The Use Of Radiology In The Evaluation And Monitoring Of Gastrointestinal Disorders

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Abstract

While magnetic resonance enterography and computed tomography have become standard small intestinal imaging procedures for the assessment of patients with confirmed or suspected Crohn's disease, there are significant differences in the comprehension and application of these imaging techniques. Enhancing the comprehension of imaging results, terminology, and application will enhance the effectiveness of various imaging methods in guiding treatment choices, as well as evaluating treatment outcomes and consequences. A panel consisting of experts from the Institute of Abdominal Radiology Crohn's Disease-Focused Screen, the The community of Pediatric Radiology, the American Gastroenterological Organization, and other professionals, conducted a thorough evaluation of the data regarding imaging results related to inflammation in the small bowel caused by Crohn's disease. They have also developed suggestions for the assessment, interpretation, and utilization of computed tomography (CT) and magnetic resonance imaging (MRI) in cases of small bowel Crohn's disease. This study provides recommendations for identifying imaging results that show the presence of small bowel Crohn's disease. It also explains how inflammatory small bowel Crohn's disease and its difficulties should be stated. Additionally, it discusses interest extra-enteric results that may be observed during imaging. The study suggests that cross-sectional enterography ought to be performed when diagnosing Crohn's disease and should be considered for monitoring small bowel Crohn's disease. This study presents a valuable morphologic construct that

explains how imaging change results as a disease progresses and responds to treatment. It also provides standardized ideas for radiologic presentations that effectively communicate essential data to gastroenterologists as well as surgeons.

Keywords: Gastrointestinal disorders, Computed tomography enterography (CTE), radiology, computed scan, Crohn's disease, magnetic resonance imaging.

1. Introduction

Computed tomography enterography (CTE) and magnetic resonance enterography (MRE) are the most efficient techniques for visualizing the small intestine in individuals with Crohn's disease (1,2). Cross-sectional enterography methods are used in addition to ileocolonoscopy to detect intramural or proximal small intestinal inflammation in about 50% of Crohn's disease patients who have normal endoscopic tests (3-5). CTE and MRE are valuable diagnostic techniques for Crohn's disease, since they help determine the extent of disease involvement and identify any problems associated with the illness (3-5). Recent findings indicate that cross-sectional imaging may be valuable in evaluating the effectiveness of treatment, examining the healing of the intestine, and tracking the development of the illness (6).

The Society of Abdominal Radiology (SAR) has created a specialized panel focused on Crohn's Disease. This panel has developed specific guidelines for the technical aspects of doing these tests (7-9). CTE and MRE are currently conducted at numerous facilities, with the radiologic literature emphasizing the technical elements of diagnosing and identifying wall inflammation or penetrating consequences, such as fistula and abscess, using different imaging techniques and results. Prior consensus statements from reputable organizations such as the European Crohn's and Colitis Organization and European Society of Gastrointestinal and Abdominal Radiology, along with SAR recommendations, provide essential guidelines on when and how to perform imaging for patients with inflammatory bowel disease (2,7,8). Currently, there is a lack of consensus regarding the structures that should be assessed during cross-sectional enterography, the standardized terminology for describing imaging findings in Crohn's disease, the best approach to describing the severity and extent of different imaging findings in order to guide medical and

surgical treatment, and the appropriate timing for performing these tests, as there is no agreement between US gastroenterology and radiology societies. This study aims to provide a standardized framework for correlating particular imaging results with clinically relevant interpretations and for characterizing different phenotypes of Crohn's disease. The ultimate goal is to provide gastroenterologists and surgeons with valuable guidance in making critical treatment choices for patients with Crohn's disease. The process of standardization will enhance patient care by facilitating a better comprehension of the conveyed imaging results and by promoting the comparison of reported research in the field.

2. Computed Tomography Enterography (CTE) And Magnetic Resonance Enterography (MRE)

Given that the results of CTE and MRE have a significant impact on patient care for a considerable number of symptomatic patients, it is crucial to conduct a systematic evaluation of CTE and MRE pictures in order to optimize patient outcomes. An illustrative instance of how a methodical examination of imaging results and standardized terminology could enhance patient care is evident in the standardized reporting template for pancreatic cancer (9-11).

