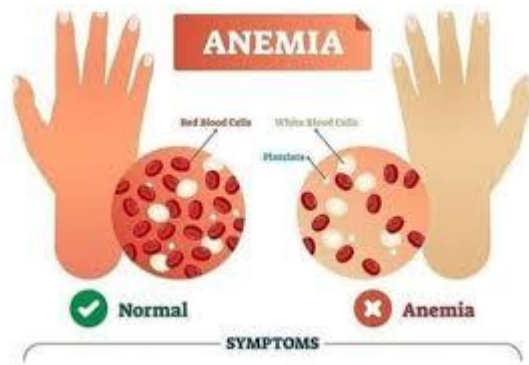


## ANEMIA

**Definition/description:** Anaemia refers to a decrease in the oxygen-carrying capacity of the blood, caused by decreased production of red blood cells, increased destruction of red blood cells, increased demand for iron, or formation of abnormal red blood cells.



**Common symptoms and signs of anaemia:** Symptoms include fatigue, breathlessness, palpitations, headache, tinnitus, anorexia, and bowel disturbances. Signs include pallor, retinal haemorrhages, and tachycardia, heart murmurs and cardiomegaly leading to heart failure in severe cases. In chronic iron deficiency, anaemic nail changes lead to spoon-shaped concave nails (koilonychia).



### Classification of anaemia and haemoglobinopathies:

- o Haemolytic anaemia (autoimmune and non-autoimmune)
- o Iron-deficiency anaemia (microcytic anaemia)
- o Aplastic anaemia (normocytic anaemia)
- o Pernicious anaemia (macrocytic anaemia)
- o Sickle cell anaemia
- o Thalassemia

## *Anaemia*

### ☐ Haemolytic anaemia

**Definition/description:** Haemolytic anaemia refers to the excessive intravascular or extravascular (in the spleen) destruction of red blood cells. The normal survival rate of RBCs is about 120 days. In haemolytic anaemia, it is much shorter.

**Causes** include autoimmune causes, infections, splenomegaly, drugs, RBC membrane disorders (spherocytosis), enzymopathies (deficiency of glucose-6-phosphate dehydrogenase) and haemoglobinopathies (sickle cell disease and thalassemia). Drugs which trigger haemolysis in G-6-PD deficiency include acetylsalicylic acid, ascorbic acid, dapsone and vitamin K. Fava bean ingestion in the diet is also associated with this form of anaemia. Malaria is the most common cause of anaemia in the developing world.

**Symptoms and signs** (of G-6-PD deficiency associated haemolytic anaemia): Symptoms include jaundice, palpitations, dyspnoea and dizziness. Signs include splenomegaly, cyanosis and Reynaud's phenomenon.



**Investigations:** A full blood count shows spherocytosis (sphere-shaped rather than bi-concave disk shaped as normal). A direct antiglobulin test (Coomb's test) demonstrates the antigen responsible for RBC destruction. A rise in bilirubin and LDH, and urinary haemosiderin are other features of G-6-PD associated haemolytic anaemia.

**Management:** Identify the cause and administer the appropriate treatment. Steroids and splenectomy are useful. Raynaud's phenomenon can be avoided by keeping warm.

### ☐ Iron deficiency anaemia (microcytic anaemia)

**Definition/Description:** Iron deficiency anaemia is due to chronic blood loss. This is the most common form of anaemia.

**Cause:** An increased requirement for, or decrease in the intake of, iron can cause an iron deficiency. Chronic blood loss is the most common cause of iron deficiency anaemia.

**Symptoms and signs:** In the early stages of iron deficiency the condition may be asymptomatic. Fatigue and loss of energies are common in severe cases. Patients may have an abnormal desire to eat clay, dirt, paint, ice, etc. This abnormal craving is called pica. Glossitis, cheilitis and abnormal nails showing concavity (spoon-shaped nails called koilonychia) are common in advanced stages.



**Investigations:** Laboratory investigations include a FBC for the estimation of haemoglobin, haematocrit, mean corpuscular volume, and mean corpuscular haemoglobin concentrations. The FBC will show low values for all these in iron deficiency anaemia. In addition, microcytosis is present and the RBC distribution width is increased. Other investigations include serum iron (low), iron-binding capacity (increased) and serum ferritin (low) estimations.

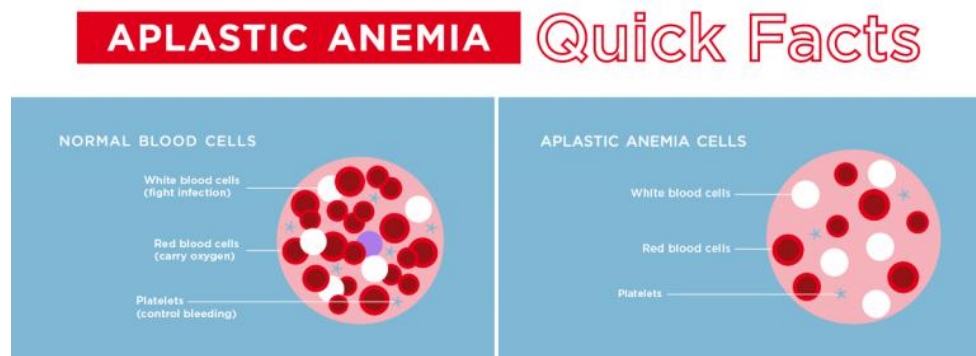
Hematocrit	↓ to ↓ ↓ ↓ ↓
MCV	↓ to ↓ ↓ ↓ ↓
MCHC	↓
Serum iron	↓ to ↓ ↓ ↓ ↓
Serum TIBC	Normal to ↑
Serum ferritin	↓ to ↓ ↓ ↓
Stainable iron in marrow	Absent
Reticulocytes	Normal to ↓

**Management:** Management protocols include the identification and elimination of the cause of blood loss, and administration of oral or parenteral iron therapy. Iron salts such as ferrous sulphate, gluconate or fumarate are used. Therapy should continue for up to six months after the correction of haemoglobin levels in order to refill iron stores in the tissues. The progress of treatments should be assessed by serial haemoglobin measurements until RBC levels reach normal values.

### □ **Aplastic anaemia (normocytic anaemia).**

**Definition/description:** A decrease in haematopoietic bone marrow leading to

pancytopenia (involving all blood cells) results in aplastic anaemia.



**Cause:** These include idiopathic (60%), hereditary (Fanconi's anaemia), viral hepatitis, irradiation, insecticides and drugs (sulphonamides, NSAIDs, antithyroids, etc).

**Symptoms and signs:** Symptoms of anaemia (due to a deficiency of RBCs) include bleeding tendencies, purpura (blood to pool under the skin),



haematuria, epistaxis, ecchymosis (very large bruised area), and gingival bleeding (due to thrombocytopenia). Susceptibility to infections (due to leucopenia) is common. Headache and dyspnoea occur in a majority of patients.

**Investigations:** A FBC and estimation of erythropoietin (raised).

**Management:** Identification and removal of the cause, control of infection, bone marrow transplantation, haemopoietic stem cell transplantation and use of steroids are all used based on the severity of the condition.

### □ Pernicious anaemia (macrocytic anaemia)

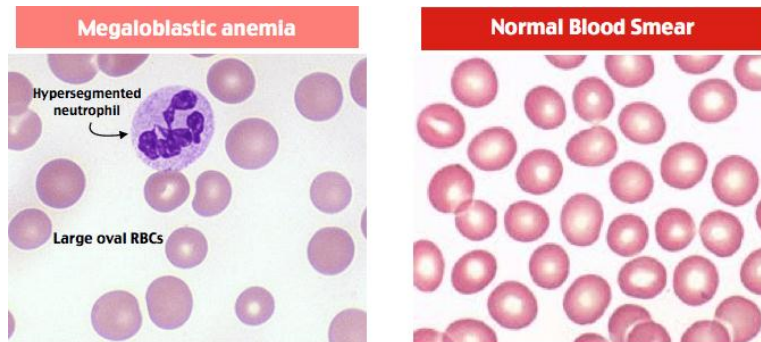
**Definition/Description:** Pernicious anaemia is characterised by the failure of intrinsic factor secretion in the stomach (due to an autoimmune process), which is responsible for the absorption of vitamin B12 (cobalamin).

**Cause:** An autoimmune disorder causes pernicious anaemia, resulting in permanent atrophy of the gastric mucosa. Total gastrotomy can also cause this form of anaemia. A higher incidence of pernicious anaemia occurs in individuals with blood group A.



**Symptoms and signs:** General symptoms and signs of anaemia include neurological symptoms such as paraesthesia of the fingers and toes, and dementia. Glossitis, periodic diarrhoea, weight loss, and mild jaundice due to haemolysis are also common.

**Investigations:** These include FBC (macrocytic),



serum B12 levels (low), detection of autoantibodies (parietal cells), and a gastric biopsy showing atrophic gastritis.



**Management:** This includes treatment with hydroxycobalamin, iron, potassium supplements, immunosuppressive drugs and blood transfusions.

### ***Haemoglobinopathies***

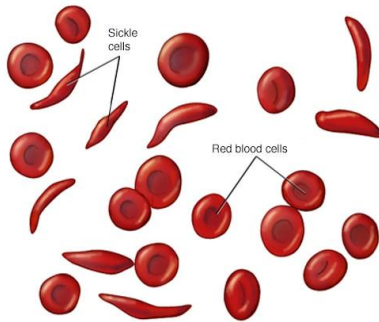
#### ☐ **Sickle cell anaemia**

**Definition/Description:** Sickle cell anaemia is an inherited disorder. Red blood cells become sickle-shaped when blood experiences lower oxygen tension (as in an unpressurised aircraft, or during GA administration), decreased pH, or dehydration. These changes result in erythrocytosis, increased RBC adhesion and blood viscosity, and increased vascular occlusion.

**Cause:** Sickle cell anaemia is inherited by an autosomal recessive means.

**Symptoms and signs:** It is common in equatorial Africa and among those Africans who have migrated from that region to other parts of the world. Symptoms and signs include general symptoms of anaemia and lethargy, growth retardation, delayed puberty, increased susceptibility to infection, leg ulceration, and infarcts in the spleen, lungs, kidneys, bowel, bones, and fingers. Often these features are precipitated by dehydration, excessive cooling, or infection.

**Investigations:** These include a FBC, blood film showing sickle-shaped cells



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and haemoglobin electrophoresis.

Results of laboratory examination in sickle cell anaemia			
Laboratory examinations	results	Values in this disease	Values in health
WBC count	increased	10000 -30000	5000 -10000
RBC count	decreased	1 -4 million/mm <sup>3</sup>	4 -6 million/mm <sup>3</sup>
Hb count	decreased	6 -8g/100ml	Male=13.5-17.5g/dl Female=11.5-15.5g/dl
Haematocrit reading	decreased	10 -30%	45%
Reticulocyte count	increased	10-40%	1-2%
Hb electrophoresis	positive	HbS & HbF	HbA
Urine analysis	Albumin casts	positive	negative
Serum bilirubin	increased	1-3 mg/100ml	0.2-0.8mg/100ml
Platelet count	increased	40000-50000/mm <sup>3</sup>	150000-400000/mm <sup>3</sup>
Bone marrow examination	Increased red cells	40-70%	8-30%

**Management:** Precipitating factors such as dehydration, infections and excessive cooling need to be avoided. Treatment includes folic acid supplements, hydration, a warm climate, antibiotics, analgesics, and blood transfusions.

### □ Thalassaemias

**Definition/Description:** Thalassaemias are inherited disorders in which synthesis of one of the globin chains of the haemoglobin is either reduced or absent, resulting in haemolysis and anaemia.

Normally, haemoglobin is composed of four protein chains, two  $\alpha$  and two  $\beta$  globin chains. In thalassemia, patients have defects in either the  $\alpha$  or  $\beta$  globin chain, causing the production of abnormal red blood cells.

**Cause:** The thalassaemias are classified according to which chain of the haemoglobin molecule is affected. In  $\alpha$  thalassaemia (also known as thalassaemia major), production of the  $\alpha$  globin chain is affected, while in  $\beta$  thalassaemia (also known as thalassaemia minor) production of the  $\beta$  globin chain is affected. Deletion of one of the  $\alpha$  loci is more common in people of African or Asian descent, making them more likely to develop  $\alpha$  thalassaemia.  $\beta$  thalassaemias are common in Africans, Greeks and Italians.

**Symptoms and signs:** These include severe anaemia, failure to thrive and early death. Those who survive show a mongoloid appearance of the head and face due to bone marrow hyperplasia. Leg ulcerations and hepatosplenomegaly may also occur in these patients.



**Investigations:** Haemoglobin electrophoresis shows increased HbA in minor, and raised HbF in major thalassemia. Radiographs of the skull and phalanges show increased bone marrow cavities and a \_hair-on-end\_ appearance of the skull vault.

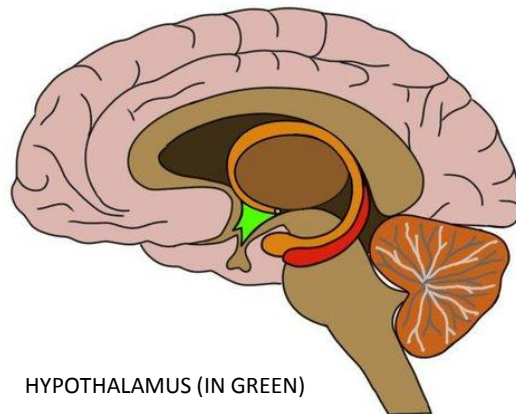
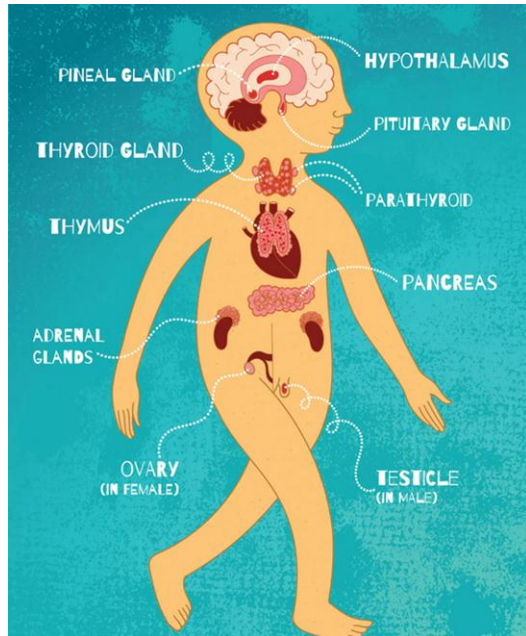
**Management:** Blood transfusions and iron chelating agents are administered to avoid iron overloading. A splenectomy may be conducted if hypersplenism is present.

## Diseases of the endocrine gland/ introduction.

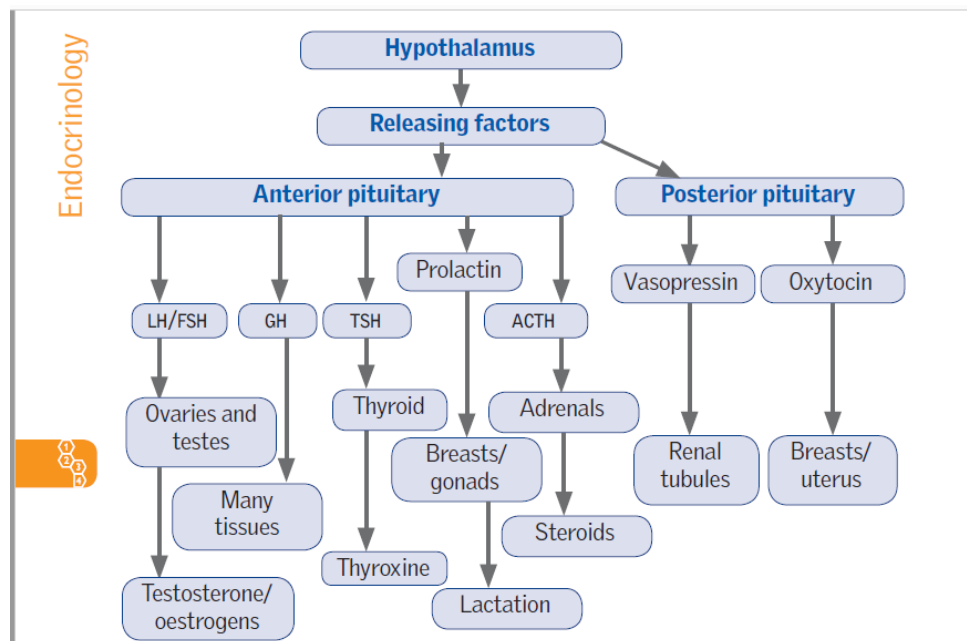
**Hypothalamus/ pituitary/ thyroid/ parathyroid/ adrenals/ gonads.**

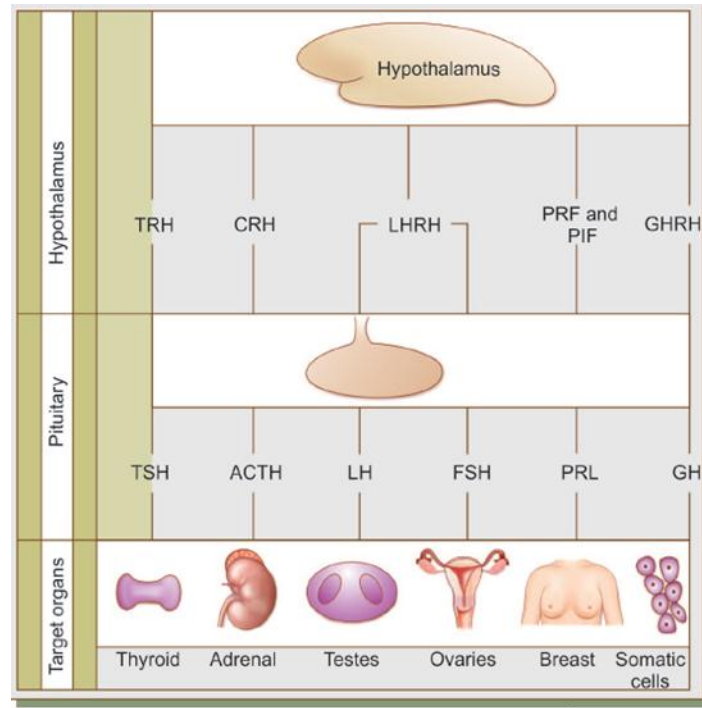
### Introduction

Endocrine and metabolic disorders are relevant to anesthetics because some disorders present systemic manifestations and require especial management modifications.



The hormones are produced at three levels, i.e. hypothalamus (releasing hormones), pituitary (trophic or stimulating hormones) and target organ such as thyroid, parathyroid, adrenals, gonads etc. (active hormones or prohormones) Figure 1.





**The hormones released by the hypothalamus include**

**Vasopressin, or antidiuretic hormone (ADH):** causes water reabsorption in the kidneys, maintains blood pressure

**Oxytocin:** “the cuddle/love hormone,” regulates social interaction and sexual reproduction

**Growth hormone (GH):** in children, acts on several parts of the body to promote growth; in adults, maintains body structure, metabolism, and maintenance of blood glucose levels

**Prolactin:** plays a role in lactation, maintenance of the reproductive system, behavior, and regulation of the immune system

**Corticotrophin-releasing hormone (CRH):** controls the body’s response to stress

**Growth hormone-releasing hormone (GHRH):** (no, there wasn’t a typo – this is a real, redundant-sounding hormone) can you guess what this does? That’s right! This hormone stimulates the release of the growth hormone

**Somatostatin:** this hormone inhibits the secretion of pancreatic and gastrointestinal hormones

**Gonadotrophin-releasing hormone (GnRH):** this is released from the nerve cells in the brain, controlling the production of luteinizing hormone and follicle-stimulating hormone



**Thyrotrophin-releasing hormone:** regulates the production and secretion of thyroid-stimulating hormone and prolactin

### Common Symptoms in Endocrine Diseases

In endocrine diseases, symptoms of over- or under-secretion of hormones are encountered. Some general symptoms include weight loss or gain, excessive hair loss or growth, skin pigmentation, fertility or menstrual problems, dwarfism, slow mental activity, disturbances in the heart rate and rhythm, gigantism, and chronic fatigue.

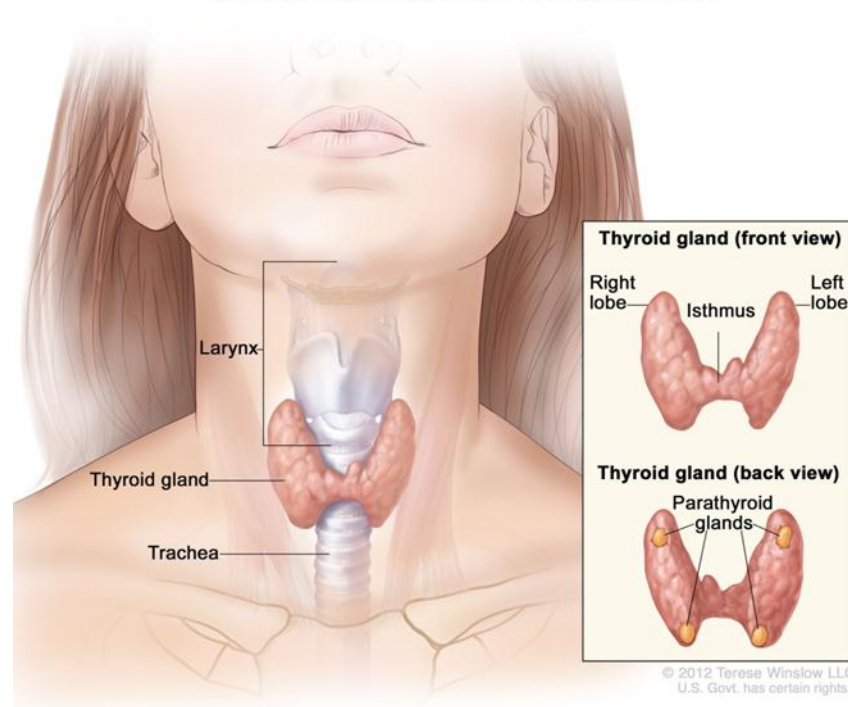
### Common Investigations in Endocrine Diseases

Investigations into endocrine diseases include thyroid function tests, isotope scanning, fine needle cytology, plain x-rays of the appropriate anatomic region, ultrasound, CT scan, MRI, biochemical investigations such as estimation of levels of hormones, blood glucose, serum cortisol levels, urea and electrolytes, vitamin D levels, serum calcium and phosphate levels.

### Diseases of the Parathyroid Gland

Diseases of the parathyroid glands include primary hyperparathyroidism, secondary hyperparathyroidism, hypoparathyroidism and pseudohypoparathyroidism.

**Anatomy of the Thyroid and Parathyroid Glands**



- **Primary hyperparathyroidism**

**Definition/description:** High levels of parathyroid hormone (PTH) due to glandular pathology results in primary hyperparathyroidism.

**Cause:** Adenoma or hyperplasia of the parathyroid gland.

**Symptoms and signs:** Often, patients are asymptomatic. When symptomatic, features include polyuria, excessive thirst (due to hypercalcaemia), anorexia, weakness, constipation, vomiting, renal colic, backache, hypertension, renal stones, peptic ulceration, giant cell tumour of the bone, and pancreatitis.

**Investigations:** These include serum calcium (>10.5 mg/dL), phosphate (raised), alkaline phosphatase (raised), bicarbonate, vitamin D, x-rays of the hands and skull ('pepper-pot' like erosions of skull), brown tumours of the bone, abdominal x-rays for renal stones, ultrasound of the neck, radioactive thallium-technetium subtraction scan and immunoassays for PTH.

**Management:** This includes surgery for adenoma and hyperplasia of the parathyroid gland. In addition, administration of vitamin D in severe cases may be necessary.

- **Secondary hyperparathyroidism**

**Definition/Description:** Prolonged hypocalcaemia associated with renal failure and deficiency of dietary vitamin D can lead to secondary hyperparathyroidism. Stimulated PTH can also result in secondary hyperparathyroidism. Treatment includes correction of the underlying cause.

- **Hypoparathyroidism**

**Definition/description:** Hypoparathyroidism may be either primary due to autoimmune disease, or secondary as a result of thyroid surgery.

**Symptoms and signs** include peri-oral and peripheral paraesthesia, cramps, and abnormalities of the hair, nails and teeth in chronic cases. Tetany in acute cases is characterised by tingling in the extremities, spasms in the hands, facial twitching.





**Investigations** include estimation of serum calcium (low), phosphate (raised), and alkaline phosphatase (normal) levels. Skull x-ray shows basal ganglion calcifications, and plasma PTH levels are low.

**Management** includes IV administration of calcium gluconate and in acute cases, long term alfacalcidol.

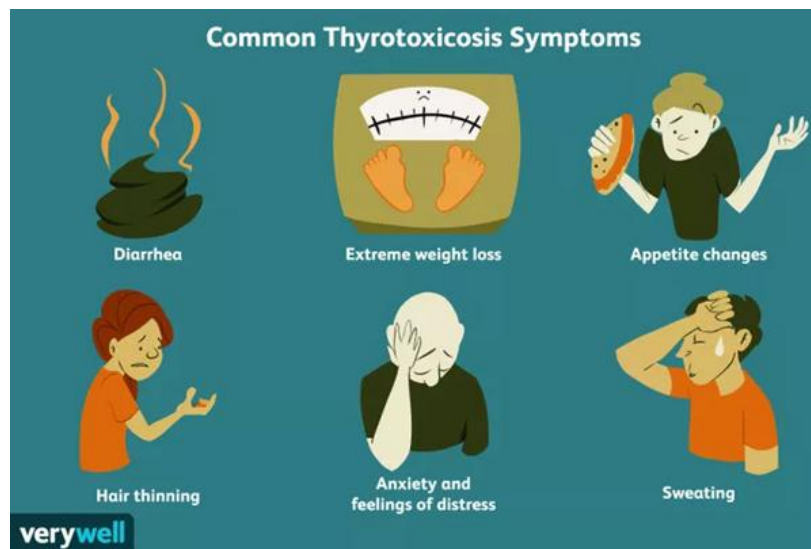
## Diseases of the Thyroid Gland

- **Hyperthyroidism (Thyrotoxicosis)**

**Definition/description:** Also known as thyrotoxicosis, this disorder is characterised by over-production of thyroid hormone. Thyroid hormone exists in two main forms: thyroxine (T4) and triiodothyronine (T3).

**Cause:** A common cause of hyperthyroidism is an autoimmune disorder (Graves' disease), where antibodies stimulate the thyroid to secrete excess hormone. Less often, a nodule within the multinodular goitre, or a thyroid adenoma producing excessive thyroxine is responsible.

**Symptoms:** Common symptoms include sweating, heat intolerance, sleep disturbances, irritability, amenorrhoea, palpitations, weight loss, increased appetite, and anxiety.



**Signs** include tachycardia, atrial fibrillation, exophthalmos, fine tremor, goiter, and peritibial myxoedema.

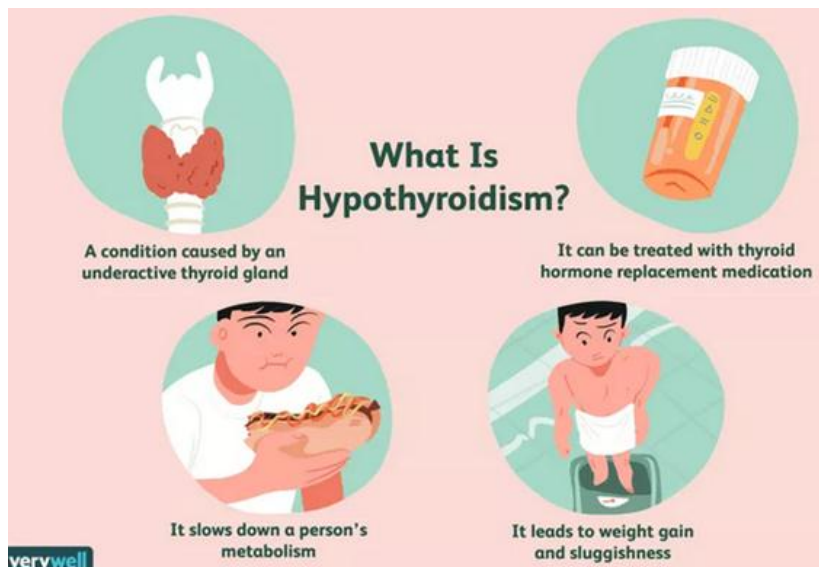


**Investigations:** T3 is raised (80-220 ng/dL). T4 or (fT4) is also usually raised (5.0 to 12.0 µg/dL). Thyroid Stimulating Hormone (TSH) (0.5 to 5.0 mIU/L ) may be suppressed in those with multinodular goitre. The presence of thyroid autoantibodies may be detected.

