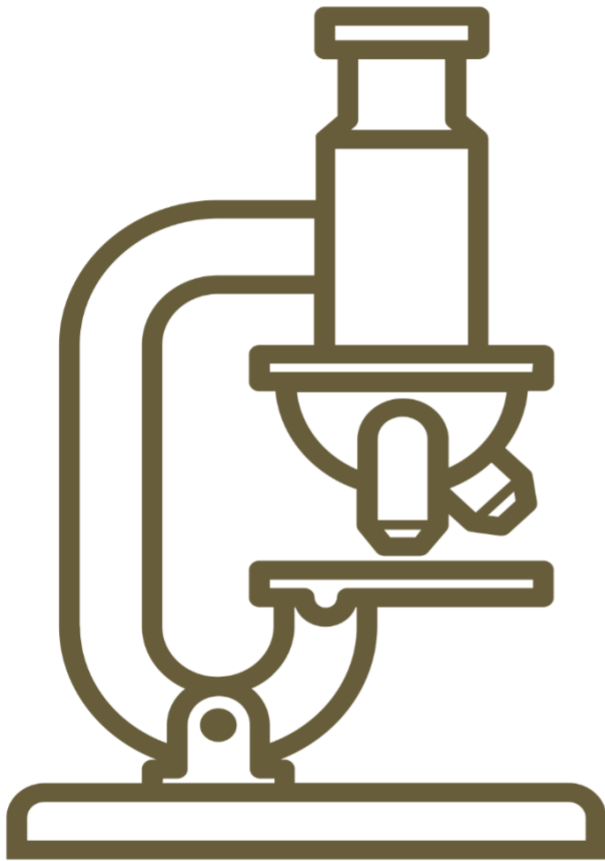




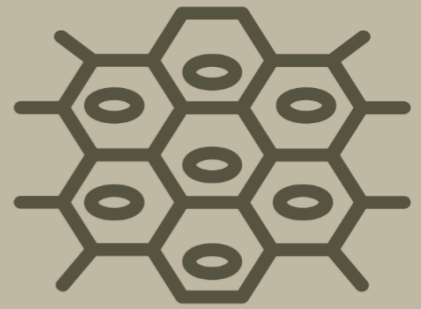
HISTOLOGY



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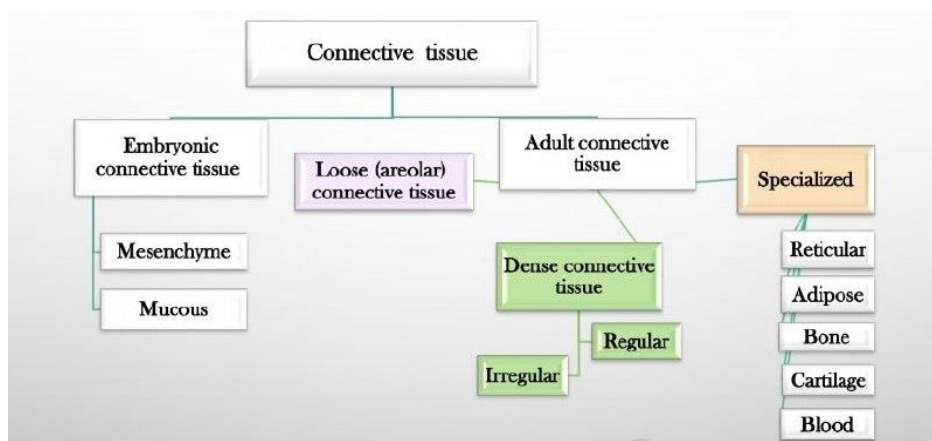


SHEET NO.

