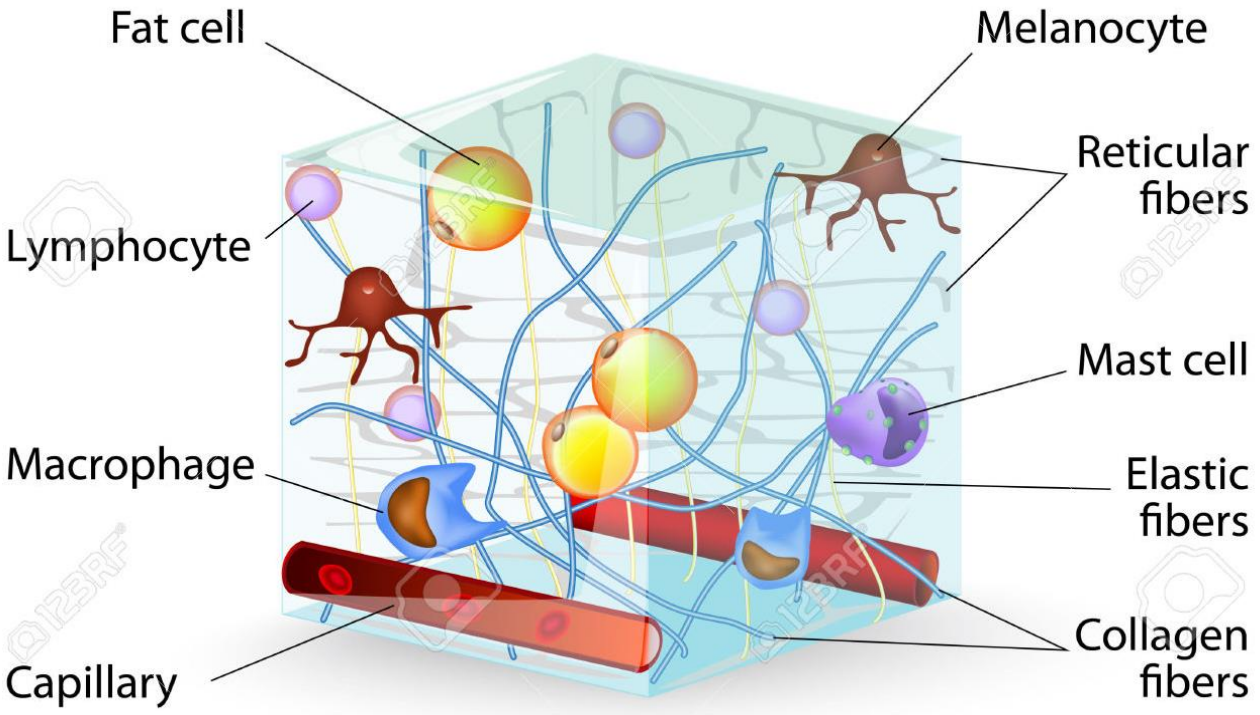
Connective Tissue



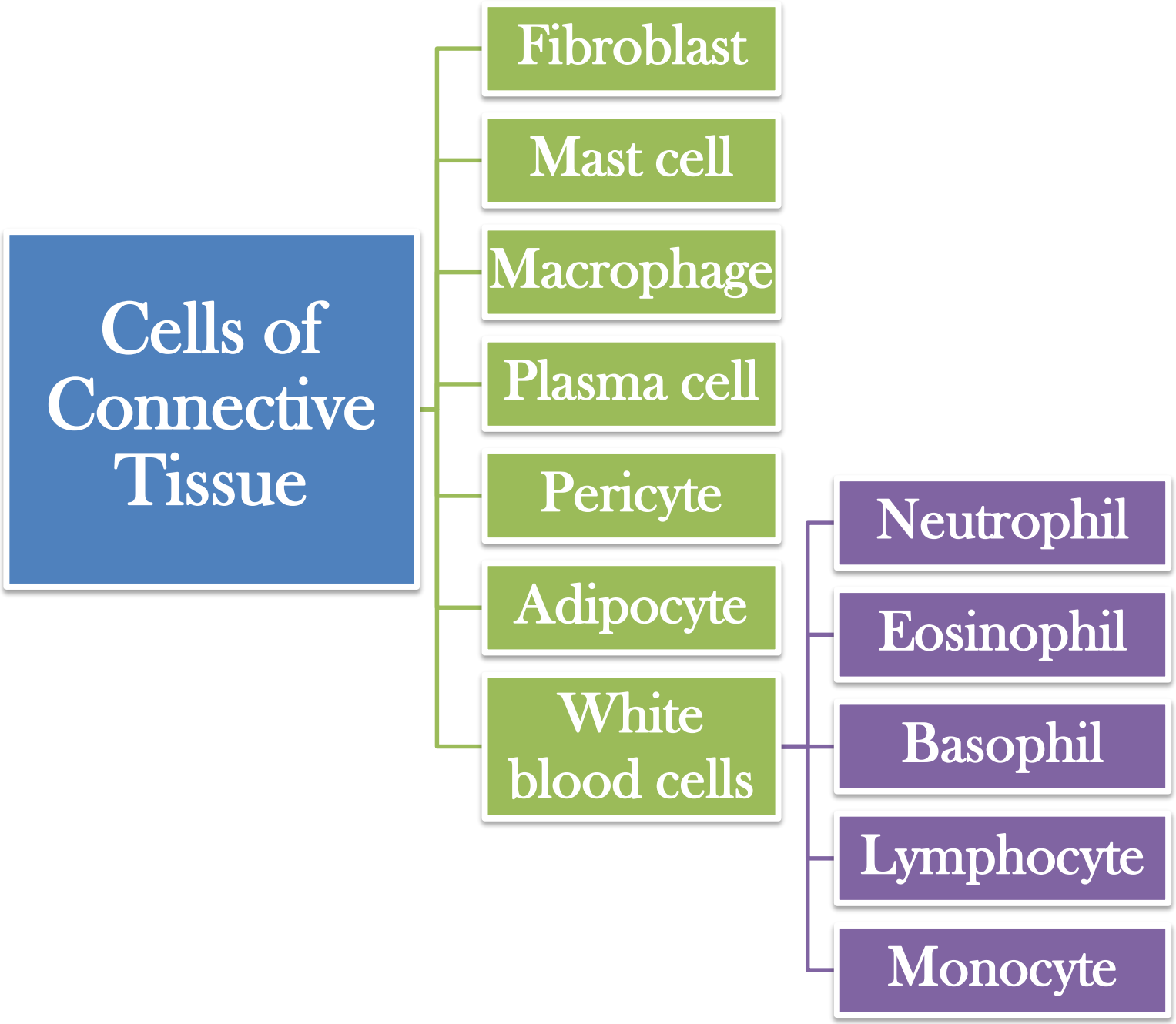
General Features

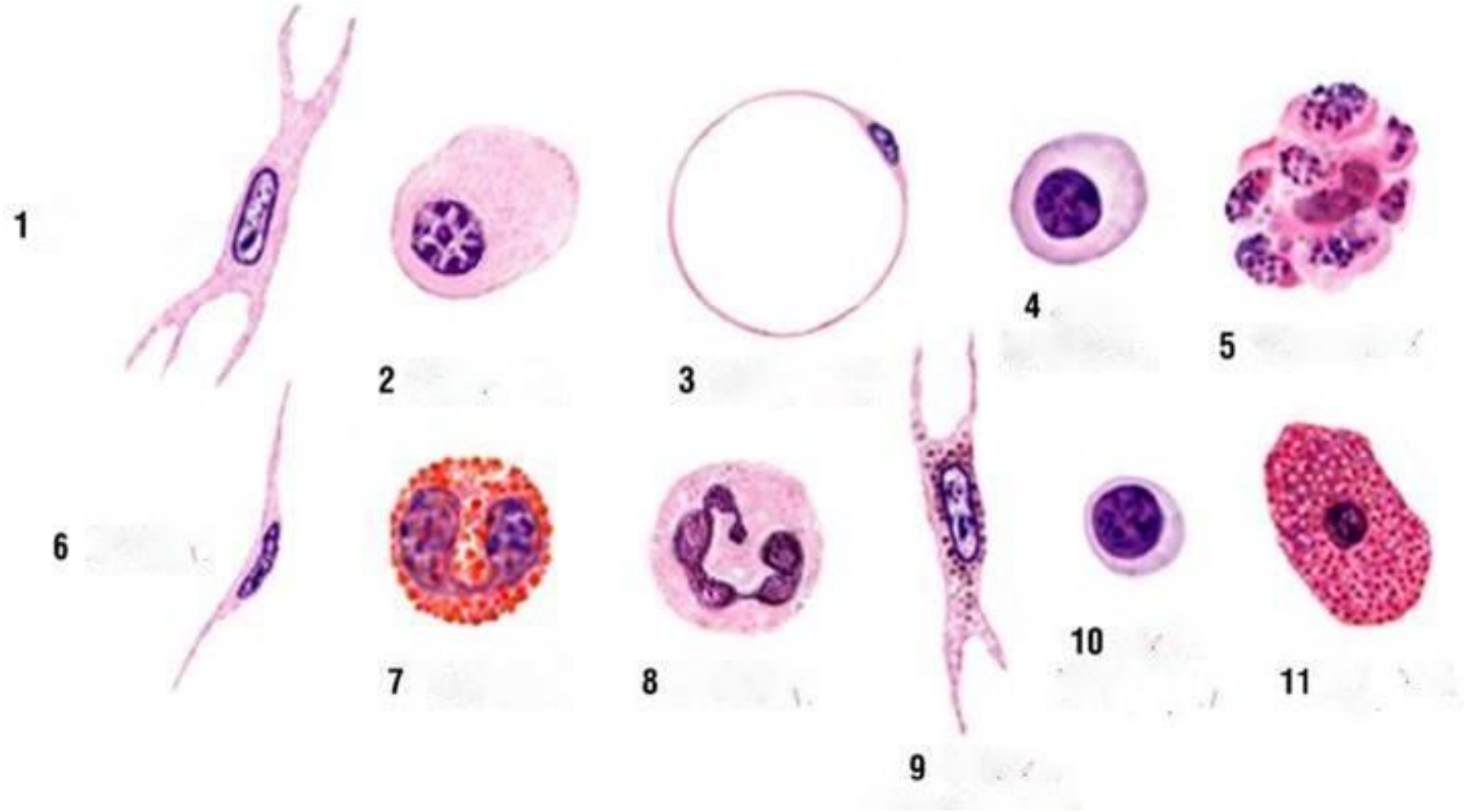
- Originates from the mesoderm (Except some parts of the head and neck).
- Composed of cells (fixed and wandering), fibres and ground substance.
- Variable vascularity.
- Variable regenerative power.

Functions of connective tissue

- Structural framework for body.
- Transportation of fluids and dissolved substances.
- Protection of delicate organs.
- Supports, surrounds, and connects other tissues.
- Storage of energy in the form of lipids.
- Defend the body against microorganisms.

Cellular Components of connective tissue


Cells of Connective Tissue
Fibroblast
Mast cell
Macrophage
Plasma cell
Pericyte
Adipocyte
White blood cells
Neutrophil
Eosinophil
Basophil
Lymphocyte
Monocyte



1. Fibroblast
2. Plasma cell
3. Adipocyte
4. large lymphocyte
5. Macrophage
6. Fibrocyte
7. Eosinophil
8. Neutrophil
9. Cell with pigment granulaes
10. Small lymphocyte
11. Mast cell

Connective tissue cells

Fibroblasts: Secrete both fibers and ground substance of the matrix.

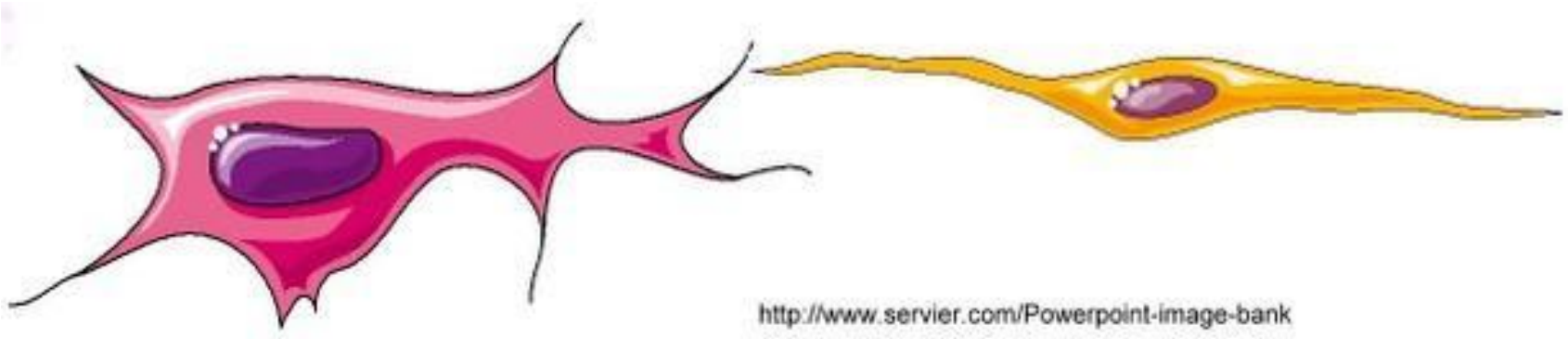
Macrophages: Phagocytes that develop from Monocytes

Plasma Cells: Antibody secreting cells that develop from B Lymphocytes

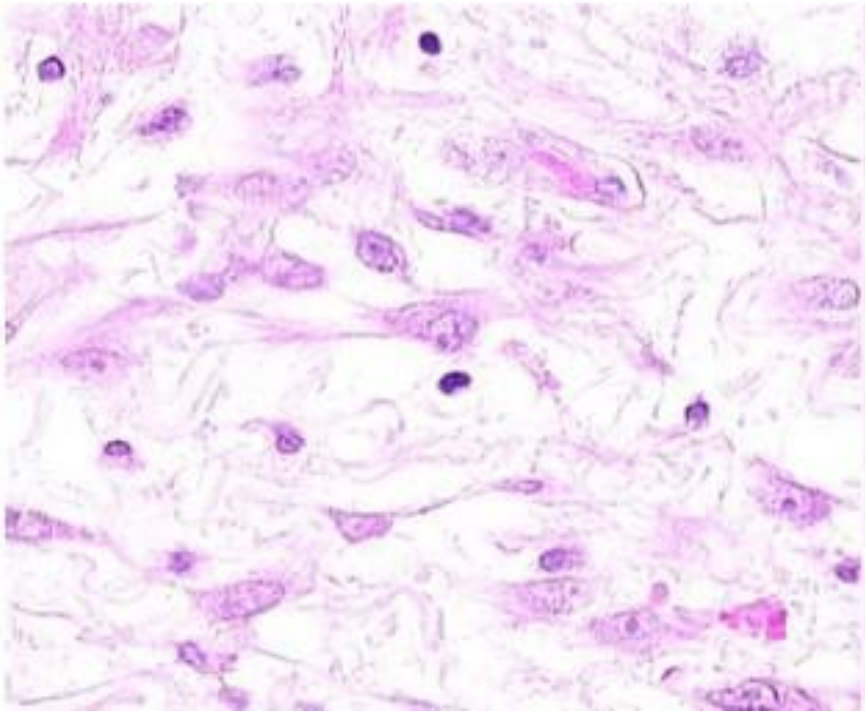
Mast Cells: Produce histamine that helps dilate small blood vessels in reaction to injury.

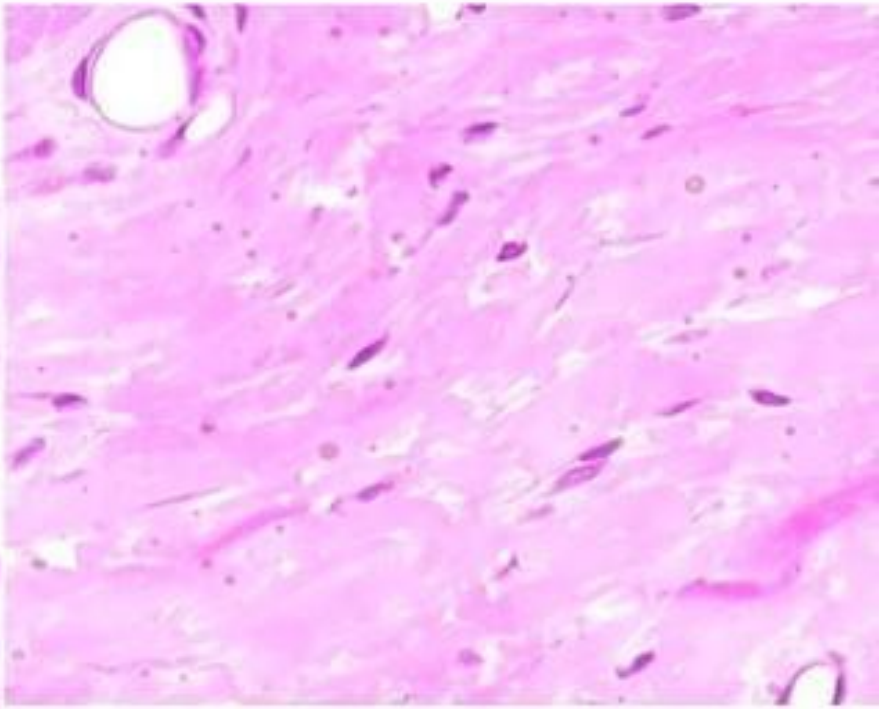
Adipocytes: Fat cells that store triglycerides, support, protect and insulate.

