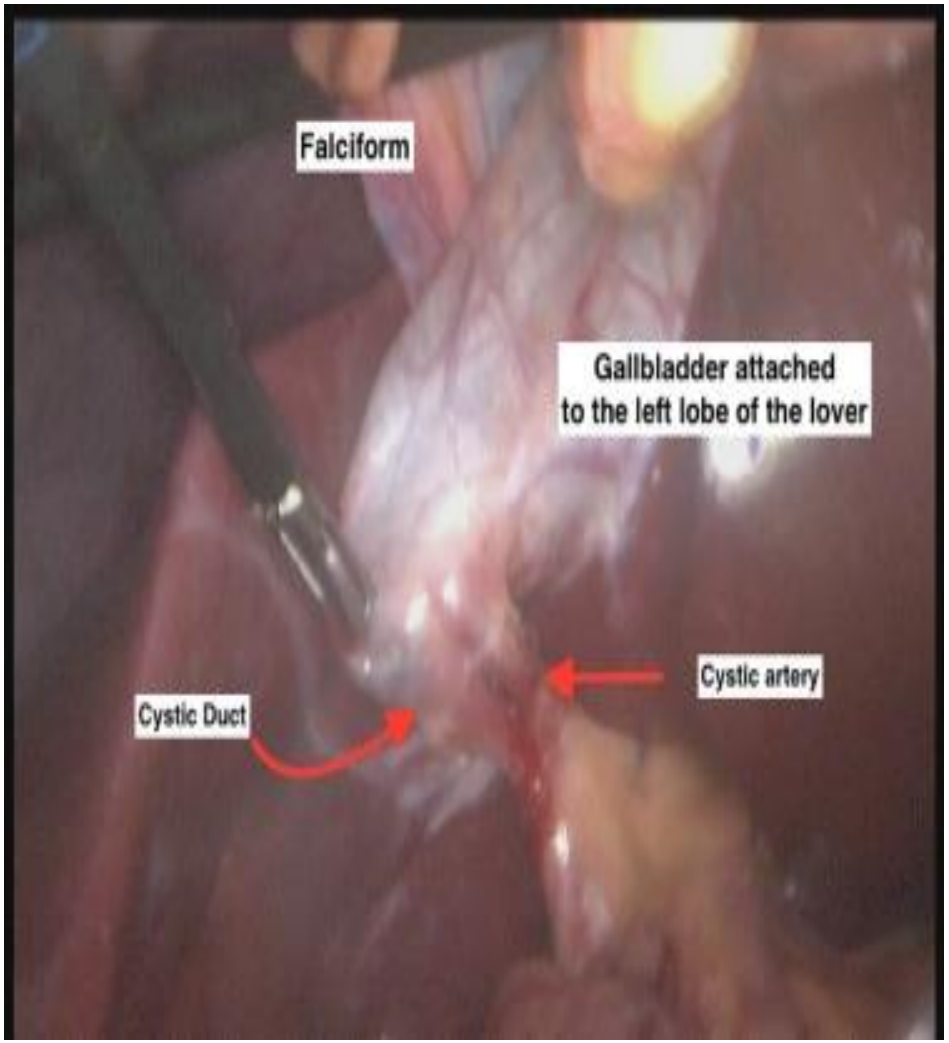
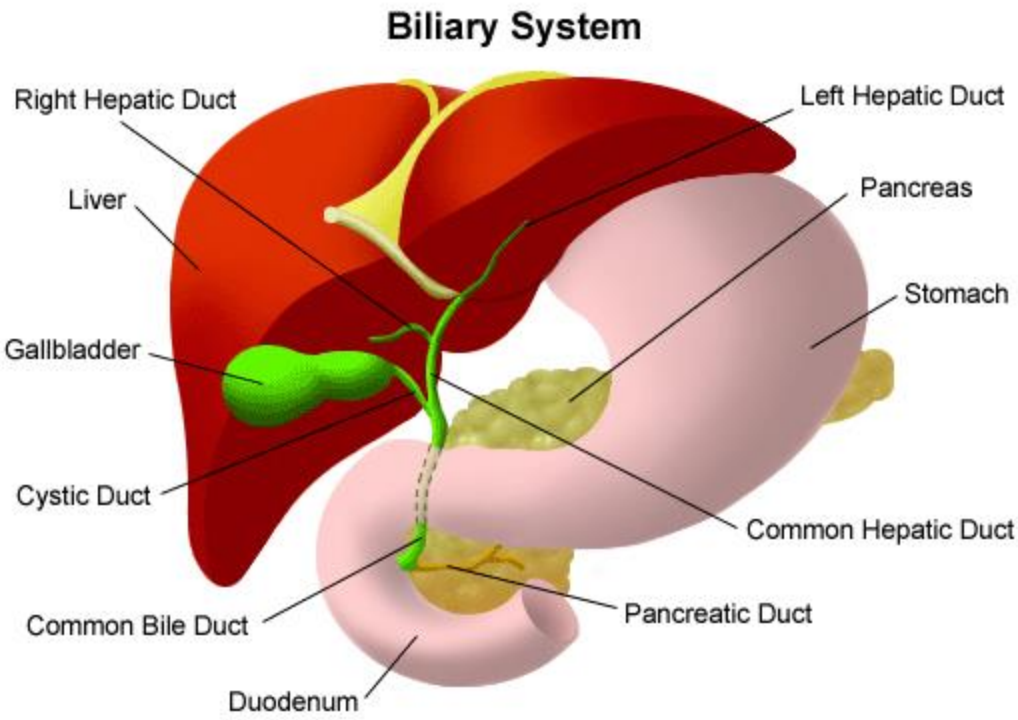
Gallbladder disorders

