CONNECTIVE TISSUE (C.T.)

- Objectives:

  By the end of this lecture, the student should be able to:

  1. Enumerate the general characteristics of C.T.
  2. Classify C.T. into *C.T. proper (C.T.P.)* and *special types of C.T.*
  3. Describe components of C.T.P.
  4. Classify C.T.P. and know the distribution and function of each type.

DEFINITION OF C.T.

- It is one of the 4 basic tissues.
- It is mesodermal in origin.
- It supports, binds, and connects other tissues and organs providing structural and metabolic support for them.

General Characteristics of C.T.

1. C.T. is formed of widely separated, few cells with abundant extracellular matrix.
2. Most C.T. are vascular.

COMPONENTS & TYPES OF CONNECTIVE TISSUE

Components of C.T.

1. **Cells:** different types.
2. **Fibers:** collagenous, elastic & reticular.
3. **Matrix:** the intercellular substance, in which cells and fibers are embedded.

Types of C.T.

- Soft → C.T. Proper
- Rigid (firm, rubbery) → Cartilage
- Hard (solid) → Bone
- Fluid (liquid) → Blood

Components of Connective Tissue Proper

Components of C.T. Proper:

A. Cells.

B. Fibers.

C. Matrix.

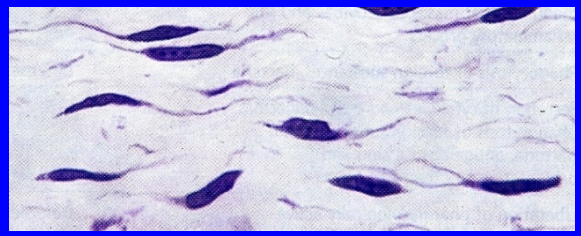
(A) Cells

1- Fibroblasts.
2- Macrophages.
3- Mast cells.
4- Plasma cells.
5- Adipose cells (Adipocytes, Fat cells).
6- Leucocytes.

1- Fibroblasts

L/M:

- Most common cell; found nearly in all types of C.T. proper.
- Flat branched cells (spindle-shaped) with basophilic cytoplasm.
- They can divide.
- Old fibroblasts are called fibrocytes.



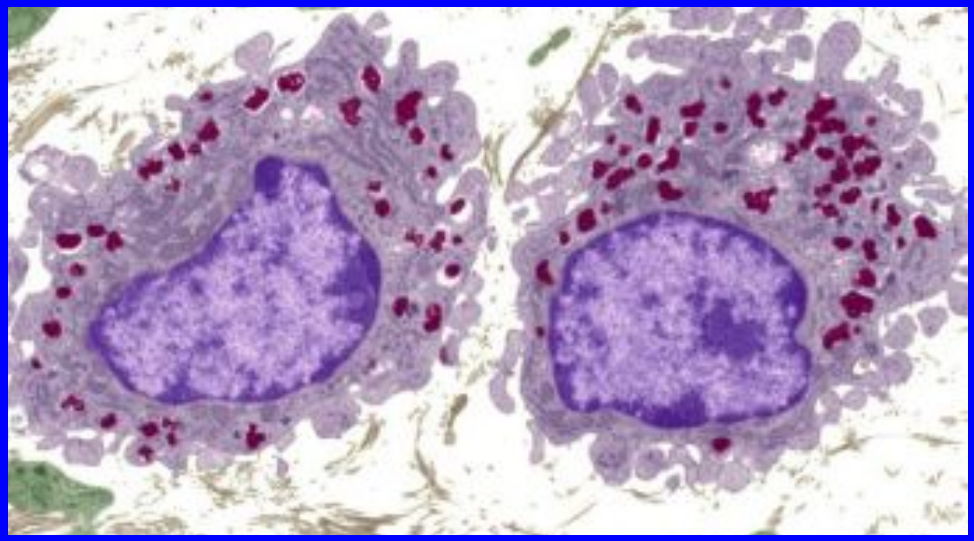
Function:

1. Formation of proteins of C.T. fibers.
2. Formation of C.T. matrix.
3. Healing of wounds.

2- Macrophages

L/M:

- Basophilic cytoplasm, rich in lysosomes.
- Irregular outlines.
- They can divide.
- They originate from blood monocytes.



