

# Diagnostic Imaging Pathways - Crohn's Disease (Suspected)

## Population Covered By The Guidance

This pathway provides guidance on imaging patients with clinically suspected Crohn's disease.

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### Quick User Guide

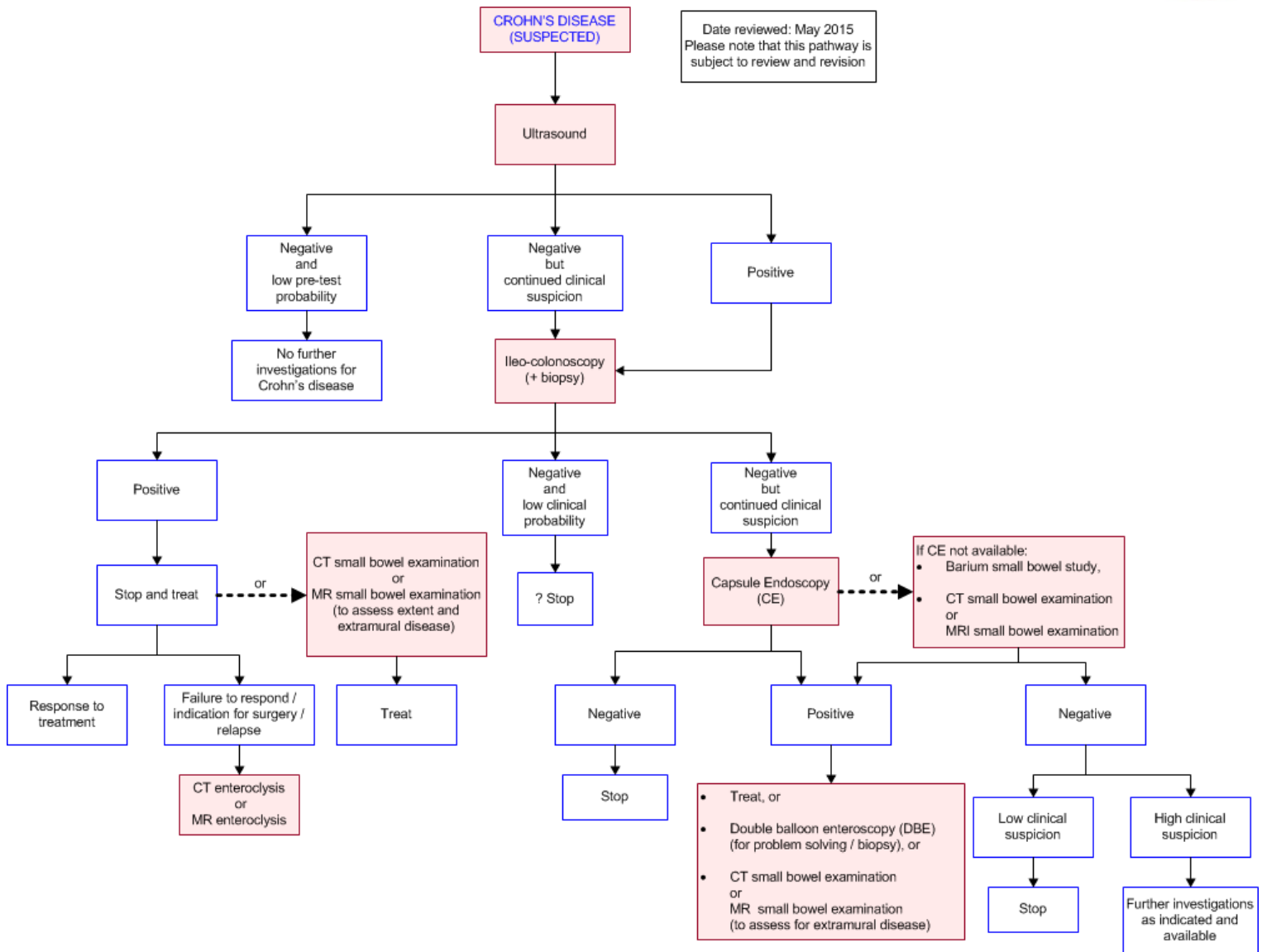
Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the **PINK** text box will bring up the full text.

