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Contemporary Surgical Management for Ileosigmoid Fistulas in Crohn's Disease

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Abstract
Background Current diagnostic modalities and surgical treatments for ileosigmoid fistulas (ISF) in Crohn's disease (CD) are not well characterized.
Methods ISF patients operated during 2000–2007 in a prospectively collected CD surgery database were included. Disease extent, diagnostic studies, medications, and smoking status were retrospectively reviewed.
Results One hundred four CD patients with ISF (median age 37) underwent ileocolic resection (75 open, 29 laparoscopic). Sigmoid colon was treated with primary repair (26), segmental resection (71), and subtotal colectomy (7). Thirty-eight patients required additional surgery for CD manifestations (ileovesical fistula (11), enterocutaneous fistula (11), and synchronous small bowel disease (22)). Overall sensitivity of studies for ISF detection was 63% (66/104) (colonoscopy 35% (31/89), CT scan 41% (31/76), fluoroscopy 53% (31/58)). Stoma diversion (53 patients, 51%) occurred more with open surgery (81% vs. 63%, $p=0.04$), intraoperative ureteral stents (28% vs. 2%, $p<0.0001$), additional small bowel procedures (42% vs. 18%, $p=0.008$), longer overall length of stay (10 vs. 6 days, $p<0.0001$), preoperative steroid use ≥20 mg prednisone (40% vs. 18%, $p=0.02$), and preoperative albumin ≤3.5 gm/dl (43% vs. 22%, $p=0.02$). Mortality was nil. Overall morbidity was 37% with anastomotic leak 4%. Neither was affected by stoma diversion, laparoscopy use, or sigmoid colon treatment.
Conclusions While most ISF in CD are found preoperatively, some are still incidental surgical findings. Sigmoid resection and primary repair have comparable morbidity if appropriately individualized. Laparoscopic treatment is acceptable in select cases without added morbidity.

Keywords Crohn's disease · Intestinal fistula · Ileal disease · Surgery

Introduction

Fistula development in patients with Crohn's disease (CD) is common and often associated with a more aggressive natural history of disease. Among patients that have an ileocolonic distribution of disease, approximately a third will have an internal or enterocutaneous fistula, with a large minority of these having a component to the sigmoid colon.[1] Overall, fistulas between diseased terminal ileum and the sigmoid colon represent 15% to 30% of patients with internal fistulas[1,2] and approximately 5% of all patients presenting with Crohn's disease.[2,3]

While ileosigmoid fistulas (ISF) in CD are relatively common and surgery is considered to be the mainstay of treatment, historically, their management has been challenging[4,5] with only few recent reports characterizing

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contemporary outcomes.[6,7] The complexity of ISF in CD is in no small part because ISF often occurs in conjunction with more extensive disease including additional small bowel or colonic locations, fistulization to bladder or other bowel segments, or enterocutaneous fistula. Moreover, preoperative diagnostic studies have traditionally been inaccurate, and while the majority of ISF are found preoperatively, it is not uncommon for an ISF to be discovered only at the time of surgery. Expanded uses of laparoscopy in the treatment of ISF have also yet to be formally examined.

In this study, we sought to provide an updated experience of surgical treatment of ISF in CD at a tertiary referral center specializing in inflammatory bowel disease, focusing on the diagnostic work-up and operative management of this condition. In particular, we wished to elucidate the value of diagnostic studies in establishing the preoperative diagnosis of ISF, appropriate use of resection versus primary repair of the sigmoid colon, and outcomes of laparoscopic treatment in a modern cohort.

Materials and Methods

The Cleveland Clinic Department of Colorectal Surgery prospectively maintained database of CD patients was used to identify all patients with operative treatment of an ISF from 2000 through 2007 and a retrospective study of these patients was conducted. This database has Institutional Research Board approval and is HIPAA-complaint in design. Database variables included patient demographics, duration and extent of disease, previous surgical procedures, and preoperative histopathologic diagnosis. Other recorded outcome measures were surgical procedure details, length of hospital stay, postoperative histopathologic diagnosis, and postoperative complications. A retrospective chart review was conducted to verify preoperative diagnostic study results, concurrent medication use, smoking status, and use of colonoscopy preoperatively or intraoperatively.