- The gallbladder is a reservoir for bile located on the undersarface of the liverat the confflunce of the right and left halves of the liver.
- Consist of fundus,a body,and the infundibulum.
- Its separated from liver by cystic plate.
- The infundibulum of gallbladder makes angle with the body and may obscure the common hepatic duct.

- Callots triangle is bounded by the common hepatic duct on left,the cystic duct inferiorly, and the cystic artery superiorly(originates from the right hepatic artery).
- The venous drainage is directly into the liver parenchyma or into the common bile duct plexus.
- The cystic duct arise from infundibulum of gallbladder and extend to join the common hepatic duct.


Falciform
Gallbladder attached
to the left lobe of the lover
Cystic artery
Cystic Duct


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

Ch es)

Table 1. Diseases of the Gallbladder

Disease	Description
Cholelithiasis	Microscopic crystals or large stones in the gallbladder
Cholecystitis	Inflammation of the gallbladder
Choledocholithiasis	Common bile-duct stones
Biliary dyskinesia	Motility disorder of the gallbladder caused by scarring or spasm of the sphincter of Oddi
Gallbladder perforation	A hole or opening in the wall of the gallbladder. *Acute:* generalized biliary peritonitis; *subacute:* acute plus pericholecystic abscess; *chronic:* cholecystoenteric fistula
Gallstone pancreatitis	Inflammation of the pancreas caused by obstruction of the pancreatic duct by a gallstone
Gallbladder polyps	Overgrowths or lesions in the gallbladder wall

Source: References 5-8.

Cholelithiasis (Gallstones)

- Gallstone disease, or cholelithiasis, is one of the most common surgical problems worldwide.
- Gallstones are abnormal, inorganic masses formed in the gallbladder and, less commonly, in the common bile or hepatic ducts

- They are a frequent cause of abdominal pain and dyspepsia.

