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المحاضرة السادسة

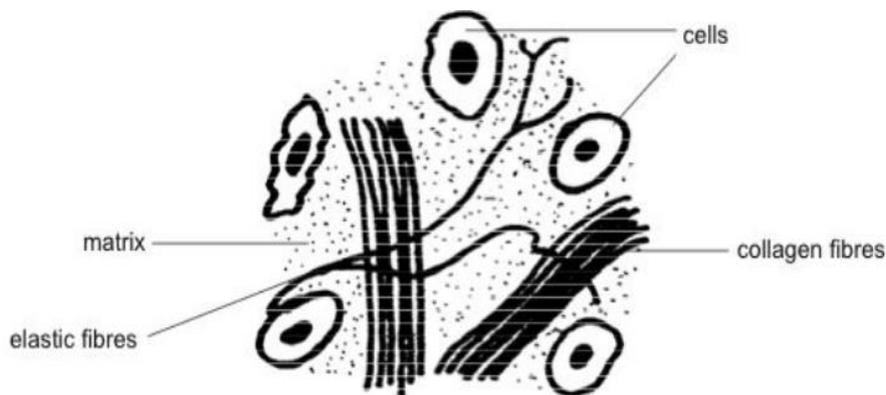
The Connective Tissue

The Connective tissue:

### ❖ Structure of Connective Tissue

- Connective tissue has three main components:
  1. Ground substance
  2. Fibers
  3. Cells

Together the ground substance and fibers make up the extracellular matrix. The composition of these three elements is vary from one organ to the other. This offers great diversity in the types of connective tissue.



**Structural elements of connective tissue**

- Three types of fibers are found in connective tissue:

#### 1- Collagen Fibers

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.

- ❖ The major functions of connective tissue include:

1. Binding and supporting.
2. Protecting.
3. Insulating.
4. Storing.

5. Transporting substances within the body.

### Types of Connective Tissue

Connective tissue is divided into four main categories:

1. Connective proper
2. Cartilage
3. Bone
4. Blood

#### *1- Connective proper*

Connective tissue proper has two subclasses: **loose** and **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) elastic.

#### **A- loose connective tissue**

##### **Areolar Connective Tissue**

These tissues are widely distributed between other tissues. The functions of areolar connective tissue include the support and binding of other tissues.

##### **Adipose Connective Tissue**

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.

##### **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 lymph nodes, spleen, and bone marrow.

#### **B- Dense connective tissue**

##### **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. This tissue is located 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.

### 2- 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 ear, the nose, the knee, 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.

