



Preoperative cross-sectional imaging findings in patients with surgically complex ileocolic Crohn's disease

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Abstract

Purpose The aim of this study was to evaluate the diagnostic performance of preoperative cross-sectional imaging findings using the SAR-AGA definitions in Crohn's disease (CD) patients who underwent ileocolic resection (ICR) with and without surgically complex ileocolic CD (CIC-CD).

Methods 69 CD patients [38 men; mean (\pm SD) age: 40.6 (16.2) years] who underwent ICR were retrospectively classified by surgical complexity by a colorectal surgeon using operative findings. CIC-CD was defined as ileal CD, not confined to the distal ileum. Two radiologists retrospectively evaluated the preoperative imaging for the presence and type of penetrating disease, stricture, or probable stricture using the SAR-AGA consensus definitions. The diagnostic performance of preoperative imaging findings was compared for patients with and without CIC-CD. Estimated blood loss (EBL), operative time (OT), conversion to open surgery, diversion, and length of hospital stay (LOS) were compared.

Results 60.9% had CIC-CD and 79.7% underwent primary ICR. Penetrating disease was more common in patients with than without CIC-CD (76.2% vs. 40.7%, $p=0.0048$) and similar among primary versus redo ICR ($p=0.12$). Patients with CIC-CD had more complex fistulas (59.5% vs. 11.1%; $p<0.0001$) and fewer simple fistulas (2.4% vs. 18.5%; $p=0.03$) than those without. Mesenteric findings (abscess, inflammatory mass) were more frequent in patients with (35.7%) than without (0%) ($p=0.0002$) CIC-CD. Stricture and probable stricture were similar ($p=0.59$). CIC-CD patients had greater EBL (178 cc vs. 57 cc, $p=0.006$), conversion rates (30% vs. 0%, $p=0.0026$), and diversion (80% vs. 52%, $p=0.04$).

Conclusion Complex fistula, mesenteric abscess, or inflammatory mass defined by the SAR-AGA guidelines suggests CIC-CD. ICR for CIC-CD had greater EBL, conversion to open surgery, and diversion.

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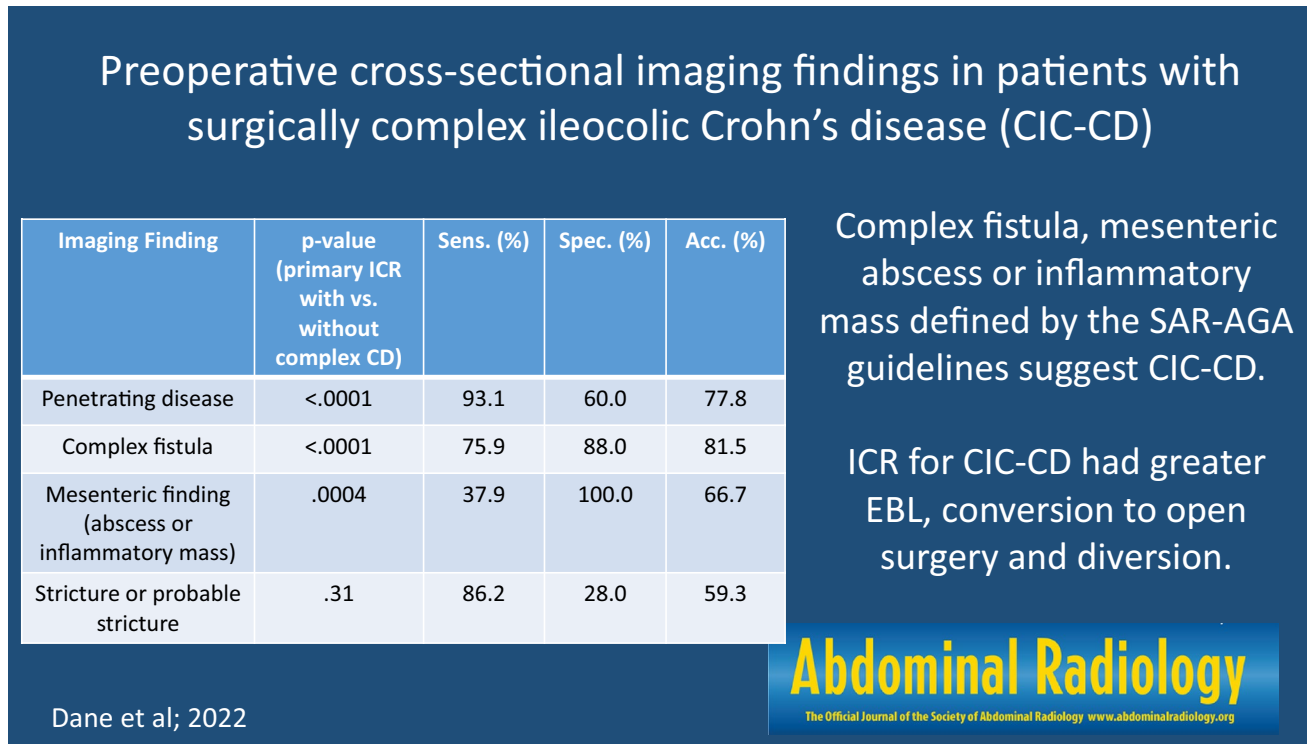
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Graphical abstract



