Human Anatomy

Lecture 3 **Assist. Prof. Dr. Dalya Basil**

Lymphatic System

Lymphatic System is a part of the body's defense system against microorganisms and other harmful substances. It's includes:

- Lymph
- Lymphatic vessels
- Lymphatic tissue
- Lymphatic nodules
- Lymph nodes
- Tonsils
- The spleen
- The thymus

Function of Lymphatic System:

1- Fluid balance:

Approximately 30 liter of fluid pass from the blood capillaries into the interstitial spaces each day, whereas only 27 liter from the interstitial spaces back into blood capillaries. If the extra 3 liter of fluid were to remain in the interstitial spaces, edema would result causing tissue damage and death.

2- Fat absorption:

The lymphatic system absorbs fat and other substances from the digestive tract through lacteals, which are the lymphatic vessels lining the small intestine. Fats enter the lacteals and pass through the lymphatic vessels to the venous circulation.

3-Defense: Microorganism and other foreign substances are filtered from lymph by lymph nodes and from blood by the spleen. In addition, lymphocytes and other cells are capable of destroying microorganism and other foreign substances.

Lymph is composed of water and solutes derived from two sources:

1- Substances in plasma such as ions, nutrients, gases, and some proteins pass from blood capillaries into the interstitial fluid and become part of the lymph.

2- Substances derived from cells such as hormones, enzymes, and waste products.

Lymphatic vessels travel along with blood vessels. Lymphatic vessels have blind ended, permeable to proteins even cells.

Lymphatic Tissues and Organs:

Primary lymphatic organs: include bone marrow and thymus gland.

Secondary lymphatic organs: include the lymph nodes, spleen, and the lymphatic tissues.

Thymus: is a bilobed gland located in the superior mediastinum, the partition dividing the thoracic cavity into left and right parts.

The thymus increases in size until the first year of life, after which it remains approximately the same size until 60 years of age, after which it decreases in size.

Although the size of the thymus is fairly constant throughout much of life, by 40 years of age much of the thymic lymphatic tissue has been replaced with adipose tissue.

Each lobe of the thymus is surrounded by a thin connective tissue capsule. Extension of the capsule, called trabeculae extend into the substance of gland, dividing it into lobules.

Unlike other lymphatic tissue, which has a fibrous network of reticular fibers, the framework of thymic tissue consists of epithelial cells.

Near the capsule and trabeculae, the lymphocytes are numerous and form dark-staining areas of the lobules called cortex.

A lighter-staining central portion of the lobules called medulla, has fewer lymphocytes. The medulla also contains rounded epithelial structures, called thymic corpuscles (Hassall corpuscles), whose function is unknown.

- Thymus function is as a production & maturation place for T cells (lymphocytes)

- Lymphocytes that enter the thymus mature and develop into activated T-lymphocytes i.e. able to respond to antigens encountered elsewhere in the body. These lymphocytes are capable of reacting to foreign substances, but they normally do not react to and destroy healthy body cells.

Lymph Node: Lymph nodes are small, rounded, or bean-shaped structures, ranging in size from 1-25 mm long.

They are distributed throughout body along lymph vessels. They filter the lymph, removing bacteria and other materials. In addition to that Proliferation of T & Plasma cells occurs within lymph node.

Approximately 450 lymph nodes are found throughout the body.

Superficial lymph nodes are in the subcutaneous tissue, and **deep lymph nodes** are everywhere else.

There are three superficial groups of lymph nodes on each side of the body: inguinal nodes in the groin, axillary nodes in the axilla, and cervical nodes in the neck.

A dense connective tissue **capsule** surrounds each lymph node. Trabecule extend from the capsule subdivide lymph nodes into compartments containing diffuse lymphatic tissue, lymphatic nodules, and lymphatic sinuses.

The outer cortex consists of lymphatic nodules separated by diffuse lymphatic tissue and lymphatic sinuses.

The inner medulla is organized into branching, irregular strands of diffuse lymphatic tissue separated by lymphatic sinuses.

Spleen: It is the largest lymphatic tissue, which is located in the left, superior corner of the abdominal cavity.

The spleen has an outer capsule of dense connective tissue and a small amount of smooth muscle. Trabeculae from the capsule divide the spleen into small, interconnected compartments containing two specialized types of lymphatic tissue called white pulp & red pulp.

Approximately one-fourth of the volume of the spleen is white pulp and the three-fourth is red pulp.

White pulp is diffuse lymphatic tissue and lymphatic nodules surrounding the arteries within the spleen. Red pulp is associated with the veins, it consists of the splenic cords and the venous sinuses. The splenic cords are a network of reticular cells that produce reticular fibers.

The spaces between the reticular cells are occupied by macrophages and blood cells that have come from the capillaries. The venous sinuses are enlarged capillaries between the splenic cords. They are unusual in that they have large, intercellular slits in their walls.