### 3- Bone

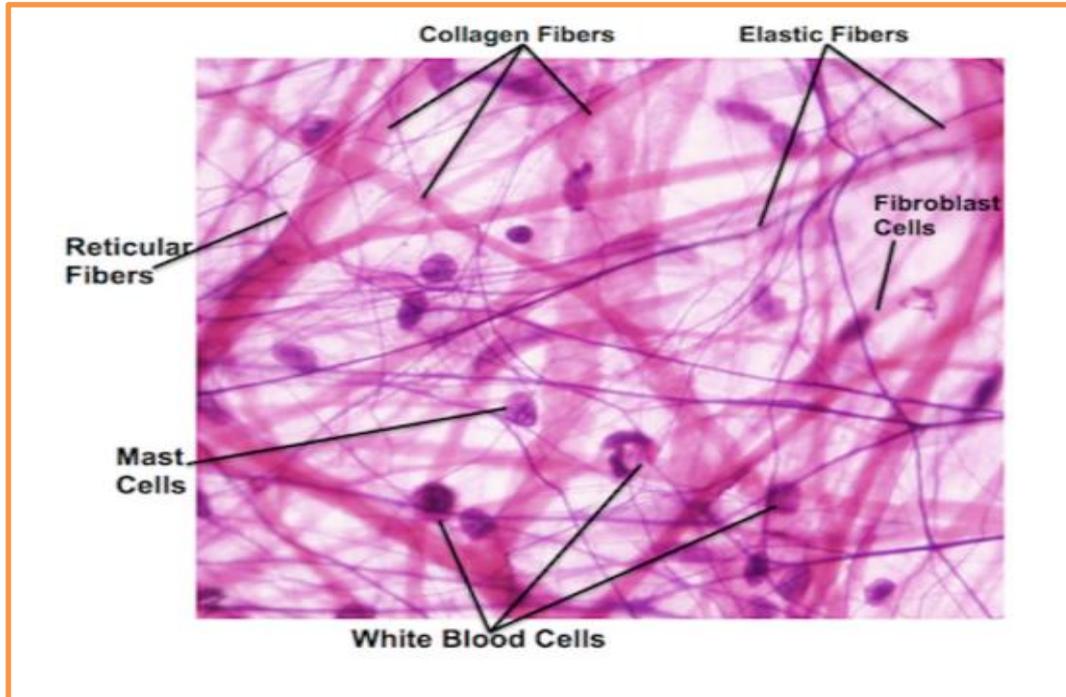
Bone tissue is also called the osseous tissue. The osseous tissue is relatively hard and lightweight in nature. It is mostly formed of calcium phosphate in the chemical arrangement termed calcium hydroxyapatite, which gives bones their rigidity. It has relatively high compressive strength, but poor tensile strength, and very low shear stress strength.

The hard outer layer of bones is composed of compact bone tissue, so-called due to its minimal gaps and spaces. This tissue gives bones their smooth, white, and solid appearance, and accounts for 80% of the total bone mass of an adult skeleton.

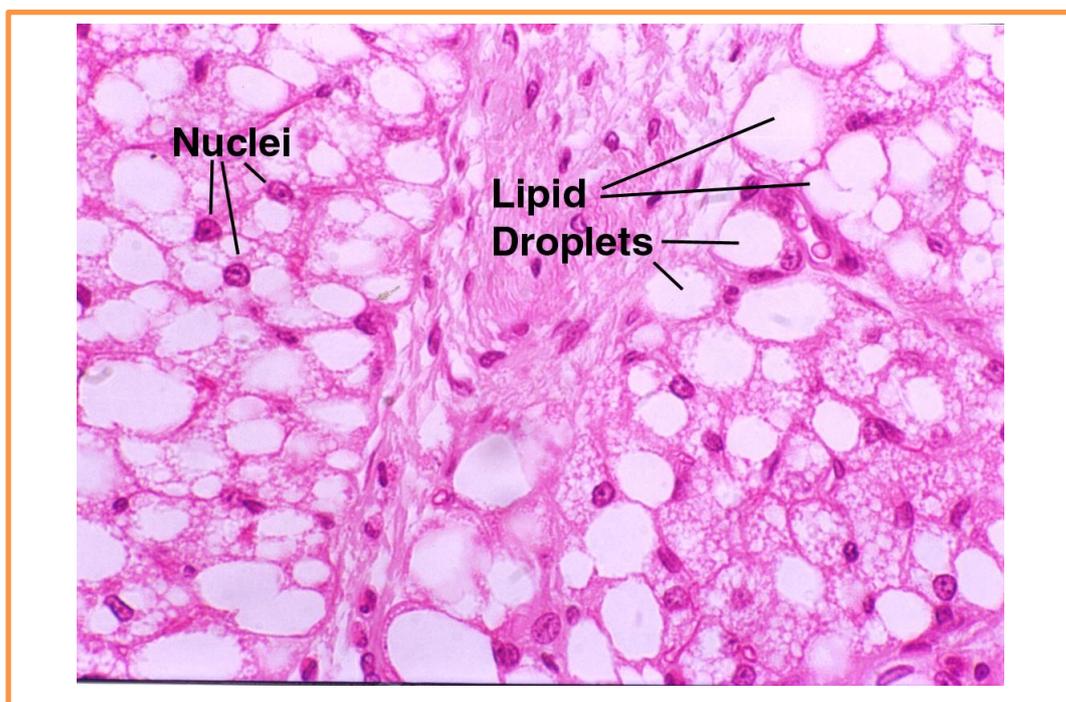
Filling the interior of the bone is the trabecular bone tissue (an open cell porous network also called cancellous or spongy bone), which is composed of a network of rod and plate-like elements that make the overall organ lighter and allow room for blood vessels and marrow.