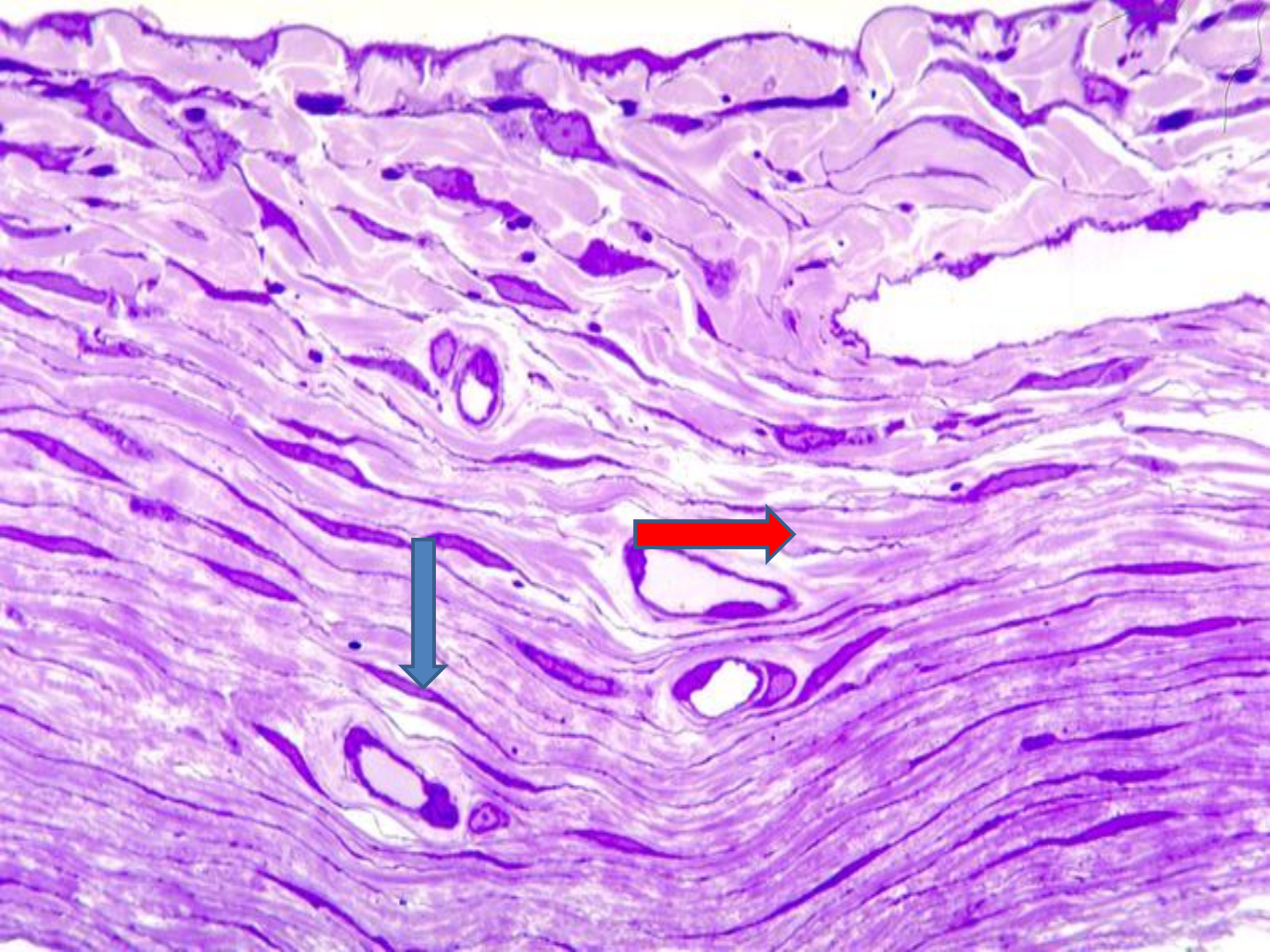
Fibroblast / Fibrocyte



http://www.servier.com/Powerpoint-image-bank








PC
P
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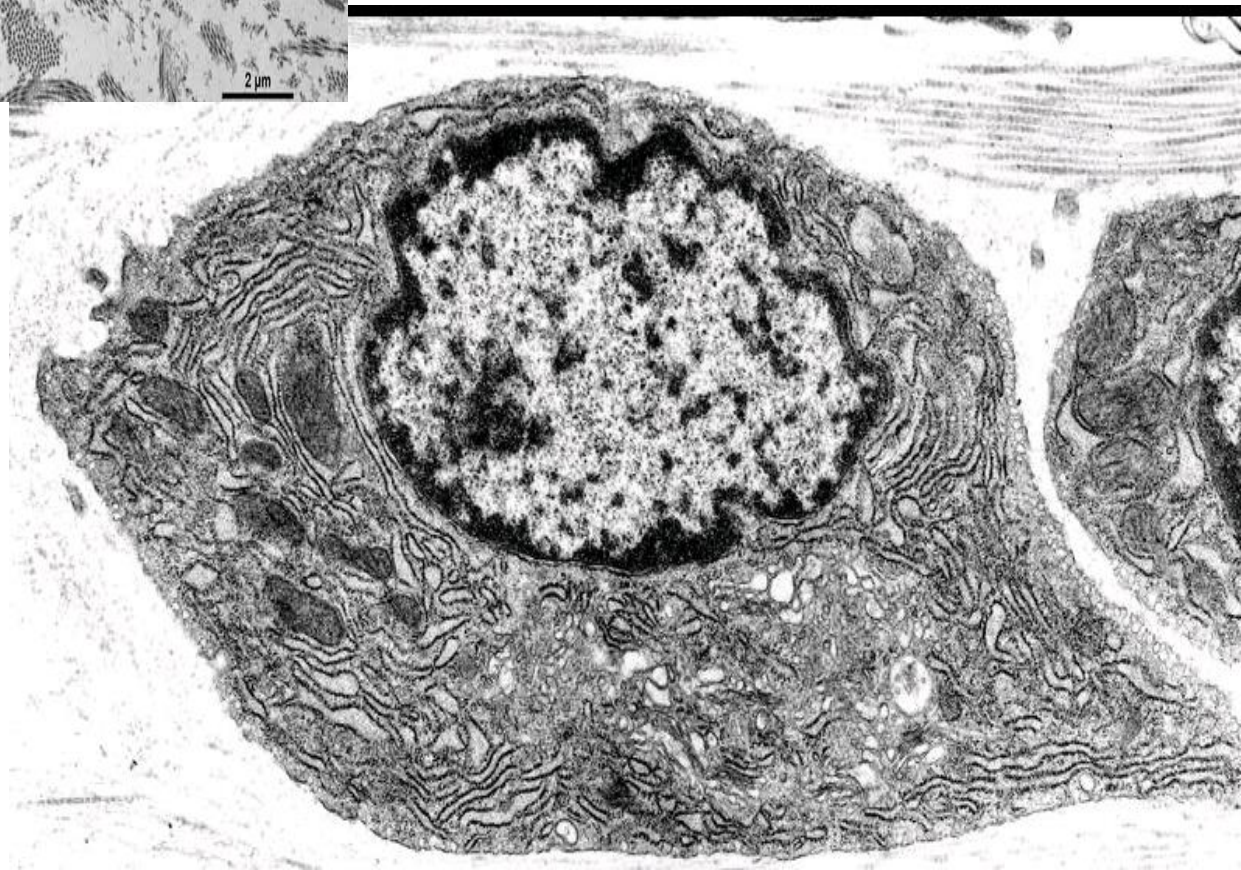
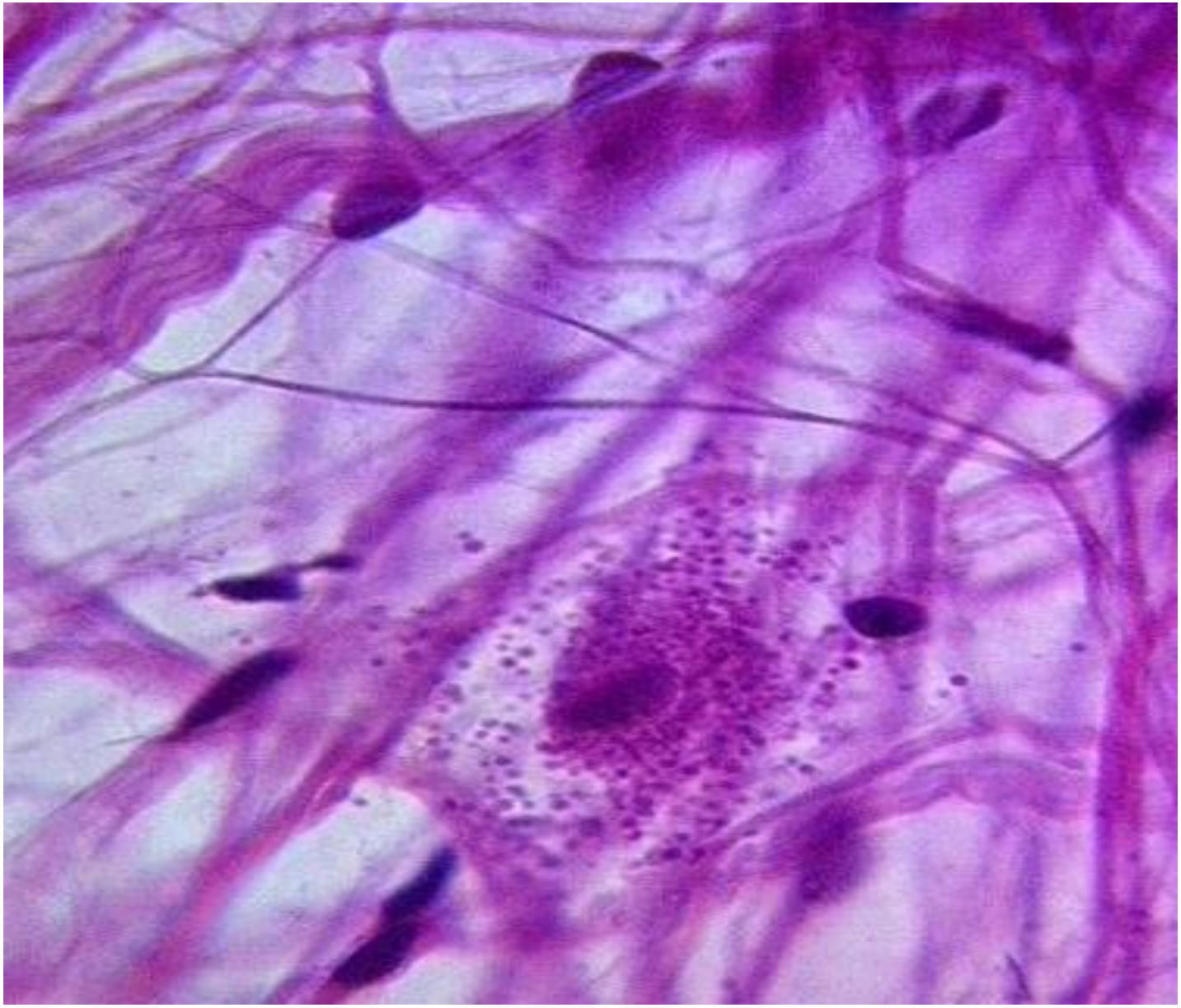
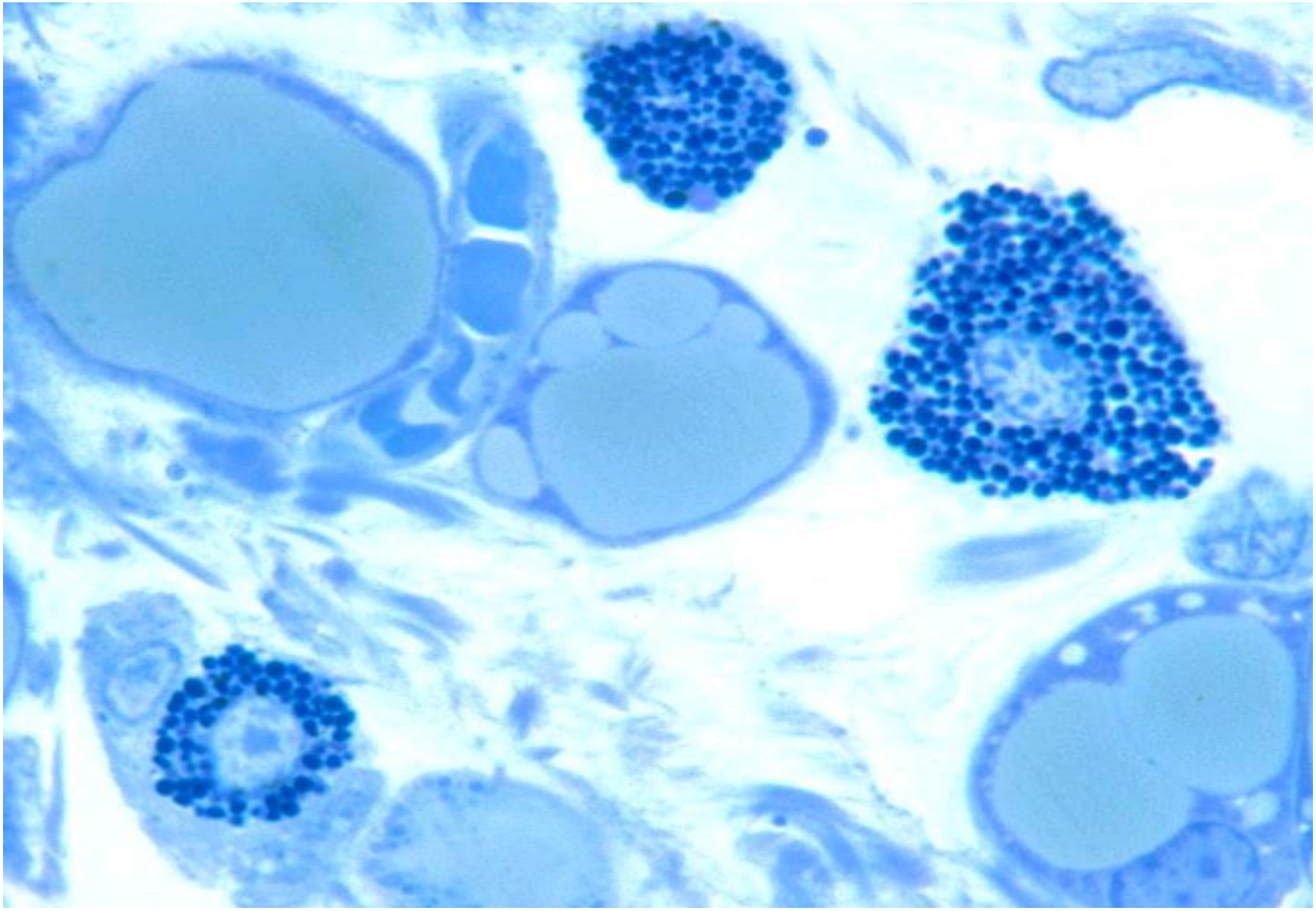
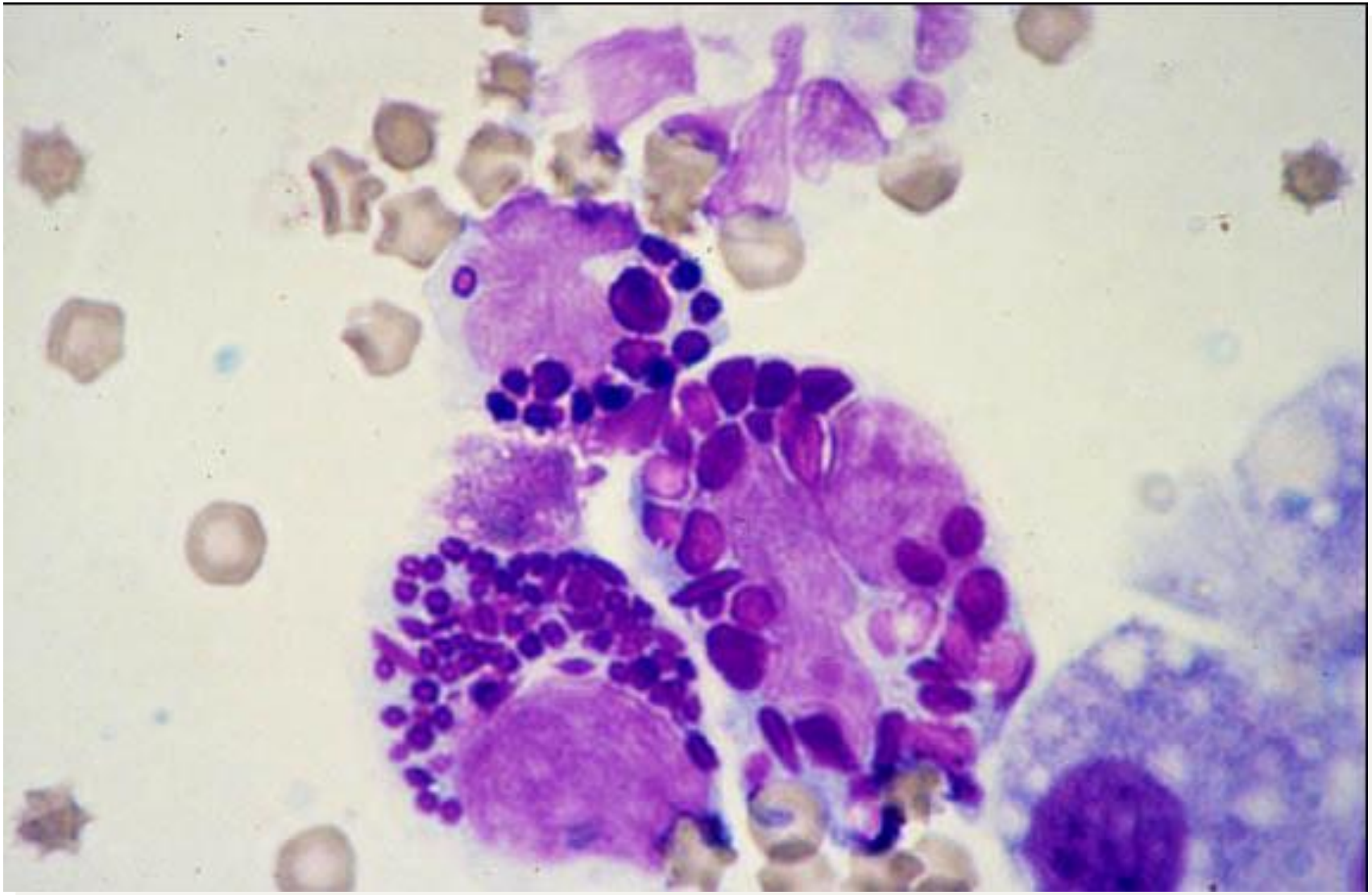
Copyright H. Jastrow
2 µm

