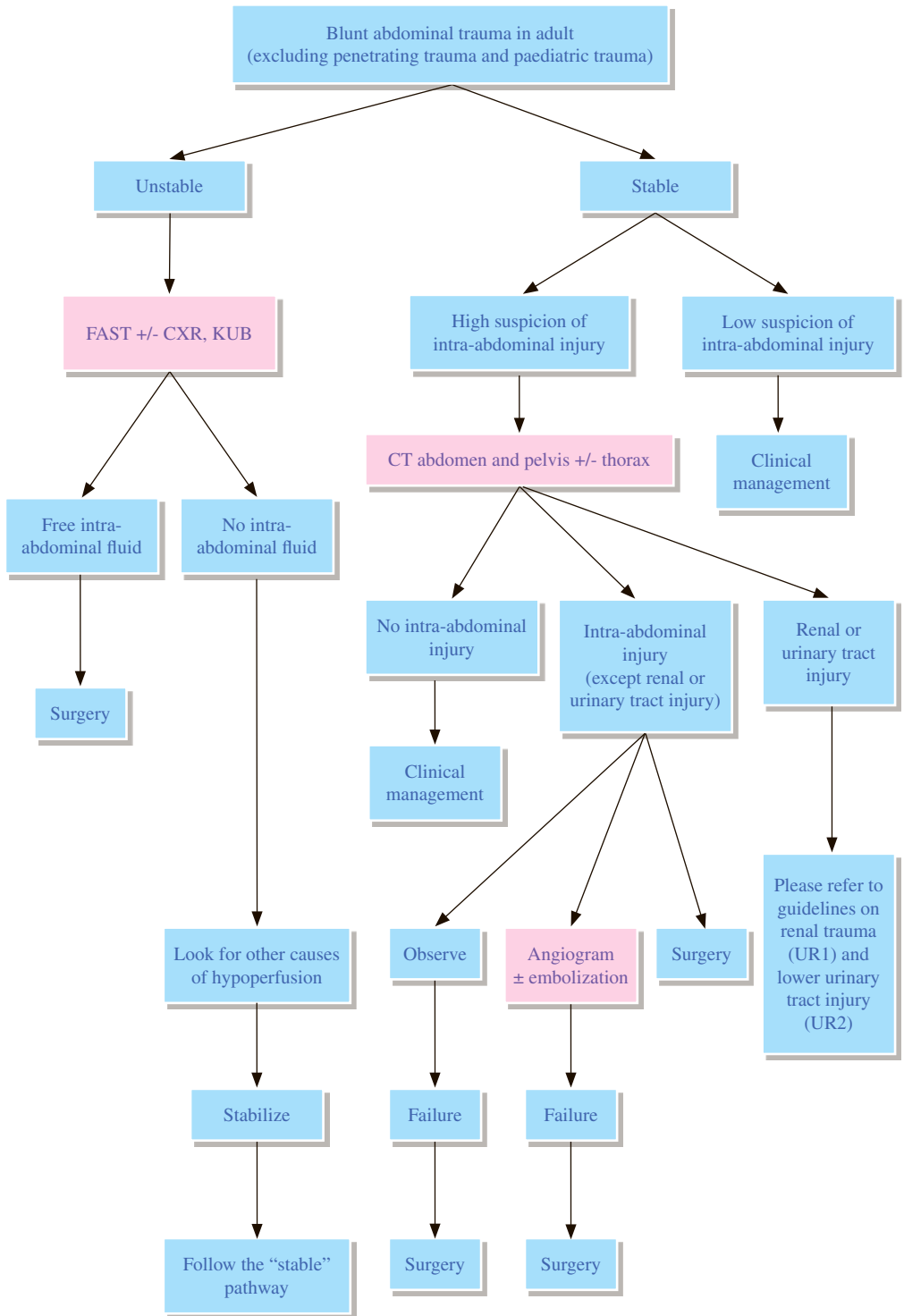


# Gastrointestinal Radiology



Hong Kong College of Radiologists

GI 1 Blunt abdominal trauma in adult



## REMARKS

### 1 General

- 1.1 Penetrating trauma and paediatric trauma are excluded in this guideline.
- 1.2 The extent and choice of imaging is influenced by the haemodynamic stability of the patient together with the severity of trauma, site of trauma, and other associated injuries.

### 2 Plain radiograph

- 2.1 Plain radiographs including chest X-ray (CXR) and kidney, ureter and bladder radiograph (KUB) can evaluate fracture, pneumothorax, pneumomediastinum, and abnormal intra-abdominal gas collection, but they are frequently negative.
- 2.2 CXR, KUB and focused assessment with sonography for trauma (FAST) are complementary examinations if patient condition permits.

### 3 US

- 3.1 US is not an appropriate modality to evaluate organ injury in a patient with blunt abdominal trauma. A negative US does not rule out visceral injury.
- 3.2 FAST is to check for intra-abdominal free fluid that can guide decisions on further management.
- 3.3 A negative FAST does not completely rule out haemoperitoneum. There is a false negative rate of >15%.

### 4 CT

- 4.1 In stable patients with blunt abdominal trauma, CT abdomen and pelvis is the primary imaging modality for deciding whether the patient needs urgent surgery, angiography +/- therapeutic embolization, or close observation.
- 4.2 CT is excellent for identifying active haemorrhage, or hepatobiliary, splenic, pancreatic, genitourinary, intestinal, or diaphragmatic injury.
- 4.3 CT evaluation of abdomen and pelvis for blunt trauma does not require the use of oral contrast. Scanning should include the lower thorax through to the floor of the pelvis with administration of intravenous (IV) contrast.

