Crohn’s disease: a modern view on surgical management

Since its first description in 1932, Crohn’s disease (CD) remains a challenging pathology. While still incurable, major improvements in medical and surgical treatments have been recently made. However, during their lifetime, up to 80% of patients with CD will eventually require surgery. Therefore, improving the outcomes is a major goal, but it requires a multidisciplinary environment. The aim of this mini-review is to analyze the modern surgical management of CD, focusing on the pre-, the intra-, and postoperative management.

Crohn’s disease (CD) was first described by Burrill B. Crohn and colleagues in 19321. Since its first description, the exact pathogenesis of CD remains relatively unclear. A complex interplay between conditioning factors (genetic influences, triggering events) and effector mechanisms (tissue damage through dysregulation of the intestinal immune and nonimmune functions) seems to explain most of the pathogenesis of the disease2. The integration of clinical, biological, radiological, endoscopic, and histological features is required to make the diagnosis3, 4.

In 2016, CD is still incurable. Therefore, the concept in treating CD is to induce remission and then to maintain it1. Recently, medical therapy has evolved and new drugs have been introduced with success, such as biological agents (anti-TNF: infliximab, adalimumab and more recently the gut-specific vedolizumab)5-7. However, more than half of the patients still require surgery within 10 years of their diagnosis8-10. The aim of this review is to analyze the modern surgical management of CD.

A Short Note on History

When Crohn and colleagues initially described the disease, CD was thought to be best treated as a cancer with wide oncological resection margins and extensive mesenteric dissection. However, this came at the cost of the sacrifice of long segments of bowel with still a high recurrence rate. Subsequently, bypass of affected segments has been tried but rapidly abandoned (frequent complications2 and risk of tumoral development in the diverted segment5). The return to (limited) resectional surgery and development of stricturoplasty were the first steps towards modern surgical management. Recently, laparoscopic surgery has been introduced with success11.

Historically, medical treatment (often steroids) was continued until there was no other option than surgery. The main drawback of this approach is the timing of surgery and the fitness of the patient, who will generally be fragile and debilitated by the time of surgery, significantly increasing the risk of (post)operative complications. A more flexible approach, with surgery proposed earlier, is probably safer, but implies multidisciplinary management.

Modern Surgical Management

Surgical indications have evolved during the last decades. Today, surgery is indicated for complications related to CD. These include strictures, fistulae, abscess, failure of medical therapy, perforation, hemorrhage, and cancer8, 12. During their lifetime, 80% of patients with CD will eventually require surgery4, 8, 13. Interestingly, most patients with CD would have preferred to have had their surgery done 12 months earlier because of the achieved improvements3, 14. However, we should keep in mind that surgery is not curative and recurrence is common if not the norm7, 8, 15.

Preoperative management

Before considering surgery, several parameters need to be considered. Two distinct situations can be encountered: elective and emergency presentation. Obviously, the preparation for surgery mainly depends on this initial presentation. However, a complete preoperative assessment is imperative and a good collaboration between surgeons and gastroenterologists is an essential principle in the decision-making process.

Excellent perioperative care is essential for good outcomes in patients with CD3, 12. The addition of a personalized enhanced recovery protocol to perioperative care, such as Enhanced Recovery After Surgery (ERAS) or Fast Track, can improve patient outcomes. It encompasses a preoperative, intraoperative, and postoperative care regimen16.

Overall the preoperative care regimen should include (Table 1)3, 4, 12:

a. Reduce the risk factors of anastomotic complication by improving nutrition (enteral or parenteral nutrition), weaning steroids (if possible) and draining sepsis (percutaneously or surgically)
b. Allowing fluid and carbohydrate loading just before the surgery if possible (ERAS)16
c. Correct the electrolytes and normalize hemoglobin/hematocrit levels
d. Consider the risk of adrenal suppression in patients chronically on steroids
e. Ensure up to date imaging (Magnetic Resonance Enterography or Computed Tomography Enterography) and colonoscopy, especially to ensure no obstruction distally to planned anastomoses
f. Ensure multidisciplinary team (MDT) discussion and appropriate involvement of dieticians, stomatherapists, and psychologists in pre-op preparation. Medical and surgical counseling is important, and the patient should be aware of the potential complications (written consent)
g. Ensure proper deep vein thrombosis prophylaxis, using low-molecular-weight heparin, compression stockings, intermittent calf compression devices (high risk of thrombotic complications13)
h. Limit the use of bowel preparation (ERAS)16

