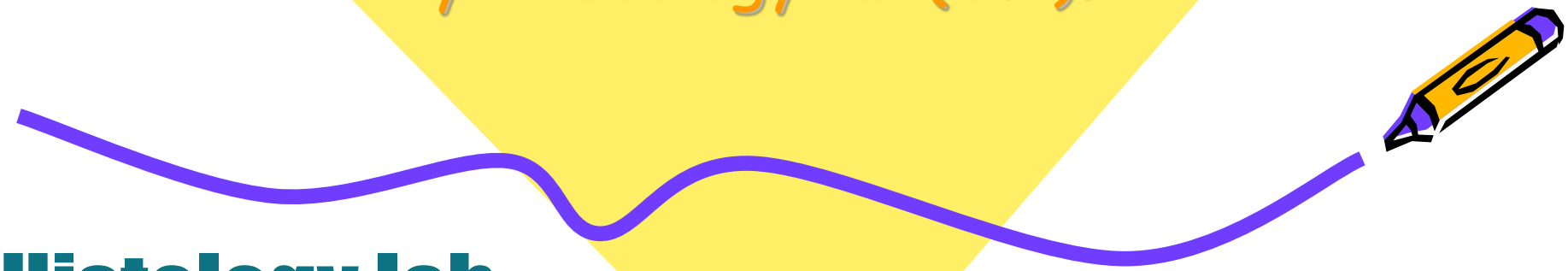
Respiretory System

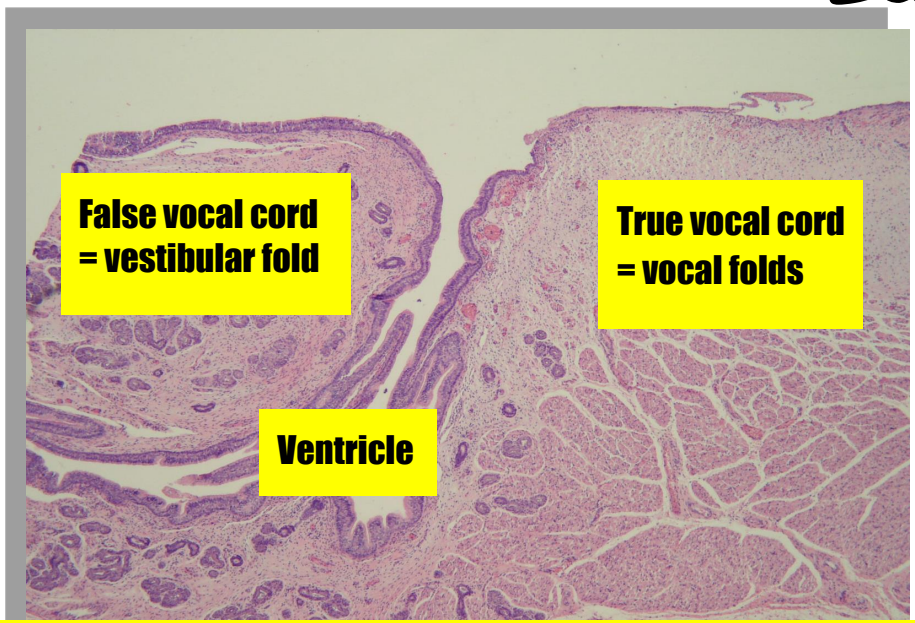
by :histology lab(SH).

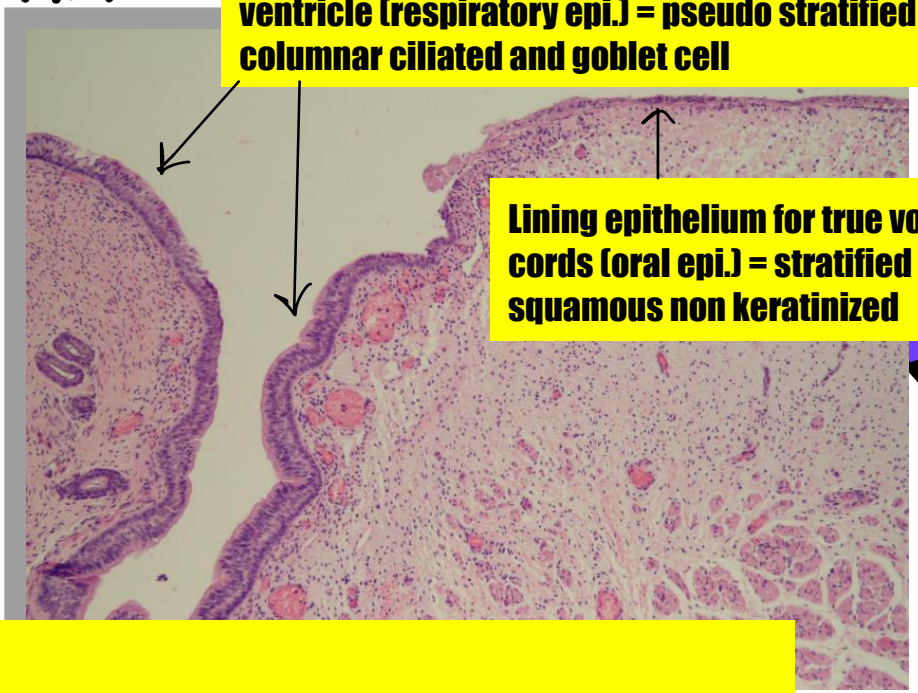


RS Histology lab

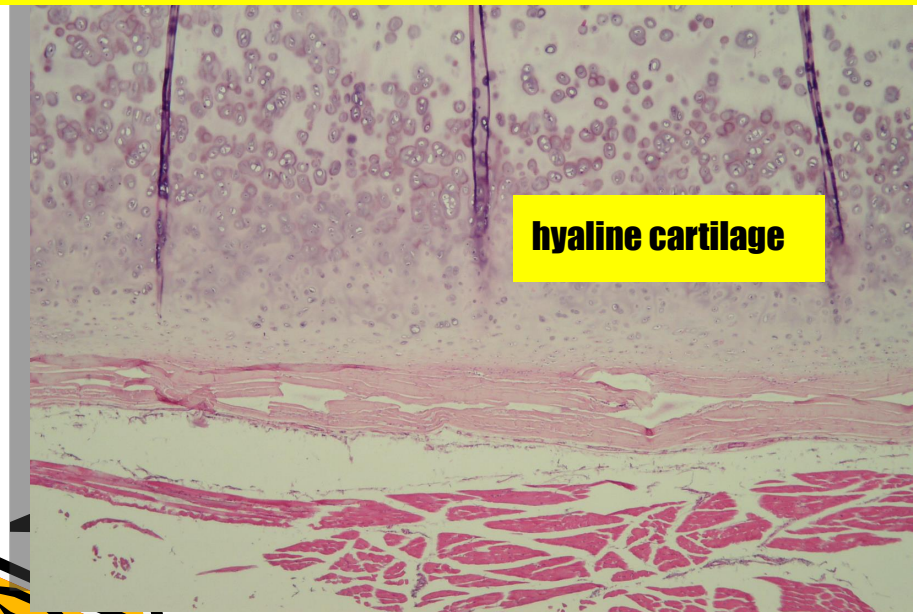
Modified by ; Ghaith Aldaboubi

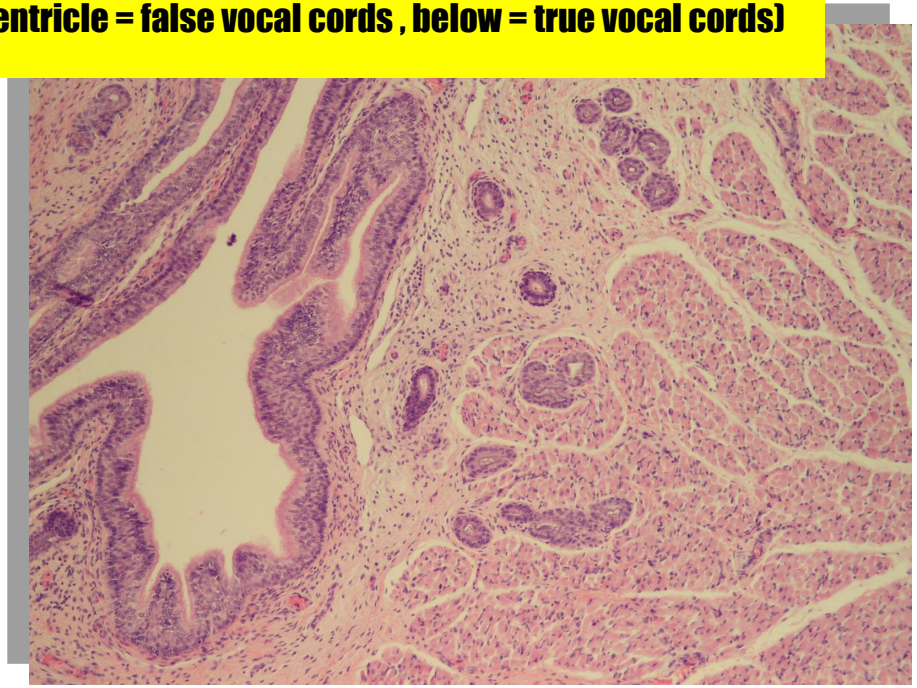
Larynx





Larynx ; box of hyaline cartilage , from inside we have mucosa
In this longitudinal section passes through ventricle (above the ventricle = false vocal cords , below = true vocal cords)





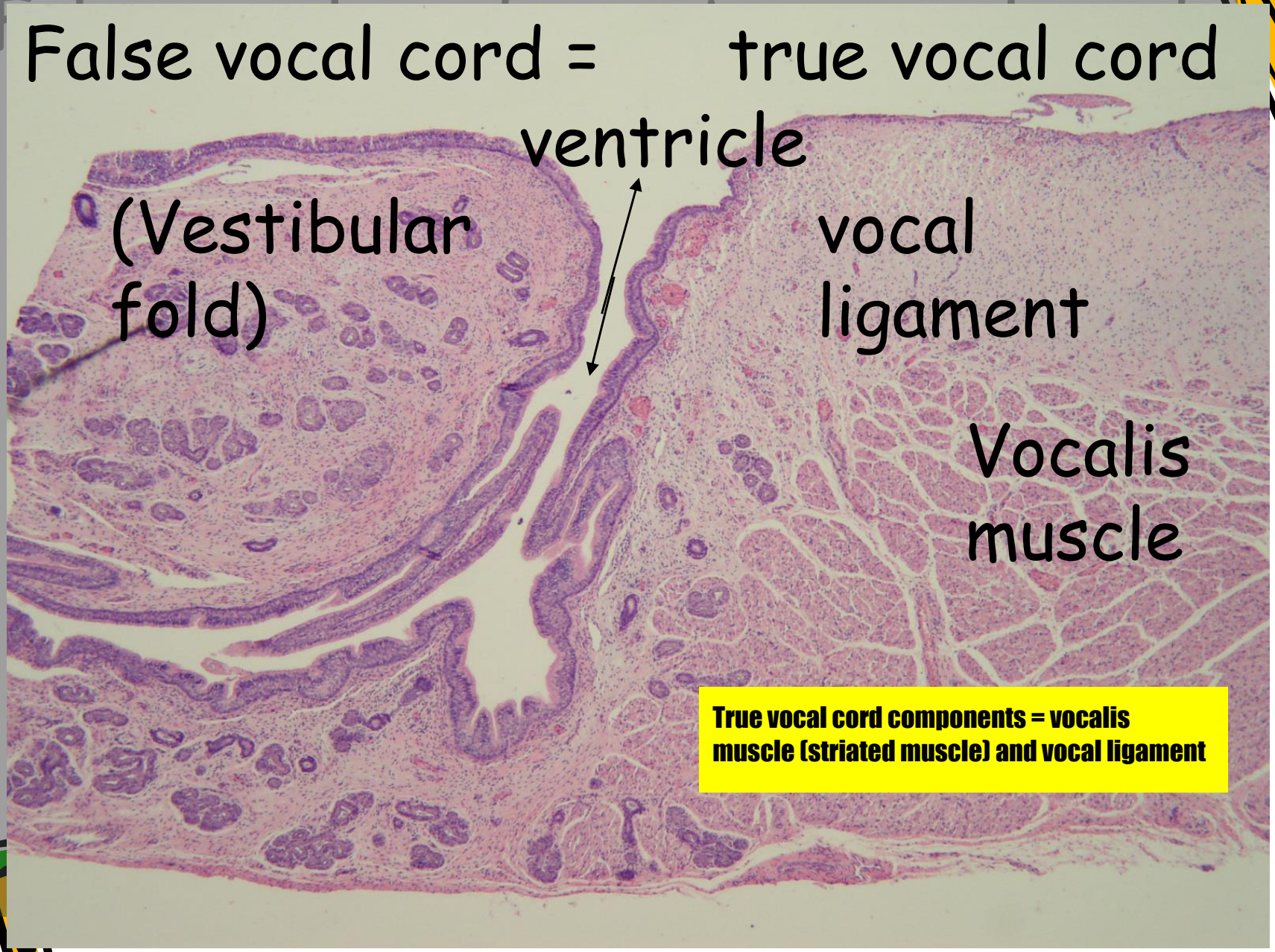
False vocal cord = (Vestibular fold)

ventricle

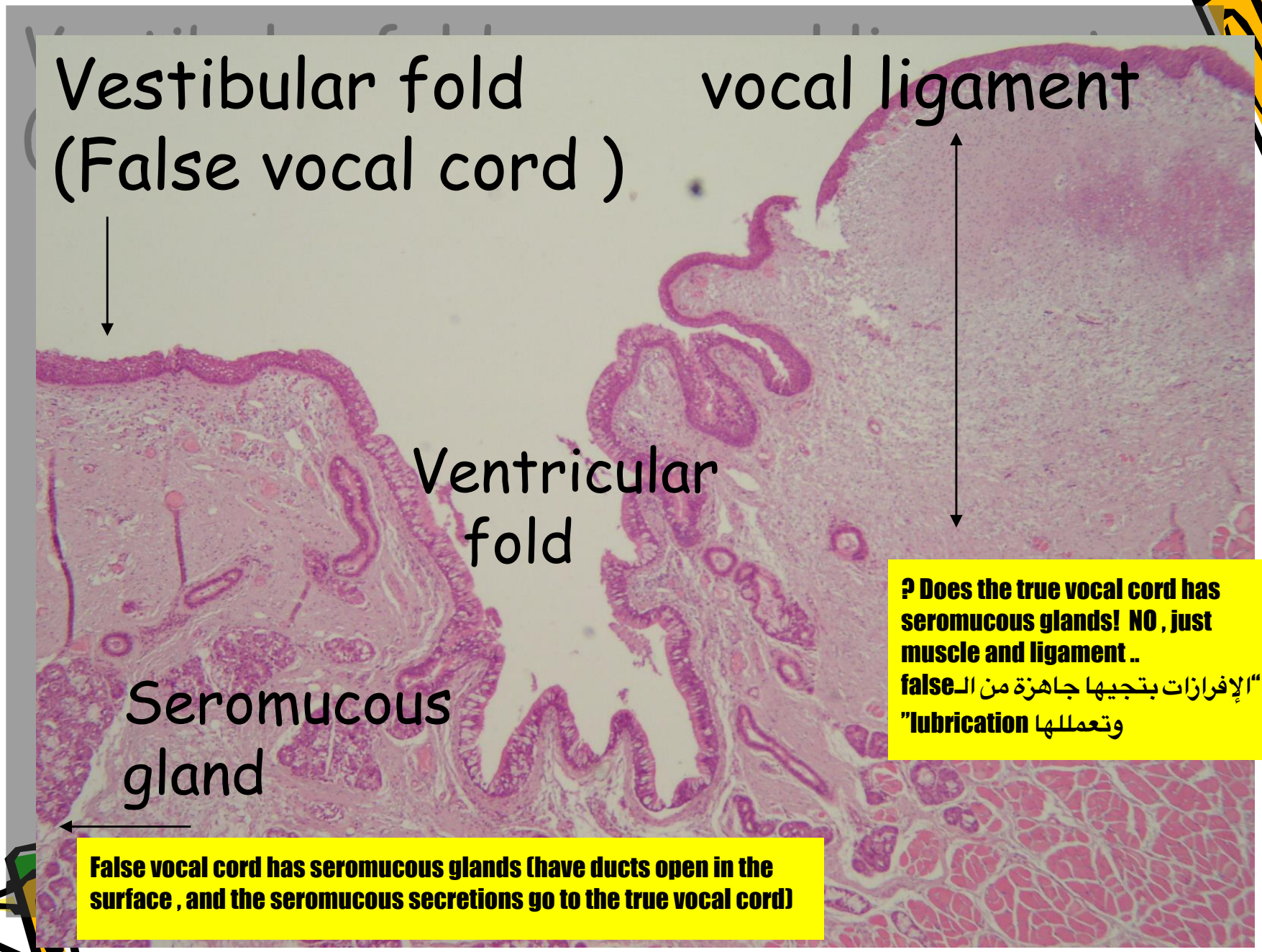
true vocal cord

vocal ligament

Vocalis muscle



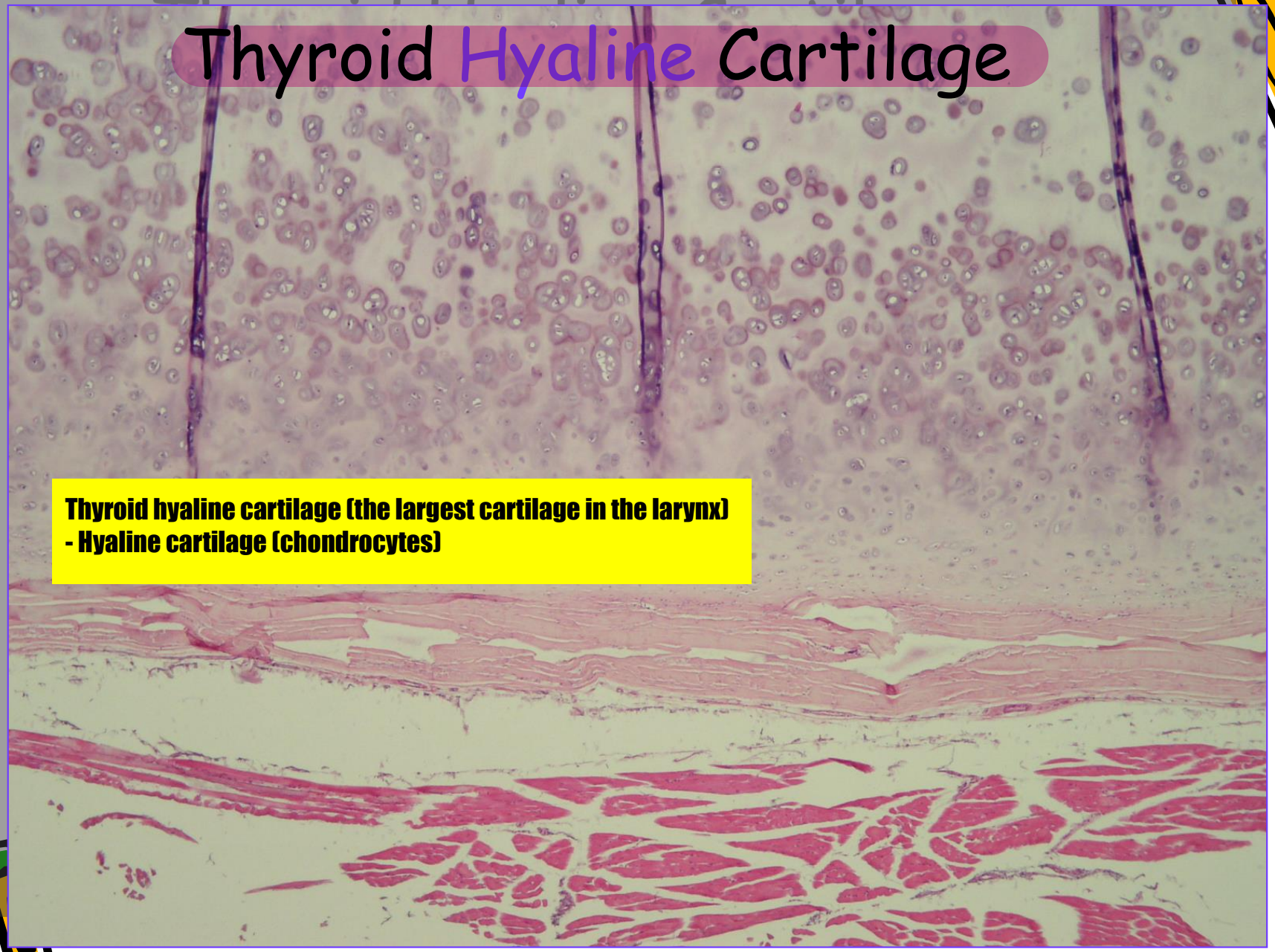
True vocal cord components = vocalis muscle (striated muscle) and vocal ligament



False vocal cord has seromucous glands (have ducts open in the surface , and the seromucous secretions go to the true vocal cord)

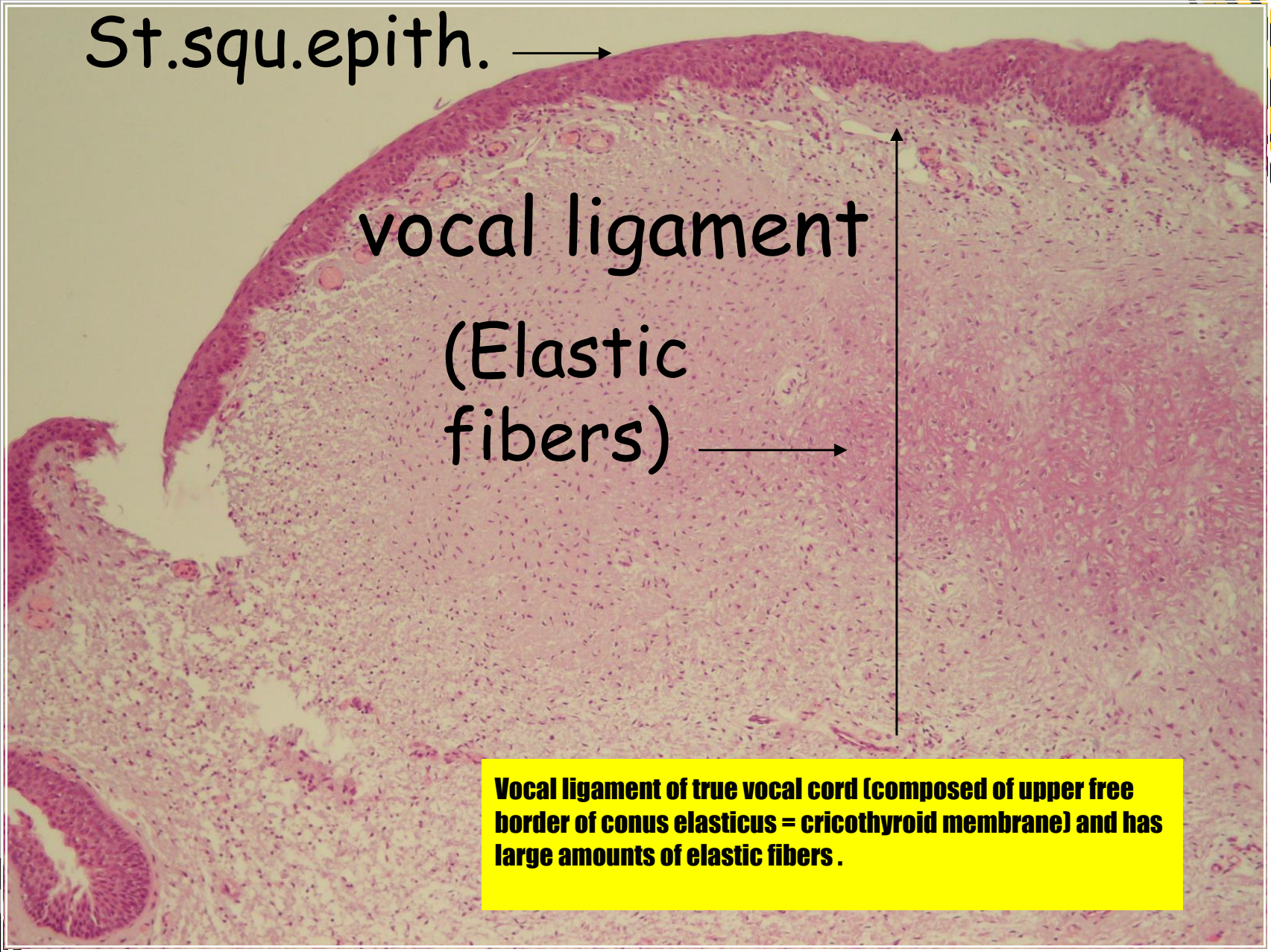
? Does the true vocal cord has seromucous glands! NO , just muscle and ligament ..
"الإفرازات بتجيها جاهزة من الـfalse وتعمللها lubrication"

