Chapter 4 Connective Tissue

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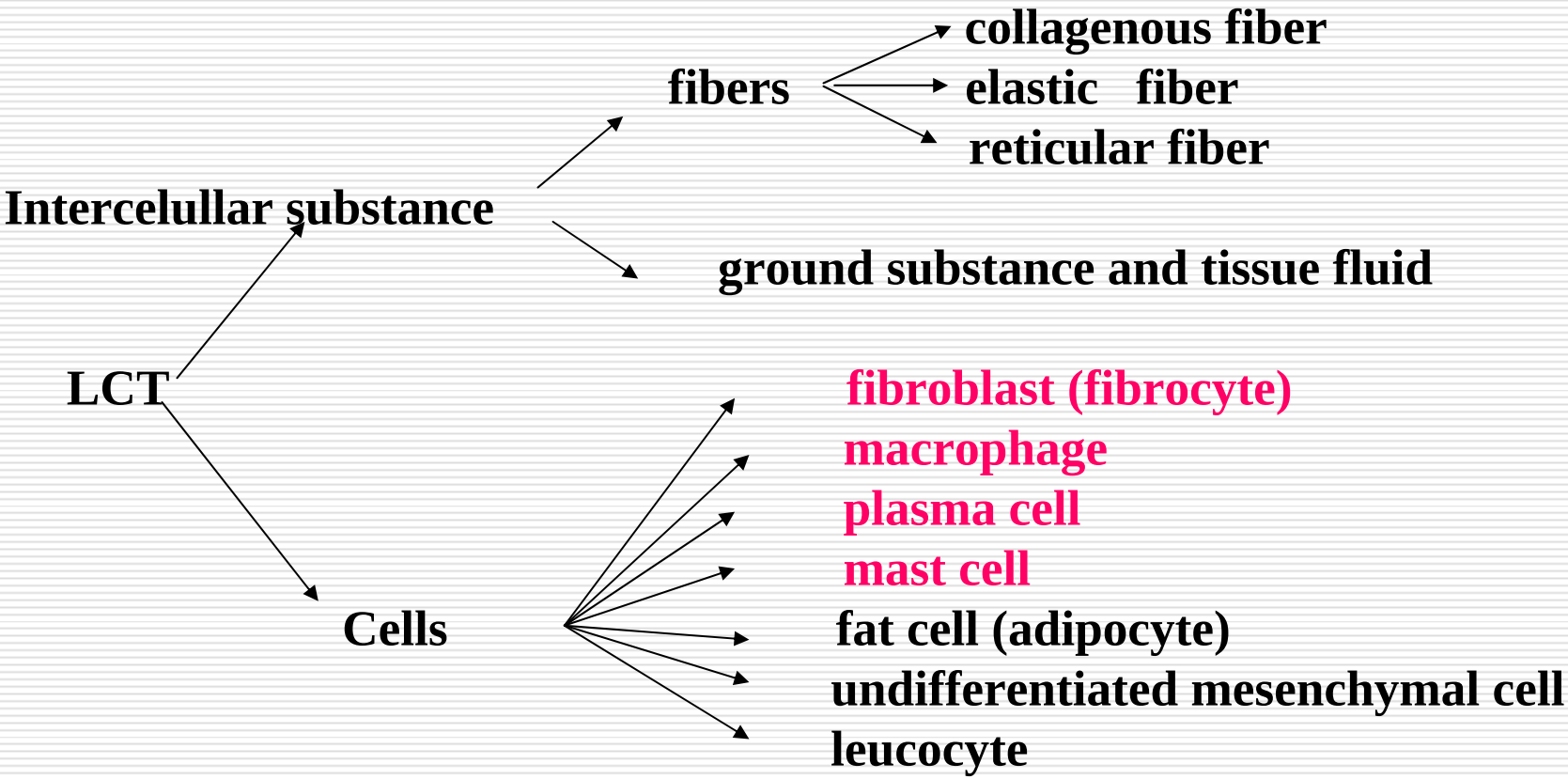
Component: cell and intercellular substance (fibers, ground substance and tissue fluid)

Origin: mesenchyme (embryo stage)

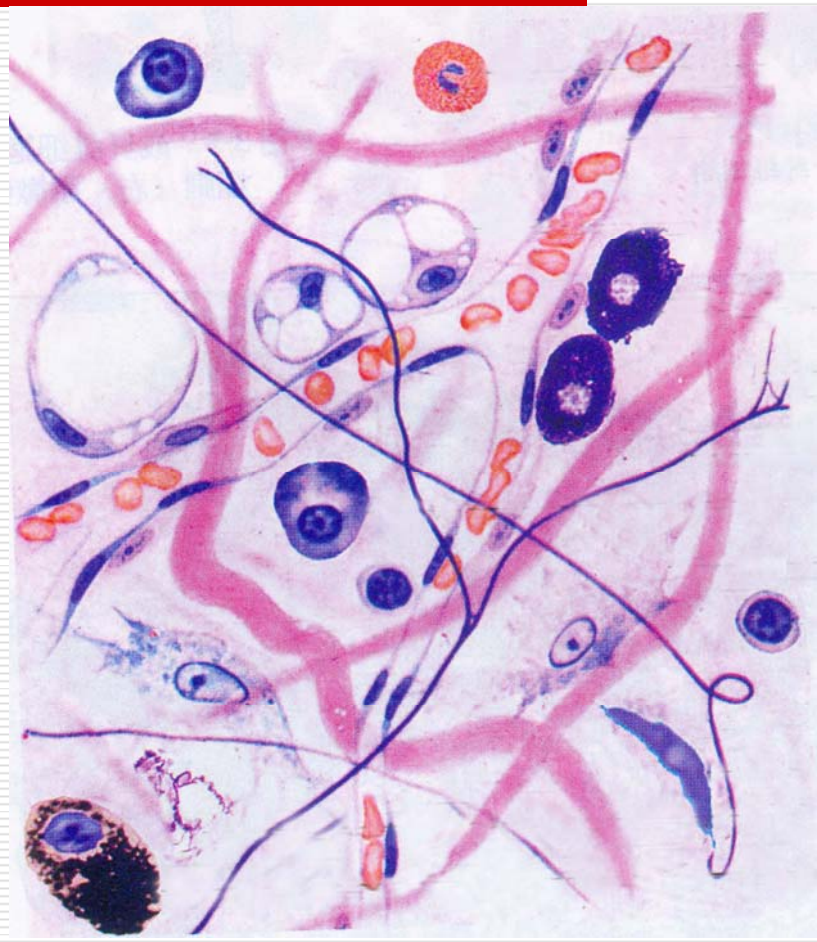
Connective tissue:

- **Loose and dense connective tissue, adipose tissue, reticular tissue**
- **Cartilage and bone**
- **Blood**

Ⅰ. Loose connective tissue



Loose Connective Tissue (model)



