جامعة الملك سعود
King Saud University

MED439
KING SAUD UNIVERSITY

Lecture 4 :
Lymphoid tissue

Histology Team
MED 439

Objectives:

1- Lymph nodes.
2- Spleen.
3- Tonsils.
4- Thymus.

LYMPHOID TISSUE

Diffuse: *(mucosa associated lymphoid tissue)

Extra information

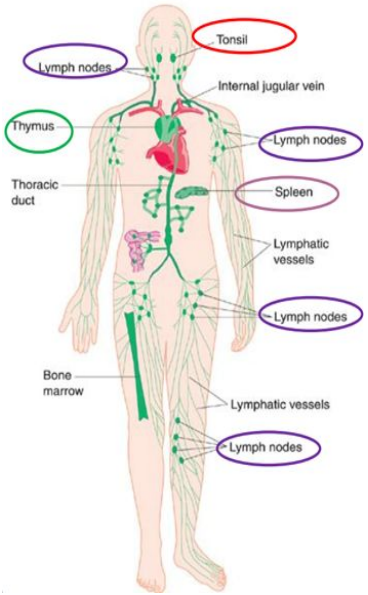
*mucous membrane : It consists of epithelial + connective tissue , It is located in wet area for example: inside the mouth or nose

*the lymphatic system consist of lymphatic organs and lymphatic Vessels

Encapsulated

*has capsule

1) Lymph nodes
2) Spleen
3) Tonsils (are incompletely encapsulated)
4) Thymus



Extra information

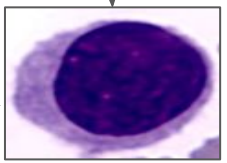
Primary lymphoid organs: organs where lymphocytes are formed and matured
Example: red bone marrow and thymus
Secondary lymphoid organs: other lymphoid organs:
Example: lymph node, spleen, tonsils, MALTs, peyer's patches

Extra information

*lymphoid tissue = leucocytes + lymphocytes

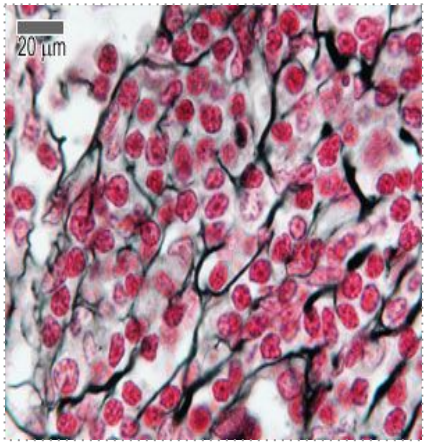
lymphocyte is important to filtrate the lymph

Lymphocyte



Lymph Nodes

Helpful Videos:



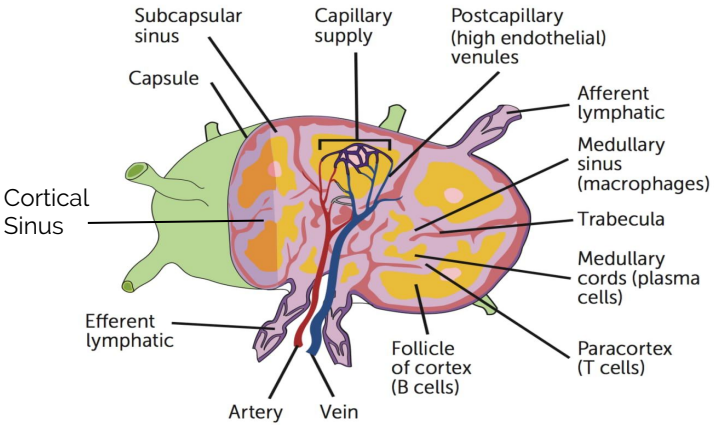
- Ovoid, kidney shaped organs.
- **Each node has:**