### 4- Blood

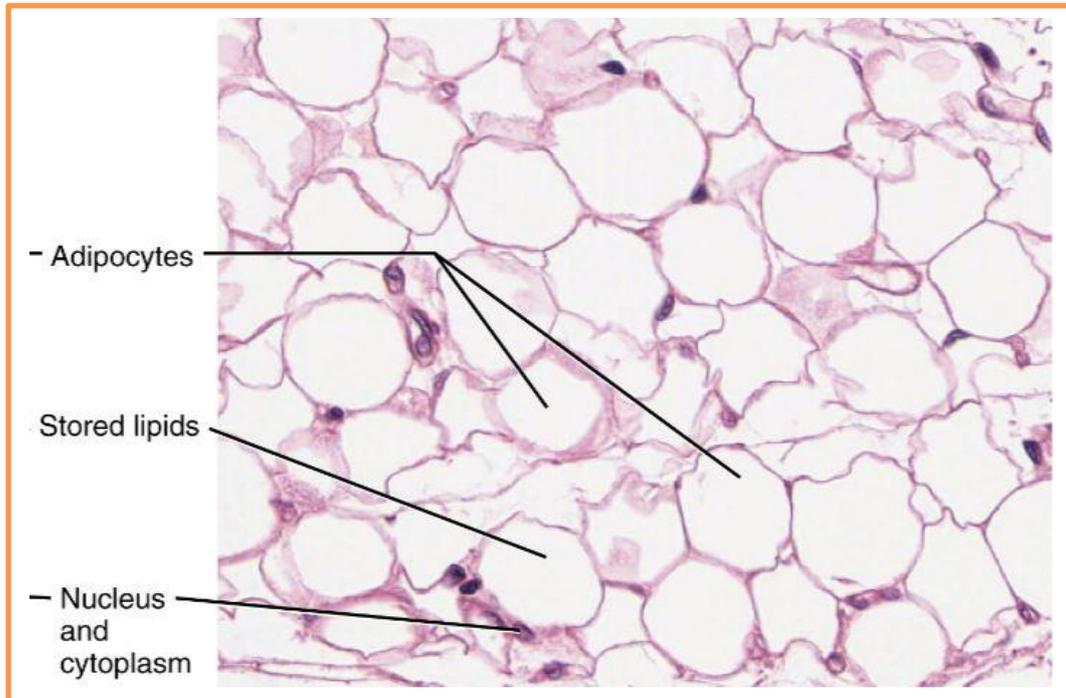
This is considered a specialized form of connective tissue. Blood is a bodily fluid in animals that delivers necessary substances, such as nutrients and oxygen, to the cells and transports metabolic waste products away from those same cells. It is made up of blood cells and is surrounded by a nonliving fluid called **plasma**.



