East Lancashire Hospitals
NHS Trust
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East Lancashire Teaching Hospital Trust

# Clinical Radiology Referral Guidelines

## Gastrointestinal Referrals


Safe | Personal | Effective

June 2024 v2

# EAST LANCASHIRE HOSPITALS NHS TRUST

# CLINICAL RADIOLOGY REFERRAL GUIDELINES

These guidelines are intended to be used by all "referrers" requesting imaging at East Lancashire Hospitals NHS Trust. They are appropriate for both primary and secondary care clinicians and Non-Medical Referrers (NMR) to promote the best use of imaging and resources for the benefit of our patients.

The Ionising Radiation (Medical Exposure) Regulations (IR(ME)R) provide for the health protection of individuals undergoing medical exposures involving ionising radiation. All diagnostic tests should therefore be carefully considered prior to referral and should only be requested appropriately. Diagnostic tests which do not utilise Ionising Radiation (such as ultrasound and magnetic resonance imaging) carry their own potential risks and as such are as strictly governed in terms of justification. This not only serves to protect patients, but also to manage demand appropriately and keep waiting times to a minimum.

The aim for all examinations should be to obtain the maximum information with the minimum of radiation. This means that on occasions the imaging undertaken may not be what the referring clinician/NMR expects. Radiology has set examination protocols utilised for the legal authorisation and justification of requests.

## Optimising radiation dose

The use of radiological investigations is an accepted part of medical practice justified in terms of clear clinical benefits to the patient, which should far outweigh the small radiation risks. However, even small radiation doses are not entirely without risk. A small fraction of the generic mutations and malignant diseases that occur in the population can be attributed to natural background radiation. Diagnostic medical exposures account for one-sixth of the total population dose.

The Ionising Radiation (Medical Exposure) Regulations (IR(ME)2017 require that the unnecessary exposure of patients to radiation is kept to a minimum and ELHT must comply with these regulations. This is achieved by avoiding undertaking investigations unnecessarily (especially repeat examinations) and the use of dose optimisation utilising locally set diagnostic reference levels (DRLs).

The effective dose for a radiological investigation is the weighted sum of the doses to a number of body tissues, where the weighting factor for each tissue depends on its relative sensitivity to radiation-induced cancer of severe hereditary effects. This provides a single dose estimate related to the total radiation risk, no matter how the radiation dose is distributed around the body (Table 1).

Typical effective doses for some common diagnostic radiology procedures range over a factor of about 1,000 from the equivalent 1-2 days of natural background radiation.

**Table 1**

| Typical effective doses from diagnostic medical exposure | | | |
|---|---|---|---|
| **Diagnostic Procedure** | **Typical effective dose (mSv)** | **Equivalent number of chest x-rays** | **Approximate equivalent period of natural background radiation** |
| **Radiographic examinations** | | | |
| Limbs & joints (except hip) | <0.01 | <0.5 | <1.5 days |
| Chest (single PA film) | 0.02 | 1 | 3 days |
| Skull | 0.06 | 3 | 9 days |
| Thoracic spine | 0.7 | 35 | 4 months |
| Lumbar spine | 1.0 | 50 | 5 months |
| Hip | 0.4 | 20 | 2 months |
| Pelvis | 0.7 | 35 | 4 months |
| Abdomen | 0.7 | 35 | 4 months |
| IVU | 2.4 | 120 | 14 months |
| Barium swallow | 1.5 | 75 | 8 months |
| Barium meal | 2.6 | 130 | 15 months |
| Barium follow-through | 3 | 150 | 16 months |
| Barium enema | 7.2 | 360 | 3.2 years |
| CT Head | 2 | 100 | 10 months |
| CT Chest | 8 | 400 | 3.6 years |
| CT abdomen or pelvis | 10 | 500 | 4.5 years |
| **Radionuclide Studies** | | | |
| Lung ventilation (Xe-133) | 0.3 | 15 | 7 weeks |
| Lung perfusion (Tc-99m) | 1 | 50 | 6 months |
| Kidney (Tc-99m) | 1 | 5 | 6 months |
| Thyroid (Tc-99m) | 1 | 50 | 6 months |
| Bone (Tc-99m) | 4 | 200 | 1.8 years |
| Dynamic cardiac (Tc-99m) | 6 | 300 | 2.7 years |
| PET head (F-18 FDG) | 5 | 250 | 2.3 years |
| *UK average background radiation = 2.2 mSv per year: regional averages 1.5-7.5 mSv per year | | | |

