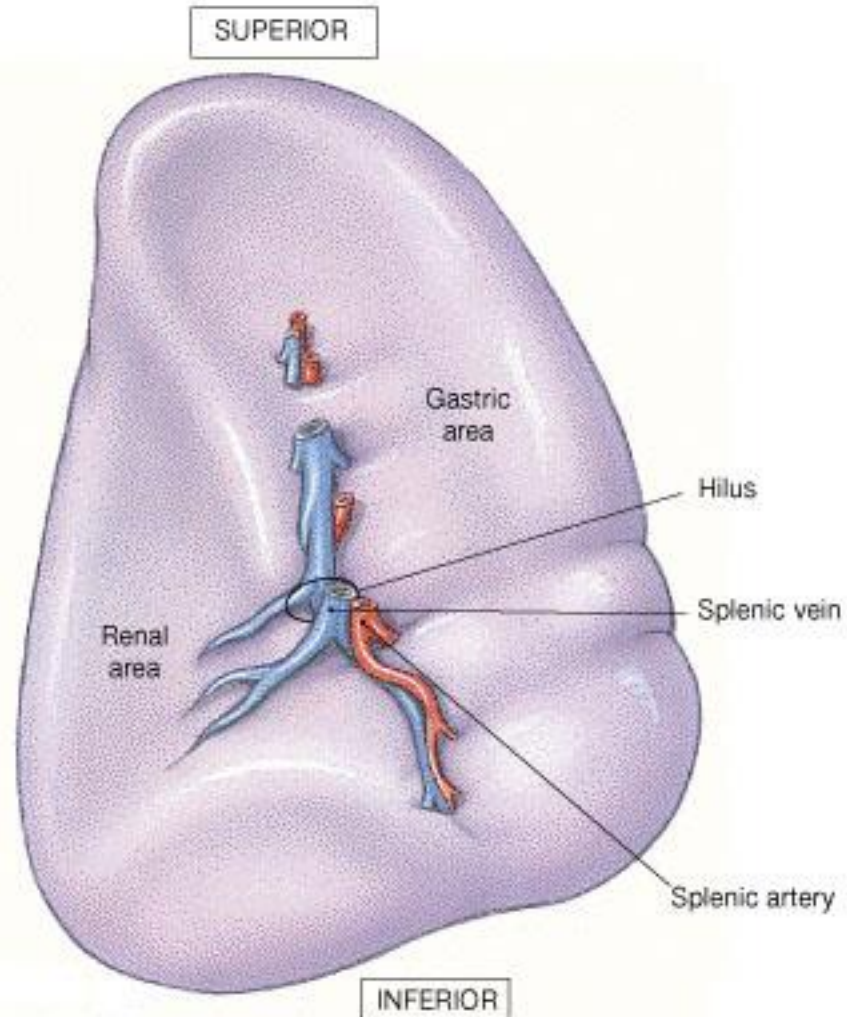


Spleen

Largest lymphoid organ located on the left side of the abdominal cavity beneath diaphragm, it covered by the visceral peritoneum, below it thick capsule of dense irregular c.t contains some smooth muscle fibers, these capsule has trabeculae that extend inward and contains lymphocyte and macrophages.

It is served by splenic artery and vein, which enter and exit at the hilus.

