Annals of Gastroenterology (2011) **24,** 276-279

Minimally invasive surgery in Crohn's disease

Piero Bazzi, Marco Montorsi, Antonino Spinelli

University of Milano, Italy

Abstract

Surgery still represents the most frequent treatment for the management of Crohn's disease complications. The laparoscopic approach has been widely applied over the past twenty years. A longer learning curve has slowed the diffusion of laparoscopic surgical therapy for inflammatory bowel diseases. Today, in selected patients with Crohn's disease, minimally invasive surgery has proved to be as safe and effective as an open approach, leading to reduced postoperative pain and hospital stay, faster return to daily activities, improved cosmetic result, becoming the gold standard of treatment for primary uncomplicated ileocolic disease. The increasing experience of dedicated surgeons explains how the application of laparoscopy has spread to more complicated disease with encouraging results, even if not yet evidence based.

Keywords Crohn's disease, laparoscopic colorectal surgery

Ann Gastroenterol 2011; 24 (4): 276-279

Introduction

Crohn's disease (CD) is a chronic and idiopathic inflammation that can affect any part of the gastrointestinal tract. The terminal ileum is the most frequently involved site and first diagnosis is generally made between the ages of 20 and 30 years. Surgery plays a very important role in the management of this disease and 70-90% [1] of diagnosed patients will eventually require surgical intervention for complications of CD or failure of medical treatment. Reoperation rate is approximately 40-50% within 10-15 years after the first operation [2].

Laparoscopic colorectal surgery began in the early 90's. Nowadays, newly developed instruments, refined skills and the results of clinical trials have all lead to affirm the feasibility and safety of laparoscopic surgery, which should be considered as the first-line surgical approach in selected patients. In fact, minor surgical trauma should lead to a better preservation of immune response, improved cosmetic result, less postoperative pain and faster return of bowel functionality with earlier hospital discharge [3].

Department of General Surgery, University of Milano, Istituto Clinico Humanitas IRCCS, Rozzano Milano, Italy

Conflict of Interest: None

Correspondence to: Antonino Spinelli MD PhD, Dept. and Chair of General Surgery, University of Milano, Istituto Clinico Humanitas IRCCS, Rozzano Milano, Italy, tel: +39 02 8224 4772, fax: +39 02 8224 4590, e-mail: antonino.spinelli@humanitas.it

Received 6 June 2011; accepted 13 July 2011

Primary small bowel Crohn's disease

Several studies, including four randomized trials [4-7] and three meta-analyses [8-10], have demonstrated the benefits of the laparoscopic approach to small bowel Crohn's disease regarding short-term outcomes such as post-operative pain, the use of medication, complication rates, return to normal bowel habits, hospital stay and cosmesis. For these reasons, laparoscopic procedure in primary Crohn's disease is nowadays worldwide considered the first choice surgical treatment.

Many studies have shown laparoscopy to be less painful than open surgery and to require fewer analgesics [11-15].

The reduction in post-operative pain leads to faster mobilization of patients and to an improvement in pulmonary function [17]. These are very important factors for obtaining lower rates of general complications [18] and a smoother recovery.

Benefits of laparoscopic surgery could include lower morbidity, a significantly faster resumption of bowel function and a shorter hospital stay [4,6,19-23]. It is well known that the use of opiate analgesics negatively affects recovery of gastrointestinal function [24]. The laparoscopic approach, due to both limited wound extension and tissue handling, leads to a reduction of post-operative pain, morphine administration and to a quick resolution of paralytic ileus and discharge from hospital, respectively.

Furthermore, laparoscopic surgery improves cosmesis and might induce fewer adhesions [25]. This is very important, because patients are generally young and reoperations are common.