Computed tomography (CT) scan was performed using traditional CT scan or CT enterography protocols as previously reported at our institution in CD patients.[8] CT scan radiographic reports were reviewed retrospectively. Findings on CT scan in the terminal ileum, cecum, or sigmoid were classified into the following categories: “fistula” (including suspicion of fistula), “stranding or phlegmon”, and “abscess”. Prior to the availability of CT enterography, patients also commonly underwent fluoroscopic evaluation with a small bowel series or contrast enema. These studies were categorized as “positive” or “negative” for the presence of a fistula. For the purposes of this study, the objective findings on colonoscopy of the sigmoid were included in the analysis and not comments stating that there was a “suspicion” for ISF. Colonoscopies were considered normal or had findings in the sigmoid colon which included: “fistula”, “pseudopolyp”, “erythema”, or “stricture”. Colonoscopies with a “fistula” or “pseudopolyp” were considered clinically positive for detection of the ISF for the purposes of analysis.

Overall length of hospital stay included any postoperative readmission or stoma reversal when applicable. Surgical cases initially started as laparoscopic procedures and subsequently converted to open were considered for the purposes of this study as laparoscopic procedures in an intent-to-treat analysis. We also performed a separate analysis treating converted laparoscopic cases as open, as the majority of the case was performed open. Because of the retrospective nature of this study and variations in reporting of the operative and pathologic data, we were unable to consistently identify the size and location of the fistulous opening on the sigmoid colon. Perioperative morbidity and mortality were assessed at 30 days or during same postoperative hospital stay. An ileus was defined as any delay in bowel function for at least 5 days, need for readmission, placement of a nasogastric tube, or if documented in the postoperative period by the surgical team. Medication use was assessed with chart review. Preoperative CD medication use included concurrent use of the medication up to the time of hospitalization or within 30 days of surgery and for Remicade up to 90 days within surgery.

Statistics were obtained using established methods. Statistical significance was accepted for $P<0.05$. Unadjusted bivariate comparisons of continuous variables were performed using the Mann–Whitney rank sum test and comparisons of categorical variables were performed using a χ^2 test. Data are expressed as medians with ranges as appropriate.

Results

Overall, 104 of 1,353 patients with CD who underwent a major abdominal operation over the study period had ISF (55 females, median age 37 (range 18–78) years) (Table 1). With respect to individual surgeon, three of ten surgeons performed both laparoscopic and open approaches with the remainder using an open approach exclusively. The median length of disease of the cohort was 9 (range 0–39) years, with three patients having ISF at the time of their initial clinical presentation of CD. A total of 35 patients (34%) were current smokers and ten (10%) had a history of or current perianal disease. While seven (70%) had resolution of perianal disease at the time of surgery, three (30%) patients had concurrent perianal disease. One patient with a superficial fistula in ano received no treatment at the time

Table 1 Patient Demographics and Crohn's Disease Distribution

Factor	No.
Total	104 (100%)
Female	55 (53%)
Age, median (range) in years	37 (18–78)
Length of CD, median (range) in years	9 (0–39)
Smoking status	
Never	64 (61%)
Current	35 (34%)
Prior	5 (5%)
Albumin ≤3.5 gm/dl	34 (33%)
Current medical treatments	
Infliximab	18 (17%)
Corticosteroids (any)	58 (55%)
Corticosteriods (prednisone ≥20 mg/day)	30 (29%)
Imuran	21 (20%)
Previous laparotomy within 12 months	6 (6%)
Previous or current perianal disease	10 (10%)
Other intra-abdominal fistulous disease	38 (37%)
Ileovesical fistula	11 (11%)
Enterocutaneous fistula	11 (11%)
Other small bowel disease	22 (21%)
Other colonic disease	7 (7%)

of ISF surgery; another with an anorectal stricture underwent dilatation at the time of surgery, and a final patient with a fistula in ano underwent a seton change at the time of surgical treatment of their ISF. Additional synchronous distribution of disease included ileovesical fistula in 11% (11), enterocutaneous fistula in 11% (11), other small bowel disease in 22 (21), and other colonic disease in 7% (seven). Primary presenting clinical symptom or feature was pain, 42 (40%); obstruction, 17 (16%); weight loss, 11 (11%); enterocutaneous fistula, 11 (11%); pneumaturia, nine (9%); abscess, five (5%); bloody stools or diarrhea, six (6%); colonic stricture, two (2%); and fevers, one (1%).

