

A think tank of the Italian society of colorectal surgery (SICCR) on the surgical treatment of inflammatory bowel disease using the Delphi method: Crohn's disease

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Abstract The management of Crohn's disease (CD) requires extensive expertise. Many treatment options are available, and surgery still plays a crucial role. In recent years, many medical societies have provided surgeons and gastroenterologists dealing with CD with authoritative guidelines. However, a certain degree of variation can be observed in these papers, and application of guidelines in clinical practice should be improved. The Italian society of colorectal surgery (SICCR) promoted the project reported here, which consists of a think tank of Italian colorectal surgeons to address the surgical aspects of CD management. Members of the society were invited to express their opinions on several items proposed by the writing committee, based on evidence available in the literature. The results are presented, focusing on relevant points. The present paper is not an alternative to available guidelines; rather, it offers a snapshot of the attitudes of SICCR surgeons about the surgical treatment of CD. The management of CD is, by necessity, patient-tailored, and it is based on clinical data and surgeon's preference, but the committee was able to identify some points of major

disagreement and suggested strategies to improve quality of available data and acceptance of guidelines.

Keywords Crohn's disease · Inflammatory bowel disease · Surgery · Guidelines

Introduction

In recent years, several medical societies have published authoritative consensus guidelines concerning the management of inflammatory bowel disease (IBD). These papers agree on the majority of topics, but several discrepancies can be noticed between guidelines from different societies. The present consensus on Crohn's disease (CD) and another on ulcerative colitis (UC) [1] represent a think tank of Italian colorectal surgeons affiliated with the Italian society of colorectal surgery (SICCR) (<http://www.siccr.org/index.php?lang=ENG&pagid=home>). These are not intended to replace or implement available guidelines. The aim of this project, promoted by SICCR, was to identify the agreement of surgeons affiliated with SICCR who treat patients with IBD with the evidence in the literature, in order to identify areas where there is room for improvement and points that could be clarified by collaborative studies.

The project was articulated in three steps with iterative revision of the output (Delphi method):

1. *Review and identification of relevant questions* Literature review and identification of critical points from a surgeon's perspective, drafting of "items" and supporting text, and circulation among members of the project committee. Experts joining the consensus defined relevant questions concerning surgery for

On behalf of the Italian society of colorectal surgery (SICCR).

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IBD based on the literature data and personal experience. The junior consensus participants had the task of systematically reviewing the literature (assigning priority to papers published within the last 15 years) for the defined questions, and to write the first draft of the text. The level of evidence (EL) was graded according to the “The Oxford Levels of Evidence 2” of the Oxford Centre for Evidence-Based Medicine (OCEBM) (<http://www.cebm.net/index.aspx?o=5653>). The panel Chairs reviewed the text according to the literature data and wrote provisional *items* that were circulated among the committee along with the supporting text, which was modified according to members’ comments. The text with *items* was then submitted to the SICCR Governing Board. Items were kept if they achieved enough priority and agreement; otherwise, they were removed or changed.

2. *Broad circulation of “items”* After revisions and approval by the Governing Board, *items* with EL were circulated among SICCR members dealing with IBD through two Web-based surveys (CD and UC). Members were asked to rate items anonymously (“Agree”, “Partially agree”, “Do not agree”, “Not able to respond”), and to make any comments they considered important.
3. *Collection of results and manuscript finalization* The results of the surveys were collected and analysed. Agreement is reported after each *item*. *Items* that achieved less than 70 % of agreement are discussed in detail in a dedicated section. The text was revised according to comments, if any, and the section including the output of the surveys was added to the manuscripts. The revised text was approved by members of the committee and was submitted to the SICCR Governing Board.

Section I: Items and supporting text

Abdominal CD

Classification

Item 1

The Montreal revision of the Vienna classification is recommended to classify CD phenotypes [EL5] Young age, ileocolonic localization, and penetrating/stricturing disease predict frequent relapses [EL2], and non-colonic and penetrating diseases are strongly associated with the need for major surgery [EL3]
[Agreement: “Agree” 75 %, “Partially agree” 25 %]

The Montreal revision (Table 1) [2] added isolated upper gastrointestinal (GI) location (L4) and introduced “perianal disease” (“p”), which can overlap with CD patterns defined by the Vienna classification (“non-stricturing non-penetrating”, “stricturing”, “penetrating”). The use of a classification system is recommended at diagnosis as a shift towards more aggressive patterns can be observed over time, and several CD-related factors may predict disease evolution [3, 4].

