Liver Disease

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General Introduction
• Liver is the largest gland in humans.
• It lies in the right upper quadrant of the abdomen. In adult, the liver weighs about 1500gm and about 5% of the body weight of a newborn.
• The most common liver diseases are tumor (benign, malignant), abscess, liver cirrhosis, cyst, etc.
Anatomy
• The peritoneal duplications on the liver surface are referred to as ligaments. The liver connects the diaphragm and abdomen wall with falciform, coronary (whose lateral margins on either side are the right and left triangular ligaments), umbilical ligament. It is adjacent to the gallbladder, colon, kidney, duodenum, stomach, adrenal gland esophagus. The reflections of peritoneum forms gastrohepatic and hepatoduodenal ligaments which attach the liver to the stomach and duodenum.
• The hepatoduodenal ligament contains the hepatic artery, portal vein, extrahepatic biliary ducts, lymphatic duct, lymph node and nerve. Dual blood supplying systems provide the liver oxygen & nutrients, portal vein and hepatic artery. The former provides about 75% blood supply and the artery provides about 25%. Most of the hepatic effluent drains into the three major hepatic veins, right, middle and left. In the most of person, the middle vein joins the left vein (80%).
Morphologic Anatomy

The classic morphologic liver with division into right and left lobes, as seen topographically. These true lobes are bound toward the inferior aspect by the transverse fissure posteriorly. The portion of the right lobe anterior to this point is the quadrate lobe, limited on the left by the umbilical fissure and on the right by the gallbladder fossa. Posterior to the right lobe is the fourth lobe, the caudate (spigelian) lobe, separated by the lesser omentum.
The term *functional anatomy* refers to the description of hepatic segmentation that is the real anatomic basis for modern hepatic surgery.

The description by Couinaud is the most complete and, although it appears complex at first, its exactness has been proven useful by its extensive application to liver surgery.
• *Cantle line*-anteriorly at the middle of the gallbladder bed and posteriorly at the left of the vena cava, separates the liver into two parts—the right and left hemilivers.
The right glissonian pedicle divides into anterior and posterior portions. The right anterior branch arises immediately from the upper right pedicle, running in a frontal plane before dividing into ascending and descending branches for segments 5 (inferior) and 8 (superior)
Organization of the Left Liver

- The intrahepatic portion of the left glissonian pedicle gives rise to branches that lead to segments 2, 3, and 4.
Organization of Segment 1 (Caudate Lobe)

- From the functional viewpoint, segment 1 is autonomous. Its vasculature is independent of the glissonian division and of the three hepatic veins.
Lab and image examination
assessment of liver function

- Routine test: bilirubin (direct/indirect). Liver transaminimase (ALT & AST)
- Alkaline phosphatase, albumin, transferrin,
- Prothrombin time (PT)
- Quantitive assessment: lidocaine metabolite formation (MEGX test); ICG metabolic test
- Specific test: hepatitis marker (HAV, HBV, HCV, HEV etc), tumor marker AFP, CEA
Various liver function tests, alone or in combination, have been touted as useful for predicting risks of surgery including liver resection. Single serum measures that have been correlated with outcome include serum bilirubin and serum alanine aminotransferase.

The best-validated predictor of surgical morbidity and mortality in patients with cirrhosis is the Child-Pugh score, which incorporates ascites, bilirubin, albumin, prothrombin time, and encephalopathy.
• B-US: inexpensive, noninvasive, readily accepted by patients, is commonly used in screening and follow up. IOUS is more sensitive, can find lesions less than 3mm
• CT: the most important diagnostic imaging instrument, especially the spiral CT & enhanced CT
• MRI (magnetic resonance imaging)
Liver

Abscess
Liver abscess is caused by bacterial or amebic infection; both of them have some common manifestation, fever, liver region ache and hepatomegaly. More recent studies have suggested small but significant increases in the incidence of pyogenic liver abscess (as high as 22 per 100,000 hospital admissions). This may reflect better, more available, and more frequently used high-quality imaging techniques.

