Sub: Anatomy & Physiology

TOPIC: Connective Tissue

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II.Connective Tissue

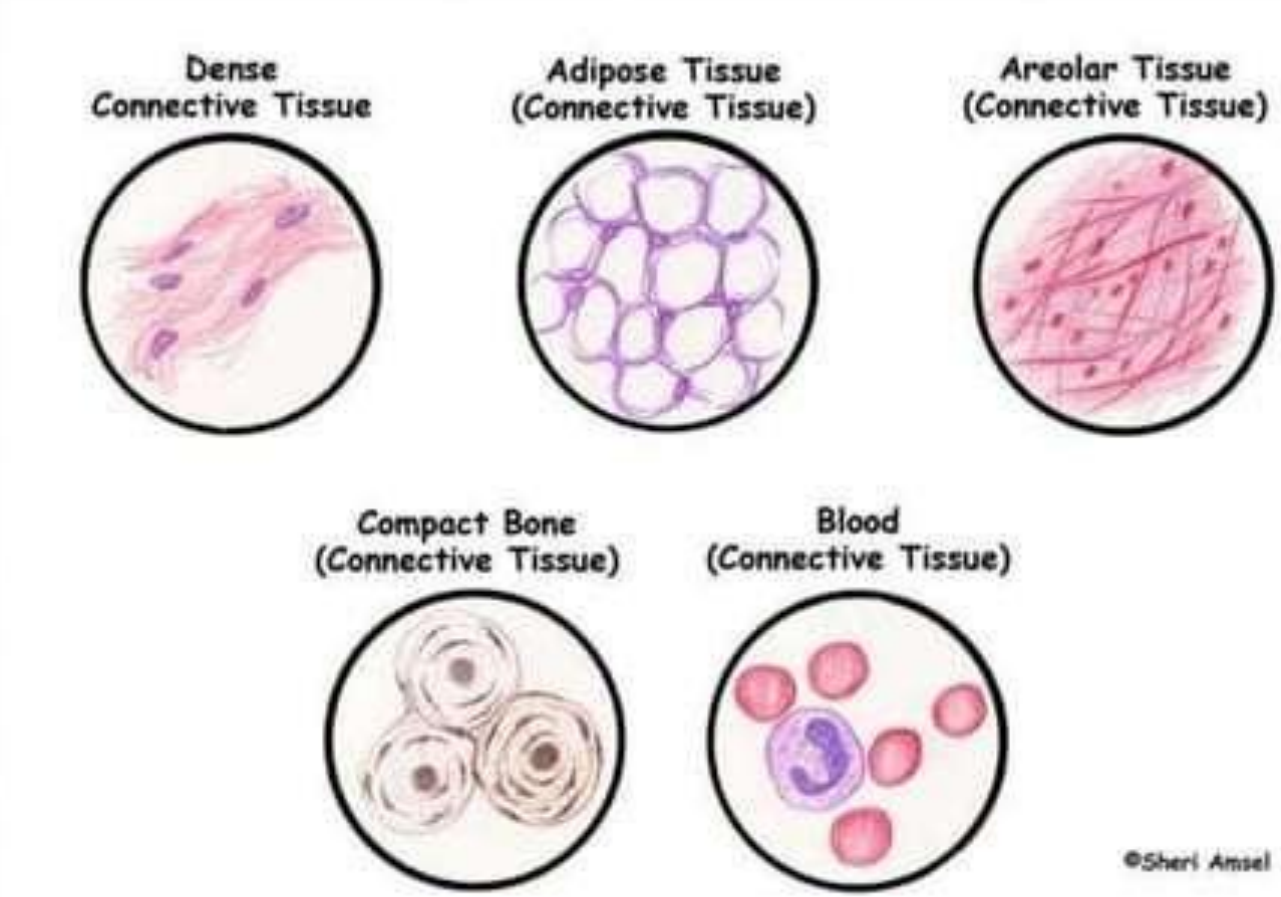
- **Connective tissue is incredibly diverse and contributes to energy storage, the protection of organs, and the body's structural integrity.**

Key Points:

- Connective tissue is the most abundant and widely distributed of the primary tissues.
- Connective tissue has three main components: cells, fibers, and ground substance. Together the ground substance and fibers make up the extracellular matrix.

