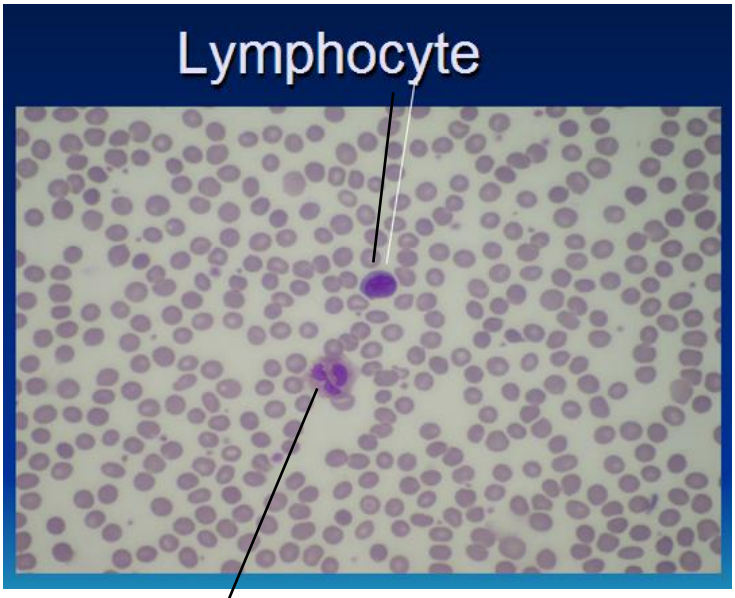
# Lymphatic System

**lymphocyte:**

- responsible for adaptive immune rxn
- against specific Ag

**Neutrophil :**

- innate immune rxn
- non-specific
- has granules (specific + azurophilic)



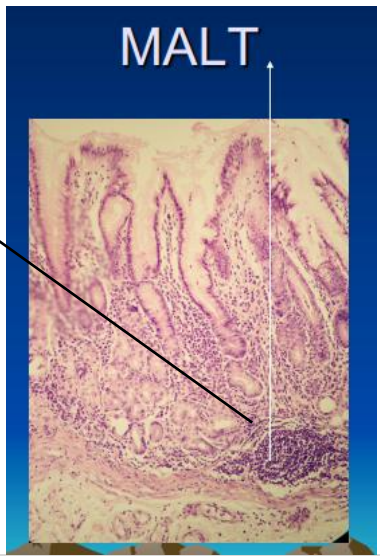

**Neutrophil**

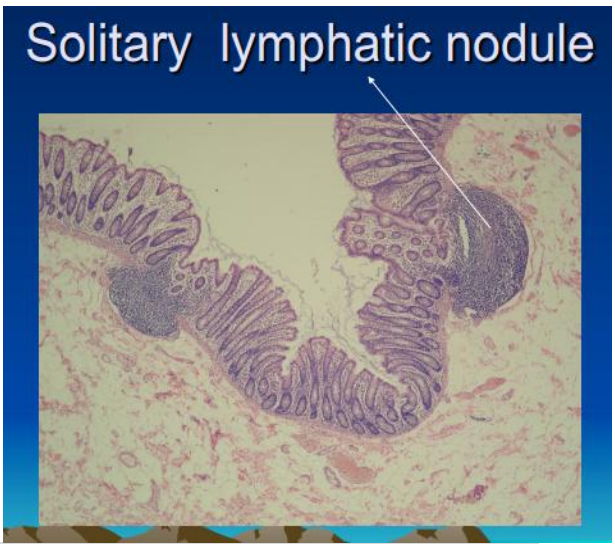
## Mucosal Associated Lyphatic Tissue

Single nodule  aggregation (peyer's patches)

- present in the wall of the gut , bronchi (RS) or in the urinay tract.

This one looks like primary follicle (hasn't been exposed to Ag) coz there's no germinal center



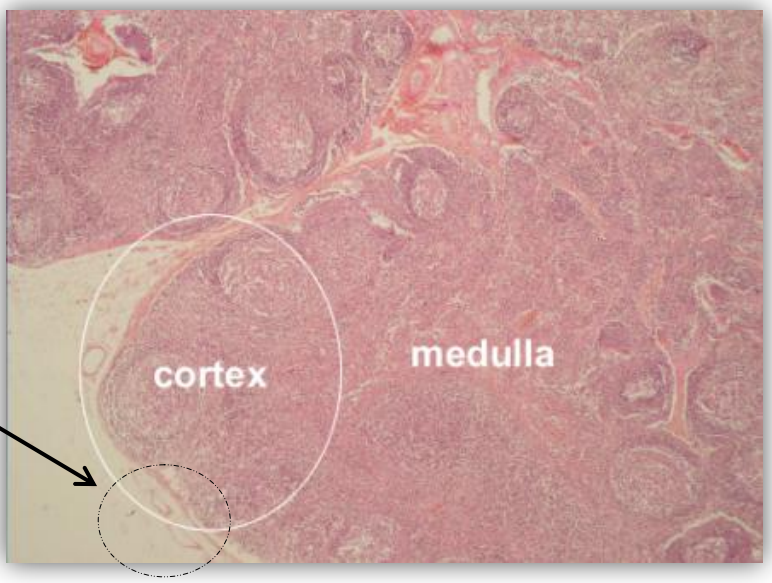
- Those lyphatic nodules are in the lamina propria "close to the lumen" so as when a bacteria arrives and penetrates the mucosa, it'll find these nodules
- What's the major cell here ?B-cell , with T-helper and macrophages "i.e Ag presenting cells" .. also we might find plasma celland memory cell
- Peyer's patches are present in the terminal ilium

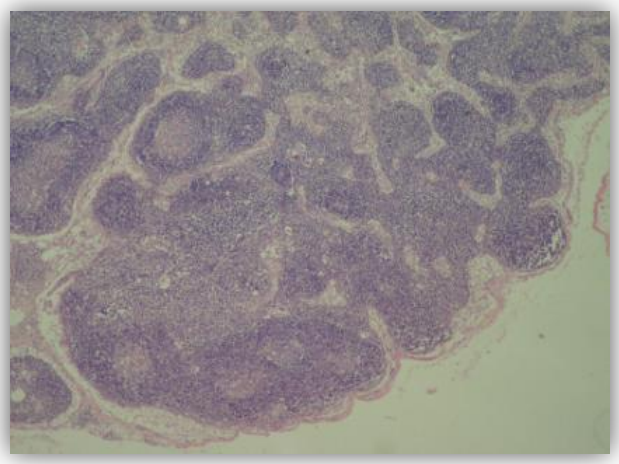
# Lymphoid Organs

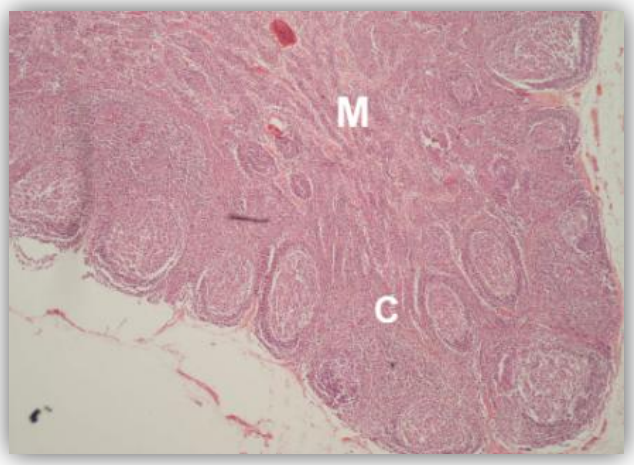
## 1. Lymph Node

**Follicle** = cortex

Here it has germinal center, which means that this follicle at one time had been exposed to an Ag and an immune rxn happened



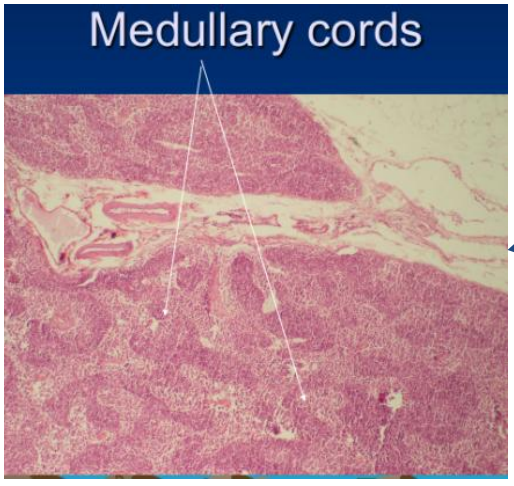


These both pictures have 2ry follicle ( have germinal centers)