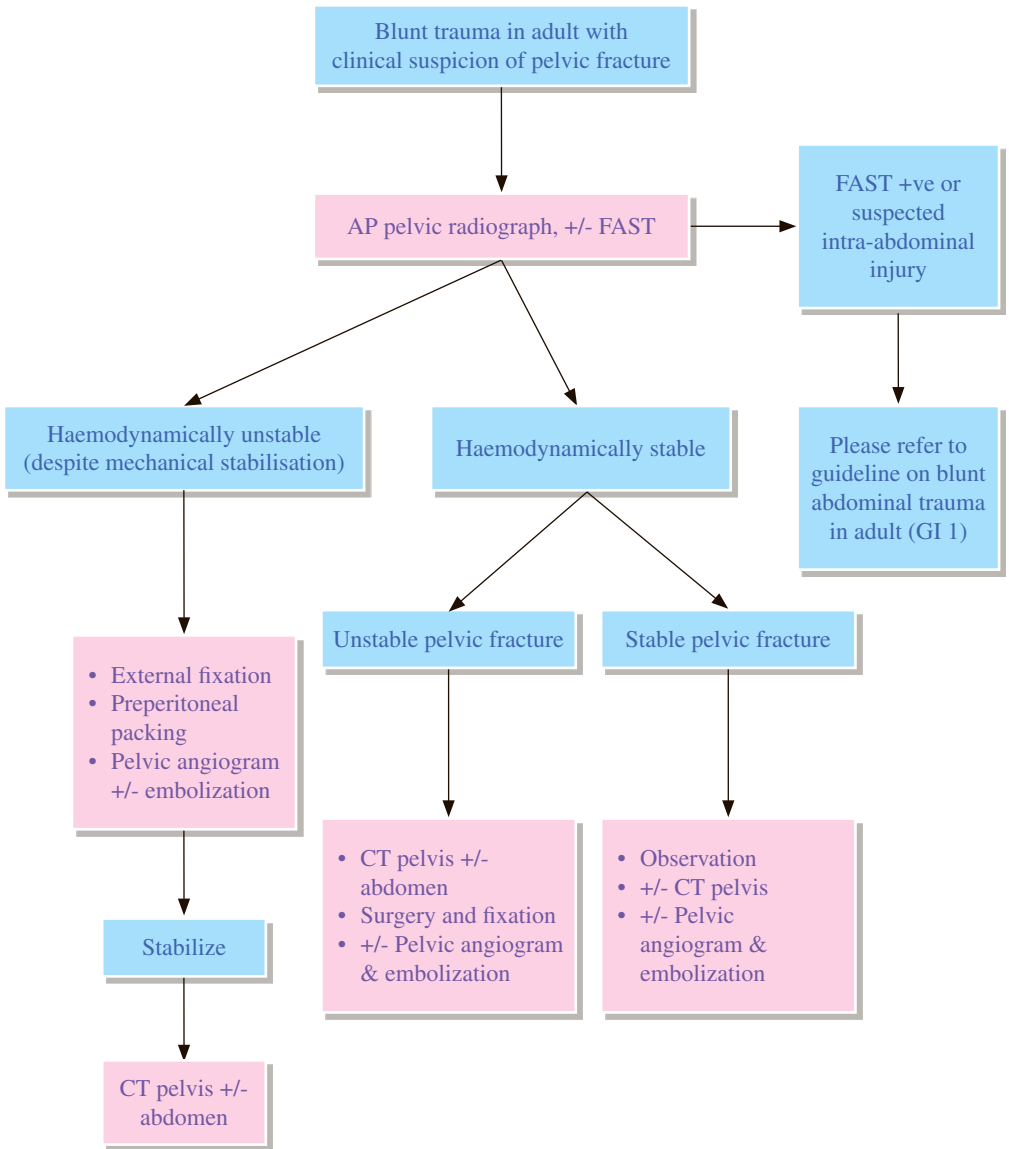
### 5 Angiography

- 5.1 Not appropriate as an initial imaging modality. It is appropriate if additional clinical information or imaging suggests possibility of active haemorrhage or pseudoaneurysm in haemodynamically stable patients.

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## GI 2 Blunt pelvic trauma



## REMARKS

### 1 General

- 1.1 The clinical management of pelvic trauma is dependent on the haemodynamic status and the amount of blood loss.
- 1.2 Concomitant major trauma to other sites has to be excluded in significant pelvic trauma.
- 1.3 Unstable fracture includes rotationally unstable or vertically unstable fractures, please refer to Young and Burgess Classification.<sup>13</sup>

### 2 Plain radiograph

- 2.1 Anterior-posterior (AP) radiograph of the pelvis is recommended in patients with high clinical suspicion of pelvic fracture.
- 2.2 Additional images, such as pelvic inlet or outlet views, need not be obtained in acute phase of injury.
- 2.3 Plain radiograph can underestimate the extent of bony injury and fracture pattern on plain radiograph does not predict haemorrhage or the need for angiography.

### 3 CT

- 3.1 CT pelvis is required for haemodynamically stable patients with high-energy pelvic injuries or disruption of pelvic ring.
- 3.2 CT is useful in pre-operative planning of pelvic, sacral and acetabular fractures. 2- and 3-dimensional reformats are useful in selected cases.
- 3.3 CT abdomen and pelvis should be done if intra-abdominal and pelvic injuries are suspected.

### 4 Angiography

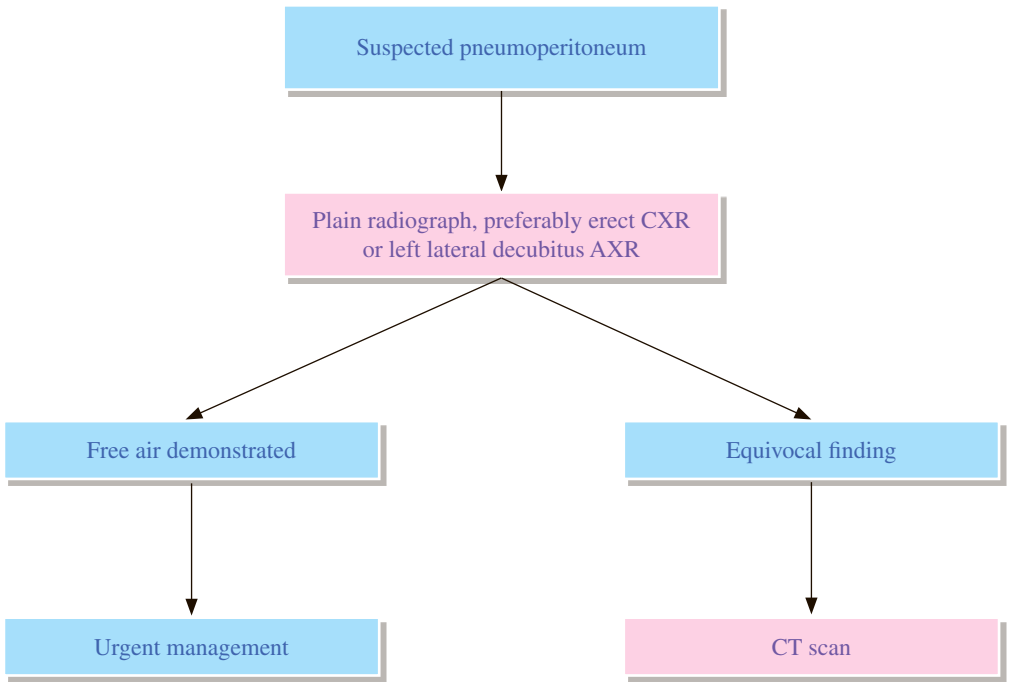
- 4.1 Angiography with pelvic embolization is useful in patients with pelvic fractures who are haemodynamically unstable.
- 4.2 Patients with evidence of contrast extravasation in pelvis on CT may require pelvic angiography and embolization regardless of haemodynamic status.

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### GI 3 Suspected pneumoperitoneum

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## **REMARKS**

### **1 Plain radiograph**

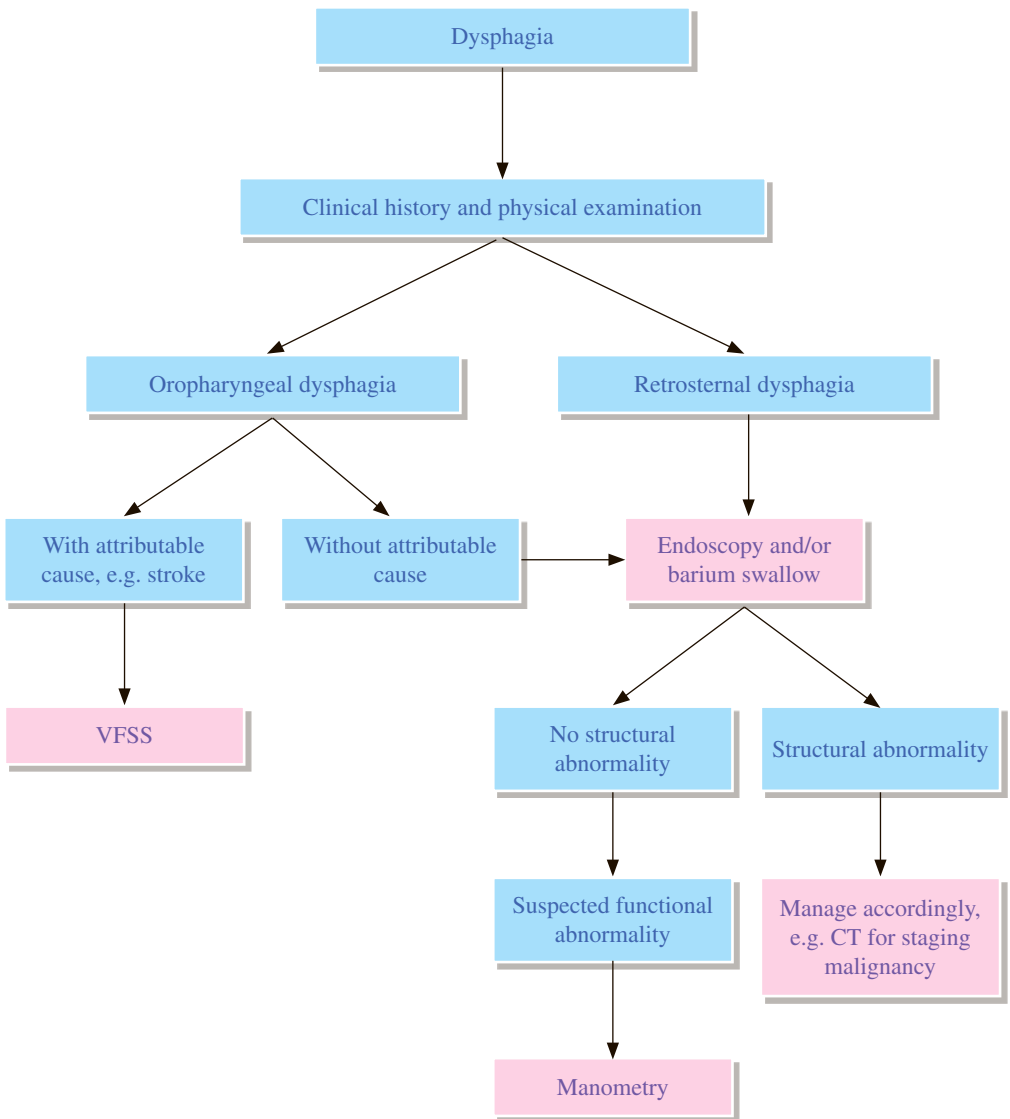
- 1.1 Erect chest X-ray (CXR) is used to detect subphrenic gas.
- 1.2 Left lateral decubitus abdominal X-ray (AXR) also helps to demonstrate free air, especially in ill patients who cannot sit or stand.

