SESSION LEARNING OBJECTIVES

This session aims to:

- Understand the use of various diagnostic tests and procedures for liver and biliary disorders
- Comprehend how and why the symptoms and signs of liver disorder appear
- Describe the aetiology, pathology and principles of treatment for common and important disorder of the liver and biliary tract
DISEASES OF THE LIVER AND BILIARY TRACT

- Investigation of liver disease
- Clinical features and presentations of liver disease
- Liver diseases
  - Chronic liver disease
  - Viral hepatitis
  - Alcoholic liver disease
  - Hepatocellular carcinoma
- The gall bladder and biliary system
  - Gall stones
  - Cholecystitis
THE LIVER AND BILIARY TRACT

THE LIVER - HISTOLOGY

THE LIVER AND BILIARY TRACT

INVESTIGATION OF LIVER DISEASE

- Liver function tests used to assess liver disease
  - Bilirubin
  - Aminotransferases (Alanine Aminotransferase [ALT], Aspartate Aminotransferase [AST])
  - Alkaline phosphatase
  - Gamma glutamyl transferase (GGT)
  - Albumin

- Tests to determine severity and activity of liver disease
  - Biochemical tests (Liver Function Tests [LFTs])
  - Coagulation tests
INVESTIGATION OF LIVER DISEASE

○ Imaging
  • Ultrasound
  • CT Scan
  • Magnetic Resonance Imaging (MRI)
  • Endoscopic Retrograde Cholangiopancreatography (ERCP)

○ Liver biopsy
PRIMARY LIVER CANCER

http://brighamrad.harvard.edu/Cases/bwh/images/335/ct2.jpg
# CLINICAL FEATURES & PRESENTATIONS OF LIVER DISEASE

- Asymptomatic abnormal liver function tests
- Jaundice
- Gastrointestinal bleeding
- Ascites
- Hepatic encephalopathy
- Haematologic disorders
- Endocrine / Neurological disorders
- Skin disorders
JAUNDICE

○ Definition
  • Yellow appearance of skin, sclerae and mucous membranes produced by increased bilirubin in body fluids
  • Clinically detected when bilirubin >50μmol/L

○ Classification
  • Pre-hepatic - Haemolytic
  • Intra-hepatic - Hepatocellular
  • Post-hepatic - Cholestatic
  • Neonatal hyperbilirubinaemia

○ Pathophysiology
  • varied

○ Causes
  • Depend on types
# TYPES OF JAUNDICE

<table>
<thead>
<tr>
<th>Type</th>
<th>Prehepatic or Hemolytic Jaundice (e.g., Hemolytic anemia)</th>
<th>Intrahepatic Jaundice (e.g., Hepatitis)</th>
<th>Posthepatic or Obstructive Jaundice (e.g., Gallstones)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td>Excessive</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Hemolysis of erythrocytes</td>
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<tr>
<td>Hemoglobin</td>
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<td>Globin</td>
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<td>Heme</td>
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<tr>
<td>Iron</td>
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<tr>
<td>Unconjugated bilirubin in blood</td>
<td>Increased in blood</td>
<td>Increased in blood</td>
<td>Normal</td>
</tr>
<tr>
<td>Liver cells</td>
<td></td>
<td>Hepatocellular damage prevents conjugation and excretion</td>
<td>Normal</td>
</tr>
<tr>
<td>Conjugated bilirubin</td>
<td></td>
<td>Increased in blood</td>
<td>Increased in blood</td>
</tr>
<tr>
<td>Bile</td>
<td></td>
<td>Inflammation obstructs flow to hepatic duct</td>
<td></td>
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<tr>
<td>Intestine</td>
<td></td>
<td>Obstructed flow to intestine causes backup to liver and blood</td>
<td></td>
</tr>
<tr>
<td>Feces</td>
<td>Normal or darker color</td>
<td>Variable</td>
<td>Light color</td>
</tr>
</tbody>
</table>


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CAUSES & EFFECTS OF LIVER INJURY