It has been demonstrated that the introduction of a fast-track perioperative care program, also referred to as enhanced

recovery after surgery (*ERAS*) [26,27], may reduce hospital stay to 2-3 days after open colorectal surgery [28,29], even if high readmission rates are reported [28,30]. Only a few studies have evaluated the role of the laparoscopic approach combined to fast-track protocols in enhancing recovery after colorectal surgery and report conflicting results: Basse et al [31] found no difference between fast-track patients undergoing laparoscopic or open resection, while King et al [32] found a significant reduction of the hospital stay in fast-track patients after laparoscopic surgery. The only randomized, multicenter clinical trial (LAFA-study) [33] that investigated both surgical technique (laparoscopic and open) combined with fast-track and standard care demonstrated that the best option is laparoscopic resection embedded in a fast-track care procedure. Nevertheless, this study focused on colon cancer, so these results have not yet been validated in patients with inflammatory bowel disease.

The mean conversion rate reported in the current literature is 11.2% and ranges from 4.8% to 29.2% [8].

As already reported in some studies [6,34,35] the duration of laparoscopic surgery for ileocolic resection can be very similar to open surgery after completion of the learning curve by the surgical team.

The safety of laparoscopic ileocolectomy has also been proven in the long-term outcomes. Eshuis et al reported no differences with open surgery when reoperating for disease recurrence and non-disease related complications. They found no differences between the two groups even considering health-related quality of life indexes like SF-36 that measures physical/mental aspects and the intestine-specific GIQLI. On the contrary, body image and cosmesis scale scores investigated by the BIQ were significantly higher in the laparoscopic group, reflecting greater satisfaction with the cosmetic result [36].

Recurrent small bowel Crohn's disease

Although for primary laparoscopic ileocolectomy there are many clinical trials demonstrating short and long-term benefits, in the current literature there is a paucity of studies which investigate the feasibility and safety of laparoscopic resection for recurrent disease [37-41], and these are often small sample sizes. Recently Chaudhray et al [42] reported one of the largest series of patients who underwent laparoscopic ileocolonic resection for recurrent Crohn's disease, demonstrating the same benefits observed after primary resection without increased complication rates or delayed discharge. Although the operating time was longer, conversion rate was similar to that reported after primary resection.

In conclusion, more contributions with larger sample size are needed to go deeper into this topic, but the laparoscopic approach in recurrent Crohn's disease should not be avoided in principle because, despite high technical difficulty, in expert hands it can be feasible, safe and has significant advantages in the postoperative period.

Crohn's colitis

Terminal ileitis is the most frequent presentation of Crohn's disease and, more rarely, about 30% of cases present disease affecting the colon with or without rectal involvement.

Although for small bowel Crohn's disease the laparoscopic technique has been adopted worldwide and its benefits have been well established, in the present literature only a few studies have investigated the role of laparoscopy in the surgical treatment of Crohn's colitis.

The largest series of laparoscopic colectomies for Crohn's disease has been recently reported by Holubar et al [43] from the Mayo Clinic: 92 patients underwent minimally invasive colectomies with short hospital stay and low postoperative morbidity, confirming prior results obtained by other authors [44,45]. Umanskiy et al [45] also demonstrated reduced operative times: this result can be attributed to the high experience reached by the surgeons, but also to a patient selection bias due to non-randomized inclusion criteria of the laparoscopic group.

Ultimately, the laparoscopic approach is feasible and safe in patients with Crohn's colitis and can improve surgical outcome when performed by experienced hands in selected cases. However, these findings must be supported by more contributions and are not yet validated by randomized controlled trials.

Gastroduodenal Crohn's disease

This is a rare condition that affects up to 4% of patients with Crohn's disease; it can be an asymptomatic endoscopic or clinical-radiographic finding where obstruction is the most frequent presentation. Medical therapy with PPI and steroids or immunosuppressive agents is the current management but sometimes surgery is necessary when medication fails. Gastrojejunal bypass and stricturoplasty are the validated surgical options. Because this type of disease and surgical procedures are very uncommon, there is lack of experience in the current literature regarding the laparoscopic approach in the surgical treatment of gastroduodenal Crohn's disease. Shapiro et al from The Mount Sinai Medical Center [46] published in 2008 their first experiences of 13 laparoscopic gastrojejunal bypasses, reporting lower morbidity rates and shorter hospital stay than after open surgery.

