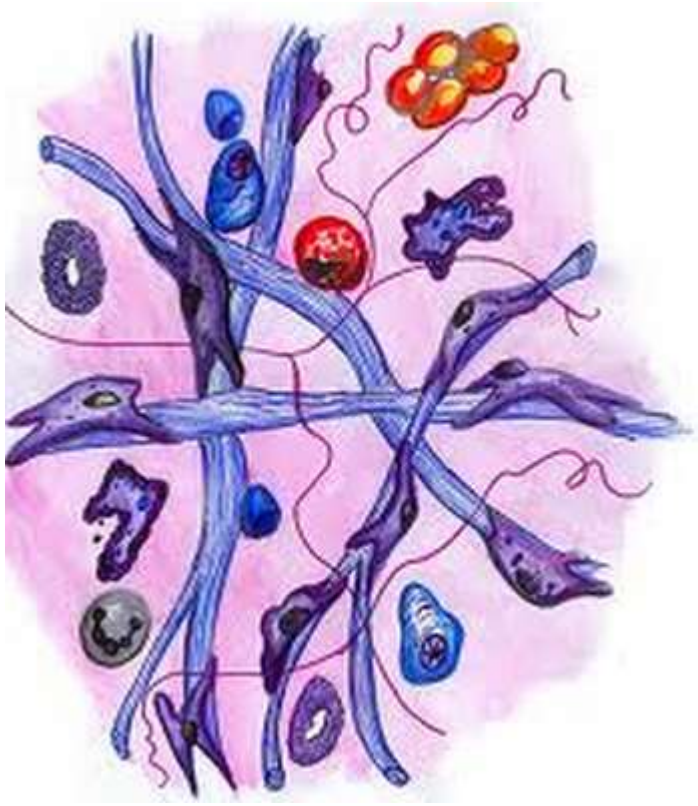
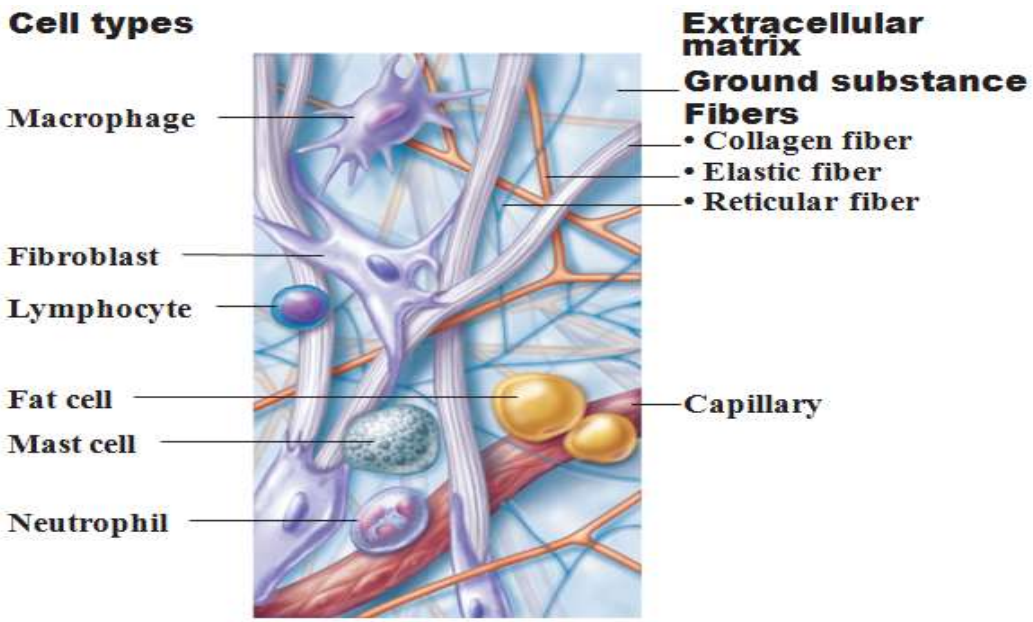
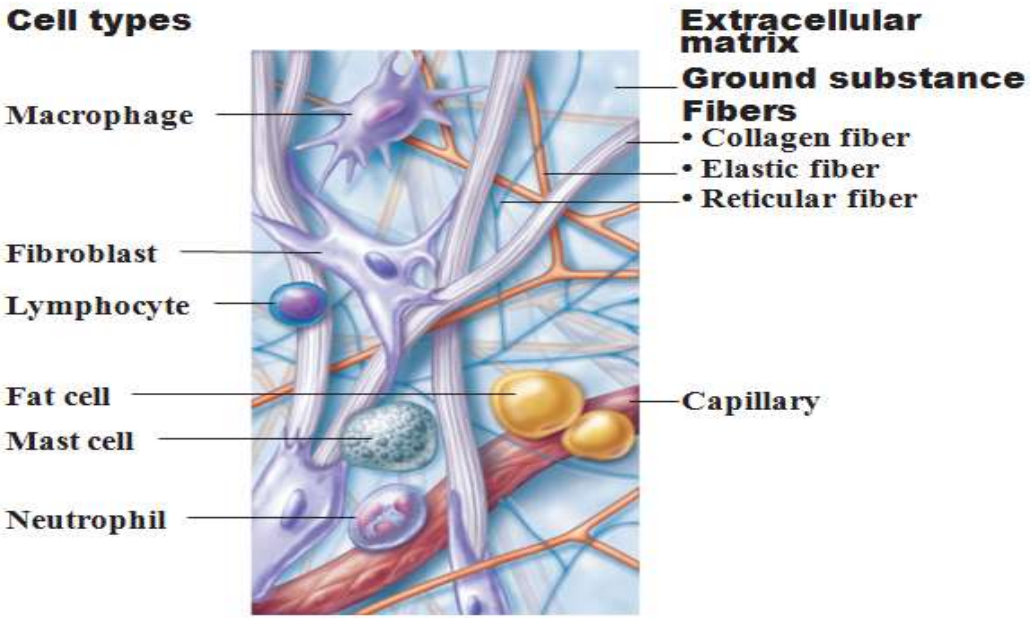
Connective Tissue





Dr. Rajeev Kr Mukhia

- One of the basic tissue which gives structural & metabolic support to other tissue & organ of the body.
- **Made up of;**
  A. Cells
  B. Extracellular materials (ECM-give strength to CT)
     - Fibres
     - Ground substance



Composition of connective Tissue

A. Cells: 2 types;

1. Fixed cells (Intrinsic cells)

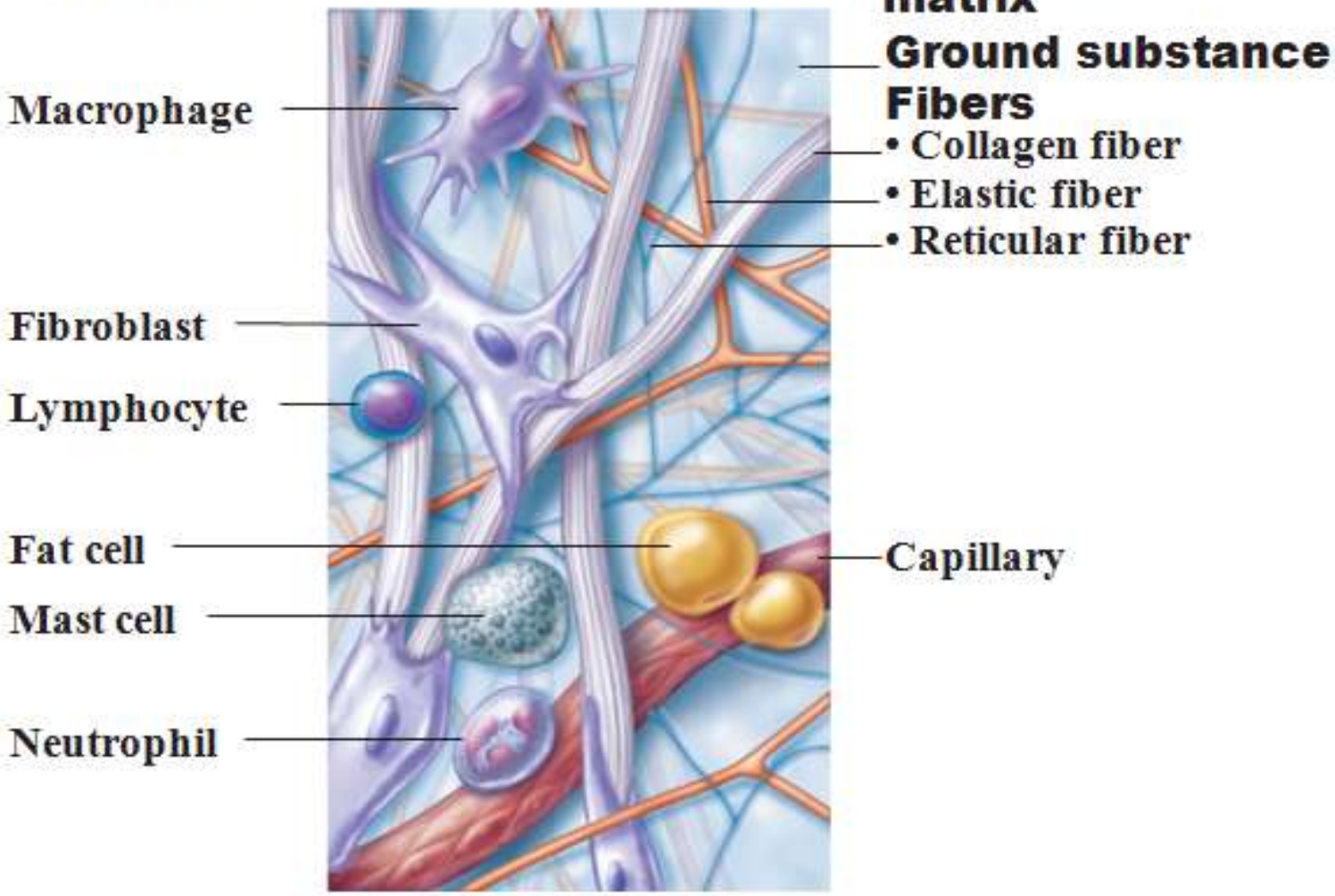
a. Fibroblasts & fibrocytes
b. Fat cells (Adipocytes)
c. Fixed macrophage (Histiocytes)

