

Biology

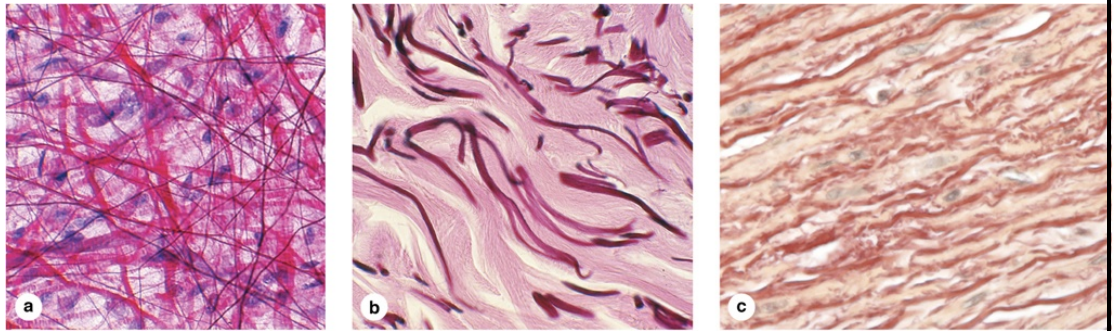
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Connective Tissues

II-Fibers:

Collagen fibers (white fibers):

They are the most numerous and strongest fibers in the body derived from connective tissue cells called fibroblasts. Fresh collagenous fibers are colorless and they give the tissue white color when grouped in great no. e.g. in tendon. These fibers are straight or wavy, unbranched consist of protein called collagen which is the major structural protein of the extracellular matrix and the single most abundant protein in human tissues. This protein characterized by the formation of triple helices in which 3 polypeptide chains are wound tightly around one another in a ropelike structure.



Collagen fibers always run parallel to each other forming bundles, which branched and anastomose.

There are several types of collagen fibers (currently named type I to XXI)

MEDICAL APPLICATION

***Keloid** is a local swelling caused by abnormal amounts of collagen that form in scars of the skin. Keloids, which occur most often in individuals of black African descent, can be a troublesome clinical problem to manage; not only can they be disfiguring, but excision is almost always followed by recurrence.

*Vitamin C (ascorbic acid) deficiency leads to scurvy, a disease characterized by the degeneration of connective tissue. Without this vitamin, fibroblasts synthesize defective collagen, and the defective fibers are not replaced. This process leads to a general degeneration of connective tissue that becomes more pronounced in areas in which collagen renewal takes place at a faster rate. The periodontal ligament that holds teeth in their sockets has a relatively high collagen turnover; consequently, this ligament is markedly affected by scurvy, which leads to a loss of teeth.

Elastic fibers (yellow fibers):

Connective tissues also contain elastic fibers, which are particularly abundant in organs that regularly stretch and then return to their original shape.

Elastic fibers are composed principally of a protein called elastin.

They differ from collagen that they are thinner than the white fibers, they branched and unite with one another forming irregular network, when they present in great quantity they appear yellow, the fibers run individually and not in bundle.

They are not stained with heamatoxylin-eosin, but stain with special stain orcein, they are generally formed by fibroblasts.

Medical application:

Marfan syndrome, a disease characterized by a lack of resistance in the tissues rich in elastic fibers. Because the large arteries are rich in components of the elastic system and because the blood pressure is high in the aorta, patients with this disease often experience aortic swellings called aneurysms, a life-threatening condition.

Reticular fibers:

Reticular fibers are another form of collagen (Type III). They are arranged as a loose meshwork of thin fibers providing supportive scaffolding for the specialized cells of various organs as well as blood vessels.

They are formed from collagen, and they are not stained with hematoxylin-eosin, but stained with silver stain and appear black, they are associated with special cells called reticular cells.

Clinical Correlation:**Sun Exposure and Molecular Changes in Photoaged Skin**

Chronological aging of the skin is a complex process that is associated with functional and structural changes within the stratified squamous epithelium (epidermis) as well as the underlying connective tissue of the dermis. When these changes are intensified by prolonged exposure to solar or ultraviolet (UV) radiation, the process is referred to as **photoaging**.

