UNIT 8 - BLOOD / LYMPHATIC / CARDIOVASCULAR SYSTEMS

Diseases and Disorders of the Blood / Lymphatic / Cardiovascular

Diseases and Disorders of the Blood

A. **Anemias**

The anemias result from inadequate numbers of erythrocytes or a deficiency in the production of normal hemoglobin. The general signs and symptoms include fatigue, weakness, pallor, headache, and fainting. Tachycardia typically occurs as the body tries to increase the circulation of the blood. Treatment is related to the cause of the anemia.

1. **Hemorrhagic Anemia**

   Hemorrhagic anemia is caused by a decrease in the amount of circulating erythrocytes lost because of hemorrhage or bleeding. The blood loss may be acute such as with a trauma or surgery or chronic such as blood loss associated with ulcers. Blood transfusions and IV fluids are successful to replace lost blood. It is important to prevent shock which may lead to death.

2. **Aplastic Anemia**

   Aplastic anemia is characterized by the inability of the red bone marrow to produce erythrocytes which have been destroyed due to toxic chemicals and anti-cancer drugs. Bone marrow transplants or stem cell transplants are effective treatments. Transfusions are helpful in relieving short-term relief from the anemia symptoms.

3. **Iron Deficiency Anemia**

   Iron deficiency anemia occurs when the body is deficient of iron which impairs the body's ability to make normal hemoglobin. The erythrocytes made are smaller and paler than normal red cells. Treatment includes iron supplements taken with vitamin C to improve the absorption of iron in the intestines.

4. **Pernicious Anemia**

   Pernicious anemia occurs when there is a dietary deficiency of vitamin B_{12} or the loss of the intrinsic factor from the lining of the stomach which prevents the absorption of vitamin B_{12}. Not only is the number of erythrocytes reduced, but those cells that are produced are abnormally large and have fragile cell membranes. It is treated with injections of vitamin B_{12}.

5. **Hemolytic Anemia**
   Hemolytic anemia results from the abnormal destruction of erythrocytes. The cause of the hemolytic anemia must be determined before the appropriate treatment can be administered.

B. **Hemolytic Disease of the Newborn**
Hemolytic disease of the newborn is also known as erythroblastosis fetalis. This disease occurs in the fetus if the fetus is Rh+ while the mother is Rh-. During the first pregnancy, the mother will form antibodies against the Rh+ blood. Since the antibodies have only formed, they do not cross the placenta and harm the fetus' blood. If a second Rh+ pregnancy occurs, the antibodies have already been made, now cross through the placenta and begin to destroy the Rh+ red blood cells. The result is a reduction in the number of circulating red blood cells in the fetus as well as jaundice due to the accumulation of bilirubin in the skin. The Rh- mother must receive an injection of Rhogam after every Rh+ pregnancy in order to destroy the antibodies that have been made against the Rh+ blood. The fetus may require transfusions and light therapy.

C. **Hemophilia**
Hemophilia is caused by a sex-linked genetic trait resulting in the inability to produce blood-clotting factor VIII. As a result, the intrinsic pathway cannot complete its set of chemical reactions and the enzyme thromboplastin is not made. As a result, fibrinogen cannot be converted to fibrin and the blood cannot clot. This disease appears almost exclusively in males, due to the fact that they only have one X-chromosome. The most common signs including excessive bruising, nosebleeds, and bleeding into the joints. The disease is treated by injecting the missing blood clotting factor, or factor VIII into the blood.

D. **Leukemia**
Leukemia is a cancer of the blood characterized by the overproduction of immature white blood cells, which are released prematurely into the circulation. In contrast to popular belief, more adults are afflicted with this disease than children. The causes are unknown. The large number of immature leukocytes reduce the production of erythrocytes and platelets The symptoms include increased susceptibility to infection because of the immature white blood cells; fatigue, pallor, and anemia due to a decrease in the number of circulating red blood cells; and increased bruising due to reduced numbers of platelets. Treatment typically includes transfusions, bone marrow transplants, and chemotherapy.

E. **Mononucleosis**
Mononucleosis, or infectious mononucleosis, is a noncancerous leukocyte disorder caused by a virus. This virus is typically transmitted in the saliva and is nicknamed the "kissing disease." Unlike its name seems to suggest, the affected leukocyte is actually a lymphocyte. Signs and symptoms include extreme fatigue, sore throat, rash, enlargement of cervical lymph nodes, and splenomegaly. It typically resolves itself with four to six weeks.

F. **Polycythemia**
Polycythemia is an excessive number of erythrocytes. This disease is caused by an overproduction of blood cells within the body. The result is viscous (thick) blood which flows slowly through the blood vessels. The person is at increased risk for heart attack and stroke due to the formation of blood clots within the blood. The cause is unknown. Treatment includes phlebotomy to remove excess blood as well as medications to try to reduce the excessive blood formation.

