

Lymphoid Tissue

Dr Punita manik

Professor

Department of Anatomy

K G's Medical University

U P

Lucknow

Classification

- **Diffuse Lymphoid tissue:** diffuse arrangement of lymphocytes and plasma cells deep to epithelium in Lamina propria of digestive, respiratory and urogenital tracts forming an immunological barrier against invasion of microorganisms.
- **Dense Lymphoid tissue:** presence of lymphocytes in the form of nodules

Classification

Dense Lymphoid Tissue: Nodules are found either in association with mucous membranes of viscera or as discrete encapsulated organs.

2 Types

1. **MALT** (Mucosa associated Lymphoid Tissue; Nonencapsulated)
2. **Discrete Lymphoid organs** (Encapsulated)

- **MALT:**

- Solitary Nodules

- Aggregated Nodules(Peyer's patches)

- Lymphoid nodules in vermiform appendix

- Waldeyer's ring at the entrance of pharynx

- **Discrete Lymphoid Organs:**

- Thymus**

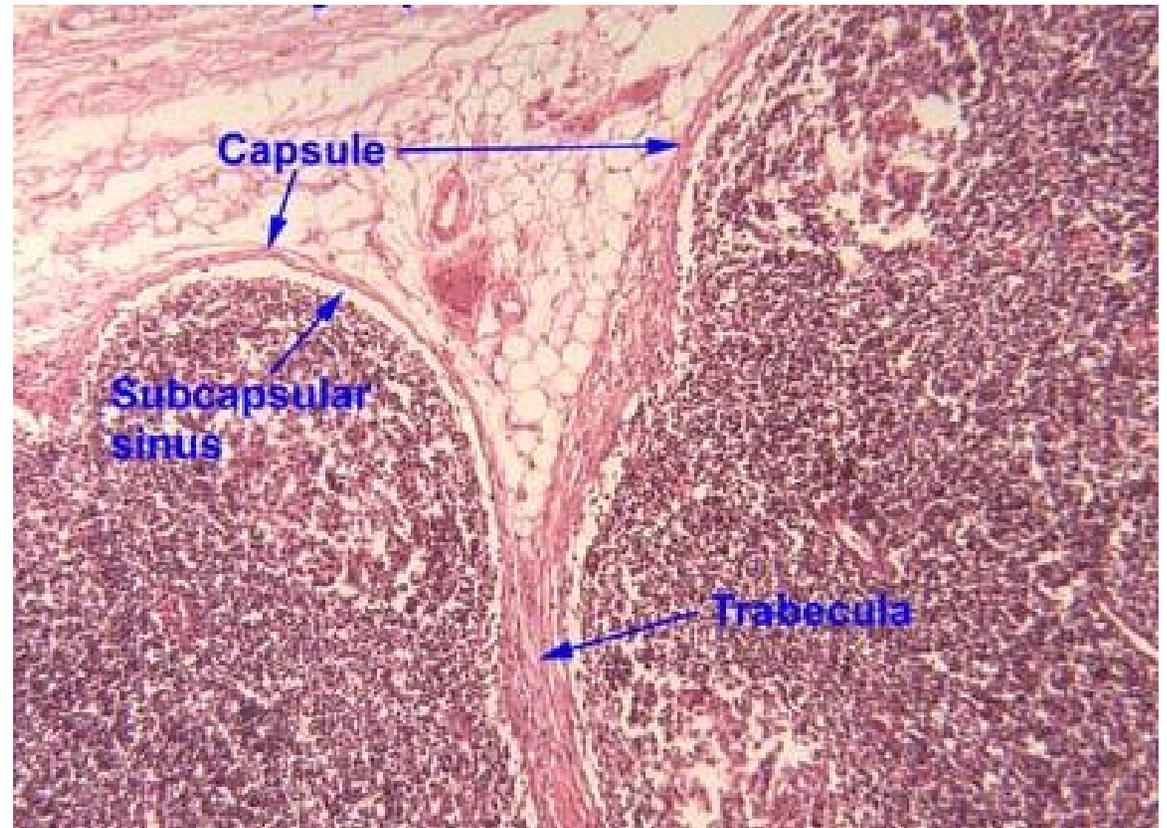
- Lymph Node**

- Spleen**

- Tonsil**

Lymph Node

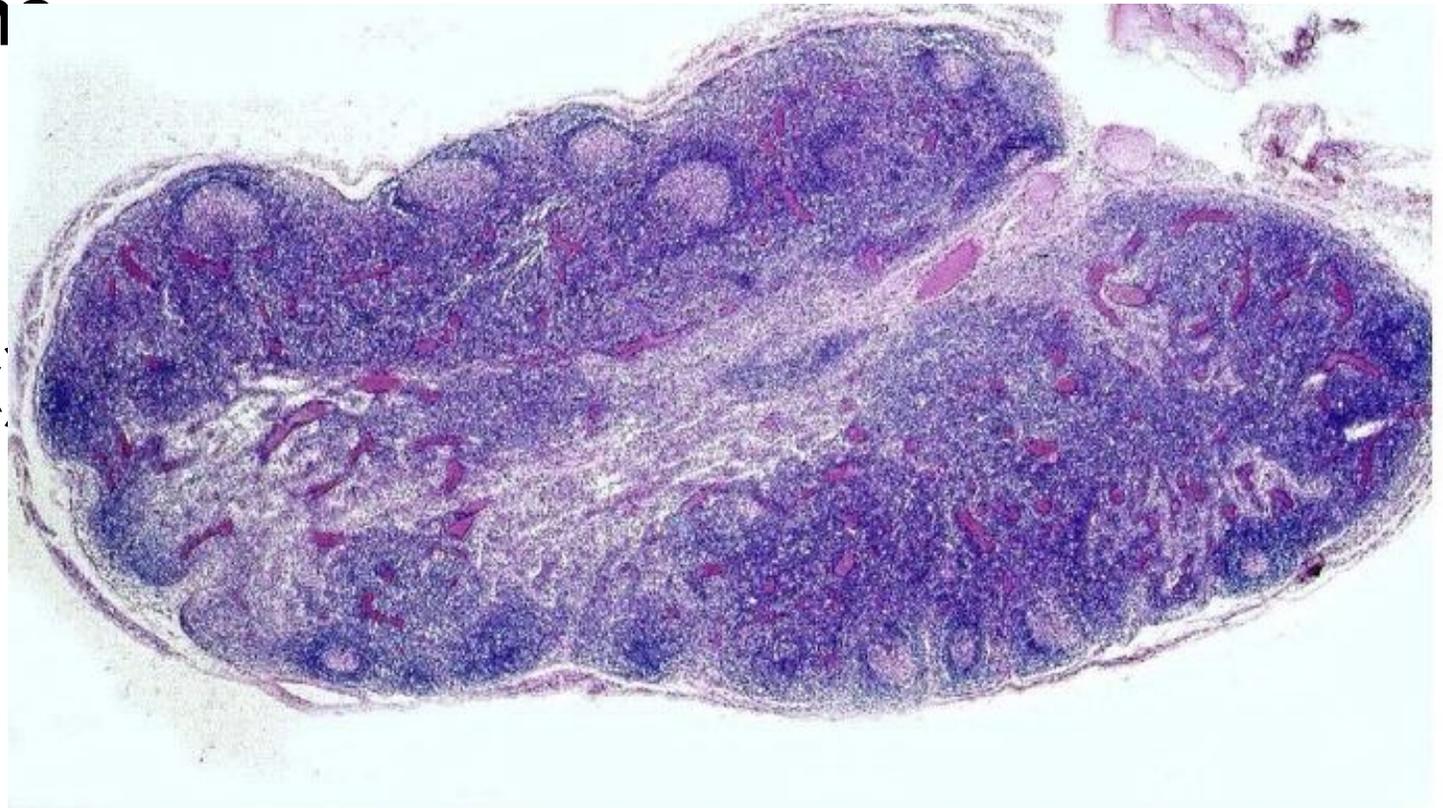
- **Connective tissue framework**
 - Capsule**
 - Trabecula**
 - Reticular**
 - Stroma (fibres)**



Components of Lymph Node

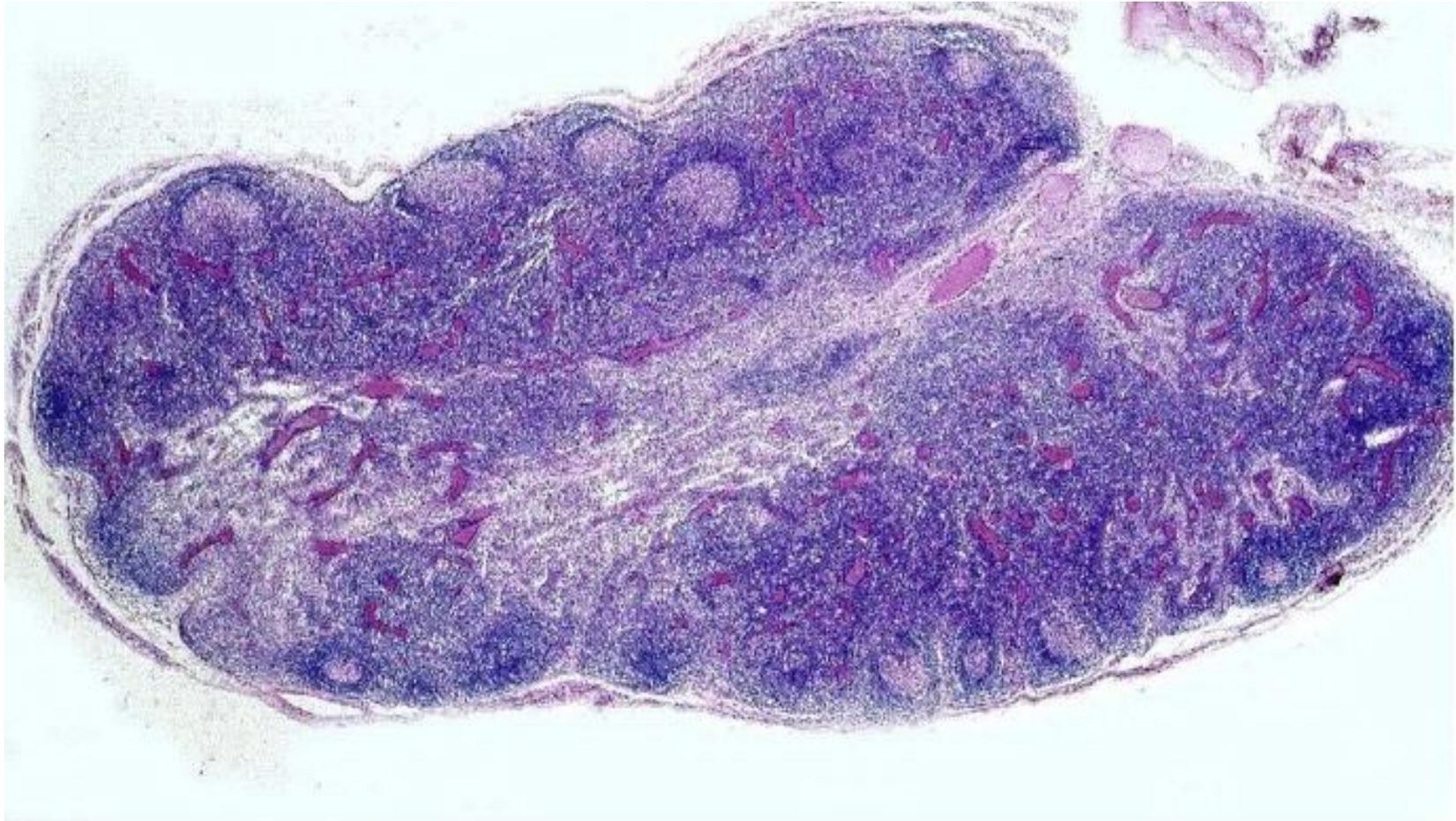
- **Parenchyma** -

1. Cortex
2. Paracortex
(Inner Cortex)
3. Medulla



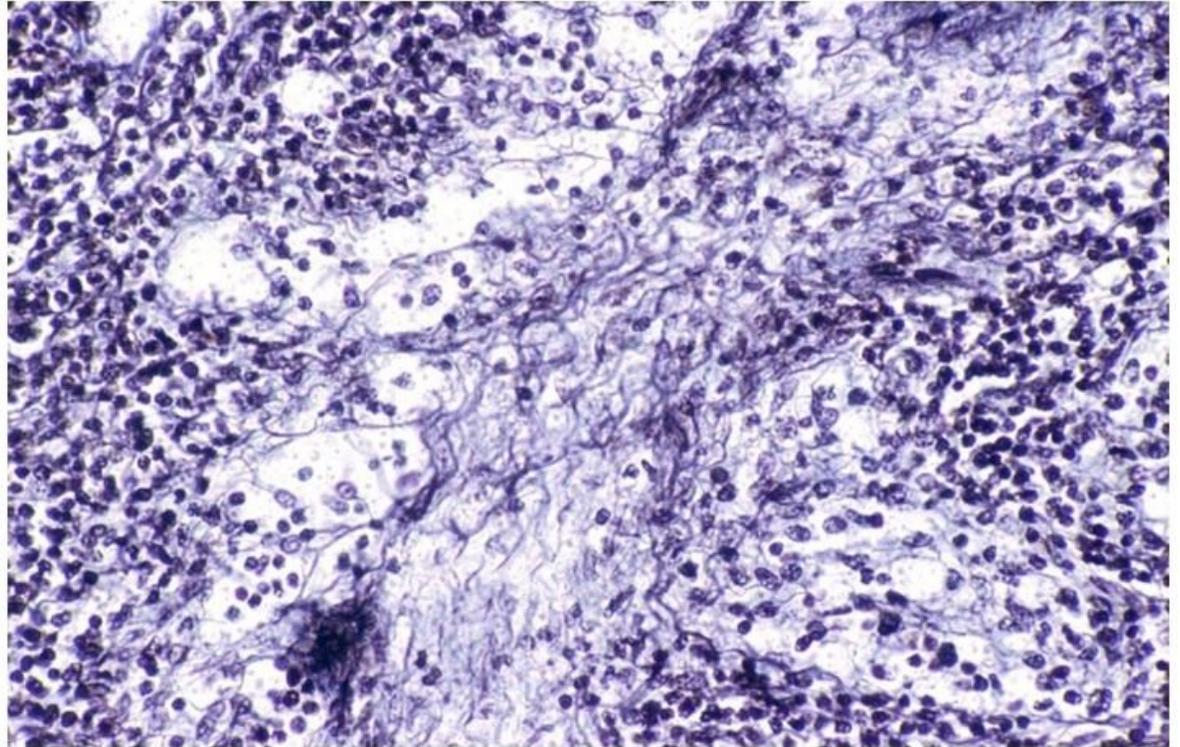
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Lymph node