**Management** includes antithyroid drugs (Carbimazole or propylthiouracil) and surgery.

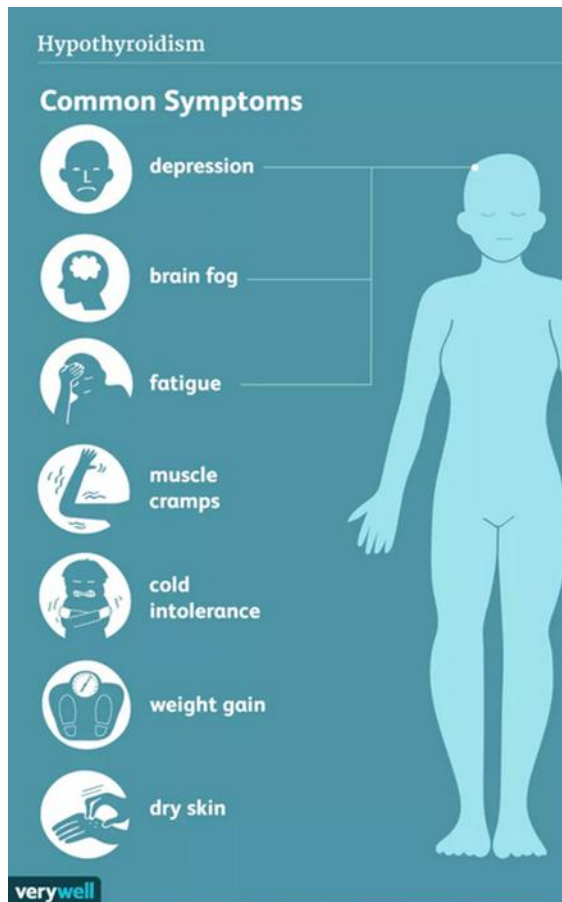
- **Hypothyroidism**

**Definition/Description:** Underproduction of thyroid hormone results in hypothyroidism.



**Causes** include **an** iodine deficiency, (the most common cause worldwide) or an autoimmune disorder (Hashimoto's disease). Thyroidectomy or radiation of the gland, and occasionally hypopituitarism, may be etiologically associated.

**Symptoms** include weight gain, cold intolerance, depression, tiredness and constipation.



**Signs** include the slow relaxation of tendon reflexes, myxoedema (deposition of subcutaneous mucopolysaccharides), hair loss, a hoarse voice, cold skin and bradycardia.



**Investigations** include estimation of T4 (low) and TSH (high) levels. Tests for cholesterol (hypercholesterolemia) and anaemia are necessary. Thyroid autoantibodies in the autoimmune variant can be detected.

**Management:** Thyroxin replacement is the treatment of choice.

## Diseases of the Pituitary Gland

- **Hypopituitarism**

**Definition/description:** A condition characterised by the deficiency of anterior or posterior pituitary hormones is called hypopituitarism.

- **Pituitary dwarfism**

Hypopituitarism in children typically results in short stature with normal proportions, and slow growth due to a deficiency in the growth hormone. This condition is called **pituitary dwarfism**.



**Causes** include anterior pituitary tumours, surgery on the pituitary for tumours, past head injury, tuberculosis, sarcoidosis, and radiation.

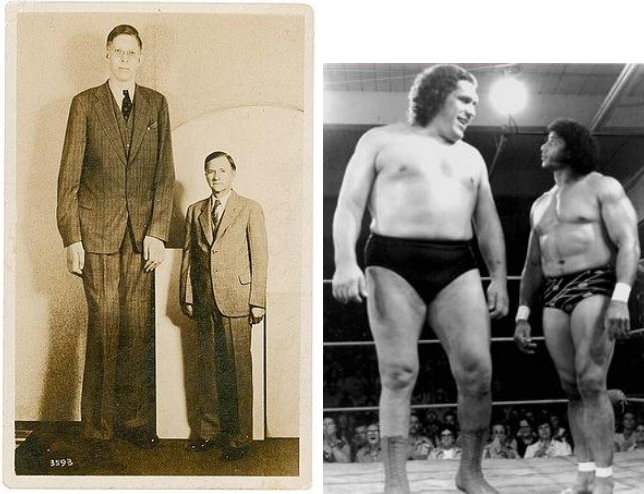
**Symptoms and signs** include myxoedema, infertility, amenorrhoea, depression, signs of hypoglycaemia, muscle weakness, and short stature.

**Investigations** include CT scan, MRI, glucose, T4 and TSH levels, prolactin, gonadotrophins, cortisol and testosterone levels.

**Management:** Hormone replacement therapy; recombinant growth hormone (GH) is recommended for children with a deficiency of growth hormone.

- **Acromegaly and gigantism**

**Definition/description:** Acromegaly and gigantism are syndromes that result when the pituitary gland produces excess growth hormone (GH). Nearly always this is due to a pituitary adenoma. If this occurs after epiphyseal plate closure at puberty, the condition is called **acromegaly**; if before the closure of the epiphyses, the result is **gigantism**.



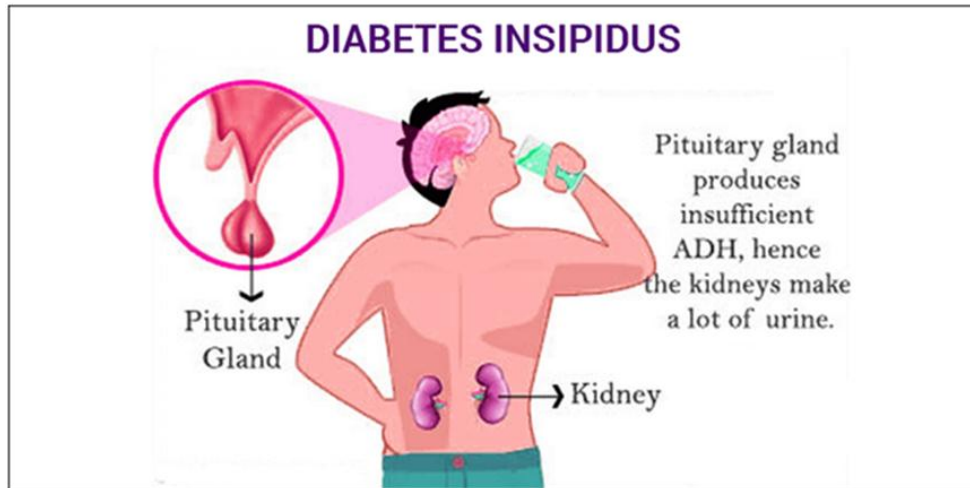
**Symptoms and signs in acromegaly:** Excess secretion of growth hormone usually starts between the ages of 20 and 40. Headache is common due to the pituitary tumour. Other features include coarsening of the facial features, enlargement of the extremities, a husky voice, excessive sweating and offensive body odour, hypertension, joint symptoms of degenerative arthritis, peripheral neuropathy, impaired glucose intolerance, menstrual irregularities and heart failure. These patients are at a higher risk of developing gastrointestinal cancers.



**Symptoms and signs in gigantism:** This is a rare condition. Excess growth hormone secretion begins in childhood before the closure of epiphyses. Bone growth is faster but does not show major deformities. Soft tissue swellings are common. Peripheral nerves are enlarged. A eunuchoid habitus (partially resembling, or having the general characteristics of a eunuch) is often present.

- **Diabetes insipidus (DI)**

**Definition:** Diabetes insipidus (DI) is characterised by an inability to produce concentrated urine due to the complete or partial deficiency of antidiuretic hormone (ADH), or renal resistance to the ADH action. These are respectively known as cranial diabetes insipidus and nephrogenic diabetes insipidus.



**Causes:** Causes of cranial DI can be idiopathic, a head injury, or sarcoidosis. Nephrogenic DI may be caused by drugs, renal disease and glycosuria.

**Symptoms and signs:** These include polyuria resulting in large volumes of pale coloured urine. Frequent urination, nocturia and polydipsia and dehydration are other common symptoms.

In patients with diabetes insipidus, osseous infiltrates are often found on the skull and jaws and can be identified on conventional dental radiographs. Loose teeth are another feature of DI. Due to excessive thirst, children with DI drink large amounts of water (fluoridated at optimal level) which can result in dental fluorosis.

**Investigations:** Estimation of urine osmolality and a 24-hour urine output is required to confirm polyuria.

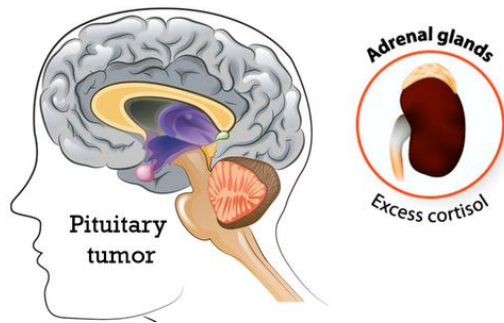
**Management** includes administration of desmopressin for cranial DI, and treatment of the underlying cause for nephrogenic DI. Underlying causes should be identified and treated.

## Diseases of the Adrenal Gland

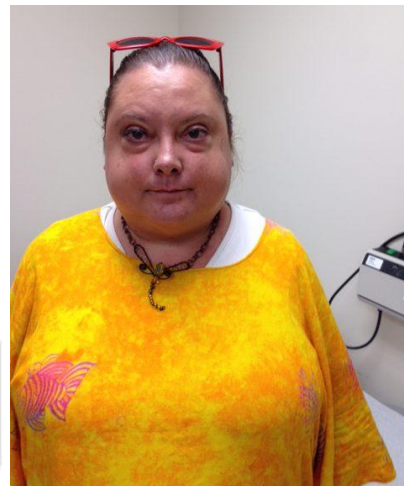
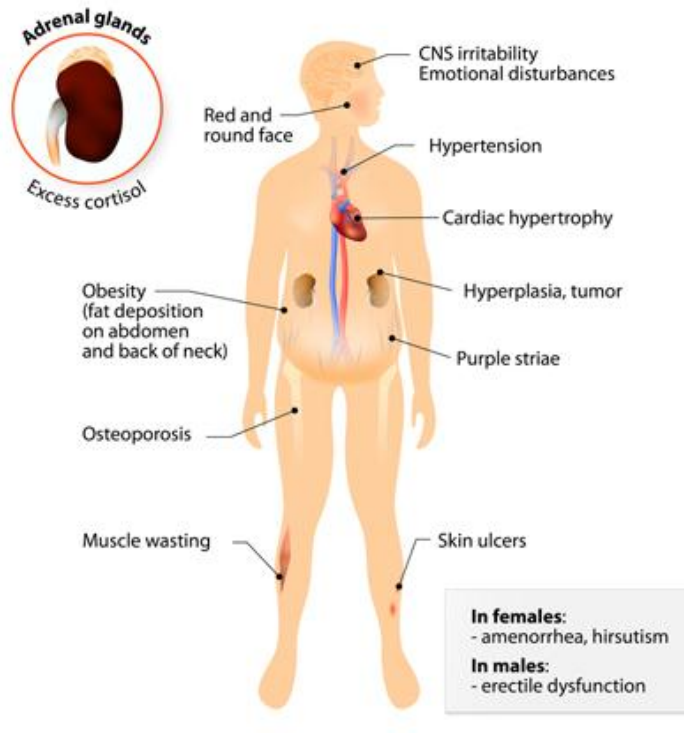
- **Adrenocortical Excess (Cushing's syndrome); hyperadrenalism**

**Definition/description:** Cushing's syndrome refers to the clinical picture resulting from circulating cortisol excess from any cause, whereas **Cushing's disease** results from hyperfunction of the adrenal cortex from pituitary Adrenocorticotrophic Hormone (ACTH) excess, usually due to pituitary adenoma.





**Cause:** Hyperfunction of the adrenal cortex



- **Adrenal insufficiency: Primary adrenal insufficiency (Addison's disease) and secondary adrenal insufficiency**

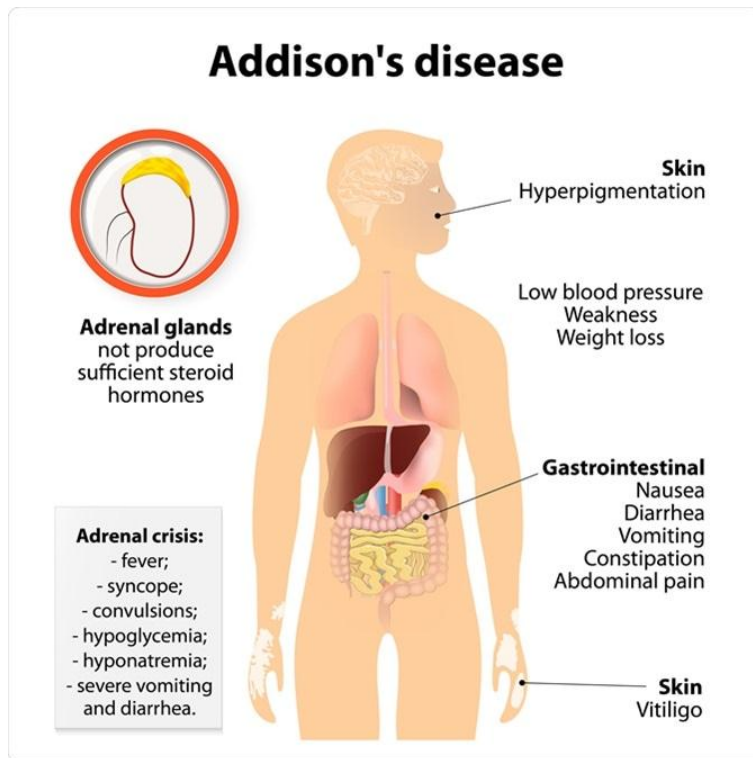
**Definition/Description:** A disease of the adrenal glands causing primary adrenal insufficiency is called **Addison's disease**.

**Cause: Primary adrenal insufficiency** involves autoimmune destruction of the glands in about 80% of cases. Other causes include TB, metastatic disease and hypoparathyroidism, diabetes mellitus and Graves' disease.

**Secondary adrenal insufficiency** results from panhypopituitarism, a lack of ACTH, and in those patients who are receiving steroids.

**Symptoms/Signs:**



**Weight loss/anorexia****Pigmentation of feet****Treatment**

Addison's disease is treated with medications that serve to replace the hormones that the body cannot produce. These drugs include hydrocortisone, which is used to replace cortisol, and mineralocorticoid, which is used to replace aldosterone.

## Diseases of connective tissues and Rheumatology/ introduction/major manifestations/ investigations

### Introduction

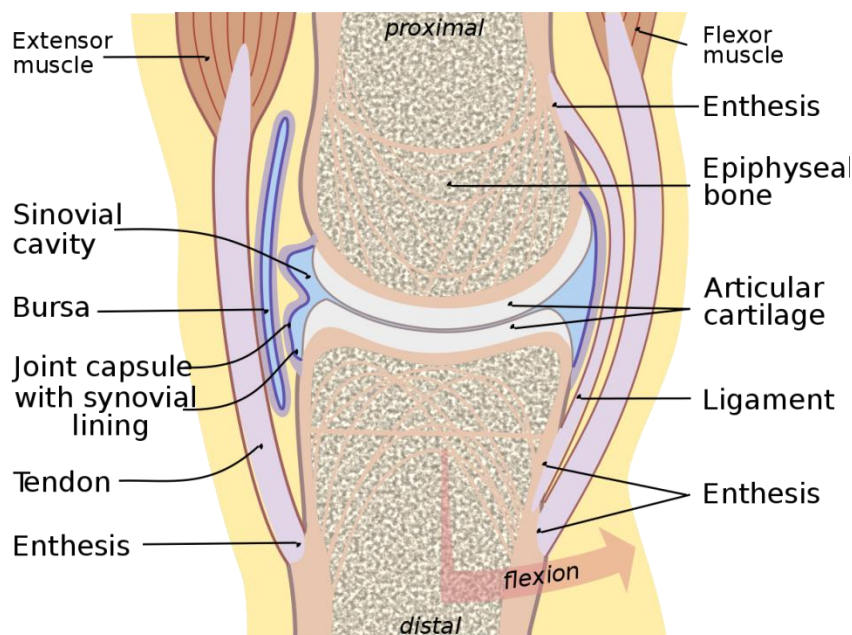
Musculoskeletal and joint disorders are common. These can have developmental, inflammatory, immunological, infective, degenerative or neoplastic origins.

A connective tissue disease is any disease that affects the parts of the body that connect the structures of the body together.

Connective tissues are made up of two proteins: collagen and elastin. Collagen is a protein found in the tendons, ligaments, skin, cornea, cartilage, bone and blood vessels. Elastin is a stretchy protein that resembles a rubber band and is the major component of ligaments and skin. When a patient has a connective tissue disease, the collagen and elastin are inflamed. The proteins and the body parts they connect are harmed.

Because there are so many different kinds of connective tissue diseases, symptoms may vary and may affect different parts of the body. Body parts that may be affected include:

- Bones.
- Joints.
- Skin.
- Heart and blood vessels.
- Lungs.
- Head and face.



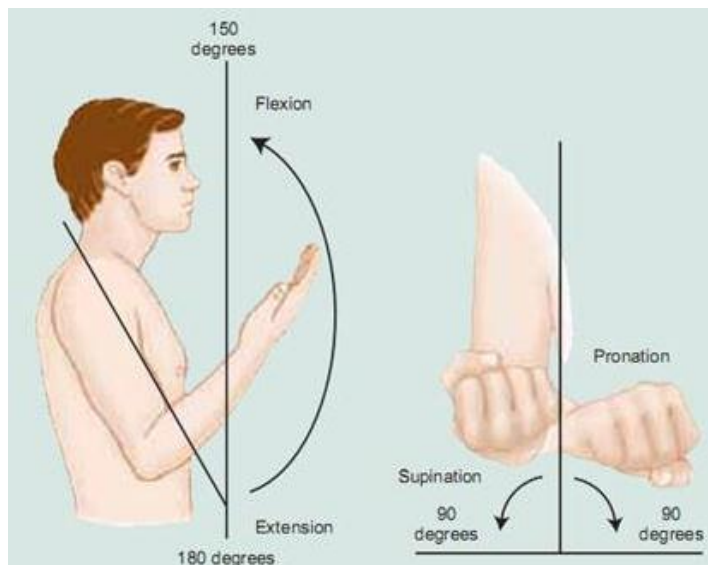
## Common Symptoms of the connective tissues and Rheumatology (Musculoskeletal and Joint) Disease

Depending on the bones and joints involved and the type of underlying pathology, symptoms include pain, rigidity, stiffness or impaired movement of joints or limbs, deformity, and susceptibility to fracturing.

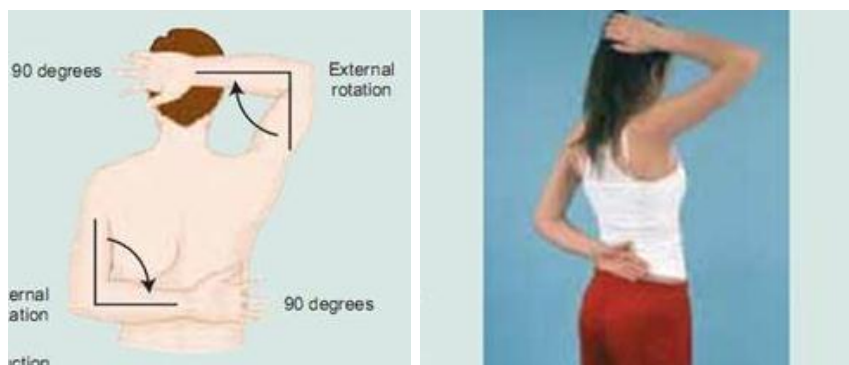
### Examination of the Locomotor System

#### Examination:

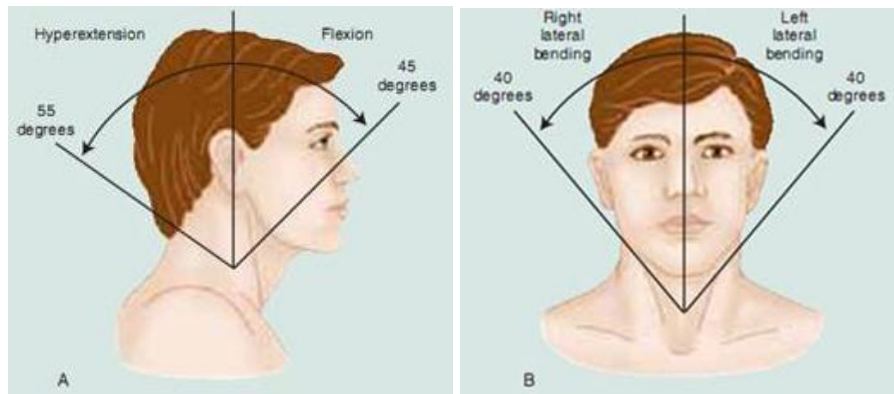
- o Observe any abnormality of the posture or gait
- o Inspect joints and muscles
- o Check active joint movements
- o Inspect the dorsum of the hands and wrists. Ask the patient to make a clenched fist, show the palms, touch the little finger with the thumb, and put the wrists through a full range of movements.
- o **Ask the patient:**
  - To bend and straighten their elbows



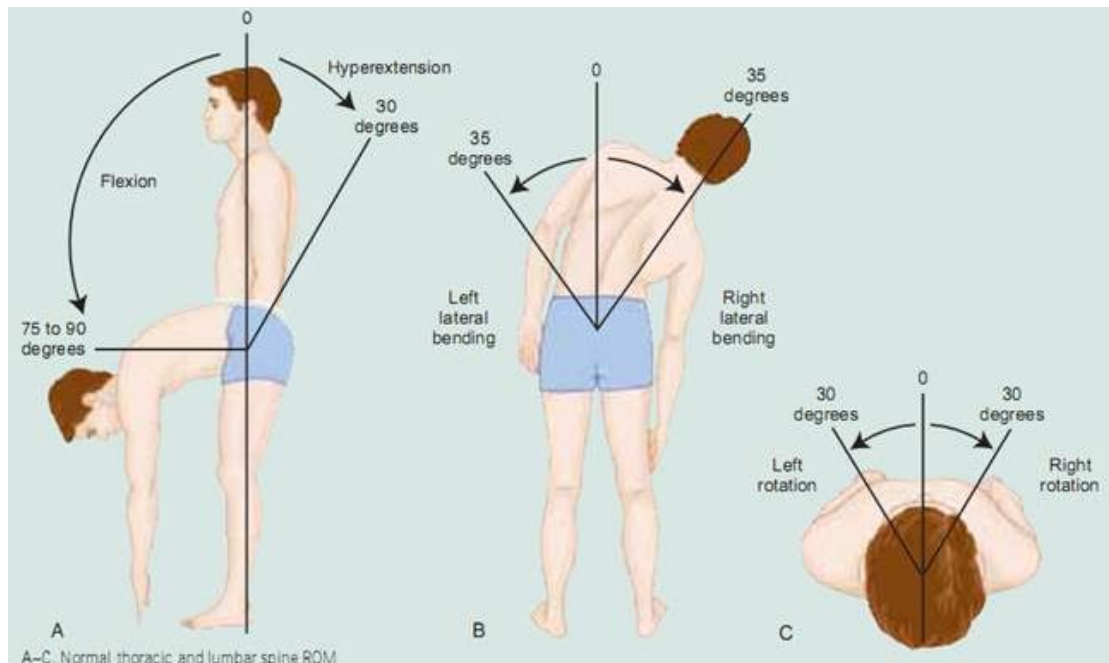
- To raise an arm above their head and then touch the back of their neck



- To flex their neck and try to touch the tip of each shoulder with their ears



- To attempt to touch their toes with the knees held straight
- To extend by leaning backwards and lateral extension by sliding a hand as far as possible down the lateral side of the thigh, and to rotate by turning their head and shoulders to the right and left
- To move the joints in all directions.

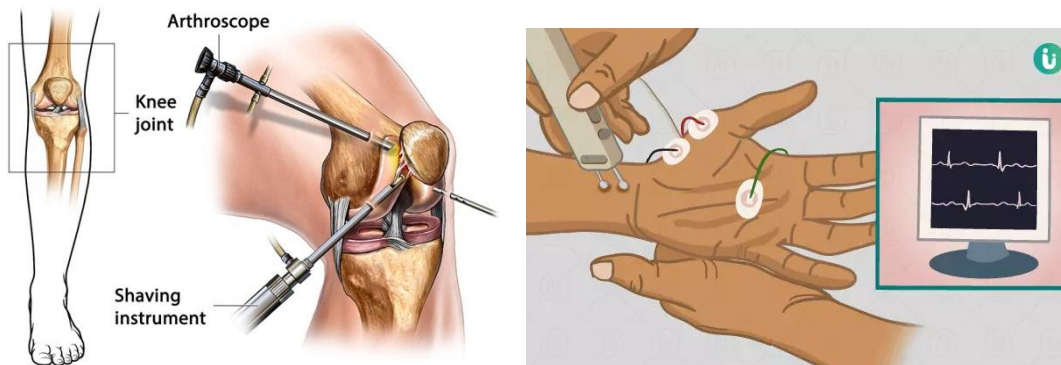


Palpate for any swelling, coarse crepitus and effusion, and note any tenderness.



**Investigations in connective tissues and Rheumatology (Musculoskeletal and Joint) Disease**

Investigations in musculoskeletal and joint disease include x-rays, CT scans, arthroscopy, immunological studies, biopsy, biochemical studies, and electromyography.



### Diseases of Muscle, Bone and Joints

- **Osteoarthritis**

**Definition:** Osteoarthritis, also known as degenerative joint disease, is the most common form of inflammatory joint diseases involving often-used joints such as hips, knees, feet, spine, hands and temporomandibular joint.

### Osteoarthritis of the Knee

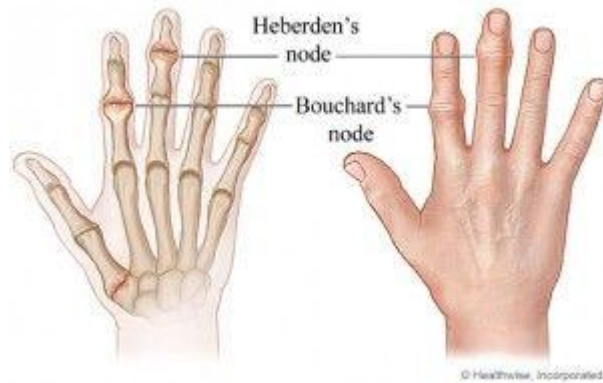


**Cause:** The exact cause of osteoarthritis is not known. Long term wear and tear of joints is associated with its cause. Other factors associated with osteoarthritis include trauma to the joints, metabolic disorders, pre-existing structural defects of the joints, and obesity.

**Symptoms and signs** include stiffness or pain in the joint(s) in the morning lasting 15-20 minutes, and without any signs of redness or swelling. Joint noises (crepitus) on movement of the joint(s) and appearance of **Heberden's** nodes (gelatinous cysts or bony outgrowths on the dorsal aspects of the distal interphalangeal joints) may also



occur. If nodes appear on the proximal interphalangeal joints, they are called **Bouchard's nodes**.



**Investigations:** These include x-rays of the joint (revealing erosions, osteophytes, jointspace narrowing, etc), FBC (normal), ESR (normal), rheumatoid factor (negative), synovial fluid aspiration/microscopy, and serum uric acid (to rule out gout).



