Republic of Iraq
Ministry of Higher Education
Al-Mustaqbal University
Radiology Techniques Department
Second Stage \ Special Radiological Procedures-1

Lecture No. (3)

Computed Tomography of the Liver and Biliary Tree,

Computed Tomographic Cholangiography

&

Computed Tomography of the Pancreas

By

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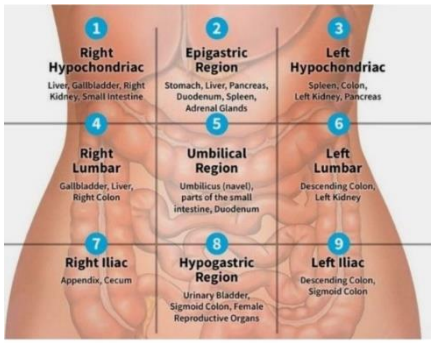
Computed Tomography of the Liver and Biliary Tree



Indications

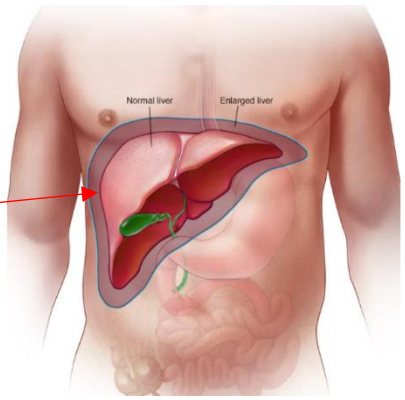
1. Suspected focal or diffuse liver lesion

2. Staging known primary or secondary malignancy

3. Abnormal liver-function tests

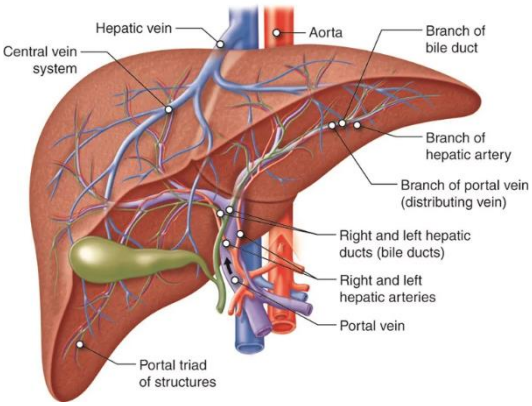
4. Right upper-quadrant pain or mass

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

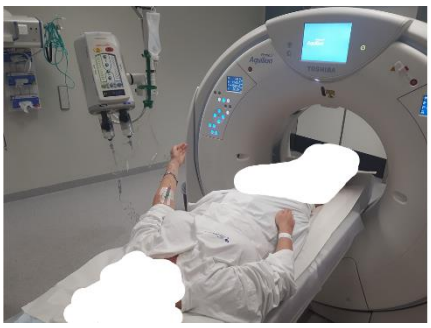
1. Pregnancy

2. Allergy to iodinated contrast agents

3. Impairment of renal function

Renal function test

- The following parameters are commonly included in assessing renal function (the normal values/reference range is mentioned)
  - Serum Urea (15-45 mg/dl)
  - Serum Creatinine (0.6 – 1.2 mg/dl)



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**.

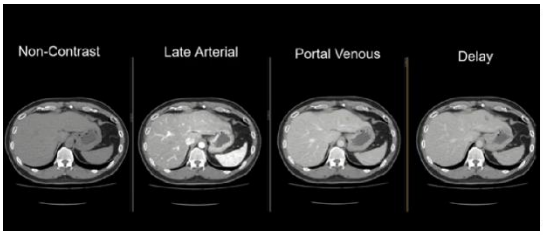
***Slice thickness** will depend upon the **CT scanner specification** but should be 5 mm or less.

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).



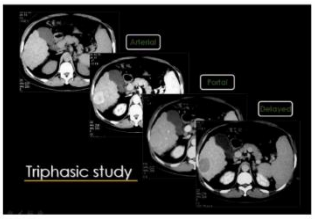
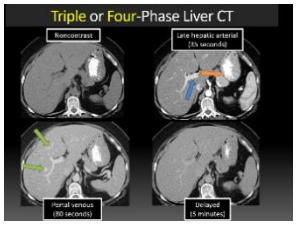


Figure (7). Triphasic of contrast liver CT



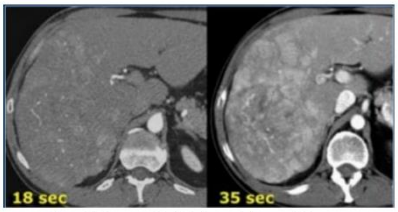


Figure (6). Hypervascular lesion is seen in late arterial phase.