Please note that the doses from some CT examinations are particularly high and the demand for CT imaging continues to rise. **It is therefore particularly important that referrals for CT are thoroughly justified and that techniques that minimise dose while retaining essential diagnostic information are adopted.**

In these referral guidelines, the doses are grouped to support the referrer in understanding the order of magnitude of radiation doses of the various investigations (Table 2).

| **Table 2**<br>**Typical effective doses of ionising radiation from common imaging procedures** | | |
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| Symbol | Typical effective dose (mSv) | Examples |
| None | 0 | Ultrasound (US), Magnetic Resonance Imaging (MRI) |
| ☢ | <1 | Chest, limbs & pelvis X-ray, mammography |
| ☢ ☢ | 1-5 | Lumbar spine X-ray, Nuclear Medicine (NM) (e.g., bone), Computed tomography (CT) head and neck |
| ☢ ☢ ☢ | 5-10 | CT chest or abdomen, NM (e.g., cardiac) |
| ☢ ☢ ☢ ☢ | >10 | Extensive CT studies, some NM studies (e.g., some Position Emission Tomography co-registered with CT (PET-CT) |
| The average annual background dose in most parts of Europe falls within the 1-5 mSv range ☢ ☢ | | |

**Pregnancy and Protection of the foetus**

Irradiation of a foetus should be avoided whenever possible. This includes situations in which the woman herself does not suspect pregnancy. The prime responsibility for identifying such patients lies with the referring clinician. Radiology also checks the pregnancy status of patients when they attend for examination.

Persons of childbearing potential presenting for an examination in which the primary beam irradiates the pelvic area (essentially, any ionising irradiation between the diaphragm and the knees), directly or by scatter, or for a procedure involving radioactive isotopes, will be asked whether they are or may be pregnant.

If the patient can exclude the possibility of pregnancy, the examination can proceed. If the patient is definitely pregnant, or if pregnancy cannot be excluded, the justification for the proposed examination should be reviewed by the radiologist and the referring clinician/NMR, with a decision taken on whether to defer the investigation until after delivery. However, a procedure of clinical benefit to the parent may also be of indirect benefit to the unborn child and a delay in an essential procedure may increase the risk to the foetus as well as the parent. This consideration is especially relevant in an emergency situation and all decisions must be documented.

**Guidelines Key**

The pages of each section are composed five columns:

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| **Clinical/diagnostic problem** | Situation for requesting an examination |
| **Investigation** | Possible imaging techniques |
| **Dose** | Level of exposure to radiation ☢ |
| **Recommendation** | Recommendation on appropriateness of the investigation |
| **Comment** | Explanatory notes |

**Gastrointestinal System**

| Clinical/diagnostic problem | Investigation | Dose | Recommendation | Comment |
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| Difficulty in swallowing: high dysphagia | Ba Swallow | ☢ ☢ | Indicated | Motility disorders, which must be explored with the patient in prone or supine position, may be seen despite normal endoscopy. Subtle strictures, not seen at endoscopy, are best shown by marshmallow or other bolus study. |
| | Video fluoroscopy | ☢ ☢ | Indicated | Video recording of swallow is essential. A multidisciplinary approach with speech therapist and ENT surgeon is best. |
| Difficulty in swallowing: low dysphagia<br><br>(See also CA11, G01) | Ba Swallow | ☢ ☢ | Indicated only in specific circumstances | Endoscopy should be considered as the first-line investigation for recent onset progression dysphagia in patients >40. Barium swallow before endoscopy is useful for high dysphagia. Webs and pouches are well shown by barium studies. Motility disorders, which must be looked for with the patient in prone or supine position, may be seen despite normal endoscopy. Subtle strictures, not seen at endoscopy, are best shown by marshmallow or other bolus study. |
| Heartburn/chest pain: hiatus hernia or reflux | Ba swallow / meal | ☢ ☢ | Indicated only in specific circumstances | Reflux is common; investigation is only indicated when lifestyle changes and empirical therapy are ineffective. pH monitoring is the gold standard for reflux, though endoscopy alone will reliably show early changes of reflux oesophagitis and enables detection and biopsy of metaplasia. Barium studies to assess oesophageal motility before antireflux surgery do not reliably predict postoperative dysphagia. |
| Suspected oesophageal perforation | CXR | ☢ | Indicated | CXR will be abnormal in 80% of cases, but pneumomediastinum is visible in only 60% of cases. |
| | Contrast swallow | ☢ ☢ | Indicated | Non-iconic iodinated contrast medium is the only safe agent. It is sensitive, but if no leak is seen proceed to immediate CT. |
| | CT | ☢ ☢ ☢ | Indicated | CT is sensitive for the presence of perforation and for the detection of mediastinal and pleural complications. |