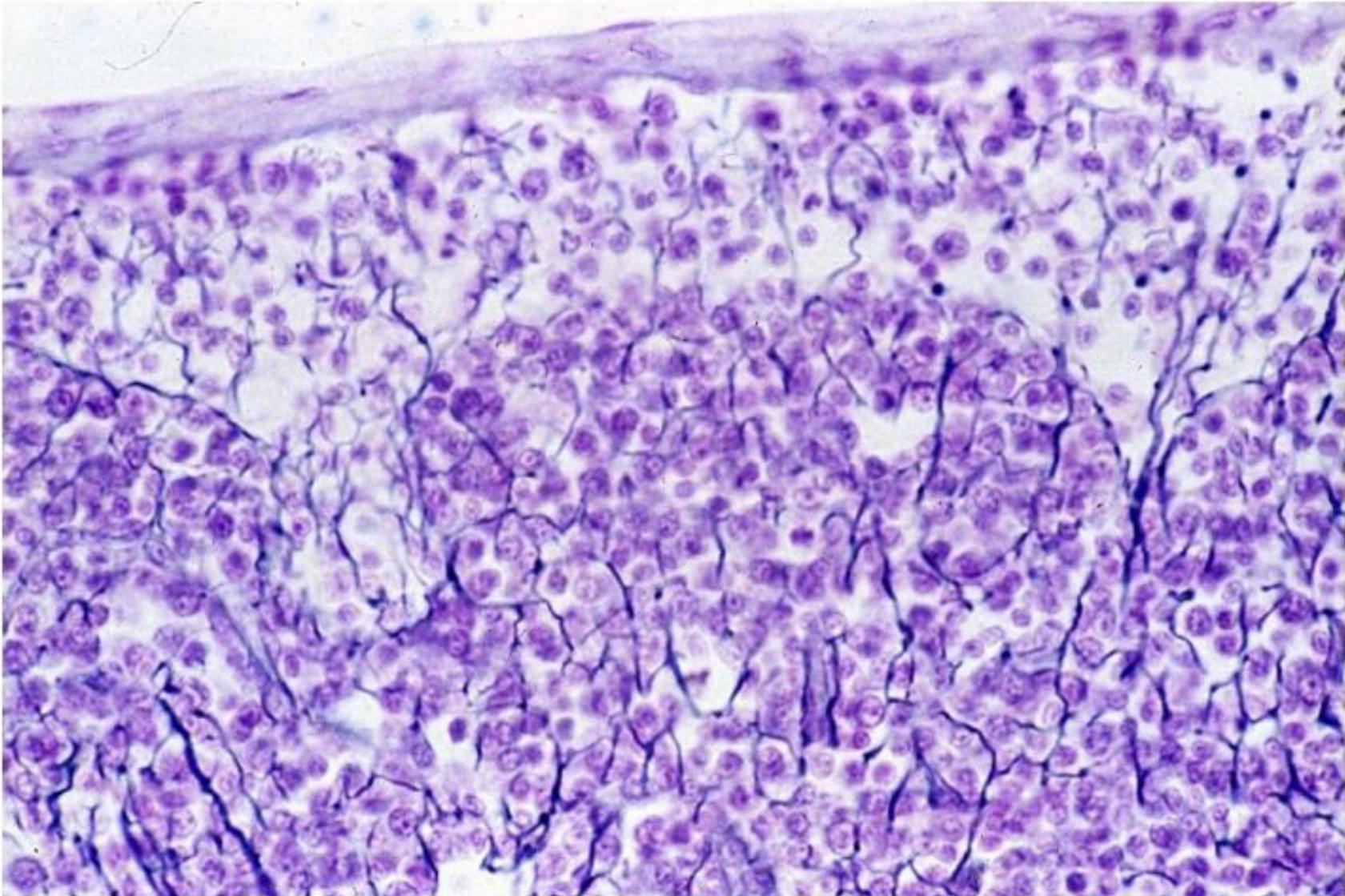
Lymph Node Reticulum

- Reticular stroma-
reticular fibres and
phagocytic reticular
cells
- Gives structural
support to the
lymphoid cells



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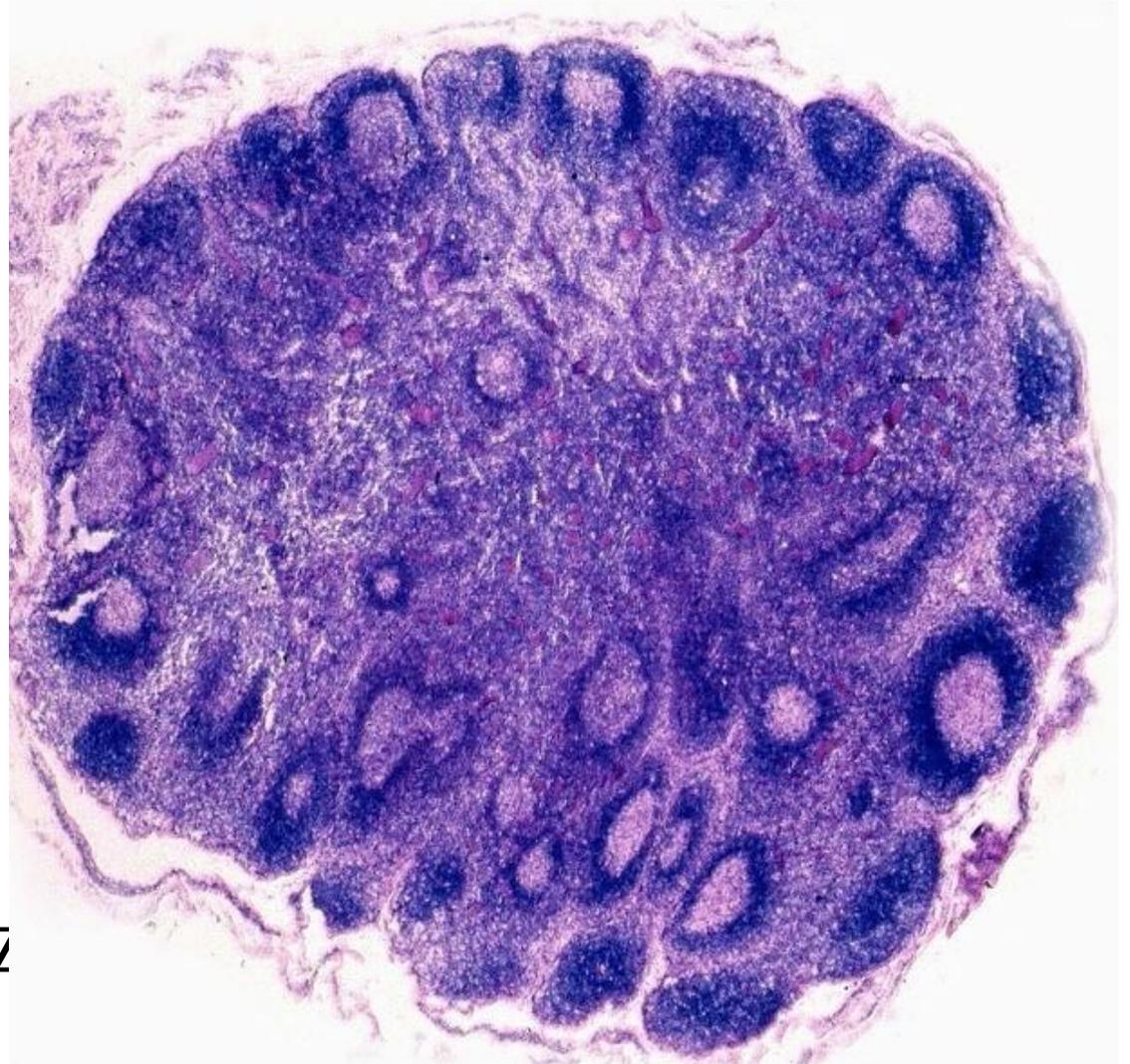
Lymph Node Reticulum



Cortex

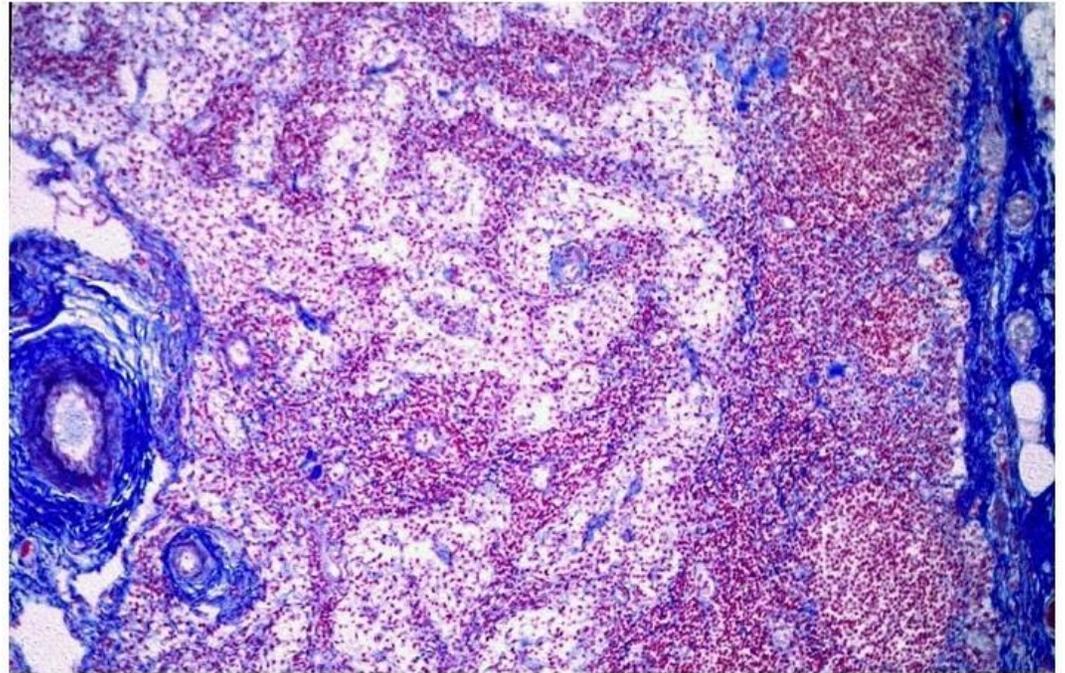
Subcapsular Sinus
Lymphatic Nodules
Primary Nodule
Secondary Nodule
Germinal Centre

- **Paracortex:**
Inner cortical Zone
Thymus dependent zone



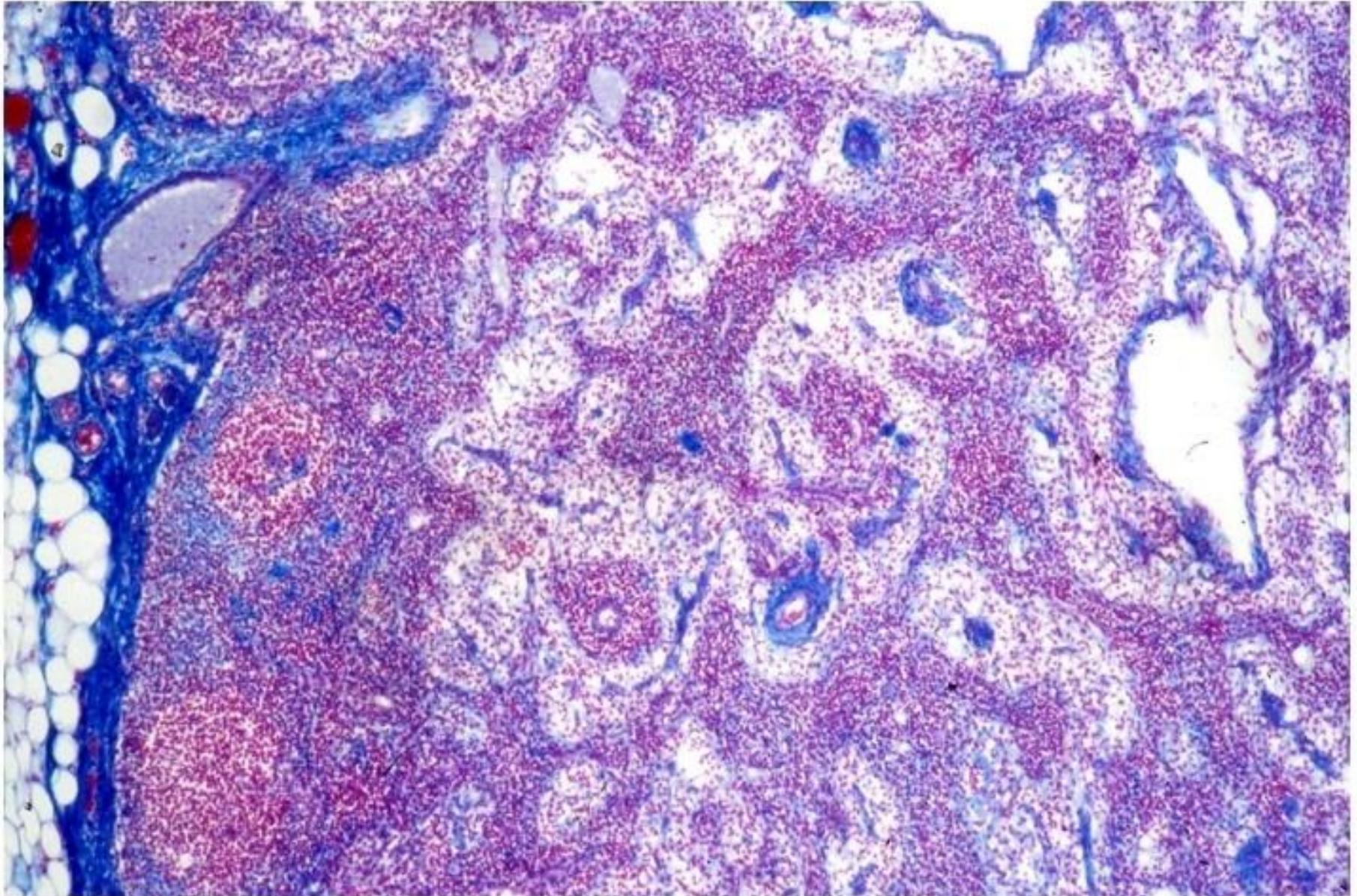
Lymph Node

- **Medulla:**
- **Medullary Cords -Darkly stained, branching anastomosing – B Lymphocytes, plasma cells& macrophages**
- **Medullary Sinuses-Lightly stained**