### **2 CT**

- 2.1 CT is useful for clarification of equivocal finding on plain radiograph.

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## **REMARKS**

### **1 General**

- 1.1 Dysphagia can be classified by level (oropharyngeal or retrosternal) and aetiology (structural or functional).
- 1.2 Careful history taking often helps to differentiate the level of dysphagia and provides clues about the underlying aetiology, especially for oropharyngeal dysphagia.
- 1.3 Abnormalities of mid & lower oesophagus to gastric cardia may cause referred dysphagia to upper chest or pharynx. Therefore, the oesophagus and gastric cardia should also be assessed in patients with oropharyngeal dysphagia without attributable causes.

### **2 Barium swallow**

- 2.1 Barium swallow and endoscopy are complementary to each other in assessing oesophageal strictures and tumours.
- 2.2 The length and the severity of stenosis are well demonstrated on barium swallow.
- 2.3 Barium swallow can detect motility disorders and it may be more sensitive to detect certain structural abnormalities such as oesophageal webs and rings.
- 2.4 Endoscopy allows biopsies to be taken and is more sensitive to detect mild reflux oesophagitis or other subtle oesophagitis.

### **3 Video-fluoroscopic swallowing study (VFSS)**

- 3.1 VFSS focuses on evaluating the oral cavity, pharynx and cervical oesophagus to assess for oral and pharyngeal swallowing phase abnormalities.

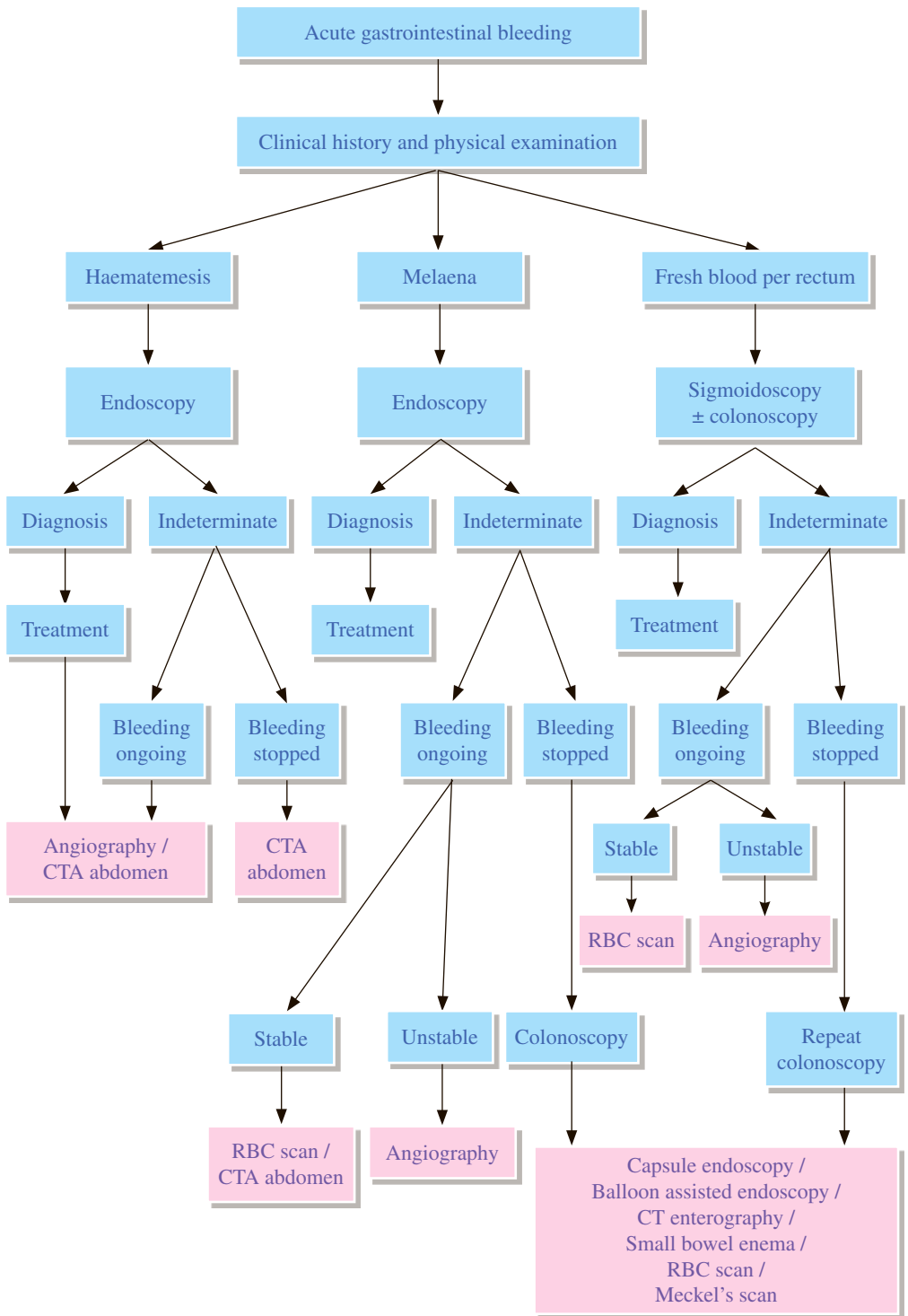
### **4 CT**

- 4.1 CT can be used to assess extrinsic lesions and for tumour staging prior to surgery.

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GI 5 Acute gastrointestinal bleeding



## REMARKS

### 1 Plain radiograph

- 1.1 Abdominal X-ray (AXR) is of no value in diagnosing acute gastrointestinal (GI) bleeding.

### 2 Small bowel study

- 2.1 Small bowel barium studies may detect Meckel's diverticulum or small bowel tumours. If both small bowel study and angiography are required for investigation of acute GI bleeding, angiography should be performed first.

### 3 Nuclear medicine

- 3.1 Technetium-99m (Tc-99m) labelled red blood cell (RBC) scan
  - 3.1.1 It is indicated primarily for overt mid or lower GI bleeding.
  - 3.1.2 It is also helpful in identifying the source of obscure GI bleeding.
  - 3.1.3 It can detect a bleeding rate as low as 0.05-0.1ml/min and can help to localize the bleeding site, but errors in localization occur in cases of gastric or duodenal source.
  - 3.1.4 It can localize intermittent bleeding.
- 3.2 Meckel's scan
  - 3.2.1 In a young patient with lower GI bleeding, Meckel's diverticulum has to be considered.

