Biliary Tract Disease

HPB Division, Surgery Department of Ramathibodi Hospital MD.
Anatomy

- Intrahepatic bile duct
  - IHD
    - Primary
    - Secondary
- Extrahepatic bile duct
  - Rt & Lt HD
  - CHD
  - Cystic duct
  - GB
  - CBD
Anatomy (Intrahepatic)
Investigation in biliary tract disease

- Blood chemistry
  - LFT

- Imaging
  - Plain film
  - Ultrasound
  - CT scan
  - Cholangiogram
    - MRCP
    - ERCP
    - IOC
Investigation: Plain X-ray

- 15-40% of GS \(\rightarrow\) radiopaque

- Plain films are important to exclude other disease
  - PUP
  - bowel obstruction with dilated loops of bowel
  - right lower lobe pneumonia
Investigation: US

- Abdominal ultrasound
  - Ultrasound is initial investigation who suspected disease of biliary tree
  - Investigation of choice for GS specificity (>$98\%)$ and sensitivity (>$95\%)$
  - Limitation in distal CBD, pancreas, obesity, pain

Posterior acoustic shadow
Investigation: US

- **Obstructive jaundice**
  - Direct evidence of obstruction
    - Cause of obstruction with proximal bile duct dilatation
  - Indirect evidence of obstruction
    - Bile duct dilatation (CBD >8mm, IHD>4mm)
    - GS with bile duct dilatation
Investigation: CT or MRI

- CT or MRI
  - CT are inferior to U/S in diagnosing GS
  - Sensitivity of detect GS only about 55%
  - Diagnosis of choice in patient with suspected HPB neoplasm
Cholangiogram

- Radiograph of the bile ducts made after the ingestion or injection of media
- Gold standard for detect intra-bile duct lesion

- MRCP (Magnetic resonance cholangiopancreatography)
- ERCP (Endoscopic retrograde cholangiopancreatography)
- IOC (Intraoperative cholangiography)
Cholangiogram: MRCP

Reconstruction bile duct anatomy by magnetic resonance machine

- Non invasive
- Can’t Rx procedure
Cholangiogram: ERCP

- Visualize ampulla
- Do Rx procedure
  - Biopsy
  - Stent
  - Remove stone

- Invasive
- Complication (5%)
  - Perforation
  - Bleeding
  - Pancreatitis
  - Cholangitis
Cholangiogram: IOC

- Useful in operative field, when need to visualize bile duct
  - Via cystic duct
Benign disease

- Benign
  - GS, GS with sequelae
  - Acalculous cholecystitis
  - CBD stone, CBD stone with sequelae
  - IHD stone
  - Choledochal cyst
Biliary tract diseases

Acalculous cholecystitis
CBDS
GS
IHDS
Choledochal cyst

Asymptomatic
AC
Sympatomatic

Emphysematous
Empyema
Chronic
Perforation

GS ileus
Fistula
CA GB
Mirizzi
Gallstone
Gallstone

- Inability to maintain certain biliary solutes, primarily cholesterol and calcium salts, in a solubilized state.
- Gallstones are classified by their
  - Cholesterol
    - Mixed (70%)
    - Pure (10%)
  - Pigment stones (20%)
    - black
    - brown
Gallstone

- Asymptomatic
- Symptomatic
- Sequelae or complication
  - Acute cholecystitis
    - Gangrenous cholecystitis
    - Gallbladder perforation
    - Empyema gallbladder
    - Emphysematous gall bladder
  - Chronic calculous cholecystitis
    - Cholecystoenteric fistula \(\rightarrow\) GS ileus
    - Mirizzi’s syndrome
Asymptomatic

- Check up
- **1% - 2%** develop symptoms or complications related to their gallstones per year
- Over a 20-year period, **2/3 of asymptomatic patients with gallstones remain symptom-free**
- Rx : Expectant
Symptomatic gallstone (SGS)

- Biliary colic
  - Steady pain (*not colic*)
  - Epigastrium or RUQ
  - Usually lasts 1 to 5 hours, but subsides by 24 hours
  - 50% association with meal
  - Radiate to right shoulder or scapula
  - No peritoneal findings
  - No SIRS
Symptomatic gallstone (SGS)