Function:

Phagocytosis.

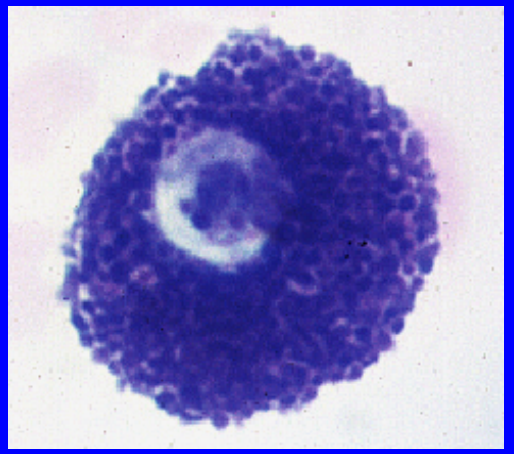
3- Mast Cells

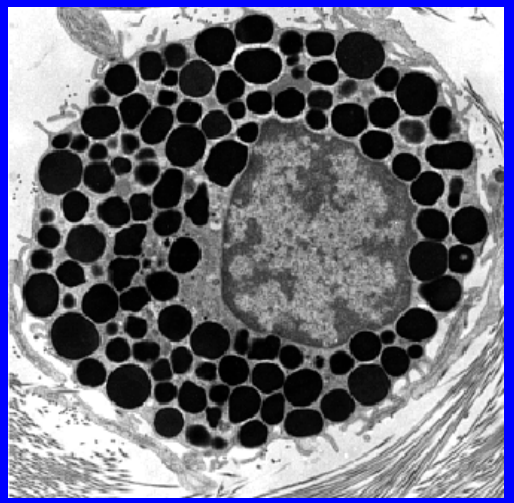
L/M:

- Cytoplasm contains numerous basophilic cytoplasmic granules.

Function:

1. Secrete heparin (anticoagulant).
2. Secrete histamine (allergic reactions).

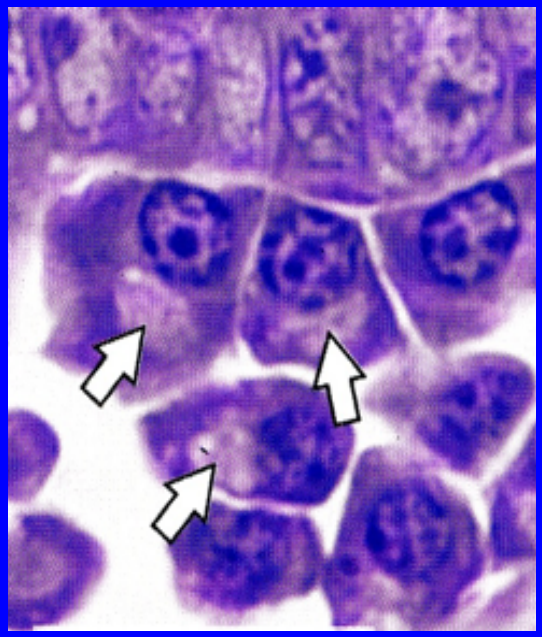




4- Plasma Cells

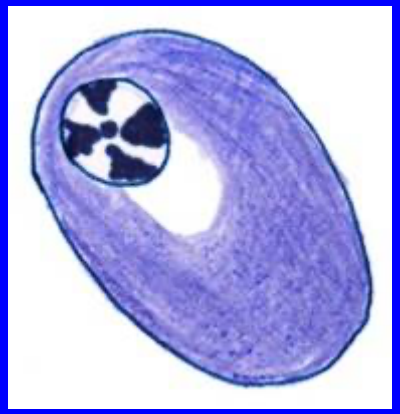
L/M:

- Basophilic cytoplasm with a negative Golgi image.
- Nucleus: spherical, eccentric with a clock-face appearance of chromatin.
- Derived from B-lymphocytes.