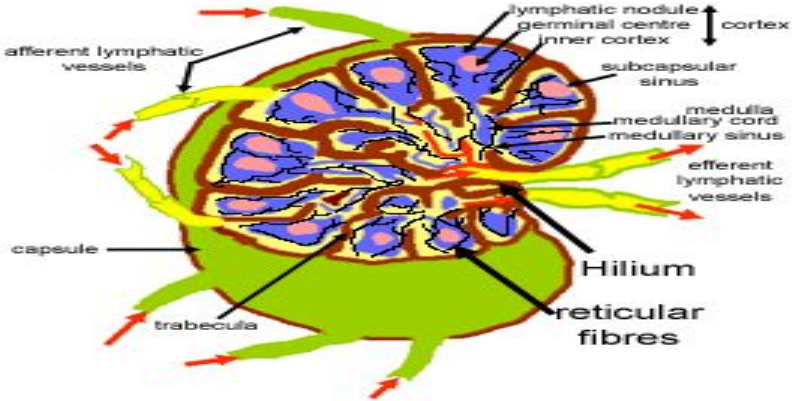
1- A convex surface which receives afferent lymph vessels. *a = Arrive

2- A hilum where efferent lymph vessels leave and drain lymph from the node. *e = Exit

- Each lymph node has a dense connective tissue capsule.

- From the capsule, connective tissue septa (trabeculae) extend into the outer part (cortex) of the node and divide it into incomplete compartments.
- The framework of the node is formed by reticular connective tissue.





Extra information

*-The capsule is dense , irregular collagenous connective tissue
-it has lymphatic vessels to filter the lymph.

Extra information

*Efferent lymphatic vessel:
-carry cleaned , filtered lymph.
-it has one vessel to give enough time for filtration the lymph.

Extra information

*Afferent lymphatic vessels:
-carry the lymph towards the lymph nodes to be poured in supcapsular sinus.
-it has more than one vessel.

*The type of collagen is very important

Lymph Nodes

Each lymph node is divided into three regions:

1- Cortex

2- Paracortex

3- Medulla

Lymph Nodes

(A)Stroma
*supportive tissue

1- Capsule.*type 1 collagen

2- Trabeculae (septa)

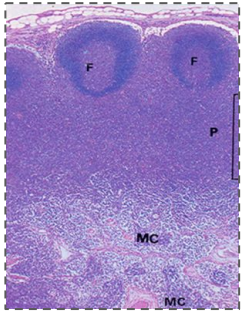
3- Reticular C.T.*extension of trabeculae - type 3 collagen

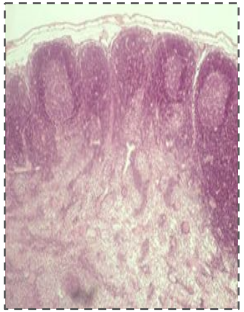
(B)Parenchyma
*(lymphoid tissue + lymph sinuses)

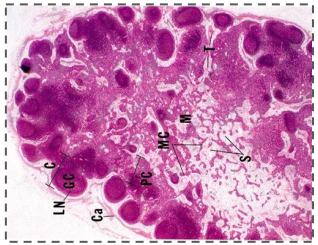
1- Cortex

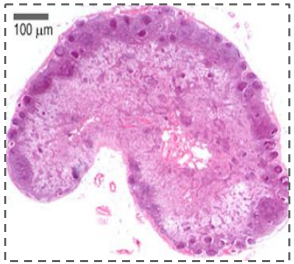
2- Paracortex

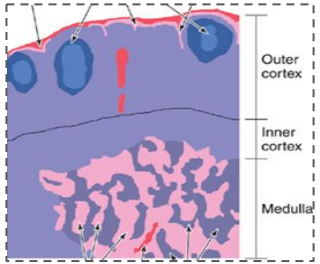
3- Medulla









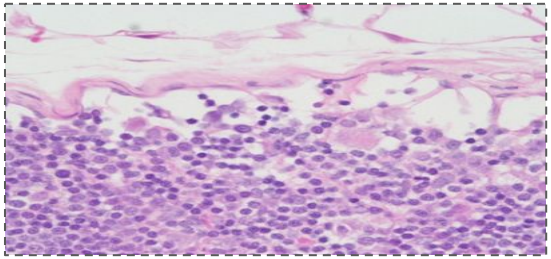


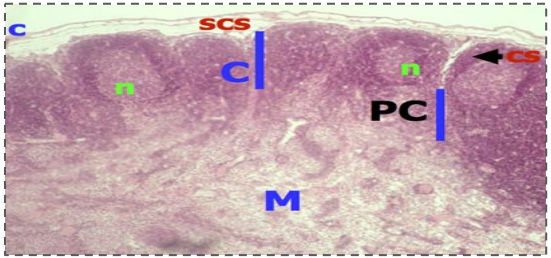
Lymph Nodes

- Cortex

contains the:

- ➢ Subcapsular lymphatic sinus.
- ➢ Cortical sinuses.
- ➢ Lymphoid nodules (primary & secondary) composed mainly of B lymphocytes, macrophages and reticular cells.





Extra information

*All the lymphatic organs are rich in macrophage because it is immune organ.

*The macrophage move along the lymphatic to clean it.

Lymph Nodules (Follicles):

* B cells is the main type of cells

Lymph nodules are small masses of lymph tissue (lymphocytes). Lymph nodules may be:

(A) Primary nodules: formed of virgin B lymphocytes.* with out germinal center

(B) Secondary nodules: with paler germinal centers and it Contain:

1- Germinal centers , central light areas filled with activated B lymphocytes (active) , B lymphoblast (inactive) , plasma cells and macrophages.

2- The germinal center is surrounded by a darker-staining region called the corona.

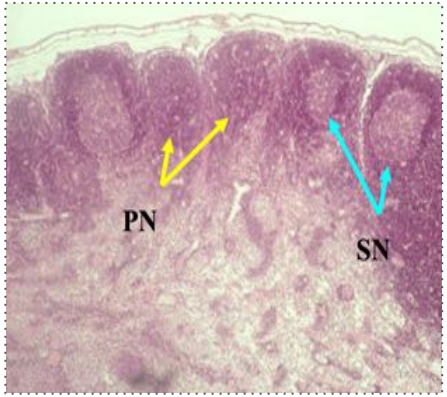
Extra information

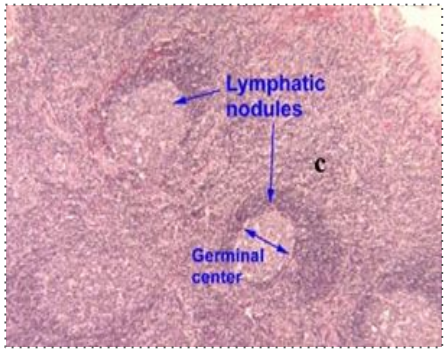
*lymph nodule exist only on the cortex part of lymph node

*primary nodules before infection

*Secondary nodules after infection

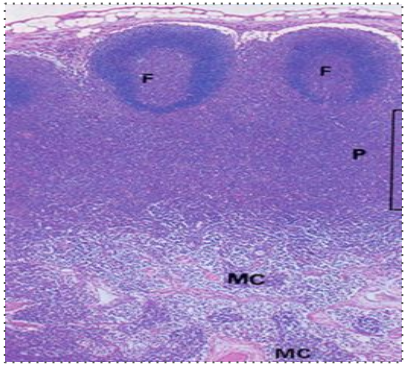
Cortex :





❖ PARACORTEX :

- It is the region between cortex and medulla.
- It is the thymus dependent zone and contains T lymphocytes.
- It contains high endothelial venules through which lymphocytes enter the lymph node; B cells enter the cortex and T cells settle in the paracortex.
- Has NO nodules.



❖ MEDULLA:

Consists of:

- Medullary cords.

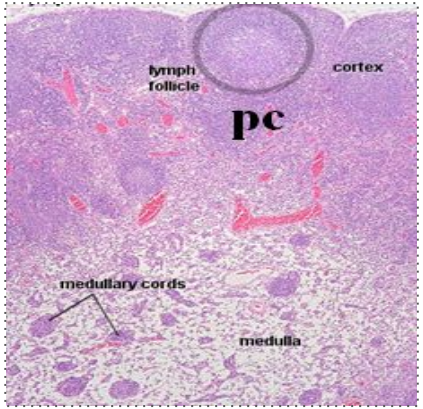
are composed of:

B & T lymphocytes, plasma cells and macrophages.