Fixed cells are responsible for production & maintenance of ECM.

2. Free cells (Extrinsic cells)

a. Plasma cells
b. Mast cells
c. Free macrophage
d. Leucocytes

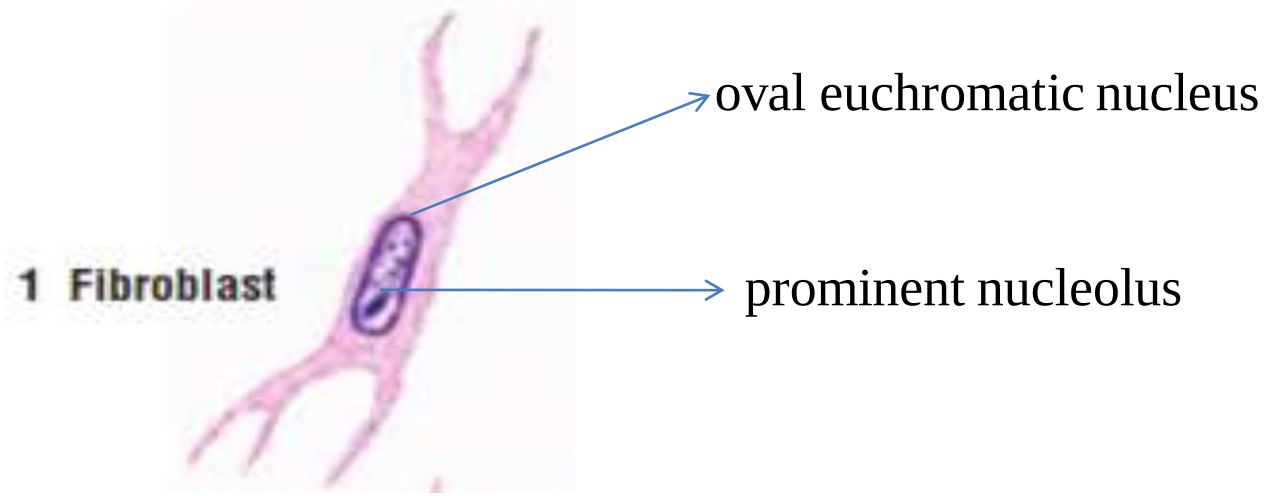
Free cells are responsible for tissue reaction to injury or invasion of m/o.


Cell types
Macrophage
Fibroblast
Lymphocyte
Fat cell
Mast cell
Neutrophil
Extracellular matrix
Ground substance
Fibers
• Collagen fiber
• Elastic fiber
• Reticular fiber
Capillary

1. Fixed cells (Intrinsic cells)

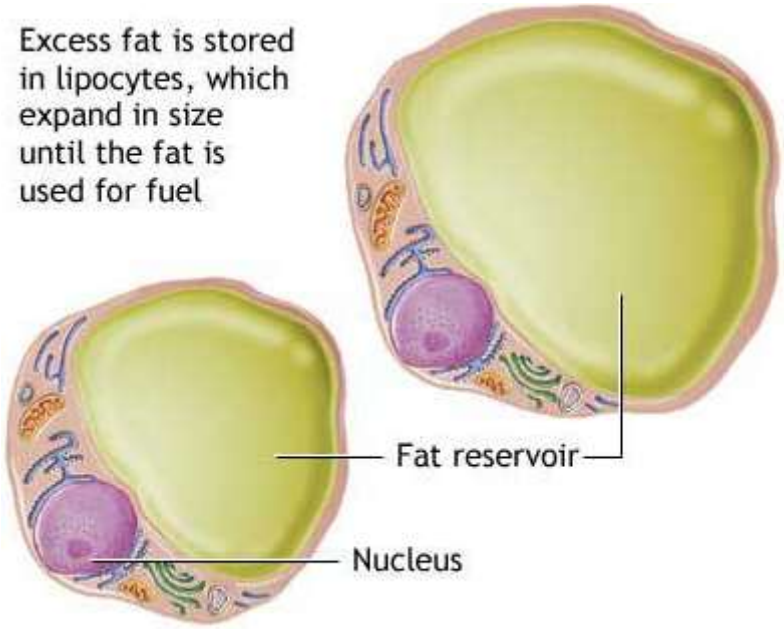
a. Fibroblasts & fibrocytes:

- Most commonly seen cell in CT.
- Shape: Flat & fusiform with slender process.
- Responsible for formation of fibres & ground substance.
- Fibrocytes: Old inactive & resting fibroblast.



b. Fat cells (Adipocytes)

- Each cells is spherical or polygonal , consists of peripheral rim of cytoplasm with an eccentric nucleus.
- Contain large central lobule of fat.
- With H&E stain the fat is dissolved by solvent/xylol hence cell resemble a signet ring.
- Incapable of division.
- Store energy(lipid).



