College of Health and Medical Technologies
Department of Radiology Technologies

COMPUTED TOMOGRAPHY OF THE LIVER AND BILIARY TREE

2 nd stage

LECTUER 3

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MSc Radiographic Imaging

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Indications

1. Suspected focal or diffuse liver lesion.
2. Staging known primary or secondary malignancy.
3. Abnormal liver-function tests.
4. Right upper-quadrant pain or mass.
5. Hepatomegaly.
6. Suspected portal hypertension.
7. Characterization of liver lesion.
8. Pyrexia of unknown origin.
9. To facilitate the placement of needles for biopsy.
10. Assessment of portal vein, hepatic artery or hepatic veins.
11. Assessment of patients with surgical shunts or transjugular intrahepatic portosystemic shunt (TIPS) procedures.
12. Follow-up after surgical resection or liver transplant.

Contraindications

1. Pregnancy.
2. Allergy to iodinated contrast agents

Technique

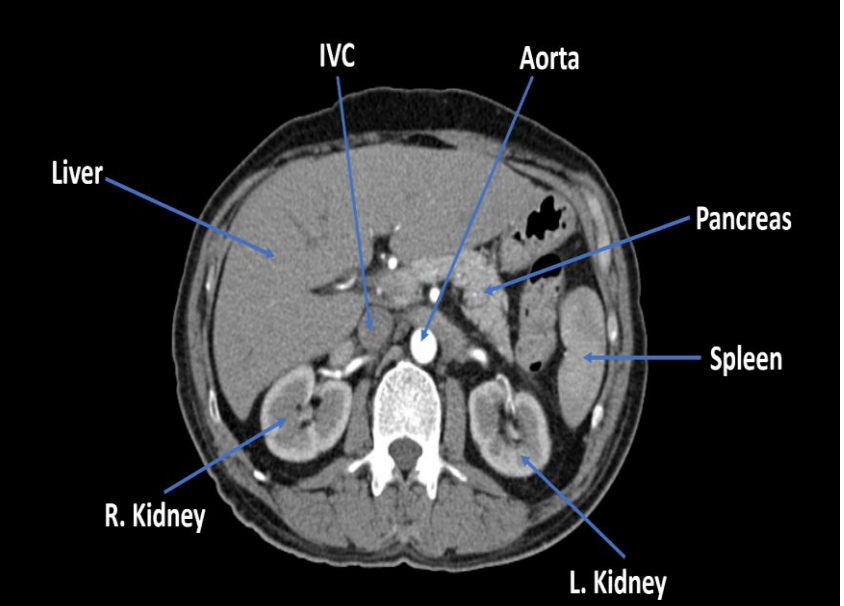
Single-phase (portal phase) contrast-enhanced computed tomography:

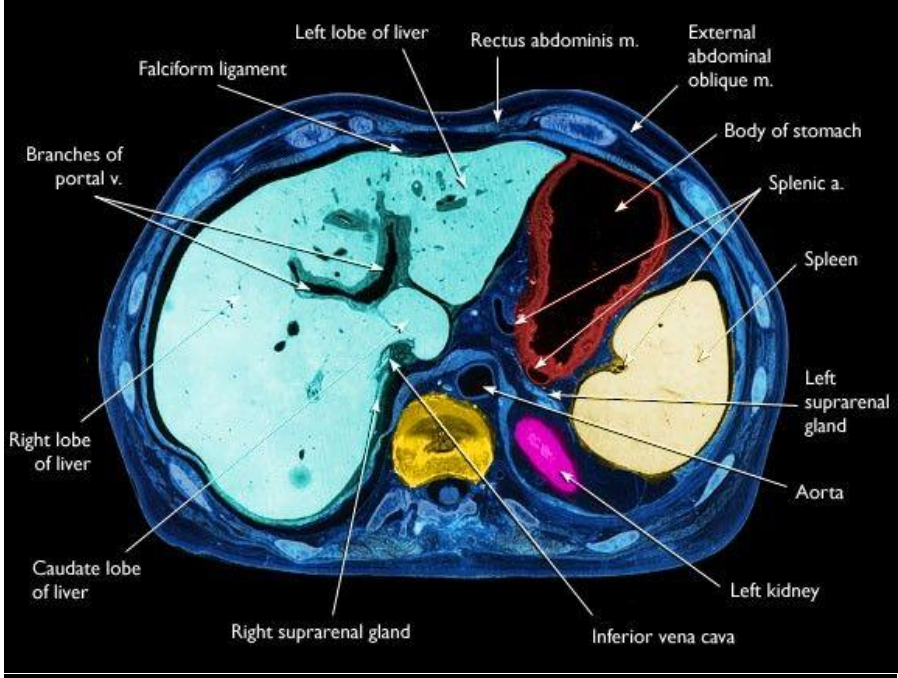
- This is the technique for the majority of routine liver CT imaging.
- The liver is imaged during the peak of parenchymal enhancement— i.e. when contrast-medium-laden portal venous blood has fully perfused the liver (around 60–70 s after the start of a bolus injection).
- Oral contrast may be given but is not necessary if only the liver is being investigated. Slice thickness will depend upon the CT scanner specification but should be 5 mm or less.

