

# The Liver - Dr. Mzhda

## Anatomy and embryology of the liver

- Foregut structure, endodermal bud(liver, gal bladder, extrahepatic ducts)
- Liver cells are bipotential develop(hepatocytes & intrahepatic bile ducts cells)
- Liver endothelial cells arise from vitellian & umbilical vein, this form sinusides
- Glissons capsule
- Ligaments include:
  - rt & lt triangular lig.
  - falciform lig. (from umbilicus to interlober fissure of liver)
  - coronary lig.
  - hepatoduodenal lig.
  - gastrohepatic lig.

## Blood supply and neural innervations

- Blood supply:
  - 75% portal vein
  - 25% hepatic artery from:
    - 80% caeliac art.
    - 20% SMA
- Venous (rt., lt, middle hepatic vein to IVC)
- Neural is via parasympathetic (vagus nerve)and sympathetic

## Lymphatics drainage

- Peri-sinusidal space of Disse and peri-portal clefts of Mall to hilar cystic duct LNs and with common bile duct to caeliac area...

## Internal structure

- 8 segmental functional units:
  - Right include 5,6,7,8 segments
  - Left include 1,2,3,4 segments
- Real functional unites are lobules
- Cantlies line separate rt & lt lobes

## Functions of the liver (*storage, metabolism, production, secretion*)

1. Maintain core body temp.
2. pH balance and correction of the lactic acidosis
3. Synthesis of clotting factors
4. Glucose metabolism, glycolysis, glycogenesis
5. Protein metabolism, urea formation
6. Bilirubin formation
7. Drugs and hormones metabolism
8. Removal of gut endo-toxins & foreign bodies.. (reticuloendothelial system)

## Investigations

### 1. LFT

- Bilirubin (pre-, post- & hepatic dis.)
- Alk. phosphatase (obstructive jaundice, cholestatic liver)
- AST, ALT (↑ in acute hepatocellular dis. like viral hepatitis, alcohol abuse, autoimmune dis., medications)
- GGT (liver injury, acute alcohol ingestion)
- Albumin
- Prothrombin time (PT)

### 2. 2- Imaging

#### a. Sonography

- liver tumor, bile duct dilatation, gal stones
- doppler sonography flow of HA, PV, HV
- guiding percutaneous biopsy
- therapeutic as in abscess drainage by pig-tail catheter

#### b. CT –Abdomen with or without contrast (oral & intravenous contrast)

- Lesions, haemangiomas
- inflammatory ring enhancement
- density (solid or cystic lesions)

#### c. MRI

- no iodine, non-invasive

#### d. MRCP

#### e. MRA

- for chronic liver disease and coagulopathy PV thrombosis

#### f. ERCP

- in obstructive jaundice
- stone retrieval
- balloon dilatation of stricture
- endoprosthesis
- brush cytology

#### g. EUS

- hilar tumor extend

#### h. PTC

- if ERCP failed or impossible as in patient with prev. polya gastrectomy, in hilar bile duct tumor

#### i. Angiography

- selective for diagnosis and therapeutic
- visualize rt, Lt. hepatic art.
- patency of portal vein
- nature of liver nodule as primary liver tumor has good arterial blood supply
- therapeutic intervention as in :-
  - embolisation of bleeding sites
  - occlusion A-V malformation
  - treatment of liver tumor (chemoembolisation)

#### j. Nuclear med scan with Iodoida is Te 99 labelled redionuclide specially in dx of bile duct leak, biliary obst.

- Sulphur colloid liver screening for kupffer cells, in adenoma & haemangioma no kupffer cells so it isn't enhanced

#### k. Laparoscopic & Laparoscopic US

- staging of hepatopancreaticobiliary cancer which not seen by other methods
- In 30% to diagnose peritoneal metas. and superficial liver tumors
- With US increase this % by showing also the relation of the tumor to the bile ducts art.

#### l. Flurodeoxyglucose-positron emission tomography (FDH-PET)

- Depend on glucose intake by cancer cells in comparison with adenoma, liver inflammation.