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| Acute GI bleeding: haematemesis / melaena | Endoscopy | None | Indicated | Endoscopy enables diagnosis in most cases of upper GI bleeding can be used to deliver haemostatic therapy. |
| | Abdominal US | None | Indicated only in specific circumstances | Abdominal US is only useful to look for signs of chronic liver disease. |
| | CT and CT angiography | ☢ ☢ ☢ | Specialised investigation | CT in increasingly used in the diagnosis of acute GI bleeding before angiography, but evidence to support its use is limited with only small series reported. |
| | NM (labelled red cells) | ☢ ☢ | Specialised investigation | NM is used after endoscopy. It is easy to perform but time consuming. Red-cell labelling can detect bleeding rates as low as 0.1mL/min, which is more sensitive than angiography. Red-cell study is most useful in intermittent bleeding. |
| | Angiography | ☢ ☢ ☢ | Specialised investigation | In cases of uncontrollable bleeding, angiography can often be used to identify the bleeding or to direct surgery accurately. It can be used to effect treatment by transcatheter embolization. |
| | AXR | ☢ | Not indicated | AXR is of no value. |
| | Ba studies | ☢ ☢ | Not indicated | Barium studies preclude angiography. |
| Dyspepsia | Ba studies | ☢ ☢ | Indicated only in specific circumstances | Most patients can be treated without investigation and will undergo a trial of therapy. Endoscopy is the investigation of choice. The diagnosis of gallstone disease is important if endoscopy or barium studies are normal. Routine endoscopic investigation of patients of any age, presenting with dyspepsia and without alarm signs, is not necessary. However, in patients aged ≥55 with unexplained and persistent recent-onset dyspepsia lone an urgent referral for endoscopy should be made.<br><br>Urgent specialist referral for endoscopic investigation is indicated for patients of any age with dyspepsia when presenting with any of the following: chronic GI bleeding, progressive unintentional weight loss, |

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| | | | | progressive difficulty in swallowing persistent vomiting, iron-deficiency anaemia, and epigastric mass. Barium meal is indicated for failed or refused endoscopy and may be considered for diagnosis of functional dyspepsia after negative endoscopy. |
| | US | None | Indicated only in specific circumstances | The diagnosis of gallstone disease with US is important in the older age group if endoscopy or barium studies are normal. |
| Ulcer: follow up | Ba studies | ☢ ☢ | Not indicated | Scarring precludes accurate assessment with barium studies. Endoscopy is preferred to confirm complete hearing and to obtain biopsies where necessary. |
| Suspected anastomotic leaks after recent upper GI surgery | Contrast swallow / meal | ☢ ☢ | Indicated | If water-soluble contrast swallow does not show a leak at the anastomotic site and there is clinical concern, a barium swallow should be performed with caution. CT may also be considered. |
| Previous upper GI surgery (not recent): dyspeptic symptoms | Ba studies | ☢ ☢ | Indicated only in specific circumstances | Gastric remnant is best assessed by endoscopy (gastritis, ulceration, dysplasia, recurrent tumour etc.). |
| Previous upper GI surgery (not recent): dysmotility / obstructive symptoms | Ba studies | ☢ ☢ | Indicated | Barium studies show surgical anatomy and may show dilated afferent loop, narrowed anastomoses, internal hernias, closed loops etc. |
| | NM | ☢ ☢ | Specialised investigation | NM is a good method of assessment of gastric emptying, dumping and stasis. |
| Intestinal blood loss: chronic or recurrent | Ba meal<br>Ba enema | ☢ ☢<br>☢ ☢ | Not indicated initially | Initial investigation is endoscopy of the upper GI tract and colon, Barium meals and enemas have a role if endoscopy is not possible. Video capsule endoscopy should be considered, where available, for obscure GI bleeding that persists or recurs after a negative initial endoscopy. For small discrete lesions, small bowel enema is more sensitive than barium follow-through. |
| | Ba small bowel enema | ☢ ☢ | Indicated | |