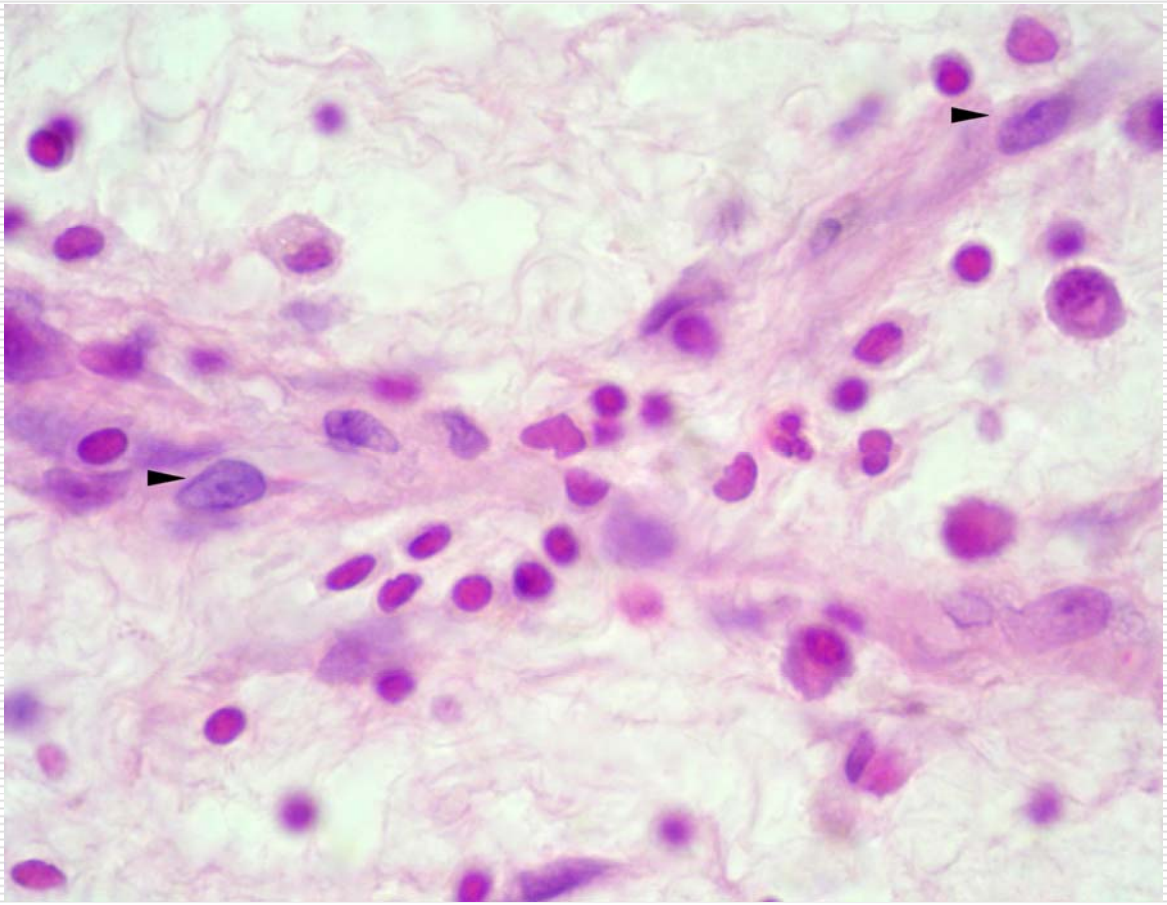
1. Cells of the connective tissue

1.1 Fibroblast

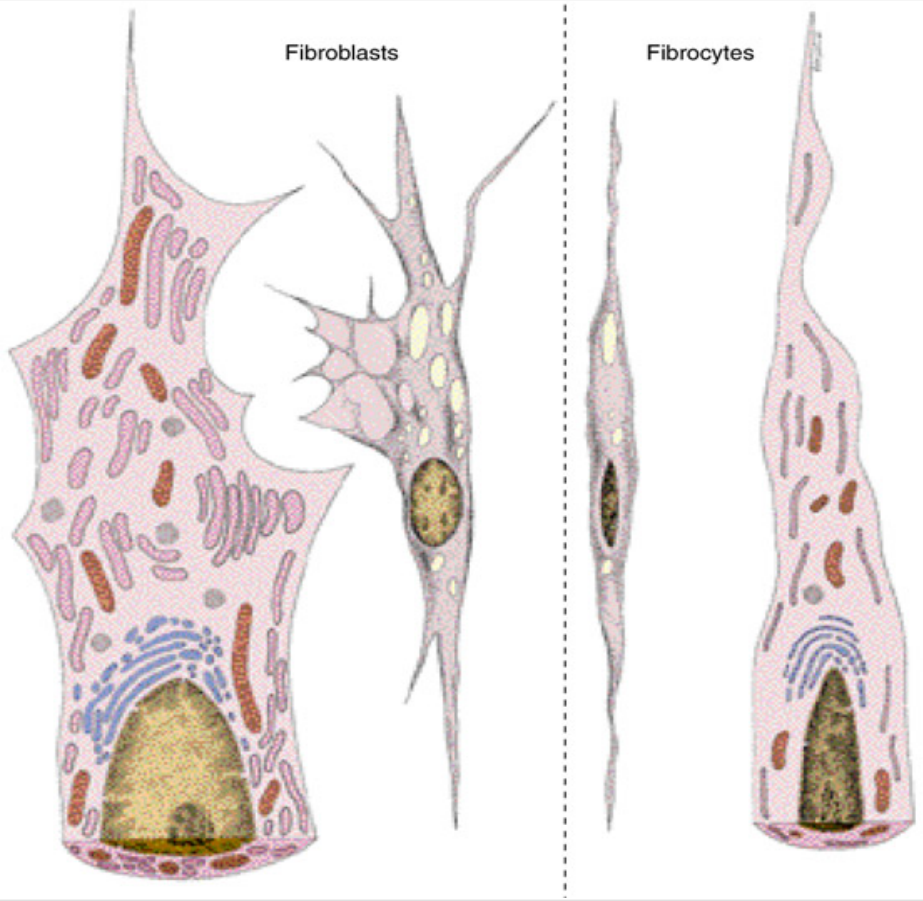
LM: large flat cells with branching processes larger oval and pale staining nucleus , one or two nucleoli , weakly basophilic cytoplasm

Fibrocytes: inactive fibroblast, spindle-shaped, smaller and darker nucleus, acidophilic cytoplasm

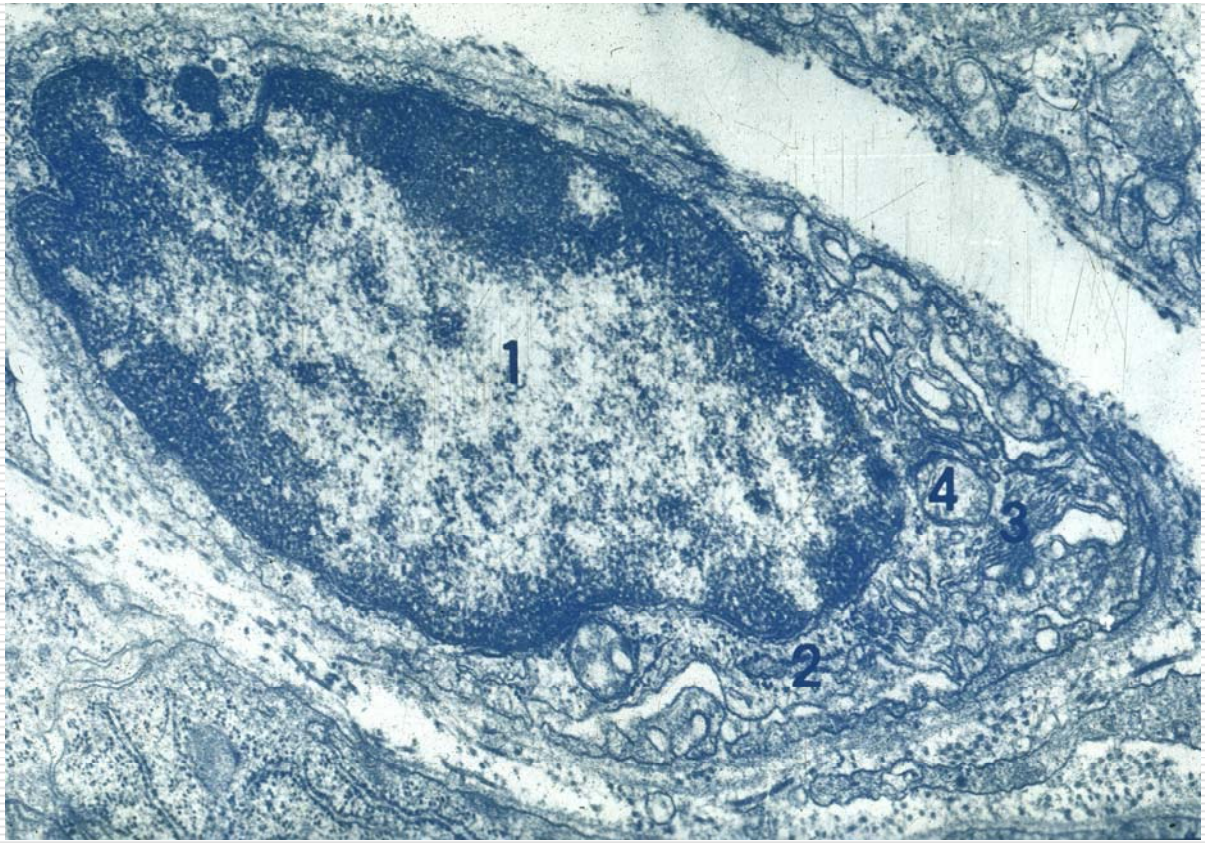
Fibroblast（LM）



Fibroblast and fibrocyte (model)



fibroblast（EM）



EM: developed rough endoplasmic reticulum, free ribosomes, Golgi complex, surrounded by collagenous fibers

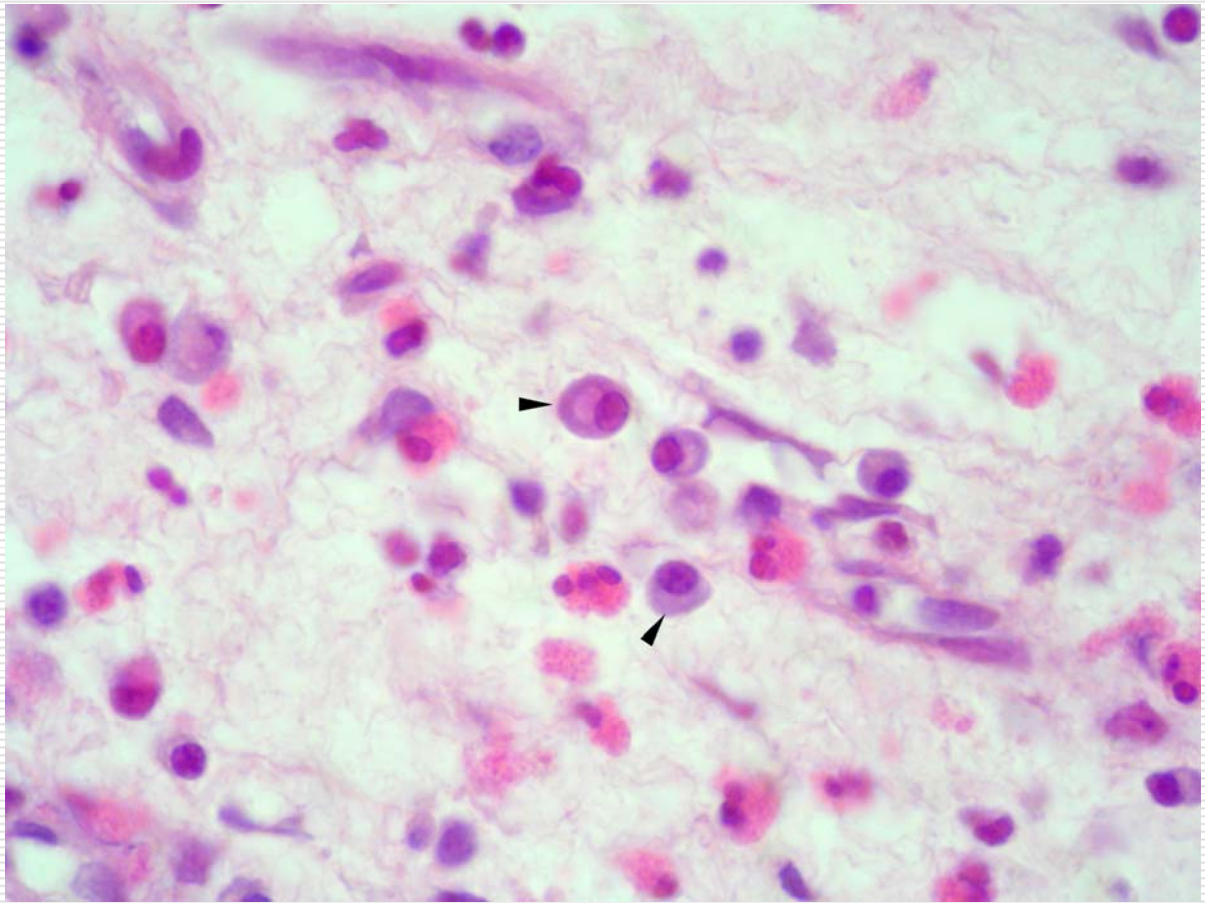
Function: synthesis of fibers and ground substance

1.2 Plasma cell

Distribution:

LM: a smaller ovoid or round cell, a not center located nucleus, deeply-stained heterochromatin arranged like figures on a clock-face, and intensely basophilic cytoplasm

Plasma cell（LM）



Plasma cell（EM）

EM: well-developed Golgi complex and a pair of centrosome in lightly-stained area, abundant of RER

Origin: B lymphocyte

Function: synthesis immunoglobulin,Ig (antibody)