7



Connective tissue

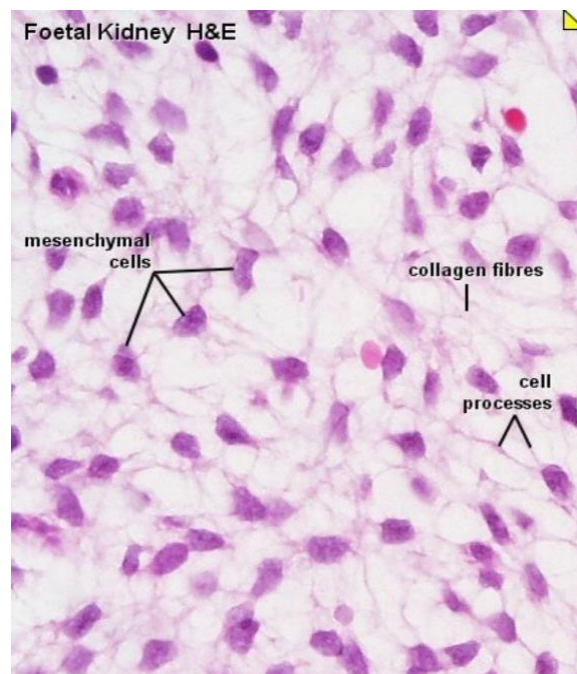


First : Embryonic CT

1-Mesenchyme CT

- **General organization** : Sparse, undifferentiated cells, uniformly distributed in matrix with sparse collagen fibers
- **Location/Example** : Mesodermal layer of early embryo
- **Function** : Contains stem/progenitor cells for all adult connective tissue cells

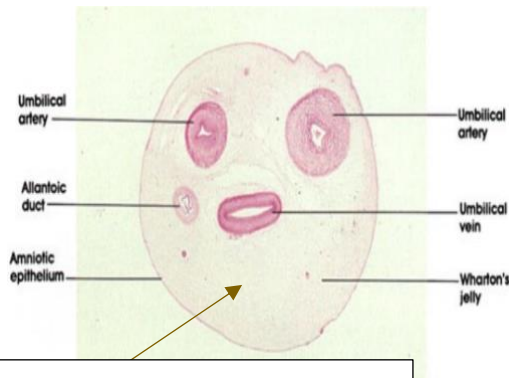
As we said the formation of connective tissue comes from the mesoderm (a layer from the embryo), so mesoderm will later form the mesenchyme (the very primitive connective tissue), mesenchymal cells are stem cells which will later form the future connective tissue. At some step in the embryo will start developing and there will be mesenchymal stem cells, events are extremely tightly organized by certain signaling pathways (each type will be formed according to its signaling pathway) all start from mesenchymal cells and start to differentiate into specific types of connective tissue in the adult.



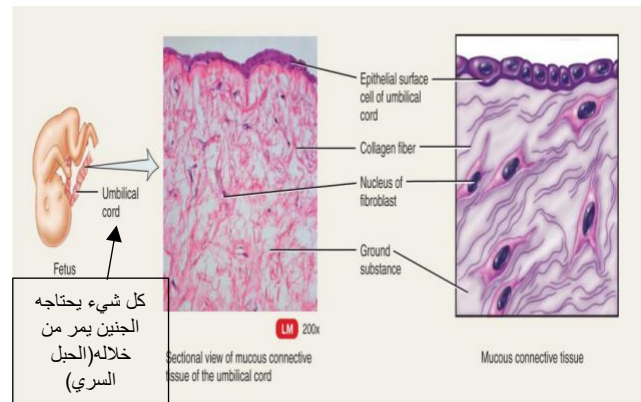
2- Mucuos (Mucoïd tissue)

- **General organization** : they are random fibroblasts and collagen fibers in viscous matrix. it's a gel-like connective tissue with few cells found most abundantly around blood vessels in umbilical cord.
- **Function** : it gives support and cushions for the supported structure inside (blood vessels)
- **Location/Example** : Matrix of the fetal umbilical cord

It's precious structure because it contains mesenchymal stem cells, which is used as treatment for some diseases.



Whrton's jelly (the filling in between)



Second : Adult CT

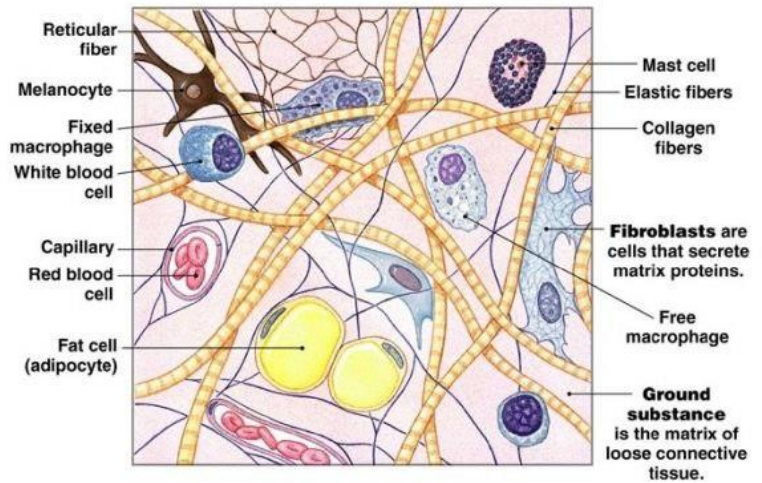
1-Loose [Areolar] CT (proper)