Pyogenic hepatic abscesses constitute over 80% of liver abscesses, the rest primarily being amebic in nature.
Pyogenic liver abscess
Etiology
In general, the pathophysiology of liver abscess involves two basic elements. The presence of the organism and the vulnerability of the liver. The organism infects the hepatic parenchyma through: 1) portal system 2) ascending from the biliary tree 3) the hepatic artery during generalized septicemia 4) direct extension from Para hepatic infection 5) a direct route after trauma 6) Cryptogenic abscess
Most organisms enter the liver through the portal routes. Hepatic clearance of the portal bacteria is a very common event in healthy persons. In general the human liver remains sterile in most circumstances. But when the introduction of other factors occurs, such as necrotic tissue, hepatic injury, malignant tumor, poor perfusion or congenital or acquired biliary or vascular obstruction, the infection may be induced.
The portal venous system drains the gastrointestinal tract, and therefore any infectious disorder of the gastrointestinal tract can result in an ascending portal vein infection (pylephlebitis) with exposure of the liver to large amounts of bacteria. The most common causes of pylephlebitis are diverticulitis, appendicitis, pancreatitis, inflammatory bowel disease etc.
Hepatic infections from the biliary tree are presently the most common identifiable cause of hepatic abscess. Biliary obstruction results in bile stasis, with the potential for subsequent bacterial colonization, infection, and ascension into the liver. This process is known as ascending suppurative cholangitis. The nature of biliary obstruction is mostly related to stone disease or malignancy. In Asia, intrahepatic stones and cholangitis are a common cause, whereas in the Western world, malignant obstruction is becoming a more predominant factor.
Any systemic infection (e.g., endocarditis, pneumonia, osteomyelitis) can result in bacteremia and infection of the liver via the hepatic artery. Multiple microabscess formation is a relatively common finding at autopsy in patients dying of sepsis, but these patients are generally not included in analyses of pyogenic liver abscess.
• Hepatic abscess can be the result of direct extension of an infective process. Common examples of this include suppurative cholecystitis, subphrenic abscess, perinephric abscess, or even perforation of the intestine directly into the liver.

• Penetrating and blunt trauma can result in an intrahepatic hematoma or an area of necrotic liver that can subsequently develop into an abscess. Bacteria may have been introduced from the trauma, or the affected area may be seeded from systemic bacteremia. Hepatic abscesses associated with trauma can present in a delayed fashion, up to weeks after the injury.
Despite advance in diagnostic techniques, no probable cause of hepatic abscess has been identified in 13 to 35% of cases. In a series from 1996, 45% of hepatic abscesses were cryptogenic (no cause for a hepatic abscess is found). Possible explanations for cryptogenic hepatic abscess are undiagnosed abdominal pathology, resolved infective process at the time of presentation, or host factors such as diabetes or malignancy rendering the liver more susceptible to transient hepatic artery or portal vein bacteremias.
• Iatrogenic reason: Patients undergoing hepatic arterial chemoembolization (HACE), when the liver cancer is unresectable. But this treatment could introduce an important new cause for pyogenic abscesses, due to hepatic cell death
Pathology and Microbiology
The organisms that cause the liver abscess are bacteria, fungi, virus (CMV), amebia etc. Many hepatic abscesses are polymicrobial and account for about 40% of cases. Anaerobic organisms are involved 40% to 60%. The most common organisms cultured are Escherichia coli and Klebsiella pneumoniae. Other common organisms encountered are Staphylococcus aureus, Enterococcus species, Streptococcus viridans.
The abscess usually occurs in the right lobe. The reason for this is probably the streaming of the superior mesenteric vein fraction of portal flow to the right lobe of the liver as well as its relatively greater volume. Abscesses vary from less than a millimeter to several centimeters. They always appear honeycombed lesion. Grossly, hepatic abscesses appear yellowish compared with the normal. The liver is usually enlarged and on palpation may reveal fluctuant
Diagnosis
Clinical manifestation

• The clinical signs are not specified. The patients often suffer from chill, fever, right upper quadrant pain, nausea, fatigue, anorexia. Fever, chills, and abdominal pain are the most common presenting symptoms. It should be considered during the differentiation in fever with unknown origin (FUO).