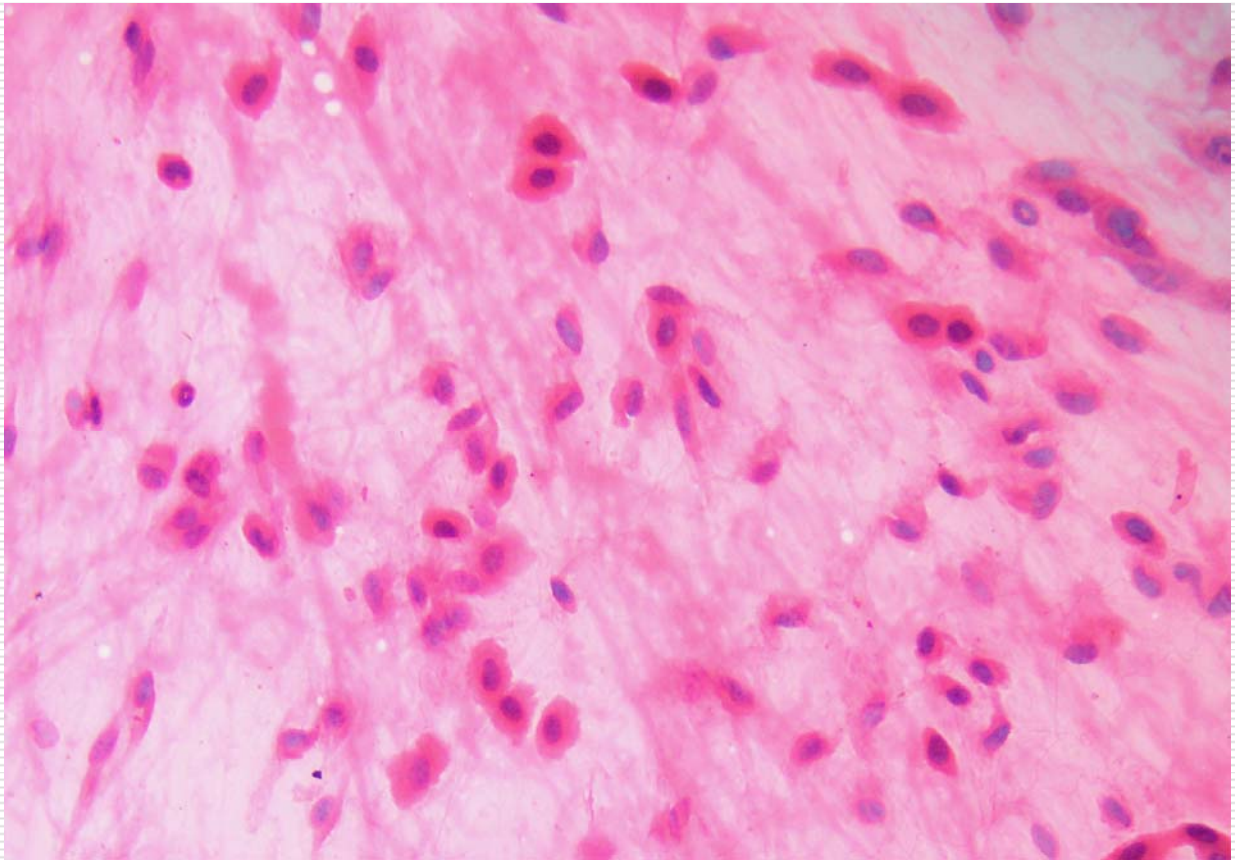
1.3 Macrophages

LM: irregular shape with pseudopodia, small and dark nucleus, strong acidophilic cytoplasm

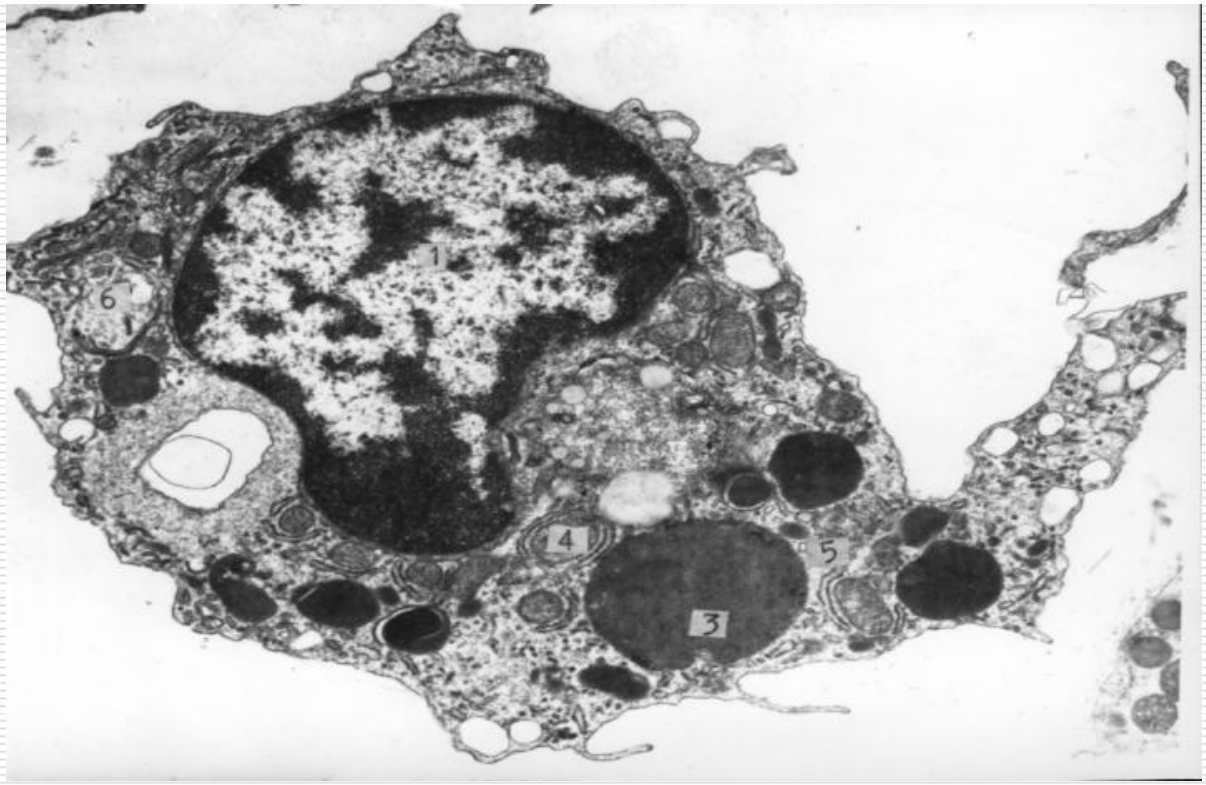
EM: rich in lysosomes, pinosomes, phagosomes and residual body microtubules and microfilaments

Origin: monocyte in blood

Macrophage（LM）



macrophge（EM）



Function of macrophage:

(1) Chemotaxis: chemotactic factor

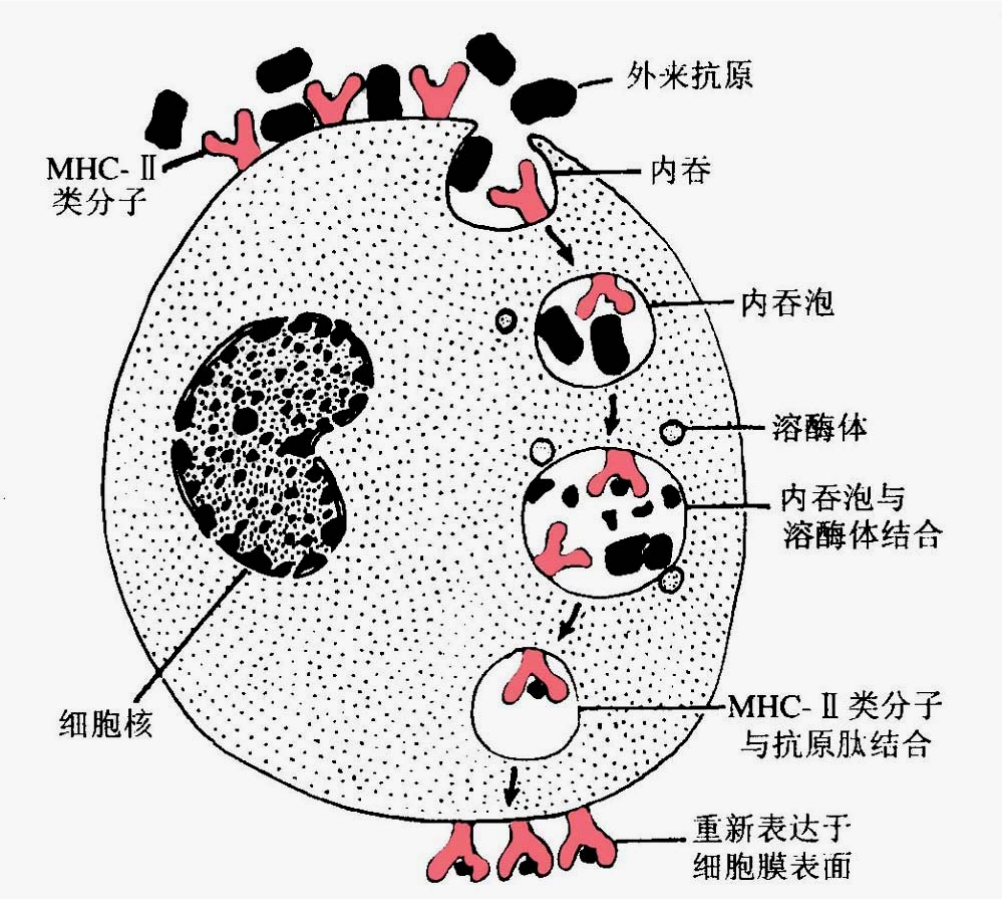
(2) Phagocytosis: specific phagocytosis

nonspecific phagocytosis

(3) Secretion: lysozyme, interferon, complement, etc.

