Minimally invasive surgery in Crohn’s disease

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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

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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. Nowdays, 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].

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

Conflict of Interest: None

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Recurrent small bowel Crohn’s disease

Although for primary laparoscopic ileocolonectomy 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 Crohn’s 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.

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