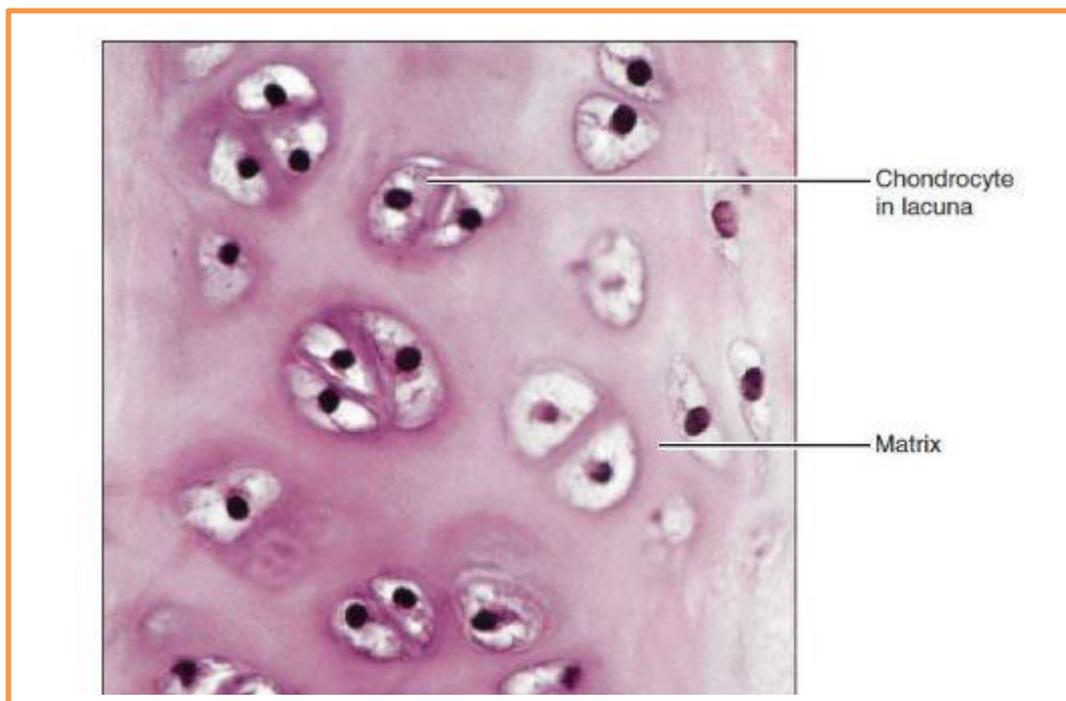
Areolar Connective Tissue



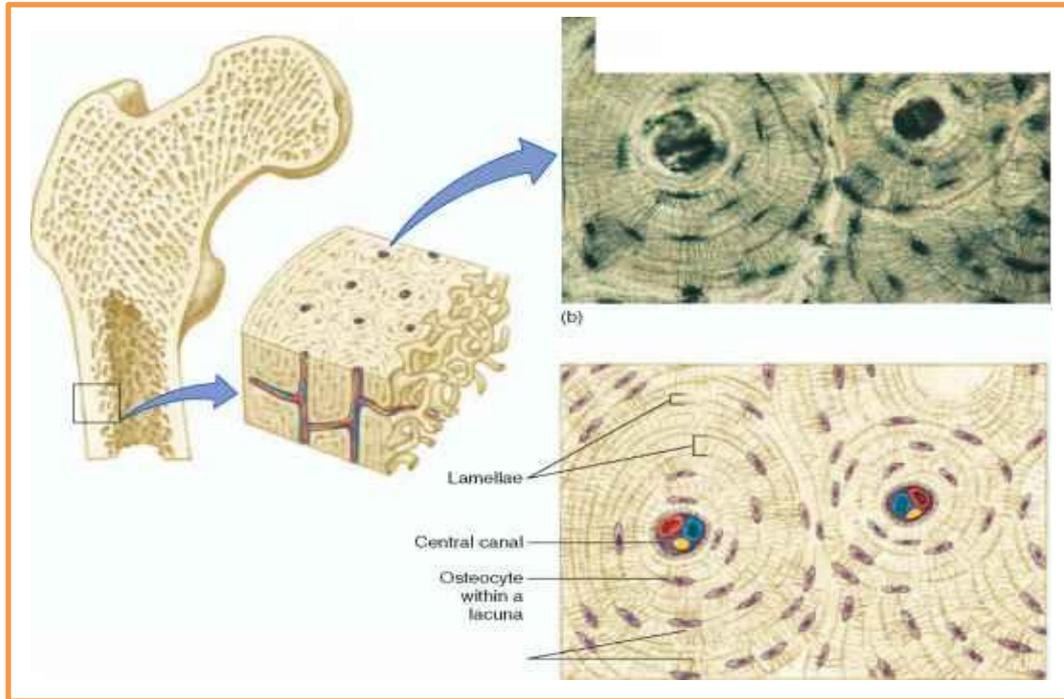