To date, probably due to the rarity of the disease and limited number of operations, no other clinical trials have supported these findings and no certain conclusions on the benefits of laparoscopic procedures in gastroduodenal Crohn's disease can be drawn.

New technical aspects

Single-incision laparoscopic surgery

Single-incision laparoscopic surgery was first described

in the early 1990s when the first appendectomy and cholecystectomy were performed with the aim of minimizing surgical incisions and morbidity rates, improving cosmesis and short-term outcomes in respect to standard laparoscopic procedures. However, this technique developed slowly and only in recent years has been applied to main operations of general, urologic and gynecologic surgery. The initial experience of single-incision laparoscopic segmental colectomy and ileocolic resection for Crohn's disease has been recently reported [47,48], with longer operative time but similar morbidity rates and length of hospital stay compared to laparoscopic assisted procedures. Single-incision laparoscopic colectomy could be feasible and safe when performed by expert laparoscopic surgeons after completing an additional learning curve, and must be validated by further clinical trials.

Laparoscopic resection with transcolonic specimen extraction

Eshuis et al [49] reported a series of ten patients affected by Crohn's disease who underwent total laparoscopic ileocolic resection with endoscopic transcolonic specimen removal. The procedure was possible only for small inflammatory masses (<7-8 cm) and needed longer operative time; infectious complications were high with 2 intraabdominal abscesses and patients did not perceive benefits in terms of body image with respect to conventional laparoscopic surgery. Thus, based on these findings, the benefits of laparoscopic resection followed by endoscopic transcolonic specimen extraction are unclear and the technique would not appear to be as safe as conventional laparoscopic surgery.