The performances of diagnostic modalities for detecting ISF are summarized in Table 2. Colonoscopy was performed in 89 (86%) patients either as part of the preoperative evaluation, 81 (91%) or as a planned intraoperative component secondary to suspicion of ISF or sigmoid Crohn's colitis, eight (9%). Colonoscopic evaluation of the sigmoid colon was reported as normal in 34 (38%) patients. Findings in the sigmoid colon on colonoscopy included presence of a fistula in ten (11%), erythema in 17 (19%), pseudopolyp in 17 (19%), erythema and pseudopolyp in four (4%), and stricture in seven (8%). CT scan and fluoroscopic contrast studies were able to detect a fistula in 41% (31/76) and 53% (31/58) cases respectively. Of 76 CT scans performed, 36% (27/76) used CT enterography, which was not associated with any statistical difference in ISF detection rates compared to traditional abdominal CT scan protocols (55% (15/27) versus 33% (16/49), $p=0.09$). The combination of all diagnostic studies resulted in preoperative detection of ISF in 66 (63%) patients.

Operative management of the cohort is summarized in Table 3. While most operations used an open approach, 29 (28%) cases started laparoscopically with two patients (7%) requiring conversion to an open procedure both due to complex anatomy and difficulty with completing laparoscopic mobilization for a total of 27 (26%) completed laparoscopic cases. The vast majority of cases (93%, 97 patients) were treated with ileocolic resection combined with primary repair of the sigmoid fistula or sigmoid resection but with preservation of the remaining colon. On the other hand, a small minority (7%, 7 patients) underwent subtotal colectomy in continuity due to more extensive colonic disease. Management of the sigmoid colon was at the discretion of the operating surgeon and included primary repair in 26 patients (25%) and segmental resection in 71 cases (68%). Pathologic examination of the surgical specimen revealed that individuals with histological evidence of CD of their sigmoid colon (36/97, 37%) were more likely to have undergone a segmental sigmoid resection rather than primary repair (45% vs. 16%, $p=0.02$). There were no differences in rates of stoma creation, use of laparoscopic or open surgery, preoperative diagnosis of ISF, rates of small bowel disease requiring surgery, presence of intraoperative phlegmon or abscess, or overall length of stay (LOS) in patients with primary repair versus those with segmental sigmoid resection.

Table 2 Sensitivity of Diagnostic Studies in the Preoperative Detection of Ileosigmoid Fistula

Test	Positive findings (%)
Colonoscopy (fistula)	10/89 (11)
Colonoscopy (fistula or pseudopolyp)	31/89 (35)
Colonoscopy (fistula, pseudopolyp, or erythema)	48/89 (54)
CT scan (fistula seen)	31/76 (41)
CT scan (abscess, phlegmon, or stranding)	59/76 (78)
Fluoroscopic contrast studies	31/58 (53)
Combined tests[a]	66/104 (63)

[a] Colonoscopy (fistula or pseudopolyp) or CT scan (fistula seen) or fluoroscopic contrast studies

Table 3 Operative Management of Patients with Ileosigmoid Fistula and Crohn's Disease

	No.
Approach	
Open	75 (72%)
Laparoscopic attempt	29 (28%)
Laparoscopic completed	27 (26%)
Ileal disease	
Ileocolic resection	97 (93%)
Subtotal colectomy with terminal ileum resection	7 (7%)
Sigmoid colon	
Primary repair/wedge resection	26 (25%)
Segmental resection	71 (68%)
Subtotal colectomy	7 (7%)
Additional small bowel disease	
Resection	15 (14%)
Strictureplasty	5 (5%)
Both resection and strictureplasty	2 (2%)
Protective ileostomy	53 (51%)
Ureteral stents	16 (15%)
Overall length of stay, median (range) in days	8 (2–31)
Primary length of stay, median (range) in days	6 (2–31)

Additional synchronous small bowel disease was managed with resection in 15 patients (14%), strictureplasty in five (5%), or both in two cases (2%). All bladder fistulas were managed with primary bladder repair. No patients required a permanent stoma in this series. Protective stoma was used in 53 (51%) patients and the median overall length of stay was 8 (range 2–31) days. Patients undergoing creation of protective stomas were more likely to have open resection (83% vs. 65%, $p=0.03$), small bowel disease requiring additional surgical intervention (30% vs. 12%, $p=0.03$), placement of intraoperative ureteral stents (28% vs. 2%, $p<0.0001$), longer overall LOS (median 10 vs. 6 days, $p<0.0001$), preoperative steroid use ≥20 mg prednisone (40% vs. 18%, $p=0.02$), and preoperative albumin ≤3.5 gm/dl (43% vs. 22%, $p=0.02$) (Table 4).

