RATIONAL IMAGING

Magnetic resonance imaging in Crohn's disease

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This article explores the use of magnetic resonance imaging as an emerging modality in the investigation of Crohn's disease

The patient

A 35 year old man presented with multiple discharging fistulas through the midline below the umbilicus and left iliac fossa. At seven years of age, he had had a colectomy with an ileostomy for Crohn's disease.

What is the next investigation?

Imaging in Crohn's disease aims to detect the presence of ulceration, fistulas, bowel oedema, strictures, and extraintestinal abnormalities.

Plain abdominal radiograph

Plain abdominal radiography may help identify complications related to Crohn's disease, such as bowel obstruction or perforation, but it has a limited role assessing inflammatory activity.

Barium examinations

Radiological imaging of the small bowel has traditionally relied on barium examinations. Barium examinations, however, result in a considerable number of false negative results.¹ A barium examination may also overlook extramural complications such as fistulas, sinuses, and extraintestinal abscesses.

Enteroclysis

Conventional enteroclysis is performed after placement of a naso-jejunal catheter and infusion of a barium and methylcellulose solution, which provides double contrast images of the small intestine. The technique produces excellent visualisation of the mucosa, although extraintestinal detail is limited. One of the disadvantages of enteroclysis is discomfort experienced by the patient during intubation. The effective radiation dosages on barium and enteroclysis examinations range from 2 mSv to 4 mSv.

Fistulography

Fistulography may be performed to outline fistulous tracks and their communication with the bowel.

Occasionally, fistulography may not demonstrate a fistula in its entirety, as a chronic fistula may have a fibrotic or stenosed lumen. Furthermore, fistulography may not accurately demonstrate the extent of bowel involvement or outline internal (inter-loop) fistulas.

Ultrasound

A meta-analysis has shown that ultrasonography of the bowel has high sensitivity in diagnosing inflammatory bowel disease, particularly of the terminal ileum. Sensitivity and specificity are 75-94% and 67-100%, respectively.² Sonographic findings in inflammatory bowel disease include increased bowel wall thickening, increased bowel vascularity, and associated mesenteric lymphadenopathy. Crohn's related complications such as fistulas and abscesses can also be detected on sonography. Comprehensive examination of the entire bowel is often limited, however, because of the presence of excessive bowel gas and overlapping bowel loops. Furthermore, bowel ultrasonography usually requires specialist experience that may not be widely available.

LEARNING POINTS

Traditional imaging of Crohn's disease has relied on barium examinations and conventional enteroclysis. These tests have the disadvantage that they lack extraintestinal detail. Barium examinations may also result in a large number of false negative results

Ultrasonography of the bowel has high sensitivity for diagnosing inflammatory bowel disease but is highly operator dependent, and comprehensive evaluation of the bowel may be hampered by excessive bowel gas and overlapping bowel loops

Computed tomography has high sensitivity for diagnosing intestinal and extraintestinal abnormalities in inflammatory bowel disease. However, this technique carries a high radiation dose, which may prohibit its use in young patients or patients who need repeated investigations

Magnetic resonance imaging is an emerging modality that has high sensitivity for detecting intestinal and extraintestinal changes in Crohn's disease. This non-ionising technique provides excellent tissue contrast resolution and can help reduce the amount of radiation that patients receive

This series provides an update on the best use of different imaging methods for common or important clinical presentations. The series advisers are Fergus Gleeson, consultant radiologist, Churchill Hospital, Oxford, and Kamini Patel, consultant radiologist, Homerton University Hospital, London.

Fig 1 Axial magnetic resonance imaging (T2 weighted image) showing a fistula with high signal intensity arising from the ileum and coursing anteriorly and towards the left iliac fossa (arrows). The asterisk indicates the stoma bag

Computed tomography

Comparative studies of computed tomography enterography and enteroclysis have reported sensitivities and specificities of 73-82% and 70-98%, respectively.³ The current generation of computed tomography scanners can acquire images rapidly—within one breath-hold—and are also widely available.

Computed tomography of the abdomen carries high radiation dosages, however, which is worrying because young patients with Crohn's disease may have several examinations during the disease process. The effective radiation dosages of computed tomography of the abdomen and pelvis typically range from 7 mSv to 10 mSv.⁴

Magnetic resonance imaging

Enteroclysis and enterography with magnetic resonance imaging can be used in the diagnostic investigation of patients with Crohn's disease.^{5,6} Enteroclysis is performed after instillation of a naso-jejunal catheter and infusion of 1.5-2 litres of iso-osmotic enteral contrast. This technique provides optimal bowel distension, which can be useful in identifying early mucosal disease and subacute or partial strictures. These advantages have to be counterbalanced by the complexity of the procedure and the patient's discomfort.

