The Role of Magnetic Resonance Enterography in Diagnosis of Crohn's Disease

Essay

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List of Abbreviations

2D	:	Two dimensions
3D	:	Three dimensions
ADC	:	Apparent diffusion coeffcient
CD	:	Crohn's disease
CT	:	Computed tomography
DCE-MRI	:	Dynamic-contrast enhanced magnetic resonance imaging
DWI	:	Diffusion-weighted imaging
FLASH	:	Fast Low Angle Shot
FIESTA	:	Fast imaging employing steady - state acquisition
GBCAs	:	Gadolinium-based contrast agents
Gd	:	Gadolinum
GIT	:	Gastro intestinal tract
HASTE	:	Half-Fourier acquisition single-shot turbo spin echo
IBD	:	Inflammatory bowel disease
IMA	:	Inferior mesenteric artery
IV	:	Intra venous
MRE	:	Magnetic resonance enterography
MRI	:	Magnetic resonance imaging
NES	:	Nephrogenic systemic fibrosis
PEG	:	Polyethylene glycol
SB	:	Small bowel
SBFT	:	Small bowel follow through
SMA	:	Superior mesenteric artery
SMV	:	Superior mesenteric vein

SPACE	:	Sampling Perfection with Application oriented Contrasts using
SSFSE	:	Single - shot fast spin echo
T1WI	:	T1 weighted image
T2WI	:	T2 weighted image
TPN	:	Total Parenteral Nutrition
UC	:	Ulcerative colitis
VIBE	:	Volume Interpolated Breathhold Examination

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Introduction

Crohn's Disease (CD) is a chronic, relapsing, and remitting inflammatory bowel disease, which is characterized by transmural, patchy, granulomatous inflammation. The disease can affect any part of the gastrointestinal tract, however, ileocolic (right lower quadrant) disease is most commonly seen ***(Carucci and Levine, 2002).***

The etiology of CD remains unclear, but there is increasing evidence that genetic as well as environmental factors play a role in causing a sustained activation of mucosal immune responses ***(Podolsky,2002).***

The incidence of Crohn's disease seems to be bimodal, the first peak occurs in late adolescence and early adulthood, while a second, smaller increase in incidence can be seen between the fifth and seventh decades of life ***(Loftus, 2004).***

Prevalence in many developed countries is estimated at 0.1% ***(Horsthuis et al.,2005).***

Traditionally, small-bowel follow through (SBFT) examination has been the standard radiologic approach used to assess patients with active CD, as more than 70% of patients have involvement of the small intestine. Small-bowel enteroclysis has been reported to be more accurate than SBFT at detecting early mucosal lesions but requires nasojejunal intubation. Both methods provide only limited and indirect information in regard to the state of the bowel wall and extraluminal extension of CD ***(Bruining and Loftus, 2006).***

Cross-sectional imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI) are advantageous in their ability to visualize superimposed bowel loops and to improve visualization of extra luminal findings and complications ***(Guimarães et al., 2010).***

Thus, CT enterography has become accepted as a noninvasive imaging technique to evaluate CD. It allows direct visualization of extra enteric structures and can reliably identify active inflammation in the small intestine ***(Masselli et al.,2008).***

However, because patients with CD often require multiple imaging studies over their lifetime, MR enterography (MRE) has been introduced as a radiation-free alternative method to evaluate patients with CD ***(Fidler, 2007).***

In CD, formation of perianal fistulas and/or abscesses can be seen in a large percentage of patients. There is a tendency towards imaging of these fistulas, given that in CD fistulas can be very extensive and complex, rendering the conventional gold standard diagnostic technique (i.e., examination under anesthesia) is not wholly accurate ***(Halligan and Buchanan 2003).***

MRE is a technique that has evolved in the last decade. It involves the use of MRI to assess the small bowel, following distension with an oral contrast agent. Recent technologic advances in the field of MRI, such as the development of high-field-strength MRI, fast-acquisition sequences, and improved software, allow examination of the gastrointestinal tract (GIT) with this modality. MRI provides multi planar images with excellent soft-tissue contrast with use of minimally invasive techniques and lack of radiation exposure, which is relevant in young patients who need to be

reassessed on multiple occasions over the course of these chronic conditions ***(Martin et al., 2007).***

MRE more accurately depict submucosal pathology in transmural CD, including determining the presence and extent of inflammation, fibrotic disease, and other intra-abdominal complications, compared to other diagnostic modalities, including CT. Further evidence supports that another diagnostic strength of MRE is the ability to differentiate inflammation from fibrosis within the submucosa of the bowel wall and within the peri-enteric tissues. MRE can show enteric as well as extra-enteric complications, including bowel obstruction, abscesses, tethering, and fistulae. These manifestations may be visualized on MRE with less dependency on bowel distension as required for optimal CT imaging ***(Tiwari et al.,2013).***