جامعة الأمير سطام بن عبد العزيز
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CBD stones & strictures (Obstructive jaundice)

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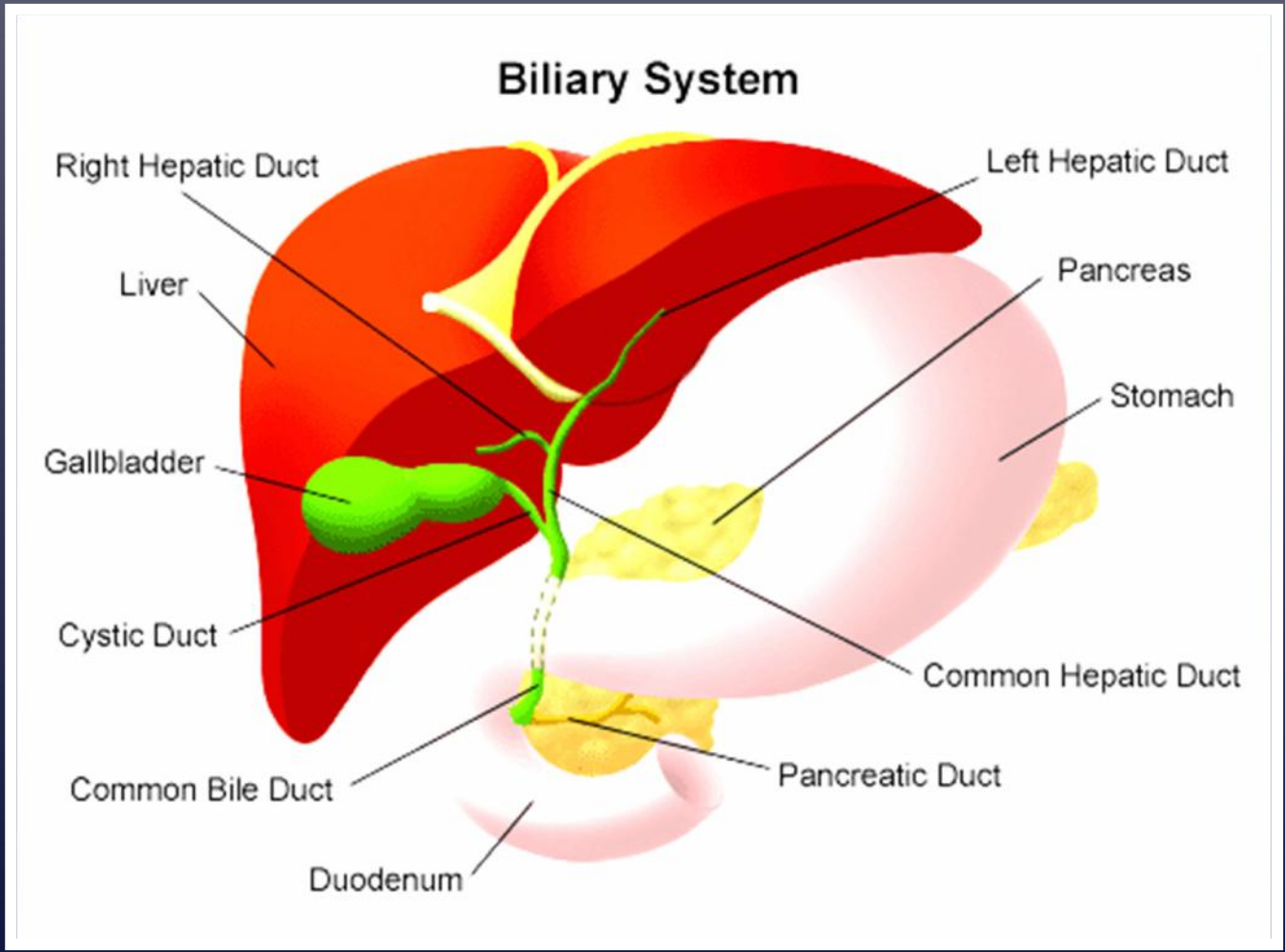
Jaundice

- A yellow discoloration of the skin, sclerae, and other tissues caused by excess circulating bilirubin.
  - A yellow-to-orange color may be imparted to the skin by consuming too much beta carotene, the orange pigment seen in carrots. In this condition, the whites of the eyes remain white, while people with true jaundice often have a yellowish tinge to the eyes.

Anatomy


Biliary System
Right Hepatic Duct
Left Hepatic Duct
Liver
Pancreas
Stomach
Gallbladder
Cystic Duct
Common Hepatic Duct
Common Bile Duct
Pancreatic Duct
Duodenum

Physiology

- Bilirubin is derived from Hb breakdown.
- Unconjugated bilirubin transported to liver
  - Bound to albumin because **insoluble** in water
- Transported into hepatocyte & conjugated
  - With glucuronic acid → now water soluble
- Secreted into bile
- In ileum & colon, converted to urobilinogen
  - 10-20% reabsorbed into portal circulation and re-excreted into bile or into urine by kidneys

Pathophysiology

- Jaundice = bilirubin staining of tissue at a level greater than 2 mg%.
  - Normal level 0.1 – 1.1 mg%.
- **Mechanisms:**
  - ↑ production of bilirubin
  - ↓ hepatocyte transport or conjugation
  - Cholestasis
    - Impaired excretion of bilirubin
    - **Impaired delivery of bilirubin into intestine**
      - Surgical jaundice or obstructive jaundice

Classification

Pre-hepatic	Hepatic	Post-hepatic
Haemolysis	Hepatitis	Common bile duct stones
Gilbert's Syndrome	Alcohol	Benign strictures
	Cholestatic liver disease	Ascariasis
	Haemochromatosis	Pancreatic cancer
	Wilsons	Cholangiocarcinoma
	Alpha 1 Anti-trypsin deficiency	Liver metastases
	Liver metastases	

DDx: Unconjugated bilirubinemia

- **↑ production**
  - Extravascular hemolysis
  - Extravasation of blood into tissues
  - Intravascular hemolysis
  - Errors in production of red blood cells
- **Impaired hepatic bilirubin uptake**
  - CHF
  - Portosystemic shunts
  - Drug inhibition: rifampin, probenecid

DDx: Unconjugated bilirubinemia

- **Impaired bilirubin conjugation**
  - Gilbert's disease (dec. glucuronyltransferase)
  - Crigler-Najar's syndrome (no glucuronyltransferase)
  - Neonatal jaundice (physiologic)
  - Hyperthyroidism
  - Estrogens
  - Liver diseases
    - chronic hepatitis, cirrhosis, Wilson's disease

