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

Lecture No. (5)

Intraoperative Cholangiography,

Postoperative (T-Tube) Cholangiography

&

Percutaneous Transhepatic Cholangiography

By

Dr. Samer Adnan

Intraoperative Cholangiography

Indications

Performed during cholecystectomy or bile duct surgery, to avoid need for surgical exploration of the common bile duct. *(Preoperative MRCP and/or EUS has **replaced this technique in some centres**.)

Contraindications

None.

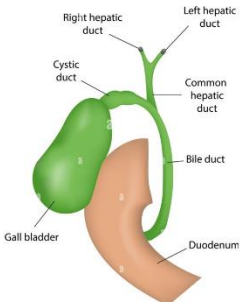
Contrast Medium

High osmolar contrast media (HOCM) or low osmolar contrast media (LOCM) **150**—i.e. **low iodine content to avoid obscuring any calculi**; 20 mL.

Equipment

1. Operating table with CR/DR available or a film cassette tunnel

2. Mobile x-ray machine



Patient Preparation

As for surgery.

Technique

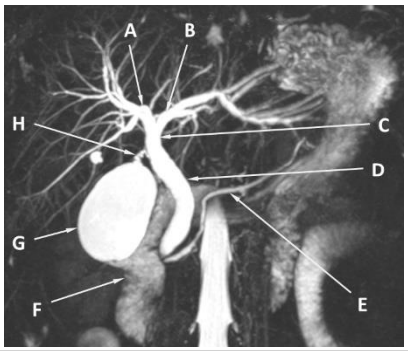
The **surgeon cannulates** the cystic duct, with a fine **catheter** prefilled with contrast medium (with **all air bubbles** that **might simulate calculi**) **carefully excluded.**

Images

1. After 5 mL have been injected.

2. After 20 mL have been injected. **Contrast** medium should be seen to **flow** freely into the duodenum. Spasm of the sphincter of Oddi is a fairly **frequent** occurrence and may be *due to* anaesthetic agents or surgical manipulation. It can be relieved by glucagon, propantheline or amyl nitrite.

The criteria for a normal operative choledochogram were given by Le Quesne1 as the following:



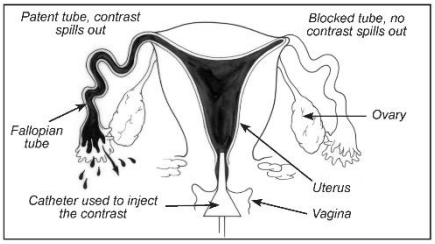
1. Common bile duct width not greater than 12 mm

2. **Free flow** of **contrast** medium **into** the duodenum

3. The **terminal narrow segment** of the **duct** is clearly seen

4. There are **no filling defects**

5. There is **no excess** retrograde filling of the hepatic ducts.



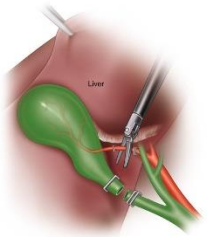
Postoperative (T-Tube) Cholangiography

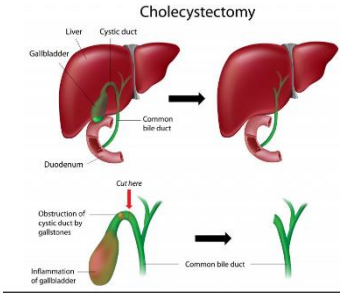
Indications

1. To exclude biliary tract calculi, where (a) **operative cholangiography** was **not performed**, or (b) the **results of operative cholangiography are not satisfactory** or are suspect.

2. **Assessment** of biliary leaks **following biliary surgery**

Contraindications

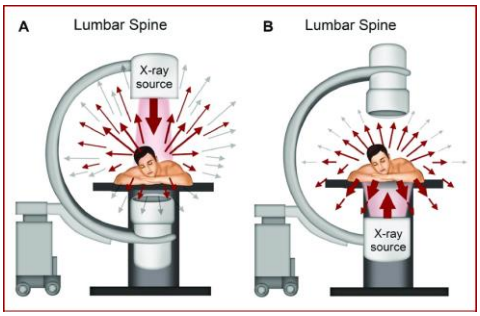




None.

Contrast Medium

HOCM or **LOCM** 150 mg I mL–1; 20–30 mL.



Equipment

Fluoroscopy unit with spot image device.

Patient Preparation

Antibiotics may be considered **if previous cholangitis** or **if immunosuppressed** (e.g. **liver transplant**).

Preliminary Image

Coned supine PA of the right side of the abdomen.

Technique

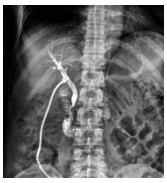
1. The examination is performed **on** or **about** the 10th postoperative day, **prior to removal of the T-tube.**

2. The patient lies supine on the x-ray table. The drainage tube is clamped off near to the patient and cleaned thoroughly with antiseptic.