A review of population-based studies reported that several factors are commonly associated with an aggressive disease course, with more frequent clinical recurrences needing treatment [5]. Specifically, early disease onset, CD localized in the terminal ileum, and penetrating/stricturing disease were associated with clinical recurrence. An US population-based study suggested that ileocolonic (HR, 3.3), small bowel (HR, 3.4), and upper GI (HR, 4.0) extent, and penetrating disease behaviour (HR, 2.7) were strongly associated with the need for major surgery, whereas a slightly higher risk was observed in active smokers (HR, 1.7), male patients (HR, 1.6), and patients who began corticosteroid treatment early (HR, 1.6) [6]. The European Crohn’s and Colitis Organization (ECCO) recommended proactive medical management of patients with two or more predictors of an aggressive disease course [7].

Preoperative assessment

Item 2

Serological markers should be routinely used to implement clinical assessment of disease [EL2]
 High serum levels of CRP are associated with active disease or infectious complications. Post-operative follow-up can be guided by CRP levels [EL2]
[Agreement: “Agree” 50 %, “Partially agree” 37.5 %, “Do not agree” 12.5 %]

A complete serological assessment is mandatory in CD patients scheduled for surgery. The use of biomarkers is nowadays accepted as more reliable than clinical assessment alone, and the utility of tools such as the CD activity index (CDAI) alone is debated and should be questioned in assessing response to treatment and when planning clinical trials [8]. C-reactive protein (CRP) is a valid tool, which can be used in assessing disease as well as in guiding treatment [9] and post-operative management.

Table 1 Vienna classification and Montreal revision for Crohn's disease [2]

	Vienna	Montreal
Age at diagnosis	A1 below 40 years	A1 below 16 years
	A2 above 40 years	A2 between 17 and 40 years
		A3 above 40 years
Location	L1 ileal	L1 ileal
	L2 colonic	L2 colonic
	L3 ileocolonic	L3 ileocolonic
	L4 upper	L4 isolated upper ^a
Behaviour	B1 non-stricturing, non-penetrating	B1 non-stricturing, non-penetrating
	B2 stricturing	B2 stricturing
	B3 penetrating	B3 penetrating
		p perianal disease modifier ^b

^a L4 is a modifier that can be added to L1–L3 when concomitant upper gastrointestinal disease is present

^b “p” is added to B1–B3 when concomitant perianal disease is present

Item 3

Ileocolonoscopy is the first-line examination in preoperative assessment of CD, but magnetic resonance imaging (MRI) and computed tomography (CT) are needed to assess extramural disease and complications [EL1]

In young patients, MRI is preferable to CT to avoid exposure to radiation [EL1]

Transabdominal contrast-enhanced ultrasound (US) is a useful tool, but an experienced operator is required and the examination may be limited by disease location (upper small bowel, rectum), patient body habitus, and technical issues [EL3]

[**Agreement:** “Agree” 81.25 %, “Partially agree” 18.75 %]

Most CD patients need surgery for disease involving the terminal ileum, which is easily reached by ileocolonoscopy. Small bowel enteroscopy is not routinely recommended, and capsule endoscopy is associated with the risk of obstruction due to potential impaction of the capsule in a stricture. Endoscopy allows for adequate assessment of the mucosa, but it should be implemented with extramural assessment by means of cross-sectional imaging. CT and magnetic resonance (MR) enterography and enteroclysis are equally accurate in assessing disease severity and in detecting extraluminal complications [10]. The latter achieves better bowel distension. MR enterography is particularly useful in planning surgical treatment [11] and should be considered the ideal tool for young patients [12]. However, it is expensive and time-consuming, and an experienced operator is required.

Transabdominal contrast-enhanced US has recently been suggested as a reliable, non-invasive tool for assessing stricturing CD [13, 14], but a high level of expertise is required and the usefulness of the examination can be limited by patient- and disease-related factors.