### 4 CT abdomen (CT angiography & CT enterography)

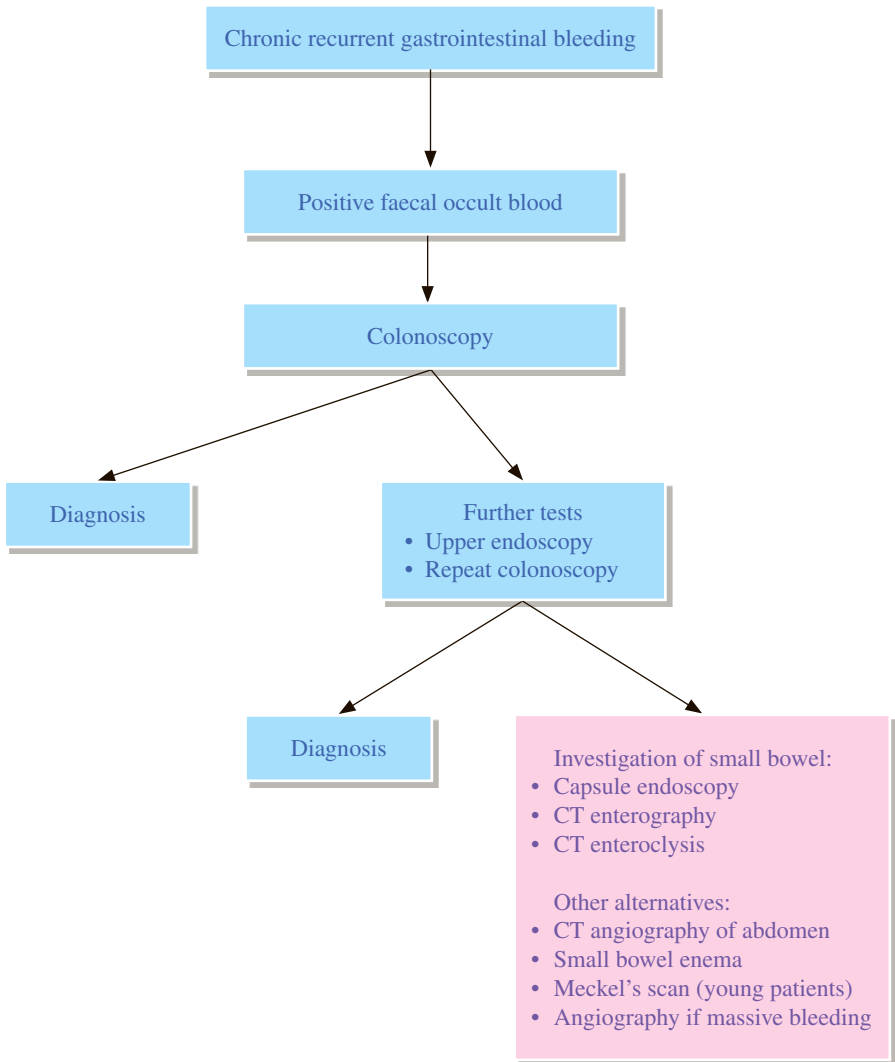
- 4.1 In upper gastrointestinal bleeding (UGIB), it is useful for localizing obscure UGIB, and for work-up in patients with UGIB with prior history of aortic reconstruction or pancreaticobiliary procedure.
- 4.2 In lower gastrointestinal bleeding (LGIB), it can be used to localize LGIB, identify the pathological causes and direct treatment, as well as provide arterial anatomy for treatment planning.
- 4.3 CT enterography or CT enteroclysis is the choice in obscure LGIB when capsule endoscopy is contraindicated, e.g. suspected obstruction or suspected stricture.

### 5 Angiography

- 5.1 For bleeding to be detected on angiography, it must be active arterial or capillary bleeding, with rate greater than 0.5 ml/min. It is usually not useful in venous bleeding.
- 5.2 The bleeding site can be localized on angiography, and in selected cases, vasopressin infusion or embolization can be used to arrest the bleeding.
- 5.3 Roles in UGIB
  - 5.3.1 In active UGIB when upper endoscopy is unable to control or localize the bleeding source, or when re-bleeding occurs, or when the patient is haemodynamically unstable.
- 5.4 Roles in LGIB
  - 5.4.1 In massive LGIB with haemodynamic instability or heavy transfusion need;
  - 5.4.2 Also allows treatment by means of embolization.

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## REMARKS

### 1 Barium enema

- 1.1 Vascular lesions such as angiodysplasia may not be detected on barium enema.

### 2 Small bowel study

- 2.1 Small bowel enema is preferred to follow through study. The diagnostic yield of follow through study is low.
- 2.2 Meckel's diverticulum and small bowel tumours might be detected on small bowel study.

### 3 Nuclear medicine

- 3.1 Meckel's scan
  - 3.1.1 In a young patient with chronic recurrent gastrointestinal bleeding, Meckel's diverticulum has to be considered.

### 4 CT enterography or CT enteroclysis

- 4.1 There is no consensus on the diagnostic algorithm for the investigation of small bowel bleeding after exclusion by upper endoscopy and colonoscopy. Capsule endoscopy is generally regarded as the first line investigation.
- 4.2 CT enterography or CT enteroclysis are alternatives, especially in patients with contraindications to capsule endoscopy such as:
  - 4.2.1 Suspected obstruction
  - 4.2.2 Suspected stricture

### 5 CT angiography of abdomen

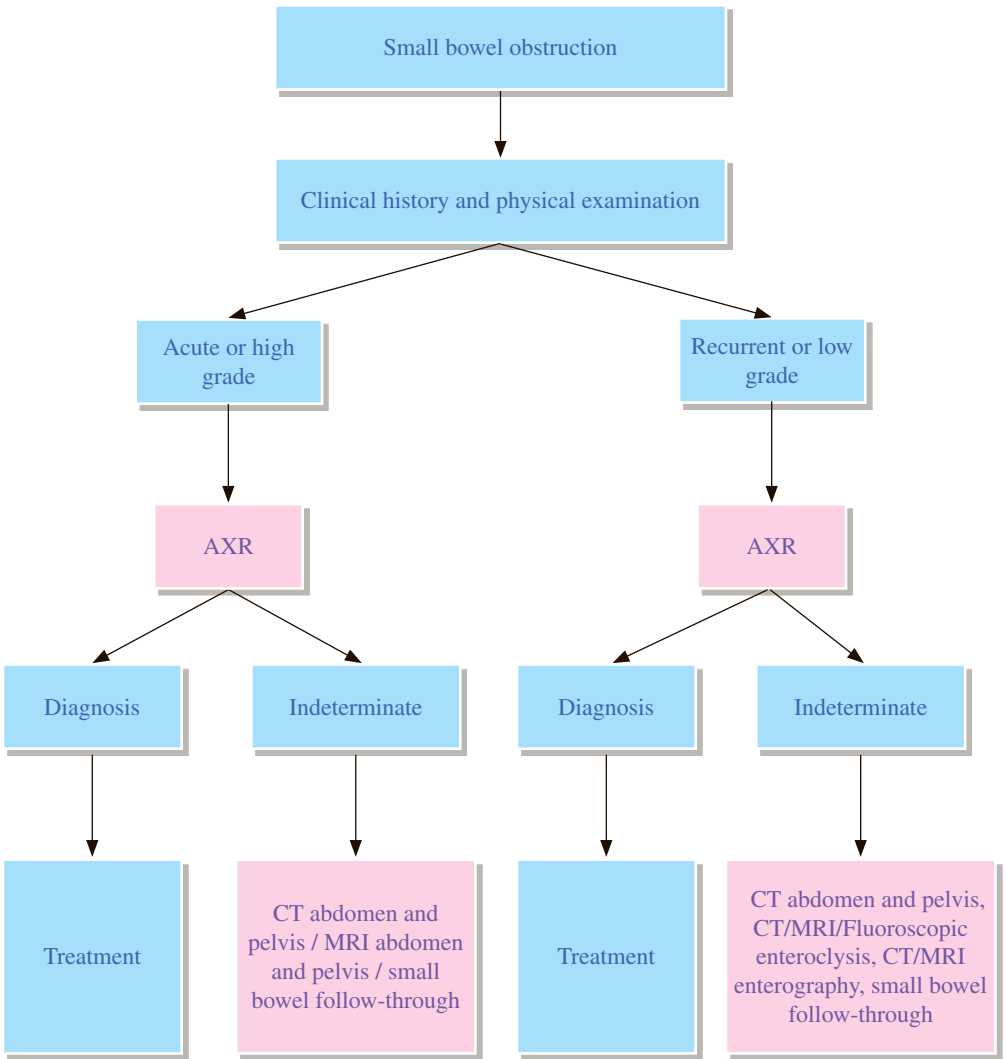
- 5.1 CT angiography of abdomen is useful in patients with active bleeding, chronic bleeding not localized by other means, for diagnosing underlying pathological causes and vascular causes, and for planning angiography and endovascular intervention.