Thyroid Hyaline Cartilage



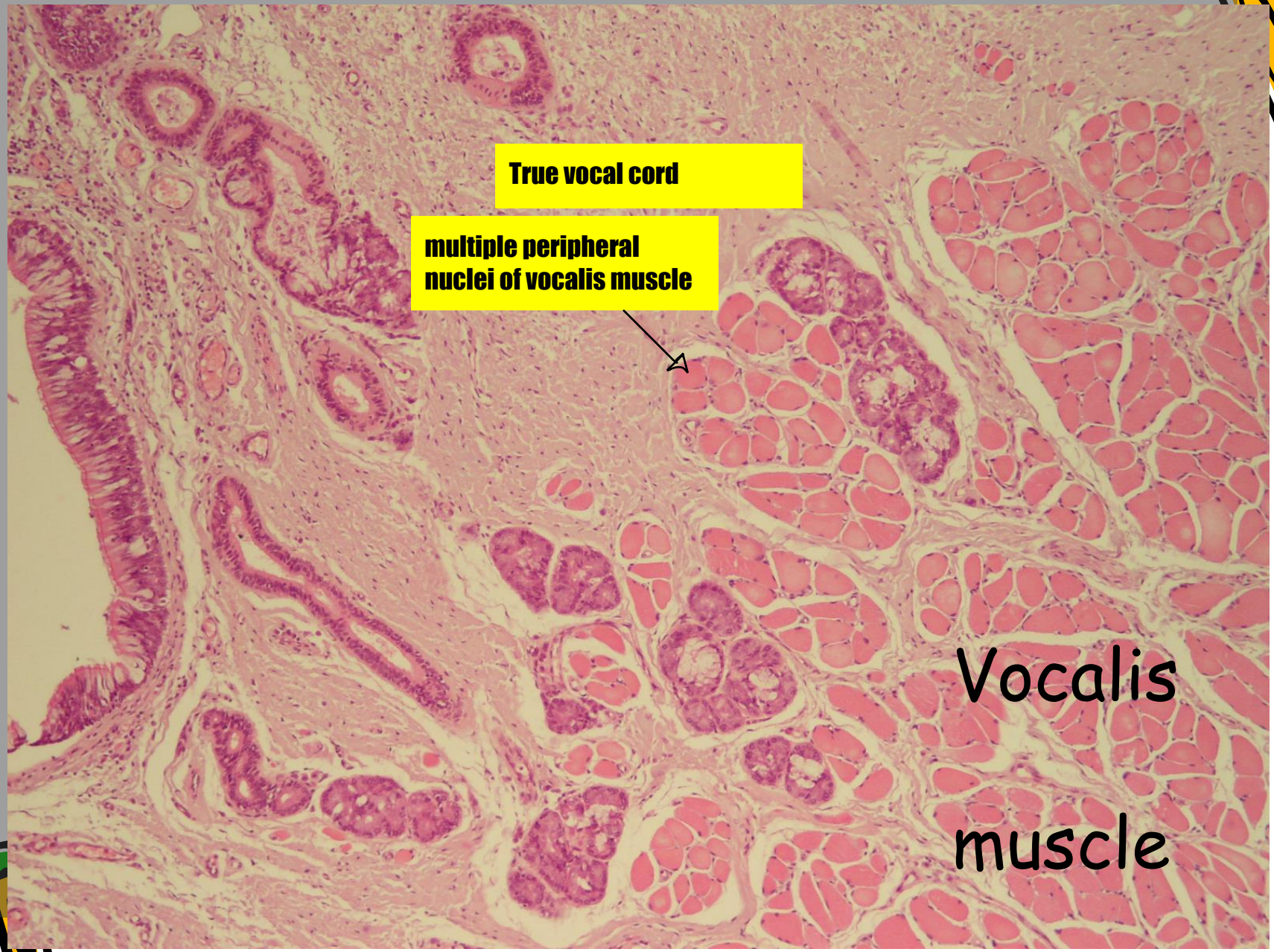
Thyroid hyaline cartilage (the largest cartilage in the larynx)
- Hyaline cartilage (chondrocytes)

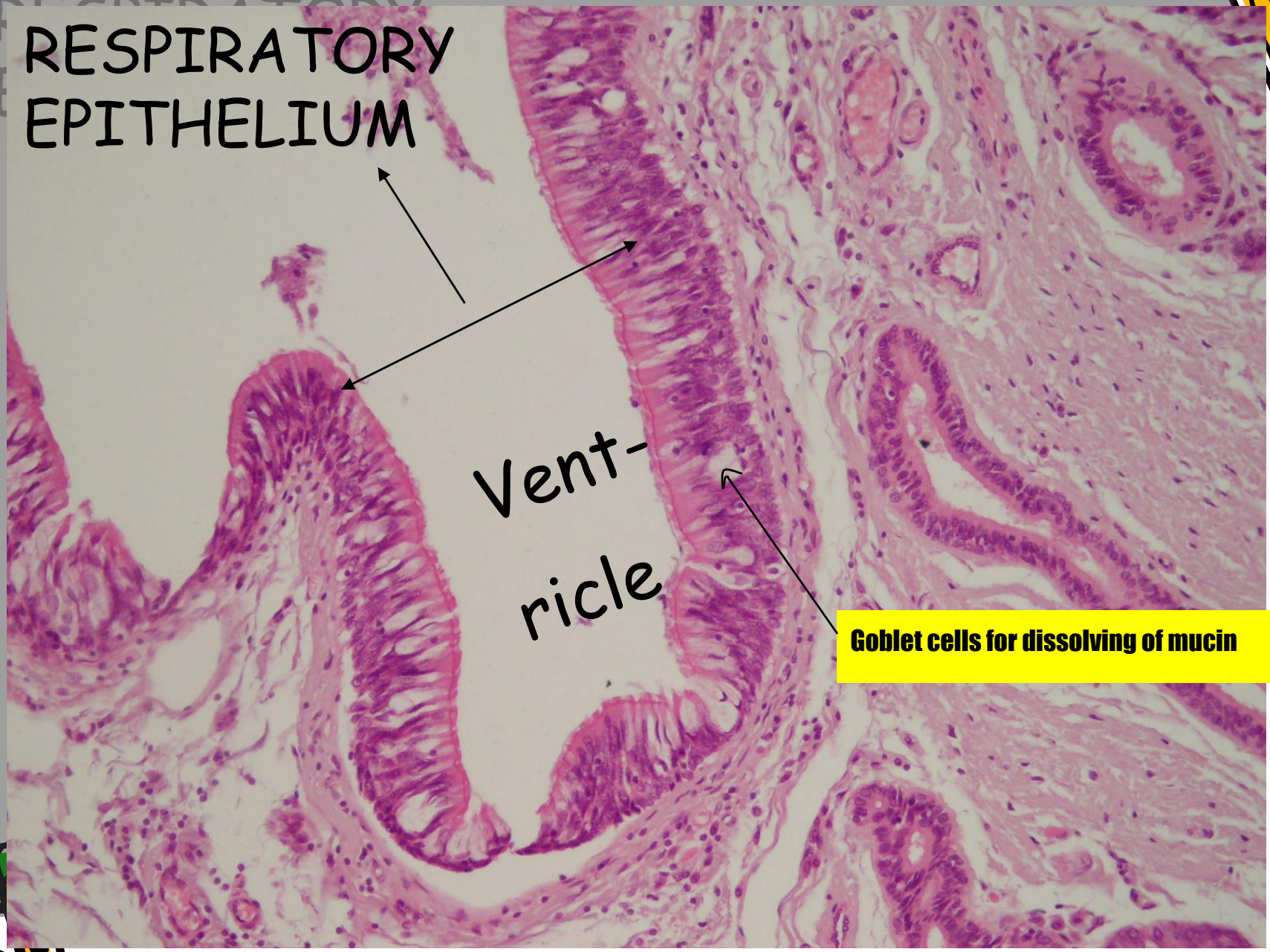
true vocal cord



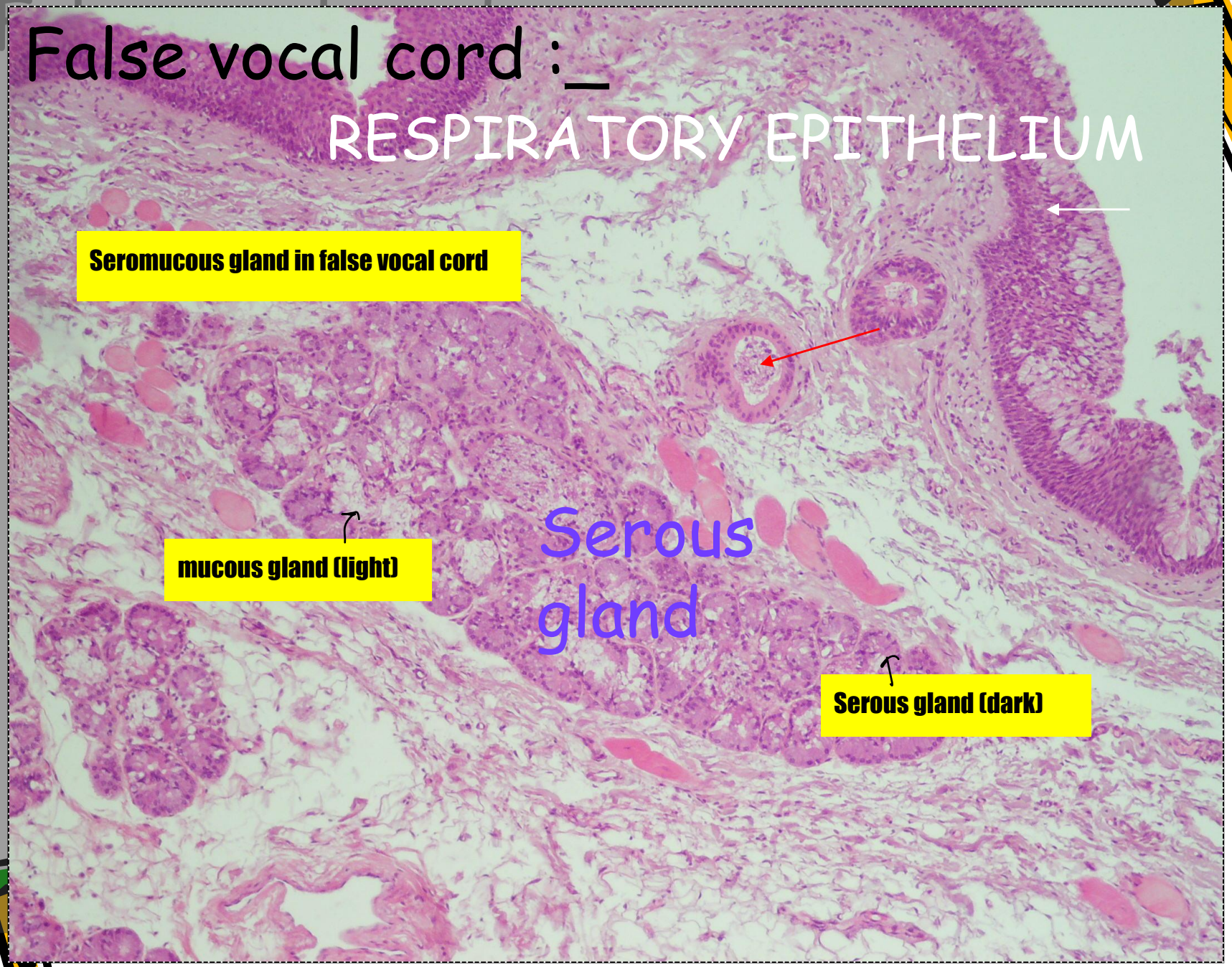
Vocal ligament of true vocal cord (composed of upper free border of conus elasticus = cricothyroid membrane) and has large amounts of elastic fibers .

Vocalis muscle of true vocal cord = striated muscle " the nucleus located peripherally" "peripheral nuclei"

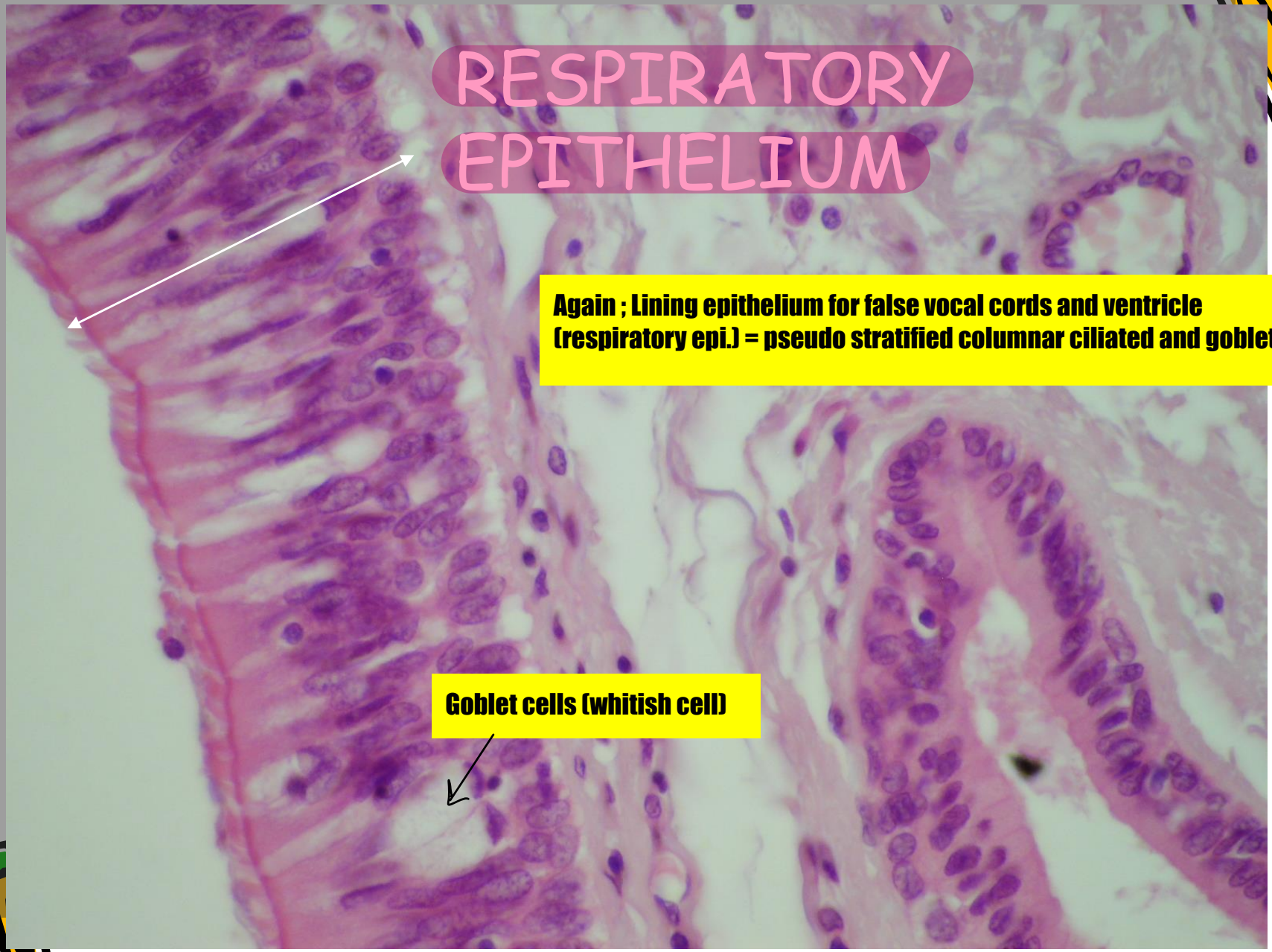

True vocal cord
multiple peripheral nuclei of vocalis muscle
Vocalis muscle


RESPIRATORY EPITHELIUM
Vent-
ricle
Goblet cells for dissolving of mucin

False vocal cord :_



RESPIRATORY EPITHELIUM

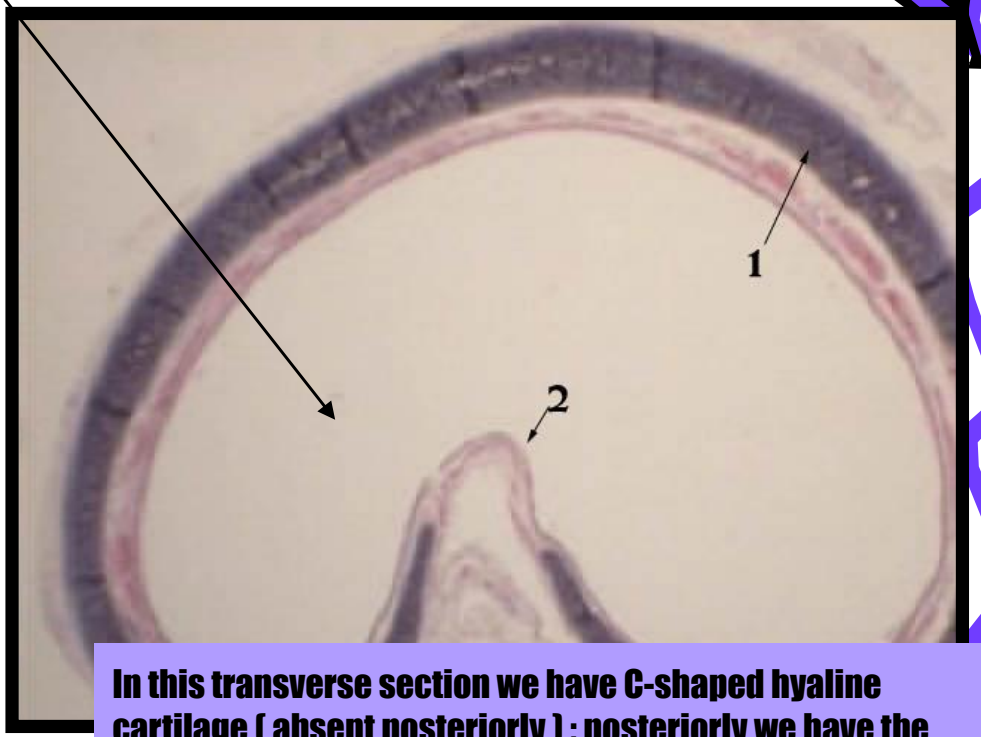


Again ; Lining epithelium for false vocal cords and ventricle (respiratory epi.) = pseudo stratified columnar ciliated and goblet cell

Goblet cells (whitish cell)

We finished the larynx part, so let's start now with the trachea ⤵️

C-SHAPE **TRACHEA**- transeverse section

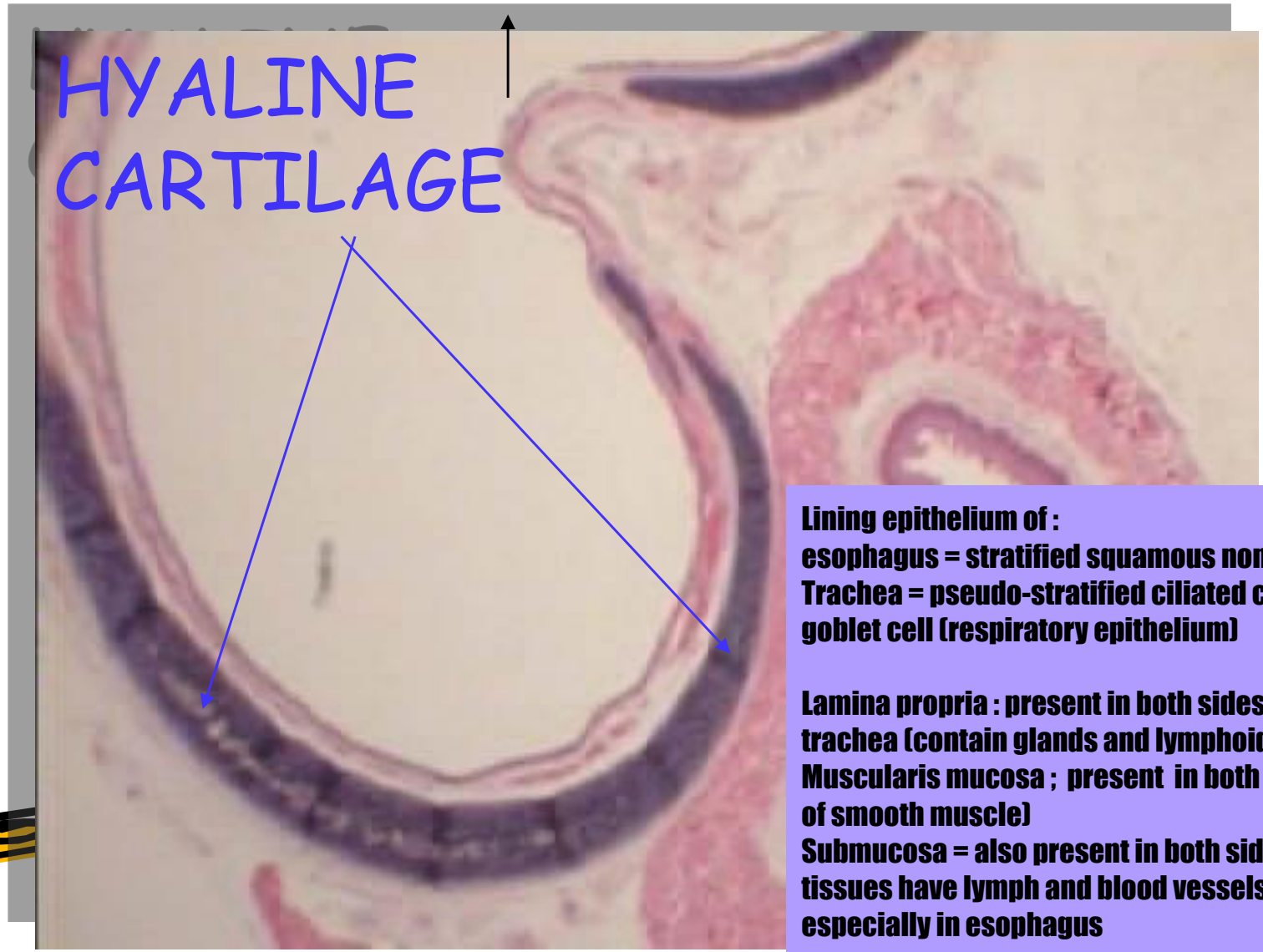


ESOPHAGUS- posteriorly

In this transverse section we have C-shaped hyaline cartilage (absent posteriorly) ; posteriorly we have the trachealis muscle (smooth muscle-innervated by ANS) + esophagus.
(trachea lied anterior to the esophagus)

- esophagus = collapsed lumen ; open during bolus descending
- Trachea = always open ; because of C-shaped hyaline cartilage for the passage of air.

