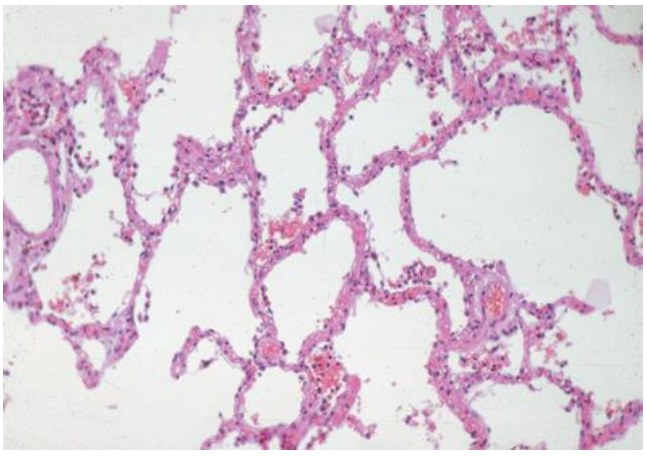
lungs

Structure and Function of the Lungs

The lungs consist of two distinct components: a system of tubes whose chief function is to conduct air into and out of the lungs and the alveoli (singular, alveolus), where oxygen and carbon dioxide are exchanged between air and the pulmonary capillaries. Just as a tree branches progressively and ends in a foliage of leaves, so the conducting tubes branch repeatedly and terminate in clusters of pulmonary alveoli.

The primary functions of lungs is oxygenation of the blood and removal of carbon dioxide. The respiratory tract is particularly exposed to infection as well as to the hazards of inhalation of pollutants from the inhaled air and cigarette smoke. There exists a natural mechanism of filtering and clearing of such pollutants through respiratory epithelium, tracheobronchial lymphatics and alveolar macrophages.

Besides, the lungs are the only other organ after heart through which all the blood of the body passes during circulation. Therefore, cardiovascular diseases have serious effects on the lungs, and conversely, diseases of the lungs which interfere with pulmonary blood flow have significant effects on the heart and systemic circulation.



Histologic structure of the lung illustrating alveoli and thin alveolar septa containing pulmonary capillaries (original magnification ×100)

Atelectasis

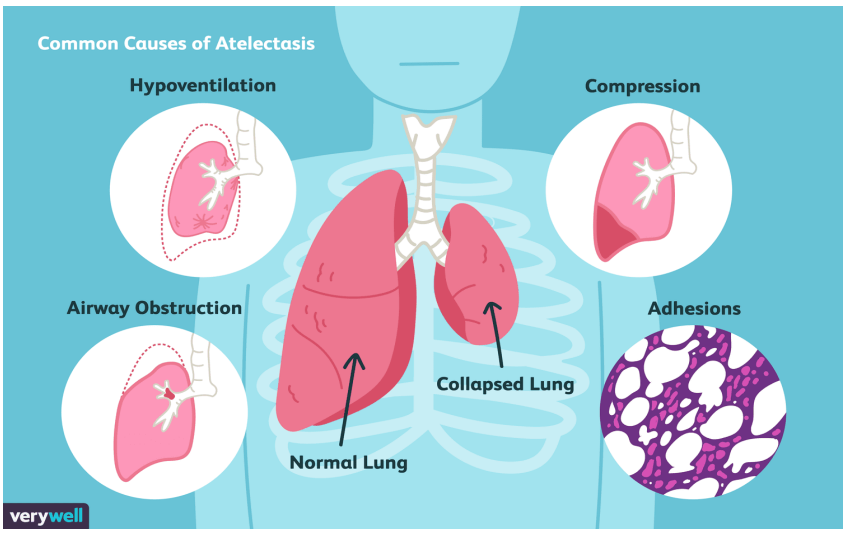
Atelectasis literally means incomplete expansion of the lung (*ateles* = incomplete + *ectasia* = expansion). It refers to a collapse of parts of the lung. There are two types of atelectasis: obstructive and compression.

Obstructive Atelectasis

Complete blockage of a bronchus by thick mucous secretions, by a tumor, or by an aspirated foreign object prevents air from entering or leaving the alveoli supplied by the blocked bronchus, and the air already present is gradually absorbed into the blood flowing through the lungs. As a result, the part of the lung supplied by the blocked bronchus gradually collapses as the air is absorbed. The volume of the affected pleural cavity also decreases correspondingly, causing the mediastinal structures to shift toward the side of the atelectasis and the diaphragm to elevate on the affected side.

Compression Atelectasis

Compression atelectasis results when fluid, blood, or air accumulates in the pleural cavity, reducing its volume and thereby preventing full expansion of the lung.

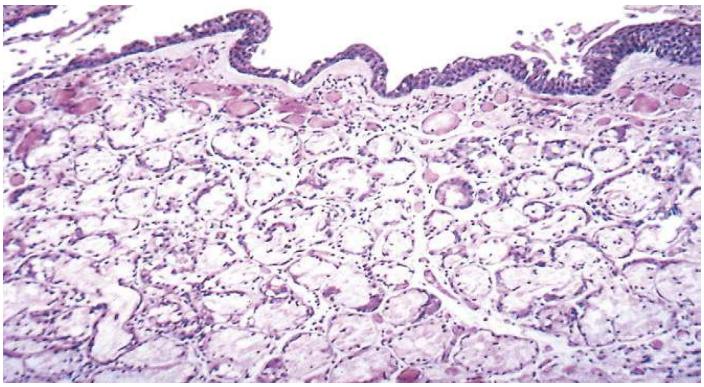


- **Chronic Bronchitis**

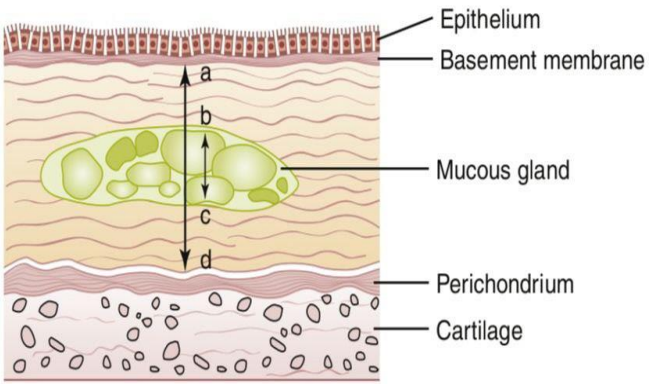
The major causes of chronic bronchitis are cigarette smoking (90% of cases) repeated airway infections, genetic predisposition, and inhalation of physical or chemical irritants. Chronic bronchitis is diagnosed *symptomatically* by hypersecretion of bronchial mucus and a chronic or recurrent productive cough of more than 3 months' duration and occurring each year for 2 or more successive years in patients in whom other causes have been excluded.

Pathologic changes in the airway include chronic inflammation and swelling of the bronchial mucosa resulting in scarring, increased fibrosis of the mucous membrane, hyperplasia of bronchial mucous glands and goblet cells and increased bronchial wall thickness, which potentiates obstruction to airflow.

Diagnosis. Measures used to confirm the diagnosis include chest radiography, Pulmonary function tests show normal total lung capacity (TLC), Arterial blood gas (ABG) evaluation may show elevated Paco2 and decreased Pao2 Secondary polycythemia (increased numbers of red blood cells) related to continuous or nocturnal hypoxemia is common. Hypoxemia leads to a compensatory production of red blood cells in an attempt to carry more oxygen to the body tissues.



Histologic features of chronic bronchitis



Structure of a normal bronchial wall

Lung cancer

Cancer is defined as an abnormal growth of cells which tend to proliferate in an uncontrolled way and, in some cases, to metastasize (spread).

Lung cancer is a disease of uncontrolled cell growth in tissues of the lung. This growth may lead to **metastasis**, invasion of adjacent tissue and infiltration beyond the lungs. **The vast majority of primary lung cancers are carcinomas of the lung**, derived from epithelial cells. Lung cancer, the most common cause of cancer-related death in men and the second most common in women.

Tumors can be benign or malignant; Benign tumors can usually be removed and do not spread to other parts of the body. Malignant tumors, on the other hand, grow aggressively and invade other tissues of the body, allowing entry of tumor cells into the bloodstream or lymphatic system which spread the tumor to other sites in the body. This process of spread is termed **metastasis**; the areas of tumor growth at these distant sites are called **metastases,** certain organs particularly the **adrenal glands, liver, brain, and bone** are the most common sites for lung cancer metastasis.

- **Classification of lung cancer**

1-Non-small Cell Lung Carcinoma (NSCLC)

The non-small cell lung carcinomas are grouped together because their prognosis and management are similar. There are three main sub-types: squamous cell lung carcinoma, adenocarcinoma, and large cell lung carcinoma Accounting for 25% of lung cancers,] squamous cell lung carcinoma usually starts near a central bronchus. Adenocarcinoma accounts for 40% of lung cancers.] It usually originates in peripheral lung tissue. Most cases of adenocarcinoma are associated with smoking; however, among people who have never smoked.

2-Small cell lung carcinoma

Small cell lung carcinoma (SCLC, also called "oat cell carcinoma") is less common. It tends to arise in the larger airways (primary and secondary bronchi) and grows rapidly, becoming quite large. The "oat" cell contains dense neurosecretory granules (vesicles containing neuroendocrine hormones) which give this an endocrine/paraneoplastic syndrome association. While initially more sensitive to chemotherapy, it ultimately carries a worse prognosis and is often metastatic at presentation. Small cell lung cancers are divided into Limited stage and Extensive stage disease .This type of lung cancer is strongly associated with smoking.

3-Metastatic cancers

The lung is a common place for metastasis from tumors in other parts of the body. These cancers are identified by the site of origin, thus a breast cancer metastasis to the lung is still known as breast cancer.

Signs and Symptoms Of Lung Cancer

Symptoms that suggest lung cancer include:

- dyspnea (shortness of breath)
- hemoptysis (coughing up blood)
- chronic coughing or change in regularcoughing pattern
- wheezing
- chest pain or pain in the abdomen
- cachexia (weight loss), fatigue and loss ofappetite
- dysphonia (hoarse voice)
- clubbing of the fingernails (uncommon)
- dysphagia (difficulty in swallowing)

Risk Factors

1-Smoking

2-Radon gas

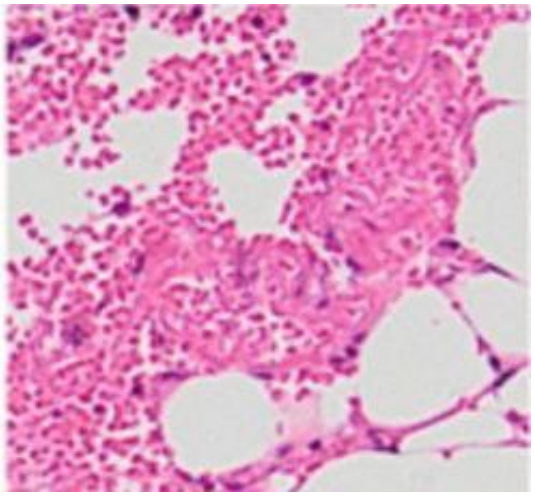
3-Air pollution and Asbestos

4-Genetics

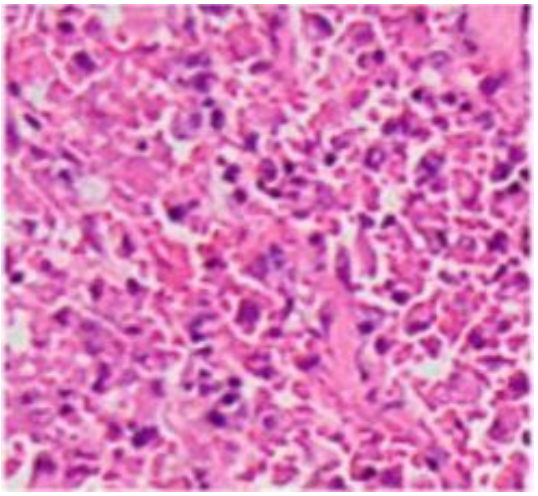
5-Viruses

Diagnosis

Chest radiograph is one of the first investigative steps if a person reports symptoms that may suggest lung cancer. This may reveal an obvious mass, widening of the mediastinum (suggestive of spread to lymph nodes there), atelectasis (collapse), consolidation (pneumonia)or pleural effusion .CT imaging is typically used to provide more information about the type and extent of disease. **Bronchoscopy or CT-guided biopsy** is often used to sample the tumor for histopathology .**Lung cancer often appears as a solitary pulmonary nodule on a chest radiograph**.



Normal lung



lung cancer

Kidney

Normal Structure

The kidneys are bean-shaped paired organs, each weighing about 150 gm in the adult male and about135 gm in the adult female. The hilum of the kidney is situated at the midpoint on the medial aspect where the artery, vein, lymphatics and ureter are located. The kidney is surrounded by a thin fibrous capsule which is adherent at the hilum. Cut surface of the kidney shows 3 main structures: well demarcated **peripheral cortex, inner medulla and the innermost renal pelvis .**

The parenchyma of each kidney is composed of approximately one million microstructures called nephrons. A nephron, in turn, consists of 5 major parts, each having a functional role in the formation of urine: the glomerular capsule (glomerulus and Bowman's capsule), the proximal convoluted tubule (PCT), the loop of Henle, the distal convoluted tubule (DCT), and the collecting ducts.

Function of Kidney

1. Excretion of waste products resulting from protein metabolism.
2. Regulation of acid-base balance by excretion of H+ ions (acidification) and bicarbonate ions.
3. Regulation of salt-water balance by hormones secreted both intra- and extra-renally.
4. Formation of renin and erythropoietin and thereby playing a role in the regulation of blood pressure and erythropoiesis respectively.

Renal Function Tests

a) Renal blood flow
b) Glomerular filtration
c) Renal tubular function
d) Urinary outflow unhindered by any obstruction.

Renal function tests are broadly divided into 4 groups

1. Urine analysis.

2. Concentration and dilution tests.

3. Blood chemistry.

4. Renal clearance tests.

Glomerular Diseases

Definition and classification

Glomerulonephritis (GN) or Bright's disease is the term used for diseases that primarily involve the renal glomeruli. It is convenient to classify glomerular diseases into 2 broad groups:

I. Primary glomerulonephritis in which the glomeruli are the predominant site of involvement.

II. Secondary glomerular diseases include certain systemic and hereditary diseases which secondarily affect the glomeruli.

A number of clinical syndromes are recognized in glomerular diseases. The following are six major glomerular syndromes commonly found in different glomerular diseases:

- nephritic and nephrotic syndromes;
- acute and chronic renal failure
- asymptomatic proteinuria and hematuria.

1-Acute Nephritic Syndrome

This is the acute onset of **haematuria, proteinuria, hypertension, oedema and oliguria** following an infective illness about 10 to 20 days earlier.

2- Nephrotic Syndrome : Nephrotic syndrome is a constellation of features in different diseases having varying pathogenesis; it is characterised by findings of massive proteinuria, hypoalbuminaemia, oedema, hyperlipidaemia, lipiduria, and hypercoagulability.