3. A 23G needle, extension tubing, and 20 mL syringe are assembled and filled with contrast medium (e.g. a butterfly needle).

*__After__ all air bubbles have been expelled, the **needle is inserted** into the **tubing** between the **patient** and the **clamp**. The injection is made under fluoroscopic control, the total volume depending on duct filling.

*In the case of recent biliary anastomosis (i.e. liver transplant), **only a small volume** of contrast (approximately 10 mL), gently injected, is required.

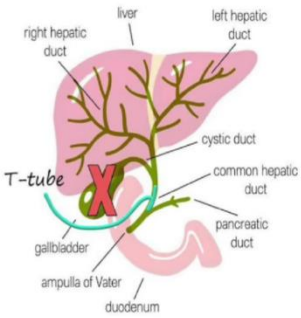


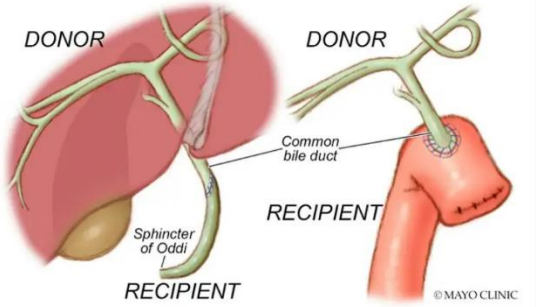
Images

Intermittent fluoroscopic 'grab' images during filling are frequently useful. PA **and** oblique exposures **when** there is **satisfactory opacification of the biliary system**.

Aftercare

None.





Complications

Due to the contrast medium

The biliary ducts do absorb contrast medium, and cholangio-venous reflux can **occur *with* high injection pressures**. Adverse reactions are therefore possible, but the incidence is small.

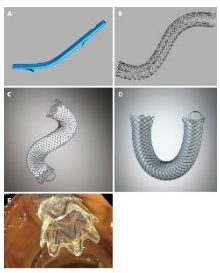
Due to the technique

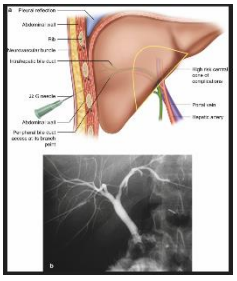
Injection of contrast medium **under high pressure** into an **obstructed biliary tract** can produce septicaemia.

Percutaneous Transhepatic Cholangiography

Indications

1. **Prior to therapeutic intervention,** e.g. biliary drainage procedure to relieve obstructive jaundice, or to drain infected bile





2. Place a percutaneous biliary stent

3. Dilate a postoperative stricture

4. Stone removal (discussed later)

5. To facilitate ERCP by rendezvous technique

6. Rarely for diagnostic purposes only

Contraindications

1. Bleeding tendency:

The normal number of platelets in the blood is 150,000 to 400,000 platelets per microliter (mcL) or 150 to 400 × 10^9/L. Normal value ranges

(a) Platelets less than 100 × 109 L–1

(b) Prothrombin time prolonged >2 s **more than control**

Vitamin K will **correct** abnormal prothrombin time **due to biliary obstruction** if **hepatocellular function is preserved**; if it is not, or the patient requires **urgent** intervention, then platelet transfusion and FFP can be **used.**

2. Biliary tract sepsis except specifically to control the infection by drainage.

Contrast Medium

LOCM 150 mg I mL–1; 20–60 mL.

Equipment

1. **Fluoroscopy** unit with **digital** spot film device (**tilting table** optional)

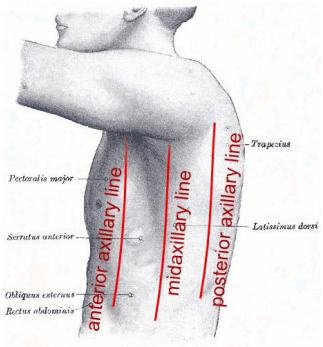
2. Chiba needle (a fine, flexible 22G needle with stilette, 15–20-cm long)

3. Appropriate catheters and wire **for drainage or interventional procedure planned**

Patient Preparation

1. Haemoglobin, prothrombin time and platelets are **checked**, and **corrected if necessary**

2. **Prophylactic antibiotics**, e.g. ciprofloxacin 500–750 mg oral **before** and **after procedure**

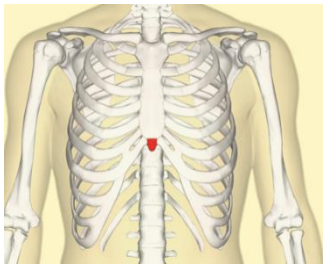


3. Nil by mouth or **clear fluids only** for 4 h prior to the procedure

4. **Ensure** patient well hydrated, by i.v. fluids if necessary

5. Sedation (i.v.) and analgesia with oxygen and monitoring

Preliminary Imaging



US to **confirm position of liver and dilated ducts**.