Keywords Crohn's disease · Inflammatory bowel disease · Ileocolic resection · CT · MR

Introduction

More than half of patients with Crohn's disease (CD) will undergo surgery within 10 years of diagnosis [1]. As a disease characterized by recurrent inflammation, strictures, and penetrating disease with fistulas, CD surgery can be complex and technically challenging, requiring surgical expertise [2].

There is currently no consensus in the surgical literature regarding a definition of complex small bowel CD [3]. Varied descriptions exist such as based on surgical complexity, the length of diseased bowel, the length of residual bowel, or recurrent disease [2, 4–6]. Here, we defined complex ileocolic CD as ileal disease with ileo-sigmoid, ileo-vesicular, ileo-rectal, ileo-appendiceal, or enteroenteric fistulas (or any combination of these organs) plus phlegmon, abscess, or difficult mesentery. Preoperative identification of complex ileocolic CD can improve perioperative planning and subsequently postoperative outcomes.

The Society of Abdominal Radiology and American Gastroenterological Association (SAR-AGA) developed consensus recommendations for the interpretation of small bowel CD [7]. Although there are descriptions of complex CD in the surgical literature, to our knowledge, the association of

preoperative imaging findings defined by the SAR-AGA consensus with surgical complexity and complex ileocolic CD has not yet been described in the radiology literature. Therefore, the purpose of our study is to retrospectively assess the diagnostic performance of preoperative cross-sectional imaging findings as defined by the SAR-AGA guidelines, in CD patients who underwent ileocolic resection with and without surgically complex ileocolic CD.

Methods

Patients

This study was institutional review board approved and HIPAA compliant. Eighty-seven patients who underwent ileocolic resection for CD by an IBD specialized surgery team from February 2017 through February 2020 were submitted for independent retrospective surgical classification and radiologic assessment as described below. Seventeen patients without available preoperative cross-sectional imaging in the Picture Archive and Communication System (PACS) and 1

patient who underwent surgery for intramesenteric abscess rather than ileocolic resection were excluded. This resulted in a final patient cohort of 69 CD patients who underwent ileocolic resection [38 men and 31 women; mean (\pm SD) age: 40.6 (16.2) years].

Definition of complex ileocolic Crohn's disease and surgical classification system

A novel surgical classification system for ileocolic Crohn's disease reflecting the complexity and difficulty of surgical resection is described in Table 1. Complex ileocolic CD was defined as ileal disease with ileo-sigmoid, ileo-vesicular, ileo-rectal, ileo-appendiceal, or enteroenteric fistulas (or any combination of these organs) plus phlegmon, abscess, or difficult mesentery.