Diseases and Disorders of the Lymphatic System

A. **Acquired Immunodeficiency Syndrome (AIDS)**
The major cause of AIDS is an infection by the human immunodeficiency virus (HIV) which infects the T-helper cells resulting in the progressive destruction of cell mediated immunity by the T cells and eventually humoral (antibody) immunity. The patient is susceptible to opportunistic infections such as Kaposi's sarcoma and pneumocystis carnii pneumonia. This syndrome was first described in 1981 by the Centers for Disease Control. HIV is transmitted by infected blood or body fluids, especially those which contain white blood cells, such as semen.

AIDS infection begins with infection by HIV which is only detectable by laboratory tests. At that time, the person is diagnosed with HIV infection. Eventually there will be an appearance of symptoms, a diagnosis of AIDS (when the T-helper cell [CD4 cell] drops below 200 cells per mm^3. HIV infection is characterized by flu-like symptoms, weight loss, fatigue, night sweats, and fevers.

There is no cure for AIDS. Antiviral therapy is available which does seem to control the virus for long periods. At this time, however, there is no known cure.

B. **Measles**
Measles, also known as rubeola, is a highly contagious viral infection that may be one of the most dangerous of all childhood infections. Measles is spread by direct contact or by contact with infected respiratory droplets. Its incubation period is from one to two weeks. Signs and symptoms include fever, photophobia, malaise, anorexia, conjunctivitis, coryza, hoarseness, cough, and Koplik's spots. Koplik's spots appear as bluish white specks surrounded by a red halo and are the definitive signs of measles. They appear in the mouth and may

bleed. Severe infections may lead to pneumonia and encephalitis. Use of the measles vaccine has reduced the incidence of measles in children, but there are more adolescents being diagnosed with the disease. Measles is a major cause of death in children worldwide.

C. **Mumps**
Mumps is a viral infection affecting the parotid salivary glands. It is common in children. Recovery is good, although it may cause sterility or meningitis. The virus is transmitted by droplets or direct contact. Signs and symptoms include fatigue, headache, low-grade fever, difficulty chewing, and earache, which are followed by parotid gland swelling. The use of vaccines has reduced the incidence in the United States.

D. **Rubella**
Rubella, or German measles, is a mildly contagious viral infection which produces a three day rash and swelling of the lymph nodes. The rubella virus is transmitted contact with contaminated body fluids or articles of clothing. The signs and symptoms include headache, fever, fatigue, lymph node enlargement, and red maculopapular rash. The rash typically begins on the face and spreads rapidly over the body, but disappears after about three days. Rubella has devastating consequences on a growing fetus and may cause blindness, heart problems, and/or deafness. The spread of rubella in the United States has been controlled by the use of vaccines.

E. **Tetanus**
Tetanus, also known as lockjaw, is a bacterial infection. It is generally systemic and is fatal in over 50% of unimmunized people. Transmission of the bacteria generally begins when a person is walking through contaminated dirt and receives a puncture wound. The exotoxins produced by tetanus enter the body and cause local infection and tissue death. There are painful, involuntary muscle contractions of the face, neck, and back. Seizures can also occur. Treatment requires the use of the tetanus antitoxin and may need respiratory support until antibiotics can control the infection.

Diseases Or Disorders Of The Cardiovascular System

A. **Aneurysm**
An aneurysm is an abnormal dilation found in an arterial wall. An aneurysm can be caused by atherosclerosis, arteriosclerosis, a history of trauma or infection. They can be located in any artery. Symptoms vary with where it is located, but generally there are known to cause pain. Treatment includes the surgical removal of the affected part with a graft replacement. The biggest complication of aneurysm is their potential for rupture which may lead quickly to death due to the massive blood loss. If an aneurysm ruptures in the cranial cavity, it will probably cause a stroke.

B. **Arteriosclerosis**
Arteriosclerosis is the hardening of an artery which impairs its ability to regulate blood pressure. It is estimated that one-half of the deaths in the United States are directly related to arteriosclerosis. Arteriosclerosis is the cause of coronary artery disease and the leading cause of strokes.

C. **Atherosclerosis**
Atherosclerosis is a form of arteriosclerosis which is characterized by the formation of fatty plaques in the arteries. When cholesterol remains in the blood for extended periods of time, circulating monocytes try to remove the cholesterol from the bloodstream. Eventually, the monocytes become filled with the cholesterol and attach to the walls of the blood vessels. These cells release chemicals which thicken the inner wall. Eventually the fatty plaque s formed and projects into the lumen of the blood vessel reducing the flow of blood.