- **Natural**
  - 10 - 20% develop symptoms or complications related to their gallstones per year

- **Treatment**
  - Elective cholecystectomy (LC)
  - Avoid dietary fats and large meals while awaiting surgery
Surgery in asymptomatic GS

- **Indication (Absolute)**
  - Risk of CA GB
    - Porcelian GB
    - GS >3cm
    - GB polyp > 1cm

- **Indication (Relative)**
  - Can’t assessed to hospital
  - Splenectomy in hemolytic disease
    - Hereditary spherocytosis
    - Sickle cell anemia
    - Thalassemia
Gallstone

- Asymptomatic
- Symptomatic

- Sequelae or complication
  - Acute cholecystitis
    - Gangrenous cholecystitis
    - Gallbladder perforation
    - Empyema gallbladder
    - Emphysematous gall bladder
  - Chronic calculous cholecystitis
    - Cholecystoenteric fistula → GS ileus
    - Mirizzi’s syndrome
Acute cholecystitis

- **Mechanism**
  - Obstruction of cystic duct by gallstone (80%) → Calculous cholecystitis
  - No cholelithiasis in 20% (acalculous) → Acalculous cholecystitis
Sign & Symptom

Abdominal pain
- Seem to be biliary colic but constant
  > 12 hr

Peritoneal sign
- Murphy’s
- Guarding
- Mass

SIRS
- Fever
- Leukocytosis
Investigation

- CBC
  Leukocytosis (PMN or band)

- LFT
  Transaminases $\Leftrightarrow$ or slightly increase
  ALP $\Leftrightarrow$
  Bilirubin $\Leftrightarrow$

- Ultrasound
  GB distenstion
  GB wall thickening
  Pericholecystic fluid
  Gallstone
Ultrasound
Treatment of AC

- Stabilized patient
  - IV rehydration, Correct metabolic disorder
  - ATB IV: Ceftriaxone + Metronidazole

- Early cholecystectomy (LC) within 48-72 hr
- GB drainage (Cholecystostomy)
- Interval cholecystectomy (next 6 to 10 weeks)

Gold standard

Not recommend
LC. VS OC.

- LC
  - แผลเล็กกว่า
  - ปวดแผลน้อยกว่า
  - Ambulate ได้เร็วกว่า
  - นอนรพ. น้อยกว่า
  - ค่าใช้จ่ายแพงกว่า

- OC
  - แผลใหญ่กว่า
  - ปวดแผลมากกว่า
  - Ambulate ได้ช้ากว่า
  - นอนรพ. นานกว่า
  - ค่าใช้จ่ายถูกกว่า
Gallstone

- Asymptomatic
- Symptomatic

**Sequelae or complication**

- **Acute cholecystitis**
  - Gangrenous cholecystitis
  - Gallbladder perforation
  - Empyema gallbladder
  - Emphysematous gall bladder

- **Chronic calculous cholecystitis**
  - Cholecystoenteric fistula → GS ileus
  - Mirizzi’s syndrome
Gangrenous cholecystitis

- **Sequelae or complication**
  - **Acute cholecystitis**
    - *Gangrenous cholecystitis*
    - Gallbladder perforation
    - Empyema gallbladder
    - Emphysematous gallbladder
  - **Chronic cholecystitis**
    - Cholecystoenteric fistula $\rightarrow$ GS ileus
    - Mirrizi’s syndrome

![Diagram of gallbladder with gallbladder distension, increased intraluminal pressure, gall stone impacted in Hartmann’s pouch, fluid secretion, and prostaglandin $I_2$ and $E_2$ secretion.](image)
Empyema gallbladder

- **Sequelae or complication**
  - Acute cholecystitis
    - Gangrenous cholecystitis
    - Gallbladder perforation
    - Empyema gallbladder
    - Emphysematous gallbladder
  - Chronic cholecystitis
    - Cholecystoenteric fistula → GS ileus
    - Mirrizi’s syndrome

