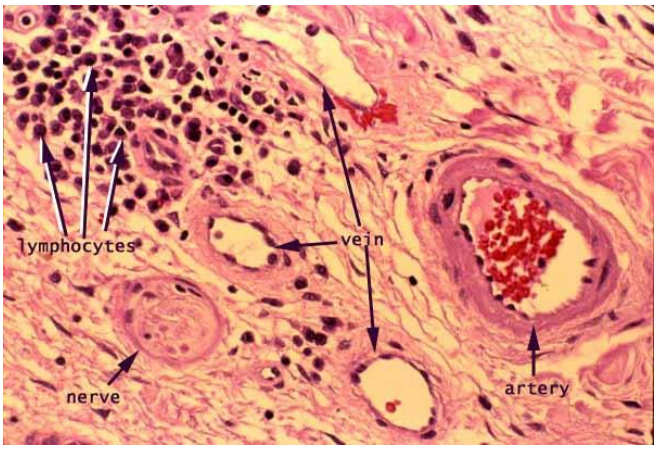
الكلية	العلوم
القسم	علوم حياة
المادة باللغة الانجليزية	Histology
المادة باللغة العربية	علم الانسجة
المرحلة الدراسية	الثالثة
اسم التدريسي	د.هند يونس خلف عبدالله
عنوان المحاضرة باللغة الانجليزية	Type of Connective Tissue
عنوان المحاضرة باللغة العربية	أنواع النسيج الضام
رقم المحاضرة	3
المصادر والمراجع	
	Junquera Basic Histology Text and Atlas.Copyright © 2013 by McGraw-Hill Education

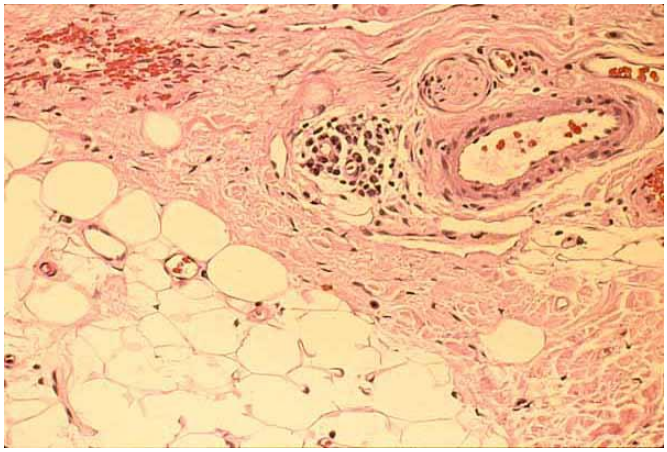
TYPES of Connective Tissue

1- **Proper connective tissue (skin)**contains all of the basic components of connective tissue in reasonable proportion, including cells (of several types), extracellular fibers, and extracellular ground substance. Loose ordinary connective tissue is sometimes called areolar tissue.

Skin dermis



skin dermis and hypodermis



Loose / Dense. Connective tissue. may be distinguished as either loose or dense, depending on the proportion of fibers. The intrinsic strength of collagen is the same in both loose and dense connective tissue.

Dense connective tissue is so named because of high density of extracellular fibers, and relatively smaller proportions of ground substance and cells.

Densely packed type I collagen fibers provide main strength with resistance to tearing and stretching.

