Editorial

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Using MR Enterography and CT Enterography for Routine Crohn's Surveillance: How We Do It Now, and How We Hope to Do it in the Future

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Take-home points

- Response to therapy as demonstrated by MR enterography (MRE) and CT enterography (CTE) has been associated with decreased risk of hospitalization and surgery and maintenance of symptomatic remission.
- Transmural healing of active inflammatory small bowel Crohn's disease (CD) assessed by small bowel imaging in CD should be used as an adjunct to endoscopic remission to improve assessment of bowel healing.
- Tight monitoring of active inflammatory small bowel Crohn's disease using biomarkers, endoscopy and CTE and MRE can be used to guide beneficial treatment escalation.
- For Crohn's patients under the age of 35 or those undergoing cross-sectional enterography for response assessment rather than symptomatic exacerbation, there is a preference for MRE to potentially minimize radiation exposure and improve the reliability of response assessment.
- During an active flare or for patients presenting to the emergency room with obstructive symptoms, both CTE and MRE are routinely ordered and help guide the need for surgery.

We read with interest the provocative article by Ha et al. [1] comparing agreement between three gastrointestinal (GI) radiologists from different institutions in assessing response to therapy for small bowel CD. In this study 96 patients underwent 2 MRE exams, and 96 patients underwent CTE followed or preceded by MRE. Response to therapy was defined as no change in severity and extent of disease, improved, or worsened. Importantly, there was significantly improved radiologist agreement in response assessment when two MRE exams were compared (e.g., in terminal ileum, the intraclass correlation coefficient was 0.656 between 2 MRE exams versus 0.490 between CTE and MRE exams).

This article addresses and raises key questions relating to current response assessment for small bowel CD. As noted by the authors, the goal of CD treatment is resolution of enteric inflammation [2]. Response to therapy as demonstrated by MRE and CTE has been associated with decreased risk of hospitalization and surgery [3-6], and maintenance of symptomatic remission [7].

The imaging literature has focused largely on performance characteristics of a single CTE or MRE exam, which are similar [8-11]. While many have assumed that response assessment would consequently be similar, the authors found that response assessment was more consistent

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between MRE exams.

What might be the reasons for this finding? First, there are no agreed upon response criteria for CTE or MRE for small bowel CD. Second, MR inflammation severity scores used in clinical trials highlight reproducibly identified and responsive observations (e.g., wall thickness, intramural T2 signal, restricted diffusion) that reflect varying severities of endoscopic or histologic inflammation [12-15]. Ha and colleagues also assessed disease extent, reflecting the length of disease and number of inflamed segments. Comparison between two MRE exams may be more concordant given the increased opportunities to compare multiple imaging findings using different pulse sequences. A validated CTE inflammation severity scoring system that could also guide radiologist clinical assessment would likely be beneficial.

How imaging findings of small bowel inflammation are combined with stricturing and penetrating complications is not defined by MR imaging severity scales and highlights need for response guidelines. Deepak examined multiple enterography examinations in CD patients on various medical therapies [3]. Lesion response was defined as a decrease in length without worsening of additional imaging features or development of penetrating complications. In responders, all inflamed segments improved; in partial response, some lesions improved while others demonstrated no change [3,16]. Both response and partial response were associated with a decreased risk of hospitalization, surgery, and corticosteroid usage. Patients who were maintained in a state of response did not progress to surgery [16]. This study provides a simple rubric linking penetrating and stricturing complications with loss of response.

What are we to make of these findings, and how should they influence our behavior and recommendations? Firstly, it should be recognized that both arms in the study by Ha et al. [1] had acceptable and moderate reproducibility for assessing response. Secondly, the symptomatic nature of Crohn's flares and their propensity to involve bowel obstruction and penetrating complications, means that neither patients nor referring clinicians are able to completely control which imaging modality will be utilized: a late night trip to the emergency department (ED) almost always means a CT will be performed, but this imaging has been shown to be well justified because nearly one-third of CD patients in this setting will have perforation, obstruction or abscess [17]. Additionally, detection of new penetrating and obstructing complications often results in a change in management regardless of inflammation present on prior imaging exams.

