

**College of Health and Medical Technologies**

**Department of Radiology Technologies**

**Radiological procedures- 1**

**INTRAOPERATIVE CHOLANGIOGRAPHY  
POSTOPERATIVE (T-TUBE) CHOLANGIOGRAPHY  
PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY**

**2 nd stage**

**LECTUER 5**

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# **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 (HO CM) or low osmolar contrast media (LO CM) 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**

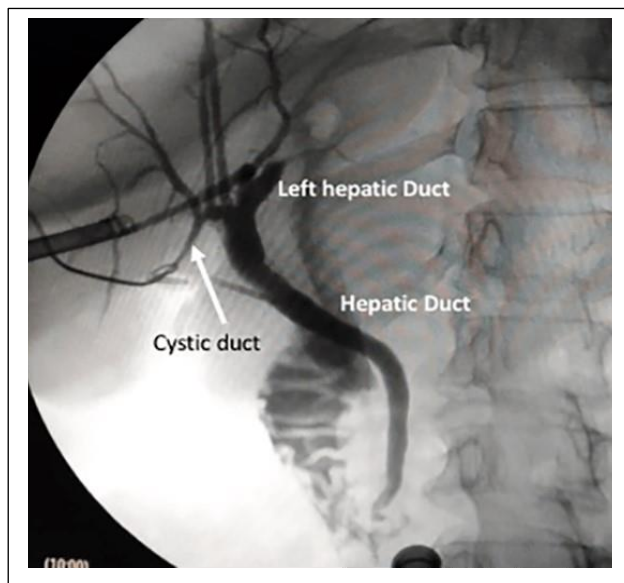
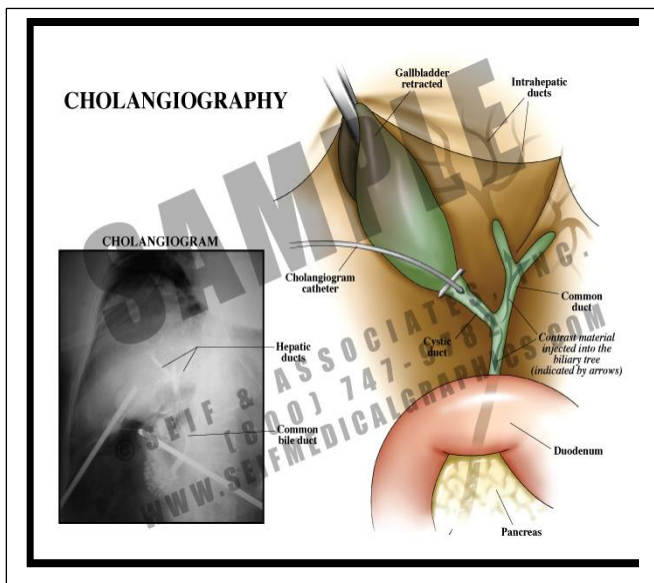
The surgeon cannulates the cystic duct, with a fine catheter prefilled with contrast medium (with all air bubbles that might simulate calculi) carefully excluded.

## **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 Quesnel 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<sup>-1</sup>; 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

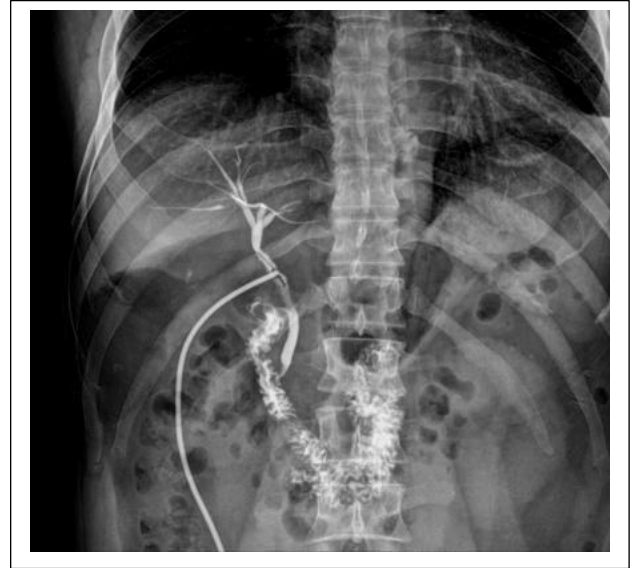
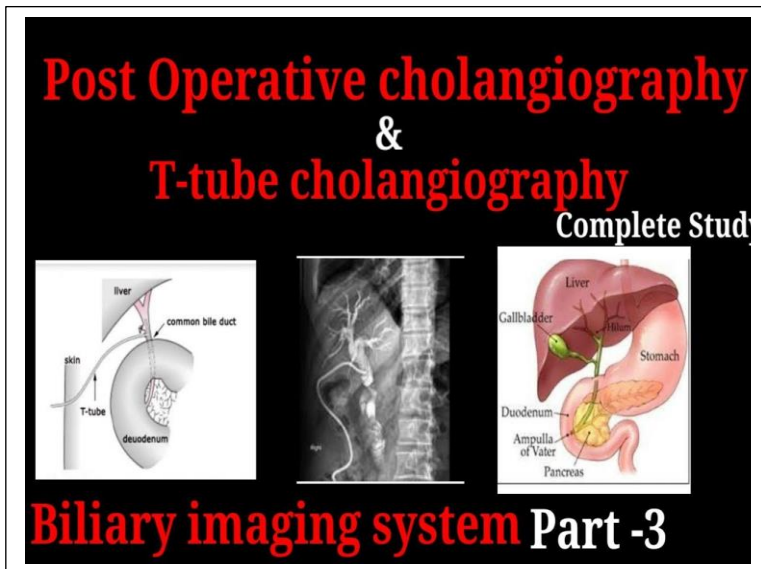
None. **Complications**

### 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 septicemia.



# **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:
  - (a) Platelets less than  $100 \times 10^9 \text{ L}^{-1}$
  - (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<sup>-1</sup>; 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 stylet 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%.<sup>1</sup>

### 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.