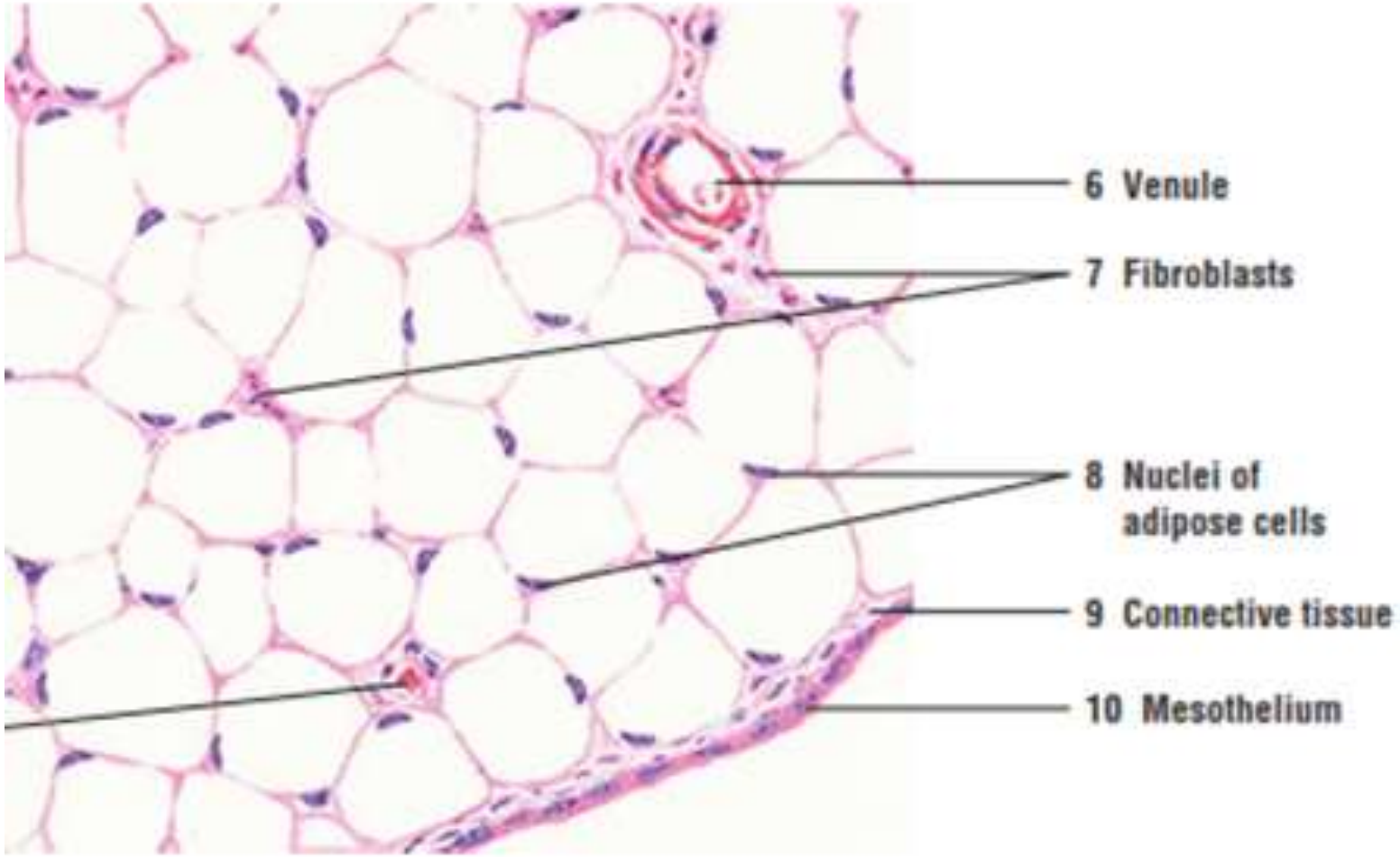


Fig: Adipose tissue

c. Fixed macrophage (Histiocytes)

- Irregular in shape with numerous filopodial process.
- They are derived from blood monocytes.
- Acidophilic cytoplasm with hyperchromatic nucleus.
- Cytoplasm contain numerous lysosomes filled with hydrolytic enzyme.
- Function : Phagocytosis

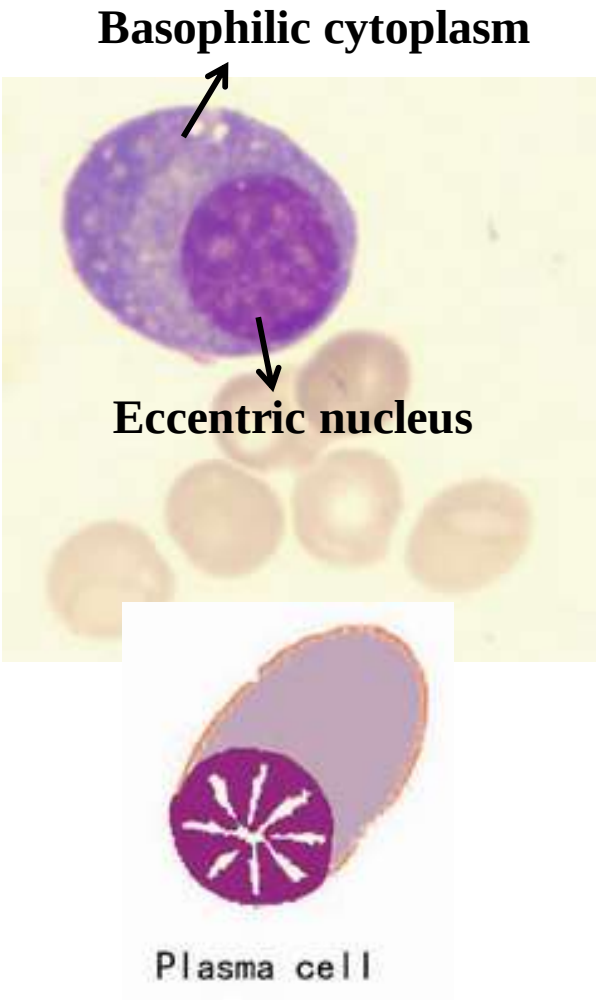
Play a role in the local defense

of the body against bacterial invasion.

2. Free cells (Extrinsic cells)

a. Plasma cells:

- Oval shape cells with basophilic cytoplasm.
- Clump of chromatin are distributed around the periphery of nucleus giving a cartwheel appearance.
- Derived from B- lymphocytes.
- Involved in defense of the body by producing antibodies (immunoglobulins).
- Found: more in gastrointestinal and respiratory tracts.



b. Mast cells

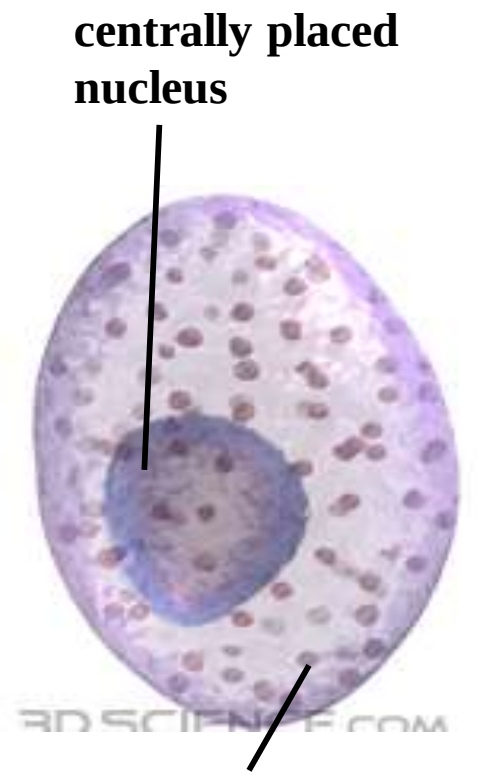
- Shape: round or fusiform cells with centrally placed round nucleus.
- Cytoplasm filled with metachromatic granules.

- Found: fibrous capsule of liver, along blood vessel, mucosa of alimentary & digestive tract.
- They are involved in inflammatory reactions, allergies and hypersensitive states.

Function:

- ✓ It produce heparin which is anticoagulant in function.

- ✓ Produce histamine which promotes capillary leakage, oedema & contraction of smooth muscle.



c. Free macrophage

- During antigenic stimulation or inflammation, the fixed macrophages withdraw their processes & become free macrophage.

d. Leucocytes

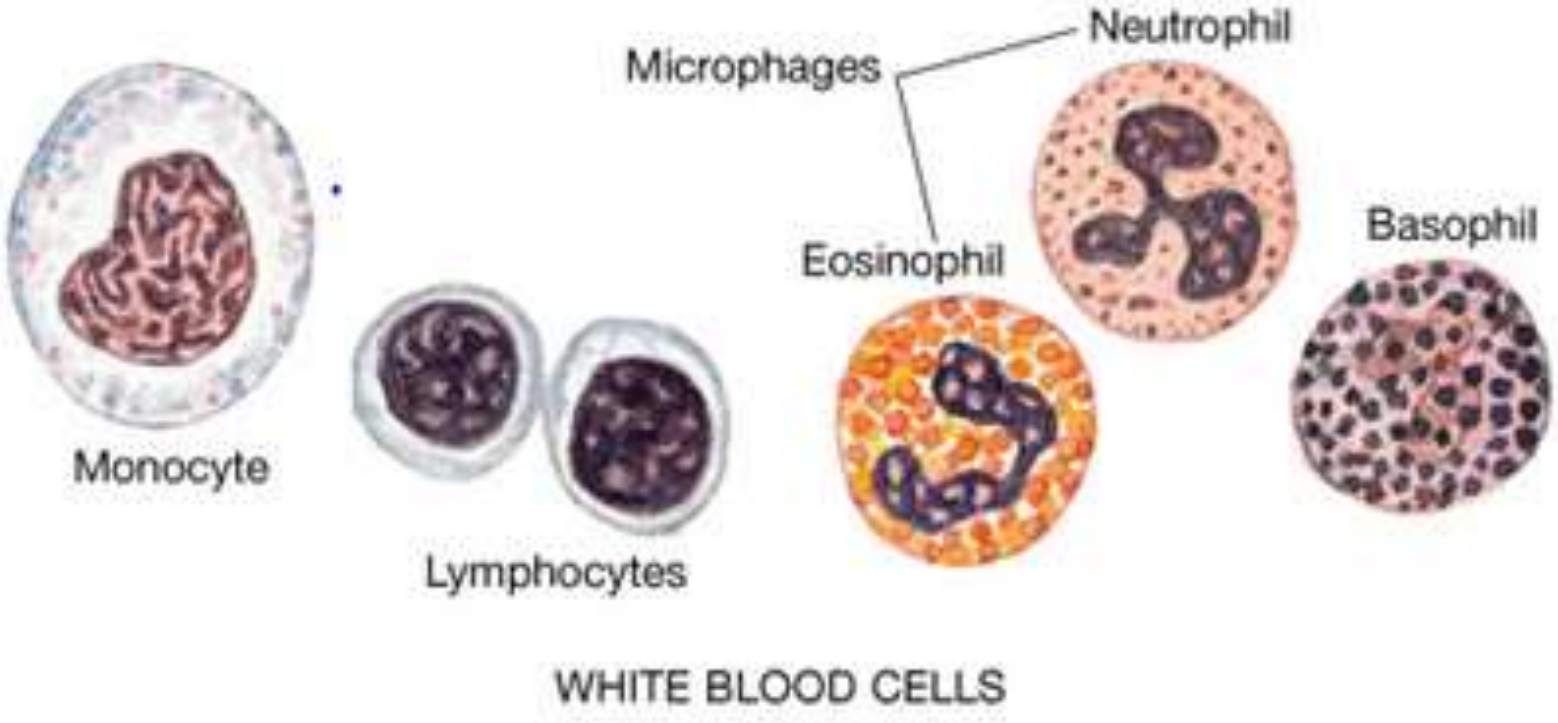
- White Blood Cells migrate from blood vessels into connective tissue.