DDx: Conjugated Bilirubinemia

- **Intrahepatic cholestasis/impaired excretion**
  - Hepatitis (viral, alcoholic, and non-alcoholic)
    - Any cause of hepatocellular injury
  - Primary biliary cirrhosis or end-stage liver dz
  - Sepsis and hypoperfusion states
  - TPN
  - Pregnancy
  - Infiltrative dz: TB, amyloid, sarcoid, lymphoma
  - Drugs/toxins i.e. chlorpromazine, arsenic
  - Post-op patient or post-organ transplantation
  - Hepatic crisis in sickle cell disease

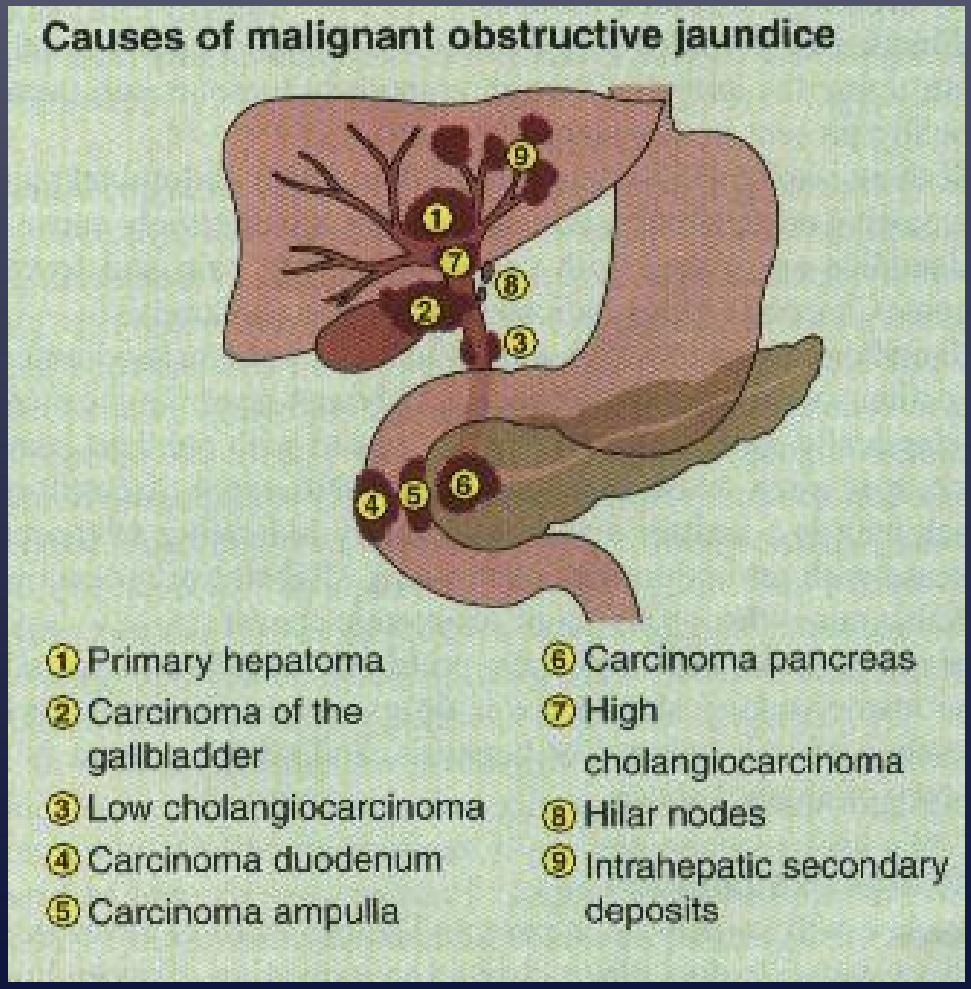
DDx: Obstructive Jaundice

- **Obstructive Jaundice– extrahepatic cholestasis**
  - **Choledocholithiasis** (CBD or CHD stone)
  - **Cancer** (peri-ampullary or cholangio Ca)
  - **Strictures** after invasive procedures
  - Acute and chronic **pancreatitis**
  - **Primary sclerosing cholangitis (PSC)**
  - Parasitic infections
    - Ascaris lumbricoides, liver flukes

Causes

- **Benign**
  - Gall stones
  - Chronic Pancreatitis
  - Traumatic biliary Stricture
  - Sclerosing Cholangitis
  - Parasites
- **Malignant**
  - Primary Hepatoma
  - Cholangiocarcinoma
  - Carcinoma Duodenum
  - Carcinoma Pancrease
  - Hilar nodes
  - Intrahepatic secondary deposit

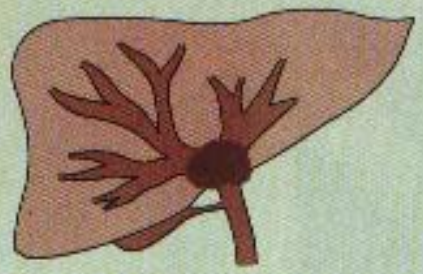
Malignant Causes



Clinical Presentation

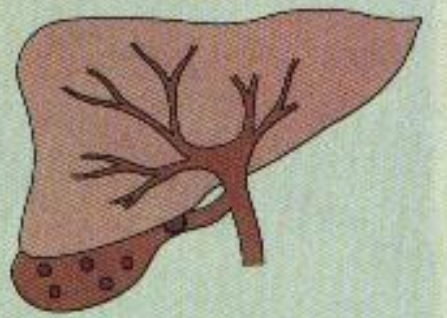
- Jaundice
  - Painless or painful
  - Progressive or intermittent
- Biliary Colic
- Acute Cholangitis
  - Charcot's triad
- Acute Pancreatitis
- Courvoiser's Law

Common clinical scenarios and associated biliary tract pathology



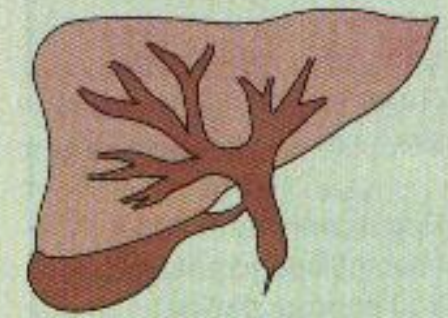
Carcinoma at the porta hepatis

- Dilated intrahepatic ducts
- Collapsed gallbladder
- Non-dilated common bile duct



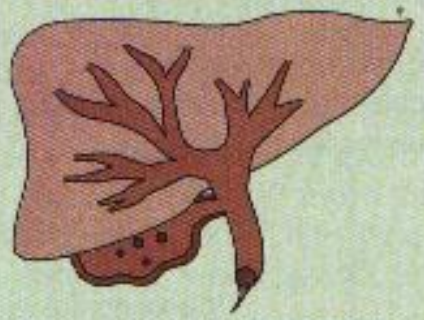
Stone impacted in Hartmann's pouch

- No jaundice
- Normal intrahepatic ducts
- Distended gallbladder (mucocele)
- Non-dilated common bile duct