3- Acute Renal Failure: As already described above, acute renal failure (ARF) is characterised by rapid decline in renal function. ARF has many causes including glomerular disease, principally rapidly progressive GN and acute diffuse

proliferative GN.

4- Chronic Renal Failure: These cases have advanced renal impairment progressing over years and is detected by significant proteinuria, haematuria, hypertension and azotaemia. Such patients generally have small contracted kidneys due to chronic glomerulonephritis.

5- Asymptomatic Proteinuria: Presence of proteinuria unexpectedly in a patient may be unrelated to renal disease (e.g. exercise-induced, extreme lordosis and orthostatic proteinuria), or may indicate an underlying mild glomerulonephritis. Association of asymptomatic haematuria, hypertension or impaired renal function with asymptomatic proteinuria should raise strong suspicion of underlying glomerulonephritis.

6- Asymptomatic Haematuria: Asymptomatic microscopic haematuria is common in children and young

Specific Types Of Glomerular Diseases

I. Primary Glomerulonephritis

1- Acute Glomerulonephritis: Acute GN is known to follow acute infection and characteristically presents as acute nephritic syndrome. Based on etiologic agent, acute GN is subdivided into 2 main groups: acute post-streptococcal GN and acute non-streptococcal GN, the former being more common.

2- **Chronic Glomerulonephritis:** Chronic GN is the final stage of a variety of glomerular diseases which result in irreversible impairment of renal function. The conditions which may progress to chronic GN, However, about 20% cases of chronic GN are *idiopathic* without evidence of preceding GN of any type.

II. Secondary Glomerular Diseases : Glomerular involvement may occur secondary to certain systemic diseases or a few hereditary diseases.

1- Lupus Nephritis

2- **Diabetic Nephropathy**

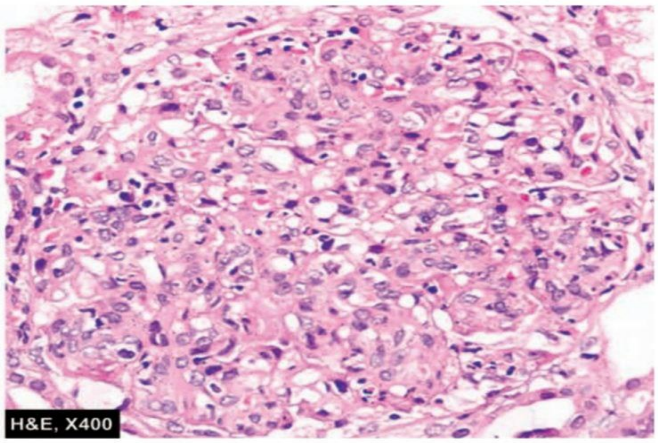
3- Hereditary Nephritis

A group of hereditary diseases principally involving the glomeruli are termed hereditary nephritis. These include the following:

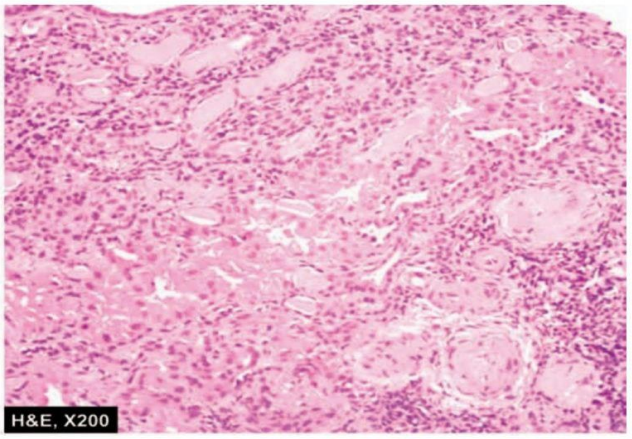
A-Alport's syndrome

B- Fabry's disease

C- Nail-patella syndrome



Acute post-streptococcal GN



End-stage kidney in chronic GN

Tumors Of Kidney

Both benign and malignant tumors occur in the kidney, the latter being more common. These may arise from *renal tubules* (adenoma, adenocarcinoma), *embryonic tissue* (mesoblastic nephroma, Wilms' tumor), *mesenchymal tissue* (angiomyolipoma, medullary interstitial tumor) and from the *epithelium of the renal pelvis* (urothelial carcinoma). Besides these tumors, the kidney may be the site of the secondary tumors.

Benign Tumors

Benign renal tumors are usually small and are often an incidental finding at autopsy or nephrectomy.

Cortical Adenoma

Cortical tubular adenomas are more common than other benign renal neoplasms. They are frequently multiple and associated with chronic pyelonephritis or benign nephrosclerosis.

Oncocytoma

Oncocytoma is a benign epithelial tumor arising from collecting ducts.

Other Benign Tumors

- Angiomyolipoma
- Mesoblastic nephroma
- Multicystic nephroma
- Medullary interstitial
- Reninoma

Malignant Tumors

The two most common primary malignant tumors of the kidney are *adenocarcinoma* and *Wilms' tumor.* A third malignant renal tumor is *urothelial carcinoma* occurring more commonly in the renal pelvis is described in the next section along with other

tumors of the lower urinary tract.

Adenocarcinoma of Kidney (*Hypernephroma)*

Hypernephroma is an old misnomer under the mistaken belief that the tumor arises from adrenal rests because of the resemblance of the tumor cells with clear cells of the adrenal cortex. It is now known that the renal cell carcinoma (RCC) is an adenocarcinoma arising from tubular epithelium. This cancer comprises 70 to 80% of all renal cancers and occurs most commonly in 50 to 70 years of age with male preponderance

Etiology

1-Tobacco

2-Genetic factors

A-von Hippel-Lindau (VHL) disease

B-Hereditary clear cell RCC

C-Papillary RCC

3-Cystic diseases of the kidneys

4-Other risk factors. Besides above, following other factors are associated with higher incidence of RCC:

i) Exposure to asbestos, heavy metals and petrochemical products.

ii) In women, obesity and estrogen therapy.

Classification

Based on cytogenetic of sporadic and familial tumors, RCC has been reclassified into clear cell, papillary, granular cell, chromophobe, sarcomatoid and collecting duct type

Clinical Feature

Renal cell carcinoma is generally a slow-growing tumor and the tumor may have been present for years before it is detected. The classical clinical evidence for diagnosis of renal cell carcinoma is the triad of *gross hematuria, flank plain* and *palpable abdominal mass.* The most common presenting abnormality is hematuria that occurs in about 60%

of cases. By the time the tumor is detected, it has spread to distant sites via haematogenous route to the lungs, brain and bone, and locally to the liver and lymph nodes.

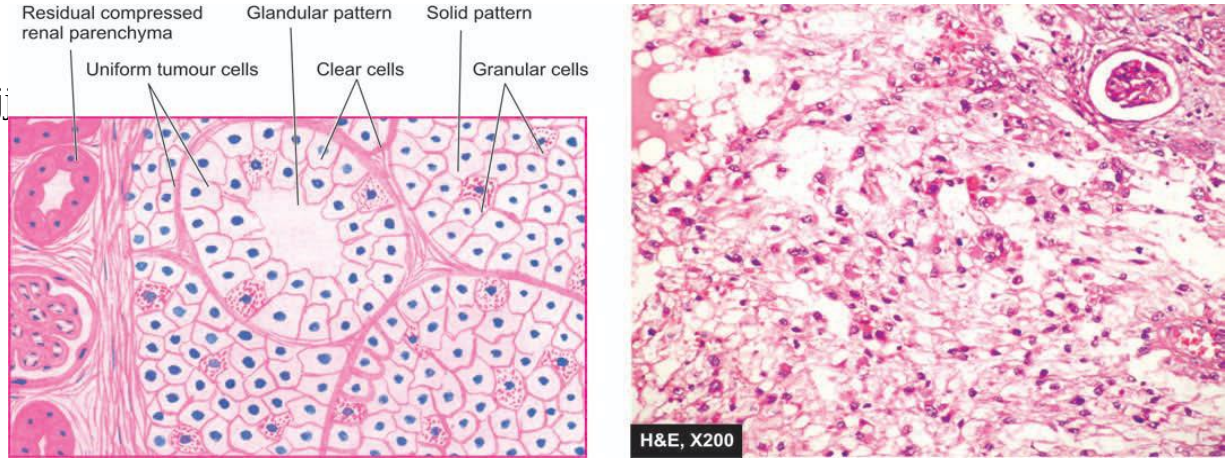
Wilms' Tumor

Nephroblastoma or Wilms' tumor is an embryonic tumor derived from primitive renal epithelial and mesenchymal components. It is the most common abdominal malignant tumor of young children, seen most commonly between 1 to 6 years of age with equal sex incidence.

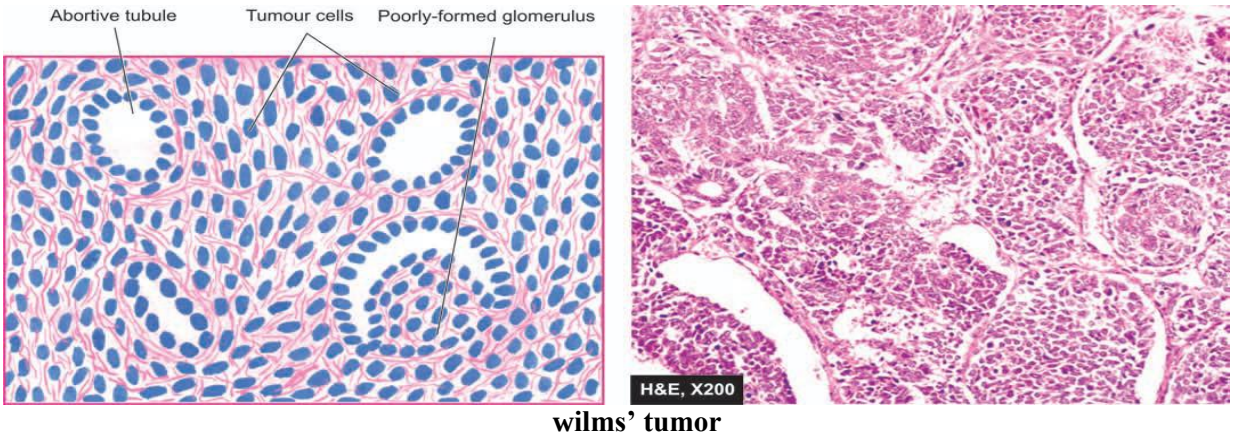
Secondary Tumors

Leukemic infiltration of the kidneys is a common finding, particularly in chronic myeloid leukemia. Kidney is a common site for blood-borne metastases from different primary sites, chiefly from cancers of the lungs, breast and stomach.

jj



Renal cell carcinoma



wilms' tumor

LIVER

Anatomy

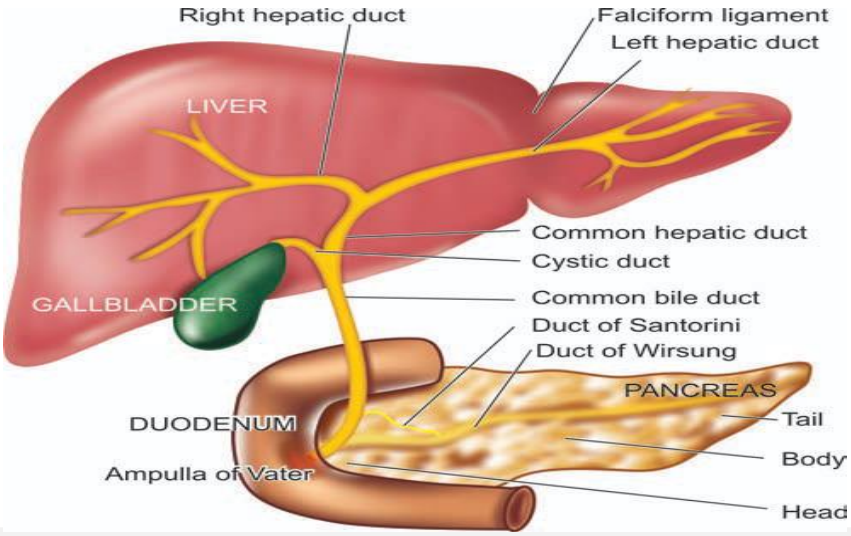
The liver is the largest organ in the body weighing 1400-1600 gm in the males and 1200-1400 gm in the females. There are 2 main anatomical lobes—right and left, the right being about six times the size of the left lobe. The right and left lobes are separated anteriorly by a fold of peritoneum called the *falciform ligament*, inferiorly by the fissure for the *ligamentum teres,* and posteriorly by the fissure for the *ligamentum venosum.*

The liver has a double blood supply—the portal vein brings the venous blood from the intestines and spleen, and the hepatic artery coming from the coeliac axis supplies arterial blood to the liver. This dual blood supply provides sufficient protection against infarction in the liver.

Functions

The liver performs multifold functions. These are briefly listed below:

1. Manufacture and excretion of bile.
2. Manufacture of several major plasma proteins such as albumin, fibrinogen and prothrombin.
3. Metabolism of proteins, carbohydrates and lipids.
4. Storage of vitamins (A, D and B12) and iron.
5. Detoxification of toxic substances such as alcohol and drugs.



Liver Function Tests

I. Tests For Manufacture and Excretion of Bile

1. Bilirubin

A) Serum bilirubin estimation

B) In faeces

C) In urine

2. Urobilinogen

3. Bromsulphalein Excretion.

4. Bile Acids (Bile Salts)

II. Serum Enzyme Assays

1. Alkaline Phosphatase

2. γ-glutamyl transpeptidase (γ-GT).

3. Transaminase (Aminotransferase).

A) Serum aspartate transaminase or AST(formerly glutamic oxaloacetic transaminase or SGOT)

B) Serum alanine transaminase or ALT (formerly glutamic pyruvic transaminase or SGPT)

III. Tests for Metabolic Functions

1. Amino acids and protein metabolism

A) Serum proteins

B) Immunoglobulins

2. Lipid and lipoprotein metabolism

3. Carbohydrates metabolism

IV. Immunologic Tests

1. Nonspecific immunologic reactions

A) *Smooth muscle antibody*

B) Mitochondrial antibody

C) *Antinuclear antibody*

2. Antibodies to specific etiologic agents

i)Hepatitis B surface antigen (HBsAg)

ii) *Hepatitis B core antibody (HBc)*

iii) *Amoeba antibodies* to *Entamoeba histolytica*

V. Ancillary Diagnostic Tests

1. Ultrasonography

2. FNAC and\or percutaneous liver biopsy.

Hepatic Failure

Though the liver has a marked regenerative capacity and a large functional reserve, hepatic failure may develop from severe acute and fulminant liver injury with massive necrosis of liver cells *(acute hepatic failure)*, or from advanced chronic liver disease *(chronic hepatic failure).* Acute hepatic failure develops suddenly with severe impairment of liver functions whereas chronic liver failure comes insidiously. The prognosis is much worse in acute hepatic failure than that in chronic liver failure.