Function:

Secretion of antibodies (immunoglobulins).



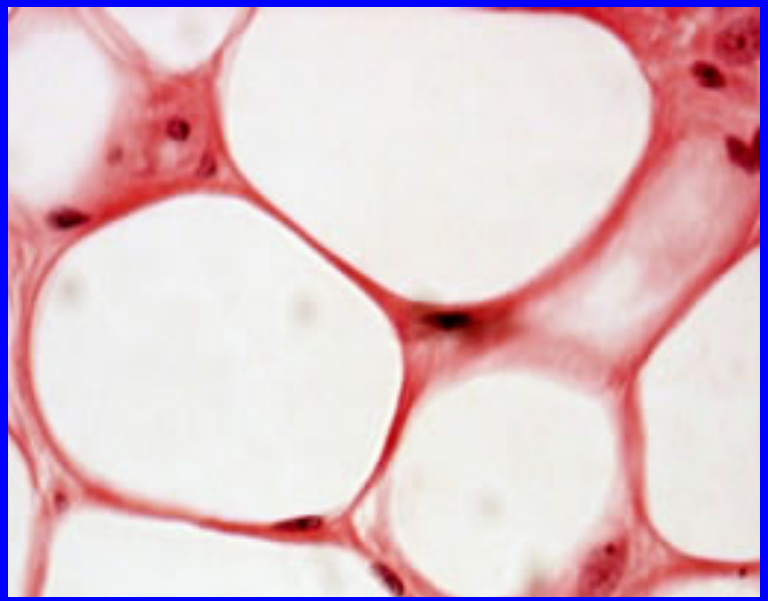
5- Adipose Cells (Adipocytes, Fat Cells)

L/M of Unilocular Adipose Cells:

- Large spherical, with a single large fat droplet.
- Thin rim of cytoplasm at the periphery.
- Nucleus: flattened, peripheral.

Function:

Storage of fat.



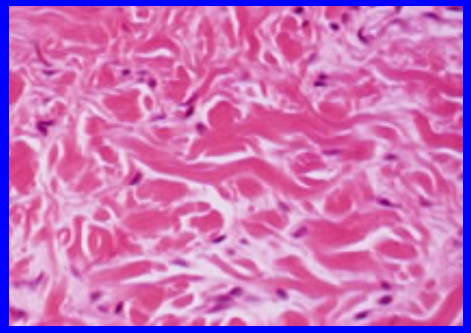
6- Leucocytes (White Blood Cells)

- Appear normally in C.T. proper.
- Neutrophils increase in acute inflammation.
- Lymphocytes and monocytes increase in chronic inflammation.
- Eosinophils and basophils increase in allergic inflammation.

(B) Fibers

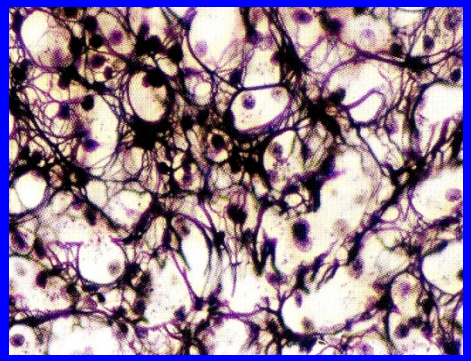
1- Collagen Fibers (made of collagen type I):

- Non-branched fibers, arranged in bundles.
- Acidophilic.



2- Reticular Fibers (made of collagen type III):

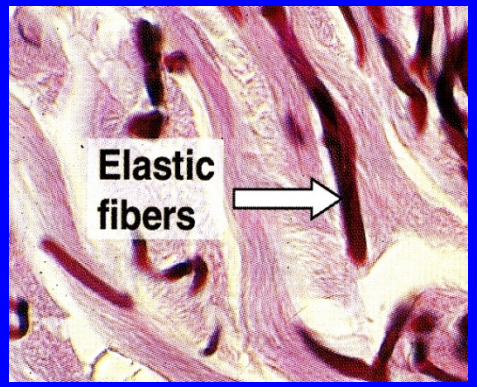
- Branch and form a network.
- Stained black with silver.