Carcinoma of the pancreas

- Dilated intrahepatic ducts
- Distended, thin-walled gallbladder
- Dilated proximal common bile duct
- Distal stricture appears to be malignant



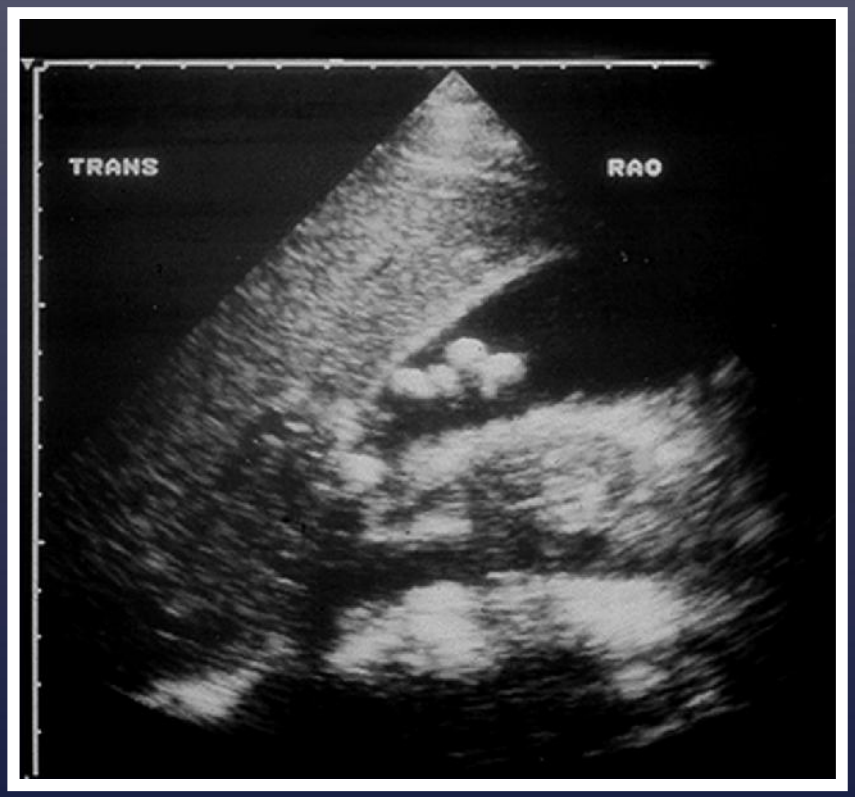
Stone impacted in lower bile duct

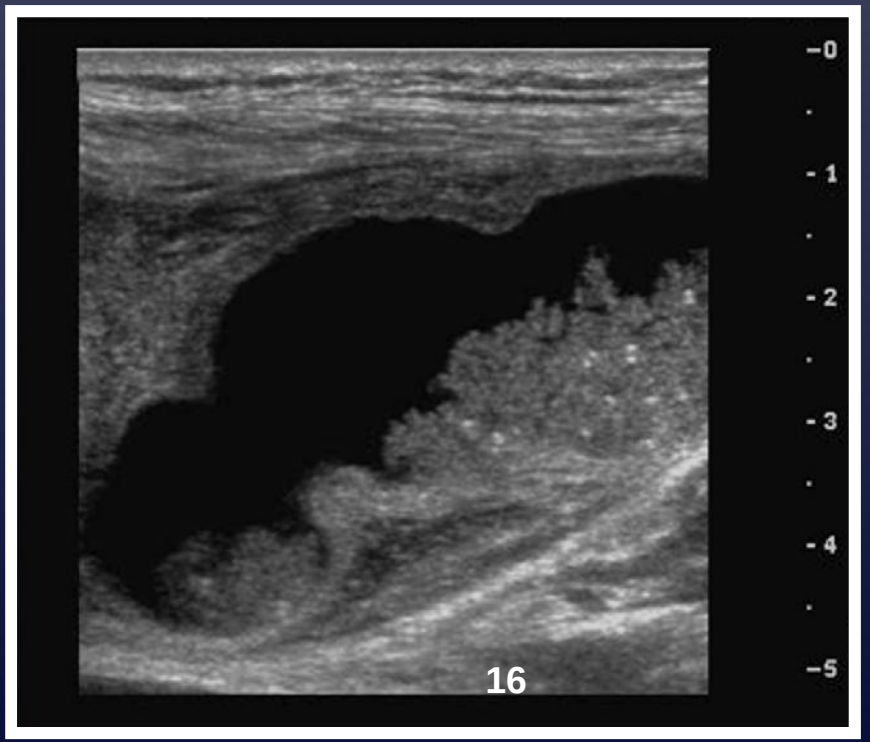
- Dilated intrahepatic ducts
- Non-distended, thick-walled gallbladder (Courvoisier's law)
- Dilated common bile duct
- Stone impacted at lower end of common bile duct

Investigations

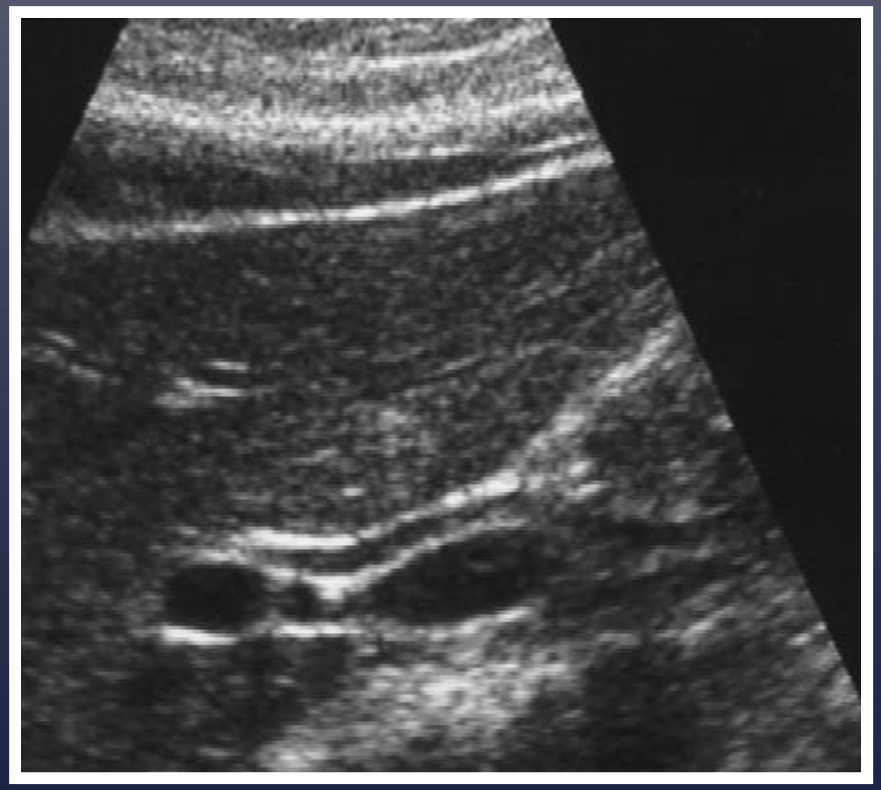
- **Laboratory**
  - Full blood count
  - UCE
  - LFT
  - Clotting studies
  - Amylase
  - HbsAg, anti-HCV
- **Imaging**
  - US
  - ERCP
  - PTC
  - CT
  - MRI