Figure 1



Figure 2

**Management** includes NSAIDs and treatment of any underlying condition. Intraarticular corticosteroids and joint replacement may occasionally be necessary.

- **Rheumatoid arthritis**

**Definition/Description:** Rheumatoid arthritis is a multisystem immunologically mediated disorder characterised by inflammatory changes involving mainly the synovial joints such as hands, wrists, ankles and knees, and the presence of circulating antibodies to IgG (rheumatoid factor).

**Cause:** Unknown. The majority of patients are genetically predisposed individuals.

**Symptoms and signs:** These include symmetrical joint pain, stiffness, redness, swelling of joints of the hands, wrists and ankles mostly in the morning, 'spindled' appearance of the fingers and 'broadening' of the forefoot may appear at some stage of the disease. As disease progresses, shoulders, elbows, knees, cervical spine and temporomandibular joints may be involved. Hips are usually not involved.

**General symptoms** include fever, malaise, night sweats and weight loss. Joint mobility and stability are impaired and subluxation and ankylosis may occur. Deformities include ulnar deviation of fingers, loss of finger function, ‘Z’ deformity of the thumb, ‘swan necking’ of fingers, clawing of toes with painful sensations (walking on pebbles), and subcutaneous nodules (rheumatoid nodules).



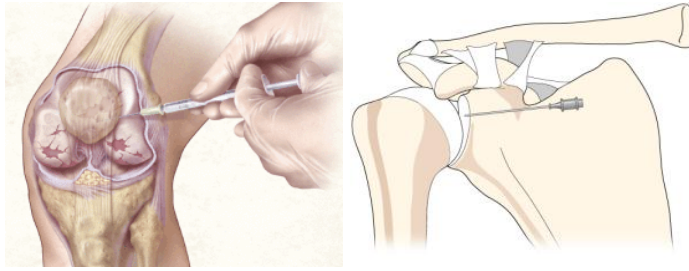
**Investigations:** These include x-rays (of joints showing erosions, periarticular osteoporosis, ankylosis or subluxation),



ESR (elevated), FBC, C-reactive protein (high), serum albumin (low) and globulin (high), fibrinogen (high), urinalysis for protein, arthroscopy, synovial biopsy and RA factor titre (may be negative in up to 30% of cases).

**Management:** NSAIDs (aspirin or indomethacin, for example), intra-articular corticosteroid injections, and immunosuppressants such as cyclophosphamide, azathioprine or methotrexate are used in management of the condition.

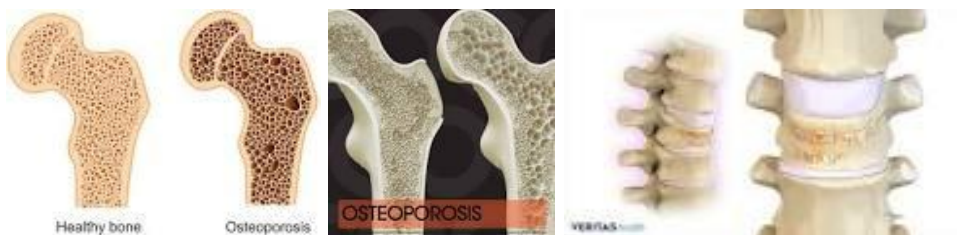




**Prognosis:** After 10 years, 25% of patients will enjoy complete remission, 40% moderate impairment, 25% severe impairment, and 10% will be crippled by the disease.

- **Osteoporosis**

**Definition:** Osteoporosis refers to loss of bone mass per unit volume.

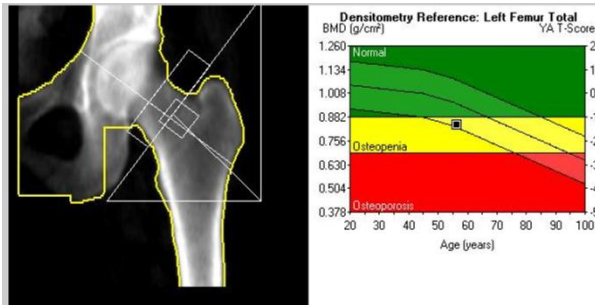


**Cause:** Causes of and predisposing factors for osteoporosis include advancing age, androgen/oestrogen deficiency as in postmenopausal women, thyrotoxicosis, Cushing's syndrome, low calcium intake, long term steroid use, inflammatory arthritis, chronic renal disease and bone marrow replacement as seen in lymphomas and leukaemia treatments.

**Symptoms and signs:** Typical symptoms and signs of osteoporosis include bone pain, back ache, kyphosis, crush vertebral fractures, and fractures with minimal trauma, (particularly of the neck of the femur and distal radius).

**Investigations:** These include radiology (reduced bone density, fractures), DEXA scan or bone mineral density (BMD) test of the wrist and hip.





**Management:** These include calcium and Vitamin D supplements, bisphosphonates and oral calcium, and hormonal replacement therapy (HRT) for postmenopausal women.

## **Diseases of the nervous system/ introduction, Major manifestations/ investigations.**

### **Introduction**

Neurological diseases such as stroke, epilepsy, facial neuralgias and palsies are common in the general population. For many neurological conditions, diagnosis begins with localization. In other words, to determine *what* type of pathology a patient is suffering, it is often helpful to start with determining *where* within the nervous system the lesion lies. Identifying the level of dysfunction within the central or peripheral nervous system is critical for developing an appropriate differential diagnosis. Diseases that affect the brain and spinal cord (the central nervous system) are distinct from peripheral nervous system pathologies. The traditional “complete” neurological exam consists of a thorough assessment of mental status and higher cortical function, the cranial nerves, the motor system (bulk, tone, and power), sensation (touch, vibration, proprioception, pain, and temperature), deep tendon reflexes, coordination/cerebellar function, and gait.

### **Common Symptoms of the Nervous System Disorders**

- Persistent or sudden onset of a headache.
- A headache that changes or is different.
- Loss of feeling or tingling.
- Weakness or loss of muscle strength.
- Loss of sight or double vision.
- Memory loss.
- Impaired mental ability.
- Lack of coordination.

### **Examination of the Nervous System**

Look for: muscle wasting, visible fasciculation (muscle twitches) in the thighs and calves occurring at rest (which stop during voluntary movements), tremors, and muscle spasticity, and decreased tone.

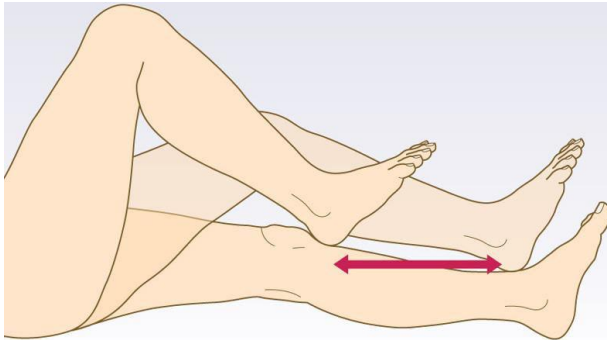
### **General Neurological Examination**

Assess:

- o Power and tone of the musculature

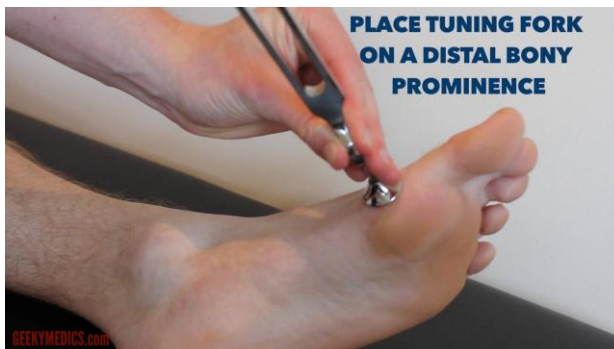


o Coordination (heel-shin test)



o Sensations such as touch or pain (with the patient's eyes closed),

o Vibration sense



o Tendon reflexes, plantar reflexes, and abdominal reflexes.



### Plantar Reflex

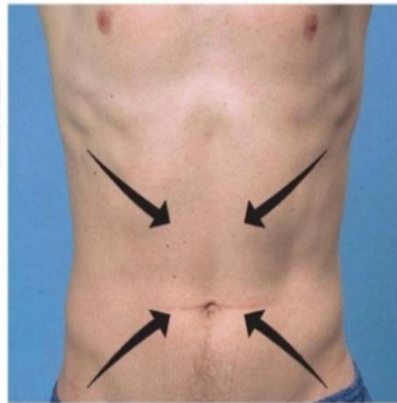
- ❑ Stroke the lateral aspect of the sole from the heel to the ball of the foot, curving medially across the ball
- ❑ Note movements of the toes, normally plantar flexion

*Plantar reflex with down going toes/Negative Babinski*



## Abdominal Reflexes

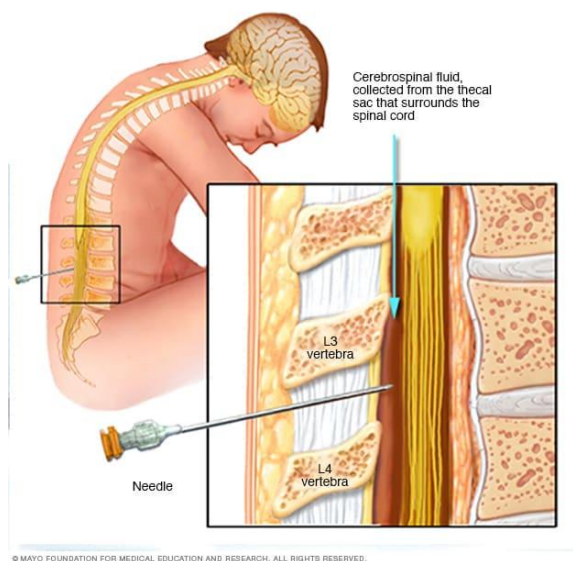
- Lightly but briskly stroke each side of the abdomen, above (T8, T9, T10) and below (T10, T11, T12) the umbilicus.
- Note the contraction of the abdominal muscles and deviation of the umbilicus toward the stimulus.



## Common Investigations in Nervous System Disorders

Some of the commonly employed investigations in neurological disorders include:

- o Lumbar punctures for suspected infection subarachnoid haemorrhage and malignancy



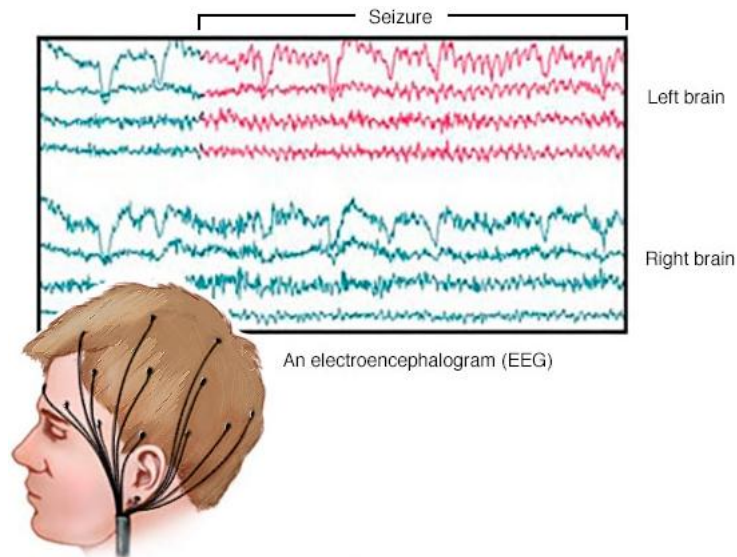
- o Angiography for vascular occlusions and vasculitis



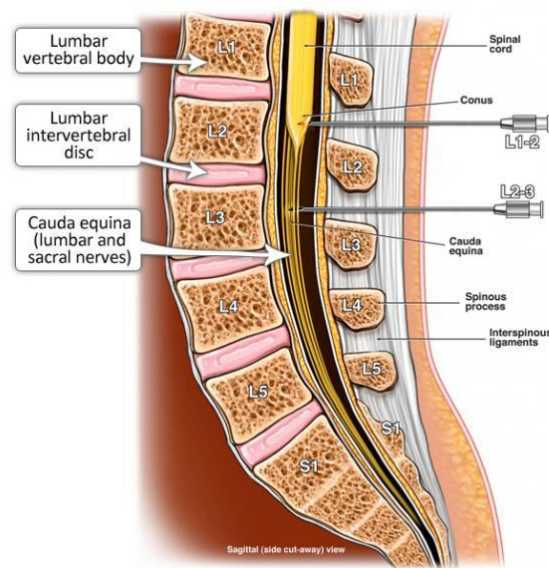
- o CT scans for subdural or extradural haematoma, intracranial tumours, oedema and hydrocephalus



- o Electroencephalography (EEG) for epilepsy and encephalopathy



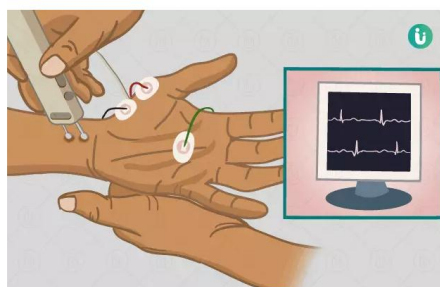
- o Myelography for visualizing the spinal canal and cord



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- o MRI for posterior fossa and spinal cord examination, and to detect demyelination,
- o Electromyography for distinguishing myopathies from neuropathies.



Electromyography (EMG)

- o Brain biopsies used for suspected tumour.

**Principles of critical care medicine/ major manifestations of critical illness/ shock/ sepsis**

Critical care medicine (or ‘intensive care medicine’) is concerned predominantly with the management of patients with acute life-threatening conditions (‘the critically ill’). In addition to emergencies, intensive care units (ICUs) admit high-risk patients electively after major surgery. Frequently, ICU staff provide care throughout the hospital as medical emergency teams or outreach care. Teamwork and a multidisciplinary approach are central to the provision of intensive care and this functions most effectively when directed and coordinated by committed specialists.

ICUs are usually reserved for patients with established or impending organ failure. They are equipped with monitoring and technical facilities, including an adjacent laboratory (or ‘near patient testing’ devices) for the rapid determination of blood gases and simple biochemical data such as serum potassium, blood glucose and serum lactate levels. Technological advances have led to the development of more compact and complex mechanical ventilators that are adaptable to individual patient demands. Portable ultrasound and echocardiography equipment is commonly available. Patients receive continuous expert nursing care (in the UK a nurse/patient ratio of 1:1 in an ICU or 1:2 in a highdependency unit [HDU]) and also the constant attention of appropriately trained medical staff.





**High-dependency units** offer a level of care intermediate between the general ward and that provided in an ICU. They provide monitoring and support for patients with single organ failure and for those who are at risk of developing organ failure. They can also provide a 'step-down' facility for patients being discharged from intensive care.

### Levels of care for critically ill patients

#### Level 0

- Patients whose needs can be met through normal ward care

#### Level 1

- Patients at risk of their condition deteriorating
- Patients recently relocated from higher levels of care whose needs can be met with additional advice and support from the critical care team

#### Level 2 (HDU)

- Patients requiring more detailed monitoring, including support for a single organ system failure
- Certain postoperative patients (e.g. after major surgery in high-risk patients)
- Patients stepping down from intensive care

#### Level 3 (ICU)

- Patients requiring advanced respiratory support (tracheal intubation and mechanical ventilation)
- Patients with MOFS (**Multiple organ failure syndrome**)

### The Modified Early Warning Scoring System

Score	3	2	1	0	1	2	3
<b>HR</b>		<40	40–50	51–100	101–110	111–129	≥130
<b>BP</b>	>45% ↓	30% ↓	15% O	Normal*	15% ↑	30% ↑	>45% ↑
<b>RR</b>		≤8		9–14	15–20	21–29	≥30
<b>Temp</b>		<35.0°C		35.0–38.4°C		≥38.5°C	
<b>CNS**</b>				A	V	P	U
<b>Urine</b>	NIL	<0.5 mL/kg/h	<1mL/kg/h		>1.5 mL/kg/h		

(HR: heart rate; BP: blood pressure; RR: respiratory rate; CNS: central nervous system. \* Normal for patient. \*\* Assessment of conscious level; A: alert; V: responsive to verbal stimulus; P: responsive to painful stimulus; U: unresponsive).

**ACUTE DISTURBANCES OF HAEMODYNAMIC FUNCTION (SHOCK)**

The term 'shock' describes acute circulatory failure with inadequate or inappropriately distributed tissue perfusion resulting in decreased oxygen delivery to the tissues. The effects of inadequate tissue perfusion are initially reversible, but prolonged oxygen deprivation leads to critical derangement of cell processes, end-organ failure and death. Thus prompt recognition and treatment of shock is essential. The causes of shock are listed in below. Shock is often the result of a combination of these factors: e.g. in sepsis, distributive shock is frequently complicated by hypovolaemia and myocardial depression.

**CAUSES OF SHOCK****1. Hypovolaemic (reduced preload)**

Haemorrhage: trauma, gastrointestinal bleeding, fractures, ruptured aortic aneurysm

Fluid loss: burns, severe diarrhoea, intestinal obstruction.

**2. Cardiogenic (pump failure)**

Myocardial infarction

Myocarditis

Atrial and ventricular arrhythmias

Bradycardias

Rupture of a valve cusp

**3. Obstructive**

Obstruction to outflow: massive pulmonary embolism, tension pneumothorax

Restricted cardiac filling: cardiac tamponade, constrictive pericarditis

**4. Distributive (decrease in systemic vascular resistance)**

Vascular dilatation: drugs, sepsis

Arteriovenous shunting

Maldistribution of flow, e.g. sepsis, anaphylaxis

**SEPSIS**

**Sepsis** is an infection with evidence of a systemic inflammatory response (Table 12.3). There may be progression to severe sepsis and/or septic shock.

Sepsis in elderly people or in the immunosuppressed is common without the classic clinical features of infection. The systemic inflammatory response syndrome also occurs with severe burns, trauma and acute pancreatitis, and these conditions may mimic infection.

**Differing degrees of severity of sepsis**

**Sepsis – systemic inflammatory response syndrome (SIRS) associated with infection:**

SIRS is two or more of:

Fever  $>38^{\circ}\text{C}$  or hypothermia  $<36^{\circ}\text{C}$

Tachycardia: heart rate  $>90$  beats/min

Tachypnoea: respiratory rate  $>20$  breaths/min or  $\text{PaCO}_2 < 4.3$  kPa

Leucocytosis (white blood cell count  $>12 \times 10^9/\text{L}$ ), leucopenia (white cell count  $<4 \times 10^9/\text{L}$ ) or bandaemia ( $>10\%$  immature forms)

**Severe sepsis – sepsis with dysfunction of one or more organs:**

Kidneys – creatinine  $>177 \mu\text{mol/L}$  or urine output  $<0.5 \text{ mL/kg/h}$  for 2 h

Coagulation – platelets  $<100$ , aPTT  $>60$  s, INR  $>1.5$

Respiratory – new or increased oxygen needs to keep  $\text{SpO}_2 > 90\%$

Liver – bilirubin  $>34 \mu\text{mol/L}$

Tissue hypoperfusion: systolic BP  $<90$  mmHg, MAP  $<65$  mmHg, drop in  $>40$  mmHg from patient's normal BP or serum lactate  $>2$  mmol/L

**Septic shock – persisting tissue hypoperfusion after a fluid challenge:**

Evidence of tissue hypoperfusion after an intravenous fluid bolus with saline 0.9% or Hartmann's solution.

(aPTT, activated partial thromboplastin time; BP, blood pressure; INR, international normalized ratio; MAP, mean arterial pressure over a cardiac cycle, approximated from systolic and diastolic pressures;  $\text{SpO}_2$ , peripheral capillary oxygen saturation.)

**MANAGEMENT OF SHOCK****Ensure adequate oxygenation and ventilation**

- Maintain patent airway: use oropharyngeal airway or endotracheal tube if necessary
- Oxygen 15 L/min via face mask with reservoir bag unless oxygen restriction necessary
- Support respiratory function early: non-invasive or mechanical ventilation
- Monitor: respiratory rate, blood gases and chest X-ray

**Restore cardiac output and blood pressure**

- Lay patient flat or head-down
- Expand circulating volume with appropriate fluids given quickly via large-bore cannula
- Inotropic support (Adrenaline, Dopamine), vasodilators, intra-aortic balloon counterpulsation in selected cases

- Monitor in all: skin colour, pulse, blood pressure, peripheral temperature, urine output, ECG
- Monitor in selected cases: CVP monitoring, cardiac function/output

**Investigations**

- All cases: FBC, serum creatinine and electrolytes, blood glucose, liver biochemistry, coagulation, blood gases, ECG
- Selected cases: culture of blood, urine, sputum, pus and CSF, D-dimers, blood lactate, echocardiogram

**Treat underlying cause** • Haemorrhage, sepsis, anaphylaxis

**Treat complications** • Coagulopathy, acute kidney injury, etc.

(CSF, cerebrospinal fluid; CVP, central venous pressure; ECG, electrocardiogram; FBC, full blood count).



الباطنية

محاضرة 1

دكتور

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**Diseases due to infection/ concepts of infection major manifestations /methods of diagnosis bacteremia/ septicemia / principles of management.**

***INFECTION***

The entry and development or multiplication of an infectious agent in the body of man or animals. It also implies that the body responds in some way to defend itself against the invader, either in the form of an immune response (evidence of this may not be readily available) or disease. An infection does not always cause illness.

**Infection:** The invasion and multiplication of microorganisms such as bacteria, viruses, and parasites that are not normally present within the body. An **infection** may cause no symptoms and be subclinical, or it may cause symptoms and be clinically apparent.

***CONTAMINATION***

The presence of an infectious agent on a body surface; also on or in clothes, beddings, toys, surgical instruments or dressings, or other inanimate articles or substances including water, milk and food. *Pollution* is distinct from contamination and implies the presence of offensive, but not necessarily infectious matter in the environment. Contamination on a body surface does not involve a carrier state.

**Signs and Symptoms of Infection**

- Fever (this is sometimes the only sign of an infection).
- Chills and sweats.
- Change in cough.
- Sore throat or new mouth sore.
- Shortness of breath.
- Nasal congestion.
- Stiff neck.
- Burning or pain with urination.

Infection, often the first step, occurs when bacteria, viruses or other microbes that cause disease enter your body and begin to multiply. Disease occurs when the cells in your body are damaged — as a result of the infection — signs and symptoms of an illness appear.

**Types of infections**

- **Viral infections.** Viruses are very tiny infectious organisms. ...
- **Bacterial infections.** Bacteria are single-celled microorganisms. ...



- **Fungal infections.** ...
- **Parasitic infections.** ...

## **MODES OF TRANSMISSION**

An infectious agent may be transmitted from its natural reservoir to a susceptible host in different ways.

**Which may be classified as:**

**A. DIRECT:** reservoir and host are present at the same place and time.

- a) Direct contact (skin, STD)
- b) Droplet infection: 30-60cm (coughing, laughing, speaking, sneezing)
- c) Contact with soil (hookworm, tetanus)
- d) Inoculation into skin or mucosa (needle, bites)
- e) Vertical or called transplacental ( rubella, toxoplasmosis, congenital syphilis).

**B. INDIRECT:**

Reservoir and the new host are not present at the same place and time.

- a) Vehicle-borne (water, food, blood, tissues)
- b) Vector-borne
  - 1) mechanical(crawling or flying)
  - 2) biological (multiplication & development in vector)
- c) Air-borne
  - 1) droplets nuclei( T.B, measles)
  - 2) dust
- d) Fomite-borne (typhoid fever, hepatitis)

**C. BOTH**

**Portal of entry:**

1. Respiratory tracts
2. Gastro-intestinal tract
3. Skin and mucous membrane
4. Mechanical through polluted needles, blood products.
5. Genital tract.

## **Causative Factors Of Disease**

The traditional epidemiologic triad model holds that infectious diseases result from the interaction of **agent, host, and environment**.

The agent is the cause of disease; the host is an organism, usually a human or an animal, that harbors the disease, the environment is those surroundings and conditions external to the human or animal that cause or allow disease transmission.

### **1. Agent factors**

The disease agent is defined as a substance, living or nonliving, or a force, tangible or intangible, the excessive presence or relative lack of which may initiate or perpetuate a disease process.

#### **It classified into:**

1. Biological agents
2. Nutrient agents
3. Physical agents
4. Chemical agents;
  - i. Endogenous (produced in the body)
  - ii. Exogenous (arising outside the human host)
5. Mechanical agents; (friction, other forces)
6. Absence or insufficiency or excess of factor necessary to life
7. Social agent

2. **Host:** A person or other animal, that affords subsistence or lodgment to an infectious agent under natural conditions.

#### **Host factors (intrinsic)**

It classified into:

1. Demographic characteristics (age, sex and ethnicity).
2. Biological characteristics (genetic factors, biochemical levels of the blood, blood group, enzymes and immunological factors).
3. Social and economic characteristics (occupation, education, marital status, economic status, etc.).
4. Lifestyle factors (living habits, nutrition, use of alcohol and smoking, behavioral pattern).

### **3. Environmental factors (extrinsic)**

It is defined as all that which is external to the individual human host, living and nonliving, and with which he is in constant interaction.

- a. Physical (air, water, soil, housing, climate, heat light, noise, radiation, etc.)
- b. Biological (living things which )surrounds man, including man himself

c. Psychosocial (cultural values, customs, and habits, beliefs, attitudes, morals, religion, education, lifestyle, community life, and health)

**Dynamics of infectious disease:**

1. Incubation period (IP).
2. Prodromal period (PP).
3. Illness (appearance of characteristic sign and symptoms).
4. Convalescent period.

\*\*infectivity may occur at any of these periods, and according to type of diseases.

**Incubation period (I.P):** is the time interval between invasion by the infectious agent and the appearance of first sign or symptom of the disease in question.

I.P can be ranging from very short (few hrs), to very long (few months or years).

**Prodromal period (P.P):** is the interval between the onset of symptoms and appearance of specific characteristic clinical manifestations.

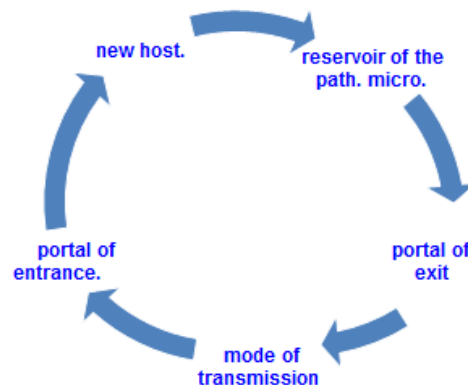
**I.P**

**P.P**

**Exposure → Onset of symptoms → Appearance of characteristic symptoms**

**Communicable period:** Is the time during which the infectious agent may transferred directly or indirectly from an infected person to another person, or from an infected animal to man.

**sequence of events in infection:**  
(dynamic of disease transmission)



More specifically, transmission occurs when the agent leaves its **reservoir** or host through a **portal of exit**, is conveyed by some **mode of transmission**, and enters through an appropriate **portal of entry** to infect a **susceptible host**. This sequence is sometimes called the **chain of infection**.

**RESERVOIR:** The reservoir of an infectious agent is the habitat in which the agent normally lives, grows, and multiplies. Reservoirs include;

- 1) **Humans** He may be a case or carrier
  - a) **Cases** (clinical, Sub-clinical infection & latent).
  - b) **Carrier** (inadequate Rx, inadequate immune response)

**Carriers** commonly transmit disease because they do not realize they are infected, and consequently take no special precautions to prevent transmission.

**Cases** A case is defined as "a person in the population or study group identified as having the particular disease, health disorder or condition under investigation"

- 2) **Animals**
  - a) Arthropods (tick, mite, flies).
  - b) Lower vertebrates (dogs, bats, mouse, sheep).
- 3) **Environment** (soil in tetanus and anthrax).

## PREVENTION AND CONTROL

**Successful prevention depends upon;**

- A. Knowledge of causation,
- B. Dynamics of transmission,
- C. Risk factors & risk groups,
- D. Availability of early detection and treatment measures.