The scenario described by Ha and colleagues therefore applies to the common scenario of an asymptomatic or minimally symptomatic Crohn's patient on biologic therapy for CD small bowel inflammation. In this setting ileoscopy is often falsely negative [11,18] due to proximal or intramural disease [19]. Selecting therapeutic targets in inflammatory bowel disease (STRIDE) guidelines state that transmural healing assessed by small bowel imaging should be used as an adjunct to endoscopic remission to show a deeper level of healing [2], and the CALM study demonstrated that appropriate treatment escalation led to higher proportions of patients achieving mucosal healing and deeper overall remission [20]. Tight monitoring using biomarkers, endoscopy and CTE and MRE can be used to guide beneficial treatment escalation [3,21-26]. In light of the findings by Ha and colleagues, both providers and patients should advocate for MRE coverage from insurance companies in order to better assess treatment response to improve clinical management decisions.

We perform surveillance CTE or MRE examinations in patients with known or suspected small bowel CD similarly to our colleagues at Asan, taking into account clinical presentation, disease distribution, levels of biomarkers, response to therapy, and interval progression to guide further management decisions. For our patients under the age of 35 who will require serial imaging, we have a preference for MRE's to limit radiation exposure [27]. During

Table 1. Factors Favoring MRE vs. CTE

Considerations Favoring MRE	Considerations Favoring CTE
35 years of age or younger	Presentation to emergency department or presenting with severe symptomatic exacerbation
Pregnant	CTE access
Suspect perianal fistula or sepsis	Claustrophobia at MRE
Asymptomatic, response assessment	Suspect complex intra-abdominal penetrating disease
MRE access	Older patient

CTE = CT enterography, MRE = MR enterography

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Table 2. Sensible Response Criteria Based on Long-Term Outcomes that Incorporate Inflammation Severity and Extent along with Penetrating and Stricturing Complications

Response Assessment Category	Proposed Criteria	Rationale
Transmural healing	Resolution of imaging findings of small bowel inflammation	Associated with mucosal healing and achieves biologic target
Response	All small bowel inflammatory segments decrease in severity and length of inflammation without development of penetrating or stricturing complications	Associated with positive long-term outcomes (decreased risk of surgery or hospitalization)
Partial response	At least one small bowel inflammatory segment decreases in severity and length of inflammation without 1) other inflamed segments becoming longer or worsening in inflammation severity, 2) development of penetrating or stricturing complications	Associated with positive long-term outcomes (decreased risk of surgery or hospitalization)
Loss of response (disease progression)	Any of the following: 1) increase in length or severity of small bowel inflammation, 2) development of penetrating or obstructing complications (even when an inflamed segment shortens or has less inflammation)	Therapy is not decreasing inflammation severity or extent Penetrating and obstructing complications may indicate irreversible bowel damage and require treatment regardless of improvement in inflammation elsewhere

an active flare or for patients presenting to the emergency room with obstructive symptoms, both cross-sectional examinations are routinely ordered and help guide the need for surgery. Table 1 further highlights considerations when selecting an imaging modality in patients with CD.

How would we like to gauge response to therapy in the future? We would like the decision of imaging modality to be based on a discussion with the patient of the evidence for alternative imaging modalities and their concerns. Certainly, owing to Crohn's flares and their associated complications, as well as patient preferences, CTE will continue to play a role in small bowel imaging given its widespread availability. Radiologists and gastroenterologists should agree on practical yet reproducible criteria for comparing inflammation severity as well as disease extent (length and sites of disease), incorporating simple rubrics to incorporate new or resolving penetrating and obstructing complications (Table 2). Response criteria should include transmural healing, as well as the more frequent response and partial response categories, and loss of response (e.g., when penetrating or stricturing complications occur). Wise use of CTE and MRE for initial and subsequent imaging of patients with small bowel CD, coupled with reproducible and widely understood response criteria linked to long term outcomes, will be critical tools to guide management decisions as the therapeutic armamentarium continues to increase and diversify.

Availability of Data and Material

Data sharing does not apply to this article as no datasets were generated or analyzed during the current study.

Conflicts of Interest

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