Diagnostic investigations are crucial in every stage of inflammatory bowel disease (IBD) management: for evaluation of suspected IBD, assessment of disease extension and activity, evaluation of therapeutic responses, and detection of complications. Over the past few years the spectrum of diagnostic and therapeutic investigations has considerably widened with recent technical progress such as small bowel capsule endoscopy (SBCE), double balloon endoscopy (DBE), high resolution computed tomography (CT) and magnetic resonance imaging (MRI). Ileocolonoscopy remains the gold standard for evaluation of inflammatory lesions in the colon and terminal ileum. However, ileocolonoscopy cannot always be complete, and there are several drawbacks related to the invasiveness, procedure-related discomfort, risk of bowel perforation, and relatively poor patient acceptance.

Furthermore, CT and MR have consistently been shown to possess a superior sensitivity and specificity compared to conventional small bowel follow-through (SBFT) for the detection of luminal lesions in proximal small bowel, providing in addition invaluable information on the presence of extraluminal complications. These facts led to the general recommendation of using cross-sectional imaging modalities (CT or MR) for the assessment of IBD lesions in the more proximal intestine[1].

Both CT and MR allow visualization of the entire small and large intestine and, with adequate bowel distension and elimination of peristaltic artifacts, enable evaluation of the type and extent of mucosal abnormalities, mural alterations, fistulas and extraintestinal complications. MR has the potential to overcome some of the limitations associated with CT, mainly lower incidence of adverse events related to the intravenous contrast employed compared to CT, and lack of ionizing radiation[2, 3, 4].

Clinical applications

1. EVALUATION OF SUSPECTED IBD

Colonoscopy with multiple biopsy specimens is established as the first line procedure for diagnosing colonic inflammatory lesions[5]. Ileoscopy is superior for the diagnosis of CD of the terminal ileum when compared with radiological techniques[6] including MR and CT[7] especially for mild lesions. SBCE and enteroscopy with biopsy by a push endoscope or DBE are useful procedures for diagnosis of CD in selected patients with suggestive symptoms after failure of conventional radiology[8]. CD may affect the ileum out of reach of an ileocolonoscope, or involve more proximal small bowel (10% of patients.) Additionally, at the time of diagnosis 16% of patients have penetrating lesions (fistulas or abscesses)[9]. Endoscopy and radiology are complementary techniques to define the site and extent of disease, so that optimal therapy can be planned[10,11,12].

2. ASSESSMENT OF DISEASE EXTENSION, ACTIVITY, AND SEVERITY

Colonoscopy predicts the anatomical severity of CD colitis with a high probability[13]. Anatomical criteria of severity are defined as deep ulcerations eroding the muscle layer, or mucosal
detachments or ulcerations limited to the submucosa but extending to more than one third of a defined colonic segment\(^{13}\). When there is severe, active disease, the value of full colonoscopy is limited by a higher risk of bowel perforation\(^{14}\) and diagnostic errors are more frequent. In these circumstances initial flexible sigmoidoscopy is safer, and it has been recommended to postpone ileocolonoscopy until the clinical condition improves\(^{15}\), but by then the severity of endoscopic lesions will conceivably have changed and the prognostic value of severe ulceration lost\(^{16}\).

Given the high sensitivity and specificity of MR for the detection of severe lesions, and the importance of these findings to guide therapeutic decisions, whenever disease severity leads to contraindicate a full colonoscopy, or a structuring lesion prevents evaluation of proximal intestinal segments, MR should be performed to document the existence and nature of inflammatory lesions. In patients with a well established diagnosis, MR could replace ileocolonoscopy in reassessment of disease activity and extension, with the additional advantage of assessing the whole gastrointestinal tract in only one diagnostic procedure. An index of disease activity based on MR findings has shown to have a high correlation with disease severity assessed by CDEIS\(^{17}\).

### 3. ASSESSMENT OF THERAPEUTIC RESPONSES

Assessment of responses to a particular therapeutic option should not be only based on clinical symptoms. It is well established that persistence of mucosal lesions, even in the absence of symptoms, is associated with higher risk of relapse and complications requiring hospitalization and surgeries\(^{18}\). Whereas the value of treatment intensification based only on persistence of mucosal lesions remains to be demonstrated with appropriate trials, persistence of mucosal lesions should lead to close monitoring or consideration of other therapeutic alternatives before irreversible intestinal damage leading to loss of function and/or surgery occurs. Since lesions associated with a severe course of disease are ulcerations\(^{16}\), documentation of cure of these lesions should be the main objective of assessment of responses to therapy. For that purpose both CT and MR have high diagnostic accuracy and are alternatives to conventional ileocolonoscopy.

Although an index of disease activity based on MR findings has shown a good correlation with CDEIS\(^{17}\), it remains to be demonstrated if the magnitude of changes in response to therapeutic interventions also correlate well. Meanwhile, for therapeutic studies CDEIS remains the gold standard.

### 4. DETECTION OF COMPLICATIONS

In stricturing disease CT, and particularly MR can provide information on the predominant nature of the structuring lesion. Relatively low (<100\%) enhancement after contrast administration, and particularly delayed enhancement, favor a predominance of fibrosis as the cause of the stricture, whereas high and early hyperenhancement reflect a prominent inflammatory component. CT and MR provide also invaluable information on anatomical and functional aspects of a stricturing lesion such as length, shape, and proximal dilatation, which should be considered for electing medical treatment, endoscopic dilatation, or surgery.

In the evaluation of fistulizing lesions CT and MR have a central role. Perianal fistulizing disease is best assessed using MR. The high soft tissue contrast provided by MR facilitates the identification of fistulous tracts and abscesses. Intraabdominal fistulas and abscesses can also be assessed using MR, but for these lesions CT provides a higher resolution and easier differentiation between distended intestinal segments and abscess formation.

MR can also detect hepatobiliary lesions suggestive of sclerosing cholangitis, and CT vascular complications, particularly mesenteric venous thrombosis.