Adipose Connective Tissue



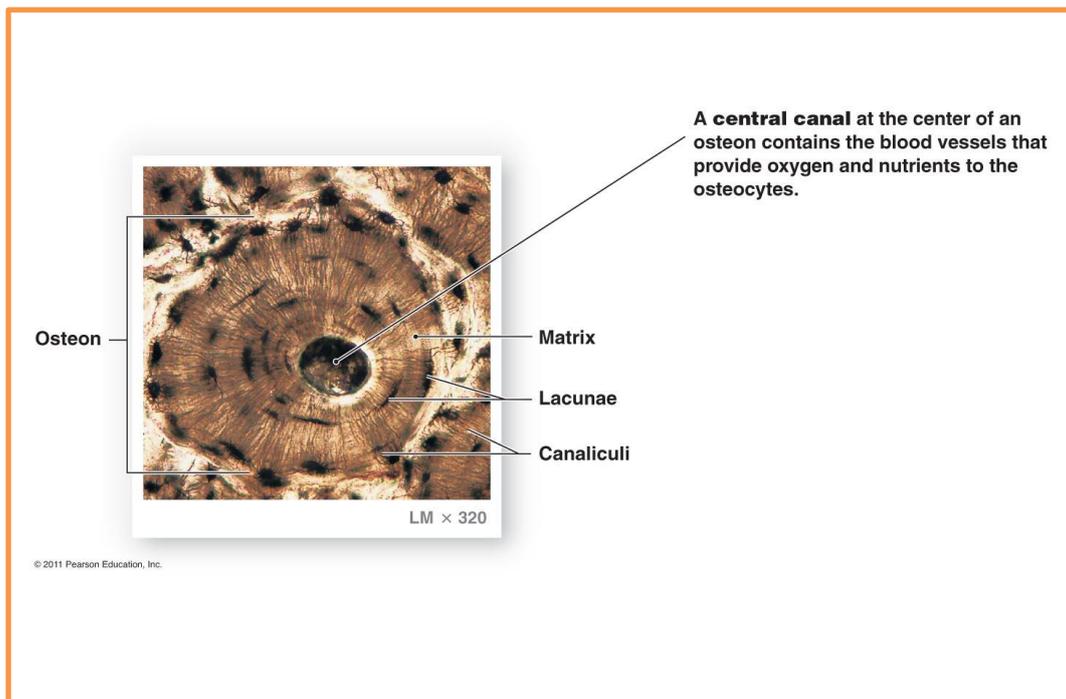
Adipose Connective Tissue