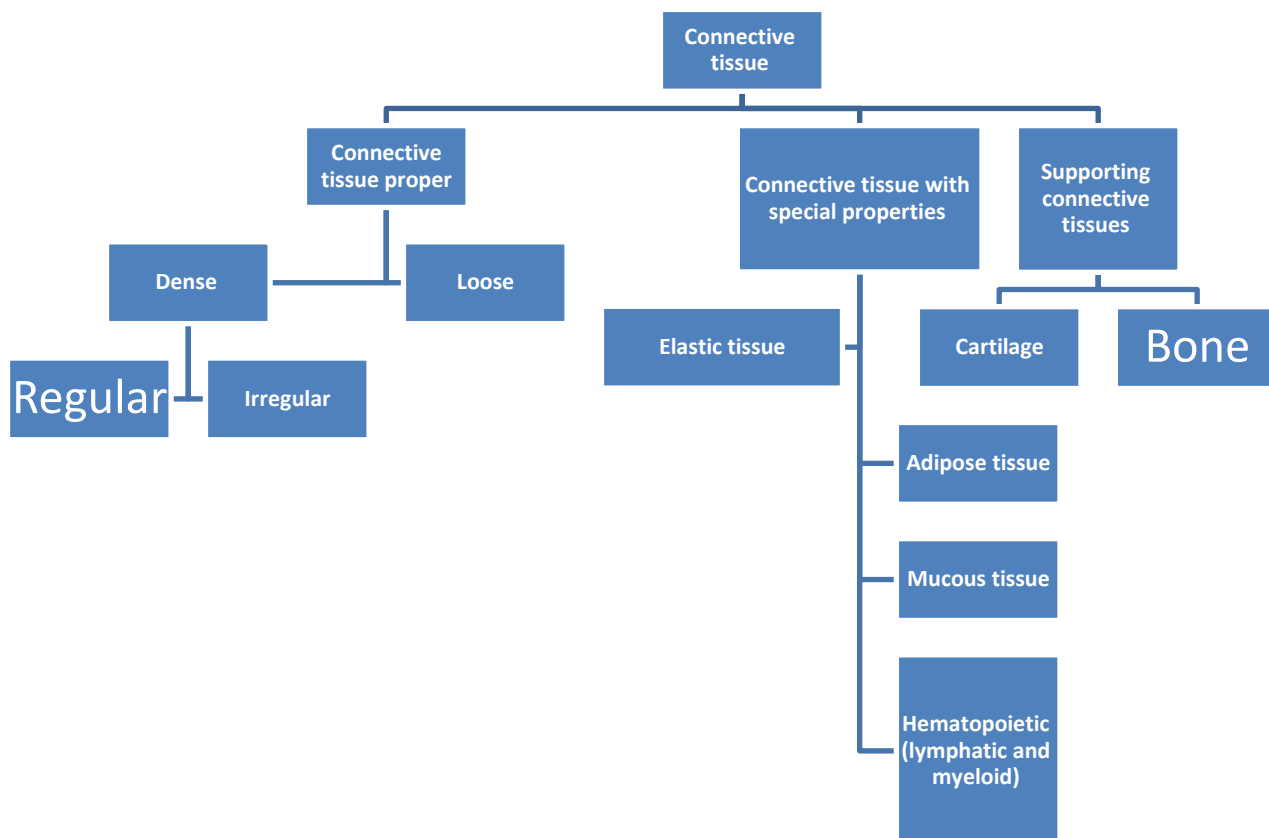
Chronic sun exposure ages the skin at an accelerated rate, especially in exposed areas of the body such as the face, neck, dorsal surface of the hands, and forearms. Clinical signs associated with photoaging include dyspigmentation, freckles, deep wrinkles, increased laxity, and increased risk for cutaneous cancers.

The best strategies to prevent photodamage caused by solar and UV radiation is the use of physical and chemical sunscreens to prevent UV penetration into skin. Other methods are also used in treating damaged skin. These include reducing skin inflammatory reactions with anti-inflammatory medications.

Ehlar-Danlos Syndrom:

Are genetic conditions, the commonest one are autosomal dominant, rare type are autosomal recessive. They are group of disorders that affect connective tissue supporting the skin, bones, blood vessels and many other organs and tissues. They characterized by fragile skin, unstable joints due to faulty or reduced amounts of collagen.