(4) Immune reaction: antigen-presenting cell, immune regulation

Function of macrophage



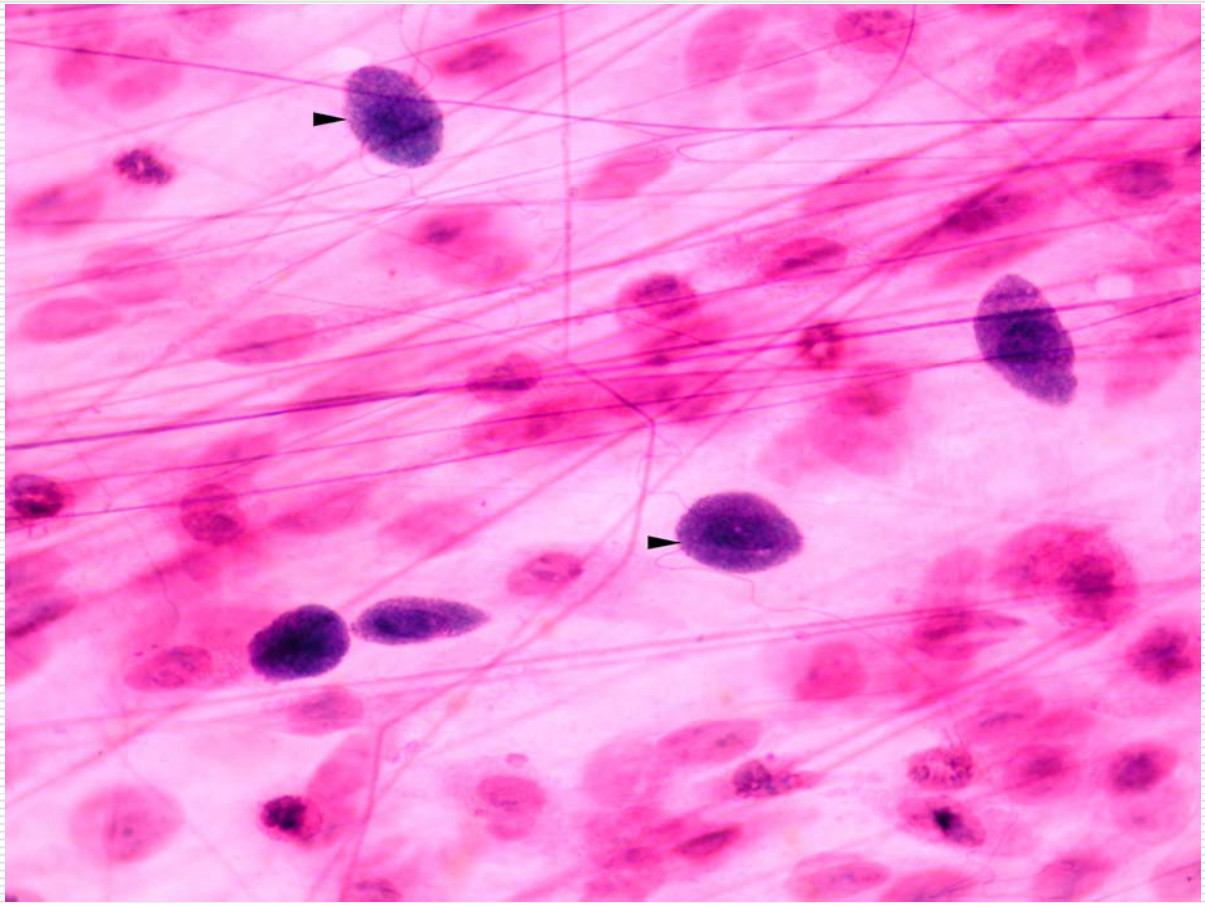
1.4 Mast cells

Distribution: along the course of small blood vessels

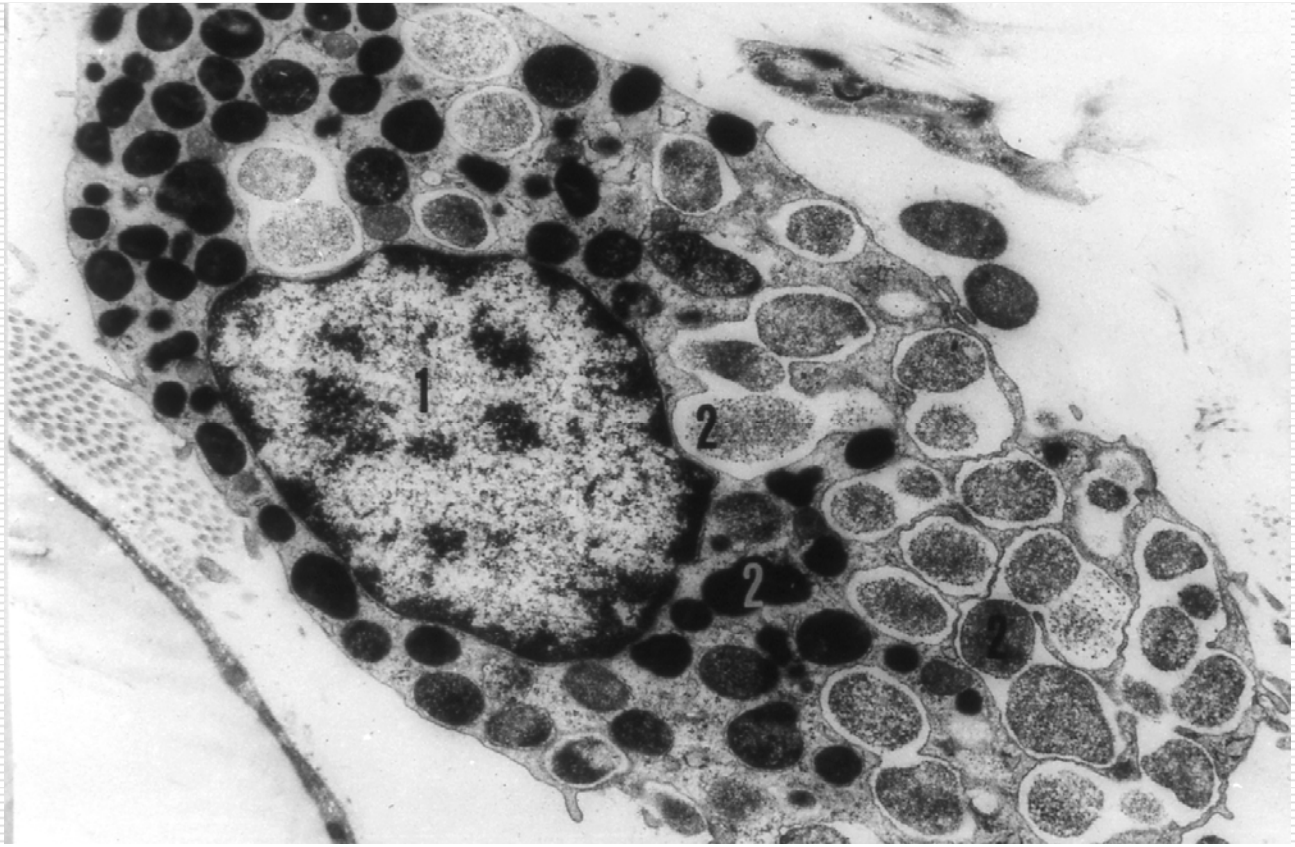
LM: large ovoid cells, small and pale nucleus, numerous basophilic granules in cytoplasm metachromasia

EM: numerous dense granules enveloped by a membrane, the granules contain heparin, histamine, eosinophil chemotactic factor (ECF)

Mast cell（LM）



Mast cell（EM）



Origin: bone marrow

Function: Mast cells are involved in allergic reaction. The eosinophil chemotactic factors induce emigration of eosinophils from the blood to reduce allergic reaction

1.5 Fat cell

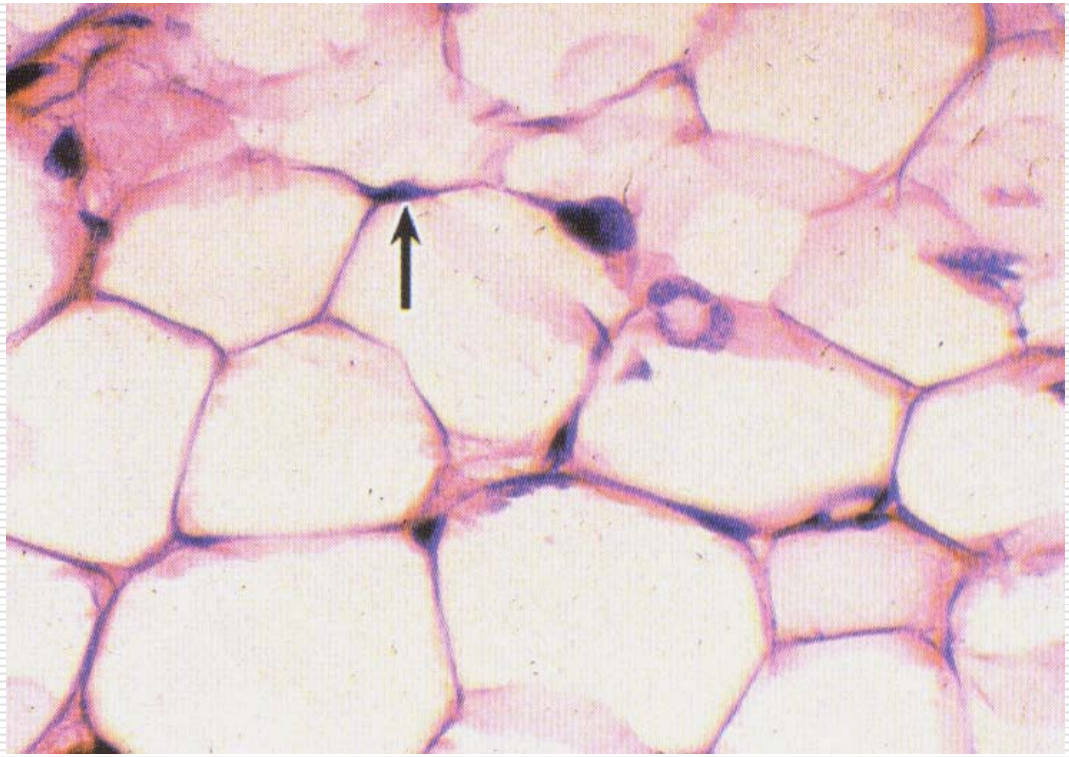
LM:

Function:

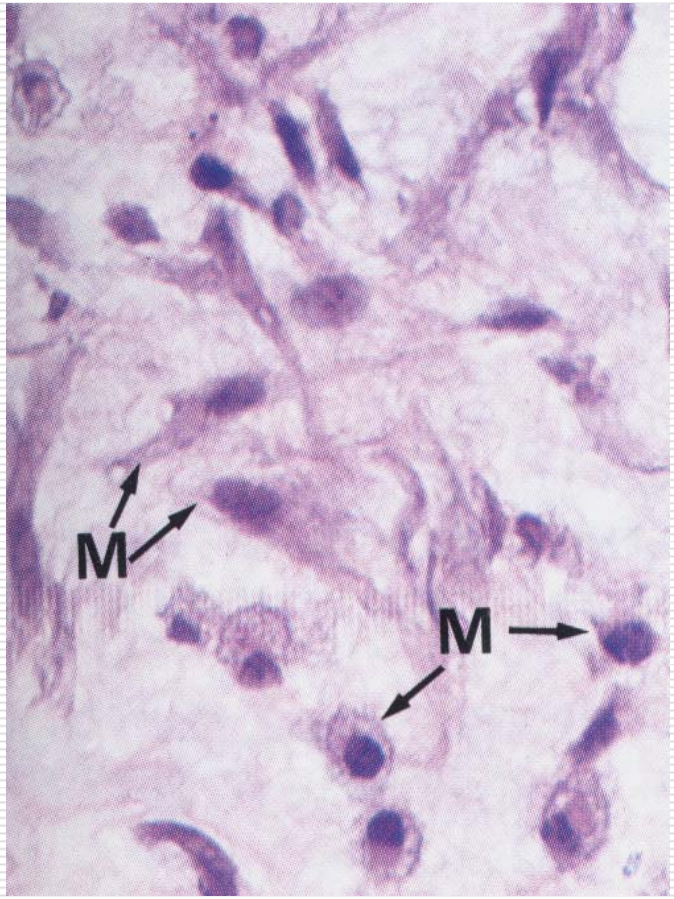
1.6 Undifferentiated mesenchymal cell

1.7 Leukocyte

Fat cell and adipose tissue



Undiferentiated mesenchymal cell（LM）



2. Fibres

2.1 Collagenous fibres

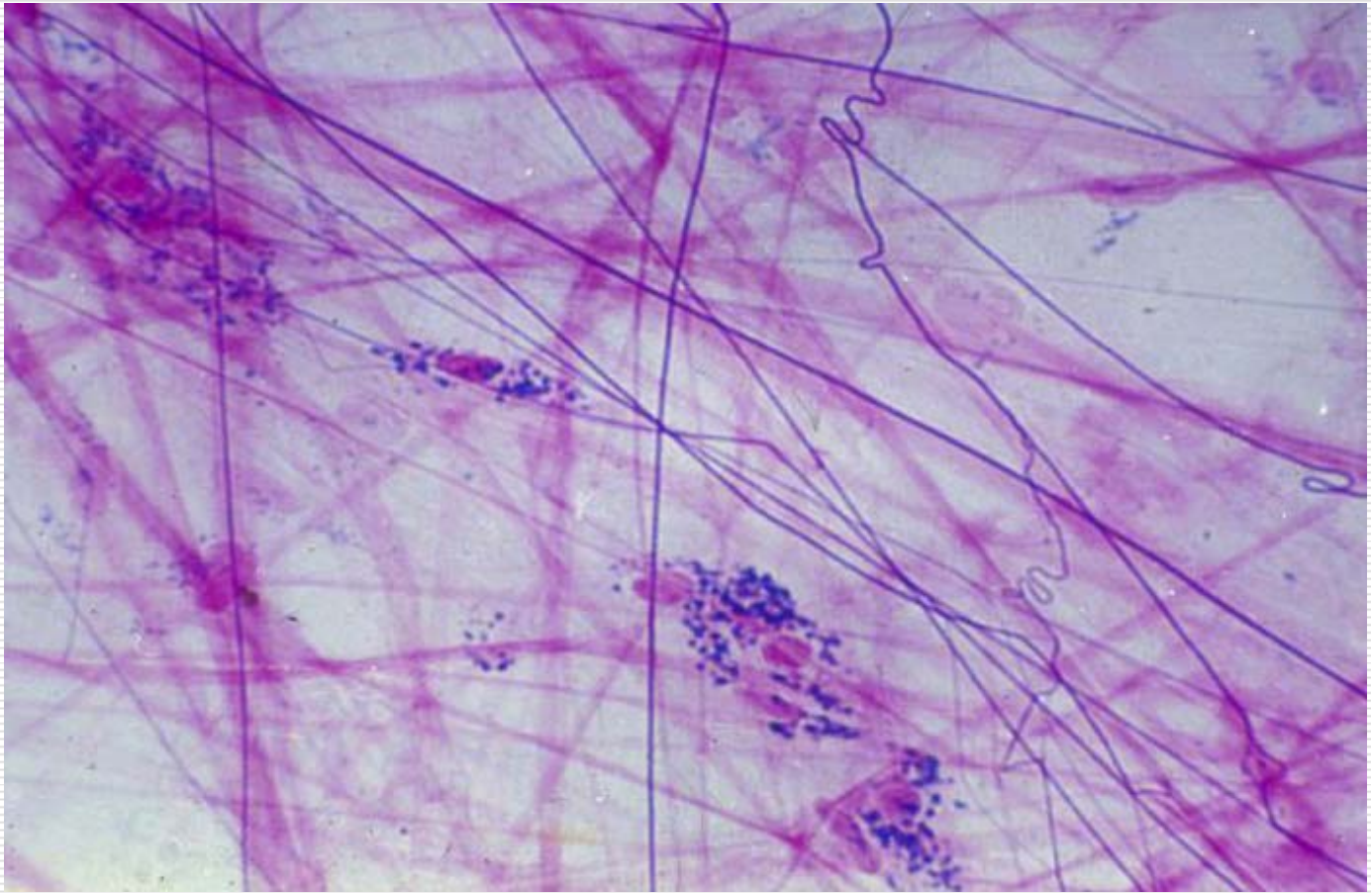
LM: acidophilic, wavy in form, frequently branch and re-combine forming a network

EM: Collagenous fibre is composed of many collagenous fibrils

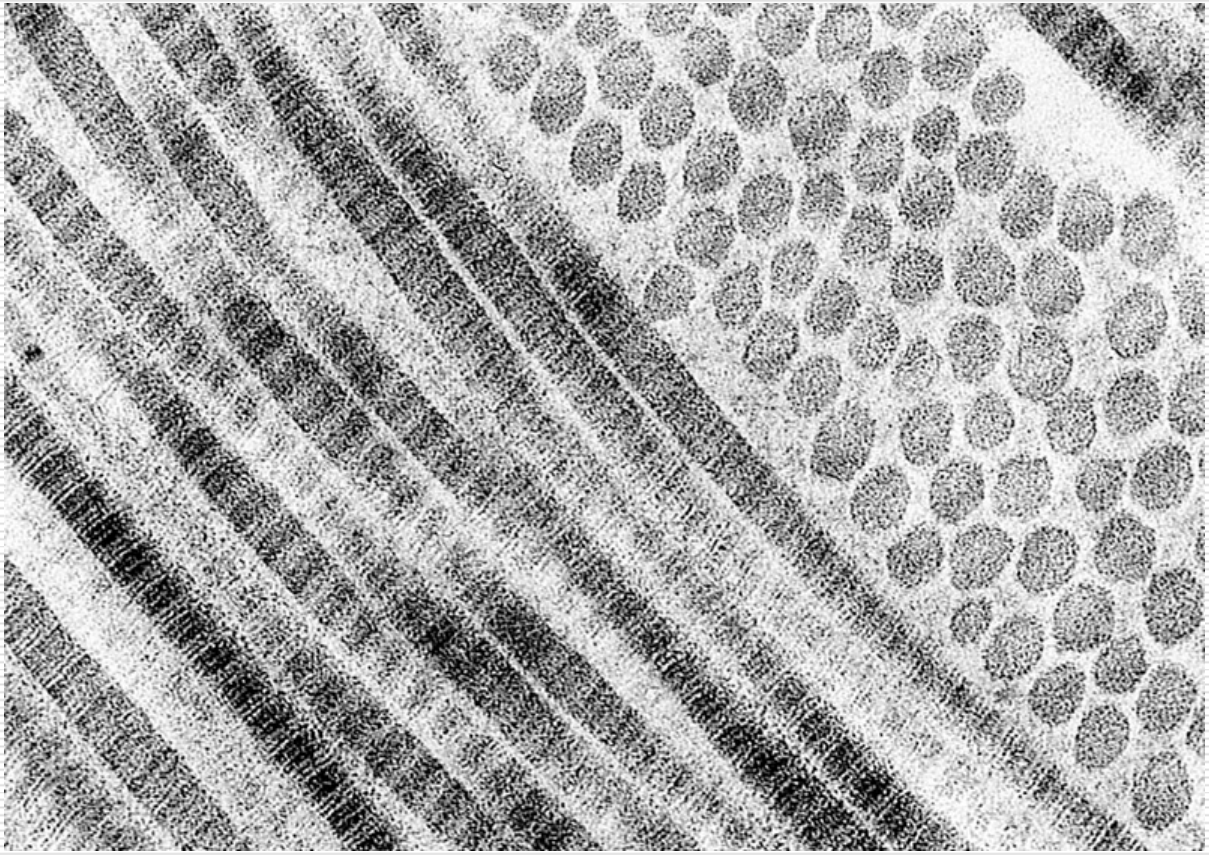
Component: type I and III collagen

Function: tensile strength

Loose connective tissue (spread section)



Collagenous fibril

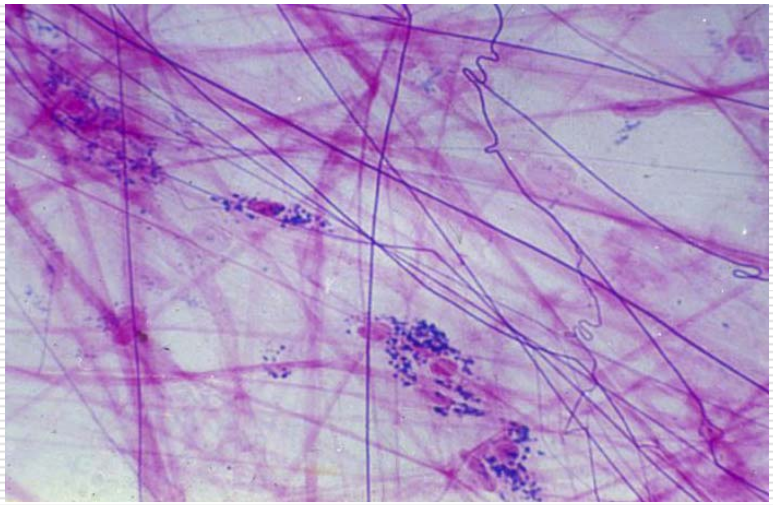


2.2 Elastic fibres

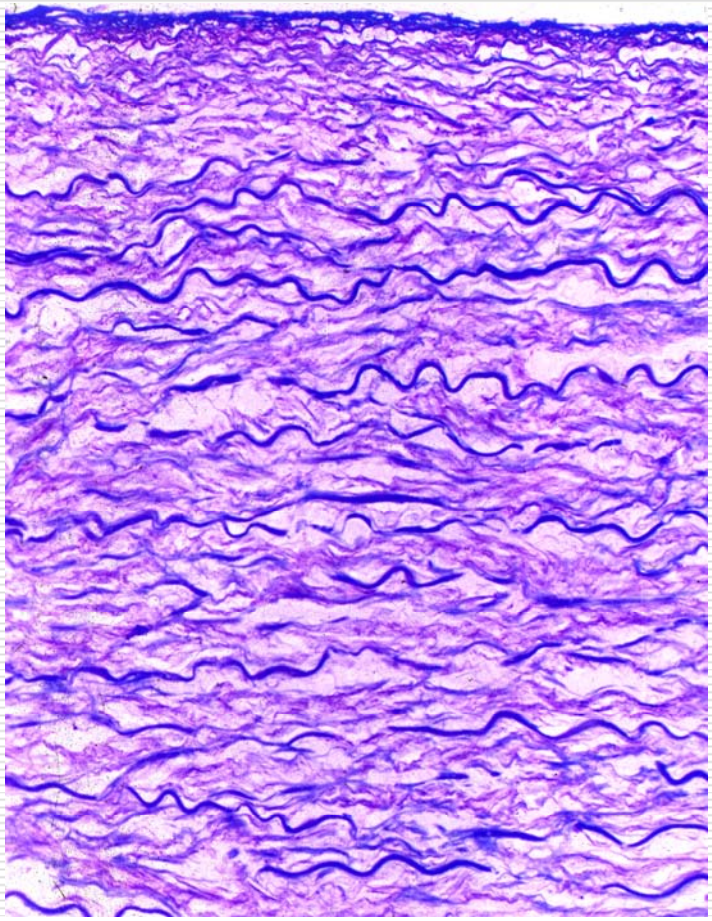
LM: The branched fibres, thiner,dark-blue coloring