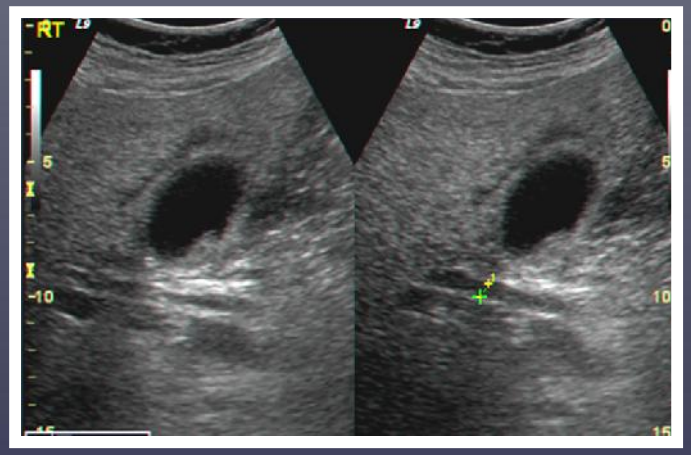
Sonography: Gallbladder

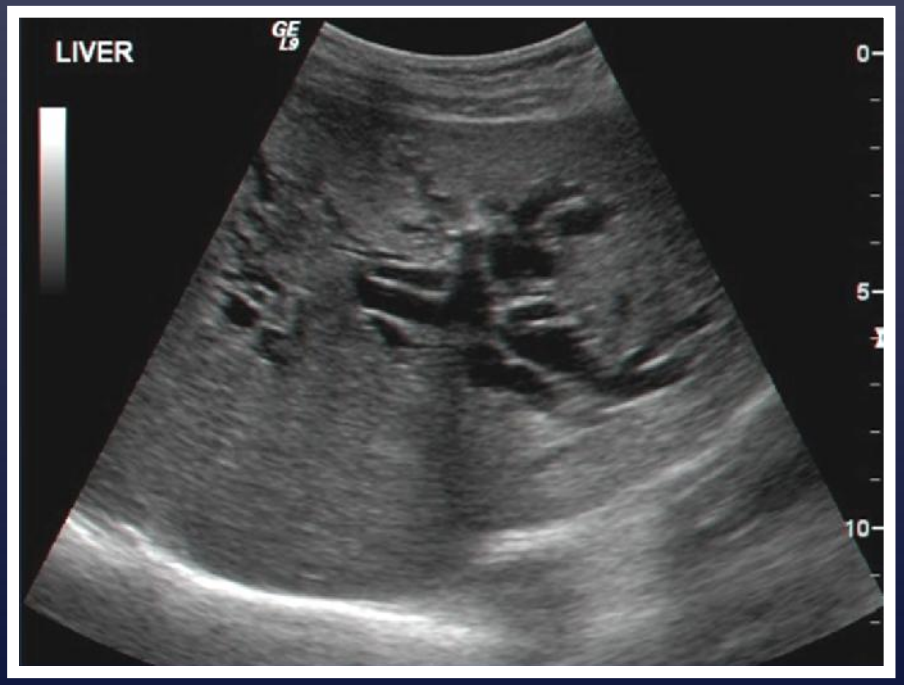




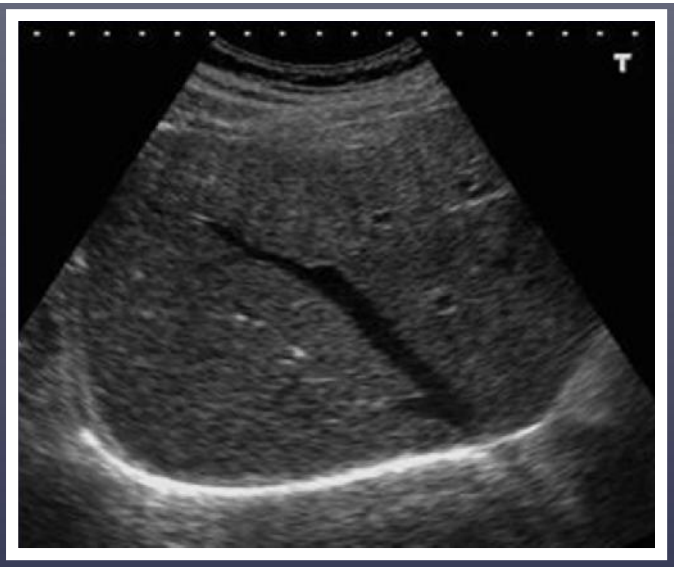
Sonography: Dilated Bile Ducts







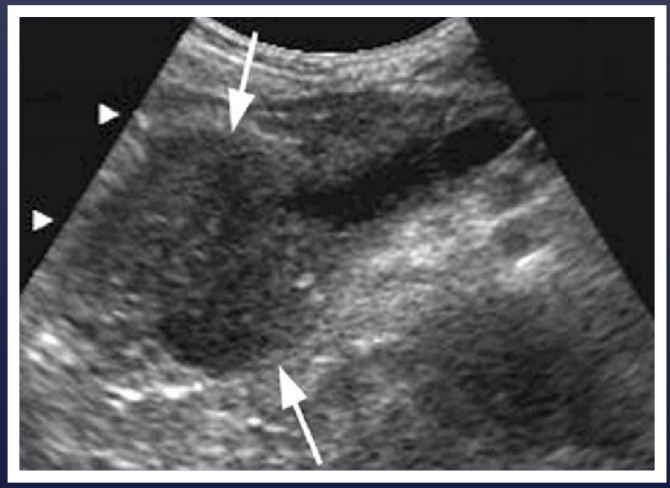
Sonography: Liver

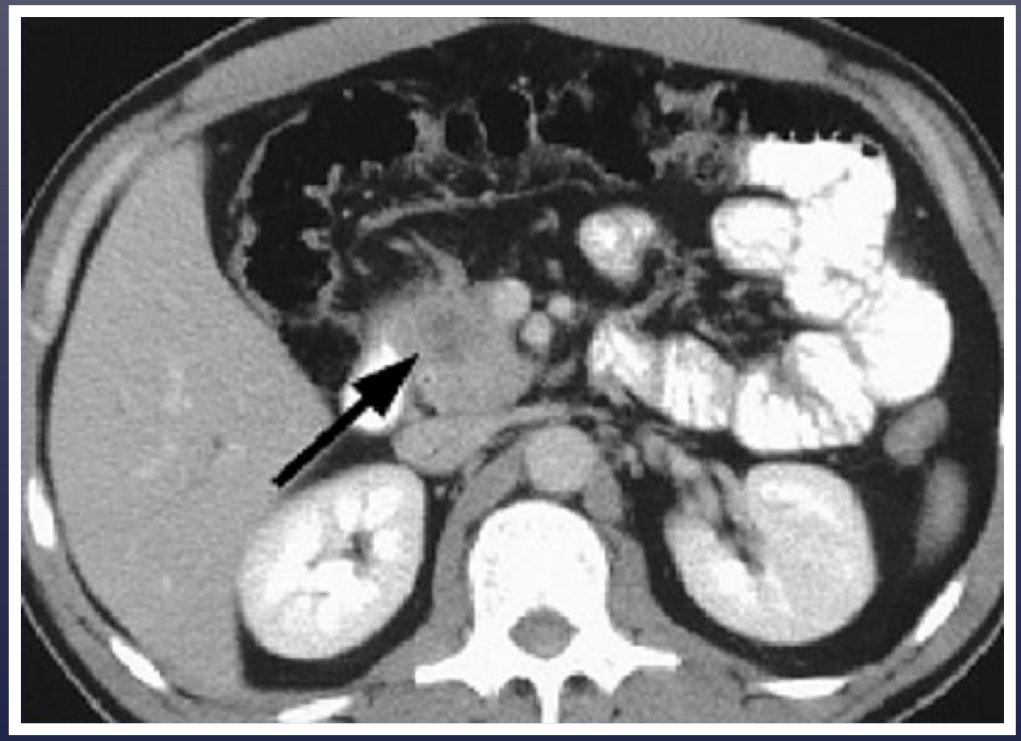


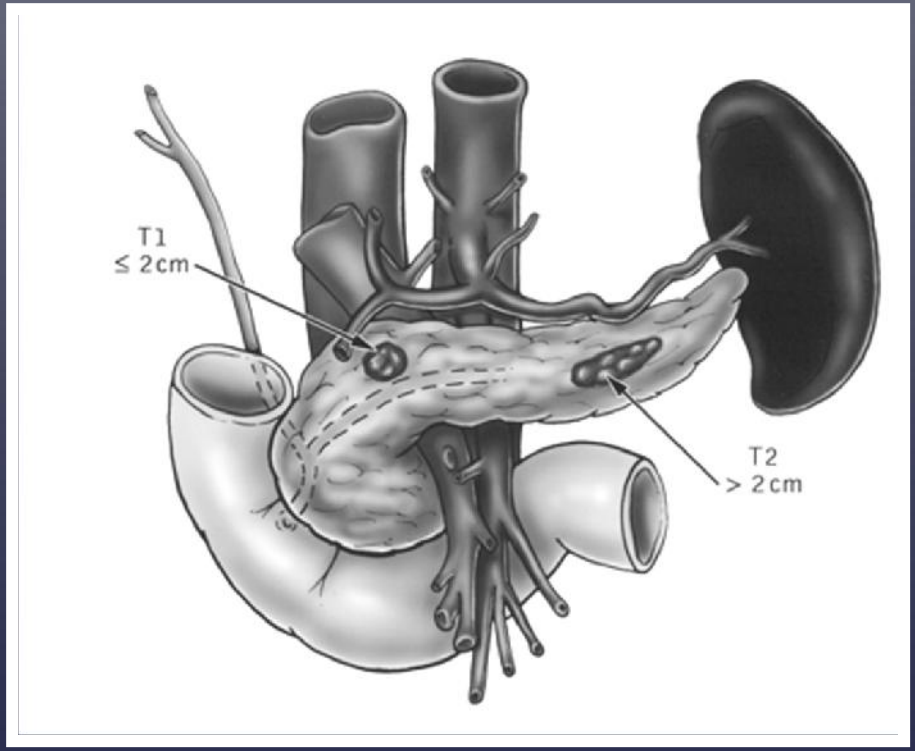
CT scan: Liver