N.B. *Other important types of collagen include:*
type II (in cartilage).
type IV (in basement membranes)

3- Elastic Fibers (made of elastin):

- Branched.
- Stained brown with orcein.



Types of Connective Tissue Proper

Types of C.T. Proper:

I. Loose (Areolar) C.T.
II. Dense Collagenous C.T.
III. Elastic C.T.
IV. Reticular C.T.
V. Adipose Tissue.

I- LOOSE (AREOLAR) C.T.

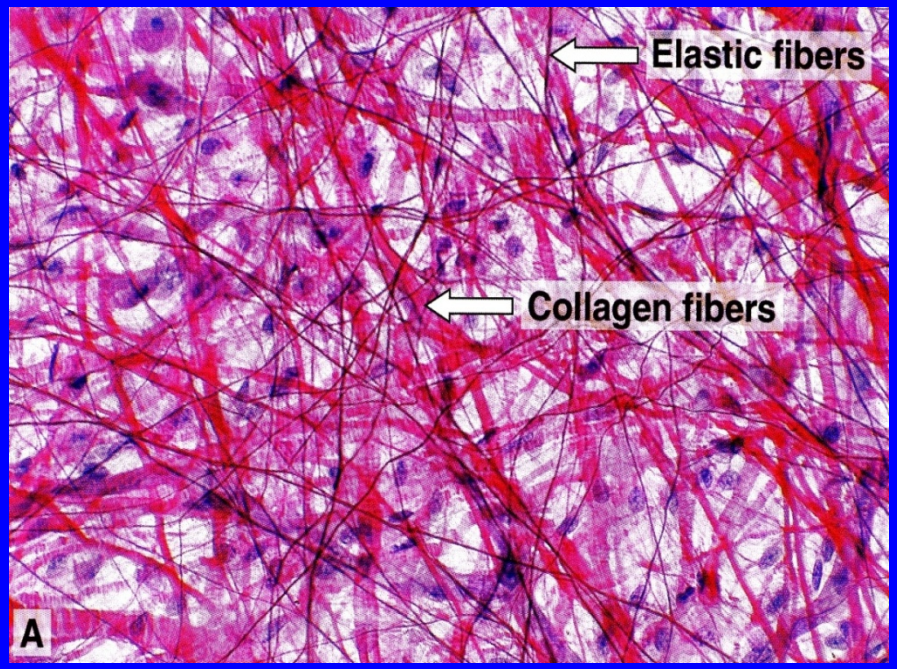
The most common type of C.T. proper.

L/M:

- Contains all the main components of C.T.P.: all types of C.T. cells & fibers + abundant matrix.
- No predominant element in loose C.T.

Sites:

e.g. Subcutaneous tissue.



II- DENSE COLLAGENOUS C.T.

L/M:

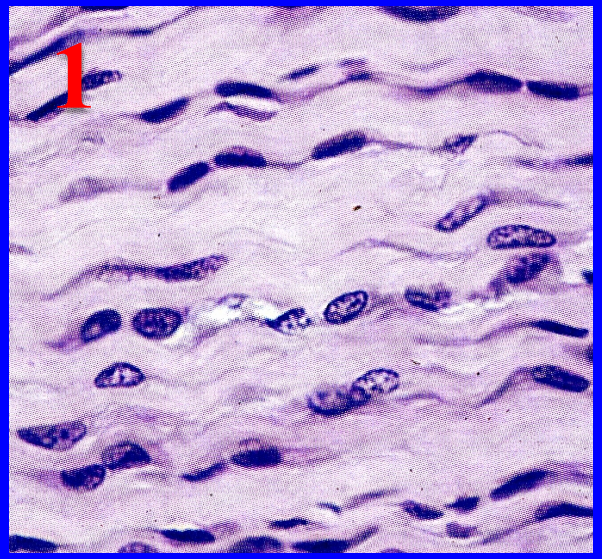
Predominance of collagen fibers + fibroblasts.