EM: elastin and microfibrils

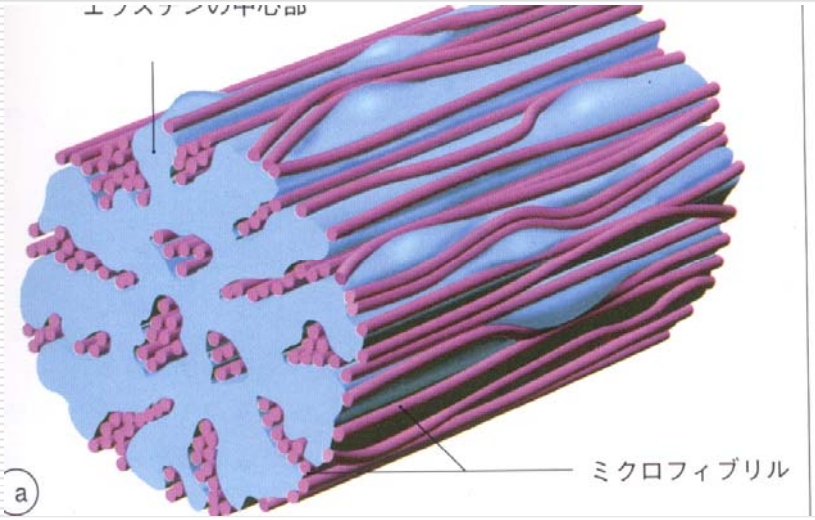
Function: elasticity

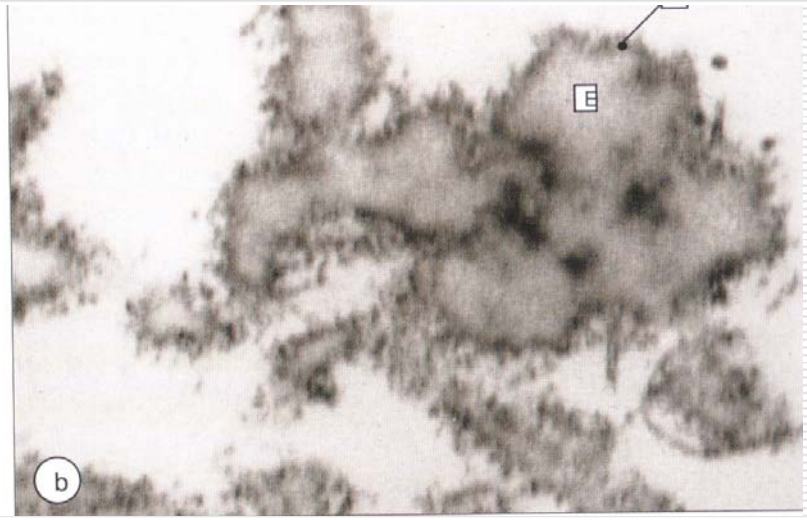


Elastic fiber（LM）

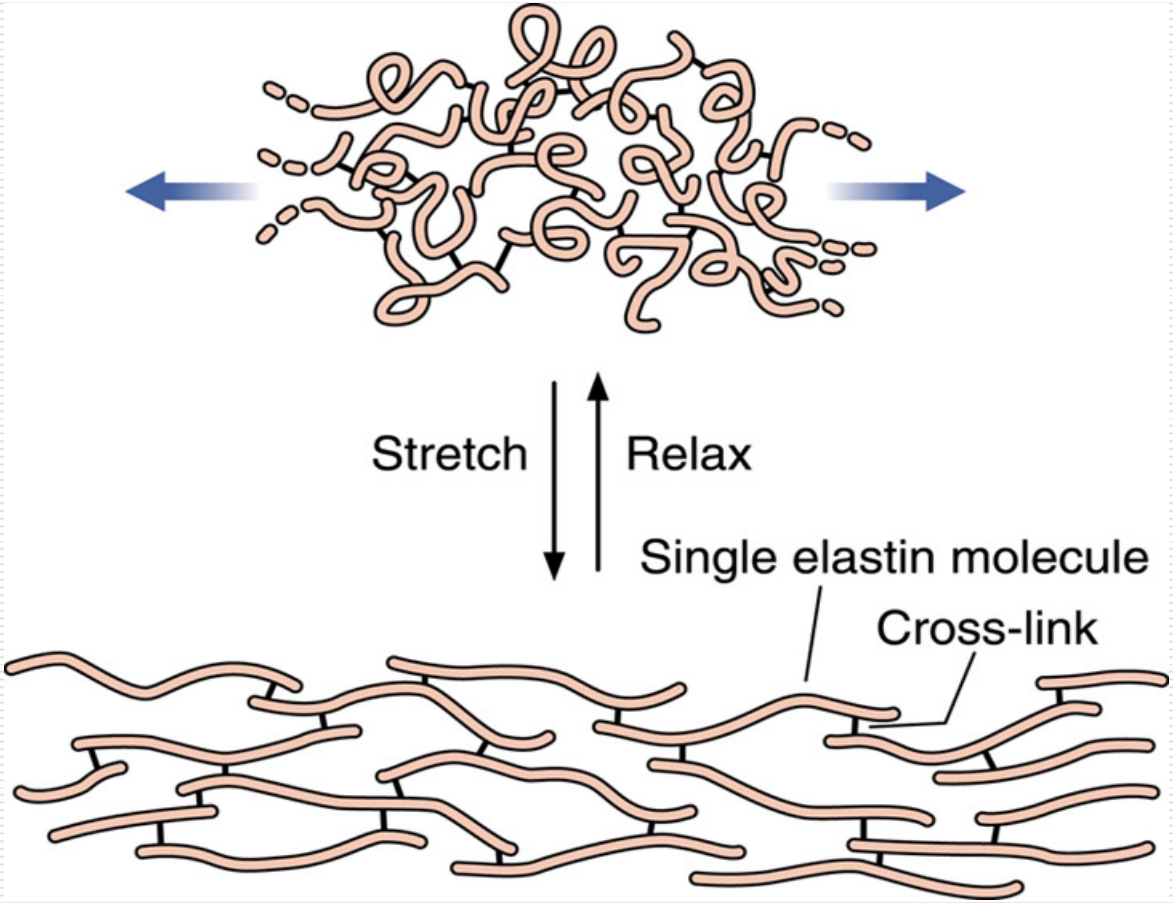


Elastic fiber（EM）





Elastic fiber molecule



2.3 Reticular fibres

LM: The branched and thiner fibres (argyrophil fiber)

EM: 64nm periodic cross-banding (type III collagen)

Distribution: lymphatic organ etc. as a fine network

Function: supporting to individual cells

3. Ground substance

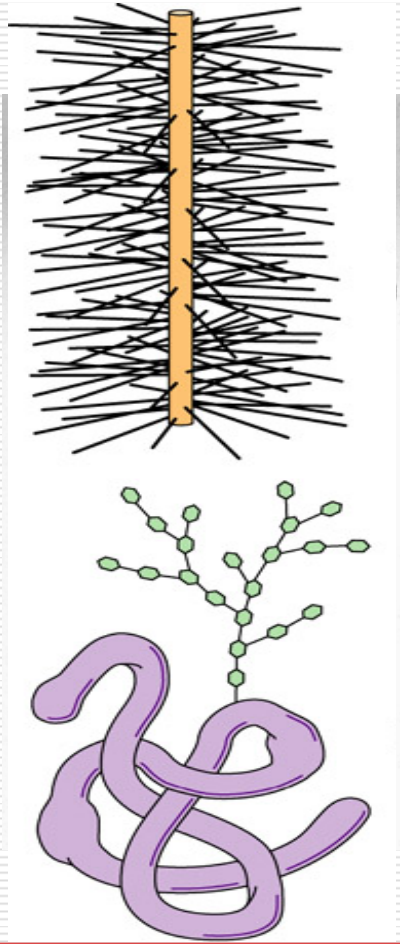
3.1 Glycosaminoglycan

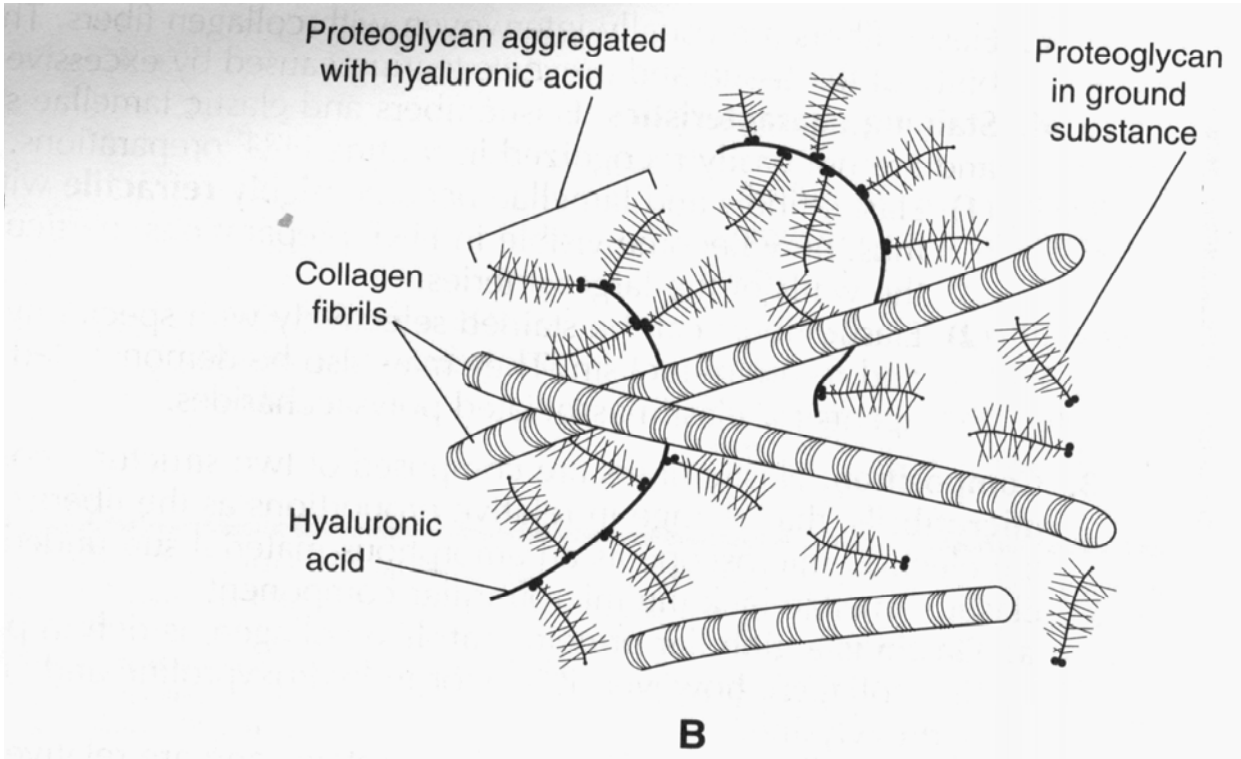
Including hyaluronic acid, chondroitin sulfate A,C, keratin sulfate and heparan sulfate. They work as a molecular sieve.