Sonography: Panreas

CT scan: Panreas






T1
≤ 2cm
T2
> 2cm

ERCP (Endoscopic retrograde cholangiopanreatography)

Endoscopic US

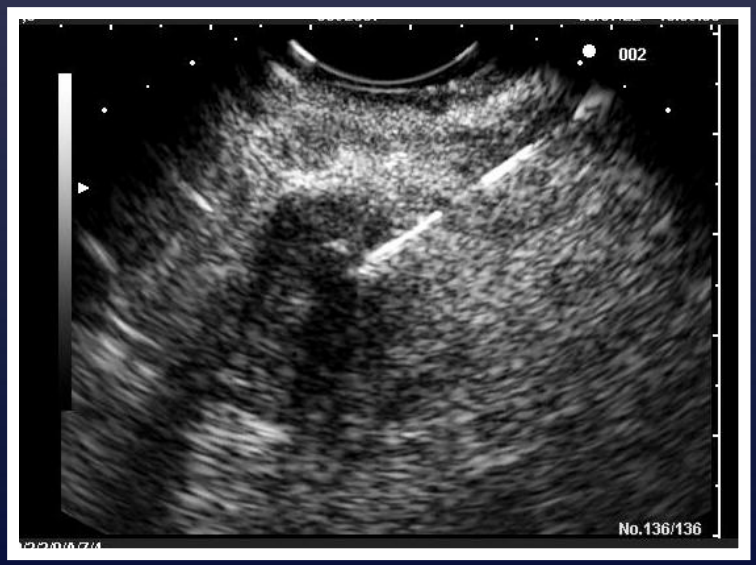
- combines endoscopy and US
- Visualization
  - Pancreas (sensitivity > CT for small tumors)
  - Biliary Strictures (sensitivity similar to MRCP)
  - Choledolithiasis
- tissue sampling (EUS-FNA)