Comparison of computed tomography and magnetic resonance imaging in Crohn's disease

Investigation	Advantages	Disadvantages
Computed tomography	Faster scanning time (10-20 seconds)	High radiation dose
	Wider availability	Potential adverse reaction to intravenous contrast
	Allows global assessment of the abdomen and pelvis	Intravenous contrast relatively contraindicated in patients with renal impairment
Magnetic resonance imaging	High tissue contrast	Longer scanning time (30-40 minutes)
	No radiation	Expertise not widely available
	Higher sensitivity in detecting disease ¹⁰	Contraindicated in patients with metallic medical or surgical implants

Enterography is performed after oral ingestion of 1.5-2 litres of enteral contrast, which helps to distend the bowel. Enteral contrast agents used in magnetic resonance imaging enterography include superparamagnetic iron particles, polyethylene glycol, locust bean gum, and mannitol solution. Enterography is less uncomfortable for the patient but may not produce the uniform bowel distension achieved by enteroclysis.

A recent prospective randomised study found that enterography and enteroclysis had similar rates of diagnostic accuracy, and recommended enterography for follow-up of established Crohn's disease.⁷ Comparative and prospective magnetic resonance imaging studies have reported a sensitivity of 88-98% and specificity of 78-100%.⁷⁻⁹

Magnetic resonance imaging has several advantages over conventional barium examinations. It provides extraintestinal detail and delineates complications more accurately than barium examinations or conventional enteroclysis. The important advantages of magnetic resonance imaging compared with computed tomography (table) include better tissue contrast, absence of exposure to radiation, and higher sensitivity for intestinal and extraintestinal changes in Crohn's disease.¹⁰ Dynamic real time examination of bowel movements and peristalsis can also be performed on

Fig 2 Coronal magnetic resonance imaging (True-FISP) image again showing the fistulas with high signal intensity (arrows) arising from the area of thickened inflamed distal ileum (arrowheads). Fissuring transmural ulcers are seen as high signal linear tracks traversing the thickness of the bowel wall (thin arrows)

Fig 3 Coronal magnetic resonance image showing dilated obstructed small bowel (arrowheads) proximal to the inflamed segment (arrow)

Fig 4 Coronal post contrast magnetic resonance image showing pronounced low signal intensity at the ileostomy opening (arrows), which is indicative of a fibrotic stricture

magnetic resonance imaging, and this may be useful in identifying contrast flow across stenotic lesions. The excellent tissue contrast obtained on magnetic resonance imaging can also be used to differentiate between fibrotic and acute inflammatory disease. This differentiation is clinically useful, as fibrotic disease may need surgery, whereas inflammatory disease may benefit from medical treatment.

Outcome

The patient had a barium examination and fistulography, but both were inconclusive. Ultrasound was

thought to be inappropriate because of suspected bowel strictures and obstruction. We thought that a non-ionising modality would be the best option for further evaluation because he had undergone multiple radiological investigations since childhood.

He therefore had magnetic resonance imaging enterography, which showed a fistula arising from the distal ileum. The fistula tracked anteriorly to the infraumbilical region and also towards the left iliac fossa (fig 1). A 15 cm long segment of actively inflamed ileum with deep, transmural ulceration was seen distal to the origin of the fistula (figs 2, 3). A fibrotic stricture was present at the ileostomy opening (fig 4). The inflamed ileal segment and granulation tissue around the fistulas were causing obstruction of the proximal small bowel.

The patient had surgery with limited resection of the abnormal segment and fistulas. The ileostomy was then refashioned.

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10-MINUTE CONSULTATION

Otalgia

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Case history

A 35 year old patient presenting with a three day history of unilateral otalgia and fever is diagnosed as having acute otitis media and prescribed amoxicillin. He returns three days later with persistent fever and headache.

What you should cover

History

Pain varies widely from severe pain of acute otitis media to the deep boring otalgia of malignant otitis externa (pseudomonas osteomyelitis of the temporal bone). Sharp lancinating pain indicates neuralgia.

Otorrhoea—purulent otorrhoea can follow acute otitis media, but if it is persistent cholesteatoma may be present. Watery otorrhoea is seen in otitis externa, but after head injury it indicates a leak of cerebrospinal fluid.

Hearing loss may be seen in all the above conditions.

Itching is a cardinal symptom of otitis externa.

Tinnitus is not a disease specific symptom.

Vertigo and headache are unusual—they may indicate a complication of otitis media.

Otalgia can precede Bell's palsy (idiopathic facial nerve palsy) but is usually more severe and persistent with Ramsay Hunt syndrome (herpes zoster oticus). Pain can be associated with lesions of the pinna—tender nodules (chondrodermatitis nodularis helices), haematoma, or laceration.

Useful reading

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Referred otalgia is common and may account for 50% of cases (box). It occurs with tonsillitis and quinsy and after tonsillectomy, but if sore throat develops rapidly (often <24 hours) with dysphonia, epiglottitis is more likely. Pain on chewing indicates a dental, temporomandibular joint, or parotid problem. Otalgia presenting with dysphagia or dysphonia can be associated with pharyngeal tumours. A sharp lancinating pain arising

Causes of referred otalgia

Paranasal sinus infection

Teeth:

Teeth grinding

Molar impaction

Infection or abscess

Pharynx:

Acute tonsillitis or quinsy

Epiglottitis

After tonsillectomy

Parotid gland:

Calculi

Infection

Trauma

Neck problems:

Goitre

Lymphadenopathy

Musculoskeletal problems

Cervical spine

Malignancy:

Tongue base, tonsil, nasopharynx, hypopharynx

Neuralgia:

Trigeminal neuralgia