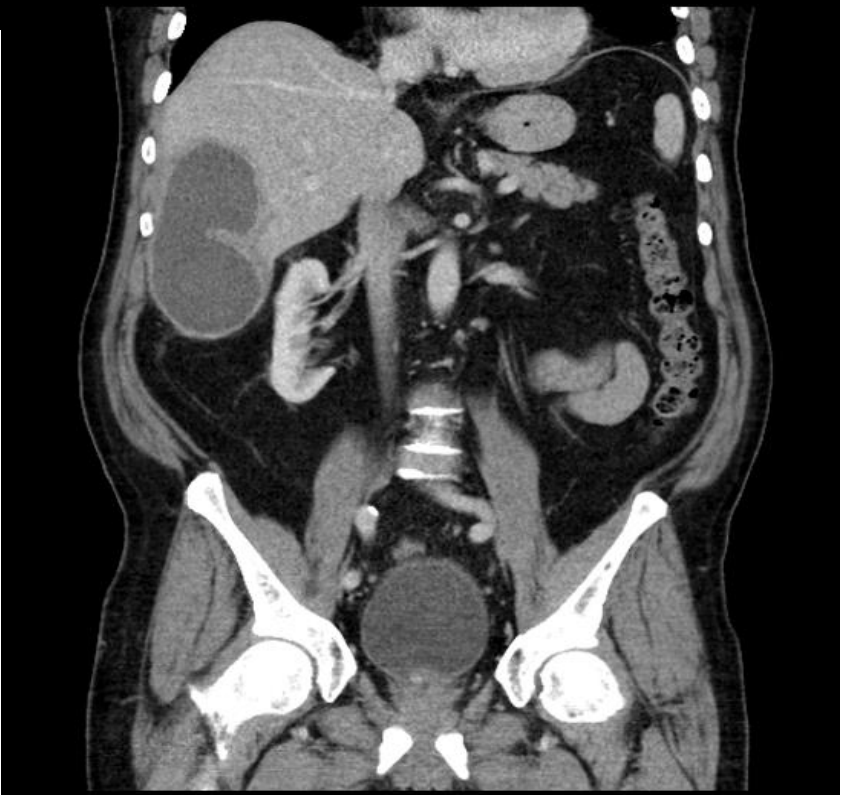
Multiphasic contrast-enhanced computed tomography

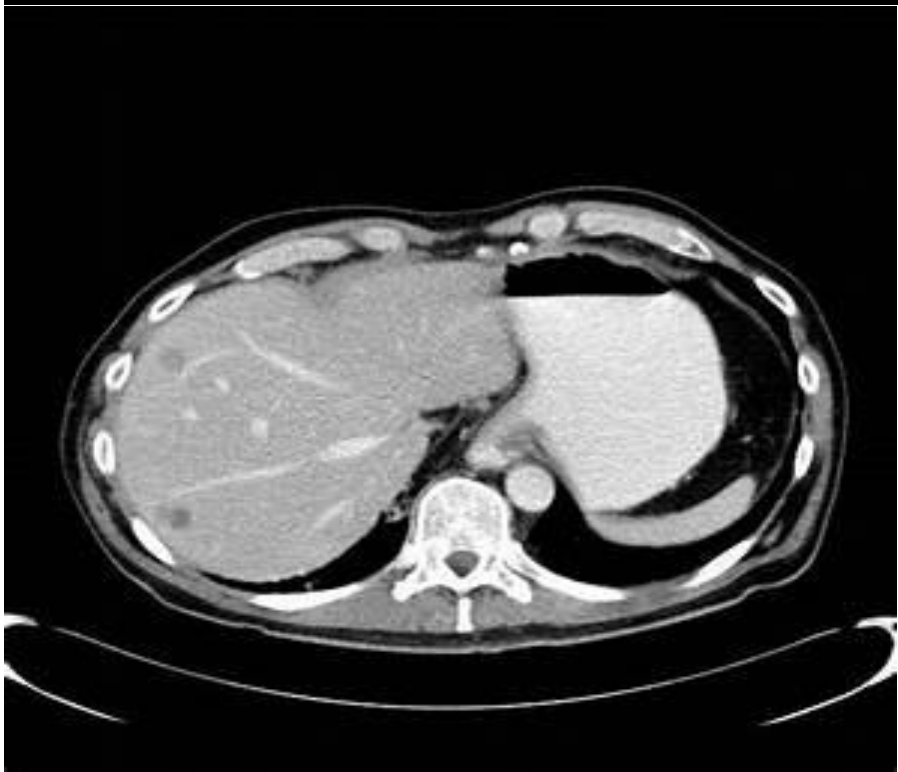
- The fast imaging times of helical/multislice CT enable the liver to be scanned multiple times after a single bolus injection of contrast medium. Most primary liver tumours receive their blood supply from the hepatic artery, unlike normal hepatic parenchyma, which receives 80% of its blood supply from the portal vein.
- Liver tumours (particularly hypervascular tumours) will therefore enhance strongly during the arterial phase (beginning 20–25 s after the start of a bolus injection) but are of similar or lower density to enhanced normal parenchyma during the portal venous phase (washout).
- Some tumours are most conspicuous during early-phase arterial scanning (25 s after the start of a bolus injection), and others later, during the late arterial phase 35 s after the start of a bolus injection. Thus a patient who is likely to have hypervascular primary or secondary liver tumours should have an arterial phase scan as well as a portal venous phase CT scan (discussed previously).

