

# The Lymphatic System

Lymphoid tissue is a form of connective tissue made up principally of lymphocytes and macrophages in a framework of reticular fibres. Lymphocytes produce an immune response to foreign materials (antigens) in the body.

**Lymphocytes** are constantly being circulated in lymphatic vessels and in blood vessels. They enter the surrounding connective tissue between the endothelial cells of the smaller vessels by amoeboid movement. **B** lymphocytes differentiate into plasma cells which produce antibodies – a **‘humoral’ response** - to **specific antigens**. **T** lymphocytes attack en masse, i.e. they elicit a **‘cellular’ response** e.g. to **parasites**.

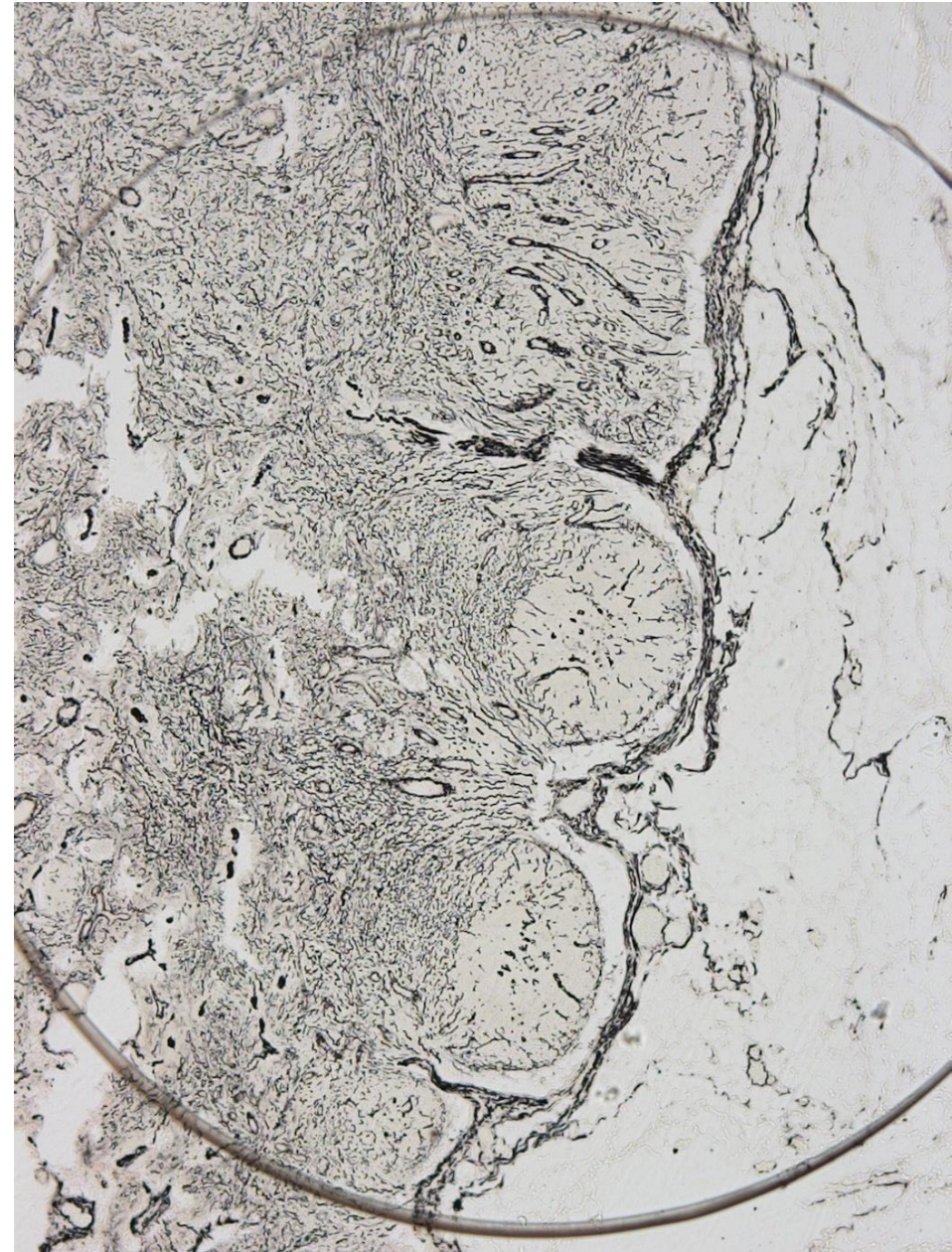
**Macrophages** identify and ingest the foreign substances and cause the lymphocytes to react. They may be either **‘fixed’** i.e. attached to the reticular fibres ,or **‘free’**. They are derived from **monocytes** which are formed in the bone marrow.

The lymphatic system consists Of **lymphatic vessels** and **lymphoid tissue**. The latter may be either **encapsulated**, e.g . lymph nodes , spleen, thymus , or **nonencapsulated**,e.g. tonsil, **Peyer’s patches** in the ileum ,appendix. Usually the lymphocytes are diffusely arranged ; when they are actively proliferating, pale – stained ovoid to spherical **‘germinal centres’** appear and the lymphoid tissue is said to be **‘nodular’**. Nodular lymphoid tissue is characteristic of the cortex of the lymph node and tonsil.

# The Lymphatic System

## Slide A239 x50 Lymph Node Technique: Silver Impregnation

- Compare this slide to the Haematoxylin & Eosin slide
- This section demonstrates the reticular fibre framework of a lymph node.
- Collagen and reticular fibres have been stained black. Note:
- The coarse fibre in the capsule and two trabeculae (what fibre type?)
- The finer fibre of the cortex and the medulla (what fibre type?)
- The subcapsular, paratrabecular and Medullary sinuses.
- How did you identify them?
- What is the function of a lymph node?
- In which direction does the lymph flow?
- What are the rounded, pale - stained regions in the outer cortex?





# The Lymphatic System

Slide GAM 2.

x50

Lymph Node

**Technique:**Haem & Eosin

**Compare this slide to the silver impregnated tissue slide.**

This section through a lymph node is routinely stained with H&E.

## **Note:**

The eosinophilic capsule and trabeculae (what fibre type?)

The subcapsular, paratrabecular and medullary sinuses.:

The nodules with pale stained germinal centres in the outer cortex; and the

Diffuse lymphocytes in the inner cortex and medullary cords.

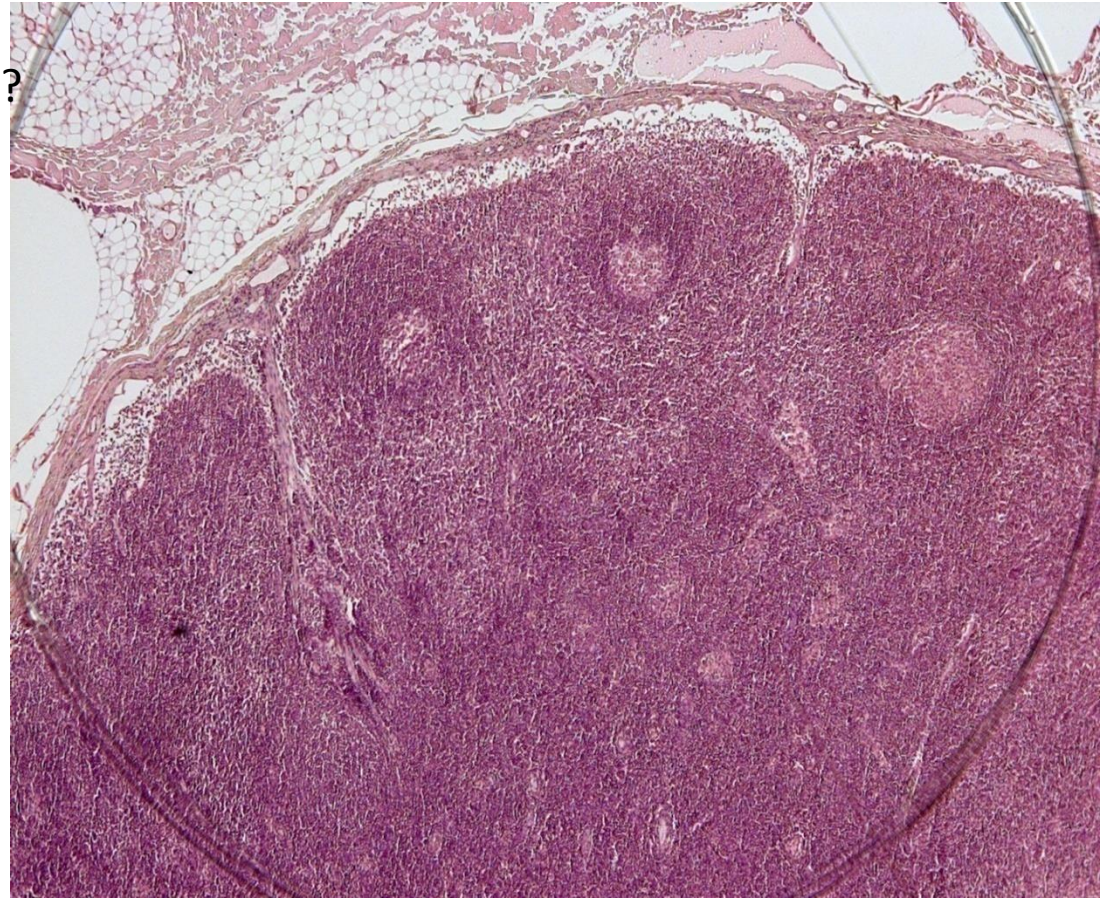
What is the function of a germinal centre?