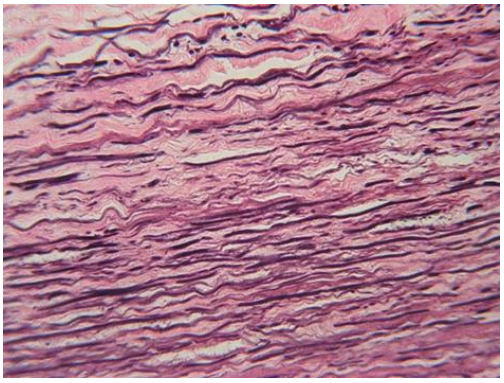
Dense *collagenous* connective tissue is found wherever the tensile strength of collagen is of paramount importance. Examples include **dermis** (the layer of the skin which yields leather), tendons and **ligaments**, and **organ sheaths** (such as the "white" of the eye (sclera), the cornea, or the capsule of the kidney).
Dense *elastic* connective tissue is found wherever the elasticity of elastin is of paramount importance, as in the **ligamentum flavum** (*flavum* refers to the yellow color conferred by the elastin) and the **aorta**.
Regular/Irregular. Dense connective tissue may be further described as either regular or irregular, depending on the orientation of the fibers .
In regular connective tissue (example: tendon) the fibers are all aligned in a single

direction, conferring tensile strength primarily in that direction .

In irregular connective tissue (example: dermis) the fibers are arranged in various directions, although even here collagen fibers may adopt a preferential orientation as revealed by "Langer's lines."

Elastic tissue is a dense connective tissue which contains predominantly elastic fibers rather than collagen. It is more elastic (obviously) than dense collagenous connective tissue.

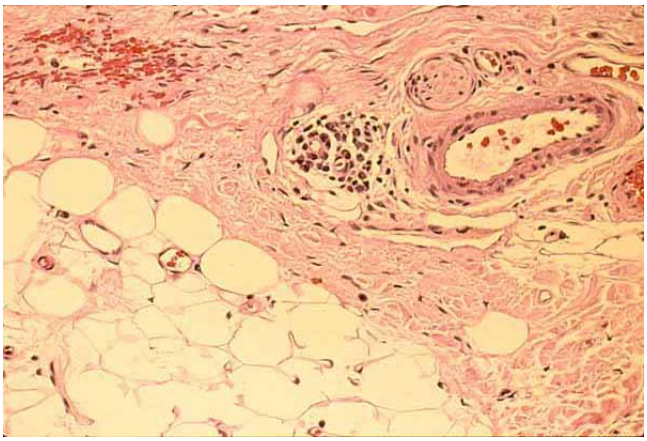
Examples include the wall of the aorta and the elastic ligament of the spine (called ligamentum flavum .



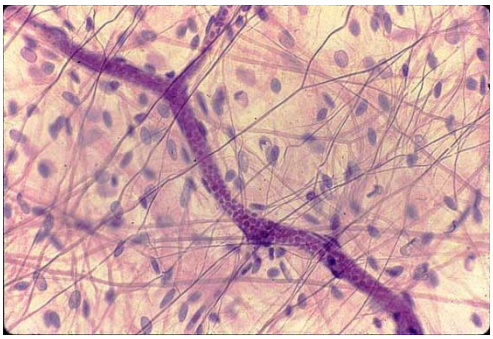
Loose connective tissue has a relatively large proportion of ground substance, of cells, or of both cells and ground substance. In other words, loose connective tissue lacks the massive fibrous reinforcement that characterizes dense connective tissue. Nevertheless, the same types of fibers are still found, although fewer and more delicate.

Proper loose connective tissue, sometimes called **areolar tissue**, is common throughout the body. (The word *areolar* refers to areolar tissue's variable spaces (areolae) filled with ground substance.) Examples of areolar tissue include **hypodermis**, lamina propria, submucosa, mesentery, and **fascia**.

Adipose tissue is loose connective tissue which is dominated by fat cells, or adipocytes. Since most loose connective tissue contains scattered clusters of adipocytes, the term *adipose tissue* is usually reserved for large masses (grossly visible) of these cells.



Areolar tissue is another name for loose irregular connective tissue, with unspecialized proportions of the various matrix components and cells. The word "areolar" in its name refers to the many small spaces (areolae), of variable size and filled with ground substance, that characterize this tissue. Examples of areolar tissue occur throughout the body.



2- **Special" connective tissue** (bone, cartilage, lymphoid tissue (spleen and lymph nodes), and blood.