A collaborative team consisting of radiologists, medical oncologists, pancreatologists, and pancreatic surgeons proposed a structured reporting template for pancreatic carcinoma. This template aims to document objective imaging findings in order to inform and enhance treatment decisions (12). The use of imaging techniques in Crohn's disease is undergoing continuous development. Initially, cross-sectional imaging was used for the purpose of detecting and determining the severity of Crohn's disease. However, it is now being utilized more often to assess the effectiveness of therapy, providing objective measurements that may inform choices on treatment and perhaps change the course of the illness (13,14). Mucosal healing, as identified through colonoscopy, has been found to lead to better outcomes in patients with Crohn's disease (15-18). However, more recent studies have shown that cross-sectional imaging, particularly magnetic resonance enterography (MRE), has a strong association between mucosal healing observed during endoscopy and transmural healing observed during cross-sectional imaging.

Detecting this healing through imaging has also been linked to improved outcomes (19-21). Therefore, it is essential for referring clinicians and radiologists to have a mutual comprehension of the imaging objectives. Many researchers have consequently investigated the correlation between objective and subjective imaging findings and the severity of endoscopic and histologic inflammation (4,22–25). Additionally, some researchers have assessed the extent of intestinal damage through cross-sectional findings (26). When evaluating treatment response, it is necessary to have information on the duration of involvement, the intensity of inflammation or intestinal dilation, and any surgical resections that have been performed.

The current Montreal classification, as well as the pediatric Paris classification, categorizes different types of Crohn's disease based on specific characteristics such as nonstricturing and nonpenetrating inflammatory disease, stricturing disease, penetrating complications, and perianal fistula. However, these classifications do not provide information about the extent and severity of inflammation or the anatomical relationship between different phenotypes, which are crucial factors for making important decisions regarding surgical and medical management (27-29). The Montreal/Paris classifications do not consider the dynamic progression of the disease, the simultaneous occurrence of stricturing and penetrating disease complications, or the frequent presence of active inflammation in stricturing complications. Both CTE and MRE have the ability to consistently identify the range of morphological variations and accompanying "complications". As a result, radiologists must accurately characterize and consistently report the anatomical extent of inflammation and complications associated with Crohn's disease.

These guidelines outline the specific imaging findings that need to be assessed, the manner in which the disease burden should be defined, and the pathophysiologic conclusions that will enhance the capacity of gastroenterologists and intestinal surgeons to make optimal therapy choices. For instance, radiologists are advised to inspect for strictures associated with Crohn's disease. These strictures are described in this guideline as segments of the small intestine that have constriction of the lumen and clear dilation in the proximal (upstream) region. Furthermore, these suggestions highlight the need of describing the length of strictures and the radiologic findings of simultaneous inflammation and blockage

when they are detected. These components provide a significant amount of essential information that a gastroenterologist must examine while deciding on medicinal, surgical, or endoscopic treatment choices.(30)

When discussing the importance of imaging results related to present or previous inflammation in the small intestine, it is necessary to utilize specific words that describe the underlying physiological changes. Active inflammation in Crohn's disease should be diagnosed according to predetermined criteria, as should inflammation that is not specific. Medical treatment may effectively treat active inflammation. If there are no visible signs of current inflammation in individuals suspected of having Crohn's disease, it is important to clearly note this in the radiologic report. In people with Crohn's disease, it is possible for the inflammation in the small intestine or colon to completely resolve, resulting in the bowel reverting to its natural appearance. In such instances, it is equally accurate to state that there is no evidence of small intestinal inflammation. Partial response to medical treatment may be identified by a reduction in the intensity of imaging results in an inflammatory section, or a transformation into smaller and irregular patches of involvement throughout the length of the affected segment (13).

Alternatively, inflammation may subside but leave behind certain indications, such as uneven fat deposits in the wall of the small intestine, remaining pseudosacculation and scarring, or slight thickening of the wall without narrowing of the inner space. These indications may also include other changes in shape or signal that indicate ongoing inflammation, such as the absence of high signal intensity in T2 imaging, excessive enhancement, or restricted diffusion. The conclusion of the report should say "Crohn's disease with no imaging signs of active inflammation is present" when there are sequelae of earlier inflammation but no ongoing inflammation. Avoid using terms like quiescent or chronic since they might be misinterpreted, particularly by patients who now have access to their imaging data in many institutions. Gastroenterologists and patients who rely on imaging data to make clinical choices should be aware that the classification of active vs inactive illness based on imaging criteria does not necessarily correspond to the histological, endoscopic, or clinical activity of the disease. There is a correlation between various evaluation methods; however the characteristics evaluated using different methods differ.

