Liver

Anatomy of Liver

- Largest organ
- Right upper quadrant
- Having large right lobe and smaller left lobe
- Functional anatomy: “Couinaud” : Divided into 2 lobes along the line passing between gall bladder fossa and middle hepatic vein. “Cantil’s line”
- 8 segments

I – IV -------functional left lobe V – VII -----Functional right lobe

- Ligaments that fix the liver in its place:
  
  Left triangular ligament
  
  Right triangular ligament
  
  Falciform ligament
  
  Lesser omentum (hepatoduodenal ligament)

- Hilum of liver:
  
  Bile duct
  
  Hepatic artery
  
  Portal vein

- Foramen of Winslow:
  
  Anterior: CBD, HA, PV
  
  Posterior: IVC
  
  Upper: Liver
  
  Lower: duodenum
• Liver Blood supply:
  Portal vein 80%
  Hepatic artery 20%
• Internal anatomy of the liver
  Liver Lobule: the functional Unit within liver segments
• Embryology
  Foregut
  Hepatocytes
  Biliary passages
  Septum transversum
  Kupffer cells

**Liver Functions**

- Metabolism of bilirubin
- Formation of bile;
- Water, electrolytes, bile pigments, bile salts, phospholipids (lecithin), and cholesterol.

Metabolism of bilirubin

Investigations of liver

**Liver Function tests:**
**USED TO**
- Detect presence of liver disease
- Distinguish among different types of liver diseases
- Gauge the extent of known liver damage
- Follow the response of treatment

**Tests for excretory function**
- Serum bilirubin
- Urine bilirubin
• Blood ammonia

Tests that indicate liver cell injury
Serum enzymes:
• AST
• ALT
• Gamma-glutamyl transpeptidase

Serum Enzymes – that reflect cholestasis
• Serum Alkaline phosphatase
• 5’Nucleotidase

Tests that measure Biosynthetic function of liver
• Serum Albumin
• PT ,INR

Imaging of liver

Ultrasound: First line test
Useful for:
• Liver SOL
• State of biliary passages
• As a guide for needle liver biopsy or catheterization.

Doppler Ultrasound:
• Blood flow
• Vascularity of liver tumors

Computerized tomography (CT scan):
• Triple-phase spiral CT is the gold standard imaging modality of liver.
• Liver lesions down to 1cm
• Its density can be measured
• Vascularity of lesion---contrast

Magnetic resonance imaging
• More or less similar to CT scan
• Its advantages:
  o No radiation
  o No contrast of value in allergy to iodine
Magnetic resonance cholangiopancreatography (MRCP):
- Provide excellent quality imaging of biliary tracts noninvasively

Magnetic resonance angiography “MRA“:
- Provide high quality images of portal veins and hepatic arteries without the need for cannulation.

Endoscopic retrograde cholangiopancreatography (ERCP)
- Diagnosis
- Therapeutic
- Indications:
  - Obstructive jaundice? Aetiology
  - An imaging suggested abnormality in biliary tracts
- Preparation:
  - Checking coagulation state; PT, INR
- Informed consent:
  - Pancreatitis
  - Cholangitis
  - Bleeding
  - Perforation of duodenum
- Prophylactic antibiotics
- Therapeutic ERCP
  - Sphincterotomy and Stone retrieval from CBD
  - Balloon dilatation of strictures
  - Stenting (Endoprosthesis) of strictures of CBD.

Percutaneous transhepatic cholangiography
- Indications:
  - When Endoscopic cholangiography failed
  - When ERCP impossible <<polya gastrectomy

Selective Visceral angiography:
- Diagnosis - Clear anatomy of hepatic artery prior to liver resections 6
- Therapy:
  - Embolization
  - arteriovenous malformation
  - Stop bleeding from liver
  - Chemoembolization for liver tumors

Nuclear medicine scanning
- Technetium 99m labeled radionuclide:
  - Handled like bile and so its uptake and excretion can be monitored in real time.
  - Useful in:
    - Bile leak
Laparoscopy and laparoscopic ultrasound:

- Staging of liver tumors
- Detection of small lesions not detected by other imaging modalities
  - Peritoneal sedlings
  - Small superficial lesions
- Help in detection of other additional lesions not detected by CT or MRI

Fluorodeoxyglucose-potassium emission tomography

- Helpful for determining the nature of a mass lesion detected by other imaging modalities

Liver trauma

1. Blunt injuries:
   Contusion, laceration, avulsion

2. Penetrating injuries:
   Stab, Gunshot

Diagnosis of liver injury:

Clinical suspicion of liver injury

All lower chest and upper abdominal stab wounds should be suspect, especially if considerable blood volume replacement has been required.