The basic approach in controlling disease is to identify the weak points and break the weakest links in the chain of disease process.

**Principles of disease control:**

- I. **Controlling the reservoir**
- II. **Interruption of the mode of transmission.**
- III. **Protection of the susceptible host.**
  - I. **Controlling the reservoir**
    - A. **Control of carriers** (human reservoir):
      1. Discovering of carriers
      2. Prevent their contact with others
      3. Thoroughly treated
    - B. **Control of cases** (human reservoir):
      1. Early detection(diagnosis);
      2. Notification and reporting for surveillance purposes;

3. Isolation;
4. Treatment
5. Disinfection

## **II. Interruption of the mode of transmission. Include control of:**

- a) **Vehicles;** as water-borne by chlorination, milk-borne by boiling or pasteurization, food-borne by adequate cooking and good storing.
- b) **Vectors-borne;** by control of mosquito (malaria control program), control of breeding places, and animal eradication.
- c) **Environment;** by changing some component of man's environment to prevent the entering of infective agent to susceptible host, by:
  - Good environmental sanitation
  - Sanitary water supply
  - Sanitary sewage disposal.

## **III. Protection of the susceptible host. This cover the following:**

- 1) **Identification of contacts.**
- 2) **Quarantine.** Is the complete limitation of freedom of movement of well person or domestic animals exposed to communicable diseases for a period of time not longer than the longest usual IP of disease to prevent effective contact with those not exposed.

### **Types of quarantine:**

- A. Absolute quarantine (as above).
- B. Modified quarantine (selective partial limitation of movement, as exclusion of children from school).

### **3) Immunization.**

### **4) Chemical prophylaxis.**

- A. Causal(elimination of invading agent).
- B. Chemical (prevention clinical symptoms)

## **BACTEREMIA**

**Bacteremia is the presence of bacteria in the bloodstream.**

Bacteremia may result from ordinary activities (such as vigorous tooth brushing), dental or medical procedures, or from infections (such as pneumonia or a urinary tract infection).



- Bacteremia usually causes no symptoms, but sometimes bacteria accumulate in certain tissues or organs and cause serious infections.
- People at high risk of complications from bacteremia are given antibiotics before certain dental and medical procedures.

Usually, bacteremia that results from ordinary events, such as dental procedures, is **temporary** and causes no symptoms. Bacteremia that results from other conditions may cause fever. If people with bacteremia have fever, a rapid heart rate, shaking chills, low blood pressure, gastrointestinal symptoms (such as abdominal pain, nausea, vomiting, and diarrhea), rapid breathing, and/or become confused, they probably have sepsis (**Septicemia**) or septic shock.

### Diagnosis

- Culture of a blood sample

**Bacteremia** is the simple presence of bacteria in the blood while **Septicemia** is the presence and multiplication of bacteria in the blood. **Septicemia** is also known as **blood poisoning**.

### MANAGEMENT

#### Prevention

People who are at high risk of complications due to bacteremia (such as those who have an artificial heart valve or joint or certain heart valve abnormalities) are often given antibiotics before procedures that can cause bacteremia:

- Dental procedures
- Surgical treatment of infected wounds

Antibiotics help prevent bacteremia and thus infections and sepsis from developing.

#### Treatment

- Antibiotics

If an infection or sepsis develops, it is treated with antibiotics.

- Doctors remove sources of bacteria (such as catheters).



الباطنية

محاظرة 2

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## Diseases of the respiratory system-Introduction

### Introduction

Respiratory diseases are common. Some respiratory diseases are chronic in nature and require treatment for a long time. Patients with chronic respiratory diseases such as asthma require special considerations in the management of his conditions. It is essential therefore that practicing anesthesia should possess a basic knowledge of respiratory diseases in order to take appropriate steps in managing anesthetic procedures.

### Common Symptoms of Respiratory Diseases

**Cough:** A cough is an explosive expiratory act that is reflexively or purposefully intended to clear the airways. In most instances, the presence of mucus or foreign material in the airway causes coughing. A persistent cough is an indication of chronic irritation of the pulmonary airway.

Coughs may be acute or chronic.

Acute cough is a feature of the common cold.

Other causes include pneumonia, postnasal drip and exacerbations of chronic pulmonary obstructive disease (COPD). Pulmonary embolism and cardiac failure in the elderly can also cause acute episodes of coughing.

A chronic productive cough is common in smokers as a result of chronic bronchitis. Other common causes of chronic cough include postnasal drip syndrome, gastroesophageal reflux disease, asthma, and use of ACE inhibitors. Chronic cough with haemoptysis may be a feature of tuberculosis or bronchogenic carcinoma. The green or yellow colour of the sputum is suggestive of pyogenic infection. Dry spasmodic coughing associated with wheezing is a sign of asthma.

**Dyspnoea:** Dyspnoea is characterised by shortness of breath or breathlessness.

**Pulmonary causes** of dyspnoea include pneumothorax, pulmonary embolism, bronchospasm due to asthma, foreign body and toxic inhalation, acute bronchitis, pneumonia, obstructive lung disease and pleural effusion.

**Cardiac causes** of dyspnoea include acute myocardial ischaemia or infarction, ventricular dysfunction and cardiogenic pulmonary oedema.

**Other causes** include anxiety disorders and anaemia. Anxiety related dyspnoea is called hyperventilation syndrome.



**Chest pain:**

**Pulmonary and pleural causes** of chest pain include pneumonia, pulmonary embolism, pleuritis, lung cancer and rib fractures.

**Cardiac causes** of chest pain include angina, myocardial infarction, acute aortic dissection and pericarditis.

**Gastric causes** of chest pain include gastroesophageal reflux disease, peptic ulcer disease and oesophageal spasm. Herpes zoster (involving thoracic dermatome) and emotional factors (depression, for example) also cause chest pain.

**Haemoptysis:** Haemoptysis is the coughing up of blood or blood stained sputum.

**Respiratory causes** of haemoptysis include bronchial carcinoma, pulmonary tuberculosis, pulmonary embolism, chronic bronchitis, pneumonia, and bronchiectasis, pulmonary oedema.

**Other causes** include mitral stenosis and clotting disorders.

**Wheezing:** Wheezing results from a narrowing of the airways.

Causes include asthma, COPD, heart failure, vocal cord dysfunction and anaphylaxis.

**Stridor:** Stridor is a high pitched inspiratory sound formed by extrathoracic upper airway obstruction.

Causes of stridor include foreign body aspiration, epiglottitis, croup, vocal cord dysfunction, laryngeal tumours, allergic reactions and retropharyngeal abscesses.

## Examination of the Respiratory System

### *General Observation*

Look for evidence of respiratory distress such as breathlessness, wheezing, cough and exhalation with pursed lips. Also look for signs of cyanosis, finger clubbing, and tobacco staining on the fingers. The radial pulse should be recorded. Tachycardia suggests significant respiratory distress.

**Examination of the face:** Look for signs of **anaemia** (pale conjunctivas),



central \ **cyanosis** (bluish tinge of the tongue or lips)



and **Cushingoid** appearance as a result of long term steroid use.



**Neck examination** may indicate goitre, or lymph node enlargement.



### ***Physical Examination of the Chest***

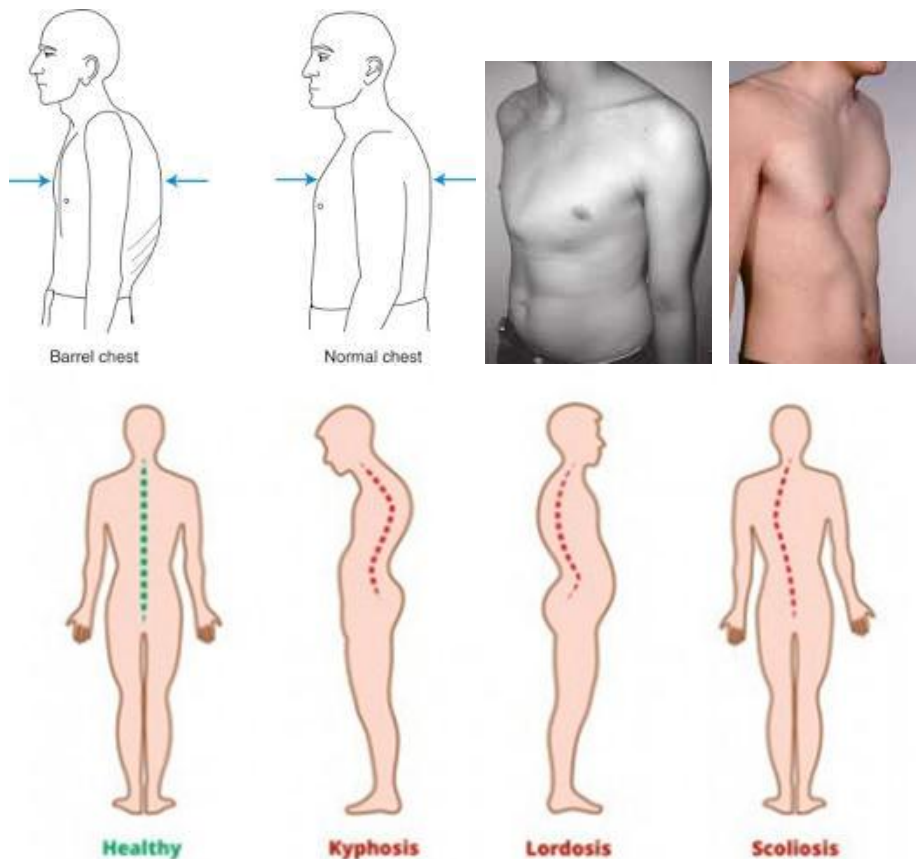
Methods include inspection, palpation, percussion and auscultation.

#### **Inspection of the chest:**

With patient sitting or standing ask the patient to fully expose the chest and upper abdomen. Look for:

o **Chest wall abnormalities**: kyphosis (abnormal anterior–posterior curvature of the spine), scoliosis (abnormal lateral curvature of the spine), barrel chest (chest wall increased anterior-posteriorly), pectum excavatum (sternum sunken in to the chest), pectus carinatum (sternum protruding from the chest, also known as pigeon chest), scars, and skin lesions need to be noted.





o Check for: respiration frequency (normal adult 12-16 breaths per minute), respiratory depth (hyper- or hypo-ventilation), maximum chest expansion (measuring the inspiratory and expiratory difference; > 4 cm is normal), and mode of breathing, either thoracic or abdominal (in normal subjects it is mainly abdominal).

o Abnormal inspiratory movements can occur in cases of fractured ribs and sternum, whereas an abnormal expiratory movement can occur in asthma and acute bronchitis.

### **Palpation of the Chest Wall**

o Position of the trachea: insert the tip of the index finger into the suprasternal notch to detect any deviation of the trachea. In pneumothorax, the trachea is deviated away, as it is also in the presence of masses and enlarged lymph nodes.



o Chest expansion: should be symmetrical, and normally 4-5 cm. Symmetrical reduction occurs, for instance, in bronchial asthma, emphysema, and stiff lungs (pulmonary fibrosis).



o Feel for vibrations: place both palms on the posterior lung fields, and ask the patient to count from one to ten. Feel for vibrations and compare the right and left lung fields. Increased vibration can be felt in pneumonia. Decreased vibration is a feature of pleural effusion. A —crackling‖ sensation on palpation is an indication of subcutaneous emphysema. Sometimes, pleural rub is also palpable.



o Test for tactile fremitus, the vibration felt by a hand placed on the chest during vocal fremitus. Ask the patient to say —*ninety nine*” and use the ulnar aspect of the palm to feel changes in sound conduction. Tactile fremitus is increased over the areas of lung consolidation.



### **Percussion of the Chest Wall**

o The physician attempts to examine changes in the density of lung fields by noting

their resonance. Steps include:

- Placing the left hand on the patient's chest wall, palm downwards and fingers slightly apart so that the second phalanx of the middle finger is precisely over the area to be percussed.
- Pressing the finger firmly against the chest wall along an intercostal space.
- Performing percussion with the middle finger of the free hand striking the middle phalanx of the middle finger of the stationary hand.
- Performing this action symmetrically on all lung fields, and on both anterior and posterior chest walls.



- Comparing both sides of the chest.

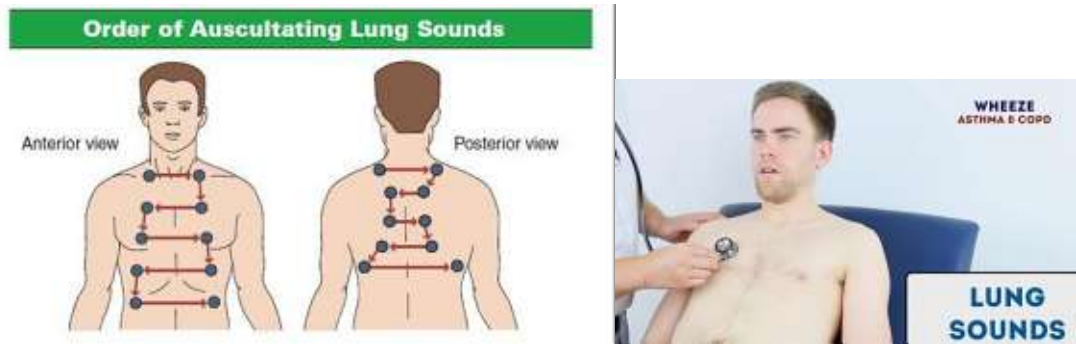
The percussion note over a normal lung is resonant. The percussion note is dull when the lung is separated from the chest wall by pleural fluid (stony, dull note), or in cases of pulmonary consolidation or collapse. The percussion note is tympanic (hyper resonance) in emphysematous lungs, and in pneumothorax.

### **Auscultation for Respiratory Sounds**

Auscultation can detect respiratory sounds produced by vibrations of the vocal cords caused by the passage of air through the larynx during inspiration and expiration. These sounds are transmitted along the trachea and bronchi through the lungs to the chest wall.

Respiratory (breath) sounds may be normal, vesicular (diminished or prolonged with expiration), or bronchial.

- o Place the stethoscope over each of the five lobes of the lungs and on the front and back of the chest. Ask the patient to take deep breaths in and out with their mouth open. Auscultate over the apices and the axillae as well.



- o **Normal breath sounds** (also called vesicular breath sounds) are quiet and gentle without any gaps between the inspiratory and expiratory phase sounds.
- o **Bronchial breath sounds** are heard in pneumonic consolidation of the lung and also in pulmonary fibrosis and cavitation.
- o **Added breath sounds** of importance include rhonchi (wheezes), crepitations (crackles) and pleural rub (friction).

**Rhonchi** are musical sounds of high, medium or low pitch. In asthma, they are of high or medium pitch and audible on expiration. In bronchitis, rhonchi are audible during inspiration and expiration, and are of medium or low pitch.

**Crepitations** are non-musical sounds with a crackling quality audible during inspiration.

Excess secretions (due to oedema or viscid exudate) in small airways can cause these sounds. These may disappear after prolonged coughing.

**Pleural rub** is a creaking sound produced by the movement of the visceral over parietal pleura when both surfaces have been roughened by fibrinous exudates. These are heard at the end of inspiration and just after the beginning of expiration. It can be best heard when the patient takes a deep breath.

### Common Investigations in Respiratory Diseases

Common investigations in respiratory disease include:

Chest x-ray, sputum microscopy, sputum culture, flow rate and lung volume measurements, arterial blood gas analysis, spirometry, pulmonary gas exchange, pulse oximetry, bronchoscopy, pleural biopsy, CT scans, magnetic resonance imaging (MRI) and ultrasonography.





الباطنية

محاظرة 3

دكتور

مؤيد عزيز



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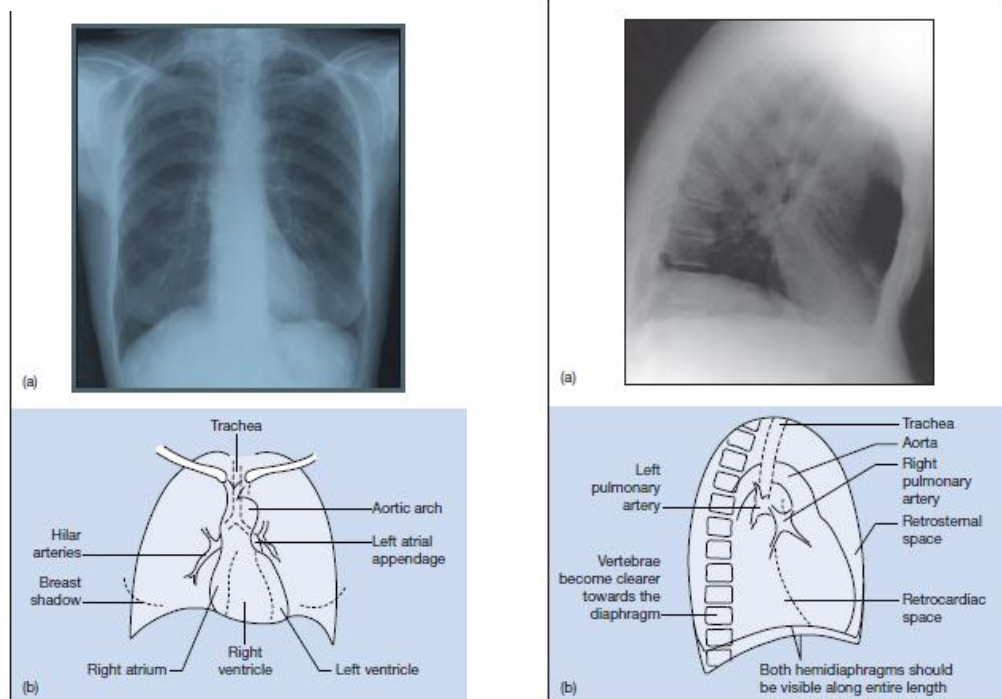
**Diseases of the respiratory system- Major manifestations / investigations/ resp. function tests.**

**Investigation of the respiratory system**

**I Chest radiology**

Chest radiography is often the initial diagnostic study performed to evaluate patients with respiratory symptoms. It may also be the initial evidence of pulmonary disease in a patient without symptoms, e.g., the pulmonary nodule found on an incidental x-ray.

Normal chest X-rays are shown in Fig. 1 A (posteroanterior) and Fig. 1 B (lateral).



**Fig. 1 A** (posteroanterior)

**Fig. 1 B** (lateral)

**II CT scanning** is more sensitive than plain CXR and may be useful in detecting interstitial lung disease, cavitation and empyema. CT chest scans are shown in Fig. 2.

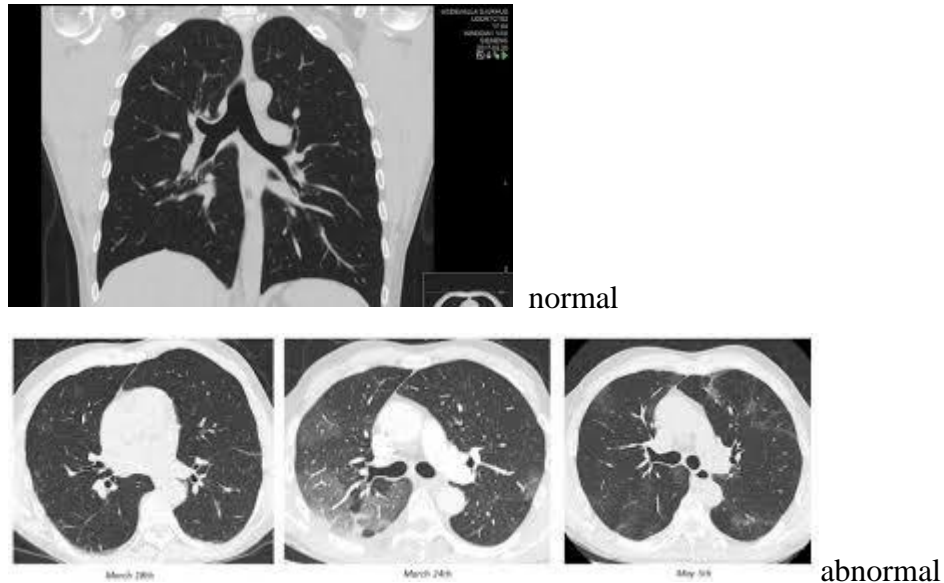


Fig 2 CT scanning

### III Blood gases

The normal arterial values are:

- . PaO<sub>2</sub> 10–13 kPa (values fall with age)
- . PaCO<sub>2</sub> 4.7–6.0 kPa
- . pH 7.35–7.45
- . Standard HCO<sub>3</sub> 23–27 mmol/l

The pH indicates acidosis or alkalosis.

PaCO<sub>2</sub> reflects alveolar ventilation.

PaO<sub>2</sub> reflects ventilation/perfusion imbalance, gas transfer or venous-to-arterial shunts.

#### PaCO<sub>2</sub> .

- 1) raised may account for an acidosis of respiratory origin, e.g. respiratory failure
- 2) reduced may account for an alkalosis as a result of hyperventilation

#### PaO<sub>2</sub>

- 1) raised suggests the patient is on added oxygen
- 2) reduced indicates lung disease (the PaCO<sub>2</sub> is usually high) or a right-to-left shunt

#### HCO<sub>3</sub>

- 1) raised standard HCO<sub>3</sub> \_accounts for a metabolic alkalosis
- 2) reduced accounts for a metabolic acidosis (usually renal or diabetic ketoacidosis)

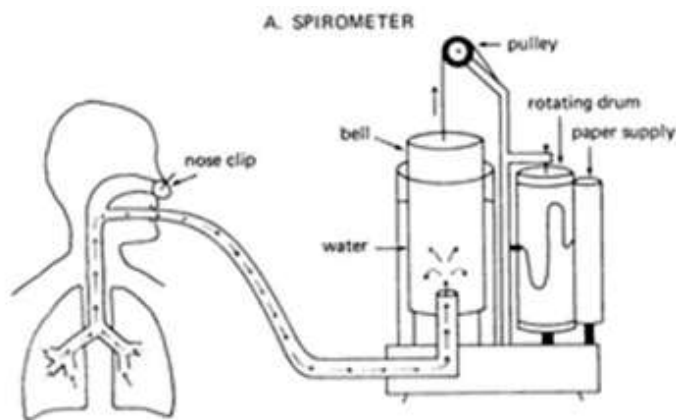
#### IV Pulmonary function tests

Pulmonary function tests (PFTs) are non-invasive tests used mainly to do the following:

- Categorize of different types of lung processes (restrictive versus obstructive)
- Assess disease severity (in overall prognosis and preoperative evaluation)
- Evaluate post-treatment lung function

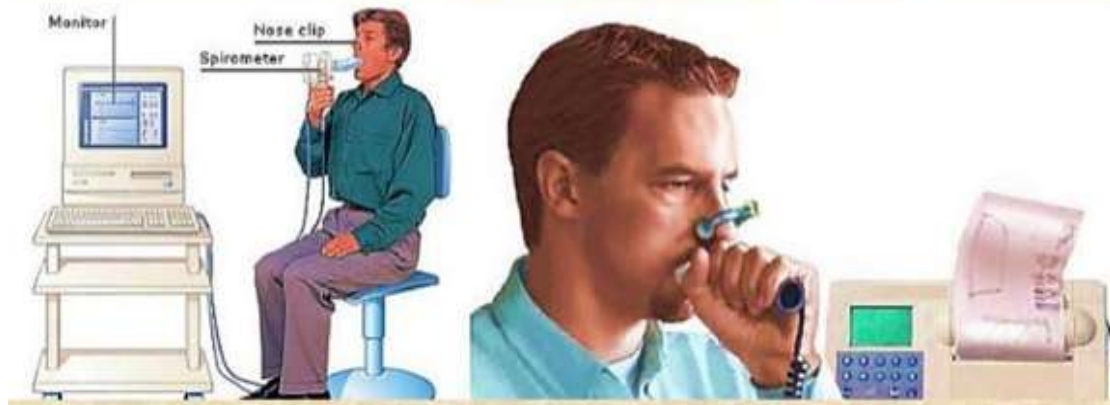
#### Spirometry

Subject exhales as fast and as long as possible from full inspiration into a spirometer, before and after bronchodilatation.



B. SPIROMETER TRACE (SPIROGRAM)

## Pulmonary Function testing (Spirometry )



Spirometry can be done in the office setting and allows the determination of most lung volumes and capacities, as well as expiratory flows and bronchodilator response. Complete PFTs are done in the pulmonary lab and allow the measurement of TLC, DLco, and methacholine challenge testing.

### PFTs consist of different tests:

- **Static lung compartments** are measured by lung volumes , such as total lung capacity (TLC), residual volume (RV) and vital capacity (VC) .
- **Airflow or air movement** is measured by the expiratory flow rate (ratio of forced expiratory volume in 1 second to forced vital capacity [FEV<sub>1</sub>/FVC] and forced expiratory flow 25–75% of expiration [FEF<sub>25–75</sub>, also called mid maximal flow rate (MMFR)] .
- **Alveolar membrane permeability** is measured by the **Diffusing Capacity of A Gas, Carbon monoxide diffusing capacity (Dlco)** .
- The **methacholine challenge test** is an adjunct test used for evaluating bronchial hyperactivity in asthma patients who have normal PFTs.

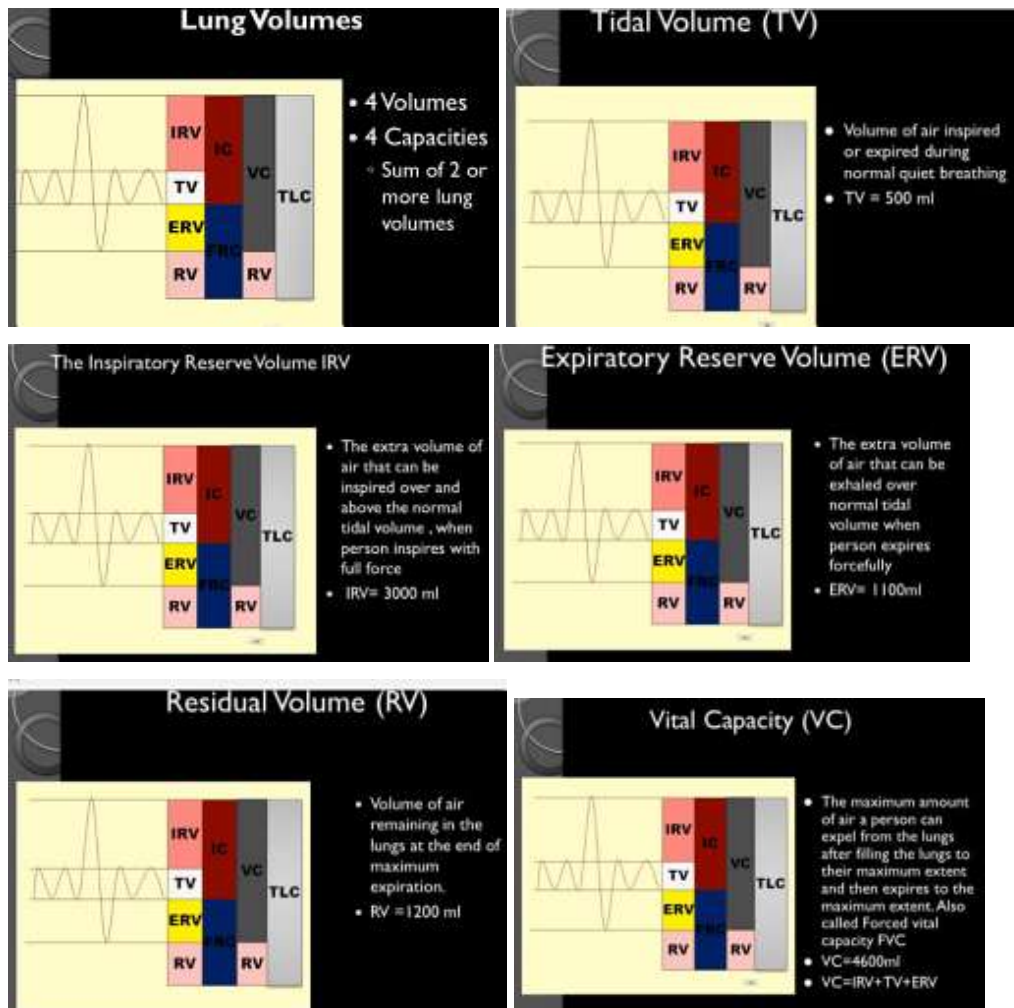
### Interpretation.

