

Chronic abdominal pain in adults

When is imaging indicated?

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Diagnostic imaging is often not indicated in patients with chronic abdominal pain. If imaging is required, the most appropriate modality will depend on the symptoms present and the individual clinical scenario. Both the referrer and the imaging specialist should ensure all procedures are justified, with potential benefits outweighing the risks.

Chronic abdominal pain in adults is a common presentation in primary care and is defined as continuous or intermittent abdominal discomfort lasting for at least six months. Chronic abdominal pain may arise from the gastrointestinal tract or its adjunctive organs or it may have a gynaecological or genitourinary origin. In many cases it is part of a functional syndrome.

From 2012 to 2013 there were more than 330,000 abdominal CT scans performed as Medicare services in Australia,¹ of which nearly 60% were requested by GPs, costing about \$146 million. Many of the scans were for nonspecific abdominal pain. Although hard data on patient outcomes are difficult to come by, such evidence that exists and anecdotal reports indicate a very low yield of CT for this



Key points

- **Diagnostic imaging is often not indicated in people with chronic abdominal pain, and most patients with functional causes can be diagnosed without the need for any diagnostic imaging.**
- **CT scans are overused in patients with undifferentiated chronic abdominal pain.**
- **The most frequent cause of chronic abdominal pain is irritable bowel syndrome.**
- **Certain symptom patterns can be identified that will indicate the optimal method of investigation.**
- **Alarm symptoms, including anaemia, blood in the stool, waking at night with gastrointestinal symptoms and weight loss, should be investigated. The most appropriate modality depends on the symptoms.**
- **A normal 'conventional' CT scan does not rule out cancer.**
- **Clinical information on the request forms for CT scans should be specific and include the suspected condition because this helps the radiologist to determine an appropriate imaging protocol and assists in the interpretation of the findings.**

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1. Suggested symptom categories for chronic abdominal pain

- Undifferentiated abdominal pain
- Intestinal colic
- Symptoms suggesting Crohn's disease
- Pelvic or iliac fossa pain, causes of which include gynaecological disease, Crohn's disease and functional syndromes
- Dyspepsia
- Biliary symptoms or right upper quadrant pain
- Renal tract symptoms
- Others (e.g. chronic abdominal wall pain, mesenteric angina)

indication. Also, there is a perception that a normal CT excludes serious pathology such as cancer. A 'standard protocol' CT does not. Furthermore, about 5% of abdominal CT scans will detect incidentalomas unrelated to the patient's symptoms, which often leads to a cascade of further tests resulting in additional risk, anxiety and cost.

The considerable cost to the health budget of CT imaging for chronic abdominal pain, as well as the ionising radiation burden to the individual and the community, behoves both referrers and radiologists to ensure that CT imaging is used appropriately. Diagnostic imaging is often not needed in patients with chronic abdominal pain. If imaging is indicated, a CT scan may not be the ideal investigation. Ultrasound, CT and MRI each have their advantages and disadvantages, in general terms and in specific clinical scenarios. The risks of ionising radiation accompanying CT should always be a consideration (especially in young patients) and a nonionising alternative such as ultrasound or MRI should be chosen if practicable and likely to yield as much diagnostic information as CT imaging. However, if the potential benefits of CT imaging are likely to outweigh the risks (that is, the procedure is justified), the CT scan should be performed and the patient reassured that the risk to the individual is small. Ultrasound has the major advantages of safety (no ionising radiation), cost and availability and it can be repeated as often as necessary, but is regarded as more operator-dependent than the other modalities. MRI also uses no ionising radiation but it does have several contraindications (such as the presence of pacemakers). It is also relatively expensive and of limited access, especially to GPs.

Clinical assessment

Clinical localisation of disease according to the site of symptoms is often unreliable. However, there are some reasonable correlates, including: epigastric pain and gastroduodenal disease; right upper quadrant pain and hepatobiliary disease; suprapubic pain and gynaecological causes.² Therefore, categorisation by the patient's predominant presenting features is useful (Box 1), although admittedly overlap does occur. Each scenario requires a different approach to imaging (Table).