Operative management
Patients with CD can be among the most technically difficult cases a surgeon will face2. Several technical aspects must be considered4: 
a. Using minimally invasive surgery as much as reasonably possible. A systematic review has reported favorable outcomes following laparoscopic resection for CD11. Better short-term outcomes can be expected16, 18 with an obvious advantage in terms of cosmetics. In addition, laparoscopy can theoretically reduce the formation of adhesions19, which is important considering the risk of reoperation in these patients. Robotic and single site procedures have been shown to be feasible and safe in selected CD patients16, 20.
b. Performing on-table endoscopy if required or if the anatomy is not clear (exclude distal stricture/stenosis when performing an anastomosis)
c. Preserving bowel length by minimal resections or use of stricturoplasty23
d. Avoiding anastomoses if major risk factors are present (sepsis, steroids, malnutrition). The risk of anastomotic leak is significant in CD and can lead to major abdominal catastrophe (enterocutaneous fistula, perforation, death). Several risk factors have been shown to be independently associated with anastomotic leak: presence of intra-abdominal sepsis, steroids and malnutrition20, 21. If more than one of these risk factors is present, an anastomosis (or a stricturoplasty) should be discouraged and a stoma is advised. A stoma should not be considered as a failure, but more as a bridge towards definitive treatment when the surgical environment will be more favorable. On the other hand, the preoperative use of azathioprine or mesacaptopurine does not seem to increase the risk of anastomotic leak22. Regarding the use of biological agents, there is still a debate with conflicting results16, 22.
e. Dealing carefully with inflamed and oedematous vascular mesenteric pedicles (use of transfixion stitch or vascular staplers)
f. Rigorous surgical technique (minimizing spillage of gastrointestinal content, meticulous hemostasis, repairing any serosal tear or enterotomy)
g. Recognizing all the strictures (especially the distal ones), by using a Foley catheter (balloon inflated at 2-2.5 cm) or a steel ball.

Small bowel disease
Small bowel is affected by CD in 30% of cases6. The surgeon should preserve the length of small bowel as much as reasonably possible. Minimal resections with 2cm macroscopic margins are recommended, and extensive resection should be clearly avoided. The risk of short bowel syndrome is obvious8 with all its devastating consequences, especially considering the likelihood of recurrent disease and further operations. In addition, studies have shown that there are no advantages of extensive resection in terms of recurrence8.

Stricturoplasty is appealing by preserving the bowel length and treating short fibrotic stenosis. Long (Finney) and extra-long (Michelassi) stricturoplasties have been shown feasible and reasonably safe6. There is a low complications rate following stricturoplasty: 4% septic complications and 23% recurrence rate23. Less than 10% of the stricturoplasties themselves restricture, so most of the recurrent disease occurs at the new sites24.

Patients with small bowel CD have a 30 fold-increased risk to develop an intestinal adenocarcinoma. In these (rare) circumstances, a true oncological resection is mandatory with adequate margins and sufficient lymphadenectomy.

Ileoacael disease
The ileoacael area is the most commonly affected location (30-50% of cases)1. There is a current trend to encourage early surgery for isolated strictureing TI, when the general condition of the patient is still good, rather than after prolonged medical therapy4. A minimally invasive ileocolacal resection is the procedure of choice16, 20. The ileocolacal resection should be limited, including only a few centimeters of macroscopically normal bowel at each end21. More extensive resections have not yet been shown to reduce the risk of recurrence. The best anastomosis is still debated. However, there is evidence that stapled joins are associated with lower risk of anastomotic leak25. Others did not find any significant differences26.