- Early and late arterial phase with portal venous phase is appropriate for patients with suspected hepatocellular cancer (triple phase). In general, late arterial and portal venous scans are appropriate to investigate suspected hypervascular metastases. Some centres, however, also use a ‘delayed’ or
- ‘equilibrium’ phase scan at 180 s to help identify and characterize primary liver tumors (quadruple phase). Terminology may be potentially confusing, as some centers may consider a triple phase scan to include arterial, portal and delayed scans. Noncontract examinations have limited usefulness.
- Haemangiomas often show a characteristic peripheral discontinous nodular enhancement and progressive centripetal ‘fill-in’.
- After the initial dual- or triple-phase protocol, delayed images at 5and 10 min are obtained through the lesion.

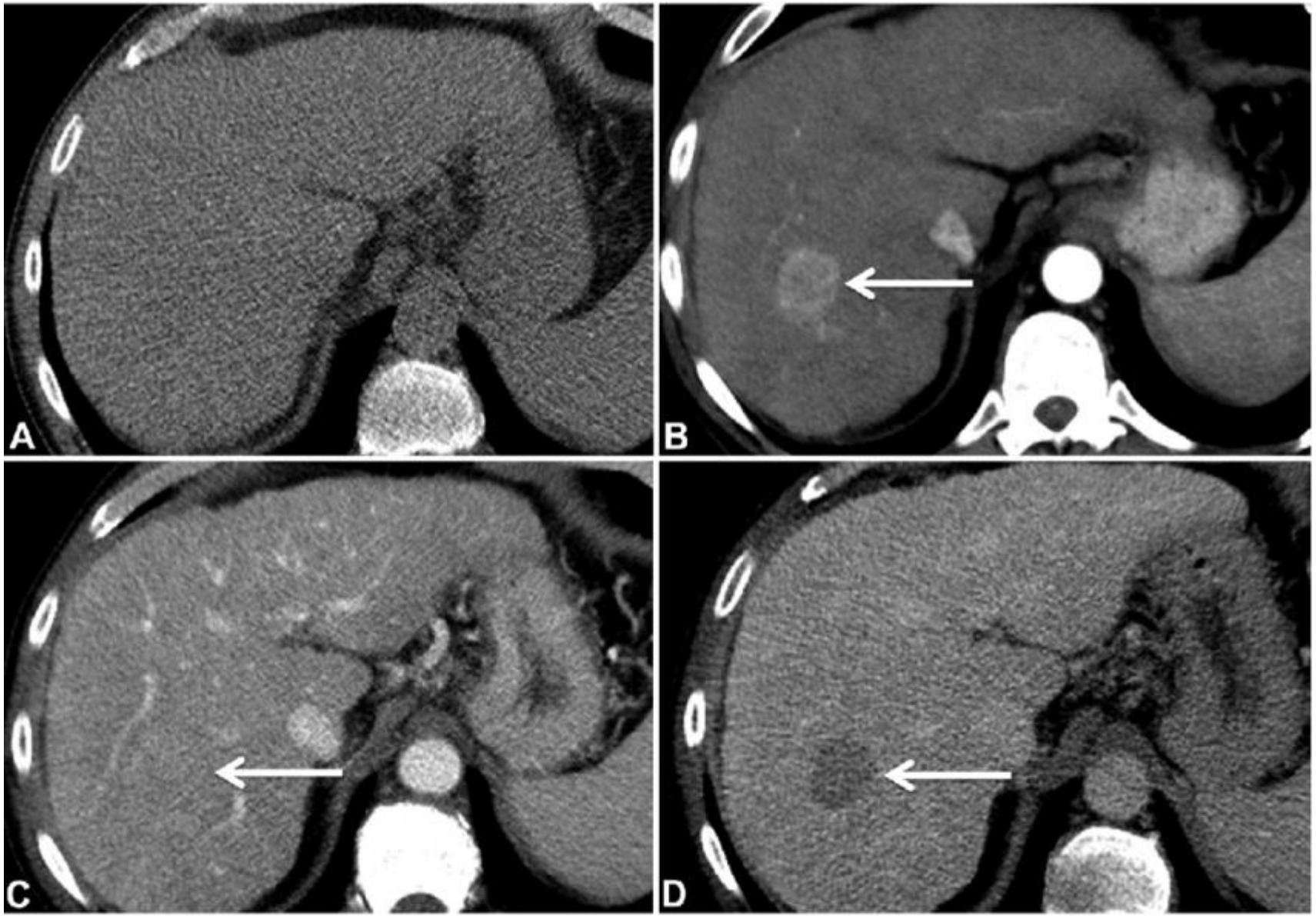

IVC
Aorta
Liver
Pancreas
Spleen
R. Kidney
L. Kidney


Left lobe of liver
Rectus abdominis m.
External abdominal oblique m.
Falciform ligament
Body of stomach
Branches of portal v.
Splenic a.
Spleen
Left suprarenal gland
Right lobe of liver
Aorta
Caudate lobe of liver
Left kidney
Right suprarenal gland
Inferior vena cava