References

1. Milsom JW. Laparoscopic surgery in the treatment of Crohn's disease. *Surg Clin North Am* 2005;**85**:25-34.
2. Hasegawa H, Watanabe M, Nishibori H, Okabayashi K, Hibi T, Kitajima M. Laparoscopic surgery for recurrent Crohn's disease. *Br J Surg* 2003;**90**:970-973.
3. Casillas S, Delaney CP. Laparoscopic surgery for inflammatory bowel disease. *Dig Surg* 2005;**22**:135-142.
4. Bemelman WA, Slors JF, Dunker MS, et al. Laparoscopic-assisted *vs* open ileocolic resection for Crohn's disease – a comparative study. *Surg Endosc* 2000;**14**:721-725.
5. Milsom JW, Hammerhofer KA, Bohm B, et al. Prospective, randomized trial comparing laparoscopic vs conventional surgery for refractory ileocolic Crohn's disease. *Dis Colon Rectum* 2001;**44**:1-8.
6. Benoist S, Panis Y, Beaufour A, Bouhnik Y, Matuchansky C, Valleur P. Laparoscopic ileocecal resection in Crohn's disease – a case-matched comparison with open resection. *Surg Endosc* 2003;**17**:814-818.
7. Maartense S, Dunker MS, Slors FM, et al. Laparoscopic-assisted versus open ileocolic resection for Crohn's disease: a randomized trial. *Ann Surg* 2006;**243**:143-149.
8. Tan JJY, Tjandra JJ. Laparoscopic surgery for Crohn's disease: a meta-analysis. *Dis Colon Rectum* 2007;**50**:1-10.
9. Dosman AS, Melis M, Fichera A. Metaanalysis of trials comparing laparoscopic and open surgery for Crohn's disease. *Surg Endosc* 2005;**19**:1549-1555.
10. Tilney HS, Constantinides VA, Heriot AG, et al. Comparison of laparoscopic and open ileocecal resection for Crohn's disease: a meta analysis. *Surg Endosc* 2006;**20**:1036-1044.
11. Schwenk W, Bohm B, Muller JM. Postoperative pain and fatigue after laparoscopic or conventional colorectal resections. A prospective randomized trial. *Surg Endosc* 1998;**12**:1131-1136.
12. Braga M, Vignali A, Zuliani W, et al. Metabolic and functional results after laparoscopic colorectal surgery: a randomized, controlled trial. *Dis Colon Rectum* 2002;**45**:1070-1077.
13. Lezoche E, Feliciotti F, Paganini AM, Guerrieri M, Campagnacci R, De Sanctis A. Laparoscopic colonic resections versus open surgery: a prospective non-randomized study on 310 unselected cases. *Hepatogastroenterology* 2000;**47**:697-708.
14. Danelli G, Berti M, Perotti V, et al. Temperature control and recovery of bowel function after laparoscopic or laparotomic colorectal surgery in patients receiving combined epidural/general anesthesia and postoperative epidural analgesia. *Anesth Analg* 2002;**95**:467-471.
15. Schwenk W, Haase O, Neudecker J, Müller JM. Short term benefits for laparoscopic colorectal resection. *Cochrane Database Syst Rev* 2005;**3**:CD003145.
16. Ekstein P, Szold A, Sagie B, Werbin N, Klausner JM, Weinbroum AA. Laparoscopic surgery may be associated with severe pain and high analgesia requirements in the immediate postoperative period. *Ann Surg* 2006;**243**:41-46.
17. Schwenk W, Bohm B, Witt C, et al. Pulmonary function following laparoscopic or conventional colorectal resection: a randomized controlled evaluation. *Arch Surg* 1999;**134**:6-12.
18. Boni L, Benevento A, Rovera F, et al. Infective complications in laparoscopic surgery. *Surg Infect (Larchmt)* 2006; **7 Suppl 2**: S109-S111.
19. Kirat HT, Pokala N, Vogel JD, et al. Can laparoscopic ileocolic resection be performed with comparable safety to open surgery for regional enteritis: data from National Surgical Quality Improvement Program. *Am Surg* 2010;**76**:1393-1396.
20. Duepree HJ, Senagore AJ, Delaney CP, Brady KM, Fazio VW. Advantages of laparoscopic resection for ileocecal Crohn's disease. *Dis Colon Rectum* 2002;**45**:605-610.
21. Schwenk W, Bohm B, Haase O, Junghans T, Muller JM. Laparoscopic versus conventional colorectal resection: a prospective randomised study of postoperative ileus and early postoperative feeding. *Langenbecks Arch Surg* 1998;**383**:49-55.
22. Msika S, Iannelli A, Deroide G, et al. Can laparoscopy reduce hospital stay in the treatment of Crohn's disease? *Dis Colon Rectum* 2001;**44**:1661-1666.
23. Salimath J, Jones MW, Hunt DL, Lane MK. Comparison of return of bowel function and length of stay in patients undergoing laparoscopic versus open colectomy. *JSLS* 2007;**11**:72-75.
24. Luckey A, Livingston E, Tache Y. Mechanisms and treatment of postoperative ileus. *Arch Surg* 2003;**138**:206-214.
25. Zmora O. Laparoscopy for Crohn's disease. *Semin Laparosc Surg* 2003;**10**:159-167.
26. Wilmore DW, Kehlet H. Management of patients in fast track surgery. *BMJ* 2001;**322**:473-476.
27. Fearon KC, Ljungqvist O, Von Meyenfeldt M, et al. Enhanced recovery after surgery: a consensus review of clinical care for patients undergoing colonic resection. *Clin Nutr* 2005;**24**:466-477.
28. Basse L, Thorbol JE, Lossl K, Kehlet H. Colonic surgery with accelerated rehabilitation or conventional care. *Dis Colon Rectum* 2004;**47**:271-278.
29. Andersen J, Kehlet H. Fast track open ileo-colic resections for Crohn's disease. *Colorectal Dis* 2005;**7**:394-397.
30. Kariv Y, Delaney CP, Senagore AJ, et al. Clinical outcomes and cost analysis of a "fast track" postoperative care pathway for ileal