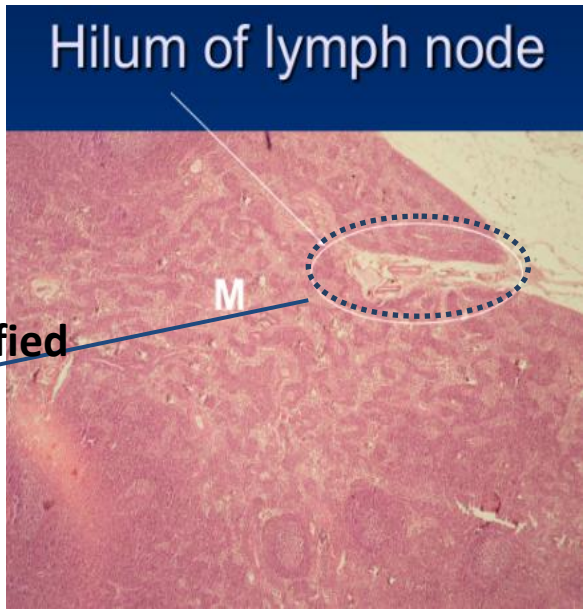
- What has been produced in the follicle goes tothe medulla and stays there temporarily
- The primary follicle has: nieve cell from the BM through the afferent that enters the lymph node through the high endothelial venoule + memory cell from other lymph node … these tow might leave without any change (if it doesn't counter an Ag)
- in the secondary lymphatic nodule : activated B-cell + nieve cells + plasma cell + memory ... the plasma and memory cells go to the medulla to make medullary cords temporarily .. then they get out. The plasma goes to the BM and the memory circulates

## Hilum of lymph node:

- Has efferent lymphatic.
- We can see blood vessels

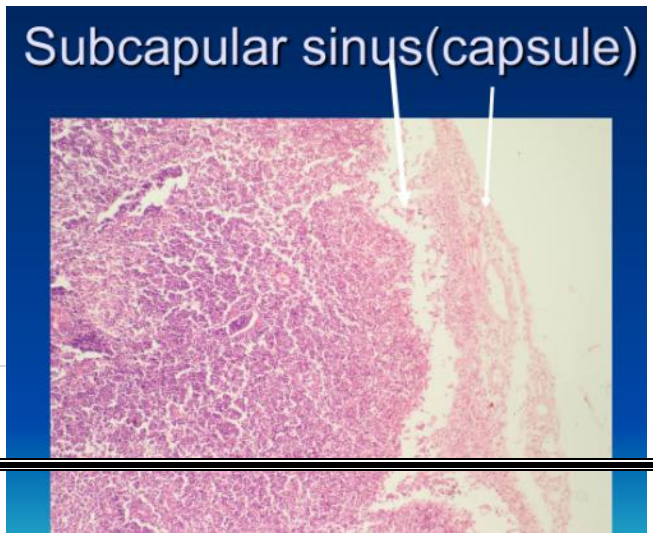



magnified



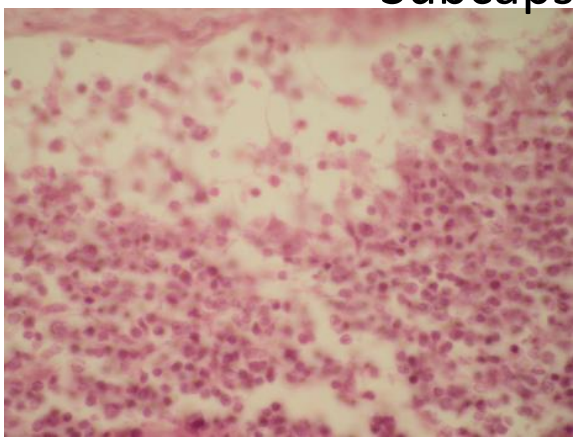

## Subcapsular sinus:

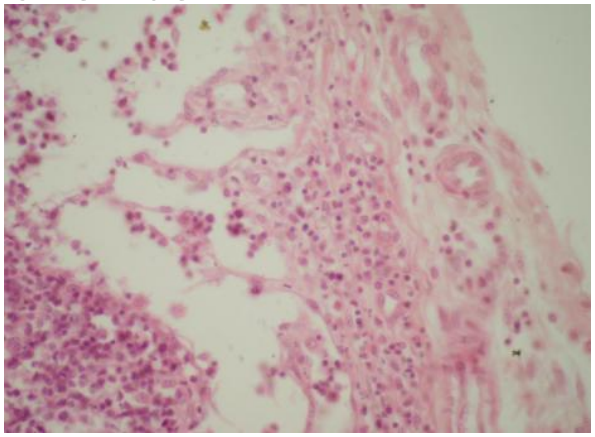
Space under the capsule ..here the lymph slows down so the



macrophage can phagocytose the Ag (99% of the bacteria get phagocytosed here )

