mortality	0 (0%)	0 (0%)	NS
Morbidity	21 (34%)	8 (28%)	NS
Ileus	6 (10%)	5 (17%)	NS
Wound complication	13 (21%)	0 (0%)	<0.01
Surgical-site infection	8 (13%)	0 (0%)	<0.05
Wound dehiscence	5 (9%)	0 (0%)	NS
Gastrointestinal bleed	0 (0%)	1 (3%)	NS
Rectal stump dehiscence	1 (2%)	0 (0%)	NS
Mental status change	0 (0%)	1 (3%)	NS
Cardiac arrhythmia	1 (2%)	1 (3%)	NS
Readmission (<30 days)	8 (13%)	3 (10%)	NS
Reoperation (< 30 days)	5 (8%)	2 (7%)	NS
Bowel obstruction	1 (20%)	1 (50%)	NS
Hemorrhage	0 (0%)	1 (50%)	NS
Wound dehiscence	3 (60%)	0 (0%)	NS
Rectal stump dehiscence	1 (20%)	0 (0%)	NS

NS not significant; *CI* confidence interval

this patient population, with resultant shorter hospital stays [20].

Our study focused solely on patients with biopsy-proven UC who required urgent or emergent STC for disease refractory to medical therapy. Patients were well matched by demographic, comorbidity, acuity of presentation, preoperative ASA score, and use of preoperative corticosteroid or immunodmodulatory therapy. Assessment of operative course demonstrated that patients who underwent laparoscopic versus open STC experienced increased operative times but decreased intraoperative blood loss. One intraoperative complication of splenic injury requiring splenectomy occurred in the open STC group. While not statistically significant, available literature does support decreased iatrogenic splenic injury with laparoscopic versus open colectomy [21].

Postoperatively, patients who underwent laparoscopic STC had significantly shorter hospital stays and negligible wound complications as compared with counterparts who underwent laparotomy. Wound complications have long been associated with increased LOS and direct cost of hospitalization [22]. Laparoscopy has been demonstrated by many studies to decrease the postoperative wound complication rate [23]. A prospective study by Poon et al. demonstrated a 50% decrease in surgical-site infections in patients who underwent laparoscopic versus open colorectal resection [24]. This study also demonstrated open colorectal resection as an independent risk factor for development of

surgical-site infection with an odds ratio of 2.36 and 95% confidence interval of 1.1–5.3 [24]. In our study, use of laparoscopy decreased surgical-site infections from 13% to 0% ($p < 0.05$) and wound dehiscence from 9% to 0% ($p = 0.13$). Lack of significance for the latter value is likely representative of a type II error secondary to sample size.

Assessment by operative approach demonstrated no difference in overall morbidity rate for laparoscopic and open STC (34% and 28%, respectively), and both were comparable to morbidity rates reported in the literature [13–20]. Mean follow-up of 36 months demonstrated equivalent time to and percentage of patients who underwent restorative ileal pouch-anal anastomosis (IPAA) with or without diverting loop ileostomy.

Other potential benefits of the laparoscopic versus open approach are decreased development of incisional hernias as well as reduced adhesion formation following abdominal surgery [25]. Decreased intra-abdominal adhesion formation may ultimately reduce incidence of small bowel obstruction and potentially facilitate ease of future IPAA construction. Further investigation and prospective studies are needed to truly assess the impact of laparoscopy on adhesion formation following STC.

Laparoscopic STC confers the benefits of improved cosmesis, reduced intraoperative blood loss, negligible wound complications, and shorter hospital stay for uncomplicated procedures. Urgent or emergent laparoscopic STC is a safe and technically feasible approach to the patient with UC

refractory to medical therapy. The utility of laparoscopy in patients with toxic megacolon, however, should be further investigated and at this time is not recommended or routinely performed by the authors.