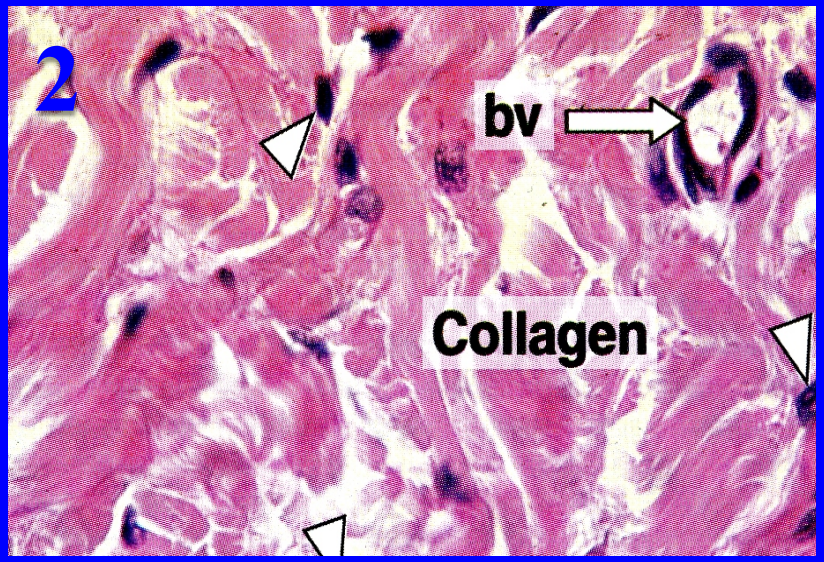
Sites:

1- Dense regular: e.g. tendons, ligaments.

2- Dense irregular: e.g. dermis of the skin, capsules.

Function: tough tissue; resistant to stretch.





III- ELASTIC TISSUE

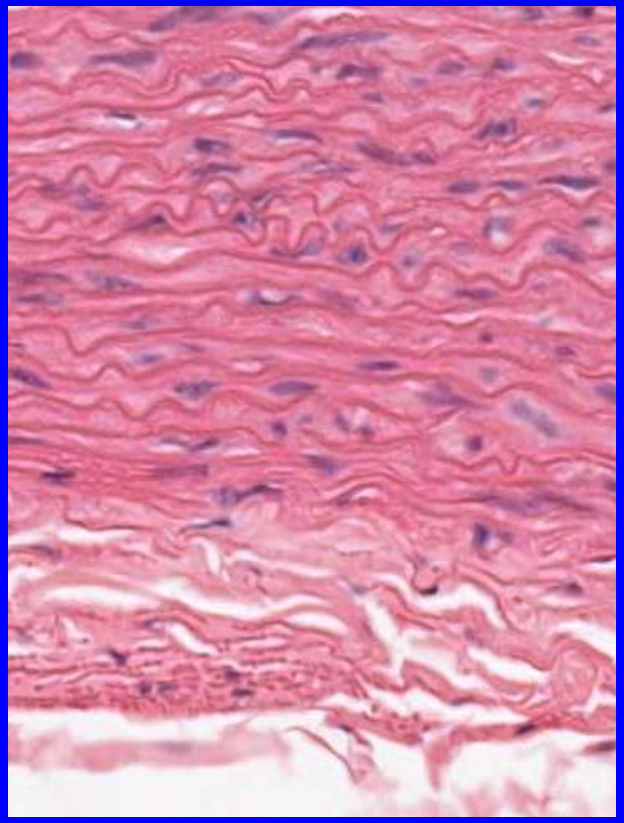
L/M:

Predominance of elastic fibers (sheets or membranes) + fibroblasts.