2. Alarm symptoms that should prompt investigation^{8,9}

- Iron-deficiency anaemia or blood in the stool – this is best investigated by upper and lower gastrointestinal endoscopy
- Awakening at night with gastrointestinal symptoms – initial investigation by endoscopic methods is suggested
- Pain extending through to the back – this may indicate pancreatic disease and should be investigated by CT scanning
- Unexplained weight loss – this symptom associated with abdominal pain may require extensive investigation by endoscopy and diagnostic imaging. CT scans can detect a pancreatic lesion or a large gastrointestinal mass, but a normal 'standard' protocol CT scan (that is, a CT scan without specific bowel preparation) does not exclude luminal malignancy
- Family history of colorectal cancer – colonoscopy is recommended; if this is unavailable, CT colonography is a reliable method of excluding colorectal cancer
- Age at onset over 50 years

Symptom categories for chronic abdominal pain

Undifferentiated chronic abdominal pain

The major causes of undifferentiated abdominal pain are the functional gastrointestinal disorders,^{3,4} including irritable bowel syndrome (IBS) and functional abdominal pain syndrome. However, inflammatory bowel disease (more specifically Crohn's disease), coeliac disease and mechanical obstruction may need to be excluded.

Irritable bowel syndrome

IBS is common, affecting about 7% of adults. Although often regarded as a diagnosis of exclusion, a positive diagnosis can be made using symptom complex criteria such as the Rome or Manning criteria.^{5,6} There is a striking lack of strong evidence to support radiological imaging in patients with suspected IBS. There is an argument for undertaking imaging to reassure the patient (and doctor) that there is no organic pathology present. However, a normal CT scan does not exclude all serious pathology. In addition, there is evidence that negative tests do not reassure the patient.⁷

Imaging should be carried out in patients who have alarm symptoms to rule out structural abnormalities that may mimic IBS (Box 2).^{8,9} Age of presentation of over 50 years is an alarm feature, so even with otherwise typical IBS and no other alarm symptoms these patients should undergo colonoscopy. For younger patients with no other alarm features, further investigation is not routinely required but this decision should be based on their individual risk for having common treatable gastrointestinal diseases such as colorectal cancer and coeliac disease. Early referral to a specialist is more beneficial than early imaging.⁸ Patients with constipation-predominant IBS should be investigated based on their assessed risk of having colorectal cancer. Those with an above average risk of cancer should undergo colonoscopy (or CT colonography, also

Table. Suggested primary investigation according to clinical scenario for patients with chronic abdominal pain

Symptom(s)	Initial imaging	Comments
Dyspepsia, no alarm symptoms	Nil; empirical treatment	+/- Ultrasound to exclude biliary disease
Dyspepsia, alarm symptoms present	Refer for an endoscopy	+/- CT and specialist referral if pancreatic disease suspected
Biliary/right upper quadrant pain	Ultrasound	Cholangiogram and specialist referral if dilated ducts +/- abnormal liver function tests
Pelvic/iliac fossa pain. Possible gynaecological cause	Ultrasound (including TVUS)	–
Pelvic/iliac fossa pain. Possible other cause	Young adult: ultrasound Older patient: CT or ultrasound	–
Possible Crohn's disease	Ultrasound	If positive or negative with high clinical suspicion: CT or MRI small bowel study and specialist referral
Bowel obstruction (nonacute/recurrent)	Plain abdominal x-ray during episode	Dependent on result and clinical suspicion
Irritable bowel syndrome/functional abdominal pain: constipation predominant (age <50 years, no alarm symptoms)	Consider specialist review Investigate as per risk of cancer (i.e. colonoscopy or CT colonography, if indicated)	–
Irritable bowel syndrome/functional abdominal pain: diarrhoea predominant (age <50 years, no alarm symptoms)	Consider specialist review Coeliac serology, stool microscopy and culture Consider colonoscopy to exclude microscopic colitis	–
Undifferentiated/nonspecific pain: no alarm symptoms	See irritable bowel syndrome (above)	–
Undifferentiated/nonspecific pain: alarm symptoms present	Dependent on symptoms – usually CT scan plus specialist referral	CT protocol is dependent on symptom(s)
Abdominal vascular disease: suspected abdominal aortic aneurysm	Pain is indication for urgent specialist referral (urgent CT)	–
Possible chronic ischaemic bowel (mesenteric angina)	Doppler ultrasound	CT angiogram if ultrasound inconclusive
Abdominal wall pain (Carnett's sign positive)	No imaging usually indicated	–
Renal/loin pain	Ultrasound or unenhanced CT	CT-IVU to follow if renal mass is shown, if there is obstruction without a cause, or if stone is seen and intervention considered CT protocol depends on suspected diagnosis