*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 IV. *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 HCC (**triple phase**).

*Some centres, however, also use a 'delayed' or 'equilibrium' phase scan at 180 s to help identify **and** characterize primary liver tumours (**quadruple phase**).

***In general**, late arterial and portal venous scans are ap**propriate to investigate suspected** hypervascular metastases.

*Terminology may be **potentially confusing**, as **some centres** may **consider a triple phase** scan to include arterial, portal and delayed scans. ***Non-contrast** examinations **have limited usefulness**.

Haemangiomas often show a **characteristic** peripheral discontinuous nodular enhancement and progressive centripetal 'fill-in'. After the initial **dual**- or **triple-phase** protocol, delayed images at 5 and 10 min are obtained through the lesion.

Computed Tomographic Cholangiography

Magnetic resonance (MR) cholangiography is noninvasive **but sometimes fails to display the normal intrahepatic ducts**. Multidetector CT cholangiography can be useful **in this instance**.

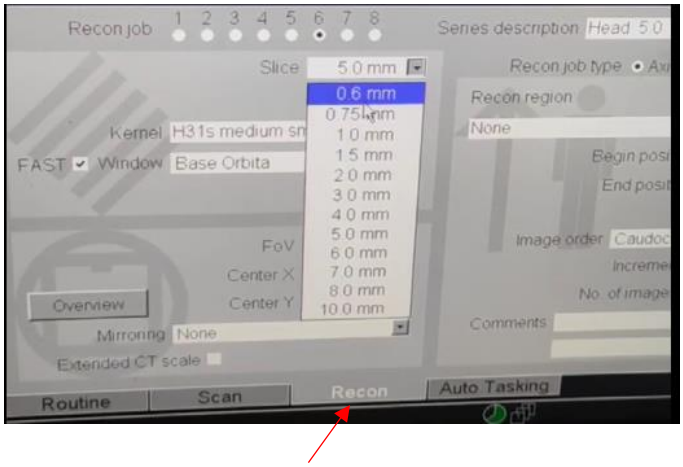
* This technique, **the biliary tree** is **opacified using an intravenous (i.v)** cholangiographic agent.

*Isotropic data from 0.625 mm section thickness slices can be **reconstructed** to provide high-resolution three-dimensional images.

*Insufficient opacification may be seen **with** excessively dilated ducts.

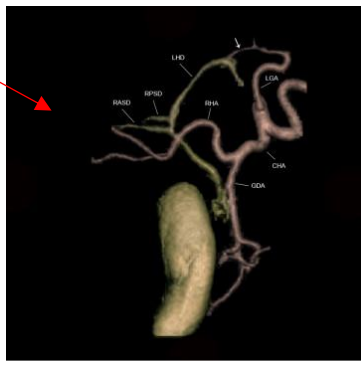
Contraindications

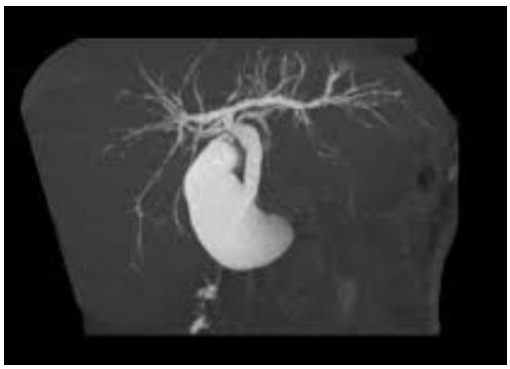
Allergy to iodinated contrast agents.



Indications

3D



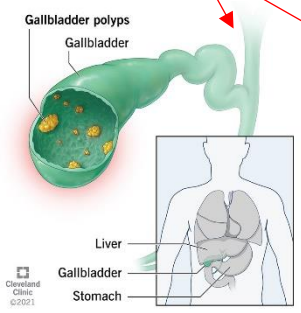


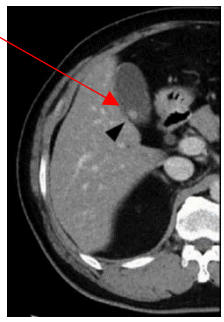
1. Screening for cholelithiasis

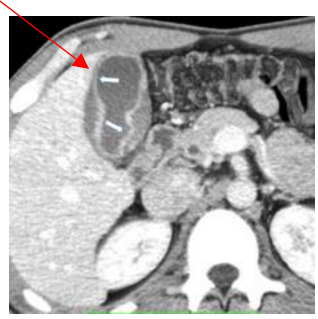
2. Preoperative screening of anatomy

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 contrast 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 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

Technique

1. **Negative** (e.g. water) **oral contrast is generally preferred.**

*__Positive__ (e.g. iodinated) oral 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.**

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.