Major functions of connective tissue include:

1) binding and supporting, 2) protecting, 3) insulating, 4) storing reserve fuel, and 5) transporting substances within the body.


Dense
Connective Tissue
Adipose Tissue
(Connective Tissue)
Areolar Tissue
(Connective Tissue)
Compact Bone
(Connective Tissue)
Blood
(Connective Tissue)
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The major functions of connective tissue include:

- Binding and supporting.
- Protecting.
- Insulating.
- Storing reserve fuel.
- Transporting substances within the body.

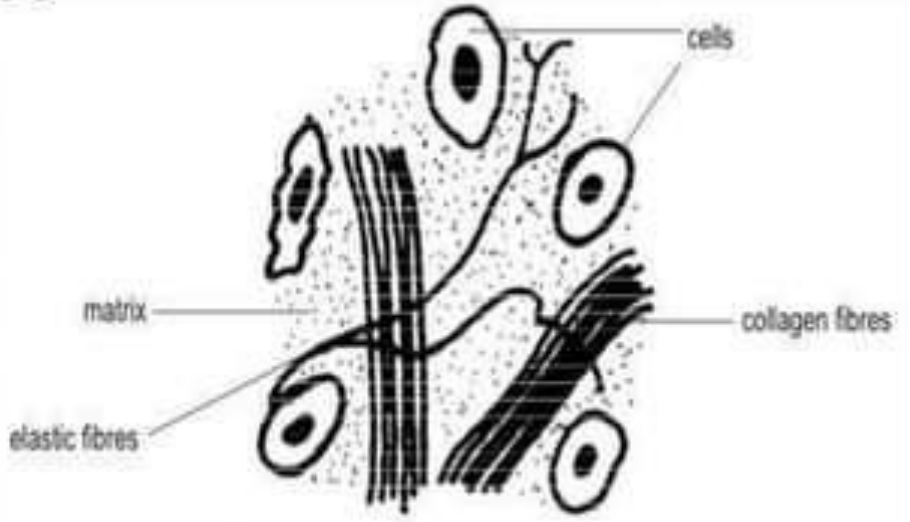
Structure of Connective Tissue

- **Connective tissue has three main components:**

Ground substance

Fibers

Cells



Three types of fibers are found in connective tissue:

1.Collagen

Collagen fibers are fibrous proteins and are secreted into the extracellular space and they provide high tensile strength to the matrix.

2.Elastic Fibers

Elastic fibers are long, thin fibers that form branching network in the extracellular matrix. They help the connective tissue to stretch and recoil.

3.Reticular Fibers

Reticular fibers are short, fine collagenous fibers that can branch extensively to form a delicate network.

Key Points

- The lymphatic system is a part of the circulatory system, comprising a network of conduits called lymphatic vessels that carry a clear fluid called lymph unidirectionally towards the heart.
- **Blood is considered a specialized form of connective tissue. In vertebrates, it is composed of blood cells suspended in a liquid called blood plasma.**
- **Adipose tissue or body fat is loose connective tissue composed of adiposities.**
- **Cartilage is a flexible connective tissue found in many areas in the bodies of humans and other animals, including the joints between bones, the rib cage, the ear, the nose, the elbow, the knee, the ankle**, the bronchial tubes, and the intervertebral discs.
- **In humans, adipose tissue is located beneath the skin (subcutaneous fat), around internal organs (visceral fat), in bone marrow** (yellow bone marrow), and in breast tissue.

Key Terms

- **cartilage**: A type of dense, non-vascular connective tissue, usually found at the end of joints, the rib cage, the ear, the nose, in the throat, and between intervertebral disks.
- **adipose tissue**: Connective tissue that stores fat and cushions and insulates the body.
- **blood**: A vital liquid flowing in the bodies of many types of animals that usually conveys nutrients and oxygen. In vertebrates, it is colored red by hemoglobin, is conveyed by arteries and veins, is pumped by the heart, and is usually generated in bone marrow.

Connective tissue is divided into four main categories:

I. Connective proper
II.Cartilage
III.Bone
IV.Blood

I. Connective tissue proper has two subclasses: 1.loose and 2.dense.

Loose connective tissue is divided into

1) areolar,
2) adipose,
3) reticular.

Dense connective tissue is divided into

1) Dense regular,
2) Dense irregular,
3) Dense elastic.