ST
MASS
PANC

FNAC

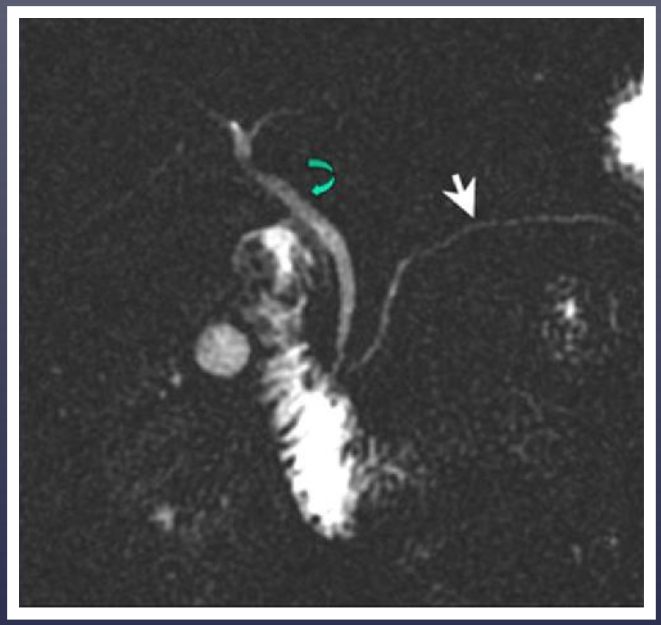
- **US**
  - Trans-abdominal
  - Endoscopic
- **CT**

- 86% diagnosis accuracy for malignancy
- Complications rare (bleeding/infection < 1%)



MRCP (Magnetic resonance cholangiopancreatography)

- Detection of biliary/pancreatic duct stones, strictures, or dilatations within the biliary system
- Malignancy
- Limitation of MRCP
  - Therapeutic applications (ERCP)
  - Expensive

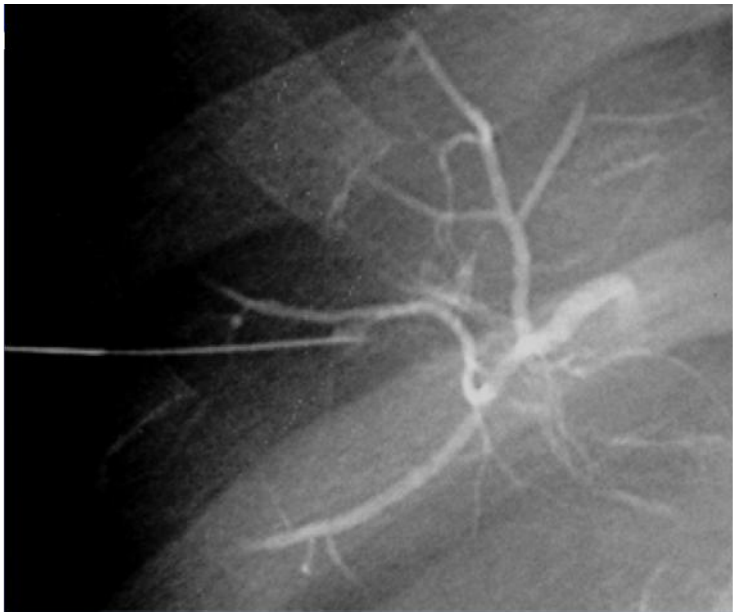


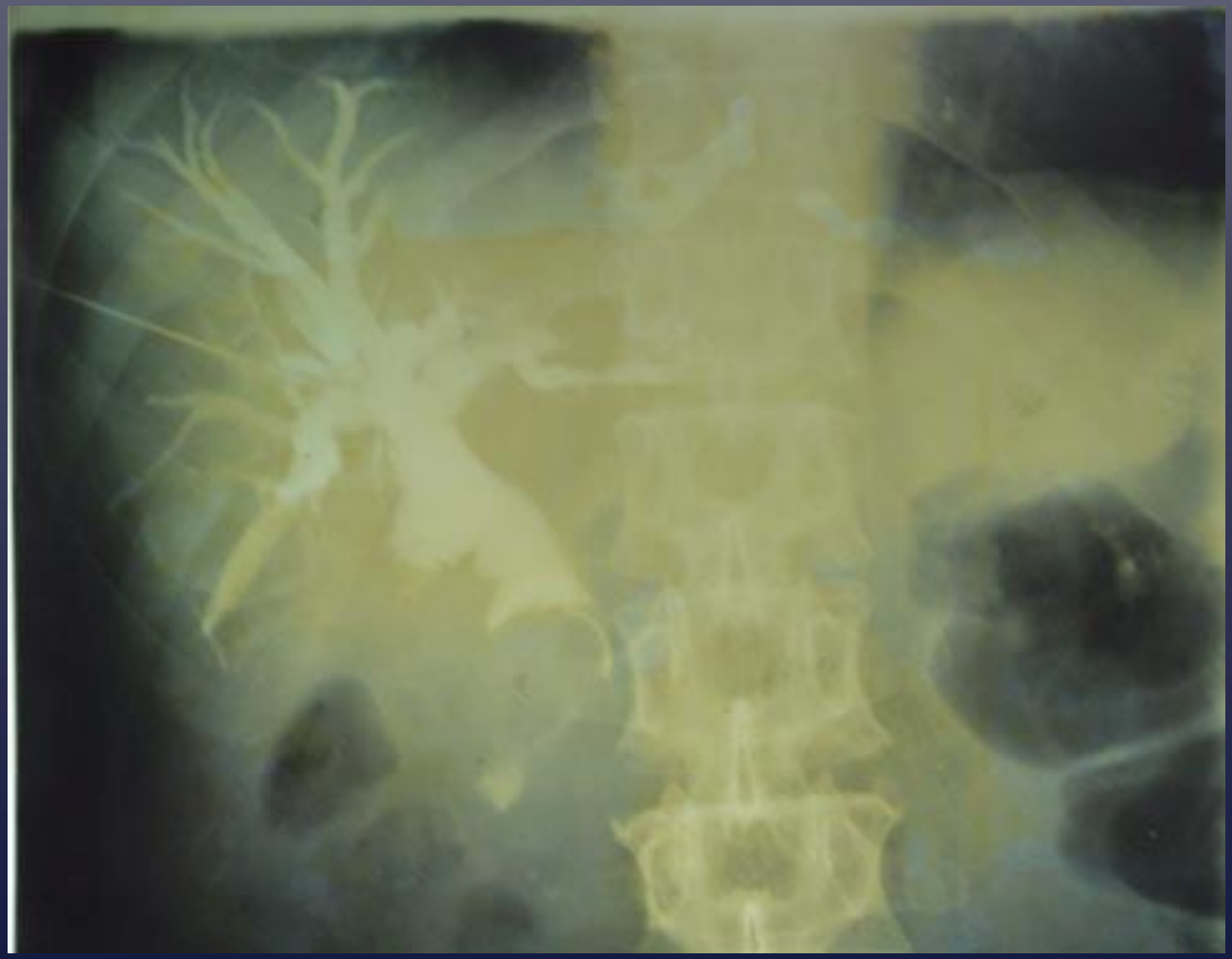
Common bile duct stone (red arrow) and multiple stones (black arrow)
gallbladder as visualized by MRCP.