3.2 Proteoglycan

a core protein associated with 4 main glycosaminoglycans

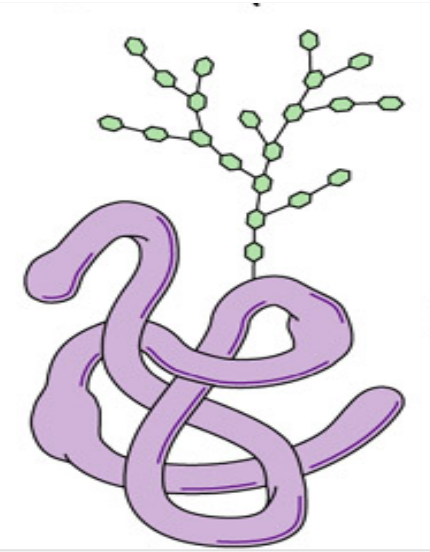
Proteoglycan and glycoprotein

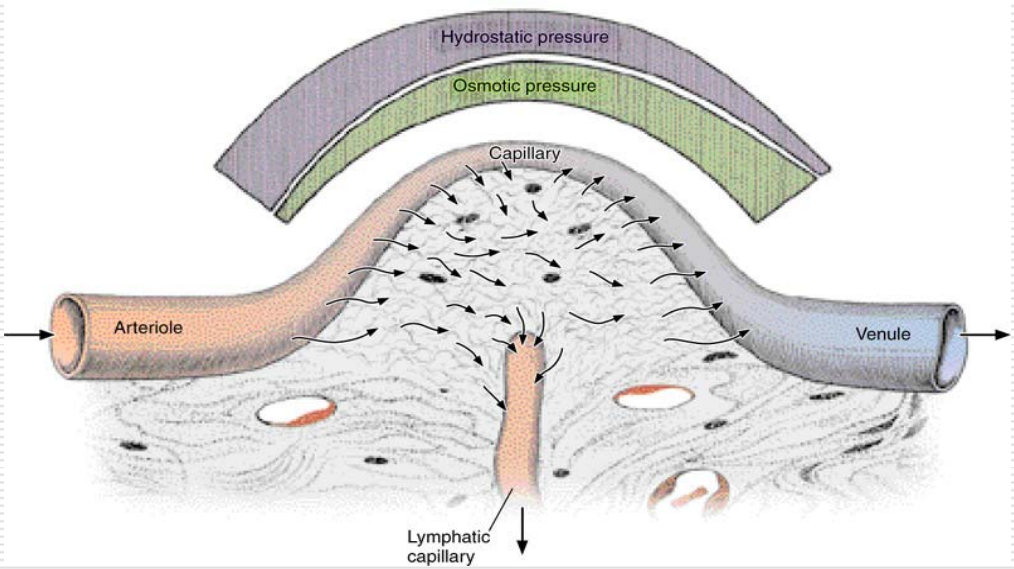




3.3 Fibronectin,

3.4 Tissue fluid





Ⅱ. Dense connective tissue

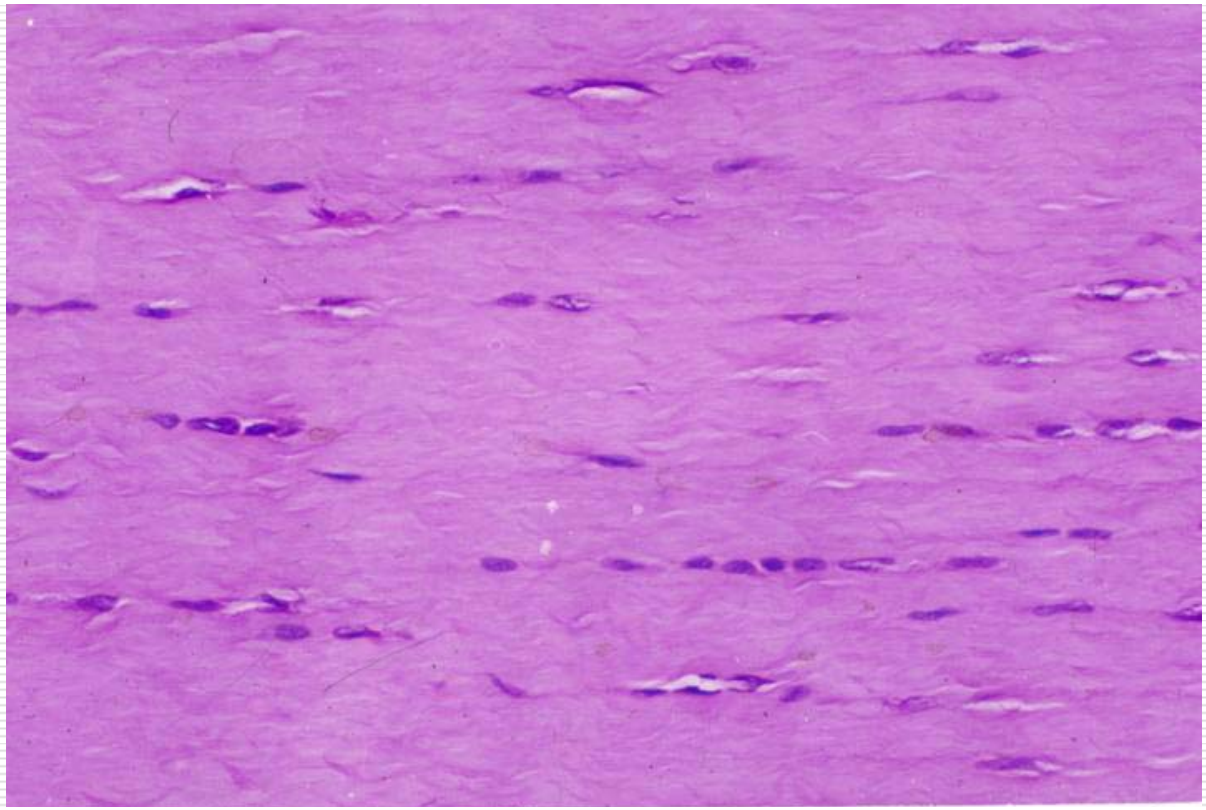
1. Dense irregular connective tissue

The collagen fibers are arranged in bundles without a definite orientation.

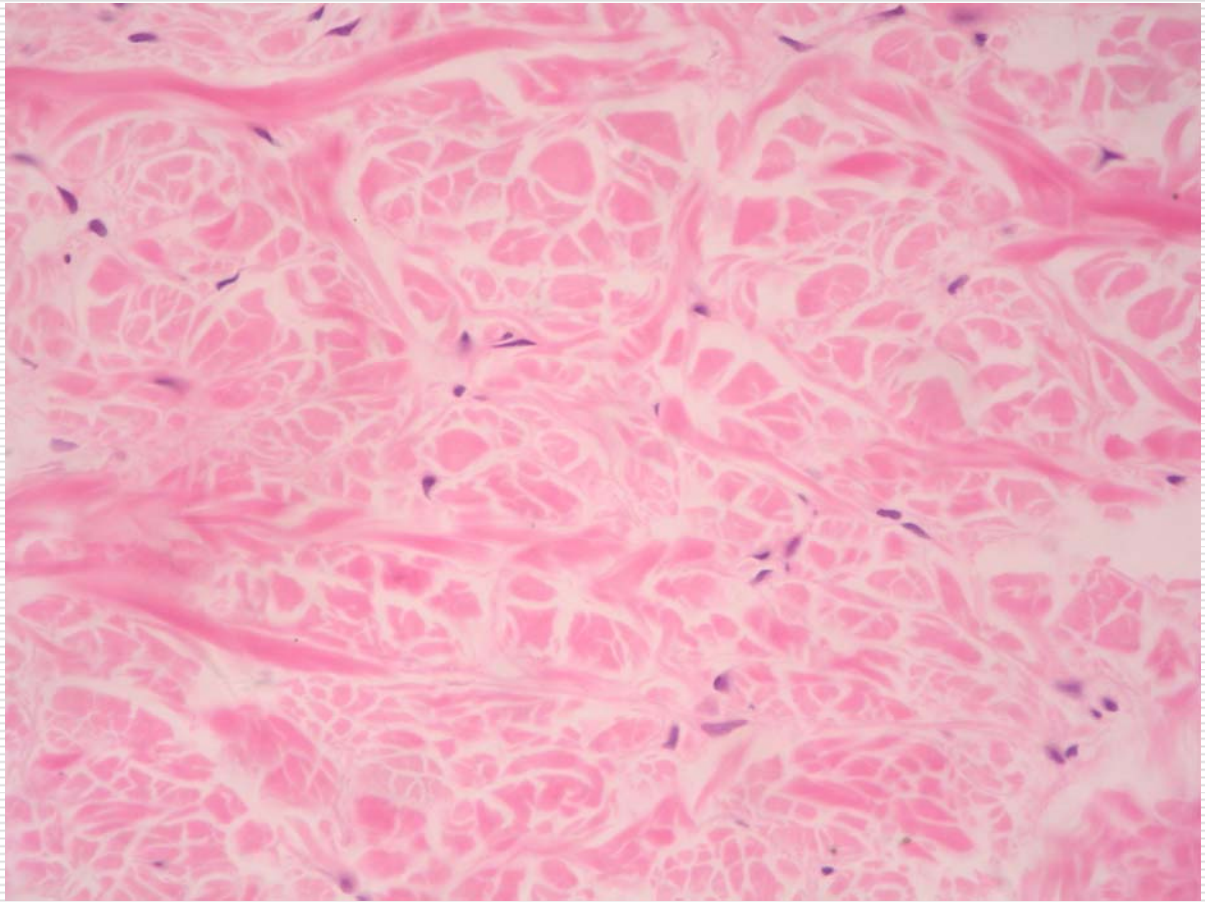
2. Dense regular connective tissue

The collagen fibers are parallel to each other. Fibroblasts (tendon cells) are located between fibrous bundles