Areolar Connective Tissue

- These tissues are widely distributed and serve as a universal packing material between other tissues. The functions of areolar connective tissue include the support and binding of other tissues.
- It also helps in defending against infection. When a body region is inflamed, the areolar tissue in the area soaks up the excess fluid as a sponge and the affected area swells and becomes puffy, a condition called edema.

Adipose Tissue or Body Fat

- **Adipose tissue**: Yellow adipose tissue in paraffin section with lipids washed out.
- **This is loose connective tissue composed of adipocytes.** It is technically composed of roughly only 80% fat. Its main role is to store energy in the form of lipids, although it also cushions and insulates the body.
- **The two types of adipose tissue are white adipose tissue (WAT) and brown adipose** tissue (BAT). Adipose tissue is found in specific locations, referred to as adipose depots.

Reticular Connective Tissue

This tissue resembles areolar connective tissue, but the only fibers in its matrix are the reticular fibers, which form a delicate network. The reticular tissue is limited to certain sites in the body, such as internal frameworks that can support lymph nodes, spleen, and bone marrow.

Dense Regular Connective Tissue

- This consists of closely packed bundles of collagen fibers running in the same direction. These collagen fibers are slightly wavy and can stretch a little bit.
- With the tensile strength of collagen, this tissue forms tendons, aponeurosis and ligaments. This tissue forms the fascia, which is a fibrous membrane that wraps around the muscles, blood vessels, and nerves.

Dense Irregular Tissue

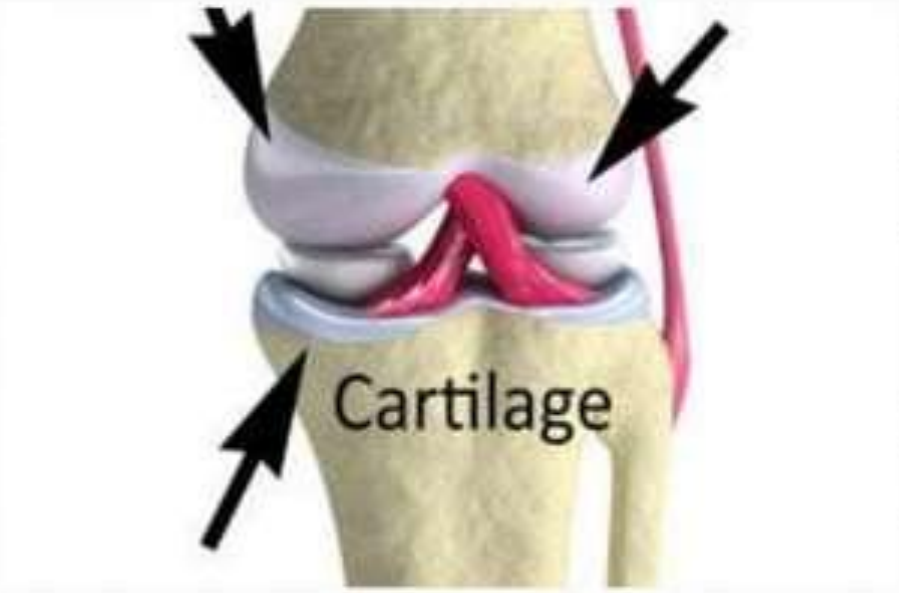
- This has the same structural elements as dense regular tissue, but the bundles of collagen fibers are much thicker and arranged irregularly. This tissue is found in areas where tension is exerted from many different directions. It is part of the skin dermis area and in the joint capsules of the limbs.