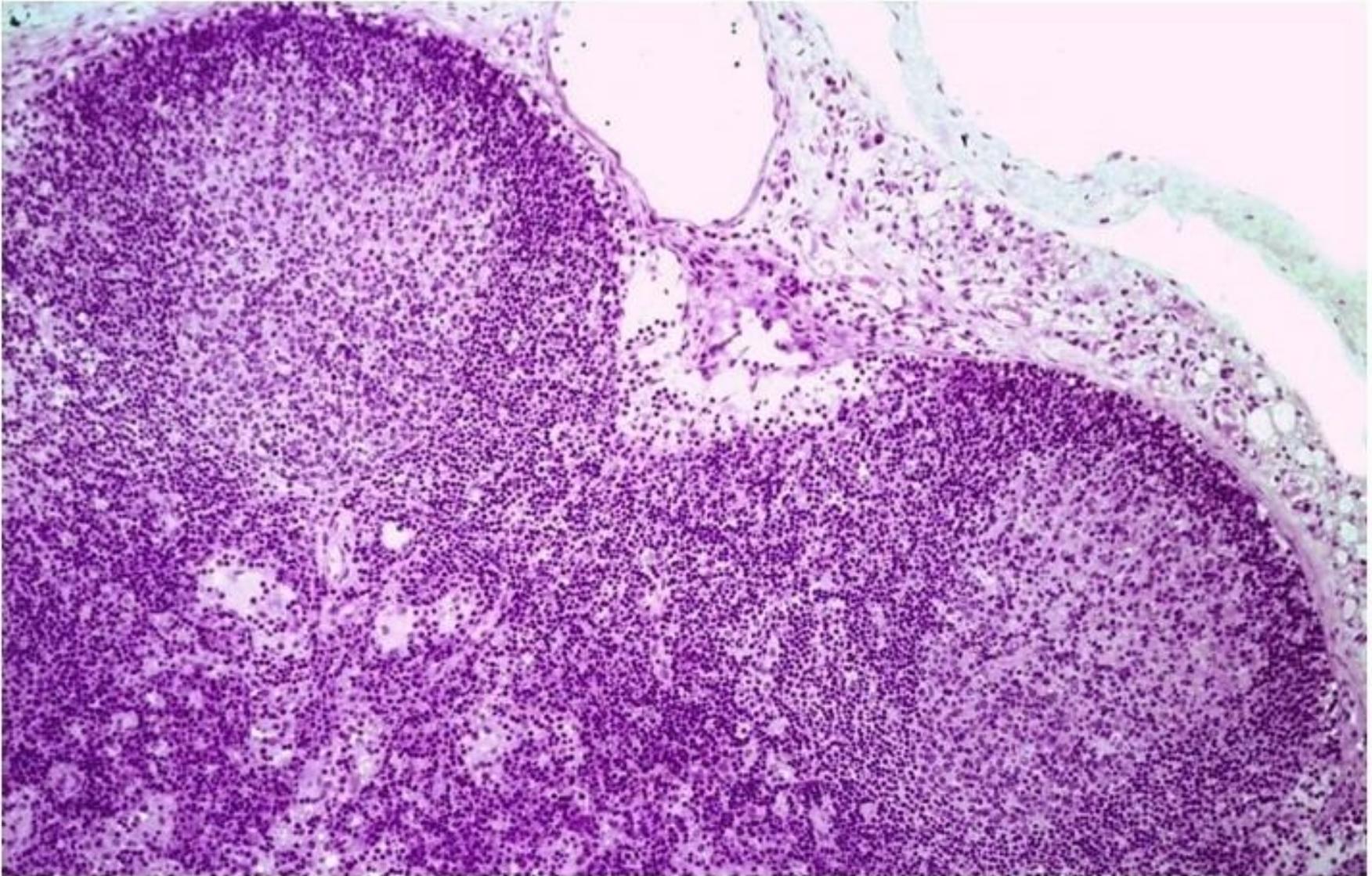


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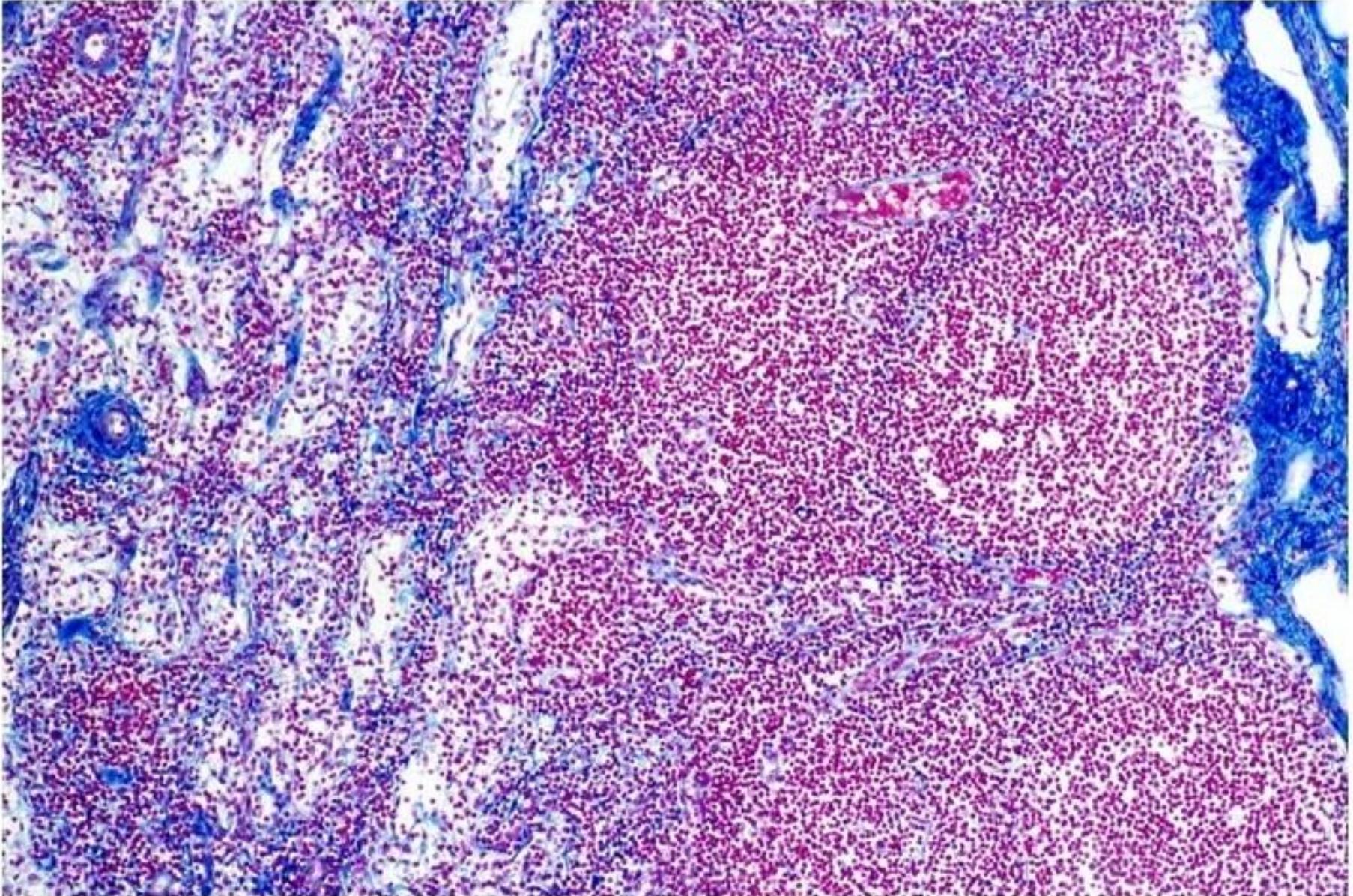
Lymph Node



Lymph Node



Lymph Node



Thymus

- Central Lymphoid organ
- Dual Origin- Lymphocytes- Mesoderm
- Reticular epithelial cells- Endoderm
- Formed only by T lymphocytes
- **No B lymphocytes**
- Divided into **lobules** of lymphoid tissue(No lymphatic nodule)
- Has Hassall's corpuscles
- Produces thymic hormones
- Fully dev at birth, involutes at puberty.

Thymus

- **COMPONENTS**

1. **Supporting Framework**

Capsule

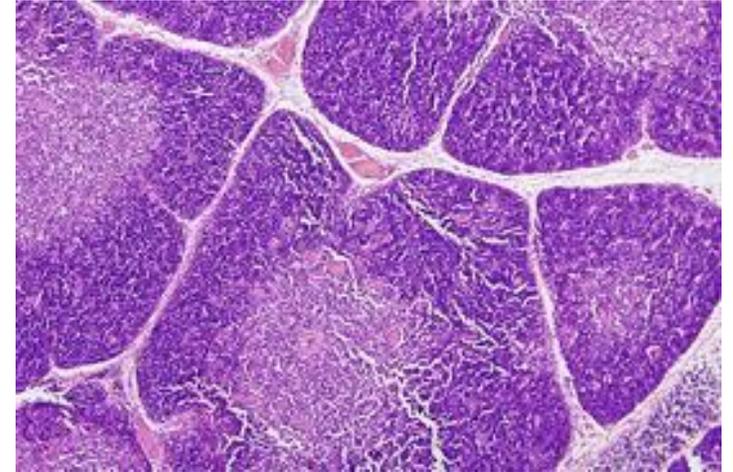
Interlobular septa

Cellular cytoplasmic reticulum

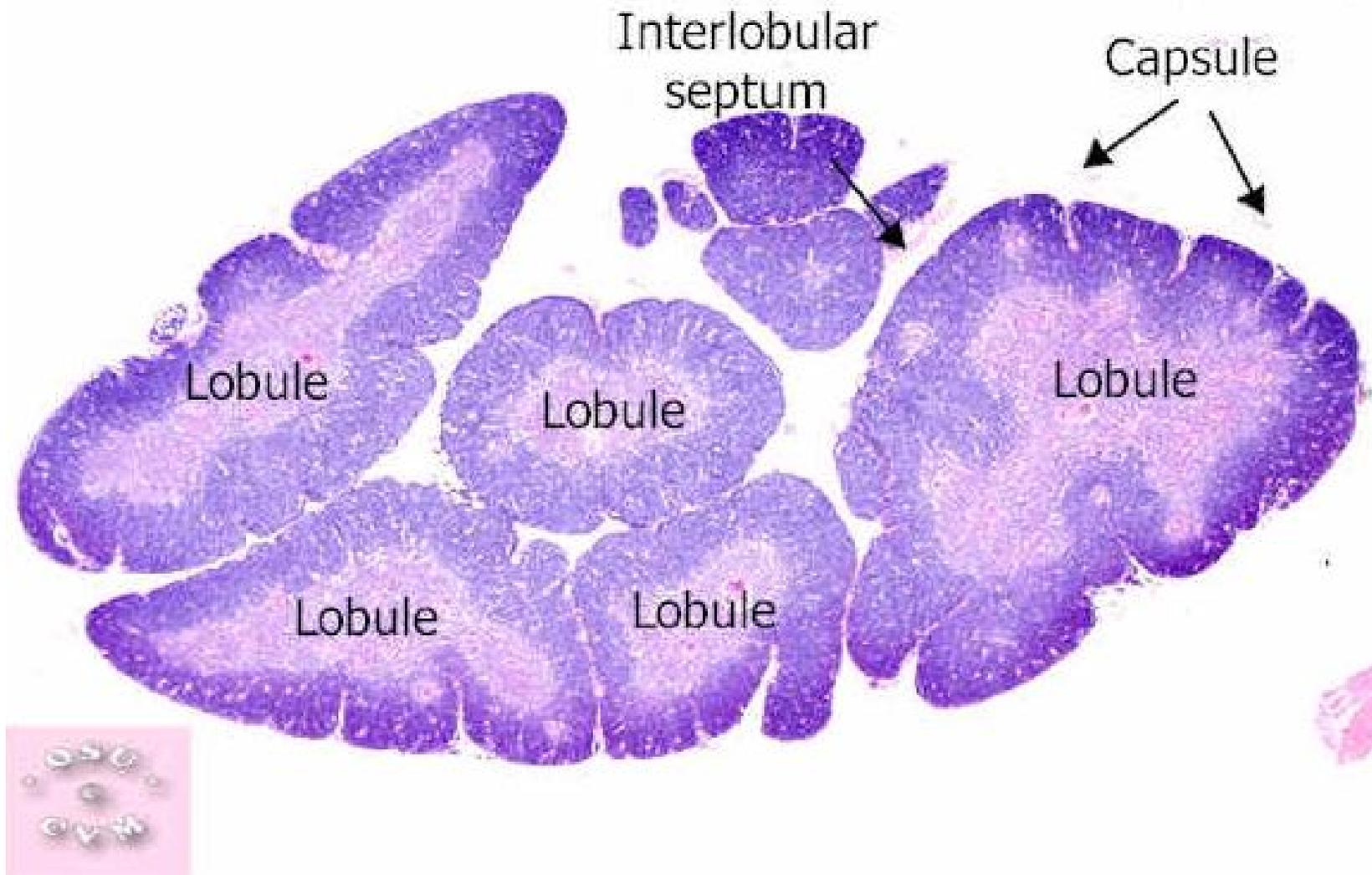
2. **Parenchyma or Lobules**

Cortex

Medulla and Hassall's corpuscles



Thymus



Cellular Cytoplasmic Reticulum

Epithelial reticular cells:

Stellate cells with cytoplasmic processes, come in contact with the cytoplasmic processes of neighbouring cells by means of desmosomes.