Patient CD grading according to proposed surgical classification system and reference standard

A board-certified colorectal surgeon with 7 years post-fellowship experience retrospectively classified the patients according to the proposed surgical classification system (Table 1) by review of the electronic medical record (EMR). This classification serves as the reference standard. The surgeon was blinded to subsequent radiologic review. Complex ileocolic CD was defined as ileal disease with ileo-sigmoid, vesicular, rectal, appendiceal, or enteroenteric fistulas (or any combination of these organs) plus phlegmon, inflammatory mass, abscess, or difficult mesentery. Difficult mesentery has phlegmonous changes in close proximity to mesenteric vessels, which can make dissection challenging because of the risk of mesenteric hematoma. The rationale for the classification system is that it is often assumed preoperatively that ileocolic disease will require a simple ileocolic

resection. The classification provides a better understanding for the surgeon and patient preoperatively that a more difficult resection may be required.

Clinical review

An abdominal radiology fellow retrospectively reviewed the electronic medical records for age at CD diagnosis, length of hospital stay (LOS), estimated blood loss (EBL), operative time (OT), body mass index (BMI), need to convert to open surgery, need for fecal diversion, and available laboratory parameters including hematocrit, albumin, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and fecal calprotectin. Time interval from imaging to surgery was recorded.

Imaging technique

Forty-three patients (62.3%) had multiplanar multisequence contrast-enhanced MR enterography and 26 patients (37.7%) had contrast-enhanced abdominopelvic CT according to standard departmental protocols. Prior to MR enterography examinations, patients ingest 750 cc Breeza® (Beekley Corp., Bristol, CT) 1 h before and 250 cc 5 min before the examination. Two-phased array flex coils cover the patient's abdomen and pelvis. A multisequence, multiplanar MR examination was performed utilizing axial and coronal half-Fourier acquisition single-shot turbo spin-echo sequences through the abdomen and pelvis and axial diffusion weighted imaging through the abdomen and pelvis. Post-contrast sequences following the injection of 1 cc intravenous glucagon include axial Golden-angle Radial Sparse Parallel (GRASP), axial radial volumetric interpolated breath-hold examination (VIBE) high-resolution images through the pelvis, and coronal VIBE images. For CT scans,

Table 1 Surgical classification system of ileocolic Crohn's disease

Grade	Definition
1a	First time ileocolic Crohn's disease resection without fistula or abscess
1b	Redo* resection for ileocolic Crohn's disease without fistula or abscess
2a	First time resection for complex ileocolic Crohn's disease
2b	Redo resection for complex ileocolic Crohn's disease
3a	First time resection for complex ileocolic Crohn's disease plus associated necessity of further small bowel resection, strictureplasty, or non-fistula-related colonic resection due to additional disease
3b	Redo resection for complex ileocolic Crohn's disease plus associated necessity of further small bowel resection, strictureplasty, or non-fistula-related colonic resection due to additional disease

Complex ileocolic Crohn's disease was defined as ileal disease with ileo-sigmoid, vesicular, rectal, appendiceal, or enteroenteric fistulas (or any combination of these organs) plus phlegmon, inflammatory mass, abscess, or difficult mesentery**

*Redo is defined as having had a prior small bowel resection

**Difficult mesentery is defined as phlegmonous changes in close proximity to mesenteric vessels

patients ingest 900 cc oral contrast (NeuLumEX; Bracco Diagnostics, Princeton, NJ) over 30 min followed by 300 cc water immediately before the CT enterography examination. Images were acquired 60 s after the beginning of intravenous contrast injection (1.5 mL/kg Isovue 300, Bracco Diagnostics at 3–4 mL/s). 0.6 mm axial slices were acquired by the scanner, from which 4-mm axial and 3-mm coronal images were reconstructed and sent to PACS for imaging review.