Abbreviations: CT = computed tomography; CT-IVU = CT-intravenous urogram; TVUS = transvaginal ultrasound.

known as virtual colonoscopy). CT colonography has a high predictive value for excluding colorectal cancer and is widely regarded as superior to barium enema and should replace it (Figure 1). However, the indications for a Medicare rebate for CT colonography are currently limited, although under review. For patients with diarrhoea-predominant IBS, most gastroenterologists would

recommend colonoscopy to exclude microscopic colitis and possibly upper endoscopy to rule out coeliac disease.

Functional abdominal pain syndrome

In contrast to IBS, there is no clear relation between functional abdominal pain syndrome and eating or bowel movements.¹⁰ The

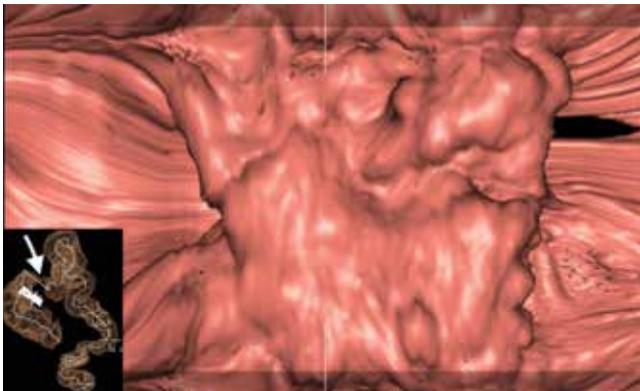


Figure 1. CT colonography of colon cancer. Inset is the CT reconstructed image of the whole colon showing the malignant stricture in the transverse colon (arrow).

pain tends to be constant or frequent and is often associated with other somatic symptoms. Imaging is usually not required in the absence of alarm features if all other diagnostic criteria for functional abdominal pain syndrome are present.

Intestinal colic

Although recurrent colic-type pain may be part of a functional syndrome, mechanical obstruction due to inflammatory or neoplastic structuring may require exclusion. If this is suspected, clinical features and a plain abdominal x-ray obtained during an episode of pain may distinguish small and large bowel disease and indicate the appropriate investigation. Postoperative adhesions are the most common cause of recurrent small bowel obstruction. In the absence of clear previously

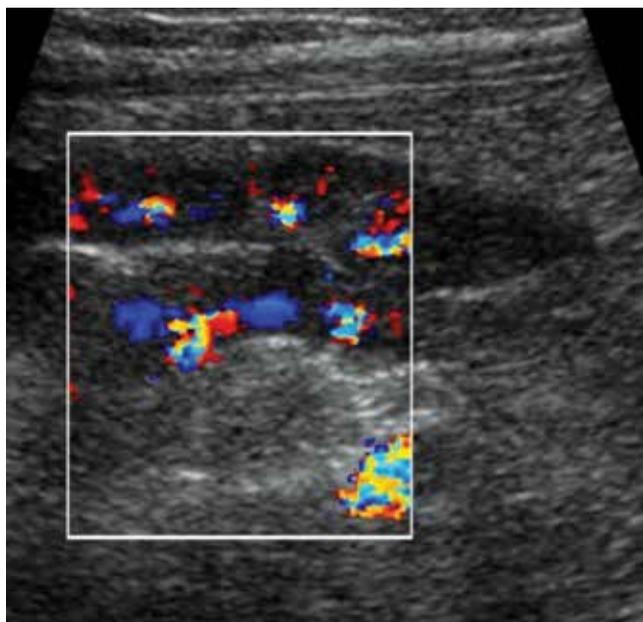


Figure 2. Doppler ultrasound image of the right iliac fossa showing a thickened loop of distal ileum, with intramural hypervascularity, consistent with active Crohn's disease.