2-types:

a. Granular: neutrophils, eosinophils, basophils

b. Agranular: lymphocytes & monocytes.

- Found in large numbers during inflammatory condition.
- Function: defend the organism against bacterial invasion.



B. Fibres (ECM)

Includes**:** **3 type**

a. Collagen fibres

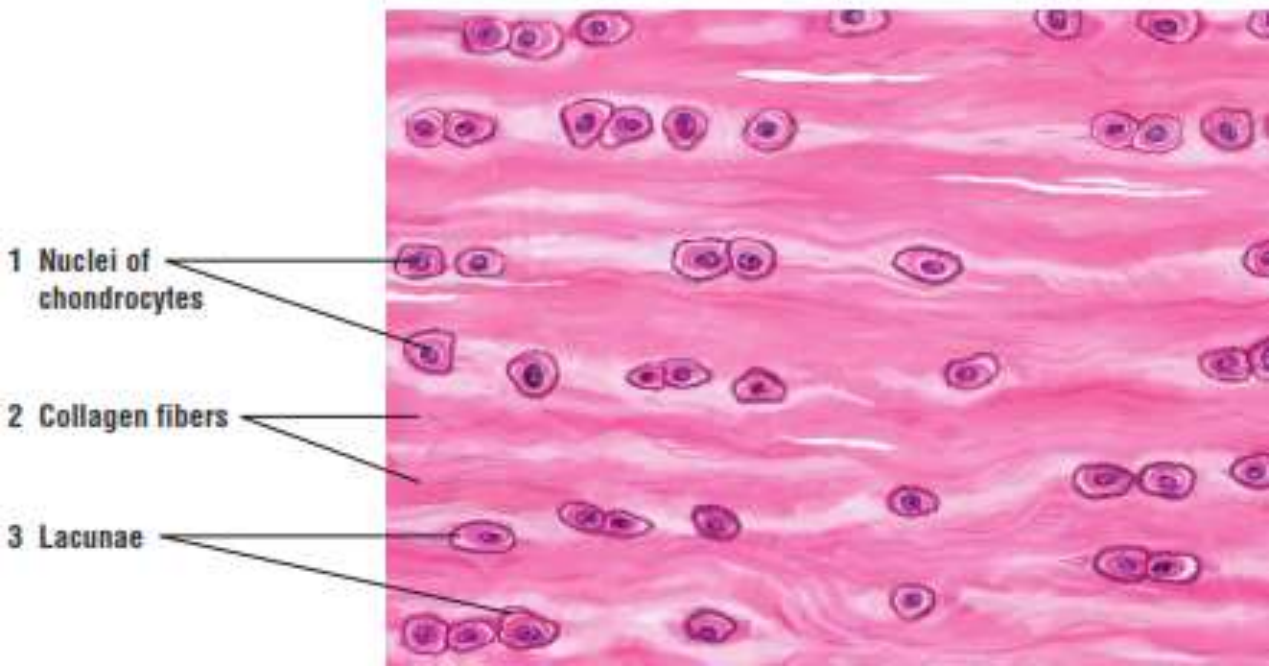
b. Elastic fibres

c. Reticular fibres

- Synthesized by fibroblast.
- Function: provide strength to connective tissue.

a. Collagen fibres

- Composed of a protein called collagen.
- Occurs singly or in bundle.
- They do not branch and run in wavy course.

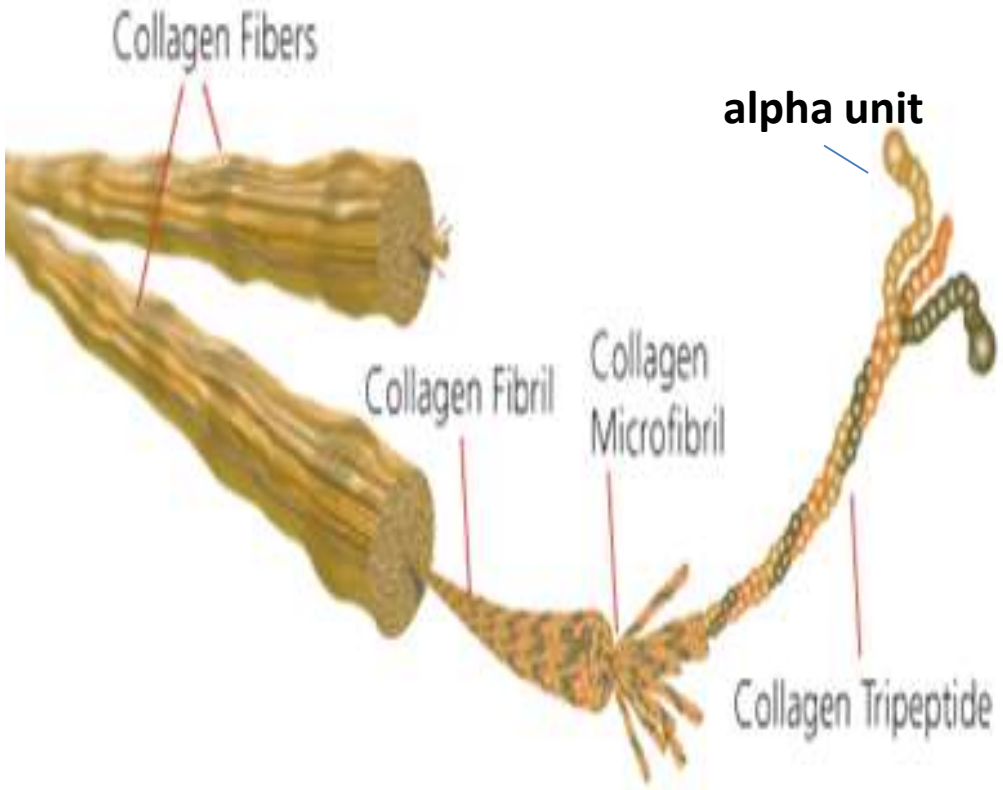


Each collagen fibres consist of small parallel fibrils.

Each fibril (E/M) - bundle of microfibrils.

Each microfibrils composed of tropocollagen molecules which are responsible for the striations.

Made of 3-polypeptide chain called alpha unit.

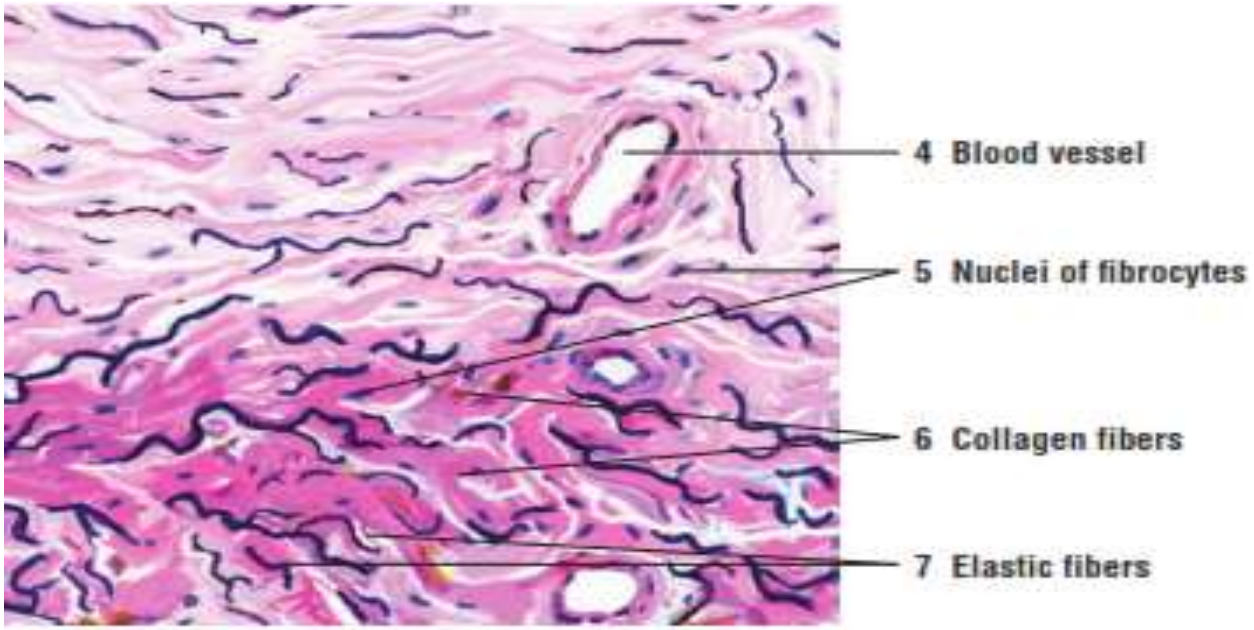


Classification of collagen fibres: 4 types

1. Type I : bone, tendon, ligament, skin.
2. Type II : hyaline & elastic cartilage.
3. Type III : liver, spleen, lymphnode, hemopoietic organ.
4. Type IV : basement membrane.