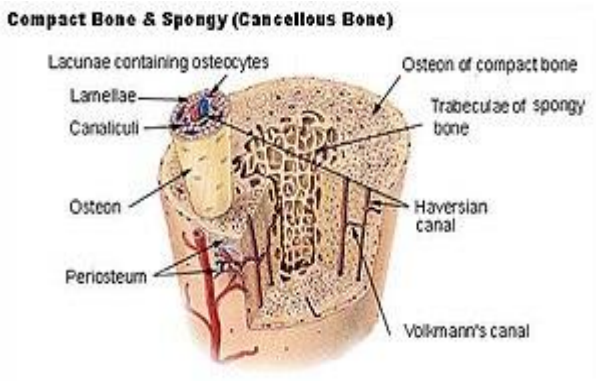
cartilage and **Bone** are special forms of connective tissue, made by specialized chondroblasts and osteoblast, with uniquely solidified ground substance.

Histogenesis of cartilage : **cartilage** , there are three type of cartilage **1- hyaline cartilage** (is located in the articular surface f the moveable joints in the walls of larger respiratory passage ,nose ,larynx,trachea,bronchi) **2- elastic cartilage**(is found in the auricle of the ear, epiglottis) .**3- fibrocartilage** is a tissue intermediate between dense connective tissue and hyaline cartilage is found in intervertebral disk in attachment of certain ligaments to the cartilaginous surface of bones .**Cartilage** derived from mesenchyme,mesenchymal cell differentiation to form **chondroblast** which secrete the extracellular matrix and the cell themselves are located in matrix cavities called **lacunae**, this cells called **chondrocytes,** the growth of cartilage attributable to two processes; interstitial growth (resulting from the mitotic division of chondrocyte) and appositionl growth (resulting from differentiation of perichondrial cells).

Bones: There are tow type of bone tissue : **Spongy bone** (consist of lamellae arranged in irregular pattern called Trabeculae ,between these trabeculae are space filled with yellow and red bone marrow , consist of connective lamellae,lacunae and canaliculi) **and compact bone(**the Maine structural unit is called osteon m each osteon consist of connective lamellae arranged around Central canal,radiating from lacunae tiny projections called canaliculi.

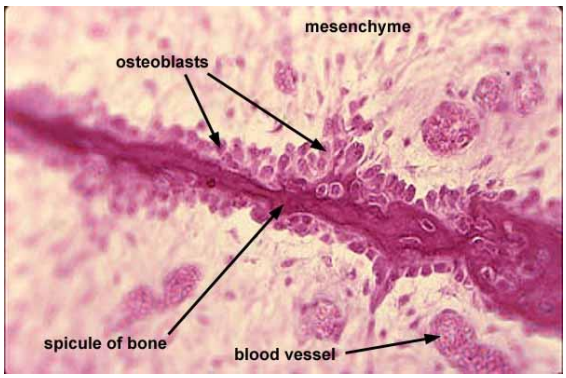
Blood vessels,nerves and lymphatic vessels from periosteum penetrate the compact

bone through **Volkmans canals**) .



Bone develops embryonically in two different ways -- either by *intramembranous ossification* (directly from mesenchymal condensations) or by *endochondral ossification* (by transformation of a pre-existing cartilagenous model). **INTRAMEMBRANOUS OSSIFICATION**

The simpler mode of bone formation is intramembranous, in which bone forms directly in mesenchyme. This is the pattern for the thin, flat bones of the skull , part of mandible and clavicles . During intramembranous bone formation, ossification occurs in spicules around mesenchymal vessels. Spicules of bone covered by osteoblasts.