### 6 Angiography

- 6.1 Catheter angiography is helpful in conditions of massive gastrointestinal bleeding and chronic bleeding not localized by other means; it can provide treatment by means of embolization.

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## REMARKS

### 1 Plain radiograph

- 1.1 Often the first line investigation to detect the presence of obstruction.<sup>1</sup>
- 1.2 Useful to establish if bowel obstruction is high or low grade.<sup>2</sup>
- 1.3 For patients in whom a strong clinical suspicion of small bowel obstruction is present, consideration should be given to immediate cross-sectional imaging, particularly CT.<sup>3</sup>

### 2 CT

- 2.1 Standard CT, performed with an intravenous (IV) contrast if possible, but generally without oral contrast, is the primary imaging modality for evaluating small bowel obstruction and should be strongly considered in the initial evaluation of patients with suspected high-grade small bowel obstruction.<sup>3</sup>
- 2.2 When abdominal X-ray (AXR) is equivocal and low-grade, and subacute small bowel obstruction is suspected clinically, CT enteroclysis has a higher site-specific sensitivity and specificity than standard CT.<sup>2</sup>

### 3 Small bowel study

- 3.1 In suspected small bowel obstruction due to adhesions, presence of water-soluble contrast in the colon on a plain radiograph obtained 24 hours after oral administration of 100 ml water-soluble contrast medium is a good predictor of resolution without operation.<sup>2</sup>
- 3.2 Fluoroscopic small bowel examinations play a much less substantial role and should not be used as a primary imaging modality in diagnosing an acute small bowel obstruction.<sup>3</sup>
- 3.3 If intermittent, recurrent, or low-grade small bowel obstruction is a primary concern, an enteroclysis is likely the next best test.<sup>3</sup>

### 4 MRI

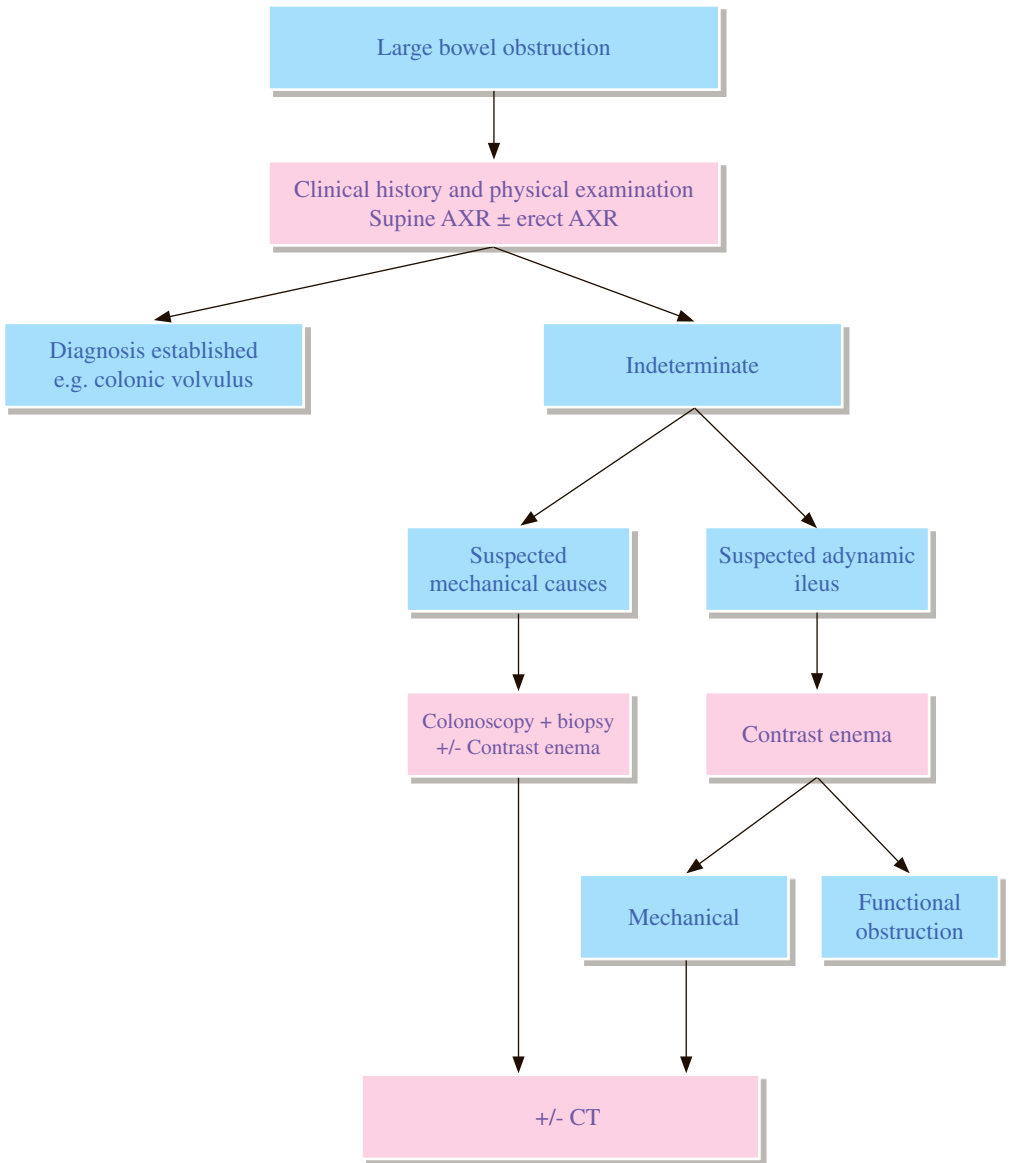
- 4.1 Children and in particular pregnant patients with known or suspected small bowel obstruction, as well as younger patients with repeated episodes of obstruction, are the ideal population to undergo MRI. In pregnant patients, only non-contrast sequences are obtained. In non-pregnant individuals, sequences with or without IV gadolinium contrast can be performed.<sup>3</sup>

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## GI 8 Large bowel obstruction

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## **REMARKS**

### **1 Plain radiograph**

- 1.1 When acute large bowel obstruction is suspected, abdominal X-ray (AXR) may be used as an initial examination to help establish the diagnosis and to indicate the likely level.<sup>1</sup>
- 1.2 Erect AXR is not indicated routinely. It may be taken when supine AXR is normal but there is strong clinical suspicion of bowel obstruction.

### **2 CT**

- 2.1 CT is the investigation of choice after AXR. It will confirm the diagnosis, delineate the level of acute large bowel obstruction and can also identify the cause.<sup>2</sup>
- 2.2 CT is also used for evaluation of extrinsic lesions and for staging of confirmed carcinoma.