While patients with a laparoscopic approach had lower rates of stoma creation (34% vs. 57%, $p=0.04$), there were no differences in use of intraoperative ureteral stents, rates of additional small bowel disease requiring surgical treatment, overall length of stay, treatment of the sigmoid colon, preoperative diagnosis of ISF, or findings of an intraoperative phlegmon or abscess (Table 5). When treating converted laparoscopic procedures as open procedures in a separate analysis, there remained a lower rate of stoma creation (33% vs. 57%, $p=0.03$); additionally, there was a lower rate of small bowel disease requiring resection/strictureplasty (15% vs. 36%, $p=0.03$). Other factors were similar. When performing a subgroup analysis among open and laparoscopic procedures performed by laparoscopic surgeons, there were a total of seven open cases performed by laparoscopic surgeons. Similar to the comparisons made with open procedures overall, laparoscopic procedures had lower rates of stoma creation (100% vs. 34%, $p=0.002$) and additional small bowel disease requiring resection/strictureplasty (57% vs. 17%, $p=0.02$), but were similar with respect to intraoperative ureteral stents use, overall length of stay, preoperative diagnosis of ISF, and findings of intraoperative phlegmon or abscess.

There were no deaths, and overall per-patient morbidity was 37% (Table 6). Surgical site infection rate was 16% (anastomotic leak, four (4%); wound infection, eight (8%); abdominopelvic abscess, eight (8%)). Of the four anastomotic leaks, three were located at the ileocolic site and one was at the sigmoid resection colorectal anastomosis. In addition to elective stoma takedown, a total of six (6%) patients required hospital readmission because of postoperative ileus. Rates of overall morbidity, surgical site infection, and anastomotic leak were not associated with stoma diversion, use of laparoscopic technique, treatment of the sigmoid colon with resection vs. primary closure,

Table 4 Use of Protective Stoma

	Stoma ($n=53$)	No. stoma ($n=51$)	p value
Sigmoid colon resection or subtotal colectomy	81% (43)	69% (35)	NS
Open surgical approach	81% (43)	64% (32)	0.04
Preoperative ISF diagnosis	66% (35)	61% (31)	NS
Small bowel disease with strictureplasty or resection	30% (16)	12% (6)	0.03
Intraoperative phlegmon or abscess	64% (34)	53% (27)	NS
Intraoperative ureteral stents	28% (15)	2% (1)	<0.0001
Overall length of stay[a], median (range) in days	10 (4–29)	6 (2–31)	<0.0001
Preoperative use Remicade (≤90 days)	21% (11)	14% (7)	NS
Preoperative use steroids (≥20 mg prednisone)	40% (21)	18% (9)	0.02
Preoperative albumin <3.5 gm/dl	43% (23)	22% (11)	0.02
Previous laparotomy within 12 months	9% (5)	2% (1)	NS

ISF ileosigmoid fistula, *NS* not significant

[a] Overall length of stay included any postoperative readmission or hospital days associated with stoma takedown

Table 5 Use of Laparoscopy

	Open (n=75)	Laparoscopic (n=29)	p value
Sigmoid colon resection or subtotal colectomy	72% (54)	83% (24)	NS
Covering stoma	57% (43)	34% (10)	0.04
Preoperative ISF diagnosis	64% (47)	62% (18)	NS
Small bowel disease with resection/strictureplasty	35% (26)	17% (5)	NS
Intraoperative phlegmon or abscess	61% (46)	52% (15)	NS
Intraoperative ureteral stents	17% (13)	10% (3)	NS
Overall length of stay[a], median (range) in days	8 (4–29)	7 (2–31)	NS

ISF ileosigmoid fistula, *NS* not significant

[a] Overall length of stay included any postoperative readmission or hospital days associated with stoma takedown

concurrent medication use (steroids, Remicade, or Imuran), or smoking status.