Perioperative considerations

Item 4

Intake of ≥ 20 mg prednisolone (or equivalent steroid) for ≥ 6 weeks is a risk factor for post-operative complications [EL2], and adequate tapering is recommended when feasible [EL5]

There is no need to discontinue thiopurines at surgery [EL2]

Perioperative exposure to biologics may increase the risk of abdominal septic complications [EL1]

[**Agreement:** “Agree” 43.75 %, “Partially agree” 50 %, “Do not agree” 0 %, “Not able to respond” 6.25 %]

Item 5

Each treatment should be decided jointly by members of an experienced multidisciplinary team [EL5]

[**Agreement:** “Agree” 93.75 %, “Do not agree” 6.25 %]

Observational studies support a role of steroids in increasing the rate of post-operative complications and agree in indentifying a cut-off of 20 mg for more than 6 weeks [15, 16]. Data on 8260 CD patients obtained from

the American College of Surgeons National Surgical Quality Improvement Program® (ACS-NSQIP®) (<http://site.acsnsqip.org/>) confirmed that intra-abdominal septic complications (15.2 vs. 12.9 %, $p = 0.004$) and venous thromboembolism [odds ratio (OR) 1.66; 95 % confidence interval (CI) 1.17–2.35] after an abdominal surgery [17].

A meta-analysis of comparative studies supported the safety profile of thiopurines in CD patients undergoing surgery [18]. Conversely, septic complications were increased by steroids and anti-TNF drugs [18]. Concerning biologics, data on overall post-operative complications have been conflicting. However, when assessing only septic complications and removing confounders, recent systematic reviews with meta-analysis found increased likelihood of complications with biologics [19, 20].

A close interaction between IBD team members and the patient is important to optimize surgical timing.

Indications for surgery

- Ineffective medical treatment

Item 6

Surgery should be considered in patients with symptomatic CD unresponsive to medical treatment or developing drug-related complications [EL2]

Patients with acute Crohn's colitis with suspected perforation and/or patients whose condition worsens or does not improve within 48–96 h after medical treatment should be offered surgery [EL3]

[**Agreement:** “Agree” 81.25 %, “Partially agree” 18.75 %]

Symptomatic patients with mild to moderate disease should be approached with first-line medical treatment (i.e. aminosalicylates, antibiotics, and steroids), and failure to obtain a response defines severe CD [21]. Intravenous (IV) steroids, immunosuppressant drugs, and biologics should be considered. Surgical treatment is warranted in case of failure of first- and second-line therapy, as well as in patients with severe or steroid-dependent CD of limited extent and in those with contraindications or adverse effects to medical treatment [22].

Surgery should be considered early in patients with CD colitis with signs or symptoms suggestive of free perforation or failure to improve after 48–96 h since rescue medical treatment was initiated [23, 24].

- Complications

- a. Intra-abdominal abscess and perforation

Item 7

US- or CT-guided percutaneous drainage of entero-parietal, intra-mesenteric, or retroperitoneal abscess can be attempted along with antibiotic administration. Surgical drainage with or without resection is needed when this approach fails or is not feasible [EL3]

Percutaneous drainage can also be used as a bridge to surgery to optimize the patient's condition [EL3]

Surgery should be considered in patients with symptoms/signs suggestive of free perforation [EL3]

Asymptomatic, entero-enteric fistulas do not require surgery. Surgery should be considered for patients with fistulas and symptoms/signs of localized or systemic sepsis unresponsive to medical treatment [EL3]

[**Agreement:** “Agree” 93.75 %, “Partially agree” 6.25 %]

There is no consensus as to what constitutes the ideal management of intra-abdominal abscess. A recent review suggested that percutaneous drainage with antibiotics, assisted by imaging tools, should be the first-line approach to these patients [25], reserving surgery for unsuitable patients or if prior approach fails [23, 24]. An option is to use a two-stage approach, meaning that percutaneous drainage is suited to drain acute sepsis, delaying surgery until the clinical condition of the patient has been optimized [25]. Immediate resection offers less chance of subsequent complications compared with simple suturing. After resection of a perforated segment of small bowel, an end stoma, diverted and non-diverted anastomosis are all viable options and are based on intra-operative findings and the general status of the patient. A non-diverted anastomosis can be performed [23, 24]. Similarly, for colonic perforation, a proximal diversion and mucous fistula, a Hartmann's procedure, and diverted anastomosis are adequate options [23, 24, 26].