documented evidence of this, CT or MRI (with dedicated small bowel protocols – enterography or enteroclysis) may be needed.¹¹ Patients with large bowel obstructive symptoms (recurrent or subacute) require urgent specialist referral and investigation, with the modality partially depending on whether the patient will tolerate bowel preparation.

Suspected Crohn's disease

Ultrasound is a reasonable initial test for suspected Crohn's disease (Figure 2).^{12,13} The negative predictive value of ultrasound in the context of low clinical probability is high. A positive ultrasound (nonspecific demonstration of thickened bowel loops), or a negative one but with continuing clinical suspicion, should be followed by specialist referral of the patient for ileocolonoscopy with or without subsequent radiological small bowel imaging by CT or MRI.¹⁴

Pelvic or iliac fossa pain

The differential diagnosis of chronic pelvic or iliac fossa pain includes Crohn's disease, colonic diverticular disease, functional disease and gynaecological disease. If endometriosis or ovarian or other adnexal diseases are suspected, pelvic ultrasound (including transvaginal ultrasound if appropriate) is the investigation of first choice (Figure 3).¹⁵ For patients who do not meet the criteria for IBS or have alarm symptoms, the choice of imaging depends on the provisional clinical diagnosis. For example, diverticular disease and its complications are best initially imaged by CT. Small or even moderate-sized colon cancers cannot be excluded on CT (unless combined with CT colonography).

Dyspepsia

Dyspepsia is defined as a symptom complex of epigastric pain or discomfort thought to originate in the upper gastrointestinal tract.

Diagnostic imaging has little place in patients with uncomplicated dyspepsia, which is usually treated empirically,¹⁶ other than in selected individuals to exclude (by ultrasound) biliary disease



Figure 3. Ultrasound of left adnexal mass showing cystic component containing internal echoes, partly solid, consistent with endometriosis.

3. Alarm symptoms in patients with dyspepsia¹⁷

- Age over 50 years and recent onset of symptoms
- Daily constant pain
- Unintended weight loss
- NSAID drug use
- Persistent vomiting
- A past history of gastric ulcer or gastric surgery
- First-degree relative with upper gastrointestinal malignancy
- Anaemia
- Dysphagia/odynophagia
- Gastrointestinal bleeding

as an alternative or concomitant diagnosis. Alarm features (or red flags; Box 3)¹⁷ or failure of treatment response are indications for investigation with endoscopy as the primary modality. However, patients with suspected pancreatic disease (those with pain extending through to the back, weight loss, jaundice or abnormal liver function or recent onset of diabetes) should also undergo CT scanning (Figure 4). Functional dyspepsia is essentially a diagnosis of exclusion of organic disease.⁴

Right upper quadrant pain or biliary-type pain

Ultrasound is very accurate at diagnosing or excluding gallstones and is the examination of first choice.¹⁸ If the ultrasound is negative, alternative diagnoses should be considered. Whether gallstones are present on ultrasound or not, specialist referral or opinion should be sought if there is bile duct dilatation in the presence of pain (Figure 5) and/or if there are abnormalities of serum liver function tests suggesting biliary obstruction that may require surgical or endoscopic intervention. While awaiting a specialist appointment,