- Medullary lymph sinuses.

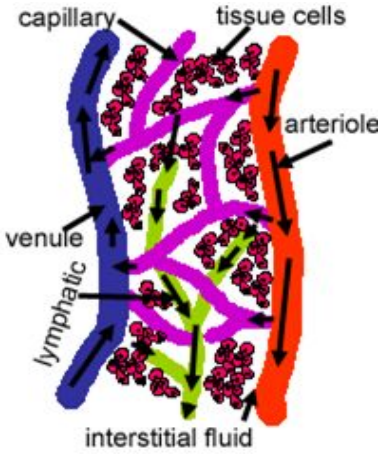
are continuous with:

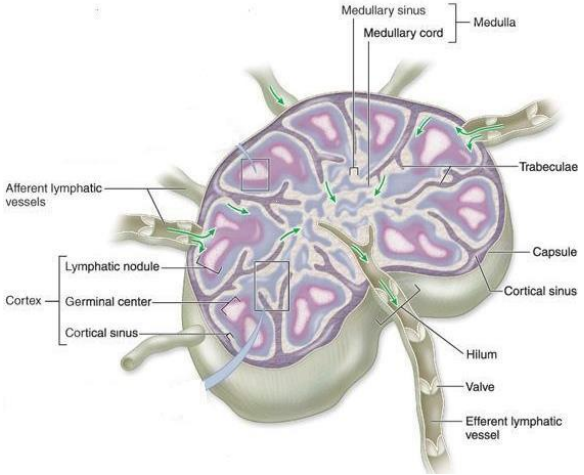
the subcapsular and cortical lymph sinuses.

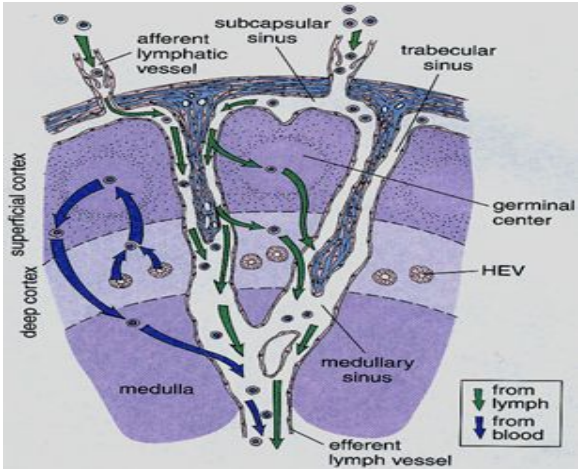


LYMPH FLOW THROUGH THE LYMPH NODE

Afferent lymph vessels → Subcapsular sinuses → Cortical sinuses (Trabecular sinuses) → Medullary sinuses → Efferent lymph vessels







FUNCTION Of LYMPH NODE:

"The Lymph-nodes are the only ones responsible for filtering the lymphatic fluid"

- Proliferation of B and T lymphocytes.
- Filtration of lymph from bacteria and other foreign substances.

Clinical Applications

Palpable lymph node

The presence of antigen or bacteria leads to rapid proliferation of lymphocytes of the lymph node (L.N), leading to increase of L.N. to several times of its normal size, so the L.N. becomes enlarged and palpable to the touch.

THYMUS

Function:

- Maturation of T lymphocytes (produce immunocompetent T lymphocytes).
- It involutes after puberty and becomes infiltrated by adipose tissue.
- Remnants of thymus remain in adult to form T lymphocytes.
- No B lymphocytes,no plasma cells in the thymus.

A)Stroma		B) Thymic lobule	
Capsule	Interlobular trabeculae (incomplete)	Cortex	Medulla

- Bilobed lymphatic organ located in thorax.
- Enclosed in a thin connective tissue capsule.
- Septa (trabeculae) from the capsule into the organ, subdividing it into incomplete lobules..
- Possesses no lymph nodules, no lymph sinuses, no reticular fibers.
- Each lobule is divided into an outer cortex and inner medulla.