Dense regular connective tissue



Dense irregular connective tissue



3. Elastic Tissue

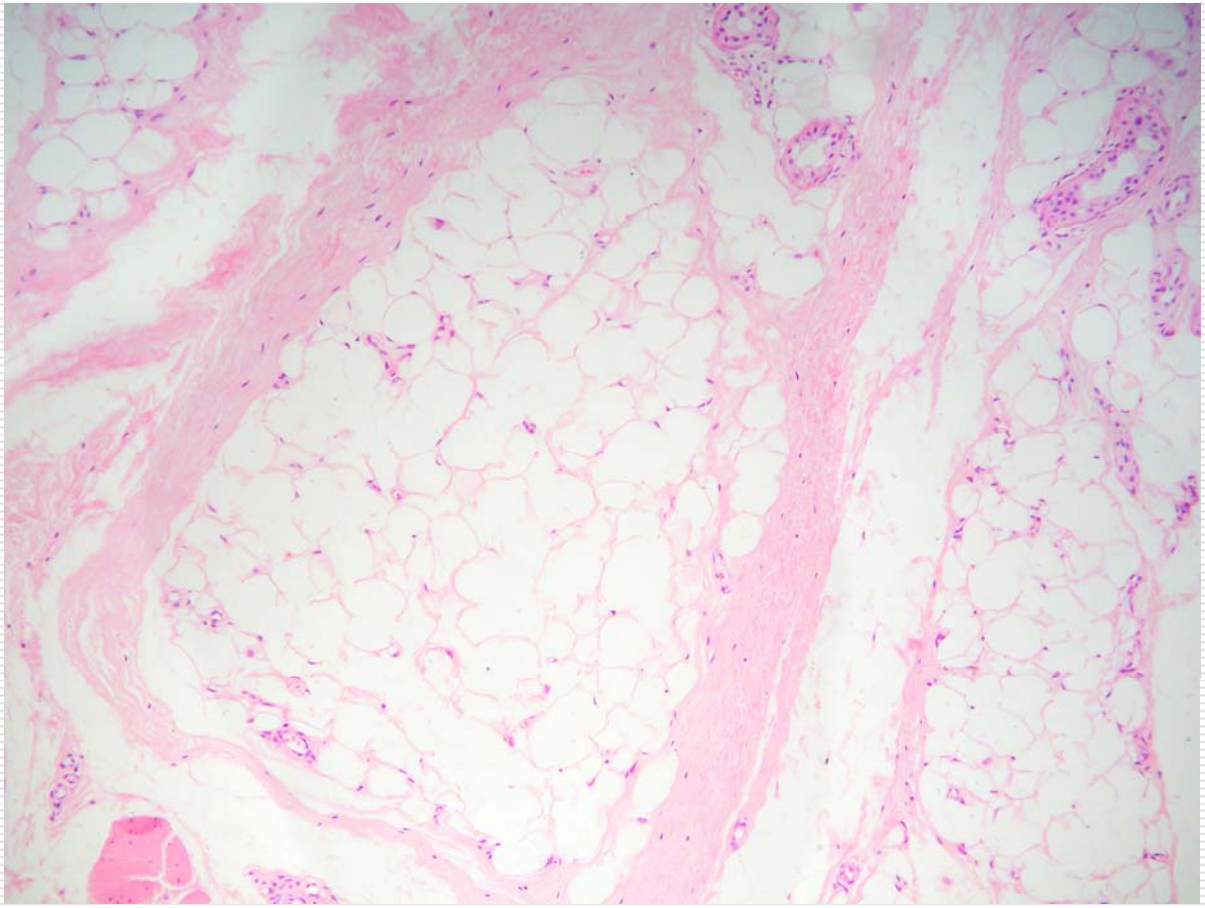
- To be composed of bundles of thick, parallel elastic fibers.

Ⅲ. Adipose tissue

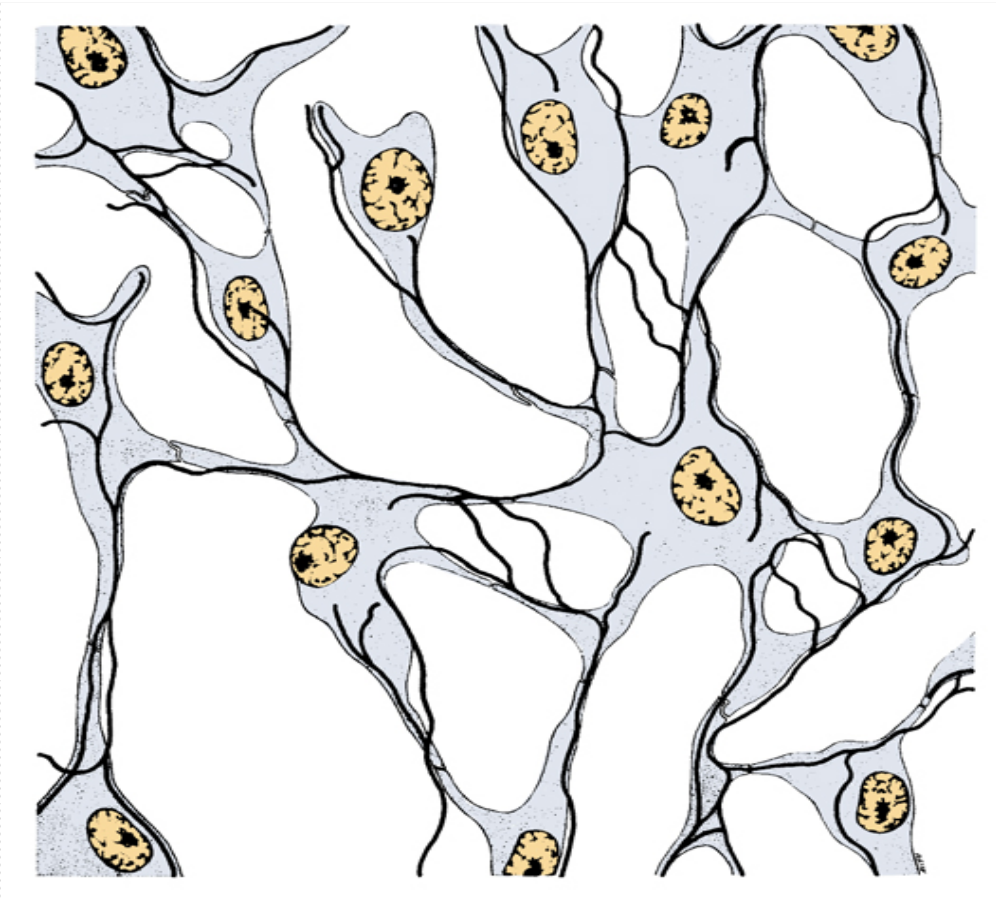
3. Reticular tissue

To be composed of reticular cells, reticular fibres and ground substances in lymphatic organs and bone marrow

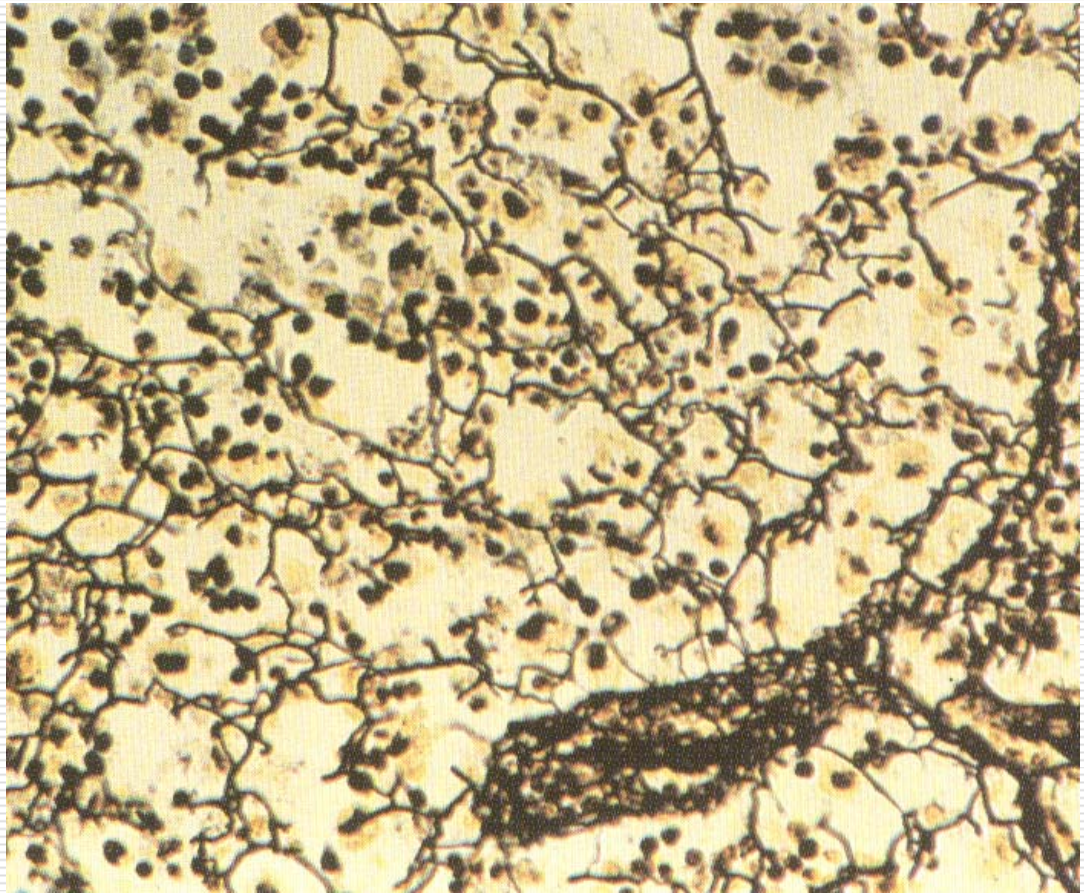
Fat cell and adipose tissue



Reticular tissue(model)



Reticular fiber （argyrophil）



The Highlight of this Chapter

1. Structure and function of Fibroblast, macrophage, plasma cell and mast cell (light and electron structure).
2. General feature of three kinds of fibers and ground substance.