Asymptomatic entero-enteric fistulas do not require surgery, but surgical intervention is mandatory when signs of abdominal or systemic sepsis occur [25, 27]. Resection is the recommended approach.

- b. Obstruction

Item 8

Symptomatic strictures with minimal inflammation located at any site, unresponsive to medical treatment or endoscopic dilation need surgery [EL3]

[**Agreement:** “Agree” 100 %]

Fibrotic strictures are a common complication in CD patients. Fibrosis results from complex, immune-mediated interactions between the patient and environmental factors, and no medical treatment is able to reverse bowel fibrosis [28, 29]. When strictures are within the reach of an endoscope, and if the procedure is performed in centres with experienced surgeons, endoscopic dilation can be an option for short strictures (<4 cm) [30]. However, there is a risk of subsequent surgery even if the procedure is performed in specialized centres, with more than 30 % patients needing surgery within 3 years [31].

c. Haemorrhage

Item 9

Interventional radiologic/endoscopic techniques can be attempted in patients with massive bleeding at any site. If they are not feasible or fail, surgery should be advocated [EL3]

[Agreement: “Agree” 81.25 %, “Partially agree” 12.5 %, “Do not agree” 0 %, “Not able to respond” 6.25 %]

Haemorrhage is an exceptional complication of CD and can result from a penetrating ulcer eroding into the vessels of the submucosa. Treatment depends on patient status. When the patient is stable, endoscopy is recommended, as it may identify the source of bleeding and endoscopic hemostasis can be implemented [32, 33]. Angiography with embolization is an alternative in stable patients. When these measures fail, or if the patients are hemodynamically unstable, surgical exploration must be performed, with bowel resection and/or intra-operative endoscopy [32, 33].

d. Growth retardation

Item 10

Surgery should be considered in young patients with growth retardation despite appropriate medical treatment [EL4]

[Agreement: “Agree” 62.5 %, “Partially agree” 31.25 %, “Do not agree” 0 %, “Not able to respond” 6.25 %]

CD patients in childhood or developmental age should be monitored from adequate height and weight gain with growth charts. Failure to thrive with signs of skeletal alterations and delayed puberty despite adequate medical treatment could justify surgery in prepubertal CD patients [34].

• Neoplasia

Item 11

Long-standing, active CD is a risk factor for inflammation-driven carcinoma [EL1]

Ileal and ileocolonic segments with long-standing disease should be carefully inspected and biopsied if a stricturoplasty is performed [EL3]

Patients with asymptomatic strictures of the large bowel not adequately surveyed should undergo surgery [EL3]

Multifocal low-grade dysplasia, high-grade dysplasia, dysplasia-associated lesion or mass (DALM), and carcinoma of the colon and rectum require surgery [EL3]

[Agreement: “Agree” 81.25 %, “Partially agree” 12.5 %, “Do not agree” 6.25 %]

The 3rd Scientific Workshop of the ECCO focused on the risk of malignancy in IBD and concluded that CD patients are at increased risk of adenocarcinoma arising in bowel segments with long-standing, severely active disease via an inflammation-driven pathway [35, 36]. Some cases of carcinomas arising at the site of stricturoplasty have been reported; hence, it is recommended to perform biopsies in segments suited for bowel sparing techniques in patients with long-standing disease [36].

The risk of malignant transformation of large bowel strictures is reported to be as high as 3.6 and 4.9 % at 5-year and 10-year follow-up in a European population-based study [37]. The risk of developing colorectal cancer in patients with stricturing phenotype is 5.5 % after 5 years and 7.5 % after 10 years, compared with 0.4 % of other patterns [37]. Hence, strictures of the large bowel should be carefully surveyed or patients should be offered resection.

There is still debate about how to assess dysplasia in IBD patients [38]. Dysplasia predicts concomitant or future development of aggressive carcinoma, and it is prudent to recommend resection in case of DALM, high-grade dysplasia, and multifocal low-grade dysplasia located in the large bowel, after biopsies with pathological confirmation [39, 40].