Imaging review

Two board-certified abdominal radiologists with 7 and 5 years post-fellowship experience and expertise in inflammatory bowel disease imaging retrospectively reviewed the preoperative cross-sectional imaging (CT or MRI) closest to ileocolic resection independently, with discrepant cases settled by consensus review. The radiologists were blinded to each patient's surgical classification. All imaging findings were assessed using the definitions provided by the SARA-AGA consensus for the interpretation of small bowel CD [7]. The presence or absence of penetrating disease, abscess (defined as mesenteric fluid collection with rim enhancement and/or internal air) or inflammatory mass (defined as an ill-defined mass-like soft tissue attenuation in the mesentery but without water attenuation), and stricture (defined as luminal narrowing with upstream bowel dilation ≥ 3 cm) or probable stricture (MRI only, defined as fixed luminal narrowing over multiple sequences but with upstream lumen < 3 cm diameter) were recorded. For patients with penetrating disease, the presence of either a sinus tract (defined as a blind-ending tract), simple fistula (defined as 1 fistula connecting 2 structures), or complex fistula (defined as 2 or more fistulas) was recorded. For patients with fistulas, the presence of enteroenteric, enterocolic, enterovesicular, and fistulas to the abdominal wall was recorded. The type of cross-sectional imaging assessed was noted.

Statistical analysis

Age was compared between groups using unpaired t-tests. Laboratory values, LOS, OT, BMI, and EBL, and time interval from imaging to surgery were compared using the Mann–Whitney *U* test. The frequencies of all cross-sectional imaging findings, sex, requirement for conversion to open surgery, and need for fecal diversion were compared using Fisher's exact tests. Statistical analysis was not performed for grade 3 patients alone given the small number of patients classified as having grade 3 ileocolic CD. The sensitivity, specificity, accuracy, positive predictive value (PPV), and negative predictive value (NPV) of each cross-sectional imaging finding were calculated. Inter-reader agreement was assessed by Cohen's Kappa. A *p* value less than 0.05 indicated statistical significance. Analysis was performed using statistical software (SPSS Statistics version 25; IBM).

Results

Patients

Fifty-five patients (79.7%) underwent primary ileocolic resection for CD and 14 patients (20.3%) had a redo operation. Twenty-five patients (36.2%) were classified as grade 1a, 2 patients (2.9%) were grade 1b, 29 patients (42.0%) were grade 2a, 8 patients (11.6%) were grade 2b, 1 patient (1.4%) was grade 3a, and 4 patients (5.8%) were classified as grade 3b ileocolic CD. Forty-two patients (60.9%) had complex ileocolic CD (grade 2 or 3) whereas 27 patients (39.1%) did not (grade 1). There was no statistically significant difference in age or sex between the patients with complex ileocolic CD (grade 2 or 3) compared to those without (grade 1) ($p=0.36$ and 0.46 , respectively) (Table 2).

Patients undergoing redo ileocolic resection were more likely to have complex ileocolic CD (grade 2 or 3) than those undergoing primary ileocolic resection (85.7% versus

Table 2 Patient characteristics and surgical grade

Grade	Number of patients (n, %)	Age (years) mean [SD]	Gender
1a	25, 36.2%	38.0 [15.2]*	12 men and 13 women***
1b	2, 2.9%	44.0 [32.5]*	1 man and 1 woman***
2a	29, 42.0%	37.5 [14.0]	17 men and 12 women
2b	8, 11.6%	45.5 [15.2]	7 men and 1 woman
3a	1, 1.4%	38.0	1 woman
3b	4, 5.8%	69.3 [9.6]	1 man and 3 women
All primary resection (1a, 2a, 3a)	55, 79.7%	37.7 [14.3]**	29 men and 26 women****
All redo resection (1b, 2b, 3b)	14, 20.3%	52.1 [18.8]**	9 men and 5 women****

* $p=0.91$; ** $p=0.0025$; *** $p=0.58$; **** $p=0.55$

54.5%, $p=0.04$). Additionally, patients undergoing redo ileocolic resection were older than those undergoing primary ileocolic resection [mean (\pm SD) age: 52.1 (18.8) years and 37.7 (14.3) years, respectively; $p=0.0025$]. Sex was similar in redo and primary ileocolic resection groups ($p=0.55$).

Clinical review

Patients with complex ileocolic CD undergoing primary resection had significantly greater EBL (178 cc vs. 57 cc, $p=0.006$), more frequent conversion to open surgery (30% vs. 0, $p=0.0026$), and fecal diversion (80% vs. 52%, $p=0.04$) than those without complex ileocolic CD.