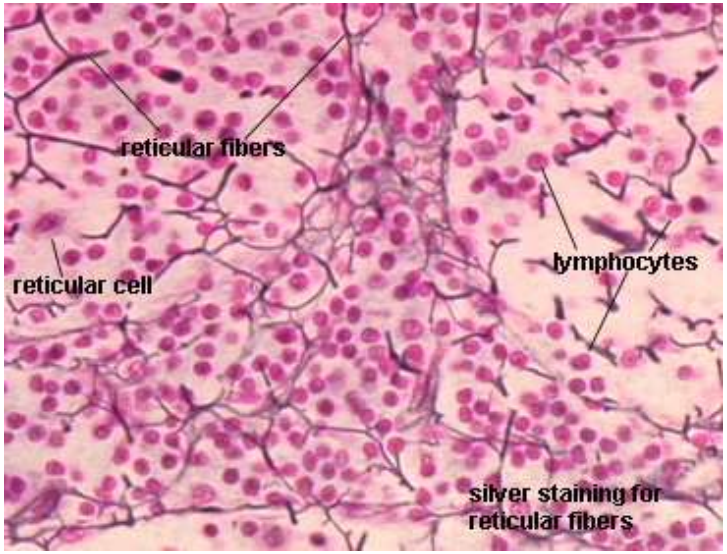
b. **Elastic fibres**

- Thin, small, branching fibres which are capable of stretching & returning to their original length.
- Fibers occurs singly and not in bundles.
- Composed of elastin protein.
- Found in:
- lungs,
- bladder wall,
- blood vessels & skin.



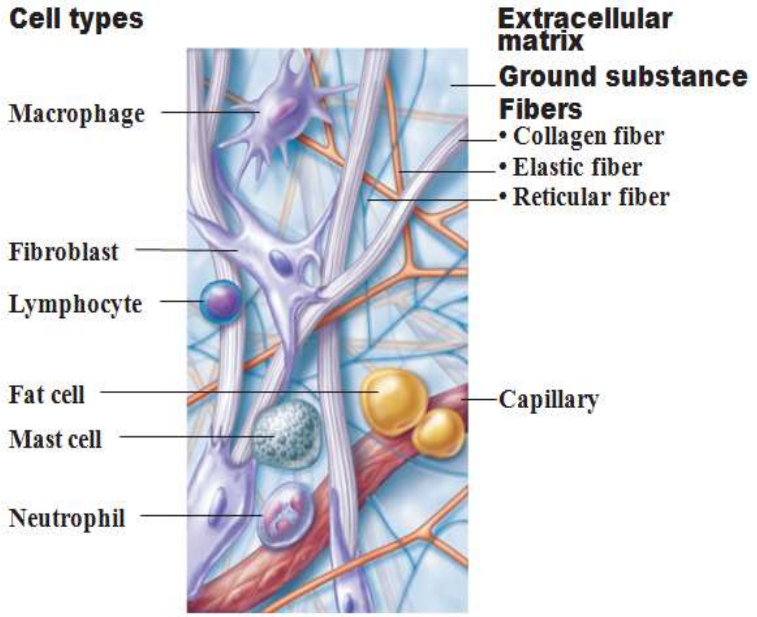
C. Reticular fibres

- Formed mainly of type III collagen fibres.
- Thin & form supportive framework of lymphoid organ & gland.
- Visible only stained by sliver stain.



B. Ground Substance (ECM)

- Transparent, homogeneous viscous solution.
- Fills the space between cells & fibres.
- Composed: of 3 components



1. mucopolysaccharides- glycosaaminoglycans.
2. structural glycoproteins- fibronectin, chondronectin and laminin.
3. water & electrolytes.

Functions of connective tissue

1. Support- provides structural and mechanical support to the body by binding the cells and organs together.

2. Storage- Adipose tissue is the storehouse of energy and loose areolar tissue stores water and electrolytes.

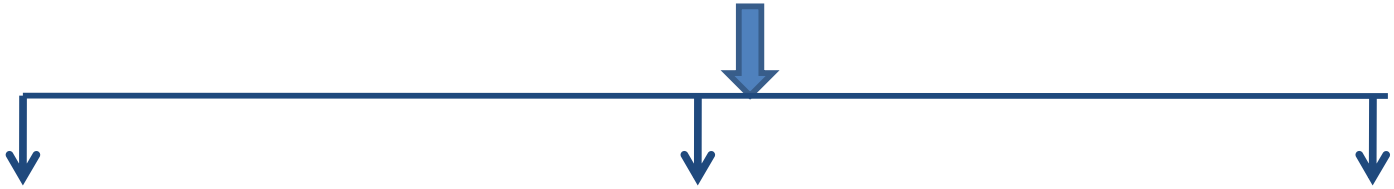
3. Transport- nutrients and metabolic wastes are exchanged between cells and blood.

4. Repair- has great regenerative capacity and heal the injury or wound.

5. Defense- either by phagocytosis of foreign body or by producing specific antibodies against antigen.

Classification of CT

Connective tissue



Connective tissue proper

a. Loose CT

b. Dense CT

c. CT with special properties.

Scleral CT

a. Cartilage

b. Bone

Fluid CT

a. Blood

b. Lymph

connective tissue proper / ordinary CT

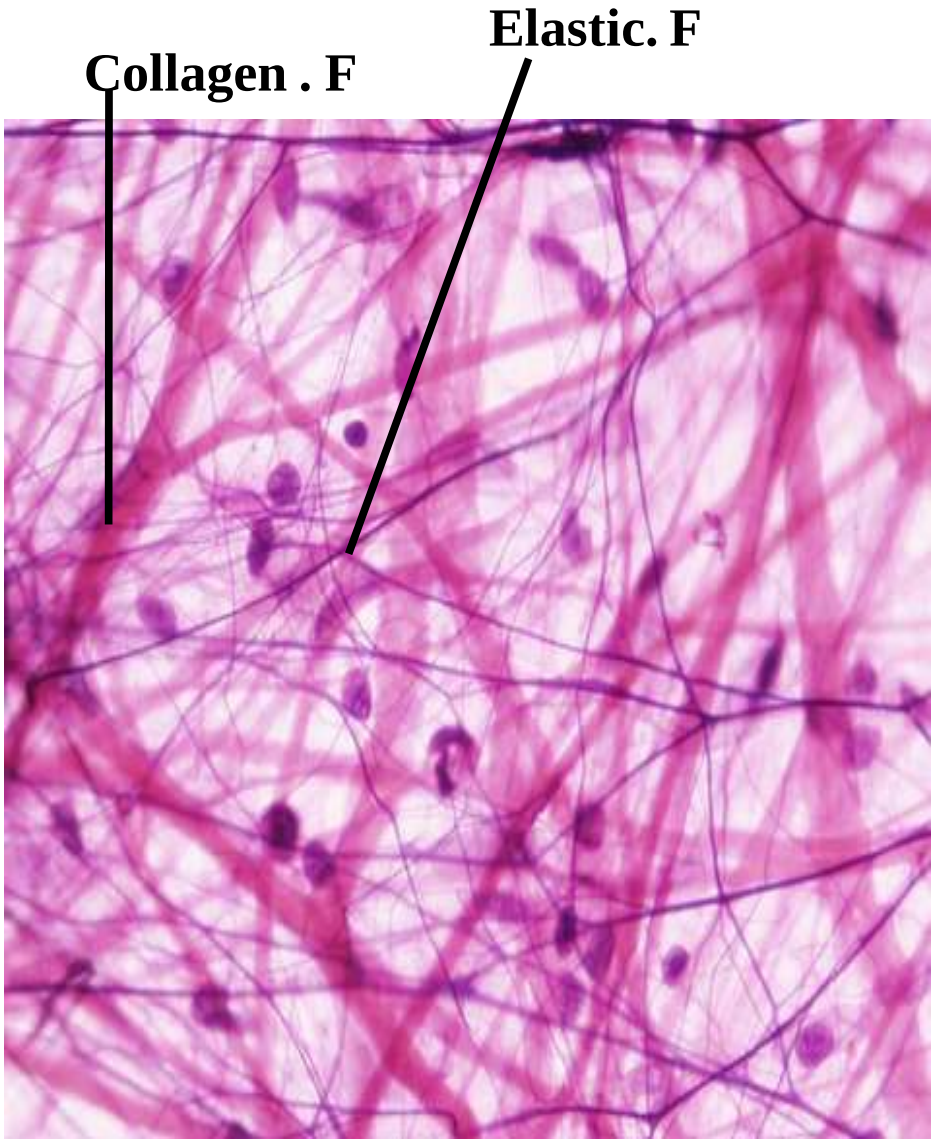
1. Loose areolar connective tissue

✓Few loosely arranged collagen & elastic fibres.