Abscess in GB
Emphysematous cholecystitis

- Sequelae or complication
  - Acute cholecystitis
    - Gangrenous cholecystitis
    - Gallbladder perforation
    - Empyema gallbladder
    - **Emphysematous gallbladder**
  - Chronic cholecystitis
    - Cholecystoenteric fistula $\rightarrow$ GS ileus
    - Mirrizi’s syndrome

**Gas-forming organisms bacterial infection**
Clinical

- Severe
  - Hypotension
  - Disturbance of consciousness
  - Sepsis

Compromised host

Abdominal pain
- Seem to be biliary colic but constant >12 hr

Peritoneal sign
- Murphy’s
- Guarding
- Mass

Gangrenous cholecystitis
- Empyema gallbladder
- Emphysematous gallbladder

SIRS
- Fever
- Leukocytosis
Chronic Calculous Cholecystitis

- Acute cholecystitis
  - Gangrenous cholecystitis
  - Gallbladder perforation
  - Empyema gallbladder
  - Emphysematous gallbladder

- Chronic cholecystitis
  - Cholecystoenteric fistula
  - Mirrizi’s syndrome

Chronic calculous cholecystitis

- Ongoing inflammation or recurrent episodes of inflammation
- U/S: Contracted, thick-walled GB
- Treatment as SGS ➔ Elective LC
Cholecystoenteric fistula

- Sequelae or complication
  - Acute cholecystitis
    - Gangrenous cholecystitis
    - Gallbladder perforation
    - Empyema gallbladder
    - Emphysematous gallbladder
  - Chronic cholecystitis
    - Cholecystoenteric fistula → GS ileus
    - Mirrizi’s syndrome

- The most common sites for fistulas are the duodenum (80%) and the hepatic flexure of the colon (20%)
Gallstone ileus

- Gallstone ileus = Misnomer
- Passage of a stone biliary-enteric fistula leading to a mechanical bowel obstruction
- Most common point of obstruction = Ileocelecal valve

Bouveret’s syndrome = passage of stone biliary-enteric fistula leading to duodenal obstruction
Clinical

- Cardinal sign of small bowel obstruction or gastric outlet obstruction
  - Obstipation
  - N/V
  - Abdominal pain
  - Abdominal distension
- HX of biliary colic

Investigation?
- Rigler triad
  - Aerobilia (Pneumobilia)
  - Intestinal obstruction
  - Abnormal ectopic of GS

Figure) Gallstone ileus pre-lithotripsy
Merizzi’s syndrome

- **Sequela or complication**
  - Acute cholecystitis
    - Gangrenous cholecystitis
    - Gallbladder perforation
    - Empyema gallbladder
      - Emphysematous gallbladder
  - Chronic cholecystitis
    - Cholecystoenteric fistula → GS ileus
    - Mirrizi’s syndrome

- Obstruction of CHD secondary to an impacted GS in cystic duct
Clinical

- Obstructive jaundice
- History of biliary colic

U/S
- Impact GS at cystic duct
- IHD dilatation
- CBD not dilatation
Benign disease

- Benign
  - GS, GS with sequelae
  - Acalculous cholecystitis
  - CBD stone, CBD stone with sequelae
  - IHD stone
  - Choledochal cyst
Acute Acalculous Cholecystitis

- 5-10% of all patients with acute cholecystitis
- Occur in
  - elderly and critically ill patient
  - burns
  - long-term parenteral nutrition
  - major operations such Ex. AAA repair, cardiopulmonary bypass
- Gallbladder stasis and ischemia have been implicated as causative factors
- Radiologic findings are also similar except for the absence of gallstones
- Treatment was same as calculous cholecystitis
Acute Acalculous Cholecystitis

- Dehydration
- Shock
- Sepsis
- Massive transfusion

Comorbidity (cancer, diabetes mellitus, or vascular disease)

- Microvascular occlusion and hypercoagulability

- Acalculous cholecystitis
Benign disease

- Benign
  - GS, GS with sequelae
  - Acalculous cholecystitis
  - CBD stone, CBD stone with sequelae
  - IHD stone
  - Choledochal cyst
Biliary tract diseases

- Acalculous cholecystitis
- CBDS
- GS
- IHDS
- Choledochal cyst
  - Asymptomatic
  - Pancreatitis
  - Obstruction
    - Partial
    - Biliary colic
  - Cholangitis
    - Complete
    - Obstructive Jx
Choledocholithiasis
(CBD Stone)
Choledocholithiasis