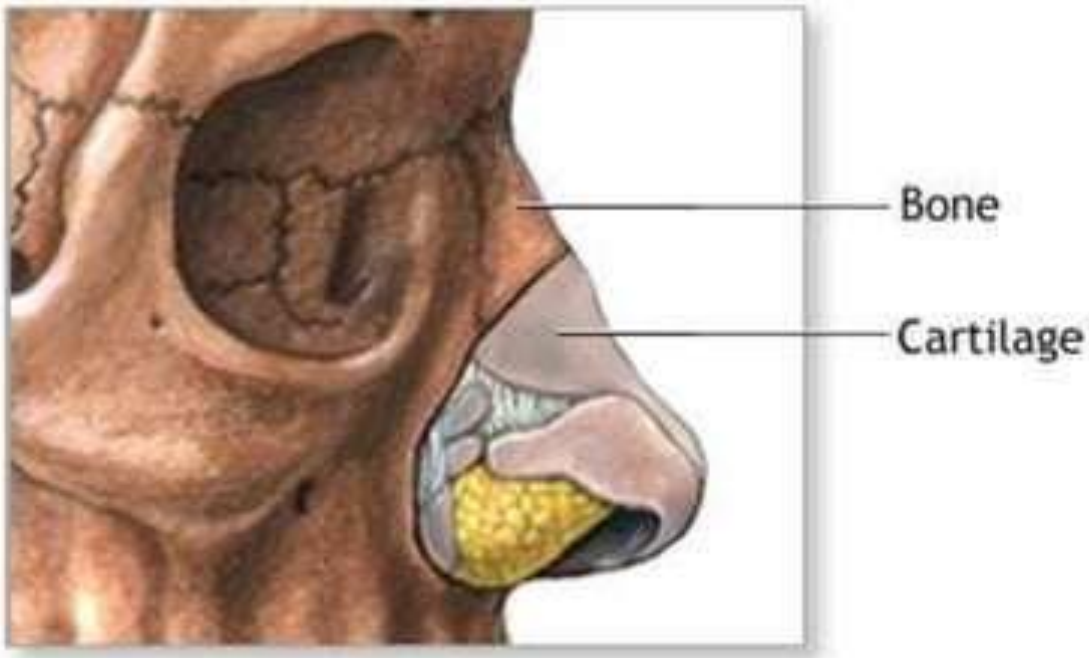
Elastic Connective Tissue

- The main fibers that form this tissue are elastic in nature. These fibers allow the tissues to recoil after stretching. This is especially seen in the arterial blood vessels and walls of the bronchial tubes.

II.CARTILAGE

- This is a flexible connective tissue found in many areas in the bodies of humans and other animals, including the **joints between bones, the rib cage, the ear, the nose, the elbow, the knee, the ankle, the bronchial tubes**, and the intervertebral discs.
- **Cartilage is composed of specialized cells called chondroblasts** and, unlike other connective tissues, cartilage does not contain blood vessels.
- **Cartilage is classified in three types: 1) elastic cartilage, 2) hyaline cartilage, and 3) fibrocartilage**, which differ in the relative amounts of these three main components.


Cartilage



A.D.A.M.


Ligament
Cartilage
Synovial
Destruction of cartilage
Synovial inflammation

- **Cartilage** is the type of connective tissue. Many of us are familiar with this flexible tissue that makes up our nose and ears. Cartilage is strong due to the collagen fibers within its matrix, and it is resilient due to a gel matrix. Cartilage is also found in the body as a cushion within the skeletal system.

Elastic Cartilage

- This is similar to hyaline cartilage but is more elastic in nature. Its function is to maintain the shape of the structure while allowing flexibility. It is found in the external ear (known as an auricle) and in the epiglottis.

Hyaline Cartilage

- This is is the most abundant of all cartilage in the body. Its matrix appears transparent or glassy when viewed under a microscope. It provides strong support while providing pads for shock absorption. It is a major part of the embryonic skeleton, the costal cartilages of the ribs, and the cartilage of the nose, trachea, and larynx.

Fibrocartilage

- This is a blend of hyaline cartilage and dense regular connective tissue. Because it is compressible and resists tension well, Fibrocartilage is found where strong support and the ability to withstand heavy pressure are required. It is found in the **intervertebral discs of the bony vertebrae and knee meniscus.**
- Bone tissue is also called the osseous tissue. The osseous tissue is relatively hard and lightweight in nature. It is mostly formed of calcium phosphate in the chemical arrangement termed calcium hydroxyapatite.

III. BONES

- Bones are a fourth example of connective tissue. Bones are made up of different types of connective tissue, including bone tissue and marrow. Bone tissue is either spongy or compact depending on the organization of the cells and matrix.

Long bone

IV.BLOOD

- **This is considered a specialized form of connective tissue. Blood is a bodily fluid in animals that delivers necessary substances, such as nutrients and oxygen**, to the cells and transports metabolic waste products away from those same cells.

- **It is an atypical connective tissue since it does not bind, connect, or network with any body cells. It is made up of blood cells and is surrounded by a nonliving fluid called plasma.**

THANK YOU