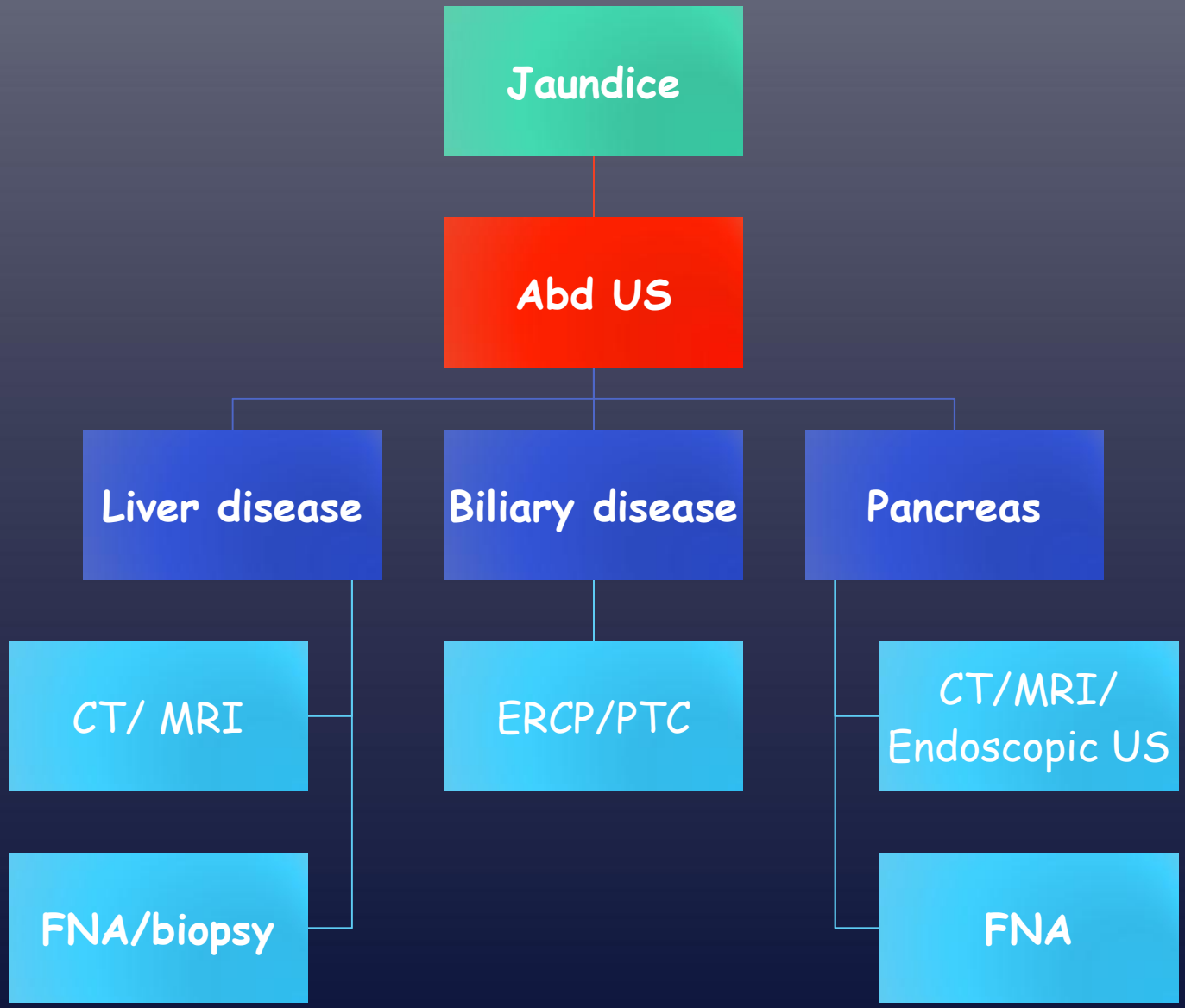
Percutaneous transhepatic cholangiogram (PTC)

- The liver is punctured to enter the peripheral intrahepatic bile duct system
- Contrast medium is injected into the biliary system
- Identification of the obstruction
- Therapeutic for lesions proximal to the common hepatic duct

- Complications (~in 3% severe)
  - peritonitis
  - Sepsis
  - Cholangitis/subphrenic abscess






Jaundice
Abd US
Liver disease
Biliary disease
Pancreas
CT/ MRI
FNA/biopsy
ERCP/PTC
CT/MRI/
Endoscopic US
FNA

Treatment

- **Non surgical**
  - Endoscopic sphincterotmy
    - Spontaneous extrusion of stone into duodenum
    - Extaction with balloons
    - Extraction with basket

7 Common bile duct stone (arrow) extraction using a Dormia basket as visualized by ERCP.

- Palliative therapy- drainage
  - Malignant Stricture
  - External drainage **PTC**
  - Internal drainage-Stent **ERCP**

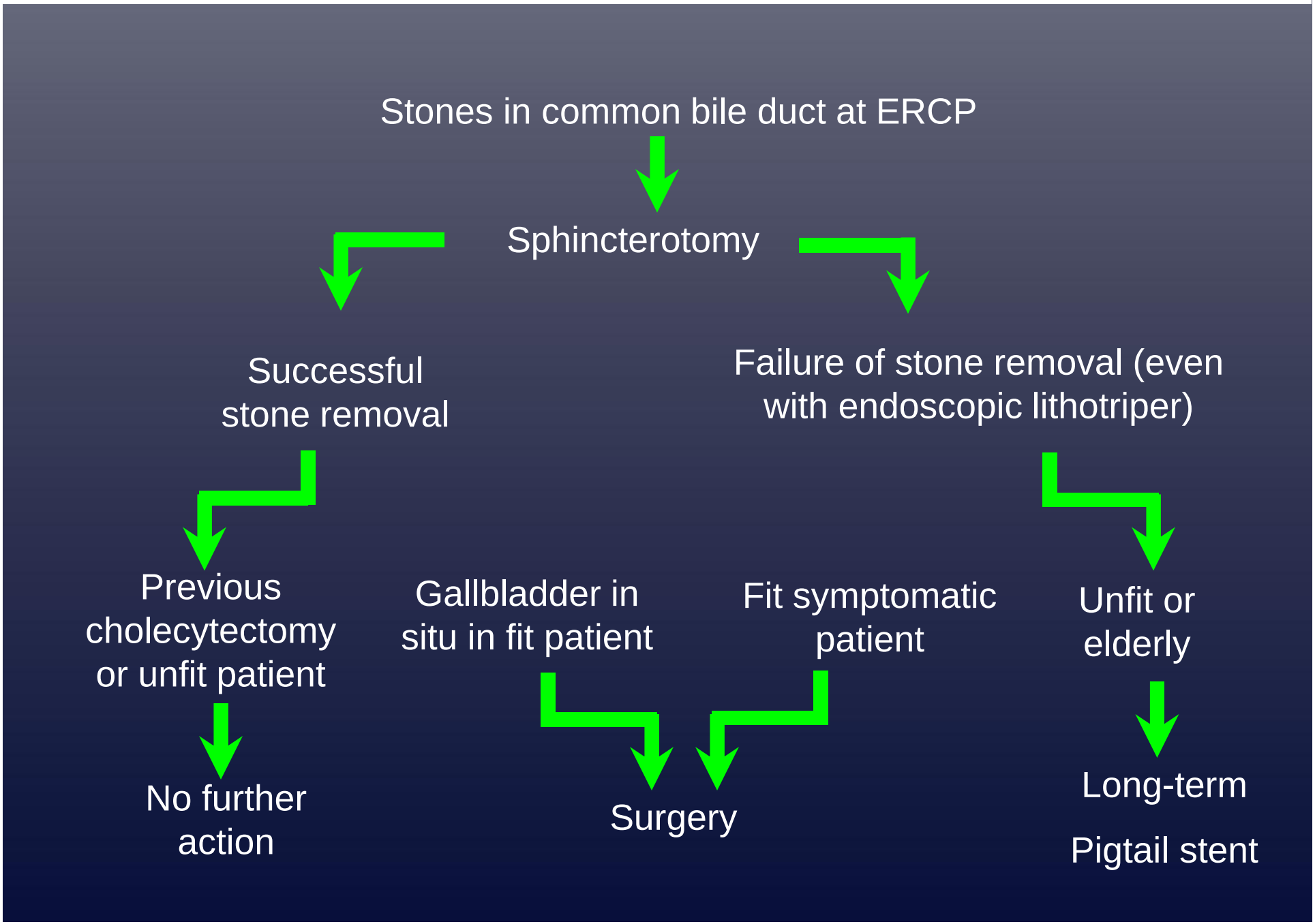
- **Minimal Invasive Surgery**
  - Laparosopic exploration of CBD
    - Via cystic duct
    - By direct choledochotomy
- **Open surgery**
  - Supra duodenal sphincteroplasty with T tube drainage
  - Trans duodenal sphincteroplasty
  - Choledochoduodenostomy
  - Whipple’s operation