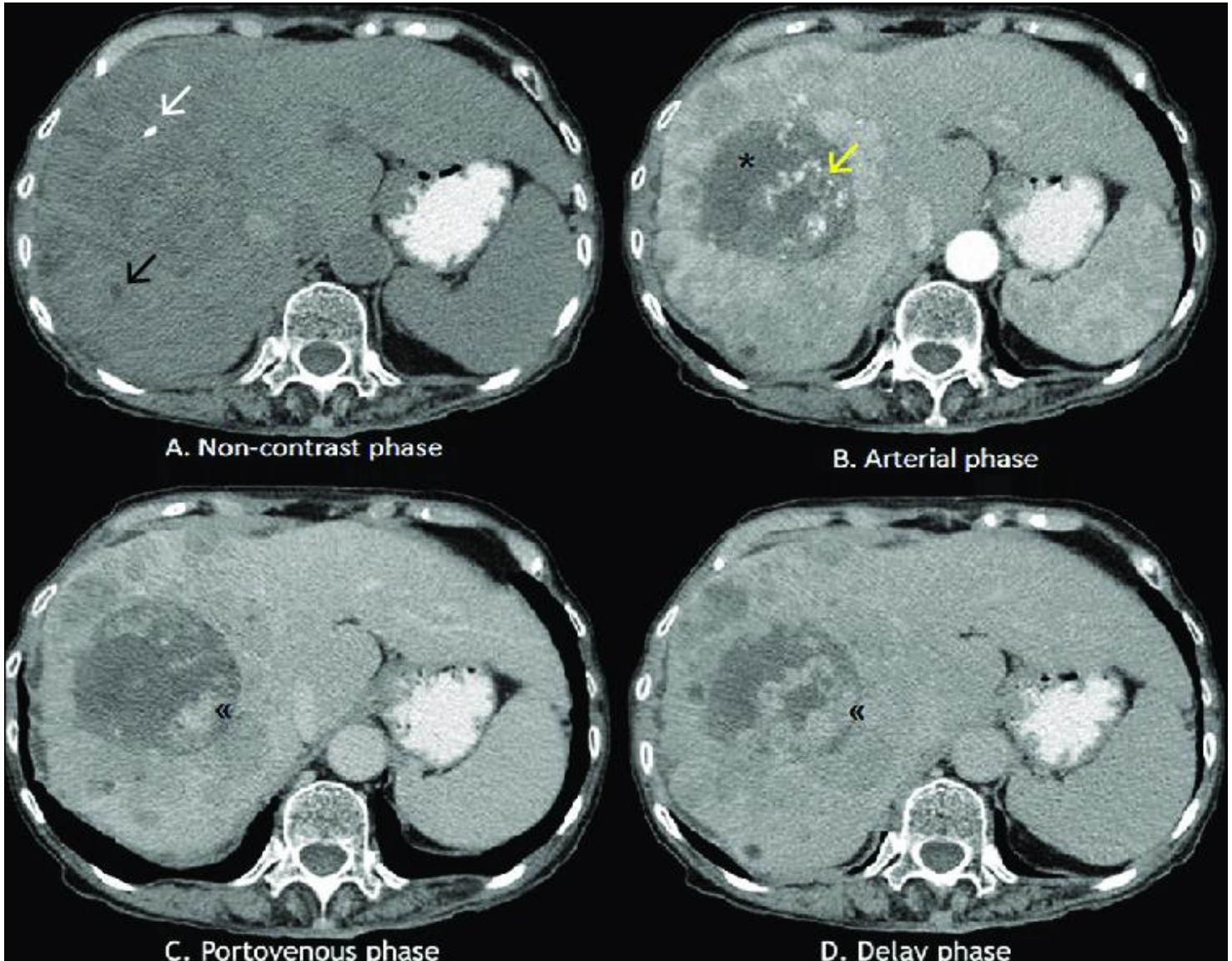




Multiphasic contrast-enhanced computed tomography



Multiphasic contrast-enhanced computed tomography



COMPUTED TOMOGRAPHIC CHOLANGIOGRAPHY

Contraindications

Allergy to iodinated contrast agents.