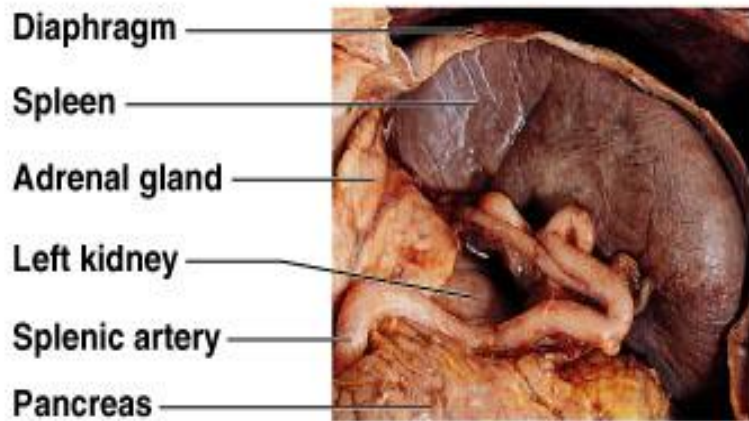
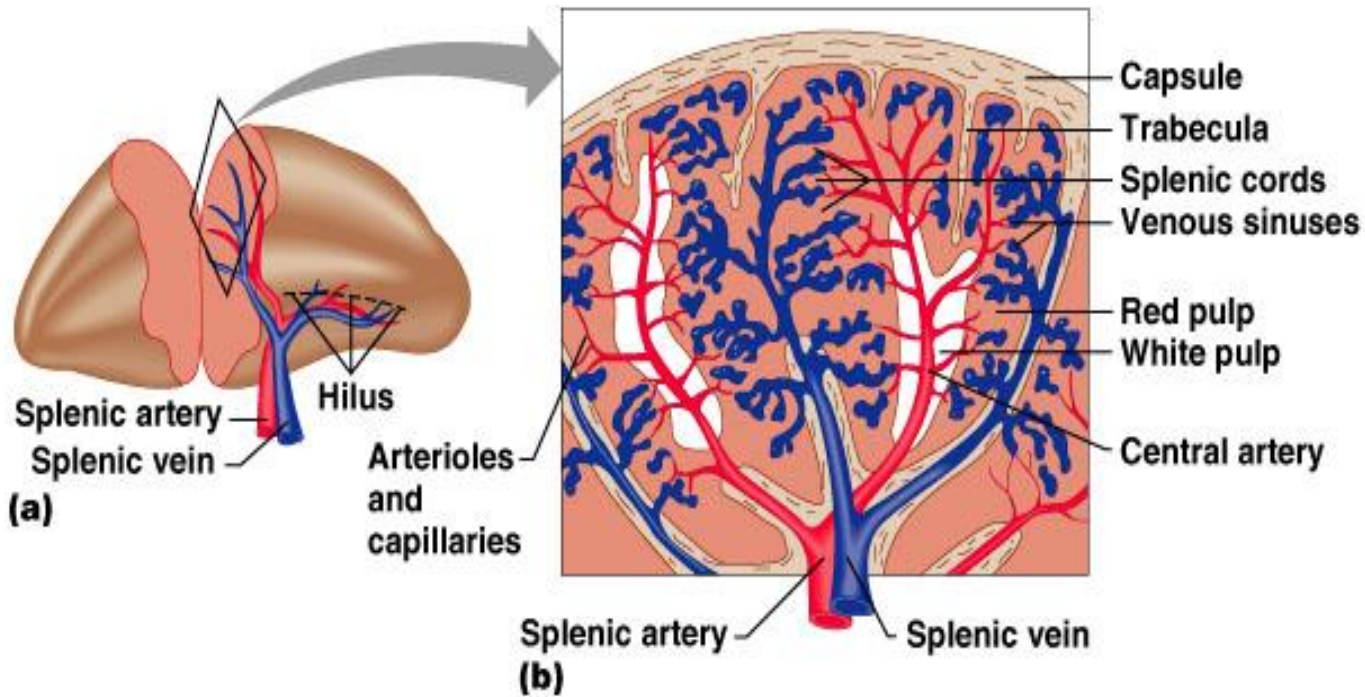
Spleen



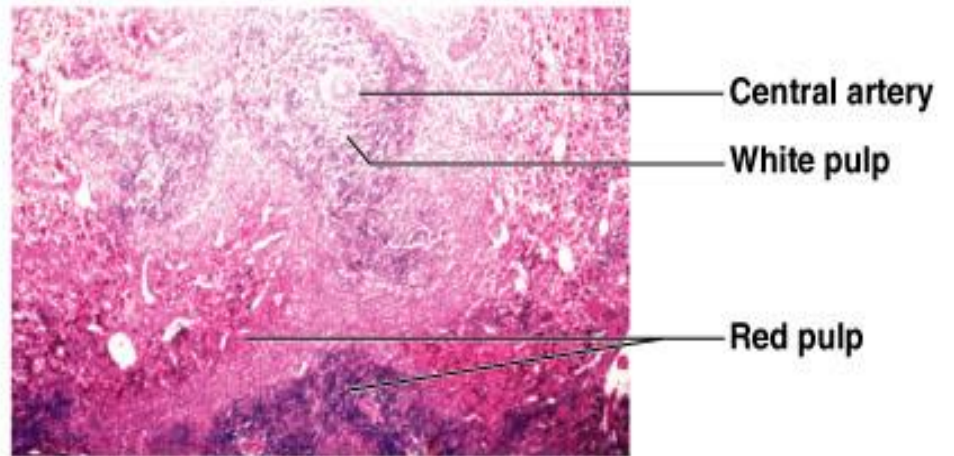
(b) Visceral surface of spleen

Histological Structure

- 1-White pulp with lymphoid tissue. ●
- 2-Red pulp found between white pulp and trabeculae. ●
- 3-Marginal zone forms border between red and white pulp. ●