Similarly, severe crushing injuries to the lower chest or upper abdomen often combine rib fractures, haemothorax and damage to the spleen and/or liver

Tools may be of help in the diagnosis of liver injury:

- FAST
- Peritoneal aspirate
- Laparoscopy

Management of liver injury

- General consideration:
- Not usual
- Serious
- Think of associated injuries
General plan:

General resuscitation: ATLS

- Penetrating injury: emergency, laparotomy
- Blunt injury: stable circulation after initial resuscitation sent the patient for CT scan with oral and iv contrast

In Blunt injury to liver There is a place for conservative treatment

When to stop conservative treatment?

1. Ongoing blood loss
2. Generalized peritonitis

Surgical approach to liver trauma

1. Good and wide access (rooftop) incision
2. Stop blood inflow “Pringle manueuvre”
3. Suturing of tears
4. Excision of avulsed devitalized tissue
5. Repair of major vessel injury
6. Packing

Complications

1. Massive blood loss
2. Abscess ..... Subcapsular hematoma
3. Bile collection “Biloma;, Biliary fistula
4. Arteriovenous fistula
5. Arteriobiliary fistula
6. Hepatic artery aneurysm
7. Liver failure

Pyogenic liver abscess

Aetiology: in the majority unknown

Possible causes:

1. Impaired biliary drainage
2. Hematogenous, drug abuse, teeth cleaning
3. Local spread : diverticulitis
4. Immune compromised: opportunistic
5. Infecting mo: Enteric organisms; Streptococcus faecalis, Klebseilla, Proteus vulgaris, E coli, Streptococcus melleri
6. Opportunistic staph

**Clinical features**

Nonspecific, Fever, malaise, anorexia, Right upper quadrant discomfort
Jaundice occurs in up to one third of affected patients

**Diagnosis:**

**Lab investigations:**

- Leucocytosis,
- an elevated erythrocyte sedimentation rate
- an elevated alkaline phosphatase (AP) level
- Blood cultures reveal the causative organism in approximately 50% of cases

**Ultrasound examination**

reveals pyogenic abscesses as round or oval hypoechoic lesions with well-defined borders and a variable number of internal echoes

**CT scan**

highly sensitive in the localization of pyogenic liver abscesses

![CT scan image]

**Treatment:**

- Antibiotics
- Percutaneous drainage under ultrasound guide

Look for the source!
Amoebic Liver Abscess

Causative: Entamoeba histolytica

Clinical Features

- History of dysentery
- Travel to endemic area
- Symptoms: non specific

Diagnosis:

- US
- CT scan
- Confirmation is by isolation of the causative organism.

Treatment

Metronidazol 750mg t.i.d for 5 – 10 days

Portal Hypertension

Portal circulation: Portal vein formed from confluence of SMV and splenic vein. Also a tributary from coronary (left gastric) vein.

Portasystemic communications:

- Gastroesophagus junction
- Anal canal
- Retroperitoneum
- Falciform ligament

Normal portal venous pressure is about 10 -15 mmHg.