Discussion

We report on a large modern cohort of CD patients with ISF undergoing surgical treatment over an 8-year period at a tertiary referral center specializing in inflammatory bowel disease. We intentionally selected a study period limited to patients treated in the year 2000 or later when the role of laparoscopic treatment of CD is widely accepted and modern diagnostic modalities are routinely available. This study focuses on important unresolved issues in contemporary surgical management, including use of laparoscopy, outcomes following resection or repair of the sigmoid colon, and the efficacy of current diagnostic modalities. Despite the addition of CT enterography as a diagnostic tool, ISF remains an often incidental surgical finding. We observed comparable morbidity of sigmoid resection and primary sigmoid repair. Laparoscopic treatment also appeared to have comparable outcomes to open surgery and was associated with less use of diverting stoma.

Diagnostic modalities have been historically poor for the detection of ISF, with the largest recent series reporting a detection rate of 77%.[6] Another large study by Michelassi et al. which included all types of enteric and colorectal fistulas in CD, preoperative diagnosis of the fistula was achieved in 69% of patients.[9] Despite the availability of multiple complementary studies for detection, only 63% of ISF patients in our cohort had studies providing preoperative knowledge of the ISF. CT enterography has been demonstrated to add diagnostic value in the setting of CD,[8] and MRI enterography has been used with some success compared to small bowel series for CD.[10] In spite of the increasing availability of the state of the art in diagnostic imaging, our results still underline the need for improved diagnostic methods for ISF detection, as well as the importance of intraoperative assessment of the bowel and the importance of a high degree of suspicion for associated disease.

Table 6 Morbidity of Surgical Treatment for ISF in CD

	No.
Mortality	0 (0)
Overall morbidity per patient	38 (37)
Surgical site infection per patient	17 (16)
Anastomotic leak	4 (4)
Wound infection	8 (8)
Abscess	8 (8)
Ileus	22 (20)
Bleeding, requiring perioperative transfusion	7 (7)

The presence of concurrent CD manifestations in the setting of ISF is well documented in previous reports. An early series by Broe and Cameron of ISF in CD reported perianal disease in 6%, enterovesical fistula in 24%, and enterocutaneous fistula in 6%.[2] While the current series of ISF demonstrated enterovesical fistula in 11%, a previous study observed rates of concomitant bladder fistula as high as 30% in patients with ISF.[11] A separate study from the same group in the early 1980s demonstrated additional fistula in 56% of patients, including bladder (17%), enterocutaneous (15%), and enteroenteric (27%).[12] Our overall rate of synchronous disease while still significant might be reduced compared to previous series because of a greater awareness of the complications of Crohn's disease in a contemporary cohort and a more rapid referral for surgery after failure of medical management before extensive fistulization can occur.

Previous series have given conflicting recommendations in the management of the sigmoid colon. In an earlier report from our institution, sigmoid resection was used almost exclusively.[4] A primary criticism of this group of patients was that a substantial number were malnourished and a covering stoma was often created. Several other authors have advocated primary repair of the sigmoid colon and have reported satisfactory results after primary repair of the sigmoid colon.[12,13] In contrast, repair and resection were equally used with comparable morbidity in a large series reported by Young-Fadok et al.,[6] encompassing 90 CD patients with ISF treated over a 20-year period. The majority of patients in our study still required segmental

resection of the sigmoid colon. In general, a sigmoid colon with extensive inflammatory changes also involving the mesocolon would be poorly suited for a primary repair. It is therefore not surprising that in our series patients with sigmoid resection were significantly more likely to have histopathologic evidence of CD of the sigmoid colon. However, when the sigmoid colon is minimally involved and is only the target organ of the fistula originating from the ileocolic CD, a double resection may be unnecessary and the patient can be well served with an ileocolic resection and primary repair of the sigmoid fistula. In patients selected on the basis of the above-mentioned criteria, we encountered no difference in morbidity when comparing resection versus primary repair of the sigmoid colon. Overall, operative decision-making for the sigmoid colon should consider the presence or absence of Crohn's sigmoid colitis, location of the fistula (mesenteric border), size of the fistula defect, and presence of concomitant surrounding inflammation or infection.