Connective tissue classification



a-Loose Connective Tissue:

Loose connective tissue (areolar tissue) supports many structures that are normally under pressure and low friction. A very common type of connective tissue, Loose connective tissue comprises all the main component of connective tissue proper. There is no predominant element in this tissue. The most numerous cells are fibroblasts and macrophages but all the other types of connective tissue cells are present. A moderate amount of collagen, elastic, and reticular fibers.

b-Dense Connective Tissue:

Dense connective tissue is divided into two sub-categories:

- **dense irregular connective tissue**
- **dense regular connective tissue**

Dense connective tissue contains relatively few cells with much greater numbers of collagen fibers.

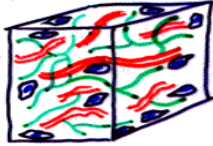
Dense irregular connective tissue has bundles of collagen fibers that appear to be fairly randomly orientated (as in the dermis).

Dense regular connective tissue has closely-packed densely-arranged fiber bundles with clear orientation (cord like structure or bands) and relatively few cells (such as in tendons). This type include:

- 1. white regular dense connective tissue e.g. tendons. Tendons connect muscle to bone.**
- 2. yellow elastic dense regular connective tissue e.g. ligaments:** They have a similar structural arrangement to tendons, but differ in their yellow color, which is due to the abundance of elastic fibers in the tissue. **Ligaments connect bone to bone.**

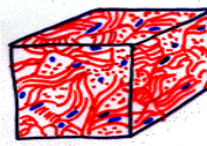
TYPES OF CONNECTIVE TISSUE

Loose Connective Tissue



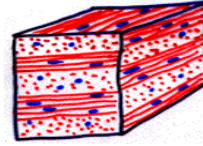
(e.i. mesentery, omentum)

Dense Irregular Connective Tissue

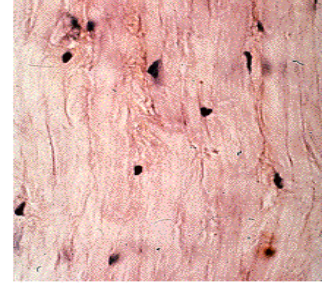
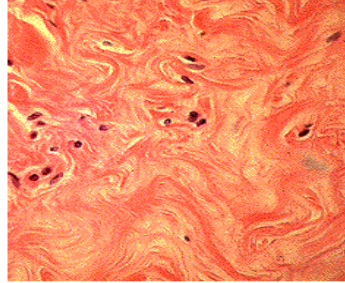
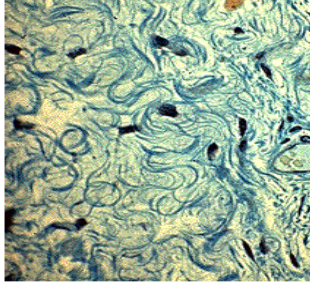


(e.i. dermis of skin)

Dense Regular Connective Tissue



(e.i. tendons, ligaments, cornea)



II- Connective tissue with special properties:

Elastic tissue:

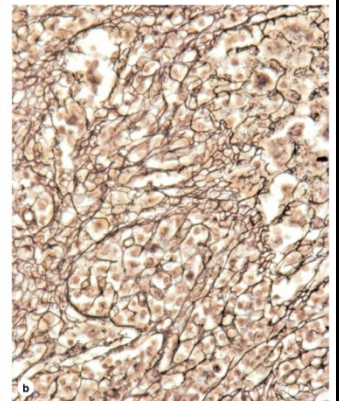
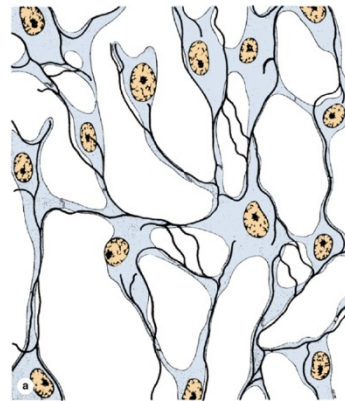
Elastic tissue is composed of bundles of thick, parallel elastic fibers.

Mucous tissue:

This is found in the umbilical cord (Wharton's jelly). It is a loose connective tissue composed of fibroblasts.

Reticular tissue:

Reticular tissue is a specialized loose connective tissue consisting of reticular fibers initially associated with specialized fibroblast called reticular cells. Reticular tissue provides the architectural framework that creates a special microenvironment for hematopoietic and lymphoid organs (bone marrow, lymph nodules, nodes and spleen).



Mesenchymal tissue:

Is the connective tissue of embryo, consists of mesenchymal cells in a gel like amorphous ground substance containing scattered reticular fibers.