Large pale staining nuclei

Eosinophilic cytoplasm

Secretory granules: liberate **Thymosin** and **Thymopoietin**

Cellular Cytoplasmic Reticulum

- Gives support to the lymphocytes of thymic lobules
- *This reticulum is different from the reticulum of other lymphoid organs where it is formed by the reticular fibres.*

Parenchyma

Cortex:

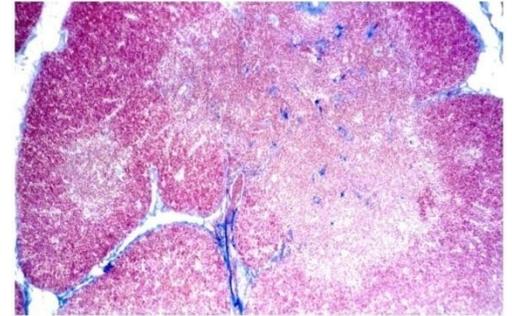
Darkly stained

Densely packed lymphocytes-Thymocytes

Outer cortex-Large cells-Lymphoblasts

Lymphoblasts divide by mitosis, push cells towards deeper part of cortex

Blood Thymic Barrier: between thick basement membrane of capillaries and processes of epithelial reticular cells



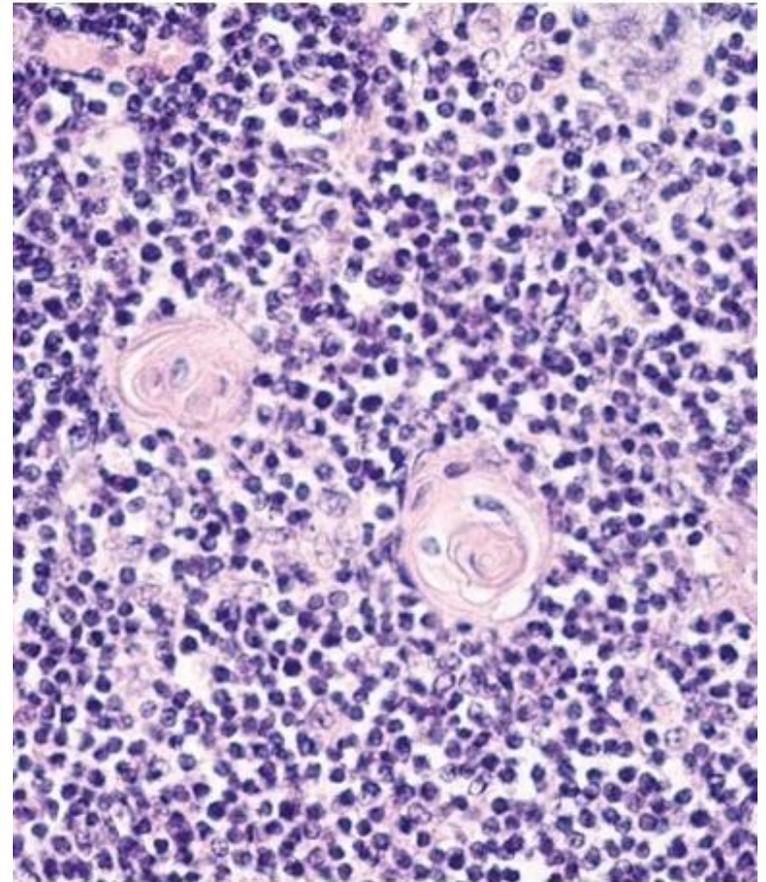
Parenchyma

Medulla

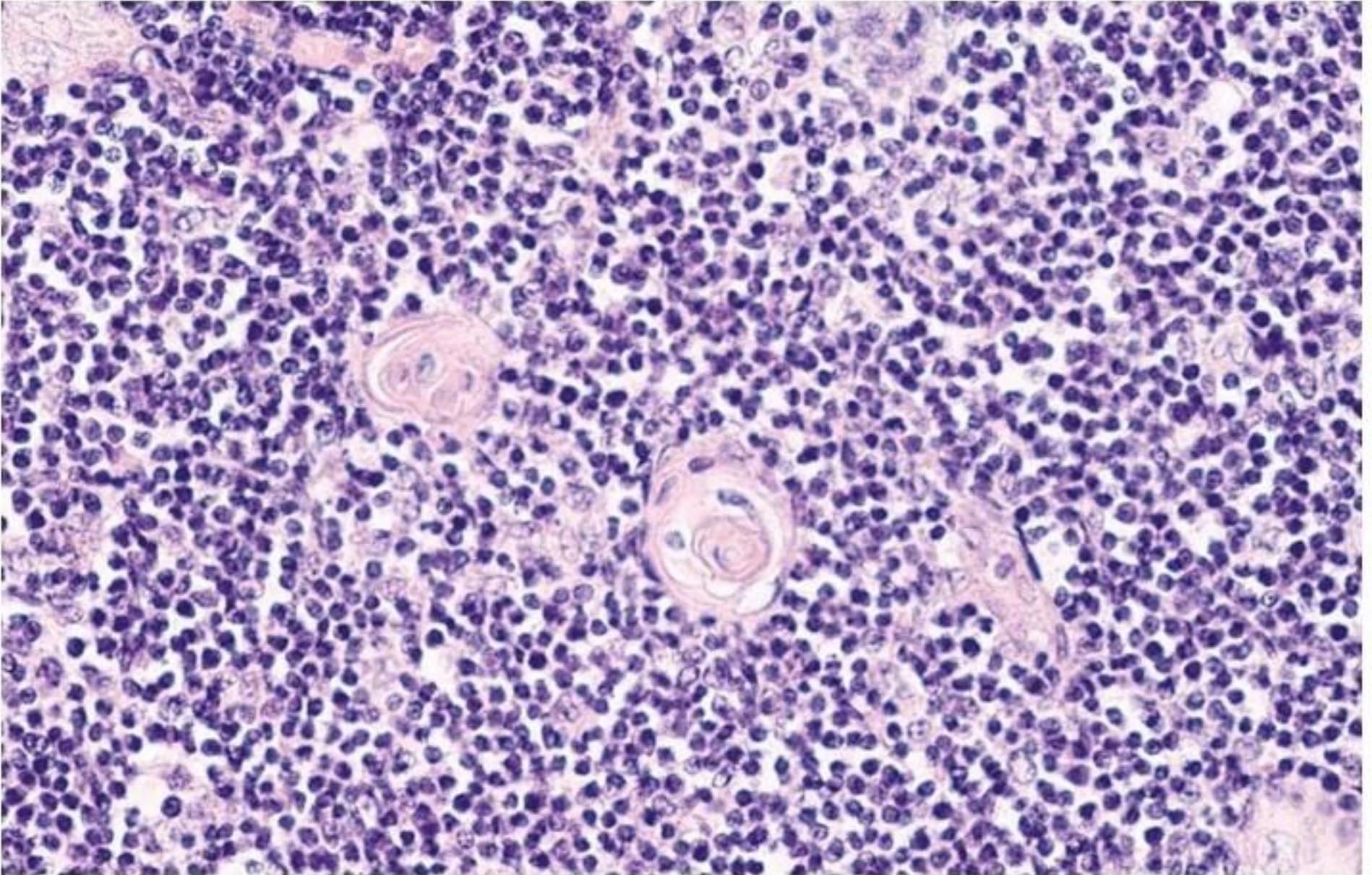
Lightly stained because lymphocytes are less densely packed.

Characteristic Feature: **presence of Hassall's Corpuscles**

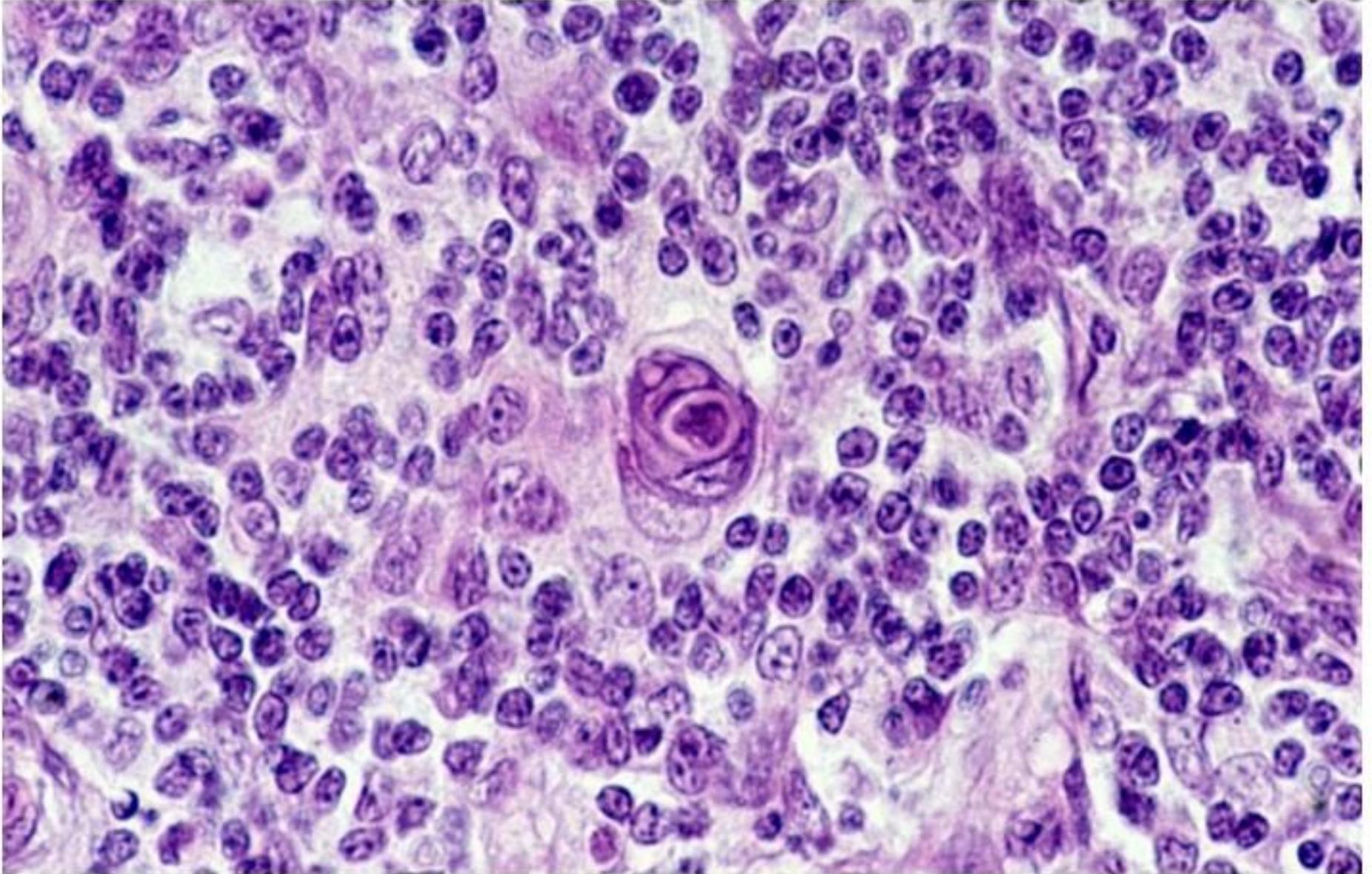
Hassall's Corpuscles: *Round lamellated acidophilic bodies(30-100mm), central homogeneous hyaline material surrounded by concentric layers of flattened epithelial cells. These cells are filled with keratin filaments*



Thymus



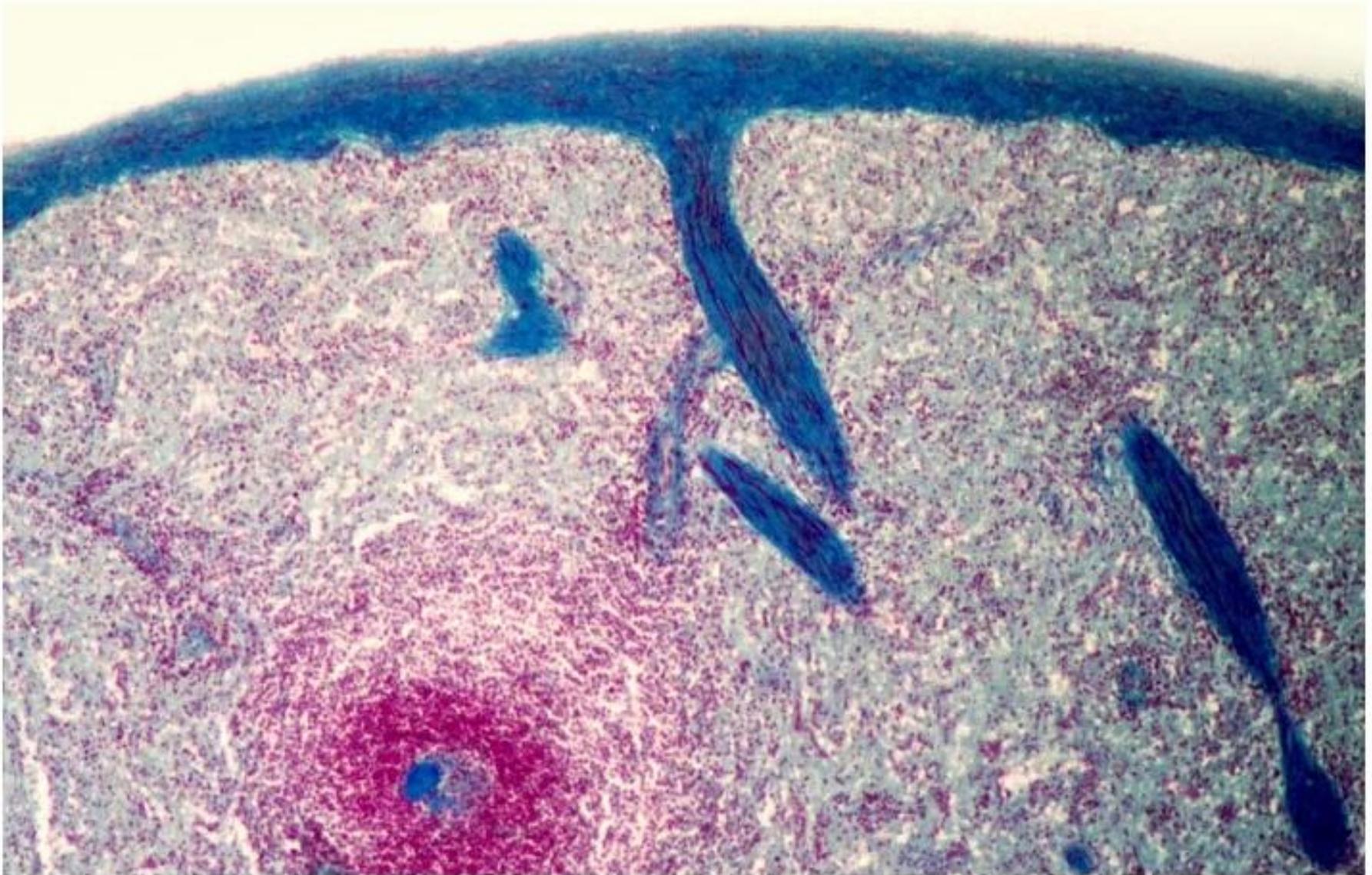
Thymus



Spleen

- Largest Lymphoid organ
- Blood forming organ(**Haemopoesis**) in foetal life
- Blood destroying organ in post natal life (**Graveyard of RBC**)
- Filtration of blood from antigens, microorganisms, and aged platelets and abnormal and aged RBCs.