TRACHEALIS (SMOOTH) MUSCLE



Lining epithelium of :
esophagus = stratified squamous non keratinized
Trachea = pseudo-stratified ciliated columnar and goblet cell (respiratory epithelium)

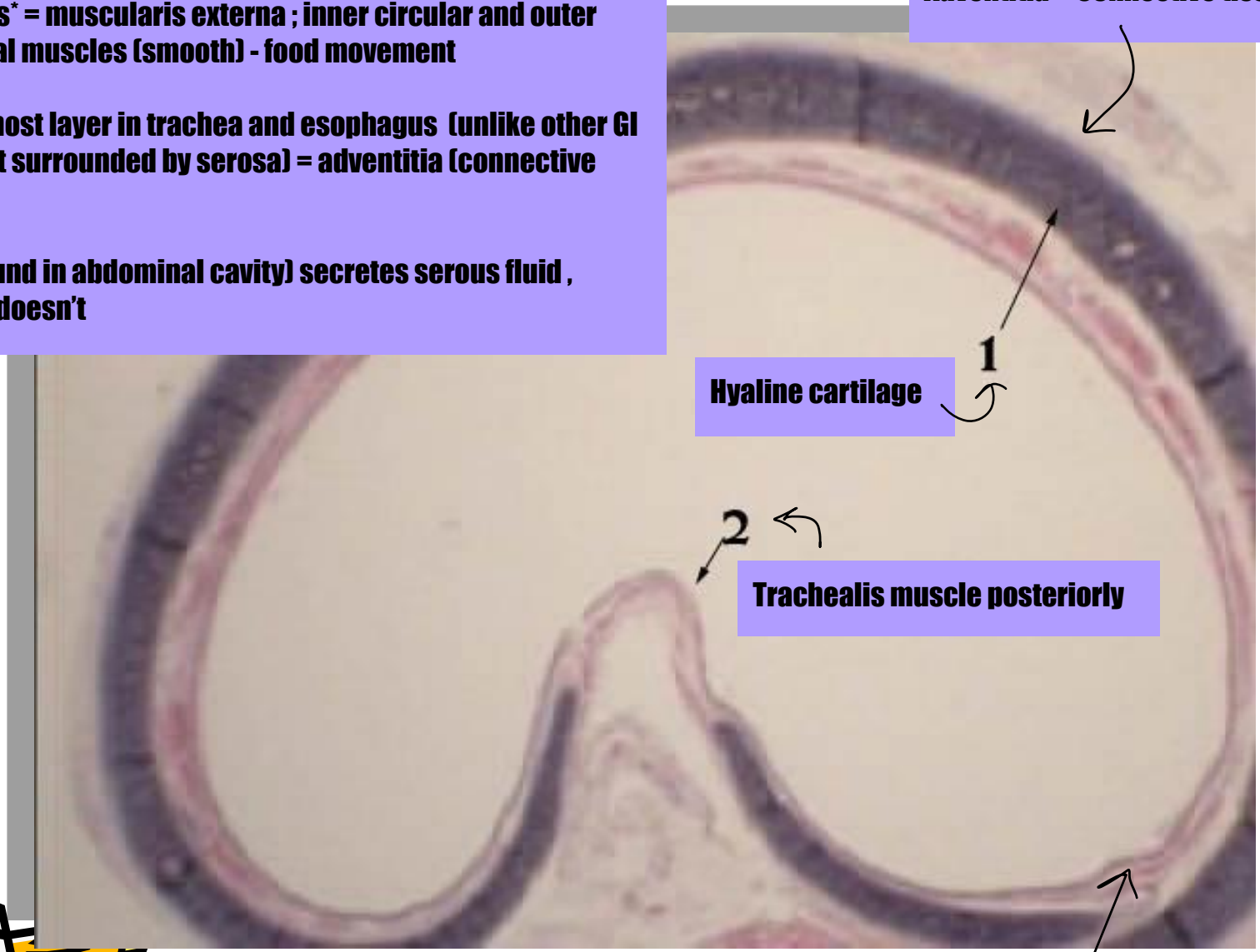
Lamina propria : present in both sides of esophagus and trachea (contain glands and lymphoid tissues)
Muscularis mucosa ; present in both side (thin ribbon of smooth muscle)
Submucosa = also present in both side (connective tissues have lymph and blood vessels, glands especially in esophagus

After submucosa in
trachea we have supportive layer = hyaline cartilage + smooth muscle
esophagus = muscularis externa ; inner circular and outer longitudinal muscles (smooth) - food movement

The outermost layer in trachea and esophagus (unlike other GI organs that surrounded by serosa) = adventitia (connective tissue)

Serosa (found in abdominal cavity) secretes serous fluid , adventitia doesn't

Adventitia = Connective tissue



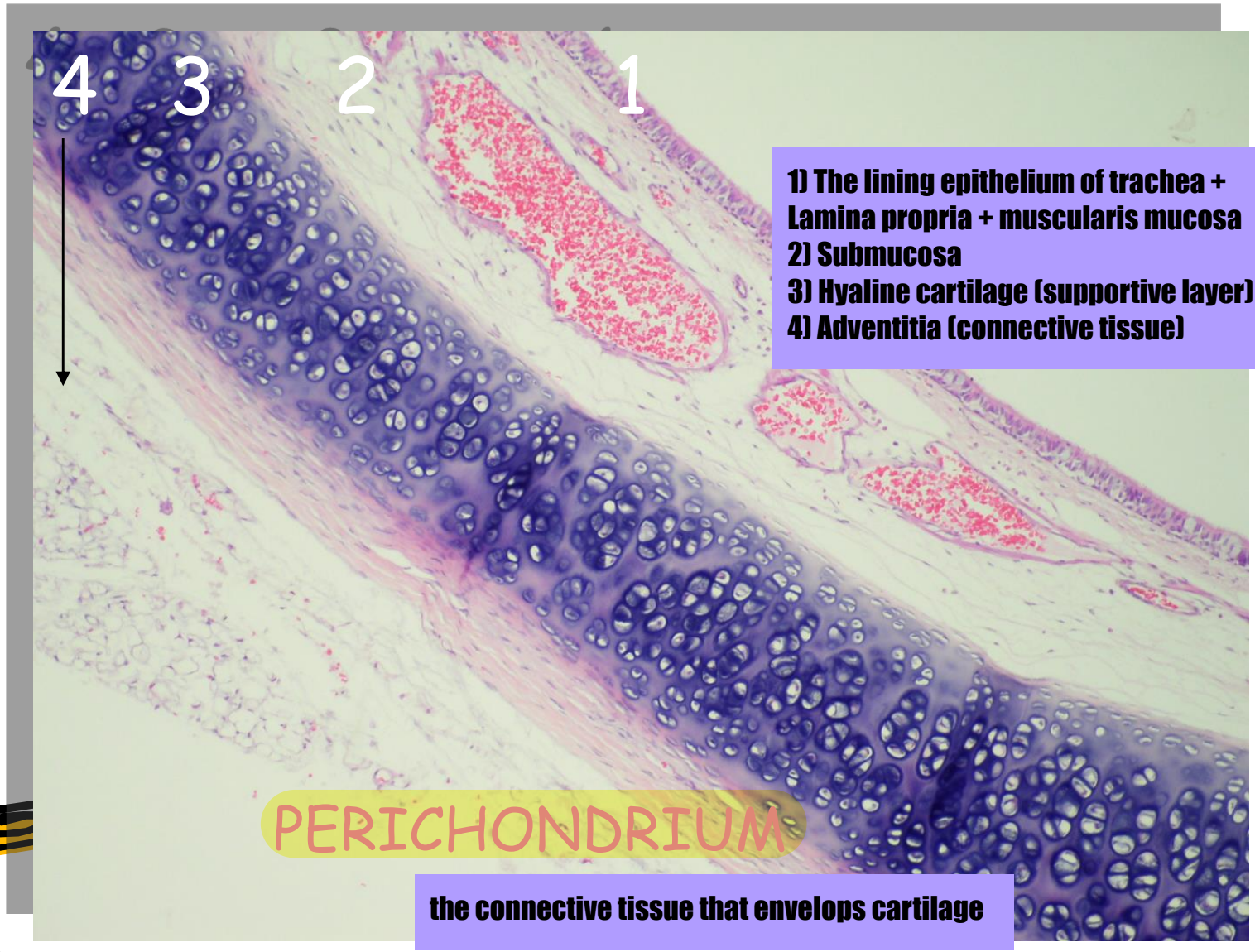
Hyaline cartilage

Trachealis muscle posteriorly

The lining epithelium of trachea : pseudo-stratified columnar ciliated with goblet cells
Lamina propria and muscularis mucosa (3 layers)

TRACHEALIS (SMOOTH) MUSCLE

MUCOSA ,SUBMUCOSA,CARTILAGE.ADVENTITIA



1) The lining epithelium of trachea + Lamina propria + muscularis mucosa
2) Submucosa
3) Hyaline cartilage (supportive layer)
4) Adventitia (connective tissue)

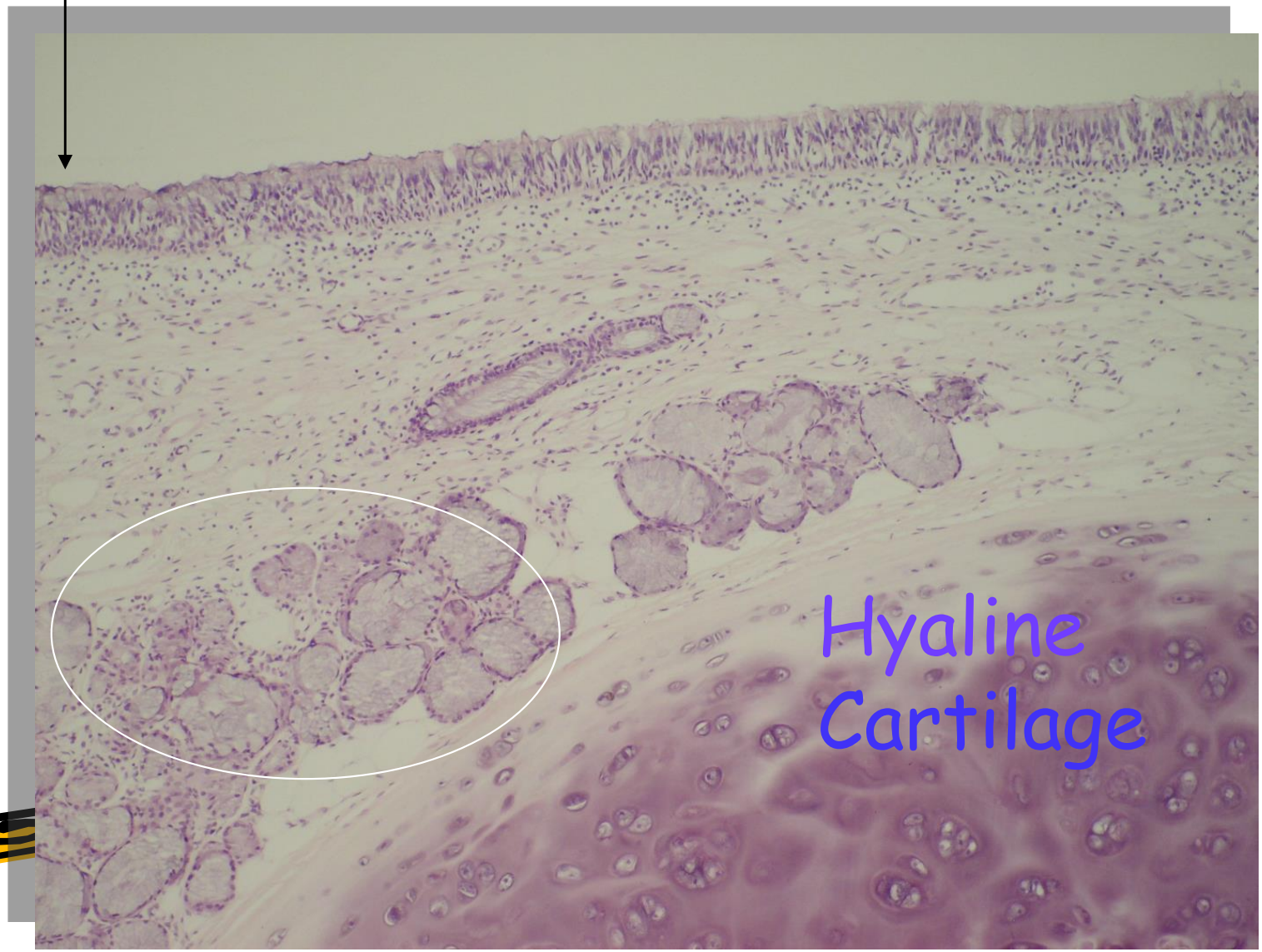
PERICHONDRIUM

the connective tissue that envelops cartilage

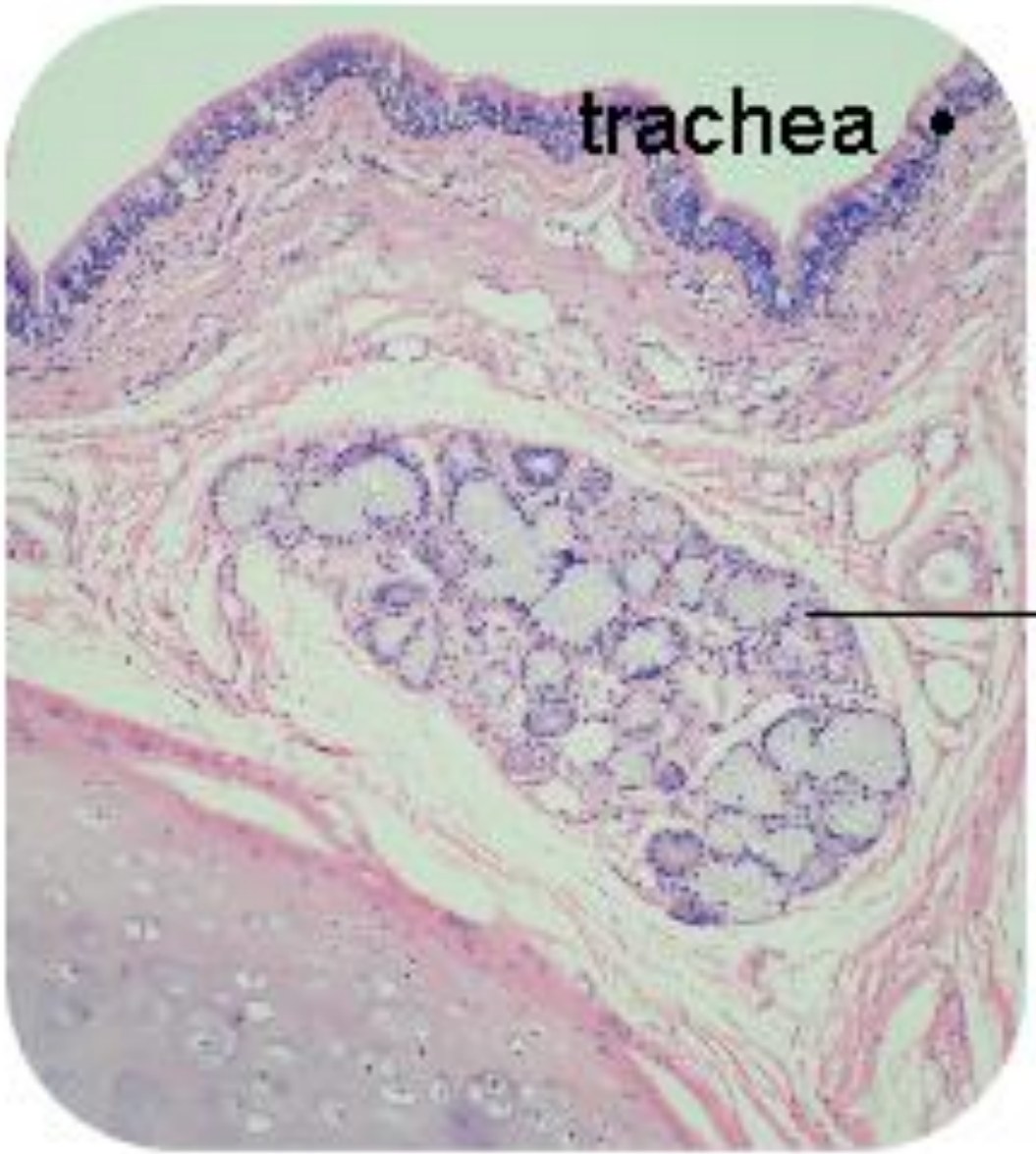
Seromucous gland present in Lamina propria + Submucosa , and has a duct open on the lumen

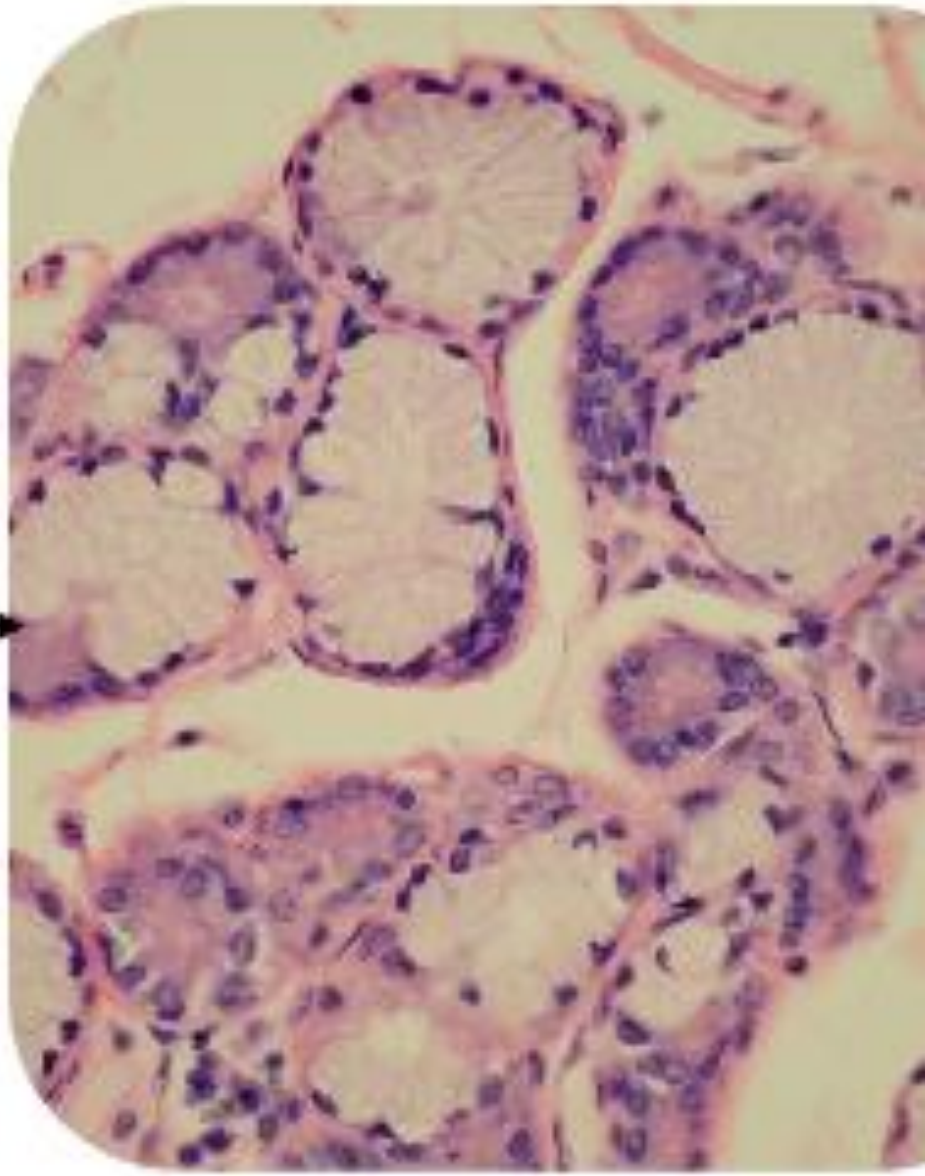
a seromucous gland in Lamina propria may extend to Submucosa