The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

## Pathway Diagram



## Image Gallery

*Images coming soon.*

## Teaching Points

- **Diagnosis of Crohn's disease can be difficult as there is no single accepted gold standard diagnostic test and small bowel is well known to be a difficult area to investigate thoroughly for both endoscopic and radiological procedures [1,2](#)**

## Investigation of Crohn's Disease

- The investigation of Crohn's disease employs a variety of investigative modalities to assist in the diagnosis. These include biochemical tests, imaging examinations and endoluminal imaging techniques
- Endoluminal examination are commonly used in the investigation of Crohn's disease. These are procedures performed by a gastroenterologist and include investigations like push enteroscopy, balloon-assisted enteroscopy (single / double balloon), colonoscopy with ileoscopy and capsule endoscopy [1](#)
- Commonly used endoluminal examinations in suspected Crohn's disease are colonoscopy with ileoscopy and capsule endoscopy followed by balloon-assisted enteroscopy
- Radiological examinations are an important tool to help assist in diagnosing Crohn's disease. The main radiological examinations used in suspected Crohn's disease are ultrasonography, barium small bowel studies (enterography also known as follow through and enteroclysis), CT enterography / enteroclysis and MR enterography / enteroclysis

### Colonoscopy with Ileoscopy (Ileo-colonoscopy)

- Ileoscopy is visualising the ileum through a colonoscope inserted rectally with a retrograde approach under expert hands
- Distal 20 cms of the small bowel can be visualized under optimal conditions and biopsies can be performed if necessary [14](#)

### Capsule Endoscopy (CE)

- A non-invasive procedure where patient swallows a small (approximately 2 cms length) capsule which contains a miniature camera that wirelessly sends images to a sensor attached to a recording device. Capsule is passed per-rectum by the patient and is disposable [1](#)
- Majority of studies report high sensitivity and diagnostic yield when compared to other investigative modalities like ileo-colonoscopy, small bowel radiography and enteroscopy but lack data on positive predictive value and specificity [15,16](#)
- Conventional procedures, including endoscopic, ultrasonographic and / or radiological procedures are usually performed before using capsule endoscopy [17](#)
- There is a lack of standardised diagnostic criteria for CE to diagnose Crohn's disease and developing a scoring system may improve its specificity for Crohn's disease [15,18](#)
- One prospective study that compared CE, CT enterography (CTE) and

small bowel follow through (SBFT) studies reported similar sensitivities for Crohn's disease for both CE (83%), and CTE (82%) but significantly lower specificity for CE (53%) compared to CTE (89%) [19](#)

- **Contraindications for CE include a history of GI motility disorder, known strictures or fistulae, history of extensive abdominal surgery and active swallowing disorder. If in doubt, a patency capsule test can be performed in which, the capsule is radio-opaque and disintegrates after several days**
- **Advantages of CE include**
  - **Non-invasive**
  - **Accepted and well tolerated by patients**
  - **Ability to visualise the entire small bowel**
- **Disadvantages of CE include**
  - **Technical malfunction of the capsule**
  - **Inability to perform diagnostic or therapeutic manoeuvres, requiring further invasive investigations**
  - **Lack of anatomical details makes it difficult to localise lesions**
  - **Slow GI transit time resulting in part of the small bowel being not visualised**
  - **Strictures may result in capsule retention which may require endoscopic removal**

## **Double Balloon Enteroscopy (DBE)**

- **Also known as push-and-pull enteroscopy**
- **Can visualise the entire small bowel using retrograde and antegrade intubation but a recent systematic review concluded that complete enteroscopy was possible in only 44% of cases even with combined antegrade and retrograde approaches [29](#)**
- **Advantages of enteroscopy include**
  - **Ability for diagnostic (biopsies) and therapeutic intervention**
  - **Improved visualisation of the small bowel as a result of insufflation of air**
  - **Focused examination of any abnormality visualised**
- **Disadvantages / adverse effects of enteroscopy include**
  - **Visceral perforation**
  - **Mucosal bleeding as a result of contact by the enteroscope**
  - **Technically demanding and time consuming**
  - **Limited availability**
  - **Pancreatitis**
  - **Abdominal pain as a result of insufflation of air into the bowel**
  - **Requires sedation**