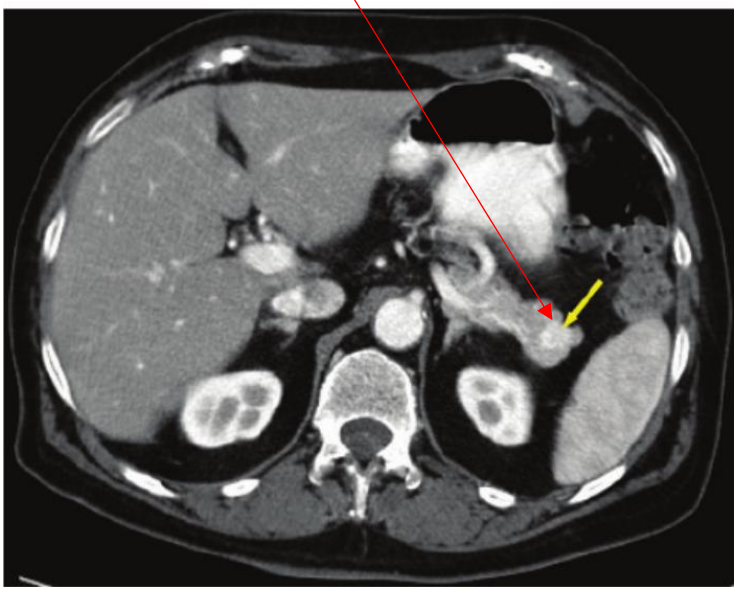
*The volume of i.v. contrast usually varies from 100 to 150 mL s−1 of **iodinated** contrast at 3–4 mL s−1, with a **saline chaser**, depending on the scanner type.

*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.