Table 3 Comparison of clinical parameters for patients undergoing primary ileocolic resection without (grade 1a) and with (grade 2a) complex ileocolic Crohn's disease

	Grade 1a	Grade 2a	<i>p</i> value
Estimated blood loss (cc)	57	178	<i>0.006</i>
Conversion to open surgery (<i>n</i> , %)	0, 0%	9, 30%	<i>0.0026</i>
Need for fecal diversion (<i>n</i> , %)	13, 52%	24, 80%	<i>0.04</i>
Length of hospital stay (days)	7.1	7.6	0.28
Operative time (minutes)	181	196	0.30
Hematocrit (L/L)	39.7	37.2	0.068
Albumin (g/dL)	4.0	4.0	0.35
C-reactive protein (mg/L)	16.8	50.3	0.42
Erythrocyte sedimentation rate (mm/hour)	25.3	41.9	0.19
Fecal calprotectin (μ g/mg)	364.9	372.9	0.97
Body Mass Index (kg/m^2)	23	24	0.70

Values in italics are statistically significant

Table 4 Summary of imaging findings by surgical grade

Grade	1-A	2-A	3-A	1-B	2-B	3-B	Total
Total patients (<i>n</i>)	25	29	1	2	8	4	69
All penetrating (<i>n</i>)	10	27	0	1	4	1	43
Complex fistula (<i>n</i>)	3	22	0	0	2	1	28
Simple fistula (<i>n</i>)	5	1	0	0	0	0	6
Sinus tract (<i>n</i>)	2	4	0	1	2	0	9
All fistula (<i>n</i>)	8	23	0	0	2	1	34
Enteroenteric fistula (<i>n</i>)	3	17	0	0	2	1	23
Enterocolic fistula (<i>n</i>)	6	20	0	0	2	1	29
Enterovesical fistula (<i>n</i>)	1	7	0	0	1	0	9
Fistula to abdominal wall (<i>n</i>)	0	1	0	0	2	0	3
Mesenteric abscess or inflammatory mass (total <i>n</i>)	0	11	0	0	3	1	15
Mesenteric abscess (<i>n</i>)	0	5	0	0	1	1	7
Inflammatory mass (<i>n</i>)	0	6	0	0	2	0	8
All stricture or probable stricture (<i>n</i>)	18	25	1	1	4	2	51
Stricture (<i>n</i>)	13	16	0	1	3	2	35
Probable stricture (<i>n</i>)	5	9	1	0	1	0	16

Complex ileocolic CD patients had trends toward longer LOS and OT, although not statistically significant (7.6 vs. 7.1 days, $p=0.28$; 196 vs. 181 min, $p=0.30$, respectively). All assessed laboratory parameters and BMI were similar among the different groups (Table 3).

Imaging review

Cross-sectional imaging was performed median 64 days (IQR 23–137 days) before surgery. Table 4 summarizes imaging findings stratified by surgical grade. Inter-reader agreement for imaging findings ranged from 0.665 to 1 (Table 5).

Comparison of patients with complex ileocolic Crohn's disease (grade 2 or 3) to those without (grade 1)

Imaging was performed median 51 days before ileocolic resection (IQR 20–132) for patients with complex ileocolic CD and 77 days (IQR 38–132 days) before ileocolic resection for patients without complex ileocolic CD ($p=0.16$). Forty-three patients (62.3%) had penetrating disease, 34 (79%) of whom had fistulas. Penetrating disease occurred more commonly in patients with complex ileocolic CD (grade 2 or 3, 32/42, 76.2%) compared to those without (grade 1, 11/27, 40.7%) ($p=0.048$). Sensitivity, specificity, and accuracy of penetrating findings for complex ileocolic CD were 76.2%, 59.3%, and 69.6%, respectively. Patients with complex ileocolic CD (grade 2 or 3) were more likely to have complex fistulas (25/42, 59.5% versus 3/27, 11.1%; $p<0.0001$), specifically enteroenteric (20/42, 47.6% versus 3/27, 11.1%; $p=0.0018$) and enterocolic fistulas (23/42, 54.8% versus 6/27, 22.2%; $p=0.0119$) than those with grade