Liver Cell Injury

- Viruses
- Chemicals
- Alcohol
- Drugs
- Cell necrosis
- Fatty changes
- Mixed cell reactions
ACUTE LIVER FAILURE

- **Definition**
  - Hepatic encephalopathy results from a sudden severe impairment of hepatic function

- **Aetiology**
  - Any cause of liver damage
  - Due to acute viral hepatitis most common

- **Epidemiology**
  - Uncommon

- **Pathophysiology**
  - Necrosis of substantial part of liver
# CHRONIC LIVER FAILURE

- Functional capacity of the liver can no longer maintain normal physiological condition
- The most common cause is cirrhosis

## Clinical Features
- Worsening liver function
- Jaundice
- Portal hypertension
- Hepatic encephalopathy
- Ascites
LIVER FAILURE

CIRRHOSIS

**Definition**
- Necrosis of liver cells followed by fibrosis & nodule formation causing abnormal liver architecture interfering with normal liver blood flow & function

**Causes**
- World-wide, the most common causes are viral hepatitis and prolonged excessive alcohol consumption
- Prolonged biliary damage or obstruction

**Pathophysiology**
- Chronic injury causing inflammation and fibrosis
- Loss of normal liver architecture
- Micronodular and Macronodular
CIRRHOSIS

Clinical Features
- Hepatomegaly
- Jaundice
- Ascites
- Endocrine changes
- Circulatory changes
- Haemorrhagic tendency
- Portal hypertension
- Hepatic encephalopathy

Investigations
- Refer back to investigations of liver
ASCITES

http://meded.ucsd.edu/clinicalimg/abdomen_ascites5.jp

CIRRHOSIS

Management
- Managing the complications
- Maintenance of nutrition
- Early detection of Hepatocellular Ca
- Avoid alcohol
- Liver transplant

Prognosis
- Overall poor, 5 year survival 50%

Differential Diagnosis
- Jaundice, causes as above
CLINICAL FEATURES OF CIRRHOSIS

Biochemical abnormalities:
- Alkaline phosphatase: may be greatly elevated if the cause is biliary obstruction.
- AST and ALT: transaminase levels are elevated, proportional to the activity of liver cell destruction.
- Bilirubin: elevated levels, which may be very high in cases caused by biliary obstruction.
- Serum albumin: low, as a result of failure of synthesis.

PORTAL HYPERTENSION

Characterized by prolonged elevation of portal venous pressure

Aetiology
90% due to cirrhosis

Pathogenesis
Increased portal vascular resistance and development of collateral vessel formation particularly in the GIT

Clinical features
- Splenomegaly (hypersplenism and thrombocytopenia)
- GIT bleeding from collateral vessels
PORTAL HYPERTENSION
PORTAL HYPERTENSION

VIRAL HEPATITIS

Common cause of jaundice

- **Causes**
  - Common (hepatitis A, B, C, E and D viruses)
  - Less common (cytomegalovirus, E-B virus)

- **Epidemiology**
  - HAV = commonest, outbreaks, faeco-oral spread
  - HBV = 300M carriers, spread by IV or close body contact
  - HCV = 240M infected, blood transfusion, IV spread

- **Pathophysiology**
  - Necrosis of hepatocytes – degree depends on persons immune response
VIRAL HEPATITIS

- **Clinical Features**
  - Non-specific prodromal symptoms
  - Jaundice
  - Vomiting, diarrhoea, abdominal discomfort
  - Dark urine and pale stools

- **Investigations**
  - LFTs
  - Specific markers
VIRAL HEPATITIS

- Treatment
  - Supportive
  - Prevention (vaccine = HAV, HBV)
  - Medical (interferon for HVB and HBC)

- Prognosis & Natural Progression:
  - Depends on cause
  - HAV = excellent, most recover, no Chronic Liver Disease (CLD)
  - HBV = most recover completely, 5-10% CLD + Hepatocellular Ca, asymptomatic carriers
  - HCV = develop CLD, cirrhosis, hepatocellular Ca
COURSE OF HEPATITIS B
ALCOHOLIC LIVER DISEASE