B) Thymic lobule

Cortex	Medulla
is darker than the medulla because it is populated with immunologically immature T-lymphocytes (more than 90% will die), epithelial reticular cells, and macrophages. Here the immature T cells undergo proliferation, and transform into mature cells and then migrate to medulla.	consists of • **mature T-lymphocytes** • **epithelial reticular cells:** Epithelial reticular cells are special component only for thymus. Epithelial reticular cells responsible for maturation of T cell. • **macrophages.** • **thymic (Hassall's) corpuscles:** Hassall's corpuscles are unique structure for medulla of thymus 1- Are composed of groups of concentrically arranged keratinized epithelial reticular cells. 2- Are found in medulla of thymic lobules. 3- Increase in number with age. 4- Probably represent a degenerative process.

TONSILS

The tonsils(palatine, pharyngeal, and lingual) are incompletely encapsulated aggregates of lymphoid nodules that guard the entrance to the pharynx

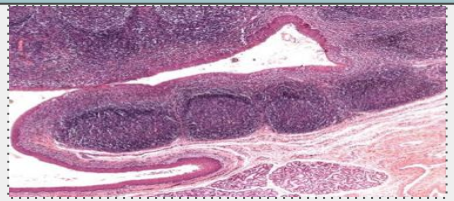
Function:

- **production of antibodies.**

palatine tonsils

Bilateral, located at the entrance of the oral pharynx.

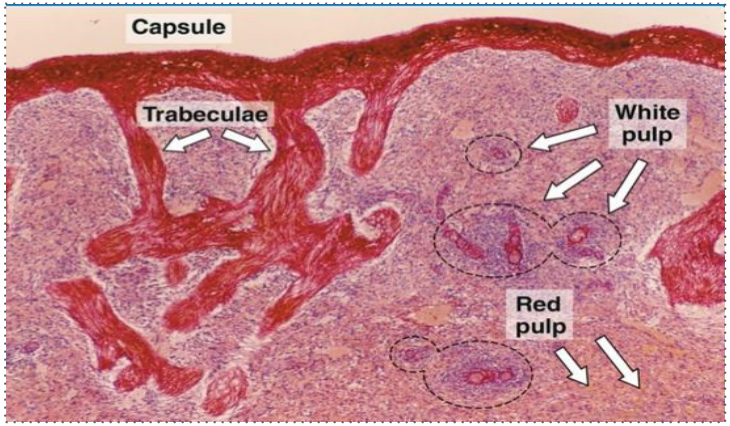
- **Incomplete capsule separates its deep aspect from the wall of the pharynx.**
- **The superficial aspect is covered by stratified squamous nonkeratinized epithelium that dips into 10-12 crypts.**
- **The parenchyma is composed of lymphoid nodules with germinal centers.**



SPLEEN

Functions:

1_Filtration of blood.
2_Phagocytosis of old RBCs & old blood platelets & invading microorganisms.
3_Production & proliferation of immunocompetent B & T lymphocytes.
4_Production of antibodies.



Note: No cortex, No medulla, No afferent lymphatic vessel.

Stroma	Parenchyma
1 _ Capsule. 2_Trabeculae. 3_Reticular C.T.	1_White pulp. 2_Red pulp.

Stroma of Spleen

1- Capsule:

is covered by visceral layer of peritoneum;
mesothelium Is formed of fibromuscular C.T. : Dense fibrous C.T. + smooth muscle cells.

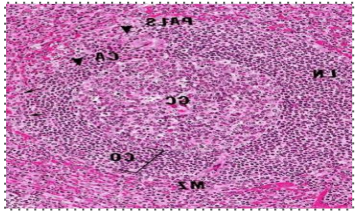
2- Trabeculae:

Are irregular, incomplete,divide the spleen into intercommunicating compartments (lobules).

3- Reticular C.T.