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| | NM (red-cell or Meckel's study) | ☢ ☢ | Indicated | When all other investigations are negative, labelled red-cell and/or Meckel's study may be useful in detecting and localising the site of chronic and/or recurrent bleeding. |
| | CT | ☢ ☢ ☢ | Indicated | IV contrast-enhanced CT is a useful technique to look for lesions that may be bleeding (e.g., tumours). CTA may show bowel angiodysplasia. |
| | Angiography | ☢ ☢ ☢ | Specialised investigation | Angiography is sensitive for angiodysplasia and to show tumour neovascularity. |
| Acute abdominal pain: perforation / obstruction | AXR + CXR erect | ☢ ☢ | Indicated | Supine AXR may be sufficient to establish diagnosis of obstruction and point an anatomical level. Consider erect AXR if supine AXR is normal and there is strong clinical suspicion of obstruction. Lateral decubitus AXR is indicated to show free gas if CXR has to be supine, CT is used increasingly as initial investigation. |
| | US | None | Indicated | US is widely used as a survey for abdominal pain. It is sensitive for free fluid in perforation, is useful in the diagnosis of acute appendicitis, and may identify bowel disease. However, CT is the investigation of choice in adults when the AXR suggest bowel obstruction or is equivocal. Much depends on body habitus. |
| | CT | ☢ ☢ ☢ | Indicated | CT is used for sealed perforations and for establishing the sire and cause of obstruction. This recommendation does not apply to children. |
| Acute small bowel obstruction: confirmation and assessment of level | Contrast studies | ☢ ☢ | Indicated only in specific circumstances | Although frequently unhelpful, a plain radiograph 4-6h after 100mL oral contrast medium is a good predictor of resolution without operation. |
| | CT | ☢ ☢ ☢ | Indicated | When AXR suggests small bowel obstruction, CT confirms diagnosis, indicates level, and may show cause. When AXR is equivocal and low-grade small bowel obstruction is suspected clinically, CT enteroclysis has a higher site-specific sensitivity and specificity than CT. |
| | AXR | ☢ | Indicated | |

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| | US | None | Indicated only in specific circumstances | US may show intestinal peristalsis to differentiate between a functional and obstructive ileus, CT is more reliable. |
| Small bowel obstruction: low grade / intermittent | CT (including CT enteroclysis) | ☢ ☢ ☢ | Indicated | CT is the investigation of choice and is more sensitive than barium small bowel study. CT enteroclysis is more sensitive than both small bowel barium study and standard CT with oral contrast medium in detecting both the cause and site of low-grade small obstruction. |
| | Water-soluble contrast study (Ba follow-through / enteroclysis) | ☢ ☢ | Indicated only in specific circumstances | The usefulness of the water-soluble studies is controversial. It may be helpful to select a group of patients for non-operative management, but the therapeutic value is not proven. |
| | MRI | None | Indicated only in specific circumstances | MRI (and MR enteroclysis) may be of value in problem solving and has the advantage of no radiation but is still an evolving technology. |
| Suspected small bowel disease (Crohn's disease) | Ba small bowel meal | ☢ ☢ | Indicated | Barium studies are gradually being replaced by CT (in adults) and US (in children and young women). Video capsule endoscopy is promising but should only be considered when strictures have been excluded. |
| | Ba small bowel enema | ☢ ☢ | Indicated | |
| | Endoscopy and video capsule endoscopy | None | Specialised investigation | |
| | US<br>CT<br>MRI | None<br>☢ ☢ ☢<br>None | Specialised investigation | Use of these techniques is evolving – e.g., in the assessment of disease activity – and they are especially useful in the assessment of extramural complications. |
| Change of bowel habit to looser stools with or without rectal bleeding persistent | Ba enema | ☢ ☢ ☢ | Indicated | Colonoscopy is often the first-line investigation. Barium enema is an alternative to colonoscopy and is widely used as the first-line investigation of change in bowel habit in the absence of rectal bleeding. Barium enema is insufficient with rectal bleeding, but flexible sigmoidoscopy followed. |