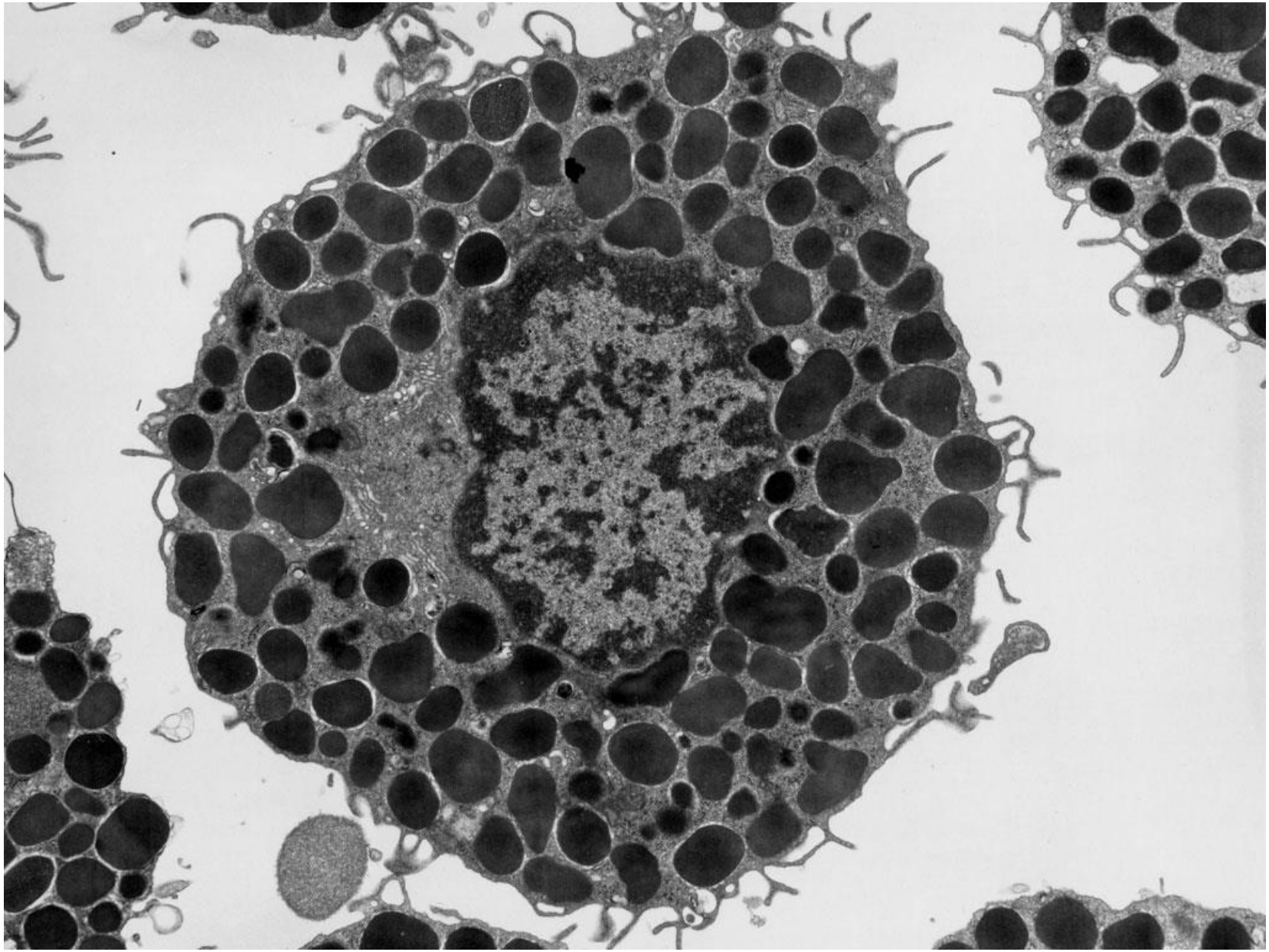


Mast cell

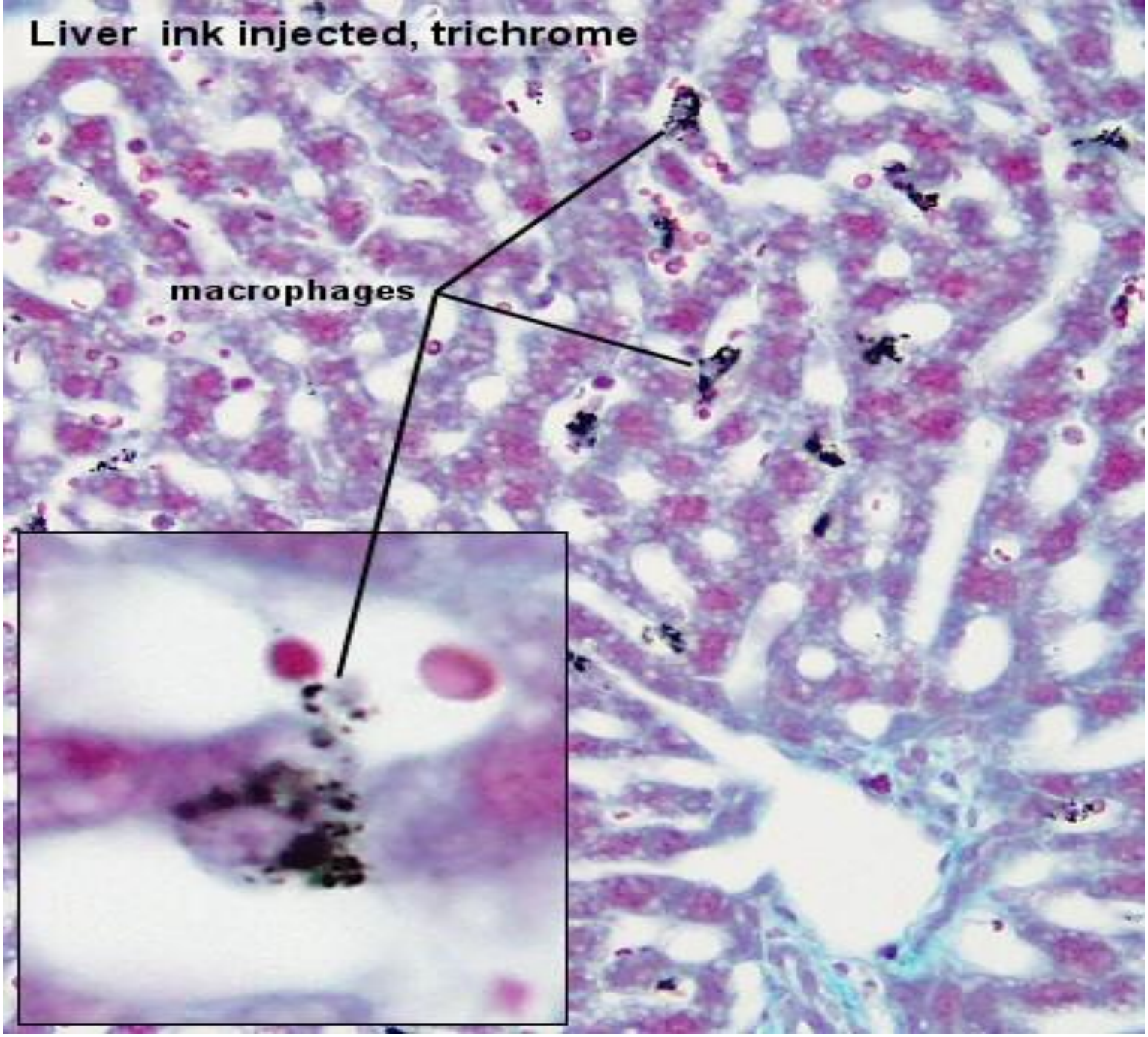


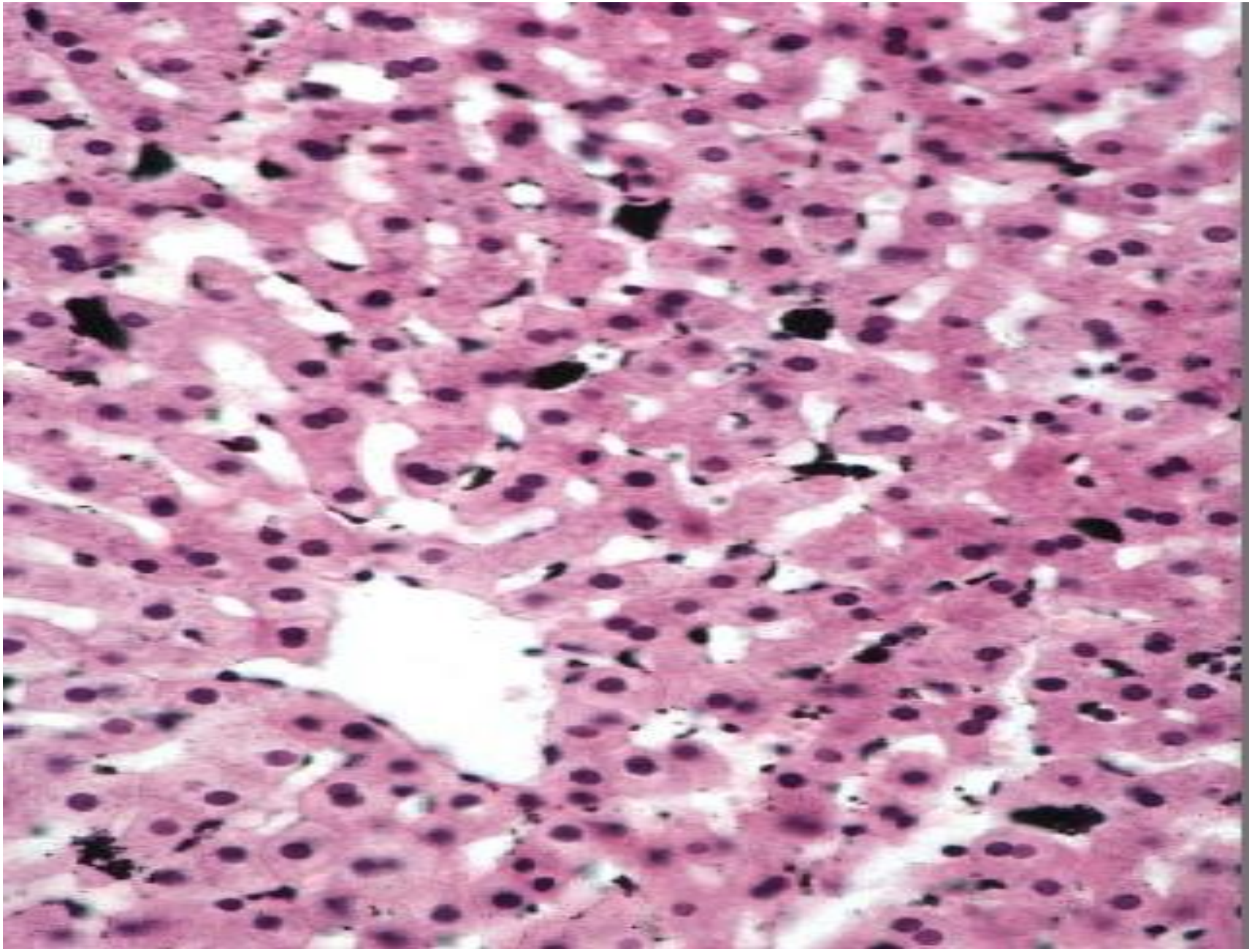


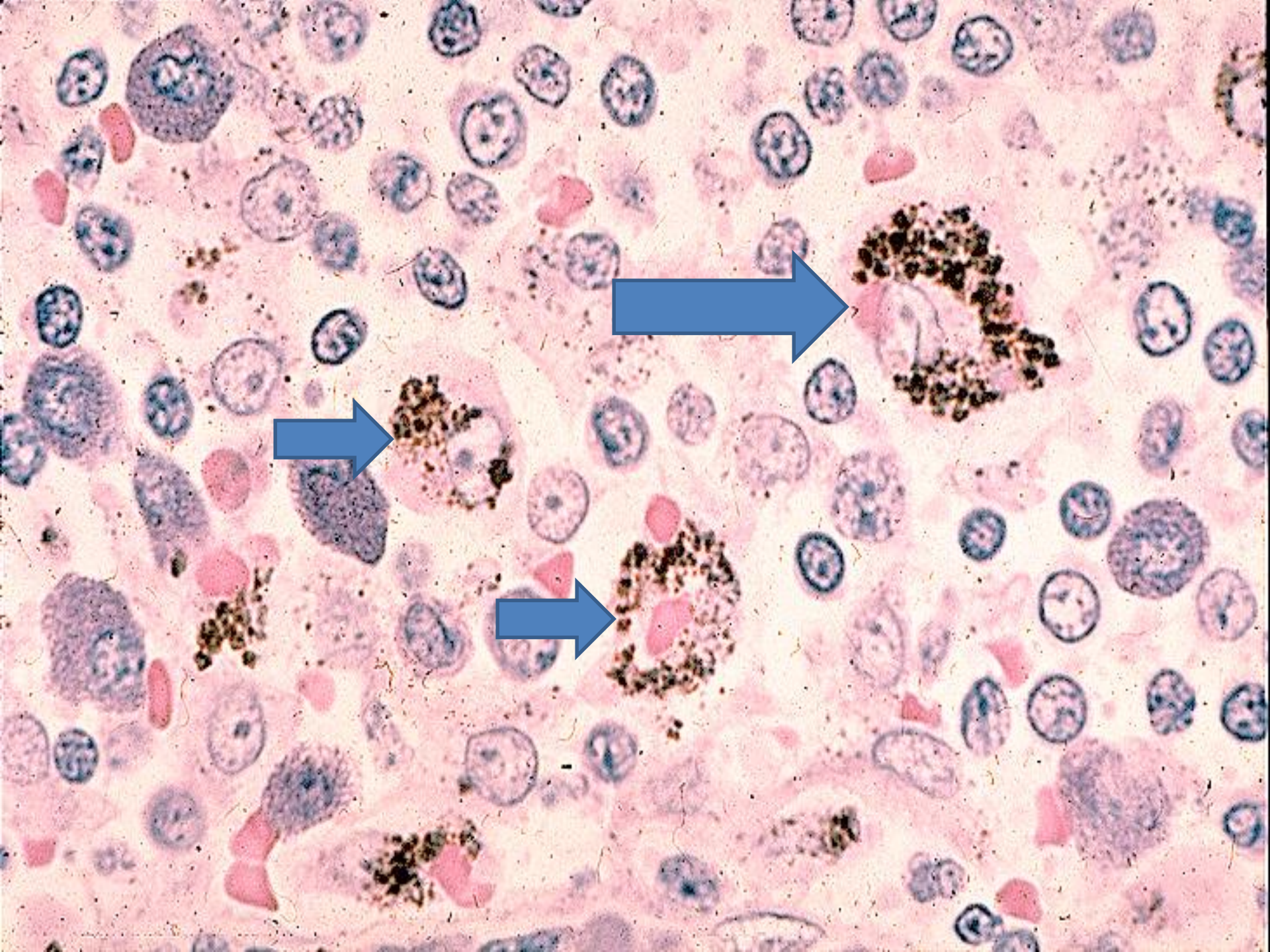


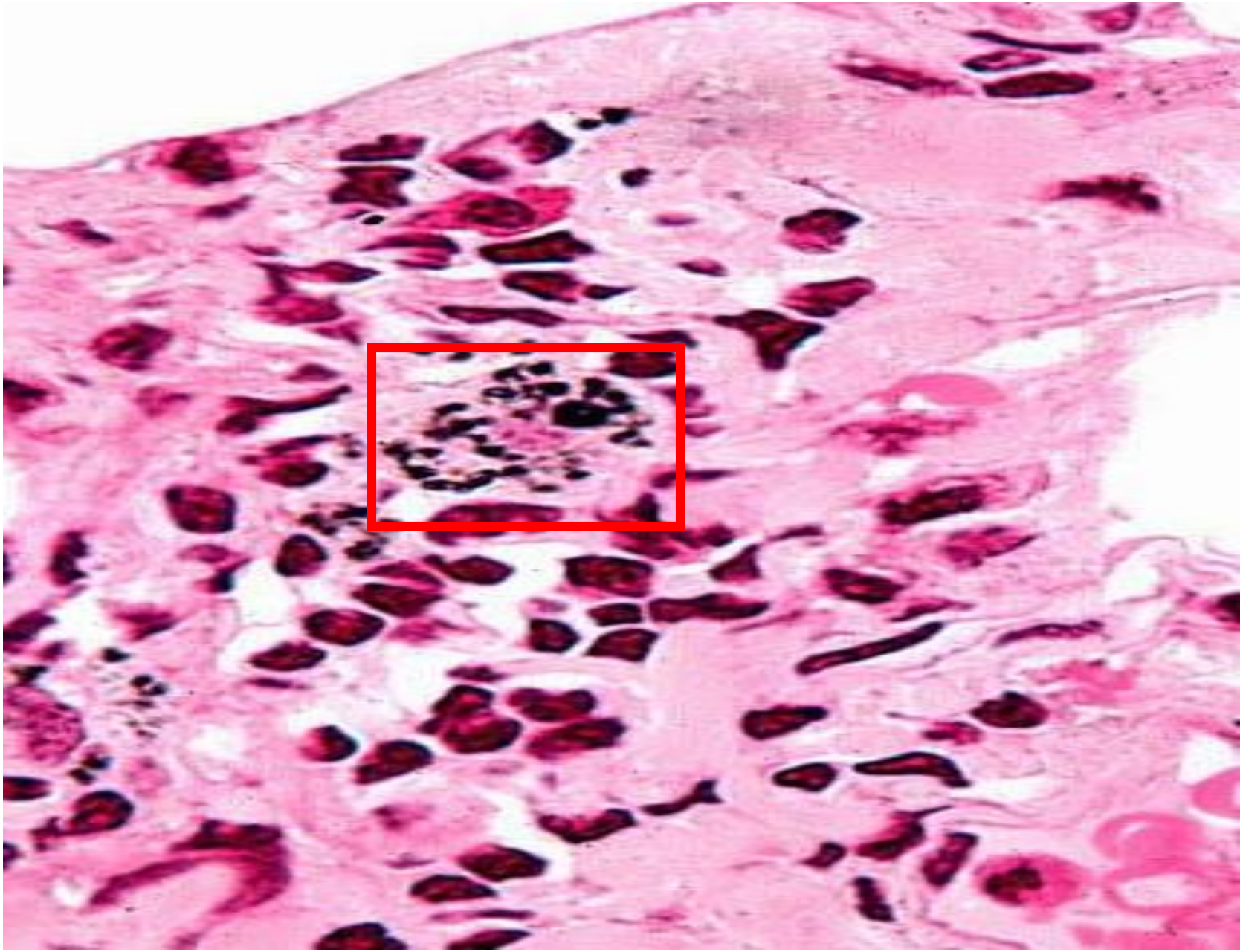


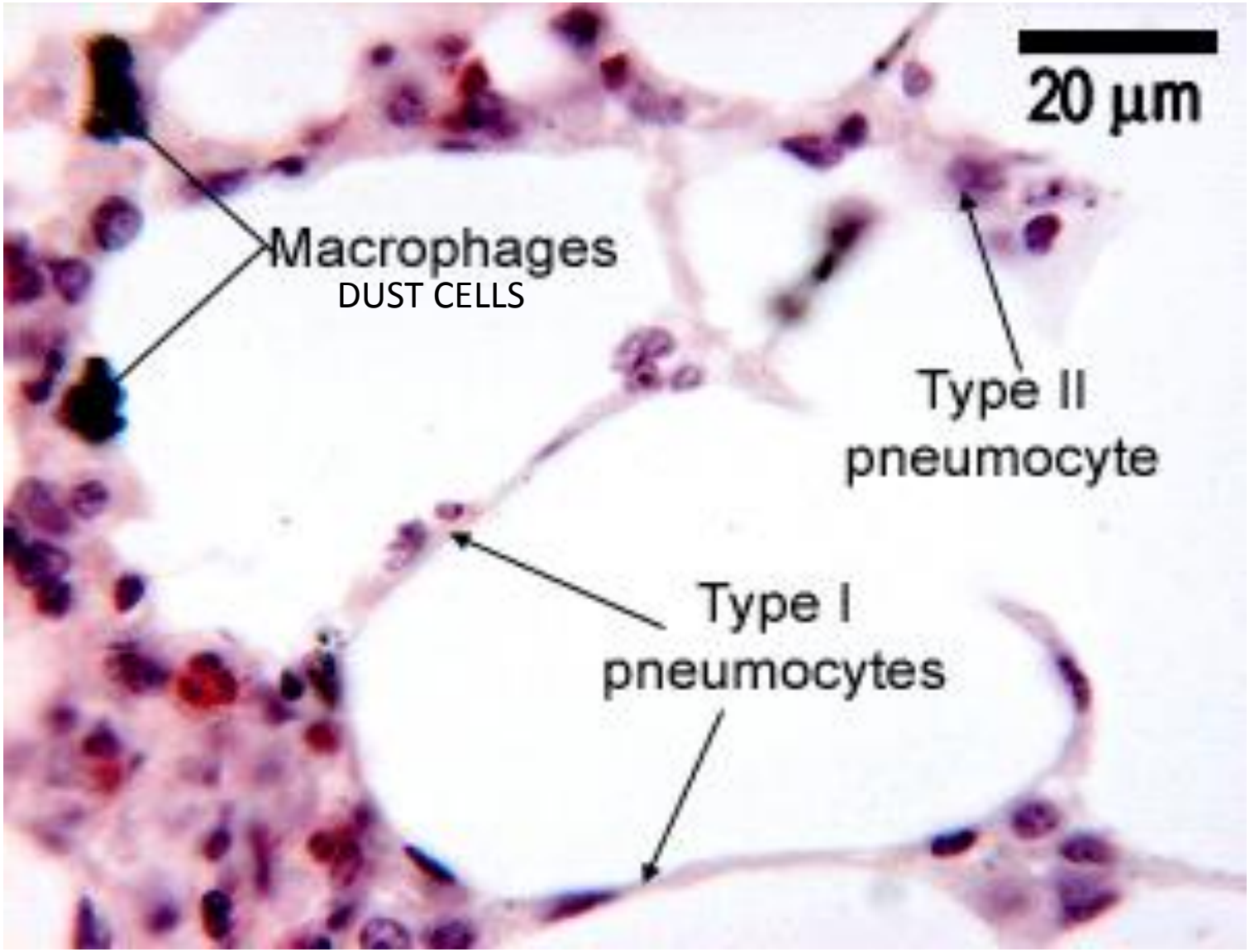
Macrophage

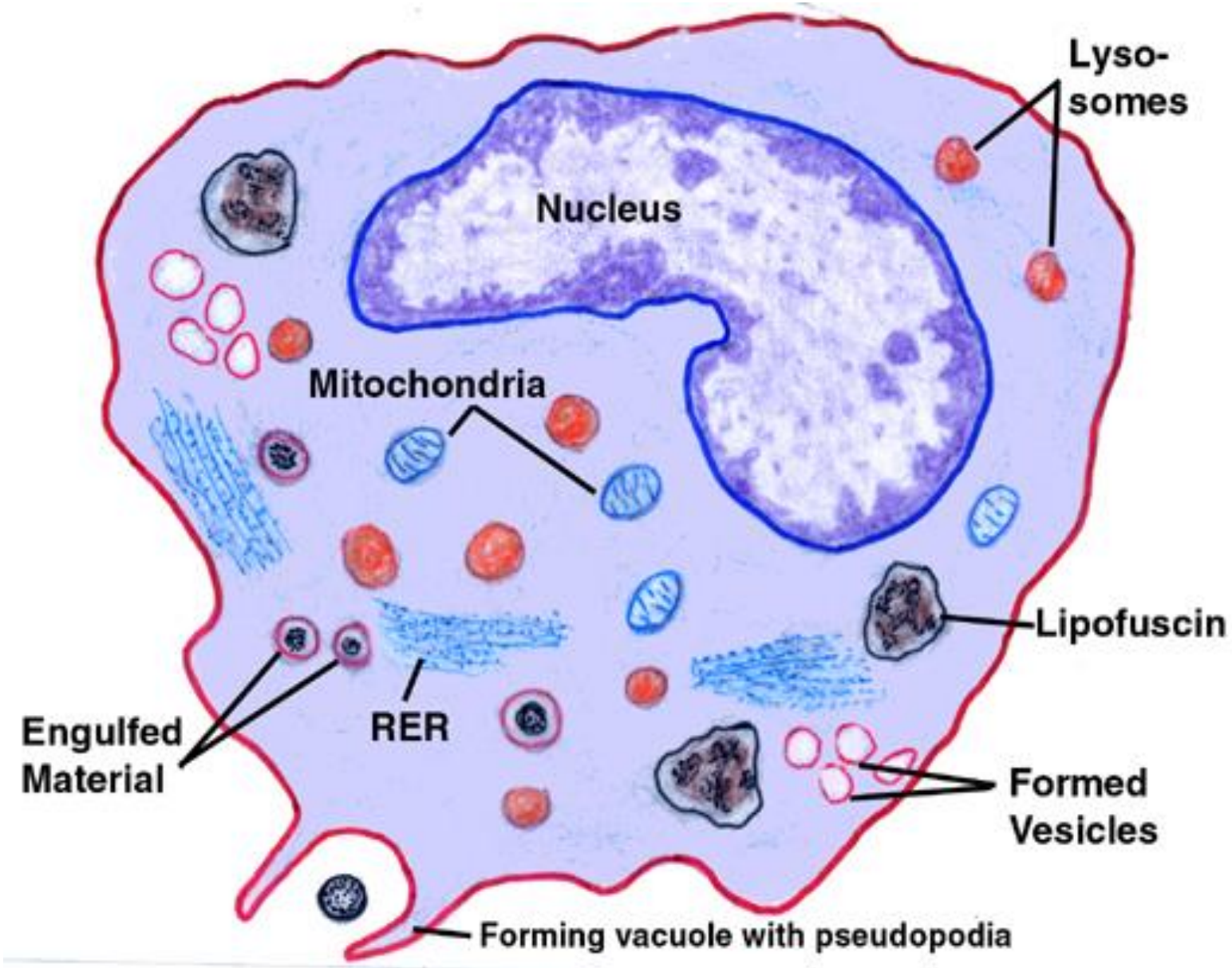

Liver ink injected, trichrome
macrophages

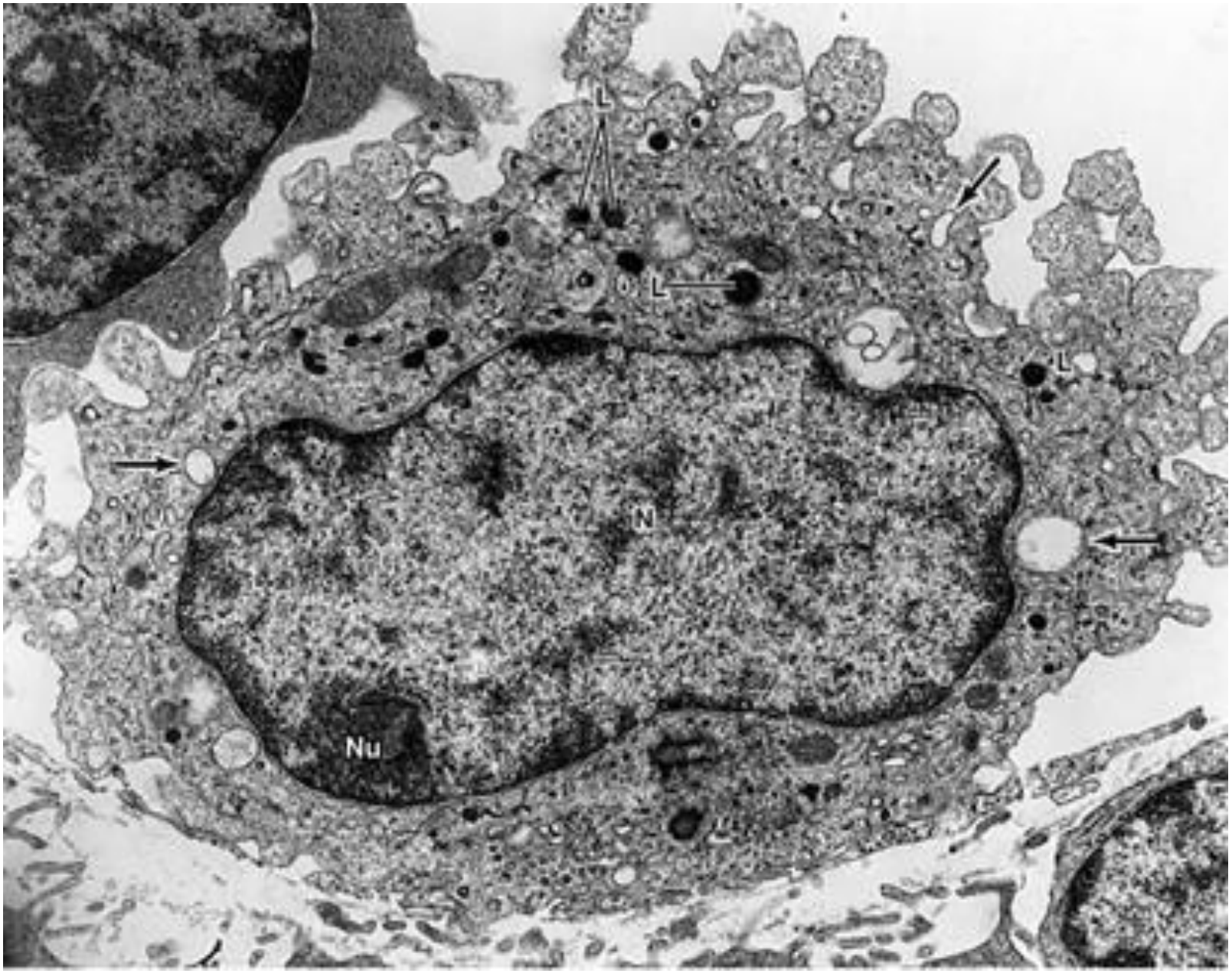







20 µm
Macrophages
DUST CELLS
Type II
pneumocyte
Type I
pneumocytes


Lyso-
somes
Nucleus
Mitochondria
Lipofuscin
Engulfed
Material
RER
Formed
Vesicles
Forming vacuole with pseudopodia


L
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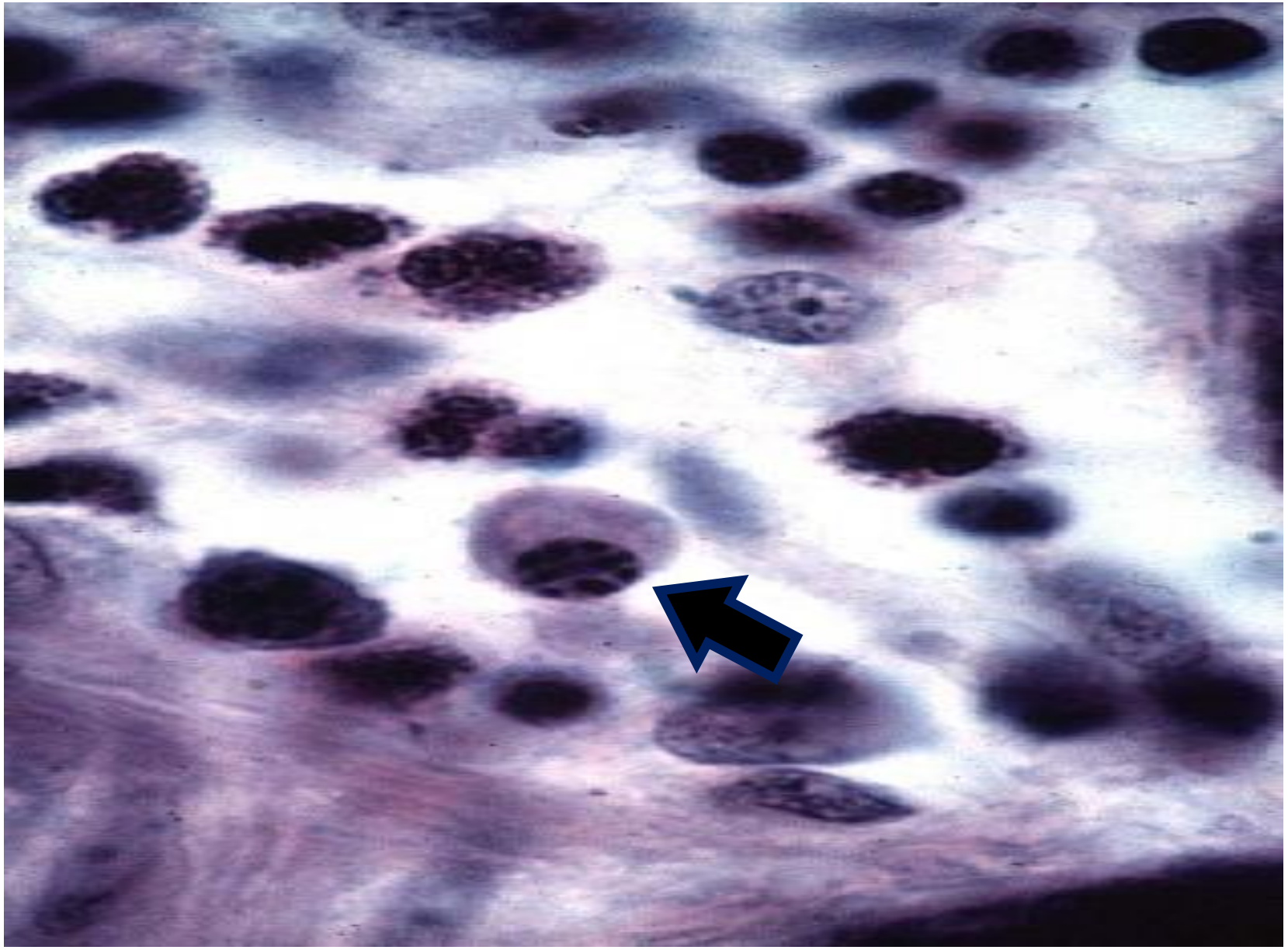
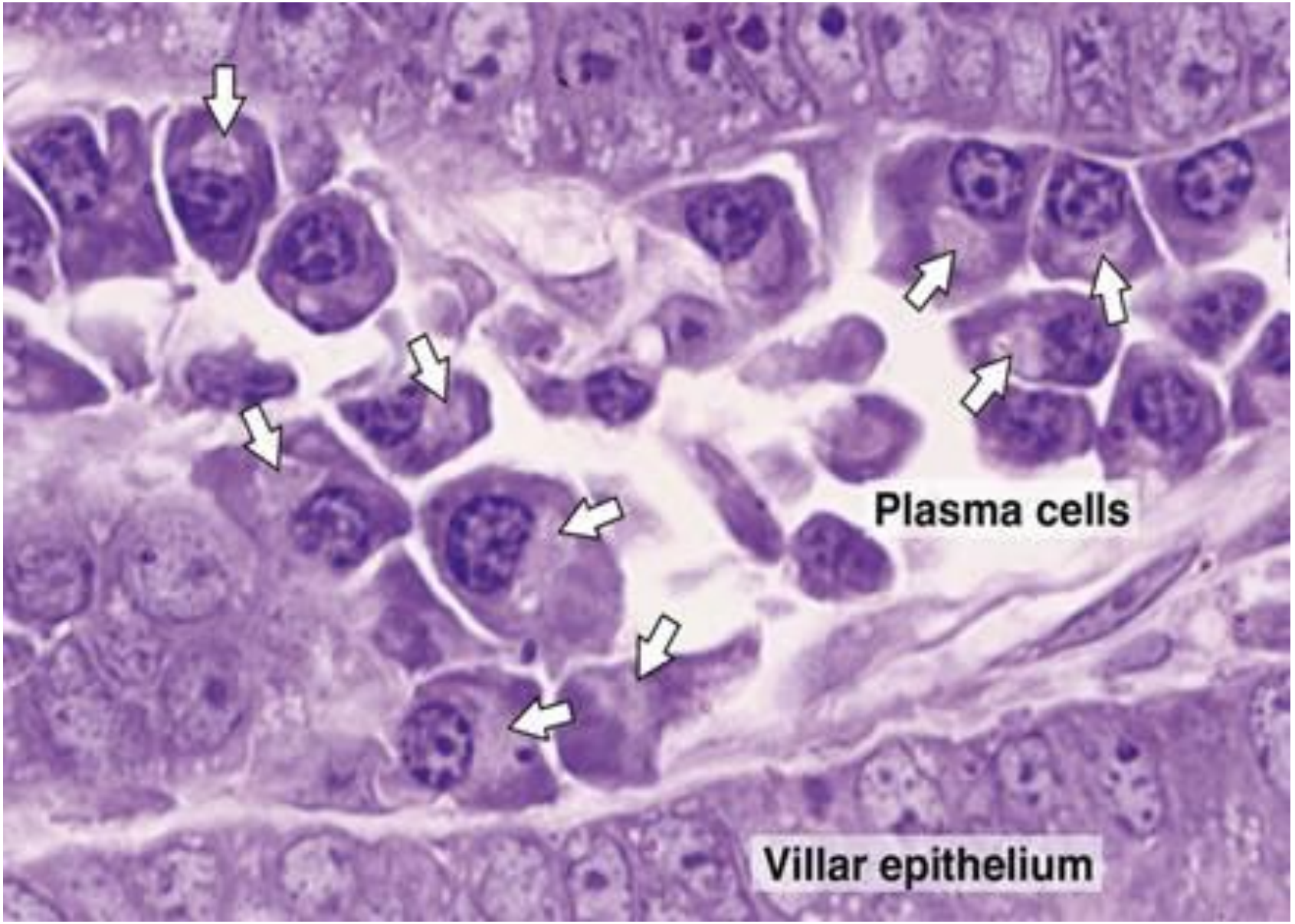
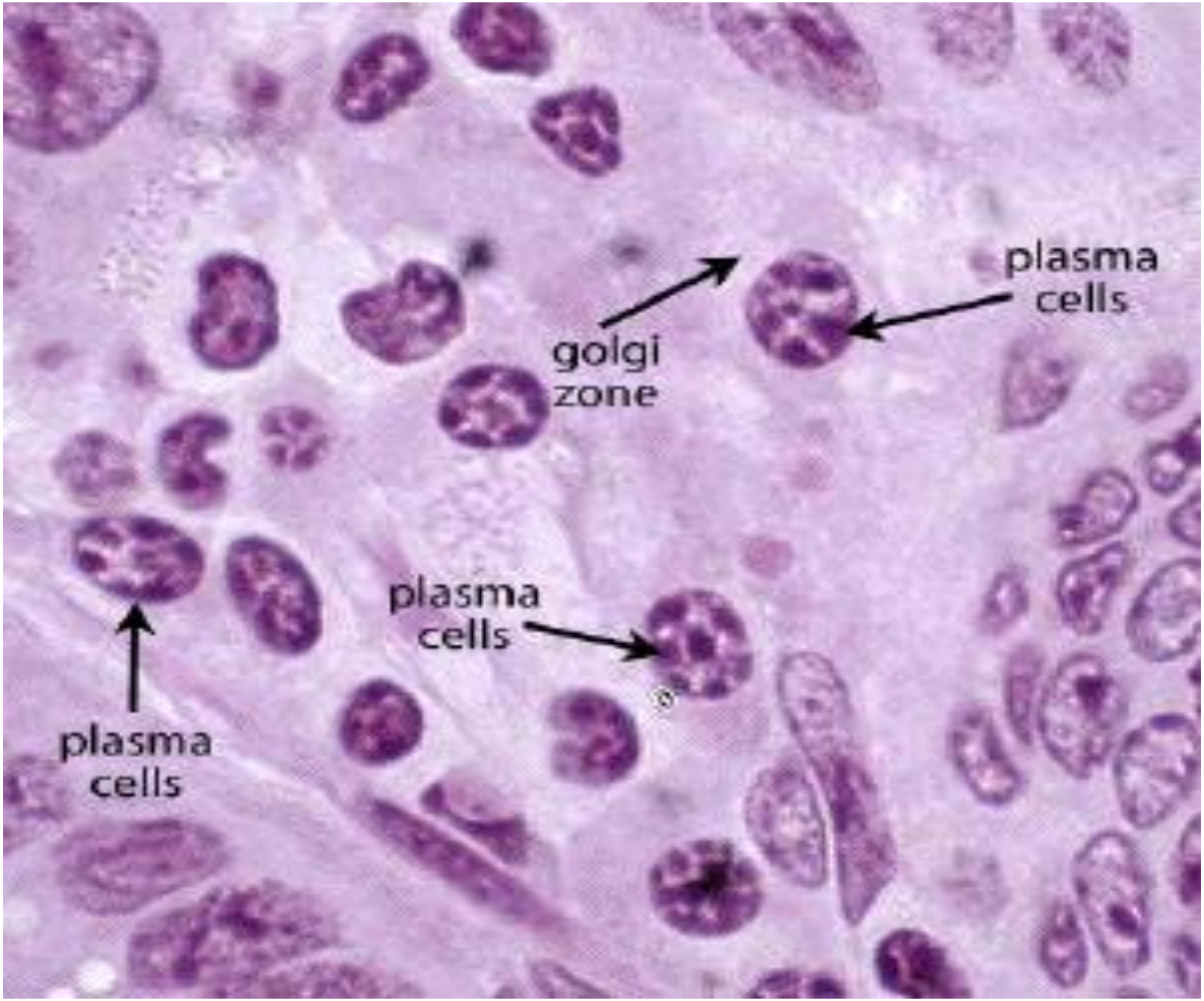
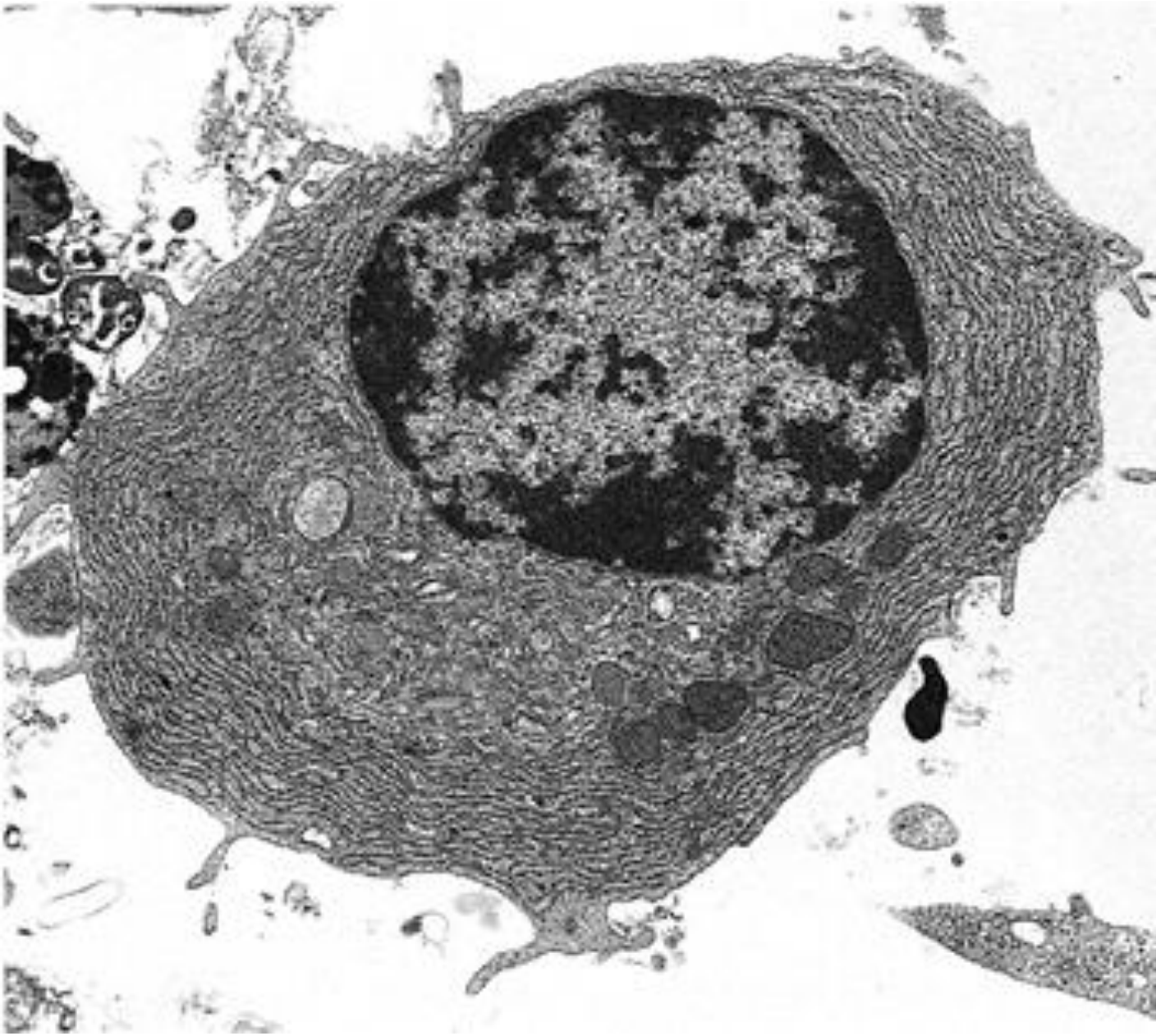
Plasma cell