Subcapsular sinus





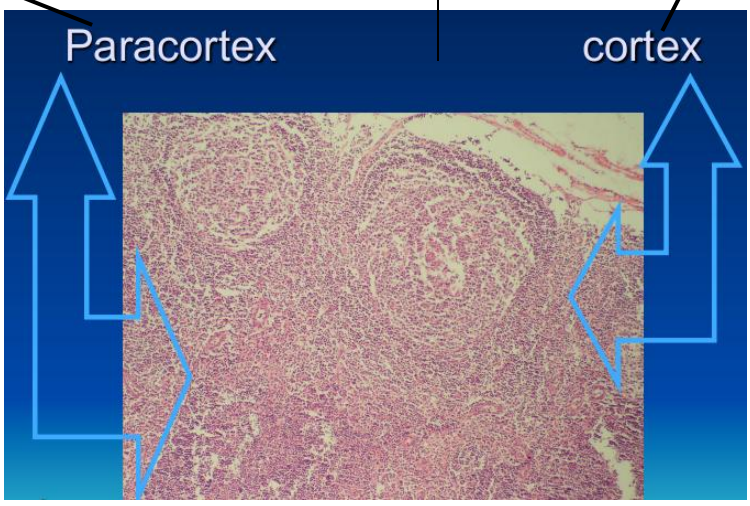
Deep to the follicles

Has the **T-cell** with its Ag presenting cell

Yo8abelha in the spleen: the periarterial sheath

Under the capsule ..feha el follicles

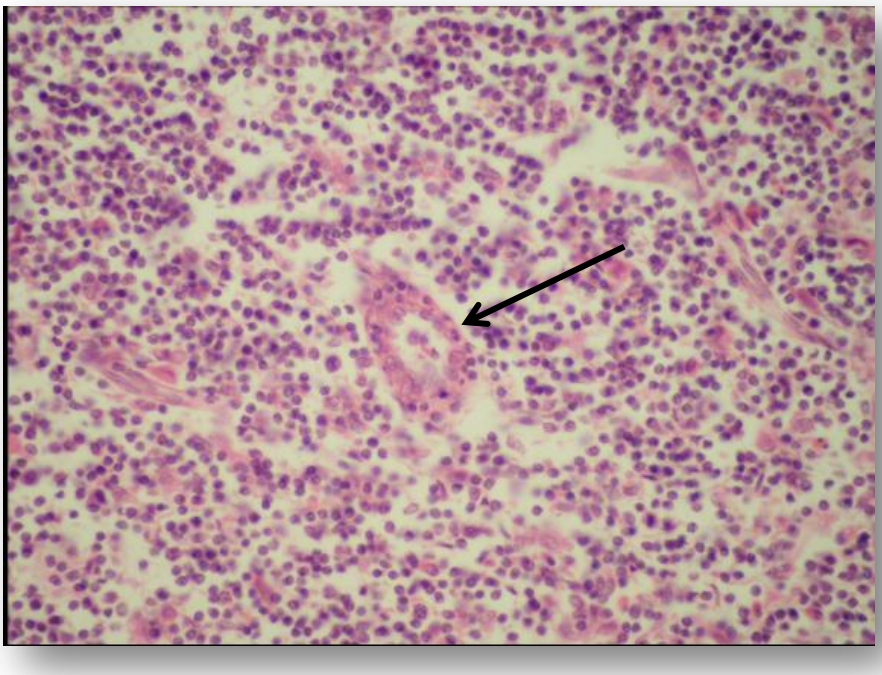
Has B-cell with its Ag presenting cell

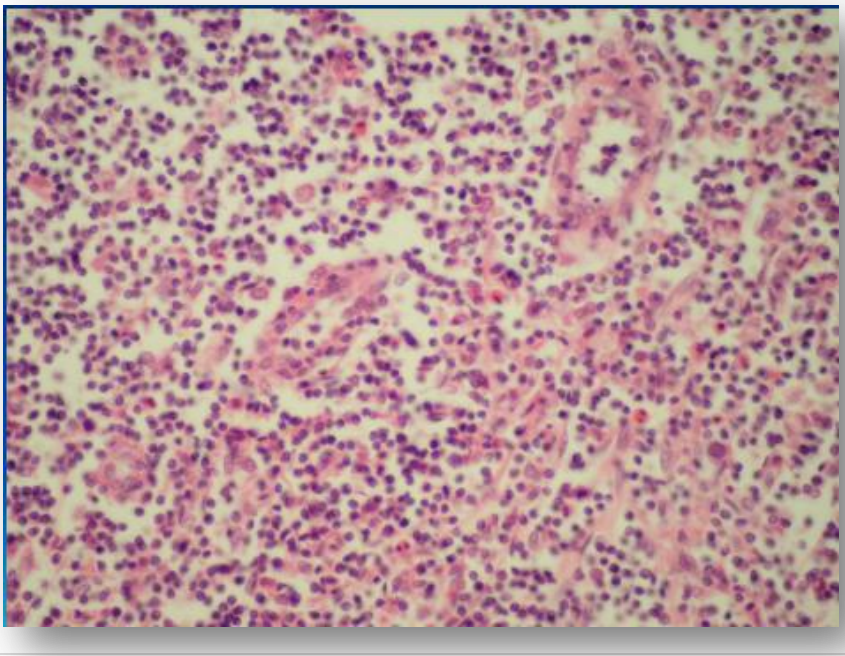



- Both the periarterial sheath and the paracortex are called **thymus dependent zone**

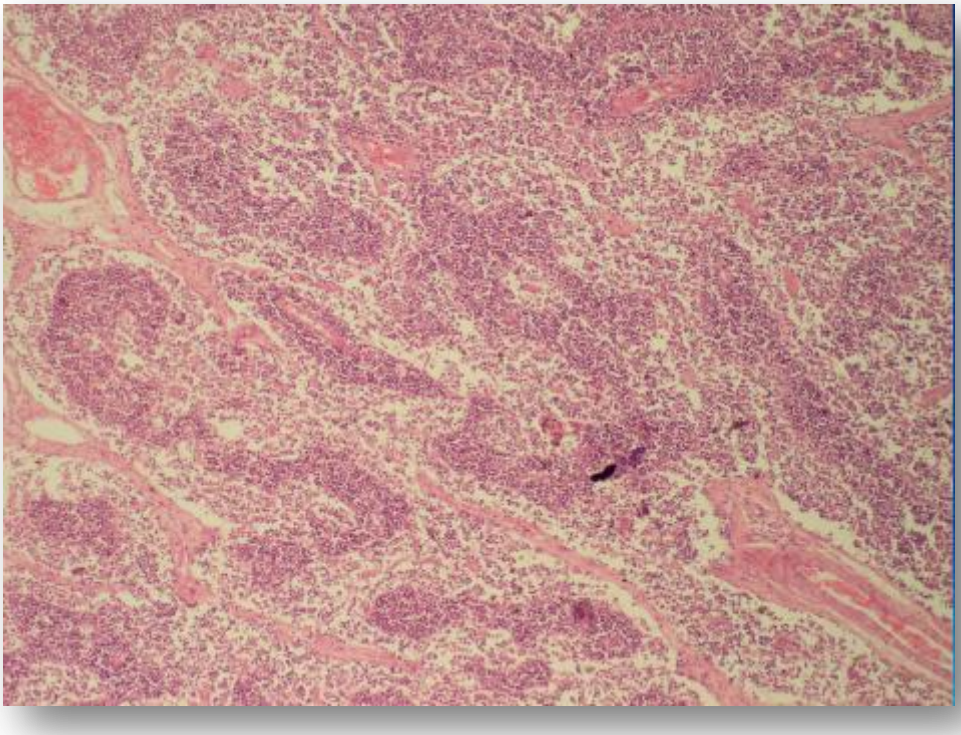
## Post capillary venule:

- Has very thin wall
- The lining epithelium has rounded nucleus .. so its cuboidal or low-columnar
- Important for the recurculation(mainly for the return of the nieve cell )



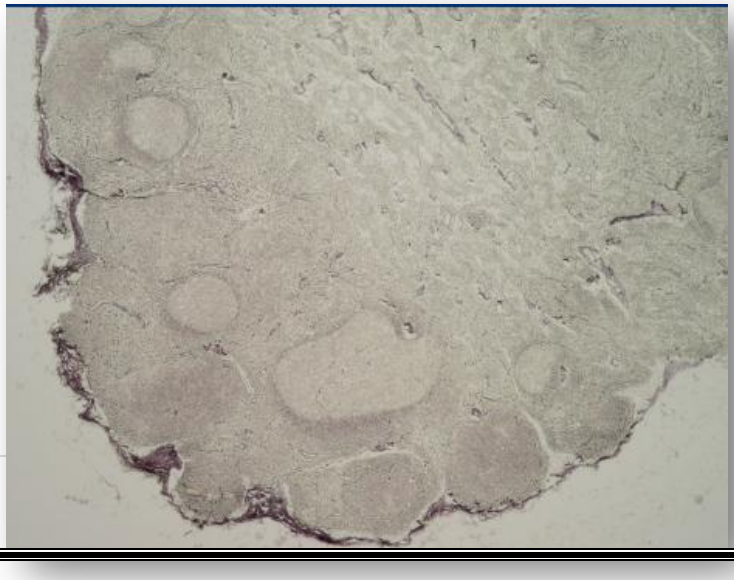


## medulla of the lymph nodes:

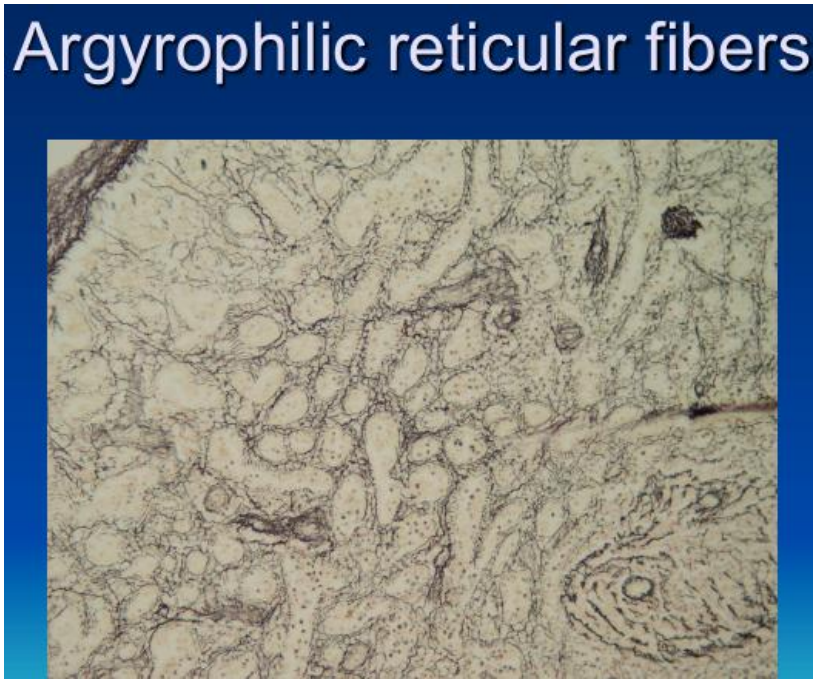


- Composed of medullary cordes surrounded by lymph sinuses
- Here; the products of the cortex (plasma and memory cells) stay for a while before exiting the lymph node