(c)



(d)

White pulp

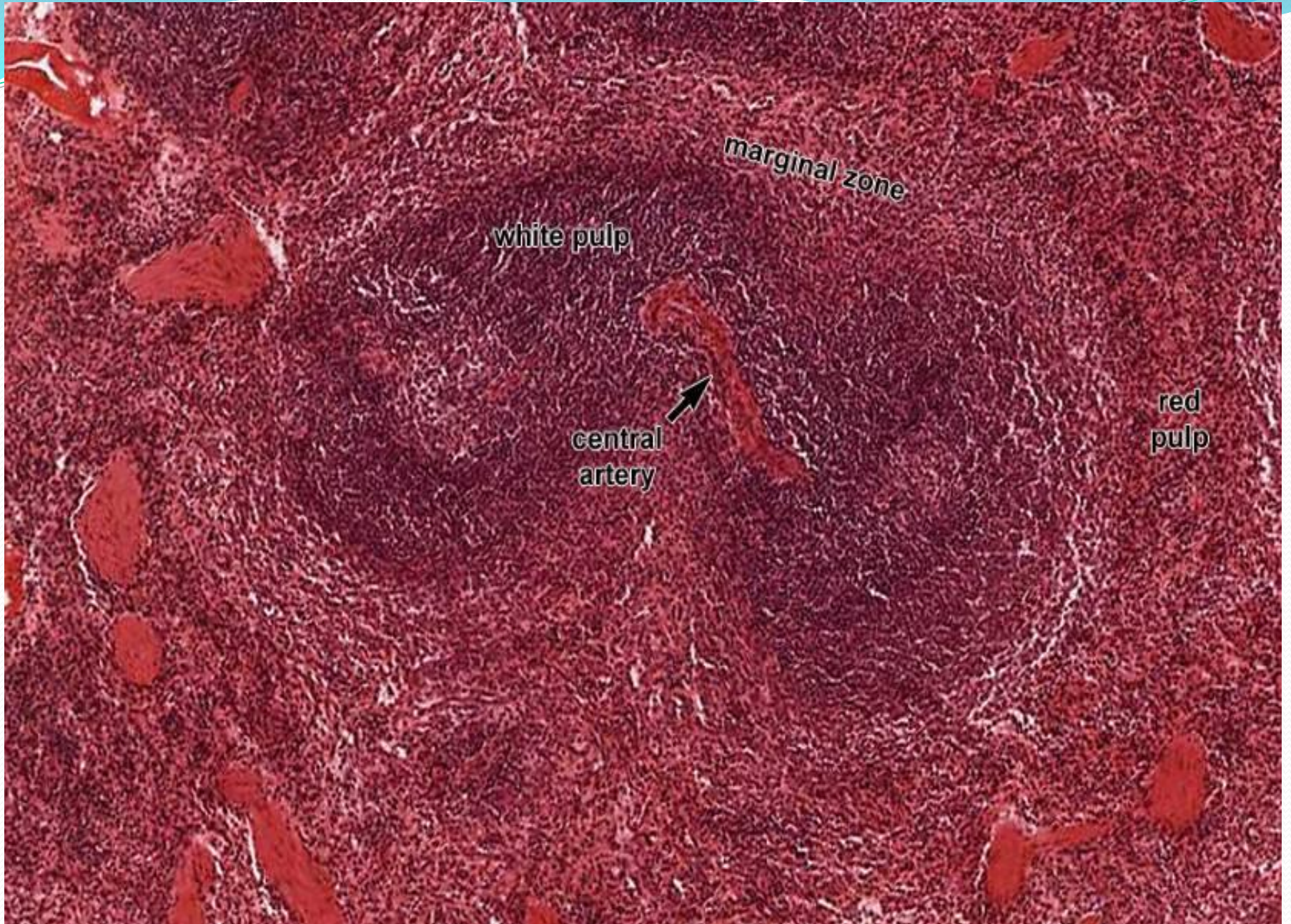
_Is covered of branches of arteries central artery and diffused lymphatic tissue, form irregular masses around central artery this area is called (periarterial lymphatic sheath) (PALS), in PALS- T lymphocytes.

_Lymphoid follicles comprise mostly B lymphocyte cells.

_Reticular fibers.

_W .p is also composed of dense aggregation of lymphocytes as nodules some with germinal center.

