



---

## Laparoscopic surgery in Crohn's disease: state of art

*Antonino Spinelli MD PhD, Piero Bazzi MD*

---

### Abstract

Surgery plays a crucial role in the management of patients affected by Crohn's disease because of the high operation and recurrence rate.

Laparoscopic colorectal surgery for began in the early 90's and demonstrated significant benefits as less post-operative pain, faster post-operative ileus resolution, earlier hospital discharge and improved cosmetic results. In Crohn's disease, the laparoscopic approach was adopted more slowly than in other colorectal diseases, becoming the surgical approach of choice for selected patients and,

later, its indications have extended to complicated or recurrent disease in high volume referral centres. A further evolution of laparoscopic surgery in patients with Crohn's disease is nowadays represented by the use of Single Incision Laparoscopic Surgery (SILS).

Moreover, patients undergoing laparoscopic surgery for Crohn's disease may benefit from a combination with an enhanced recovery perioperative care program, resulting in a smoother and faster perioperative course.

---

### 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 50% and of these, 50% will need a third 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 post-operative pain and faster return of bowel functionality with earlier hospital discharge[3].

---

### 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 ileocaecal Crohn's disease is nowadays

worldwide considered the first choice surgical treatment.

The mean conversion rate reported in the literature is between 10%-20%, even if there is a broad variability concerning the rate of conversion from laparoscopic to open surgery, where it ranges from 5% to 40%, probably due to a vague definition of "conversion" and to strong differences in patients cohorts[11].

The safety of laparoscopic ileocelectomy has been proven also in the long-term outcomes.



Eshuis and colleagues 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[12].

A recent meta-analysis by Patel and colleagues [13] confirmed reduced perioperative complications an incisional hernia following laparoscopic surgery in patients with Crohn's disease, with similar rates of surgical recurrence.

---

## 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.

While for small bowel Crohn's disease laparoscopic technique has been worldwide adopted with demonstrated benefits, the role of laparoscopy in the surgical treatment of Crohn's colitis is not yet well established too.

The largest series of laparoscopic colectomies for Crohn's disease has been reported by Holubar and colleagues[14] from the Mayo Clinic: 92 patients underwent mini-invasive

colectomies with short hospital stay and low postoperative morbidity, confirming prior results obtained by other Authors[ 15,16] . Nakajima and coworkers[17] with the hand-assisted laparoscopic colectomy also demonstrated operative times similar to open surgery, significantly shorter than traditional laparoscopic technique.

The laparoscopic approach is feasible and safe in patients with Crohn's colitis and can improve surgical outcome when performed by experienced hands. However, the advantages are not yet validated by randomized controlled trials.

---

## Recurrent small bowel Crohn's disease

While for primary laparoscopic ileocelectomy many clinical trials demonstrated short and long-term benefits, in the current literature there is a more limited experience referred to recurrent disease [18]. Nevertheless, the available studies showed that the laparoscopic approach to recurrent Crohn's disease should not be avoided in principle; despite high

technical difficulty, in hands of IBD surgeons with a deep expertise in laparoscopic surgery, it can be feasible, safe and lead to significant advantages in the postoperative period. We believe that laparoscopy for recurrence will be more often proposable in the near future, due to the increasing number of first operations already performed by laparoscopy.

---

## Evolution of perioperative care: Enhanced Recovery After Surgery

Two major innovations have characterized colorectal surgery over the past 20 years, namely, the introduction of laparoscopic surgery and the use of fast-track perioperative care protocols, also referred to as enhanced recovery after surgery (ERAS); this type of protocol was first developed by Henrik Kehlet in the 1990s, with the aim of reducing surgical stress and achieving smoother and faster recovery for patients[19]. ERAS have shown advantages in the postoperative outcomes of

patients undergoing open or laparoscopic resection for colorectal cancer, in particular rates of recovery and length of hospital stay[20-23]. More recently, a multicenter randomized controlled trial (the LAFA study), comparing the four combinations of ERAS or conventional care with laparoscopic or open surgery, clearly demonstrated that laparoscopic surgery with an ERAS protocol is the best option for oncologic patients[24]. However, to date, there is limited evidence on



the use of ERAS in patients with Crohn's disease. Some studies that assessed ERAS in patients undergoing colorectal resection have included a minority of patients with Crohn's disease, but no clear conclusions can be drawn from these reports since the populations are mixed, and outcomes are not reported according to disease[25-28]. Only a single study has reported the feasibility and safety of ERAS specifically in CD patients, and this in patients undergoing open surgery[29]. We recently report the first experience focused

on the combination of ERAS with laparoscopic surgery in patients with primary ileocaecal Crohn's disease: in a cohort of twenty consecutive patients prospectively enrolled and compared with a matched control-group treated with laparoscopic surgery and conventional perioperative care program (n=70), we demonstrated a faster recovery of bowel function and a shorter hospital stay with similar complication and hospital re-admission rates[30].