✓Abundant ground substance.

✓Serve as a packing material by filling spaces betn various tissue components of an organ & giving its shape.

✓E.g. subperitoneal tissue, endomysium, lamina propria.



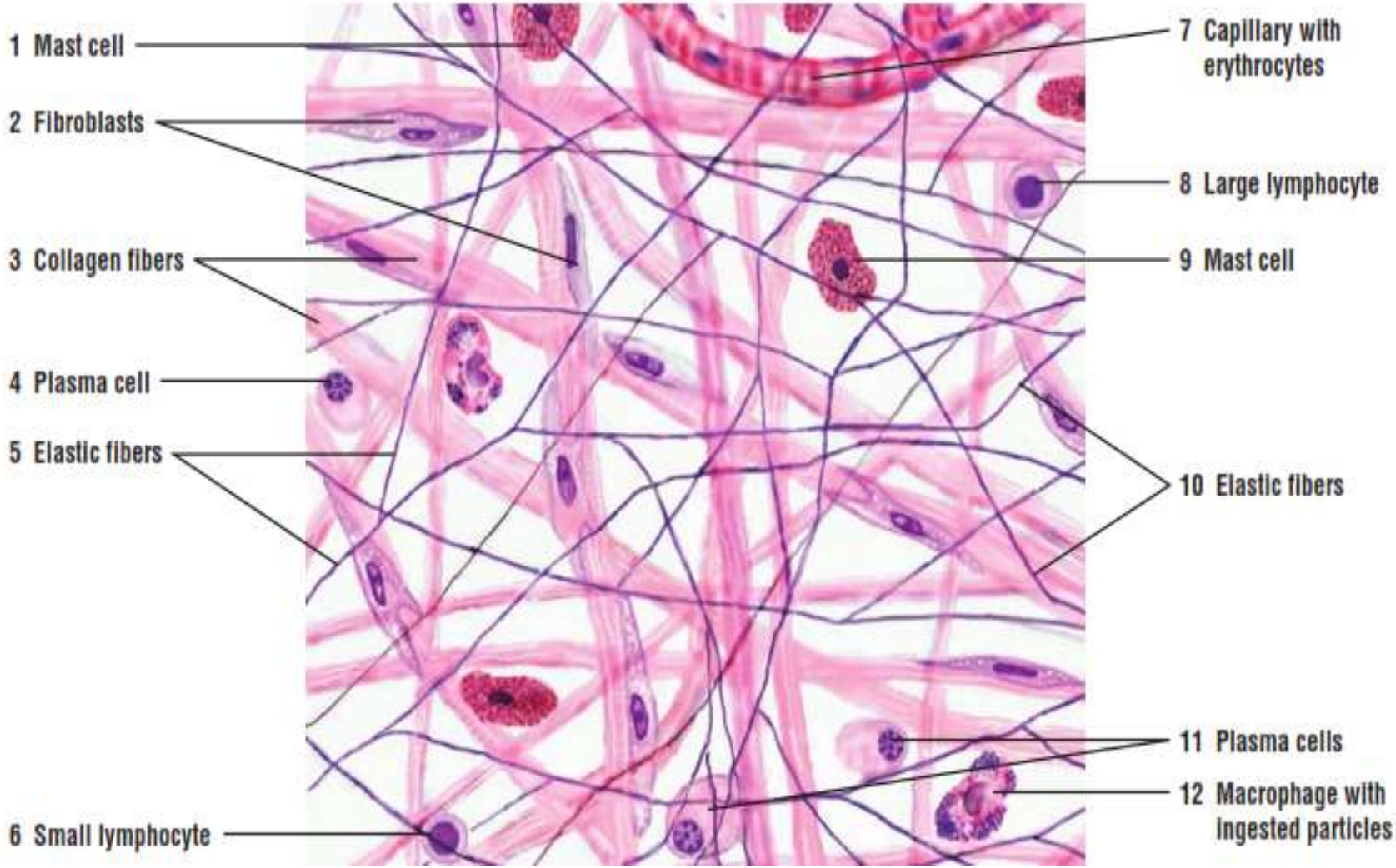


Fig: loose areolar connective tissue

Dense collagenous connective tissue

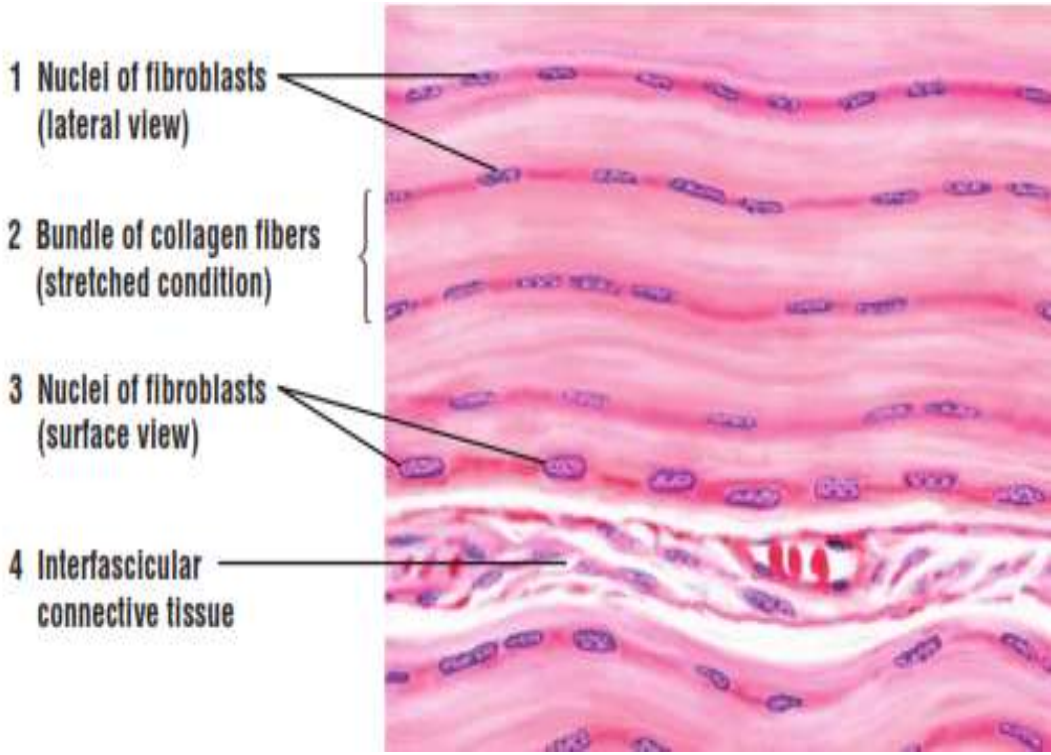
- ✓ Collagen fibres are densely packed giving strength & resistance.

2-types: Dense regular CT.

Dense irregular CT.

I. Dense regular CT.

- Bundle of parallel collagen fibres.
- Collagen fibers are densely packed in an orderly manner and contain parallel row of fibroblast.
- Less ground substance.
- E.g. tendon, ligament, aponeurosis.