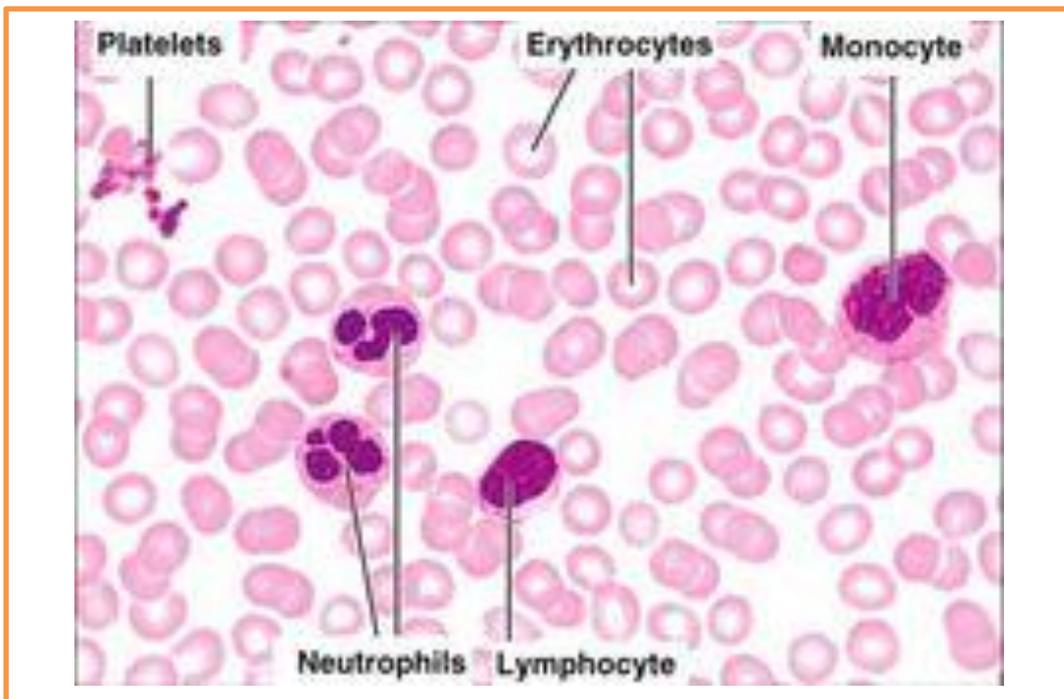
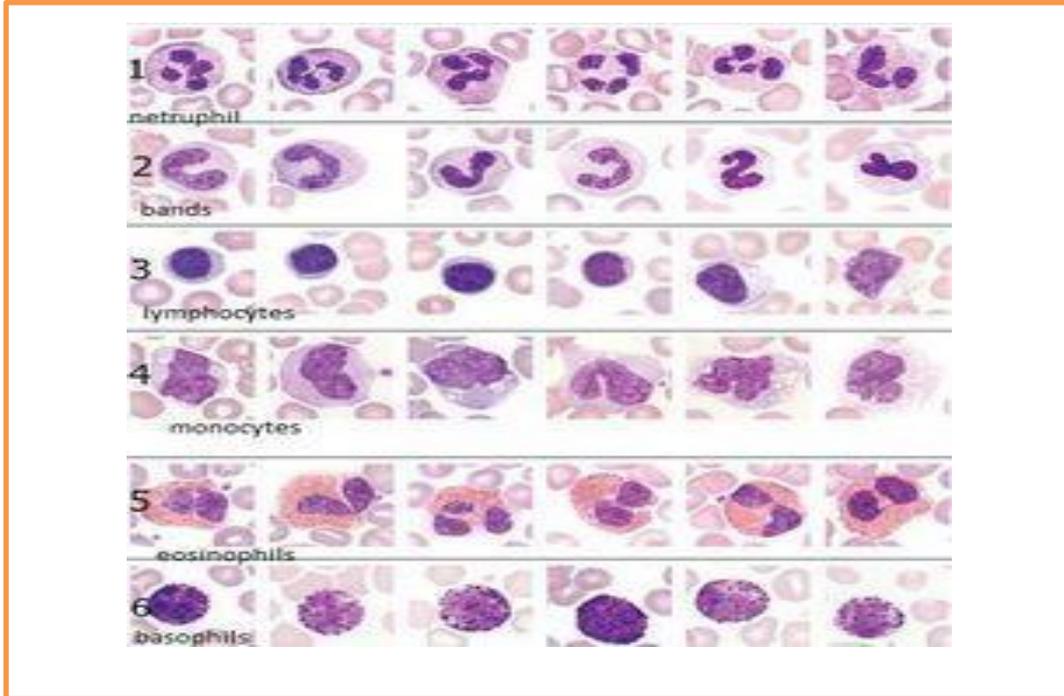
Hyaline Cartilage



Bone



Bone



Blood Tissue