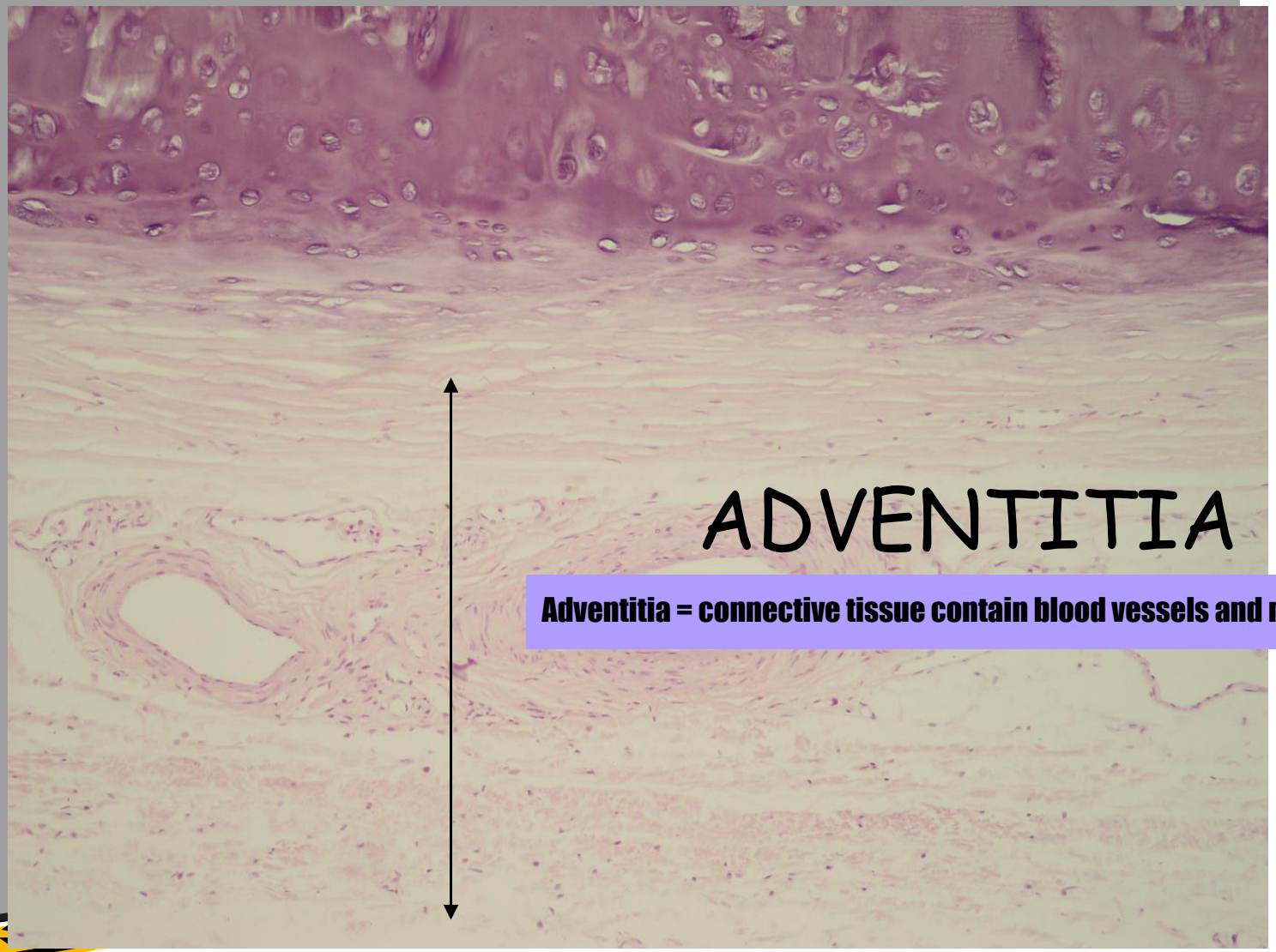
RESPIRATORYEPITHELIUM TRACHEAL GLAND IN SUBMUCOSA



Branched seromucous gland





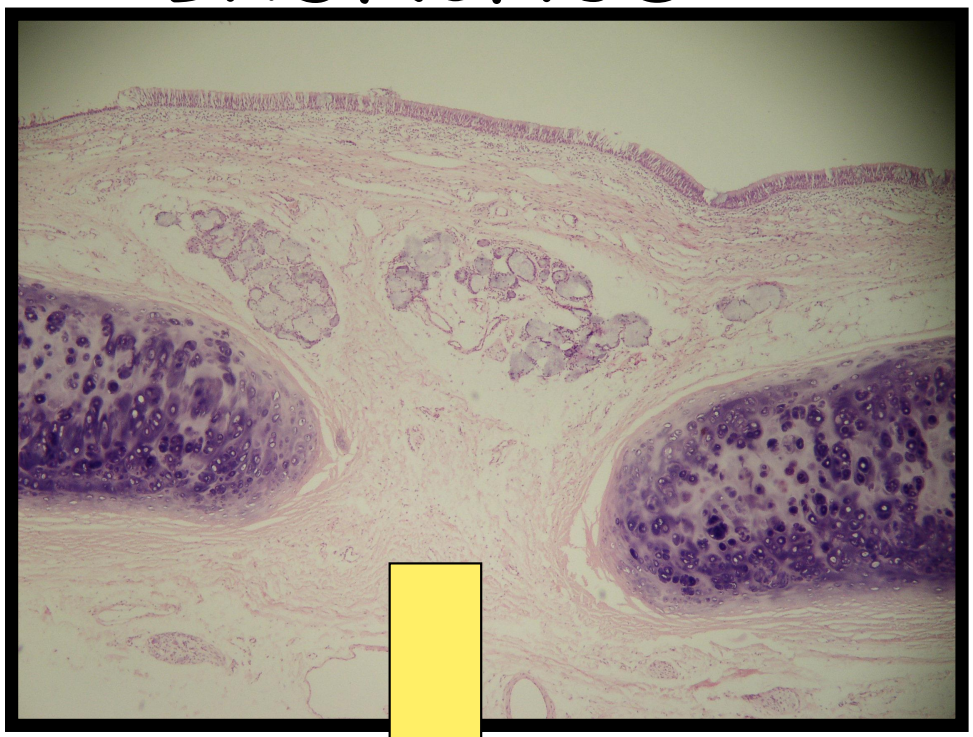


ADVENTITIA

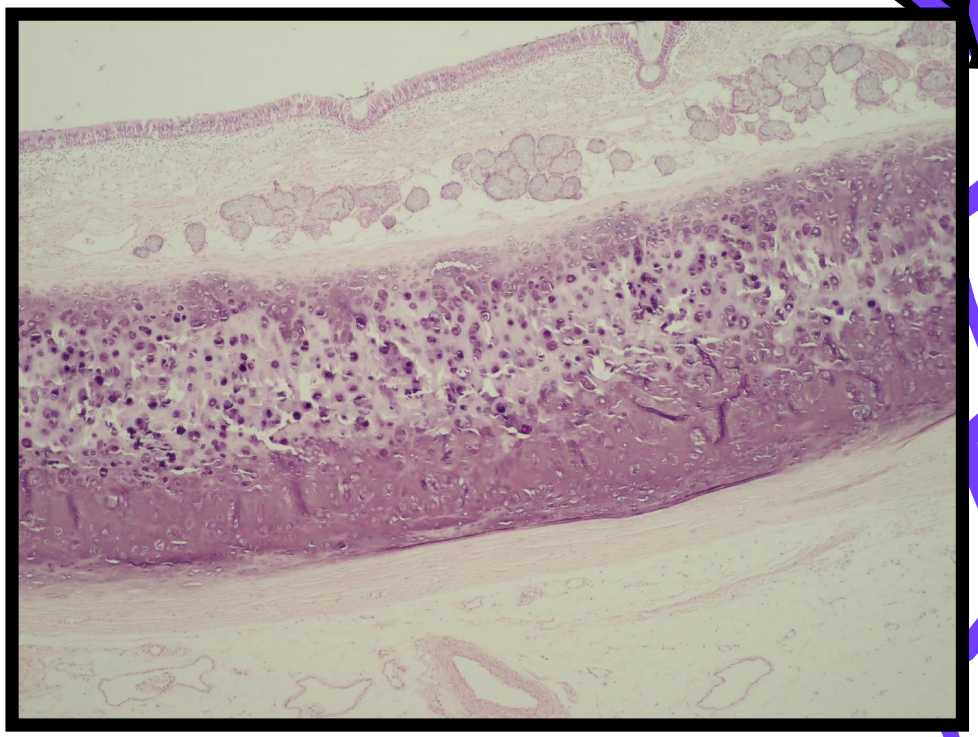
Adventitia = connective tissue contain blood vessels and nerve fibers

Let's compare Between the trachea and extrapulmonary bronchus (1° main bronchi) (right and left) : outside the lung , no lung tissue around it.

EXTRAPULMONARY BRONCHUS



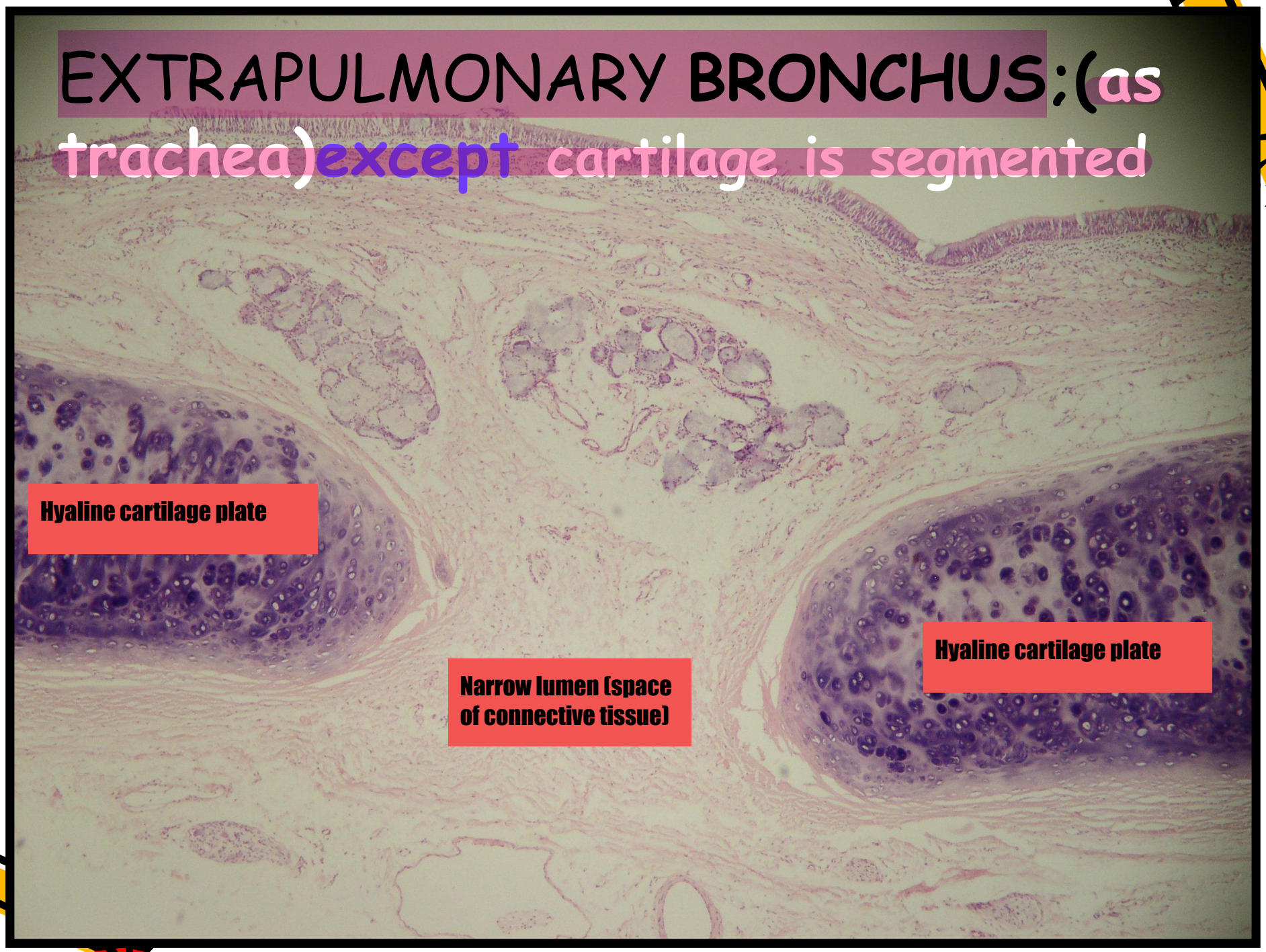
TRACHEA



Instead of C-shaped hylaine cartilage that surrounded the trachea
we have here in Extrapulmonary bronchi plates of this cartilage (in high number)
surrounding the lumen " The space between two plates : narrow space"

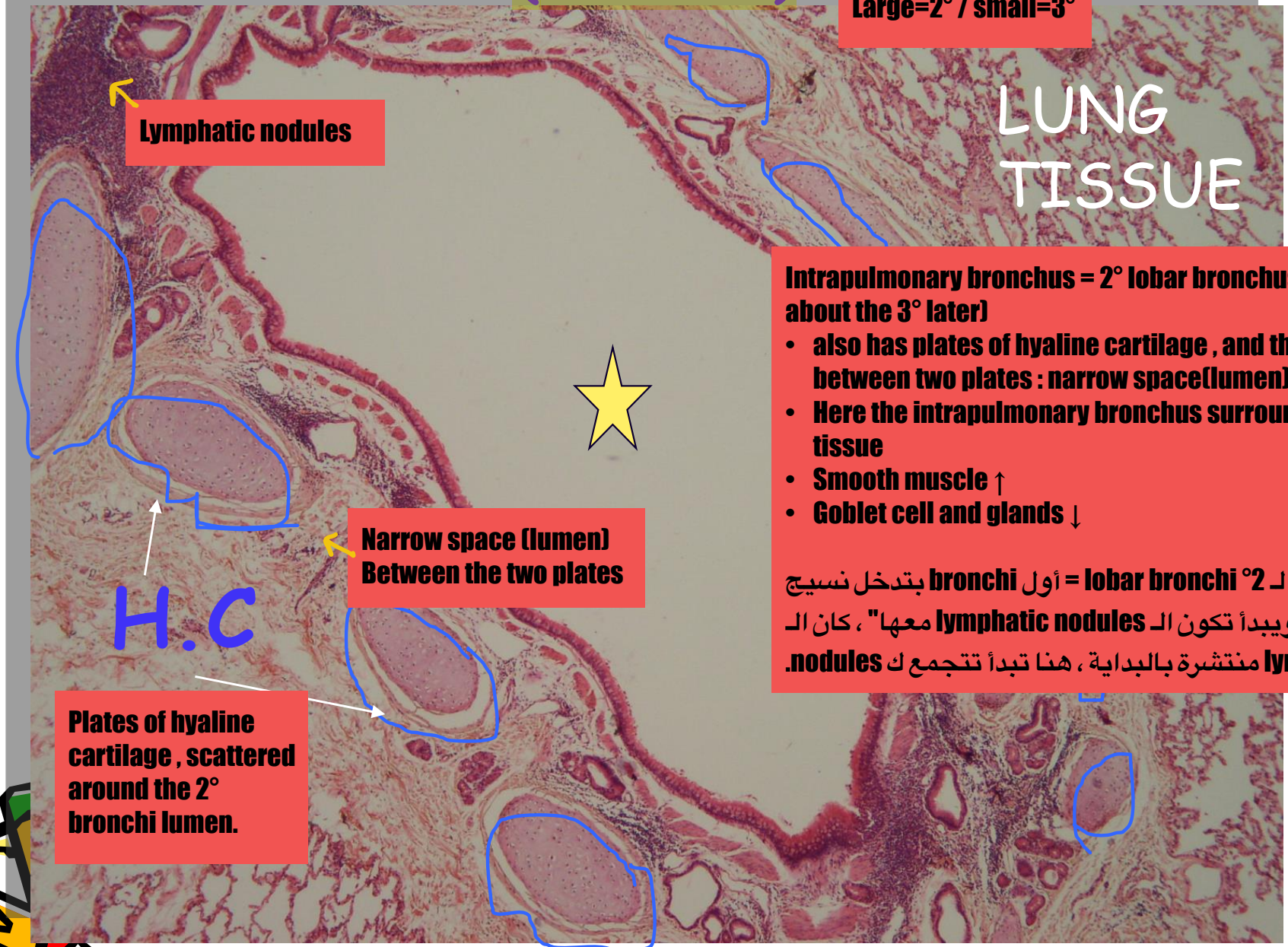
Other layers are the same to trachea (lining epi. - lamina propria - etc) .

EXTRAPULMONARY BRONCHUS:(as trachea)except cartilage is segmented



INTRAPULMONARY BRONCHUS (LARGE)

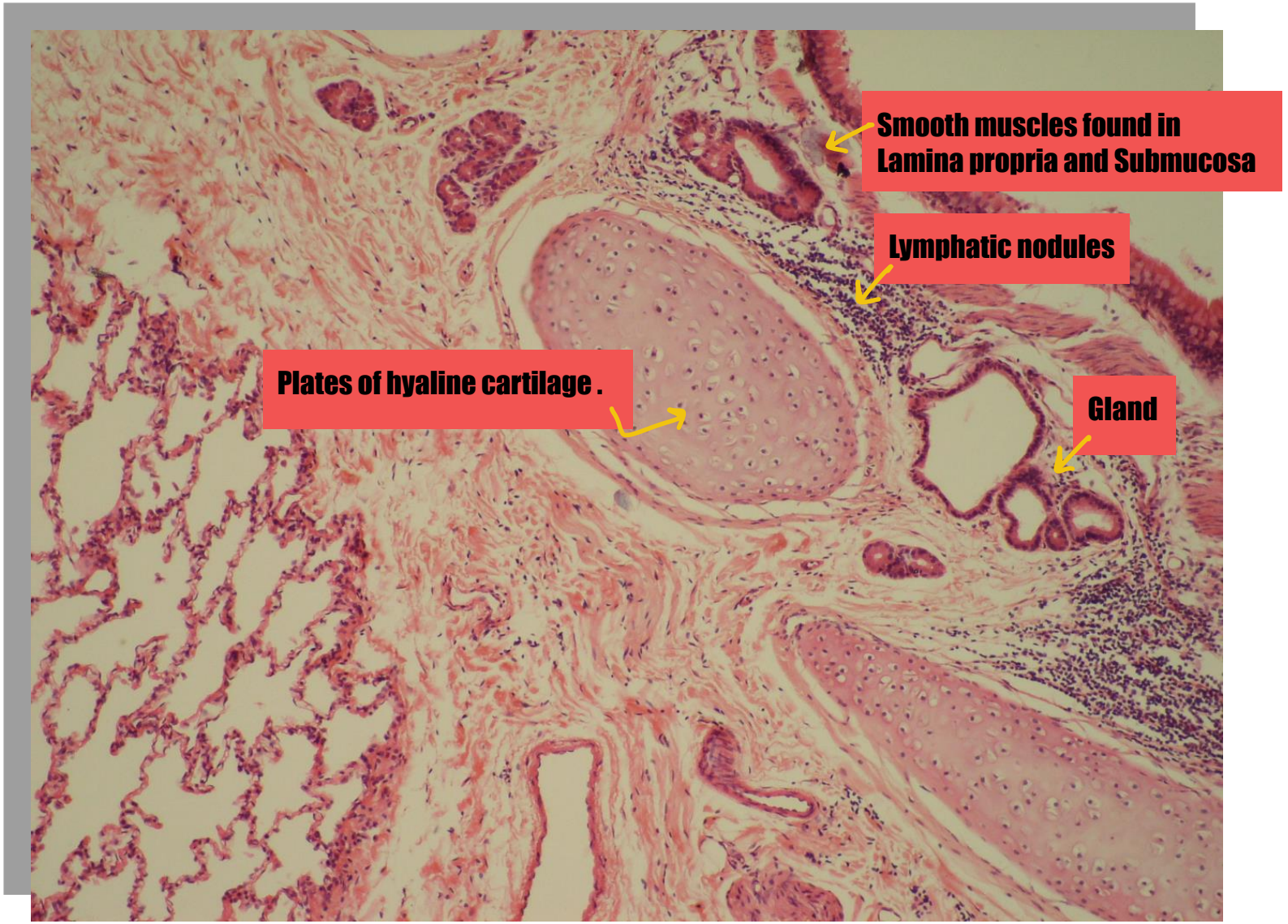
Large=2° / small=3°



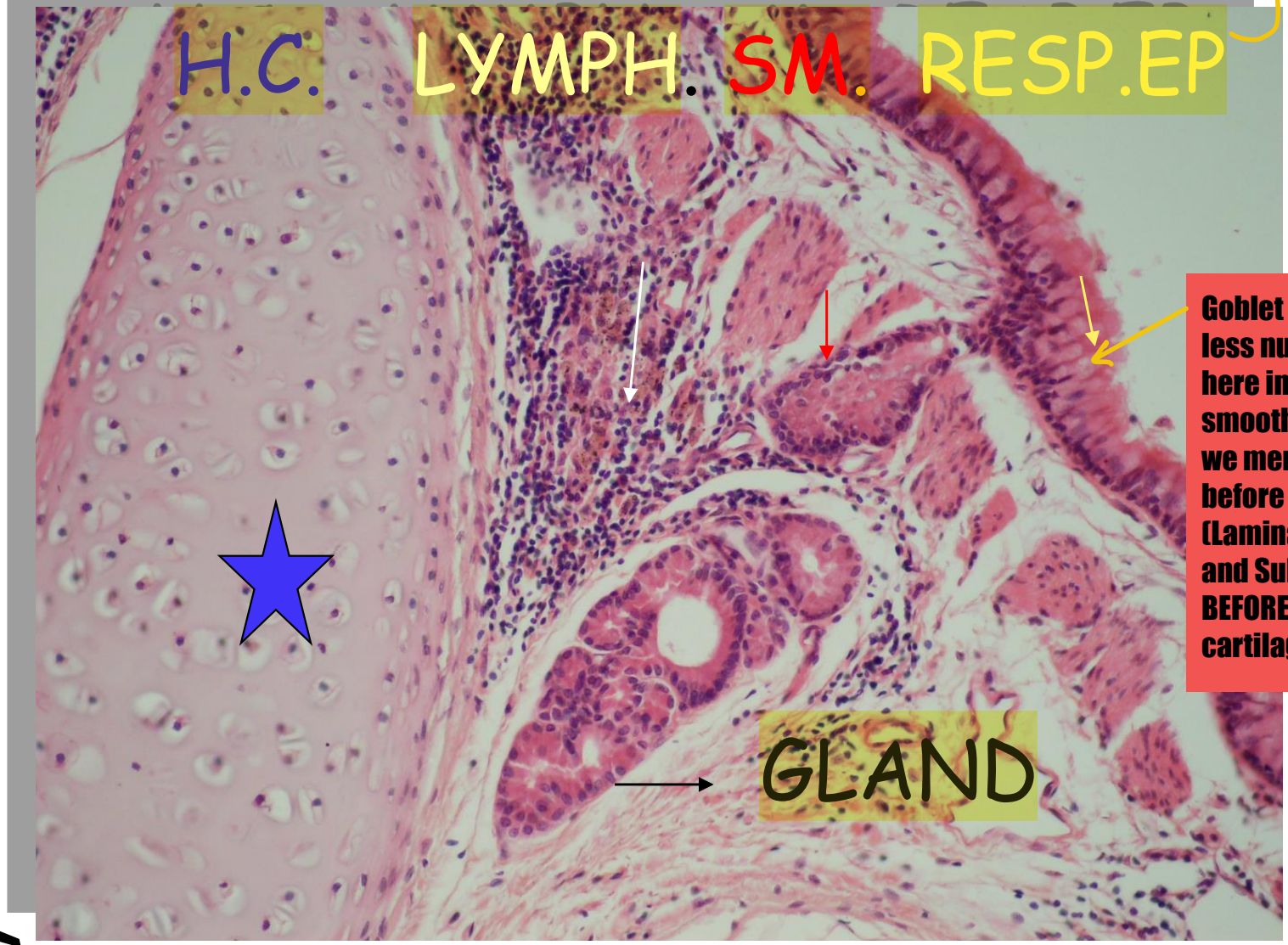
Intrapulmonary bronchus = 2° lobar bronchus (we will talk about the 3° later)

- also has plates of hyaline cartilage , and the space between two plates : narrow space(lumen)
- Here the intrapulmonary bronchus surrounded by lung tissue
- Smooth muscle ↑
- Goblet cell and glands ↓

"أحد ميزات الـ 2° lobar bronchi = أول bronchi بتدخل نسيج الرئة ويبدأ تكون الـ lymphatic nodules معها" ، كان الـ lymphatic cells منتشرة بالبداية ، هنا تبدأ تتجمع ك nodules.