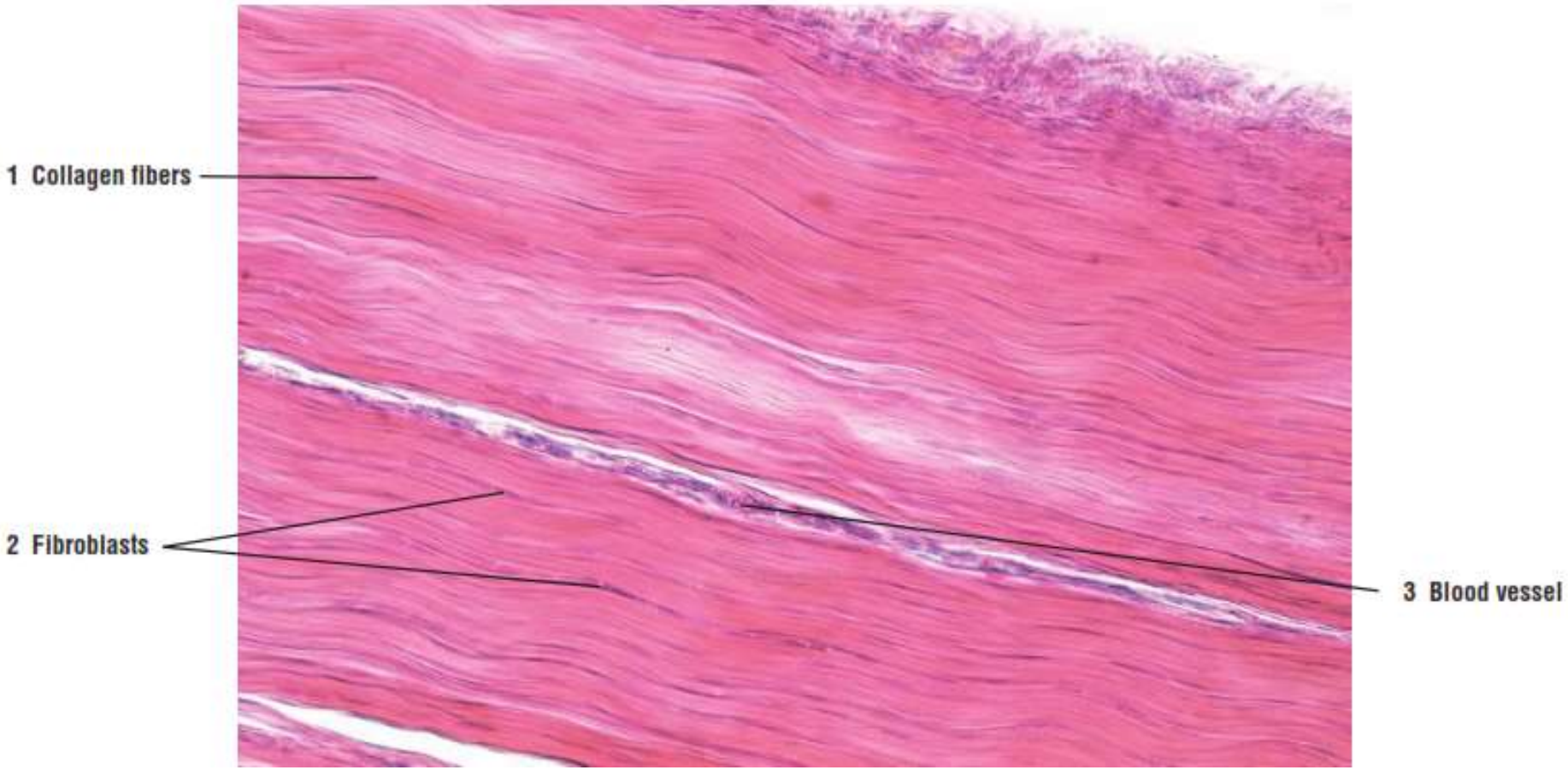
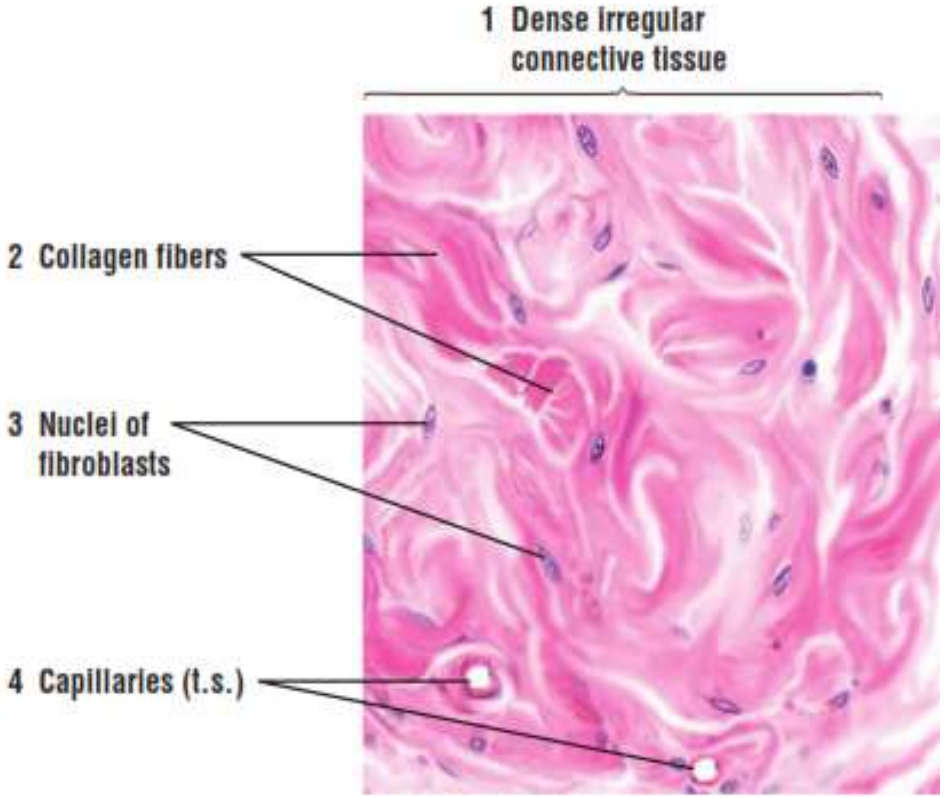


Fig: Dense regular collagenous connective tissue

II. Dense irregular CT.

- Densely packed collagen fibres but oriented in all direction.

- E.g. dermis of skin.