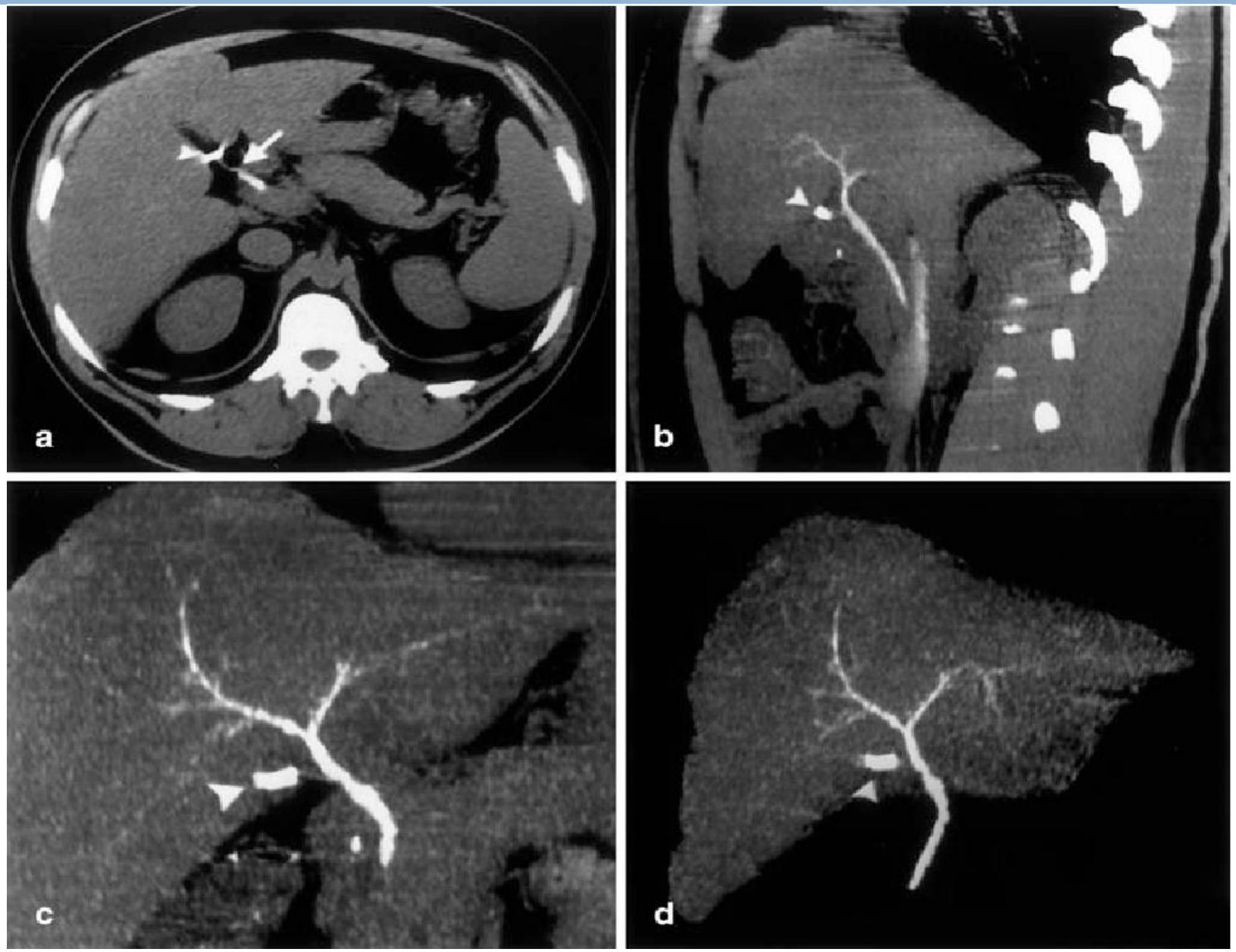
Indications

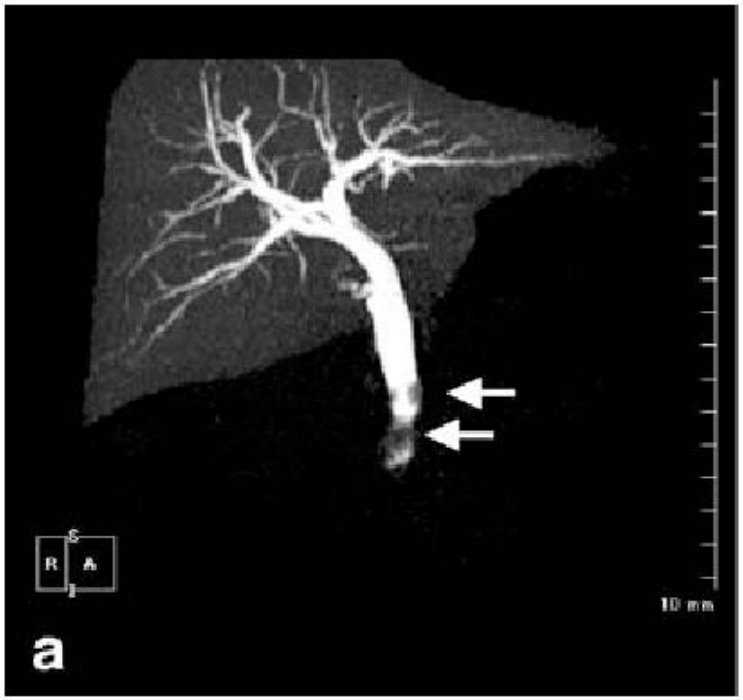
1. Screening for cholelithiasis
2. Preoperative screening of anatomy
3. Suspected traumatic bile-duct injury
4. Other biliary abnormalities—e.g. cholesterol polyps, adenomyomatosis and congenital abnormalities