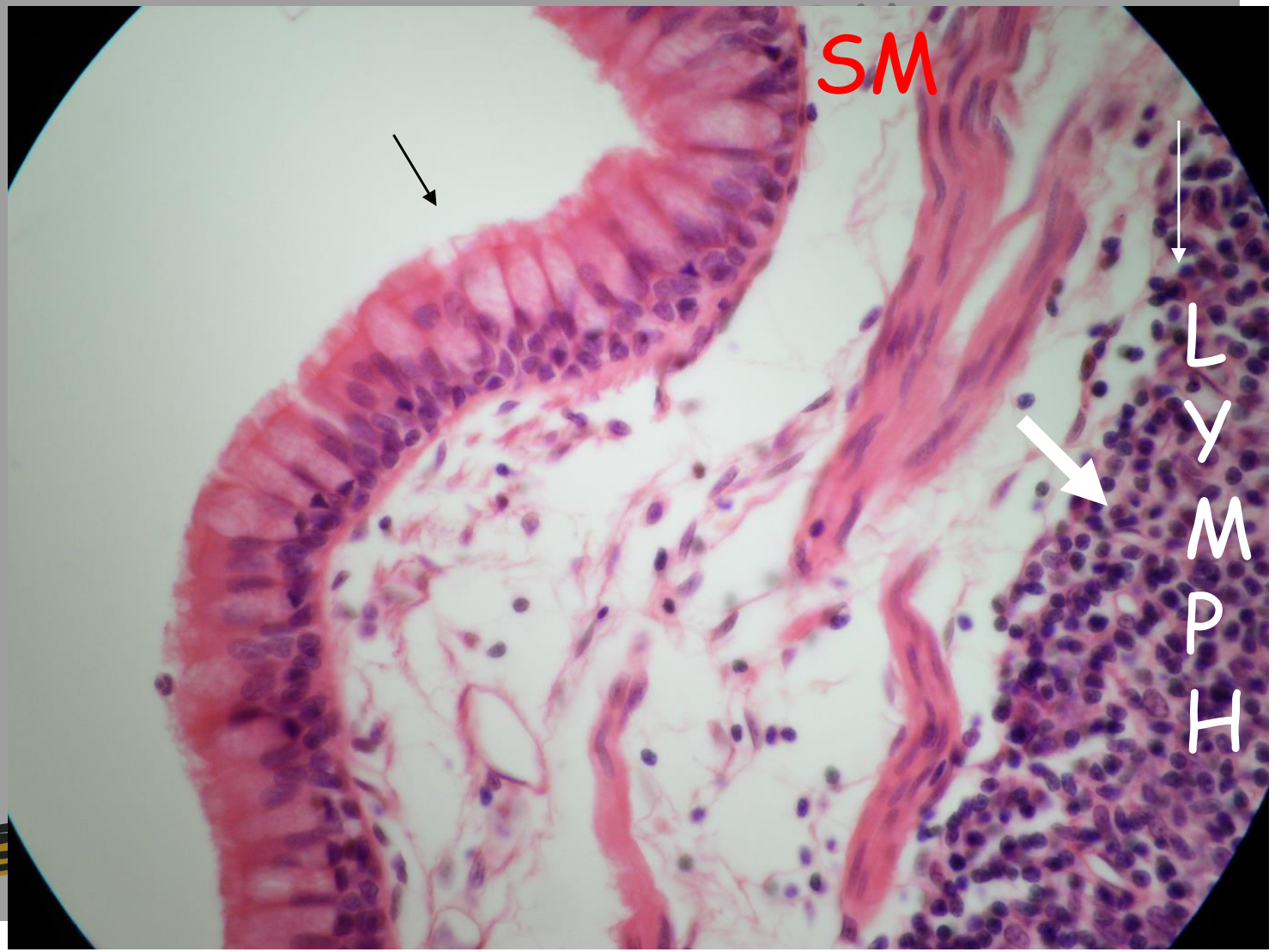

Smooth muscles found in
Lamina propria and Submucosa
Lymphatic nodules
Plates of hyaline cartilage .
Gland

Pseudo-stratified columnar ciliated with less goblet cell than (trachea and 1° bronchus)



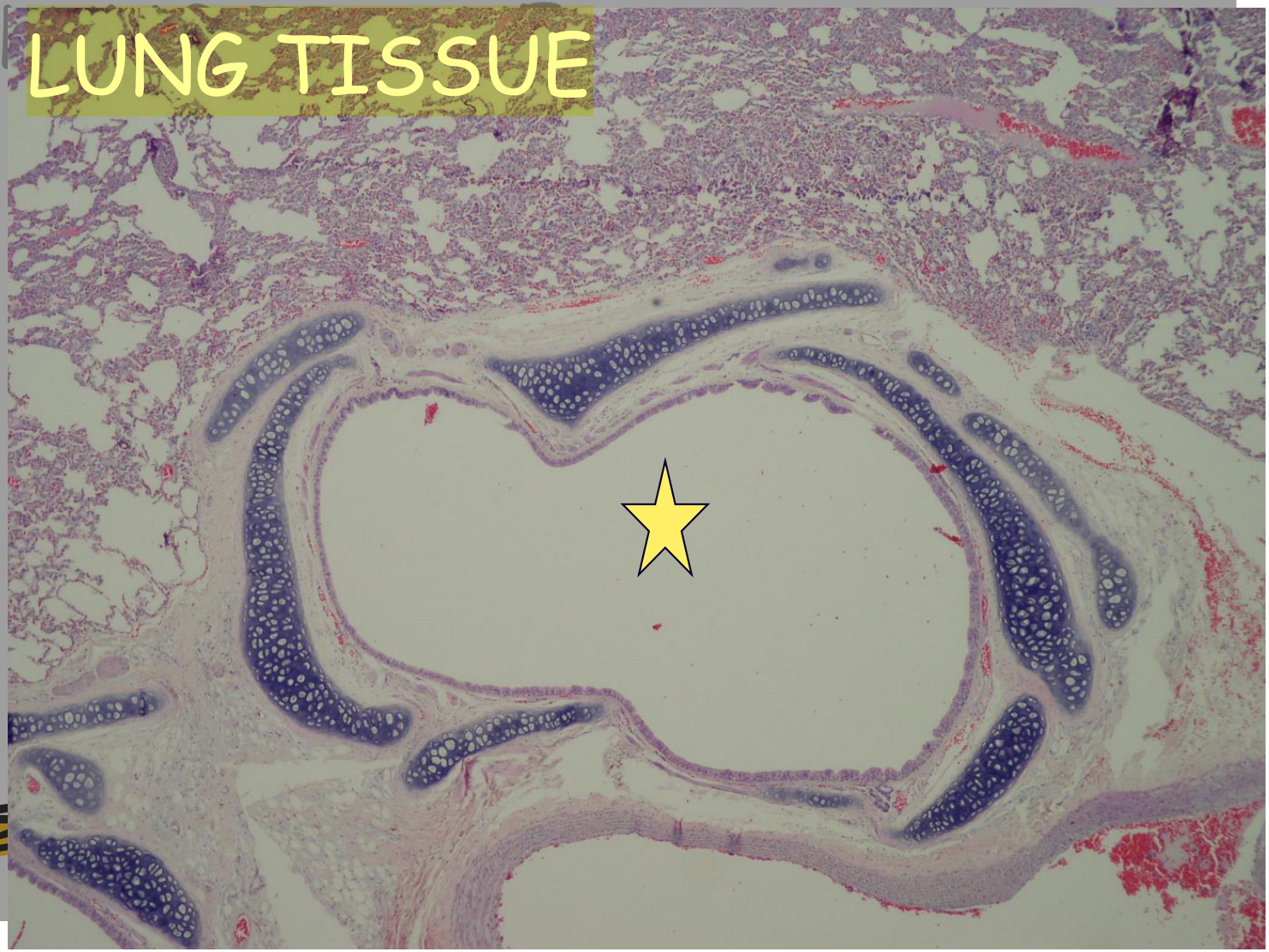
Goblet cell are less numerous here in 2° bronchi , smooth muscle as we mentioned before located in (Lamina propria and Submucosa) BEFORE the hyaline cartilage.

PSEUDOSTRATIFIEDCOLUMNAR CILIATED +GOBLET CELL



INTRAPULMONARY BRONCHUS- LARGE

so it isn't extra-Pulm. (not 1°)

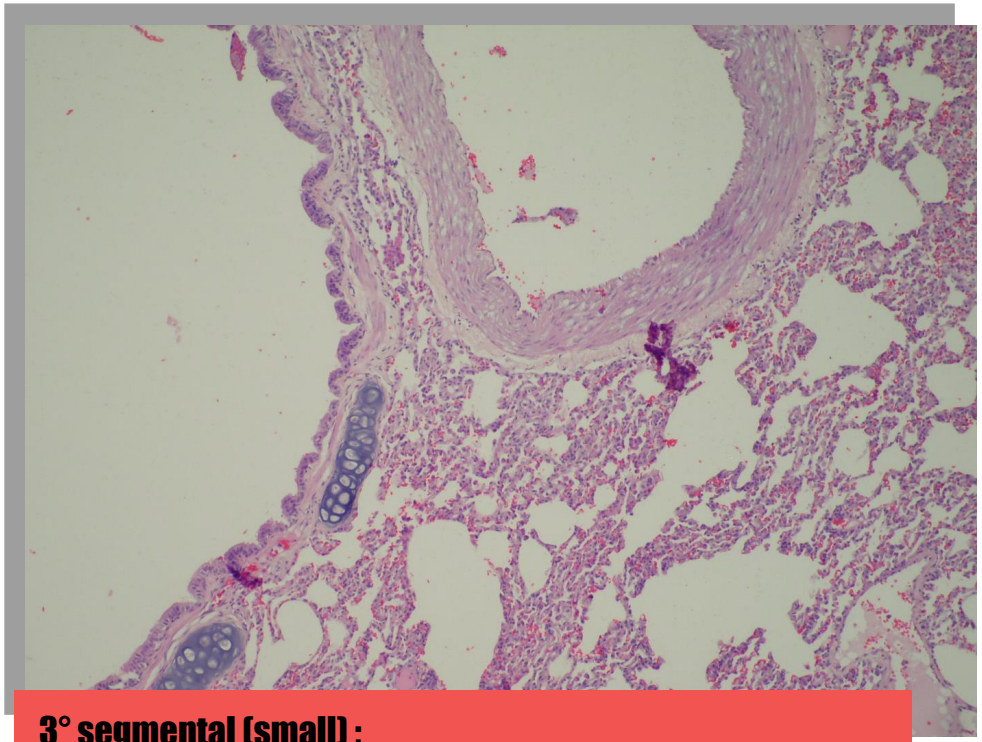


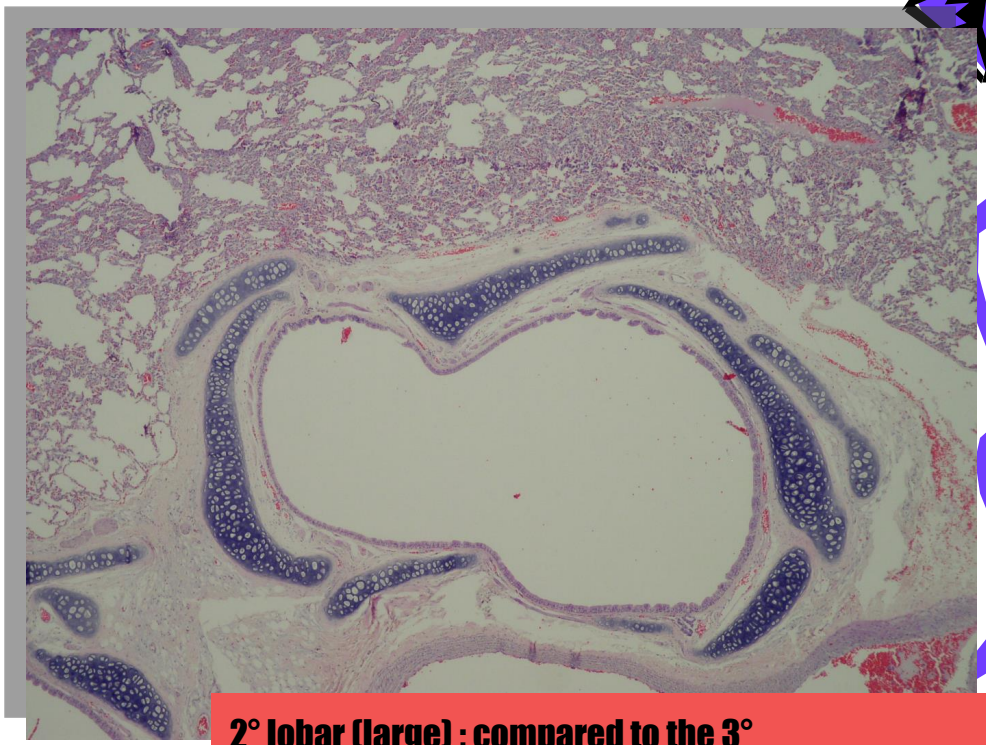
INTRAPULMONARY BRONCHUS:

SMALL

Intrapulmonary bronchus = 2° lobar *go to lobes* (large) + 3° segmental *go to lobules* (small) : more distally

LARGE





3° segmental (small) ;

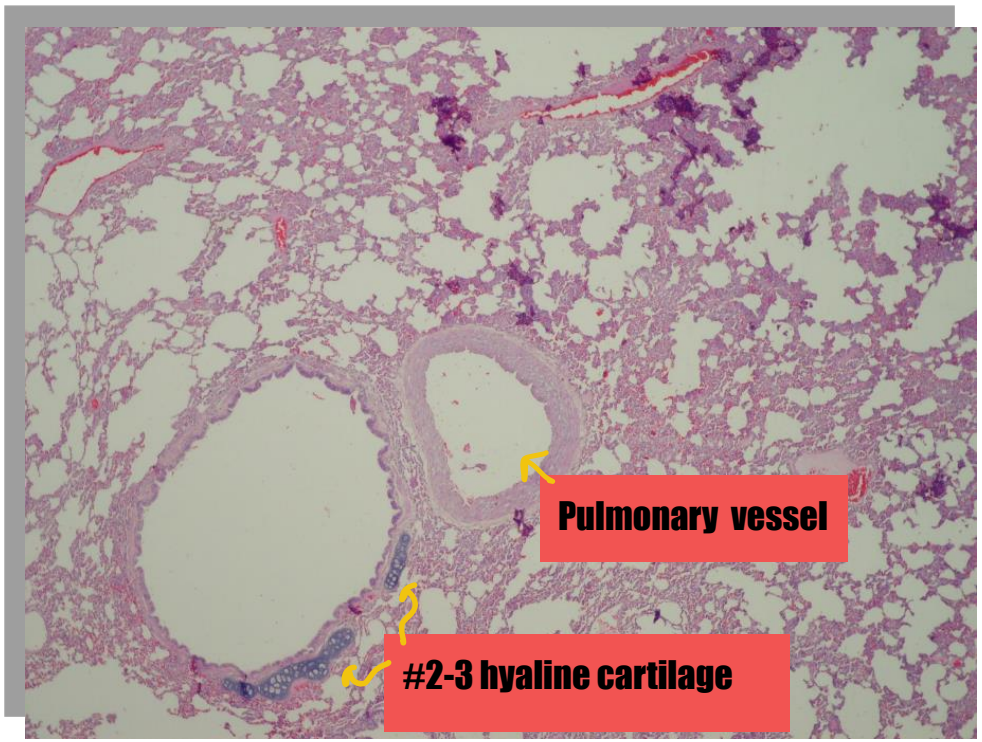
- hyaline cartilage , goblet cells ↓
- Smooth muscles , lung tissue ↑
- Folded lining epithelium (folding in mucosa) ; because of high number of smooth muscle = makes contraction

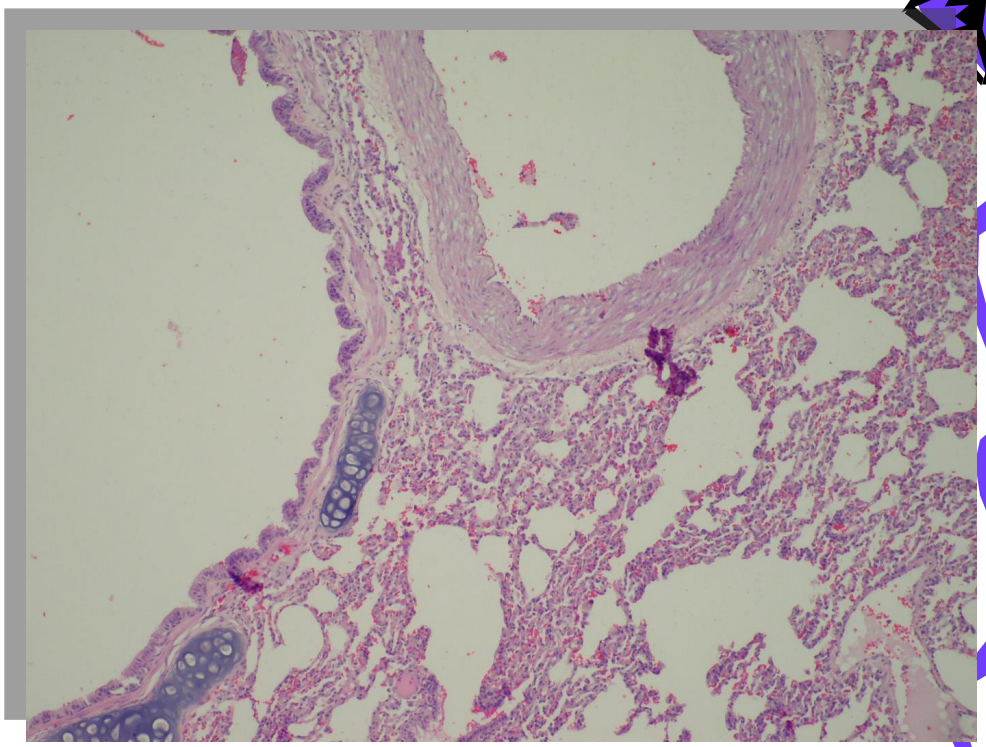
2° lobar (large) ; compared to the 3°

- more hyaline cartilage , goblet cell
- Less smooth muscle , lung tissue
- No foldings

It's possible to note blood vessels around 3° bronchi (pulmonary vessels (artery or vein))

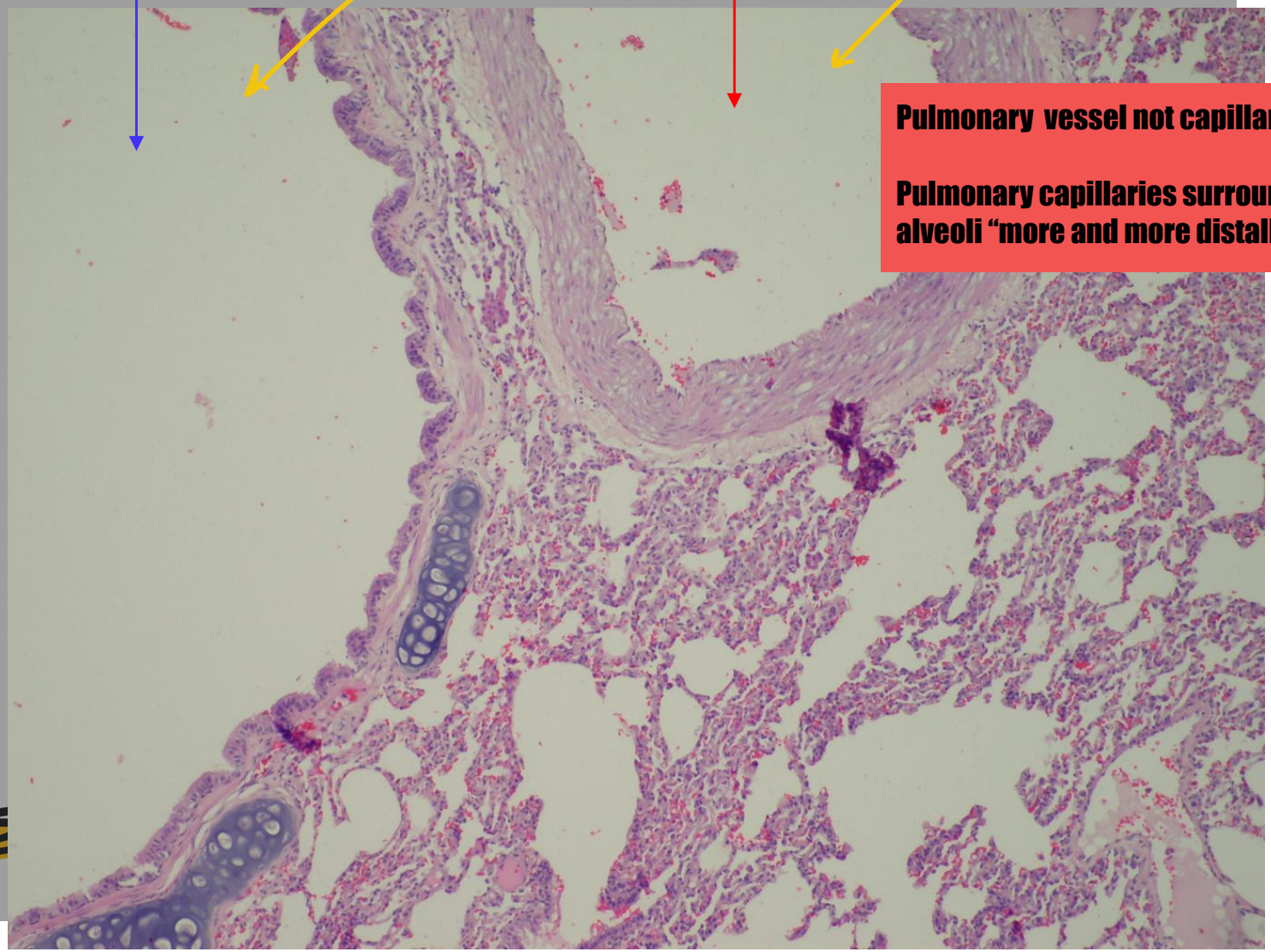
SMALL





INTRAPULMONARY BRONCHUS

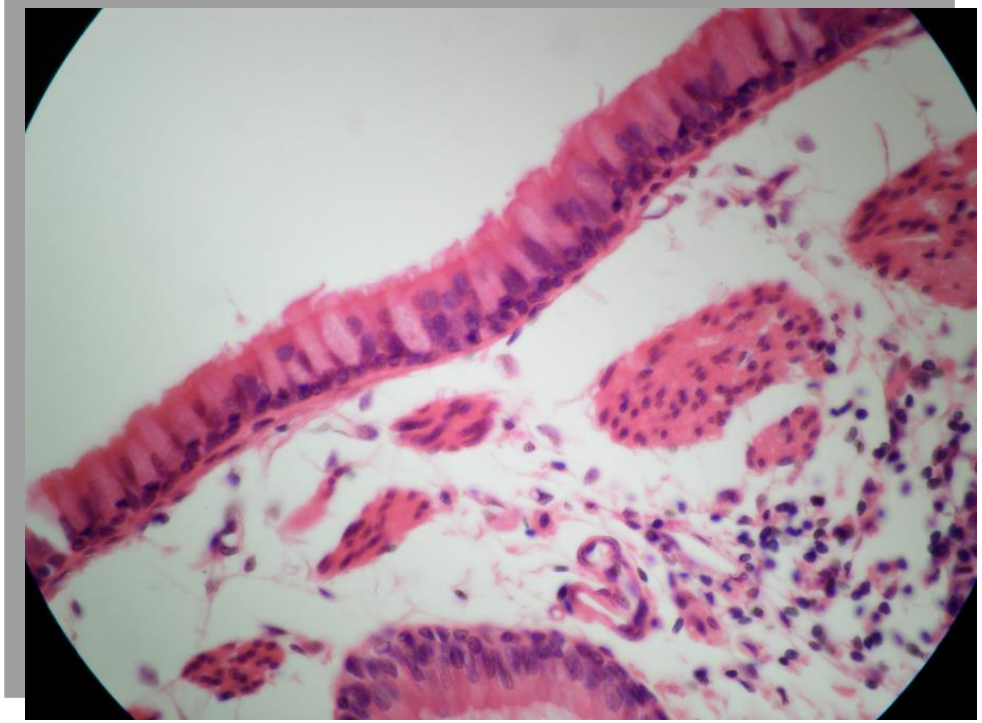
PULMONARY VESSEL

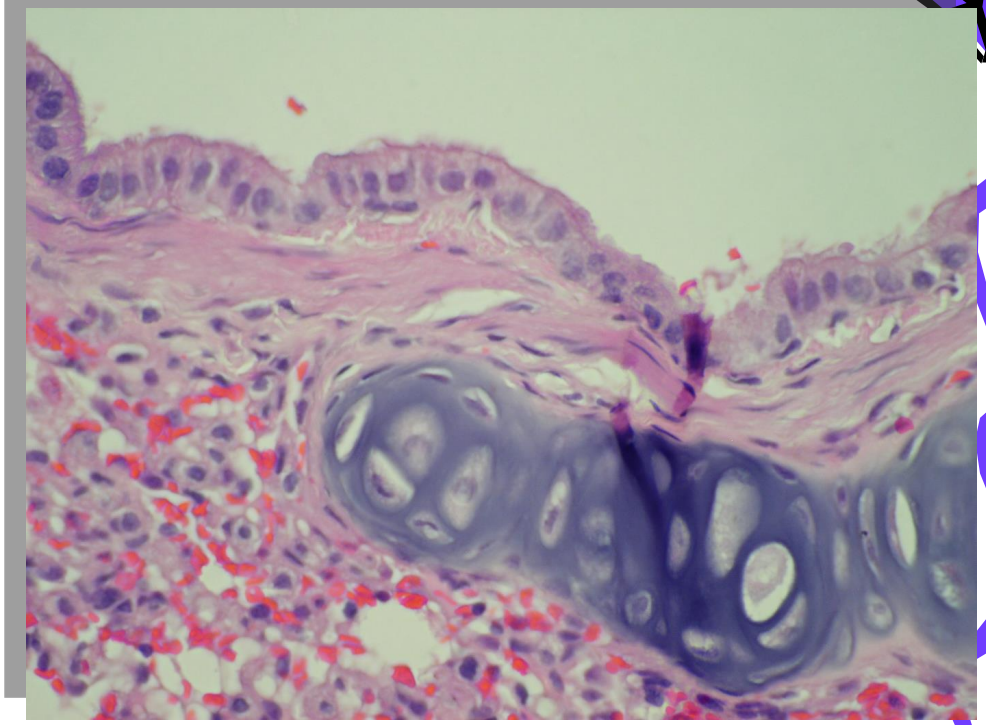


Pulmonary vessel not capillary.