pouch-anal anastomosis. A case control study. *Dis Colon Rectum* 2006;**50**:137-146.
31. Basse L, Jakobsen DH, Bardram L, et al. Functional recovery after open versus laparoscopic colonic resection: a randomized blinded study. *Ann Surg* 2005;**241**:416-423.
32. King PM, Blazeby JM, Edwings P, et al. Randomized clinical trial comparing laparoscopic and open surgery for colorectal cancer within an enhanced recovery programme. *Br J Surg* 2006;**98**:300-308.
33. Vlug MS, Wind J, Hollmann MW, et al. Laparoscopy in combination with fast track multimodal management is the best perioperative strategy in patients undergoing colonic surgery: a randomized clinical trial (LAFA-study). *Ann Surg* 2011 (in press)
34. Tabet J, Hong D, Kim CW, Wong J, Goodacre R, Anvari M. Laparoscopic versus open bowel resection for Crohn's disease. *Can J Gastroenterol* 2001;**15**:237-242.
35. Luan XJ, Gross E. Laparoscopic assisted surgery for Crohn's disease: an initial experience and results. *J Tongji Med Univ* 2000;**20**:332-335.
36. Eshuis EJ, Slors JF, Stokkers PC, et al. Long-term outcomes following laparoscopically assisted versus open ileocolic resection for Crohn's disease. *Br J Surg* 2010;**97**:563-568.
37. Heimann TM, Greenstein AJ, Lewis B, et al. Comparison of primary and reoperative surgery in patients with Crohn's disease. *Ann Surg* 1998;**227**:492-495.
38. Hasegawa H, Watanabe M, Nishibori H, et al. Laparoscopic surgery for recurrent Crohn's disease. *Br J Surg* 2003;**90**:970-973.
39. Holubar SD, Dozois EJ, Privitera A, et al. Laparoscopic surgery for recurrent ileocolic Crohn's disease. *Inflamm Bowel Dis* 2010;**16**:1382-1386.
40. Broquet A, Bretagnol F, Soprani A, et al. A laparoscopic approach to iterative ileocolic resection for the recurrence of Crohn's disease. *Surg Endosc* 2010;**24**:879-887.
41. Bandyopadhyay D, Sagar PM, Mirnezami A, et al. Laparoscopic resection for recurrent Crohn's disease: safety, feasibility and short-term outcomes. *Colorectal Dis* 2011;**13**:161-165.
42. Chaudhray B, Glancy D, Dixon AR. Laparoscopic surgery for recurrent ileocolic Crohn's disease is as safe and effective as primary resection. *Colorectal Dis* 2010 (in press)
43. Holubar SD, Dozois EJ, Privitera A, et al. Minimally invasive colectomy for Crohn's colitis: a single institution experience. *Inflamm Bowel Dis* 2010;**16**:1940-1946.
44. da Luz Moreira A, Stocchi L, Remzi FH, et al. Laparoscopic surgery for patients with Crohn's colitis: a case-matched study. *J Gastrointest Surg* 2007;**11**:1529-1533.
45. Umanskiy K, Malhotra G, Chase A, et al. Laparoscopic colectomy for Crohn's colitis. A large prospective comparative study. *J Gastrointest Surg* 2010;**14**:658-663.
46. Shapiro M, Greenstein AJ, Byrn J, et al. Surgical management and outcomes of patients with duodenal Crohn's disease. *J Am Coll Surg* 2008;**207**:36-42.
47. Champagne BJ, Lee EC, Leblanc F, et al. Single-incision vs straight laparoscopic segmental colectomy: a case-controlled study. *Dis Colon Rectum* 2011;**54**:183-186.
48. Ross H, Steele S, Whiteford M, et al. Early multi-institution experience with single-incision laparoscopic colectomy. *Dis Colon Rectum* 2011;**54**:187-192.
49. Eshuis EJ, Voermans RP, Stokkers PC, et al. Laparoscopic resection with transcolonic specimen extraction for ileocaecal Crohn's disease. *Br J Surg* 2010;**97**:569-574.