References

1. Podolsky DK (2002) Inflammatory bowel disease. N Engl J Med 347:417–429
2. Jayanthi V, Probert CS, Mayberry JF (1991) Epidemiology of inflammatory bowel disease. Q J Med 78(285):5–12
3. Rioux JD, Silverberg MS, Daly MJ, Steinhart AH, McLeod RS, Griffiths AM, Green T, Brettin TS, Stone V, Bull SB, Bitton A, Williams CN, Greenberg GR, Cohen Z, Lander ES, Hudsen TJ, Siminovitch KA (2000) Genomewide search in Canadian families with inflammatory bowel disease reveals two novel susceptibility loci. Am J Hum Genet 66(6):1863–1870
4. Thomas GA, Rhodes J, Green JT (2000) Role of smoking in inflammatory bowel disease: implications for therapy. Postgrad Med J 76(895):273–279
5. Stenson WF, Korzenik J (2003) Inflammatory bowel disease. In: Yamada T (ed) Textbook of gastroenterology, vol 2, 4th edn. Lippincott Williams & Wilkins, Philadephia, pp 1699–1759
6. Brooks JR, Veith FJ (1965) The timing and choice of surgery for ulcerative colitis. The influence of corticosteroids. JAMA 194(2): 115–118
7. Falcone RA Jr, Lewis LG, Warner BW (2000) Predicting the need for colectomy in pediatric patients with ulcerative colitis. J Gastrointest Surg 4(2):201–206
8. Fichera A, Michelassi F (2004) Indication for surgery: a surgeon's opinion. In: Sartor RB, Sandborn WJ (eds) Kirsner's inflammatory bowel diseases, 6th edn. Saunders, New York, pp 596–601
9. Kornbluth A, Sachar DB (2004) Ulcerative colitis practice guidelines in adults (update): American College of Gastroenterology, Practice Parameters Committee. Am J Gastroenterol 99(7): 1371–1385
10. Clinical Outcomes of Surgical Therapy Study Group (2004) A comparison of laparoscopically assisted and open colectomy for colon cancer. N Engl J Med 350(20):2050–2059
11. Lacey AM, Garcia-Valdecass JC, Delgado S, Castells A, Taurá P, Piqué JM, Visa J (2002) Laparoscopy-assisted colectomy versus open colectomy for treatment of nonmetastatic colon cancer: a randomised trial. Lancet 359:2224–2229
12. Abraham NS, Young JM, Solomon MJ (2004) Meta-analysis of short-term outcomes after laparoscopic resection for colorectal cancer. Br J Surg 91:1111–1124
13. Schwenk W, Haase O, Neudecker J, Muller JM (2005) Short term benefits for laparoscopic colorectal resection. Cochrane Database Syst Rev 3:CD003145
14. Milsom JW, Hammerhofer KA, Böhm B, Marcello P, Elson P, Fazio VW (2001) Prospective, randomized trial comparing laparoscopic vs. conventional surgery for refractory ileocolic Crohn's disease. Dis Colon Rectum 44(1):1–8
15. Bergamaschi R, Pessaux P, Arnaud JP (2003) Comparison of conventional and laparoscopic ileocolic resection for Crohn's disease. Dis Colon Rectum 46(8):1129–1133
16. Boyle E, Ridgway PF, Keane FB, Neary P (2008) Laparoscopic colonic resection in inflammatory bowel disease: minimal surgery, minimal access and minimal hospital stay. Colorectal Dis 10(9):911–915
17. Person B (2008) Laparoscopic surgery for inflammatory bowel diseases. Minerva Chir 63(2):151–160
18. Reissman P, Salky BA, Pfeifer J, Edye M, Jagelman DG, Wexner SD (1996) Laparoscopic surgery in the management of inflammatory bowel disease. Am J Surg 171(1):47–50
19. Marceau C, Alves A, Ouaissi M, Bouhnik Y, Valleur P, Panis Y (2007) Laparoscopic subtotal colectomy for acute or severe colitis complicating inflammatory bowel disease: a case-matched study in 88 patients. Surgery 141(5):640–644
20. Holubar SD, Larson DW, Dozois EJ, Pattana-Arun J, Pemberton JH, Cima RR (2009) Minimally invasive subtotal colectomy and ileal pouch-anal anastomosis for fulminant ulcerative colitis: a reasonable approach? Dis Colon Rectum 52(2):187–192
21. Malek MM, Greenstein AJ, Chin EH, Nguyen SQ, Sandler AL, Wong R, Byrn JC, Katz LB, Divino CM (2007) Comparison of iatrogenic splenectomy during open and laparoscopic colon resection. Surg Laparos Endosc Percutan Tech 17(5):385–388
22. Green JW, Wenzel RP (1977) Postoperative wound infection: a controlled study of the increased duration of hospital stay and direct cost of hospitalization. Ann Surg 185(3):264–268
23. Schwenk W, Haase O, Neudecker J, Müller JM (2005) Short term benefits for laparoscopic colorectal resection. Cochrane Database Syst Rev 20(3):CD003145
24. Poon JT, Law WL, Wong IW, Ching PT, Wong LM, Fan JK, Lo OS (2009) Impact of laparoscopic colorectal resection on surgical site infection. Ann Surg 249(1):77–81
25. Dowson HM, Bong JJ, Lovell DP, Worthington TR, Karanjia ND, Rockall TA (2008) Reduced adhesion formation following laparoscopic versus open colorectal surgery. Br J Surg 95(7): 909–914