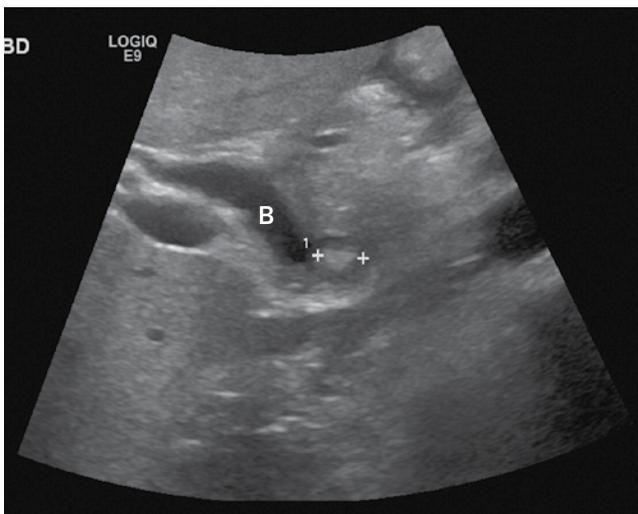


Figure 5. Ultrasound image showing dilated common bile duct (B) containing a calculus (between electronic callipers +).

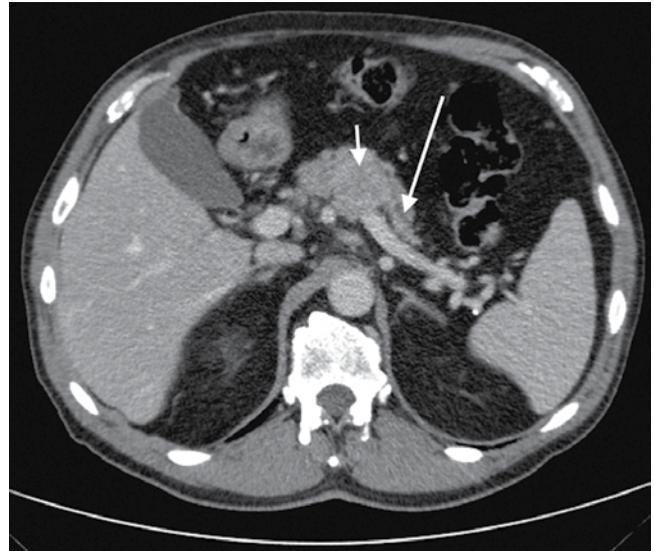


Figure 4. CT image showing pancreatic cancer (short arrow) causing obstruction and dilatation of the pancreatic duct upstream (long arrow).

noninvasive cholangiography may be performed with CT cholangiography (Figure 6) or magnetic resonance cholangiopancreatography (MRCP; Figure 7). The latter is preferred in young patients because of lack of ionising radiation and, in contrast to CT cholangiography, can be carried out when the serum bilirubin is raised.

If the initial ultrasound shows alternative pathology that accounts for symptoms, such as a periampullary or pancreatic mass, a CT scan and specialist referral are indicated.

Chronic cholecystitis (calculous or acalculous) may also cause symptoms. If this is suspected and an ultrasound is negative, a nuclear medicine ^{99m}Tc hepatobiliary iminodiacetic acid scan with gallbladder ejection fraction measurement may be indicated.



Figure 6. CT cholangiogram showing a calculus (arrow) in the dilated common bile duct.

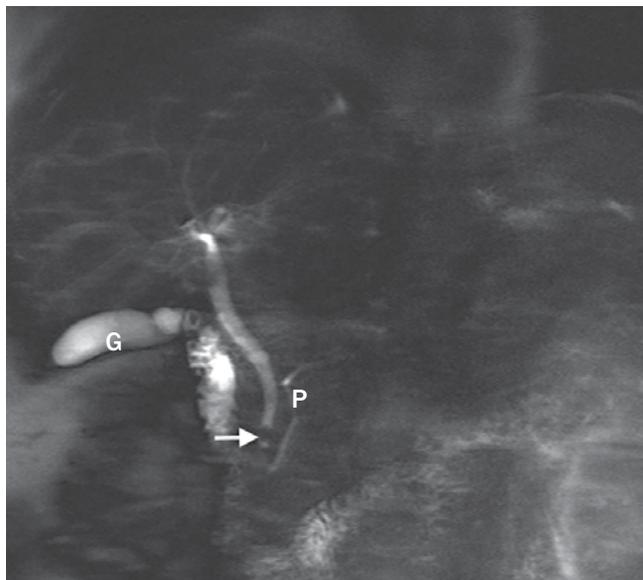


Figure 7. Magnetic resonance cholangiopancreatography showing a calculus (arrow) in a minimally dilated distal common bile duct. Note gallbladder (G) and pancreatic duct (P).