- **General organization** :
 - a- it consists of all 3 types fibers, several types of cells
 - b- semi-fluid ground substance (it's relatively more ground substance and less fibers than dense)
 - c-it's randomly distributed
- **Location/Example** :
 - a-substance layer
 - b-mucous membranes
 - c-around blood vessels
 - d- nerves and organs
- **Function**

a- Strength b-support, cushioning and elasticity

When ever you have epithelial tissue , you mast have CT (loose)

EX : in GI tract we have a lot of CT we call it **Lamena propria**



Loose connective tissue

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Fig. 3-29

2- Dense CT (proper)

- It contains more numerous, thicker fibers and far fewer cells than loose CT .

We classify them according to how the fibers are rounning in the tissue :

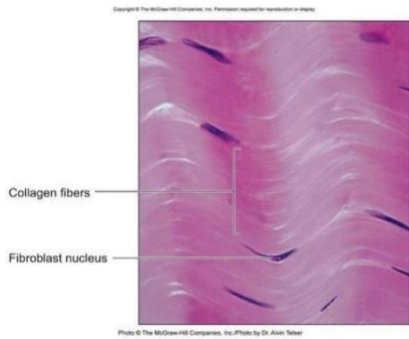
Dense regular CT

Dense irregular CT

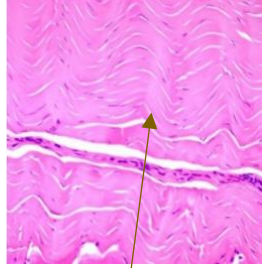
a- Dense regular CT :

- **General organization** : It consist bundles of collagen fibers and fibroblasts, and it runs in one direction.
- **Location/Example** : Tendons and ligaments
- **Function** : a- it provides a strong connections with muscelskeletal system, strong resistance force.

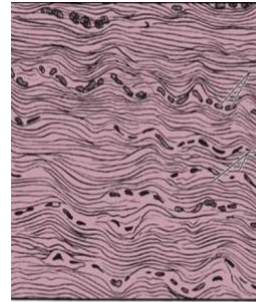
Does it make sense? yes, for example, elbo joints we have bones participating informing it, these are strong structure.. so we need something strong enough to connect them, So dense regular CT make something called ligament. It also makes the connection between the muscle and the bones, these fibers will be inserted into the bone to form a second attachment into the muscle → these fibers work as contract, this contraction run in one axis



All running in one direction

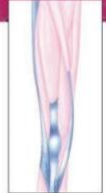
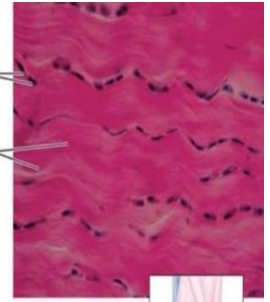


As you see, there is uniformity



Dense Connective Tissue

Location: Tendons; ligaments
Function: Binds organs together



b- Dense irregular tissue

- **General organization :**

a- little ground substance (tightly packed and close to each other) it is a bit more at the ground substance in irregular than regular.

a- Few cells (more fibroblasts)

b- Much collagen in randomly arranged fibers

- **Location/Example :** a- dermis of skin b-organ capsules

c- submucosa of digestive tract

- **Function :** protects and supports organs, resists tearing

For more understanding :

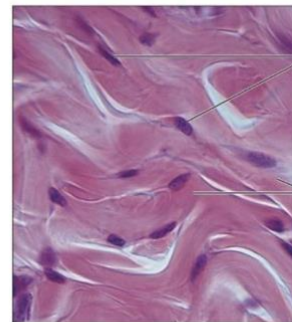
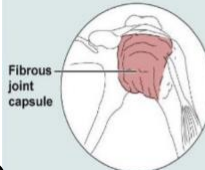
EX.: Capsules of organs covers organs from all directions → the fibers that cover it should also run in all directions so we need irregular tissue

Note : skin consist of epidermis (from the top), and dermis (from bottom) wich consist of 2 layers, Most of dermis structures consists of dense, but there is a small layer between epithelial and dense → loose CT

Description: Primarily irregularly arranged collagen fibers; some elastic fibers; major cell type is the fibroblast.