- Volume expired in the first second is the **forced expiratory volume in 1 s** (FEV<sub>1</sub>).
- Total expired is the **forced vital capacity** (FVC). Relaxed (slow) vital capacity may provide a better measure of trapped gas volume in chronic airways obstruction.

- Constriction of the major airways reduces the  $FEV_1$  more than the FVC.
- Restriction of the lungs reduces the FVC and, to a lesser degree, the  $FEV_1$ .
- $FEV_1 : FVC(FEV\%)$  ratio is low in obstructive airways disease (e.g. chronic bronchitis and asthma) and normal or high in fibrosing alveolitis and other interstitial lung diseases.
- Peak expiratory flow rate (PEFR) measures the rate of flow of exhaled air at the start of a forced expiration.

Normal values for all these tests vary with age, sex and size and appropriate nomograms should be consulted.

### Lung volumes



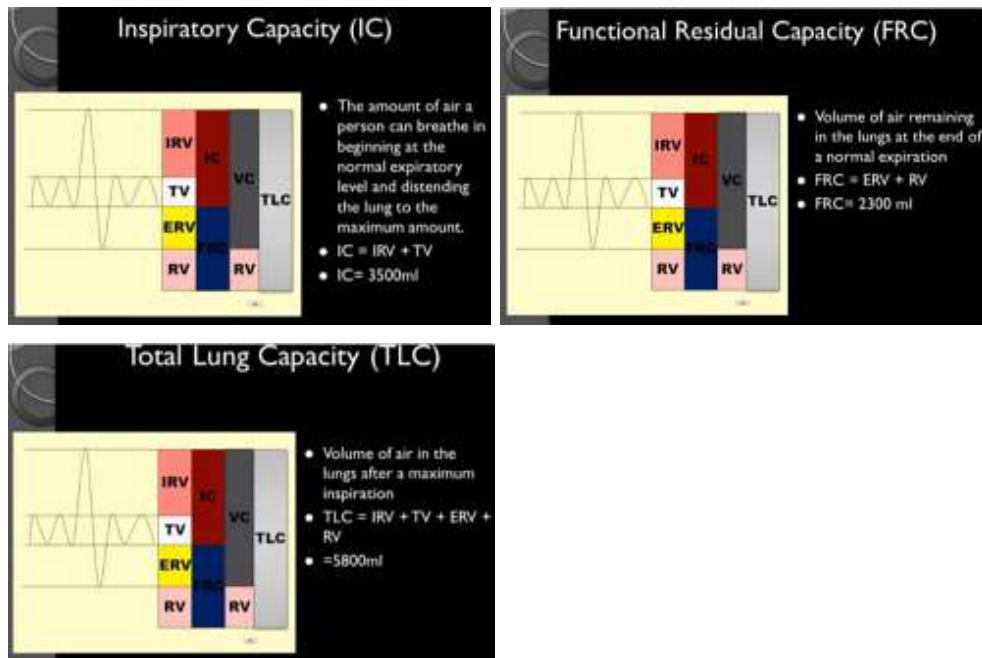


Table 1. Pulmonary Function Tests

PFT	Normal Range
TLC	80–120% predicted
RV	75–120%
FEV <sub>1</sub> /FVC Ratio	80%
DLCO	75–120%
FEV <sub>1</sub>	80–120%

### Lung volumes

Ventilatory function is measured under static conditions for the determination of lung volumes (*see* Figure 3) and thus allows for the diagnosis of restrictive lung disease.

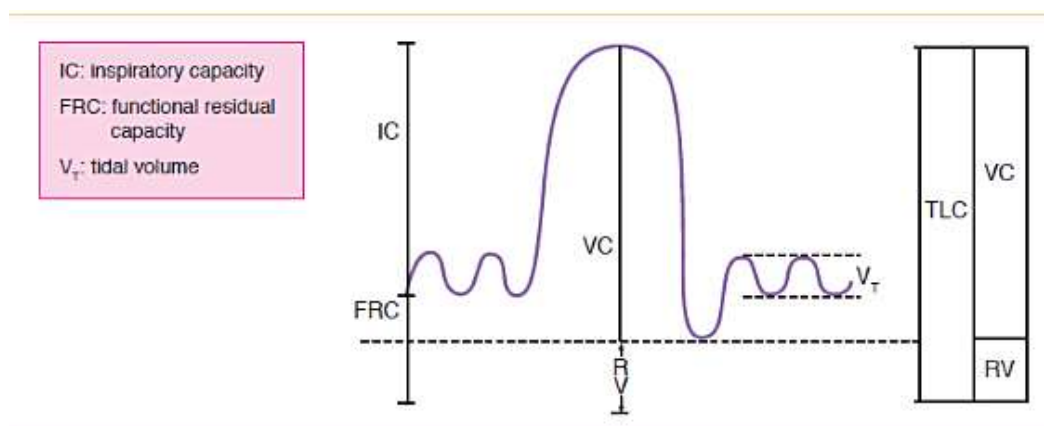
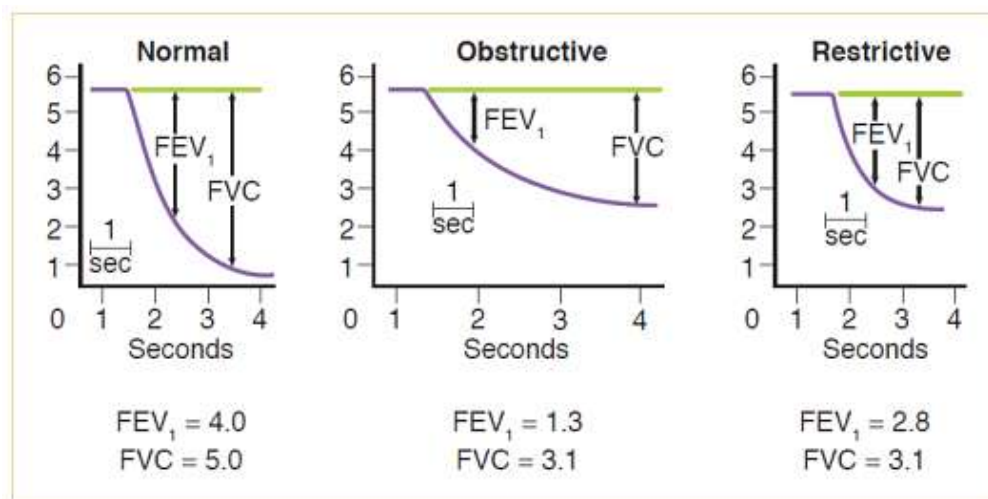


Figure 3. Determination of Lung Volumes



**Table 2. Pulmonary Indices**

Index	Description
Total lung capacity (TLC)	Volume of gas in the lungs after maximal inspiration
Residual volume (RV)	Volume of gas remaining in the lungs after forced maximal expiration (unused space)
Vital capacity (VC)	Volume of gas exhaled with maximal forced expiration TLC = RV + VC or VC = TLC – RV

**Figure 4. Forced Expiratory Volumes****Carbon monoxide diffusing capacity (DLco)**

Lung diffusion testing is used to determine how well oxygen passes from the alveolar space of the lungs into the blood. Whereas spirometry measures the mechanical properties of the lungs, the lung diffusing capacity test (DLco) measures the ability of the lungs to perform gas exchange. The single-breath DLco test requires the patient to inhale DLco gas consisting of helium, carbon monoxide, and room air. Generally, diffusing capacity is reduced when alveolar walls are destroyed and pulmonary capillaries are obliterated by emphysema, or when the alveolar-capillary membrane is thickened by edema, consolidation, or fibrosis (as in interstitial lung disease).

PFTs with an obstructive pattern and decreased DLco should prompt the consideration of emphysema. PFTs with a restrictive pattern and decreased DLco are likely to be some type of interstitial lung disease (intrapulmonary restriction) or mild left heart failure.

Increased DLco may be seen in pulmonary hemorrhage, e.g., Goodpasture syndrome.



**Figure 5.** Alveolar Diffusing Capacity

### **Methacholine challenge test**

Bronchoprovocation with methacholine is done to evaluate patients with cough or wheezing and who have a normal PFT, for possible asthma (bronchial reactivity).

During the test, the patient inhales an aerosol of methacholine. Results of PFTs (e.g., spirometry) performed before and after the inhalations are used to quantitate the response. A positive test is defined as a decrease from the baseline  $FEV_1$  of 20% or more.







الباطنية

محاظرة 5

دكتور

مؤيد عزيز



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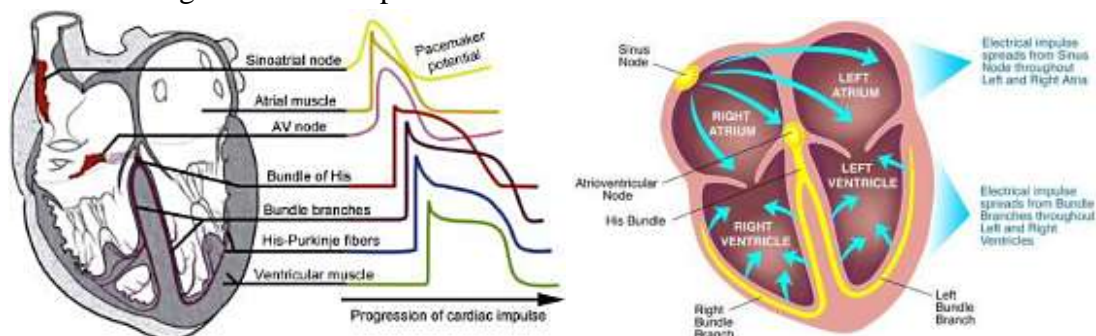
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## Principles of electrocardiography/ normal ECG/S. Tachycardia/ S. Bradycardia/ S. Arrhythmia.

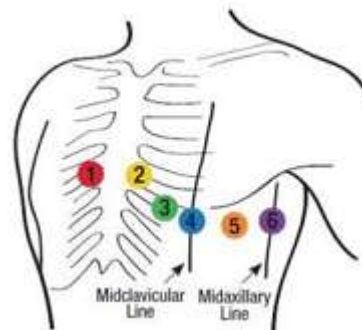
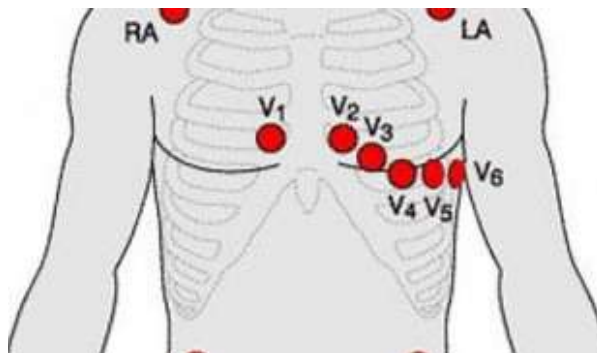
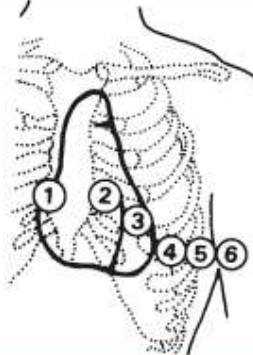
The ECG is an essential bedside test in the investigation of all patients with cardiac disease.

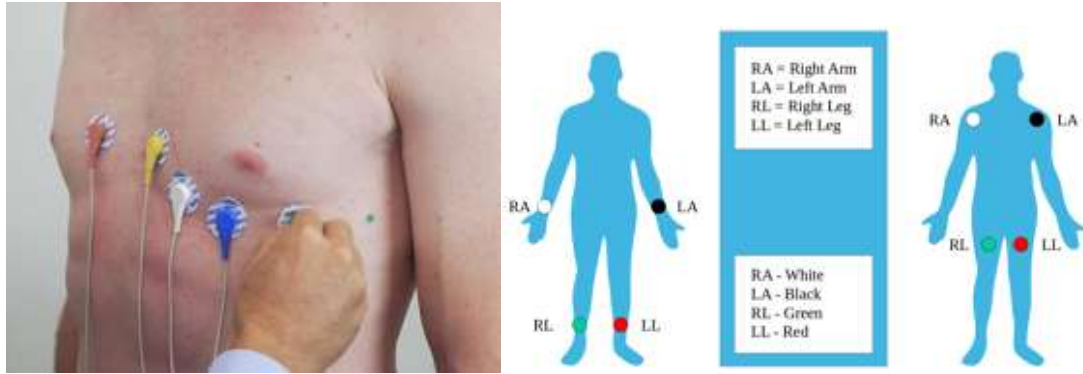
An electrocardiogram (ECG or EKG) records the electrical signal from your heart to check for different heart conditions. Electrodes are placed on your chest to record your heart's electrical signals, which cause your heart to beat. The signals are shown as waves on an attached computer monitor or printer. Electrical activity starts in the sinoatrial node (SA node, is a group of cells known as pacemaker cells, that initiates the electrical impulses to stimulate contraction, and is found in the atrial wall), passes across the atria (detected as the P wave) then travels across the atrioventricular node before causing ventricular depolarisation.



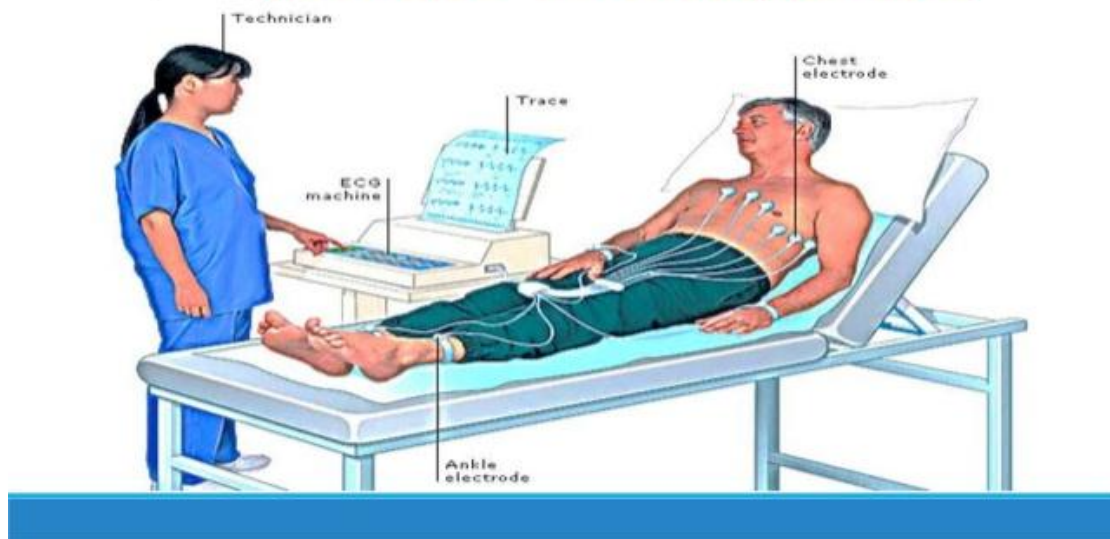
### Where to place the chest leads

- V<sub>1</sub>: Right sternal edge, fourth intercostal space
  - V<sub>2</sub>: Left sternal edge, fourth intercostal space
  - V<sub>3</sub>: Half-way between V<sub>2</sub> and V<sub>4</sub>
  - V<sub>4</sub>: The patient's apex beat
  - All subsequent leads are in the same horizontal plane as V<sub>4</sub>
  - V<sub>5</sub>: Anterior axillary line
  - V<sub>6</sub>: Mid-axillary line (V<sub>7</sub>: Posterior axillary line)
- Finish 12-lead ECGs with a long rhythm strip in lead II.



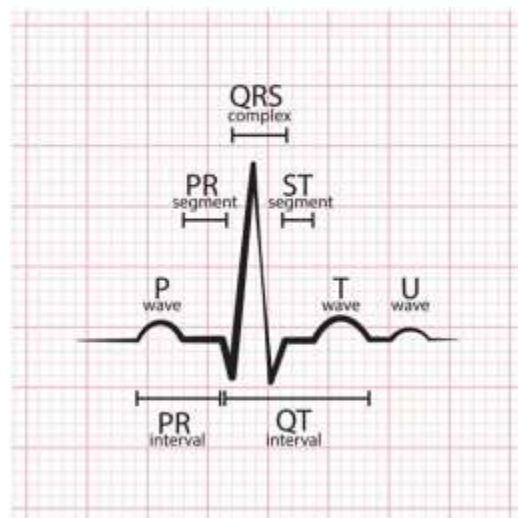
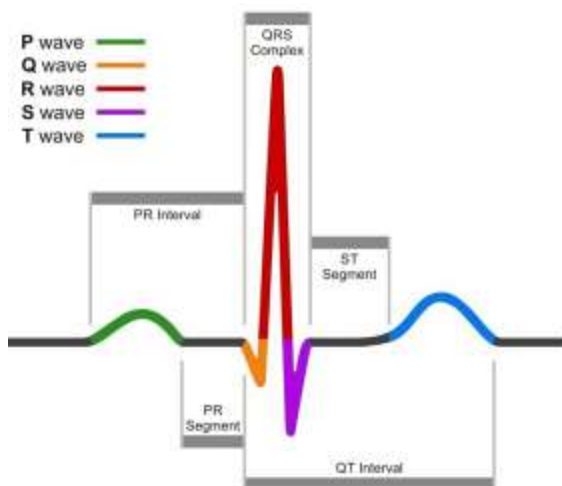


## ECG, *procedure & electrode placement*



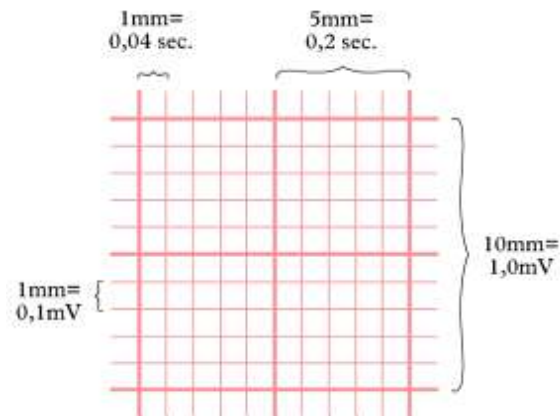
A normal ECG is shown in Fig. 1. 6

## NORMAL ECG



### *Aide memoire*

- . horizontally one little square is 0.04 s; one big square is 0.2 s
- . vertically one little square is 0.1 mV



. normal PR interval is 0.12–0.2 s

. normal QRS duration is up to 0.12 s

The QT interval varies with rate. Upper limits of normal are approximately:

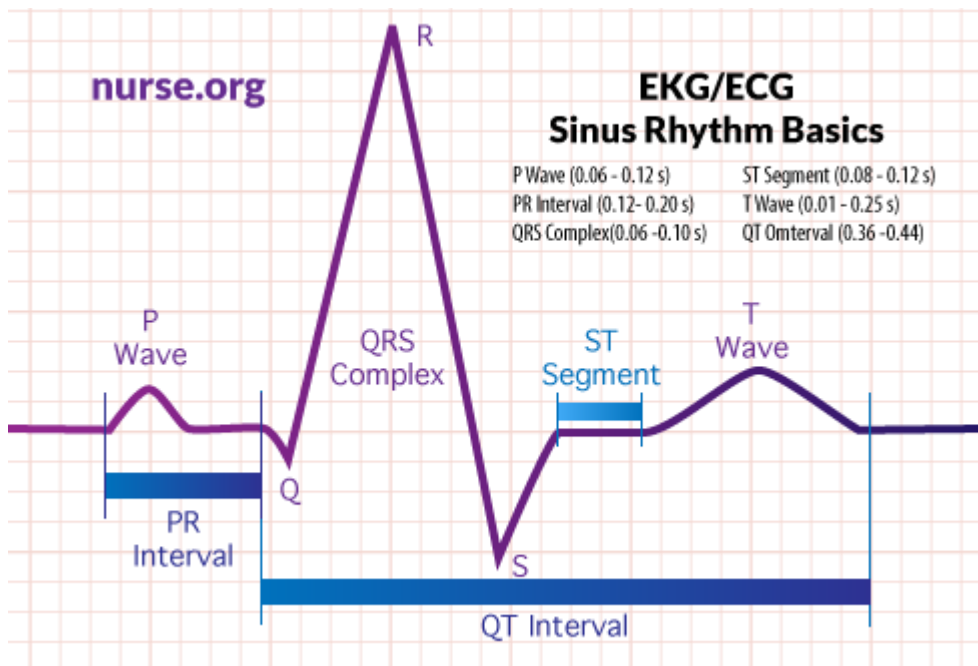
. rate 60/min QT 0.43 s

. rate 75/min QT 0.39 s

. rate 100/min QT 0.34 s.

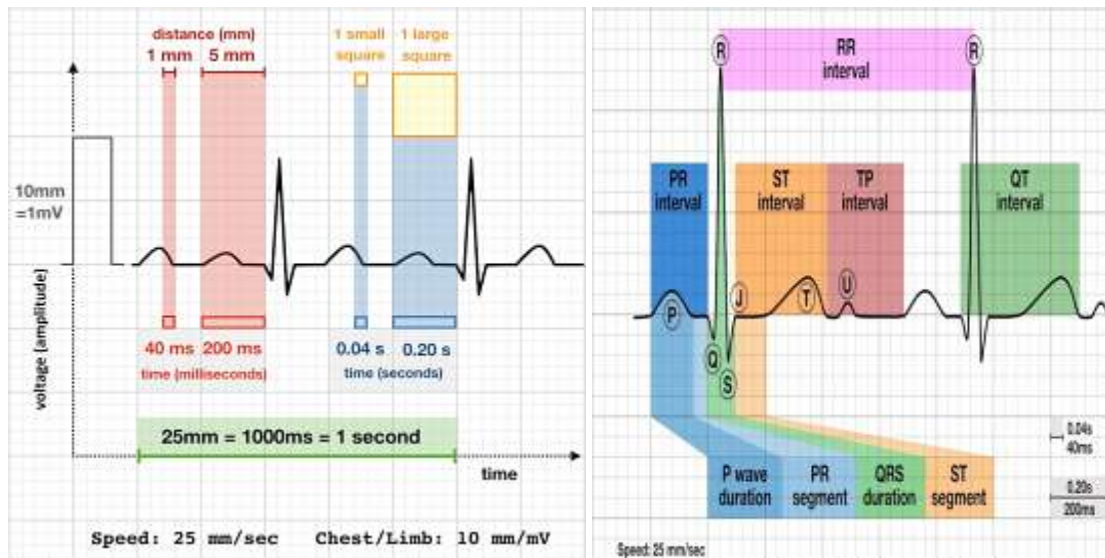
#### Criteria for normal sinus rhythm (see also Basics)

- A P wave (atrial contraction) precedes every QRS complex
- The P wave is positive in I and II, and biphasic in V1
- The P waves maximum height is 2.5 mm in II and/or III
- The rhythm is regular, but varies slightly while breathing
- The frequency ranges between 60 and 100 beats per minute



**Rate.** Count the large squares between two QRS complexes and divide into 300 (i.e. if two squares, the rate is 150/min).. If the rate is less than 60/min the patient has a bradycardia; if greater than 100/min, a tachycardia.





### Regularity

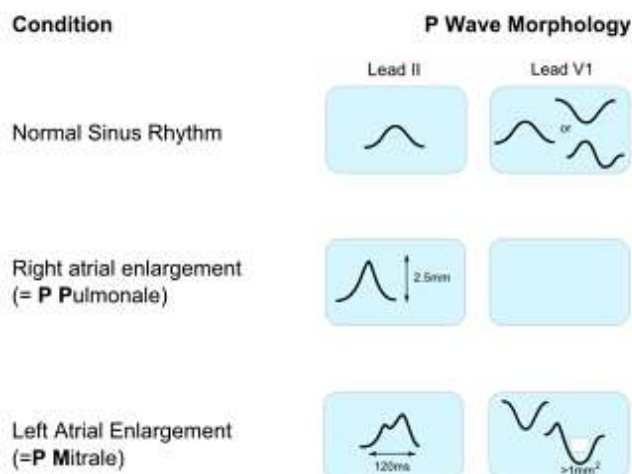
- . Use the edge of a piece of paper to mark off a series of R waves, and then shift the paper along one or more complexes.
- . The marks on the paper will still correspond with the R waves if the rhythm is regular. Total irregularity usually indicates atrial fibrillation.

### Check individual waves and intervals

- . for their presence, shape and duration.

### P wave (atrial depolarisation)

- . is most easily seen in V1 and V2
- . is peaked in right atrial hypertrophy and bifid in left atrial hypertrophy (left atrial depolarisation occurs slightly later than right, giving a second peak)
- . may be 'lost' (in the QRS complex) in nodal rhythm.



### PR interval

- . PR interval measured from the beginning of the P wave to the beginning of the QRS complex is usually 0.12–0.2 s.
- . If the PR interval is prolonged or a normal 1 : 1 ratio of PQRS complexes is lost heart block is present.

A short PR interval occurs in atrioventricular reentrant tachycardias (unusually fast AV conduction).

### **QRS complex**

. The QRS complex is caused by the rapid **depolarization** of the right and left **ventricles**.

. If the QRS complex is longer than 0.12 s bundle branch block exists.

. Pathological (broad, deep) Q waves are greater than 0.04 s (one small square wide) and greater than 0.2 mV. They may be normal in AVR or V1.

### **ST segment**

. The ventricles are depolarized during the ST segment, which is normally isoelectric. Planar elevation (>1mm) or depression (>0.5mm) usually implies infarction or ischaemia, respectively.

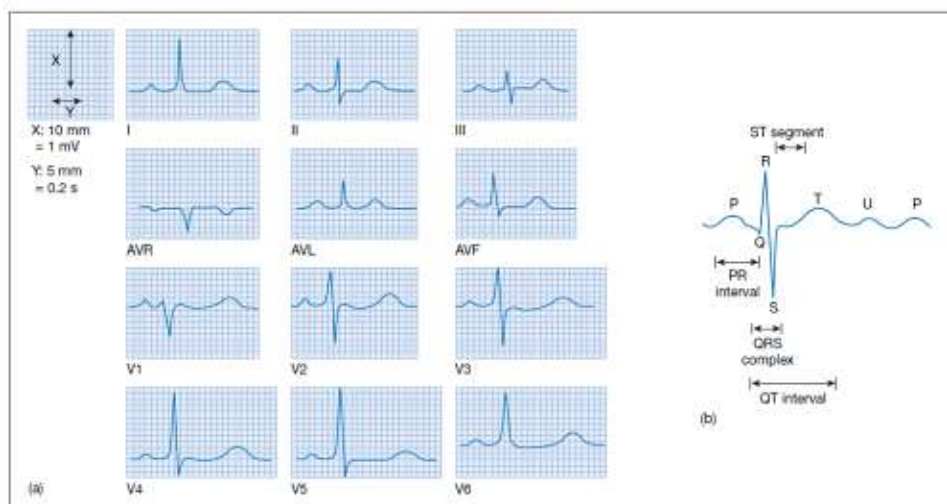
### **T wave**

. The T wave is caused by **repolarization** of the **ventricles**.

### **QT interval**

. The QT interval is measured from the beginning of the QRS complex to the end of the T wave. It varies with heart rate, and the corrected QT (QTc) is calculated by dividing the QT interval by the square root of the preceding R – R interval. QTc values between 0.35 and 0.45 s are considered normal. Prolongation is associated with ventricular arrhythmias.

View of the heart	Leads
Inferior	II, III, aVF
Lateral	I, aVL, aVR, V5, V6
Anterior	V3, V4
Septal	V1, V2



## **Cardiac arrhythmias**

**Definition/description:** Loss of rhythm resulting in irregularity of the heartbeat is called arrhythmia. Cardiac arrhythmias include isolated ectopic beats (occur just before a regular beat), bradycardia and tachycardia.