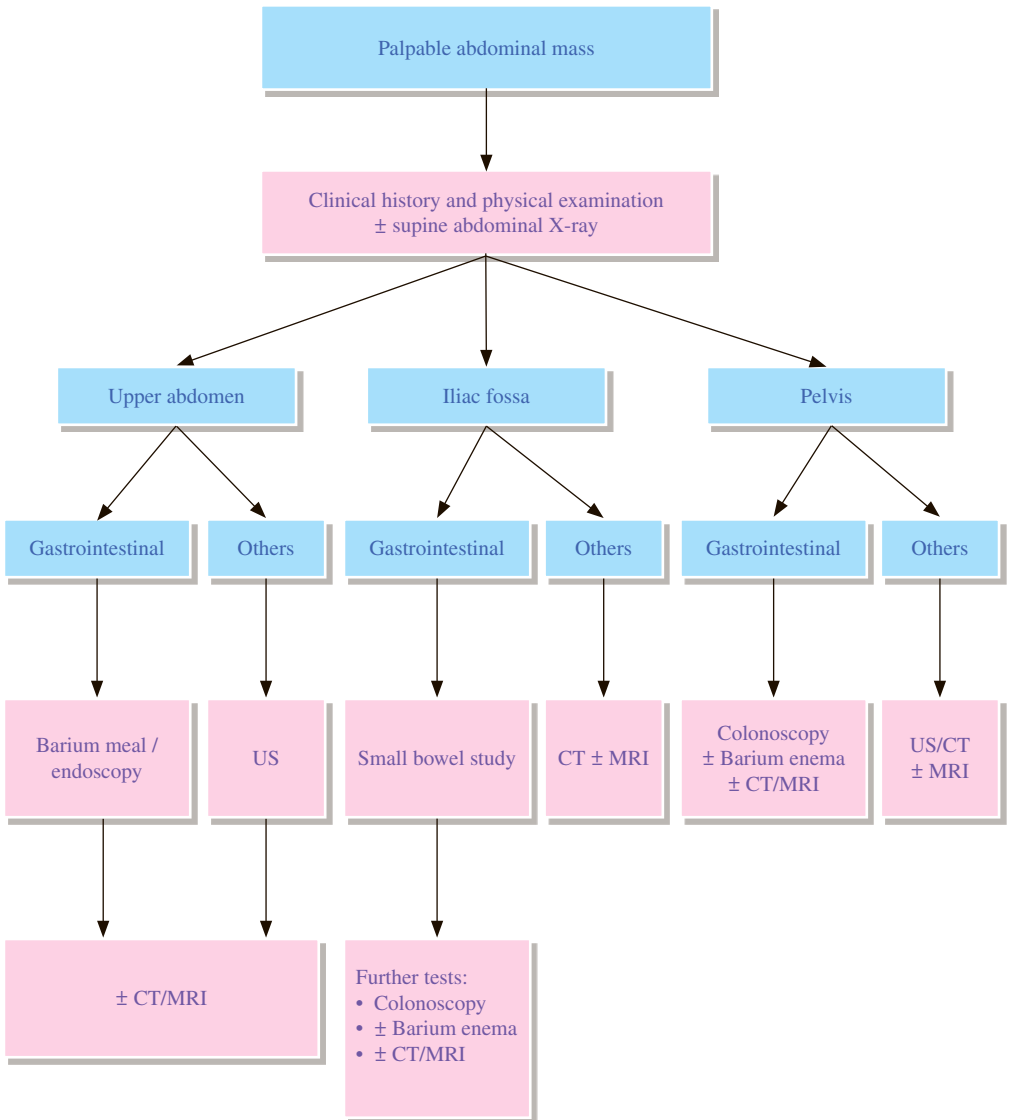
### **3 Contrast enema**

- 3.1 Helps to exclude pseudo-obstruction.
- 3.2 May consider it for problem solving if CT is not available or equivocal.<sup>1</sup>

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## GI 9 Palpable abdominal mass



## **REMARKS**

### **1 General**

- 1.1 The choice of examination depends on the symptoms and the organs suspected to be abnormal.
- 1.2 US and CT should precede barium studies to avoid barium related artefacts.

### **2 Plain radiograph**

- 2.1 Plain radiograph is of limited value.

### **3 Fluoroscopy**

- 3.1 Request should clearly indicate areas of interest so that the most appropriate studies can be employed, e.g. small bowel enema for small bowel lesions.

### **4 US**

- 4.1 US is useful in hepatobiliary system, kidneys and female pelvis but may be limited by bowel gas in both iliac fossae.

### **5 CT**

- 5.1 CT is a useful alternative to US to exclude a lesion especially in obese patients and to provide excellent survey of the abdominal organs and retroperitoneum.

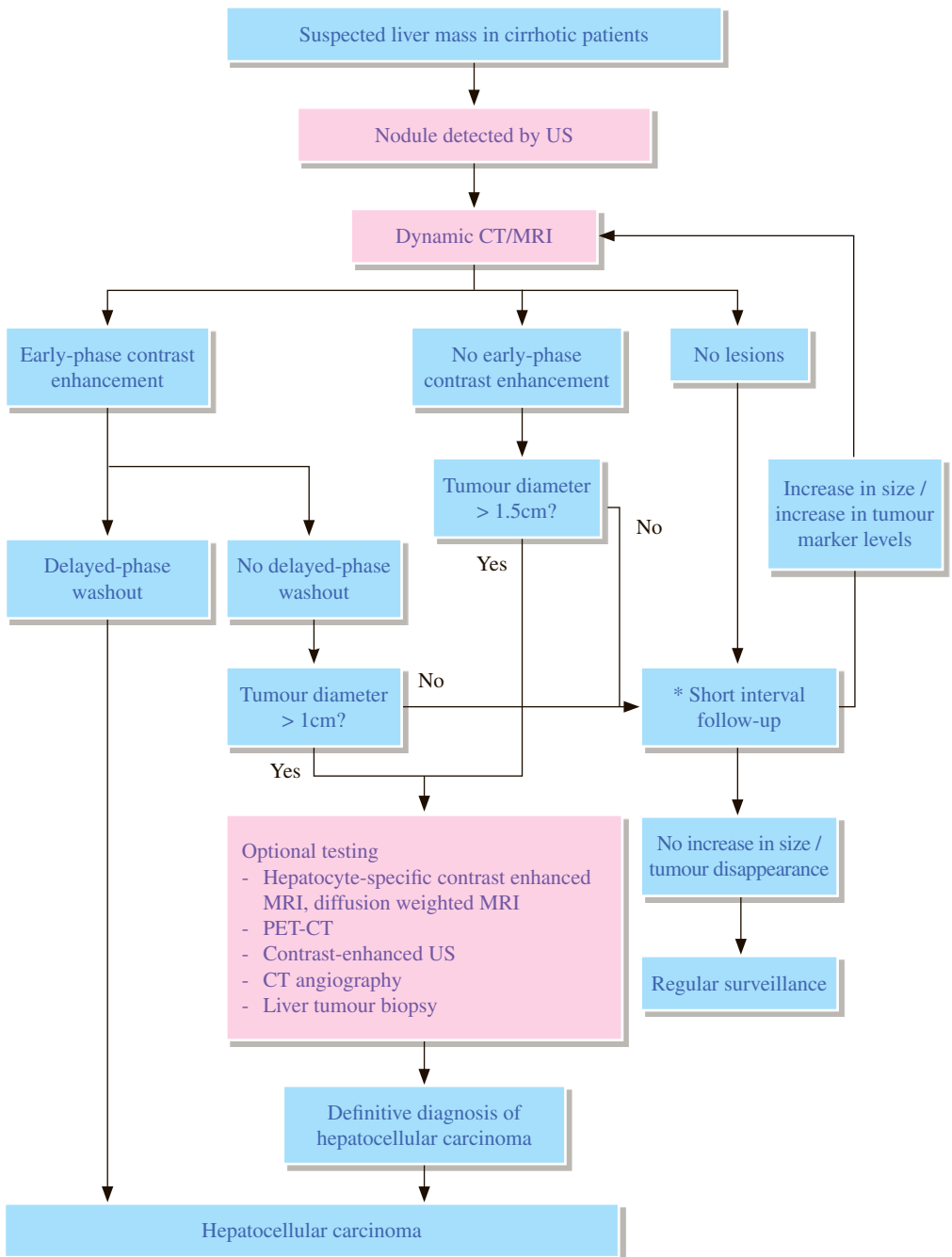
### **6 MRI**

- 6.1 MRI may be used to evaluate complex lesions not definitely characterized by US or CT.<sup>2</sup>

## **REFERENCES**

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## GI 10 Suspected liver mass in cirrhotic patients



\* 3<sup>rd</sup> JSH HCC Evidence-based guidelines recommend 3 months interval. Actual time interval for investigation and choice of tests will vary between hospitals depending on resources and machine availability.