Technique

1. The patient lies supine.

*Using US, a spot is marked over the **right** or **left lobe** of the **liver** as appropriate.

*On the **right side** this is usually intercostal *between* mid and anterior **axillary lines**.

*For the **left lobe** this is usually subcostal **to the left side of the xiphisternum** in the **epigastrium**.

2. **Using aseptic technique**, the **skin**, **deeper tissues** and **liver capsule** are anaesthetized **at the site of the mark**.

3. **During** suspended respiration the **Chiba needle** is **inserted into the liver,** but once it is **within the liver parenchyma**, the patient is *allowed* **shallow respirations**. The needle is advanced into the liver with real-time US or fluoroscopy control.

4. The **stilette is withdrawn** and the **needle** *connected* to a **syringe and extension tubing prefilled with contrast medium**. **Contrast medium** is *injected* **under fluoroscopic** control while the needle is slowly withdrawn.

*If a duct is not entered at the first attempt, **the needle tip** is **withdrawn** to approximately 2–3 cm from the liver capsule and further passes are made, directing the needle tip **more** cranially, caudally, anteriorly or posteriorly, and **contrast** is **injected** until **a duct is entered**.

*The incidence of **complications** is **not related to the number of passes within the liver itself** and the **likelihood of success** is directly related to the degree of duct dilatation and the number of passes made.

5. Excessive parenchymal injection *should be* avoided, and when it does occur, it results in opacification of intrahepatic lymphatics. *Injection* of contrast medium into a vein or artery is *followed by* rapid dispersion.

6**. If the intrahepatic ducts** are *seen* to be **dilated**, bile should be aspirated and sent for microbiological examination. (The ***incidence*** of **infected** bile is **high** in such cases.)

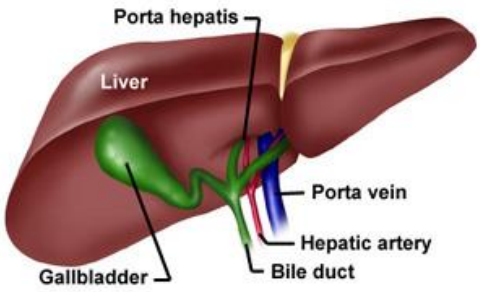
7. **Contrast medium** is **injected** to **outline the duct system** and **allow access** for a **guidewire** or **selection** of an **appropriate duct for drainage**. Where **undertaken for diagnostic purposes only**, **PTC**, the **needle** can be **removed** once **suitable images** have been obtained.

8. **Care** should be **taken not to overfill an obstructed duct system** as this may **precipitate** septic shock.

Images

As contrast medium is denser than bile, the sequence of duct opacification is therefore **gravity-dependent** and determined by the **site of injection** and the **position of the patient**.

Using the **undercouch tube** with the patient horizontal:



1. PA

2. LAO

3. RAO

4. If on a nontilting table, **rolling the patient** onto the left side will fill the left ducts and common duct above an obstruction.

*When the previous images have shown an obstruction at the level of the porta hepatis, a further image after the patient has been tilted towards the erect position for 30 min *may* **show the level of obstruction** to be **lower** than originally thought.

Delayed Images

Images taken after several hours, or the next day, ***may*** **show contrast medium** in the gallbladder **if** this was **not achieved *during*** the **initial part of the investigation**.

Aftercare

Bed rest, pulse and blood pressure measurement half-hourly for 6 h.

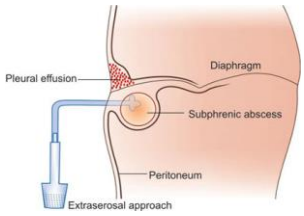
Complications

Morbidity approximately 3%; mortality less than 0.1%.

Due to the contrast medium

Allergic/idiosyncratic reactions—very uncommon.

Due to the technique



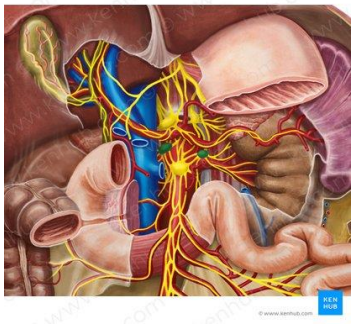
Local

1. Puncture of extrahepatic structures—usually no serious sequelae

2. Intrathoracic injection

3. Cholangitis

4. Bile leakage—may lead to **biliary peritonitis** (incidence 0.5%). More likely if the ducts are under pressure and if there are multiple puncture attempts. **Less likely** if a drainage catheter is left in situ.



5. Subphrenic abscess

6. Haemorrhage

7. Shock—owing to injection into the region of the coeliac plexus

Generalized

Bacteraemia, septicaemia and endotoxic shock. The **likelihood** of sepsis is greatest in the **presence of choledocholithiasis** *because* of the higher incidence of **preexisting infected bile.**