Spleen



Structure of Spleen

- **Connective Tissue Framework**

Capsule

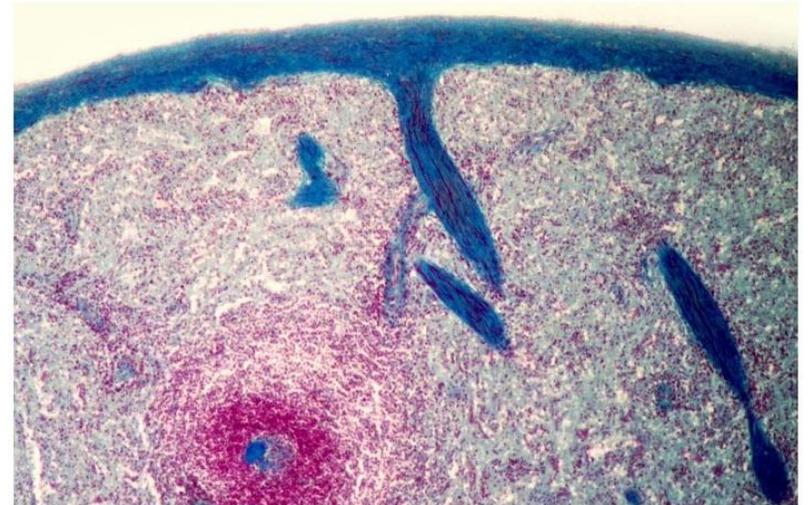
Trabecula

Reticular stroma (fibres)

- **Parenchyma**

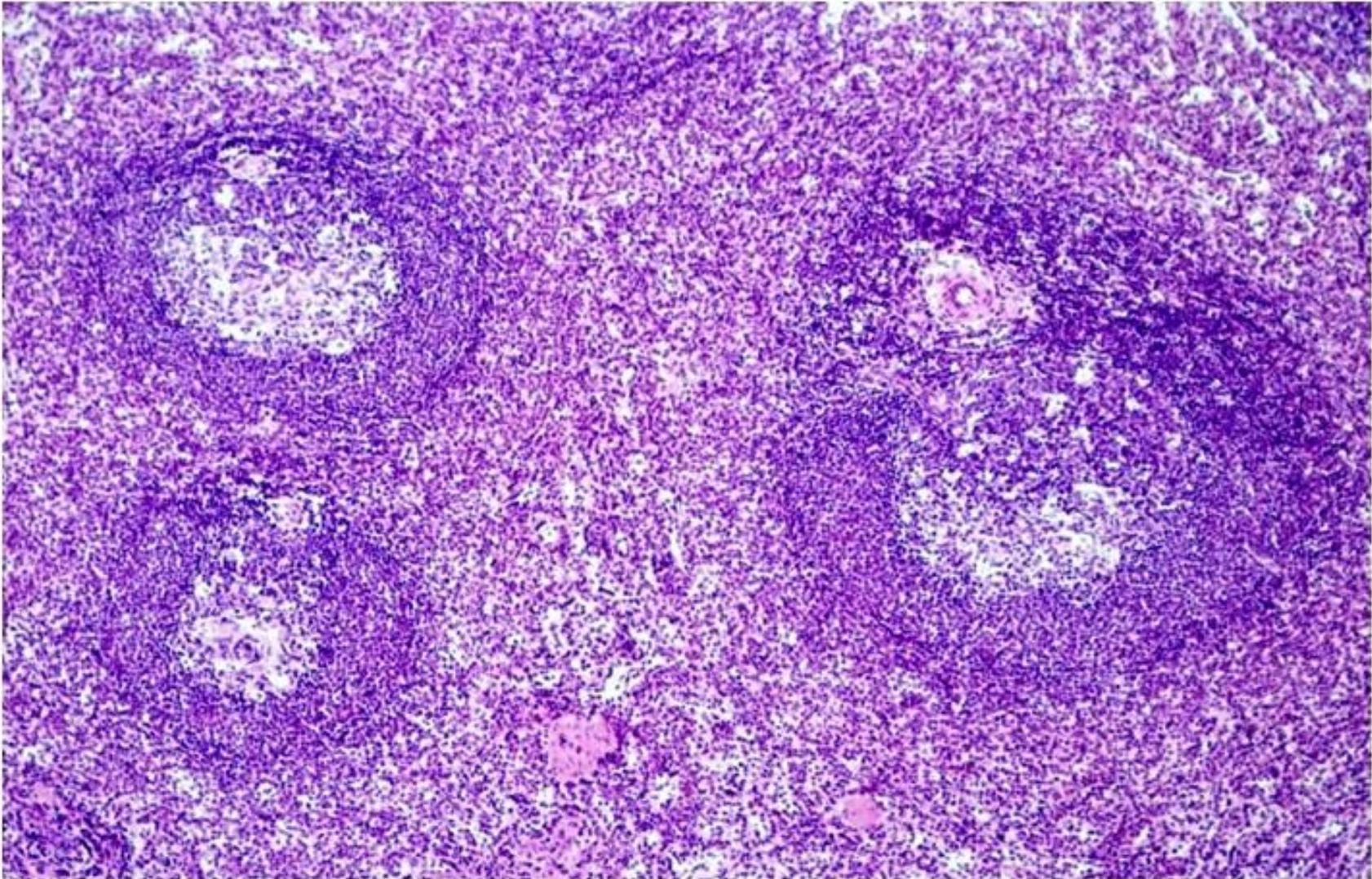
White Pulp(Typical Lymphoid Tissue)

Red Pulp(Atypical Lymphoid Tissue)



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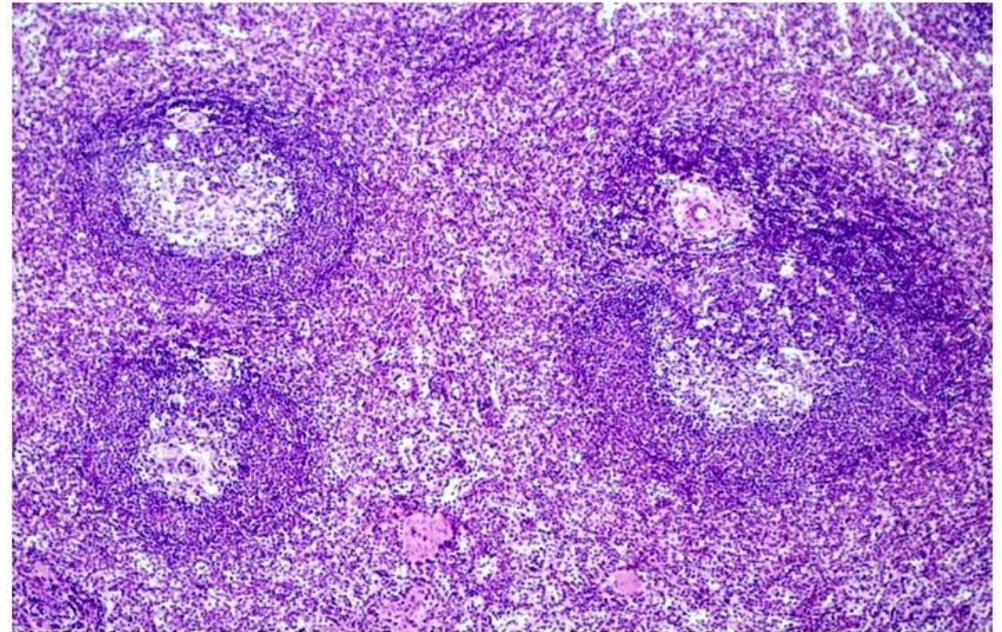
Spleen



White Pulp

- Aggregation of lymphoid tissue around the small artery or arteriole
- Artery is surrounded by lymphoid tissue- **Periarterial lymphatic sheath (PALS)**, T lymphocytes to become Central artery or white pulp artery.

- **Large collections of B lymphocytes around PALS forming lymphatic nodule with germinal centres (white pulp)**
- **In these nodules artery occupies an eccentric position, those known as central artery**

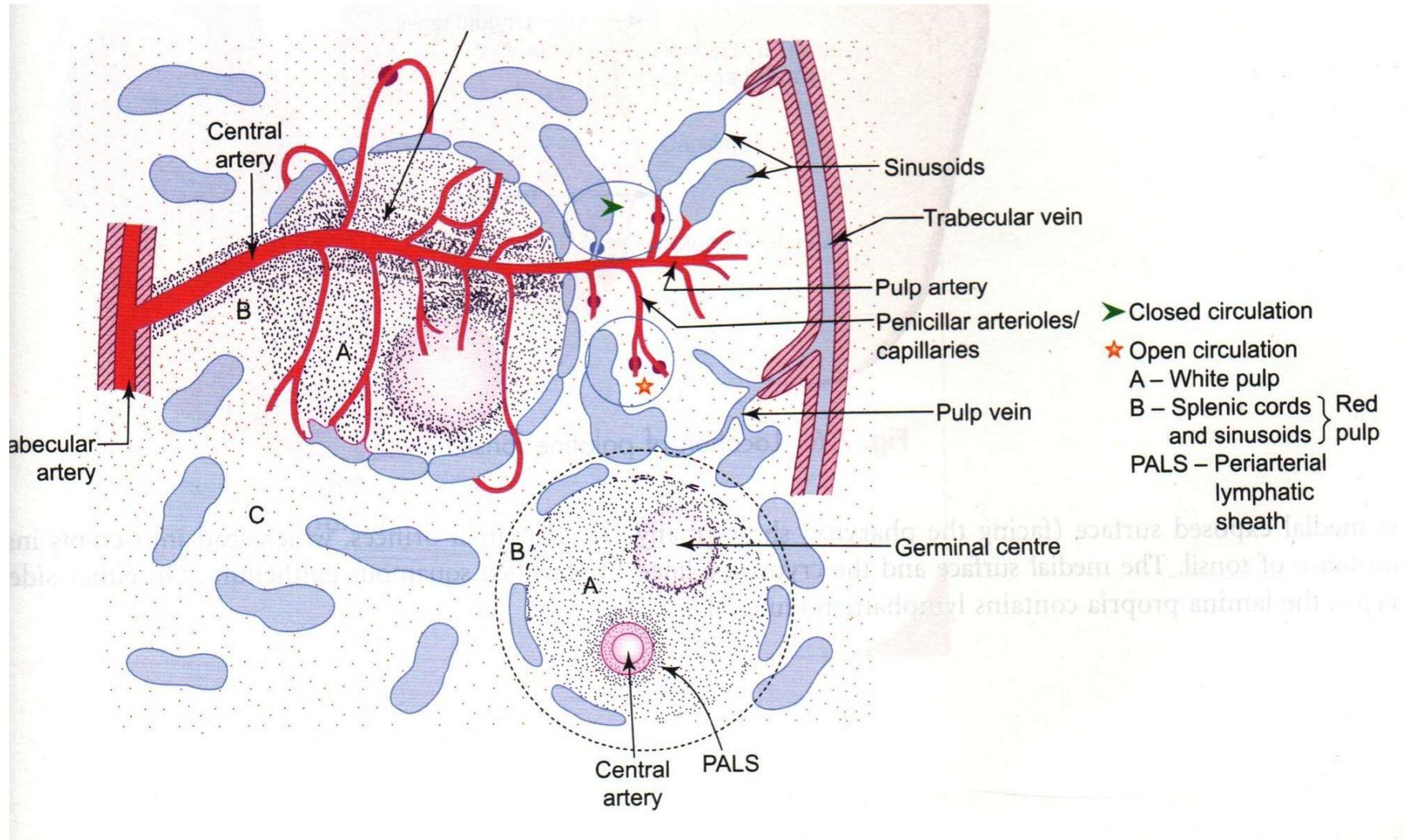


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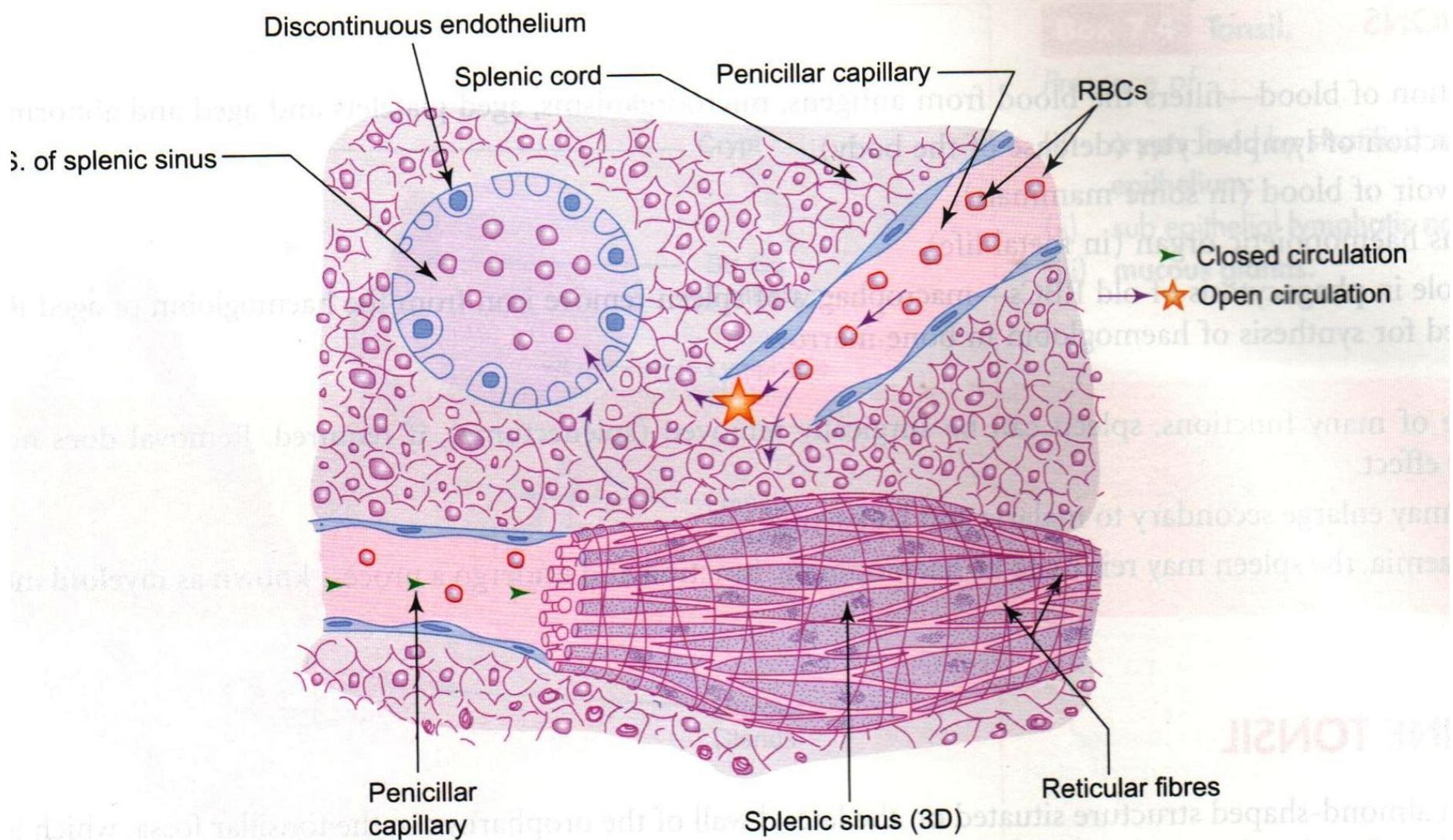
White Pulp

- The lymphatic nodules(white pulp) are surrounded by immunologically active zone containing macrophages, few T lymphocytes and blood sinuses. This zone is known as Marginal zone between white and red pulp.
- The central artery enters the red pulp where it divides to form Straight *Penicillar arterioles*.
- Some Penicillar arterioles may show thickening of the wall due to aggregation of macrophages, reticular cells and lymphoid cells know as *Ellipsoids*

Spleen circulation



Spleen circulation



Red Pulp

- Modified Lymphoid tissue
- Heavily infiltrated with all cells of circulating blood
- Gives dark red color to the tissue when fresh
- Composed of irregular anastomosing *Splenic cords of Billroth* and *Splenic venous sinuses* between the cords.
- **Splenic cord is a spongy network of reticular fibres infiltrated with reticular cells, lymphocytes, macrophages, plasma cells and all elements of circulating blood**

Red Pulp

- Splenic venous sinuses are lined by highly elongated , spindle shaped endothelial cells on a **discontinuous basement membrane.**
- The structure of these sinuses can be compared to tall wooden barrels with both ends open and the endothelial cells being represented by **wooden staves, hence known as Stave cells.**
- Externally, the sinuses are encircled by reticular fibres in a transverse direction like the steel bands holding together the staves of the wooden barrel.