Stricture formation happens when there is a clear narrowing of the passage or segment, accompanied by obvious widening of the area upstream. The presence of contemporaneous active inflammation is often seen in imaging data (31), and we have referred to this pattern as "stricture with findings of active inflammation". Strictures without detectable imaging evidence of inflammation may also be present. In this scenario, the thickness of the intestinal wall is increased without any further indications of inflammation on the imaging. Adler et colleagues (32) discovered that strictures without imaging evidence of inflammation had reduced levels of inflammation and fibrosis. However, the absence of imaging evidence of inflammation does not always indicate the absence of histologic inflammation. Although there is a lack of published data on the topic, based on the radiologist coauthors' experience, it has not been seen that penetrating illness occurs in the presence of a stricture without inflammation. The development and evaluation of imaging criteria for fibrosis is under underway (33,34).

Internal penetrating disease, excluding perianal disease, may manifest at any stage of the illness. However, it mostly affects individuals who have strictures and ongoing inflammation. Penetrating illness may result in the development of sinus tracts, fistulas, abscesses, and free perforation. Fistulas may be categorized as either simple or complicated. Simple fistulas consist of a solitary passage that connects a loop of the intestine to neighboring bowel or other structures, such as the urine bladder. Fistulas that are complex link many nearby intestinal loops or structures. In cases of both simple and complicated fistulas, the bowel loops that are impacted frequently exhibit angulation and seem to be anchored by the fistula tract. Moreover, it is often seen that there are tiny abscesses that form inside the intricate path of these fistulas. If there is no ongoing inflammation present in a fistula, it is important to mention this as well. Postoperative fistulas often do not include inflammation; however they do occur at or close to the location of surgical connections.

Colonoscopy is widely regarded as the definitive method for diagnosing colorectal inflammation. This guideline specifically focuses on Crohn's disease affecting the small intestine and the common problems seen on computed tomography enterography (CTE) and magnetic resonance enterography (MRE) in these patients. This study does not provide a detailed protocol for defining colorectal

inflammation using cross-sectional imaging. Instead, we focused on using CTE and MRE as part of an imaging approach together with clinical evaluation and ileocolonoscopy. Many institutions use transabdominal ultrasound, with or without intravenous contrast, and video capsule endoscopy to diagnose and monitor Crohn's disease. The role of these imaging techniques in clinical management is still developing. However, this work specifically focuses on computed tomography enterography (CTE) and magnetic resonance enterography (MRE) for diagnosing small bowel Crohn's disease and does not include the integration of findings from other imaging methods (35).

3. Structured reporting

Structured reporting templates are widely used by several radiologic clinics to ensure that crucial clinical information is consistently recorded in a methodical manner. Studies have shown that they enhance the accuracy and effectiveness of the information provided to referring providers (36). Multiple organizations have supported the use of structured reporting for chronic traumatic encephalopathy (CTE) and magnetic resonance elastography (MRE).

4. Summary

CTE and MRE may provide crucial data to direct therapy about the existence, intensity, and scope of Crohn's disease and its consequences, which cannot be obtained from clinical and endoscopic assessment, for both adult and pediatric patients. This guideline sets a standard for the use of CTE and MRE in patients with small bowel Crohn's disease. It also clarifies the anatomical structures that should be evaluated systematically, the importance of specific imaging findings, and the agreed-upon terminology for describing imaging findings related to inflammation and complications of small bowel Crohn's disease. Utilizing a collaborative method to connect precise imaging observations with clinically relevant assessments will enhance the accuracy of treatment decision making in the near future, as well as enhance our comprehension of the long-term difficulties associated with Crohn's disease. As new imaging methods, medications, and a deeper knowledge of the pathophysiology of Crohn's disease are produced, this collaborative approach may also adapt to include these advancements.

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