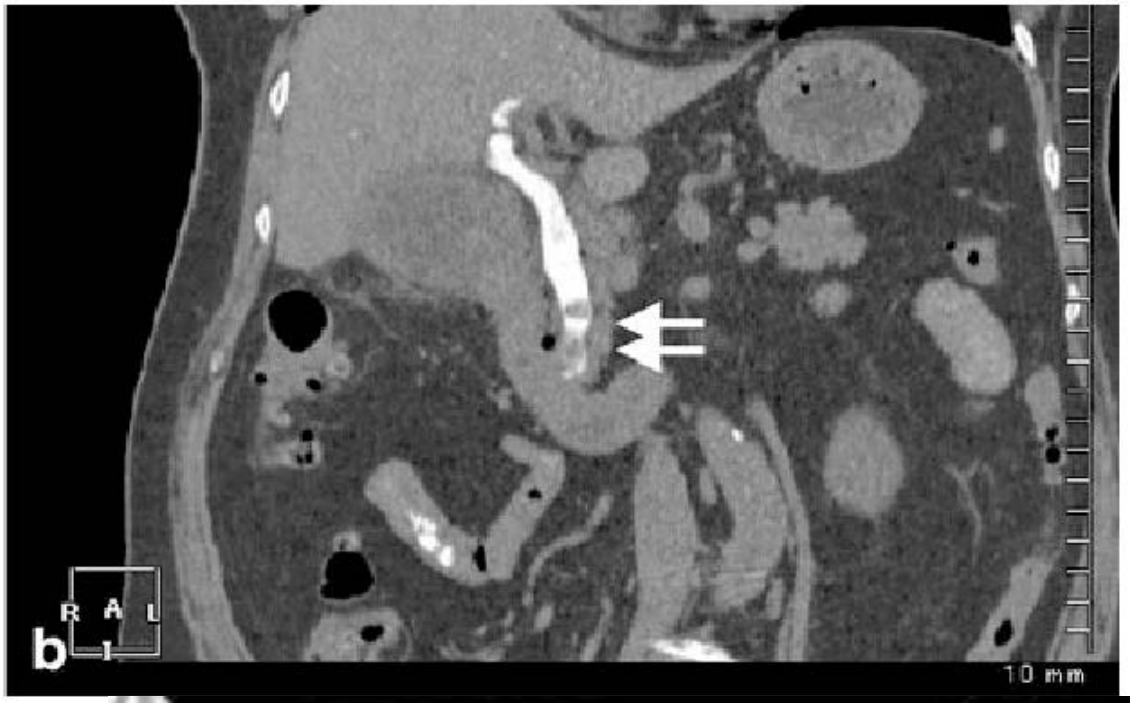
Technique

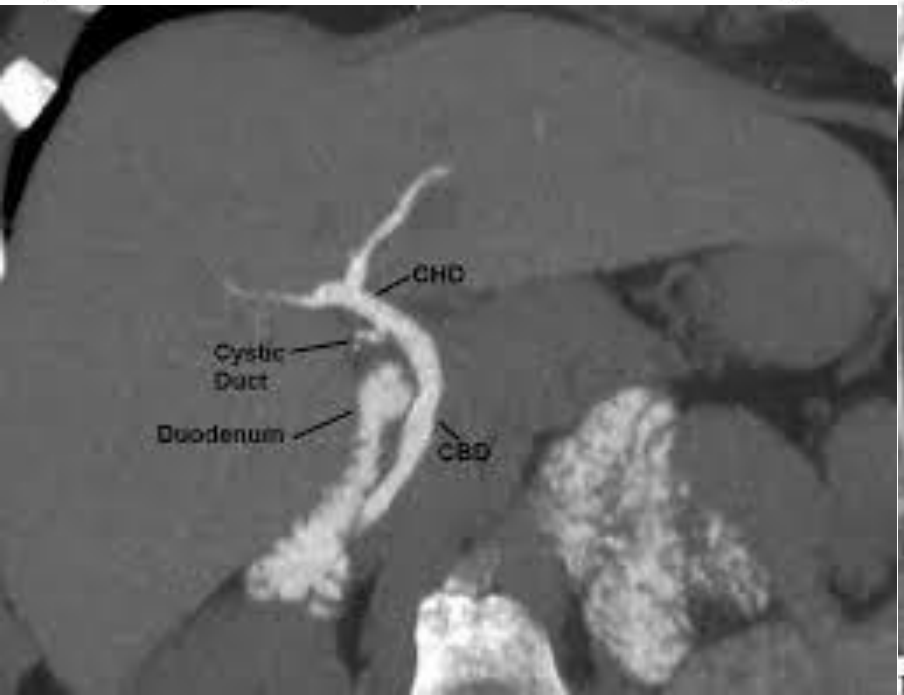
1. Patient fasted for at least 6 h.
2. 100 mL i.v. cholangiographic agent—e.g. meglumine iotroxate (biliscopin R) infused for 50 min as a biliary contrast1 or iodipamide meglumine 52%—20 mL diluted with 80 mL of normal saline infused over 30 min.
3. CT scan should be obtained at least 35 min after infusion of contrast agent.