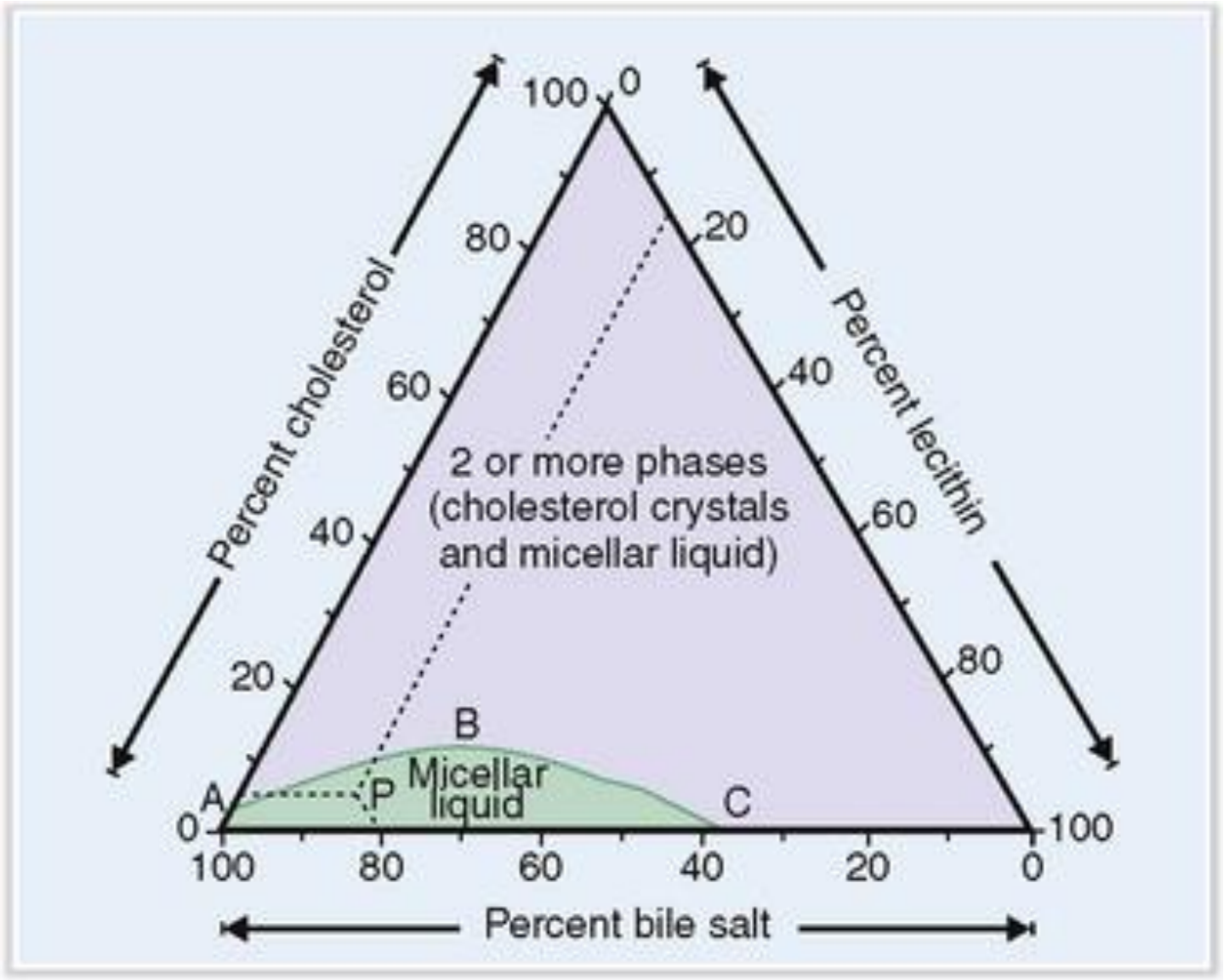
- Although gallstones can form anywhere in the biliary tree, the most common point of origin is within the gallbladder.
- Three types of gallstones exist:
  - cholesterol(70 – 80%)
  - pure pigment(black or brown 20-30%)
  - mixed

  - An important biliary precipitate in gallbladder pathogenis is biliary sludge which refer to a mixture of cholesterol crystals ,calcium bilirubante granules and mucin gel matrix(fasting state or with use of parenteral nutrition.

- Gallstones are classified according to their predominant chemical composition as either:
  - cholesterol
  - calcium bilirubinate stones
    - < 20% of stone type in Europe & US
    - 30-40% of stones in Japan