A sinus rate greater than 100 beats per minute is considered as tachycardia. A sinus rate of less than 60 bpm is considered to be bradycardia.

#### **Ectopic beats**



#### **Sinus tachycardia**



#### **Sinus Bradycardia**







الباطنية

محاظرة 6

دكتور

مؤيد عزيز



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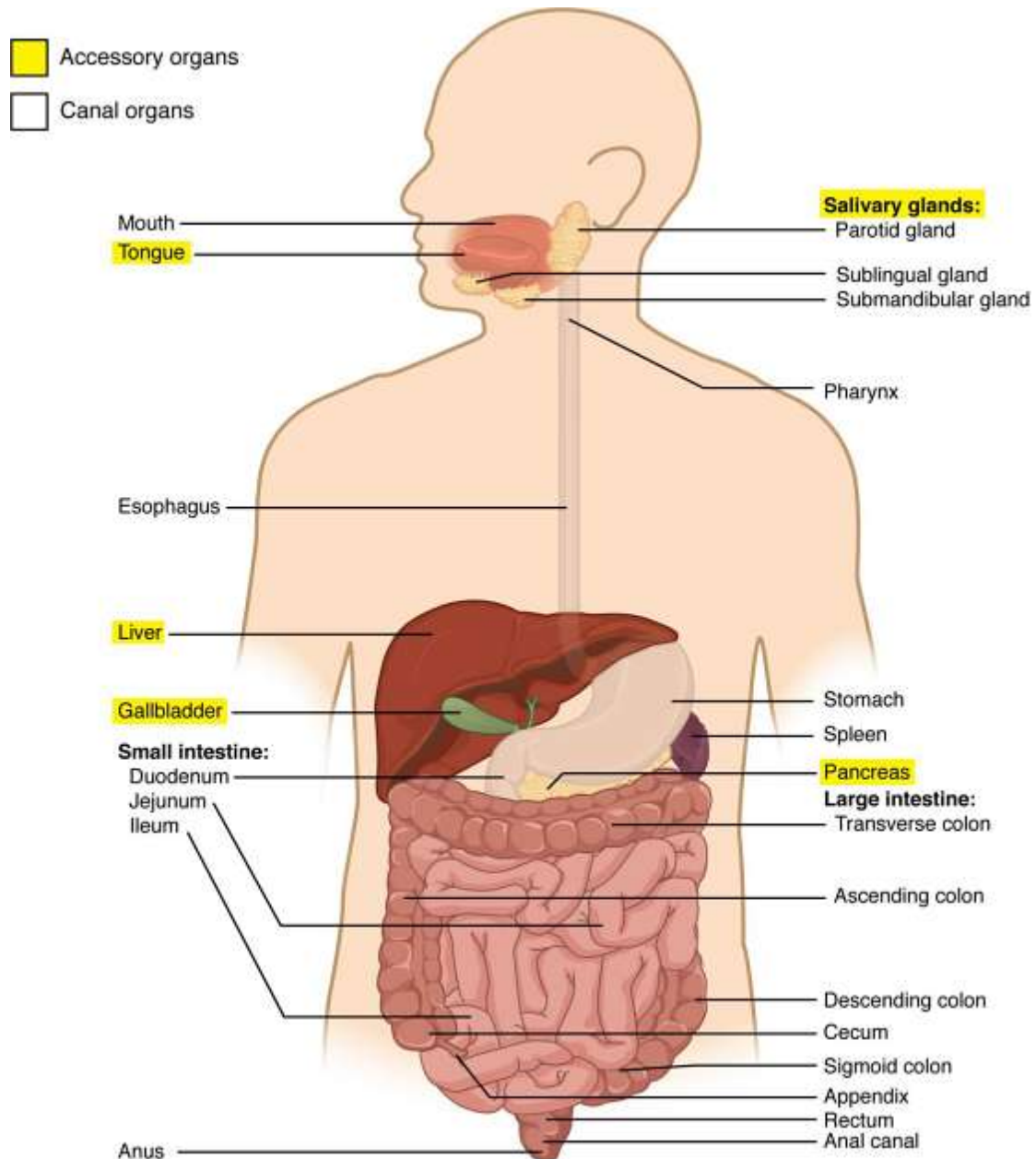


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## Diseases of the GIT/ Introduction/ major manifestation/ investigations.

### Introduction

The primary structures of the gastrointestinal system include the mouth, pharynx, oesophagus, stomach, small intestine (duodenum, jejunum and ileum), large intestines (caecum, ascending colon, transverse colon, descending colon and sigmoid colon) and rectum.



### Common Gastrointestinal Symptoms

Some of the common gastrointestinal symptoms include: abdominal pain, change in bowel patterns, weight change, heart burn, nausea and vomiting, difficulty in eating and swallowing, jaundice, chest pain, diarrhea, abdominal swelling, constipation, loss of appetite, rectal bleeding, bruising tendencies, intestinal bloating, and weakness. It should be noted that some of the above mentioned symptoms can also occur in diseases of other systems.



**Some symptoms that are common to gastrointestinal problems are briefly discussed below:**

**Abdominal pain:** Abdominal pain can be classified as visceral, parietal or referred.

- o Visceral pain results from intestinal distension or stretching of the solid abdominal organs. Pain is often described as burning, cramping, diffuse and poorly localised.

- o Parietal pain results from inflammation of the parietal peritoneum. Pain is severe, localised and aggravated by movement.

- o Referred pain is felt at a site away from the site of its origin.

Location of pain can serve as an important indicator of the abdominal disease. Pain in the umbilical area, for example, may be due to an abdominal aortic aneurysm or appendicitis. Pain in the upper epigastric region left of midline may indicate a gastric ulcer or angina and myocardial infarction.

Pain radiating to the back, neck or jaw may indicate gastro-oesophageal reflux disease (GORD), angina and myocardial infarction.

Substernal chest pain with difficulty breathing after a meal may be due to hiatus hernia.

**Change in bowel patterns:** Changes in bowel movements occur in a variety of GI disorders. These include malabsorption syndromes, irritable bowel syndrome, colorectal cancer, infections of the GI tract, food intolerance and reactions to medications.

The colour of the stool is also an indicator of GI disease. Upper GI bleeding causes black, tarry stools, lower GI bleeding causes red, bloody stools and clay coloured stools are indicative of increased bile seen in obstructive jaundice.

**Constipation:** This common condition displays decreased frequency of the evacuation of the bowels along with abnormally firm stools. Ignoring the normal habit of bowel movement, decreased fiber residue and dehydration are common causes of constipation.

**Diarrhea:** Diarrhea is defined by the World Health Organization as having three or more loose or liquid stools per day, or as having more stools than is normal for that person.

**Indigestion/gassiness/burning:** Collectively, this is known as dyspepsia. Indigestion is often described by the patient as ‘heart burn’. This is due to acid from the stomach flowing into the lower oesophagus, causing a burning sensation.

**Nausea and vomiting:** Nausea is the unpleasant feeling of needing to vomit, whereas vomiting is the forceful expulsion of gastric contents produced by involuntary contractions of the abdominal musculature. Gastric regurgitation, on the other hand, is the spitting up of gastric contents without associated nausea and abdominal muscular contractions.

**“Lump in the throat”:** This is called also globs sensation. Patients describe this as the sensation of a lump in the throat unrelated to swallowing. In this condition, there is no mass or lump in the throat. This is common in patients with gastroesophageal reflux disease (GORD).

**Hiccups:** Hiccups are repeated involuntary spasms of the diaphragm followed by the

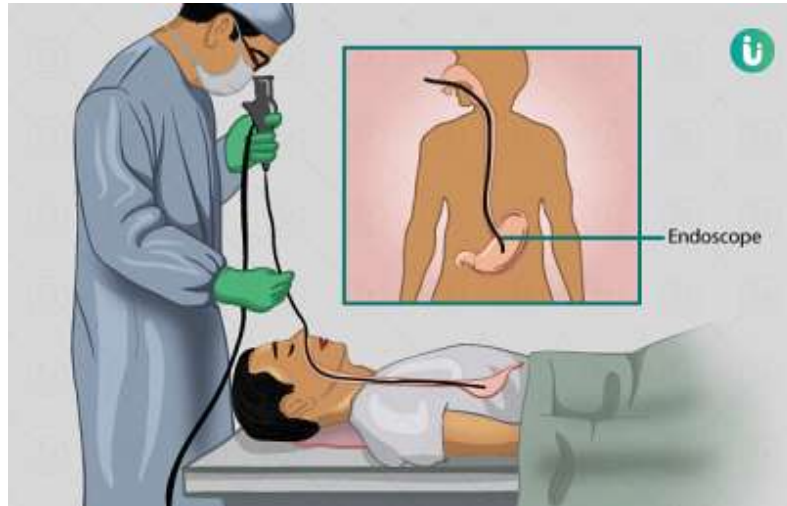
sudden closure of the glottis producing the characteristic sound.

### Investigations in Gastroenterology

A detailed health history and physical examination of the abdomen precedes investigations in assessing the diseases of the gastrointestinal system.

#### Endoscopy:

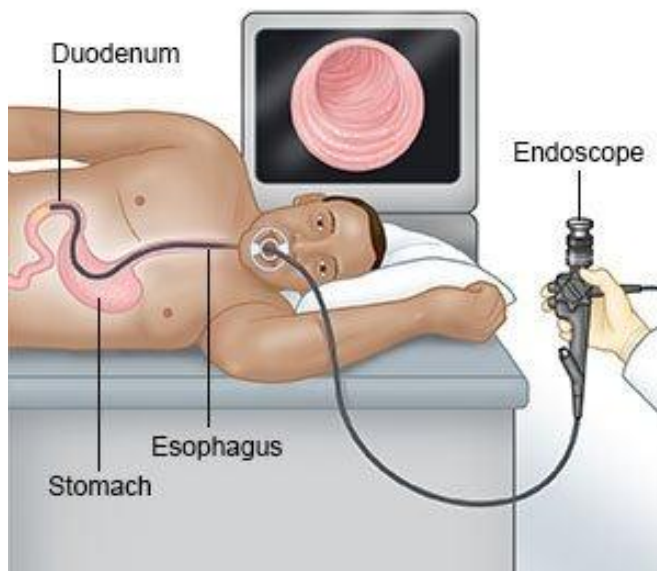
□ This is performed in order to visualize parts of the GI tract and also to take biopsies of the involved tissues.



#### Gastroscopy:

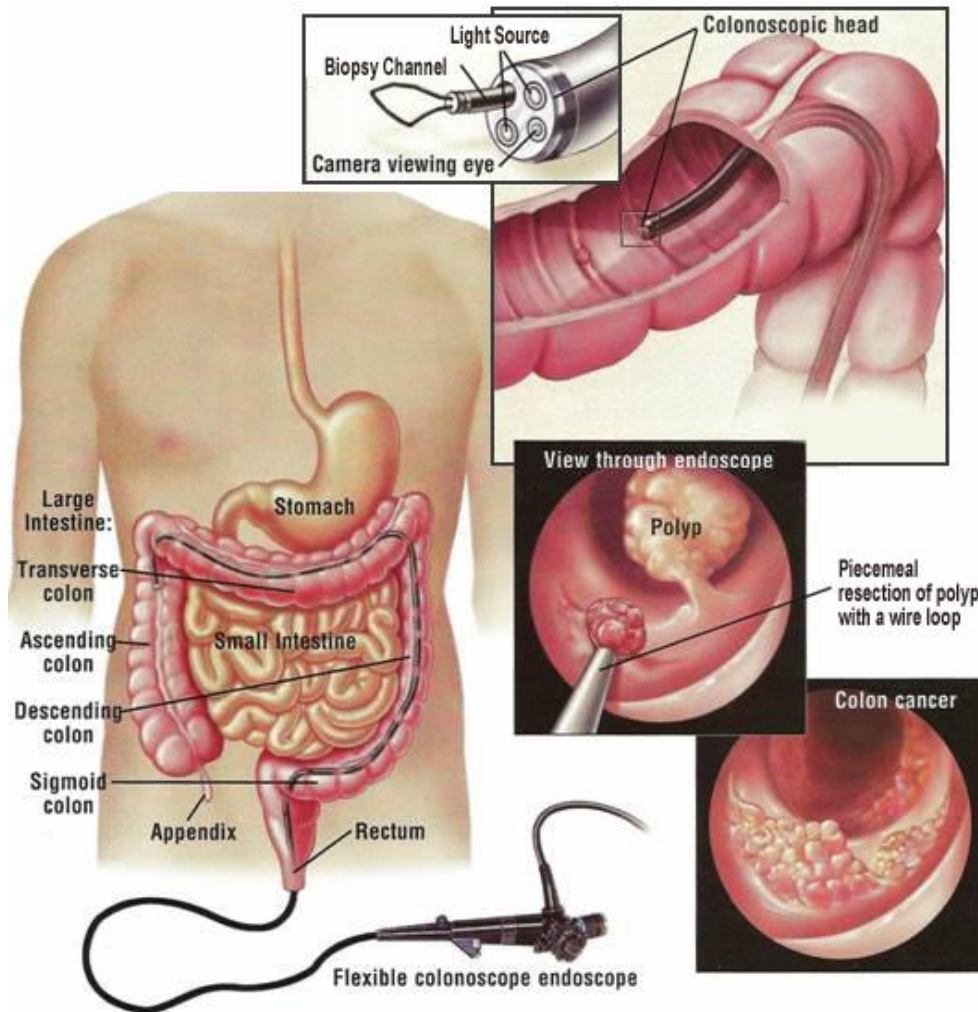
□ The oesophagus, stomach and proximal duodenum can be investigated with a gastroscope.

#### Upper Endoscopy



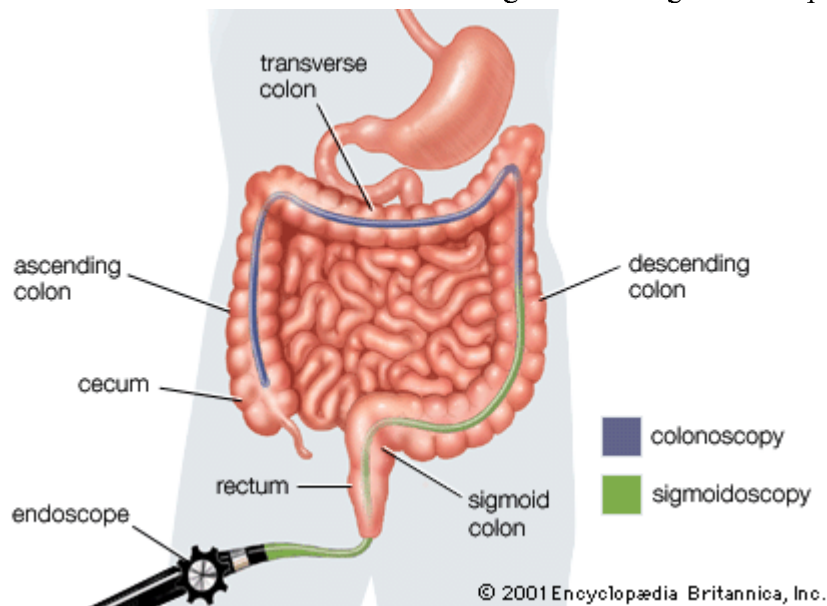
#### Colonoscopy:

□ The large bowel and terminal ileum can be investigated using the colonoscope.



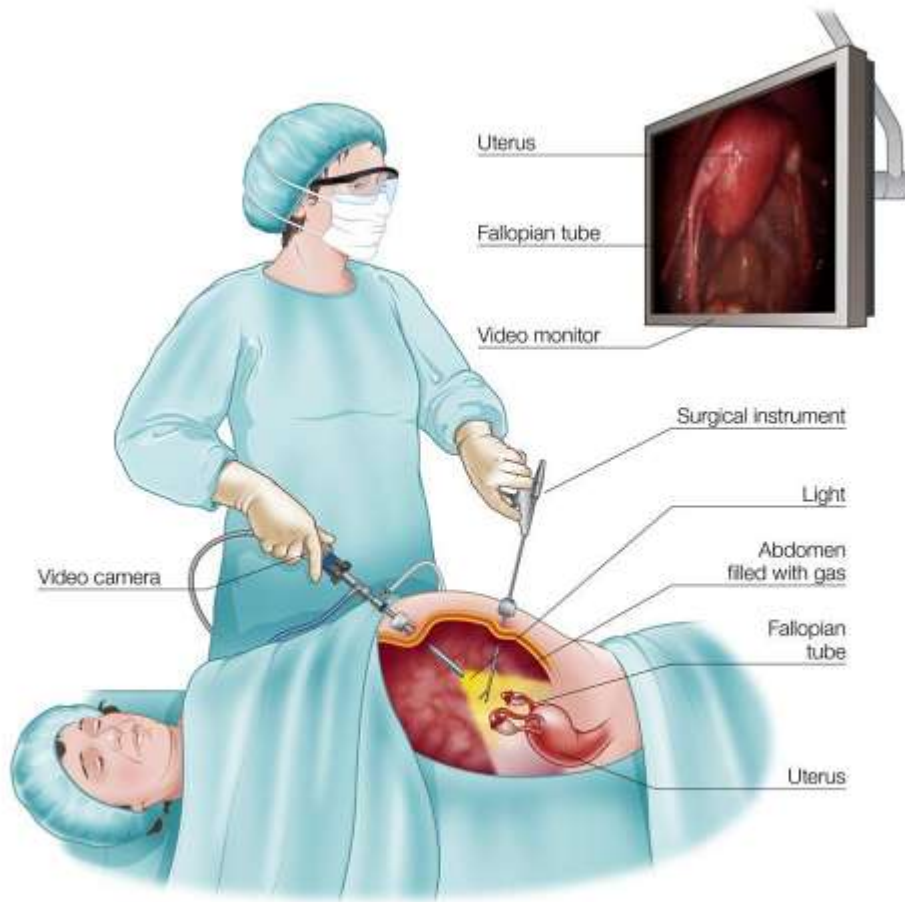
### Sigmoidoscopy:

- Diseases of the rectum can be investigated with sigmoidoscope.



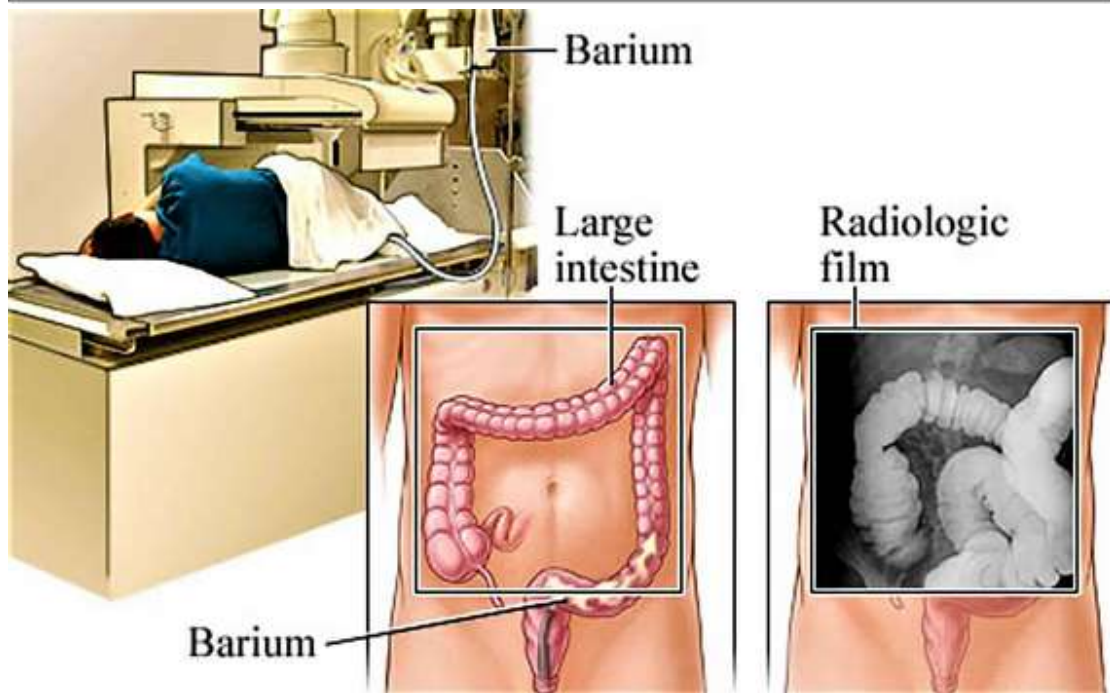
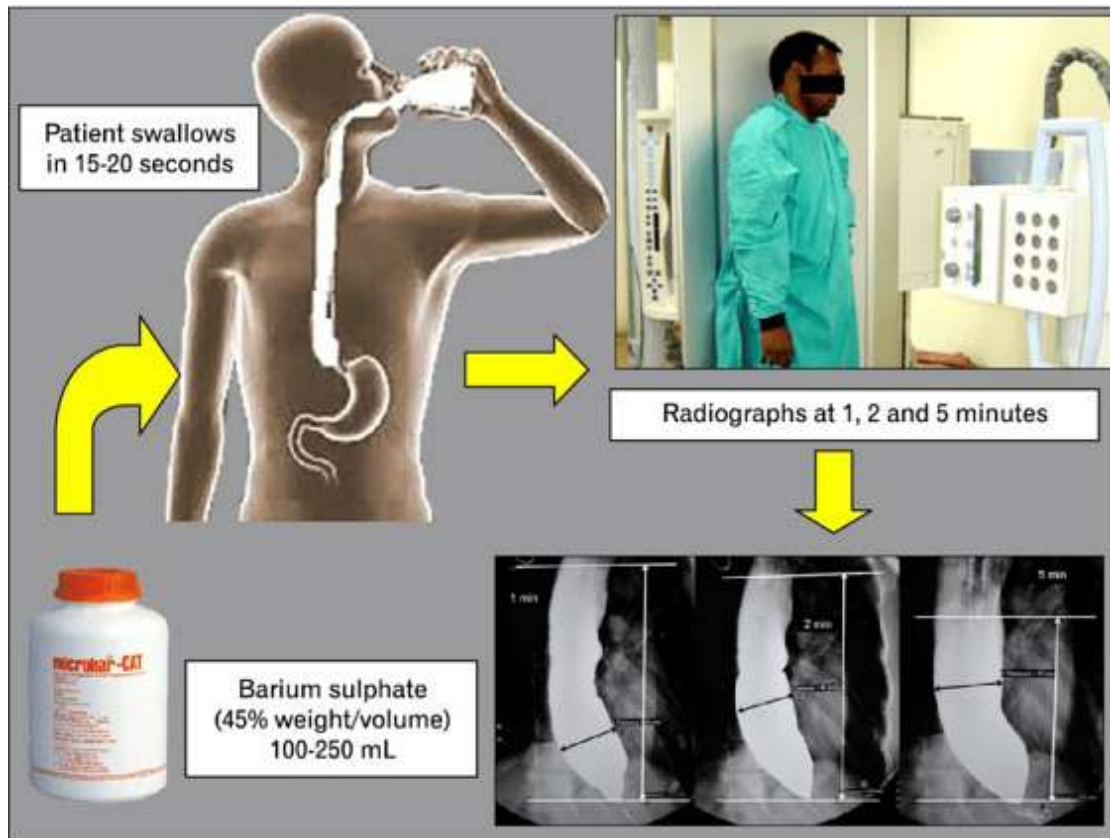
### Laparoscopy:

- This is a method of directly inspecting the abdominal organs using a fiberoptic system via one or more small incisions.

**Radiology:**

□ The whole of the GI tract can be investigated radiologically using a contrast medium such as barium swallow, barium meal or enema.





#### Faecal occult blood:

- ☐ Simple bed-side methods are used to detect haemoglobin in the blood in faeces.
- ☐ **Computed tomography(CT)** is indicated if ultrasound is technically difficult or nondiagnostic.
- ☐ **Magnetic resonance imaging (MRI)** provides superior soft tissue imaging and enables the distinction of benign and malignant lesions.





الباطنية

محاظرة 7

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# **Diseases of the liver**

**Moayad Aziz Alabdaly**

**M.B.Ch.B-D.O.M-D.V.D-M.Sc.-Ph.D.**

# Introduction

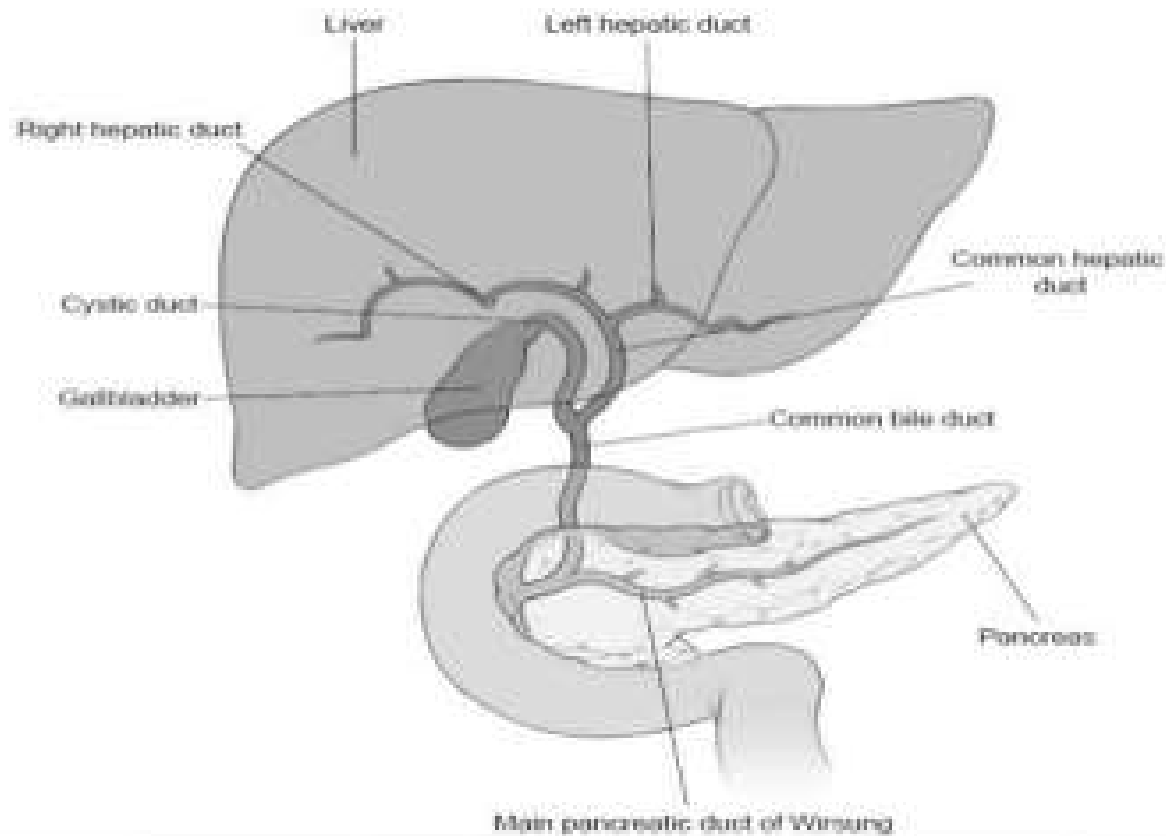
Liver diseases, and those of the gall bladder and pancreas, are common. The most common liver diseases are acute viral hepatitis, drug jaundice, gallstones, biliary tract

obstruction and carcinomatous secondary deposits.

From the anesthesia practice point of view, disorders of these organs are important because of their direct and indirect relevance to health.

# Introduction

## Pathophysiology



## Bilirubin metabolism:

Bilirubin is formed from the breakdown of hemoglobin. It is conjugated with glucuronic acid by hepatocytes, making it water soluble.

Conjugated bilirubin is secreted into bile and passes into the duodenum. In the small intestine, bile is converted to urobilinogen by the gut flora.

Most (>90%) of the urobilinogen is actively reabsorbed in the ileum and transported via the portal circulation to the liver.