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| for 6 weeks: colorectal neoplasia | CT | ☢ ☢ ☢ | Indicated | CT has an established role in the demonstration and exclusion of colorectal neoplasia. Its use can range from a minimally invasive approach to full CT colonography. There is now quite extensive experience in CT colonography. Many centres are abandoning the barium enema because CT colonography with full bowel preparation and air enema is more accurate than barium enema and closely approaches the accuracy of colonoscopy. It is already the technique of choice for the proximal colon when colonoscopy has been incomplete. The minimally invasive approach with oral contrast medium and no purgation may be appropriate in the very frail and elderly. |
| Large bowel obstruction: acute | AXR | ☢ | Indicated | AXR may suggest diagnosis and indicate likely level. |
| | Contrast enema | ☢ ☢ ☢ | Indicated | Water-soluble studies can confirm diagnosis and level of obstruction and may indicated likely cause. In some cases, interpretation is difficult. If no abnormality is seen it is important to understand that, although pseudo-obstruction may be indicated, a significant obstructing lesion may have been missed. The use of a water-soluble enema is suggested if colorectal stenting is being considered. |
| | CT | ☢ ☢ ☢ | Indicated | CT is the alternative to contrast enema and may be used in combination. It will confirm the diagnosis and level of acute large bowel obstruction and can identify the cause. |
| Inflammatory bowel disease of the colon: acute exacerbation | AXR | ☢ | Indicated | AXR is useful to monitor toxic dilatation. |
| | Contrast enema | ☢ ☢ ☢ | Indicated | Unprepared instant enema complements AXR and confirms extent of disease, although it is now becoming replaced by alternative investigations. It is contraindicated in toxic megacolon. |
| | CT | ☢ ☢ ☢ | Indicated | Although CT is not used to identify the extent of the disease, it is very useful for identification of complications such as perforation or abscess formation. |

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| | NM (white cell study) | ☢ ☢ ☢ | Indicated | Labelled white-cell study may show activity and extent of disease. |
| | MRI | None | Specialised investigation | MRI is extremely valuable in guiding the surgical management of patients with anorectal sepsis. |
| Inflammatory bowel disease of colon: Long-term follow-up | Ba enema | ☢ ☢ ☢ | Indicated only in specific circumstances | Barium enema has a limited role after complex surgery and in the evaluation of fistulae. Colonoscopy is the most reliable investigation for identification of complications, including dysplasia, stricture, and carcinoma. |
| | CT colonoscopy | ☢ ☢ ☢ | Indicated in specific circumstances | CT colonoscopy may have a limited role as an alternative to barium enema if colonoscopy not feasible. |
| Acute abdominal pain warranting hospital admission for consideration of surgery | AXR + CXR erect | ☢ ☢ | Indicated | Local policy will determine strategy. Supine AXR (for gas pattern, etc) is usually sufficient. Erect AXR is indicated only in specific circumstances. Erect CXR is used to identify perforation. US is widely used as a preliminary survey, especially in the investigation of pain believed to be of biliary or gynaecological origin. CT is now widely used as the single best investigation. |
| | US | None | Indicated | |
| | CT | ☢ ☢ ☢ | Indicated | |
| Palpable mass | AXR | ☢ | Indicated only in specific circumstances | AXR is rarely of value. |
| | US | None | Indicated | US often solves the problem. |
| | CT | ☢ ☢ ☢ | Indicated | CT is used when US is inconclusive, and to provide more complete assessment of disease extent before definitive treatment. |