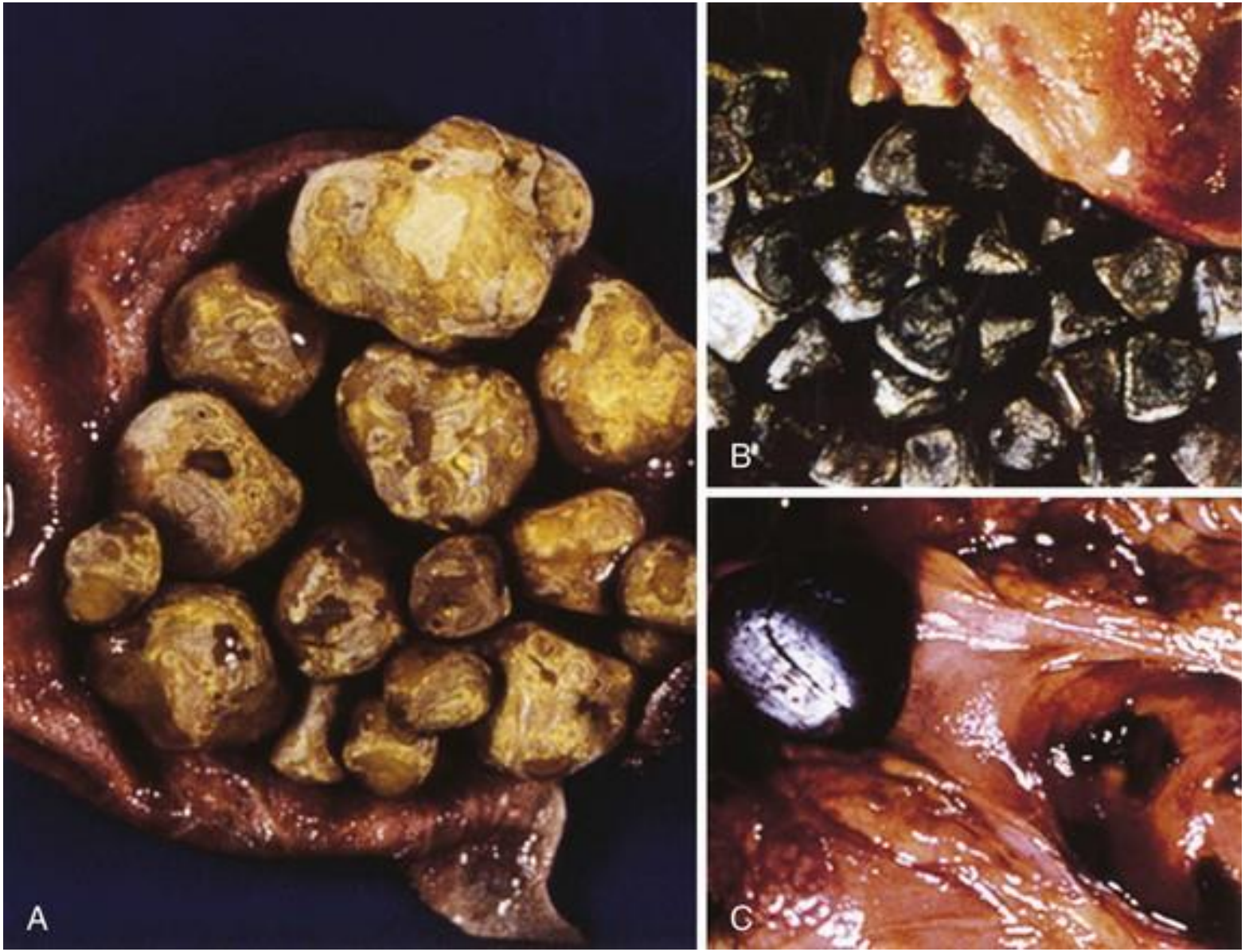
- Three compounds comprise 80-95% of the total solids dissolved in bile;
  - conjugated bile slats
  - lecithin
  - cholesterol

- Under normal conditions, a delicate balance occurs among the levels of bile acids, cholesterol, and phospholipids.
- A disparity in this balance, especially with the supersaturation of cholesterol, predisposes patients to the formation of lithogenic bile and the subsequent development of cholesterol-type gallstones.


100
0
80
20
60
40
40
60
20
80
0
100
Percent cholesterol
Percent lecithin
2 or more phases
(cholesterol crystals
and micellar liquid)
B
A
P
Micellar
liquid
C
100
80
60
40
20
0
Percent bile salt

- Pigmented gallstones are composed of calcium bilirubinate and appear in 2 major forms: black and brown.
- Pathogeneisis of cholesterol gallstones is clearly multifactorial ,but involves four factors:cholesterol supersaturation,crystal nucleation,gallbladder dysmotility,gallbladder absorption.

- Hemolysis and liver disease are associated with the black stones;
- the brown, earthy stones more frequently are formed outside the gallbladder and often are associated with bacterial infections of the biliary tract.


A
B
C

Mortality / Morbidity

- Related directly to the complications of the disease and its surgical treatment
- Approximately 10% patients with gallstones have common bile duct stones
- Gallstones can cause obstruction of the common bile duct, causing jaundice
- Cholangitis, a potentially life-threatening infection, can follow biliary obstruction

Mortality / Morbidity

- Obstruction of the neck of the gallbladder causes bile stasis, which can lead to inflammation and edema of the gallbladder wall.
- Sequelae of this condition include acute cholecystitis secondary to compromised lymphatic, venous, and, ultimately, arterial supply to the gallbladder.
- The latter can lead to gangrene or abscess formation.

- Women are more likely to develop gallstones than men, with a ratio of 2:1.

- Classically, gallstones occur in obese, middle-aged women, which leads to the popular mnemonic, fat fertile forties.