Red Pulp

- Since the gap between the endothelial cells of the splenic sinuses is 2-3micron m in diameter, only the flexible cells are able to pass easily to and from the cords and sinuses.
- **A reduction in the flexibility of erythrocytes after 120 days, signals for their destruction.**

Theories of Splenic Circulation

To explain the mode of termination of the arterial capillaries of the Penicilli

- **Closed Circulation Theory:**

Blood passes directly from the arterial capillaries in to the splenic venous sinuses of the red pulp i.e. the vascular system is closed or continuous.

Theories of Splenic Circulation

Open Circulation Theory:

- Blood passes from the arterial capillaries of penicilli into cords of Bilroth and from there into the sinuses through the spaces between endothelial cells.
- The nonflexible old erythrocytes are retained in the cords and are engulfed by macrophages.

Theories of Splenic Circulation

Another compromised Theory

Splenic circulation is closed in contracted spleen and open in distended spleen.

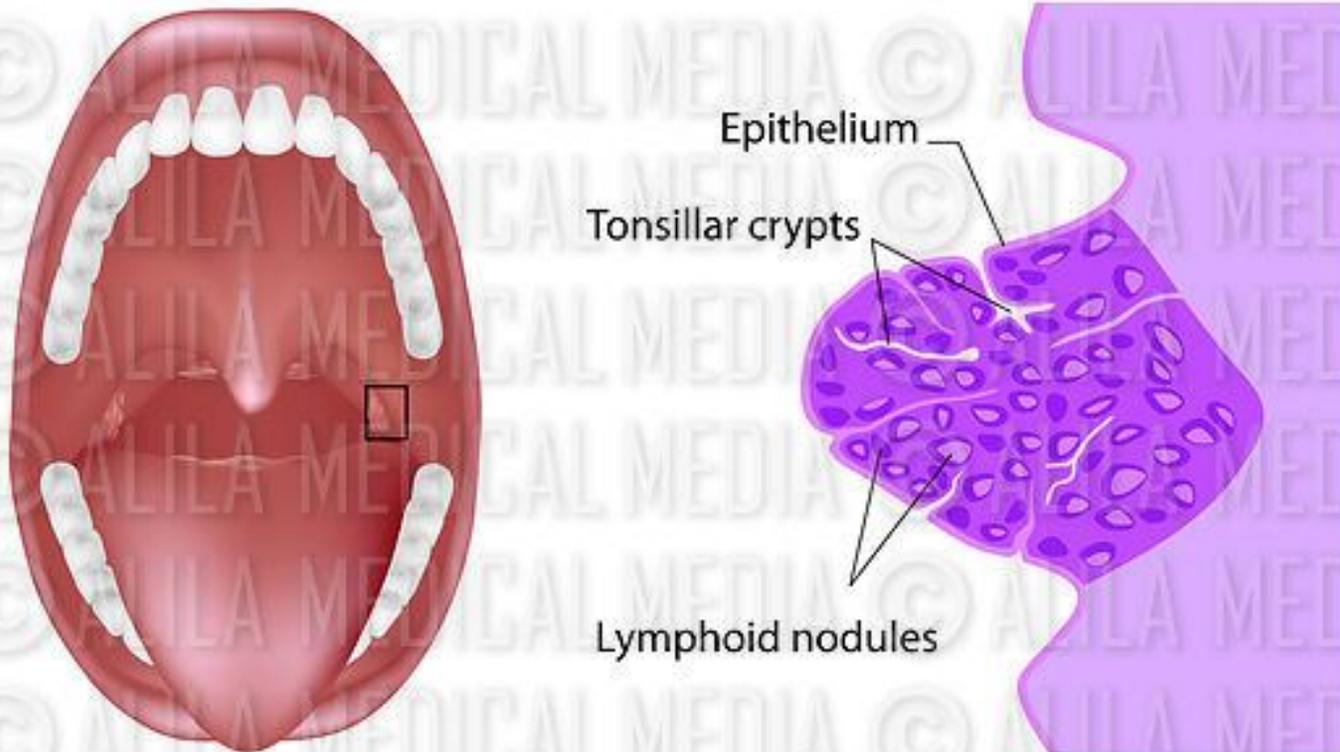
Clinical

- Removal of spleen: splenectomy can be done if required. Does not have any adverse effect
- Spleen may enlarge secondary to malaria and leukemia

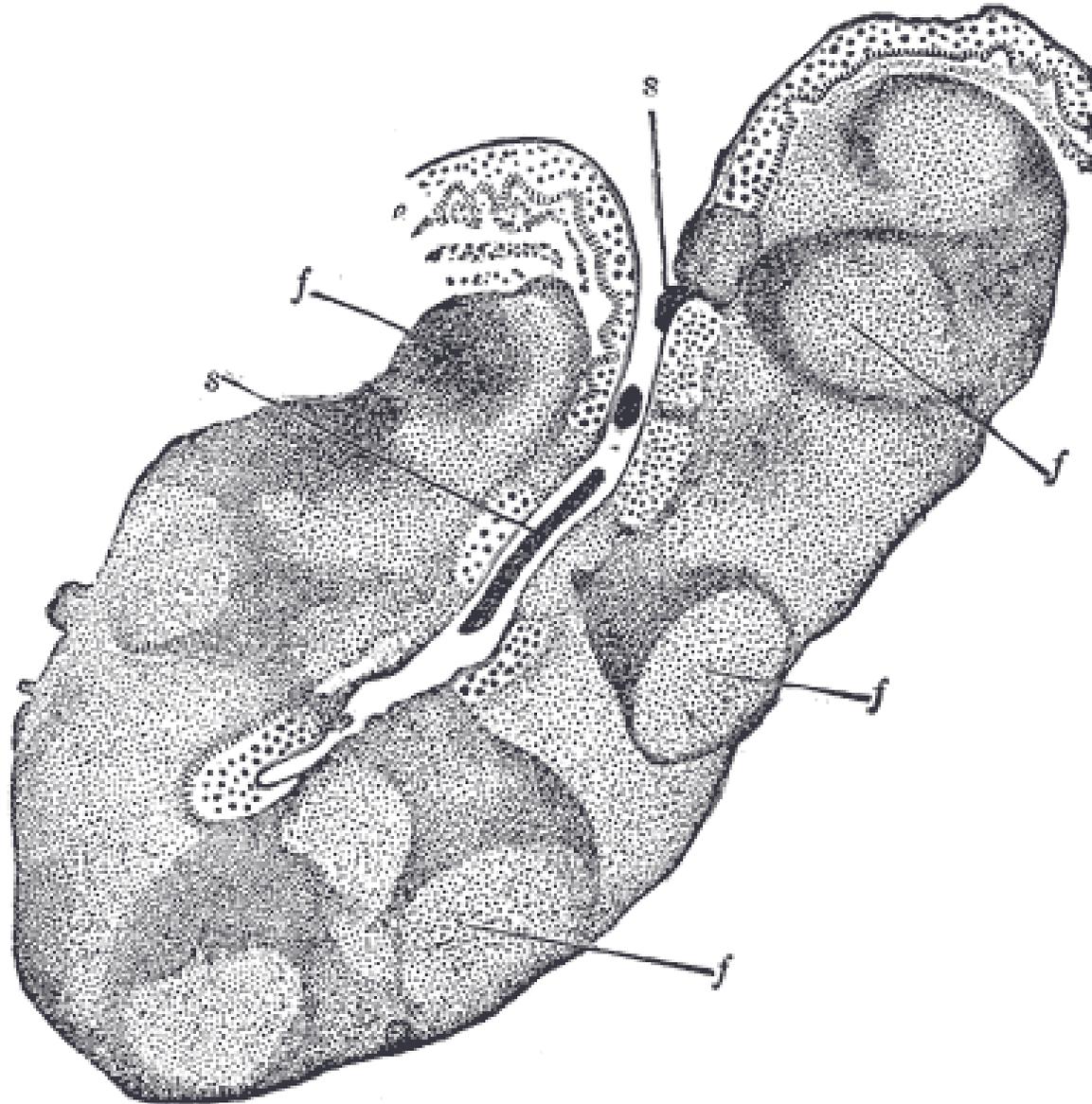
Spleen

- *Phagocytosis of old RBCs-Macrophages present in spleen remove iron from the haemoglobin of aged RBCs which is reused for synthesis of haemoglobin in bone-marrow*

Palatine Tonsil



Tonsillar crypt



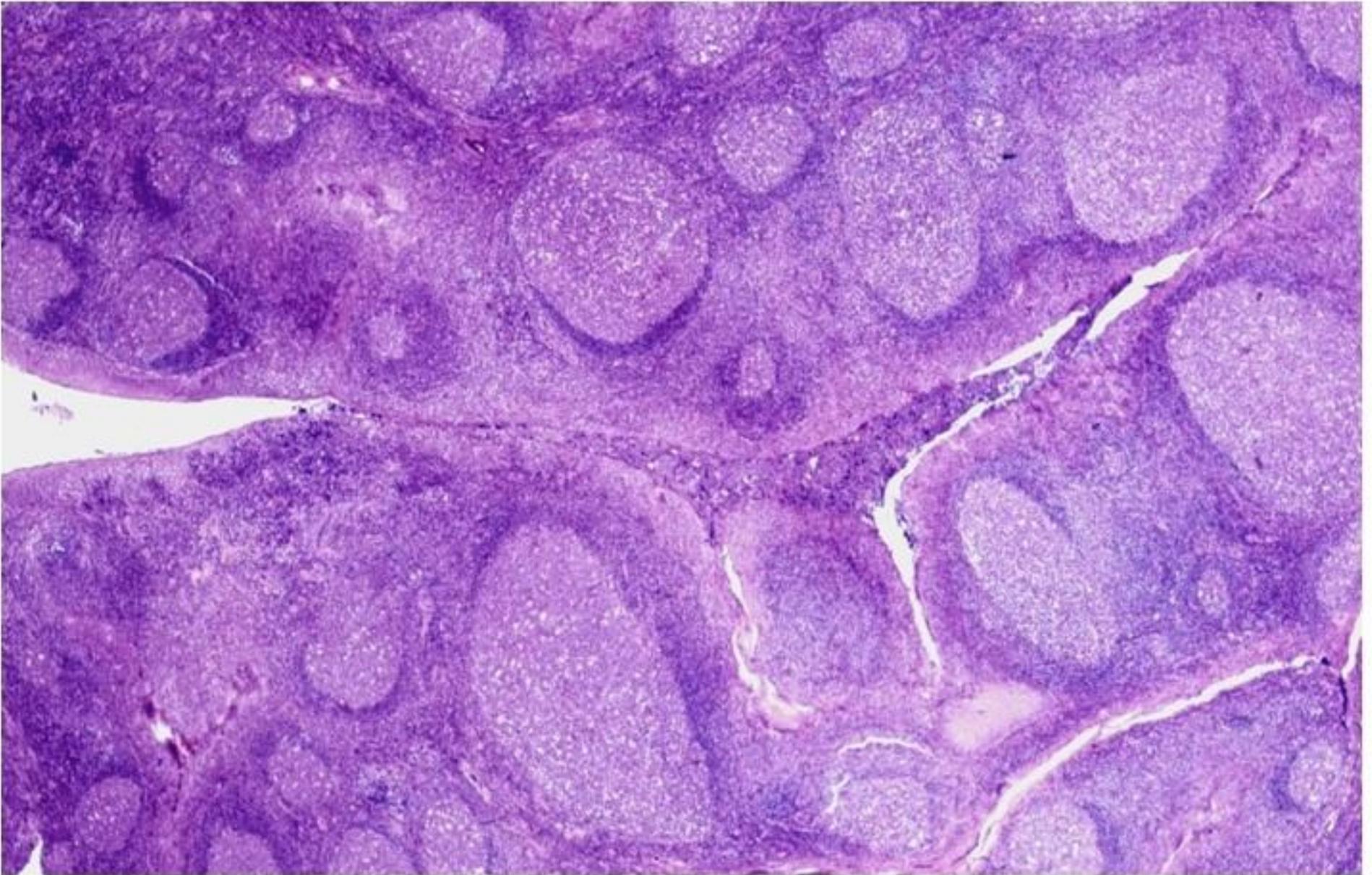
Identifying Features

1. Has numerous crypts lined by stratified squamous epithelium
2. Lamina propria contains lymphatic nodules.
3. Mucous glands in the deeper part , ducts opening in the bottom of the crypt