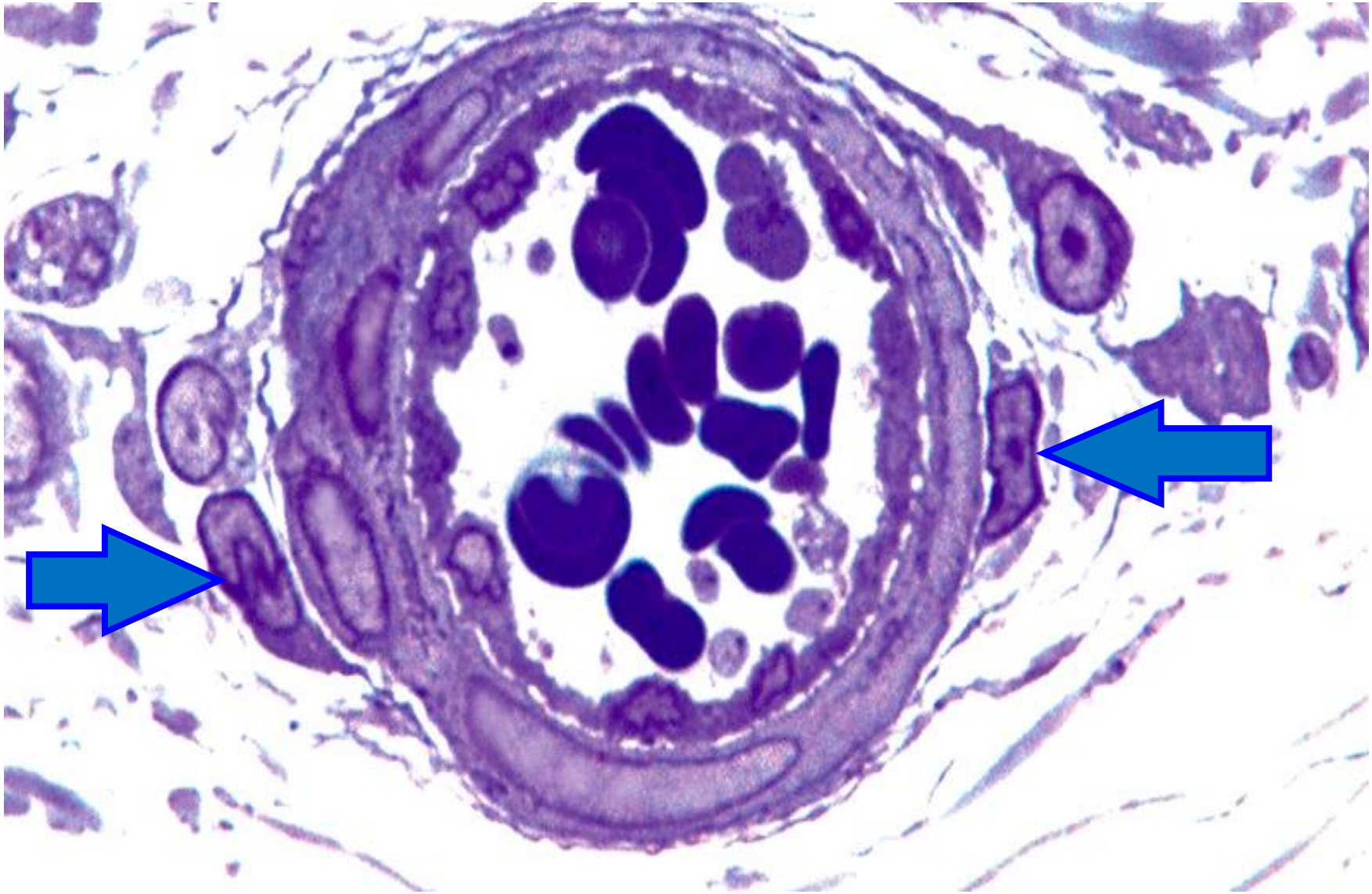


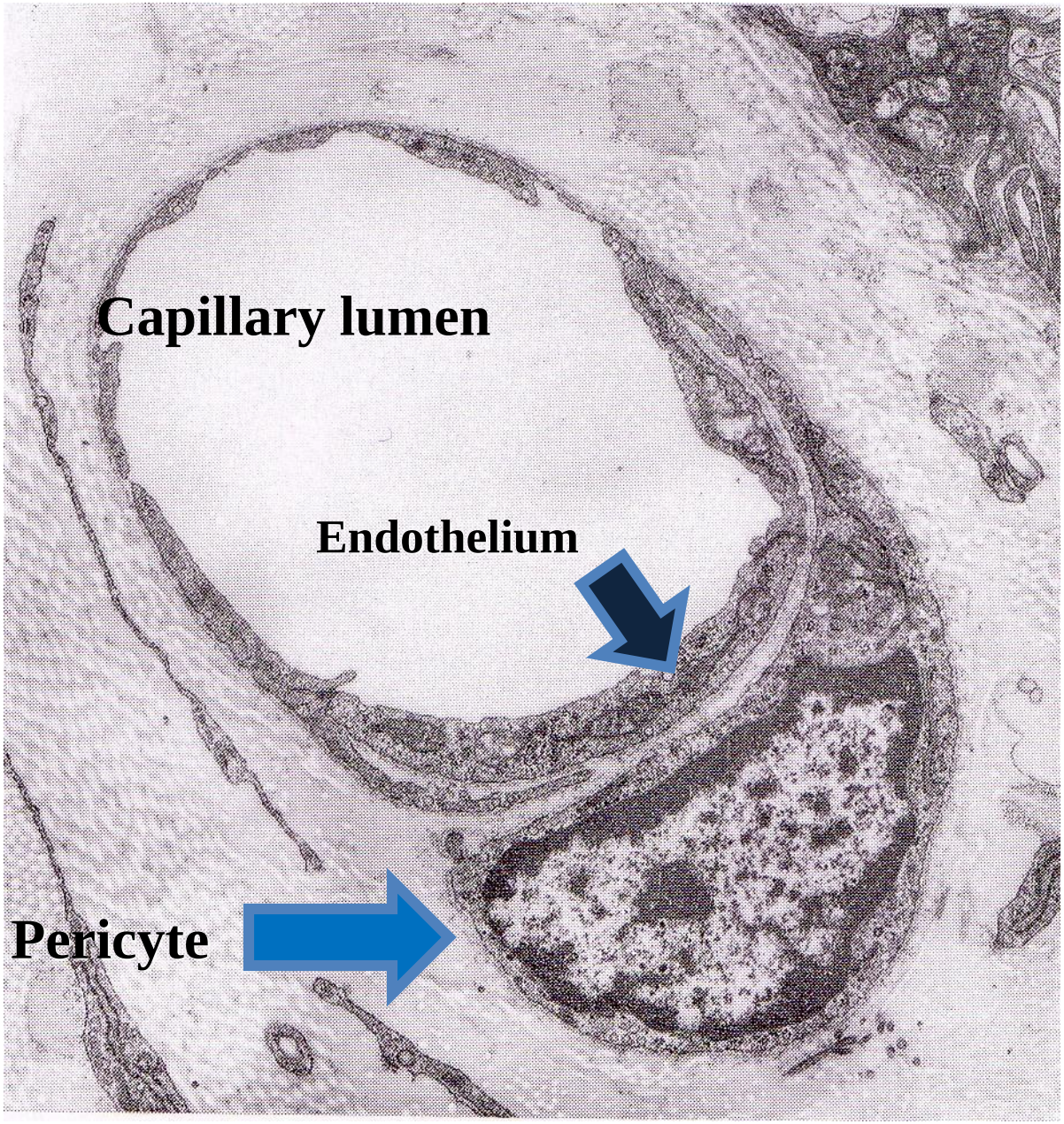

Plasma cells
Villar epithelium


plasma
cells
golgi
zone
plasma
cells
plasma
cells



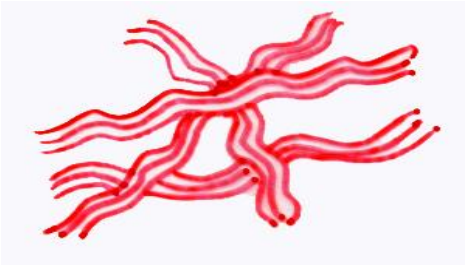
Pericyte



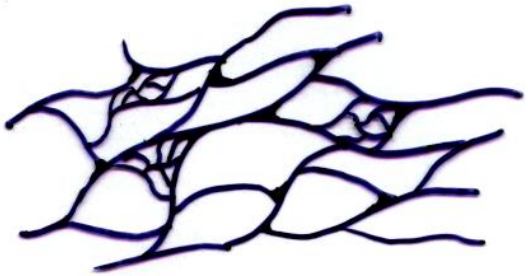

Capillary lumen
Endothelium
Pericyte

Connective Tissue Fibers

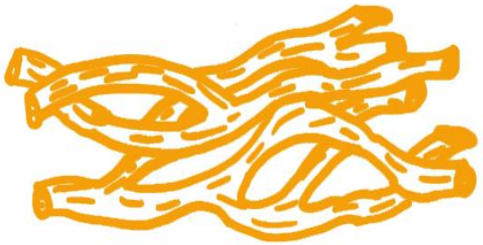
Collagenous Fibers
(bundles)

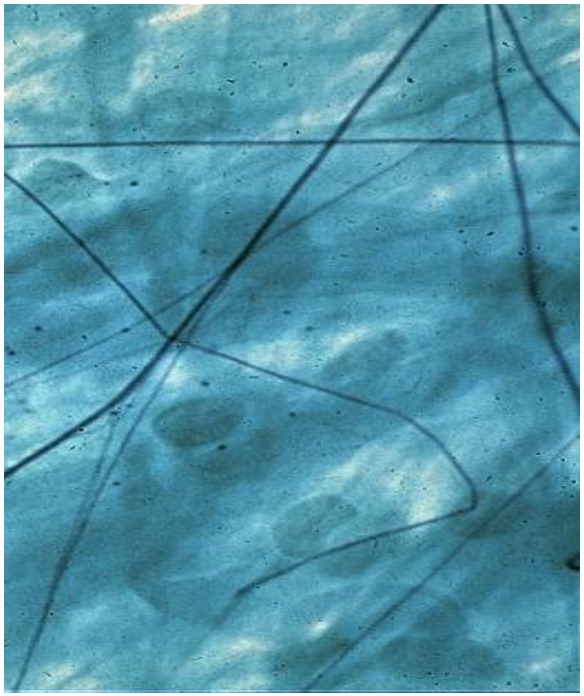


Reticular Fibers
(networks)



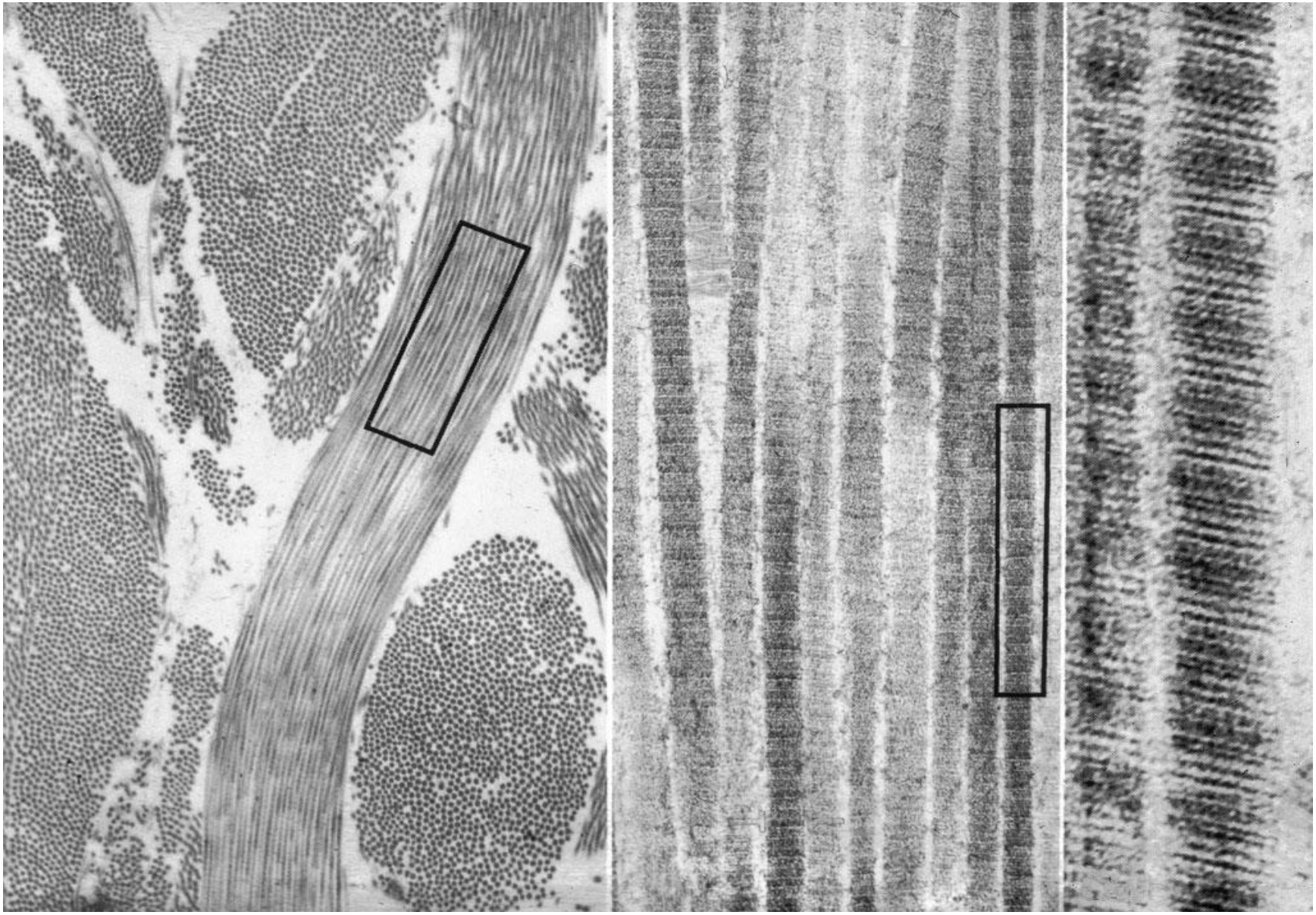
Elastic Fibers
(anastomosing bundles)



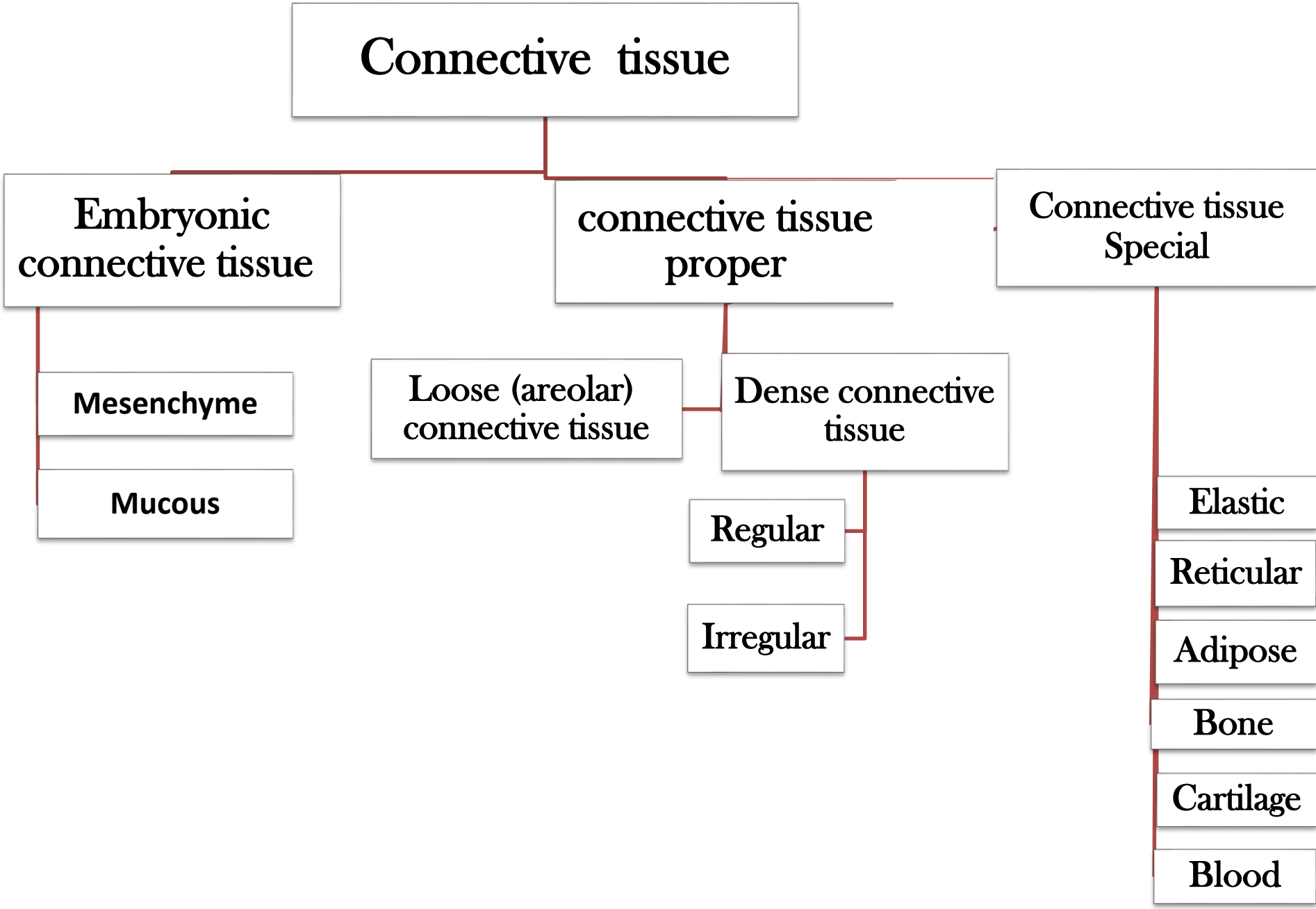


Connective Tissue Fibres

Collagen	Undulating course of longitudinally striated bundles, form meshwork of variable texture, stain pink-red in H&E. Nonextensible.
Elastic	Forms sheets or lamina, Unstained in H & E. Reversibly extinsible. Stains brown-black in Orcein or Resorscin Fuchsin.
Reticular	Delicate network, Unstained in H & E. Reversibly extinsible. PAS +ve, stains black in $AgNO_3$ (Argyrophilic).

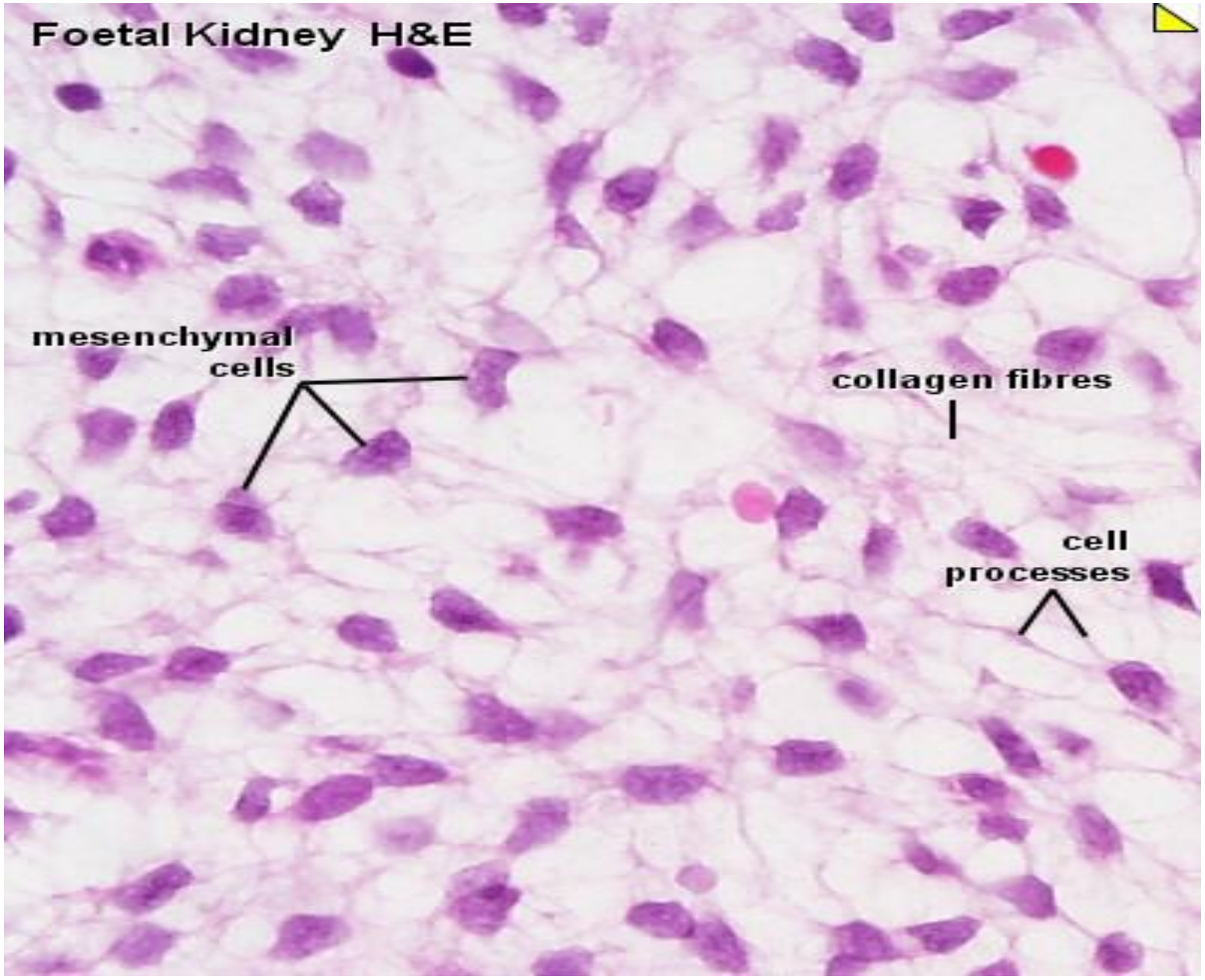


Classification of Connective Tissue


Connective tissue
Embryonic connective tissue
connective tissue proper
Connective tissue Special
Mesenchyme
Mucous
Loose (areolar) connective tissue
Dense connective tissue
Regular
Irregular
Elastic
Reticular
Adipose
Bone
Cartilage
Blood