---

## Technical development: Single-Incision Laparoscopic Surgery

Single-incision laparoscopic surgery (SILS) was first described in the early 1990s applied to appendectomy and cholecystectomy; this technique has been developed to decrease abdominal wall trauma further by reducing the number of abdominal incisions compared with the standard laparoscopic approach, with the potential benefits of lower postoperative pain, shorter hospital stay and improved cosmesis. The umbilicus is most frequently used as the single access, through which the specimen is dissected and extracted. However, this technique developed slowly and only in recent years has it been applied to main operation of general, urologic and gynaecologic surgery; the first experience of single incision laparoscopic segmental colectomy was reported in 2008[31].

SILS has been described for ileocolic resections and colectomies in patients affected by Crohn's disease, even in presence of previous surgery or complications such as fistulas; nevertheless, these reports are limited to small patient series, demonstrating the technical feasibility: no prospective randomized trials are available.

In the experiences reported by Rijcken and Maeda[32,33], no substantial differences were demonstrated in the postoperative outcome of

patients who underwent laparoscopic ileocolic resection with single-port or multi-port technique. On the contrary, Gardenbroek and coworkers from Amsterdam[34] reported in a similar 20 patients cohort of single-incision laparoscopic ileocolic resection a significant reduction in postoperative pain, hospital stay and operative time compared to a control group who underwent to standard laparoscopic ileocolic resection. Kawaharaha and colleagues reported the first and unique case of single incision laparoscopic ileocolic resection for recurrent Crohn's disease[35].

Single-incision laparoscopic total/subtotal colectomies with or without ileorectal anastomoses are reported too, but focusing on patients affected by Crohn's disease we could not find a specific experience: this are few cases included in larger and heterogeneous series [36-38] where the technique has been demonstrated as feasible and safe, without significant postoperative advantages except for cosmesis.

Anyway, single-incision laparoscopic segmental resection or total colectomy is technically feasible and safe when performed by expert laparoscopic surgeons after completing an additional learning curve, and must be validated by further clinical trials.

---

## References

1. Milsom JW. Laparoscopic surgery in the treatment of Crohn's disease. *Surg Clin North Am* 2005; 85: 25-34.
2. Bernstein CN, Loftus EV Jr, Ng SC, Lakatos PL, Moum B. Hospitalisations and surgery in Crohn's disease. *Gut* 2012; 61(4): 622-9.
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. 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. 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. 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. 8. Tan JJY, Tjandra JJ. Laparoscopic surgery for Crohn's disease: a meta-analysis. *Dis Colon Rectum* 2007; 50(1): 1-10.
9. 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. 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. 11. Neumann PA, Rijcken EJ, Bruewer M. Current status of laparoscopic surgery for patients with Crohn's disease. *Int J Colorectal Dis* 2013; 28: 599-610.
12. 12. 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(4): 563-568.
13. 13. Patel SV, Ramagopalan SV, Ott MC. Laparoscopic surgery for Crohn's disease: a meta-analysis of perioperative complications and long term outcomes compared with open surgery. *BMC Surg* 2013; 13(1): 14.
14. 14. 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.
15. 15. 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.
16. 16. Umanskiy K, Malhotra G, Chase A et al. Laparoscopic colectomy for Crohn's colitis. A large prospective comparative study. *J Gastrintest Surg* 2010; 14: 658-663.
17. 17. Nakajima K, Nezu R, Hirota M et al. The role of hand-assisted laparoscopic surgery in subtotal and total colectomy for Crohn's colitis: an experience with 335 cases. *Surg Endosc* 2010; 24: 2713-2717.
18. 18. Spinelli A, Sacchi M, Bazzi P, Leone N, Danese S, Montorsi M. Laparoscopic surgery for recurrent Crohn's disease. *Gastroenterol Res Pract* 2012;2012:381017.
19. 19. Kehlet H. Multimodal approach to control postoperative pathophysiology and rehabilitation. *Br J Anaesth* 1997;78:606-617.
20. 20. Gatt M, Anderson AD, Reddy BS, Hayward-Sampson P, Tring IC, MacFie J. Randomized clinical trial of multimodal optimization of surgical care in patients undergoing major colonic resection. *Br J Surg* 2005;92:1354-1362.
21. 21. Khoo CK, Vickery CJ, Forsyth N, Vinall NS, Eyre-Brook IA. A prospective randomized controlled trial of multimodal perioperative management protocol in patients undergoing elective colorectal resection for cancer. *Ann Surg* 2007;245:867-72.
22. 22. Serclová Z, Dytrych P, Marvan J, Nová K, Hankeová Z, Ryska O, Slégrová Z, Buresová L, Trávníková L, Antos F. Fast-track in open intestinal surgery: prospective randomized study. *Clin Nutr* 2009;28: 618-624.
23. 23. Ionescu D, Iancu C, Ion D, Al-Hajjar N, Margarit S, Mocan L, Mocan T, Deac D, Bodea R, Vasian H. Implementing fast-track protocol for colorectal surgery: a prospective randomized clinical trial. *World J Surg* 2009;33:2433-2438.
24. 24. Vlug MS, Wind J, Hollmann MW, Ubbink DT, Cense HA, Engel AF, Gerhards MF, van Wagenveld BA, van der Zaag ES, van Geloven AA, Sprangers MA, Cuesta MA, Bemelman WA. Laparoscopy in combination with fast track multimodal management is the best perioperative strategy in patients undergoing colonic surgery: a randomized clinical trial (LAFAs-study). *Ann Surg* 2011;254:868-875
25. 25. Polle SW, Wind J, Fuhring JW, Hofland J, Gouma DJ, Bemelman WA. Implementation of a fast-track perioperative care program: what are the difficulties? *Dig Surg* 2007;24:441-449.
26. 26. Vlug MS, Wind J, Van Der Zaag E, Ubbink DT, Cense HA, Bemelman WA. Systematic review of laparoscopic vs open colonic surgery within an enhanced