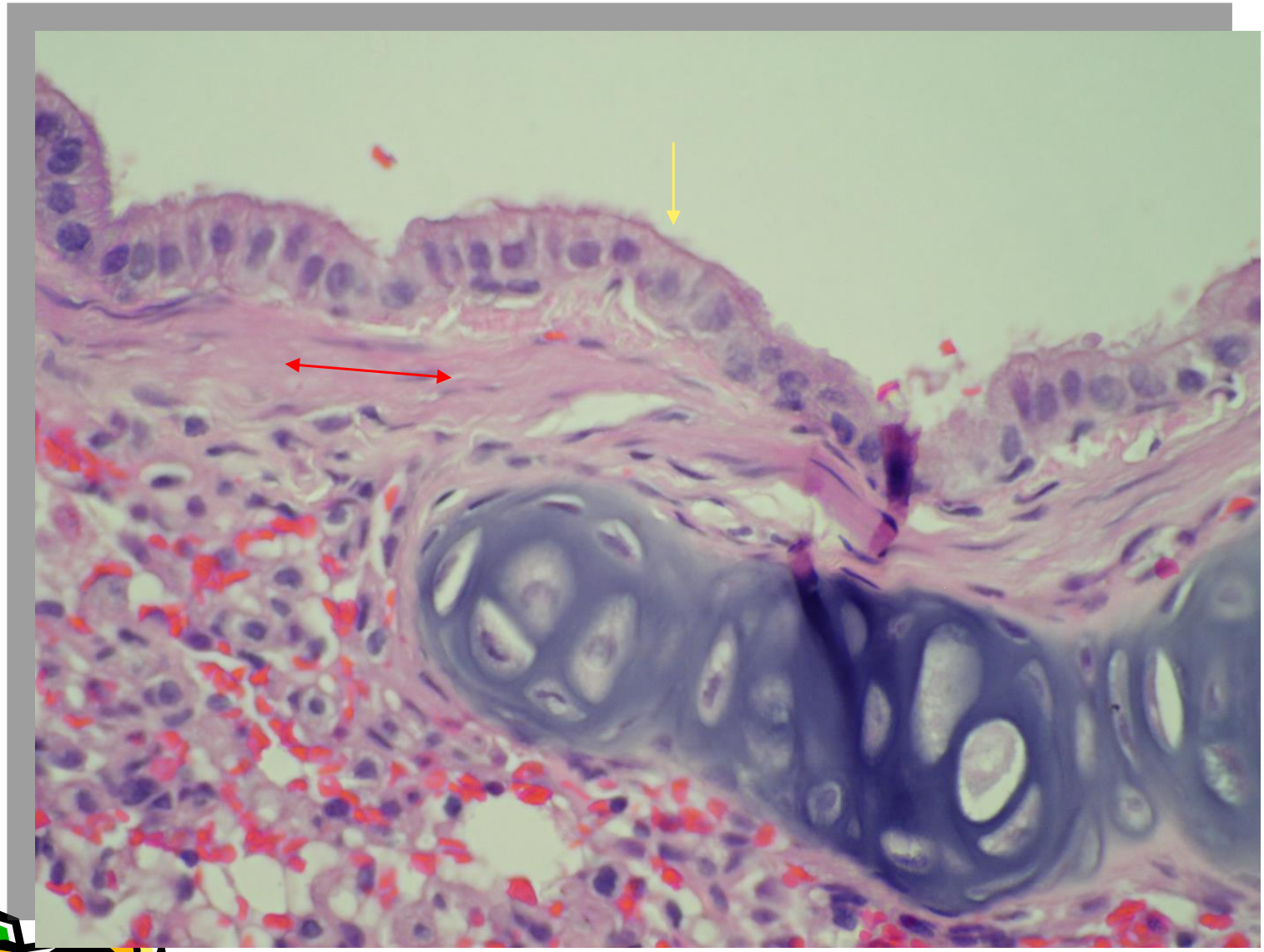
Pulmonary capillaries surround the alveoli "more and more distally"

Small intrapulmonary bronchus = 3°





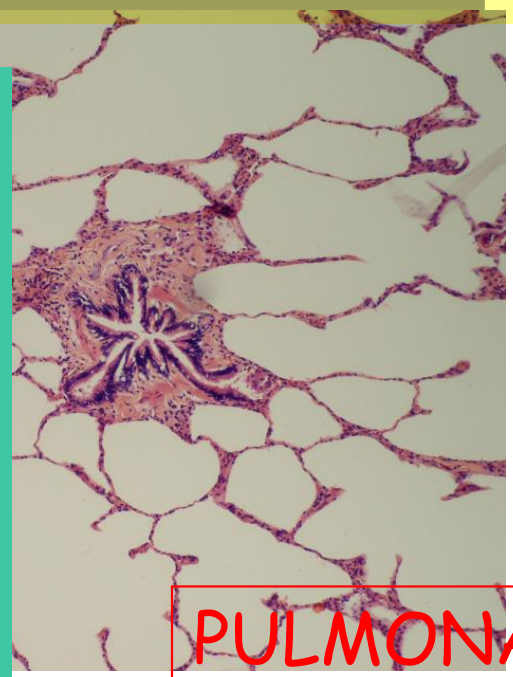
Small intrapulmonary bronchus = 3°

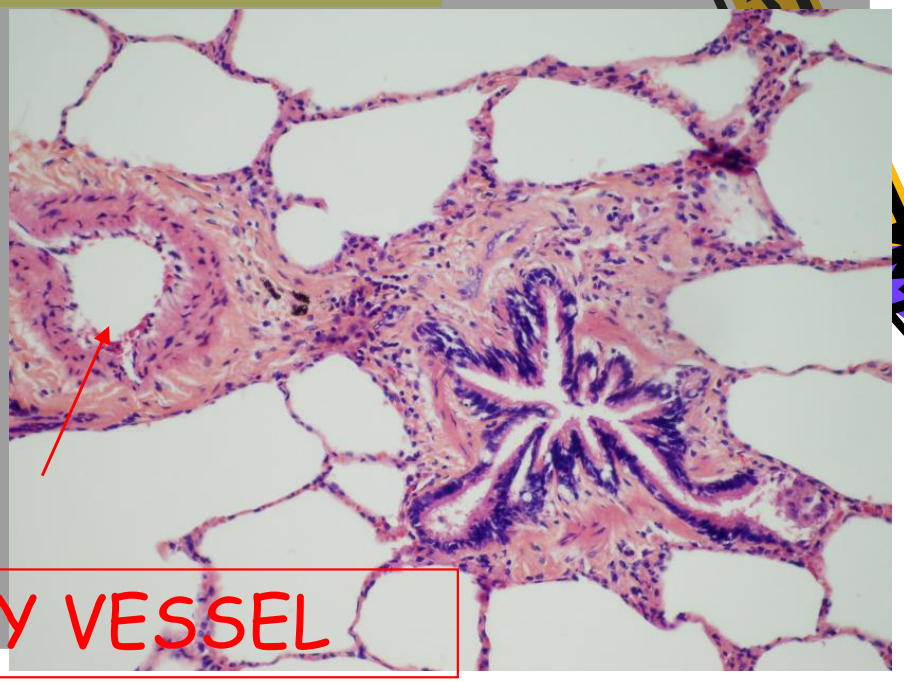


TERMINAL BRONCHIOLEs

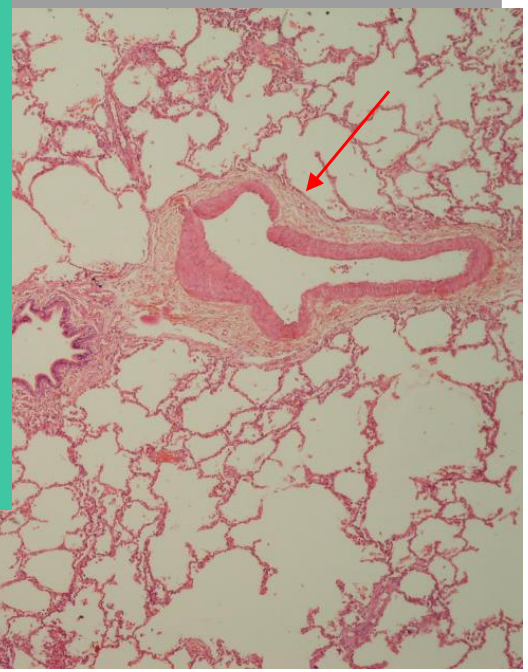
New part of RS = BRONCHIOLES ; TERMINAL BRONCHIOLES

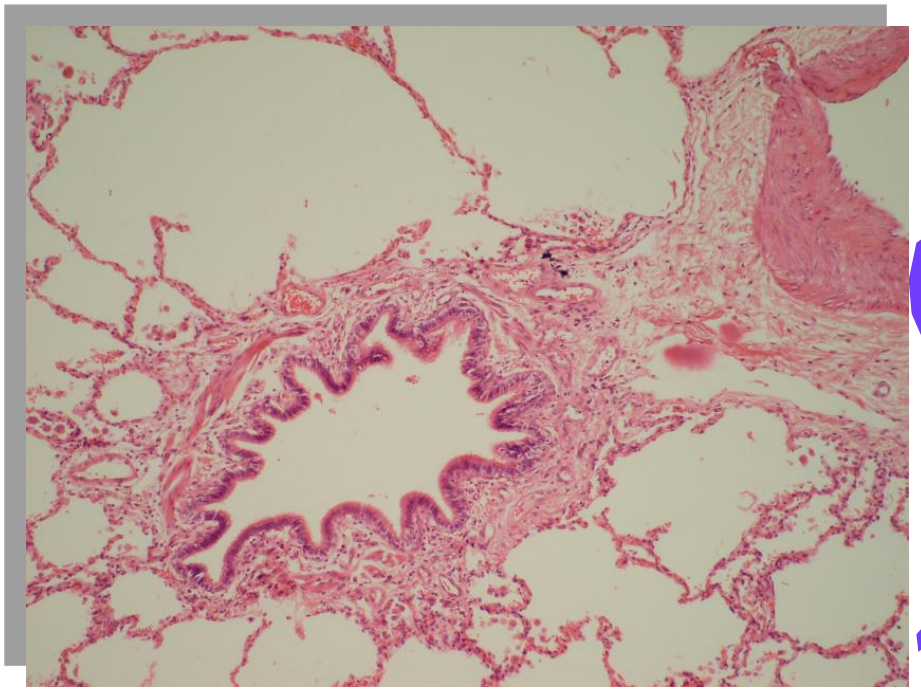
- NO Cartilage
- More smooth muscles = more folding mucosa star-like shape ⭐
- Less diameter (more distally)
- HAS PULMONARY VESSELS
- Surrounded by lung tissue
- - THE MOST IMPORTANT INFORMATION = HERE IN TERMINAL BRONCHIOLES, THE LINING EPITHELIUM TURNS TO SIMPLE COLUMNAR OR CUBOIDAL CILIATED EPITHELIUM WITH VERY FEW GOBLET CELLS and few or absent glands
- LYMPHATIC CELLS (SCATTERED ; NOT NODULES) - nodules just in 2° large bronchi , The remaining parts of RS ; scattered lymphocytes.



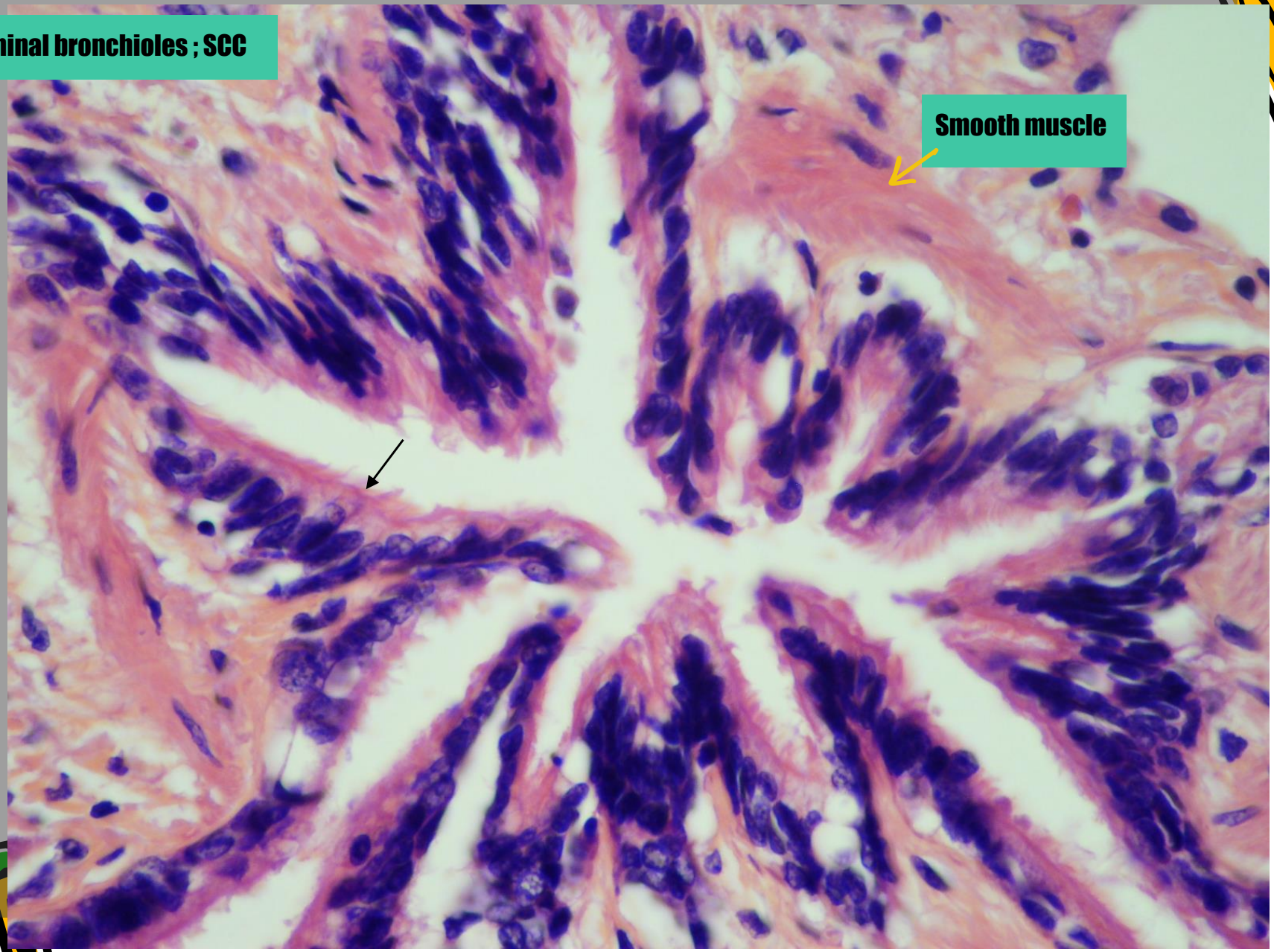


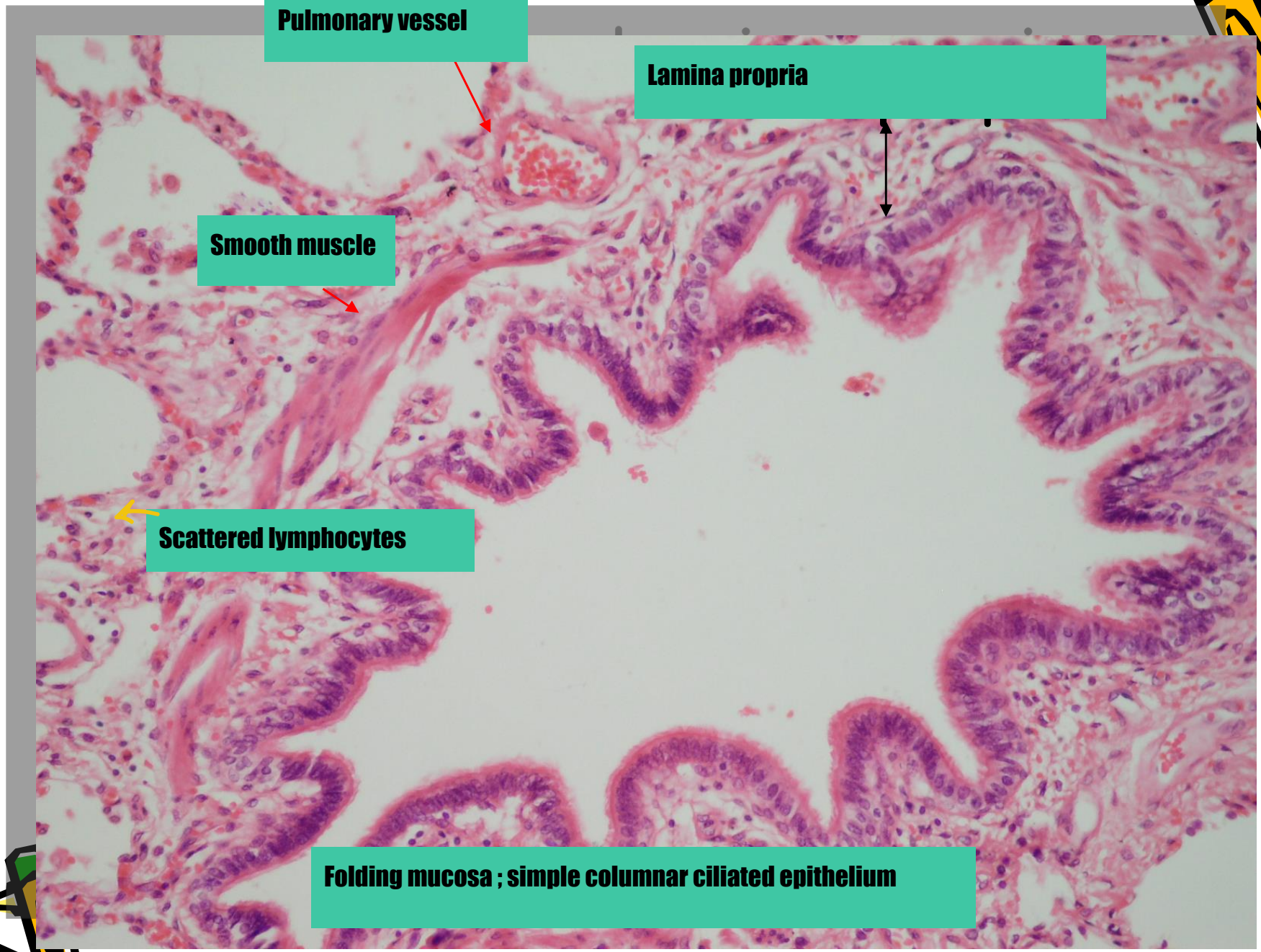
PULMONARY VESSEL

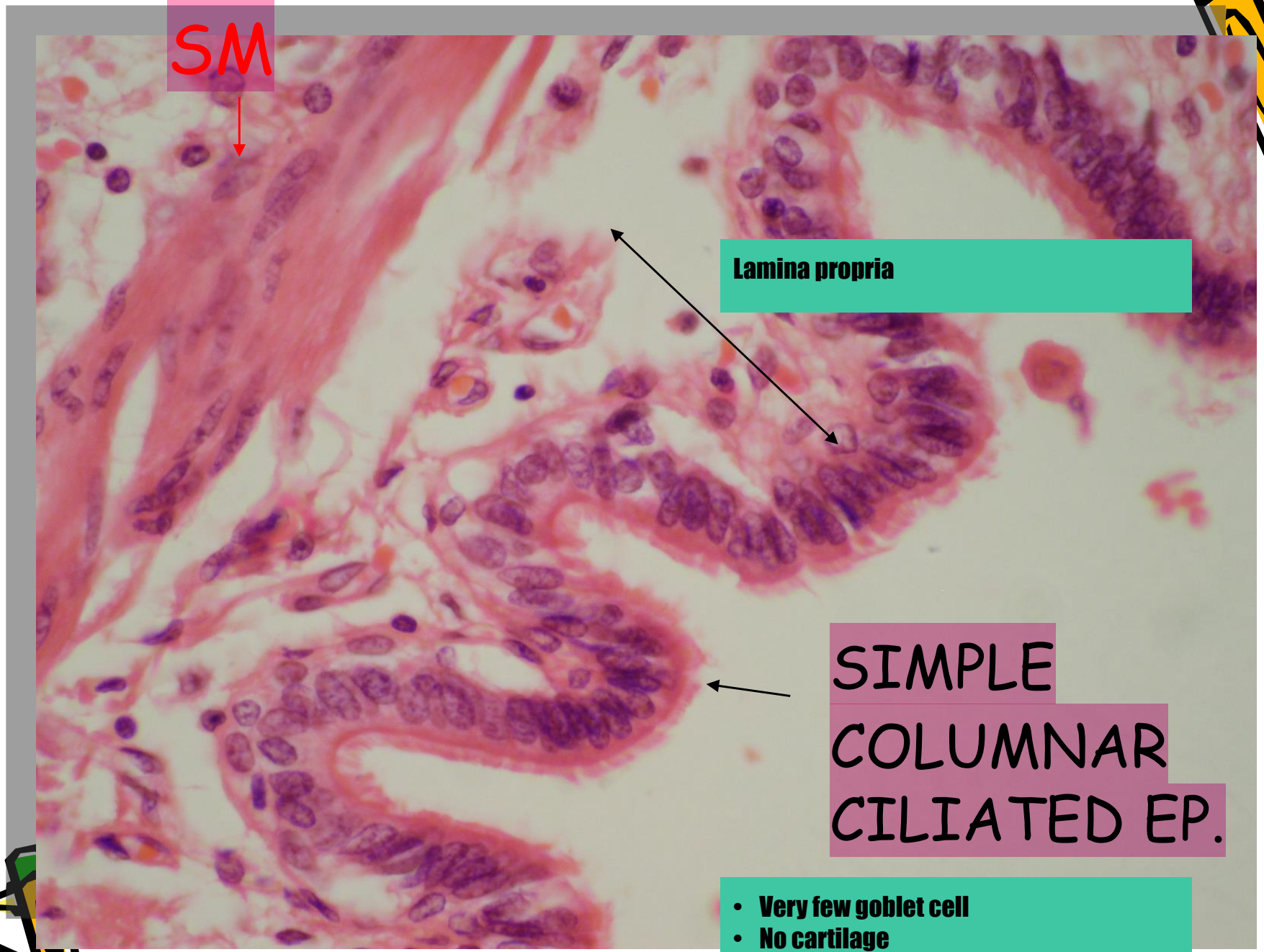




SIMPLE COLUMNAR CILIATED EP.