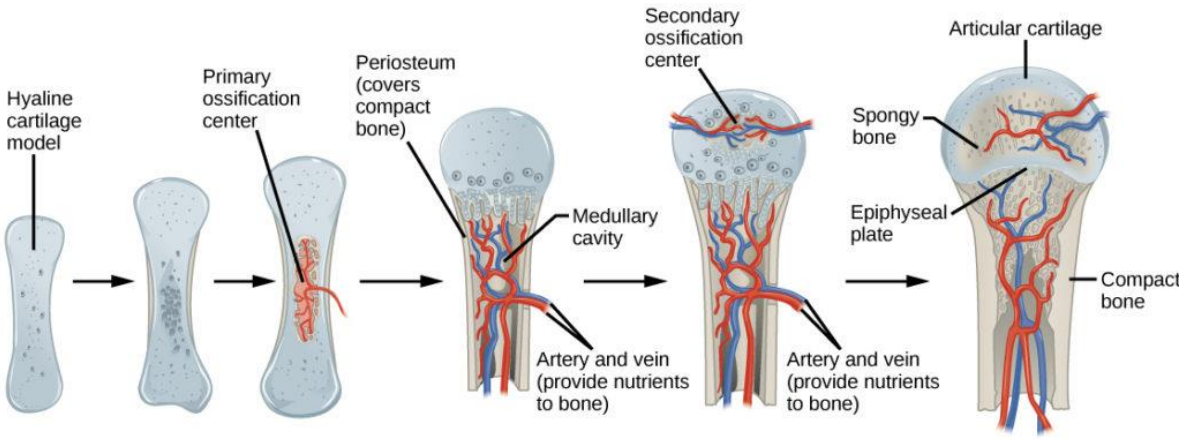


ENDOCHONDRAL OSSIFICATION

All bones except some bones of the skull and clavicles bones are modelated in hyaline cartilage ,begins forming late in 2nd month of human development continues forming until early adulthood

Endochondral ossification follows five steps. (a) Mesenchymal cells differentiate into chondrocytes. (b) The cartilage model of the future bony skeleton and the perichondrium form. (c) Capillaries penetrate cartilage. Perichondrium transforms into

periosteum. Periosteal collar develops. Primary ossification center develops. (d) Cartilage and chondrocytes continue to grow at ends of the bone. (e) Secondary ossification centers develop. (f) Cartilage remains at epiphyseal (growth) plate and at joint surface as articular cartilage.



Blood is traditionally classified as a specialized form of connective tissue, with *no fibers*, highly *fluid ground substance*, and *mobile cells*.

Blood is thus distinct from ordinary connective tissue. However, blood may also be usefully regarded as simply a fraction of ordinary connective tissue that is free to gallop around from place to place along differentiated highways.

Cell names may differ between blood and proper connective tissue. The cells which are called *macrophages* in ordinary connective tissue are called *monocytes* in blood. Blood cells similar to tissue *mast cells* are called *basophils*.

Other type of connective tissue

Fibrocollagenous (**fibrous**) **tissue** contains a substantial proportion of collagen. A principal feature of fibrous tissue is flexibility combined with great tensile strength.

The **sclera** (or "white") of the eye is a readily visible example of dense fibrous connective tissue comprising an organ sheath.

Tendons and **muscle capsules** may also dense fibrous connective tissue The ends of muscle fibers are typically attached to dense fibrous connective tissue of periosteum, tendon, or ligament.

The dermis of the skin is also fibrous connective tissue .

Lymphoid tissue is loose connective tissue with large numbers of lymphocytes that have accumulated in the tissue.

A separate page describes the lymphatic system, including lymphoid tissues in several specialized lymphoid organs -- spleen, thymus, lymph nodes, and tonsils. Lymphoid organs are also sometimes called reticular tissue because of the supporting framework of reticular fibers (a delicate, branching form of collagen).

Functions of Connective Tissue

Most connective tissue is serving several vital functions simultaneously, including --

- transport of nutrients and metabolites,
- immunological defense,
- mechanical support.

After injury, connective tissue is instrumental in tissue repair, specifically in scar formation.

Additional functions found in specialized sites include --

- reserve energy storage (as fat),
- heat generation (brown fat),
- haemopoiesis (blood cell formation).