_The W.p is enclosed within layer called marginal zone.



marginal zone

white pulp

central artery

red pulp

Marginal zone

The periphery of lymphatic sheath and nodules, is surrounded by a marginal zone that separates the white and red pulp. ●

The marginal zone contains plasma cells, mainly B-lymphocytes, macrophages and interdigitating, dendritic cells and marginal blood sinuses. ●

This area play role in (immune response and filtering the blood). ●

Red Pulp

There are two components in the red pulp:

- _Splenic cords of Billroth.
- _Tortuous blood sinuses (venous sinuses).

Splenic cords of Billroth:

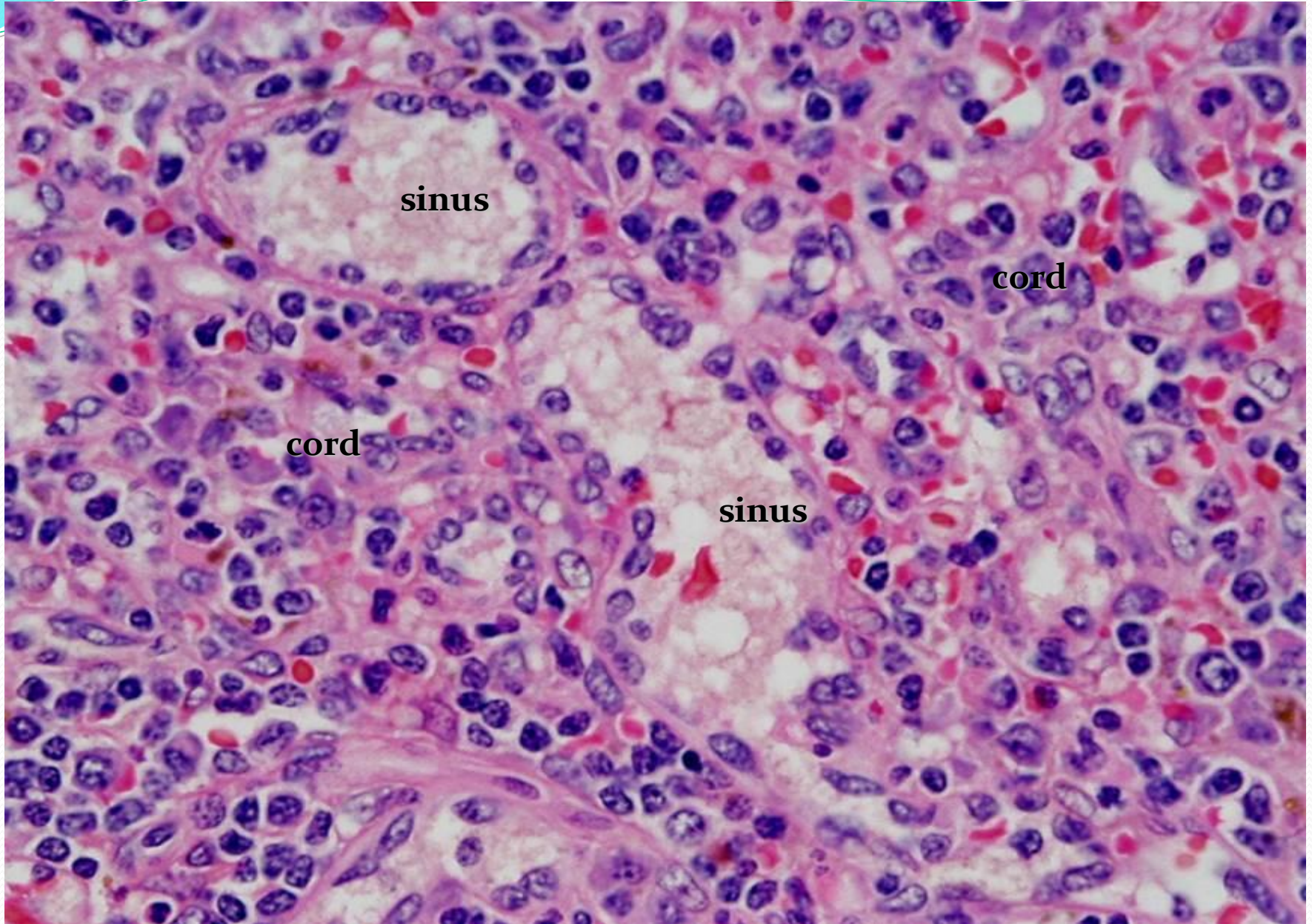
These vary in thickness and consist of a spongy cellular mass supported by reticular fibers. The collagenous trabeculae are continuous with the reticular fibers of the pulp. The lymphatic tissue is organized as cords or strands, contains large no. of RBC, lymphocytes, granular leukocytes, macrophages, embedded in meshwork of reticular t.