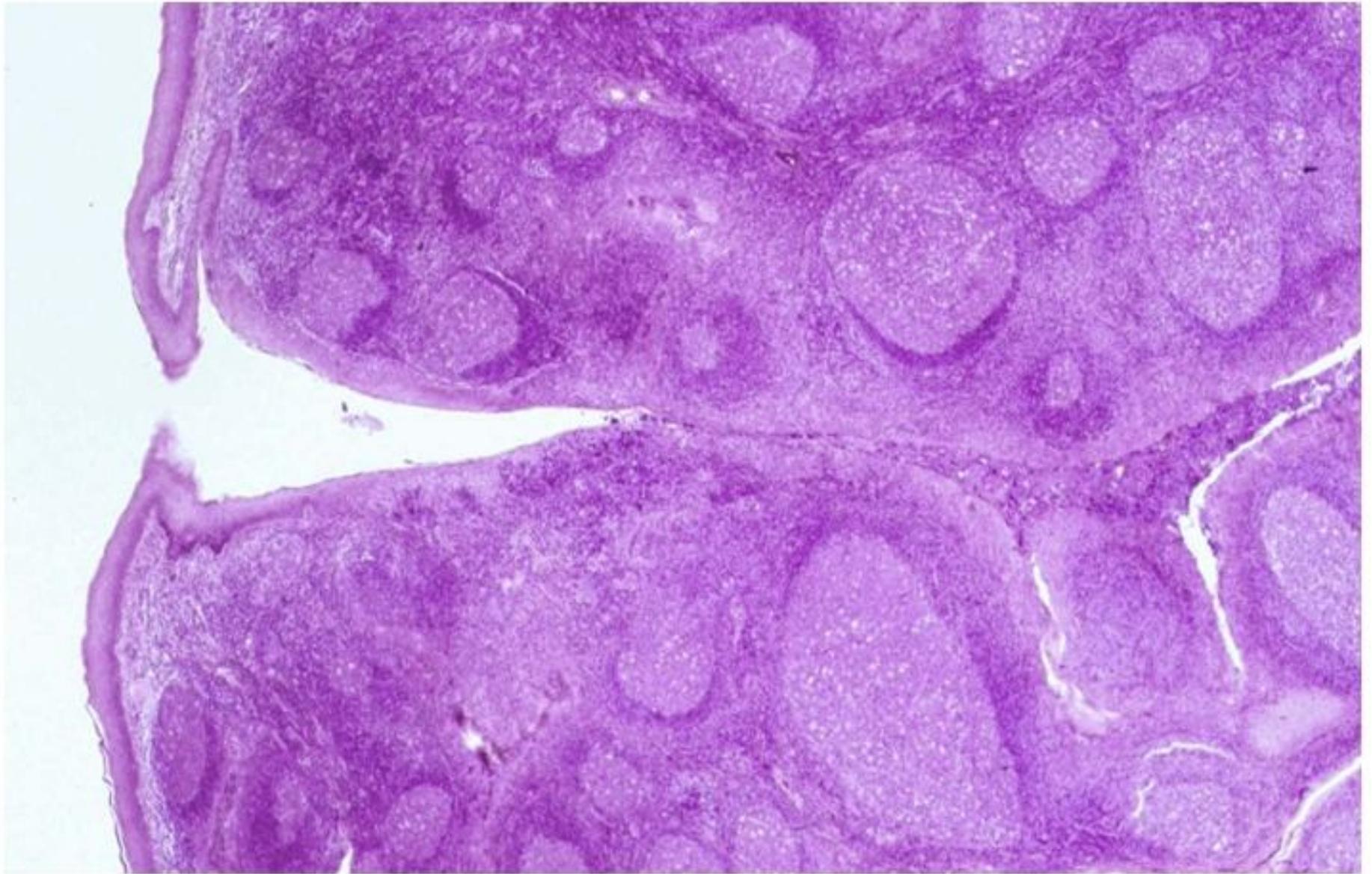
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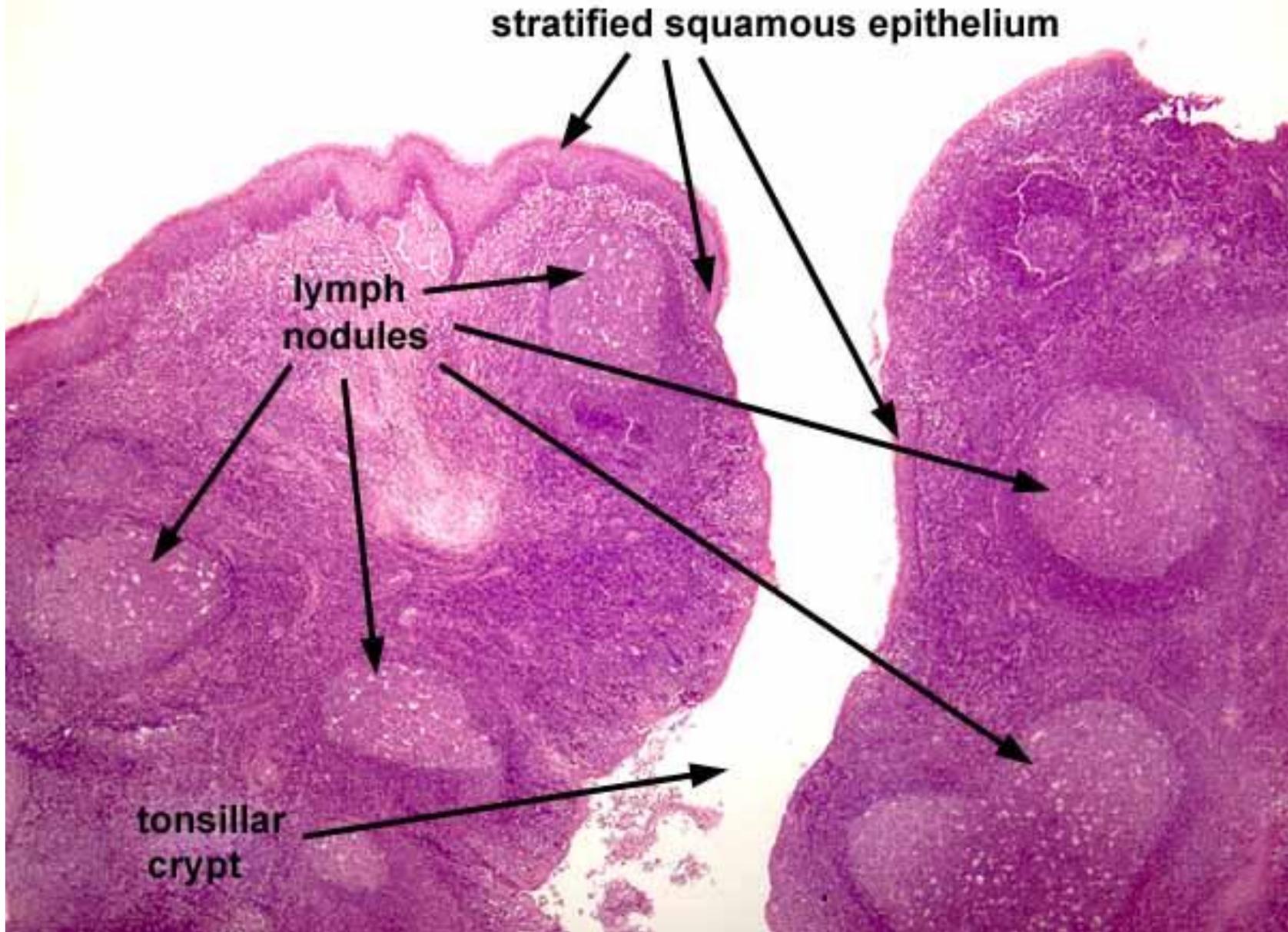
Tonsil

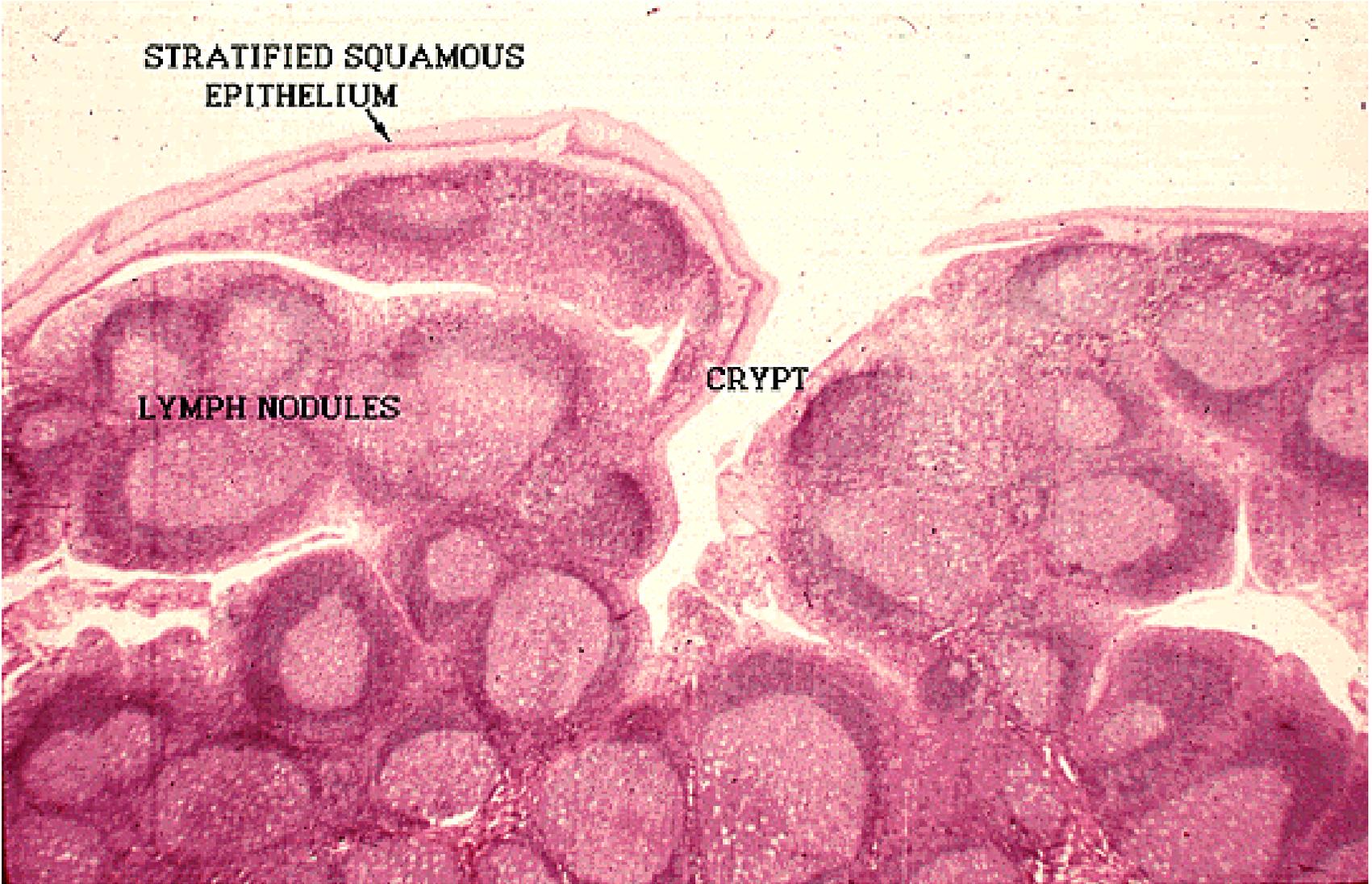


Tonsil







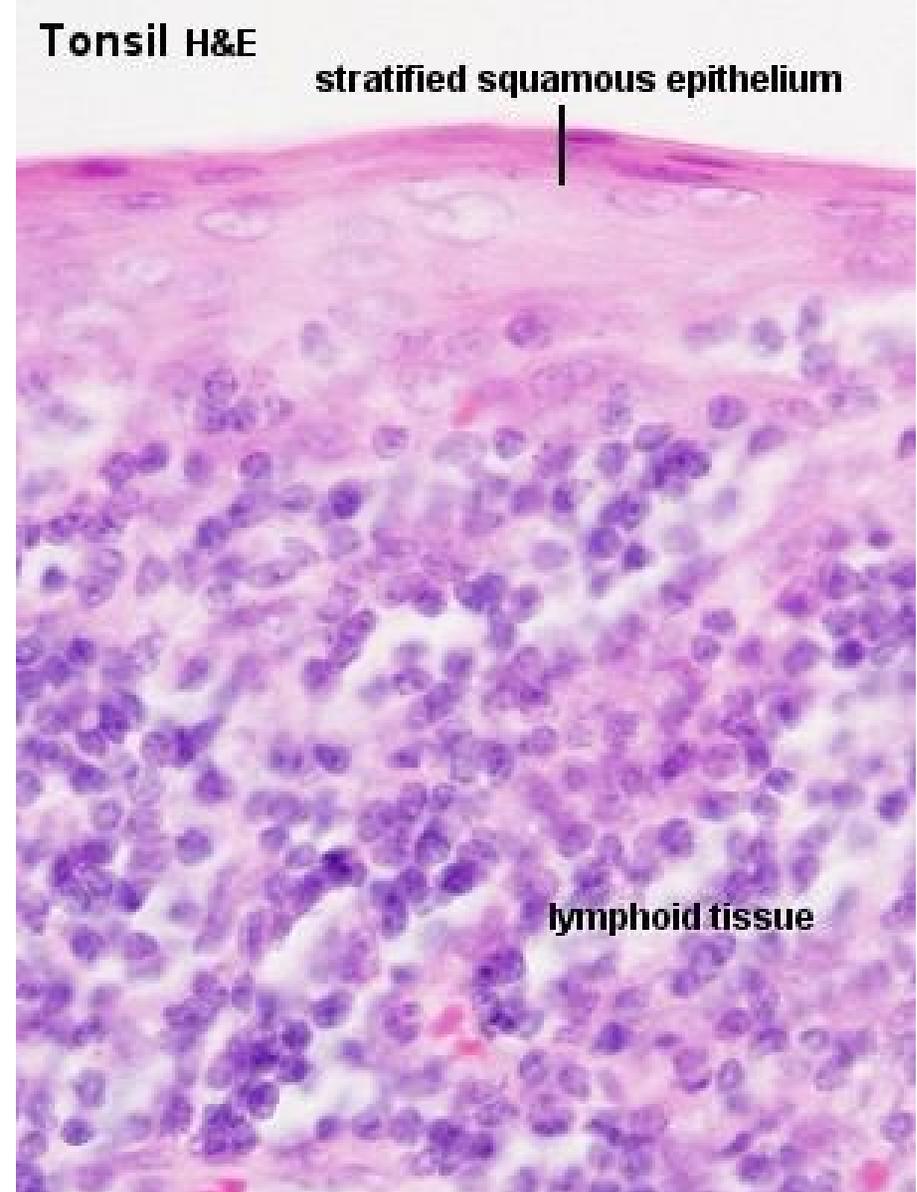
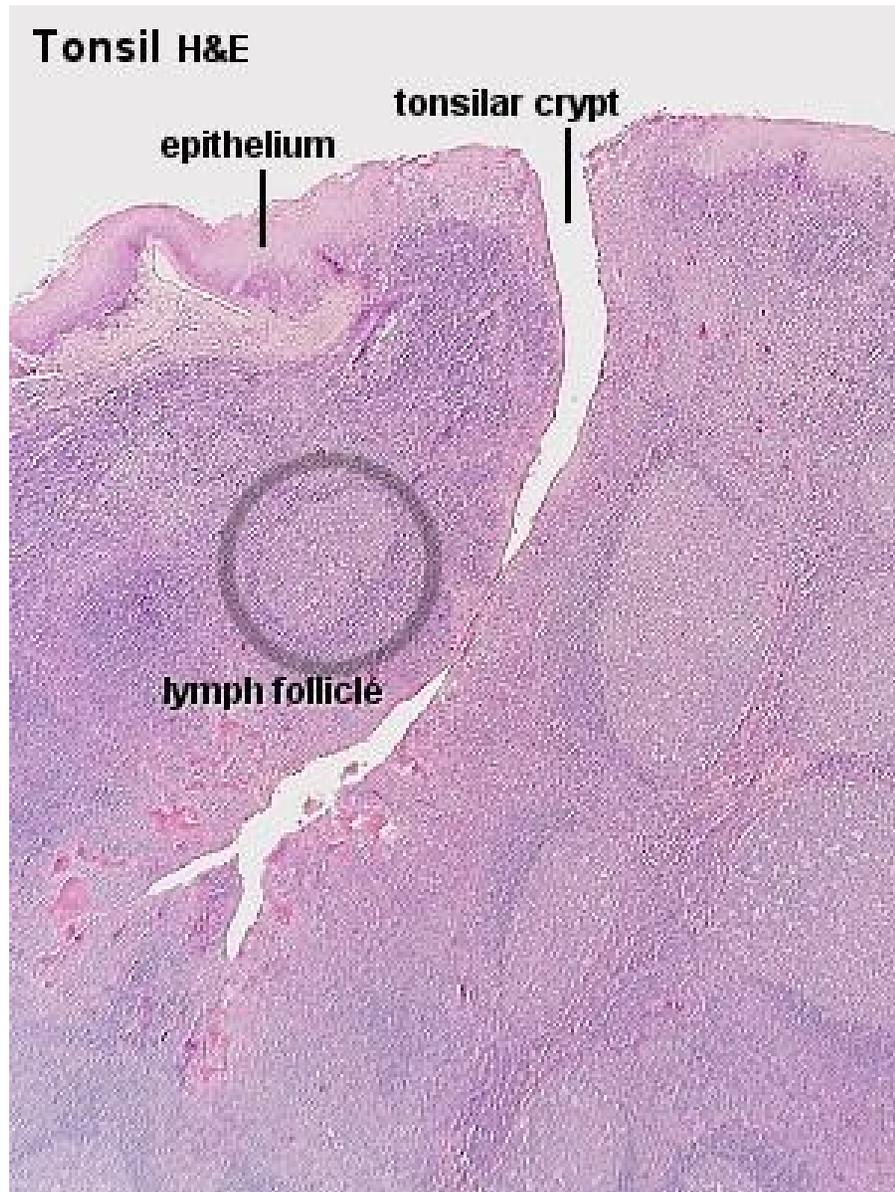