Etiology

Acute and chronic hepatic failure result from different causes:

Acute (fulminant) hepatic failure occurs most frequently in *acute viral hepatitis*. Other causes are hepatotoxic drug reactions (e.g. anaesthetic agents, non-steroidal anti-inflammatory drugs, anti-depressants), carbon tetrachloride poisoning, acute alcoholic hepatitis, mushroom poisoning.

Chronic hepatic failure is most often due to *cirrhosis*. Other causes include chronic active hepatitis, chronic cholestasis (cholestatic jaundice) and Wilson's disease.

Manifestations

1. Jaundice

2. Hepatic encephalopathy (Hepatic coma)

3. Hyperkinetic circulation

4. Hepato-renal syndrome
5. Hepato-pulmonary syndrome
6. Coagulation defects
7. Ascites and oedema
8. Endocrine changes
9. Skin changes
10. Foetor hepaticus

Hepatic infection

Viral hepatitis

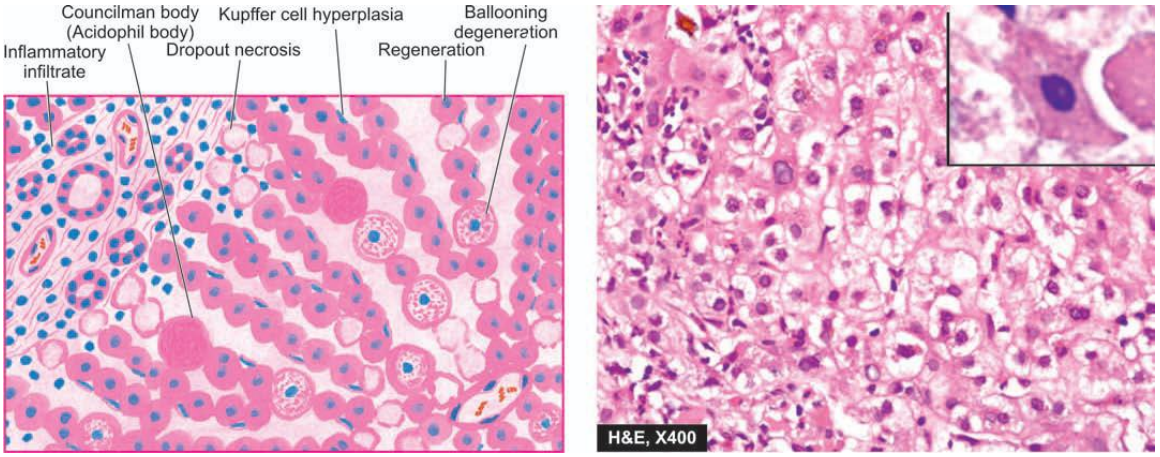
The term viral hepatitis is used to describe infection of the liver caused by hepatotropic viruses. Currently there are 5 main varieties of these viruses and a sixth poorly characterized virus, causing distinct types of viral hepatitis.

- *Hepatitis A virus (HAV),* causing a faecally-spread self-limiting disease.
- Hepatitis B virus (HBV), causing a parenterally transmitted disease that may become chronic.
- Hepatitis C virus (HCV), previously termed non-A, non-B (NANB) hepatitis virus involved chiefly in transfusion related hepatitis
- Hepatitis delta virus (HDV) which is sometimes associated as super infection with hepatitis B infection
- Hepatitis E virus (HEV), causing water-borne infection.
- Hepatitis G virus (HGV), is a recently discovered transfusion-transmitted hepatotropic virus but is not known to cause hepatitis

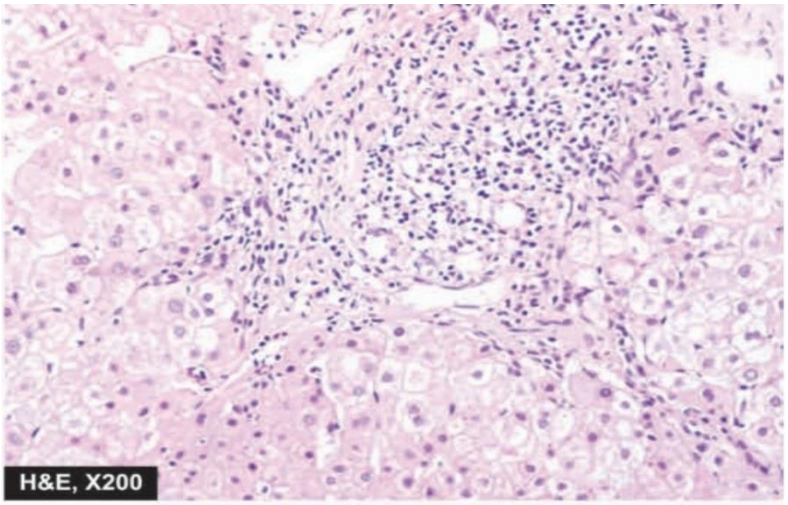
All these human hepatitis viruses are RNA viruses except HBV which is a DNA virus.

Though a number of other viral diseases such as infection with Epstein-Barr virus (in infectious mononucleosis), arbovirus (in yellow fever), cytomegalovirus, herpes simplex and several others affect the liver but the changes produced by them are

nonspecific; the term ‘viral hepatitis’ is strictly applied to infection of the liver by the hepatitis viruses.



Acute viral hepatitis



CHRONIC HEPATITIS

Other infection

Cholangitis

Cholangitis is the term used to describe inflammation of the extra-hepatic or intrahepatic bile ducts, or both. There are two main types of cholangitis—pyogenic and primary sclerosing.

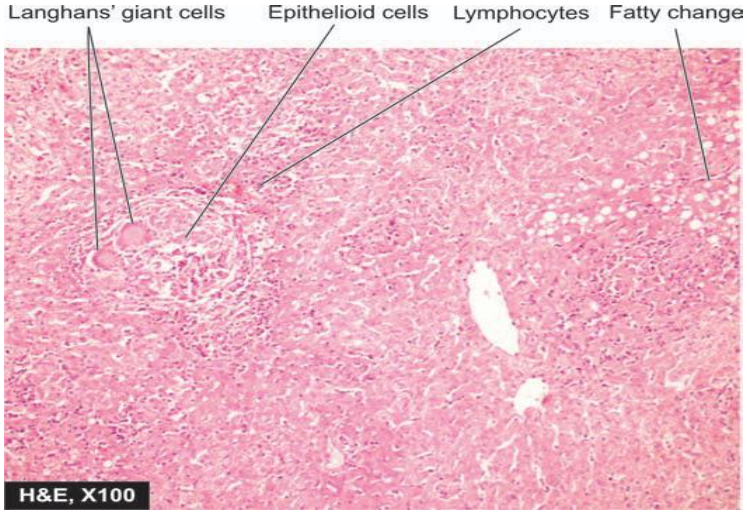
Hepatic Tuberculosis

Tuberculosis of the liver occurs as a result of military dissemination from primary complex or from chronic adult pulmonary tuberculosis. The diagnosis is possible by

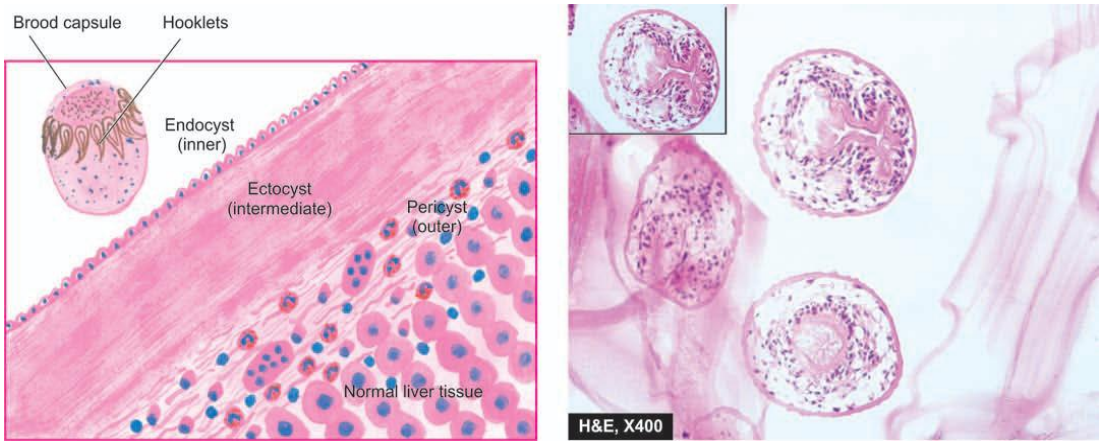
liver biopsy.

Hydatid disease (ECHINOCOCCOSIS)

Hydatid disease occurs as a result of infection by the larval cyst stage of the tapeworm, *Echinococcus granulosus.* The dog is the common definite host, while man, sheep and cattle are the intermediate hosts.



Miliary tuberculosis liver.



Hydatid cyst.

Cirrhosis

Cirrhosis of the liver is one of the ten leading causes of death in the Western world. It represents the irreversible end-stage of several diffuse diseases causing hepatocellular injury and is characterised by the following 4 features:

1. It involves the entire liver.
2. The normal lobular architecture of hepatic parenchyma is dis-organized.
3. There is formation of nodules separated from one another by irregular bands of fibrosis.
4. It occurs following hepatocellular necrosis of varying etiology so that there are alternate areas of necrosis and regenerative nodules.

Classification

Cirrhosis can be classified on the basis of morphology and etiology

A. Morphologic Classification

There are 3 morphologic types of cirrhosis: micronodular, macronodular and mixed. Each of these forms may have an active and inactive form.

B. Etiologic Classification

Based on the etiologic agent for cirrhosis, various categories of cirrhosis are described.

Specific Types of Cirrhosis

Alcoholic Liver Disease and Cirrhosis

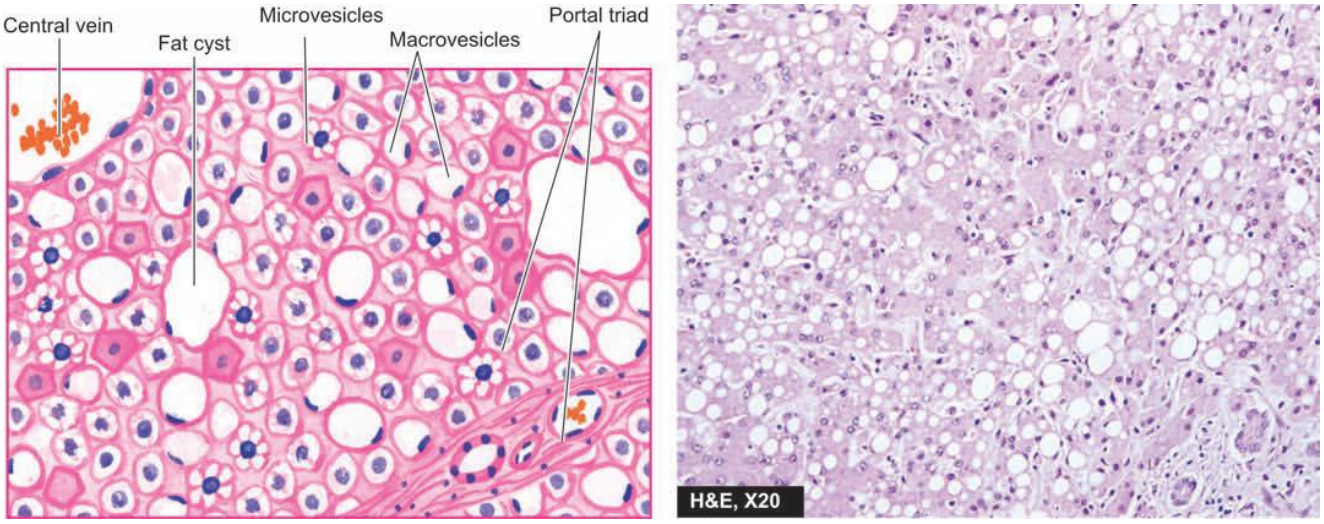
Alcoholic liver disease is the term used to describe the spectrum of liver injury associated with acute and chronic alcoholism. There are three sequential stages in alcoholic liver disease: *alcoholic steatosis (fatty liver), alcoholic hepatitis* and *alcoholic cirrhosis.*

Risk factor for alcoholic liver disease

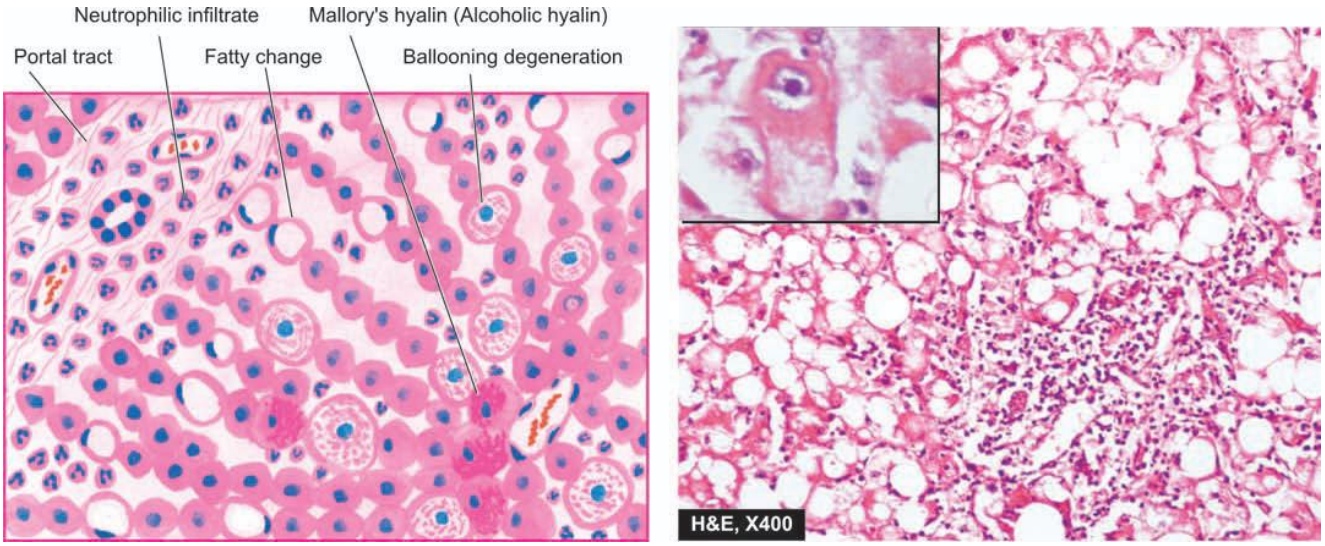
1. Drinking patterns.
2. Gender
3. Malnutrition
4. Infections
5. Genetic factors
6. Hepatitis C infection

Pathogenesis

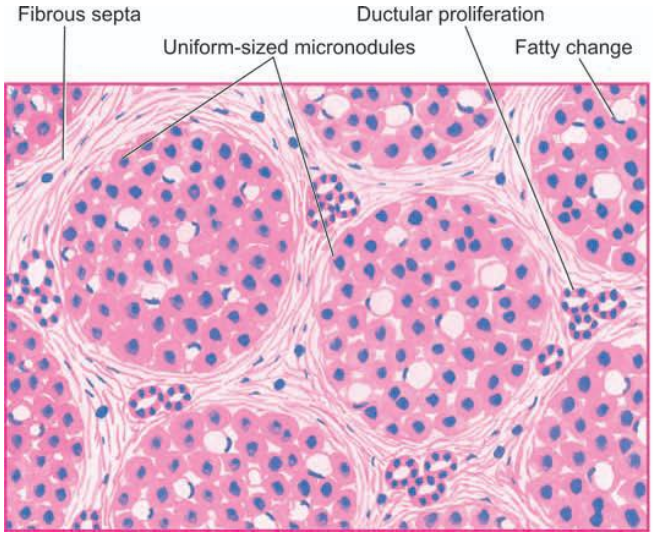
1. Direct hepatotoxicity by ethanol
2. Hepatotoxicity by ethanol metabolites
3. Oxidative stress
4. Immunological mechanism
5. Inflammation
6. Fibrogenesis
7. Retention of liver cell water and proteins
8. Hypoxia
9. Increased liver fat

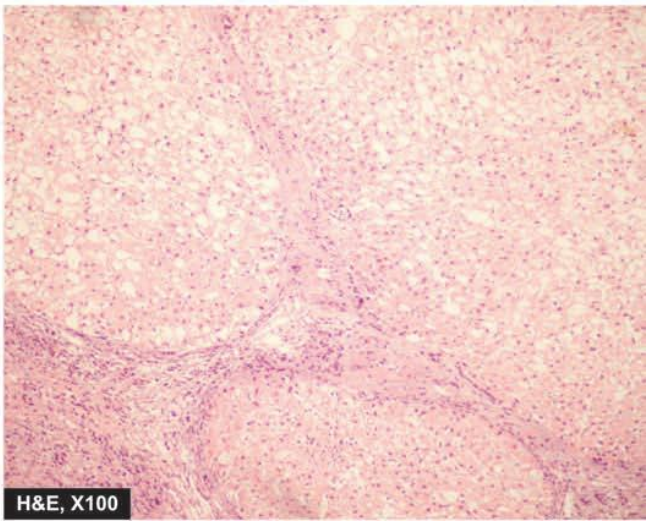


Fatty liver (alcoholic steatosis).