In CD patients, colorectal cancer should be suspected early in order to avoid diagnostic delay that can lead to poorer outcomes [4, 35, 41]. A study on more than 2843 IBD patients (1201 CD) from a tertiary US centre observed over 30 years showed that CD and UC patients undergoing surgery for colorectal cancer had similar short-term morbidity, but CD patients had significantly worse 5-year survival (41 vs. 29 %, $p = 0.04$) [41]. These data suggest that CD patients more frequently have advanced disease when they are diagnosed.

Table 2 Perianal Crohn's disease activity index, proposed by Irvine et al. [44]

	Vienna	Montreal
Discharge	No discharge	0
	Minimal mucous discharge	1
	Moderate mucous or purulent discharge	2
	Substantial discharge	3
	Gross faecal soiling	4
Pain/restriction of activities	No activity restriction	0
	Mild discomfort, no restriction	1
	Moderate discomfort, some limitation activities	2
	Marked discomfort, marked limitation	3
	Severe pain, severe limitation	4
Restriction of sexual activity	No restriction in sexual activity	0
	Slight restriction in sexual activity	1
	Moderate limitation in sexual activity	2
	Marked limitation in sexual activity	3
	Unable to engage in sexual activity	4
Type of perianal disease	No perianal disease/skin tags	0
	Anal fissure or mucosal tear	1
	<3 Perianal fistulae	2
	>3 Perianal fistulae	3
	Anal sphincter ulceration or fistulae with significant undermining of skin	4
Degree of induration	No induration	0
	Minimal induration	1
	Moderate induration	2
	Substantial induration	3
	Gross fluctuance/abscess	4

Perianal CD

Classification

Item 12

An anatomical description that makes it possible to guide the treatment and assessment of fistula activity by means of validated scores is recommended [EL5]

[**Agreement:** “Agree” 68.75 %, “Partially agree” 18.75 %, “Do not agree” 6.25 %, “Not able to respond” 6.25 %]

Parks et al. [42] defined fistulas according to the relationship of the track with the external sphincter,

whereas Bell et al. [43] later simplified Parks' anatomical classification into “simple” or “complex”. Bell's classification system is easier to apply and may guide surgical treatment. However, it should be used with caution when planning surgery. In particular, anal-vaginal fistulas represent a “grey area”. Ano- and recto-vaginal fistulas are all regarded as “complex” according to Bell's classification, but low, anal-introital fistulas should be considered “simple” and treated as such (see *Item 17*).

Along with evaluation of disease activity (e.g. by means of perianal disease activity index (PDAI), *Table 2*) [44], one of the various anatomical classifications should be used to plan surgery and to assess disease evolution.

Preoperative assessment

Item 13

Proctosigmoidoscopy is recommended before any treatment, because concomitant rectal inflammation may modify the treatment choice [EL2]

Pelvic MRI should be routinely performed before any treatment in patients with perianal Crohn's disease and should be used in the follow-up [EL2]

Endo-anal US (EUS) can be equal to MRI, but requires expertise and may cause discomfort. It might not be feasible in the case of stenosis. MRI and EUS are complementary [EL2]

[**Agreement:** "Agree" 81.25 %, "Partially agree" 12.50 %, "Do not agree" 6.25 %]

Item 14

Examination under anaesthesia (EUA) allows fistula assessment and concomitant treatment, but only in the hands of an experienced surgeon [EL5]

[**Agreement:** "Agree" 93.75 %, "Partially agree" 6.25 %]

In experienced hands, accuracy is high, which allows concomitant drainage of abscesses. In patients with perianal or perineal pain, an abscess is almost always found. When an abscess is suspected, upfront EUA should be performed to control sepsis.

Pelvic-perineal MRI is the method of choice to assess perianal CD and can be used to guide treatment [45]. Endo-anal US, especially with three-dimensional (3D) reconstruction, and MRI have similar sensitivities at detecting perianal fistulas, but the latter has higher specificity [46, 47]. The ideal management is a combination of EUA, US, and MRI.

Since endoscopic findings (e.g. rectal disease) can alter managements, endoscopy is recommended routinely in perianal CD [46, 48].