Table 5 Inter-reader agreement for imaging findings

Imaging finding	Kappa (95% confidence interval)
Penetrating disease	0.937 (0.850–1.000)
Complex fistula	0.665 (0.443–0.887)
Simple fistula	1
Sinus tract	0.901 (0.710–1.000)
Enteroenteric fistula	1
Enterocolic fistula	0.970 (0.913–1.000)
Enterovesical fistula	1
Fistula to abdominal wall	0.85 (0.561–1.000)
Abscess	0.925 (0.781–1.000)
Inflammatory mass	0.939 (0.821–1.000)
Stricture	0.889 (0.783–0.995)
Probable stricture (MRI only)	0.900 (0.766–1.000)

1 disease, and less likely to have simple fistulas (1/42, 2.4% versus 5/27, 18.5%; $p=0.03$). The frequency of enterovesical and abdominal wall fistulas was similar ($p=0.08$ and $p=0.27$, respectively). Sensitivity, specificity, and accuracy of complex fistulas for complex ileocolic CD were 59.5%, 88.9%, and 71.0%, respectively.

Fifteen patients (21.7%) had either a mesenteric abscess or an inflammatory mass. Mesenteric findings, including abscess and inflammatory mass, occurred more frequently in patients with complex ileocolic CD (15/42, 35.7%) (grade 2 or 3) than those without (grade 1) (0/27, 0%) ($p=0.0002$, $p=0.037$, and $p=0.019$, respectively). Patients with abscess had surgery median 20 days (IQR 3–32 days) after imaging and those with an inflammatory mass had surgery median 26 days (IQR 18–83 days) after imaging ($p=0.34$). No mesenteric findings (abscess or inflammatory mass) were present in patients with grade 1 disease. Sensitivity, specificity, and accuracy of mesenteric findings for complex ileocolic CD were 35.7%, 100%, and 60.9%, respectively.

There was no statistically significant difference in stricture or probable stricture between patients with (32/42, 76.2%) and without (19/27, 70.4%) complex ileocolic CD ($p=0.59$).

Key results for these groups are displayed in Table 6.

Table 6 Diagnostic performance of imaging findings for the diagnosis of complex ileocolic Crohn's disease (grade 2 or 3)

	<i>p</i> value	Sensitivity (%)	Specificity (%)	Accuracy (%)	PPV (%)	NPV (%)
Penetrating disease	<i>0.0048</i>	76.2	59.3	69.6	74.4	61.5
Complex fistula	<i><0.0001</i>	59.5	88.9	71.0	89.3	58.5
Mesenteric finding (abscess or inflammatory mass)	<i>0.0002</i>	35.7	100.0	60.9	100.0	50.0
Stricture or probable stricture	0.59	76.2	29.6	58.0	62.8	44.4

Values in italics are statistically significant

Comparison of patients who underwent primary ileocolic resection for grade 1a and 2a disease

Imaging was performed median 56 days (IQR 16–134 days) before ileocolic resection for patients with and 77 days (IQR 34–140 days) without complex ileocolic CD ($p=0.39$). Penetrating findings occurred more commonly in patients with grade 2a (27/29, 93.1%) than grade 1a disease (10/25, 40%) ($p<0.0001$). Sensitivity, specificity, and accuracy of penetrating findings for grade 2a disease were 93.1%, 60.0%, and 77.8%, respectively. Complex, enteroenteric, and enterocolic fistulas occurred more frequently in patients with grade 2a than grade 1a disease ($p<0.0001$, $p=0.0006$, and $p=0.0012$, respectively). Sensitivity, specificity, and accuracy of complex fistulas for grade 2a disease were 75.9%, 88.0%, and 81.5%, respectively.

Mesenteric findings (abscess or inflammatory mass) were also more common in patients with grade 2a (11/29, 37.9%) than 1a disease ($p=0.0004$), with no mesenteric findings in grade 1a patients. Sensitivity, specificity, and accuracy of mesenteric findings for grade 2a disease were 37.9%, 100.0%, and 66.7%, respectively.

There was no statistically significant difference in the frequency of stricture or probable stricture between these two groups (grade 1a: 18/25, 72.0%, grade 2a: 25/29, 86.2%; $p=0.31$). These findings are summarized in Table 7 and examples are depicted in Figs. 1 and 2.