Recently, stricturoplasty over the ileocolacal valve has been reported with encouraging results20, but the experience remains limited. For recurrent anastomotic stricture (up to 40% at 10 years), endoscopic dilation is a valid option with a short-term benefit in 60-80% of cases, with a risk of perforation around 2-11%26. Re-resection of ileocolic anastomasis is safe, even by laparoscopy16.

Colonie disease
About 30% of patients with CD have disease localized to the colon5. Half of them eventually require a surgery within 10 years and a quarter will end up with a permanent stoma4, 30. The choice of the surgery depends on the distribution and the extent of the inflammation, the presence or absence of proctitis and perianal disease, the presence of a suspicious lesion, and the current medical treatment (steroids).

In terms of resection, there are mainly two options: segmental and total colectomy. The former may be indicated for an isolated segment of inflammation or stricture. Similar outcomes can be achieved when comparing segmental and total colectomy, but there is an increased risk of early recurrence in the segmental group23, 31. Stricteuroplasty is not indicated for colonic stricture, notably because of the risk of malignancy in CD colitis. A resection should be the rule. Total colectomy with ileorectal anastomosis is an option if there is rectal sparring (25% of cases), with a normally functioning rectum and a good sphincter mechanism13-4.

In case of emergency presentation (toxic megacolon, perforation, hemorrhage, severe colitis not responding to medical therapy), a total abdominal colectomy and end ileostomy should be performed. When the patient has recovered from this initial surgery, completion proctectomy with permanent ileostomy or ileorectal anastomasis can be performed. This choice depends on patient’s preferences, sphincter function and severity of proctitis.

Defunctioning ileostomy may be used to decrease colonic inflammation (unlike ulcerative colitis) and may be considered for CD colitis. This will allow clinical improvement in over 80%3. Half will be able to have the stoma closed initially, but only 20% eventually continue without relapse with adequate function3, 4, 32. Therefore, most of these patients may still need a proctocolectomy with permanent ileostomy. This operation is the gold standard for treating colorectal disease and is associated with the lowest recurrence rate3. The most common complication of this procedure is perineal delayed wound healing, especially when an extensive perianal disease is present. The use of myocutaneous flap to close the perineal cavity and wound may be required3. The role of restorative proctocolectomy with an ileal pouch is still debated. Most authors regard CD as a contra-indication for restorative procedure, because the risk of pouch failure can be as high as 45%3.
Perianal disease
Anal pathology is extremely common in patients with CD (more than 50%)\(^3\), especially when distal inflammation is present. There is a highly variable clinical presentation, from very mild skin tags or fissure to extensive ulceration with perineal destruction. While rare, carcinoma is a recognized complication. Initial management should assess the activity of the bowel disease (endoscopy, MRE), and evaluate the perianal disease itself (examination under anesthesia, endoanal ultrasound, MRI)\(^3\). Several factors need to be considered when planning surgery: the presence of proctitis, the severity of disease (simple or complex fistula, undrained sepsis), the patient’s symptoms and expectations.

Quoting famous surgeons, «fecal incontinence is the result of aggressive surgeons and not progressive disease» (J. Alexander-Williams 1976; N. J. Mortsens 2015). Thus, conservative management should be a priority for mild disease (fissure, skin tags, and hemorrhoids). As a general rule, surgery should not be undertaken in the presence of active proctitis\(^3\).

For fistulating disease, four different phases can be seen\(^3, 4, 33, 34\):

a. First aid: drainage of peri-anal abscesses if there is an obvious fistula, avoiding fistula repair (high failure rate) or fistulotomy (risk of incontinence).

b. Bridging treatment: typically this phase involves leaving Seton drains in place, short course antibiotics (metronidazole and/or ciprofloxacin) and optimisation of medical therapy (azathioprine, infliximab, adalimumab). Failure of this phase necessitates a search for sepsis with an MRI or examination under anesthesia. Occasionally, a defunctioning stoma is necessary to bridge to a controlled situation.

c. Quality of life treatment: ranges from long-term Seton placement if there is an obvious fistula, avoiding fistula repair (high failure rate) or fistulotomy (risk of incontinence).

d. Planning for proctectomy: if attempts to heal anal fistulae are unrealistic, then long term defunctioning or proctectomy may be needed. Myocutaneous flap for perineal closure may be required.