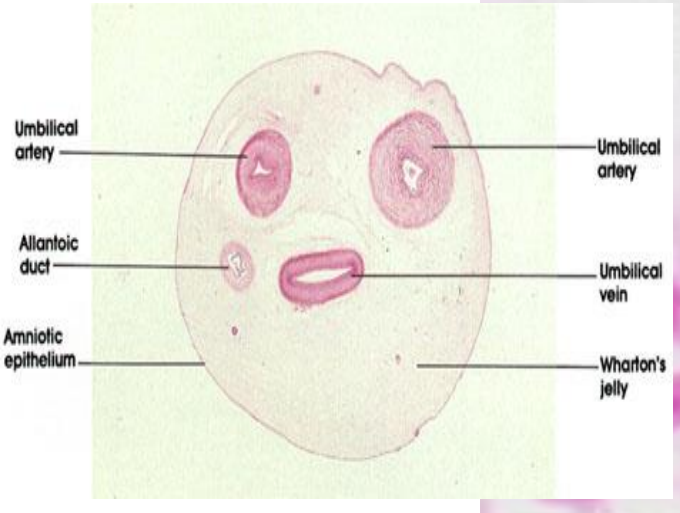
Embryonic connective tissue

Mesenchyme
connective tissue


Foetal Kidney H&E
mesenchymal cells
collagen fibres
cell processes

Embryonic connective tissue

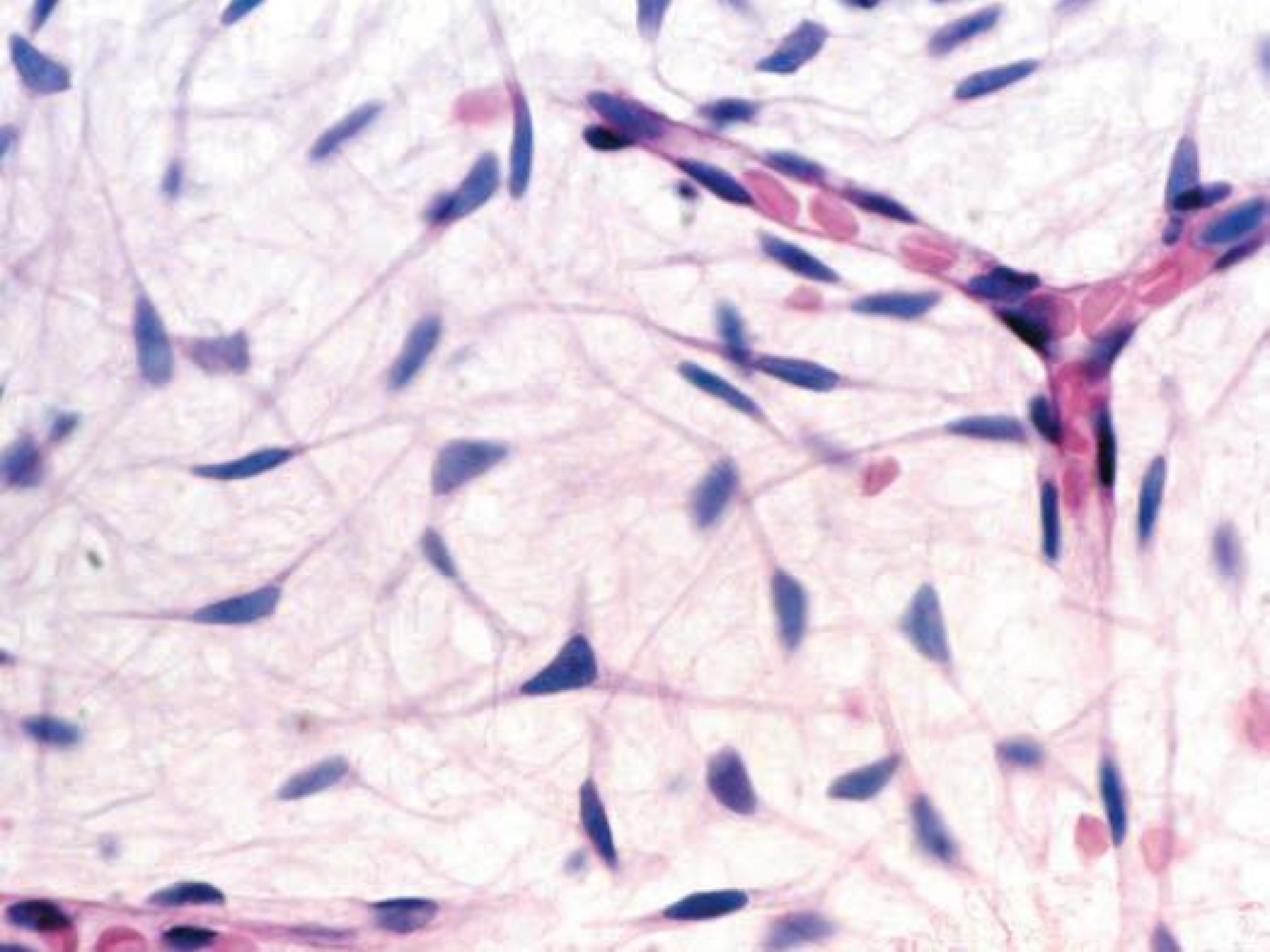
Mucous connective tissue



Umbilical Cord H&E

mesenchymal cells

collagen fibres

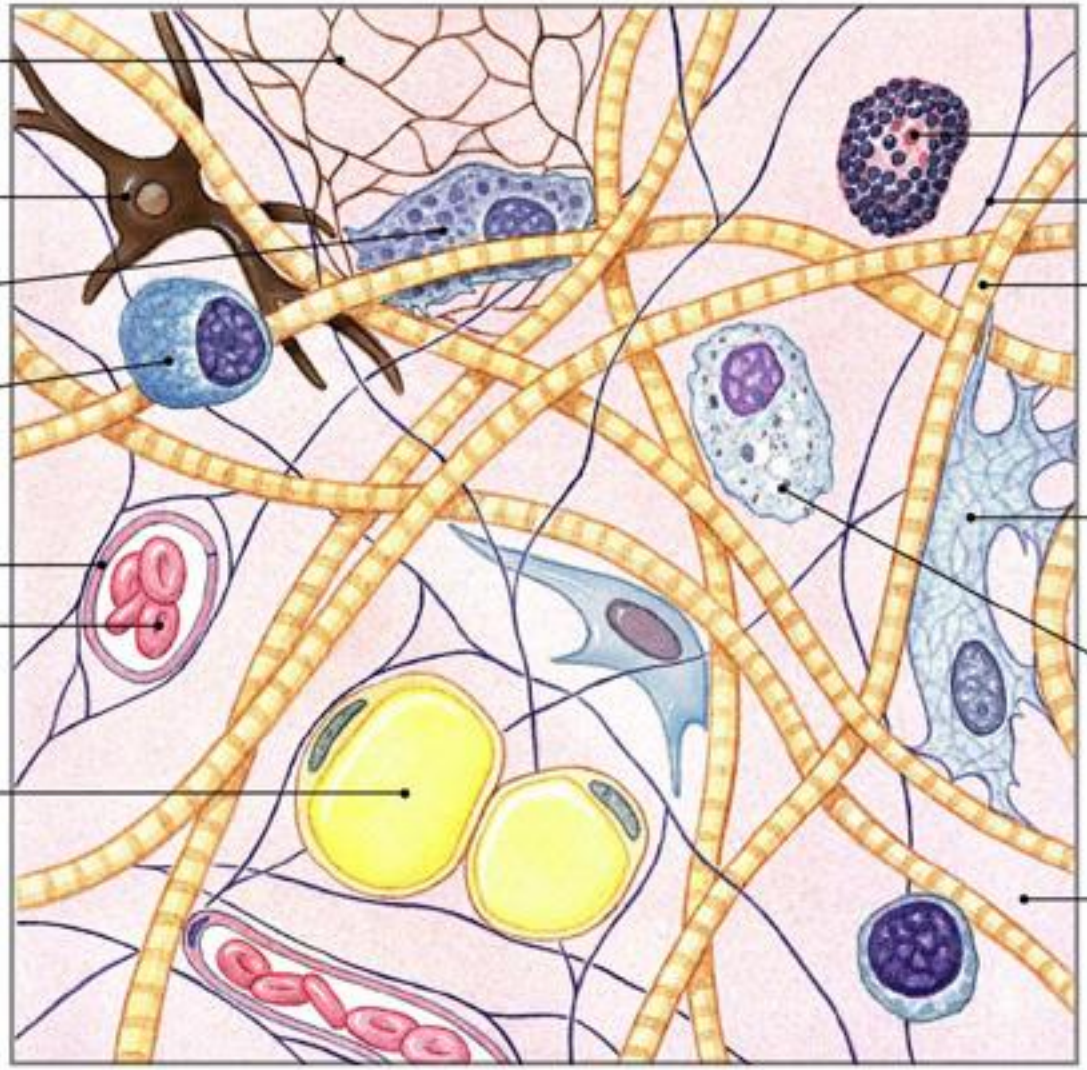


Connective tissue Proper

Loose (areolar) connective tissue

LOOSE (Areolar) CT

- Consists of all 3 types of fibers, several types of cells, and semi-fluid ground substance. (MORE CELLS AND GROUND SUBSTANCE THAN FIBERS)
- Supports epithelium (subcutaneous layer and lamina propria)
- surrounds capillaries
- Fills spaces between muscles and nerves
- Flexible but not very much resistant to stress



Loose connective tissue

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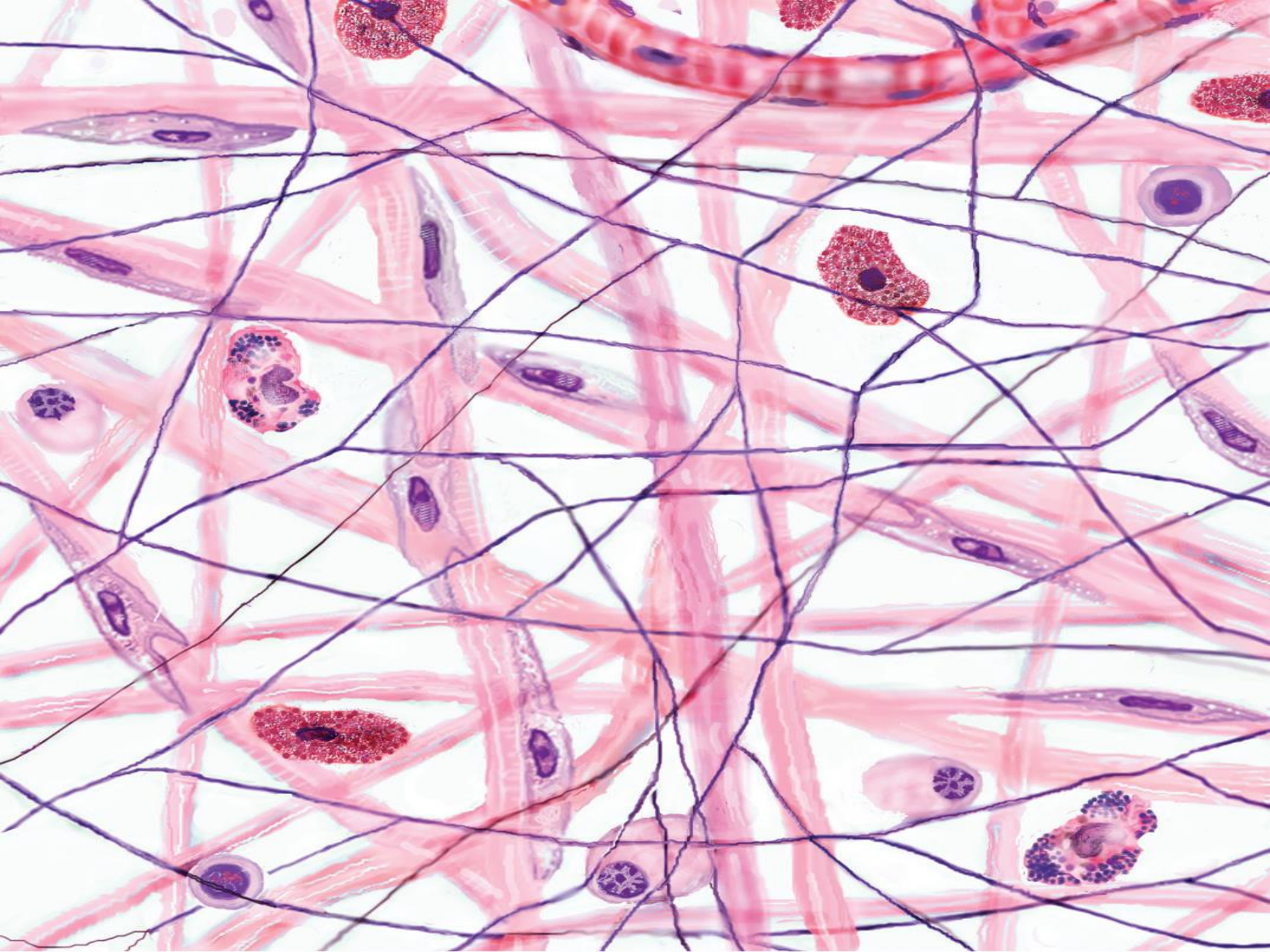
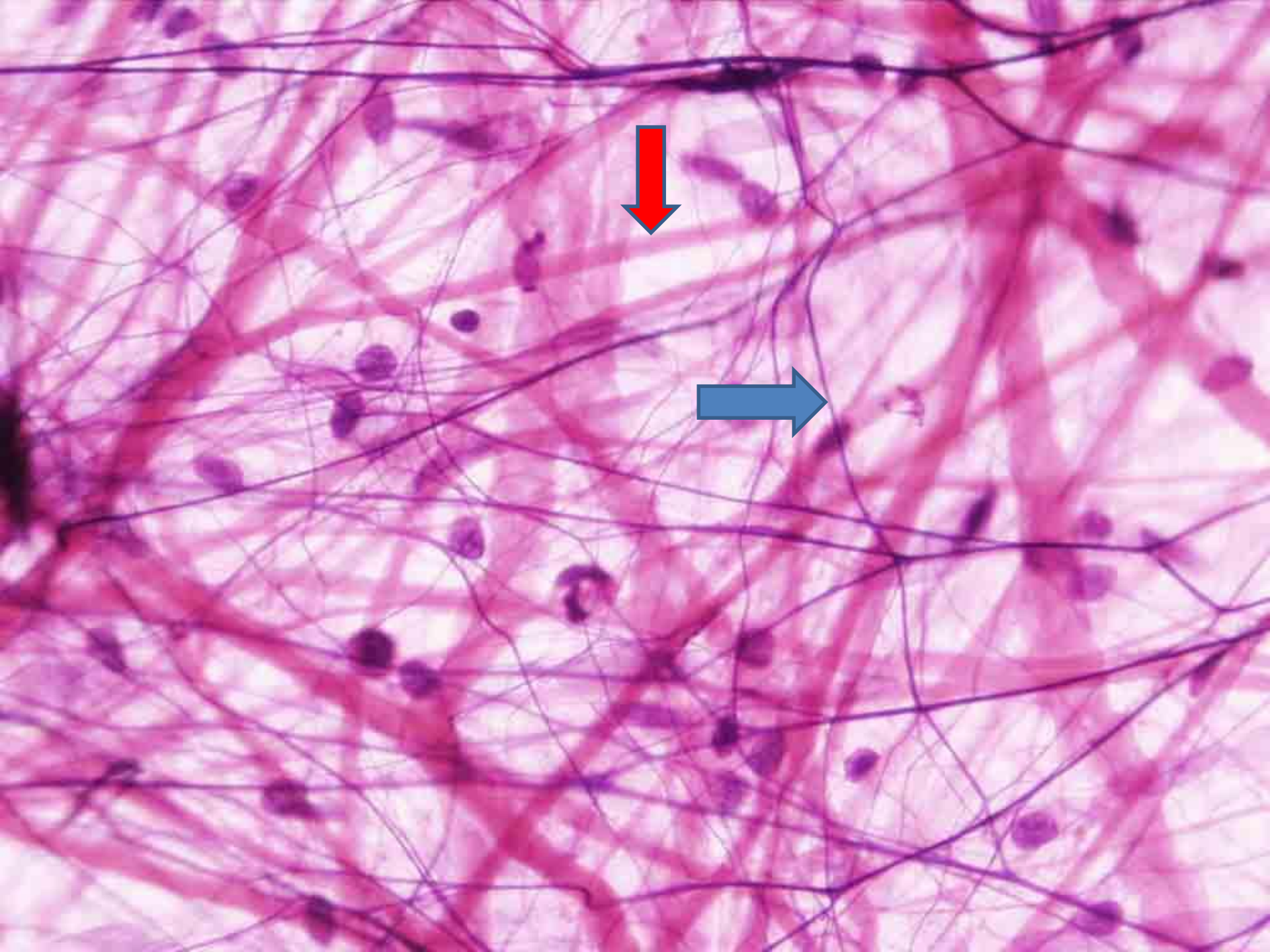
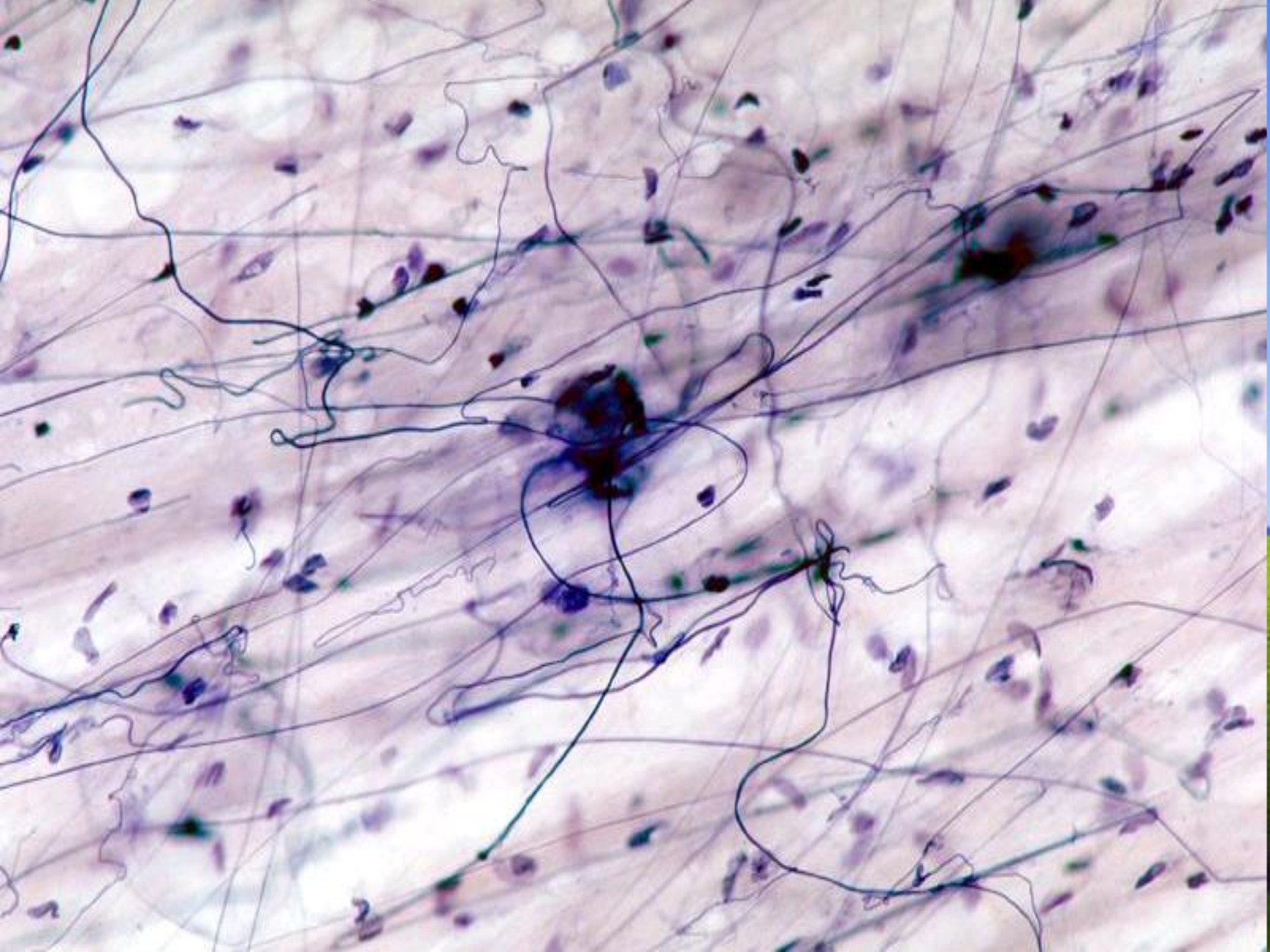
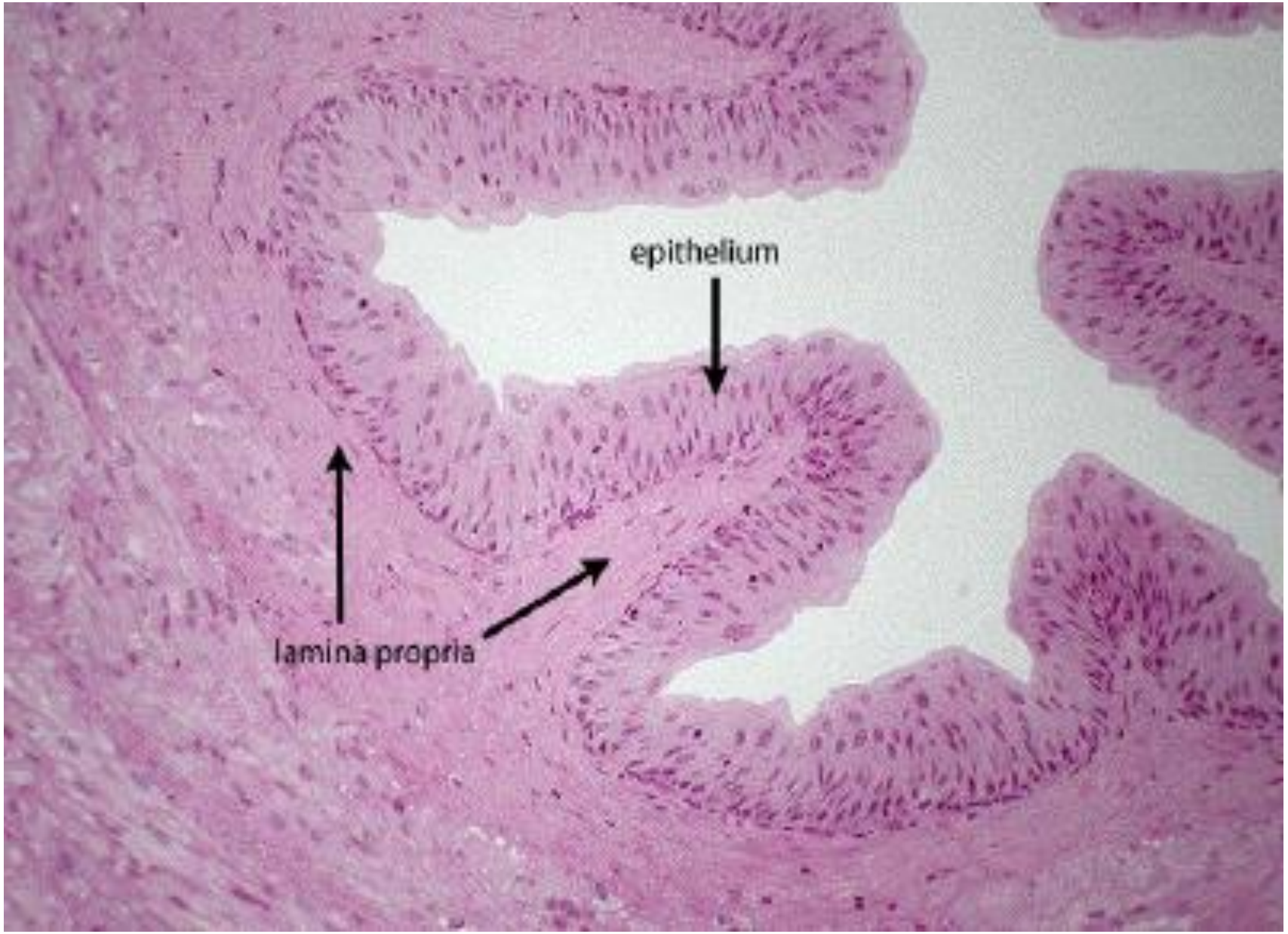
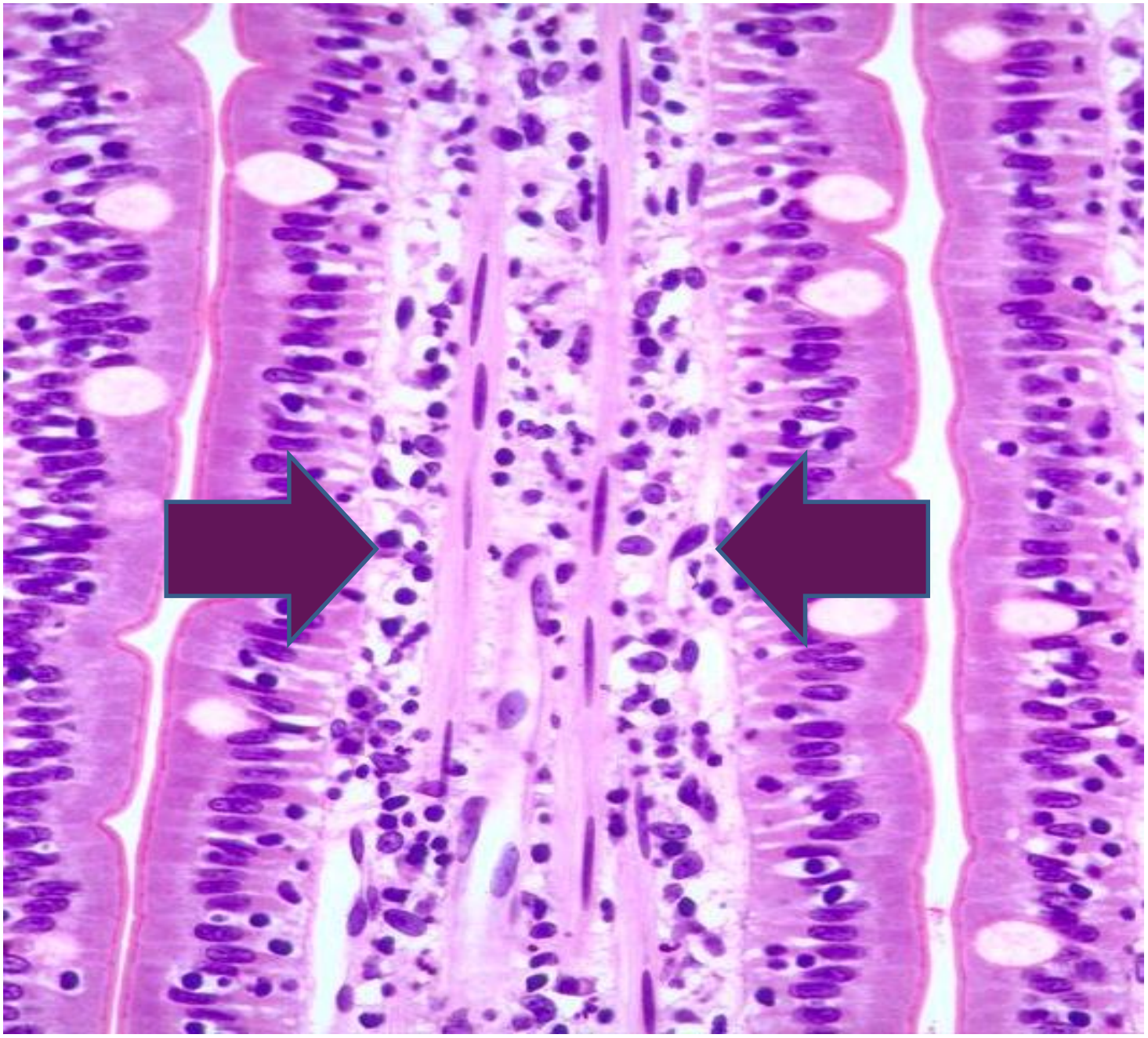
Fig. 3-29