Functional causes of biliary-type pain also occur,⁴ but organic lesions need to be excluded.

Renal tract symptoms

Chronic or recurrent pain arising from the renal tract may be experienced as loin or flank pain, and may take the form of renal colic if there is recurrent passage of ureteric calculi. Pain may also occur in the suprapubic region or be referred to the scrotum. In the latter situation, a negative ultrasound of the scrotum to exclude local causes should lead to an ultrasound of the whole renal tract. Pain may be accompanied by haematuria or evidence of chronic infection. Urinary tract ultrasonography is a satisfactory primary modality and will help rule out renal obstruction, intrarenal calculi and renal masses.¹⁹ A nonenhanced low ionising radiation dose CT is recommended in older patients, in those in whom ultrasound is inconclusive or shows obstruction but without detection of the cause, and in those with calculi in whom intervention is considered. Renal masses should be investigated with a multiphase CT scan (CT-intravenous urogram; effectively the modern CT equivalent of the conventional intravenous urogram that is now rarely indicated).

Other conditions

Less common causes of chronic pain include vascular conditions such as mesenteric artery stenosis (so-called 'mesenteric angina'), aortic aneurysms, abdominal wall pain, referred back pain and other musculoskeletal disorders. The former is initially best investigated with Doppler ultrasound or CT angiogram. Abdominal aortic aneurysms rarely cause pain until they are large (and usually palpable), and pain is a signal for urgent referral because it may be a sign of imminent leakage.

Musculoskeletal disorders are often elucidated with a history and physical examination.

Chronic abdominal wall pain is an under-recognised condition, most commonly due to anterior cutaneous nerve entrapment syndrome. It is characterised by pain that is localised to a highly specific area of the abdomen and may be diagnosed clinically by Carnett's test,²⁰ which involves tensing the muscles of the abdominal wall. If the patient's pain is unchanged or worsens, this suggests somatic pain arising in the abdominal wall, whereas if the pain decreases it is more likely that the pain is visceral. No imaging is indicated for chronic abdominal wall pain and patients usually respond to conservative management and injection of a local anaesthetic. Similarly, neuropathic pain, for example postherpetic pain, does not require imaging.

Request forms for imaging

Protocols for abdominal CT may differ significantly according to the pathology being sought or excluded. For example, a request for suspected renal colic should initiate a low-radiation dose nonintravenous contrast (unenhanced) CT, whereas suspected mesenteric angina will require a multiphase scan (precontrast, arterial and portal venous phase postcontrast). Therefore, it is essential that clinical information on request forms should be sufficient to communicate a provisional clinical diagnosis and be as specific as possible. Requests such as 'abdominal pain, cause?' and 'rule out cancer' are unhelpful. The former gives no clue as to the provisional diagnosis and thus the imaging protocol required. With regard to the latter, a negative standard CT scan does not rule out cancer and may give a false sense of security to the patient and doctor.

Conclusion

Diagnostic imaging in adults with chronic abdominal pain is over-used. When imaging is indicated, the choice of investigation will vary with each clinical scenario. It is a joint responsibility of the referrer and imaging specialist to ensure all procedures are justified, with potential benefits outweighing the risks. Providing adequate clinical information to the radiologist is essential to enable the correct modality and protocol to be performed, and to enable proper interpretation of the significance of the test results. **PMT**

Further reading

Government of Western Australia. Department of Health. Diagnostic imaging pathways. A clinical decision support tool and educational resource for diagnostic imaging. Available online at: www.imagingpathways.health.wa.gov.au (accessed February 2016).

References

A list of references is included in the website version (www.medicinetoday.com.au) of this article.

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