Alcoholic hepatitis





Alcoholic cirrhosis

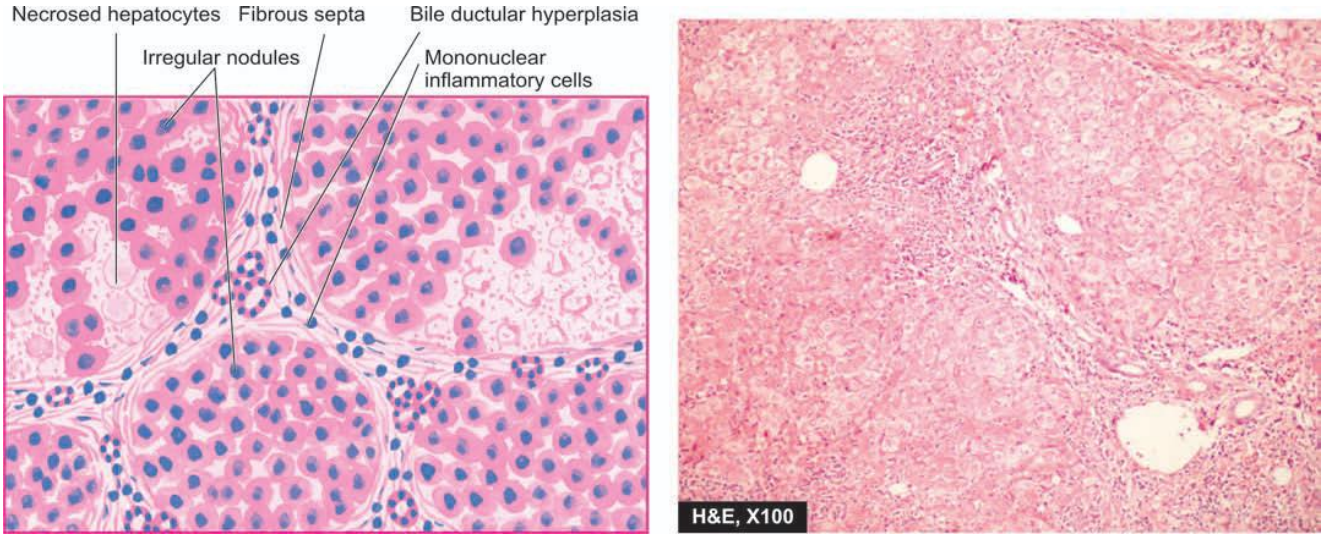
Post-necrotic Cirrhosis

Post-necrotic cirrhosis, also termed *post-hepatitic cirrhosis, macronodular cirrhosis* and *coarsely nodular cirrhosis,* is characterized by large and irregular nodules with broad bands of connective tissue and occurring most commonly after previous viral hepatitis.

Etiology

Based on epidemiologic and serologic studies, the following factors have been implicated in the etiology of post-necrotic cirrhosis.

1. Viral hepatitis
2. Drugs and chemical hepato-toxins
3. Others
4. Idiopathic



Post-necrotic cirrhosis

Biliary Cirrhosis

Biliary cirrhosis is defined as a chronic disorder characterized by clinical, biochemical and morphological features of long continued cholestasis of intrahepatic or extra-hepatic origin.

Biliary cirrhosis is of following types:

- *Primary biliary cirrhosis* in which the destructive process of unknown etiology affects intrahepatic bile ducts.
- *Secondary biliary cirrhosis* resulting from prolonged mechanical obstruction of the extra-hepatic biliary passages.
- *Primary sclerosing cholangitis and autoimmune cholangiopathy* causing biliary cirrhosis.

Pigment Cirrhosis in Haemochromatosis

Haemochromatosis is an iron-storage disorder in which there is excessive accumulation of iron in parenchymal cells with eventual tissue damage and functional insufficiency of organs such as the liver, pancreas, heart and pituitary gland. The condition is

characterized by a triad of features— *micronodular pigment cirrhosis, diabetes mellitus* and *skin pigmentation.* On the basis of the last two features, the disease has also come to be termed as *'bronze diabetes'.*

Cirrhosis in Wilson's Disease

Wilson's disease, also termed by a more descriptive designation of *hepatolenticular degeneration,* is an autosomal recessive inherited disease of copper metabolism, characterized by toxic accumulation of copper in many tissues, chiefly the liver, brain and eye. These accumulations lead to the *triad* of features:

1. Cirrhosis of the liver.
2. Bilateral degeneration of the basal ganglia of the brain.
3. Greenish-brown pigmented rings in the periphery of the cornea (Kayser-Fleischer rings).

HEPATIC TUMOURS

Benign Hepatic Tumors

These are uncommon and some of them are incidental autopsy findings. These include hepatocellular (liver cell) adenoma, bile duct adenoma (cholangioma) and haemangioma.

- **Hepatocellular (Liver Cell) Adenoma**

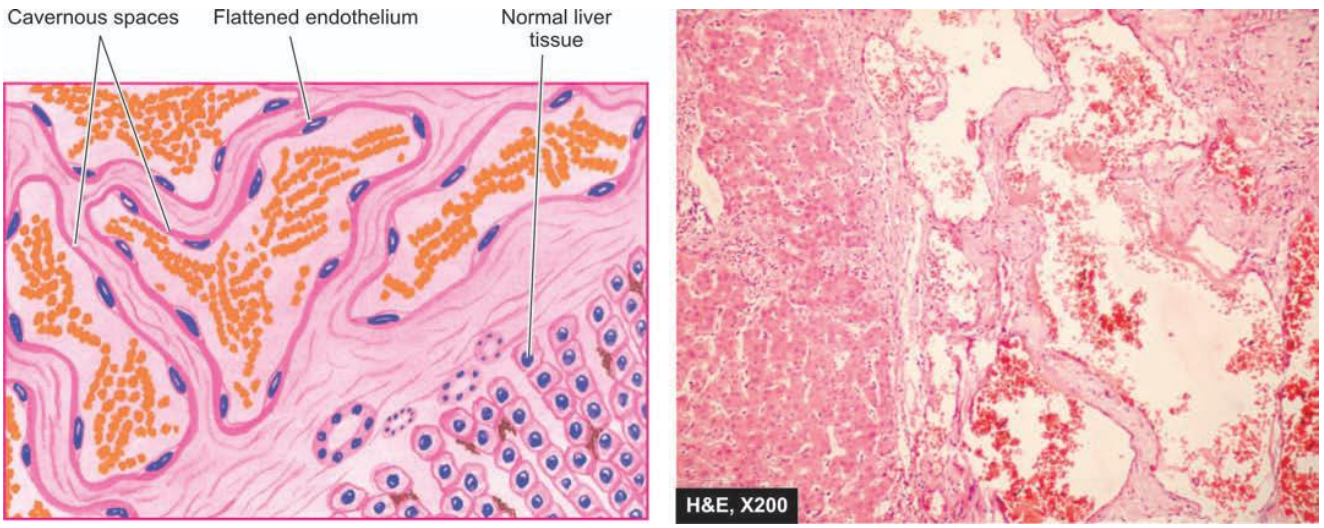
Adenomas arising from hepatocytes are rare and are reported in women in reproductive age group in association with use of oral contraceptives, sex hormone therapy and with pregnancy.

- **Bile Duct Adenoma (Cholangioma)**

Intrahepatic or extrahepatic bile duct adenoma is a rare benign tumour.

- **Haemangioma**

Haemangioma is the commonest benign tumor of the liver. Majority of them are asymptomatic and discovered incidentally. Rarely, a haemangioma may rupture into the peritoneal cavity.



Haemangioma of the liver.

Malignant Hepatic Tumors

Among the primary malignant tumors of the liver, hepatocellular (liver cell) carcinoma accounts for approximately 85% of all primary malignant tumors, cholangiocarcinoma for about 5-10%, and infrequently mixed pattern is seen.

Hepatocellular Carcinoma

Hepatocellular carcinoma (HCC) or liver cell carcinoma, also termed as hepatoma, is the most common primary malignant tumor of the liver. Liver cell cancer is more common in males than in females in the ratio of 4:1. The peak incidence occurs in 5th to 6th decades of life.

Etiology and Pathogenesis

1. Relation to HBV infection
2-Relation to HCV infection
3. Relation to cirrhosis
4. Relation to alcohol
5. Mycotoxins
6. Chemical carcinogens

Fibrolamellar Carcinoma.

A clinic pathologic variant of the HCC is fibrolamellar carcinoma of the liver found in young people of both sexes. The tumor forms a single large mass which may be encapsulated and occurs in the absence of cirrhosis.

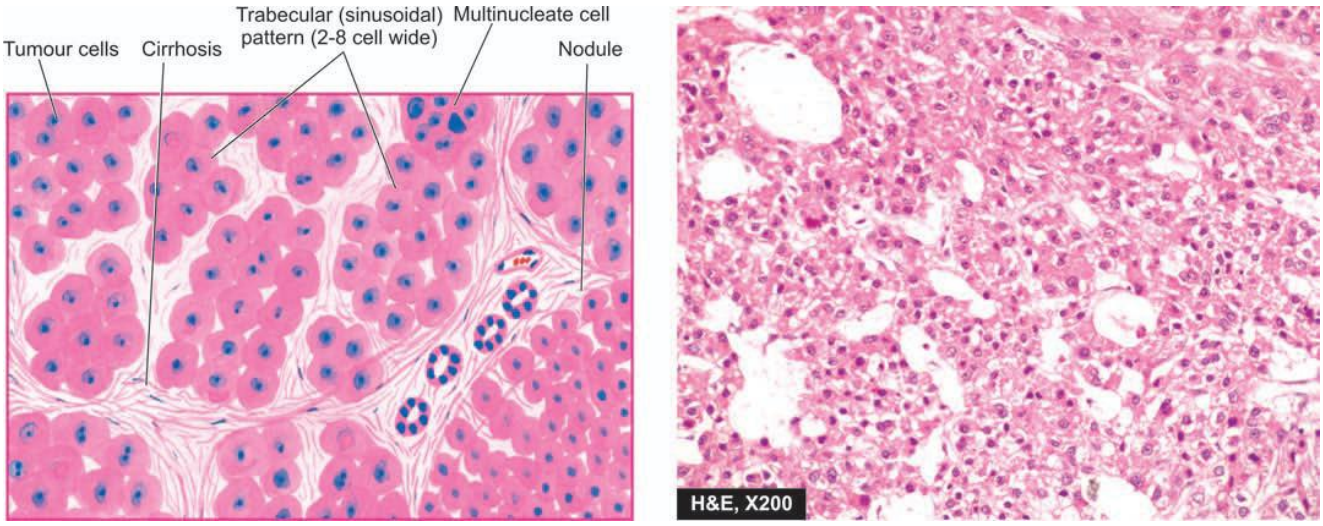
Spread

The HCC can have both intrahepatic and extrahepatic spread which faithfully reproduces the structure of the primary tumor:

- **Intrahepatic spread** occurs by haematogenous route and forms multiple metastases in the liver.
- **Extrahepatic spread** occurs via hepatic or portal veins to different sites, chiefly to lungs and bones, and by lymphatic route to regional lymph nodes at the porta

hepatic and to mediastina and cervical lymph nodes.

The causes of death from the HCC are cachexia, massive bleeding from esophageal varies, and liver failure with hepatic coma.



Hepatocellular carcinoma

Cholangiocarcinoma

Cholangiocarcinoma is the designation used for carcinoma arising from bile duct epithelium within the liver *(peripheral cholangiocarcinoma)*. None of the etiologic factors related to HCC have any role in the genesis of cholangiocarcinoma.

Hepatoblastoma (Embryoma)

Hepatoblastoma is a rare malignant tumor arising from primitive hepatic parenchymal cells. It presents before the age of 2 years as progressive abdominal distension with anorexia, failure to thrive, fever and jaundice.

Secondary Hepatic Tumors

Metastatic tumors in the liver are more common than the primary hepatic tumors. Most frequently, they are blood borne metastases, irrespective of whether the primary tumor is drained by portal vein or systemic veins. Most frequent primary tumors metastasizing to the liver, in descending order of frequency, are those of stomach, breast, lungs, colon, esophagus, pancreas, malignant melanoma and hematopoietic malignancies.

STOMACH

Normal Structure

The stomach has 5 anatomical regions

1. Cardia is the oesophagogastric junction.

2. Fundus is the portion above the horizontal line drawn across the oesophagogastric junction.

3. Body is the middle portion of the stomach between the fundus and the pyloric antrum.

4. Pyloric antrum is the distal third of the stomach.

5. Pylorus is the junction of distal end of the stomach with the duodenum. It has powerful sphincter muscle.

Gastric Analysis

A. Tests for Gastric Secretions

1. Tests for Gastric Acid Secretions

i) Histamine

ii) Histalog (Betazole).

iii) Pentagastrin (Peptavlon).

iv) Insulin meal (Hollander test).

v) Tubeless Analysis

2. Tests for Pepsin

3. Tests for Mucus

4. Test for Intrinsic Factor

B. Test for Gastrin

1. Serum Gastrin Levels

2. Gastrin Provocation Tests

i) Secretin test

ii) Calcium Infusion test

GASTRITIS

The term ‘gastritis’ is commonly employed for any clinical condition with upper abdominal discomfort like indigestion or dyspepsia in which the specific clinical signs and radiological abnormalities are absent. The condition is of great importance due to its relationship with peptic ulcer and gastric cancer. Broadly speaking, gastritis may be of 2 types—acute and chronic. Chronic gastritis can further be of various types.