Why is it pale - stained?

What does it produce?

Identify the vessels in the capsule.

Where are T Lymphocytes located?





# Lymphatic System

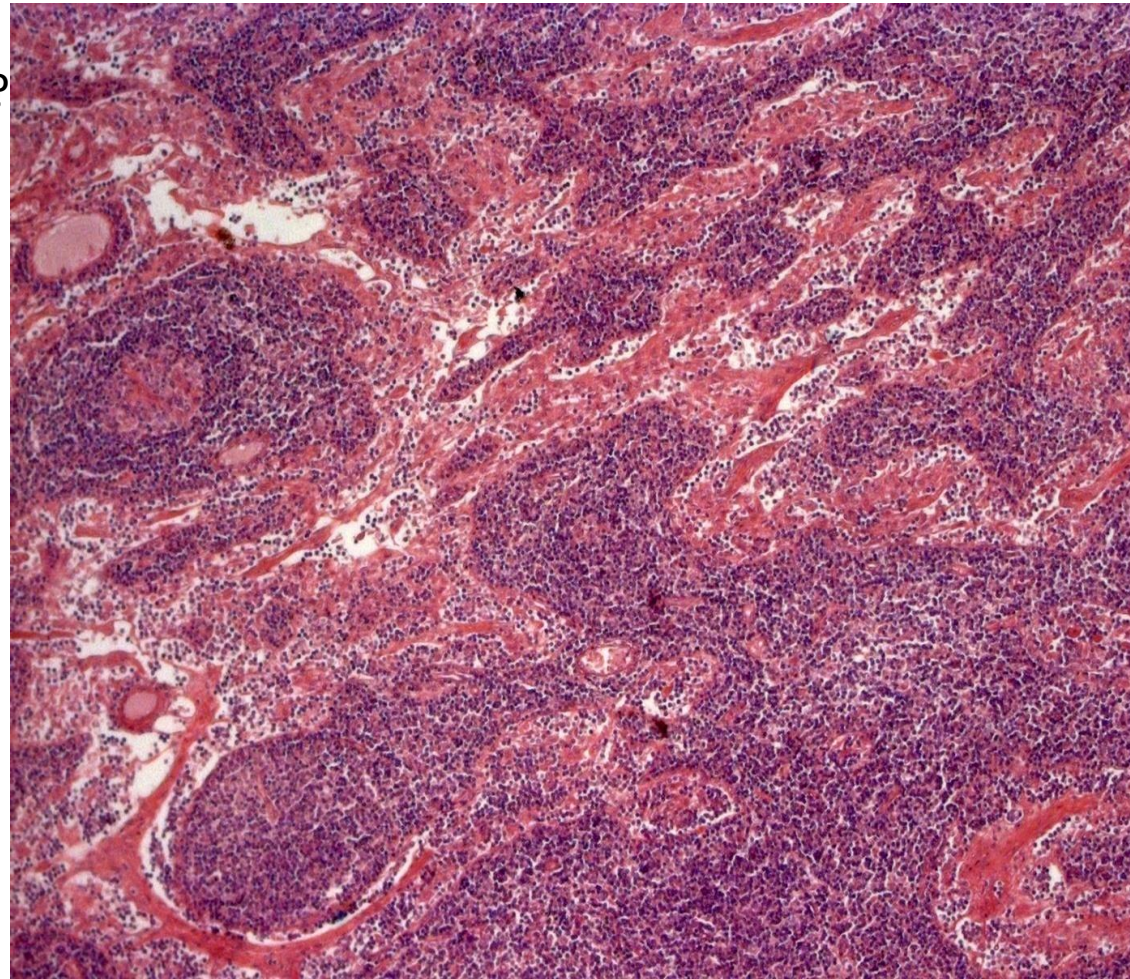
Slide A 255.    x100

Medulla of Lymph Node    Technique: H&E

In this section through the medulla of the lymph node note:

- The eosinophilic reticular fibres and
- Diffuse lymphatic tissue of the medullary cords.
- The pale stained medullary sinuses between the cords.

In which direction does the lymph flow?  
Why does the medulla stain paler than  
the cortex?





# The Lymphatic System

Slide D126. x100

Hilus of lymph node .

Technique: H&E

In this section through the hilus of a lymph node note:

- Large efferent lymphatic vessel with valves (diagonally across The field );
- Medullary cords and sinuses (bottom of the field)
- An arteriole and a venule in the connective tissue of the hilus

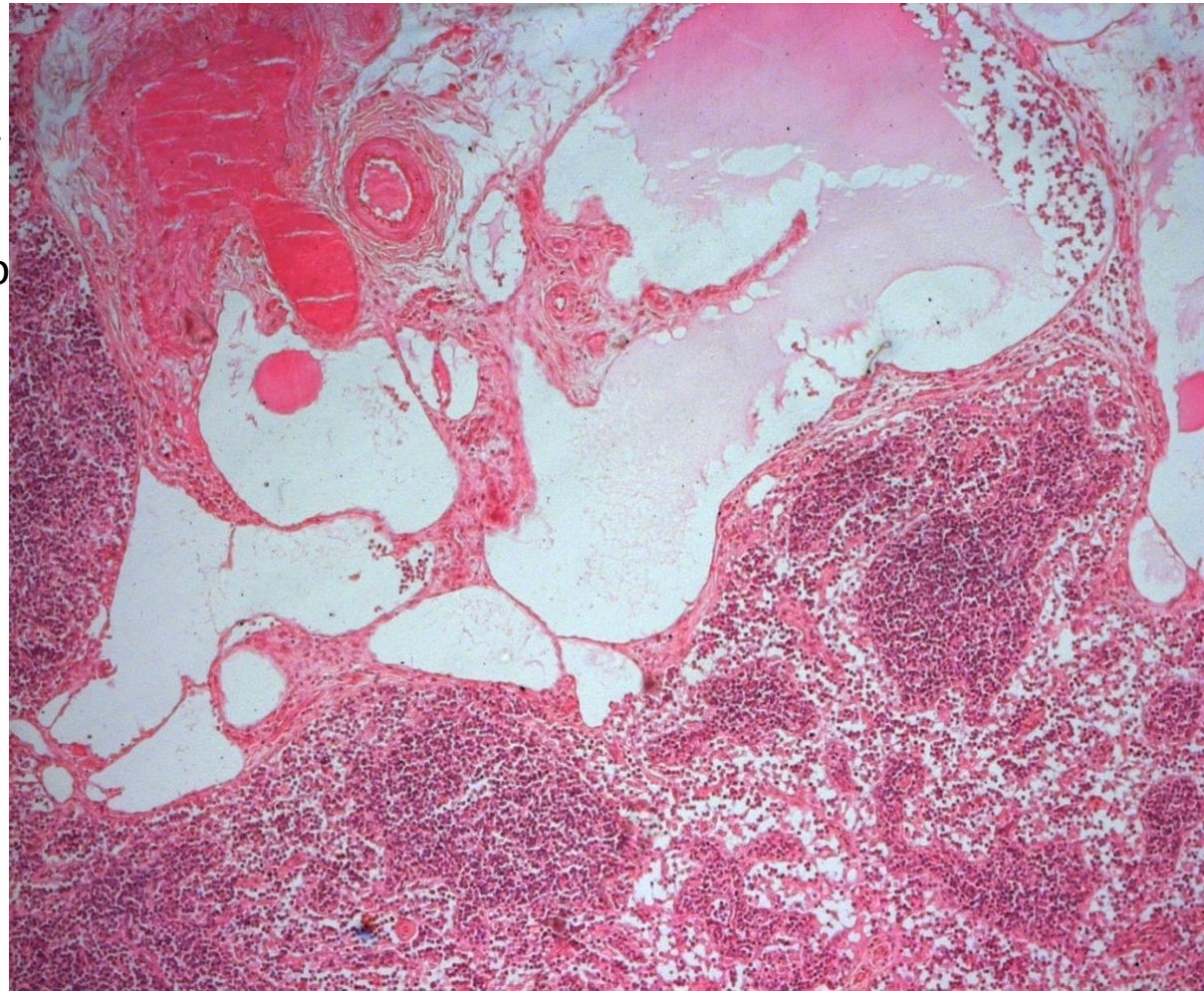
How do you identify lymph?

