Institutional imaging guidelines for the management of small bowel Crohn's disease

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Inflammatory bowel disease (IBD) represents a group of idiopathic, chronic, inflammatory intestinal conditions. Its two main disease categories are Crohn's disease (CD) and ulcerative colitis (UC), with both overlapping and distinct clinical and pathological features. The pathogenesis of IBD is incompletely understood. The incidence of CD in the developing countries accounts for <1 per 100,000 (but probably increasing) in Asia and South America. CD prevalence seems higher in urban areas than in rural areas and in higher socioeconomic classes. Among the developed countries, Canada has the highest prevalence and incidence of IBD. A recent impact report published by The Crohn’s and Colitis Foundation of Canada (CCFC) states that there are 233,000 Canadians living with IBD. Of those, 129,000 people have Crohn's disease. The prevalence of IBD currently in Canada is nearly 0.7%, equating to more than 1 in every 150 Canadians.

People with CD face a significantly elevated risk of premature death (47% higher) than the general public. Within Canada, the incidence is highest in Quebec and Nova Scotia. Nova Scotia has an incidence of 20 per 100,000 populations with an overall Canadian average of 16.3 / 100,000. Every year 5,700 new cases of CD are diagnosed Canada wide.

Imaging is commonly used to distinguish CD from other conditions causing colitis. In particular, the presence of small-bowel involvement helps distinguish CD from ulcerative colitis. Over the past decade many new treatment strategies have been developed that allow treatment of virtually all forms of CD. The success of these treatments depends on accurate diagnosis of the nature and extent of disease. Therefore, it is no longer sufficient for the radiologist to only detect the presence of CD; one must also accurately assess its subtype, location, and severity. This is particularly important in distinguishing segmental small-bowel narrowing due to active disease, effectively treated with medical therapy, from fibrotic strictures, amenable to surgical procedures. Likewise, the distinction between simple and complex fistulae is important to adequately treat these medically or surgically. In two large clinical trials, 18% of patients with CD and moderate-to severe clinical symptoms had no evidence of ulcers at ileocolonoscopy. On the other hand, a sizable proportion of patients with established CD may have persistent severe lesions in the absence of symptoms and persistence of lesions is associated with higher requirements for hospitalization, increasing requirement for medical therapy and surgeries. Therefore, objective assessment of inflammatory lesions is required for guiding therapeutic interventions and for assessing the efficacy of these interventions.

No consensus exists regarding the optimal technique and imaging modality for evaluating CD.

The choice of imaging depends upon the clinical presentation of the patient. The plethora of medical information available on the web does not make this choice an easy one, since supportive literature can be found for virtually every imaging modality. Consequently, radiologists frequently encounter requests for those imaging tests which, at times, may
not provide adequate information. The ever-emphasized issue of radiation is also a huge consideration since most of the CD patients are young and over the period time usually require frequent imaging tests.

The considerations of these factors lead us to the development of imaging guidelines for the management of Crohn's disease which are either nonexistent in literature or may not be applicable due to the local expertise and resources or lack thereof. We intend to standardize and simplify the choice of available imaging in most clinical scenarios relating to CD.

Our objective was to develop evidence based, institution specific guidelines, for the management of small bowel Crohn's disease.
Methods and materials

An extensive literature search was carried out to find out the available literature on the diagnosis of small bowel Crohn's disease.

The literature as well as the clinical and imaging guidelines available were evaluated and compared to the resources and expertise that is available at our institute.

Recommendations were made in different clinical scenarios pertinent to our institutional practices.

All the prospective and retrospective studies were included in the review.
INITIAL DIAGNOSIS AND EXTENT:

It is universally accepted that there is no single gold standard test available for the diagnosis of CD. The diagnosis is confirmed by clinical evaluation and a combination of endoscopic, histological, radiological, and/or biochemical investigations. The current view is that the diagnosis is established by a non-strictly defined combination of clinical presentation, endoscopic appearance, radiology, histology, surgical findings and more recently, serology.

For suspected CD, ileocolonoscopy and biopsies from the terminal ileum as well as each colonic segment to look for microscopic evidence of CD are first line procedures to establish the diagnosis. Ileoscopy is superior for the diagnosis of CD of the terminal ileum when compared with radiology techniques, including MR and CT, especially for mild lesions. When there is severe, active disease, the value of full colonoscopy is limited by a higher risk of bowel perforation and diagnostic errors are more frequent. CD may affect the ileum out of reach of an endoscope, or involve more proximal small bowel in 10%. Additionally, at the time of diagnosis 15.5% of patients have penetrating lesions. Radiological investigations play a key role in these cases.