Here the cortex and te medulla are clear



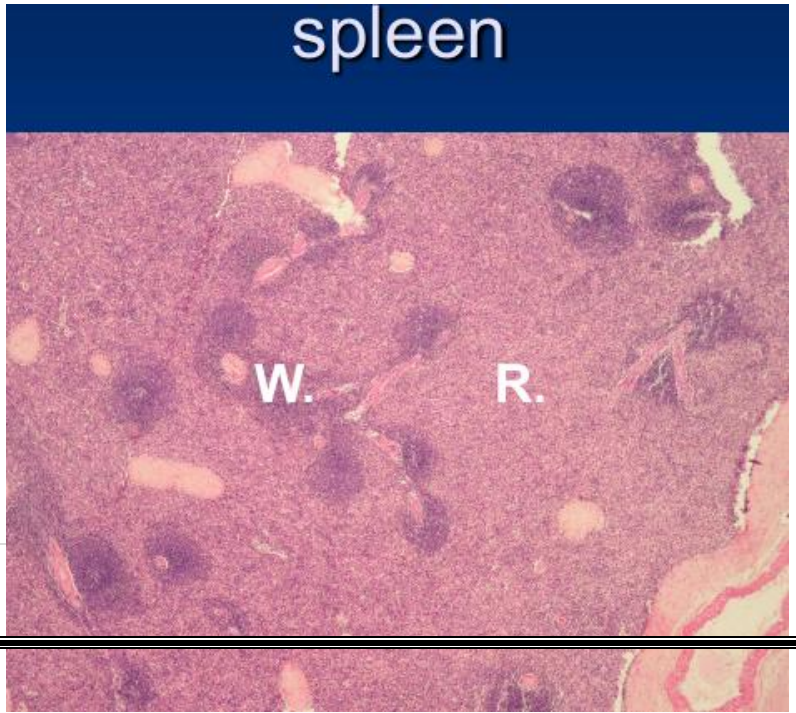
## the stroma of the lymph node:



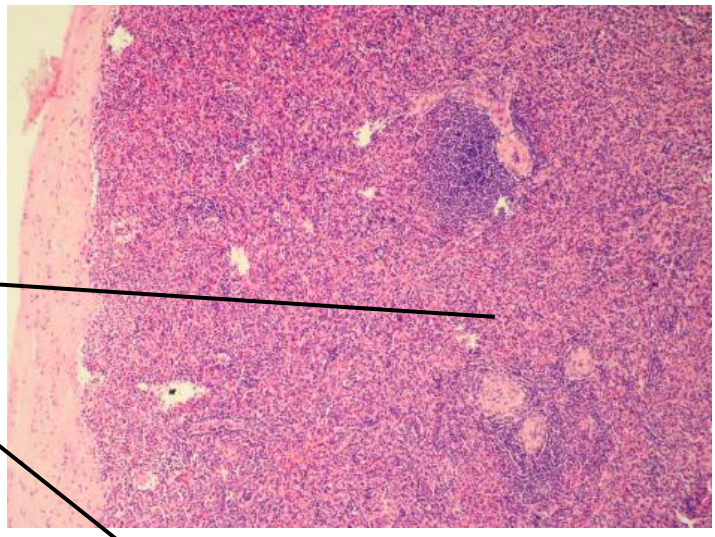

- Stroma= network of reticular fibers and cells
- The nuclei and the cells are not present with this stain (silver nitrate)
- To see the cells → use H&E

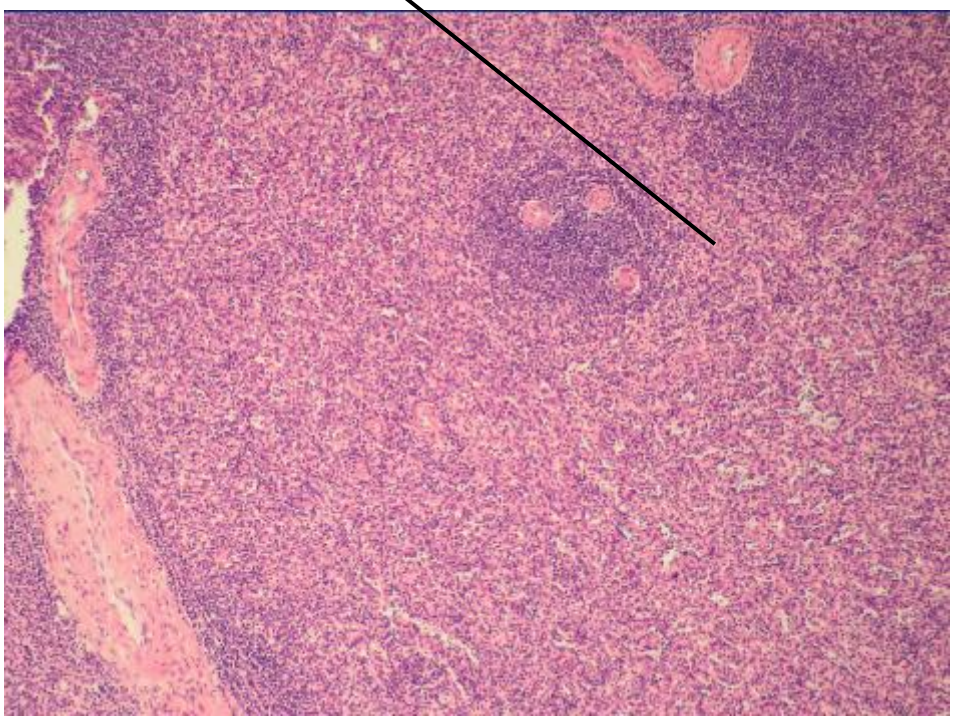
## Spleen:

- No afferent
- No lymph sinuses
- Red + white pulp
- Area with central artery = white pulp

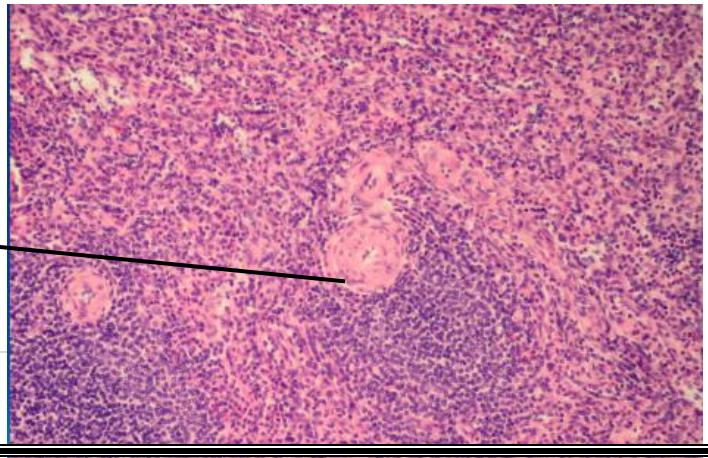


- Area with no lymphatic nodules or central artery = red pulp
  central artery
  and the cells exactly around it are T-cells