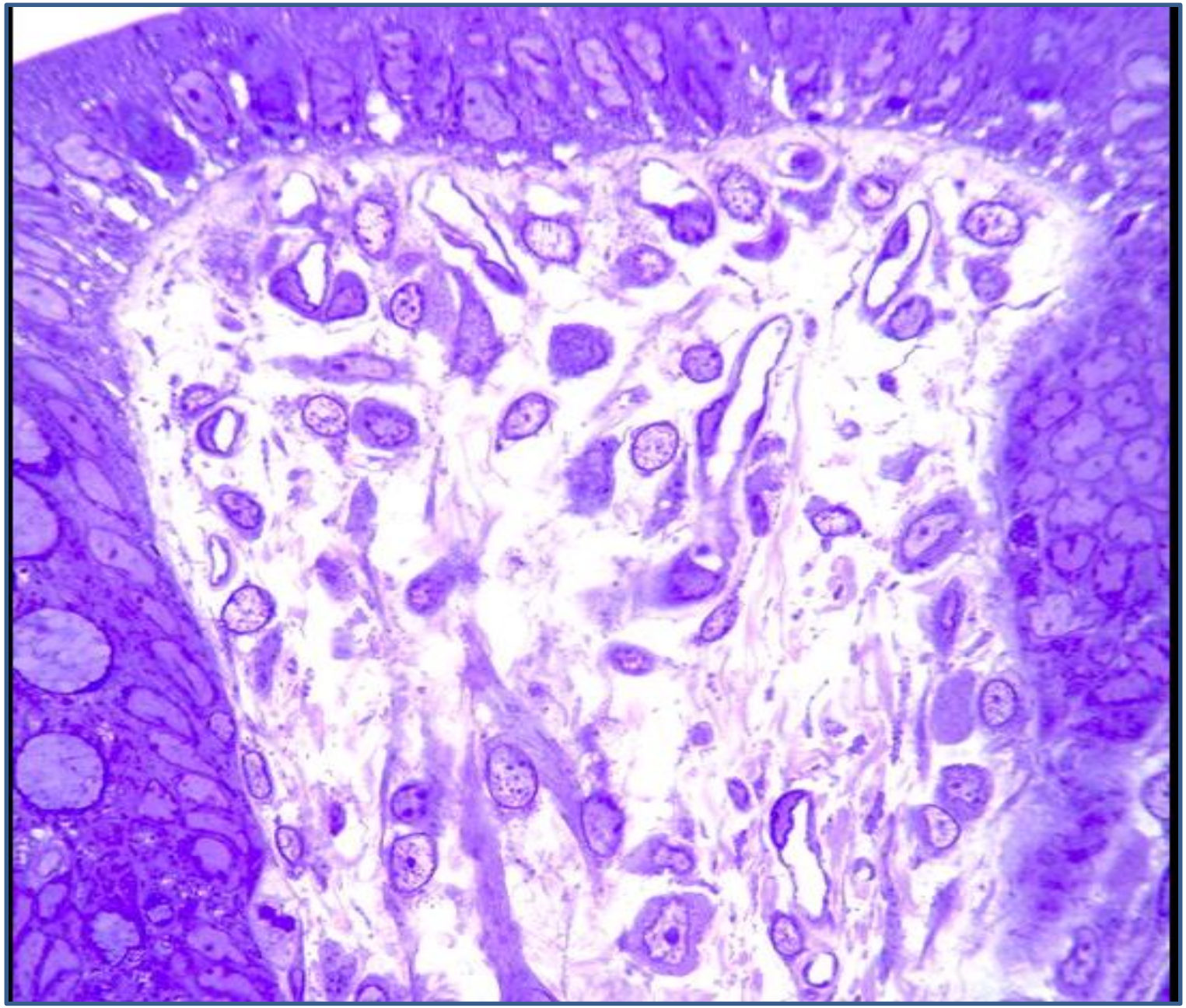







epithelium
lamina propria





Connective tissue Proper

Dense connective tissue

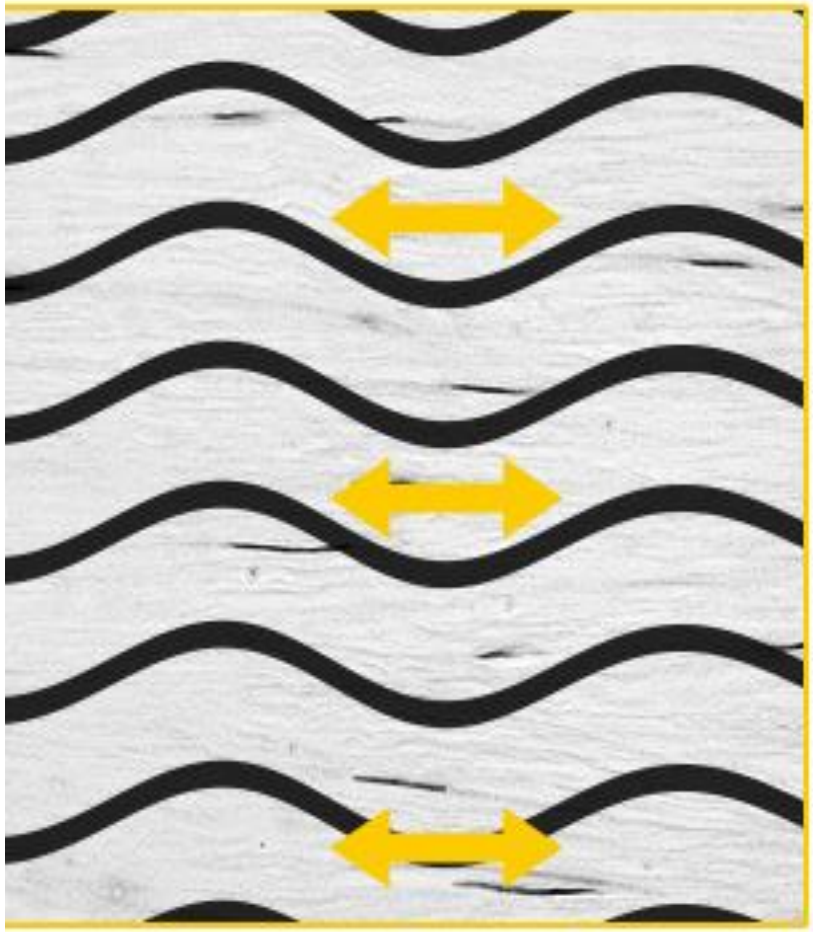
Dense Connective Tissue

Contains more numerous and thicker fibers and far fewer cells than loose CT.

a. **Dense regular connective tissue**
   Tendons and ligaments

b. **Dense irregular connective tissue**
   Dermis of skin

Direction of Dense Connective Tissue Fibers



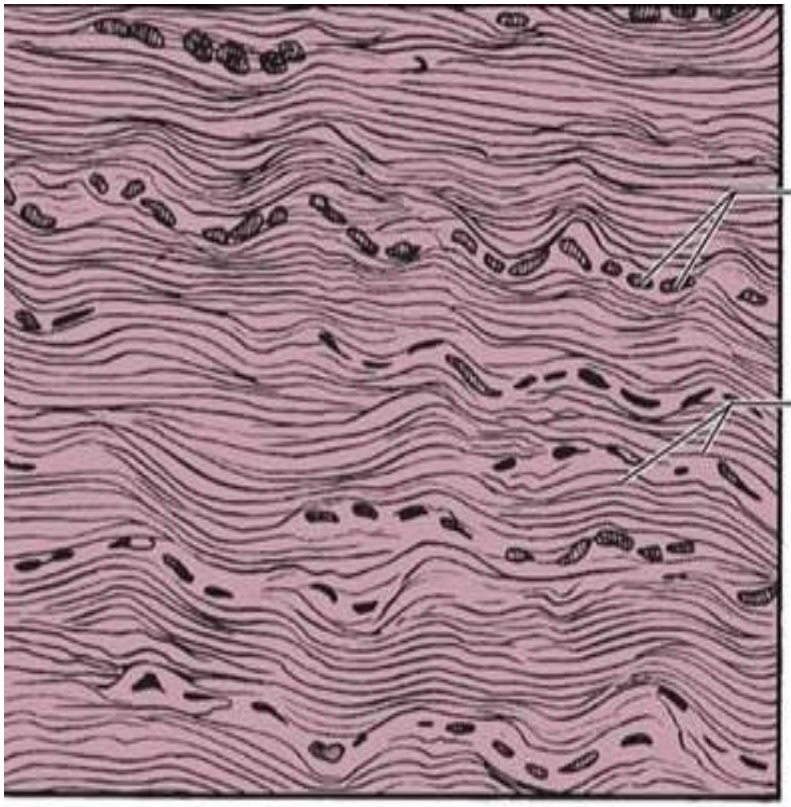
Dense Regular

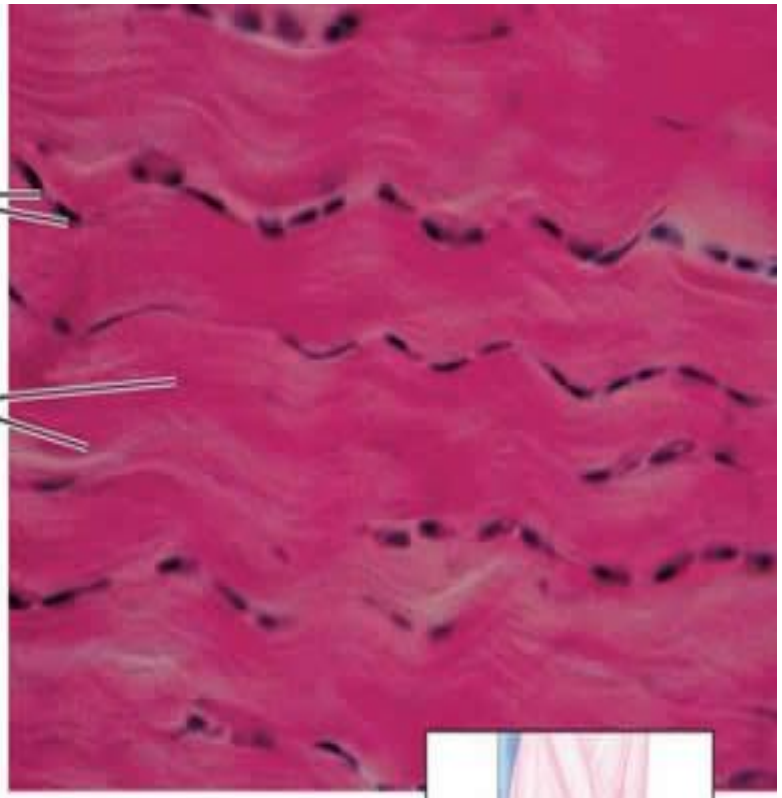
Dense Irregular

Regular Dense connective tissue

Dense regular Connective Tissue

- Consists of bundles of collagen fibers and fibrocytes.
- Forms tendons, ligaments.
- Function = provide strong attachment between various structures.