Venous Sinuses:

Are large with wide irregular lumen, 12-40 Mm wide..sinuses occupy more space than the splenic cords. The walls of sinuses lack a muscular coat and display a unique arrangement of endothelium and basal lamina.

they have elongated fusiform flattened endothelial cells called stave cells. Discontinuous basal lamina, supported by (thick reticular fiber), there are space between endothelial cells permit exchange between sinusoid and adjacent tissue.

Spleen (red pulp) at high power (40x)



Splenic blood circulation

Spleen is inserted in blood circulation, has special vascular channels in order to filter the blood and special types of blood circulation:

-Closed blood circulation

_Opened blood circulation (in human).

The splenic arteries enter spleen through hilum, follow the trabeculae as trabecular artery, then in filtered by a sheath of lymphocytes in white pulp as central artery it terminate into penicillar arteries in red pulp and sub divided in to 3-segments.

Pulp arterioles, sheathed arterioles, terminal arterial capillary.

Then the blood is carried to red pulp directly then to venous sinuses. This circulation is opened circulation.

When terminal arterial capillaries opened in venous sinuses then to vein (trabecular vein) and leave spleen by splenic vein through hilum, this circulation is closed circulation.

Functions of spleen:

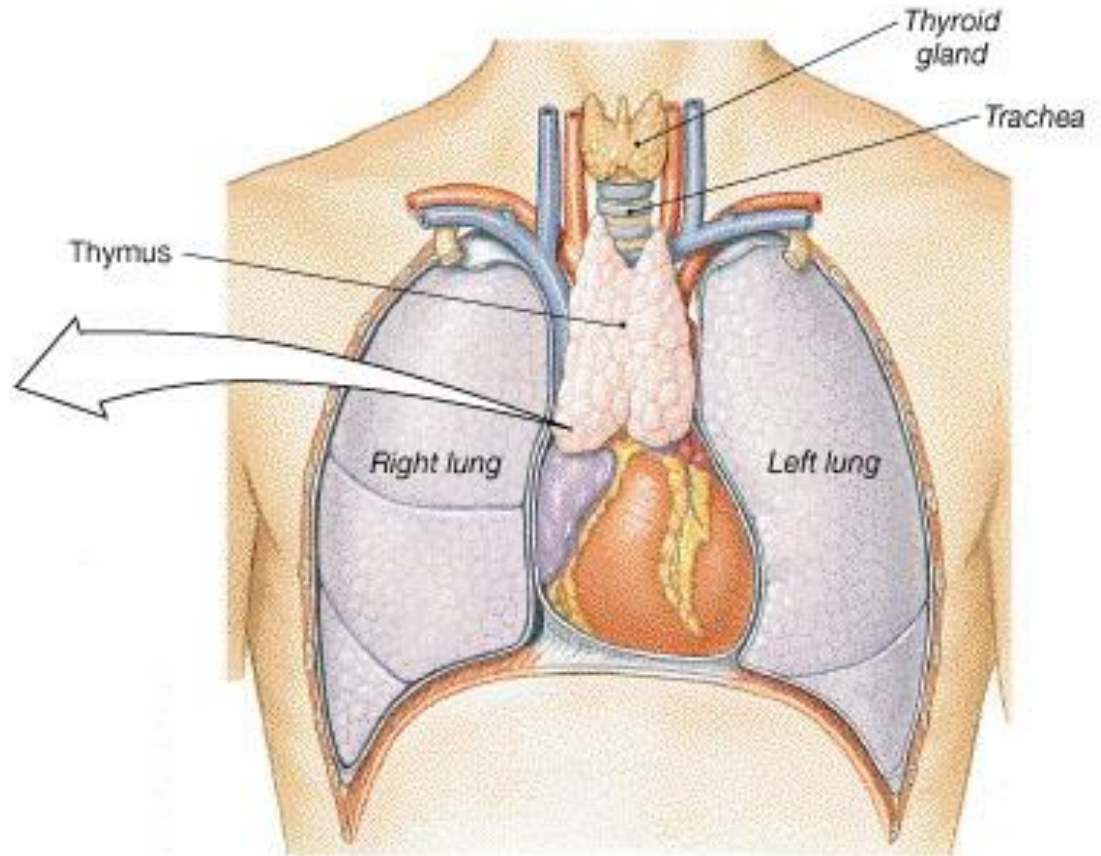
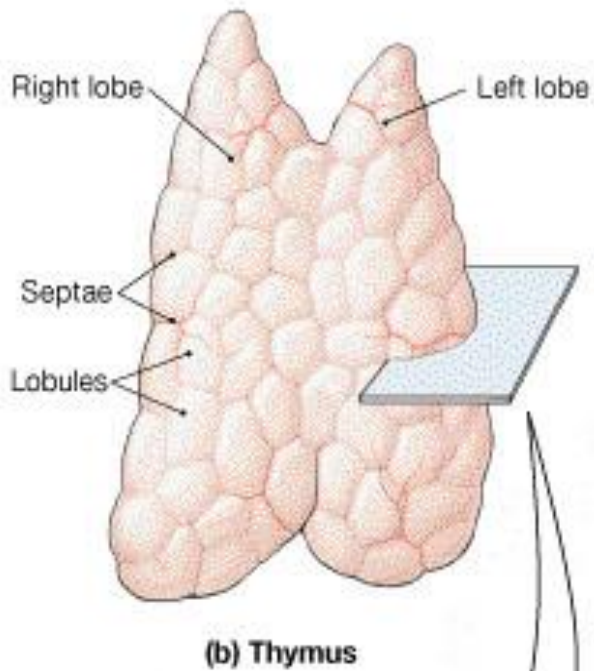
- _ Filtration of blood –removal of antigenic material and cellular debris by macrophages and dendritic cells, concentrated and presented to lymphocytes in the white pulp.
- _ Lymphocyte activation-both T and B lymphocytes are activated in the spleen, plasma cells migrate from the white pulp in to the red where they secrete IG in to the venous blood.
- _Destruction of old\damaged RBCs- phagocytosed by macrophages and the hemoglobin is broken down.