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| Malabsorption | Ba small bowel / enema<br>Ba small bowel meal | ☢ ☢<br>☢ ☢ | Indicated only in specific circumstances | Imaging is not required for the diagnosis of coeliac disease but may be indicated for other causes of small bowel malabsorption, or when biopsy is normal/equivocal. Barium studies may be useful to detect complications of coeliac disease e.g., lymphoma. Small bowel enema is more accurate than small bowel meal. |
| | NM (see local advice) | ☢ ☢ | Specialised investigation | Several NM investigations are available, which should establish the presence of malabsorption. Some of these investigations are non-radiological (e.g., breath test). |
| | CT | ☢ ☢ ☢ | Specialised investigation | CT may be useful, particularly in cases of lymphoma, chronic pancreatitis or to show lymphadenopathy associated with other causes of malabsorption, such as Whipple's disease. |
| Constipation | AXR | ☢ | Indicated only in specific circumstances | AXR may be useful in geriatric and psychiatric specialties to show extent of faecal impaction. |
| | Intestinal transit studies | ☢ ☢ | Specialised investigation | Intestinal transit studies form a simple investigation using radiopaque shapes, which can confirm normal intestinal transit. |
| | Evacuation proctography | ☢ ☢ | Specialised investigation | In some patient's constipation is secondary to a disorder of evacuation which can be shown and characterised by this investigation. |
| | MRI | None | Specialised investigation | Dynamic MRI of the pelvic floor is useful for showing pelvic compartment weakness and cystocoeles. |
| Abdominal sepsis: pyrexia of unknown origin | US | None | Indicated | Seek early radiological advice. US is often used first and may be definitive, particularly when there are localising signs; it is especially good for subphrenic/subhepatic spaces and pelvis. |
| | CT | ☢ ☢ ☢ | Indicated | CT is probably the nest test overall. Infection and tumour are usually identified or excluded. It also enables biopsy of nodes or tumour and drainage of collections (especially in recently postoperative patients when US is difficult). |
| | NM (white cell, gallium, or PET) | ☢ ☢ ☢ | Indicated | NM is especially good when there are no localising features. Labelled white-blood cell study is good for chronic postoperative sepsis; gallium will accumulate at sites of tumour (e.g., lymphoma) and infection. |

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| Hepatic metastases | US | None | Indicated | Although US is often used as the initial examination to detect liver metastases, it should not be relied on to exclude metastases. CT or MRI should be used when full staging is required. The use of US contrast agents improves the accuracy of detection of metastases to match CT and MRI. |
| | CT | ☢ ☢ ☢ | Indicated | CT is significantly more sensitive than US for the detection of liver metastases, especially small lesions. It is essential for accurate staging of metastases in patients being considered for liver resection. |
| | MRI | None | Specialised investigation | With liver-specific contrast agents MRI is even more sensitive than CT in the detection of metastases, but it is also useful for accurate characterisation of small lesions. It is widely used in the preoperative assessment of candidates for liver resection. |
| | PET-CT | ☢ ☢ ☢ ☢ | Indicated only in specific circumstances | The role of PET-CT is still evolving but may be useful for guiding liver resection. |
| Characterisation of a solitary liver lesions identified of US- e.g., haemangioma metastasis etc | CT<br>MRI | ☢ ☢ ☢<br>None | Indicated | The choice of CT or MRI depends on local provision and expertise. MRI may be more accurate than CT. |
| | Contrast – enhanced US | None | Specialised investigation | Where available, contrast-enhanced US can be accurate at excluding malignancy and characterising a focal liver lesion. |
| Known cirrhosis: Complications | US | None | Indicated | US is sensitive for ascites, in portal hypertension US may show varices, especially in the splenic hilum. US is of lower sensitivity than CT or MRI for the detection and confirmation of hepatoma. Contrast-enhanced US is helpful in centre with the expertise. |
| | CT | ☢ ☢ ☢ | Specialised investigation | Triple-phase CT is helpful, especially when US is equivocal in the presence of increase concentration of alpha feto-protein and in the staging of hepatoma. |
| | MRI | None | Specialised investigation | MRI is more sensitive than CT is the assessment of a cirrhotic liver for suspected hepatoma. |

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| Jaundice | US | None | Indicated | US reliably differentiates between obstructive and non-obstructive jaundice, but bile duct dilatation may be subtle in early obstruction. When US indicated obstructive jaundice, subsequent investigation will depend on the level of obstruction, presence, or absence of stones in the gall bladder and ducts, as well as the clinical situation. Early discussion with a radiologist is required. |
| | ERCP | ☢ ☢ | Specialised investigation | If US shows duct stones, proceed to ERCP for confirmation and therapy. ERCP remains the gold standard for intrahepatic duct changes sclerosing cholangitis but carries a risk of lactogenic pancreatitis. |
| | CT | ☢ ☢ ☢ | Specialised investigation | CT is frequently the next investigation for US-proven obstructive jaundice, especially when US shows the obstruction is below the hilum. For pancreatic cancer CT reliably predicts unresectability. In malignant hilar level obstruction, CT may provide staging information critical to the planning of surgery or palliative therapy. |
| | MRI including MRCP | None | Specialised investigation | In hilar-level obstruction, MRCP is the investigation of choice after US, MRCP reliably and non-invasively depicts the pattern and extent of duct involvement, thus facilitating planning of curative surgery or interventional treatment. In malignant hilar-level obstruction, MRI may provide staging information critical to the planning of surgery or palliative treatment. If US shows gallstones, but not definite duct stones, MRC is indicated before ERCP. |
| | Endoscopic US | None | Specialised investigation | Endoscopic Us is the most accurate method for the detection of small duct stones and small papillary or periampullary tumours. It allows biopsy of the pancreas without risk of tumour seeding. |
| | Percutaneous transhepatic cholangiogram | ☢ ☢ ☢ | Indicated only in specific circumstances | Percutaneous transhepatic cholangiogram may be performed when ERCP is not possible and as an adjunct to percutaneous therapies. |
| Suspected gall bladder disease or post- | US | None | Indicated | US in the investigation of choice to show or to exclude gallstones and acute cholecystitis. It is the initial investigation of biliary pain but cannot reliably exclude common duct stones. |