Treatment

- Perianal abscess

Item 15

Draining a perianal abscess should be a priority [EL5]
[**Agreement:** "Agree" 87.5 %, "Partially agree" 6.25 %, "Do not agree" 0 %, "Not able to respond" 6.25 %]

It is important that patients in whom the suspicion of perianal abscess is high are offered timely EUA with abscess drainage, in order to avoid spread of the local sepsis with predictably unfavourable outcomes of subsequent treatment attempts. Perianal abscess must not be overlooked.

- Simple fistula

Item 16

Asymptomatic fistulas may not require any treatment [EL3]

Symptomatic simple fistulas can be treated with loose-seton or fistulotomy, and antibiotics (metronidazole 750–1500 mg/day or ciprofloxacin 1000 mg/day) [EL3]
Low ano-vaginal fistulas could be regarded as simple and may not require surgical treatment if asymptomatic [EL5]

[**Agreement:** "Agree" 62.5 %, "Partially agree" 31.25 %, "Do not agree" 0 %, "Not able to respond" 6.25 %]

If the patient has no discomfort directly related to the fistula, and if no abscesses are found, the fistula can be simply managed with watchful waiting [49]. Antibiotics with fistulotomy or loose-seton placement are effective options for simple fistulas with accompanying symptoms [50]. The same principles apply to low anal-introital fistulas.

- Complex fistula

Item 17

Active luminal disease requires treatment [EL5]
 Complex fistulas can be managed with non-cutting seton placement [EL4]
 Immunosuppressant medications can be used as an adjunct to surgery and antibiotics [EL4]
 Infliximab and adalimumab are viable second-line medical treatment [EL1]
 A diverting ileostomy can be an option, and, in unresponsive patients, a proctectomy may be needed [EL5]
[Agreement: “Agree” 56.25 %, “Partially agree” 18.75 %, “Do not agree” 25 %]

It is important to rule out and treat concomitant rectal involvement [48]. Antibiotics are administered routinely in clinical practice. Healing rates of complex perianal fistulas could be improved by adding an immunosuppressant to loose-seton placement [50]. Recent evidence suggests that combined treatment with surgery followed by infusions of biologics is associated with a higher healing rate, shorter time until healing, and longer disease-free intervals than treatment with biologics or surgery alone [49, 51]. The use of adipose-derived stem cells injected along the tract has been recently investigated in complex perianal CD, but definitive data from trials are not yet available [52].

Patients with severe active perianal CD who fail conventional or rescue treatments [53] may be candidates to diverting ileostomy, but the rate of conversion is very low and decreases over time [54]. Proctectomy is still needed in 10–18 % of patients, due to disabling symptoms and concerns about cancer [52].

Site-specific considerations

Localized ileocaecal disease

Item 18

Symptomatic, stricturing, localized ileocaecal CD with minimal or inactive inflammation should be managed with early surgery [EL2]
 Laparoscopy should be favoured over open ileocolic resection [EL1]
[Agreement: “Agree” 81.25 %, “Partially agree” 18.75 %]

Most studies agree that primary, stricturing CD localized exclusively at the terminal ileum and associated with only minimal inflammation is best treated by early surgery, to avoid

exposing the patient to medications [55, 56]. Minimally invasive surgery is recommended in centres with expertise, allowing early recovery and reducing adhesions [57–59].

Localized colonic disease

Item 19

Resection is the ideal approach for CD involving less than a third of the colon [EL3]
[Agreement: “Agree” 43.75 %, “Partially agree” 37.5 %, “Do not agree” 18.75 %]

Although segmental resections increase the risk of post-operative clinical recurrence, the benefits of avoiding proctocolectomy overwhelm the risk of relapses, and this is the most widely accepted procedure for colonic CD with limited involvement [60–62].

Multisegment colonic disease

Item 20

Subtotal colectomy with ileorectal anastomosis may be preferable for patients with two distant colonic localizations [EL3]
[Agreement: “Agree” 25 %, “Partially agree” 31.25 %, “Do not agree” 25 %, “Not able to respond” 18.75 %]

When both ends of the colon are involved, segmental resections could still be an option, but a meta-analysis pointed out that colectomy with ileorectal anastomosis ensures longer disease-free intervals, with 4.4 more years to relapse than segmental colectomy [62].