Postoperative management
While surgery can be technically challenging, the postoperative course can be even more so. To improve the outcomes, enhanced recovery programs have been developed with quick resumption of diet, stimulation of gut motility, prevention of nausea and vomiting, avoidance of salt and water overload, use of non-opioid oral analgesia, and early removal of urinary catheters and drains\(^3\). However, it can be difficult to apply these recommendations for patients with CD after major surgery. A flexible approach is probably more advisable.

Globally, a low threshold for evaluation of suspected post-operative sepsis is recommended. On the other hand, one should be cautious to avoid re-operating on hostile abdomen, potentially causing more harm\(^3\). If an enterocutaneous fistula occurs, the acronym SNAPP (control of Sepsis, improve Nutritional state, assessment of Anatomy, Protection of skin, Plan reoperation) should be followed. If the fistula is distal, long, and has a small caliber, if there is no distal obstruction, and the nutrition is optimized, there is a good chance of spontaneous closure.

Regarding the risk of recurrent CD, all patients should be strongly encouraged to stop smoking\(^3, 4, 35\). In addition, different drugs (biologics, 5-ASA, thiopurines) have been shown to reduce the risk of recurrence\(^15, 36\). However, an individualized discussion is crucial and again MDT discussion is the cornerstone of the postoperative management of patients with CD. Nowadays, the risk of recurrence at 10 years is 44\(^\%\)\(^15\) and 56\(^\%\)\(^20\) at 20 years\(^20\). This emphasizes the importance of follow-up (endoscopy, MRE) to identify patients who will benefit from early and aggressive medical management\(^15\).

Conclusion
Surgery for CD is challenging and therefore several parameters need to be considered to improve surgical outcomes. The surgical management starts preoperatively, with a good collaboration with gastroenterologists being the definite cornerstone of a multidisciplinary management. A liberal, but responsible, use of minimally invasive surgery and the application of key concepts of enhanced recovery programs are helpful tools to decrease morbidity. Preserving bowel length and avoiding anastomosis when the environment is unfavourable should be kept in mind.

Table 1. Perioperative management for CD: parameters to consider.

<table>
<thead>
<tr>
<th>Preoperative</th>
<th>Intraoperative</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multidisciplinary / multispecialty meeting / ERAS protocol</td>
<td>Use of minimally invasive surgery / ERAS protocol</td>
<td>Multidisciplinary / multispecialty meeting / ERAS protocol</td>
</tr>
<tr>
<td>Improvement of nutrition (TPN or enteral nutrition)</td>
<td>Preserving bowel length</td>
<td>Improvement of nutrition (TPN most of the time)</td>
</tr>
<tr>
<td>Treatment of sepsis (preoperative drainage)</td>
<td>Avoiding gastrointestinal spillage, careful repair of serosal tear/enterotomy, assessing any distal stricture (Foley, ball)</td>
<td>Aggressive treatment/research of intra-abdominal sepsis</td>
</tr>
<tr>
<td>Weaning of steroids</td>
<td>If risk factors: consider stoma</td>
<td>Drugs to reduce risk of recurrence, stop smoking</td>
</tr>
<tr>
<td>Correction of electrolytes and haemoglobin</td>
<td>Haemostasis, transfusion stitches for mesentery</td>
<td>Correction of electrolytes and haemoglobin</td>
</tr>
<tr>
<td>Considering the risk of adrenal suppression</td>
<td>Considering the risk of adrenal suppression</td>
<td>Considering the risk of adrenal suppression and then weaning steroids</td>
</tr>
<tr>
<td>Up-to-date imaging and endoscopy</td>
<td>On-table endoscopy if required</td>
<td>Low threshold for repeating imaging (complications?)</td>
</tr>
<tr>
<td>DVT prophylaxis (LMWH, stockings)</td>
<td>DVT prophylaxis (stockings, compression device)</td>
<td>DVT prophylaxis (LMWH, stockings)</td>
</tr>
</tbody>
</table>

References