Function: Able to withstand tension exerted in many directions; provides structural strength.

Location: Fibrous capsules of organs and of joints; dermis of the skin; submucosa of digestive tract.



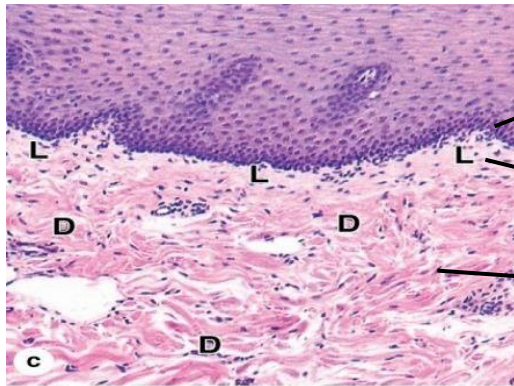
Photomicrograph: Dense irregular connective tissue from the dermis of the skin (600x).

Nuclei of fibroblasts
Collagen fibers

They are a bit more relaxed and rounded

وهذا لاننا لا نستطيع وضع النسيج الطلائي فوق نسيج dense مباشرة لانه يحوي الكثير من الكولاجين والذي يعتبر تركيب قوي وقاس، يعني الموضوع يشبه كيف بنضع الرضيع على فراش طري مو على الارض كي لا يتأذى

As you see here, there is no uniformity in this tissue fibers (they run in all directions)

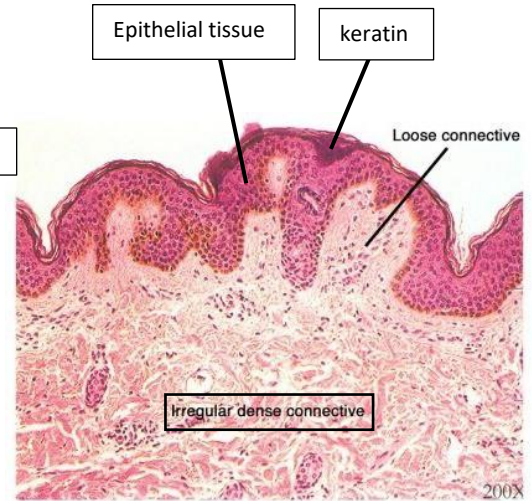


Basal layer

Loose CT
(more nuclei and collagen fibers)

Dense irregular CT

Source: Mescher AL: *Junqueira's Basic Histology: Text and Atlas*, 12th Edition. <http://www.accessmedicine.com>
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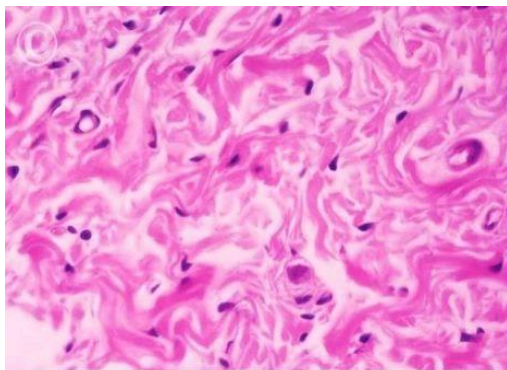
Epithelial tissue

keratin

Loose connective

Irregular dense connective

200X

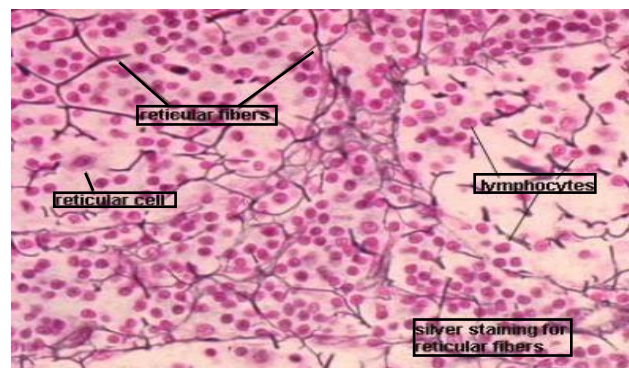
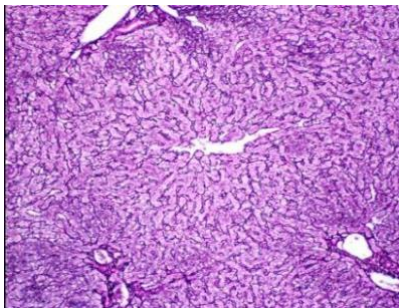