What evidence do you have here of the direction of flow?

How is a lymph node constructed to "filter" lymph?

What is the function of the blood supply to a lymph node?

Where do blood vessels enter and leave?

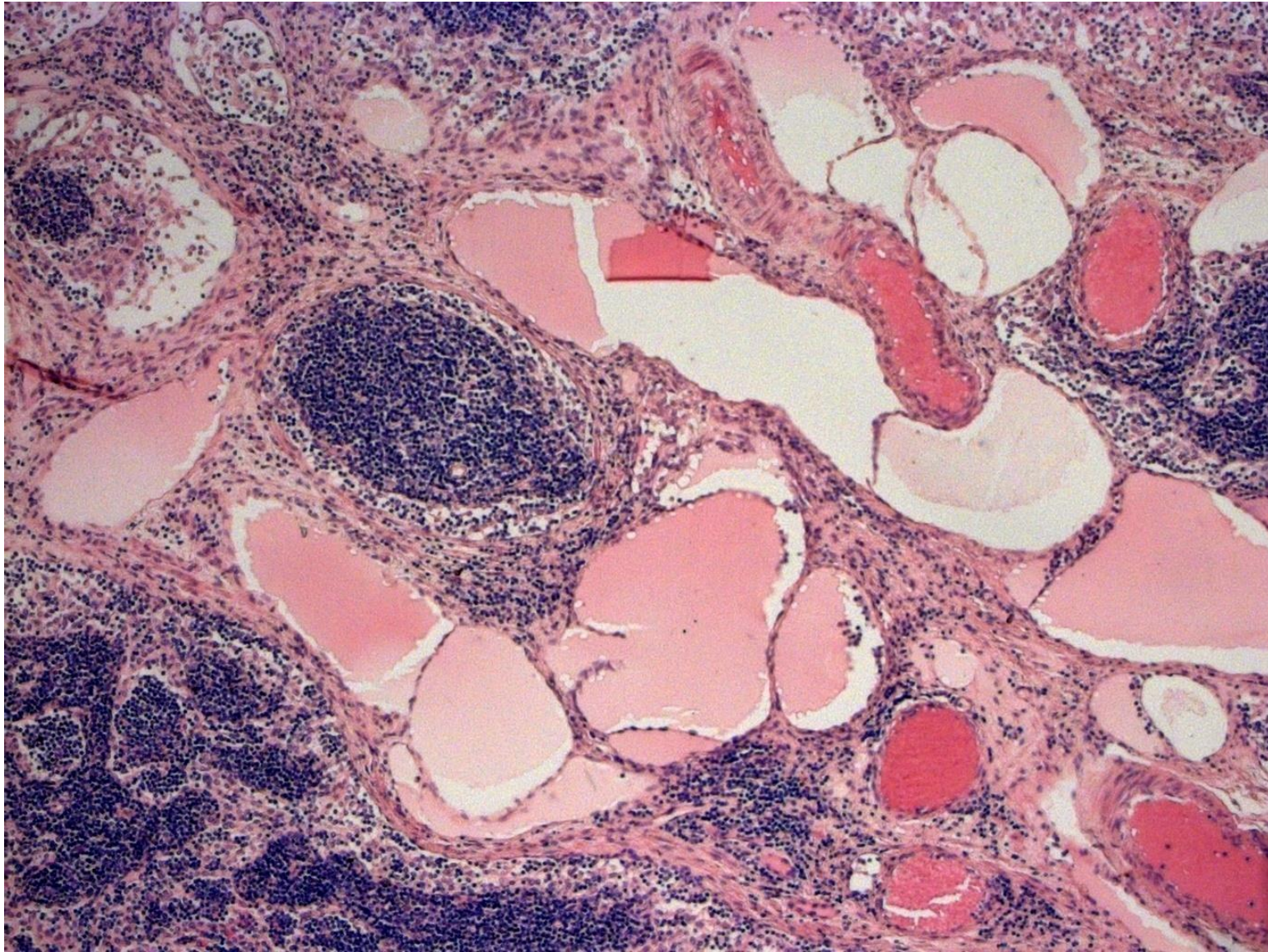




# The Lymphatic System – Hilus of Lymph Node

Slide 45    x100

Technique: H&E





# The Lymphatic System

Slide B395. x1000

Cell Types in Lymph node

Technique: H&E

In this oil immersion field of a sinus note:

The large pale -stained ,oval/rounded nuclei of reticular cells attached to the reticular fibres.

The pale –stained sausage –shaped nuclei of “fixed” macrophages (also attached to the reticular fibres.)

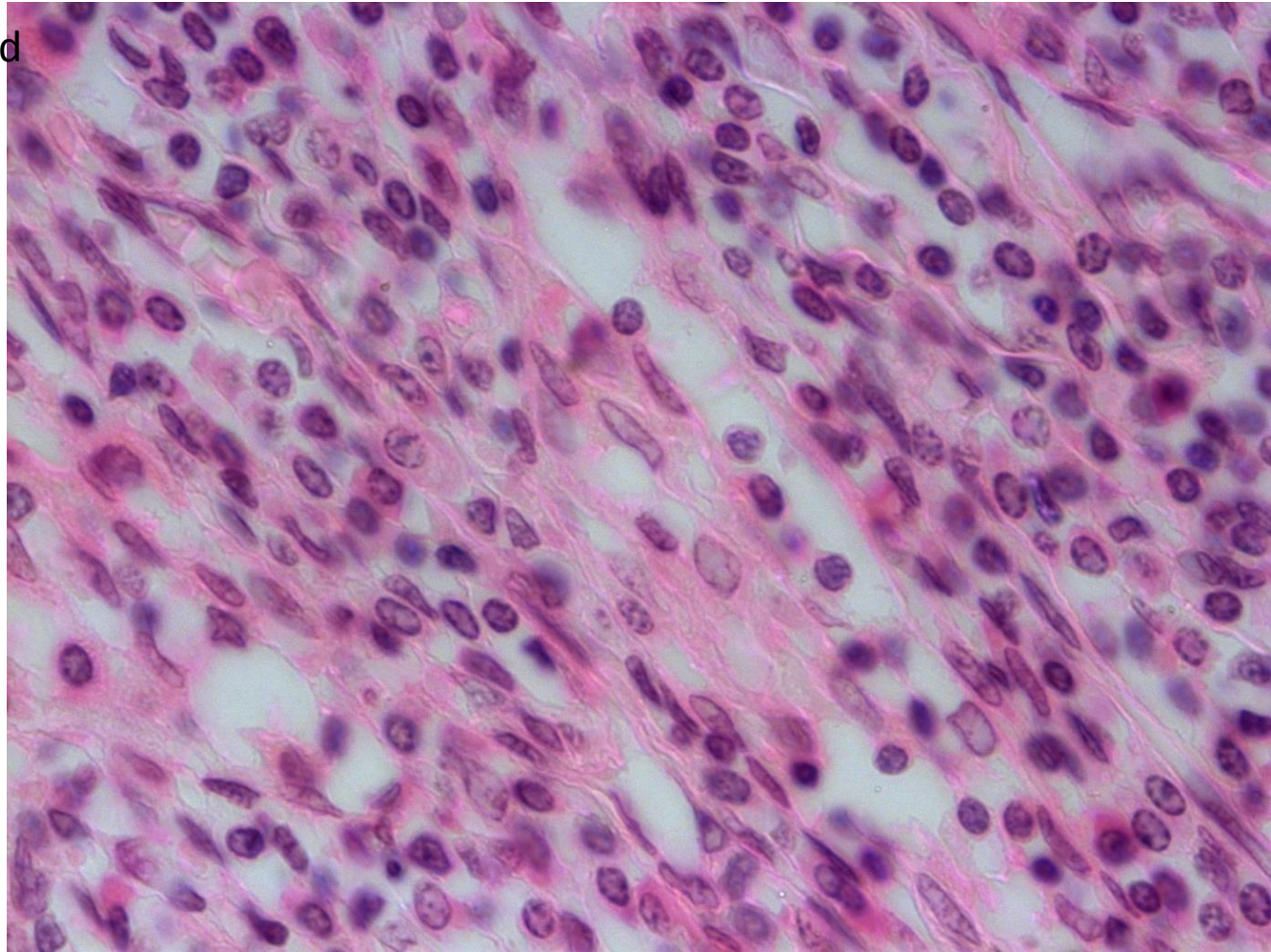
Several small lymphocytes and plasma cells in the lumen of the sinus.