Aetiology:

1. Liver cirrhosis
2. Extrahepatic portal vein occlusion
3. Intrahepatic veno-occlusive disease
4. Occlusion of main hepatic veins (Budd-Chairi syndrome)

Clinical presentation:

- Variceal bleeding
- Decompensated chronic liver disease: Encephalopathy
- Ascitis
Diagnosis

High portal venous pressure ( > 20mmHg ) :
- Hepatic venography
- Direct cannulation of portal vein

Oesophagoscopy; oesophagial varices

Doppler ultrasound and CT for patency of portal vein

Management of bleeding varices

- General resuscitation: Blood replacement
- Coagulopathy:
  Vit K iv
  Fresh frozen plasma
- Thrombocytopenia < 50*10^9/l
- Urgent endoscopy:
  Confirm dx
  therapy

Measures to stop bleeding:

- Drugs:
  Vasopressin
  Octreotide
- Endoscopic:
  Sclerotherapy ethanolamine oleate
  Banding
- Sengestakin – Blackmore tube : Temporary control
- Transjugular intrahepatic portosystemic stentshunt ( TIPS)

Complication:

- perforation of liver capsule and fatal haemorrhage
- Occlusion
- Post shuntencephalopathy

Surgical shunts for variceal haemorrhage

Child’s grade A cirrhosis in whom the initial bleed has been controlled by sclerotherapy

Types of shunts

Selective; splenorenal
Non-selective : porto-caval
Hydatid Liver Disease

The causative tapeworm: Echinococcus granulosis

Liver is affected in 80% of cases, Lung 15%. And 5% rest organs.

Clinical presentation:

Incidental finding on Ultrasound examination

Chronic right upper quadrant discomfort

Complications of cyst:

- Rupture into peritoneum; features of
  1. acute peritoneal irritation
  2. Urticaria
  3. Anaphylaxis
- Rupture into biliary passages: Jaundice and cholangitis
- Rupture into pleura: Empyema
- Infection-----Liver abscess

Diagnosis

- Ultrasound exam :
  Multilocular cyst
- CT scan :
  Floating membrane within the cyst
- Serological :
  ELISA for Antibody against hydatid antigen

Treatment:

- Mainly surgical
  Open
  Laparoscopic
- Other methods
  Drugs Albendazol
  Percutaneous injection of hypertonic saline or Alcohol

Surgical options:

-Deroofing and evacuation of contents
- Liver resection
Liver tumors

- **Benign tumors:**
  - Haemangiomas
  - Adenoma
  - Focal nodular hyperplasia

- **Malignant:**
  1) Primary
     - Hepatocellular carcinoma
     - Cholangiocarcinoma
  2) Secondary metastasis
     - Metastatic colorectal cancer
     - Metastatic neuroendocrine cancer (carcinoid)
     - Other metastatic cancers

Hepatocellular carcinoma

**Aetiology:**
- Association with chronic liver disease cirrhosis
- HBV, HCV

**Presentation**
- Middle aged
- Features of chronic liver disease
- Anorexia and Weight loss

**Diagnosis:**
- Ultrasound
- CT scan
- Alpha fetoprotein
- For staging:
  - Chest scan
  - Bone scan
  - Laparoscopy

**Assessment of patient:**
- General assessment
- Severity of underlying liver disease “Child score”
Treatment
• Surgical resection
• Liver transplantation

Depend on:
• Staging of liver tumor
• Size and site of tumor
• Availability of organ transplantation

Palliative procedures:
Local Ablation techniques:
- Radiofrequency ablation
- Ethanol ablation
- Cryoablation
- Microwave ablation

Regional liver therapies:
- Chemoembolization/embolization
- Hepatic artery pump chemoperfusion

Follow up:
- Chemotherapy ??
- Alpha fetoprotein as tumor marker
- Imaging

Cholangiocarcinoma:
- Elderly
- Primary sclerosing cholangitis
- Site: confluence of right and left hepatic ducts fibrous (Klatskin tumors)

Presentation:
Elderly patient with progressive painless jaundice

Diagnosis:
- Ultrasound: dilated intrahepatic biliary passages but not extrahepatic bile ducts.
- Spiral CT scan little evidence of mass
- Regional lymphadenopathy
- Cholangiography: hilar stricture
- Brush cytology + ve in 2/3rds

Treatment:
• Surgical resection
• Radical resection of liver parenchyma and the affected bile ducts --- potentially curative
• Local resection --- palliative

Impaired liver function:
Depends on:
- Severity of dysfunction
- Rapidity; acute or chronic