Dense irregular CT

AB911A [RM] © www.visualphotos.com

3- Reticular CT (specialized)

- **General organization** : consists of fine irregular reticular fibers and reticular cells.
- **Location/Example** : Liver, Spleen and Lymph Nodes
- **Function** : forms the framework (stroma) of organs and binds together smooth muscle cells.



reticular fibers

reticular cell

lymphocytes

silver staining for reticular fibers

Medical Application

- The regenerative capacity of connective tissue is clearly observed in organs damaged by ischemia, inflammation, or traumatic injury.
- Spaces left after such injuries, especially in tissues whose cells divide poorly or not at all (eg, cardiac muscle), are filled by connective tissue, forming dense irregular scar tissue.
- The healing of surgical incisions and other wounds depends on the reparative capacity of connective tissue, particularly on activity and growth of fibroblasts.
- In some rapidly closing wounds, a cell called the myofibroblast, with features of both fibroblasts and smooth muscle cells, is also observed.
- These cells have most of the morphologic characteristics of fibroblasts but contain increased amounts of actin microfilaments and myosin and behave
- Much like smooth muscle cells. Their activity is important for the phase of tissue repair called wound contraction.

هذا الجدول توسع من الكتاب والدكتورة
نبهت بأحد الشعب انه رح يبجي منه

TABLE 5-4 Examples of clinical disorders resulting from defects in collagen synthesis.

Disorder	Defect	Symptoms
Ehlers-Danlos type IV	Faulty transcription or translation of collagen type III	Aortic and/or intestinal rupture
Ehlers-Danlos type VI	Faulty lysine hydroxylation	Increased skin elasticity, rupture of eyeball
Ehlers-Danlos type VII	Decrease in procollagen peptidase activity	Increased articular mobility, frequent luxation
Scurvy	Lack of vitamin C, a required cofactor for prolyl hydroxylase	Ulceration of gums, hemorrhages
Osteogenesis imperfecta	Change of 1 nucleotide in genes for collagen type I	Spontaneous fractures, cardiac insufficiency

Summary :

TABLE 5-6		Classification of connective or supporting tissues.	
	General Organization	Major Functions	Examples
Connective Tissue Proper			
Loose (areolar) connective tissue	Much ground substance; many cells and little collagen, randomly distributed	Supports microvasculature, nerves, and immune defense cells	Lamina propria beneath epithelial lining of digestive tract
Dense irregular connective tissue	Little ground substance; few cells (mostly fibroblasts); much collagen in randomly arranged fibers	Protects and supports organs; resists tearing	Dermis of skin, organ capsules, submucosa layer of digestive tract
Dense regular connective tissue	Almost completely filled with parallel bundles of collagen; few fibroblasts, aligned with collagen	Provide strong connections within musculoskeletal system; strong resistance to force	Ligaments, tendons, aponeuroses, corneal stroma
Embryonic Connective Tissues			
Mesenchyme	Sparse, undifferentiated cells, uniformly distributed in matrix with sparse collagen fibers	Contains stem/progenitor cells for all adult connective tissue cells	Mesodermal layer of early embryo
Mucoid (mucous) connective tissue	Random fibroblasts and collagen fibers in viscous matrix	Supports and cushions large blood vessels	Matrix of the fetal umbilical cord
Specialized Connective Tissues			
Reticular connective tissue (see Chapter 14)	Delicate network of reticulin/ collagen III with attached fibroblasts (reticular cells)	Supports blood-forming cells, many secretory cells, and lymphocytes in most lymphoid organs	Bone marrow, liver, pancreas, adrenal glands, all lymphoid organs except the thymus

The End of sheet #7

لا تنسوا فلسطين من دعائكم ﷻ