How did you identify the Reticular fibres?

How did you distinguish between small lymphocytes and plasma cells?

What is the function of the “fixed” macrophages?

It is said that the lymph node ‘filters’ lymph. Explain this Statement?





# The Lymphatic System - Spleen

Slide CB 48 x100

Technique: Silver Impregnation

Compare this slide with the one stained with H&E.

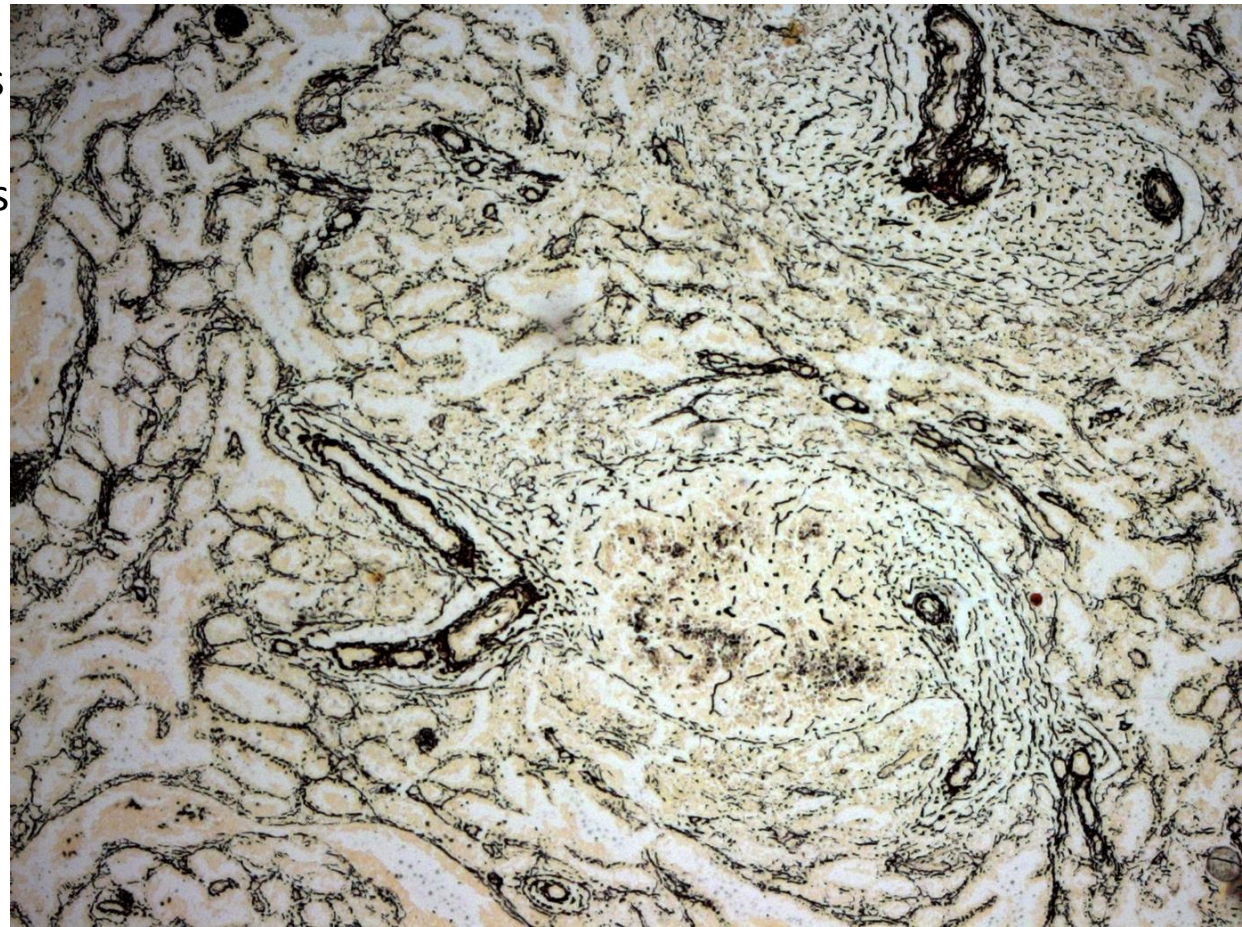
In this section through the spleen Note:

- The black stained reticular fibre framework in the spleen (cells not stained)
- The fine fibres of a mass of white pulp cut in cross section.
- Coarser fibres in the tunica media of the eccentrically placed 'central artery' (actually an arteriole).

The branching penicillar arterioles entering the red pulp.

- The red pulp made up of venous sinuses (spaces) supported by coarser reticular fibres around the venous sinuses.

Which are the splenic cords (cords of Bilroth)?





# The Lymphatic System.

## Red Pulp of Spleen

Technique: H&E

Slide CB 47. x1000

In this oil immersion field of red pulp note:

Venous sinuses containing blood (red blood cells & leucocytes seen);

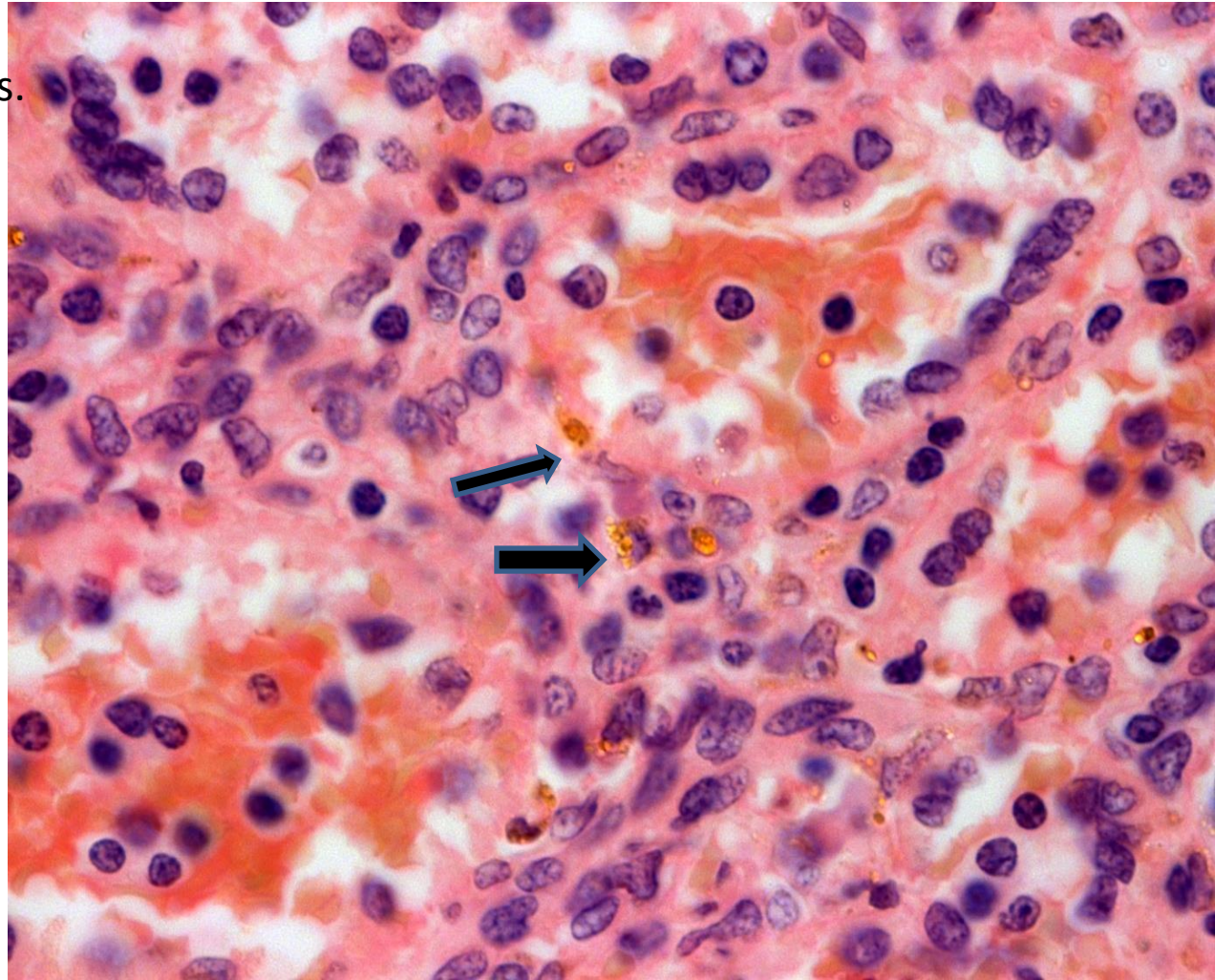
The rounded nuclei of the lining endothelial cells ('stave cells');

Splenic cords between the venous sinuses

Macrophages containing  
haemosiderin in the splenic cords.