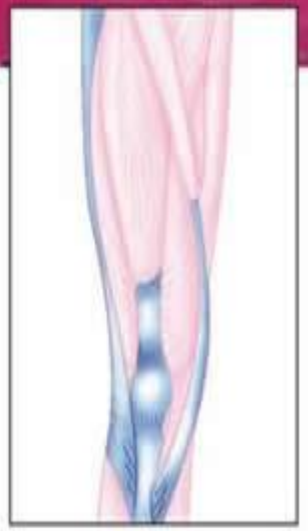


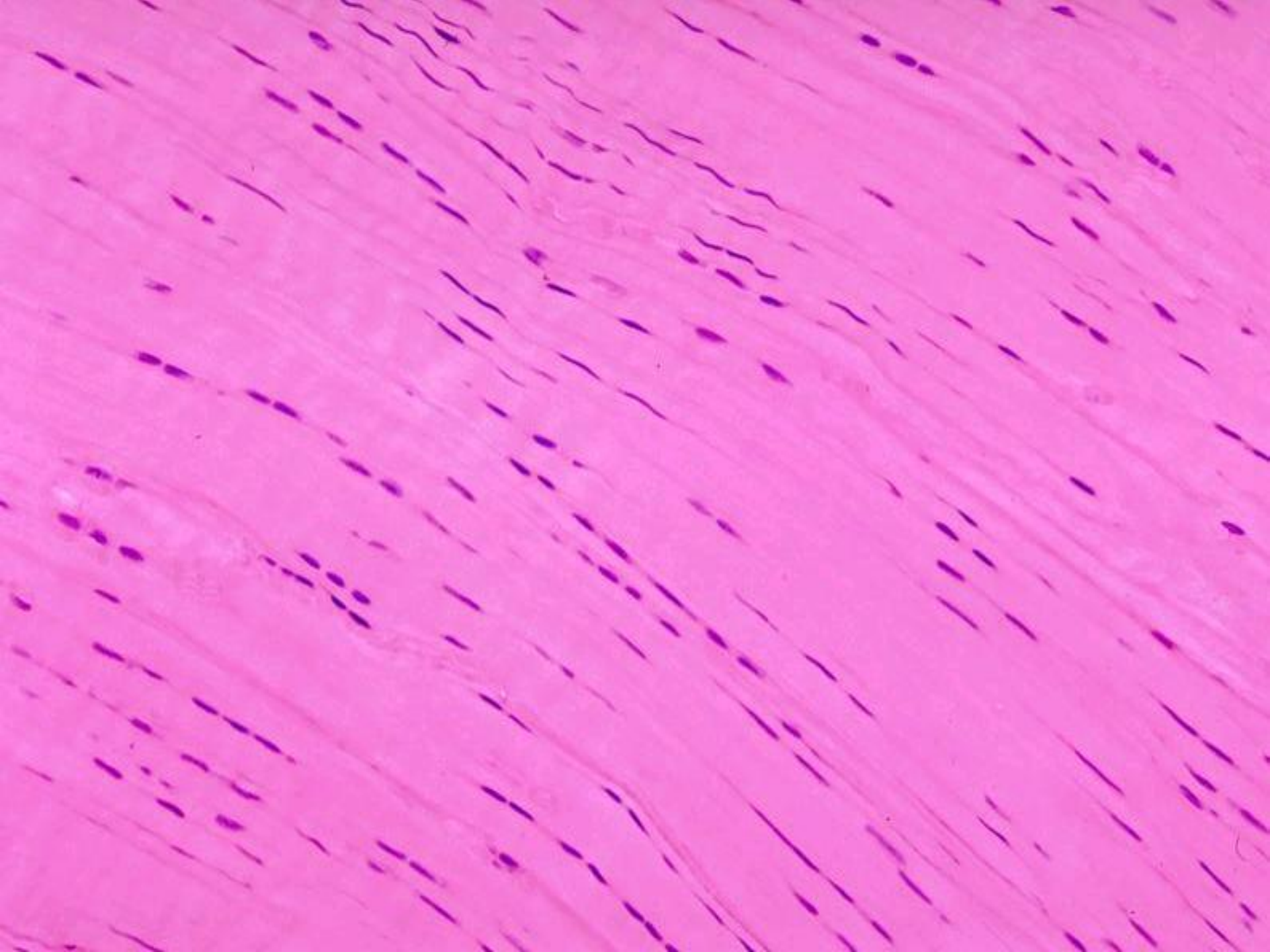


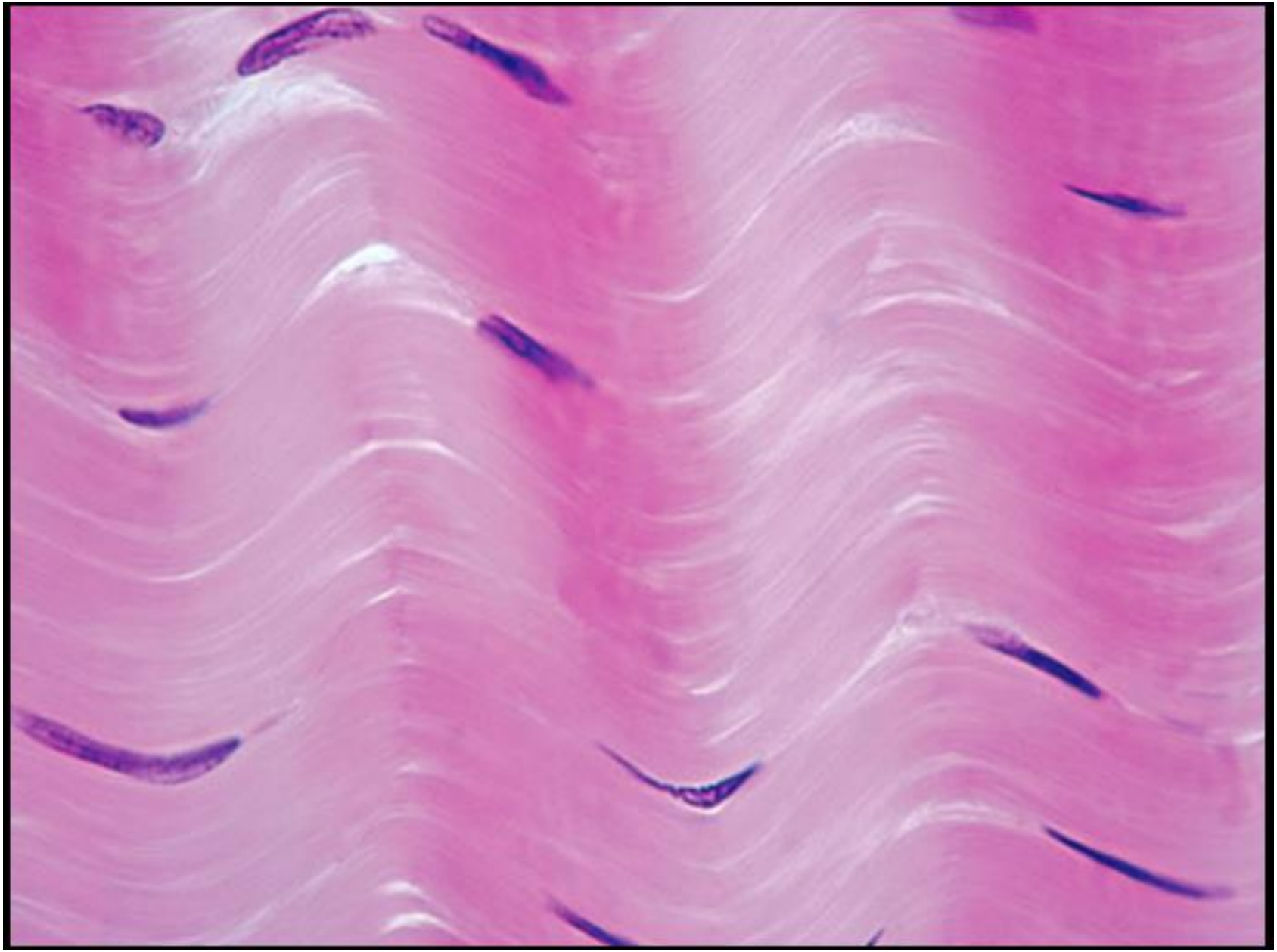
Dense Connective Tissue

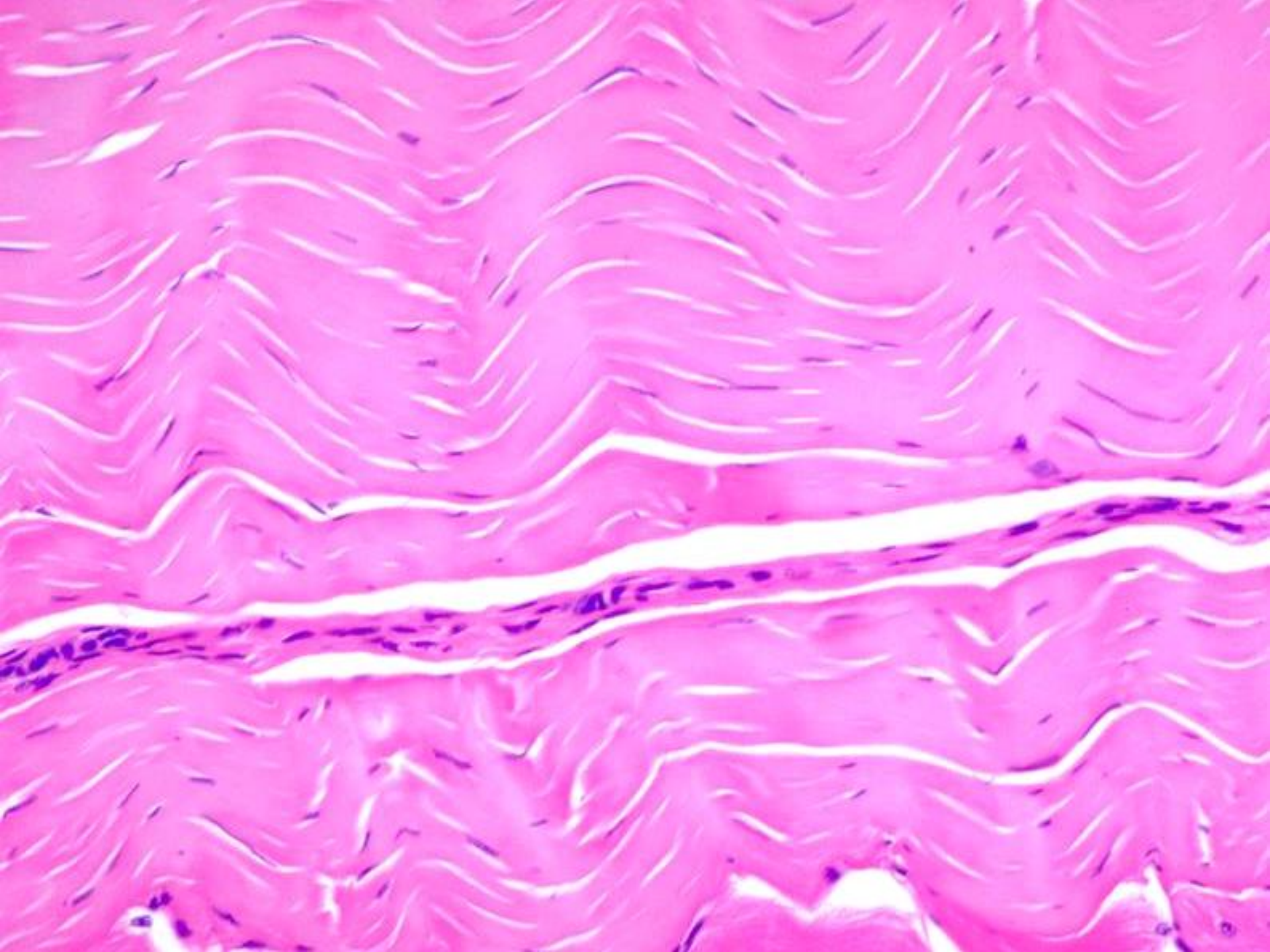
Location: Tendons; ligaments

Function: Binds organs together





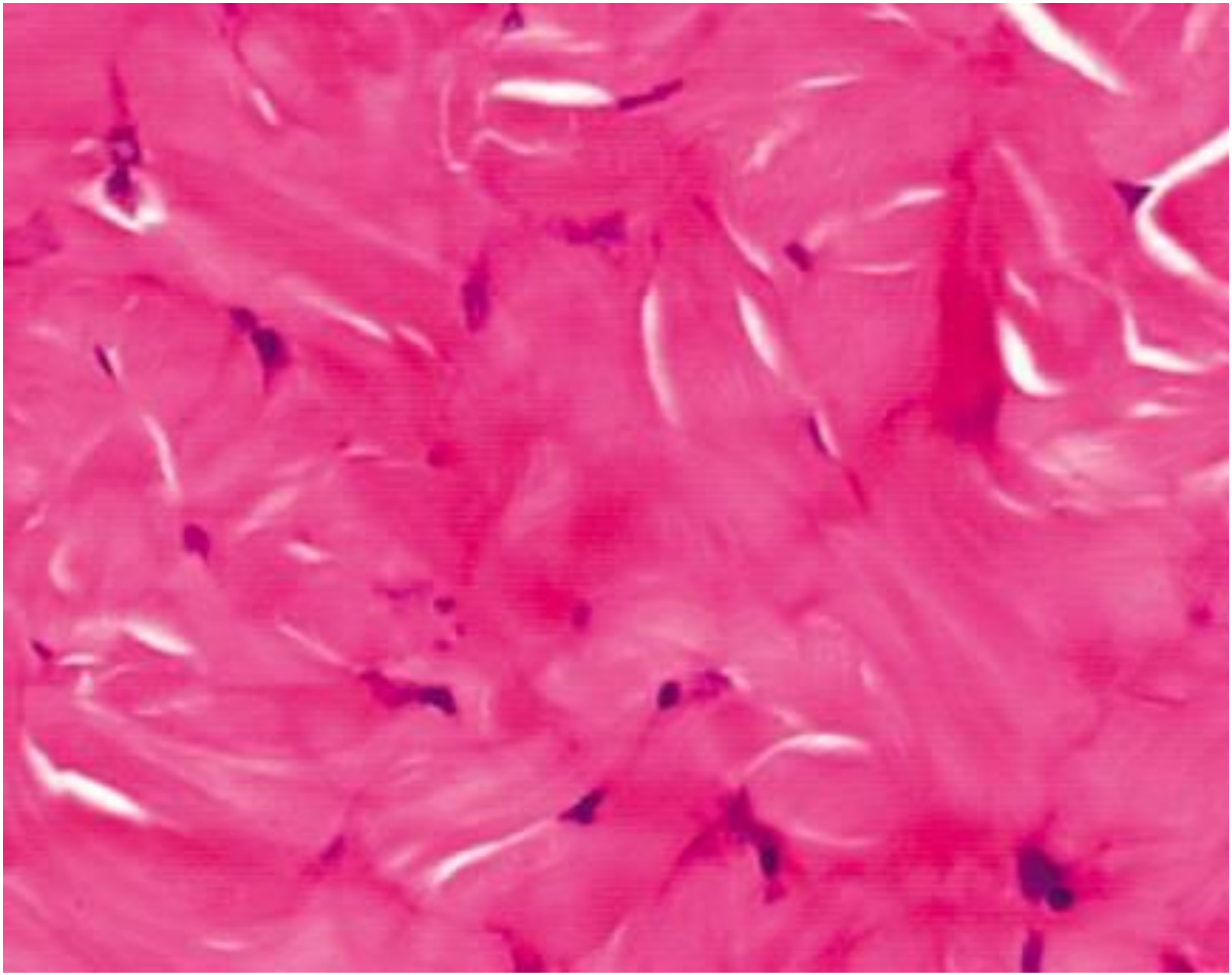


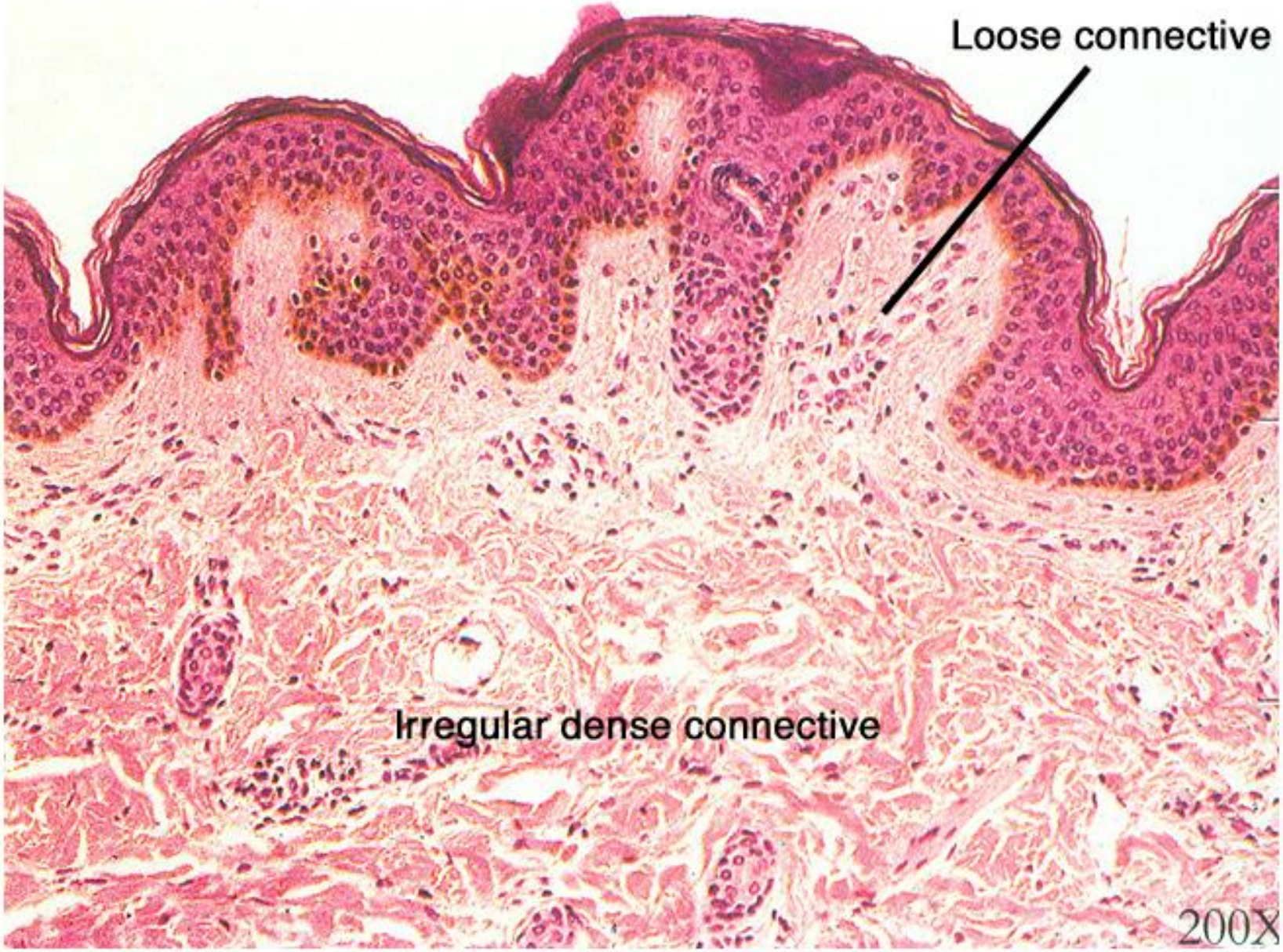


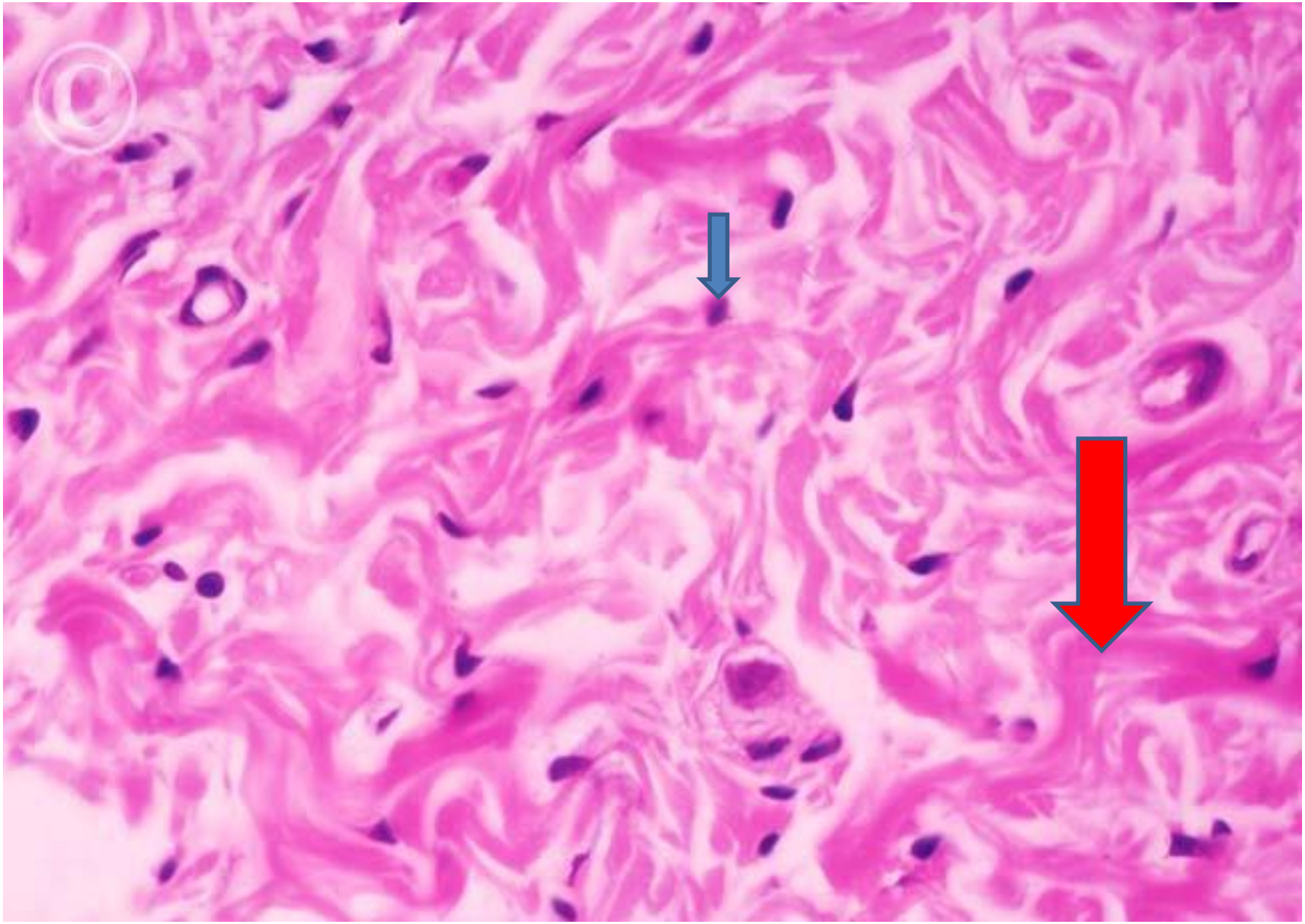
Irregular Dense connective tissue

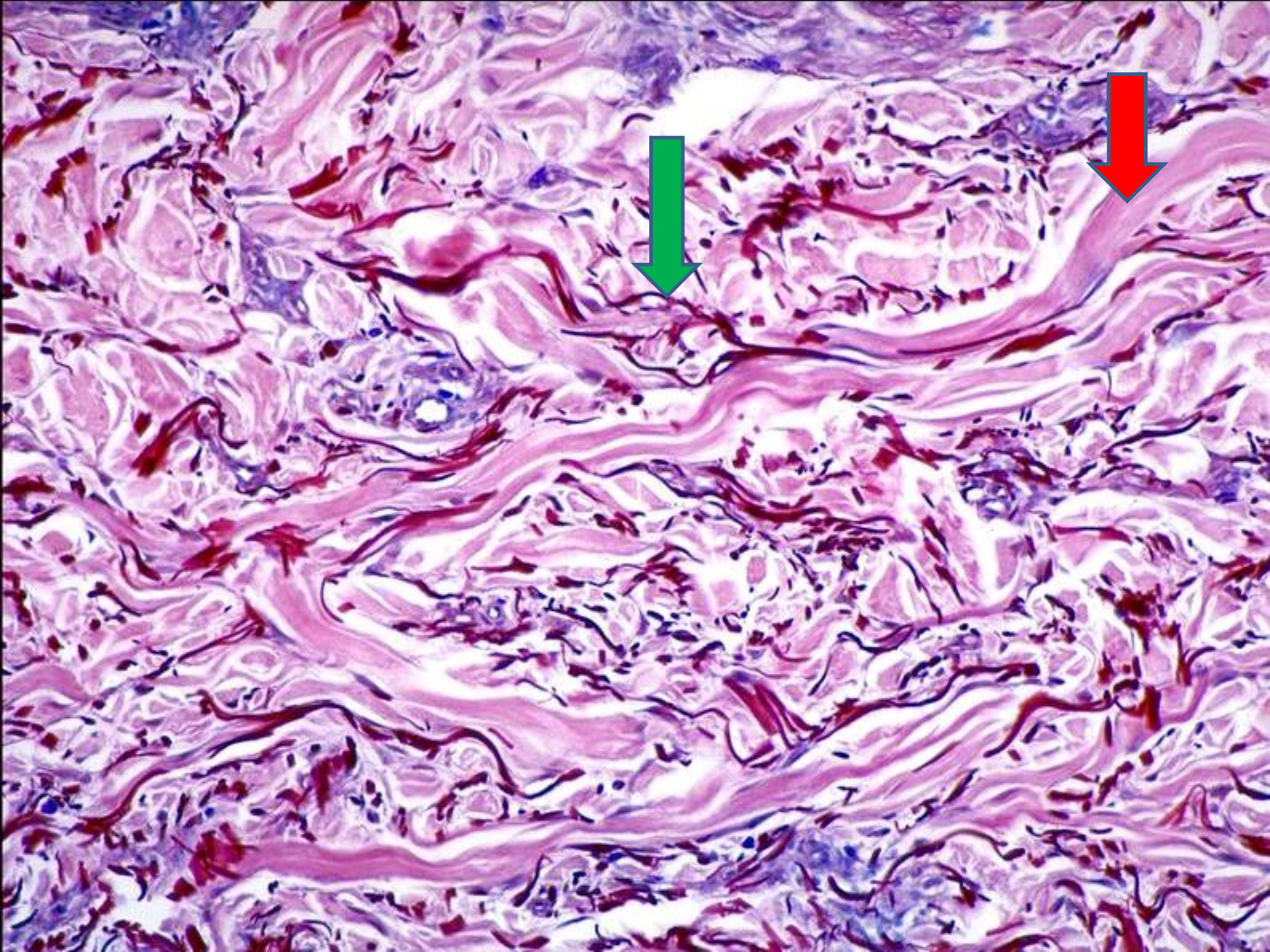
Dense Irregular CT

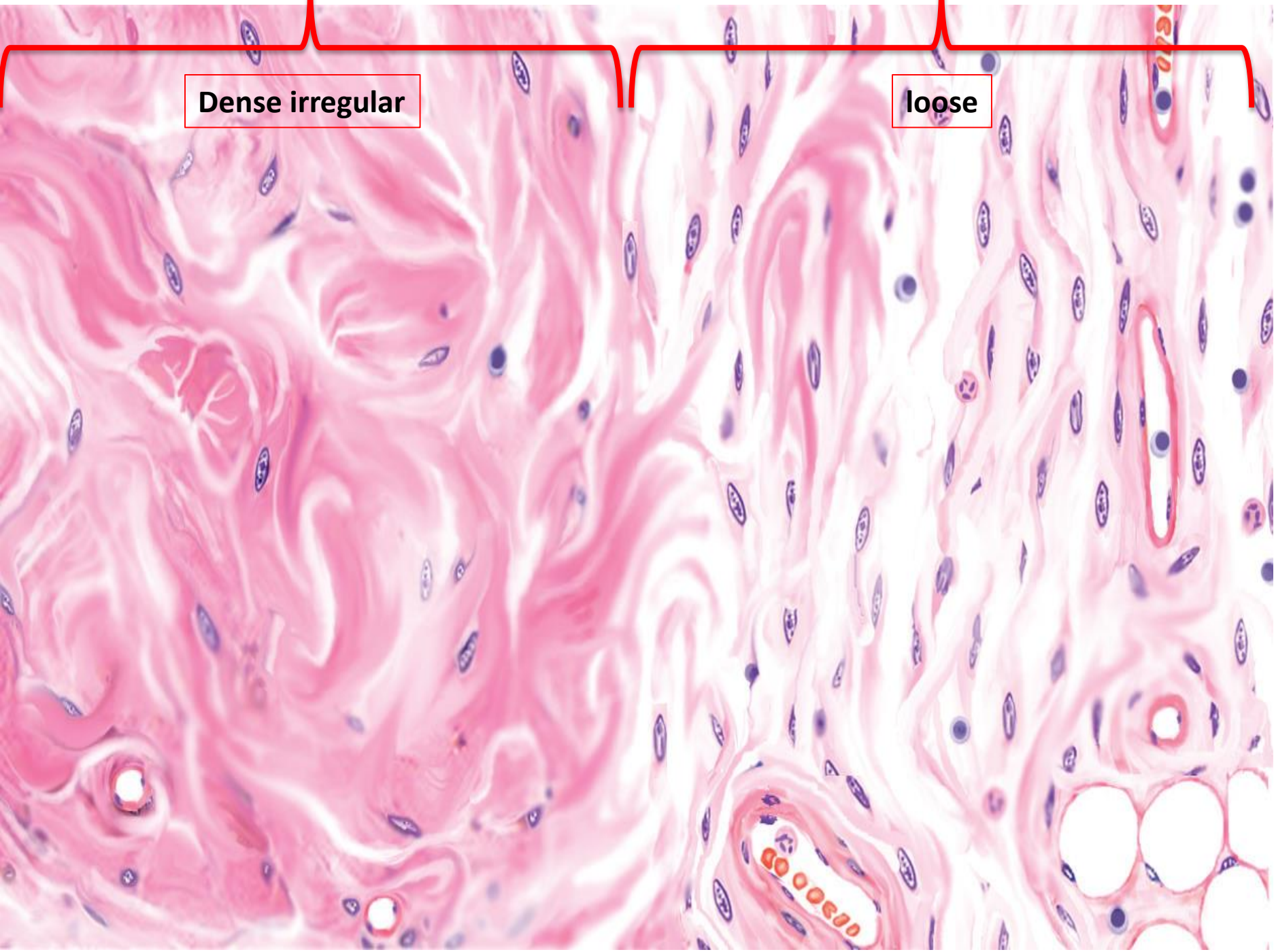
- Consists of randomly-arranged collagen fibers and a few fibrocytes.
- Found in dermis of skin
- Function = provide strength




Loose connective
Irregular dense connective
200X






Dense irregular
loose

Specialized Connective tissue

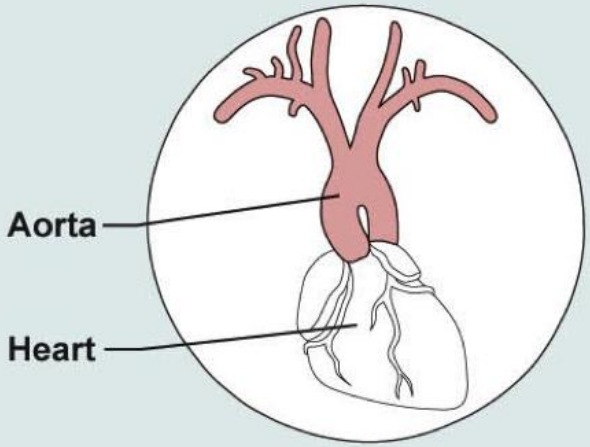
Elastic connective tissue

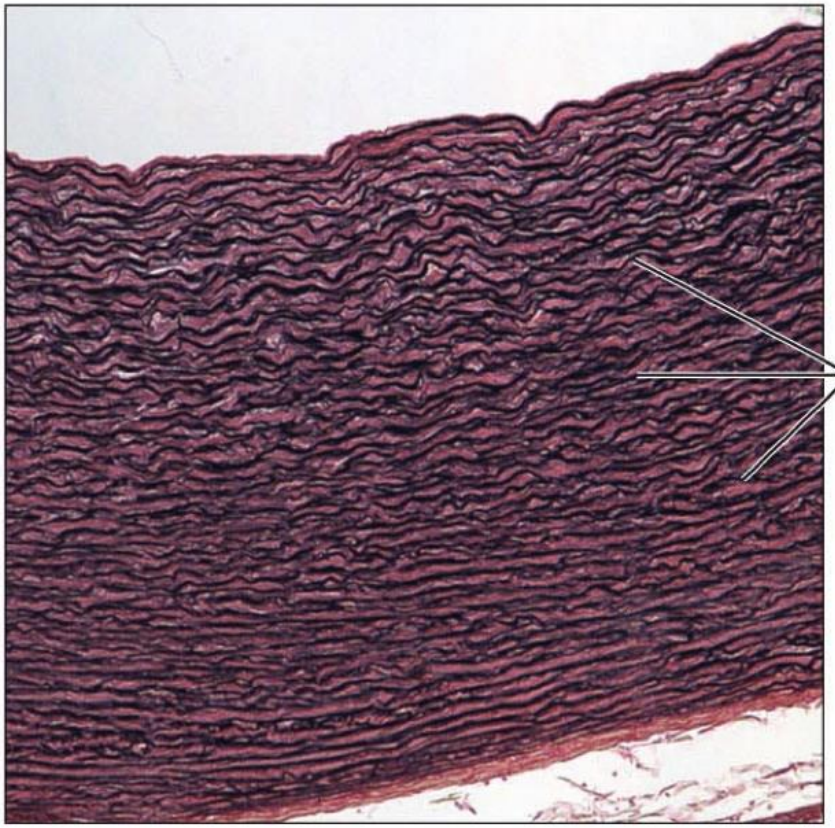
(g) Connective tissue proper: dense connective tissue, elastic

Description: Dense regular connective tissue containing a high proportion of elastic fibers.

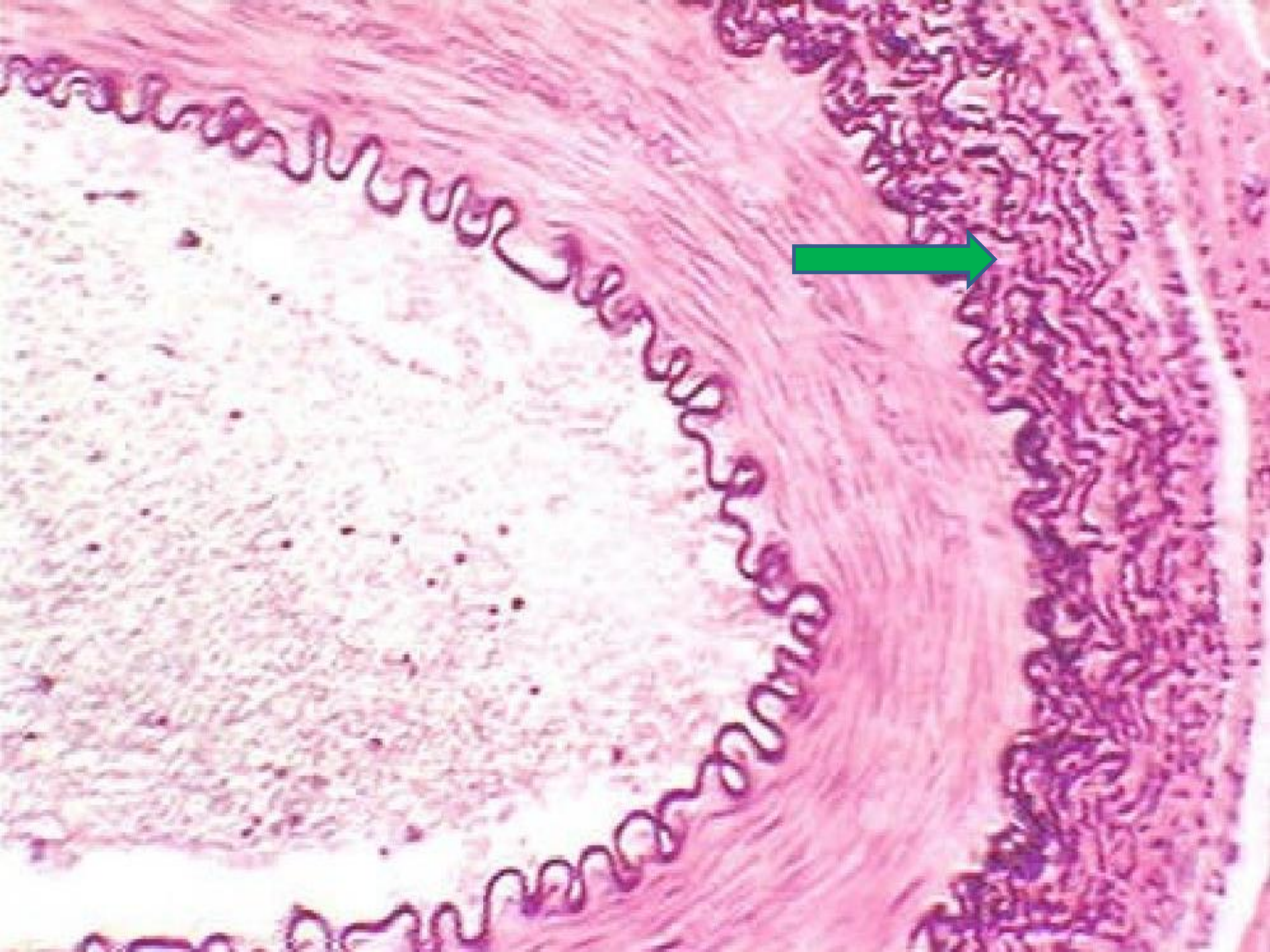
Function: Allows recoil of tissue following stretching; maintains pulsatile flow of blood through arteries; aids passive recoil of lungs following inspiration.

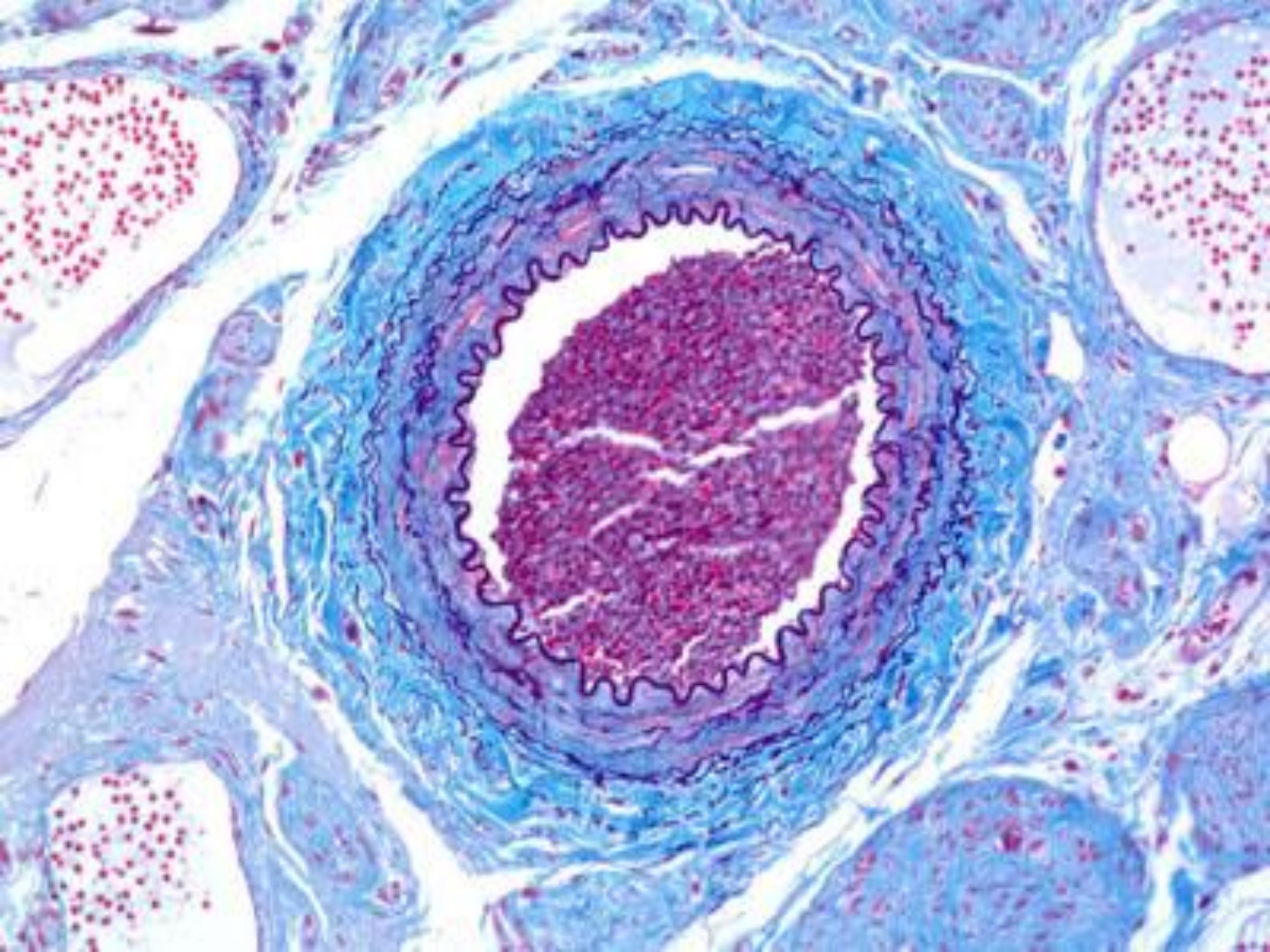
Location: Walls of large arteries; within certain ligaments associated with the vertebral column; within the walls of the bronchial tubes.

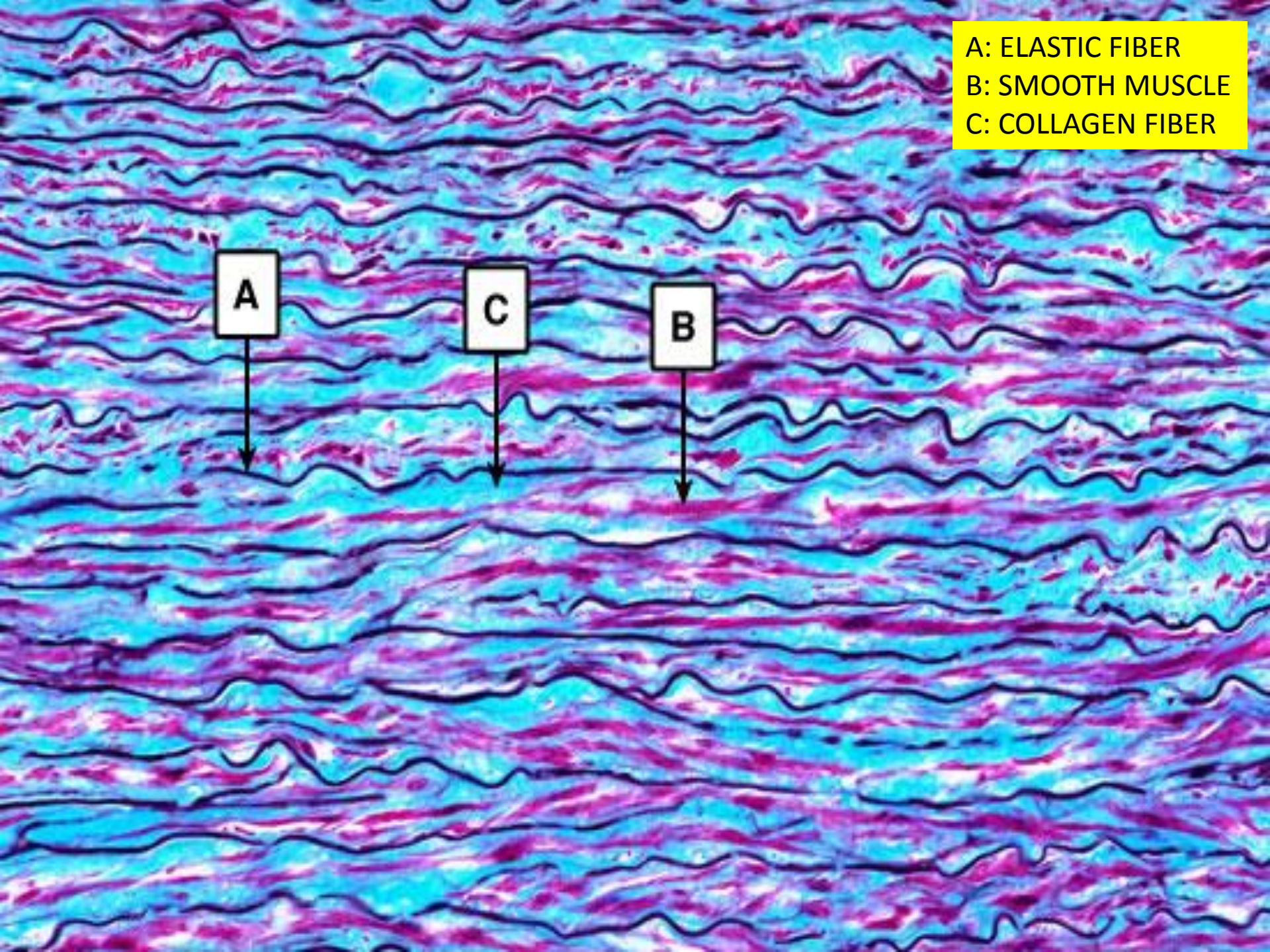




Photomicrograph: Elastic connective tissue in the wall of the aorta (85×).