- recovery programme. *Colorectal Dis* 2009;11:335-343.
28. 27. Verheijen PM, Vd Ven AW, Davids PH, Vd Wall BJ, Pronk A. Feasibility of enhanced recovery programme in various patient groups. *Int J Colorectal Dis* 2012;27:507-511.
29. 28. Delaney CP, Brady K, Woconish D, Parmar SP, Champagne BJ. Towards optimizing perioperative colorectal care: outcomes for 1,000 consecutive laparoscopic colon procedures using enhanced recovery pathways. *Am J Surg* 2012;203:353-355
30. 29. Andersen J, Kehlet H. Fast track open ileo-colic resections for Crohn's disease. *Colorectal Disease* 2005;7:394-397.
31. 30. Spinelli A, Bazzi P, Sacchi M, Danese S, Fiorino G, Malesci A, Gentilini L, Poggioli G, Montorsi M. Short-term outcomes of laparoscopy combined with enhanced recovery pathway after ileocecal resection for Crohn's disease: a case-matched analysis. *J Gastrointest Surg* 2013;17(1):126-32.
32. 31. Remzi FH, Kirat HT, Kaouk JH, Geisler DP. Single-port laparoscopy in colorectal surgery. *Colorectal Dis.* 2008 Oct;10(8):823-6.
33. 32. Rijcken E, Mennigen R, Argyris I, Senninger N, Bruewer M. Single-incision laparoscopic surgery for ileocolic resection in Crohn's disease. *Dis Colon Rectum.* 2012 Feb;55(2):140-6.
34. 33. Maeda K, Noda E, Nagahara H, Inoue T, Takii M, Watanabe K, Yamagami H, Sogawa M, Kamata N, Hirakawa K. A comparative study of single-incision versus conventional multiport laparoscopic ileocecal resection for Crohn's disease with strictures. *Asian J Endosc Surg.* 2012 Aug;5(3):118-22.
35. 34. Gardenbroek TJ, Verlaan T, Tanis PJ, Ponsioen CY, D'Haens GR, Buskens CJ, Bemelman WA. Single-port versus multiport laparoscopic ileocecal resection for Crohn's disease. *J Crohns Colitis.* 2013 Mar 15. doi:pii: S1873-9946(13)00097-4. 10.1016/j.crohns.2013.02.015. [Epub ahead of print].
36. 35. Kawahara H, Watanabe K, Ushigome T, Noaki R, Kobayashi S, Yanaga K. Single-incision laparoscopic right colectomy for recurrent Crohn's disease. *Hepatogastroenterology* 2010; 57(102-103):1170-2.
37. 36. Champagne BJ, Papaconstantinou HT, Parmar SS, Nagle DA, Young-Fadok TM, Lee EC, Delaney CP. Single-incision versus standard multiport laparoscopic colectomy: a multicenter, case-controlled comparison. *Ann Surg* 2012; 255:66-9.
38. 37. Paranjape C, Ojo OJ, Carne D, Guyton D. Single-incision laparoscopic total colectomy. *JLS* 2012; 16(1): 27-32.
39. 38. Leblanc F, Makhija R, Champagne BJ, Delaney CP. Single incision laparoscopic total colectomy and proctocolectomy for benign disease: initial experience. *Colorectal Dis* 2011; 13(11): 1290-3.