Acute Gastritis

Acute gastritis is a transient acute inflammatory involvement of the stomach, mainly mucosa.

Etiopathogenesis

1. Diet and personal habits:
    - Highly spiced food
    - Excessive alcohol consumption
    - Malnutrition
    - Heavy smoking.
2. Infections
3. Drugs
4. Chemical and physical agents
5. Severe stress

Chronic Gastritis

Chronic gastritis is the commonest histological change observed in biopsies from the stomach.

Etiopathogenesis

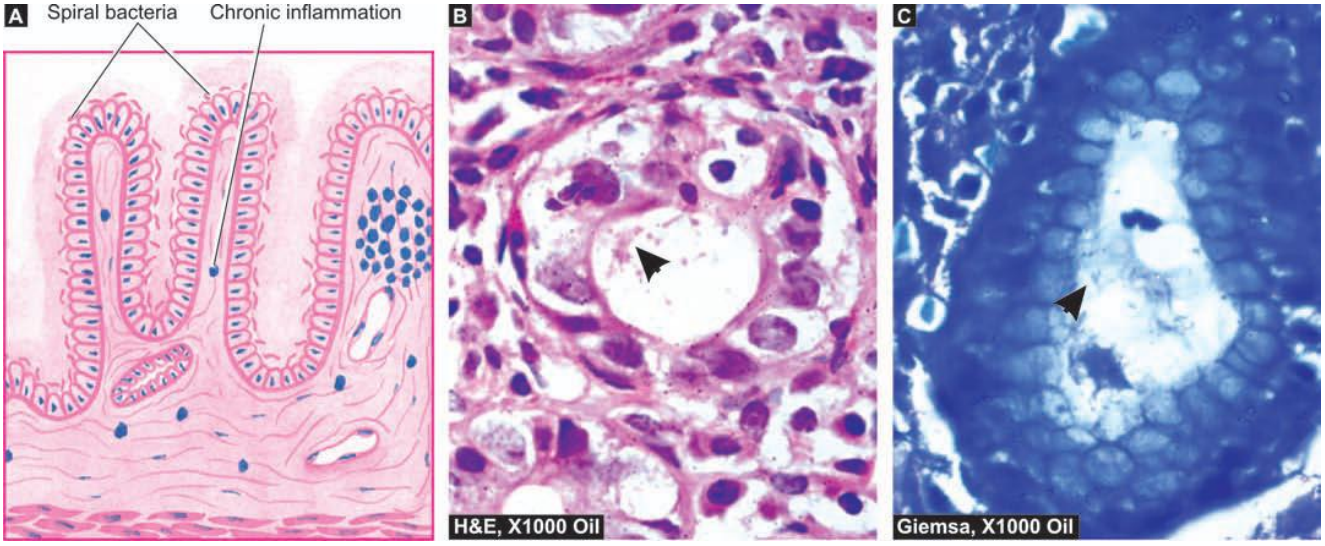
1. Reflux of duodenal contents into the stomach
2. Infection with *H. pylori*
3. Associated disease of the stomach and duodenum
4. Chronic hypochromic anaemia

5. Immunological factors such as autoantibodies to gastric parietal cells in atrophic gastritis and autoantibodies against intrinsic factor.

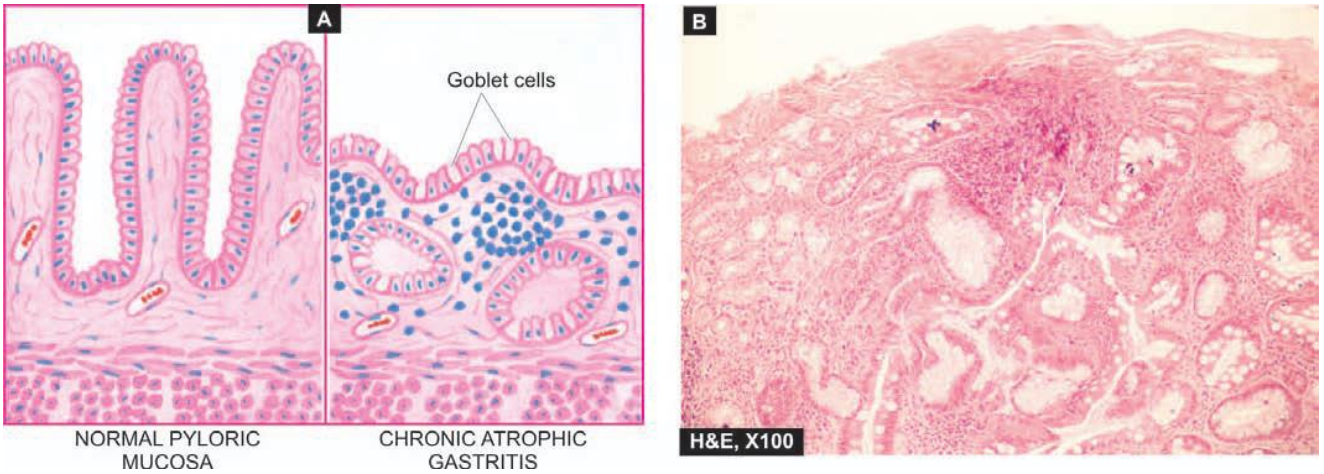
Classification

Based on the type of mucosa affected (i.e. cardiac, body, pyloric, antral or transitional), a clinicopathologic classification has been proposed.

1. Type A gastritis (Autoimmune gastritis)
2. Type B gastritis (*H. pylori*-related)
3. Type AB gastritis (Mixed gastritis, Environmental gastritis, Chronic atrophic gastritis).



Histologic appearance of *H. pylori* chronic gastritis



Chronic atrophic gastritis

Peptic Ulcers

Peptic ulcers are the areas of degeneration and necrosis of gastrointestinal mucosa exposed to acid-peptic secretions. They occur most commonly (98-99%) in either the duodenum or the stomach in the ratio of 4:1. Each of the two main types may be acute or chronic.

Acute Peptic (Stress) Ulcers

Acute peptic ulcers or stress ulcers are multiple, small mucosal erosions, seen most commonly in the stomach but occasionally involving the duodenum.

Etiology

i) *Psychological stress*

ii) *Physiological stress* as in the following:

- Shock
- Severe trauma
- Septicaemia
- Extensive burns (Curling's ulcers in the posterior aspect of the first part of the duodenum).
- Intracranial lesions (Cushing's ulcers developing from hyperacidity following excessive vagal stimulation).
- Drug intake (e.g. aspirin, steroids, butazolidine, indomethacin).
- Local irritants (e.g. alcohol, smoking, coffee etc).

Chronic Peptic Ulcers

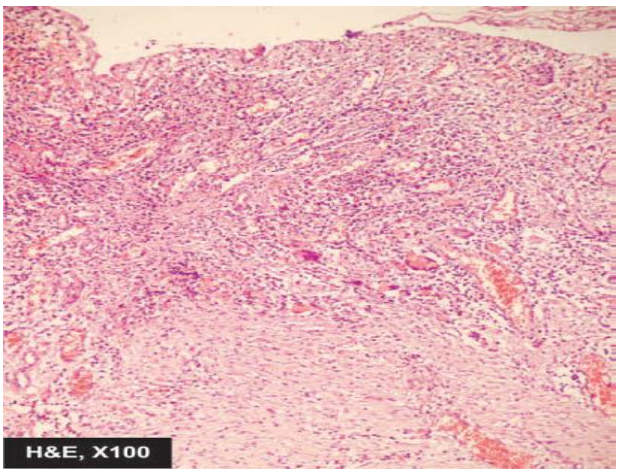
Etiology

1. Helicobacter pylori gastritis
2. NSAIDs-induced mucosal injury
3. Acid-pepsin secretions
4. Gastritis
5. Other local irritants
6. Dietary factors

7. Psychological factors
8. Genetic factors
9. Hormonal factors

Complications

1. Obstruction
2. Haemorrhage
3. Perforation.
4. Malignant transformation



Chronic peptic ulcer

Gastric Carcinoma

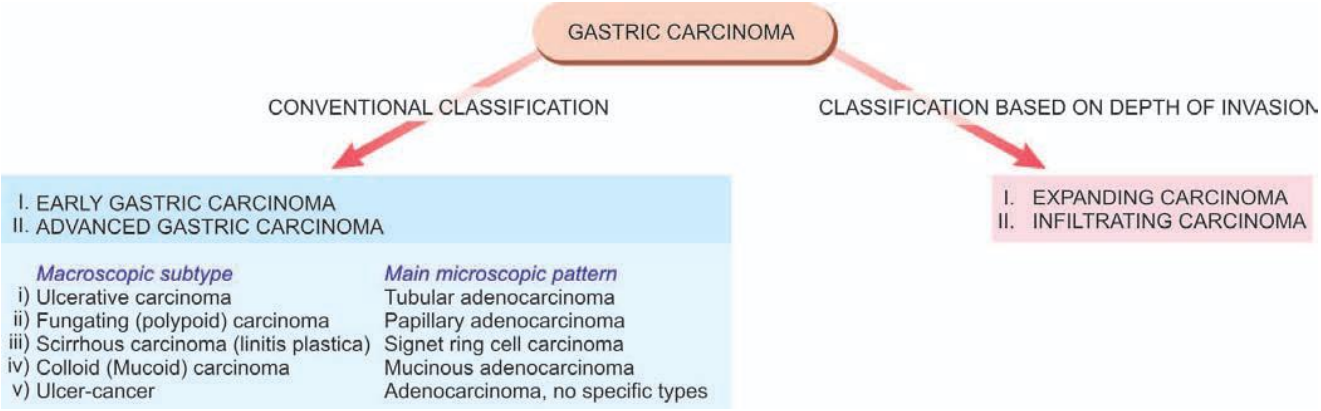
Carcinoma of the stomach comprises more than 90% of all gastric malignancies and is the leading cause of cancer-related deaths in countries where its incidence is high

Etiology

1. *H. pylori* infection
2. Dietary factors
3. Geographical factors
4. Racial factors
5. Genetic factors
6. Pre-malignant changes in the gastric mucosa

Spread

1. Direct spread
2. Lymphatic spread
3. Haematogenous spread



Pancreatitis

Acute Pancreatitis

Acute pancreatitis is an acute inflammation of the pancreas presenting clinically with 'acute abdomen'. The severe form of the disease associated with macroscopic haemorrhages and fat necrosis in and around the pancreas is termed *acute haemorrhagic pancreatitis* or *acute pancreatic necrosis.* The condition occurs in adults between the age of 40 and 70 years and is commoner in females than in males. Characteristically, there is elevation of *serum amylase* level within the first 24 hours and elevated *serum lipase* level after 3 to 4 days, the latter being more specific for pancreatic disease. Glucosuria occurs in 10% of cases.

Etiology

The two leading causes associated with acute pancreatitis are *alcoholism* and *cholelithiasis*, both of which are implicated in more than 80% of cases.

Pathogenesis

Though more than 20 enzymes are secreted by exocrine pancreas, 3 main groups of enzymes which bring about destructive effects on the pancreas are as under:

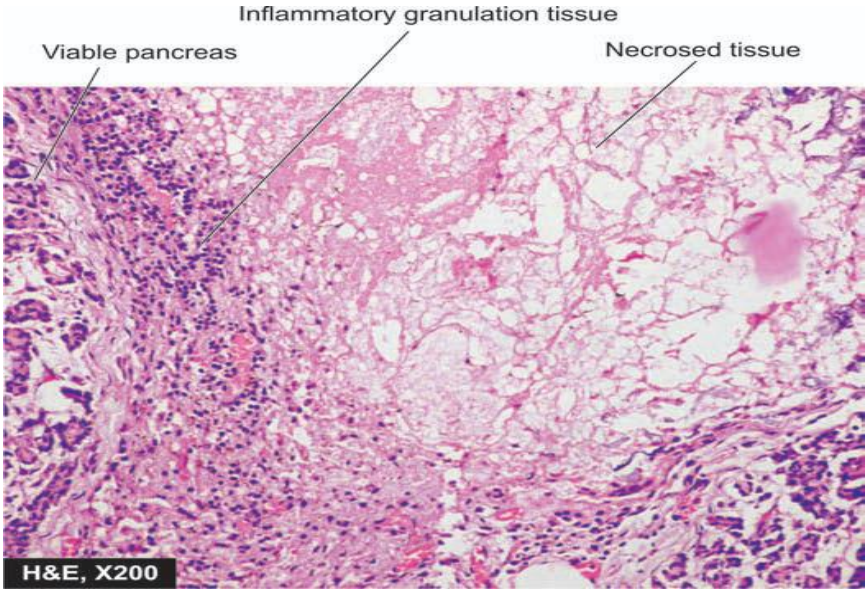
1. Proteases such as trypsin and chymotrypsin play the most important role in causing proteolysis.
2. Lipases and phospholipases degrade lipids and membrane phospholipids.
3. Elastases cause destruction of the elastic tissue of the blood vessels.

Chronic Pancreatitis

Chronic pancreatitis or *chronic relapsing pancreatitis* is the progressive destruction of the pancreas due to repeated mild and subclinical attacks of acute pancreatitis. Most patients present with recurrent attacks of severe abdominal pain at intervals of months to years. Weight loss and jaundice are often associated.

Etiology

Most cases of chronic pancreatitis are caused by the same factors as for acute pancreatitis. Thus, most commonly, chronic pancreatitis is related to *chronic alcoholism* with protein-rich diet, and less often to *biliary tract disease.*



Chronic pancreatitis

Carcinoma of Pancreas

Pancreatic cancer is the term used for cancer of the exocrine pancreas. It is one of the common cancers, particularly in the Western countries and Japan.

Etiology

1. Smoking
2. Diet and obesity
3. Chemical carcinogens
4. Diabetes mellitus
5. Chronic pancreatitis
6. H. pylori
7. Genetic factors

Intestine

Malabsorption Syndrome

Definition and Classification

The malabsorption syndrome (MAS) is characterised by impaired intestinal absorption of nutrients especially of fat; some other substances are proteins, carbohydrates, vitamins and minerals. MAS is subdivided into 2 broad groups:

Primary MAS, which is due to primary deficiency of the absorptive mucosal surface and of the associated enzymes.

Secondary MAS, in which mucosal changes result secondary to other factors such as diseases, surgery, trauma and drugs.

Clinical Feature

1. Steatorrhoea (pale, bulky, foul-smelling stools)
2. Chronic diarrhoea
3. Abdominal distension
4. Barborygmi and flatulence
5. Anorexia
6. Weight loss
7. Muscle wasting
8. Dehydration
9. Hypotension
10. Specific malnutrition and vitamin deficiencies depending upon the cause.