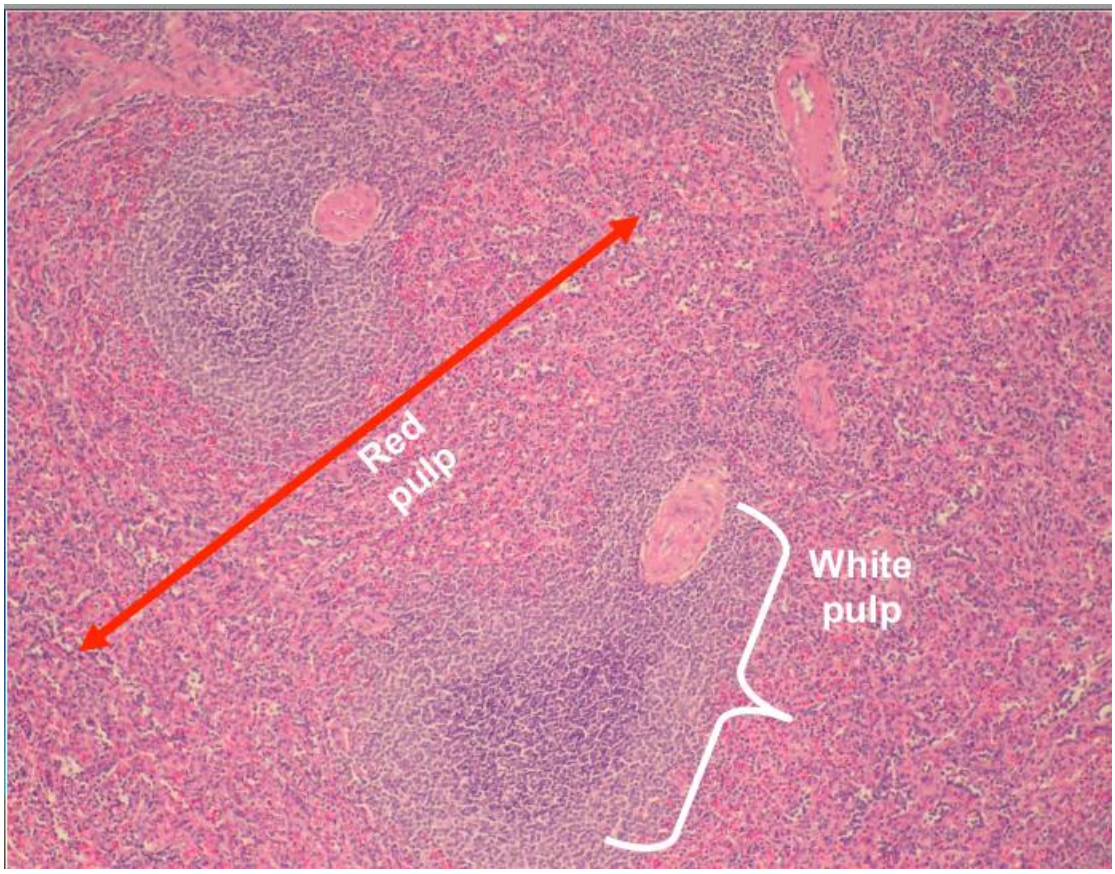


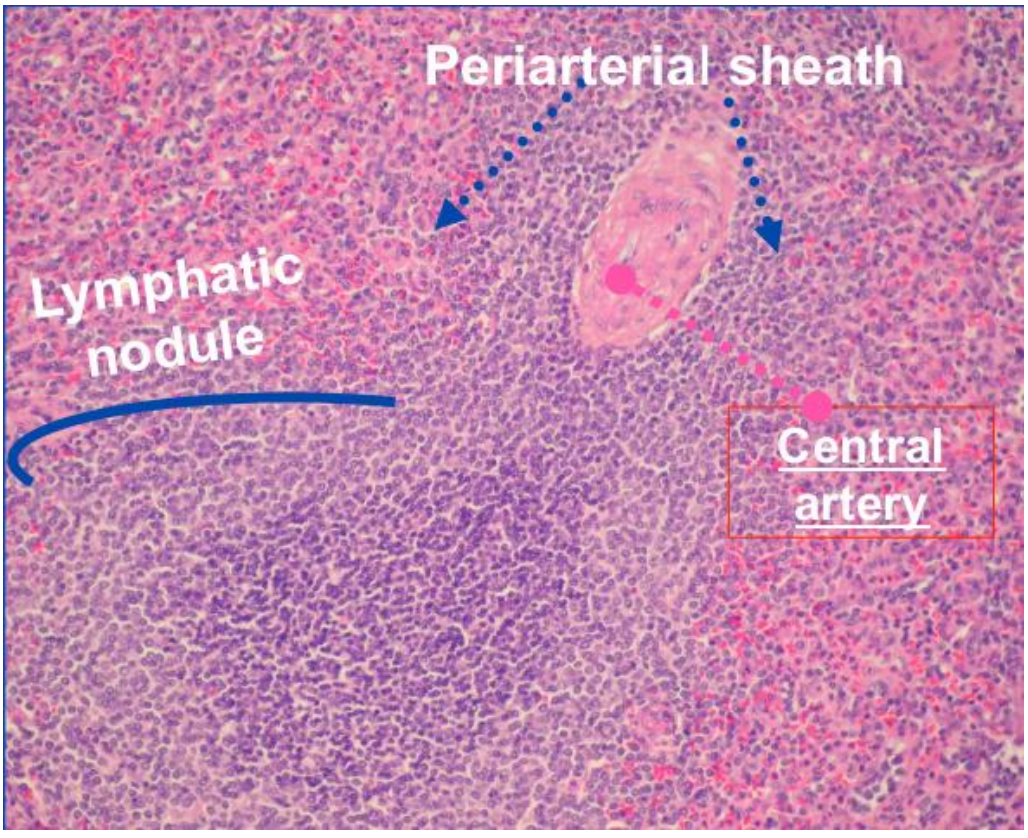


central artery

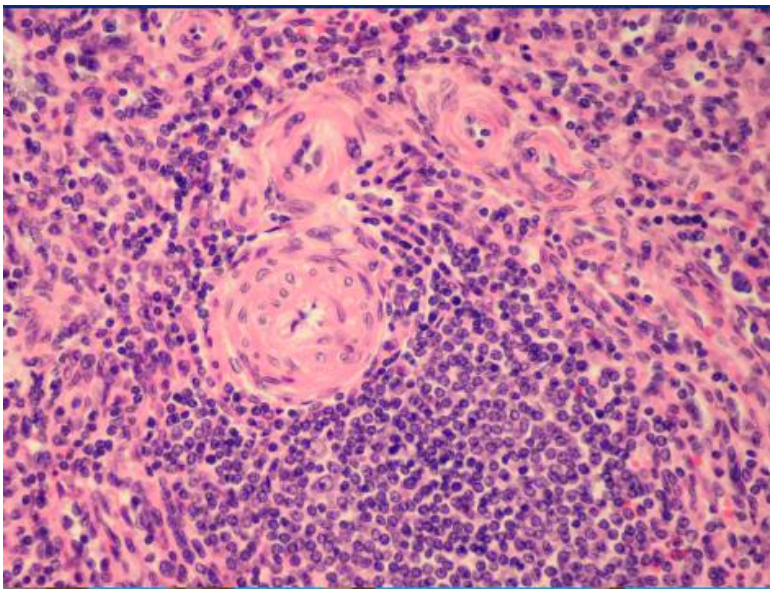


that gives blood to what's around it (to the sheath , to the follicle .. then at the end to the red pulp



Between the red and the white pulp : marginal zone → has sinuses that receives blood from the artery … here there's Ag presenting cell that looks for Ag .. also there's macrophages



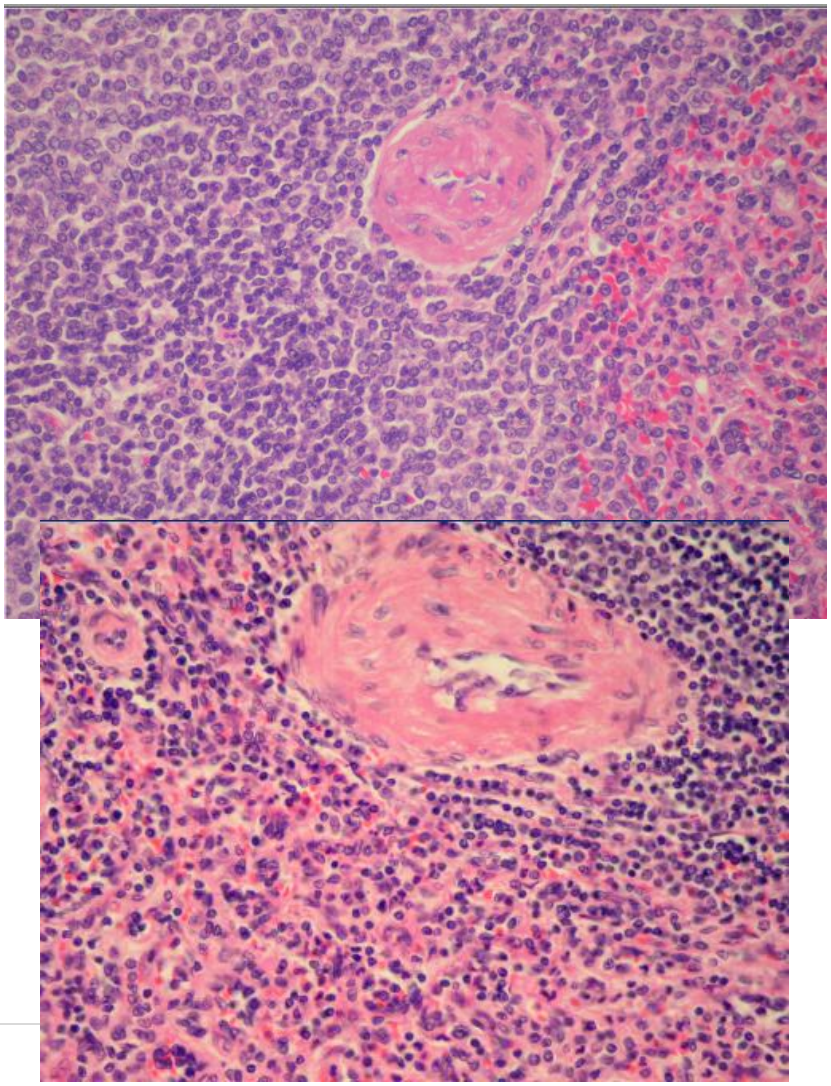
((Magnified))