With respect to use of protective stomas, some authors previously reported using a loop colostomy to cover the sigmoid colon.[2,12] In contrast, Young-Fadok and colleagues commented that ISF was never directly responsible for stoma creation, which rather depended on the incidence and management of concurrent CD (other fistulas or synchronous small bowel disease) and details of protective stoma use were not explicitly reported. We commonly use protective stomas in the operative management of complicated CD. Creation of protective stomas was associated with other small bowel disease requiring operative treatment, use of intraoperative ureteral stents, longer overall LOS, an open operative approach, malnutrition, and high-dose steroids. Although not statistically significant, we also observed more stoma creation with preoperative use of Remicade and recent laparotomy within the past 12 months. At our institution, when a protective stoma is created, it is typically placed proximal to all areas of resection, strictureplasty, or repair. Our practice is to use a covering stoma in cases of malnutrition, previous failure with operative treatment due to surgical complications or failure to control CD, preoperative use of Remicade or high-dose steroids (>20 mg prednisone), extensive small bowel disease, or extensive fistulization. Similar to the philosophy of Young-Fadok and colleagues, the presence of a fistula to the sigmoid colon is not directly responsible for protective stoma creation. We observed similar rates of morbidity in patients with and without protective stomas.

While a majority of patients had an open procedure, over a quarter of patients underwent a laparoscopic approach. In all but two cases, the procedure was successfully completed laparoscopically with no observed differences in morbidity compared to open surgery, which compares favorably to previous studies in CD that have demonstrated conversion rates from 4–40% often in the setting of concurrent fistulous disease.[14–17] Comparisons between laparoscopic and open surgery are difficult to make based on our data, as there were a number of different operating surgeons not all of which perform laparoscopic surgery. As more surgeons perform laparoscopic procedures in the future, follow-up studies may have less bias with respect to operating surgeon and more meaningful comparisons between open and laparoscopic techniques may be possible. We observed that the rate of sigmoid resection was higher in the laparoscopic group versus the open group. It is unclear from our retrospective study the exact reason that more resections were performed instead of primary repair. Theoretically, with full medialization of the descending and sigmoid colon, primary repair should remain technically feasible even with a laparoscopic approach. In addition, while it was not possible to determine the extent of inflammation from this retrospective analysis consistently, ISF in CD can be associated with a variable degree of inflammatory changes and additional manifestations of CD which all affect the overall complexity of surgical treatment. While only the stoma creation rates and small bowel resection rates were significantly less common in the laparoscopic group, the absolute rates of intraoperative findings of abscess or phlegmon might suggest that more complex patients were generally treated using open technique. However, over 50% of patients treated laparoscopically had phlegmons or abscesses and the absolute rates of sigmoid colon resection were higher in patients treated laparoscopically, thus showing that laparoscopic surgery can still succeed even in a complex condition such as CD-related ISF. Our data therefore suggest that the laparoscopic surgical approach remains feasible in the appropriate patients. The appropriate selection of patients for laparoscopic surgery might allow retention of the recovery benefits associated with laparoscopic surgery at the same time minimizing conversion rates.

While our study provides significant information about current outcomes of CD patients with ISF, it also has several limitations. First, because of the retrospective nature of the study, we were unable to uniformly ascertain the exact factors which contributed to surgical decision-making, particularly with respect to the use of covering stoma and treatment of the sigmoid colon. Furthermore, we do not have any information with respect to patients with ISF and CD that did not require operative treatment. Finally, long-term outcomes after operative repair in our cohort are not included in this study.

Similarly to all operative treatments of CD, treatment of ISF in CD must ultimately be appropriately individualized to the patient and their disease. Resection of ileocolic disease is the standard of care and treatment of the sigmoid colon should be tailored to the presence or absence of

Crohn's sigmoid colitis, fistula location (mesenteric border), fistula defect size, and presence of inflammation or infection. Covering stomas are also appropriate in cases of complicated CD and patients with high risk for anastomotic complications (malnutrition, use of immunosuppressive medications, and intra-abdominal sepsis). In select patients, the laparoscopic approach appears to be satisfactory and technically feasible.