Sites:

Large arteries, e.g. Aorta

Function: elastic tissue; stretchable.



IV- RETICULAR TISSUE

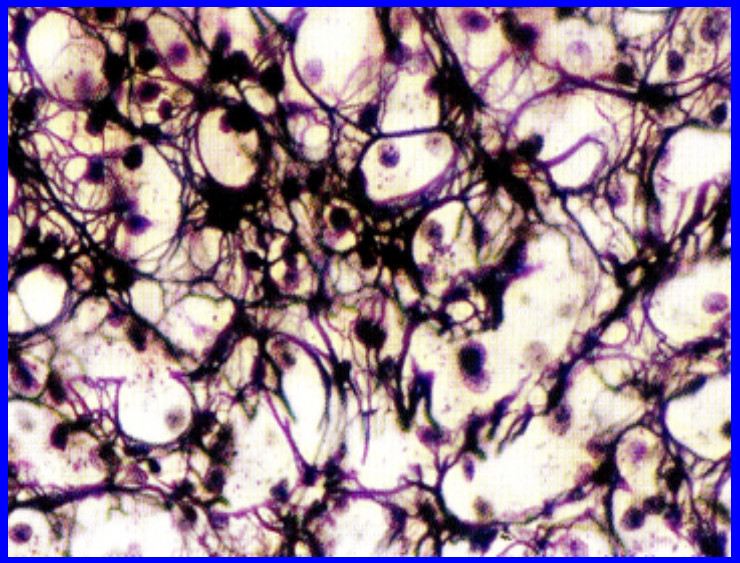
L/M:

Predominance of reticular fibers + reticular cells (specialized fibroblasts).

Sites:

Stroma of organs: e.g. liver, lymph node, spleen.

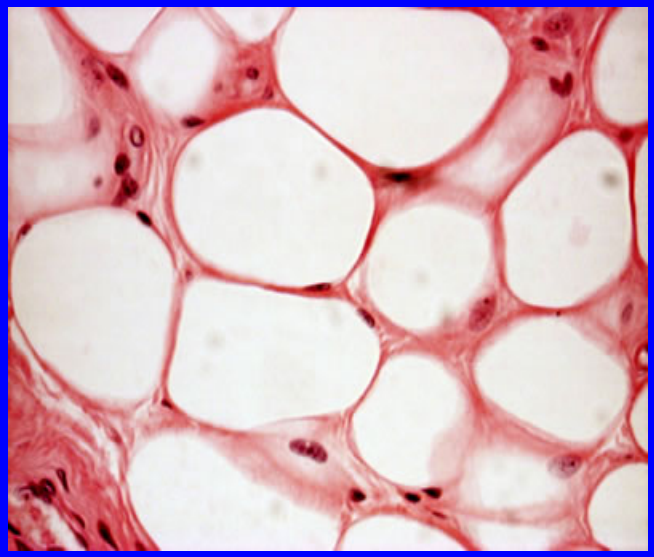
Function: structural support.



V- UNILOCULAR ADIPOSE TISSUE (WHITE ADIPOSE TISSUE)

L/M:

Predominance of unilocular fat cells.



Sites:

- Subcutaneous tissue, especially in:
  - Buttocks.
  - Abdominal wall.
  - Female breast.
- Around the kidney.

Function:

- Synthesis, storage, & release of fat.
- Supports organs, e.g. kidney.
- Heat insulation.

Functions of Connective Tissue Proper

1. **Supports**, **binds**, and **Connects** other tissues and organs.
2. **Nourishes** the surrounding structures, through its blood vessels.
3. Its **Cells** provide healing of injured tissues, produce heparin, histamine & antibodies, store fat & preserve body temperature and protect against microorganisms.
4. Its **Fibers** provide rigidity or elasticity.

References & Resources

- For Theoretical:
  - Color Textbook of Histology,
    L.P. Gartner and J.L. Hiatt.
- For Practical:
  - Di Fiore's Atlas of Histology,
    V.P. Eroschenko.

Thank you