Investigations

I. LABORATORY TESTS:

1. Tests for fat malabsorption:

i) Faecal analysis for fat content

ii) Microscopic analysis for faecal fat

iii) Blood lipid levels after a fatty meal

iv) Tests based on absorption of radioactive-labelled fat.

2. Tests for protein malabsorption:

i) Bile acid malabsorption

ii) Radioactive-labelled glycine breath test.

iii) Prothrombin time (vitamin K deficiency)

iv) Secretin and other pancreatic tests.

3. Tests for carbohydrate malabsorption:

i) D-xylose tolerance test

ii) Lactose tolerance test

iii) Hydrogen breath test

iv) Bile acid breath test

4. Vitamin B12, malabsorption:

i) Schilling test

II. Intestinal Mucosal Biopsy

Important Types of MAS

1. **Coeliac Sprue** (Non-tropical Sprue, Gluten-Sensitive Enteropathy, Idiopathic Steatorrhoea)

This is the most important cause of primary malabsorption . The condition is characterised by significant loss of villi in the small intestine and thence diminished absorptive surface area. The condition occurs in 2 forms:

Childhood form, seen in infants and children and is commonly referred to as *coeliac disease.*

Adult form, seen in adolescents and early adult life and used to be called *idiopathic steatorrhoea.*

In either case, there is genetic abnormality resulting in sensitivity to gluten (a protein) and its derivative, gliadin, present in diets such as grains of wheat, barley and rye.

2. Collagenous Sprue

This entity is regarded as the end-result of coeliac sprue in which the villi are totally absent *(total villous atrophy)* and there are unique and diagnostic broad bands of collagen under the basal lamina of surface epithelium.

3. Tropical Sprue

4. Whipple's Disease (Intestinal Lipodystrophy)

5. Protein-Losing Enteropathies

Haemorrhoids (Piles)

Haemorrhoids or piles are the varicosities of the haemorrhoidal veins. They are called *'internal piles'* if dilatation is of superior haemorrhoidal plexus covered over by mucous membrane, and *'external piles*' if they involve inferior haemorrhoidal plexus covered over by the skin. They are common lesions in elderly and pregnant women. They commonly result from increased venous pressure. The possible causes include the following:

1. Portal hypertension
2. Chronic constipation and straining at stool
3. Cardiac failure
4. Venous stasis of pregnancy
5. Hereditary predisposition
6. Tumours of the rectum.

Breast

Normal Structure

The breast is a modified skin appendage which is functional in the females during lactation but is rudimentary in the males. Microanatomy of the breast reveals 2 types of tissue components: *epithelial* and *stromal.*

Fibrocystic Change

Fibrocystic change is the most common benign breast condition producing vague 'lumpy' breast rather than palpable lump in the breast.

As such, fibrocystic change of the female breast is a histologic entity characterized by following features:

i) Cystic dilatation of terminal ducts.

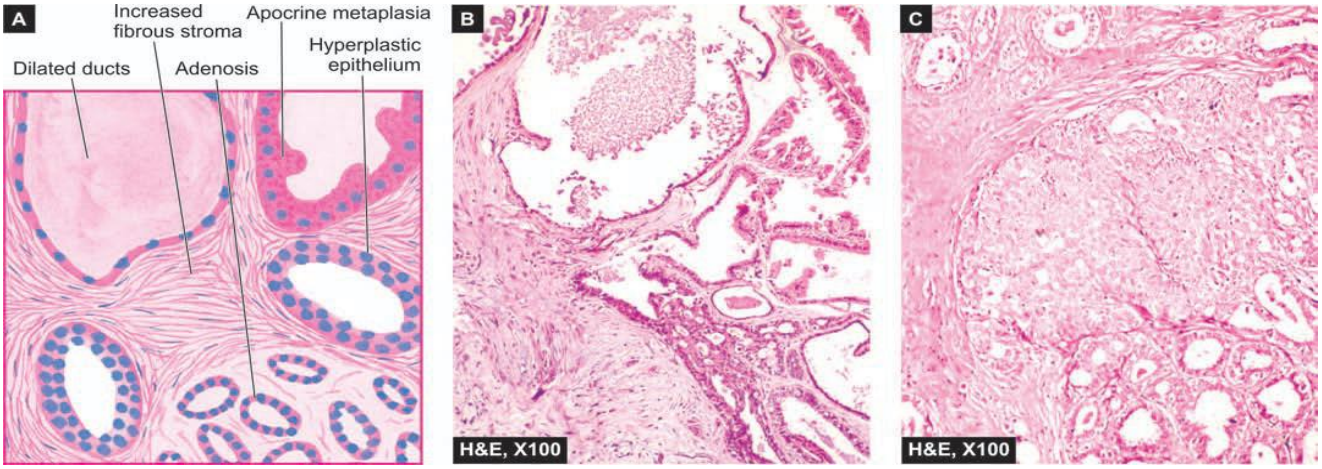
ii) Relative increase in inter- and intra-lobular fibrous tissue.

iii) Variable degree of epithelial proliferation in the terminal ducts.

It is important to identify the spectrum of histologic features by core needle biopsy or cytological findings by FNAC in fibrocystic changes since only some subset of changes has an increased risk of development of breast cancer. Presently, the spectrum of histologic changes are divided into two clinic-pathologically relevant groups:

A. Non-proliferative changes: Simple fibrocystic change.

B. Proliferative changes: Proliferative fibrocystic change.



Simple fibrocystic change. **A**, Diagrammatic view. **B**, Non-proliferative fibrocystic changes. **C**, Proliferative fibrocystic changes.

Breast Tumors

Tumors of the female breast are common and clinically significant but are rare in men. Among the important benign breast tumors are **fibroadenoma, phyllodes tumor (cystosarcoma phyllodes) and intraductal papilloma.** Carcinoma of the breast is an important malignant tumor which occurs as non-invasive (carcinoma *in situ*) and invasive cancer with its various morphologic varieties.

Carcinoma Of the Breast

Cancer of the breast is among the commonest of human cancers throughout the world. Clinically, the breast cancer usually presents as a solitary, painless, palpable lump which is detected quite often by self-examination.

Etiology

1. Geography

2. Genetic factors

i) *Family history:* First-degree relatives (mother, sister, daughter) of women with breast cancer have 2 to 6-fold higher risk of development of breast cancer. The risk is proportionate to a few factors:

- Number of blood relatives with breast cancer.
- Younger age at the time of development of breast cancer.
- Bilateral cancers.
- High risk cancer families having breast and ovarian carcinomas.

ii) Genetic mutations: About 10% breast cancers have been found to have inherited mutations

- *BRCA 1 gene* located on chromosome 17
- *BRCA 2 gene* located on chromosome 13
- *Mutation in p53 tumor suppressor gene* on chromosome 17

3. Estrogen excess

Evidences in support of increased risk with estrogen excess are as follows:

i) Women with prolonged reproductive life, with menarche setting in at an early age and menopause relatively late have greater risk.

ii) Higher risk in unmarried and nulliparous women than in married and multiparous women.

iii) Women with first childbirth at a late age (over 30 years) are at greater risk.

iv) Lactation is said to reduce the risk of breast cancer.

4. Miscellaneous factors

i) Consumption of large amounts of animal fats, high calorie foods.

ii) Cigarette smoking.

iii) Alcohol consumption.

iv) Breast augmentation surgery.

v) Exposure to ionising radiation during breast development

5. Fibrocystic change.

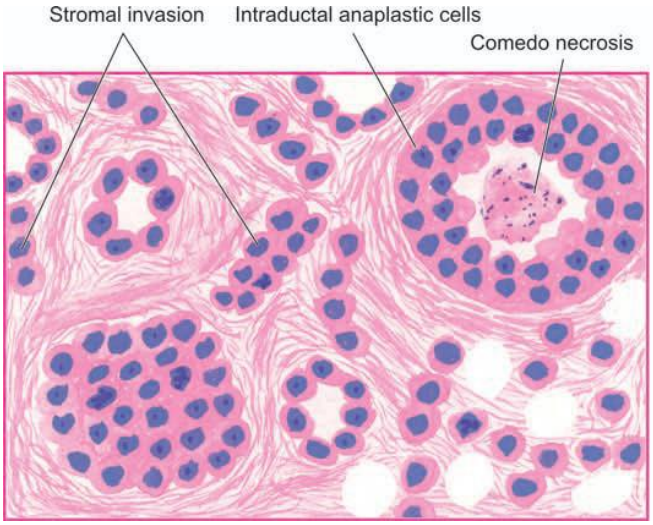
General Classification

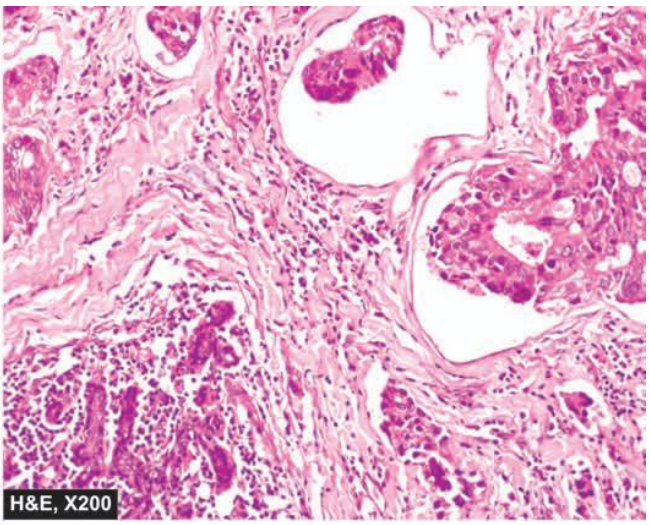
A. Non-Invasive *(IN SITU)* Breast Carcinoma

In general, two types of non-invasive or *in situ* carcinoma— **intraductal carcinoma and lobular carcinoma *in situ,*** are characterized histologically by presence of tumor cells within the ducts or lobules respectively without evidence of invasion.

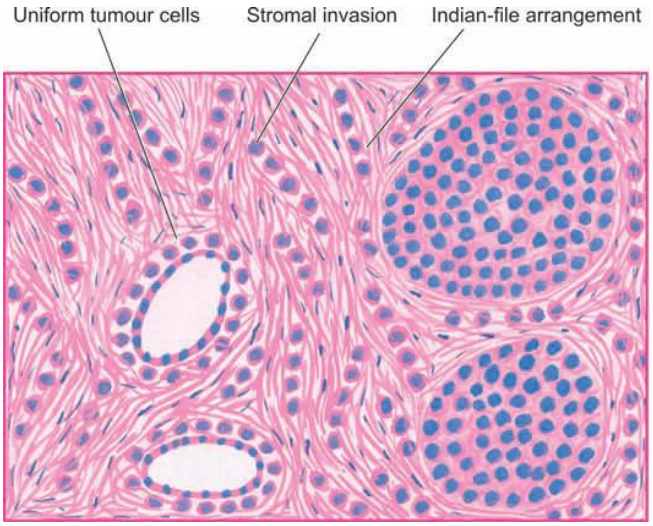
B. Invasive Breast Carcinoma

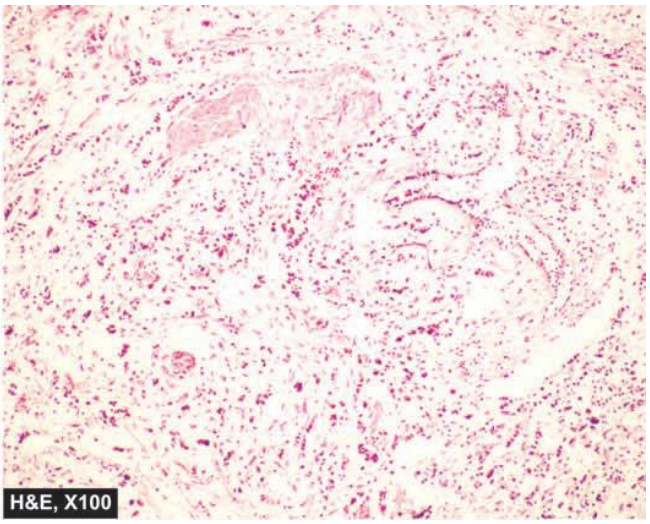
- Infiltrating (Invasive) Duct Carcinoma
- Infiltrating (Invasive) Lobular Carcinoma





Infiltrating duct carcinoma





Invasive lobular carcinoma

The Endocrine System

The development, structure and functions of human body are governed and maintained by 2 mutually interlinked systems *the endocrine system* and *the nervous system.* Anatomically, the endocrine system consists of 6 distinct organs: pituitary, adrenals, thyroid, parathyroids, gonads, and pancreatic islets; the last one is included in neuroendocrine system also).

Pituitary Gland

Normal Structure

The pituitary gland or hypophysis in an adult weighs about 500 mg and is slightly heavier in females. It is situated at the base of the brain in a hollow called *sella turcica* formed out of the sphenoid bone. The gland is composed of 2 major anatomic divisions: anterior lobe (adenohypophysis) and posterior lobe (neurohypophysis).

Hyperpituitarism

Hyperpituitarism is characterized by oversecretion of one or more of the pituitary hormones. Such hyper secretion may be due to diseases of the anterior pituitary, posterior pituitary or hypothalamus.

A. Hyper function of Anterior Pituitary

Three common syndromes of adenohypophyseal hyper function are: gigantism and acromegaly, hyperprolactinaemia and Cushing's syndrome.

Gigantism and Acromegaly

Both these clinical syndromes result from sustained excess of growth hormone (GH), most commonly by somatotroph (GH-secreting) adenoma.

CUSHING'S Syndrome

Pituitary-dependent Cushing's syndrome results from ACTH excess. Most frequently, it is caused by corticotroph (ACTH-secreting) adenoma.

B. Hyperfunction of Posterior Pituitary and Hypothalamus

Lesions of posterior pituitary and hypothalamus are uncommon. Two of the syndromes associated with hyperfunction of the posterior pituitary and hypothalamus are: inappropriate release of ADH and precocious puberty.

Inappropriate release of ADH

Inappropriate release of ADH results in its excessive secretion which manifests clinically by passage of concentrated urine due to increased reabsorption of water and loss of sodium in the urine, consequent hyponatraemia, haemodilution and expansion of intra- and extracellular fluid volume.

Precocious Puberty

A tumor in the region of hypothalamus or the pineal gland may result in premature release of gonadotropins causing the onset of pubertal changes prior to the age of 9 years. The features include premature development of genitalia both in the male and in the female, growth of pubic hair and axillary hair. In the female, there is breast growth and onset of menstruation.

Pituitary Adenomas

Adenomas are the most common pituitary tumours. They are conventionally classified according to their H & E staining characteristics of granules into acidophil, basophil and chromophobe adenomas. However, this morphologic classification is considered quite inadequate because of the significant functional characteristics of each type of adenoma including the chromophobe adenoma, which on H & E staining does not show visible granules. As a result of advances in the ultra-structural and immune-cytochemical studies, a functional classification of pituitary adenoma has emerged.