Conclusions

ISF in CD remains a challenging clinical entity to diagnose and manage. ISF often occurs in conjunction with additional distribution of CD and some are still incidental surgical findings. Sigmoid resection and primary sigmoid repair have comparable morbidity if appropriately individualized. Laparoscopic treatment is acceptable in select cases and may allow reduction in diverting stoma rates with similar morbidity.

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References

1. Farmer RG, Hawk WA, Turnbull RB Jr. Clinical patterns in Crohn's disease: a statistical study of 615 cases. Gastroenterology 1975;68(4 Pt 1):627–635.
2. Broe PJ, Cameron JL. Surgical management of ileosigmoid fistulas in Crohn's disease. Am J Surg 1982;143(5):611–613. doi:10.1016/0002-9610(82)90176-3.
3. Greenstein AJ, Kark AE, Dreiling DA. Crohn's disease of the colon. I. Fistula in Crohn's disease of the colon, classification presenting features and management in 63 patients. Am J Gastroenterol 1974;62(5):419–429.
4. Fazio VW, Wilk P, Turnbull RB Jr, Jagelman DG. The dilemma of Crohn's disease: ileosigmoidal fistula complicating Crohn's disease. Dis Colon Rectum 1977;20(5):381–386. doi:10.1007/BF02587365.
5. Garlock JH. Garlock's Surgery of the Alimentary Tract. New York: Appleton-Century-Crofts, 1967, pp 270–276.
6. Young-Fadok TM, Wolff BG, Meagher A et al. Surgical management of ileosigmoid fistulas in Crohn's disease. Dis Colon Rectum 1997;40(5):558–561. doi:10.1007/BF02055378.
7. Saint-Marc O, Vaillant JC, Frileux P et al. Surgical management of ileosigmoid fistulas in Crohn's disease: role of preoperative colonoscopy. Dis Colon Rectum 1995;38(10):1084–1087. doi:10.1007/BF02133983.
8. Vogel J, da Luz Moreira A, Baker M et al. CT enterography for Crohn's disease: accurate preoperative diagnostic imaging. Dis Colon Rectum 2007;50(11):1761–1769. doi:10.1007/s10350-007-9005-6.
9. Michelassi F, Stella M, Balestracci T et al. Incidence, diagnosis, and treatment of enteric and colorectal fistulae in patients with Crohn's disease. Ann Surg 1993;218(5):660–666. doi:10.1097/00000658-199311000-00012.
10. Bernstein CN, Greenberg H, Boult I et al. A prospective comparison study of MRI versus small bowel follow-through in recurrent Crohn's disease. Am J Gastroenterol 2005;100(11):2493–502. doi:10.1111/j.1572-0241.2005.00239.x.
11. Schraut WH, Chapman C, Abraham VS. Operative treatment of Crohn's ileocolitis complicated by ileosigmoid and ileovesical fistulae. Ann Surg 1988;207(1):48–51. doi:10.1097/00000658-198801000-00010.
12. Block GE, Schraut WH. The operative treatment of Crohn's enteritis complicated by ileosigmoid fistula. Ann Surg 1982;196(3):356–60. doi:10.1097/00000658-198209000-00015.
13. van Dongen LM, Lubbers EJ. Surgical management of ileosigmoid fistulas in Crohn's disease. Surg Gynecol Obstet 1984;159(4):325–7.
14. Schmidt CM, Talamini MA, Kaufman HS et al. Laparoscopic surgery for Crohn's disease: reasons for conversion. Ann Surg 2001;233(6):733–739. doi:10.1097/00000658-200106000-00002.
15. Pokala N, Delaney CP, Brady KM, Senagore AJ. Elective laparoscopic surgery for benign internal enteric fistulas: a review of 43 cases. Surg Endosc 2005;19(2):222–225. doi:10.1007/s00464-004-8801-5.
16. Poulin EC, Schlachta CM, Mamazza J, Seshadri PA. Should enteric fistulas from Crohn's disease or diverticulitis be treated laparoscopically or by open surgery? A matched cohort study. Dis Colon Rectum 2000;43(5):621–626. discussion 626–7 doi:10.1007/BF02235574.
17. Regan JP, Salky BA. Laparoscopic treatment of enteric fistulas. Surg Endosc 2004;18(2):252–254. doi:10.1007/s00464-003-8904-4.