Explain the presence of  
Haemosiderin in the splenic  
cords.

It is said that the spleen 'filters'  
Blood. Explain this statement.





# The Lymphatic System

Slide A238

x100

Trabecular Artery in Spleen

Technique: H&E

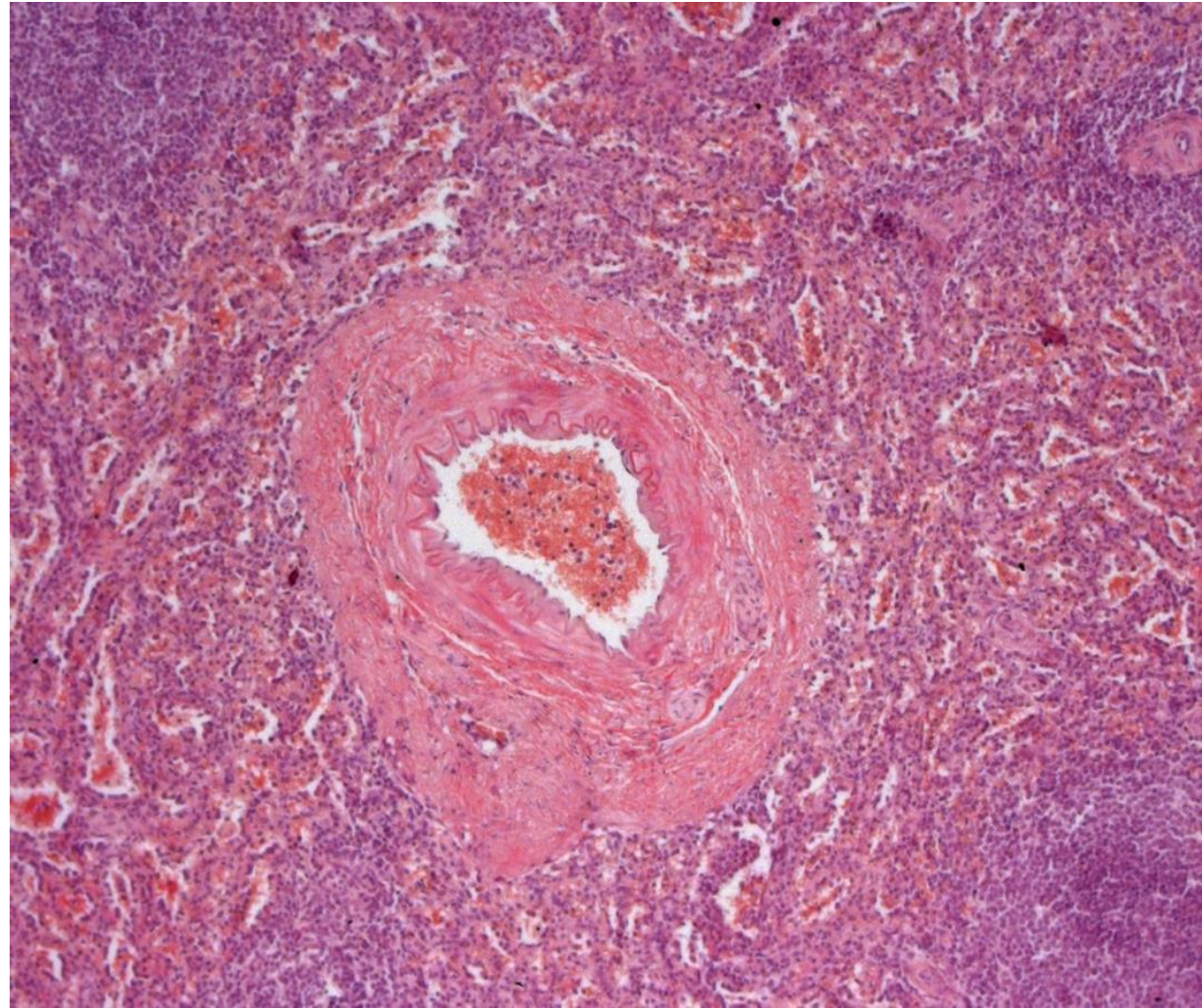
**Compare to the Trabecular Vein.**

In this transverse section of a trabecular artery note:

- The eosinophilic collagen fibres of a trabecula supporting the artery.
- The well defined tunica media
- Separated from the
- Tunica intima by a well defined internal elastic lamina.

Identify the eosinophilic fibres in The tunica media.

From which artery does the Trabecular artery arise and where does that artery enter the spleen?





# The Lymphatic System.

Slide A47    x100

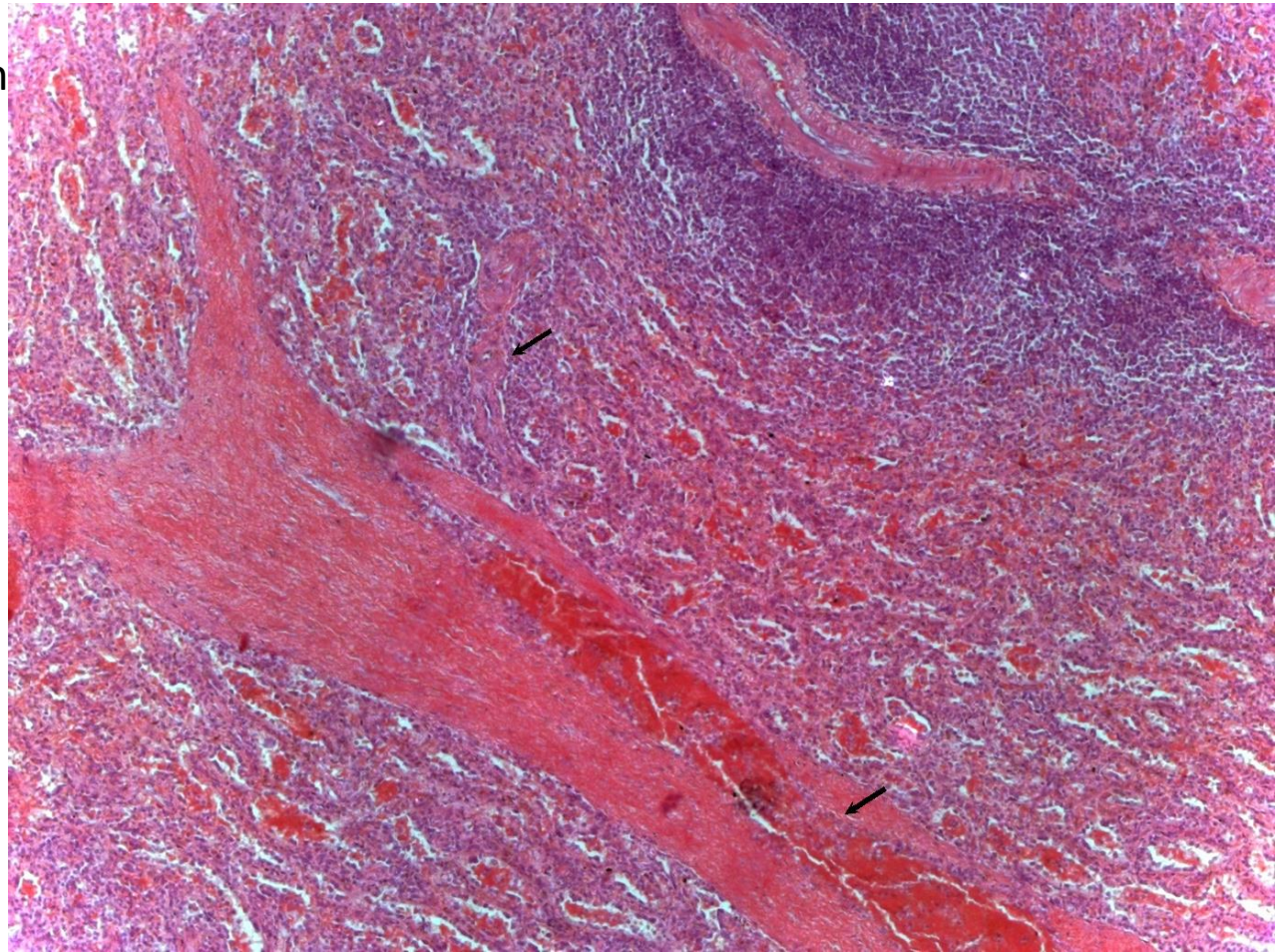
Trabecular Vein in Spleen

Technique: H&E

**Compare to the Trabecular artery.**

- Note:
- The eosinophilic collagen fibres of a trabecula supporting the vein;
  - The large trabecular vein lined By endothelium only; and
  - A pulp vein leading from the red pulp Into the trabecular Vein.