	Functional Type	Frequency	Hormones Produced	Clinical Syndrome
1.	*Lactotroph adenoma (Prolactinoma)*	20-30%	PRL	Hypogonadism, galactorrhoea
2.	*Somatotroph adenoma*	5%	GH	Acromegaly/gigantism
3.	*Mixed somatotroph-lactotroph adenoma*	5%	PRL, GH	Acromegaly, hypogonadism, galactorrhoea
4.	*Corticotroph adenoma*	10-15%	ACTH	Cushing's syndrome
5.	*Gonadotroph adenoma*	10-15%	FSH-LH	Inactive or hypogonadism
6.	*Thyrotroph adenoma*	1%	TSH	Thyrotoxicosis
7.	*Null cell adenoma/ oncocytoma*	20%	Nil	Pituitary failure
8.	*Pleurihormonal adenoma*	15%	Multiple hormones	Mixed

Thyroid Gland

Normal Structure

Embryologically, the thyroid gland arises from a midline invagination at the root of the tongue and grows downwards in front of trachea and thyroid cartilage to reach its normal position. The thyroid gland in an adult weighs 15-40 gm and is composed of two lateral lobes connected in the midline by a broad isthmus which may have a pyramidal lobe extending upwards. Cut section of normal thyroid is yellowish and translucent.

Functions

The major function of the thyroid gland is to maintain a high rate of metabolism which is done by means of iodine-containing thyroid hormones, thyroxine (T4) and tri-iodothyronine (T3).

Laboratory Tests

- Determination of serum levels of T3, T4 by radioimmunoassay (RIA).
- TSH and TRH determination.
- Determination of calcitonin secreted by parafollicular C cells.
- Estimation of thyroglobulin secreted by thyroid follicular cells.
- Assessment of thyroid activity by its ability to uptake radioactive iodine (RAIU).

Thyroiditis

Inflammation of the thyroid, thyroiditis, is more often due to non-infectious causes and is classified on the basis of onset and duration of disease into acute, subacute and chronic as under:

I. Acute thyroiditis:

1. Bacterial infection e.g. *Staphylococcus*, *Streptococcus*.
2. Fungal infection e.g. *Aspergillus*, *Histoplasma*, *Pneumocystis*.
3. Radiation injury

II. Subacute thyroiditis:

1. Subacute granulomatous thyroiditis (de Quervain's thyroiditis, giant cell thyroiditis, viral thyroiditis)
2. Subacute lymphocytic (postpartum, silent) thyroiditis
3. Tuberculous thyroiditis

III. Chronic thyroiditis:

1. Autoimmune thyroiditis (Hashimoto's thyroiditis or chronic lymphocytic thyroiditis)
2. Riedel's thyroiditis (or invasive fibrous thyroiditis).

HASHIMOTO'S (Autoimmune, Chronic lymphocytic)Thyroiditis

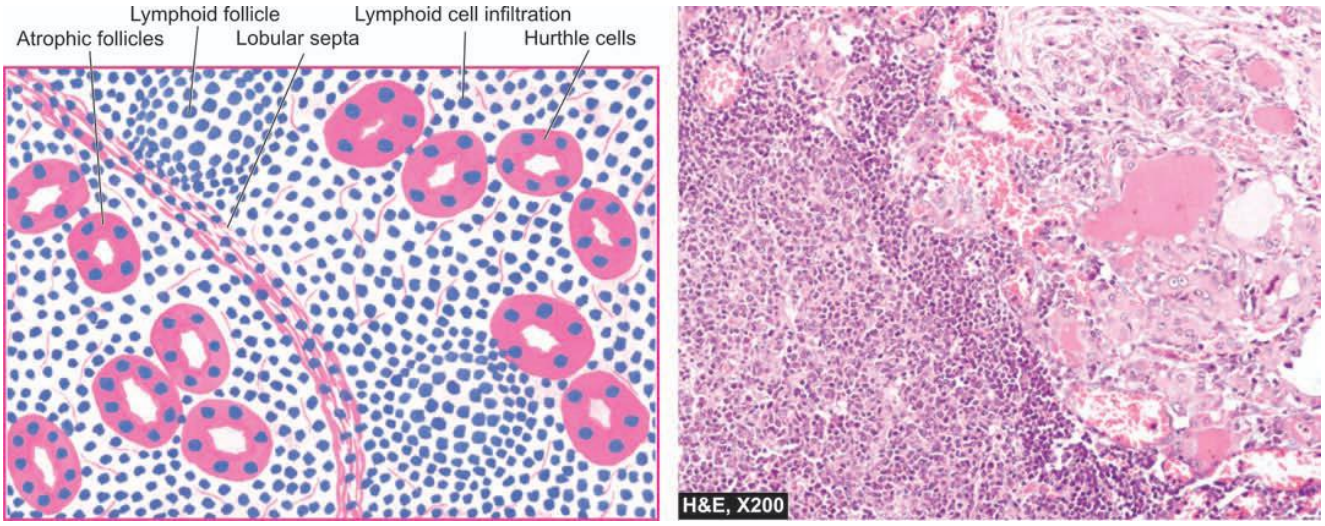
Hashimoto's thyroiditis, also called diffuse lymphocytic thyroiditis, struma lymphomatosa or goitrous autoimmune thyroiditis, is characterised by 3 principal features:

1. Diffuse goitrous enlargement of the thyroid.
2. Lymphocytic infiltration of the thyroid gland.
3. Occurrence of thyroid autoantibodies.

Hashimoto's thyroiditis occurs more frequently between the age of 30 and 50 years and shows an approximately tenfold preponderance among females.

Etiopathogenesis

1. Other autoimmune disease association
2. Immune destruction of thyroid cells
3. Detection of autoantibodies
4. Inhibitory TSH-receptor antibodies
5. Genetic basis



Hashimoto's thyroiditis

Thyroid cancer

Etiopathogenesis

1. External radiation
2. Iodine excess and TSH
3. Genetic basis

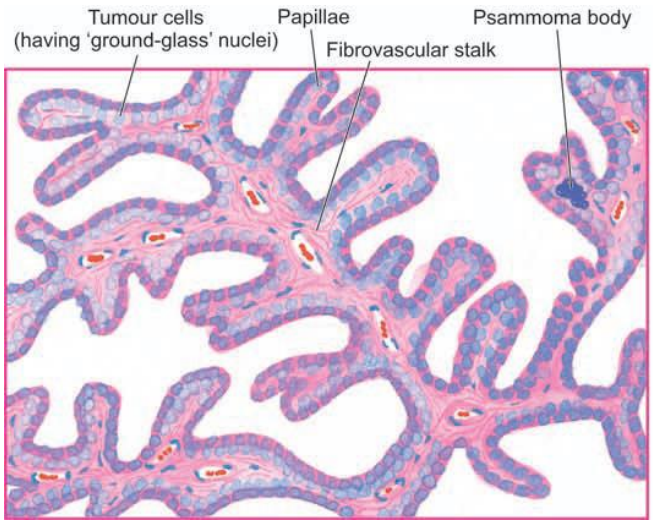
Papillary Thyroid Carcinoma

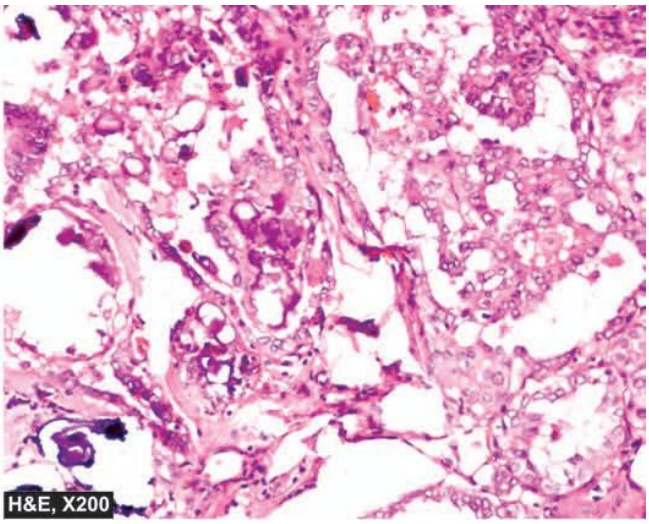
Papillary carcinoma is the most common type of thyroid carcinoma, comprising 75-85% of cases. Papillary carcinoma is typically a slow-growing malignant tumour, most often presenting as an asymptomatic solitary nodule.

Follicular Thyroid Carcinoma

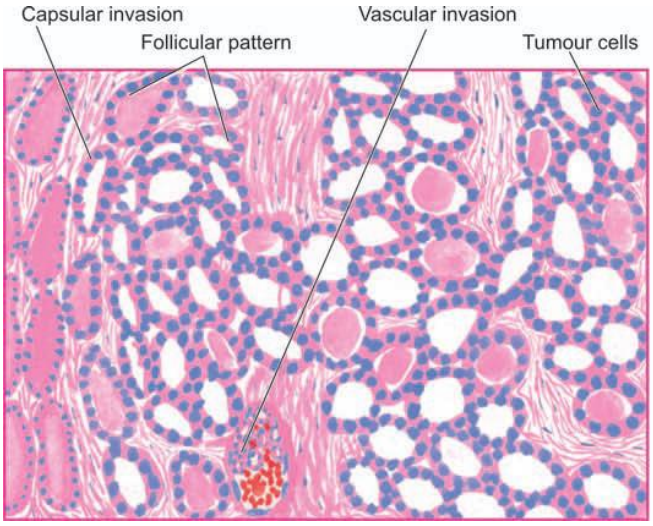
Follicular carcinoma is the other common type of thyroid cancer, next only to papillary carcinoma and comprises about 10-20% of all thyroid carcinomas.

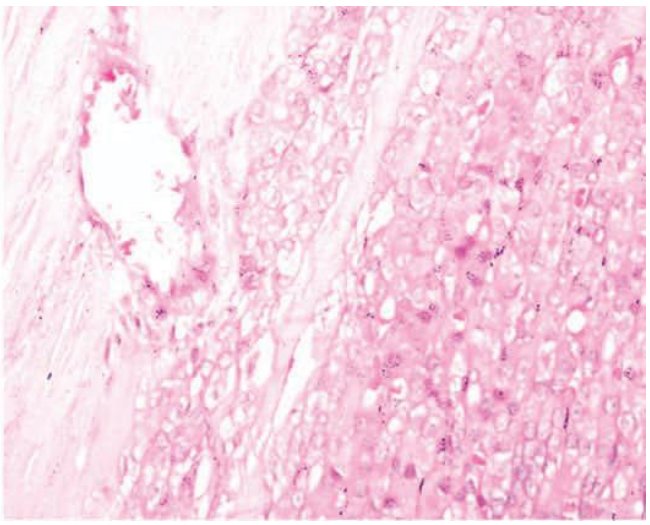
Follicular carcinoma presents clinically either as a solitary nodule or as an irregular, firm and nodular thyroid enlargement. The tumor is slow-growing but more rapid than the papillary carcinoma.





Papillary carcinoma thyroid





Follicular carcinoma

Prostate

The **prostate** lies below the bladder and has both a muscular and a glandular component. The prostate is primarily a reproductive organ. In conjunction with the seminal vesicles, the prostate produces the fluid that supports the sperm. In fact, the sperm constitute a small amount of the semen with the vast majority of the seminal fluid coming from the prostate and seminal vesicles. A further function of the prostate gland is to act as a valve for the bladder.

Prostatitis

Inflammation of the prostate i.e. prostatitis, may be acute, chronic and granulomatous types.

Acute Prostatitis

It occurs most commonly due to ascent of bacteria from the urethra, less often by descent from the upper urinary tract or bladder, and occasionally by lymphogenous or haematogenous spread from a distant focus of infection. The infection may occur spontaneously or may be a complication of urethral manipulation such as by catheterisation, cystoscopy, urethral dilatation and surgical procedures on the prostate. The common pathogens are those which cause UTI, most frequently *E. coli*, and others such as *Klebsiella, Proteus, Pseudomonas, Enterobacter*, staphylococci and streptococci. The diagnosis is made by culture of urine specimen.

Chronic Prostatitis

Chronic prostatitis is usually asymptomatic but may cause allergic reactions, iritis, neuritis or arthritis.

Chronic prostatitis is of 2 types—bacterial and abacterial.

1- Chronic bacterial prostatitis is caused in much the same way and by the same organisms as the acute prostatitis. It is generally a consequence of recurrent UTI. Diagnosis is made by detection of more than 10-12 leucocytes per high power field in expressed prostatic secretions, and by positive culture of urine specimen and

prostatic secretions. This condition is more difficult to treat since antibiotics penetrate the prostate poorly.

2- Chronic abacterial prostatitis is more common. There is no history of recurrent UTI and culture of urine and prostatic secretions is always negative, though leucocytosis is demonstrable in prostatic secretions. The pathogens implicated are *Chlamydia trachomatis.*

Granulomatous Prostatitis

Granulomatous prostatitis is a variety of chronic prostatitis, probably caused by leakage of prostatic secretions into the tissue, or could be of autoimmune origin.

Carcinoma of Prostate

Cancer of the prostate is the second most common form of cancer in males, followed in frequency by lung cancer. It is a disease of men above the age of 50 years and its prevalence increases with increasing age so that more than 50% of men
80 years old have asymptomatic (latent) carcinoma of the prostate. Thus, it is common to classify carcinoma of the prostate into the following 4 types:

1. Latent carcinoma. This is found unexpectedly as a small focus of carcinoma in the prostate during autopsy studies in men dying of other causes. Its incidence in autopsies has been variously reported as 25-35%.

2. Incidental carcinoma. About 15-20% of prostatectomies done for BEP reveal incidental carcinoma of the prostate.

3. Occult carcinoma. This is the type in which the patient has no symptoms of prostatic carcinoma but shows evidence of metastases on clinical examination and investigations.

4. Clinical carcinoma. Clinical prostatic carcinoma is the type detected by rectal examination and other investigations and confirmed by pathologic examination of biopsy of the prostate.