CT and MR are the current standards for evaluating the small bowel. Both techniques can establish disease extension and activity based on wall thickness and increased intravenous contrast enhancement. Fluoroscopic examinations have a considerably lower sensitivity for the detection of small bowel and extra luminal lesions compared to CT or MR. Although some imaging subtypes of Crohn's are based on findings on fluoroscopic examinations, especially the earlier manifestations of the disease. Evidence-based analysis has shown that the negative predictive value of CT enterography is 67%, compared with 48% for SBFT or 63% for MR enterography. The use of conventional SBFT as the initial method of examination because of its low cost seems misguided, as this likely contributes to the long lag time; it does not reliably exclude early disease and when an abnormality is suspected, it requires additional imaging to confirm the finding.

CTE has almost completely replaced the traditional small bowel follow through in most academic centers. A number of studies comparing CT enteroclysis with CT enterography have demonstrated comparable results. Higgins and colleagues showed that CTE findings are not equivalent to clinical assessment, demonstrating either unsuspected strictures in up to 16% of patients or absence of a radiologically significant stricture in more than half the subjects with clinically suspected strictures. These investigators concluded that CTE altered the management plans in more than 50% of patients. A second important finding in the same study was the effect of CTE on the physician’s level of confidence for the findings of active small bowel disease, fistula, abscess, or stricture formation, which was altered in more than 90% of cases, with clinically significant changes in up to 77.6%.
The best current evidence-based analysis shows that CTE is a good test for the diagnosis of SB Crohn's disease but barium enteroclysis is required in the group of patients with high clinical suspicion of disease with a negative CTE. In the clinical scenario where there is a high pretest probability (e.g. 85%), a positive CTE result confirms the presence of disease but a negative test result is equivocal. Further investigation with barium enteroclysis was recommended by researchers in these cases. A similar conclusion was made in a report comparing MRE with barium enteroclysis and CTE.

At our institution we do not offer fluoroscopic enteroclysis or its cross sectional variations. We prefer the use of CTE because of its greater availability and short scan times. The initial use of CT is also preferred in elderly patients because MR imaging is more time consuming and the image quality provided by MR imaging varies to a greater extent than does that of CT. Indeed, CT is more appropriate in uncooperative patients, because it requires fewer breath holds than MR imaging, thus improving patient compliance. A baseline CTE can then be used to compare to further follow up procedures. The American College of Radiology, appropriateness criteria, gives higher rating to CT enterography than MR enterography for initial diagnosis of Crohn's disease in adults. For children or young adults, however, CTE and MRE is rated equally.

**Recommendation # 1**

*For initial presentation, diagnosis and for the initial evaluation of the extent of disease, we recommend a single phase CT enterography.*

*At our institution we perform this routinely with neutral oral contrast.*

**DISEASE SURVEILLANCE / NON ACUTE PRESENTATIONS / THERAPEUTIC RESPONSE:**

75-90% of patients with Crohn's disease are in a clinical remission at any given time. Most patients with CD require frequent assessment for reactivation as well as to assess the response to medical therapy.

A recent European study retrospectively evaluated the amount of radiation received by patients with Crohn's disease. In this study, 20.8% patients received an Effective Dose (ED) # 50 mSv. The need for surgery was one of the independent predictive factors related to high EDs (ED # 50 mSv). The high cost and associated risks of treatment with anti-TNF agents and the poor correlation of disease activity with clinical symptoms make accurate assessment of response to therapy imperative. Both CT and MRI offer promise in evaluating disease activity and can be used to evaluate response to therapy. MR enteroclysis can potentially demonstrate jejunal involvement better than MR enterography and also better depicts early inflammatory changes. However due to
limitations like restricted resources, we currently do not offer enteroclysis procedures within our institute.

The signs of Crohn’s disease have been widely described in literature and many researchers have evaluated different radiological parameters to assess the disease activity on MR imaging including mural hyperenhancement, thickening and abnormal T2 signal. Recently Steward et al. has described an MR based disease activity index which focuses on the mural thickness and abnormal T2 signal.