Comparison of all primary (all grade a) to redo (all grade b) ileocolic resections for Crohn's disease

There was no statistically significant difference in penetrating (grade a: 37/55, 67.3%, grade b: 6/14, 42.9%; $p=0.12$) or mesenteric findings (grade a: 11/55, 20%, grade b: 4/14, 28.6%; $p=0.49$) between patients undergoing primary (grade a) and redo (grade b) ileocolic resection. Stricture or probable stricture occurred more commonly in grade a (44/55, 80%) than grade b (7/14, 50%) patients ($p=0.04$).

Table 7 Diagnostic performance of imaging findings to distinguish grade 1a from 2a disease in patients who underwent primary ileocolic resection for Crohn's disease

	<i>p</i> value	Sensitivity (%)	Specificity (%)	Accuracy (%)	PPV (%)	NPV (%)
Penetrating disease	<i>< 0.0001</i>	93.1	60.0	77.8	73.0	88.2
Complex fistula	<i>< 0.0001</i>	75.9	88.0	81.5	88.0	75.9
Mesenteric finding (abscess or inflammatory mass)	<i>0.0004</i>	37.9	100.0	66.7	100.0	58.1
Stricture or probable stricture	0.31	86.2	28.0	59.3	58.1	63.6

Values in italics are statistically significant

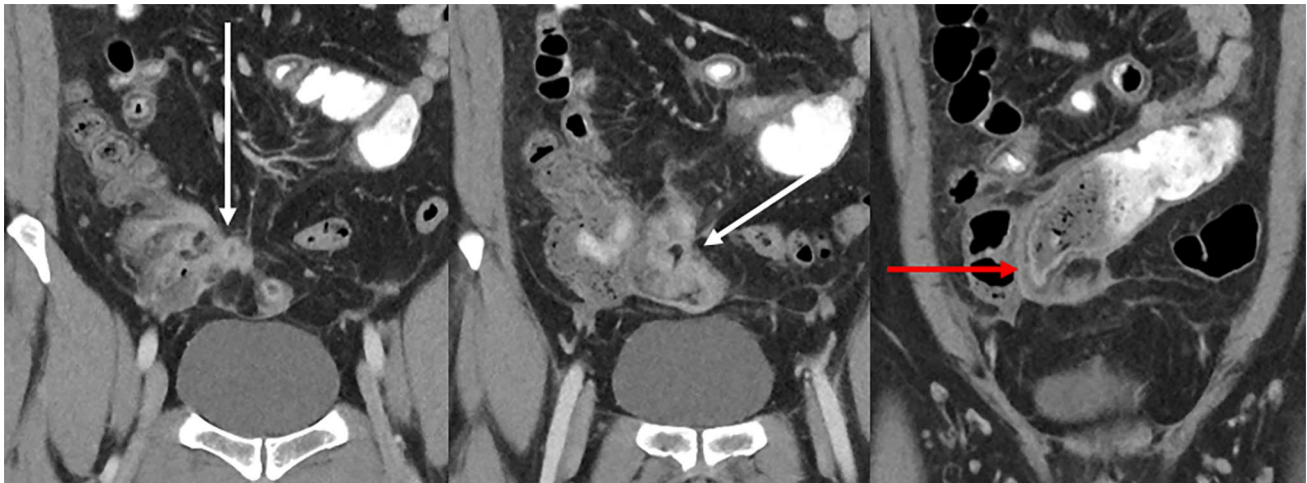


Fig. 1 37-year-old man who underwent primary ileocolic resection for complex ileocolic Crohn's disease (grade 2a). Three coronal images from abdominopelvic CT performed with intravenous and positive oral contrast demonstrate a complex ileocolic fistula (white

arrows) between the cecum, ascending colon, and distal ileum. Active inflammation within an ileal stricture (red arrow) with upstream luminal dilation also present