1. native
2. non contrast
3. without contrast
4. pre contrast

فحص بدون او قبل الصبغة

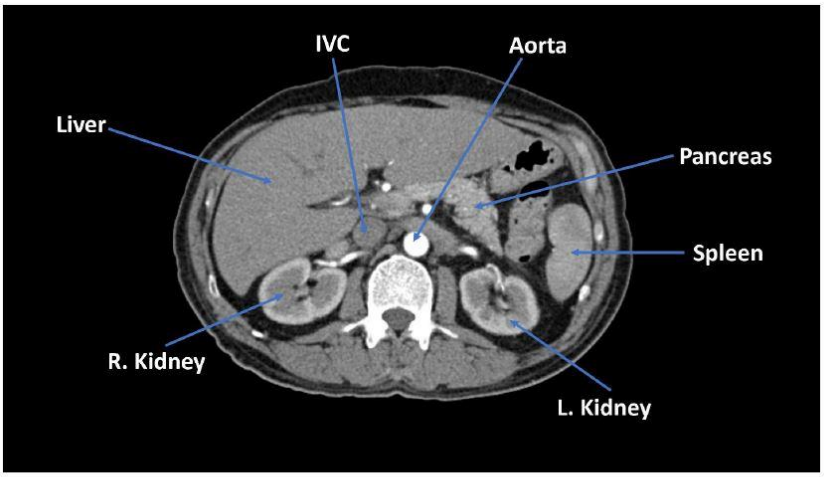


Figure (1). Normal liver CT

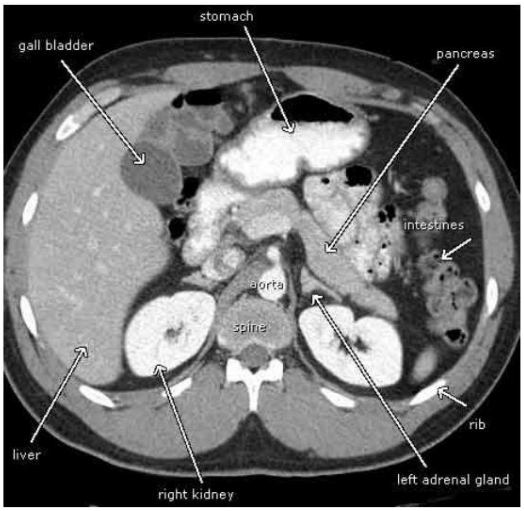
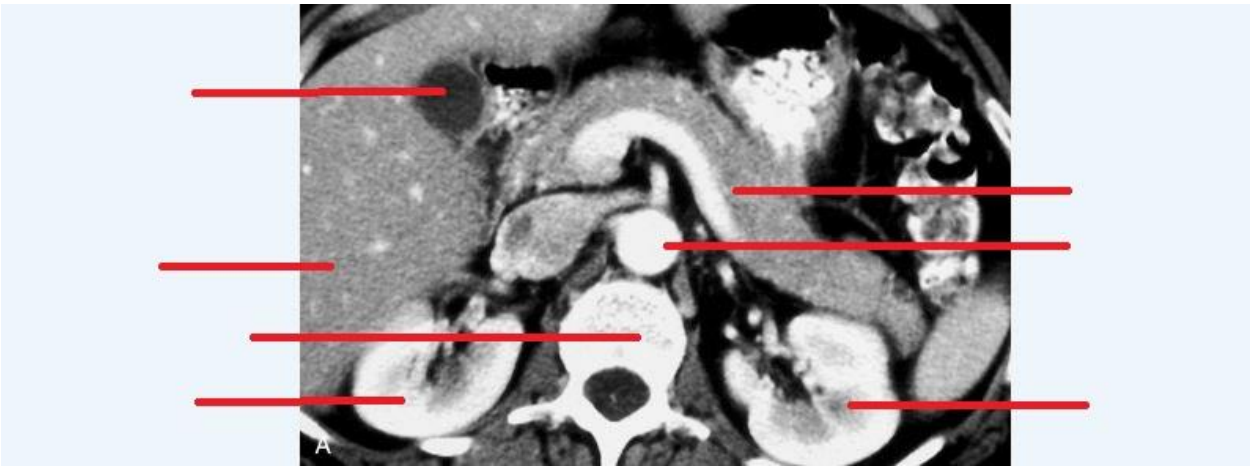
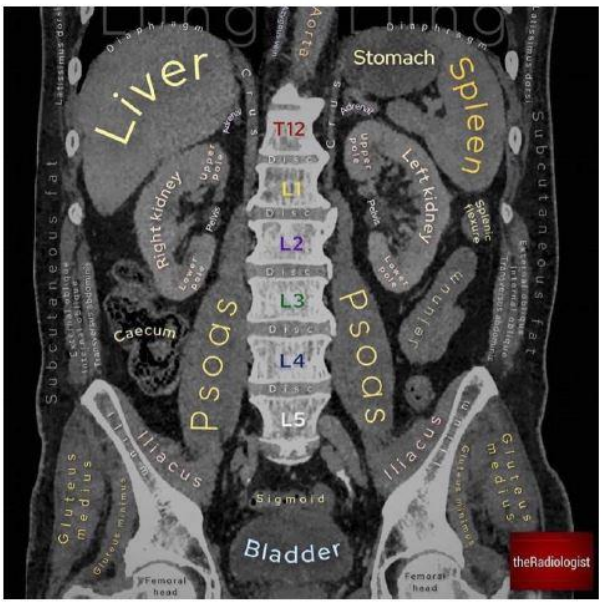


Figure (2). Normal liver CT





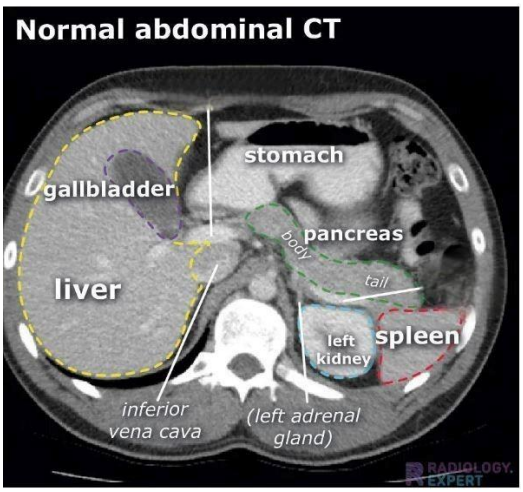


Figure (4). Normal liver CT