Etiology

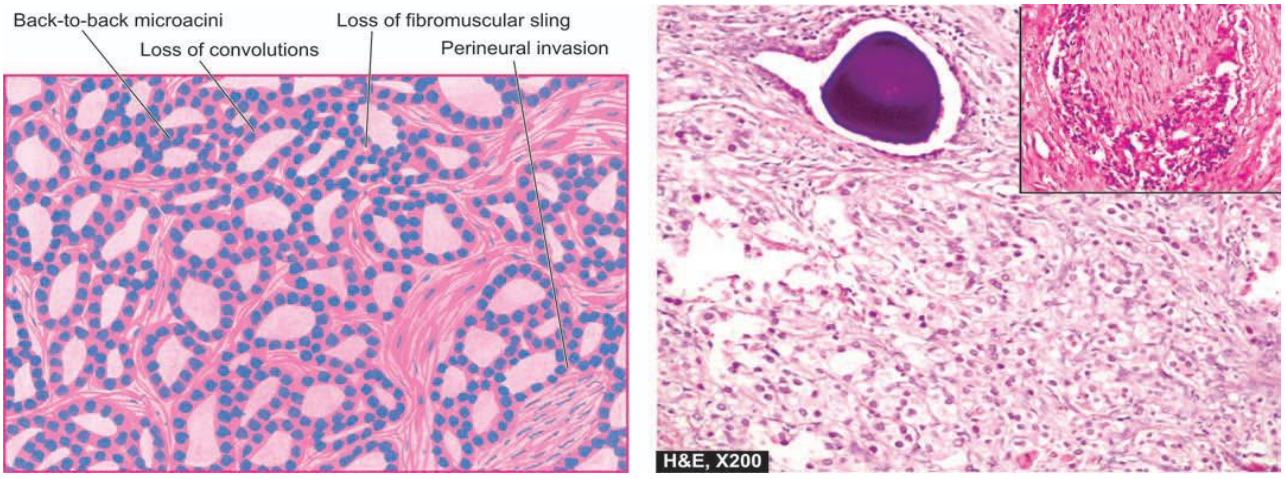
1. Racial and geographic influences
2. Environmental influences
3. Nodular hyperplasia
4. Heredity

Diagnosis

The diagnosis of prostatic carcinoma is made by cytologic, biochemical, radiologic, ultrasonographic and pathologic methods. However, definite diagnosis is established by histopathologic examination of transrectal ultrasound (TRUS)- guided core needle biopsy. Two serum **tumour markers** employed commonly for diagnosis and monitoring the prognosis of prostatic carcinoma are as under:

1- Prostatic acid phosphatase (PAP) is secreted by prostatic epithelium. Elevation of serum level of PAP is found in cases of prostatic cancer which have extended beyond the capsule or have metastasised. PAP can also be demonstrated in the normal prostatic tissues.

2- Prostate-specific antigen (PSA) can be detected by immunohistochemical method in the malignant prostatic epithelium as well as estimated in the serum. A reading between 4 and 10 (normal 0-4 ng/ml) is highly suspicious (10% risk) but value above 10 is diagnostic of prostatic carcinoma.



Carcinoma of the prostate

Uterus

Myometrium and Endometrium

The myometrium is the thick muscular wall of the uterus which is covered internally by uterine mucosa called the endometrium. The myometrium is capable of marked alterations in its size, capacity and contractility during pregnancy and labour. The endometrium responds in a cyclic fashion to the ovarian hormones with resultant monthly menstruation and has remarkable regenerative capacity.

Endometritis and Myometritis

Endometritis and Myometritis may be acute or chronic.

- **Acute form** generally results from 3 types of causes— puerperal (following full-term delivery, abortion and retained products of conception), intrauterine contraceptive device (IUCD), and extension of gonorrheal infection from the cervix and vagina.
- **Chronic form** is more common and occurs by the same causes which result in acute phase.

Endometriosis

Endometriosis refers to the presence of endometrial glands and stroma in abnormal locations outside the uterus. The chief locations where the abnormal endometrial development may occur are as follows (in descending order of frequency): ovaries, uterine ligaments, rectovaginal septum, pelvic peritoneum.

The **histogenesis** of endometriosis has been a debatable
matter for years. Currently, however, the following 3 theories of its histogenesis are described:

1. Transplantation or regurgitation theory is based on the assumption that ectopic endometrial tissue is transplanted from the uterus to an abnormal location by way of fallopian tubes due to regurgitation of menstrual blood.

2. Metaplastic theory suggests that ectopic endometrium develops in situ from local tissues by metaplasia of the coelomic epithelium.

3. Vascular or lymphatic dissemination explains the development of endometrial tissue at extrapelvic sites by these routes.

Tumors of Endometrium and Myometrium

Tumours arising from endometrium and myometrium may be benign or malignant. They may originate from different tissues as under:

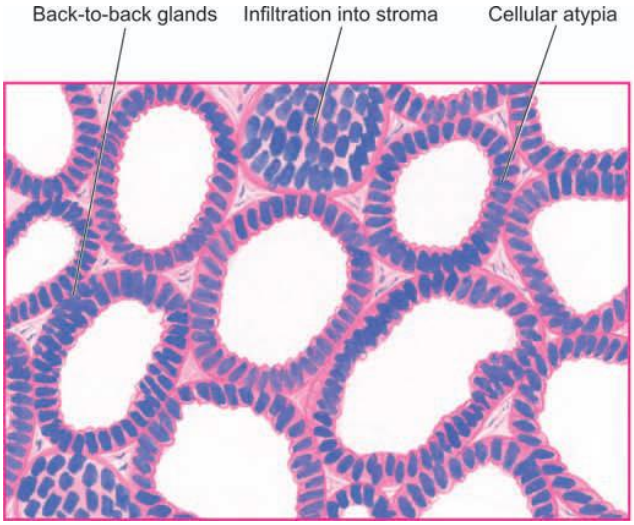
- **Endometrial glands**—endometrial polyps, endometrial carcinoma.
- **Endometrial stroma**—stromal nodules, stromal sarcoma.
- **Smooth muscle of the myometrium**—leiomyoma, leiomyosarcoma.

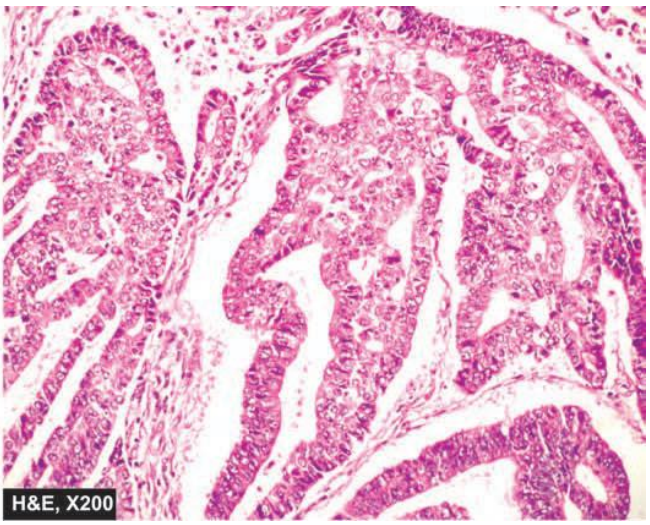
Endometrial Carcinoma

Carcinoma of the endometrium, commonly called uterine cancer, is the most common pelvic malignancy in females in the United States and Eastern Europe but is uncommon in Asia where cervical cancer continues to be the leading cancer in women. It is primarily a disease of postmenopausal women, the peak incidence at onset being 6th to 7th decades of life and is uncommon below the age of 40 years.

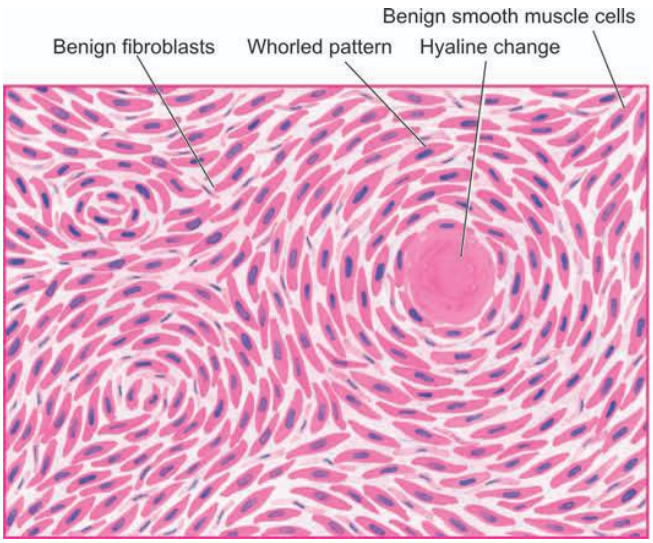
Etiology

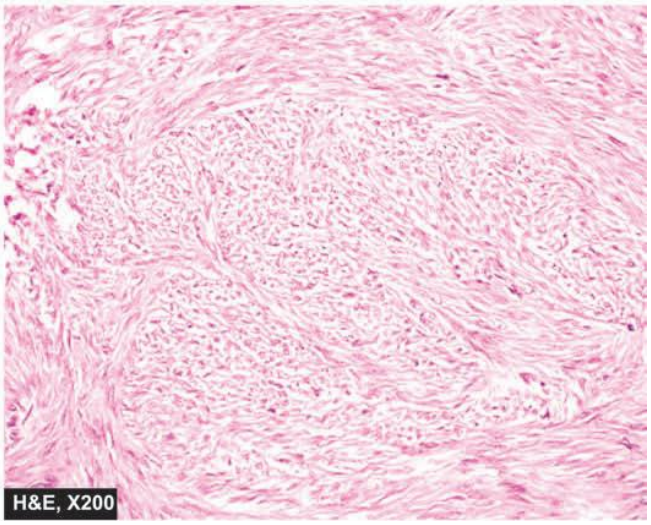
The exact etiology of endometrial cancer remains unknown. However, a few factors associated with increased frequency of its development are chronic unopposed oestrogen excess, obesity, diabetes, hypertension and nulliparous state. There is irrefutable evidence of relationship of endometrial carcinoma with prolonged oestrogenic stimulation.





Endometrial carcinoma





Leiomyoma uterus

BONE TUMORS

Introduction

Bone tumors may be primary or metastatic. Since histogenesis of some bone tumors is obscure, the WHO has recommended a widely accepted classification of primary bone tumors based on both histogenesis and histologic criteria.

It may be mentioned here that the diagnosis of any bone lesion is established by a combination of clinical, radiological and pathological examination, supplemented by biochemical and haematological investigations wherever necessary. These include: serum levels of calcium, phosphorus, alkaline phosphatase and acid phosphatase. Specific investigations like plasma and urinary proteins and the bone marrow examination in case of myeloma, urinary catecholamines in metastatic neuroblastoma and haematologic profile in lymphoma and leukaemic involvement of the bone, are of considerable help.

Osteoma

An osteoma is a rare benign, slow-growing lesion, regarded by some as a hamartoma rather than a true neoplasm. Similar lesions may occur following trauma, subperiosteal haematoma or local inflammation. Osteoma is almost exclusively restricted to flat bones of the skull and face. It may grow into paranasal sinuses or protrude into the orbit.

Osteoid Osteoma and Osteoblastoma

Osteoid osteoma and osteoblastoma (or giant osteoid osteoma) are closely related benign tumors occurring in children and young adults. The distinction between them is based on clinical features, size and radiographic appearance.

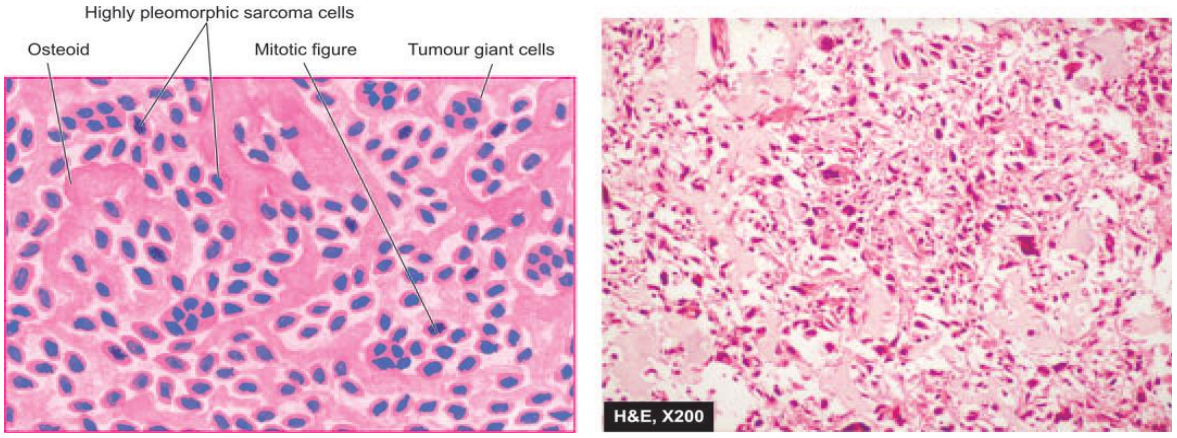
Osteoid osteoma is small (usually less than 1 cm) and painful tumor, located in the cortex of a long bone.

Osteoblastoma, on the other hand, is larger in size (usually more than 1 cm), painless, located in the medulla, commonly in the vertebrae, ribs, ilium and long bones, and

there is absence of reactive bone formation.

Osteosarcoma

Osteosarcoma or osteogenic sarcoma is the most common primary malignant tumour of the bone. The tumor is characterized by formation of osteoid or bone, or both, directly by sarcoma cells. The tumor is thought to arise from primitive osteoblast-forming mesenchyme. **Depending upon their locations within the bone**, osteosarcomas are classified into 2 main categories: central (medullary) and surface (parosteal and perosteal).



Osteosarcoma

Based upon the pathogenesis, osteosarcoma is divided into 2 types: primary and secondary.

Primary osteosarcoma is more common and occurs in the absence of any known underlying disease. Its etiology is unknown but there is evidence linking this form of osteosarcoma with genetic factors (e.g. hereditary mutation of chromosome 13 in common with retinoblastoma locus), period of active bone growth (occurrence of the tumor in younger age), and with certain environmental influences (e.g. radiation, oncogenic virus).

Secondary osteosarcoma, on the other hand, develops following pre-existing bone disease e.g. Paget's disease of bone, fibrous dysplasia, multiple osteochondromas, chronic osteomyelitis, infarcts and fractures of bone. The tumor has a more aggressive

behavior than the primary osteosarcoma.

	Histologic Derivation	Benign	Malignant
A.	OSSEOUS TUMOURS		
I.	*Bone-forming (osteogenic, osteoblastic) tumours*	Osteoma (40-50 yrs) Osteoid osteoma (20-30 yrs) Osteoblastoma (20-30 yrs)	Osteosarcoma (10-20 yrs) Parosteal (juxtacortical) osteosarcoma (50-60 yrs)
II.	*Cartilage-forming (chondrogenic) tumours*	Enchondroma (20-50 yrs) Osteochondroma (20-50 yrs) (Osteocartilaginous exostosis) Chondroblastoma (10-20 yrs) Chondromyxoid fibroma (20-30 yrs)	Chondrosarcoma (40-60 yrs)
III.	*Haematopoietic (marrow) tumours*	—	Myeloma (50-60 yrs) Lymphoplasmacytic lymphoma (50-60 yrs)
IV.	*Unknown*	Giant cell tumour (20-40 yrs) (osteoclastoma)	Malignant giant cell tumour (30-50 yrs) Ewing's sarcoma (5-20 yrs) Adamantinoma of long bones
V.	*Notochordal tumour*	—	Chordoma (40-50 yrs)
B.	NON-OSSEOUS TUMOURS		
I.	*Vascular tumours*	Haemangioma	Haemangioendothelioma Haemangiopericytoma Angiosarcoma
II.	*Fibrogenic tumours*	Non-ossifying fibroma (metaphyseal fibrous defect)	Fibrosarcoma
III.	*Neurogenic tumours*	Neurilemmoma and neurofibroma	Neurofibrosarcoma
IV.	*Lipogenic tumours*	Lipoma	Liposarcoma
V.	*Histiocytic tumours*	Fibrous histiocytoma	Malignant fibrous histiocytoma