A study by Cheriyan et al. evaluated the impact of MRE on the management of CD. It concluded that nearly 75% of patients had a change in management, either medical or surgical, after MRE, suggesting that this imaging modality had significantly influenced clinical decision-making. One of the important predictors in the management of CD is presence of fibrotic segments which may or may not lead to acute obstruction. In cases of sub-acute presentation, MR imaging can more reliably differentiate between fibrotic and non fibrotic diseased segments, compared to CT. Quencer et al. have reported that while CTE and MRE are similar in their accuracies of depicting active inflammation, MRE is significantly more sensitive in detecting fibrosis. Schill et al. has recently reported a sensitivity of 96% for MRE for detection of strictures which were surgically confirmed.

Diffusion weighted imaging and quantified ileal motility has been recently used to assess disease activity in CD). In addition Magnetization transfer has also been recently described for its ability to detect fibrosis. These new techniques, although not in wide clinical use, carry promising prospects for imaging evaluation of CD.

**Recommendation # 2**

*For surveillance of disease and non acute presentations, we recommend the use of MR Enterography in all patients at or below the age of 50 years.*

*MRE is recommended as a test of choice for distinction between active inflammatory and fibrostenotic disease.*

*Routine use of CTE is discouraged due to the potential radiation risks.*

*Fluoroscopic procedures are only recommended in cases where MR and CT are contraindicated.*

**KNOWN DISEASE WITH ACUTE PRESENTATIONS:**
Extraluminal complications such as bowel perforation with or without associated abscess must be ruled out in acutely ill patients. In patients with fulminant symptoms, radiographs are useful, because they can often detect the presence of bowel obstruction, perforation, or toxic colon distention, directing further treatment quickly. In patients with CD who present with pain, a palpable mass, or fever and in whom an abscess is suspected, barium studies have little role. While they may demonstrate a fistulous communication with an abscess, a negative study does not preclude other studies, and a positive one will likewise lead to additional imaging to guide therapy, such as percutaneous drainage.

Currently, CT or CT enterography is the initial imaging technique of choice in suspected CD complications. Studies have shown that CT-demonstrated unsuspected findings leading to a change of medical or surgical management in 28% of patients. In one study, penetrating disease was seen in 20.7% of patients referred for CT, which was a new finding in 58.1%. In another study, in approximately 50% of patients who had penetrating disease identified on CT, there was no clinical suspicion of fistula or abscess.

Although MR enterography has high sensitivity and specificity for detecting acute inflammation and is as sensitive as CT for detecting abscesses, it is not as good as CT for detecting free intraperitoneal air, which is the best imaging feature of bowel perforation. For this reason, CT with positive oral contrast administration is recommended as the primary study for patients with known IBD presenting with acute abdomen. Another advantage of CT over MRI is the rapid acquisition time, which is better tolerated by acutely ill patients and minimizes bowel motion artifact from peristalsis. Given that most acutely ill patients cannot tolerate the large volume of oral contrast material (because of nausea or bowel obstruction) required for CT enterography, positive rather than neutral or negative oral contrast material is recommended for imaging of acutely ill patients to better differentiate an abdominopelvic abscess from high-attenuation ingested intraluminal content, despite a decrease in sensitivity for detecting mucosal disease. Many acutely ill patients may be unable to tolerate any oral contrast material, in which case CT with IV contrast administration alone would be required.

**Recommendation # 3**

For patients with known disease and acute presentations, we recommend the use of oral and IV contrast enhanced CT of the abdomen in all patients regardless of the age.
Conclusion

There are virtually no published guidelines for imaging for small bowel Crohn’s disease. It is essential to standardize institutional guidelines for the imaging of Crohn’s disease so that the disease could be diagnosed reliably and to reduce the number of imaging tests with low diagnostic yield.

CT and MR enterography remain the mainstay of imaging in the evaluation of small bowel involvement in Crohn’s disease.

SUMMARY OF RECOMMENDATIONS

Recommendation # 1

For initial presentation, diagnosis and for the initial evaluation of the extent of disease, we recommend a CT enterography. At our institution we perform this routinely with neutral oral contrast.

Recommendation # 2

For surveillance of disease and non acute presentations, we recommend the use of MR Enterography in all patients at or below the age of 50 years.

Routine use of CTE is discouraged due to the potential radiation risks.

Fluoroscopic procedures are only recommended in cases where MR and CT are contraindicated.

Recommendation # 3

For patients with known disease and acute presentations, we recommend the use of oral and IV contrast enhanced CT of the whole abdomen in all patients regardless of the age.
Personal information


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References


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Detailed references available on request.