Hepaticojejunostomy

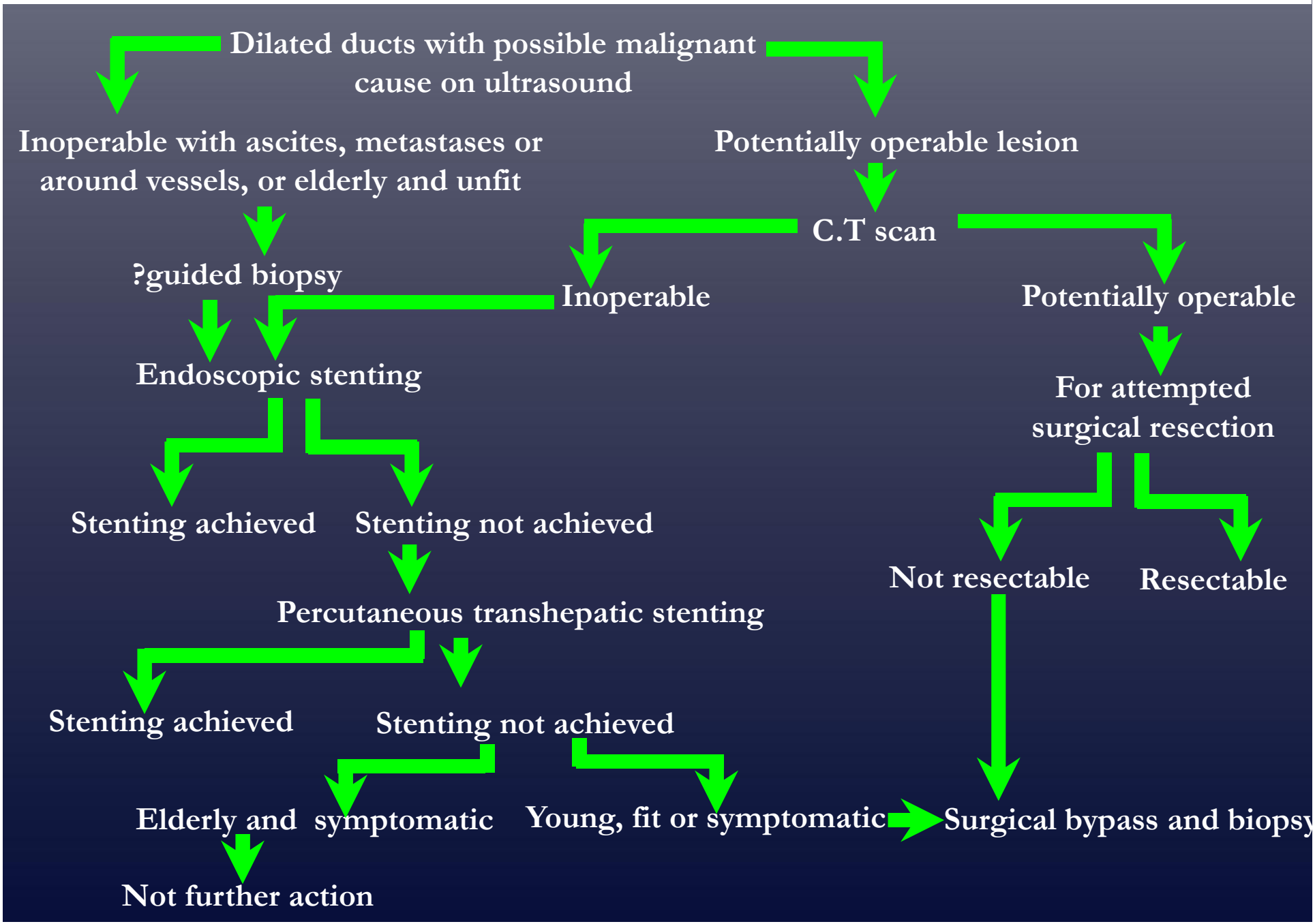
T tube Cholangiogram

T tube Cholangiogram

Common bile duct stone



Therapeutic options for malignant strictures



- What is the most commonly isolated bacteria in the common duct of patient with primary stone?

A. Escherichia coli
B. Pseudomonas aeruginosa
C. Klebsiella sp.
D. Salmonella typhii
E. Corynebacterium sp.

Answer: A

- What is the best initial procedure in defining the cause of obstructive jaundice in a 17 year old female?

A. ERCP
B. PTC
C. US
D. CT Scan
E. MRCP

Answer: C

- Which of the following statements about choledocholithiasis are correct?

A. CBD stones usually originates in the gallbladder and migrate to common duct
B. CBD stones can form de novo in the duct system
C. calcium bilirubinate stone are associated with the presence of bacteria in the duct system
D. calcium bilirubinate are formed even on the absence of bacteria in the duct system

Answer: A, B, D

THE END!