Additional considerations

Dilation of strictures

Items 21

Endoscopic dilation of strictures in CD is the first choice for anastomotic recurrences and can be an option in accessible short strictures, but should only be considered in units with surgical service available due to procedure-related complications [EL2]
 Colonic strictures should be resected [EL4]
[Agreement: “Agree” 62.5 %, “Partially agree” 31.25 %, “Do not agree” 6.25 %]

A study from the Cleveland Clinic suggested that with endoscopic dilation both primary and recurrent strictures have similar outcomes [31]. Indications and drawbacks of endoscopic dilation have been discussed in the supporting text of *Item 9* [30]. Patients should be aware that repeated procedures may be needed, and that the risk of surgery after dilation of anastomotic strictures is high, so that some patients could benefit from early surgery [63]. Due to the high risk of cancer in strictures of the large bowel, and the potential risk of perforation with disease dissemination, the panel recommend resection of colonic strictures.

Strictureplasty

Item 22

Strictureplasties can be used as an alternative to resection in patients with small bowel CD and with recurrent disease [EL2]

Conventional techniques are recommended for strictures shorter than 20 cm and achieve good results. Non-conventional techniques may be attempted for longer strictures or several small strictures located in close proximity, in patients where resection could compromise the length of the small bowel [EL2]

Strictureplasties are not recommended in colonic CD [EL4]

[**Agreement:** “Agree” 75 %, “Partially agree” 12.5 %, “Do not agree” 6.25 %, “Not able to respond” 6.25 %]

Bowel sparing techniques are associated with higher recurrence rates than resection, but are extremely useful in patients in whom massive resection and several, repeated surgical procedures have been performed within a short time, due to the risk of short bowel syndrome [30]. Patients’ nutritional status should be good; otherwise, septic complications are unavoidable after stricturoplasty, due to impaired healing.

Conventional techniques can be used for strictures shorter than 20 cm. These mainly consist of the Heineke–Mikulicz technique (suitable for 5- to 10-cm strictures) and the Finney technique (suitable for 10- to 25-cm strictures). These are easier to perform and are associated with a lower risk of recurrences [30, 64]. Unconventional strictureplasties can be suitable for longer strictures or for many short strictures in close proximity. These techniques consist of variants of the Heineke–Mikulicz and Finney procedures [65, 66] as well as more advanced procedures [67] which

should be used only in special situations due to their complexity and the higher risk of recurrence [30, 68]. There is debate about the role of ileocaecal strictureplasty, although some centres report good results [69]. Colonic strictureplasties are not recommended due to concerns about cancer.

Anastomotic technique

Item 23

Wide-lumen, stapled side-to-side anastomosis is the preferred technique for ileocolic resection [EL2]

[**Agreement:** “Agree” 62.5 %, “Partially agree” 12.5 %, “Do not agree” 6.25 %, “Not able to respond” 18.75 %]

Evidences suggest that no difference can be expected between hand-sewn and stapled ileocolic anastomosis, on condition that an adequate width of the lumen is achieved [70–72]. Stapled side-to-side anastomosis with a wide lumen is easier to perform, is less time-consuming, and results in functional end-to-end. It is the most effective choice [72].

Laparoscopy

Item 24

Laparoscopy is preferred to open ileocolic resection in experienced hands [EL1]

Selected patients with complex or recurrent disease can undergo laparoscopy [EL3]

[**Agreement:** “Agree” 68.75 %, “Partially agree” 18.75 %, “Do not agree” 12.5 %]

Minimally invasive surgery is recommended in abdominal CD when performed by experienced teams. Short-term benefits consist of early bowel function restoration, whereas better cosmesis and body image are observed in the long term. The risk of incisional hernia may be reduced [73, 74]. The best results are obtained in patients with non-penetrating, small bowel disease. However, laparoscopy involves longer operative times and higher costs.

Complex or recurrent CD can be treated laparoscopically by surgeons with adequate skills [73, 74].