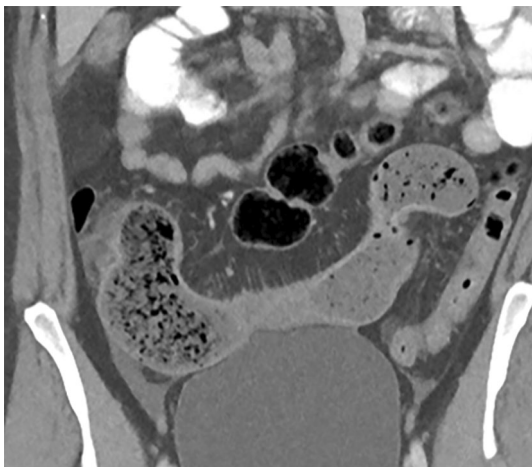


Fig. 2 33-year-old woman who underwent primary ileocolic resection for ileocolic Crohn's disease (grade 1a). Coronal CT image with intravenous and positive oral contrast demonstrates ileocecal valve stricture with upstream luminal dilation and small bowel feces sign, but no active inflammation or penetrating disease. Pseudosacculation along the antimesenteric border indicates chronicity

Discussion

Surgically complex ileocolic CD occurred in over half (60%) of our cohort of CD patients who underwent ileocolic resection. As most (80%) of our patients underwent primary ileocolic resection and 42% had primary resections for complex ileocolic CD, this indicates that surgically complex CD is not restricted to patients undergoing repeat surgery as was suggested in prior surgical studies [4].

CD patients with surgically complex ileocolic CD had greater estimated blood loss, more frequent conversion to open surgery, more frequent requirement for fecal diversion, trends toward longer hospital stay, and intraoperative time. This supports the proposed classification system of complex ileocolic CD. Additionally, this indicates that penetrating disease and particularly mesenteric findings are greater determinants of surgical complexity than whether the patient is undergoing a primary or redo ileocolic resection for CD.

Radiologic findings on preoperative cross-sectional imaging as defined by the SAR-AGA guidelines can help to

determine which patients with ileocolic CD will have surgically complex disease, both for patients undergoing primary and redo ileocolic resection. Penetrating disease, specifically complex fistulas, and mesenteric findings, such as abscess or inflammatory mass, occurred more commonly in patients with than without surgically complex ileocolic CD with high specificity. Radiologists should carefully search for these findings and, if identified, should alert the referring clinician to their presence. On the other hand, simple fistulas were more frequent in patients without surgically complex disease.

Strictures occurred with similar frequency in patients with and without surgically complex ileocolic CD, indicating that strictures do not necessarily increase surgical complexity. This is an expected result, however, as the indication for strictureplasty among patients with and without complex ileocolic Crohn's disease is the same.

There is no consensus definition of complex ileocolic CD in the surgical literature and numerous descriptions are reported [2–4]. Here, we describe a classification of ileocolic CD based on surgical complexity and apply the SAR-AGA consensus recommendations for patients with small bowel CD [7] to this classification system. To our knowledge, the implication of these imaging findings for surgical complexity has not yet been reported.

Limitations include the relatively small sample size in this retrospective, single institution study, especially the small number of patients with grade 3 ileocolic CD. Additionally, surgical complexity was determined by the assessment of one, although experienced, colorectal surgeon. Finally, the decision for surgery is often made after multidisciplinary discussion, which incorporates the imaging findings. Similarly, the decision for conversion to open surgery and fecal diversion are based not only on surgical complexity, but also on surgeon experience and preference.

In conclusion, preoperative cross-sectional imaging can help determine which patients will have surgically complex ileocolic CD. Our study did not reveal a statistically significant difference in surgical complexity based on primary versus redo ileocolic resection for CD. However, we found the presence of a complex fistula, mesenteric abscess, or inflammatory mass on imaging correlates with surgically complex ileocolic CD with high specificity. Radiologists should be aware of imaging findings associated with surgical complexity, based on the definitions provided by the SAR-AGA guidelines, and carefully search for these findings, as this knowledge may potentially help with surgical planning.

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Data availability Available.

Code availability N/A.

Declarations

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

Ethical approval This study was institutional review board approved and Health Insurance Portability and Accountability Act compliant.

Consent to participate Waiver of the requirement for informed consent.

Consent for publication Yes.

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