## Ultrasonography

- **Ultrasonography (US) can be used as a screening tool to exclude active small bowel Crohn's disease [3](#)**
- **Studies have shown that ultrasonography with right expertise can be highly sensitive and specific in inflammatory bowel disease and is comparable to MR and CT examinations. [4,5,6](#) The sensitivity dropped to 67% when early Crohn's disease was considered**
- **Due to its advantages, bowel sonography can be used to select the patients for subsequent MRI examination [7](#)**
- **CEUS involves the intravenous administration of microbubble contrast agents providing the real-time depiction of the small bowel microvasculature and perfusion [8](#)**
- **High temporal resolution of CEUS allows for the grading of disease activity, the differentiation between small bowel stricture due to inflammation or mural fibrosis, and for the assessment of the response to specific therapy [8,9,10,11](#)**
- **Colour and power Doppler US with microbubbles have major limitations due to blooming artefacts and signal saturation [8](#)**
- **Cross-sectional imaging techniques have a high accuracy for evaluation of suspected and established Crohn's disease, reliably measure disease severity and complications; they may offer the possibility to monitor disease progression. [12](#) As a result of the lack of radiation, US or MRI should be preferred over CT, particularly in young patients [12,13](#)**
- **Advantages of ultrasonography include**
  - **Non-invasive**
  - **Easily available**
  - **No ionizing radiation**
  - **Can detect extra-mural abnormalities, masses, gynaecological disorders etc.**
  - **Negative ultrasound with low clinical probability has high negative predictive value**
- **Disadvantages of ultrasonography include**
  - **Cannot visualise entire small bowel and bowel gas may preclude proper examination**
  - **Early lesions can be missed**

## Barium Small Bowel Studies

- **For a small bowel follow-through (enterography), patient drinks contract medium prior to the study and enteroclysis requires a naso-jejunal tube through which contrast is delivered directly into the small bowel**
- **Follow through is non-invasive but has sub-optimal luminal distension**

**compared with enteroclysis**

- **Both studies give very limited information regarding extramural disease and so have largely been replaced by cross-sectional imaging like CT and MR [1](#)**
- **Barium enteroclysis is reported to be more sensitive than MR / CT enteroclysis for mild abnormalities of early Crohn's disease [20,21](#)**

## **Computed Tomography Enteroclysis / Enterography**

- **CT enterography and enteroclysis are CT techniques used to provide better images of the small bowel lumen and wall than conventional CT**
- **CT enterography involves rapid oral ingestion of 2 litres of contrast media before CT scanning**
- **The contrast used is usually neutral (water density) or diluted positive contrast. CT may be performed in several phases (e.g. non-contrast, post-contrast arterial, portal venous phase or delayed phase), or combined with CT angiography. Limitations include inability of some patients to consume a large amount of fluid in a short period of time, achieving appropriate timing of the scan to obtain good bowel distension and radiation dose**
- **CT enteroclysis involves passing a naso-jejunal catheter under fluoroscopic guidance**
- **Neutral or dilute positive contrast is instilled through the tube allowing rapid filling and distension of the intestine. Images are obtained as for a CT enterography. Limitations of this technique include more invasive nature (compared to enterography), achieving correct timing of scan (less problematic than enterography) and the radiation dose. Enteroclysis has been shown to provide superior bowel distension than enterography, [22](#) however it is uncertain whether this translates into better diagnostic outcomes. There are a few comparisons in the literature. Two studies found similar accuracy between the two techniques [22,23](#)**
- **Advantageous effects of computed tomography enteroclysis / enterography include**
  - **Excellent spatial resolution**
  - **Widely available**
  - **Better inter-observer agreement**
  - **Cross-sectional imaging – can diagnose other abdominal abnormalities, extra-mural disease, etc.**
- **Disadvantageous effects of enteroclysis / enterography include**
  - **Ionizing radiation relatively high especially in young patients with Crohn's disease who may require repeated imaging**
  - **Patients may not be able to drink 2 litres of contrast for**



## **enterography**

- **Needs invasive naso-jejunal tube for enteroclysis**

## **Magnetic Resonance Enteroclysis / Enterography**

- **Similar procedural details as CT enterography / enteroclysis**
- **Major advantage of MR over CT is the lack of any ionizing radiation**
- **Major disadvantages include lesser spatial resolution, higher chance of motion artefacts, higher costs involved and lesser availability than CT**

## **MR or CT? Enteroclysis or Enterography?**

- **Although there are limitations to the literature available, it appears that CT and MR enterography are similar in their diagnostic yield for Crohn's disease [4,24,25](#)**
- **One study reported higher specificity and better distension of proximal small bowel with CT enteroclysis compared to CT enterography but the final arbiters were endoscopy and barium small bowel studies in this study [22](#)**
- **Studies comparing MR enterography and enteroclysis show mixed results where two out of three studies [26,27](#) report similar accuracies while one study [28](#) reported better detection rate of superficial lesions for MR enteroclysis**
- **MR enteroclysis provides functional information that is lacking with MR enterography and CT studies**
- **MR however has a major advantage over CT that it lacks ionizing radiation which is an important factor for younger patients with Crohn's disease who are likely to have repeated imaging tests**

## **References**

Date of literature search: May 2015

The search methodology is available on request. [Email](#)

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)

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