- Secondary CBD stone (80%)
  - GS migrate to CBD

- Primary common bile duct stones (20%)
  - Originate within the biliary tract
CBD stone

- Asymptomatic
- Symptomatic
- Complication
Investigation

- **LFT**
  - ALP \(\uparrow\)
  - Bilirubin \(\uparrow\)
  - Transaminases \(\leftrightarrow\) or slightly increase
  - 1/3 of CBD stone are normal LFT

Obstructive Jx pattern
Investigation

- **Ultrasonography**
  - Commonly the **first test**
  - GS or CBD stone
  - A dilated CBD (>8 mm in diameter), IHD
  - **Limited at distal CBD**

- **MRCP**
  - Sensitivity 95%, Specificity 89%

- **ERCP**
  - Sensitivity 91%, Specificity 100%
Treatment (2CBD stone)

- Minimally invasive in two operation
  - ERCP → Discharge → Admit for elective LC
- Minimally invasive in single operation
  - LC → ERCP or ERCP → LC
  - LC → Lap CBDE
  - High risk for conversion, Need surgical experience
  - Shortest hospital stay and cost-effectiveness
- Opened technique in single operation
  - OC + CBDE (CBD exploration)
- Other
  - Percutaneous transhepatic stone removal → LC
Treatment (2CBD stone)

- Minimally invasive in two operation
  - ERCP $\rightarrow$ Discharge $\rightarrow$ Admit for elective LC

- Minimally invasive in single operation
  - LC $\rightarrow$ ERCP or ERCP $\rightarrow$ LC
  - LC $\rightarrow$ Lap CBDE
  - High risk for conversion, Need surgical experience
  - Shortest hospital stay

- Opened technique in single operation
  - OC + CBDE (CBD explorartion)

- Other
  - Percutaneous transhepatic stone removal $\rightarrow$ LC
Sequelae of CBD stone

- Cholangitis
- GS pancreatitis
Cholangitis
Acute Cholangitis

- Ascending bacterial infection in association with partial or complete bile duct obstruction
  - Benign
  - Malignant
- Most common organism
  - *E. Coli*
  - *Klebsiella*
  - *Streptoccus faecalis*
  - *Bacteroides fragilis*
- Bile is kept sterile by continuous bile flow and antibacterial substance in bile

Increased bile duct pressure
Clinical

- Charcot’s triad (present 2/3 of patient)
  - Fever
  - Epigastrium or RUQ pain
  - Jaundice

- Reynold’s pentad (Toxic or suppurative cholangitis)
  - Fever
  - Epigastrium or RUQ pain
  - Jaundice
  - Shock
  - Mental status change
Investigation

- **LFT**
  - ALP \uparrow
  - Bilirubin \uparrow
  - Transaminases \leftrightarrow or slightly increase
  - 1/3 of CBD stone are normal LFT

- **CBC**
  - Leukocytosis

- **Ultrasound**
  - Direct or indirect evidence of bile duct obstruction

**Obstructive Jx pattern**
Treatment

- IV ATB (Ceftriaxone + Metronidazole)
- Fluid resuscitation
- Treatment cause of obstruction as soon as possible

Patient who not response to ATB (15%) or Toxic cholangitis

Emergency biliary drainage

ERCP, PTBD, T-tube
Treatment

Cholangitis

- Non-toxic
  - IV ATB
  - Biliary drainage ASAP

- Toxic
  - Emergency biliary drainage
  - IV ATB
  - PTBD
  - ERCP
  - Surgery
Benign disease

- Benign
  - GS, GS with sequelae
  - Acalculous cholecystitis
  - CBD stone, CBD stone with sequelae
  - Choledochal cyst
  - IHD stone
Malignant condition

- Cholangiocarcinoma (CCA)
- Periampullary CA
  - Gallbladder carcinoma
CCA

- Arising from biliary epithelium
- Risk factor
  - Sclerosing cholangitis
  - Choledochal cyst
  - Ulcerative colitis
  - Hepatolithiasis
  - Liver fluke
Classification