Risk factor
Increasing age
Female sex:
Pregnancies
Exogenous estrogens: oral contraceptives, menopausal hormone therapy
Genetics
Social factors:
Low social classes in Western countries
High social classes in Asian countries
Lifestyle factors
Obesity (BMI, waist circumference)
Abstinence of alcohol
Low physical activity
Diet: high caloric, high carbohydrate, low fiber (inconclusive results for smoking and coffee drinking)
Biomarkers
High insulin
High triglycerides (inconclusive results for total cholesterol and HDL cholesterol)

BMI, body mass index; HDL, high-density lipoprotein.

History

- Nausea, with or without vomiting, might be present.
- Certain foods, especially those with high fat content, can provoke symptoms.
- The patient might experience episodes of acute abdominal pain, called biliary colic.

Physical

- Murphy sign
  - pain on palpation of the right upper quadrant when the patient inhales might indicate acute cholecystitis
- Other signs of cholecystitis
  - fever
  - tachycardia

indication for prophylactic cholecystectomy

Gallstone Disease

Indications for Prophylactic Cholecystectomy

- Pediatric gallstones
- Congenital hemolytic anemia
- Gallstones >2.5cm
- Porcelain gallbladder
- Bariatric surgery
- Incidental gallstones found during intraabdominal surgery
- Recommended prior to transplantation

Complications of cholelithiasis

TABLE 2

Gallstone complications

Acute cholecystitis
Chronic cholecystitis
Choledocholithiasis
Acute cholangitis
Acute pancreatitis
Empyema in gallbladder
Obstructive jaundice
Choledochoduodenal fistula
Gallbladder perforation

Adapted from information in references 18 and 19.

Complications of cholelithiasis

- The physical examination might indicate complications of cholelithiasis.
  - Passage of gallstones from the gallbladder into the common bile duct can result in a complete or partial obstruction of the common bile duct.
  - Frequently, this manifests as jaundice.
  - In all races, jaundice is detected most reliably by examination of the sclera in natural for yellow discoloration.

Complications of cholelithiasis

- Pancreatitis, another complication of gallstone disease, presents with more diffuse abdominal pain, including pain in the epigastrium and left upper quadrant of the abdomen.

Complications of cholelithiasis

- Severe hemorrhagic pancreatitis occurs in 15% patients and carries a high mortality rate because of multisystem organ failure.
- In a few patients, the hemorrhagic pancreatic process and retroperitoneal bleeding induce discoloration around the umbilicus (Cullen sign) or the flank (Grey-Turner sign).

Complications of cholelithiasis

- Charcot triad
  - (right upper quadrant pain, fever, and jaundice)
  - associated with common bile duct obstruction and cholangitis
- Additional symptoms:
  - alterations in mental status and hypotension, indicate Raynaud pentad, a harbinger of worsening, ascending cholangitis.

Causes of cholelithiasis

- Prolonged fasting (5-10 days) can result in the formation of biliary sludge (microlithiasis) which resolves by itself when feeding is reestablished - but it can lead to biliary symptoms or gallstone formation

Lab Studies

- For patients with uncomplicated cholelithiasis, blood work results usually are normal.
- However, labs can detect complications of gallstone disease; complications might alter the course of treatment.