## Liver Trauma

- May be blunt or penetration type.
- Diagnosis depends on clinical suspicion.
  1. All lower chest and upper abdominal stab
  2. Severe crush injuries of no 1 + # ribs, haemo-, pneumothorax
  3. Penetrating wounds
  4. Patient with blunt trauma an haemo-dynamically stable but has objective sings as upper abdominal tenderness & gardening
  5. Peritoneal lavage bloody
  6. By laparoscopy

## Initial management of liver injury

### 1- Penetrating

- Resuscitation, ABC principles of ATLS.
- Two large bore cannula
- Cross matching of blood ( FFP, cryoprecipitate )
- Full blood count
- LFT, electrolytes, urea , glucose, amylase, clotting screen measurement
- Arterial gas analysis
- Chest tube if indicated
- Transfer the patient to theater

### 2-Blunt trauma

- Same as penetrating wounds
- If stable do imaging for nature of the injury
- Some cases can be treated conservatively but penetrating needs always operation
- Indication to do operation in blunt trauma
  1. ongoing bleeding
  2. coagulopathy
  3. generalized peritonitis

## Surgical approach

- Rooftop incision
- Pringle maneuver
- AB
- Treatment further depend on the type of the injury
- Damage control surgery by packing in severe injuries

## Complications of liver injuries

1. Sudden massive blood lose
2. Delay Hemorrhage
3. Subcapsular & intrahepatic haematoma
4. Liver abscess duo to liver ischemia or seroma & haematoma infection
5. Biliary fistula causing peritonitis
6. Haemobilia causing upper rt. Quaderant pain, upper GIT bleeding, jaundice
7. Hepatic artery aneurysm
8. Arteriovenouse fistula
9. Arteriobiliary fistula
10. Portovenouse hypertention if aneurysm ruptured to portal vein
11. Biliovenouse fistula causing jaundice
12. Bronchiobiliary or pleurobiliary fistula
13. Liver failure in extensive liver trauma

## Long term outcome of liver trauma

1. Liver parenchyma regeneration occur
2. Biliary tract stricture may be
  - segmental or lobular needs conservative treatment
  - or dominant extra-hepatic bile duct stricture causing obstructive jaundice treated by endo-biliary ballooning or stenting or Roux-en-Y hepatochojejunostomy

## Liver cysts

1. Primary congenital (5-14%)
  - a. As simple cysts or polycystic liver disease
  - b. Common in females
2. Secondary due to :-
  - a. Trauma
  - b. Infections (pyogenic or paracystic)
  - c. Neoplastic

### 1-Simple cystic lesions

- Common incidental sonographic finding
- Asymptomatic
- Needs no treatment
- Large one if causing abdominal discomfort do aspiration, if reoccur do deroofting laparoscopic or open laparotomy

### 2-Polycystic liver disease

- Congenital one associated with other organs as pancreas, kidneys
- Asymptomatic and incidentally sonographic finding
- No effect, no treatment
- If multiple cyst causing discomfort give simple pain killer, if not responding or causing severe pain which is due to the cyst do laparoscopic or open fenestration of the cyst.

### 3-Hydatid liver disease

- Common in Mediterranean countries
- Common in liver (70%), lung, brain, bones ....
- Echinococcus granulosum
- Human being is its interm. Host. ingestion of ova pass to intestine, portal vein, liver (larval or cystic stage)

### Clinical features

- Silent seen by autopsy or incidentally by sonography
- Abdominal discomfort or distension, dull pain at RT. UQ
- Acute abdomen by trivial trauma due to rupture of the cyst to peritoneal cavity and causing anaphylactic shock
- May cause abscess.
- If ruptured to :-
  - biliary duct ..jaundice
  - lung via diaphragm...empyema
  - stomach

### Diagnosis

1. Serology
  - a. By ELISA( enzyme linked immunosorbent assay) in 85% positive
  - b. negative if :-
    - No scoliosis in the cyst
    - No leaked
    - Not viable parasite
  - c. eosinophilia > 7% positive
2. Plain abdomen x-ray
3. Sonography for multilocular cyst
4. CT Abdomen
  - a. Floating membrane
  - b. Ruptured cyst in peritoneal cavity

### Treatment

1. Albendazol/mebendazol
  - If failed
2. Operation
3. Calcified cyst only follow up
4. Obstructive jaundice do ERCP then operation