Cross-sectional imaging is playing an increasing role in the evaluation of small bowel disorders. MR has significant advantages over CT that makes it well-suited for the evaluation of suspected small bowel disorders including the lack of ionizing radiation, superior soft tissue contrast and the ability to assess temporal changes using multiphasic images.

The ability of MR to perform multiphasic imaging without ionizing radiation is a tremendous advantage over CT. Multiphasic FISP sequences can demonstrate bowel motility and distensibility. This is helpful to differentiate contractions from fixed strictures. Decreased motility can be seen in areas of adhesions and inflammation. This altered motility may be a clue to a subtle underlying structural abnormality. Multiphasic dynamic contrast-enhanced GRE sequences allow assessment of temporal enhancement characteristics which may allow improved detection and characterization of inflammatory changes. With increasing use of cross sectional imaging for the assessment of bowel wall healing and remodeling, it is likely that multiphasic enhancement characteristics will provide more valuable information than the single phase examination acquired with CT. Limitations of MR include the relative lower spatial and temporal resolution compared to CT, exam cost, variability in image quality, and scanner access.

MR of the small bowel can be performed using either enterography or enteroclysis techniques. Oral administration of large volumes of fluid (enterography) is better tolerated by patients but has inferior distension of the small bowel in comparison to enteroclysis.
The preference of enterography or enteroclysis techniques in the assessment of Crohn’s disease is controversial. It is uniformly accepted that cross sectional imaging techniques may fail to detect subtle underlying mucosal abnormalities such as erosions and ulcerations seen on mucosal inspection with endoscopic techniques. The detection of these subtle findings may be improved with enteroclysis at the risk of decreased patient acceptance however still are inferior to the sensitivity of endoscopic visualization. The visualization of these mucosal abnormalities may not be necessary to detect inflammatory changes on cross sectional imaging as other findings such as mucosal hyperenhancement and stratified mural enhancement may be seen. Some studies have shown no significant difference in the detection of active inflammation between enterography and enteroclysis. Therefore the choice of enterography or enteroclysis will likely be driven by institutional preferences. Because of patient acceptance and investigational results, enterography is the preferred technique by our gastroenterologists despite the theoretical lower sensitivity than enteroclysis. In patients with negative imaging and high clinical suspicion, wireless capsule endoscopy (WCE) is usually subsequently performed. Enterography can also be used to screen for unsuspected strictures that are a contraindication for WCE.

Several enteric contrast agents can be utilized and are classified into either negative, positive or biphasic agents based on their signal intensity on T1- and T2- weighted images. In our practice we utilize biphasic agents. The low signal on T1- weighted sequences allows improved detection of contrast-enhancing inflammation or tumors. Negative contrast may improve the conspicuity of high signal inflammation in the bowel wall or fluid structures on T2-weighted images.

Several pulse sequences can be utilized and are complimentary to overcome limitations of the others. T2-weighted sequences include HASTE and FISP. FISP sequences allow improved visualization of mesenteric structures however are more susceptible to artifacts by air. HASTE sequences are more susceptible to intraluminal flow artifacts. Fat-suppressed T2-weighted sequences are useful at showing the high signal inflammatory changes in the bowel wall and the surrounding mesenteric fat, sinus tracts and fistulas. Following IV contrast, 2D and 3D gradient echo sequences are helpful to detect abnormal enhancement. 2D sequences are limited by the need to perform multiple breath holds that can lead to respiratory misregistration while 3D sequences may be more prone to blurring by bowel peristalsis. Spasmolytics are critical to reduce peristalsis and motion artifacts.

In our practice MR enterography is being utilized in patients where there is concern for radiation exposure (age, pregnancy), contraindications for CT (contrast allergy, renal impairment), or in surveillance of Crohn’s disease especially in younger patients. MR enteroclysis is helpful in the evaluation of low-grade small bowel obstruction.

Several studies have shown excellent results in detecting small bowel inflammation in Crohn’s disease. Findings suggesting active disease include bowel wall thickening, mucosal hyperenhancement, ulcerations, increased mesenteric vascularity (“comb” sign), high signal intensity in the bowel wall on T2-weighted images and enhancing lymphadenopathy. Complications of Crohn’s disease include penetrating disease (sinus
tracts, fistulas, and abscesses) and small bowel obstruction all of which can be well seen by MR.

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