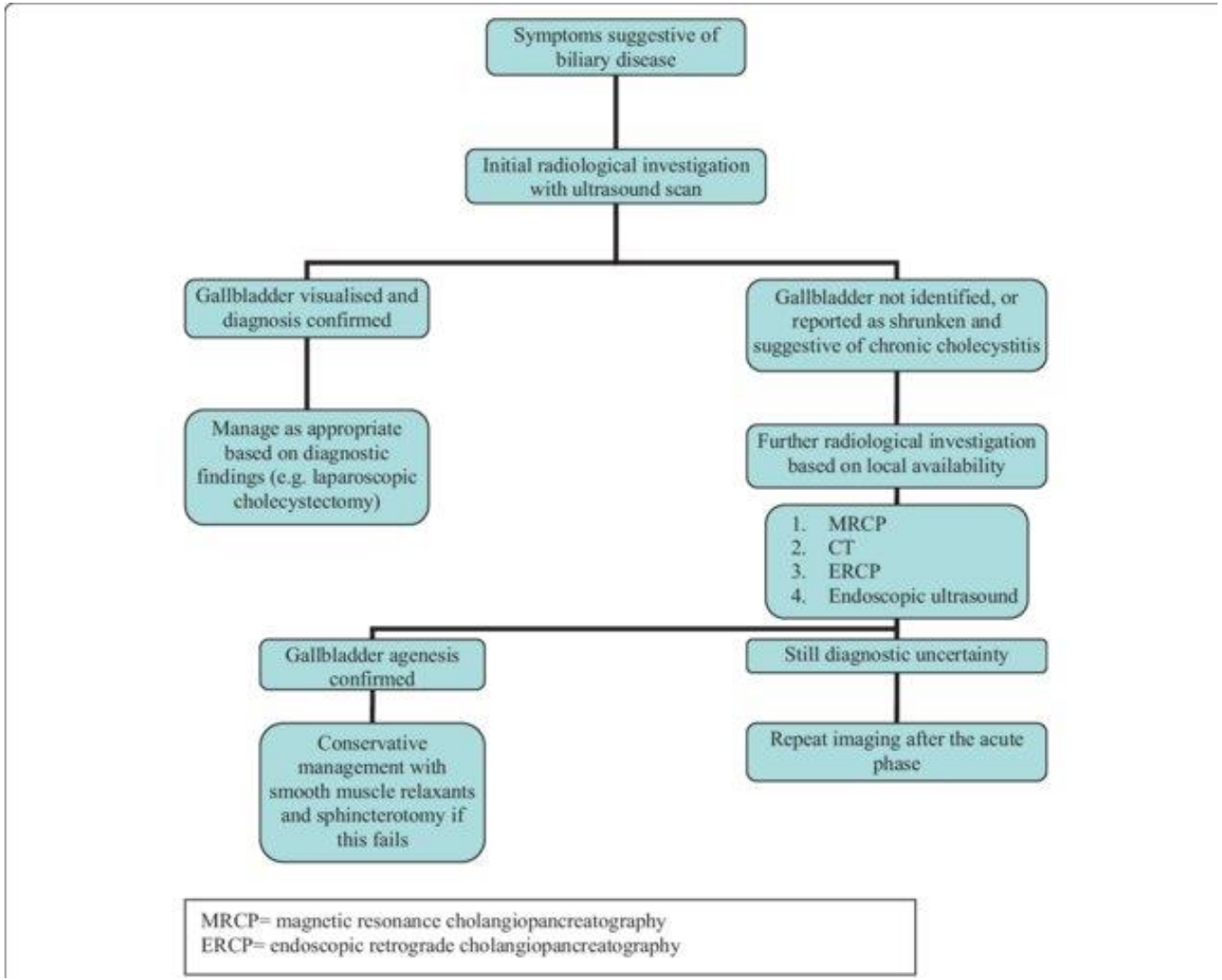
Lab Studies

- CBC
- chemistry panel, including electrolytes, liver enzymes, and bilirubin.
  - Choledocholithiasis can manifest with only elevation of serum alkaline phosphatase or bilirubin.
  - Nearly 50% of patients with symptomatic gallstone disease will have abnormal transaminases

Lab Studies

- Serum lipase and amylase levels are helpful in cases of diagnostic uncertainty or suspected concurrent pancreatitis

Radiological investigation of gallbladder



Imaging Studies

- X-rays
  - Approximately 15% of gallstones are radiopaque and can be visualized on plain x-ray.
  - A porcelain gallbladder (heavily calcified) should be removed surgically because of increased risk of gallbladder cancer.
  - Other causes of abdominal pain diagnosed with the assistance of x-rays include perforated viscus, bowel obstruction, calcific pancreatitis, and renal stones.

Imaging Studies

- Ultrasound (US) is the most sensitive and specific test for the detection of gallstones.
- US provides information about the size of the common bile duct and hepatic duct and the status of liver parenchyma and the pancreas.
- Thickening of the gallbladder wall and the presence of pericholecystic fluid are radiographic signs of acute cholecystitis

Imaging Studies

- CT scanning often is used in workup of abdominal pain without specific localizing signs or symptoms.
- CT scanning is not a first-line study for detection of gallstones because of greater cost and the invasive nature of the test.
- When present, gallstones usually are observed on CT scan.

Imaging Studies

- HIDA(A hepatobiliary iminodiacetic acid) scan does not detect gallstones
- HIDA scan identifies an obstructed gallbladder (eg, gallstone impacted in the neck of the gallbladder).
  - HIDA scan is the most sensitive and specific test for acute cholecystitis.
  - A poorly contracting gallbladder (biliary dyskinesia) might cause the patient's symptoms, and HIDA scan makes the diagnosis.
  - Acute acalculous cholecystitis is diagnosed most accurately with HIDA scan.