## REMARKS

### 1 General

- 1.1 Radiological investigations are essential in detecting hepatomegaly (and its cause) and liver masses. It is useful in differentiating benign and malignant hepatic lesions and in assessing the resectability of liver tumours.
- 1.2 The American Association for the Study of Liver Disease (AASLD) and European Association for the Study of Liver (EASL) guidelines propose a diagnostic algorithm starting from the tumor size, whereas the Asian Pacific Association for the Study of the Liver (APASL) and Japanese Society of Hepatology (JSH) guidelines recommend an algorithm starting from arterial tumour vascularity (hyper- or hypovascular in the arterial phase).

### 2 US

- 2.1 US is the best initial imaging modality as it is non-invasive and sensitive in detecting liver lesions. It is a screening test and not a diagnostic test for confirmation.
- 2.2 Contrast-enhanced US is considered as sensitive as dynamic CT or MRI in the diagnosis of hepatocellular carcinoma (HCC).

### 3 CT and MRI

- 3.1 Dynamic CT or MRI is recommended as a first-line diagnostic tool for HCC when a screening test result is abnormal.
- 3.2 Hallmark of HCC during CT or MRI is the presence of arterial enhancement, followed by washout of the tumour in the portal-venous and/or delayed phases. The AASLD and EASL guidelines accept only four-phase CT and dynamic contrast MRI for HCC diagnosis, whereas the APASL and JSH guidelines also accept contrast-enhanced US.
- 3.3 Various studies have verified the usefulness of liver specific contrast enhanced MRI. It is included in the Japanese Society of Hepatology Liver Cancer Study Group 2014 Surveillance and Diagnostic Algorithm of HCC.

### 4 Nuclear Medicine

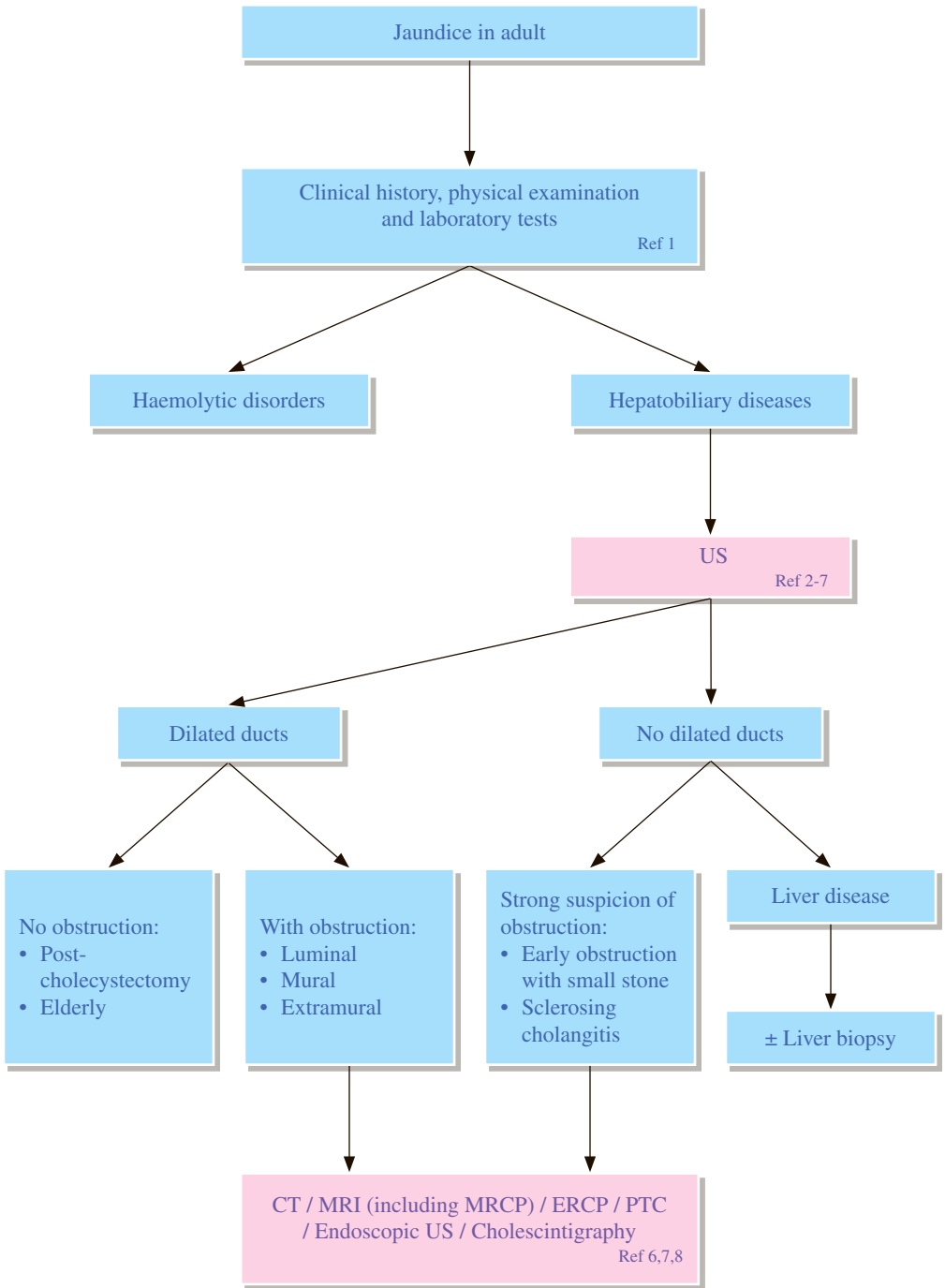
- 4.1 Fluorodeoxyglucose (FDG) PET has limited sensitivity for well differentiated HCC. Its low sensitivity is due to low uptake in well-differentiated HCC. However, focal FDG hypermetabolism in liver suggests high likelihood of malignancy (primary or secondary). False positive includes liver abscess.
- 4.2 For identification of intrahepatic HCC lesions, limited evidence found PET with C-11 acetate and other alternative tracers such as F-18 fluorocholine and F-18 fluorothymidine have substantially higher sensitivity than F-18 FDG PET. Currently PET is not a routine diagnostic tool according to most of the international guidelines.
- 4.3 F-18 FDG PET-CT was useful in ruling in extrahepatic metastases of HCC and valuable for ruling out recurrent HCC.
- 4.4 Tc-99m sulfur colloid scintigraphy (+/- Tc-99m mebrofenin scintigraphy) is helpful in differentiation of focal nodular hyperplasia from other hepatic lesions that do not contain Kupffer cells (e.g. hepatic adenoma and HCC).

**5 Angiography**

- 5.1 Angiography does not assume a major diagnostic role in modern liver imaging and is superseded by CT and MRI.