- Where does the trabecular vein leave the spleen?
- It is said that the spleen is constructed around its blood supply. Explain this statement. Why Is the spleen included here Under the lymphatic system?





# The Lymphatic System – The Spleen

Slide A232 x100

Technique: H&E

Compare this slide with the silver impregnated section.

In this section through the spleen note:

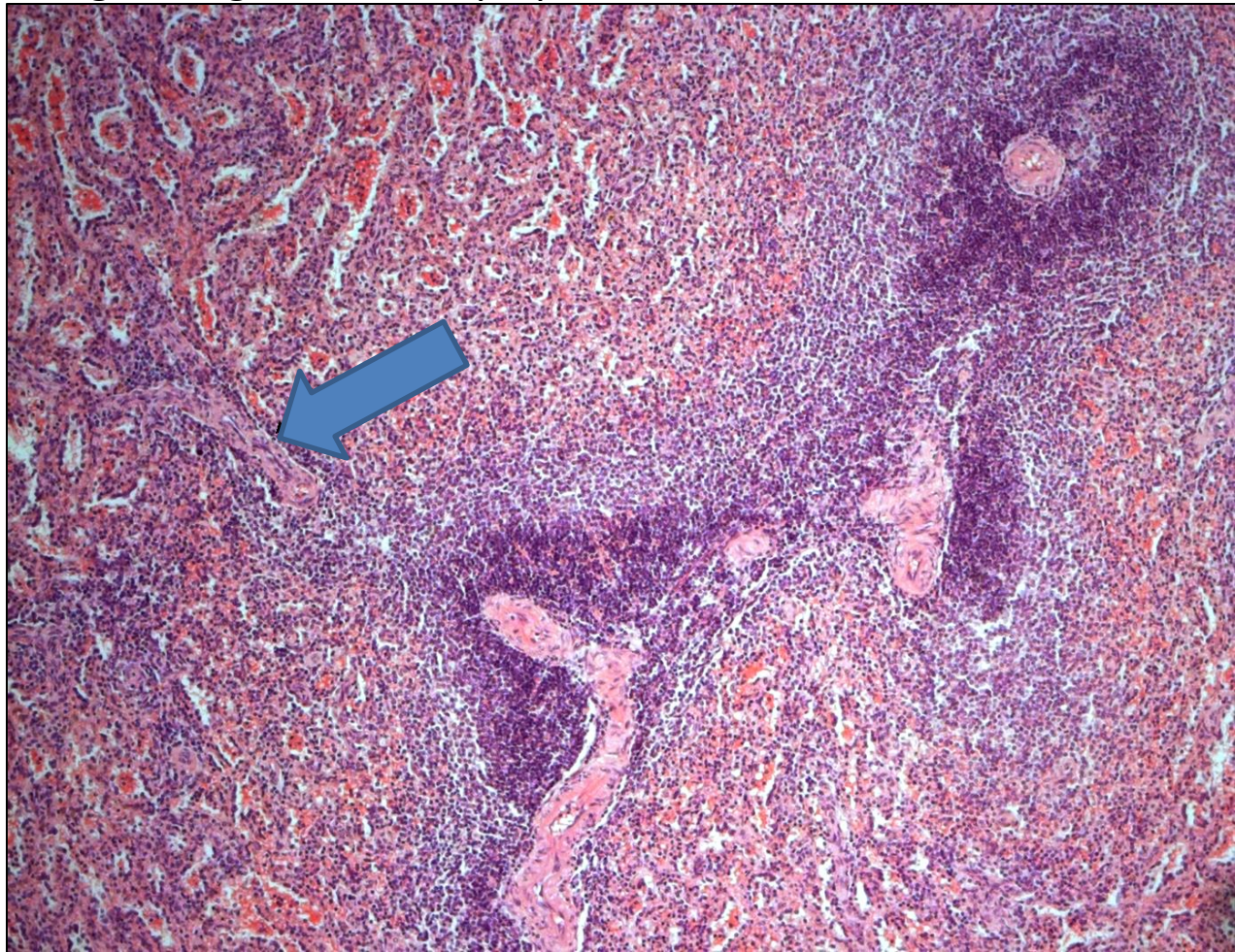
- The basophilic mass of white pulp (longitudinally/obliquely cut)
- A branching 'central artery' running through the white pulp.
- The branching penicillar arteriole entering the red pulp (ARROW)

The venous sinuses and splenic cords in the red pulp.

Why does the white pulp stain basophilically?

How did you identify the splenic cords.?

Why do they stain Eosinophilically?





# The Lymphatic System-Palatine Tonsil

Slide A259.

x50

**Technique: H&E**

In this section through a palatine tonsil **note:**

- The thick stratified squamous non-keratinised epithelium lining one of the crypts.
  - Lymphocyte infiltration and erosion of the epithelium of the crypt in the upper part of the field.
  - Nodular & diffuse lymphoid tissue.
  - Part of the capsule between the lymphoid tissue and the crypt in the lower part of the field
  - Skeletal muscle (TS) and mucous glands of the palate.
- What is the **function** of the palatine tonsil?





# Lymphatic System – Tonsillar Crypt

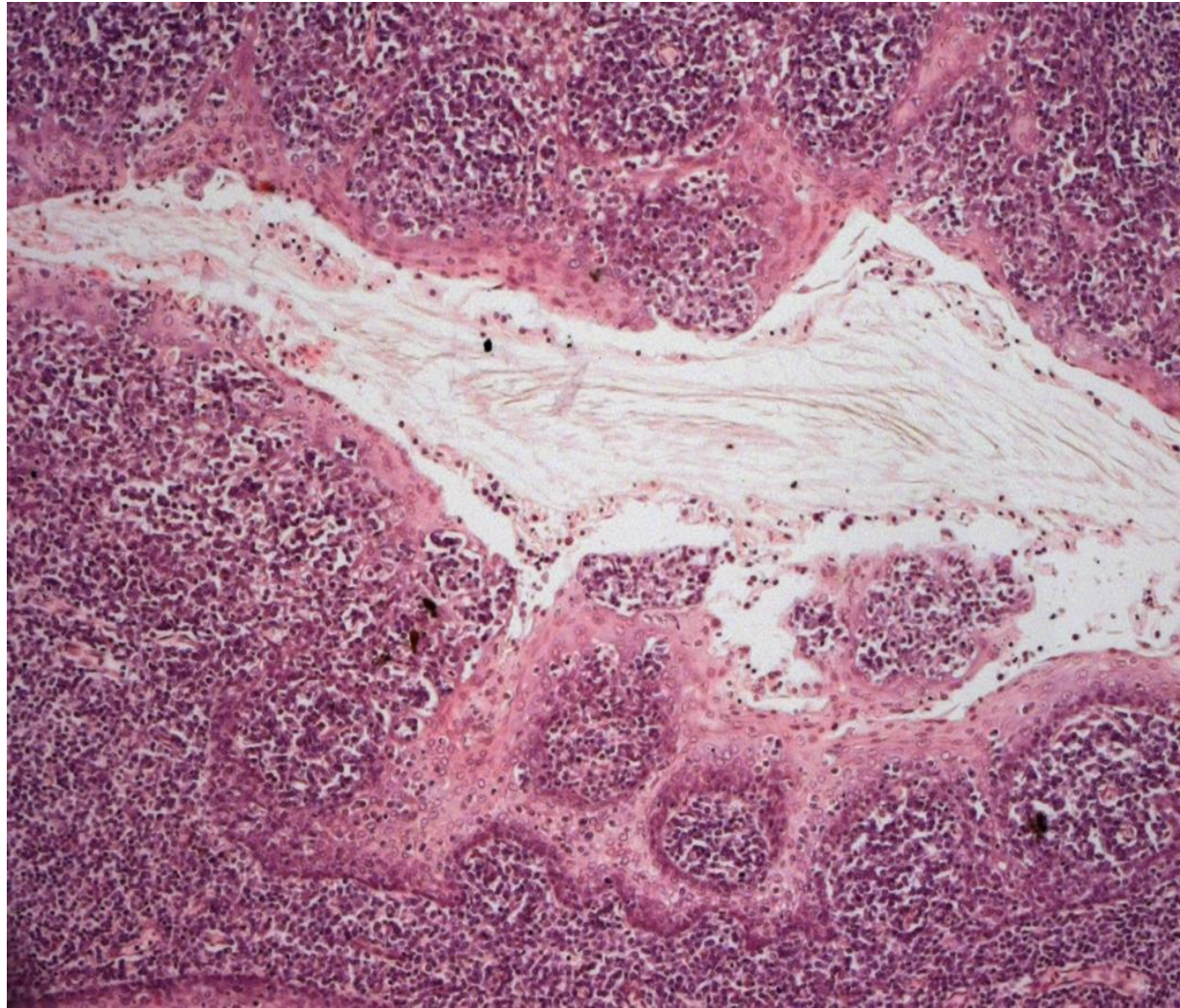
Slide D117 x100 ( Serial section to A259)

Technique: H&E

In this section through a palatine tonsil note :

- The infiltrating lymphocytes, and how they have eroded away the Stratified squamous non – keratinised epithelium.
- Small lymphocytes in the lumen of the crypts.