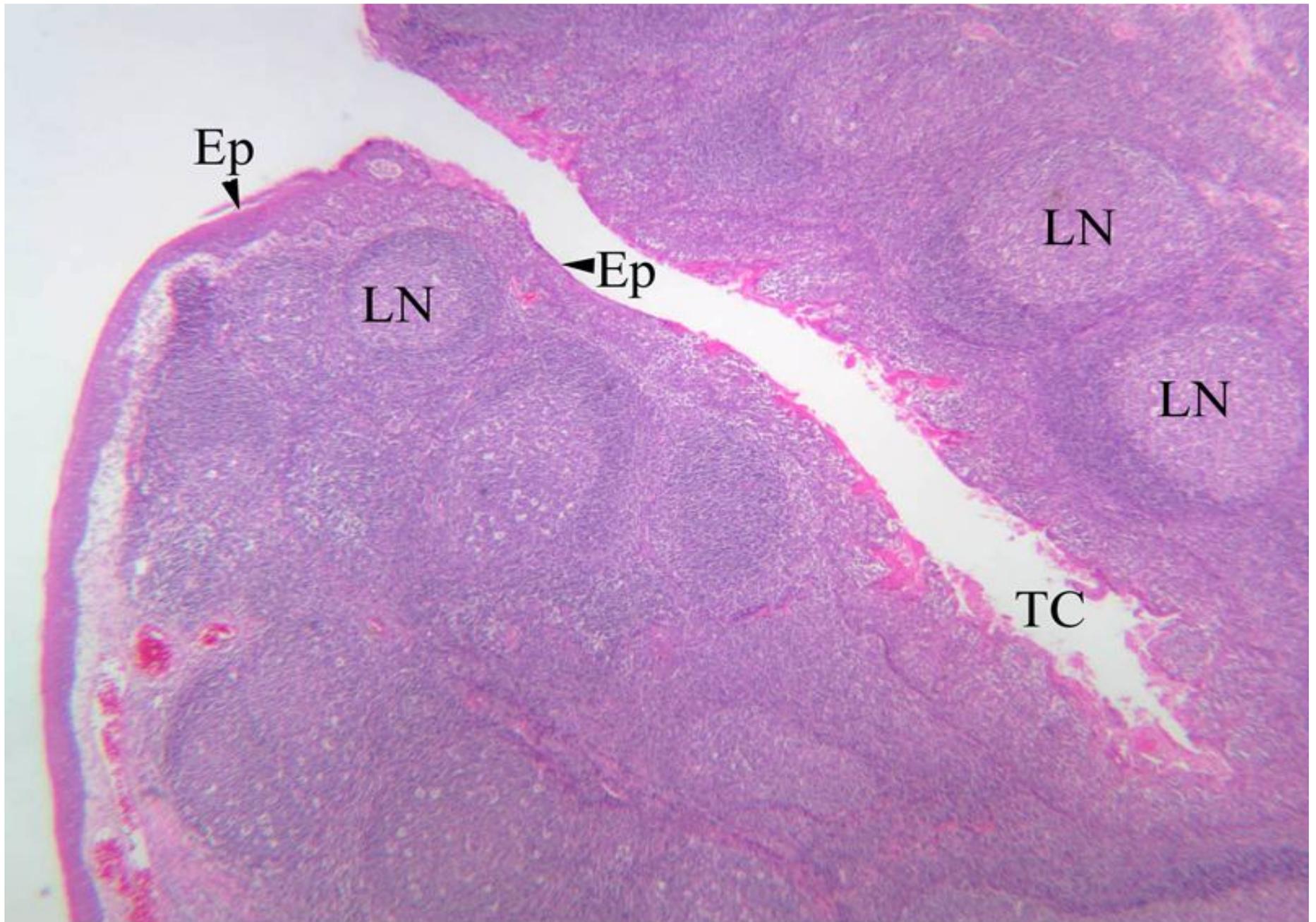
**STRATIFIED SQUAMOUS
EPITHELIUM**

LYMPH NODULES

CRYPT

Tonsil





Ep - epithelium TC - tonsillar crypt LN - lymphatic nodule

PALATINE TONSIL

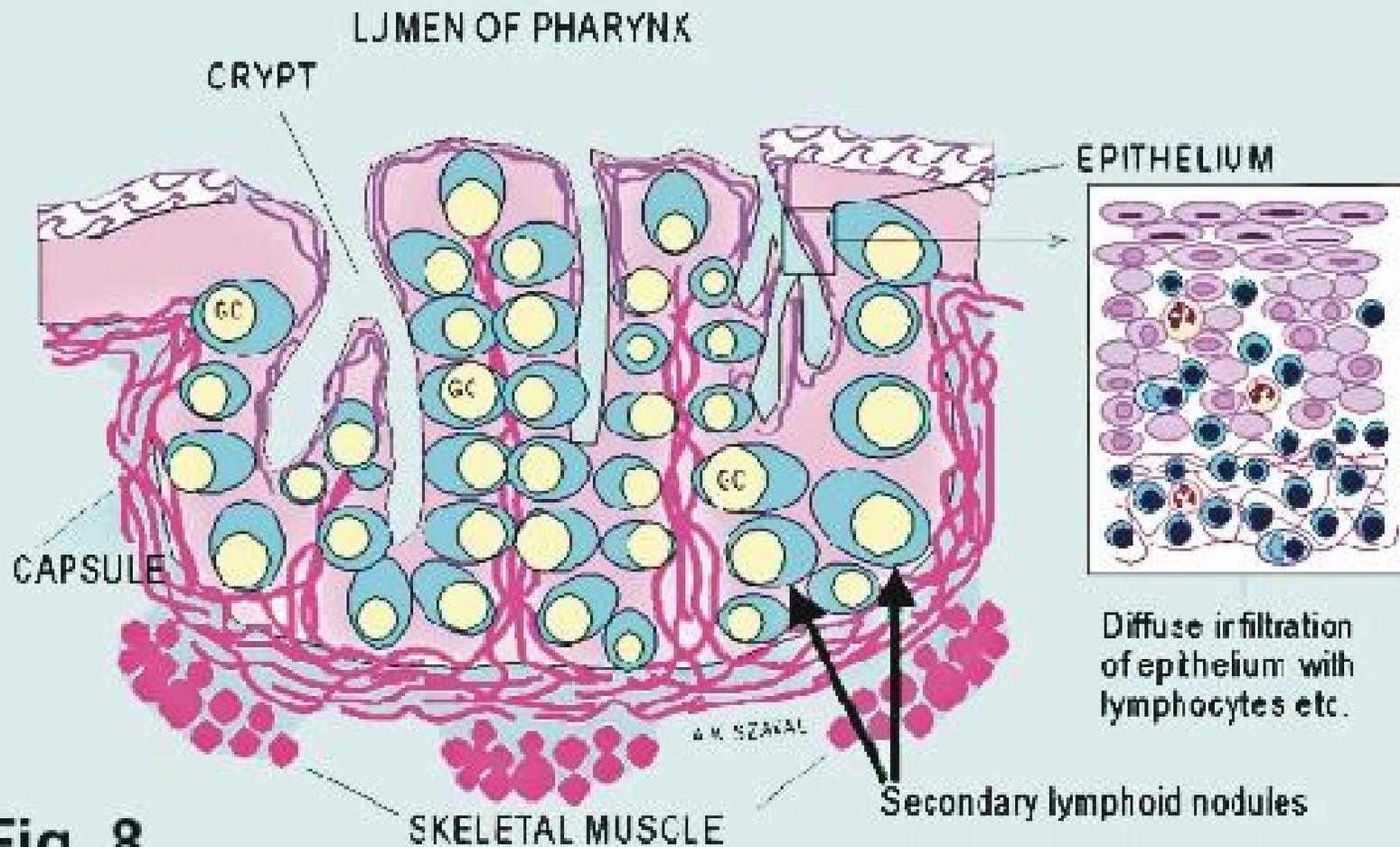
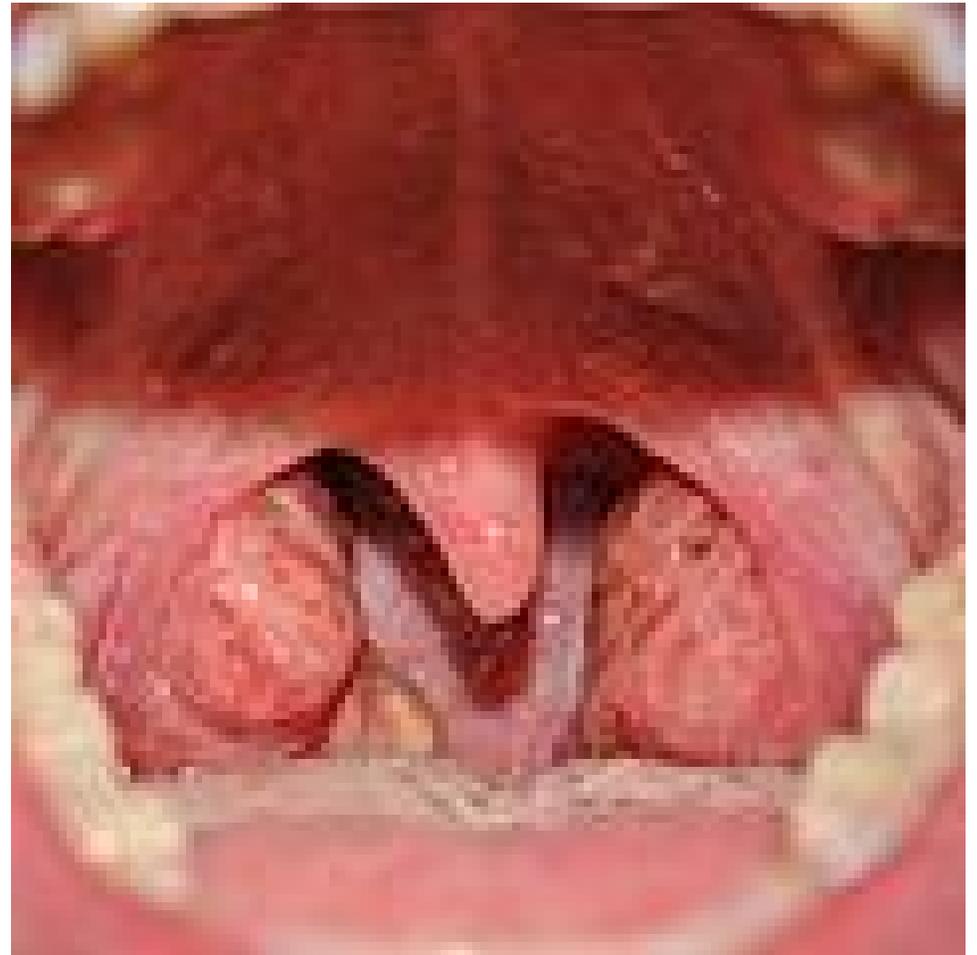


Fig. 8.

Clinical

- **In tonsillitis, the mouth of the crypts may appear purulent due to infection and pus formation.**



MCQ

Crypts of palatine tonsils are lined by

- 1. stratified squamous non keratinized epithelium**
- 2. stratified squamous keratinized epithelium**
- 3. Simple squamous epithelium**
- 4. Simple cuboidal epithelium**

MCQ

Section of a lymph node can be identified by the presence of

- 1.Thick trabeculae**
- 2. White pulp**
- 3.Interlobular septum**
- 4.Subcapsular sinus**

MCQ

White pulp of spleen can be identified from the lymphatic nodule of lymph node by the presence of

- 1. Germinal centre**
- 2. Lymphocytes**
- 3. Eccentric arteriole**
- 4. corona**

MCQ

Hassall's corpuscles are seen in

- 1. Spleen**
- 2. Lymph node**
- 3. Tonsil**
- 4. Thymus**

MCQ

Splenic sinuses are lined by

- 1. Fenestrated endothelium**
- 2. Discontinuous endothelium**
- 3. Continuous endothelium**
- 4. Columnar epithelium**

MCQ

Lymphatic nodules are present in all EXCEPT

- 1. Spleen**
- 2. Thymus**
- 3. Tonsil**
- 4. Lymph Node**