Here we can see the artery ..the smooth muscle cells that line the wall and their nuclei

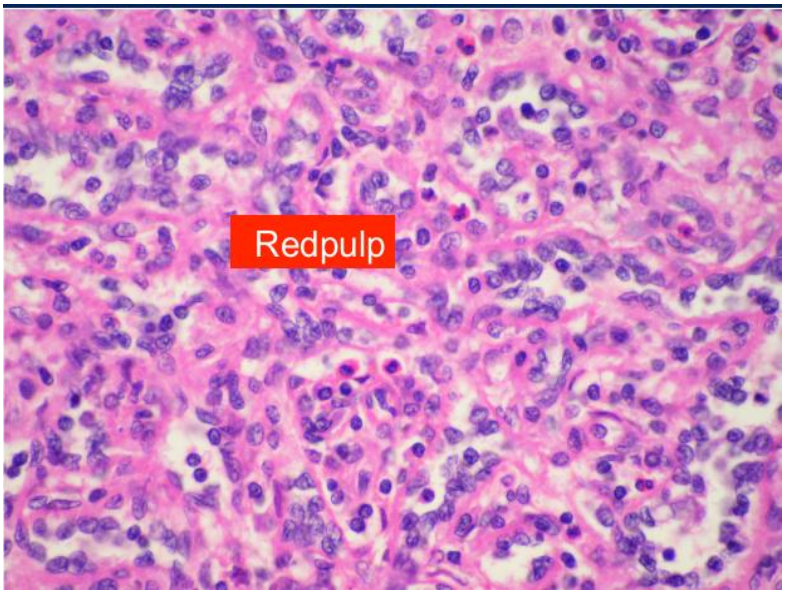
Around the artery mabasharatn :periarterial sheath

**Qu:**this area contain: T-cell \ interdigitating dendritic cell \ both \ neither

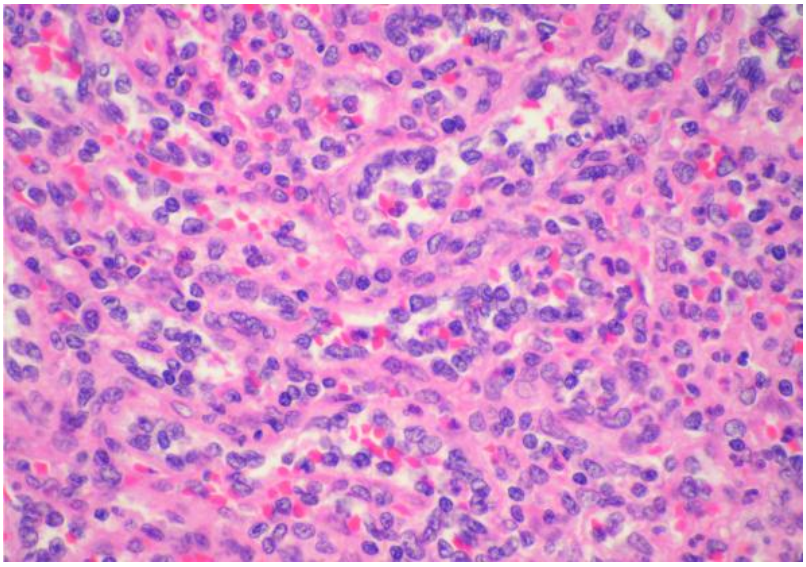
**Answer**: both



Here we don't see the follicles ..so it's the red pulp




- Blood inside the sinusoids and in the splenic cords
- الفراغات= sinusoids , and the cells around them are the splenic cords
- In the splenic cords there's : RBCs + WBCs (monocytes, lymphocytes, neutrophils, eosinophils , platelets) + plasma cells + macrophages.

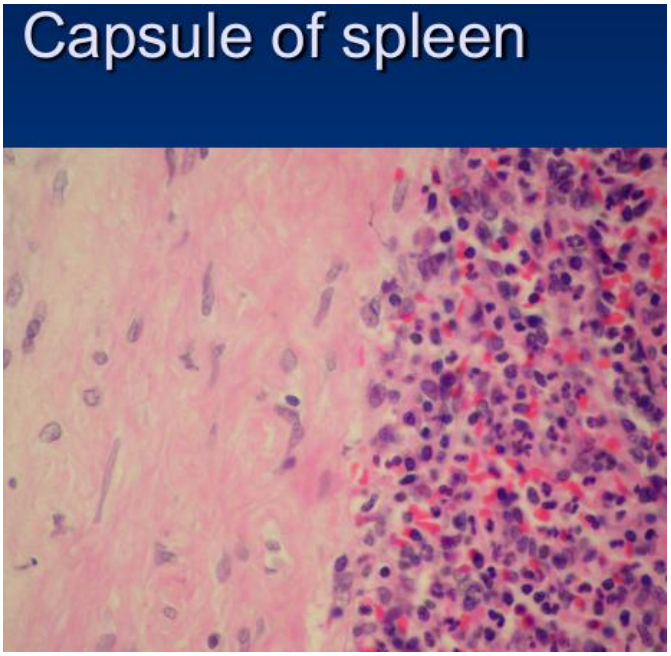


**Spleen capsule:**

We can see nuclei of smooth muscle that contract to squeeze/ to evacuate the spleen from the blood specially in cases of severe hemorrhage