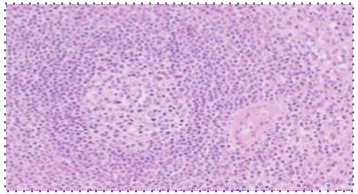
Parenchyma of Spleen

White Pulp:



1- Periarterial lymphatic sheaths (PALS):

housing
T lymphocytes.



2- Lymphoid follicles (with germinal centers):

housing
B lymphocytes. N.B.

Both 1&2 have the
acentrically located central artery (central arteriole) (follicular arteriole).

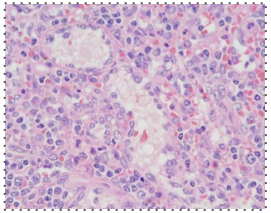
Red pulp:

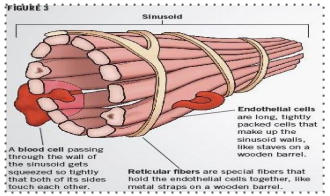
1- Splenic (pulp) cords:

Extravasated blood cells, plasma cells, macrophages & reticular cells and fibers.

2- Splenic blood sinusoids:

Are lined with elongated fusiform endothelial cells with large intercellular spaces & supported by discontinuous, circular basement membrane.

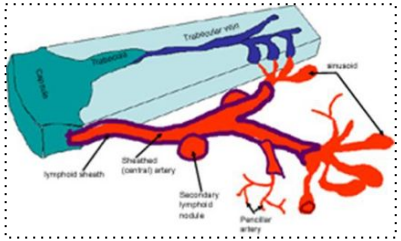


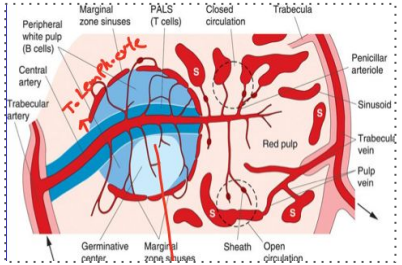


Cells of parenchyma of spleen

1. Lymphocytes.
2. Plasma cells.
3. Macrophages
4. Blood elements (RBCs, leukocytes and blood platelets).

Splenic Microcirculation





Clinical Applications

Rupture of the Spleen

Spleen is a fragile or friable organ, so major trauma to the upper left abdominal quadrant usually leads to rupture of the spleen.
Surgical removal of that ruptured spleen is essential.

MCQs:

Q1-what is the FUNCTION Of LYMPH NODE?

A)Filtration of lymph from bacteria and other foreign substances.
B)Filtration of the blood.

Q2- which option represents the flow of lymph through the lymph node ?

A) afferent lymphy vessel , subcabsular sinuses, crotical sinuses , medullary sinuses, efferent lymph vessel
B) efferent lymphy vessel , subcabsular sinuses, crotical sinuses , medullary sinuses, afferent lymph vessel
C) subcabsular sinuses, crotical sinuses , medullary sinuses, afferent lymph vessel , efferent lymph vessel
D) crotical sinuses, subcabsular sinuses, afferent lymph vessel , medullary sinuses, efferent lymph vessel

Q3-what is the FUNCTION OF THYMUS?

A)Maturation of T lymphocytes
B)Maturation of B lymphocytes
C)Maturation of T&B lymphocytes

Q4-Which of the following is bilobed and located in thorax ?

A)spleen
B)tonsils
C)thymus
D)both A&B

4)C
3)A
2)A
1)A

MCQs:

Q5-Which of the following doesn't have lymph nodules,sinuses, and no reticular fibers ?

A)spleen
B)tonsils
C)thymus
D)both A&B

Q6-Production of antibodies is done by?

A)spleen
B)tonsils
C)thymus
D)both A&B

Q7-Which one of these is the thymus dependent zone?

A) Cortex of the lymph node
B) Paracortex of the lymph node
C) Medulla of the lymph node
D) Medulla of the thymic lobule

Q8-The Hassall's corpuscle mainly consist of...?

A) Immature T lymphocytes
B) keratinized epithelial reticular cells*
C) Mature T lymphocytes
D) Plasma cells

5)C
6)D
7)B
8)B

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