Why are lymphocytes present in saliva?





# The Lymphatic System- The Thymus

Slide A 734 x50

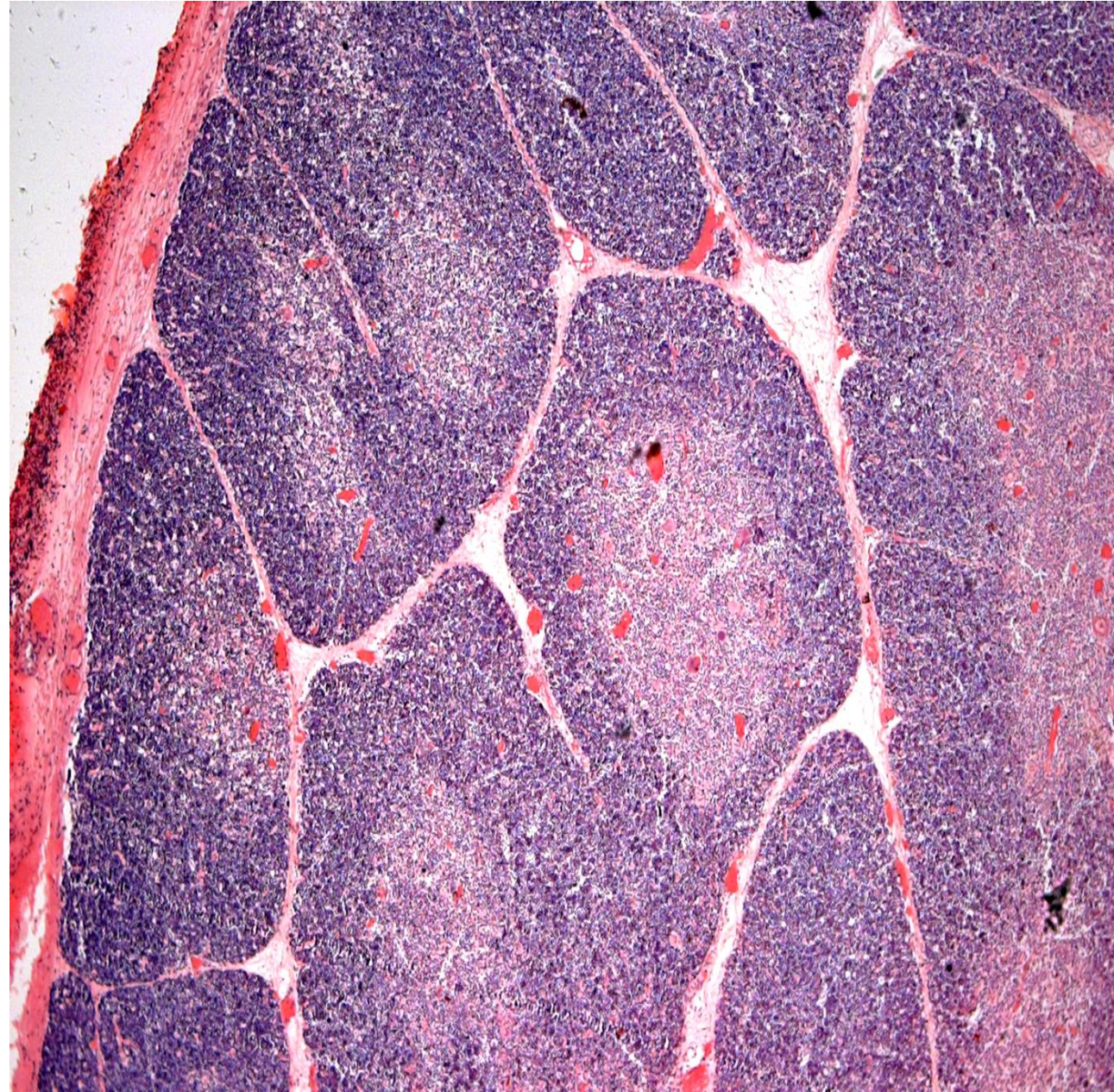
Child Thymus

Technique: H&E

Compare this slide to the adult Thymus slide.

This section demonstrates a lobule in the thymus of a child, note:

- The densely packed lymphocytes
- In the outer cortex;
- The more palely-stained medulla;
- And the connective Tissue septa
- with blood vessels.