Qu: does the spleen produce B & T lymphocytes? YES

Splenectomy = suppression of immunity

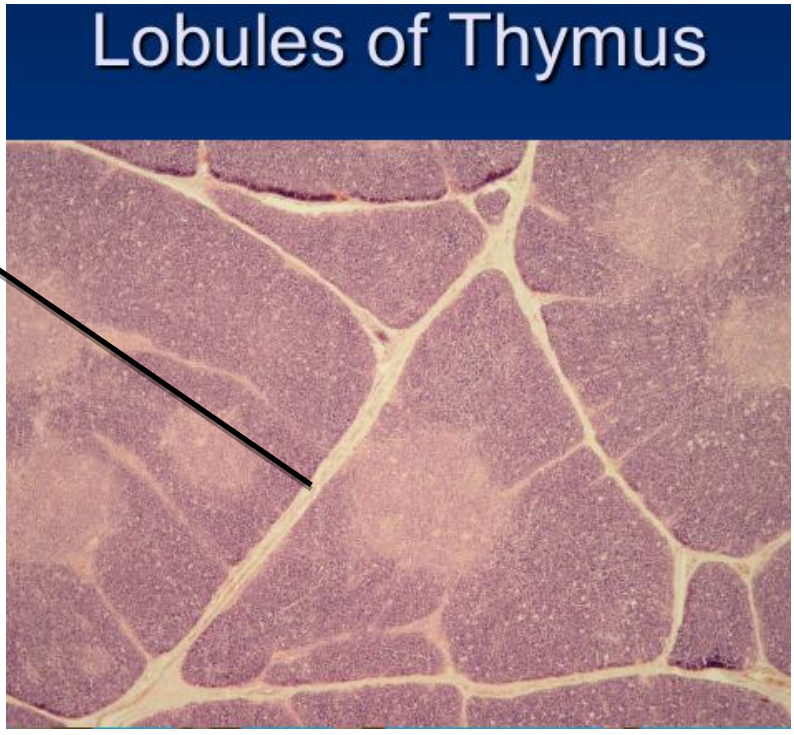



**Thymus :**

trabeculae that divide it into lobules

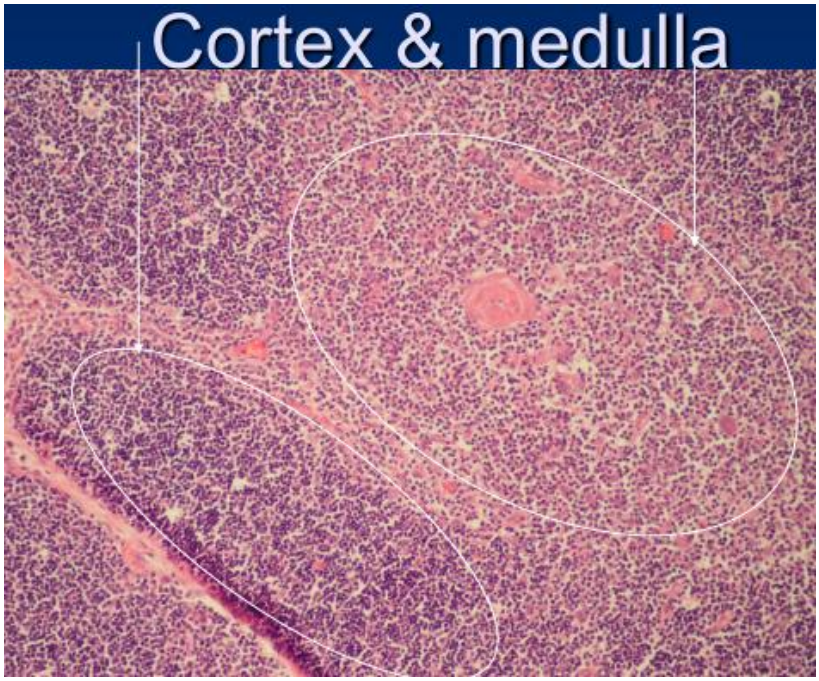
each lobule = inner medulla + outer cortex

**cortex** : has (1)T cells undergoing mitosis and proliferation to become immunocompetent



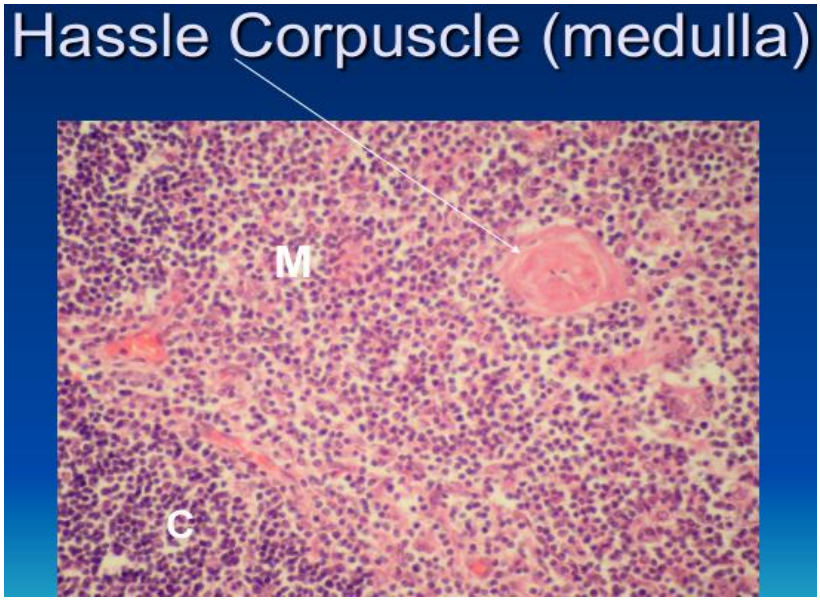
(2)7awalenha: epithelial reticular cells that help in the programming of T-cells

(3) macrophage, that phagocytose 98% of the cells coming from BM



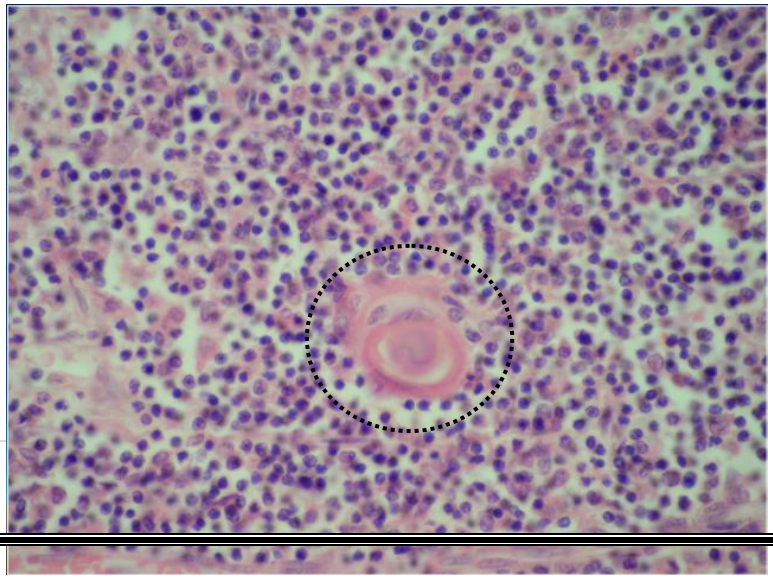

**Medulla:**

contain the Hassle Coruscle: layers of reticular cells and the central part is degenerated



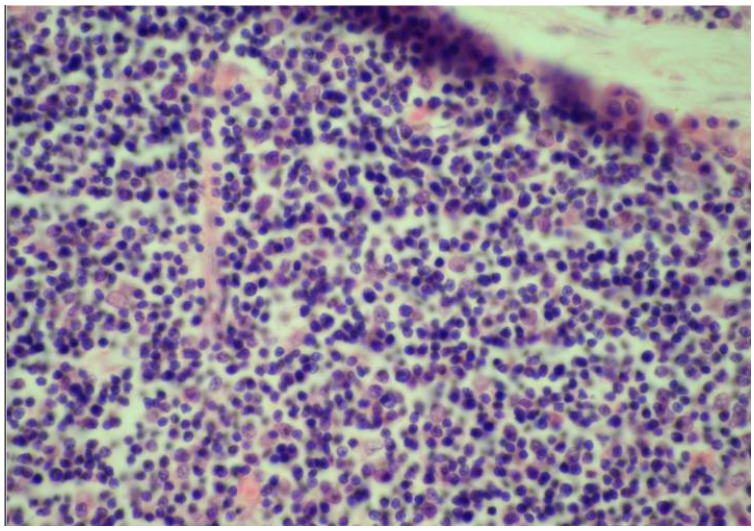

لازم اميزه عن الcentral artery

Remember: central artery is on the periphery oh the follicle

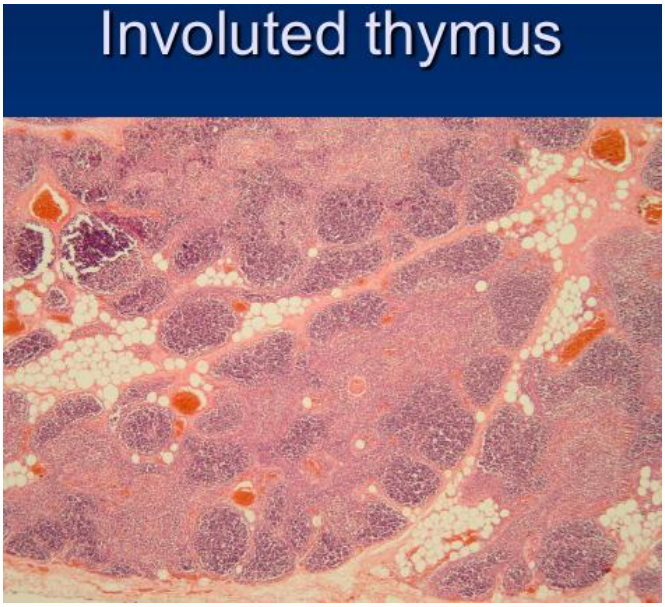


this is the thymus.