D. **Cerebrovascular Accident**
This is a sudden impairment of the cerebral circulation in one or more of the blood vessels that supply the brain. The blood vessels may rupture or be blocked by fat or a blood clot. This disrupts the supply of oxygen to the brain and causes necrosis in the brain tissue. It is the third most common cause of death in the United States. Factors that increase the risk of this disorder are atherosclerosis, lack of exercise, diabetes mellitus, use of oral contraceptives, cigarette smoking, high triglyceride levels and a family history. Symptoms include the following:

- Sudden numbness or weakness of face, arm, or leg, especially on one side of the body.
- Sudden confusion or trouble speaking or understanding speech.
- Sudden trouble seeing in one or both eyes.
- Sudden trouble walking, dizziness, or loss of balance or coordination
- Sudden severe headache with no known cause.

Treatment includes improving circulation to the brain by the use of anticoagulants, maintaining an open airway, ensuring adequate nutrition, and rehabilitation. It is extremely important to call 911 and get medical attention immediately. The use of anticoagulants, like aspirin, are important to decreasing permanent damage to the neurons by restoring the flow of oxygen. Techniques have also been implemented in which the clot may be surgically removed from the blood vessel in the brain.

E. **Coronary Artery Disease (CAD)**

Coronary Artery Disease is a form of atherosclerosis which occurs in the coronary arteries. The coronary arteries are responsible for taking highly oxygenated blood from the left ventricle to the myocardium. As the lumen of a coronary artery fills with fat, the tissue distal to the blockage has a reduced amount of oxygen and nutrients which causes damage and may provoke a heart attack. This disorder is near epidemic proportions in the United States and is attributed to a high fat diet, lack of exercise, smoking, oral contraceptives, high blood pressure, obesity, diabetes mellitus and stress. Symptoms of coronary artery disease include angina, or chest pain which is relieved when the person stops his/her activity and rests. It may be accompanied by nausea, vomiting, fainting, and sweating. Treatment may include medication to dilate the coronary arteries during the anginal attacks and angioplasty to remove the fatty plaques from the arteries.

F. **Hypertension**

High blood pressure is a blood pressure reading of 140/90 mmHg or higher. Both numbers are important.

Nearly one in three American adults has high blood pressure. Once high blood pressure develops, it usually lasts a lifetime. The good news is that it can be treated and controlled. High blood pressure is called "the silent killer" because it usually has no symptoms. Some people may not find out they have it until they have trouble with their heart, brain, or kidneys. Causes of hypertension include family history, race, stress, obesity, increased dietary intake of fats and sodium, smoking, lack of physical exercise and aging. Complications of hypertension include heart failure, aneurysms, kidney failure, heart attacks, stroke, and blindness.

A blood pressure reading below 120/80 is considered normal. In general, lower is better. However, very low blood pressures can sometimes be a cause for concern and should be checked out by a doctor.

Doctors classify blood pressures under 140/90 as either "normal," or "prehypertension." "Normal" blood pressures are lower than 120/80. "Prehypertension" is blood pressure between 120 and 139 for the top number, or between 80 and 89 for the bottom number. For example, blood pressure readings of 138/82, 128/89, or 130/86 are all in the "prehypertension" range. If your blood pressure is in the prehypertension range, it is more likely that you will end up with high blood pressure unless you take action to prevent it.

Treatment includes the use of medication to lower blood pressure along with lifestyle changes such as smoking cessation, losing weight, changing how one eats, etc.

G. **Murmur**

A murmur occurs when there is a defect in the cusp of a heart valve resulting in the leakage of blood though the closed valve. The valve may have been scarred by infection, the use of medications, or be congenital. Murmurs are classified according to how much blood is leaking through. A severe murmur will require surgery with a valve replacement.

H. **Myocardial Infarction (MI) (Heart Attack)**

A heart attack occurs when the supply of blood and oxygen to an area of the myocardium is blocked causing the death of the myocardium.

A heart attack is a life-threatening event. The warning signs of a heart attack include **Chest discomfort.** Most heart attacks involve discomfort in the center of the chest that lasts for more than a few minutes, or goes away and comes back. The discomfort can feel like uncomfortable pressure, squeezing, fullness, or pain. Heart attack pain can sometimes feel like indigestion or heartburn, **Discomfort in other areas of the upper body,** including pain, discomfort, or numbness in one or both arms, the back, neck, jaw, or stomach. **Shortness of breath and other symptoms** including a cold sweat, nausea and vomiting, or feeling light-headed or dizzy.

The risk factors for a heart attack include the following: aging, a family history of heart disease, the presence of coronary artery disease, smoking, high blood pressure, high blood cholesterol, obesity, not exercising, and atherosclerosis.

Each year, more than a million persons in the U.S. have a heart attack and about half (515,000) of them die. *About one-half of those who die do so within 1 hour of the start of symptoms and before reaching the hospital.*

Emergency personnel can often stop arrhythmias with emergency CPR (cardiopulmonary resuscitation), defibrillation (electrical shock), and prompt advanced cardiac life support procedures. If care is sought soon enough, blood flow in the blocked artery can be restored in time to prevent permanent damage to the heart. Additional care remains support until the heart has time to heal. Medications may be prescribed and diet and lifestyle changes are recommended.