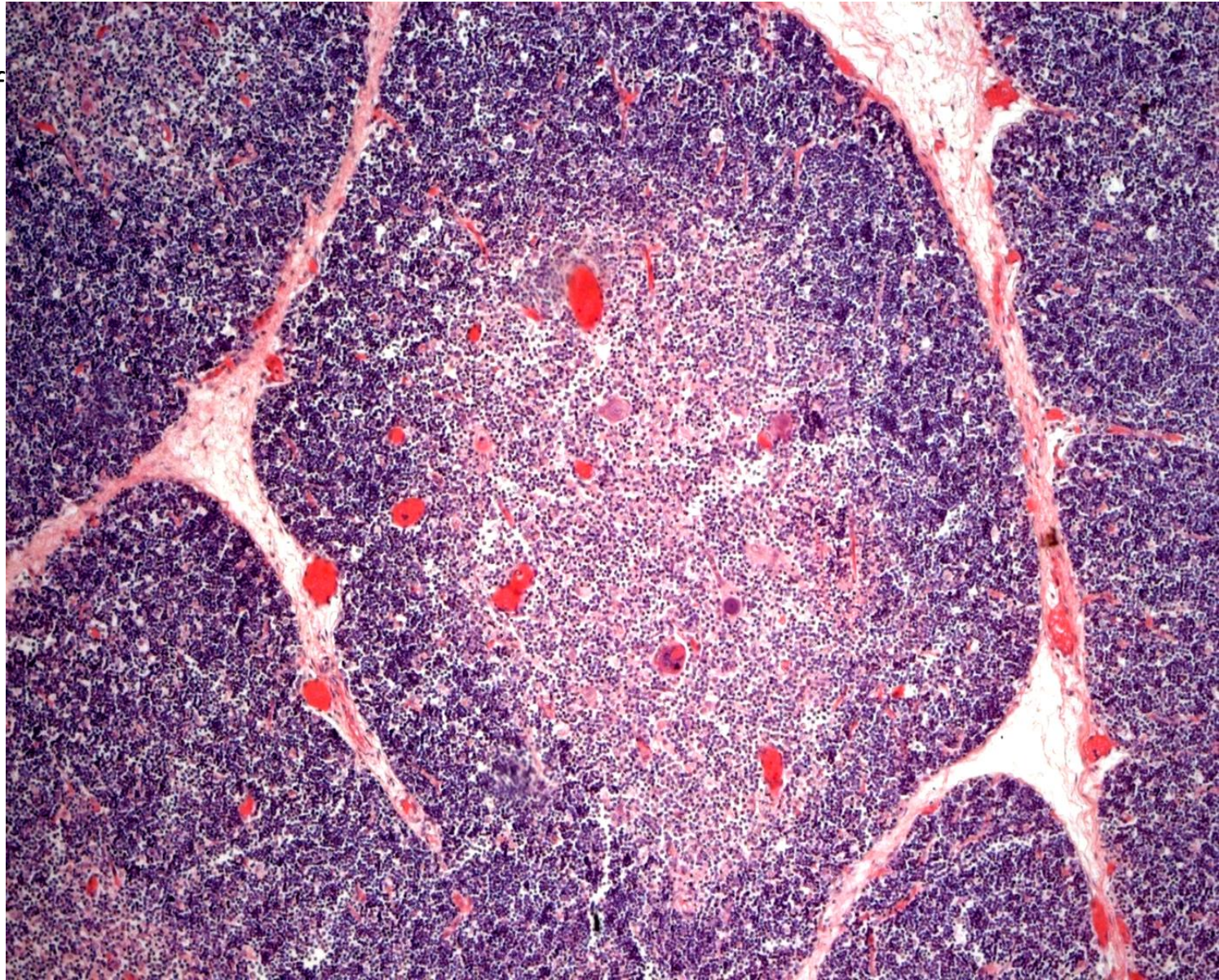
# The Lymphatic system

Slide A734 x100

Child Thymus

Technique : H&E

Compare this slide of  
A **childs** Thymus to  
That of the Adult  
Thymus





# The Lymphatic System – The Thymus.

Slide B 404 x50

Adult Thymus

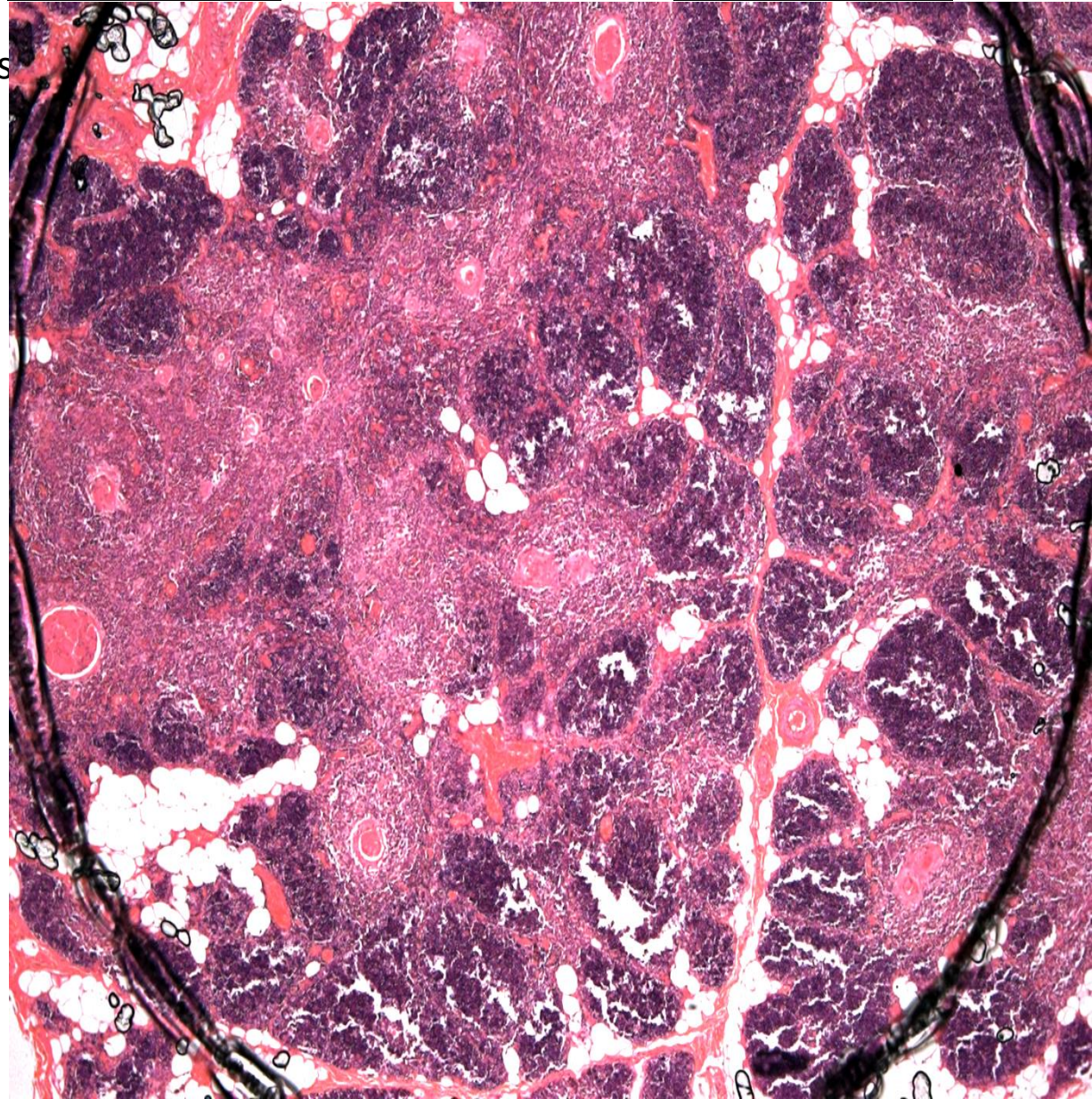
Technique: H&E

Compare this slide with the thymus  
from a child.

This section of thymus is from a  
young  
Adult.

How does this differ from that of  
the  
child?

(There are at least 3 differences! )





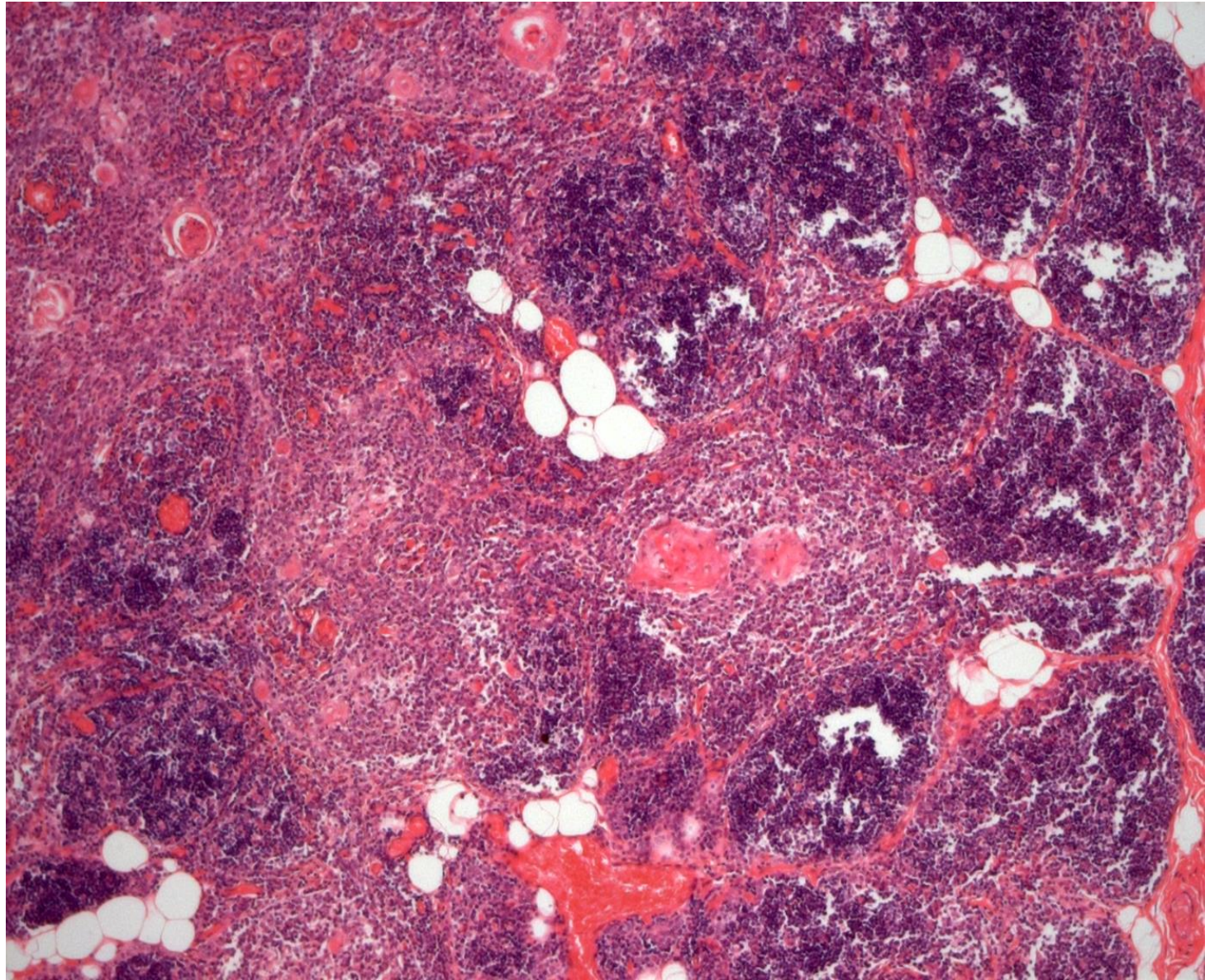
# The Lymphatic System

Slide B404 x100

Adult Thymus

Technique: H&E

Compare this slide of  
The **Adult** Thymus to  
the slide of a **childs**  
Thymus





# The Lymphatic System

Slide x400

Hassels Corpuscle in the Thymus

Technique: H&E

In the centre of the Thymus **medulla** we find eosinophilic, concentrically lamellated structures known as **Hassal's Corpuscles**.

These structures contain degenerate epithelial cells