- **Anatomically**
  - Intrahepatic
  - Perihilar or hilar (Klaskin’s tumor)
    - Most common (2/3 of all patient)
  - Distal common bile duct

- **Morphology**
  - Nodular (Most common)
  - Scirrhous
  - Diffusely infiltrating
  - Papillary
Intrahepatic CCA

- CT: Heterogenous delay enhancing with proximal IHD dilatation

FIGURE 2. CT findings for intrahepatic mass-forming cholangiocarcinoma. Note large, low-attenuating mass with irregular borders (arrows), focal dilatation of intrahepatic ducts(*), capsular retraction, and satellite nodules.
Perihilar or hilar
(Klaskin’s tumor)
Perihilar or hilar (Klaskin’s tumor)

I = Confined in CHD, Not involved confluence

II = Involved confluence But not invade secondary IHD

IIIa = Invade to Rt secondary IHD

IIIb = Invade to Lt secondary IHD

IV = Invade to Bilat secondary IHD

Bismuth-Corlette classification
Clinical

- Obstructive jaundice
  - More than 90% of patients with perihilar or distal tumors
  - Patients with intrahepatic cholangiocarcinoma are rarely jaundiced

- Less common presenting clinical features
  - pruritus, fever, mild abdominal pain, fatigue, anorexia, and weight loss.
Diagnosis

- **Tumor Marker**
  - CA19-9: If $>129$ U/mL $\rightarrow$ Sensitivity 79%, Specificity 98%
  - CEA: $>5$ U/mL

  But can be seen in cholangitis, other GI & GYN malignancy

- The initial test are usually ultrasound $\rightarrow$ CT
- Cytology or biopsy were unreliable

Patient with potential resectable should be offered surgical exploration based on radiographic finding and clinical suspicion
Diagnosis

- Perihilar, Distal CBD
  - Imaging: CT
  - +/- bile cyto, +/- brush cyto, +/- Transampullar biopsy
  (sensitivity in detecting a malignancy is low, and a benign result should be considered unreliable)

- Intrahepatic
  - Imaging: CT scan
Treatment: Curative

- Intrahepatic
  - Treat as hepatoma
  - Resection if possible

- Perihilar
  - Types I, II, III = Hilar resection with hepatectomy
    (Bile duct excision + Portal lymphadenectomy + Cholecystectomy)
    - Type IV = Palliative

- Distal CBD
  - Whipple operation
Treatment: Curative

- Intrahepatic
  - Treat as hepatoma
  - Resection if possible

- Perihilar
  - Type I, II, III = Hilar resection with hepatectomy
    (Bile duct excision + Portal lymphadenectomy + Cholecystectomy)
  - Type IV = Palliative

- Distal CBD
  - Whipple operation
Treatment: Curative

- **Intrahepatic**
  - Treat as hepatoma
  - Resection if possible

- **Perihilar**
  - Type I, II, III = Hilar resection with hepatectomy
    (Bile duct excision + Portal lymphadenectomy + Cholecystectomy)
  - Type IV = Palliative

- **Distal CBD**
  - Whipple operation
Distal CBD

- Whipple operation (Pancreaticoduodenectomy)
Treatment: Palliative

- **Biliary drainage**
  - External: PTBD
  - Internal: ERCP with biliary stent

- **Chemo, RT**
  - No benefit
Palliative: PTBD

- Percutaneous Transhepatic Biliary Drainage
Palliative: Stent
Malignant condition

- Cholangiocarcinoma (CCA)
- Periampullary CA
- Gallbladder carcinoma
Periampullary CA

- 1. Distal CCA
- 2. CA head of pancreas
- 3. Ampullary CA
- 4. CA duodenum

Treatment

- Whipple’s operation
Courvoisier ‘s law

If in present of jaundice the GB is palpable, the jaundice is unlikely to be due to stone.
Courvoisier’s law

If in present of jaundice the GB is palpable, the jaundice is unlikely to be due to stone

If obstructive jaundice from CBD stone (2°CBD stone) it’s not usually complete obstruction and GB is usually thickened and fibrotic and

Remember, 50% of dilated GB can’t be palpated on PE