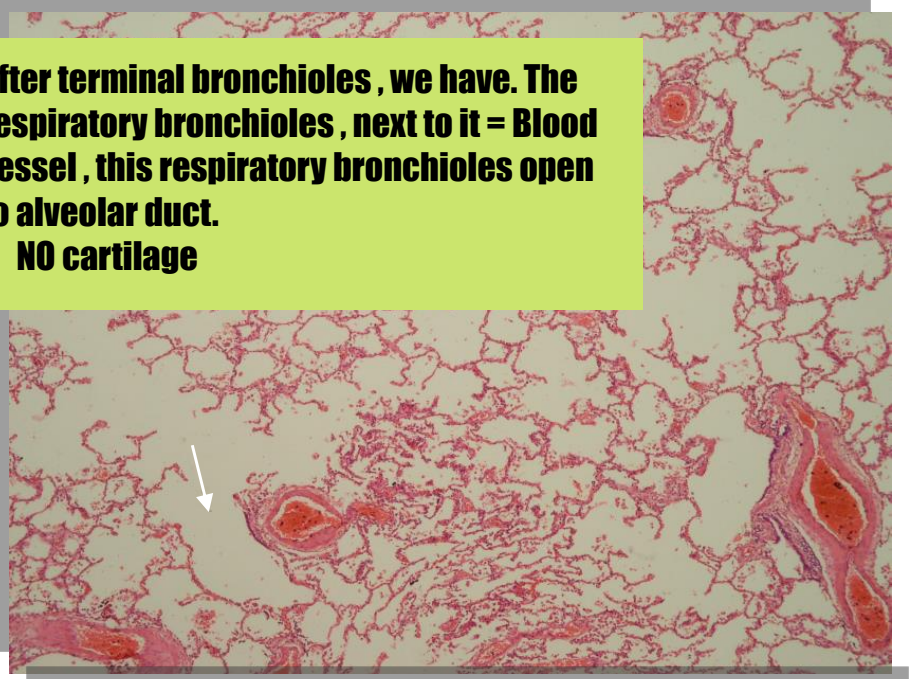

Pulmonary vessel
Lamina propria
Smooth muscle
Scattered lymphocytes
Folding mucosa ; simple columnar ciliated epithelium

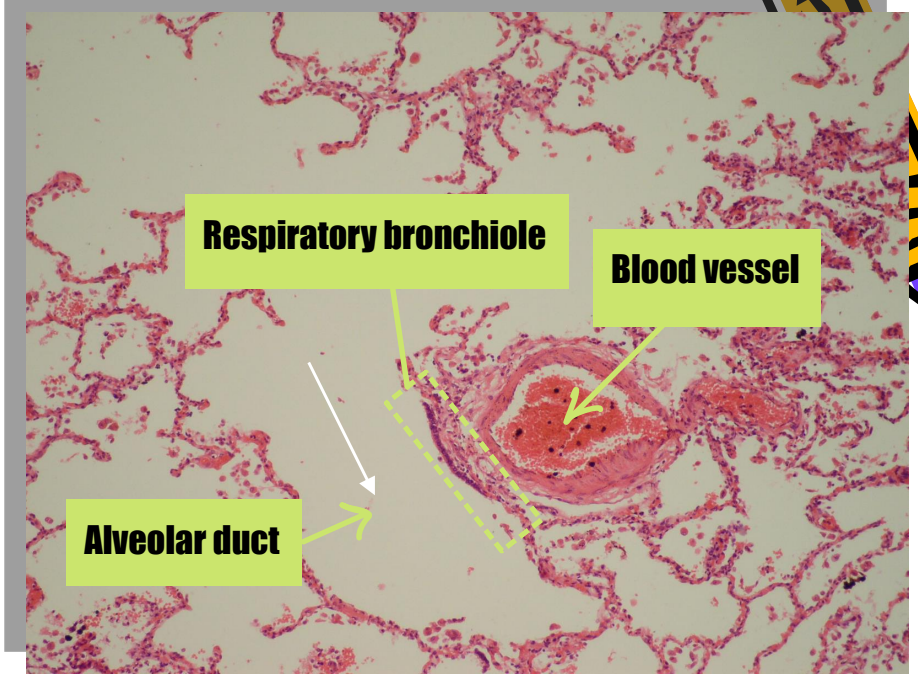

SM
Lamina propria
SIMPLE COLUMNAR CILIATED EP.
• Very few goblet cell
• No cartilage
• In this section = No gland

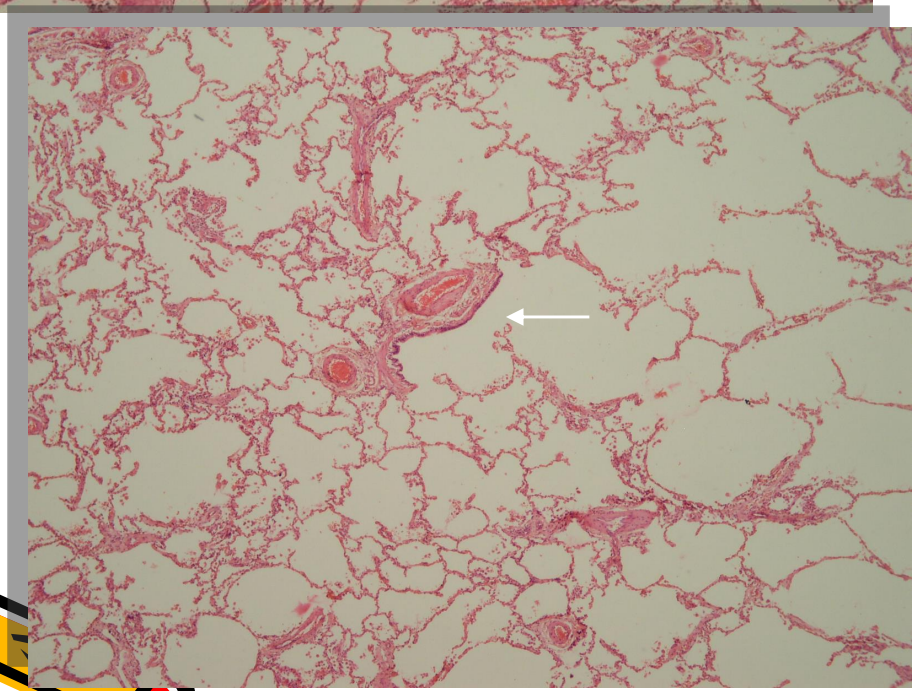
Respiretory bronchioles in lung tissue

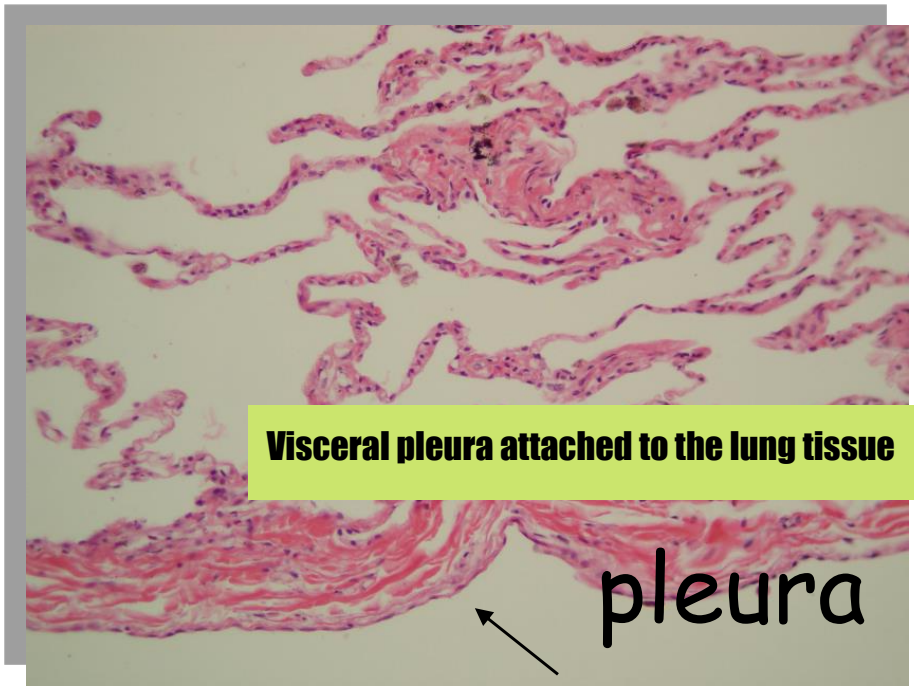
After terminal bronchioles , we have. The respiratory bronchioles , next to it = Blood vessel , this respiratory bronchioles open to alveolar duct.

- NO cartilage

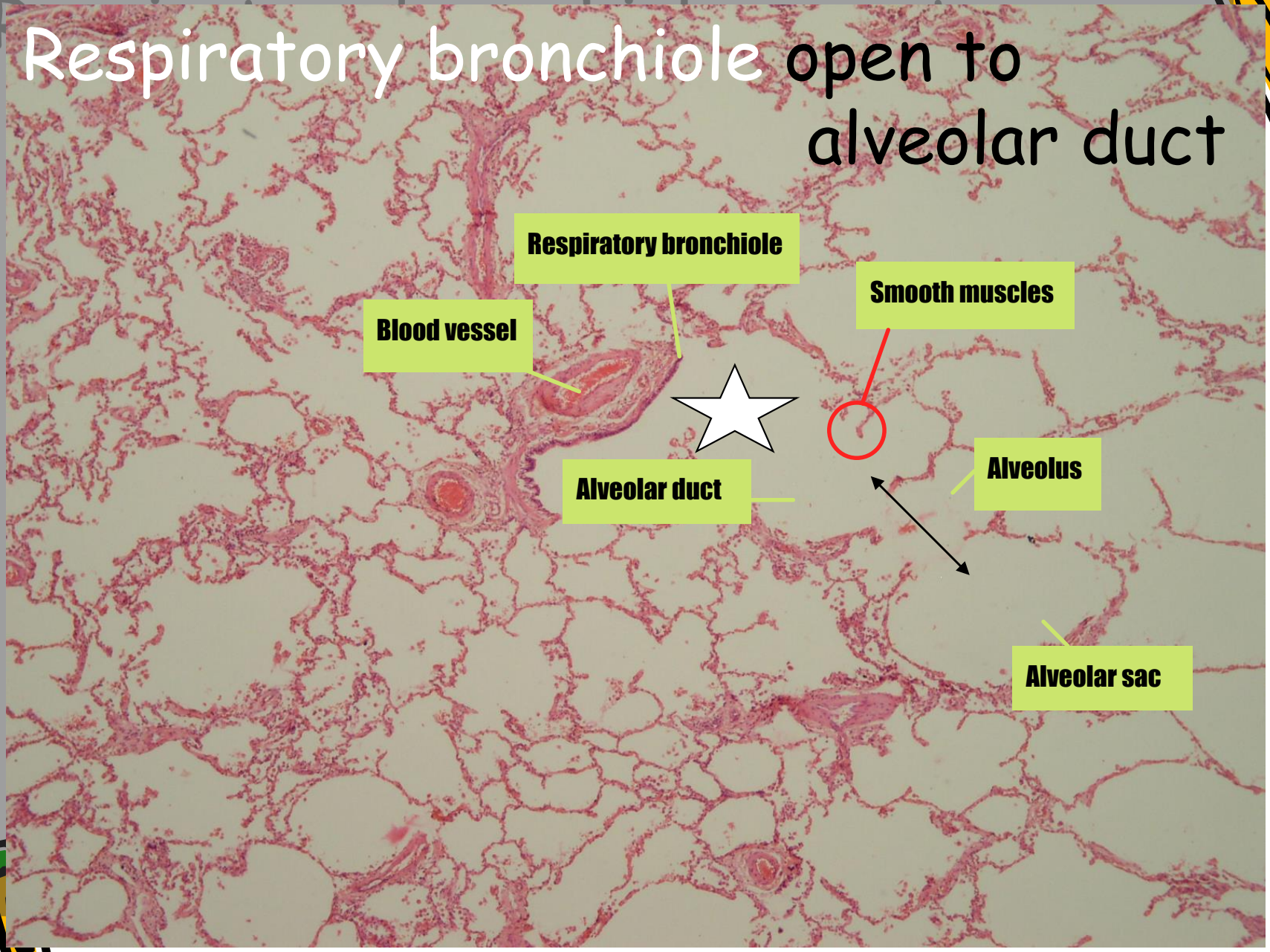


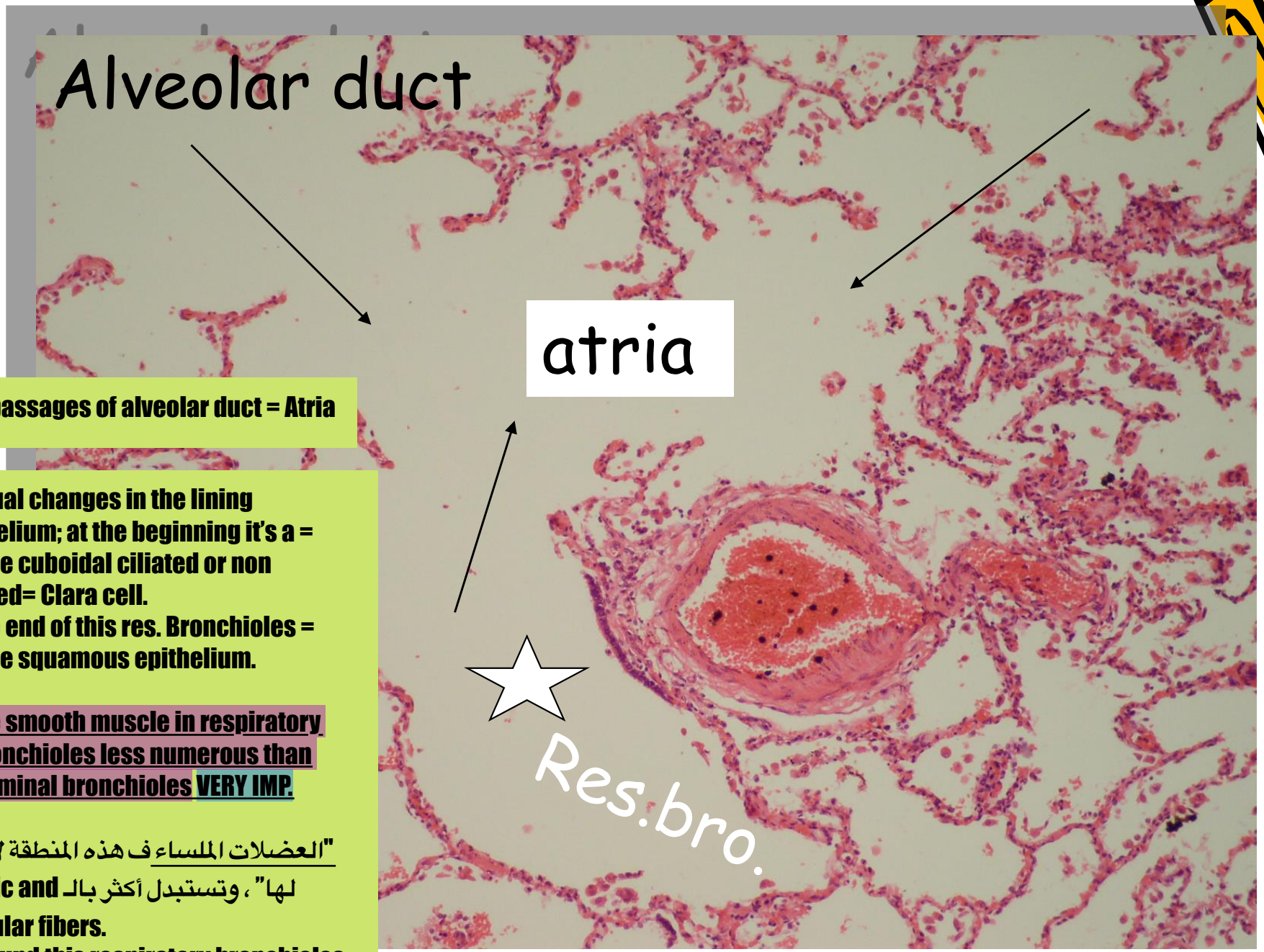






Respiratory bronchiole open to alveolar duct



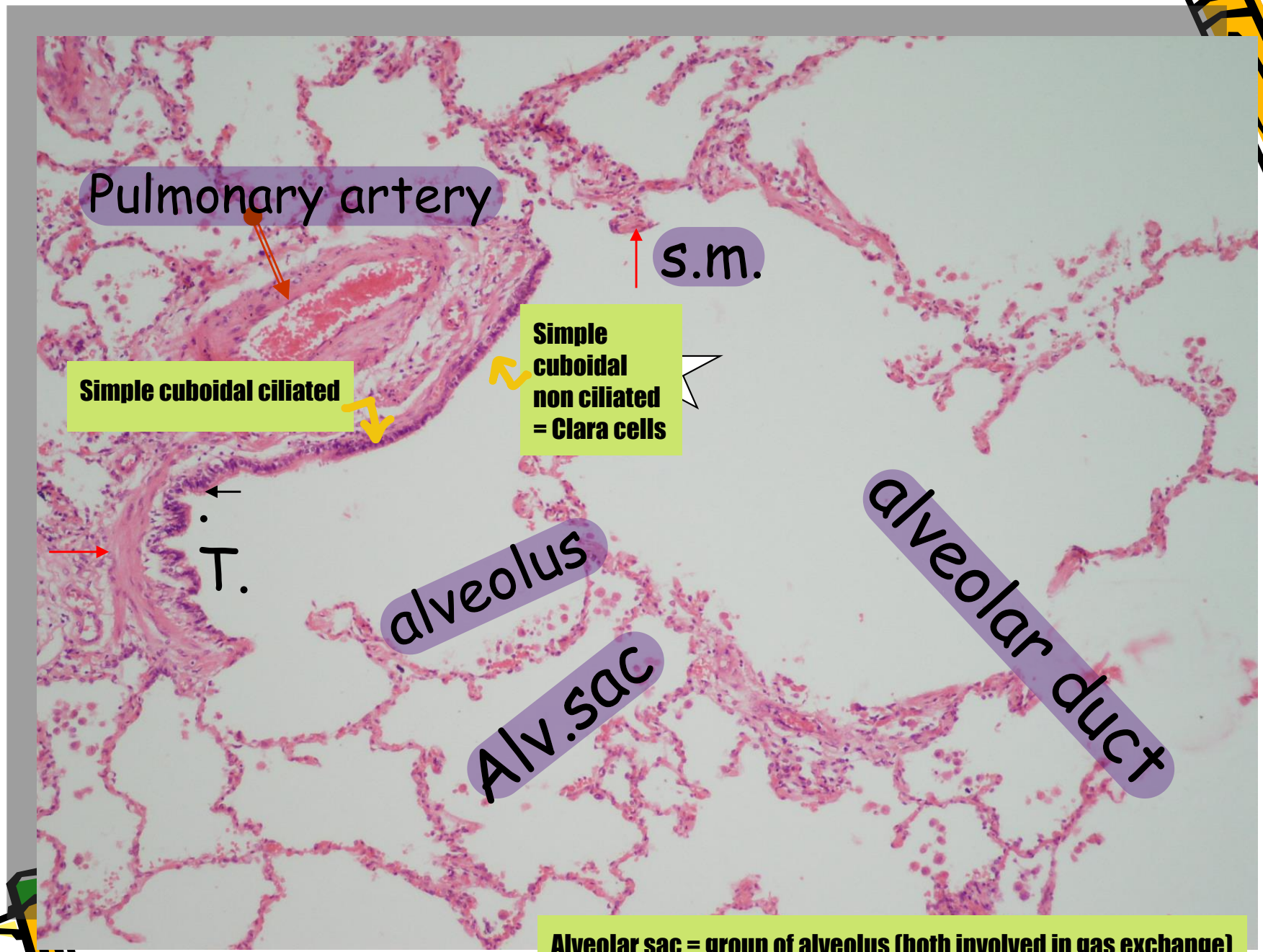


Two passages of alveolar duct = Atria

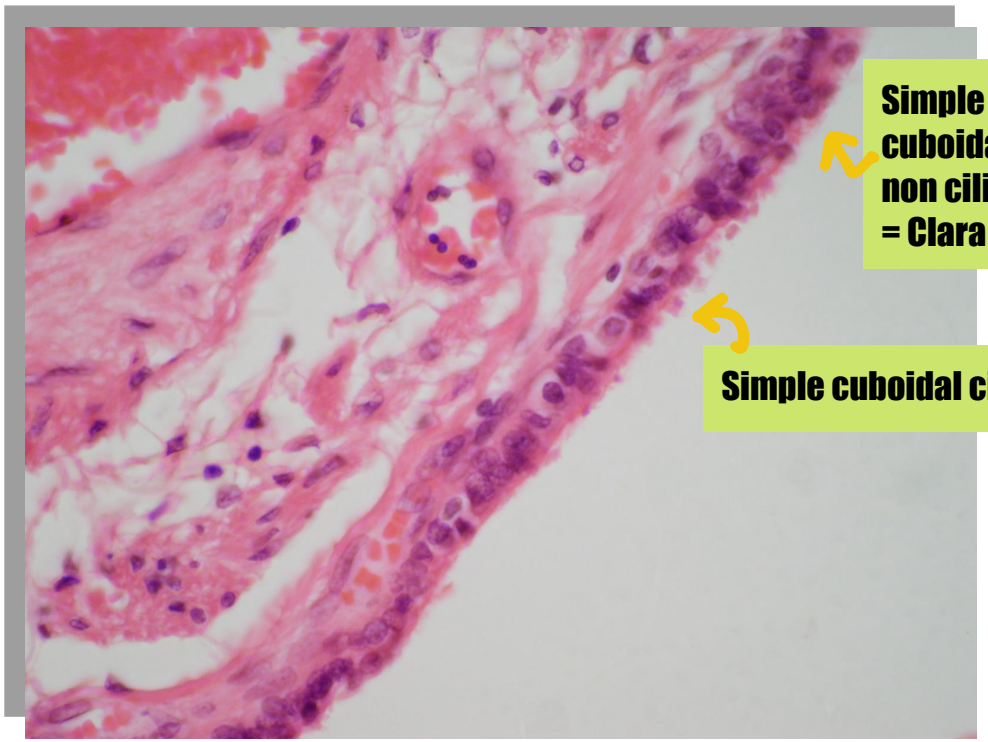
Gradual changes in the lining epithelium; at the beginning it's a = simple cuboidal ciliated or non ciliated= Clara cell.
At the end of this res. Bronchioles = simple squamous epithelium.