- **Epidemiology**
  - 10% of alcoholics develop liver disease

- **Pathophysiology**
  - Mechanism poorly understood
  - Cirrhosis

- **Clinical features**
  - Fatty liver
  - Hepatitis
  - Cirrhosis

- **Investigations**
  - LFTs

- **Management**
  - Abstinence and Management of complication
STEATOSIS - FATTY LIVER

Fatty Liver – external view

Fatty Liver – cross section

Fatty Liver – Histology
NON-ALCOHOLIC FATTY LIVER DISEASE

- Disease of affluent societies due to rise in obesity
- Most common cause of chronic liver disease after VH and alcohol

- Epidemiology
  - 3% of population in USA, prevalence higher in diabetes and metabolic syndrome

- Pathophysiology
  - First hit (increased fat import) $\rightarrow$ steatosis (fatty liver)
  - Second hit (production of toxin) $\rightarrow$ inflammation & fibrosis
NON-ALCOHOLIC FATTY LIVER DISEASE

Clinical features:
- Abnormal liver function tests

Management:
- Reduce BMI and insulin resistance

Prognosis
- Depends +/- cirrhosis
- 10% - 15% of people will progress to cirrhosis
INHERITED LIVER DISEASES

- **Hemochromatosis**
  - Iron is deposited throughout the body especially liver, pancreas, heart
  - Autosomal recessive disorder
  - Acquired

- **Wilson’s disease (hepatocellular degeneration)**
  - Excess copper deposited causing damage to several organs
  - Autosomal recessive disorder
A. Hyperplastic nodule

B. Iron stain displays iron granules

C. Nodules within bridging fibrosis

D. Fibrosis and inflammation

E. Intracellular deposition of copper

F. Hyperplastic nodules
HEPATOCELLULAR CARCINOMA

- **Epidemiology**
  - Most common primary liver tumour – 2.5-5/100,000
  - Commoner in SE Asia – 40/100,000

- **Aetiology**
  - Chronic hepatitis B infection
  - Cirrhosis
  - The risk is higher in men and rises with age

- **Clinical features**
  - Asymptomatic
  - Features of underlying chronic liver disease
HEPATOCELLULAR CARCINOMA

HEPATOCELLULAR CARCINOMA

- **Investigation**
  - Serum markers
  - Ultrasound
  - CT
  - MRI
  - Biopsy

- **Management**
  - Surgery
  - Transplant
  - Chemo-embolization
  - Largely palliative

- **Prevention**
  - Prevention of hepatitis B
# GALLSTONES

Most common disorder of biliary tree

## Classification
- Cholesterol stones
- Pigment stones
- Mixed stones

## Epidemiology
- Overall prevalence 11% (18-65 years), Increases with age. Females more prone than males

## Causes
- Increased cholesterol secretion
- Impaired gallbladder emptying

## Clinical Features
- Mostly asymptomatic
- Biliary Colic
- Acute / chronic cholecystitis
GALLSTONES


GALLSTONES

CHOLELITHIASIS – GALL STONES

http://www.ourwebdoctor.com/images/gallstn.jpg
# GALLSTONES

<table>
<thead>
<tr>
<th>Investigations</th>
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<tbody>
<tr>
<td>• Plain X-ray</td>
</tr>
<tr>
<td>• Ultrasound</td>
</tr>
<tr>
<td>• Cholecystography</td>
</tr>
<tr>
<td>• CT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mucocele, empyema, migration to common bile duct (CBD)</td>
</tr>
</tbody>
</table>

## Treatment

- Surgery (Cholecystectomy if symptomatic)
- Lithotripsy
- Oral bile acids

## Differential Diagnosis

- Acute pancreatitis
- Differential Diagnosis of RUQ pain
CHOLECYSTITIS

Acute cholecystitis is almost always associated with obstruction of gallbladder neck or cystic duct by gallstone

**Clinical features**

- Pain in RUQ/ epigastrium (severe and prolonged)
- Fever and leucocytosis

**Management**

- Bed rest, pain relief, antibiotics
- Surgery
Readings and Resources

Resources:

Set Textbooks:

Additional textbooks:
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