• Physical examination, right upper quadrant tenderness, fever, hepatomegaly, pouching pain may be found in abscess patient.
• Lab examination may show leucocytosis, liver enzyme abnormality.
• In abdominal plain x-ray right-sided atelectasis, elevated right diaphragm, pleural effusion.
B-us and CT can find the abscess cavity and make localization diagnosis. The sensitivity of ultrasound in diagnosing hepatic abscess is 80% to 95%.

CT is the most sensitive imaging for the detection of hepatic abscesses. The sensitivity of CT in diagnosing hepatic abscess is 95% to 100%. Enhanced CT should be taken to rule out the liver tumor. When the diagnosis of liver abscess is determined, but the organism that cause the disease is confused. B-us or CT guided fine needle aspiration is useful to confirm the origin: bacterial or amebic abscess.
• MRI does not appear to have any distinct advantage over CT in diagnosing hepatic abscess. Magnetic resonance imaging (MRI) is now established as a useful additional tool in the diagnosis and follow-up of hepatic abscesses.
Large hepatic abscess. Note presence of pleural effusion, and air and gas within segments 7 and 8 of the right liver.
A: MRI demonstrating multiloculated hepatic abscess (*thin arrows*) secondary to a blocked stent inserted for cholangiocarcinoma (*broad arrows*).

B: Axial T2 weighted MRI of the same patient also demonstrating the abscess (*thin arrows*) and a blocked stent within the common bile duct (*broad arrows*).
• Differential diagnosis:
  1 bacterial or amebic, which will be discussed in the text of internal medicine.
  2 liver tumor
Treatment

Untreated pyogenic Abscesses are fatal in 95-100% patients due to rupture, sepsis, or both which usually cause septic shock and death.
• The principles of management of pyogenic liver abscess must consider both the abscess and the underlying cause.

• First, the abscess must be managed, most often with a drainage procedure. In addition, antimicrobial therapy is essential in the treatment of pyogenic abscesses.

• Second, the initiating process must be identified and managed to ensure that recurrence is avoided.

• Therefore, the guiding principles for surgical management prevail: Diagnosis, Drug, and Drainage.
– General treatment: rest, maintain the balance of fluid, electrolyte, to treat the high fever etc.

• Antibiotic treatment, combined antibiotic treatment is reasonable; include anti-anaerobic, eg. mitronidazole.

• Drainage: include open drainage and percutaneous drainage. The pus should be cultured to find out the organism which can guide the antibiotic choices.

• Hepatic resection: especially in granulomatous mass or liver malignancy
Five treatment modalities are available for pyogenic liver abscesses. They are indicated in different clinical scenarios; however, in general, they represent a sequential approach to treatment.
• Parenteral broad-spectrum antibiotic therapy alone
• Percutaneous needle aspiration and antibiotic therapy: Single or repeated
• Percutaneous catheter drainage and antibiotic therapy
• Laparoscopic drainage with antibiotic therapy
• Laparotomy with intraoperative drainage and antibiotic therapy
• A trial of antibiotics alone should be reserved for patients with multiple small abscesses, low risk of abscess rupture, and lack of toxemia

• The first-line treatment for most patients with a pyogenic liver abscess should be percutaneous aspiration and antibiotic therapy

• Percutaneous catheter drainage with ultrasonography or CT guidance is indicated for patients for whom aspiration fails
Contraindications to percutaneous catheter drainage include coagulopathy, the lack of a safe or appropriate access route, and multiple macroscopic abscesses.
Operative drainage of pyogenic hepatic abscesses is indicated for the following patients: (a) patients who require laparotomy for the underlying problem, (b) those in whom percutaneous catheter drainage fails, and (c) patients with contraindications to percutaneous drainage (d) Patients whose liver abscesses rupture into the peritoneum also require laparotomy.