Thymus

Central lymphoid organ, located in the mediastinum, thin capsule, lobular organization.

Each lobule has outer cortex and inner medulla, cortex contains densely packed lymphocytes and scattered macrophages, medulla contain fewer lymphocytes, thymic (Hassall's) corpuscles and epithelial reticular cells.

Thymus Gland



(a) Location of thymus within thoracic cavity

Cortex

Is the outer layer of thymus darkly stained due to dense aggregation of T lymphocytes (thymocytes).

They don't aggregate as nodules, in cortex macrophages ; epithelial reticular cells.

_Epithelial reticular cells:

Have acidophilic cytoplasm with processes that attached to the processed of other cells by desmosomes, they secret peptide hormone (thymosin, thymopoietin, serum thymus factor. They control T-cells production, regulate development and maturation of T-cells.

Medulla

Inner layer is faintly stained contains:

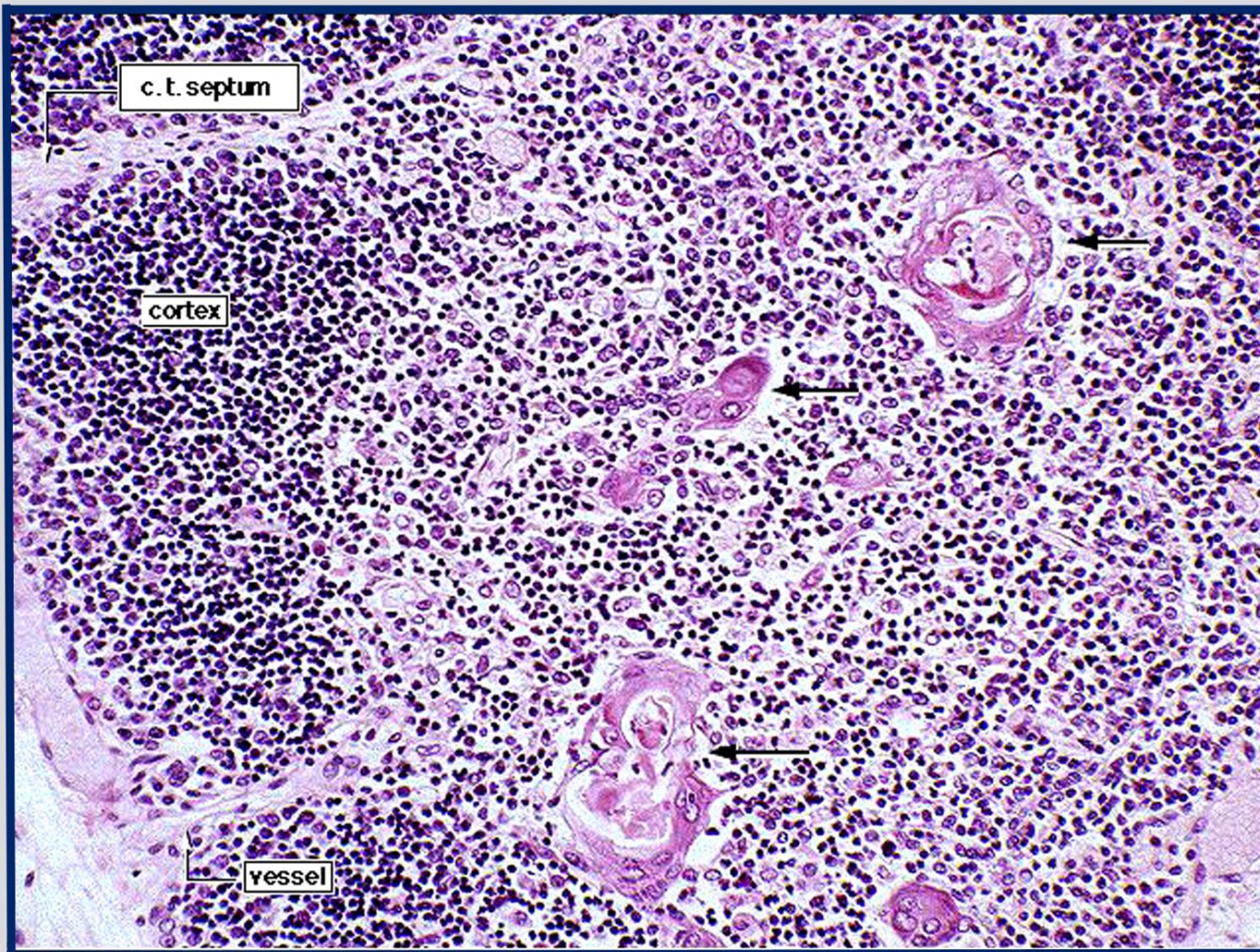
Large number of epithelial reticular cells; few T- cells, macrophages, mast and plasma cells.