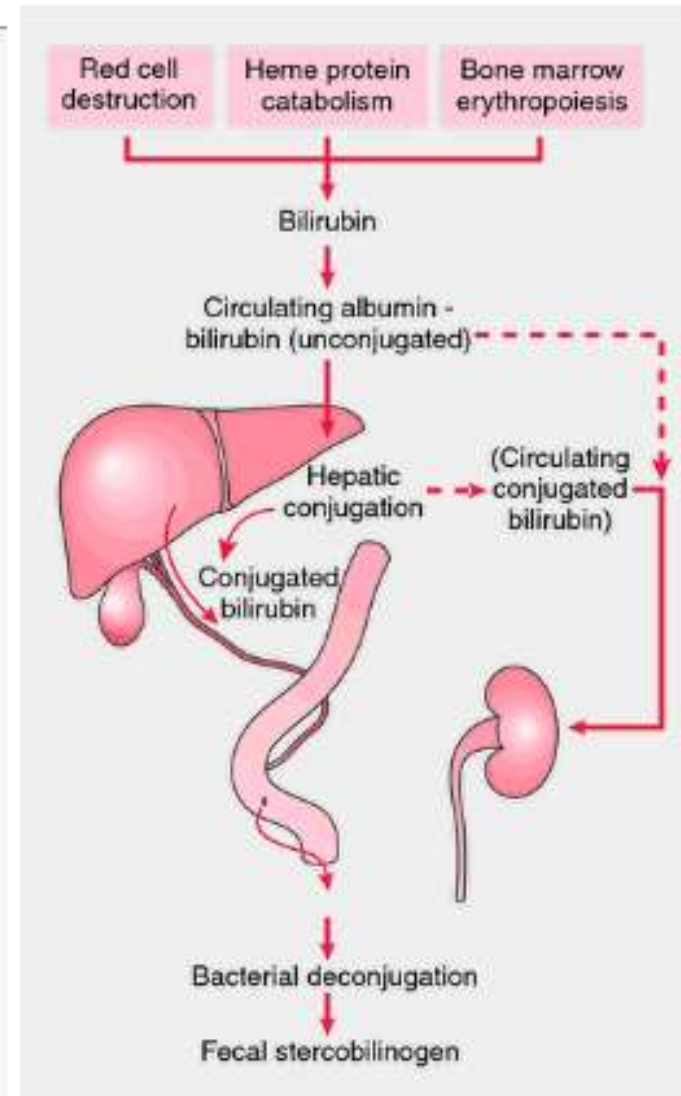
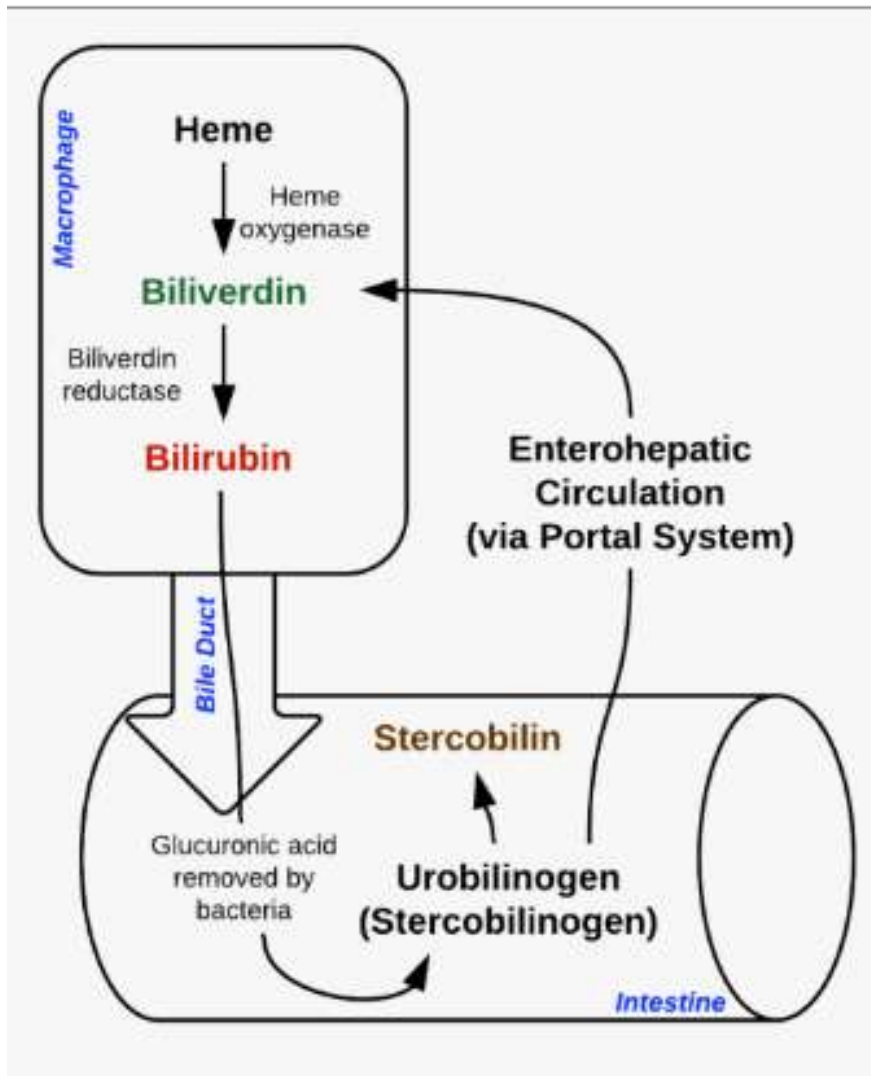
## Bilirubin metabolism:

Some of the portal urobilinogen is retaken by the hepatocytes and resecreted into the bile ( *enterohepatic circulation* ).

A portion of the bile bypasses the liver and is excreted by the kidneys into the urine.

The remainder of urobilinogen that is not reabsorbed in the ileum is converted to stercobilin in the distal small intestine or proximal colon, giving feces its characteristic brown color.

# Bilirubin metabolism:



# General Signs and Symptoms of Liver Disease

**Jaundice:** Also called icterus, jaundice is characterised by yellow pigmentation of the skin, oral mucous membrane and sclera due to deposition of bilirubin. Jaundice is detectable when bilirubin is above 30-60 mmol/L. Jaundice is often seen in liver disease such as hepatitis or liver cancer. It may also indicate obstruction of the biliary tract by, for example, gallstones or pancreatic cancer. Less commonly, jaundice is congenital in origin (e.g., biliary atresia).

# General Signs and Symptoms of Liver Disease

## Jaundice:



## JAUNDICE



# General Signs and Symptoms of Liver Disease

**Spider angioma (spider nevi):** These are small arterial dilatations on the skin of the face and neck. They contain a central red spot and reddish extensions which radiate outwards like a spider's web. They occur in healthy adults and young children. Having more than five spider nevi generally indicates liver disease.





# General Signs and Symptoms of Liver Disease

**Palmar erythema:** Redness of the palms is called palmar erythema. These are often referred to as liver palms. Palmar erythema also occurs in pregnancy, polycythemia and thyrotoxicosis.



# General Signs and Symptoms of Liver Disease

**Dupuytren's contracture:** This condition is characterised by fixed flexion of the little, and sometimes ring finger due to thickening of the palmar fascia. Dupuytren's contracture has a genetic background in some cases. It also occurs in patients with diabetes, alcoholism and epilepsy.



# General Signs and Symptoms of Liver Disease

**Finger clubbing:** Finger (nail) clubbing is characterised by the loss of the normal angle at the bed of the nails. This is a common feature in liver cirrhosis (primary biliary cirrhosis in particular). Other conditions include cystic fibrosis of the lungs, lung cancer, pulmonary tuberculosis, suppurative lung disease, congenital cyanotic heart disease, Crohn's disease, subacute bacterial endocarditis and thyrotoxicosis.

Idiopathic clubbing is sometimes seen in normal persons.

# General Signs and Symptoms of Liver Disease

## Finger clubbing:



# General Signs and Symptoms of Liver Disease

**Ascites:** Ascites is characterised by the accumulation of serous fluid in the peritoneal cavity. This causes abdominal distension and bulging flanks. Ascites can be a feature of liver disease, heart failure, protein-calorie malnutrition, nephrotic syndrome, and certain medications.





# General Signs and Symptoms of Liver Disease

**Leukonychia:** White discolouration appearing on the nails is called leukonychia. Leukonychia occurs in liver disease and in those patients on chemotherapy. In healthy individuals, leukonychia may have a genetic background.



# General Signs and Symptoms of Liver Disease

**Terry's nail:** This is a physical finding in which fingernails and/or toenails appear white with a brown or pink arc at the tip of the nails. This condition is considered to be due to a decrease in vascularity and an increase in connective tissue within the nail bed. It frequently occurs in hepatic failure and cirrhosis. Terry's nails may also occur in patients with renal failure and congestive heart failure, hyperthyroidism, diabetes and malnutrition.

# General Signs and Symptoms of Liver Disease

## Terry's nail:



# General Signs and Symptoms of Liver Disease

**Caput medusae:** This is characterised by a pattern of dilated cutaneous veins radiating from the umbilical area. This feature is observed in adults with cirrhosis of the liver with portal hypertension. In newborn babies this feature is common and is not indicative of liver disorder.





# General Signs and Symptoms of Liver Disease

**Ankle oedema:** Abnormal accumulation of interstitial fluid in the tissues around the ankles causes ankle oedema. In addition to liver diseases, causes of ankle oedema include kidney failure, heart failure, varicose veins, deep vein thrombosis and extended periods of standing. Under these circumstances ankle oedema is generally of pitting dependant type.

Non-pitting oedema of the lower limbs is seen in hypothyroidism, lymphoedema and allergy.

# General Signs and Symptoms of Liver Disease

## Ankle oedema:



## General Signs and Symptoms of Liver Disease

**Petechiae and ecchymosis:** Often seen in liver disease are multiple haemorrhagic conditions presenting as petechiae, and ecchymosis on the skin due to an underlying clotting defect. Petechiae are minor haemorrhagic spots on the skin and mucous membranes which are smaller than 3 mm in diameter. They are usually caused by thrombocytopenia or deficiency of clotting factors. Ecchymosis is a subcutaneous collection of blood as a result of haemorrhage. These lesions are

# General Signs and Symptoms of Liver Disease

## Petechiae and ecchymosis:





# Investigations in Liver Disease

1. Full Blood Count (FBC) for platelet count and microcytosis
2. Liver Function Tests for liver dysfunction
  - Some common liver function tests include:
  - Alanine transaminase (ALT)
  - Aspartate transaminase (AST).
  - Alkaline phosphatase (ALP)
  - Albumin and total protein. ...
  - Bilirubin

# Investigations in Liver Disease

- 3. Serological investigations for viral hepatitis:
  - a. Anti-HBs Ag (previous HBV infection or immunisation)
  - b. IgM Anti-HBcAg - recent HBV infection
  - c. IgM Anti-HAV - recent HAV infection
  - d. Anti-HDV - previous delta virus infection
  - e. Anti-HCV - chronic hepatitis C infection
  - f. HCV-RNA - active HCV infection

# Investigations in Liver Disease

4. Radiology for detection of air within the biliary tree and for the presence of gallstones
5. CT scan - for lesions within the liver parenchyma
6. MRI - for lesions of the liver, biliary tree and pancreas
7. Angiography of the hepatic artery - for hepatic tumours and portal hypertension
8. Endoscopy for gastroesophageal varices
9. Liver biopsy for the staging of most hepatic disorders



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محاظرة 8

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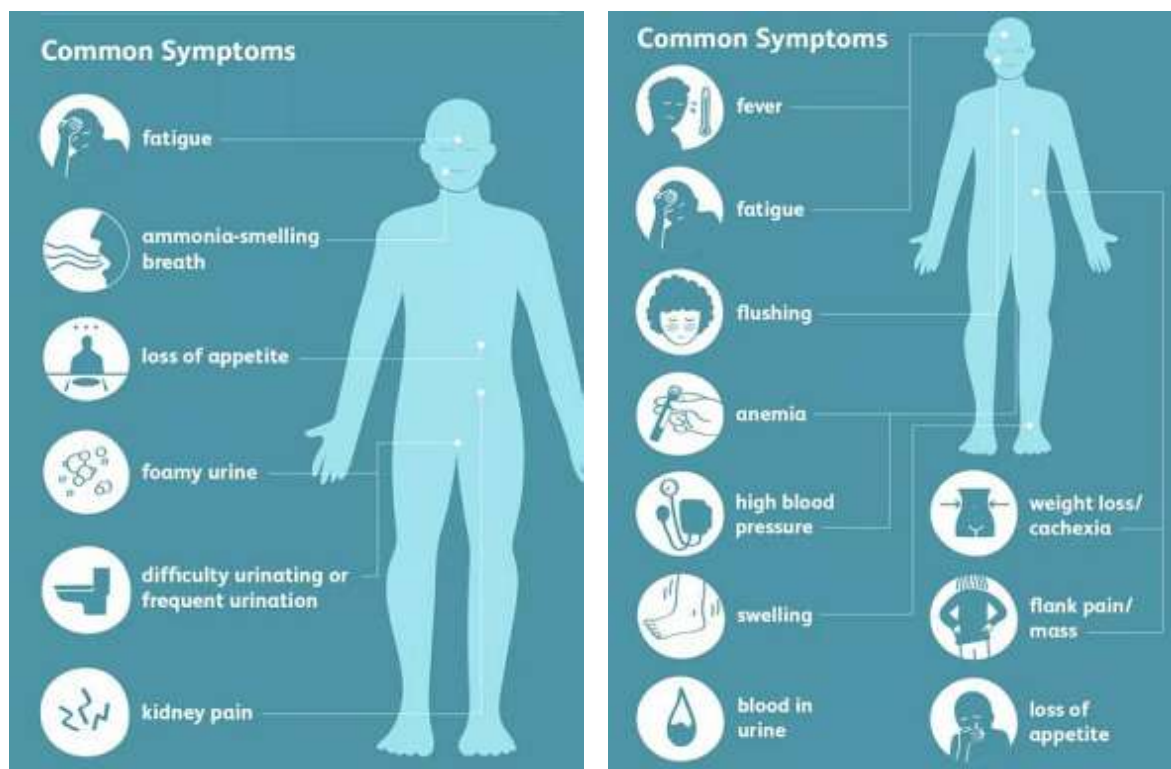


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**Diseases of the kidney / introduction / major manifestations / investigations.****Introduction**

Renal diseases are common. Disease of the renal tract presents in only a few ways. Urinary tract infection is the most common, especially in females. In males it is prostatic hypertrophy and its consequences. Proteinuria, haematuria and disorders of excretory function often cause no symptoms if mild, being picked up during routine screening. Infections, autoimmune disorders, diabetes, hypertension and other diseases can cause kidney damage. These patients require special management.

**Common Symptoms of Renal Disease**

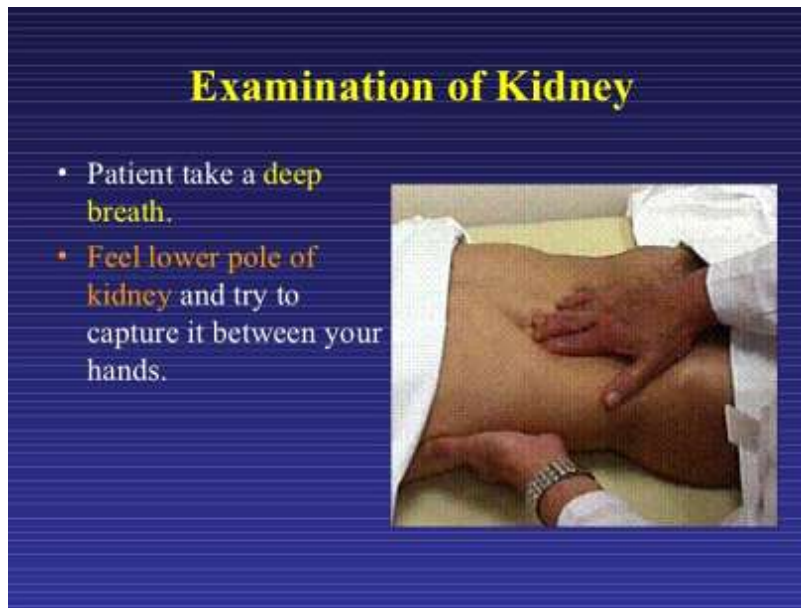
Common symptoms of kidney disease may include any of the following:

Nocturia, loin pain, polyurea, oliguria ( $<400\text{mL}/24$  hours or  $<0.5\text{mL}/\text{kg}/\text{hour}$ ), haematuria, fatigue, mild fever, incontinence, chills, altered mental states, peripheral neuropathy, nausea, vomiting, anorexia, pruritus, oedema, hypertension and anaemia.



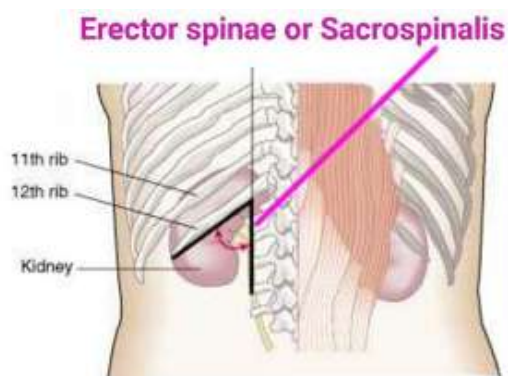
## Examination of the Kidneys

Kidneys are physically examined using a bimanual palpation technique.



Palpation of the Kidneys Steps:

1. Bimanual palpation is used to palpate the kidneys.
2. Place the posterior hand in the renal angle and with the fingers pressed forwards.  
(The renal angle is an area located on either side of the human back between the lateral borders of the erector spinae muscles and the inferior borders of the 12th rib, so called because the kidney can be felt at this location).



The 12th rib crosses obliquely the upper third of the posterior surface of the right kidney; but the middle part of the left one.

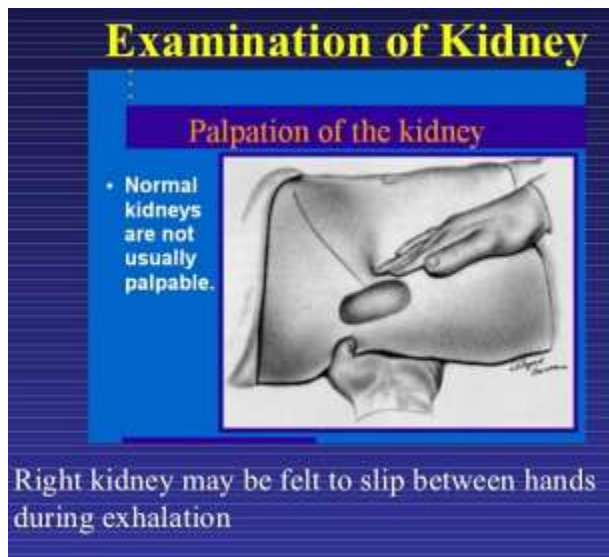
the renal angle: the lateral border of the erector spinae crosses 12<sup>th</sup> rib. The hilum of the kidneys is at the angle.



3. Position the anterior hand along the horizontal plane with the finger tips over the rectus muscle.
4. Use deep palpation and bring your two hands as close together as possible while the patient breathes deeply.
5. The kidneys may be caught between the two hands.

Usually, kidneys are not palpable in healthy individuals. Palpation of the kidneys is

contraindicated in renal transplant patients.



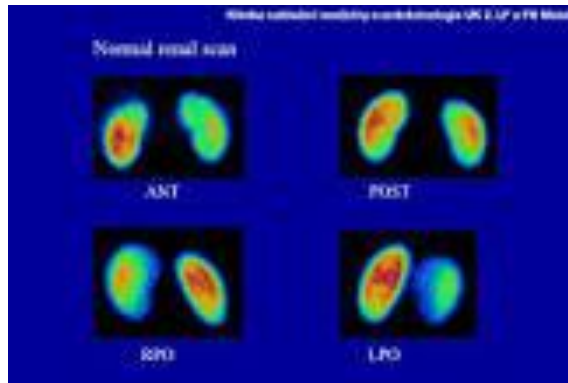
### Common Investigations in Renal Disease

Common investigations for renal diseases include the following:

- o **Urinalysis** - This test is done by stick testing for proteins, blood, glucose, ketones and pH. Microscopy for bacteria, white blood cells and casts, Biochemistry for creatinine, urea, calcium, urate and glucose.
- o **Ultrasounds** are carried out for kidney size and to detect any obstructions.
- o **X-rays** for size, shape and position of the kidneys and suspected kidney stones.
- o **Pyelography**. is a form of imaging of the renal pelvis and ureter. Types include:
  - Intravenous pyelogram – In which a contrast solution is introduced through a vein into the circulatory system.
  - Retrograde pyelography requires the retrograde injection of radio-contrast and is used to visualize the ureter and collecting system when the IVP cannot be done. This test is usually done during a test called cystoscopy.



o **Radionuclide scans** are done to assess asymmetrical kidney function. A procedure that produces pictures (scans) of structures inside the body, including areas where there are cancer cells. Radionuclide scanning is used to diagnose, stage, and monitor disease. A small amount of a radioactive chemical (radionuclide) is injected into a vein or swallowed.



o **Kidney biopsies** are done for final diagnosis.

o **Renal angiography** is carried out for renovascular disease. The procedure is done through a thin, flexible tube called a catheter. The catheter is put into a blood vessel through a small cut or incision. X-ray dye, also called contrast medium, is injected.







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محاظرة 9

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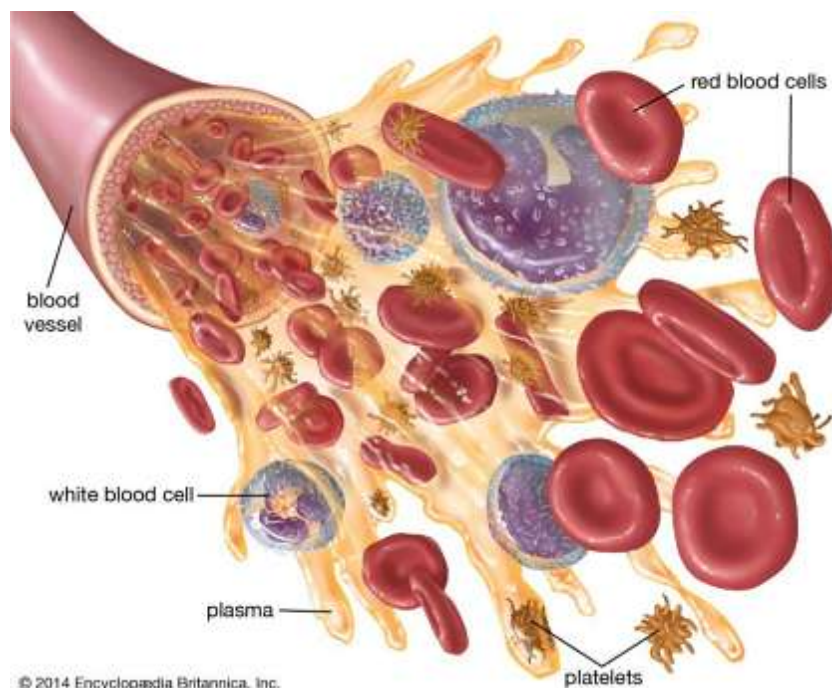
**Hematology/ introduction / major manifestations/ investigations****Introduction**

Hematology includes the study of etiology, diagnosis, treatment, prognosis, and prevention of blood diseases that affect the production of blood and its components, such as blood cells, hemoglobin, blood proteins, and the mechanism of coagulation.

The average human possesses 5 liters of blood. Blood transports oxygen from lungs to tissues; clears tissues of carbon dioxide; transports glucose, proteins, and lipids; and moves wastes to the liver and kidneys. The liquid portion is plasma, which, among many components, provides coagulation enzymes that protect vessels from trauma and maintain the circulation. Plasma transports and nourishes blood cells.

**There are three categories of blood cells:** Red blood cells (RBCs), or *erythrocytes*; white blood cells (WBCs), or *leukocytes*; and platelets (PLTs), or *thrombocytes*.

The red blood cells (erythrocytes) constitute about 45 percent of the volume of the blood, and the remaining cells (white blood cells, or leukocytes, and platelets, or thrombocytes) less than 1 percent.



Hematology is the study of these blood cells. By expertly staining, counting, analyzing, and recording the appearance, phenotype, and genotype of all three types of cells, the medical laboratory professional is able to predict, detect, and diagnose blood diseases and many systemic diseases that affect blood cells.



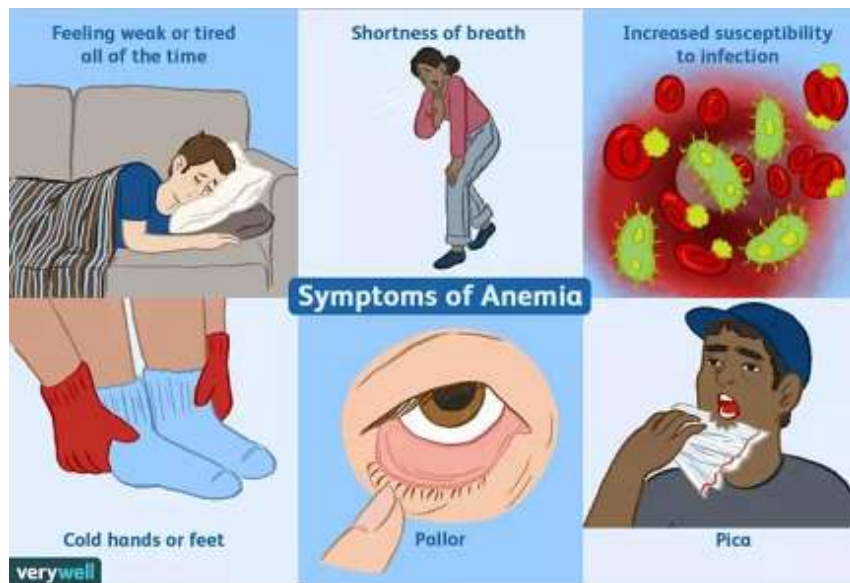
### Common Symptoms in Haematological Disorders

Symptoms of diseases of the blood and its components include fatigue, pallor, bleeding tendencies, defective coagulation and haemorrhagic episodes, and symptoms associated with infections.

Blood disorders can cause various symptoms in almost any area of the body.

Most commonly, symptoms are caused by decreases in the blood components.

Decreased red blood cells and hemoglobin can cause symptoms of **anemia**, such as fatigue, weakness, and shortness of breath.



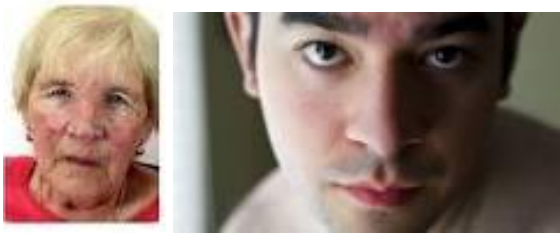
Decreased white blood cells or immune system proteins can cause recurrent fever and infections.

Decreased platelets or blood clotting factors can cause abnormal bleeding and bruising.



Occasionally, symptoms may relate to increases in blood components.

Increased red blood cells can cause thickening of the blood (increased blood viscosity) and thereby cause headache and a red complexion (plethora).



Increased immune system proteins also can cause thickening of the blood (increased blood viscosity).

Increased platelets or blood clotting factors can cause inappropriate excessive blood clotting (thrombosis).