Treatment

- Removal of the gallbladder laparoscopic cholecystectomy is the treatment of choice for symptomatic gallbladder disease
- Only gallstones that cause symptoms or complications require treatment

Acute Cholecystitis

Acute Cholecystitis

- Cholecystitis is associated with gallstones in > 90% of cases
  - Inflammation develops behind a stone impacted in the cystic duct
- May be caused by infectious agents (cytomegalovirus, cryptosporidiosis, or microsporidiosis) common in AIDS patients

- Acalculous cholecystitis
  - should be considered in patient with FUO, RUQ pain occurring 2-4 weeks after major surgery

History

- Acute attack often follows a large, fatty meal
- sudden, steady pain in epigastrium or right hypochondrium - pain may steadily subside over a period of 12-18 hours
- vomiting - 75% Of cases
- RUQ tenderness associated with muscle guarding and rebound pain

History

- Palpable gallbladder 15% of cases
- Jaundice 25% of cases
  - also suggestive of choledocholithiasis
- Fever

Labs

- WBC - elevated (12-15,000 usuallly)
- Total serum bilirubin 1-4mg/dL
- Often elevated levels of:
  - serum aminotransferase
  - alkaline phosphatase
  - serum amylase

Imaging Studies

- X-ray
  - may show radiopaque gallstones 15% of cases
- HIDA Scan
  - useful for obstructed cystic duct
  - reliable if bilirubin < 5mg/dL
- Ultrasound
  - useful for gallstone visulization

Other Conditions

- Some disorders that may be confused with acute cholecystitis:
  - perforated peptic ulcer
  - acute pancreatitis
  - appendicitis (high lying appendix)
  - liver abscess
  - hepatitis
  - pneumonia w/pleurisy on right side
  - myocardial ischemia

- The localization of pain and tenderness in the right hypochondrium with radiation to the infrascapular area strongly favors the diagnosis of acute cholecystitis

Treatment

- Conservative tx regimen of
  - TPN
  - analgesics (Meperidine preferred drug- less spasm of sphincter of Oddi)
  - antibiotics

Treatment

- Due to high rate of recurrence
- cholecystectomy advised
  - cholecystectomy must be performed when evidence of gangrene or perforation is present

Choledocholithiasis & Cholangitis

Choledocholithiasis

- Choledocholithiasis - common bile duct stones
- Occur in 15% of patients with gallstones
- Increases with age - in elderly w/gallstones occurrence as high as 50%
- Usually condition goes unknown until obstruction occurs

History

- History suggestive of biliary colic or jaudice
- frequent/recurrent attacks of severe RUQ pain- duration of several hours
- severe colic - chills/fever

History

- Charcot’s Triad- classic picture of cholangitis
  - Pain
  - Fever
  - Chills

Imaging

- The most direct and accurate way to determine the cause, location, and extent of obstruction:
  - ERCP
  - percutaneous transhepatic cholangiography

Treatment

- Common duct stone in patient with cholelithiasis and cholecystitis is usually treated with endoscopic papillotomy and stone extraction - followed by laparoscopic cholcystectomy

Primary Sclerosing Cholangitis

- Rare disorder
- Characterized by diffuse inflammation of the biliary tract leading to fibrosis and strictures of the biliary system
- Most common - men aged 20-40

Primary Sclerosing Cholangitis

- Associated with histocompatible antigens HLA-B8 and -DR3 or -DR4 - suggestive of genetic etiologic role
- Sclerosing cholangitis may occur in AIDs patients from infections caused by CMV, cryptosporidium, or microsporum

Primary Sclerosing Cholangitis

- Symptoms -
  - progressive obstructive jaundice frequently associated with:
    - malaise, pruritus,anorexia and indigestion
    - Early detection in presymptomatic phase may occur due to elevated alkaline phosphatase level

Primary Sclerosing Cholangitis

- Complications of chronic cholestasis such as osteoporosis and malabsorption of fat-soluble vitamins may occur
- Diagnosis generally made by:
  - ERCP
  - magnetic resonance cholangiography

Primary Sclerosing Cholangitis

- Tx w/corticosteroids and broad spectrum antimicrobial agents yields inconsistent and unpredictable results
- Episodes of acute bacterial cholangitis may be treated with ciprofloxacin
- high dose ursodeoxycholic acid (20mg/kg/d) may reduce cholangiographic progression and liver fibrosis

