

Cardiovascular pathology:

Congenital heart disease

1. Inter ventricular foramina:

Small openings connecting the ventricles are of no consequence, but if the openings are 1/2 or 1 cm in diameter then caused elevation of pressure in the ventricle and pulmonary artery and hypertrophy of the right ventricle.

2. Patent Foramen Ovale (PFO):

Patent foramen ovale (PFO) is a hole between the left and right atria (upper chambers) of the heart. This hole exists in everyone before birth, but usually closes shortly after being born.

Patent foramen ovale is what the hole is called when it fails to close naturally after a baby is born during normal cardiac development, patency is maintained between right and left atria by a series of ostia that eventually become the *foramen ovale*; this arrangement allows oxygenated blood from the maternal circulation to flow from the right to the left atrium, thereby sustaining fetal development. At later stages of intrauterine development, tissue flaps grow to occlude the foramen ovale, and in 80% of cases, the higher left-sided pressures in the heart that occur at birth permanently fuse the septa against the foramen ovale. In the remaining 20% of cases, a *patent foramen ovale* results; although the flap is of adequate size to cover the foramen, the unsealed septa can potentially allow transient right-to-left blood flow that enter the systemic arterial circulation.

3. Patent Ductus Arteriosus:

The ductus arteriosus in the fetus connects the descending aortic arch with the pulmonary artery and conveys most of the pulmonary outflow into the aorta. After birth, the ductus constricts in response to the increased arterial oxygen content and becomes occluded by fibrosis. Normally, the ductus arteriosus is closed functionally within the first or second day of life. Its persistence after 3 months of age is considered abnormal.

Inflammatory status of the heart:

1. Pericarditis

Pericarditis refers to inflammation of the visceral or parietal pericardium. Acute pericarditis can be classified as **fibrinous**, **purulent** or **hemorrhagic**, depending on the gross and microscopic characteristics of the pericardial surfaces and fluid.

1. Fibrinous pericarditis: The most common form of pericarditis, in which the normal smooth glistening appearance of the pericardial surface become replaced by a dull, granular fibrin-rich exudate. The rough texture of the inflamed pericardial surfaces produces the characteristic friction rub heard by auscultation. Microscopically the pericardial fluid in fibrinous pericarditis is usually rich in protein, and the pericardium contains primarily mononuclear inflammatory cells.

2. Purulent pericarditis: it occurs because of bacterial infection leads to a purulent pericarditis, in which microscopically the pericardial exudate resembles pus and contains many neutrophils.

3. Hemorrhagic pericarditis: Also called **hemopericardium** it occur as a result to bleeding into the pericardial space caused by aggressive

infectious or neoplastic processes or coagulation defects leads to hemorrhagic pericarditis. When the blood clotted in the pericardium sac that called pericardium tamponade.

4. Hydropericardium: it also called pericardial effusion is the accumulation of excess fluid within the pericardial cavity, either as a transudate or an exudate. The pericardial sac normally contains no more than 50 ml of lubricating fluid.

5. Pneumopericardium: It refers to present of air or gas in the pericardium sac.

Myocarditis

It is an inflammation of myocardium which have many types:

1. Acute suppurative myocarditis: this found in pyemia that occurs in mastitis, metritis and joint ill. The spread by way of coronary arteries, direct extension from purulent pericarditis, endocarditis, pleuritis and pneumonia also possible, Macroscopically the heart contain abscesses with hyperemic borders, the abscesses may encapsulated. Microscopically the typical appearance of abscesses is seen with neutrophils, healing may occur by organization or scar formation.

2. Parasitic myocarditis: This type of myocarditis occur due to parasitic infection of myocardium, many types of heart worms may cause parasitic myocarditis like *Dirofilaria immitis* and Hydatid cysts that found in right ventricle of dogs, also *Sarcocystis tenella* and *Toxoplasma gondii* may present in the heart muscle fibers in cattle.

Endocarditis

Endocarditis is an inflammation of the inner layer of the heart (endocardium); it usually involves the heart valves. There are several ways to classify endocarditis. The simplest classification is based on cause which either infective or non-infective, depending on whether a microorganism is the source of the inflammation or not.

1. Infective Endocarditis: it is a serious infection of endocardium by microbial invasion of heart valves or mural endocardium often with destruction of the underlying cardiac tissues characteristically results in bulky, friable vegetations composed of necrotic debris, thrombus, and organisms. Although fungi, Rickettsia (agents of Q fever), and chlamydial species can cause endocarditis, the vast majority of cases are caused by extracellular bacteria.

2. Non infected endocarditis: Also, called non bacterial thrombotic endocarditis is characterized by the deposition of small (1 to 5 mm in diameter) thrombotic masses composed mainly of fibrin and platelets on cardiac valves.

Disease of blood vessels

Arteriosclerosis: literally means “hardening of the arteries”; characterized by arterial wall thickening and loss of elasticity. Its occur due to intimal thickening following proliferation of connective tissue, hyaline degeneration, infiltration of lipid and finally calcification. This disease occur in small arteries and arterioles.

Atherosclerosis: it is characterized by the presence of intimal lesions called atheromas are raised lesions composed of lipid cores (mainly

cholesterol and cholesterol esters, with necrotic debris) covered by fibrous capsule. This disease occur in large arteries like aorta.

Arteritis: Its an inflammation of the wall of arteries which caused by microbial infection. While **Phlebitis** mean an inflammation of the veins which caused by microbial infection.

Aneurysm: Its localized dilatation of an arteries, veins or cardiac chamber.

Lymphadenitis: It is an inflammation of lymph node while the **Lymphangitis:** its means inflammation of lymphatic vessels.

Varicose veins: Its abnormally dilated tortuous veins produced by chronically increased intra luminal pressures and weakened vessel wall support. Varicose leads to lower extremity stasis, congestion, edema, pain, and thrombosis.

Hemorrhoids: Its varicose dilations of the venous plexus at the ano-rectal junction that result from prolonged pelvic vascular congestion associated with pregnancy or straining to defecate. Hemorrhoids are a source of bleeding and prone to thrombosis and painful ulceration.

Diseases of hematopoietic system and lymphatic

Anemia is usually defined as a decrease in the amount of red blood cells (RBCs) or hemoglobin in the blood. It can also be defined as a lowered ability of the blood to carry oxygen. Anemia can result from bleeding, increased red cell destruction, or decreased red cell production. These mechanisms serve as one basis for classifying anemia's:

I. On basis of causes (Aetiology): which classified into:

1. Blood loss anemias: Occur due to excessive blood loss like in tumor, parasitic infestation, and severe injuries.
2. Inadequate production of normal blood cells anemias: occur due to iron deficiency or impairment of blood cells production from bone marrow like in aplastic anemia.
3. Excessive destruction of blood cells: occur due to destruction of blood cells either due to auto immunity like hemolytic anemia.

II. On basis of morphology: which classified into:

1. Normocytic: occur when Hemoglobin levels decreased like in acute blood loss anemia of chronic disease and in aplastic anemia and hemolytic anemia.
2. Microcytic: occur as result of heme synthesis defect, Iron deficiency anemia and in Thalassemia.
3. Macrocytic: Occur due to the size of erythrocytes is larger than normal Like in Vitamin B12, Folate deficiency.