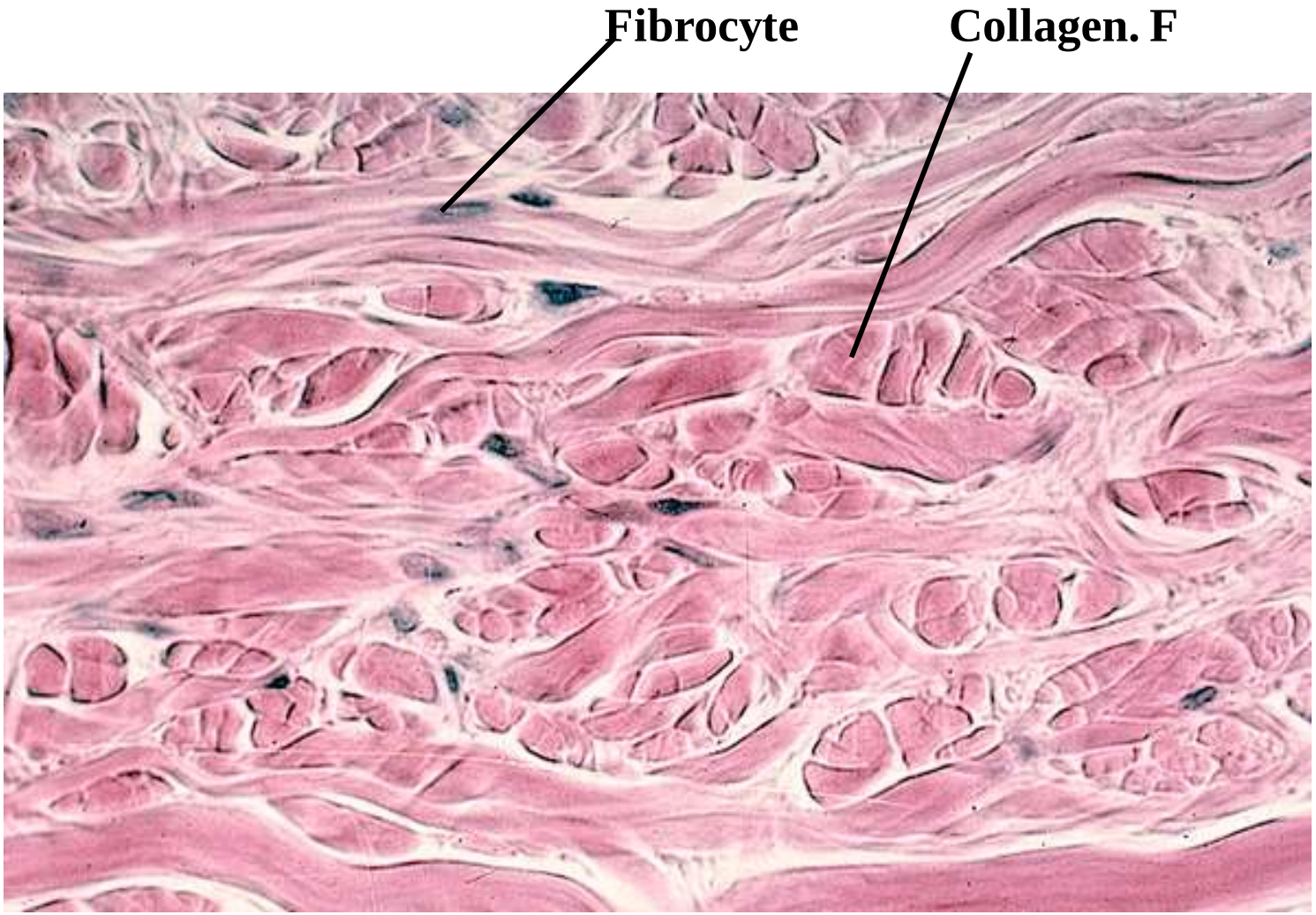


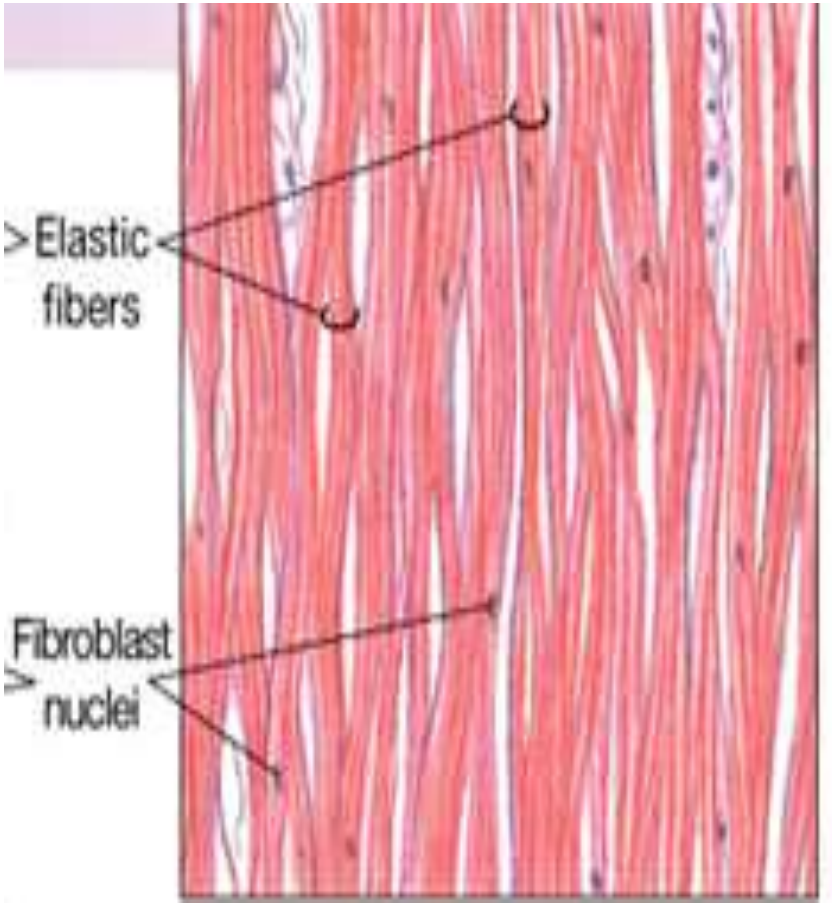
Fig: Dense irregular collagenous connective tissue

Connective tissue with special properties

Following types:

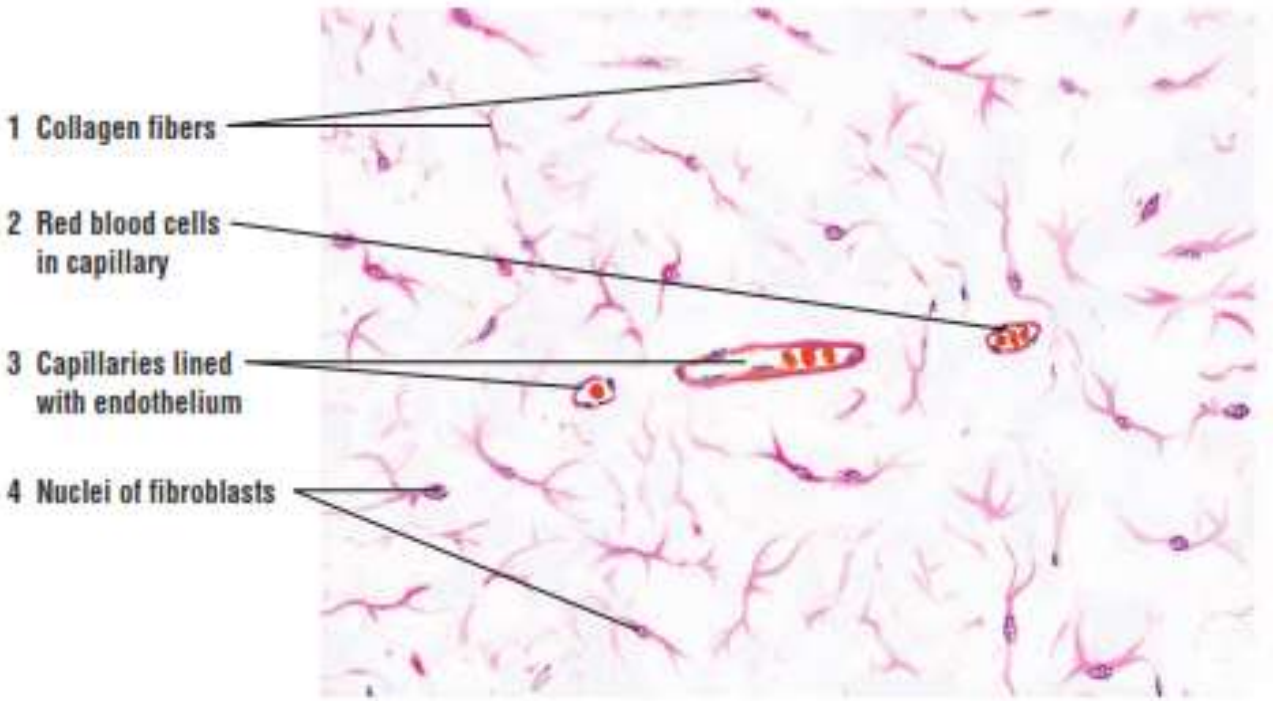
a. Elastic Tissue :

- Specialized dense CT made mainly of elastic fibres.
- Found in place where elasticity is required apart from strength.
- E.g. ligamentum nuchae, ligamenta flava, vocal folds, crico-vocal membrane.



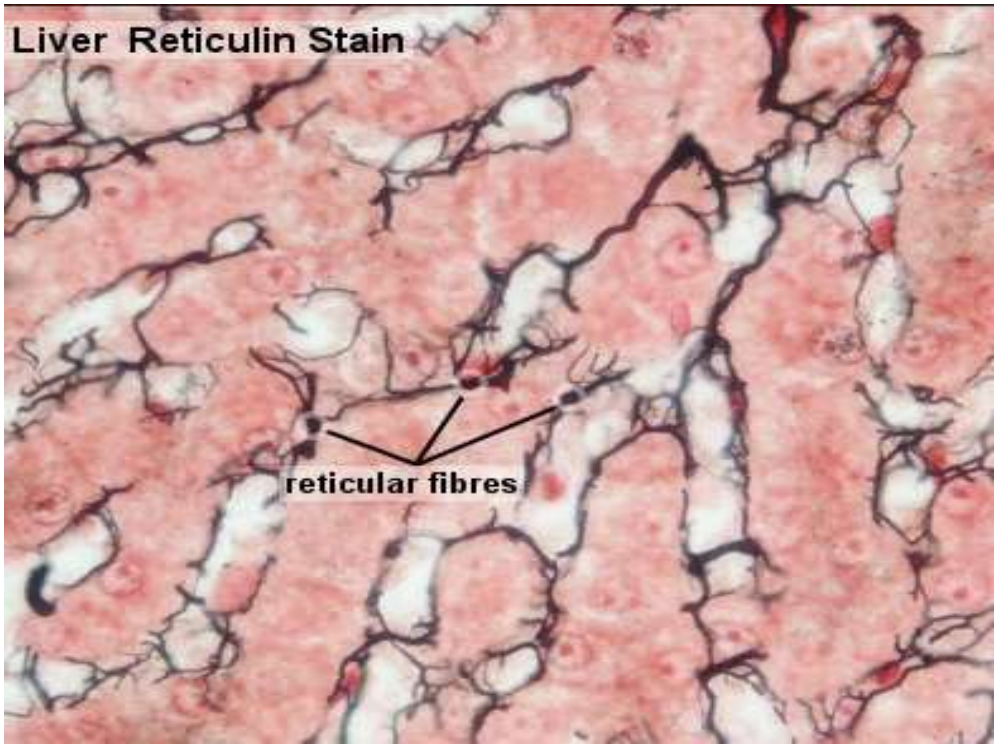
b. Mucoid tissue

- Embryonic connective tissue.
- Abundant ground substance, less cells & fibres.
- Cells present branching processes.
- E.g. Wharton's jelly of umbilical cord, vitreous body of eyeball.



c. Reticular tissue

- Consist of reticular fibres & reticular cells.
- Provides architectural framework for some cellular organs
- Present in: lymphnode, spleen, liver, kidney etc.




Thank
you!