_Thymic (Hassall's corpuscles):

Oval structures (30-150 um) in diameter, composed of flattened epithelial reticular cells arranged as lamella concentrically arranged, they filled with keratin filament that may be calcified, their function unknown.

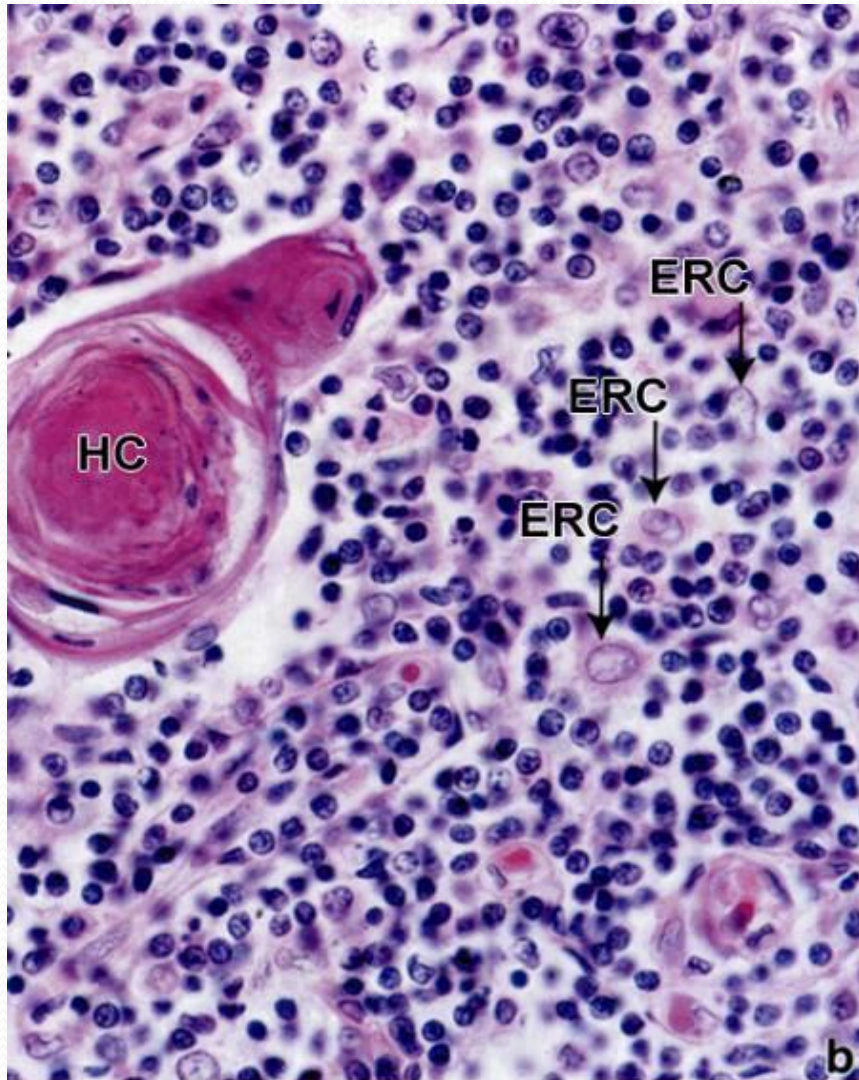
Thymic Cortex and Medulla

Thymic (or Hassall's) Corpuscles



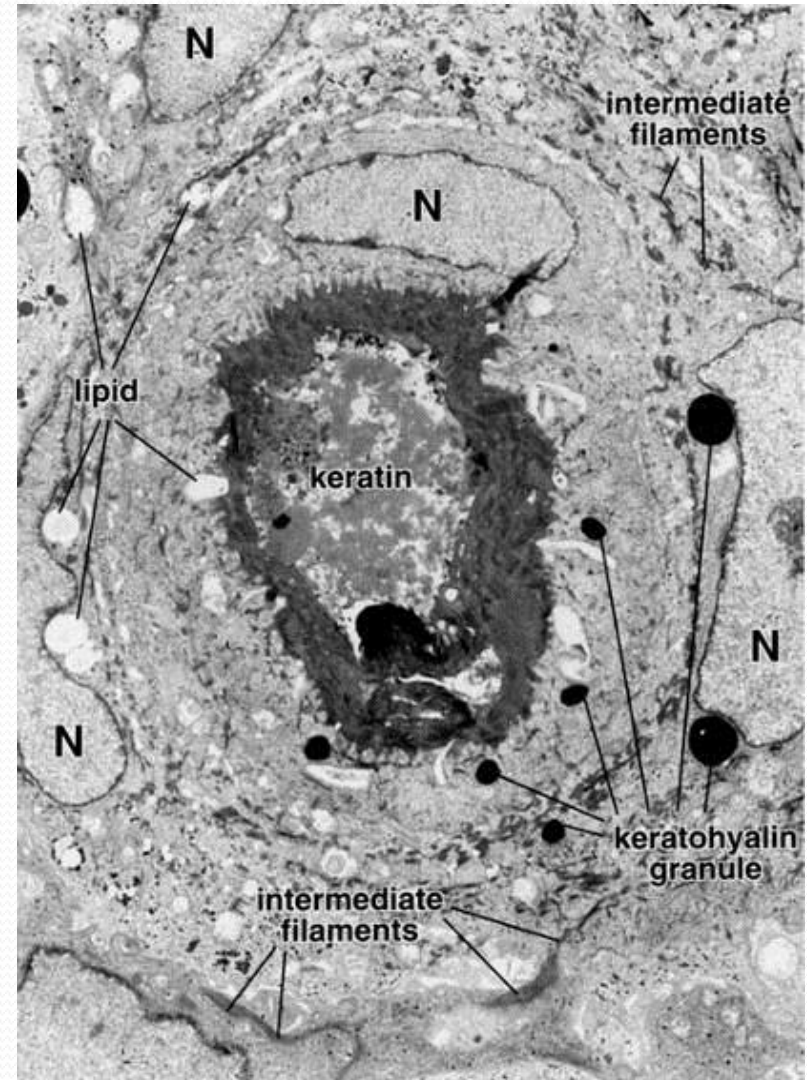
In the medulla, epithelioreticular cells form onionized structures called Hassall's corpuscles - quite prevalent in older thymus

LM view



Ross and Pawlina, *Histology: A Text and Atlas*

EM view



Ross and Pawlina, *Histology: A Text and Atlas*

Blood thymus barrier

The barrier found in the cortex separating proliferating thymocytes from the blood.

Lymphocytes are prevented from being in contact with antigens by a physical barrier that prevents the entry of antigens to the cortex from blood.

The epithelial reticular cells surround the capillaries of cortex, so the barrier is composed of :

Endothelium of capillary which is continuous (not fenestrated).

In medulla, there is no special barrier, because the capillary of medulla is fenestrated, and completely covered by epithelial reticular cells.

Major function of thymus

- _Supported the proliferation and programming of T lymphocytes.
- _It also secretes the hormone thymosin and thymopoietin that promotes the function and maintenance of T lymphocytes in particular.

Note: Size of thymus varies with age:

- _In infants it is found in the inferior neck and the heart extends into the mediastinum where it partially overlies the heart.
- _It increases in size and is most active during childhood
- _It stops growing during adolescence and then gradually atrophies.