COMPUTED TOMOGRAPHIC CHOLANGIOGRAPHY









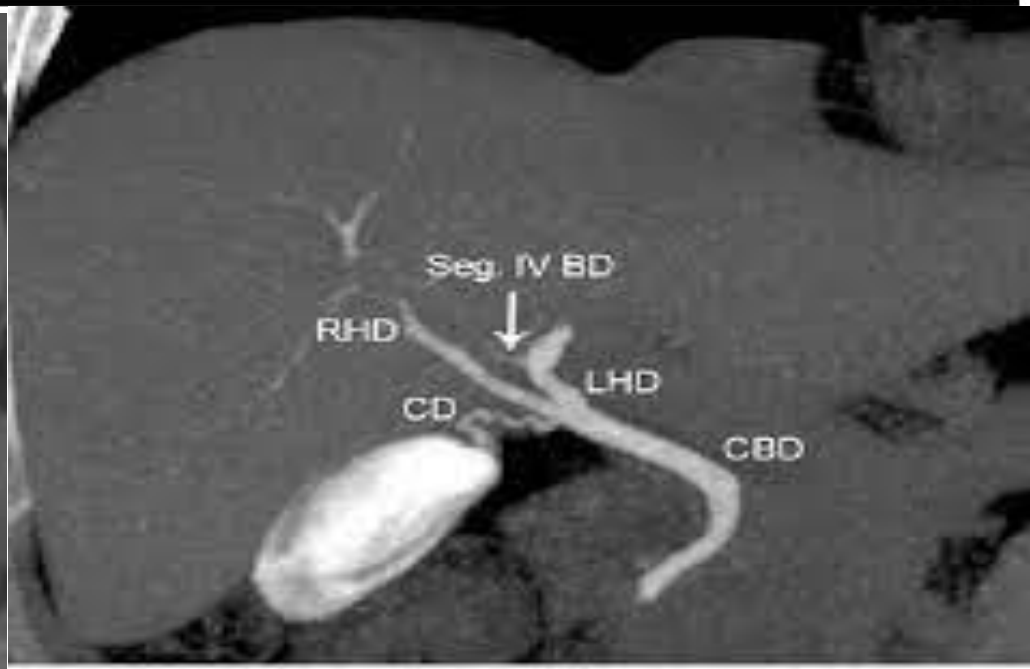


Figure 22. Segment IV drainage into the left hepatic

COMPUTED TOMOGRAPHY OF THE PANCREAS

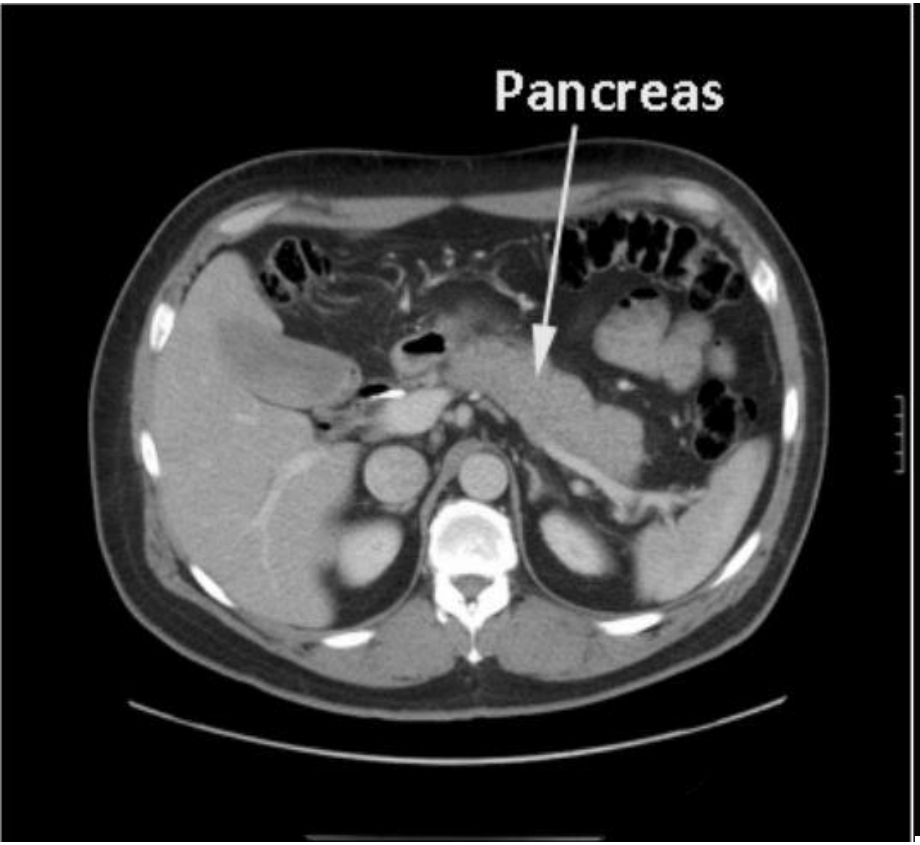
Indications

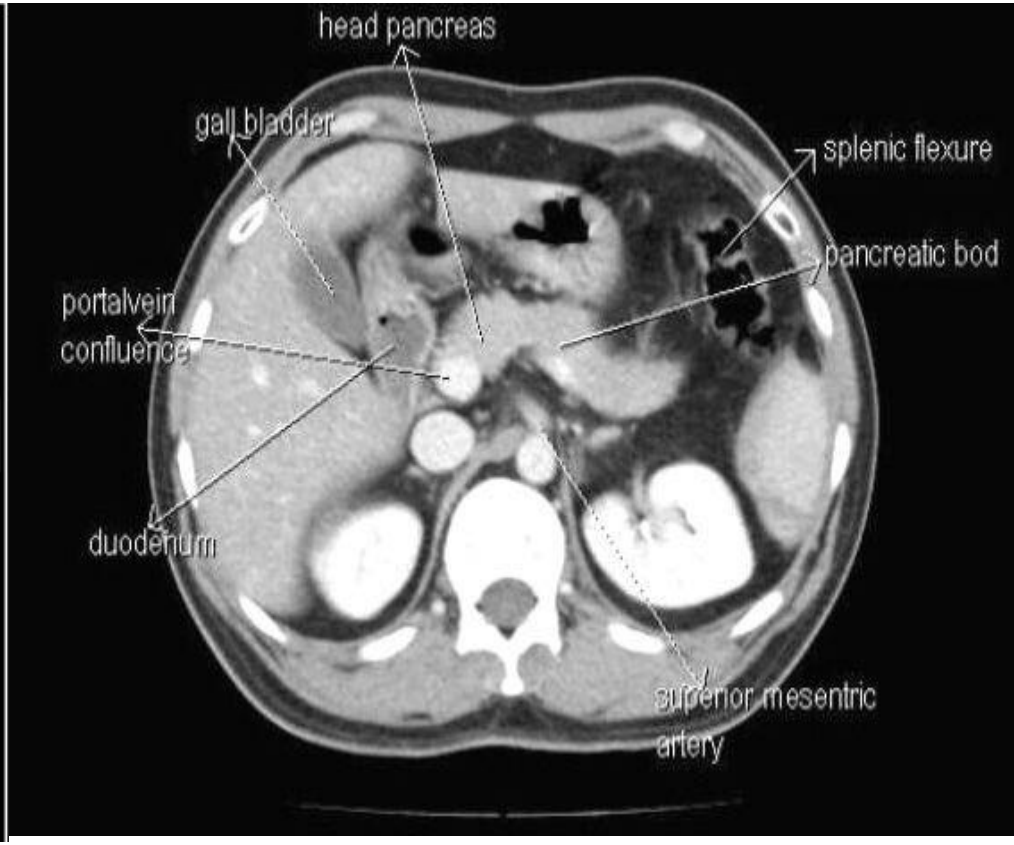
1. Epigastric pain.
2. Obstructive jaundice.
3. Suspected pancreatic malignancy.
4. Acute pancreatitis and its complications.
5. Chronic pancreatitis and its complications.

Contraindications

1. Pregnancy.
2. Allergy to iodinated contrast agents.

COMPUTED TOMOGRAPHY OF THE PANCREAS





Technique

1. Negative (e.g. water) oral contrast is generally preferred. Positive (e.g. iodinated) contrast may be given if necessary to opacify distal bowel loops but is contraindicated if CT angiography is to be performed. Volume and timing of oral contrast agent will depend upon whether opacification of distal bowel loops is required.

2. Venous access is obtained.

3. The patient is scanned supine and a scout view is obtained.

Technique

4. An initial non-contrast-enhanced examination to identify calcification is no longer indicated, as this will be evident on vascular phases.

5. The volume and strength of the i.v. contrast will depend upon the speed of the scanner. The volume of i.v. contrast usually varies from 100 to 150 mL s−1 of iodinated contrast at 3–4 mL s−1, with a saline chaser, depending on the scanner type. Pancreatic parenchymal phase enhancement (35–40 s after commencement of bolus injection) is necessary for optimum contrast differentiation between pancreatic adenocarcinoma and normal pancreatic tissue, with portal venous phase scans (65–70 s after onset of the injection) included in the protocol to investigate hepatic metastatic disease. Images should be reconstructed at 0.625–1.25 mm in the pancreatic phase and 2 mm in the portal venous phase.

6. Islet cell tumours and their metastases may show avid enhancement on arterial phase scans and become isodense with normal pancreatic tissue on portal phase scans. A portal phase scan is generally necessary to investigate flow and the relationship of the tumour to the portal vein.

THANK YOU