There's no hassle corpuscle → so it's the cortex

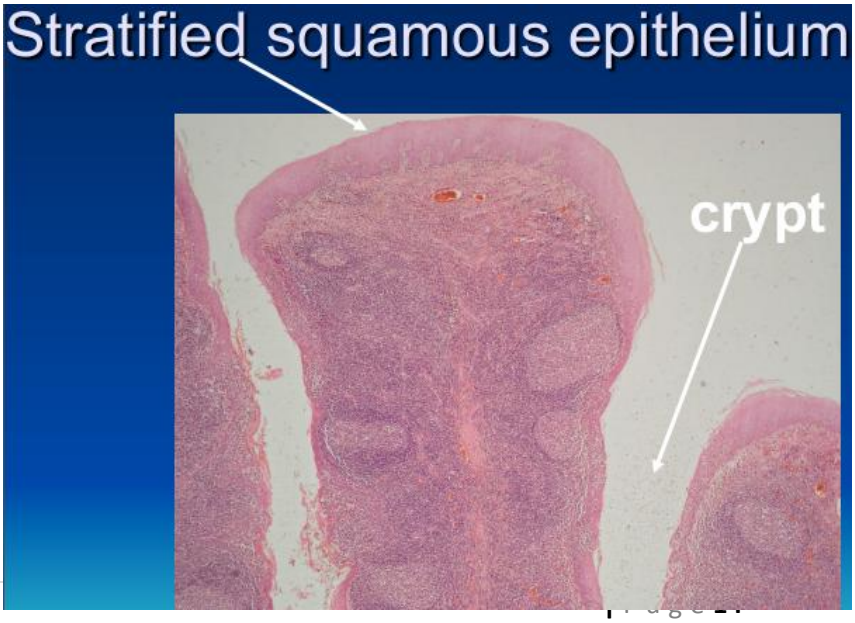


With aging; the thymus undergo involution. Cells are replaced with adipose tissue



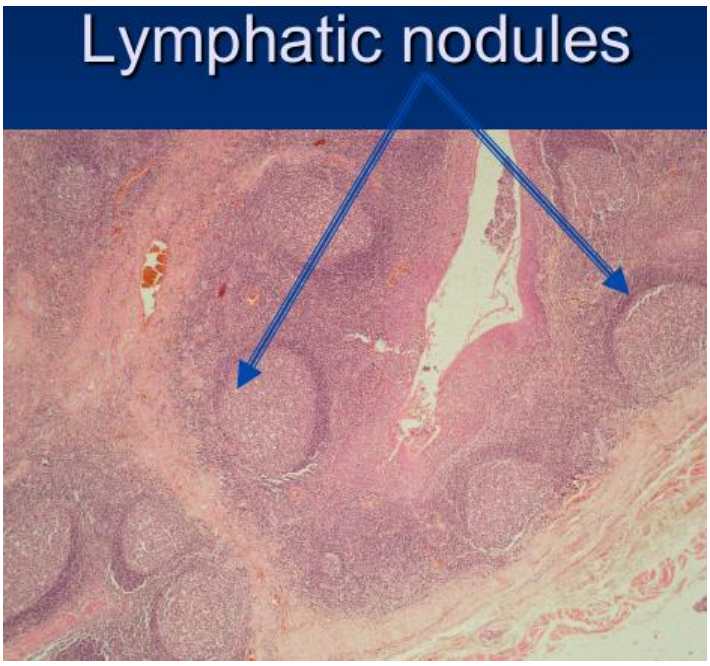

## Palatine tonsils :

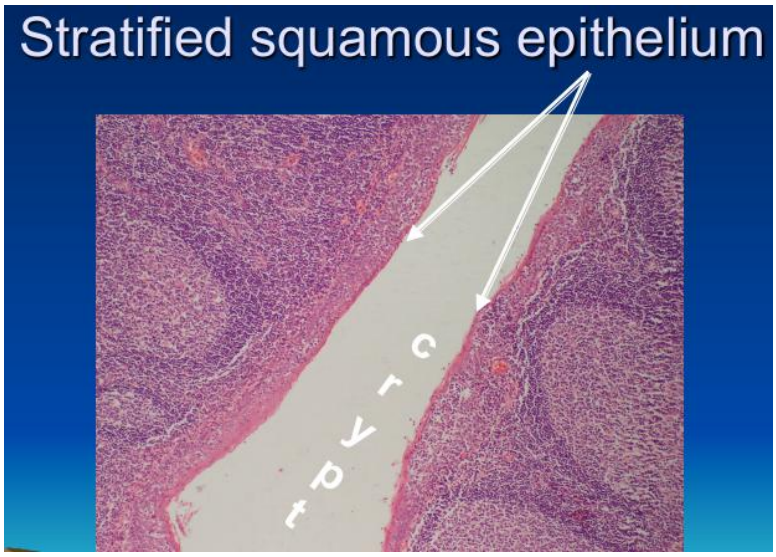
- An example of diffuse lymphatic tissue
- Lacated in the lateral wall of the oropharynx
- There's: B-lymphocytes , T-helper , plasma cell



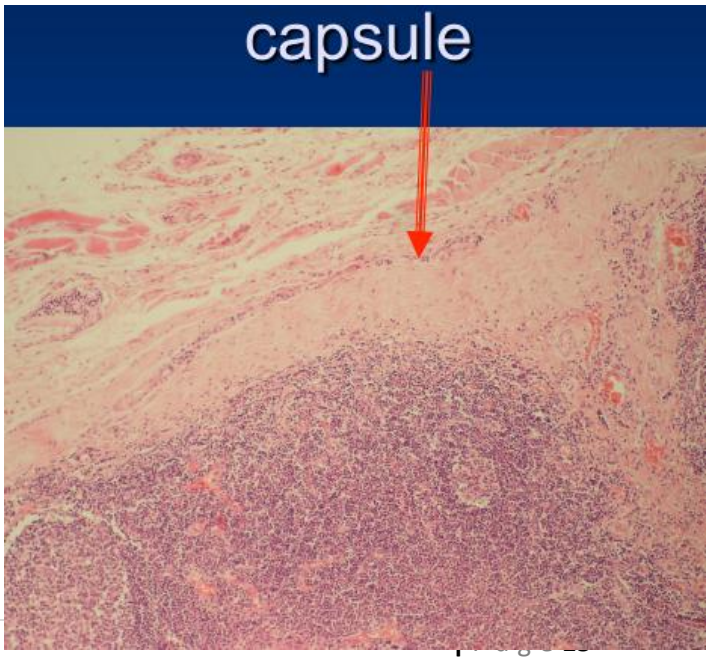
, memory cells , macrophage

- Immune rxn can happen here, commonly Ab mediated
- It's very prominent in children and if there's infection we can also see the openings of the crypts white (pus) .. but in old age it's atrophied
- The crypt is lined by stratified squamous



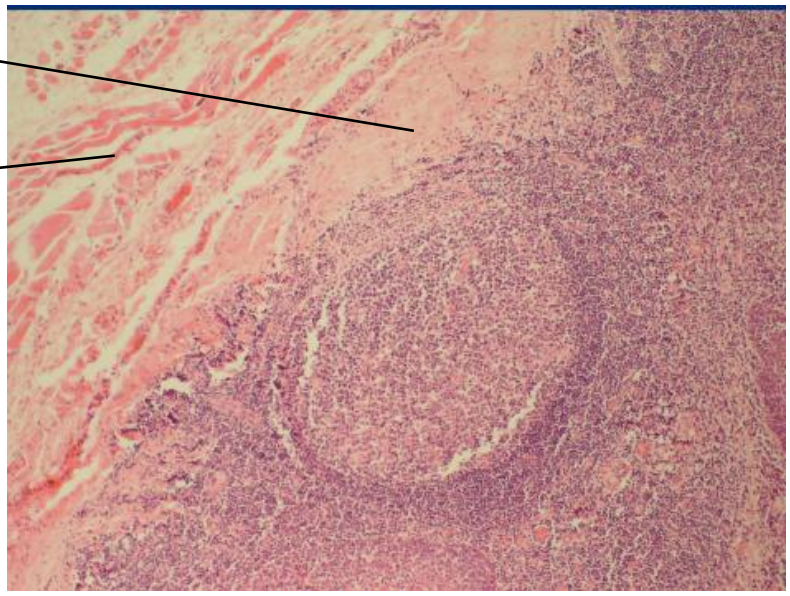




**The capsule** that surround the tonsil and separate it from the wall of the oropharynx is incomplete capsule



the capsule

smooth muscles (muscles of the pharynx )



Questions:

1- Blood thymus barrier , in the medulla or cortex? Cortex
2- The efferent contain both B & T cells ..true or false? False, only T lymphocytes
3- Cortex of the thymus contain lymphatic nodule ..true or false? False
4- Ag that enter the pass through the blood thymus barrier will stimulate the development of T-cells which has receptor to that Ag ??? false
5- Ag that has passed through the blood thymus barriers will stimulate tolerance to that Ag ? True

Best of luck ☺

ShathaTarawneh