Gastrointestinal Imaging

Advances in MRI for Abdominal Imaging

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Magnetic resonance imaging (MRI) technology continues to improve. This improvement leads to broader and greater applications in abdominal imaging. The two articles reviewed here illustrate this advancement. The first article describes the use of MR cholangiography in patients with suspected iatrogenic biliary duct injuries, and the second describes the use of MRI to identify patients with active Crohn's disease.

Using MR Cholangiopancreatography to Evaluate Iatrogenic Bile Duct Injury

Khalid TR, Casillas VJ, Montalvo BM, et al.
AJR Am J Roentgenol. 2001;177:1347–1352.

In this study, Dr. Khalid and colleagues prospectively assessed the ability of MR cholangiopancreatography (MRCP) to detect and delineate iatrogenic biliary duct injuries. Over a 16-month period, they prospectively evaluated 10 patients with clinical findings suggesting post-operative bile duct injury. These findings included right upper quadrant pain (n = 6), jaundice (n = 5), and fever (n = 4). Five patients underwent endoscopic retrograde cholangiopancreatography (ERCP), one percutaneous transhepatic cholangiography (PTC), and one had a cholangiogram via injection of a catheter in a collection near the cystic duct; three patients had ultrasound examination, and four underwent computed tomography (CT).

MRCP was performed on all patients. All examinations were interpreted by two experienced abdominal imaging radiologists blinded to the results of other radiological examinations. Final decisions as to ductal injury were reached by consensus. The images were evaluated for bile duct discontinuity, stricture, dilation, filling defects, free fluid, fluid collections, and other findings. The radiologists defined biliary excision injury as complete lack of visualization of the bile duct segment. When an excision injury or stricture was identified, they attempted to classify it according to the Bismuth classification. The MRCP findings were compared with ERCP and PTC findings.

MRCP was normal in three patients and abnormal in the other seven. The three with normal findings underwent both CT and ultrasound. Two patients had subhepatic fluid collections, and one had a small amount of free fluid. One of these patients required percutaneous catheter drainage of non-bilious fluid. The other two were treated conservatively. All three patients were asymptomatic on follow-up at 3 months.

Of the seven patients with abnormal findings, four had bile duct excision injuries, one had a high-grade stricture, and two had an intact bile duct but small fluid collections adjacent to the cystic duct remnant and free fluid. These latter two patients were felt to have cystic duct remnant leaks.

These predicted abnormalities were all confirmed at surgery and/or ERCP. ERCP did not demonstrate a leak in one of these patients, but the leak was proximal to the level of an obstruction.

In four of the five patients who underwent ERCP, MRCP was superior for purposes of surgical planning. In three patients with excision injuries, MRCP accurately delineated the proximal biliary anatomy and site of injury, whereas ERCP was only able to demonstrate the distal stump of the remaining duct.

The authors conclude that MRCP is an accurate modality for assessing patients with suspected postoperative biliary ductal injury. MRCP depicts stricture and excision injury accurately as well as completely displaying the proximal biliary anatomy. This study's patient population is quite small, and further studies, with larger sample sizes, are needed to validate their findings.

MR Imaging Evaluation of the Activity of Crohn's Disease

Koh DM, Miao Y, Chinn RJS, et al.
AJR Am J Roentgenol. 2001;177:1325–1332.

Abdominal symptoms may be nonspecific in patients with Crohn's disease. Symptoms can result from active inflammation or from fibrotic scarring and stricture formation. No ideal method exists to make this distinction. The authors' hypothesis was that MR imaging would be useful in detecting actively inflamed bowel segments as reflected by an increase in bowel wall thickness and enhancement with intravenous gadolinium, with or without accompanying perienteric changes.

The authors prospectively studied 30 clinically sympto-

matic patients with previously proven Crohn's disease who were referred for MRI by their treating physician. These patients were clinically scored for disease activity using the Crohn's Disease Activity Index. Twenty-nine patients completed the required questionnaire (scoring range, 95–677; mean, 285). The 14 men and 16 women in the study had a mean age of 37.6 years (range, 18–58 years).

The MR images were evaluated by two radiologists. They reached a consensus while blinded to the clinical scoring and the results of endoscopy, surgery, and other imaging tests.

For purposes of analysis, the gastrointestinal tract was divided into six segments; these were duodenum and small bowel, terminal ileum (distal-most 10 cm of native ileum or within 10 cm of iliocolic anastomosis or iliostomy), the cecum and ascending colon, the transverse colon, the descending colon, and the rectosigmoid.

A patient was declared to have active disease if one or more bowel loops had abnormal wall thickening and increased bowel wall enhancement. Wall thickness > 3 mm was considered abnormal. The identification of a fistula or an abscess was considered a finding of active disease. The presence of increased mesenteric vascularity, fatty proliferation, or lymphadenopathy was neither necessary nor sufficient for defining active disease.

Twenty-six patients had colonoscopy; of these 26, direct visualization of the terminal ileum was achieved in 20 patients. Two patients had both colonoscopy and surgery. Two patients went directly to surgery. The results of the above were considered the standard by which the MR results were judged.

Based on colonoscopy and/or surgery, 23 patients had active disease and 7 inactive disease. On a per patient basis, MRI had a sensitivity of 91% and a specificity of 71% in detecting active disease. The Crohn's Disease Activity Index had a sensitivity of 92% but a specificity of only 28%.

On a per segment basis, the sensitivity and specificity of MRI was 59% and 93%, respectively. The total number of segments assessed by colonoscopy and/or surgery was 124.

The authors conclude that MRI is useful in assessing the activity of Crohn's disease. They stated that in patients with equivocal clinical findings, MRI can provide disease activity assessment. Unlike CT, MRI does not use ionizing radiation and may be safely repeated.

Summary

These two articles indicate that MRI will continue to assume greater importance in abdominal imaging. Clearly, more studies will need to be performed on larger populations to validate the above-described findings. If validation occurs, MR cholangiography will fill a greater role in assessing patients without a high pre-test probability of needing endoscopic therapy, and MRI imaging will be of particular value in assessing patients with questionably active Crohn's disease so that the burden of ionizing radiation to a given patient will be minimized.

Liver Disease

Nonalcoholic Fatty Liver Disease: Simple Steatosis Versus Nonalcoholic Steatohepatitis with Fibrosis

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Nonalcoholic fatty liver disease (NAFLD) is a term recently designated for a clinicopathological syndrome that spans a spectrum from simple steatosis to nonalcoholic steatohepatitis (NASH) with various degrees of hepatic fibrosis. Simple steatosis, or fatty liver, is a benign condition that does not appear to progress histologically. On the other hand, up to 20% of patients with NASH may progress to cirrhosis over a period of 10 years, thus contributing to liver-related morbidity and mortality. Risk factors for NASH include obesity, type 2 diabetes mellitus, and dyslipidemia, implying a pathogenic role of insulin resistance. With the prevalence of obesity continuing to rise in the United States and the prevalence of NAFLD reported to be as high as 23.5% in a recent U.S. population study using data from the third National Health and Nutrition Examination Survey (Clark et al. *Gastroenterology* 2001;120:A-65), NASH may become the next epidemic liver disease that approaches or even outweighs the impact of advanced chronic hepatitis C.

Obese patients with NASH may have normal liver enzymes and thus not undergo liver biopsy, missing the opportunity for a definite diagnosis and conservative medical treatment prior to the development of cirrhosis. Although treatment modalities for NASH are limited, weight reduction and aggressive treatment of diabetes and dyslipidemia may reverse the pathogenic factor of insulin resistance, and small trials of ursodeoxycholic acid and