**Some symptoms are more suggestive of a blood disorder. Just a few examples include the following:**

Blood clot (phlebitis), usually in a leg (most often causing swelling, redness, and/or warmth of the leg or shortness of breath)

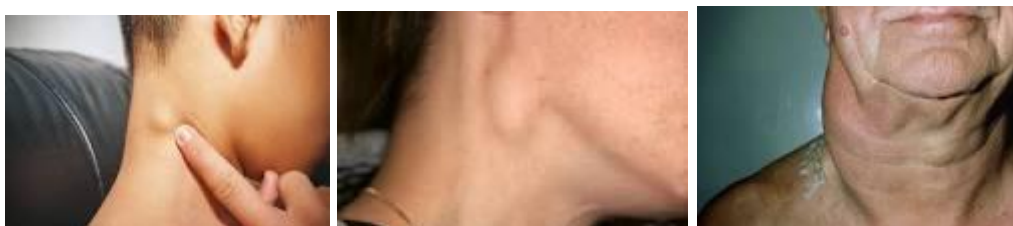


Petechiae (a fine pin-point red skin rash) caused by too few platelets



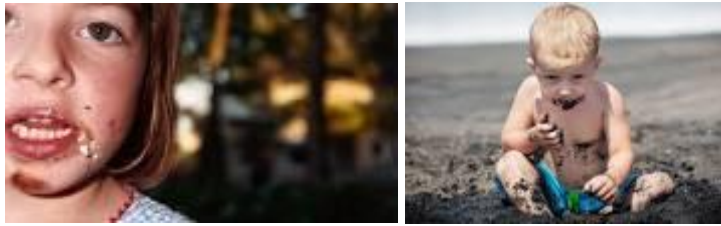
Blood blisters in the mouth (caused by too few platelets or clotting problems)

Swollen lymph nodes caused by white blood cell cancers (such as leukemias or lymphomas)



Pallor (pale skin) caused by anemia

Pica (eating of ice, dirt, or clay) suggests iron deficiency anemia



**Diagnosis of haematological disorders is made or confirmed on the basis of laboratory findings.**

- Complete blood count

Complete Blood Count (CBC)*		
Hemoglobin	Amount of this oxygen-carrying protein within a volume of blood	Men: 14 to 17 grams per deciliter Women: 12 to 16 grams per deciliter
Hematocrit	Proportion of the total amount of blood (blood volume) made up of red blood cells (plasma makes up the rest)	Men: 41 to 51% Women: 36 to 47%
Mean cellular (or corpuscular) volume (MCV)	Average volume of a red blood cell	80 to 100 femtoliters per cell
Mean cellular (or corpuscular) hemoglobin (MCH)	Amount of hemoglobin per red blood cell	28 to 32 picograms per cell
Mean cellular (or corpuscular) hemoglobin concentration (MCHC)	Average concentration of hemoglobin within red blood cells	32 to 36 grams per deciliter of red blood cells (320 to 360 grams per liter)
Red blood cell (RBC) count	Number of RBCs in a volume of blood	Men: 4.5 to 5.9 million cells per microliter ( $4.5 \text{ to } 5.9 \times 10^{12}/\text{L}$ ) Women: 4.0 to 5.2 million cells per microliter ( $4.05 \text{ to } 5.2 \times 10^{12}/\text{L}$ )
Red cell distribution width	Amount of variability in the sizes of the red blood cells	11.5 to 14.5%
White blood cell count	Number of white blood cells in a specified volume of blood	4,500 to 11,000 per microliter ( $4.5 \text{ to } 11 \times 10^9/\text{L}$ )
Differential white blood cell count	Percentages and numbers of the different types of white blood cells	Segmented neutrophils: 40 to 70%, or 1,800 to 7,700 per microliter ( $1.8 \text{ to } 7.7 \times 10^9/\text{L}$ ) Lymphocytes: 22 to 44%, or 1,000 to 4,800 per microliter ( $1 \text{ to } 4.8 \times 10^9/\text{L}$ ) Monocytes: 4 to 11%, or 200 to 1,200 per microliter ( $0.2 \text{ to } 1.2 \times 10^9/\text{L}$ ) Eosinophils: 0 to 8%, or 0 to 900 per microliter ( $0 \text{ to } 0.9 \times 10^9/\text{L}$ ) Basophils: 0 to 3%, or 0 to 300 per microliter ( $0 \text{ to } 0.3 \times 10^9/\text{L}$ )
Platelet count	Number of platelets in a specified volume of blood	140,000 to 450,000 per microliter ( $140 \text{ to } 450 \times 10^9/\text{L}$ )

- Blood smear; to reveal specific characteristics of the blood cells and examined under the microscope.

- Reticulocyte count; Reticulocytes normally make up about 0.5 to 2.5% of the total number of red blood cells.
- Special tests of blood cells; Doctors can measure the proportion of the different types of white blood cells and can determine subtypes of these cells by assessing certain markers on the surface of the cells.
- Clotting tests; The most common of these tests are the prothrombin time (PT) and the partial thromboplastin time (PTT). The levels of individual clotting factors can also be determined.
- Measures of proteins and other substances; Blood plasma (the liquid portion of blood) contains many proteins. Levels of iron and certain vitamins (for example, B12 and folate) that are necessary for the production of healthy blood cells also can be measured.
- Blood typing; Blood typing must be done before blood can be transfused.





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محاضرة 4: (1)

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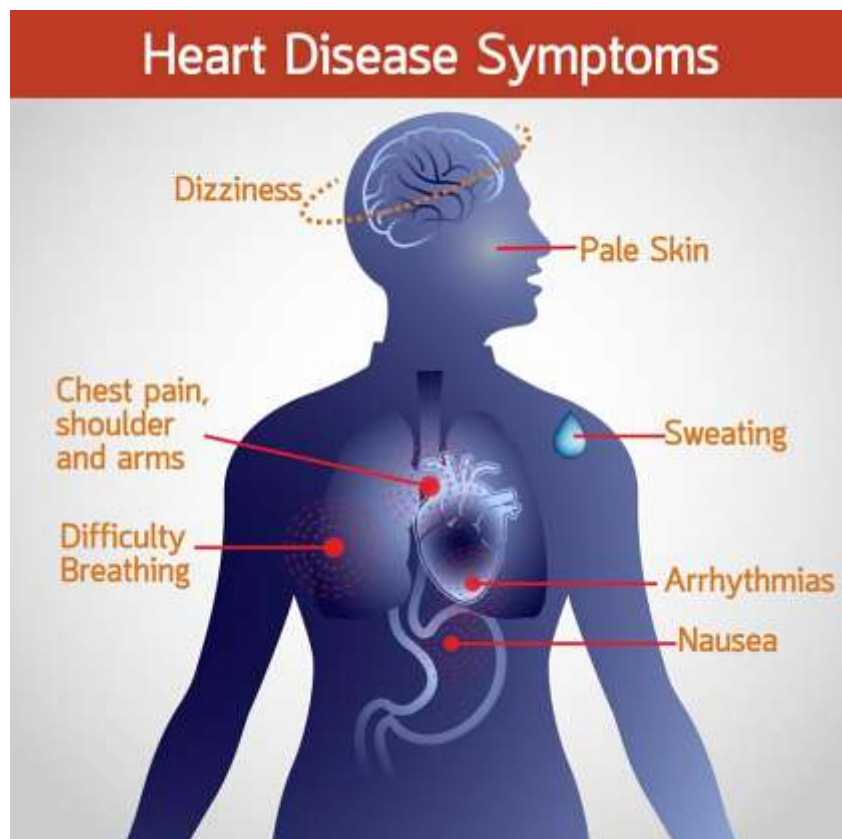


## Diseases of the C.V.S. / introduction/ major manifestation investigations

### Introduction

The components of the cardiovascular system are the heart, blood vessels and blood. From anesthetic management point of view, anesthetic practitioners are expected to have an adequate knowledge of some of the more common manifestations of cardiovascular diseases and their impact on patient health.

### Common Cardiovascular Symptoms





### **Chest pain:**

Chest pain is one of the major symptoms of heart disease. Pain can also originate from lungs, oesophagus and thorax. A practitioner should therefore be able to identify the exact source of chest pain. Chest pain of cardiac origin occurs in angina pectoris, myocardial infarction, thoracic aortic dissection, pericarditis and myocarditis. Non-cardiac causes of chest pain include tension pneumothorax, oesophageal rupture, pulmonary embolism, pneumonia, pancreatitis, thoracic malignancies, gastroesophageal reflux, peptic ulcers, costochondritis, biliary tract disorders, herpes zoster infection involving the thorax, and chest trauma.

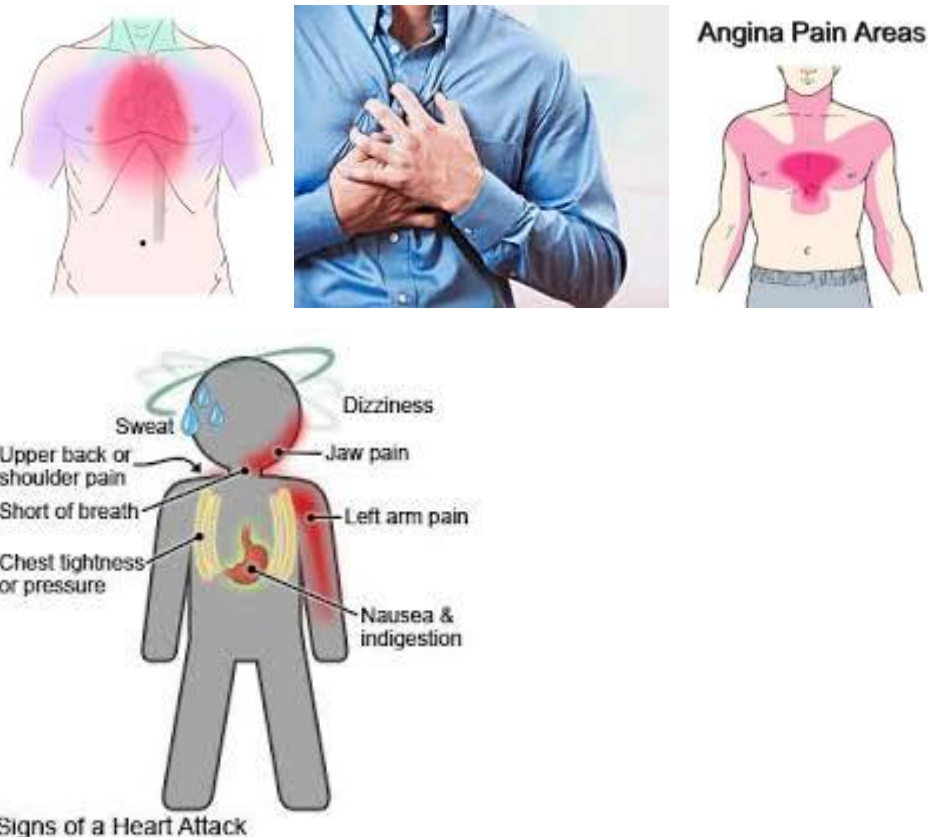
### **Quality of the chest pain due to:**

- o Angina and myocardial infarction, feels tight and crushing.
- o Dissection of an aortic aneurism has a tearing quality.

- o Pericarditis and pulmonary in origin is sharp and worse on inspiration (pleuritic pain).
- o Gastroesophageal reflux disease (GORD) has a burning quality.
- o Peptic-acid disorders are deep and of a biting, gnawing or chewing quality.

**Location of the Chest Pain:**

- o Pain of IHD and GORD are retrosternal in location and can radiate to the left arm and the jaw.



- o Pericarditis pain may radiate to the shoulders,
- o Pain due to aortic dissection may radiate to the back.
- o Pain of pulmonary origin can be located anywhere in the thorax.

**Precipitating Factors:**

- o Angina is precipitated by exercise, emotion, heavy meals or cold weather.
- o If pain occurs at rest for more than 30 minutes, it should be considered as a pain of myocardial infarction until proven otherwise.
- o Pain of GORD is associated with meals and a change in posture (bending down, for example).
- o Pulmonary pain worsens with movements of the thorax.

**Relieving Factors:**

- o Both angina and pain due to oesophageal spasm are relieved by glyceryl trinitrate (GTN) due to its action on smooth muscles.
- o GORD pain is relieved by antacids. Antacids have no effect on pain of cardiac origin.
- o Pericarditic pain is relieved by sitting forwards.

**Breathlessness:**

Breathlessness (short of breath, or dyspnea) is a normal symptom after heavy exertion, but becomes pathological if it occurs in clinical situations.

In congestive heart failure and cardiac ischemia, breathlessness is common.

Non-cardiac causes of breathlessness include asthma, pneumonia, interstitial lung disease, chronic obstructive pulmonary disease, or psychogenic factors.

**Palpitations:**

A patient's perception of cardiac activity as a racing, fluttering or skipping sensation is generally referred to as palpitations. Anxiety, exercise and febrile illness often cause heightened awareness of normal cardiac activity, however, these experiences are not to be regarded as examples of palpitations.

**Postural hypotension:**

Postural hypotension (orthostatic hypotension) results in faintness, dizziness and blurred vision within a few seconds of standing due to an excessive fall in blood pressure. Some patients may experience syncope. Elderly patients and those with hypertension are vulnerable to orthostatic hypotension. This can also occur due to vagal stimulation after urination or defecation.

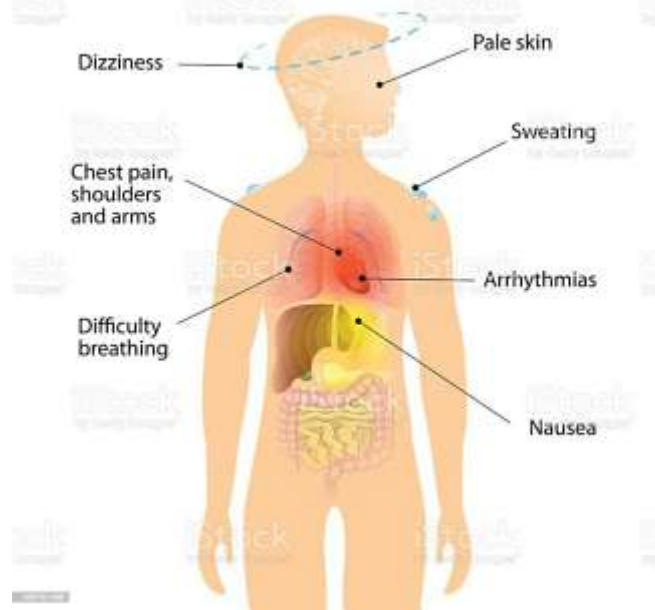
**Syncope:**

Syncope is characterized by a brief loss of consciousness with a loss of postural tone followed by spontaneous recovery. The patient becomes pale, motionless and hypotensive with a weak pulse, cool extremities and shallow respiration.

**Ankle swelling:**

There are a number of diseases that can cause swelling in the ankles. Right heart failure is one of the major cardiac causes of ankle swelling. Other causes include varicose veins, venous insufficiency, lymphatic obstruction, surgery of the foot, burns, and insect bites or stings.

## HEART DISEASE SYMPTOMS







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محاضرة 4 (2)

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## EXAMINATION OF THE CARDIOVASCULAR SYSTEM

The major elements of a cardiovascular examination include observation, palpation and auscultation. Percussion of the chest was previously used to

determine the size of the heart. This test was found to be unreliable and was abandoned. X-rays are now used to determine the size of the heart.

### Methods

Ask the patient to strip to the waist. Female patients can cover up until that part of the chest needs to be examined. Inform the patient of what you are about to do. The patient should rest in a supine position with the upper body elevated at an angle of 30-45 degrees.



Assessment of the pulse and blood pressure are essential elements of the CVS examination.

### Inspection:

Look for tachypnea (heart failure), malar flush showing a bluish tinge on the cheeks (mitral stenosis), xanthelasma and corneal

arcus (hyperlipidaemia), cyanosis (heart failure), ankle oedema (heart failure), splinter haemorrhages in the nail bed under the nail (infective

endocarditis), clubbing (congenital cyanotic heart disease, respiratory disease), pallor, (anaemia, congenital heart disease), surgical scars on the chest and chest deformities.

### Palpation:

Palpate the right radial pulse. Assess the rate (60-100 beat per minute) and rhythm.

Radial and femoral pulse should be recorded to detect if there is any delay, as found in coarctation of the aorta.

Carotid pulse should be palpated for its character.

Abnormal pulse characteristics can indicate valvular disease. Collapsing pulse is a sign of aortic regurgitation. This is assessed by raising the patient's left arm and with

## CLINICAL EXAMINATION

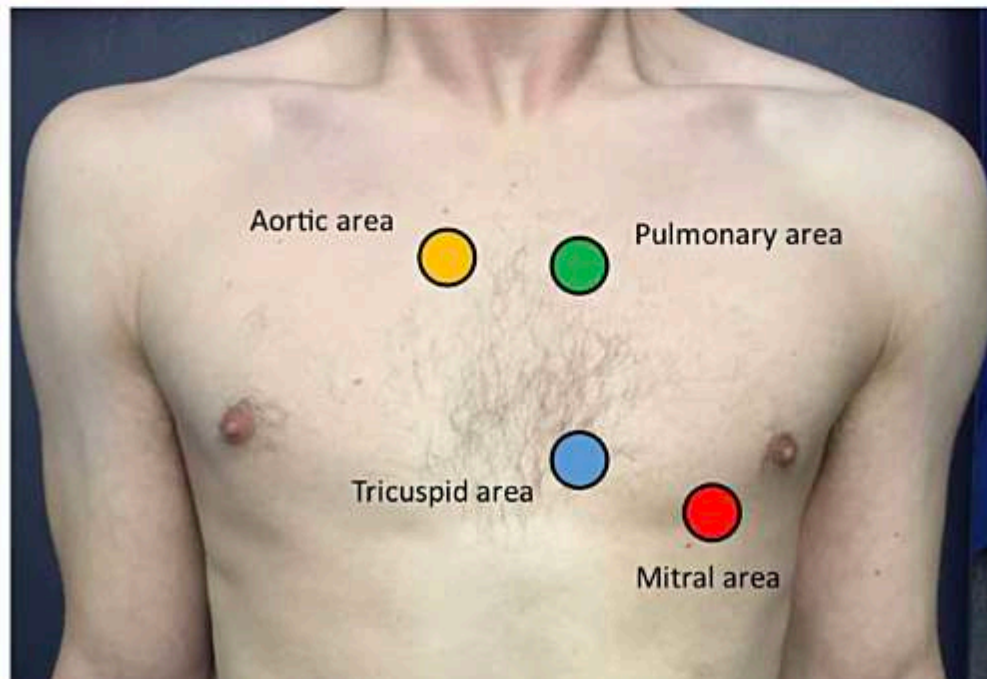
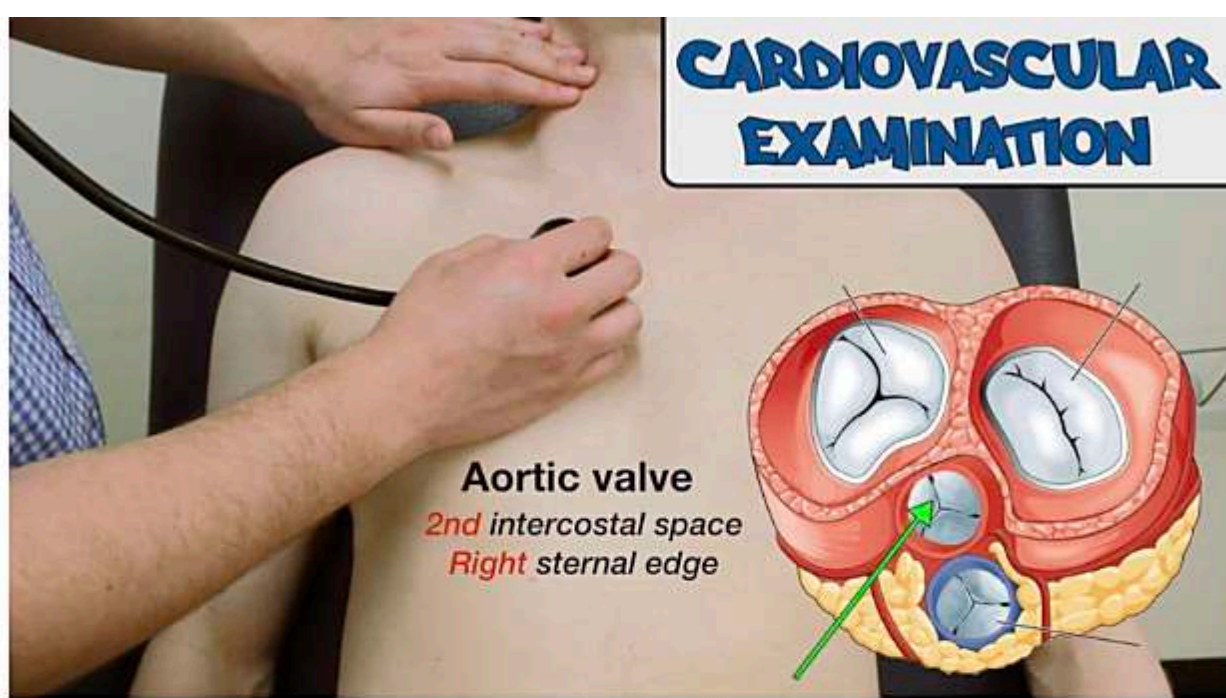
### Arterial Examination

both hands, holding the forearm (one on the wrist and the other lower down) with your fingers on the ulnar side of forearm. If you feel the pulse vibrating back down your arm, it is indicative of collapsing pulse.

**Collapsing pulse**  
(*Aortic regurgitation*)







### Auscultation:

Use a stethoscope with both a bell (which is better for low pitched sounds) and a diaphragm (used for high pitched sounds). Always feel

the carotid pulse during auscultation of the heart. This will give you an idea of the part of the cardiac cycle (systole or diastole) in which the murmur occurs.

There are normally two heart sounds: the first heart sound (S1) and the second heart sound (S2).



Assess their intensity and splitting character. Also auscultate the interval between the heart sounds for additional sounds.

- o **The first heart sound** (due to the closure of the mitral and tricuspid valves) is best heard at the apex. This signals the start of a systole. Auscultate the apex (using the bell) in the left lateral position.

- o **The second heart sound** (due to the closure of the aortic and pulmonary valves) signals the start of the diastole. (Generally diastole is longer than systole).

## COMMON INVESTIGATIONS IN CARDIOLOGY

include chest x-rays, electrocardiograms (ECGs), exercise ECGs, ambulatory ECGs and BP monitoring. Echocardiography and

angiography are also used in detecting coronary artery disease and other disorders involving the heart muscles and valves.

**Chest x-ray:** In cardiology, an x-ray of the chest is useful in identifying cardiomegal

**Electrocardiogram (ECG):** An ECG is used to measure the rate and regularity of heartbeats as well as the size and position of the

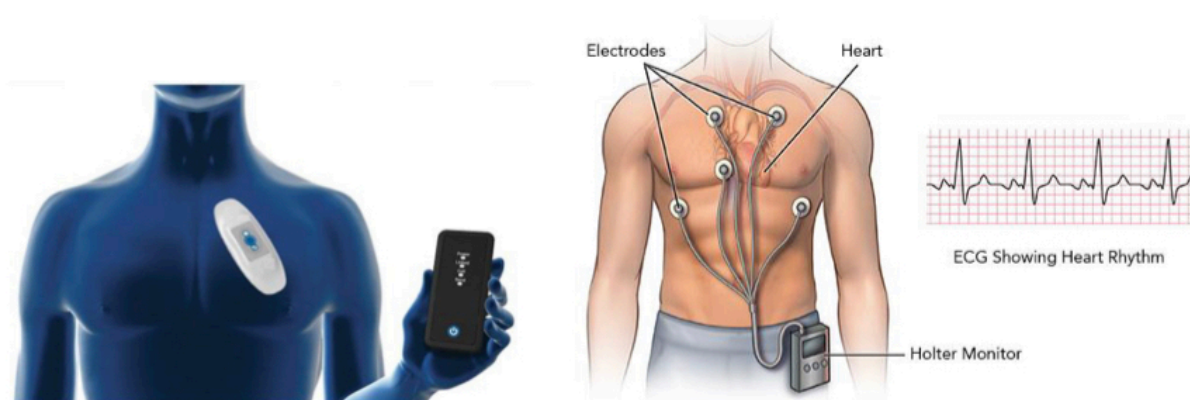
chambers, the presence of any damage to the heart, and the effects of drugs or devices used to regulate the heart, such as a pacemaker.



**Ambulatory electrocardiography (AECG):**  
An ambulatory electrocardiogram

records the electrical activity of the heart during usual activities. The most common type is the continuous recorder (such as the Holter

monitor) which provides a 24- to 72-hour record of the electrical signals from the heart. Ambulatory electrocardiography is used to detect, characterise and document cardiac arrhythmias.

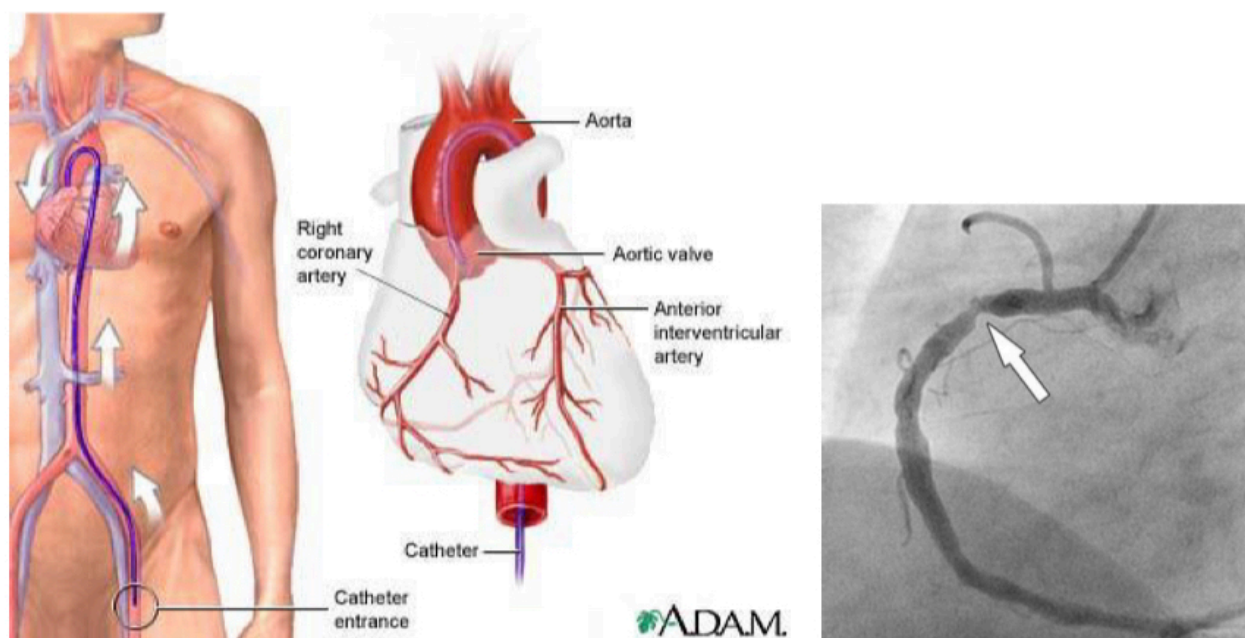


**Echocardiography (cardiac ultrasound scanning):** This is useful in assessing ventricular function and valvular abnormalities. It can detect



blood clots inside the heart, pericardial fluid build-up, and problems with the aorta.

A type of echocardiography called Doppler ultrasound provides



information on the blood flow through the chambers and valves of the heart.

**Angiography:** Angiography is an imaging technique used to visualise the lumen of arteries, veins and the heart chambers. This is done by

injecting a radio-opaque contrast agent into the blood vessels and imaging using x-ray based techniques such as fluoroscopy.

**Arterial blood gasses:** Distributions of PaO<sub>2</sub>

The normal arterial values are:.

PaO<sub>2</sub> 10–13 kPa (values fall with age) .

PaCO<sub>2</sub> 4.7–6.0 kPa .

pH 7.35–7.45 .      Standard HCO<sub>3</sub> 23–27 mmol/l

**Estimation of cardiac enzymes:** These include creatinine kinase, transaminases and lactate dehydrogenase. Troponin levels provide useful information on cardiac muscle damage, as seen in myocardial infarction.

**D-dimer (ELISA):** Helpful to exclude pulmonary embolism in patients with low pretest clinical probability or nondiagnostic lung scan.