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| cholecystectomy pain | CT | ☢ ☢ ☢ | Specialised investigation | CT has a limited role in cholelithiasis but is useful in assessment of the gallbladder wall and gallbladder masses. Ct cholangiography can be used to show duct stones in patients who are unable to undergo MRCP. |
| | ERCP<br>MRCP | ☢ ☢<br>None | Indicated only in specific circumstances | Diagnostic ERCP is no longer justified. MRP should be used to investigate suspected biliary disease unless earlier investigation suggest that therapeutic ERCP will be required. |
| | Endoscopic US | None | Specialised investigation | Endoscopic US is useful in the diagnosis of cholelithiasis if all other imaging in negative. |
| | NM (Tc99m-IDA study) | ☢ ☢ | Specialised investigation | HIDA study will show activity at site of leak. |
| Postoperative biliary leak | US | None | Indicated | US is the first investigation of suspected leak. US will show the size and anatomical position of collections. |
| | MRCP | None | Specialised investigation | MRCP can show bile duct anatomy and evidence of a biliary leak. |
| | ERCP | ☢ ☢ | Indicated only in specific circumstances | ERCP is indicted only for therapeutic purposes. |
| | NM (Tc99m-IDA study) | ☢ ☢ | Specialised investigation | HIDA study will show activity at site of leak. |
| Pancreatitis: acute | AXR + CXR | ☢ | Indicated | When acute pancreatitis presents as non-specific acute abdominal pain, AXR and erect CXR may enable exclusion of perforation and intestinal obstruction. |
| | CT | ☢ ☢ ☢ | Indicated | Contrast-enhanced CT is used early in severe cases to assess the extent of necrosis, which is helpful in prognosis. In follow-up, it is used to detect and monitor complications, and for this purpose it is superior to US, US is used to monitor more chronic pseudocysts, to avoid the high radiation dose of CT. |

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| | US | None | Indicated | US must take place early to enable identification of patients with gallstones, which indicates a diagnosis of gallstone pancreatitis. MRCP and possibly early ERCP may be considered at that stage. US of the pancreas can be normal in early pancreatitis. |
| Pancreatitis: chronic | AXR | ☢ | Indicated | AXR may show calcification (calcified duct stones) but it of limited value in exclusion. |
| | US<br>CT | None<br>☢ ☢ ☢ | Indicated | US may be definitive, especially in thin patients. CT is highly sensitive for pancreatic calcification but poorly sensitive for early parenchymal changes. US, CT, and MR cannot distinguish a chronic inflammatory form a malignant mass. |
| | ERCP<br>MRCP | ☢ ☢<br>None | Specialised investigation | MRCP shows moderate and severe ductal changes and may indicate exocrine function. MRCP does not reliably show minor side branch changes in mild chronic pancreatitis. ERCP shows duct morphology but should not be performed unless CT and MRCP are inconclusive or unless endoscopic intervention is planned. |
| Insulinoma | Endoscopic US | None | Specialised investigation | The diagnosis of functioning islet-cell tumours is made clinical and biochemical criteria. Imaging is for preoperative localisation. With non-functioning islet-cell tumours the imaging approach is the same for pancreatic carcinoma. Local expertise should determine the choice of non-evasive imaging approach and could include CT/NM with somatostatin-receptor scintigraphy and MRI. When non-invasive imaging is inconclusive or negative, invasive procedures are recommended: either arterial stimulation with venous sampling or endoscopic, US. For malignant tumours, staging procedures should include CT and somatostatin-receptor scintigraphy. |