Post-operative treatment and prophylaxis

Item 25

After ileocolonic resection, smoking, previous intestinal surgery [EL1], penetrating disease, perianal location, extensive small bowel resection [EL2], and the absence of prophylactic post-operative treatment [EL1] are predictors of early post-operative recurrence
[Agreement: “Agree” 100 %]

Item 26

Patients should be encouraged to discontinue smoking after surgery [EL1]
[Agreement: “Agree” 93.75 %, “Do not agree” 6.25 %]

Smoking is the strongest predictor of recurrence after surgical treatment of CD, and smokers have a 2.5-fold increase in surgical recurrence compared with non-smokers [75, 76]. Previous surgery, perianal CD, massive small bowel resections, as well as avoidance of early post-operative medical treatment are associated with an increased risk of recurrence [75, 77].

Item 27

Patients with known risk factors for recurrence should receive post-operative prophylactic treatment after small bowel resection [EL1]
 Azathioprine is more effective than mesalazine or antibiotics in preventing clinical and endoscopic recurrence and should be preferred in high-risk patients after resection [EL1]
 Prophylaxis should continue for at least 2 years [EL1]
[Agreement: “Agree” 62.5 %, “Partially agree” 25 %, “Do not agree” 0 %, “Not able to respond” 12.5 %]

A meta-analysis compared the effectiveness of thiopurines versus 5-aminosalicylic acid (5-ASA) derivatives and concluded that the former are more effective in preventing relapses but are more frequently associated with adverse events [78]. Since results are even more apparent at 1-year follow-up, prolonged prophylaxis is recommended [79]. Tursi et al. [80] recently tested adalimumab and infliximab as prophylactic treatment after resection of CD, but ideal candidates for such an approach need to be identified in larger trials.

Section II: Considerations on items with poor agreement

Overall, the agreement was high. Disagreement (“Do not agree”) did not exceed 25 % in all *items*. Several *items* require further comment.

Interestingly, *items* based on everyday practice and good sense (“expert opinion”) rather than strict evidence-based criteria achieved high agreement.

Great variability among respondents was observed regarding CD of the colon (*items* 19 and 20), with <50 % agreement, and 20–25 % of *item* rejection (“Do not agree”). Decisions about resection or continued medical treatment should be patient-tailored and take into account disease duration, extent, and activity. Colonic disease raises concerns about cancer, and the role of strictureplasty has been questioned. At the same time, these strictureplasties are easy to follow-up by endoscopy. Robust data are lacking on colonic CD.

The effect of perioperative medical treatment on post-operative complications was another matter of debate (*items* 4 and 27). The adverse effects of prolonged corticosteroid treatment are well known, and the safety of thiopurines is supported by consistent data. Though data on biologics are still conflicting, concerns about infection are justified when evaluating specifically post-operative abdominal complications. Post-operative prophylaxis is warranted in high-risk patients. There were also discrepancies in the combined management of complex perianal disease (*item* 17). It is likely that some surgeons would give patients biologics as first-line treatment to avoid immunosuppressant drugs.

Serological markers are accurate and probably not used enough in clinical practice (*item* 2). At the same time, there is a need of further, reliable, non-invasive markers to be used as an adjunct to clinical parameters.

Classification of perianal disease by means of anatomical and functional scales is useful to monitor disease evolution and treatment results, but was not accepted by all respondents (*item* 12). A validated, easy-to-use score taking both dimensions into account is desirable. Some respondents questioned considering ano-introital fistulas as simple, leaving asymptomatic simple fistulas untreated, or adding antibiotics to surgery in patients with simple fistulas (*item* 16). Decisions are based on patient preference, but such conduct is justifiable.

Some participants did not agree completely that surgery should be performed in children (*item* 10), but if available treatments are delivered correctly and no benefits are observed, the harm of delaying surgery should be considered, when operative management can remove inflammation.

Strong data support the use of laparoscopy in CD, but long-term benefits should not be overestimated and surgeons must have advanced skills, explaining suboptimal agreement (*item 24*). Dilation of small bowel strictures is being popularized, but access to it is limited in some hospitals (*item 21*). There are associated complications, suggesting that candidates for the procedure should be referred to high-volume centres or treated with alternative approaches. Respondents felt that further data concerning the ideal type of anastomosis after ileocolic resection would be useful (*item 23*).

Colonic and perianal CD are the areas that should be further investigated with collaborative studies, and the effects of medical treatment on surgery should be reported in detail in trials and observational studies. Technical aspects and newer techniques also need to be implemented, representing another field to be further explored.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent For this type of study formal consent is not required.

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