Primary Sclerosing Cholangitis

- In patients with ulcerative colitis, primary sclerosing cholangitis is an independent risk factor for development of colorectal dysplasia and cancer- routine colonoscopic surveillance is advised

Primary Sclerosing Cholangitis

- For patients with cirrhosis and clinical decompensation, liver transplantation is the procedure of choice

Primary Sclerosing Cholangitis

- Survival of patients with primary sclerosing cholangitis averages 10 years once symptoms appear
- Adverse prognostic factors:
  - increased age
  - increased serum bilirubin
  - increased aspartate aminotransferase levels
  - low albumin levels
  - history of variceal bleeding

SEVERITY OF ACUTE PANCREATITIS, CHOLECYSTITIS AND CHOLANGITIS #TheAmylaseSchool @DeMadaria 2021

Disease Classification	Mild	Moderate	Severe
Acute pancreatitis Revised Atlanta Classification	No criteria for moderate or severe	Local complications (collection, peripancreatic fat and/or pancreatic necrosis) and/or transient OF* (≤48h) and/or exacerbation of previous comorbidity	Persistent (>48h) OF* * OF, at least 1: A) PaO2/FIO2<300 B) Creat ≥1.9 mg/dl C) Systolic BP <90mmHg despite fluid resuscitation
Acute cholecystitis Tokyo 2018	No criteria for moderate or severe	≥1 criteria: A) WBC count >18,000 B) Palpable tender mass in the right upper abdominal quadrant C) Complaints >72 h D) Marked local inflammation (gangrenous cholecystitis, pericholecystic abscess, hepatic abscess, biliary peritonitis, emphysematous cholecystitis)	≥1 criteria: A) Hypotension requiring dopamine ≥5 mcg/kg/min, or norepinephrine B) < consciousness C) PaO2/FIO2<300 D) Oliguria/creat >2 mg/dl E) PT-INR>1.5 F) Platelets <100,000
Acute cholangitis Tokyo 2018	No criteria for moderate or severe	≥2 criteria: A)WBC count <4,000 or >12,000 B)Fever ≥39º C) Age ≥75 D) BR ≥5mg/dl E) Albuminemia <(0.7x lower limit normal value)	≥1 criteria: A) Hypotension requiring dopamine ≥5 lg/kg per min, or norepinephrine B) < consciousness C) PaO2/FIO2<300 D) Oliguria/creat >2 mg/dl E) PT-INR>1.5 F) Platelets <100,000

Carcinoma of the biliary tract

Carcinoma of Biliary Tract

- Occurs in 2% of people surgically treated for biliary disease
- Insidious onset - usually discovered during surgery
- Cholelithiasis usually present

Carcinoma of Biliary Tract

- Other risk factors:
  - Chronic gallbladder infection with salmonella typhi
  - gallbladder polyps over 1cm
  - mucosal calcification of the gallbladder (porcelain gallbladder)
  - anomalous pancreaticobiliary ductal junction

Carcinoma of Biliary Tract

- Carcinoma of the bile ducts (cholangiocarcinoma) accounts for 3% of all US cancer deaths
- Effects both sexes equally
- More prevalent 50-70 age group

Carcinoma of Biliary Tract

- 2/3 Klatskin tumors - arise at the confluence of hepatic ducts
- 1/4 in the distal extrahepatic bile duct
- remainder are intrahepatic

Carcinoma of Biliary Tract

- Signs/symptoms:
  - Progressive jaundice
  - pain RUQ w/ pain radiating to back present in gallbladder CA but occurs later in course of bile duct carcinoma
  - anorexia, weight loss
  - fever, chills (due to cholangitis)

Carcinoma of Biliary Tract

- A palpable gallbladder w/obstructive jaundice usually is said to signify malignant disease (Courvoisier's Law): however this has only proved to be accurate 50% of the time
- Hepatomegaly, liver tenderness
- Pruritus

Labs

- Conjugated hyperbilirubinemia
- elevated alkaline phophatase
- elevated serum cholesterol
- AST may be slightly elevated
- CA19-9 (elevated level can help distinguish cholangiocarcinoma from benign biliary stricture)

Imaging Studies

- Ultrasound
- CT
- MRI
- MRCP

Treatment

- Laparoscopic cholecystectomy
  - 5 year survival for localized carcinoma of the gallbladder is as high as 80%
  - survival rates drop dramatically with more extensive disease
  - Carcinoma of the bile ducts is curable by surgery in < 10% of cases

Thank you