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## REMARKS

### 1 US

- 1.1 US is a non-invasive, accurate and reliable technique for assessing the gallbladder, common bile duct and intrahepatic ducts, and should be employed as the primary investigation for evaluating the biliary system. It is also valuable in the detection of liver diseases.
- 1.2 US detection of pancreatic lesion is less reliable in certain patients, mainly due to overlying bowel gas.

### 2 Nuclear medicine

- 2.1 In very early biliary obstruction, nuclear medicine may be useful as US may not detect abnormality in the liver. Alternatively, a repeat US may show progressively dilated bile ducts. US is preferred as the initial screening test to provide anatomic details of the bile ducts.
- 2.2 Hepatobiliary scintigraphy provides a non-invasive method for evaluation of biliary system patency.

### 3 CT

- 3.1 CT is indicated when tumour is suspected and when US is inadequate.
- 3.2 It is very sensitive in detecting gallstones, air in the biliary tree and extrahepatic lesions obscured by bowel gas on US.

### 4 MRI

- 4.1 MRI can demonstrate both the site and cause of biliary obstruction. For detection of ductal calculi, magnetic resonance cholangiopancreatography (MRCP) is the most sensitive non-invasive technique.<sup>6</sup>

### 5 Cholangiography

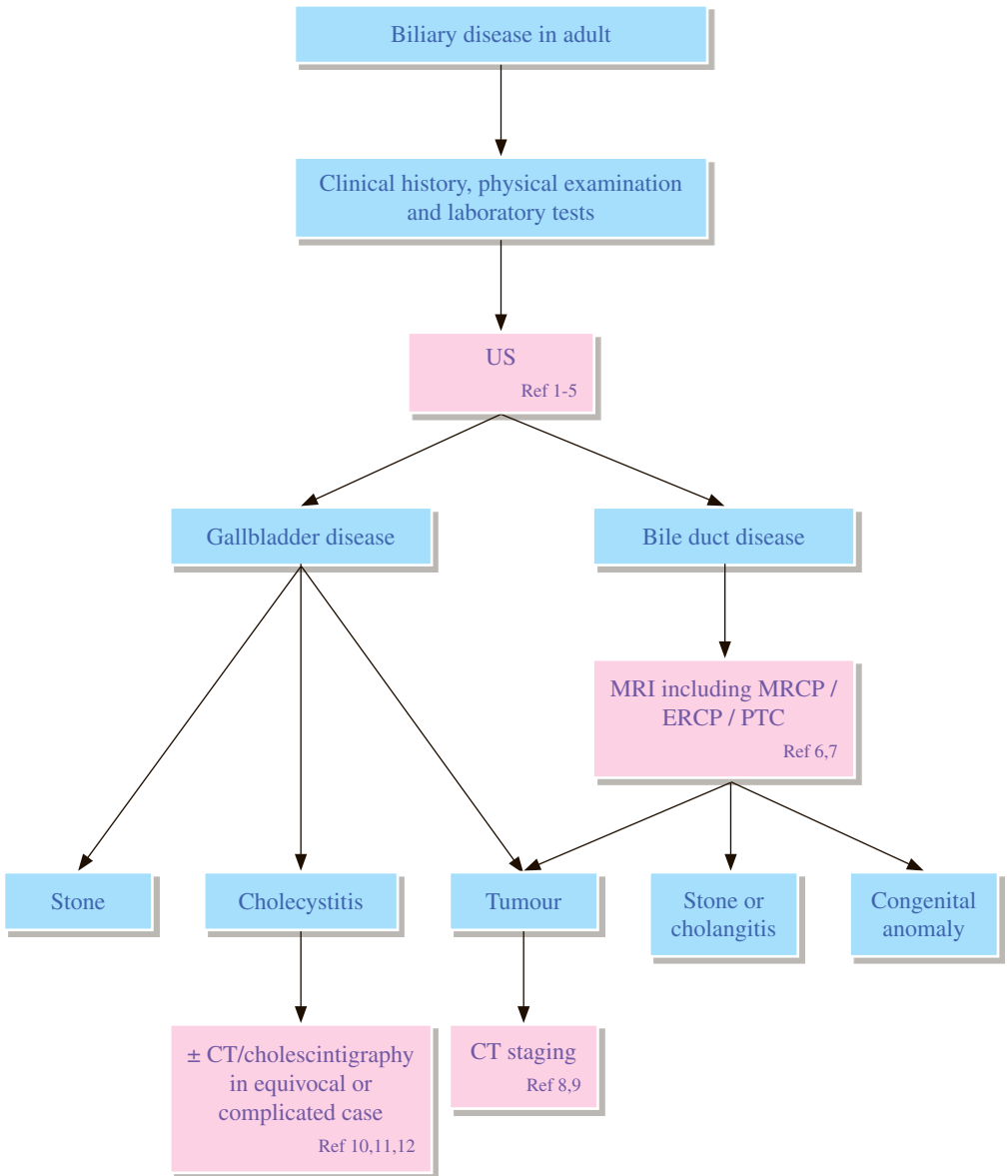
- 5.1 Cholangiography by endoscopic retrograde cholangiopancreatography (ERCP) or percutaneous transhepatic cholangiogram (PTC) is the definitive imaging modality in the assessment of the biliary tree but both are invasive. ERCP is better for low obstruction while PTC is more reliable for high obstruction.
- 5.2 Due to significant advances in cross-sectional imaging, in particular the advent of MRCP, ERCP currently has an almost exclusively therapeutic role. The main indication for ERCP remains management of common bile duct stones. It also remains the standard for stent placement in cases of obstructive jaundice.<sup>6</sup>

### 6 Endoscopic US

- 6.1 Endoscopic US is the most accurate method for the detection of small ductal stones and small papillary or periampullary tumours. It allows biopsy of the pancreas without risk of tumour seeding.

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## **REMARKS**

### **1 Plain radiograph**

- 1.1 Abdominal X-ray (AXR) is not indicated as the majority of gallstones are not radio-opaque.

### **2 US**

- 2.1 US is the initial imaging modality of choice in the work-up of suspected biliary disease as it is sensitive to diagnose gallstones and gallbladder diseases.
- 2.2 Although cholescintigraphy is recognized to have a higher sensitivity and specificity, US remains the initial test of choice for imaging patients with suspected acute cholecystitis for a variety of reasons, including greater availability, shorter study time, lack of ionizing radiation, morphologic evaluation, confirmation of the presence or absence of gallstones, evaluation of intrahepatic and extrahepatic bile ducts, and identification or exclusion of alternative diagnoses.<sup>11</sup>

### **3 CT**

- 3.1 CT plays an important role in the detection of complications of acute cholecystitis in patients who fail to improve on conventional treatment.<sup>10</sup>
- 3.2 CT also plays a role in the staging of malignant biliary disease. It has the advantage of detecting extrahepatic metastases.

### **4 MRI**

- 4.1 MRI including magnetic resonance cholangiopancreatography (MRCP) is a non-invasive method to assess the biliary tree.

### **5 Cholangiography**

- 5.1 Endoscopic retrograde cholangiopancreatography (ERCP) and percutaneous transhepatic cholangiogram (PTC) provide direct imaging of the biliary tree but are not very reliable in diagnosing gallbladder calculi. Stone extraction can be performed at the same time during ERCP.
- 5.2 PTC is good for hilar ductal obstruction and its management.

## 6 Cholescintigraphy

- 6.1 Cholescintigraphy has the highest sensitivity and specificity in patients suspected with acute cholecystitis.<sup>13</sup> In clinically equivocal cases, cholescintigraphy should be considered.
- 6.2 Cholescintigraphy is indicated in a number of hepatobiliary diseases,<sup>12</sup> including: acute cholecystitis, chronic cholecystitis (with gallbladder ejection fraction calculation), functional biliary pain syndromes, sphincter of Oddi dysfunction, assessment of biliary system patency and bile leakage, liver transplant assessment etc.

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