A: ELASTIC FIBER
B: SMOOTH MUSCLE
C: COLLAGEN FIBER
A
C
B

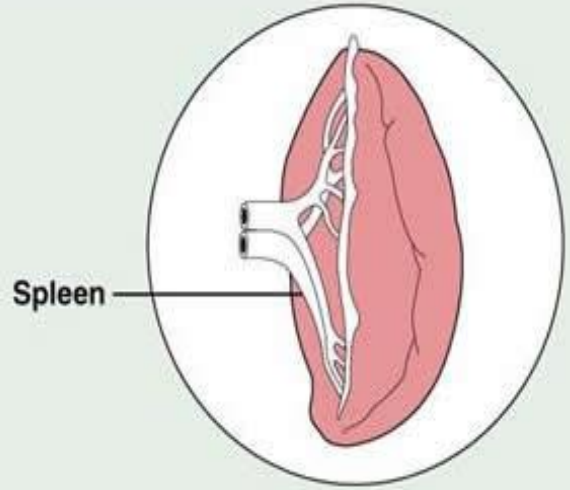
Reticular connective tissue

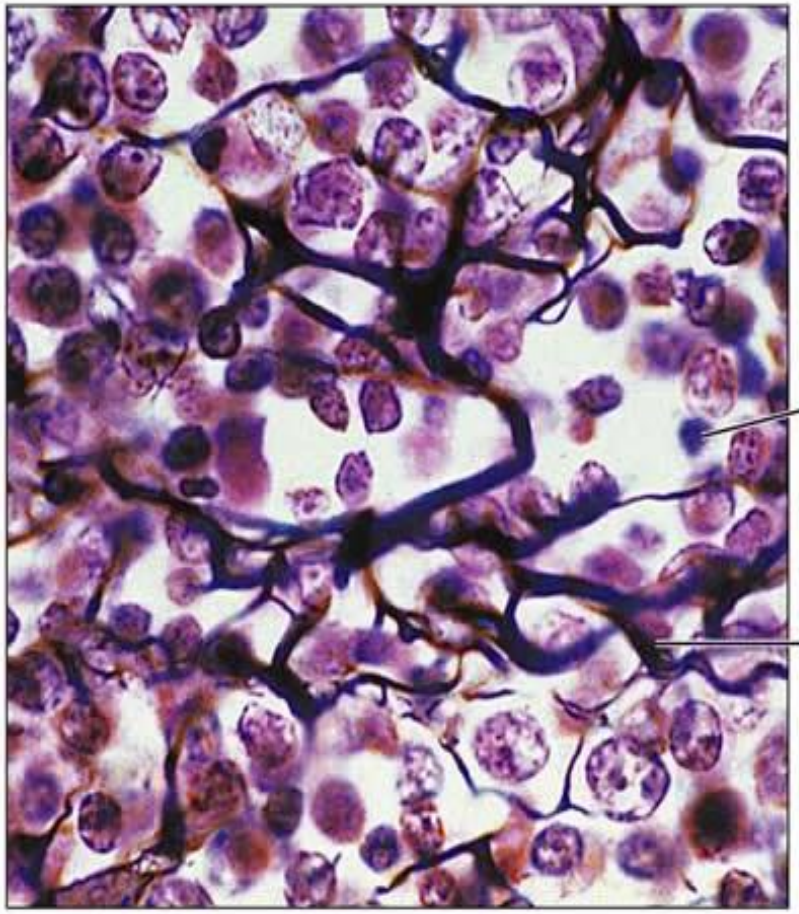
(c) Connective tissue proper: loose connective tissue, reticular

Description: Network of reticular fibers in a typical loose ground substance; reticular cells lie on the network.

Function: Fibers form a soft internal skeleton (stroma) that supports other cell types including white blood cells, mast cells, and macrophages.

Location: Lymphoid organs (lymph nodes, bone marrow, and spleen).

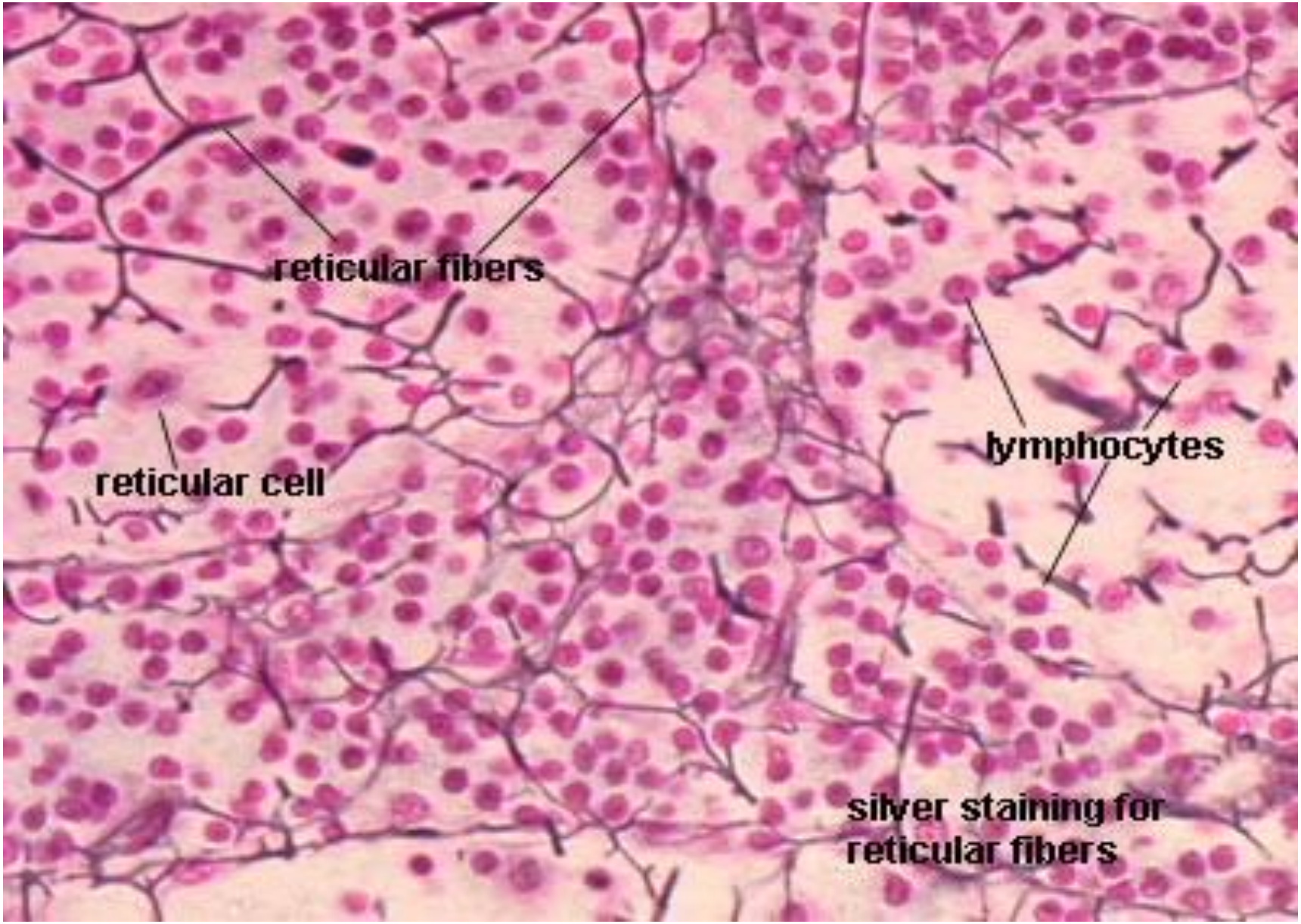


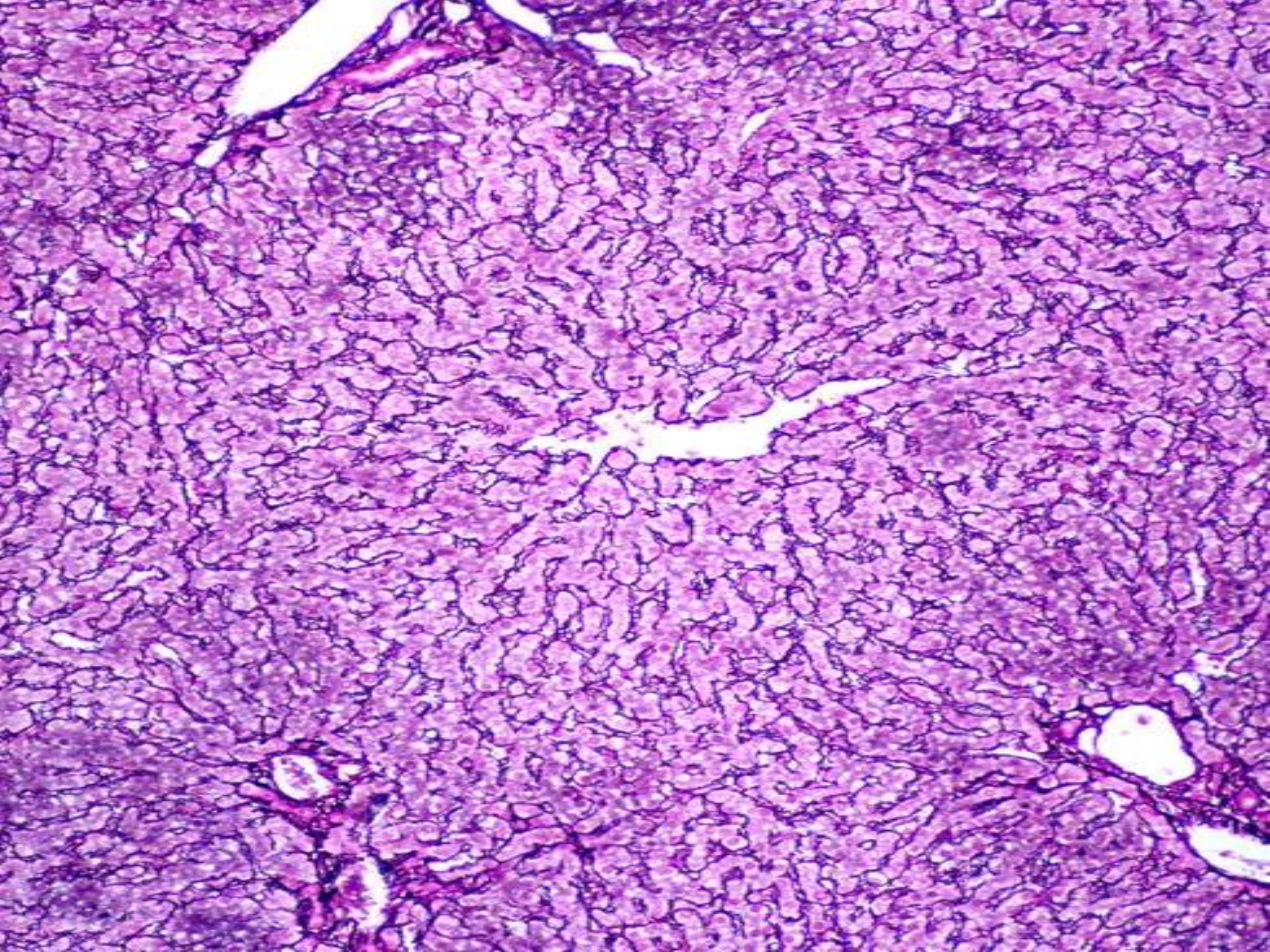


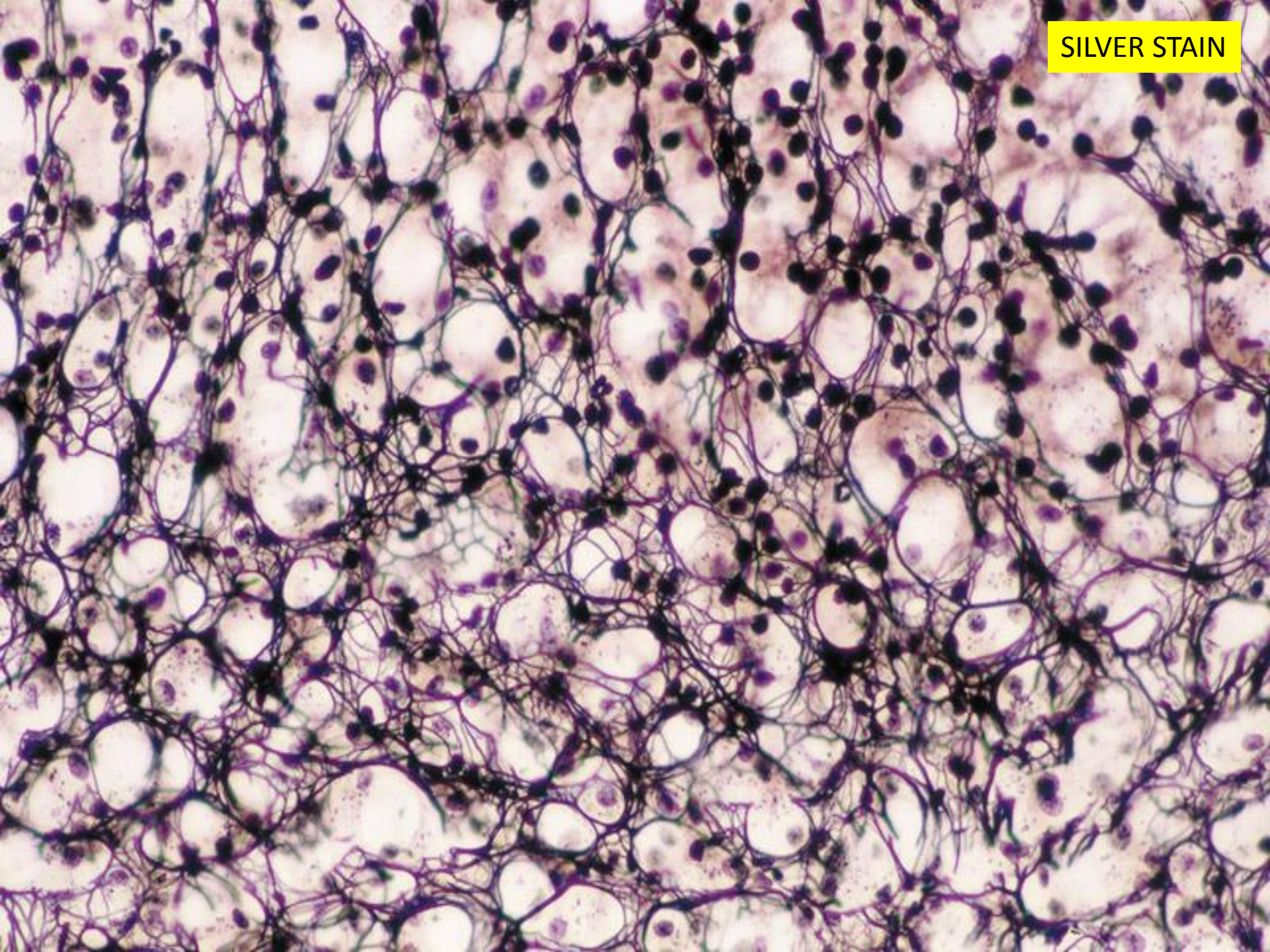
Photomicrograph: Dark-staining network of reticular connective tissue fibers forming the internal skeleton of the spleen (350×).

Reticular CT

- Consists of fine interlacing reticular fibers and reticular cells.
- Found in liver, spleen and lymph nodes.
- Function = forms the framework (stroma) of organs


reticular fibers
reticular cell
lymphocytes
silver staining for
reticular fibers




SILVER STAIN

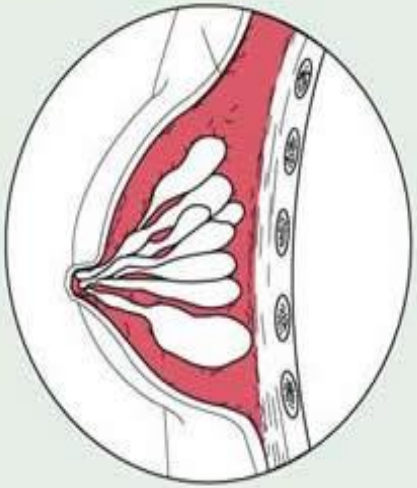
Adipose connective tissue

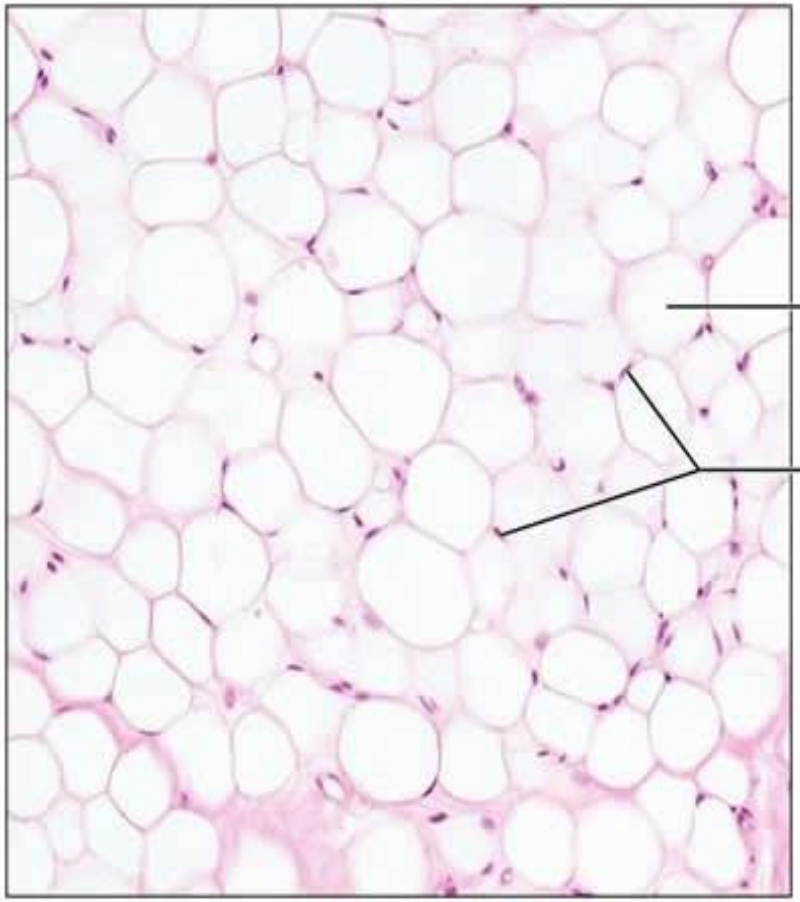
(b) Connective tissue proper: loose connective tissue, adipose

Description: Matrix as in areolar, but very sparse; closely packed adipocytes, or fat cells, have nucleus pushed to the side by large fat droplet.

Function: Provides reserve food fuel; insulates against heat loss; supports and protects organs.

Location: Under skin; around kidneys and eyeballs; within abdomen; in breasts.



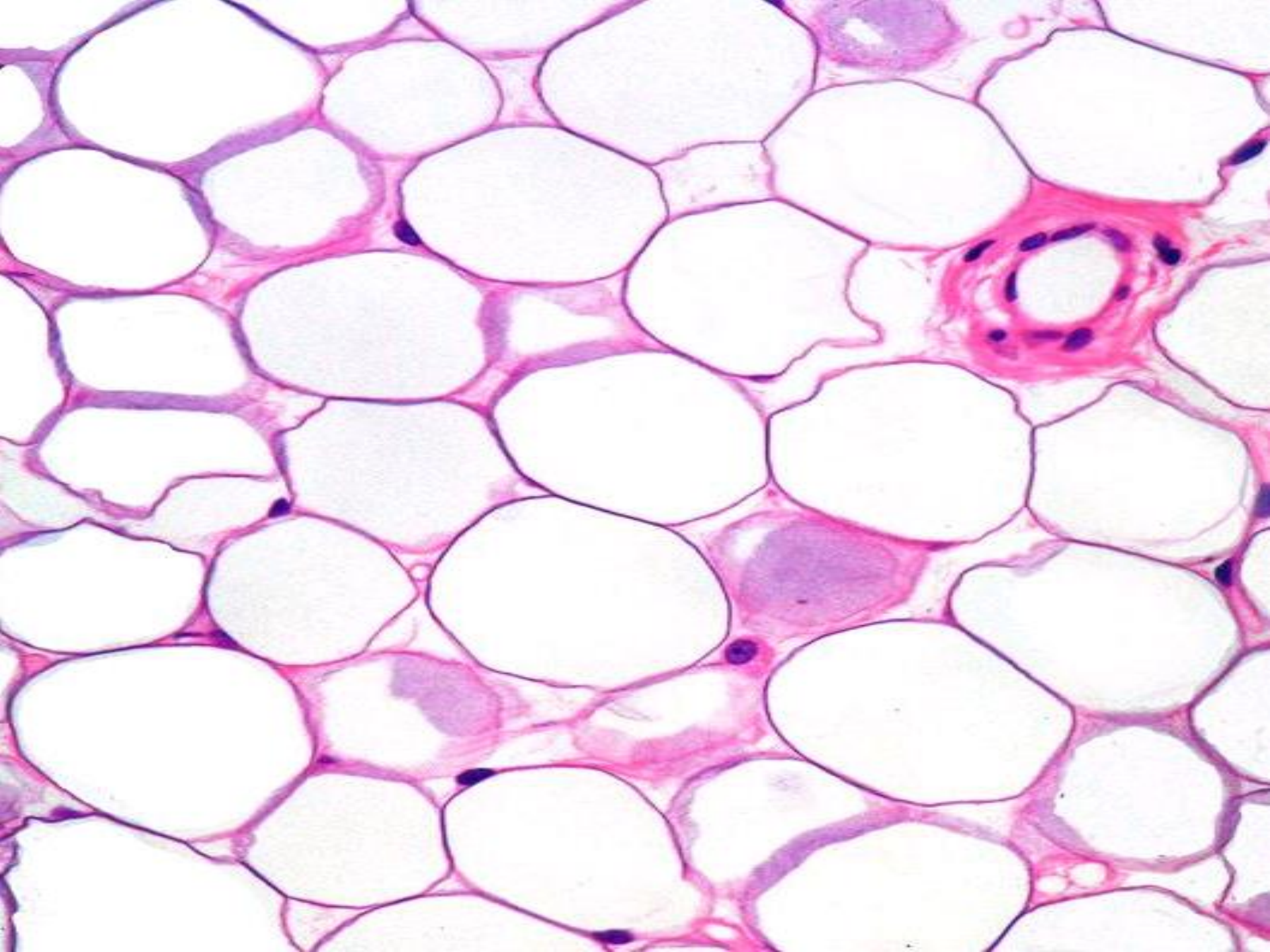


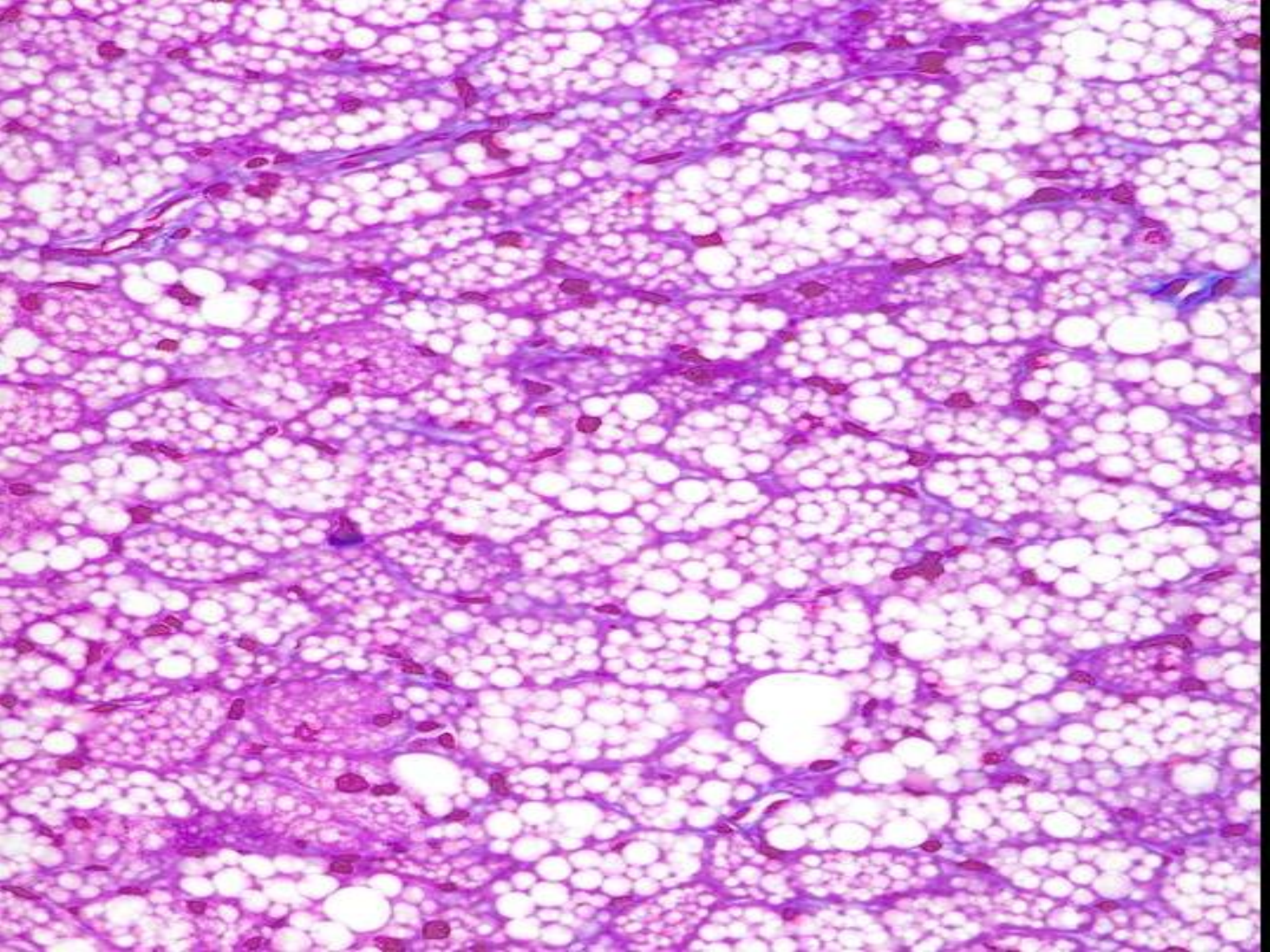
Photomicrograph: Adipose tissue from the subcutaneous layer under the skin (450×).

Adipose tissue

- Consists of adipocytes; "signet ring" appearing fat cells. They store energy in the form of triglycerides (lipids).
- Found in subcutaneous layer, around organs and in the yellow marrow of long bones.
- Function = supports, protects and insulates, and serves as an energy reserve.

- Types:
  - Yellow or white – found in most of the bulk of the human body
  - Brown fat cells – concerned with heat production, particularly important in newborn





Keloid

Is a local swelling caused by abnormally large amounts of collagen that form in scars of the skin.

It occurs most often in individuals of African descent.

Keloids

Edema

Is the excessive accumulation of water in the extracellular spaces of connective tissue