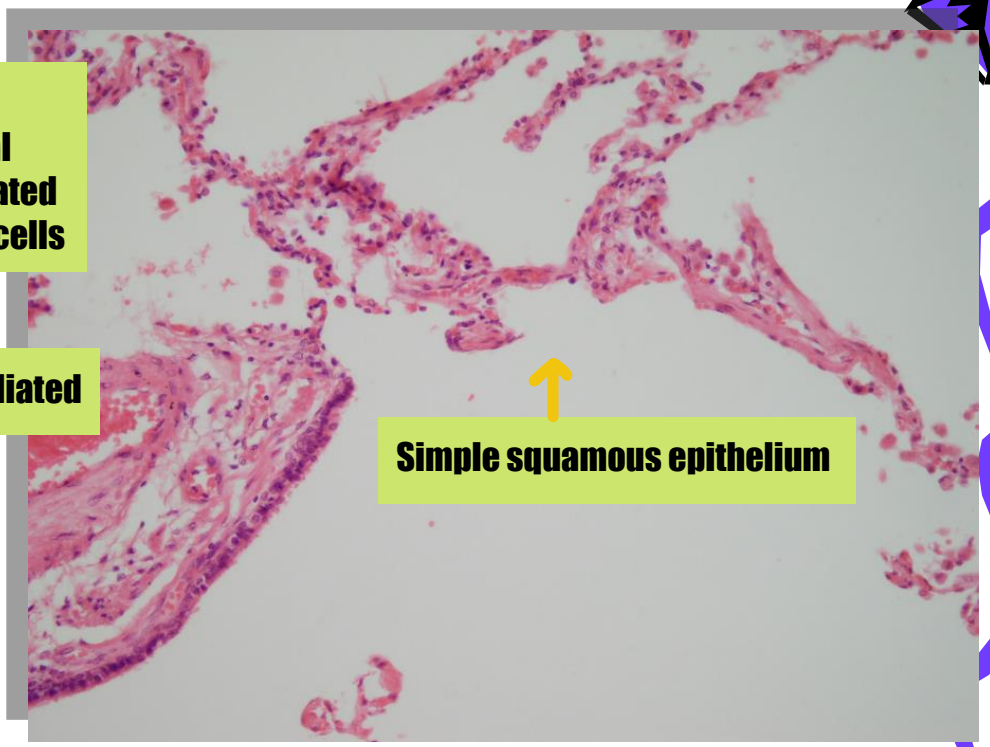
- **the smooth muscle in respiratory bronchioles less numerous than terminal bronchioles VERY IMP.**

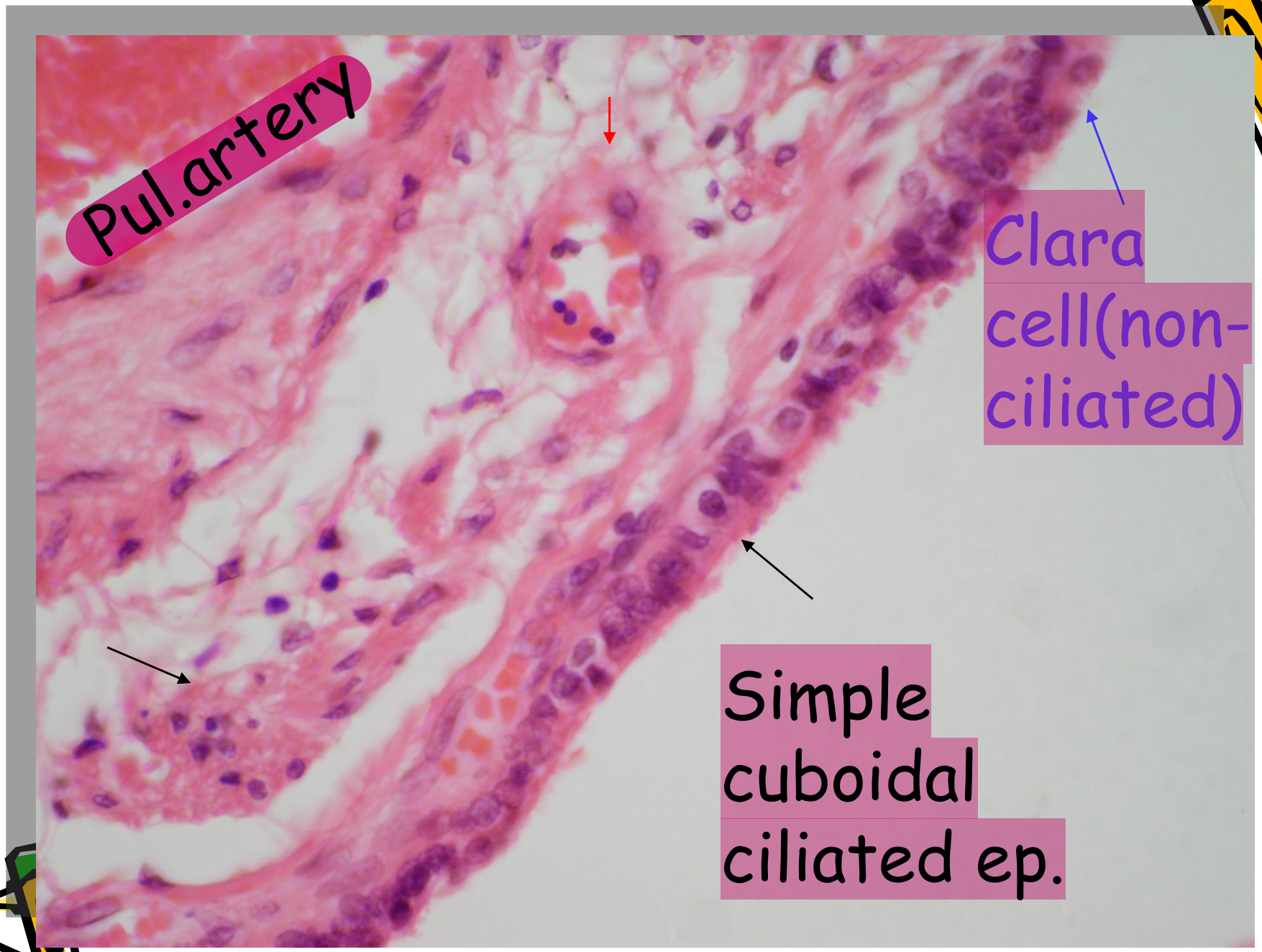
العضلات الملساء ف هذه المنطقة لا قيمة لها" ، وتستبدل أكثر بالـ elastic and reticular fibers.
Surround this respiratory bronchioles and alveoli ..

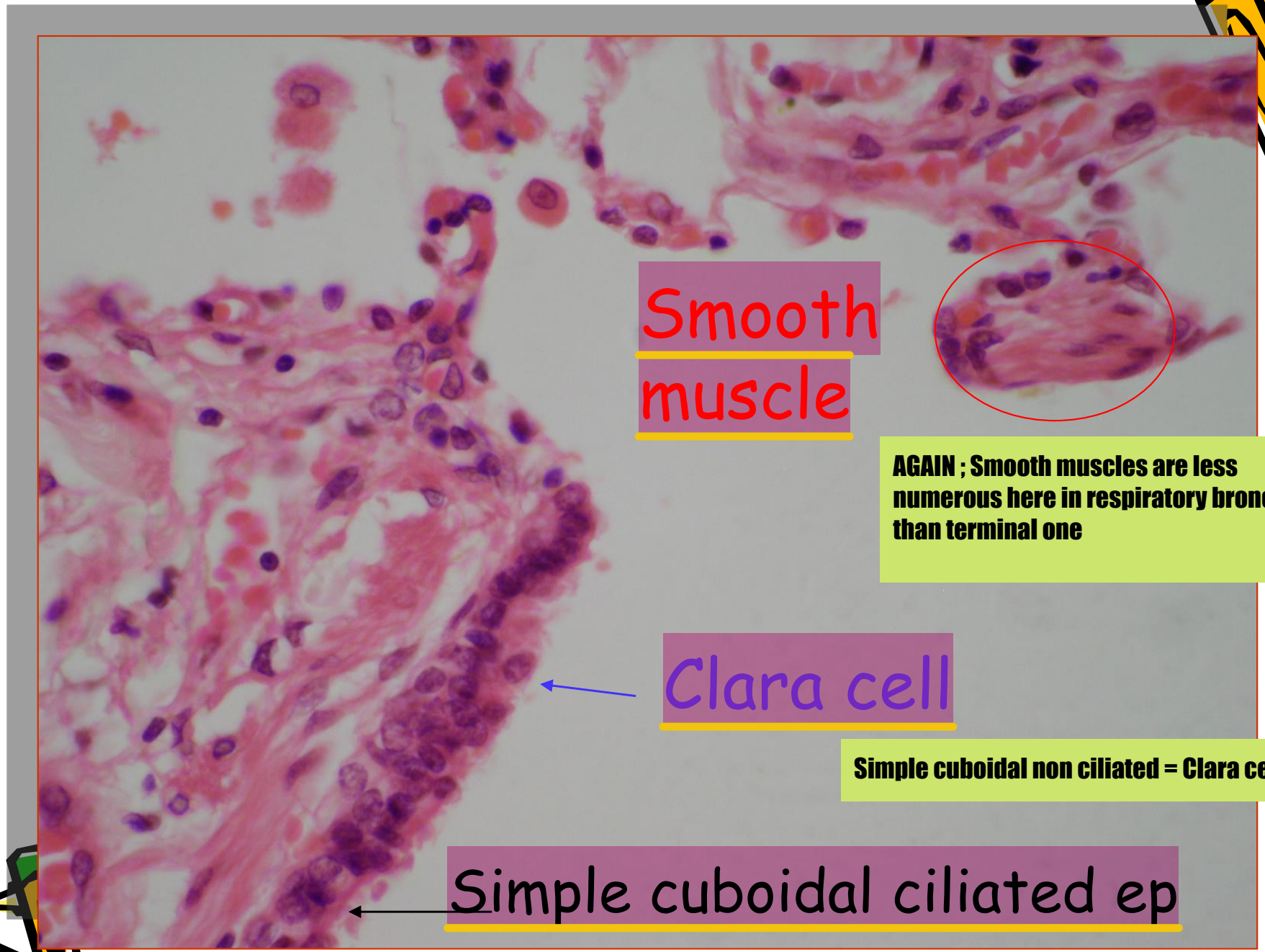

Pulmonary artery
s.m.
Simple cuboidal ciliated
Simple cuboidal non ciliated = Clara cells
T.
alveolus
Alv.sac
alveolar duct
Alveolar sac = group of alveolus (both involved in gas exchange)

Bronchial wall:





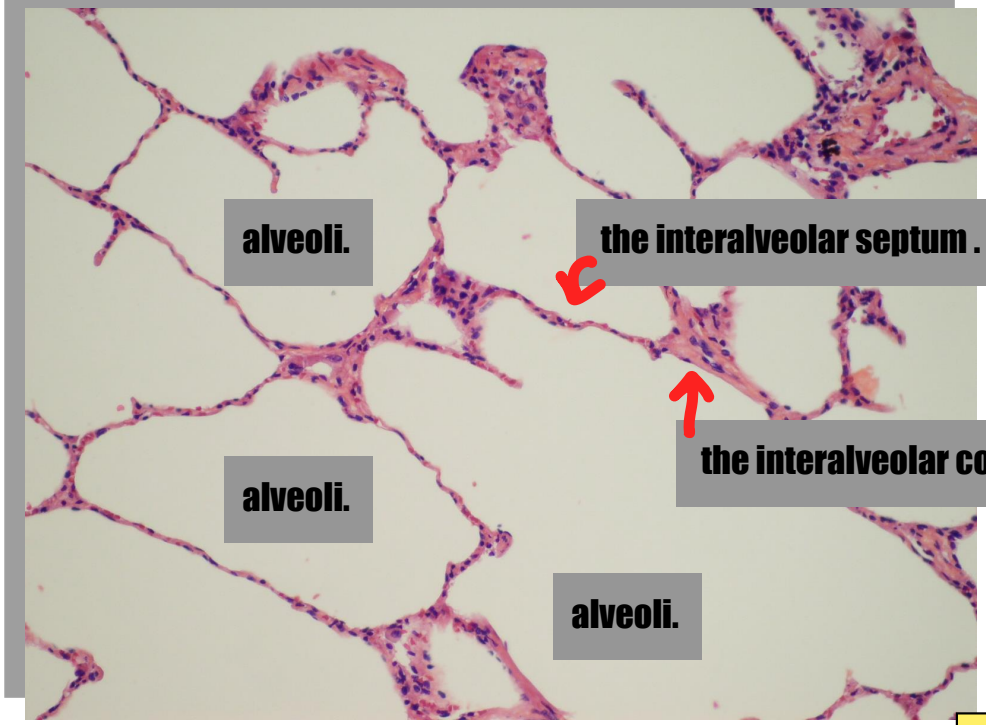

Pul.artery
Clara cell(non-ciliated)
Simple cuboidal ciliated ep.

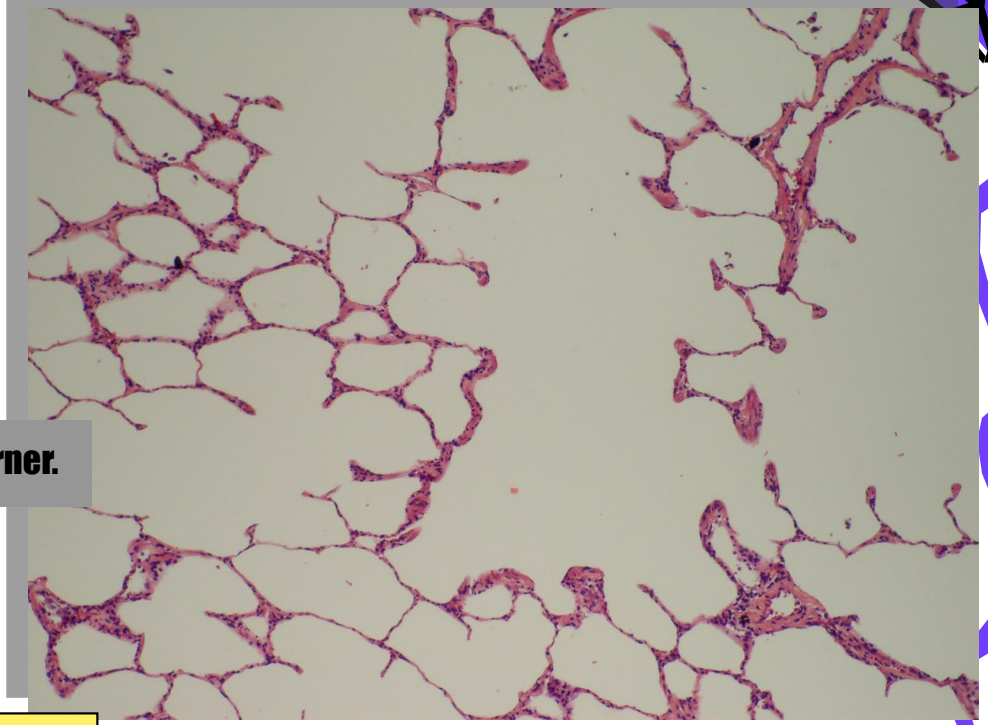

Smooth muscle
AGAIN ; Smooth muscles are less numerous here in respiratory bronchioles than terminal one
Clara cell
Simple cuboidal non ciliated = Clara cells
Simple cuboidal ciliated ep

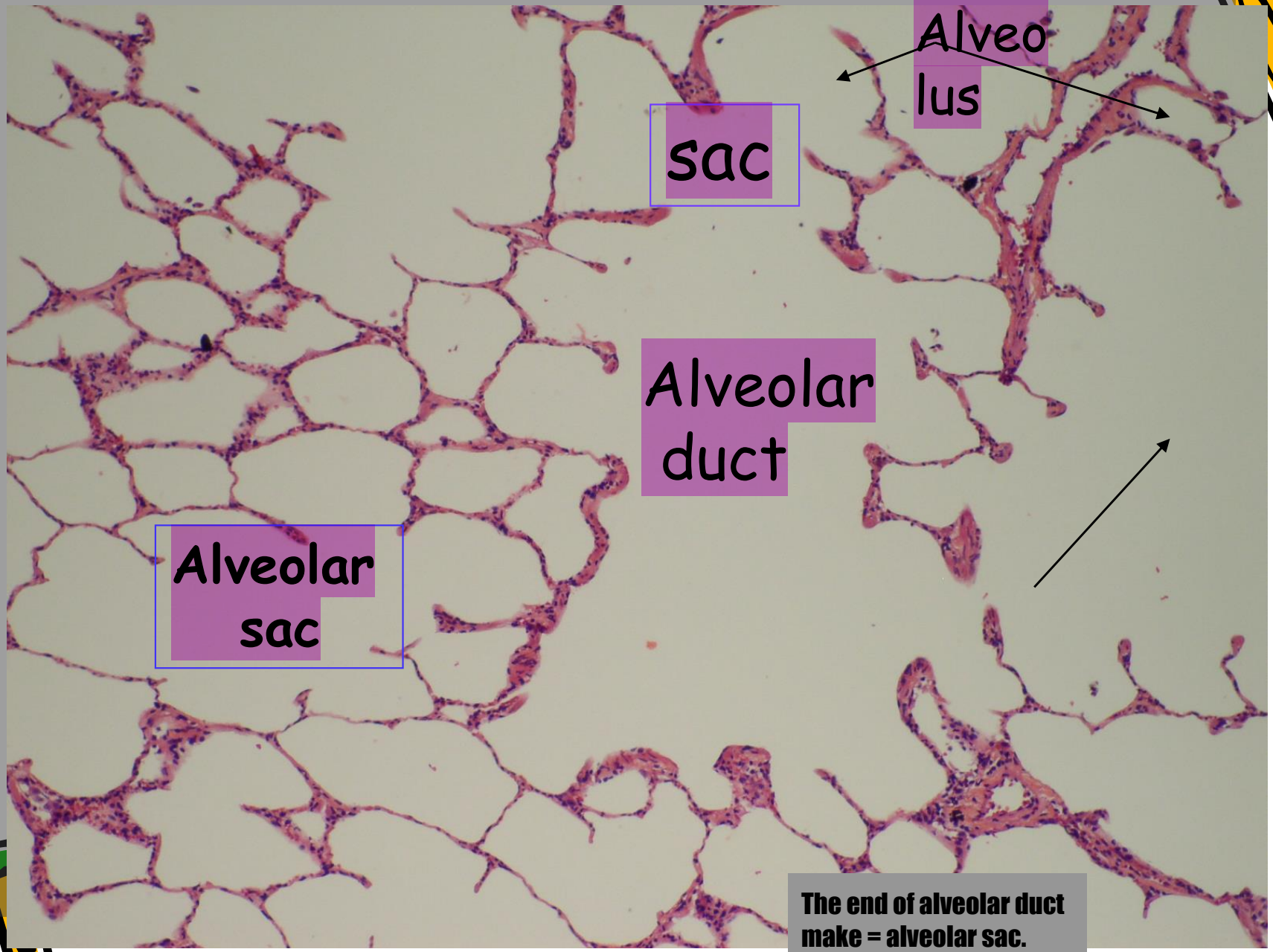
Lung tissue = alveolus

"نسيج الرئة عبارة عن حويصلات هوائية"

The alveoli separated from each other by interalveolar septum (wall) , note the interalveolar corner.

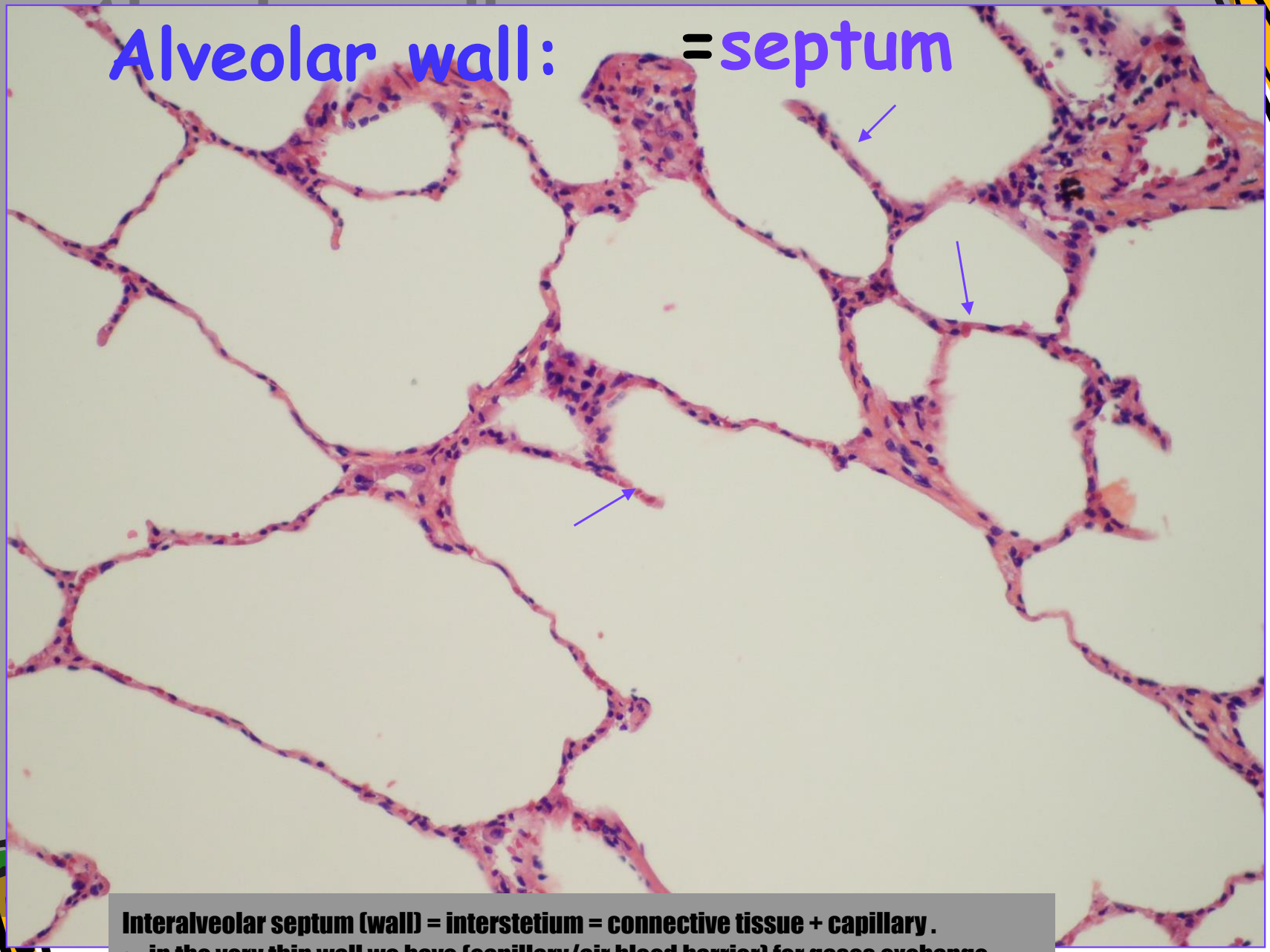






The end of alveolar duct make = alveolar sac.

Alveolar wall: =septum

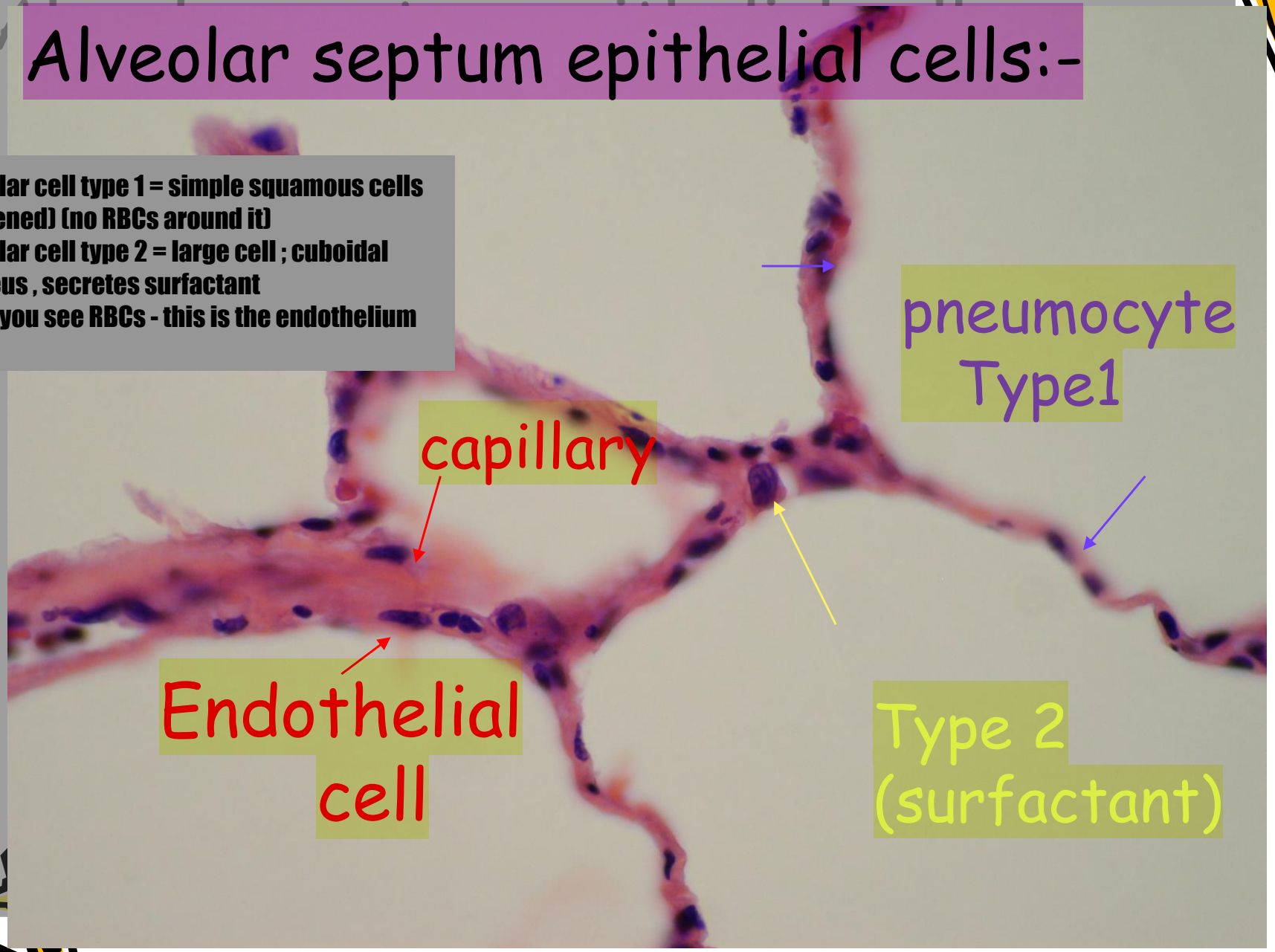


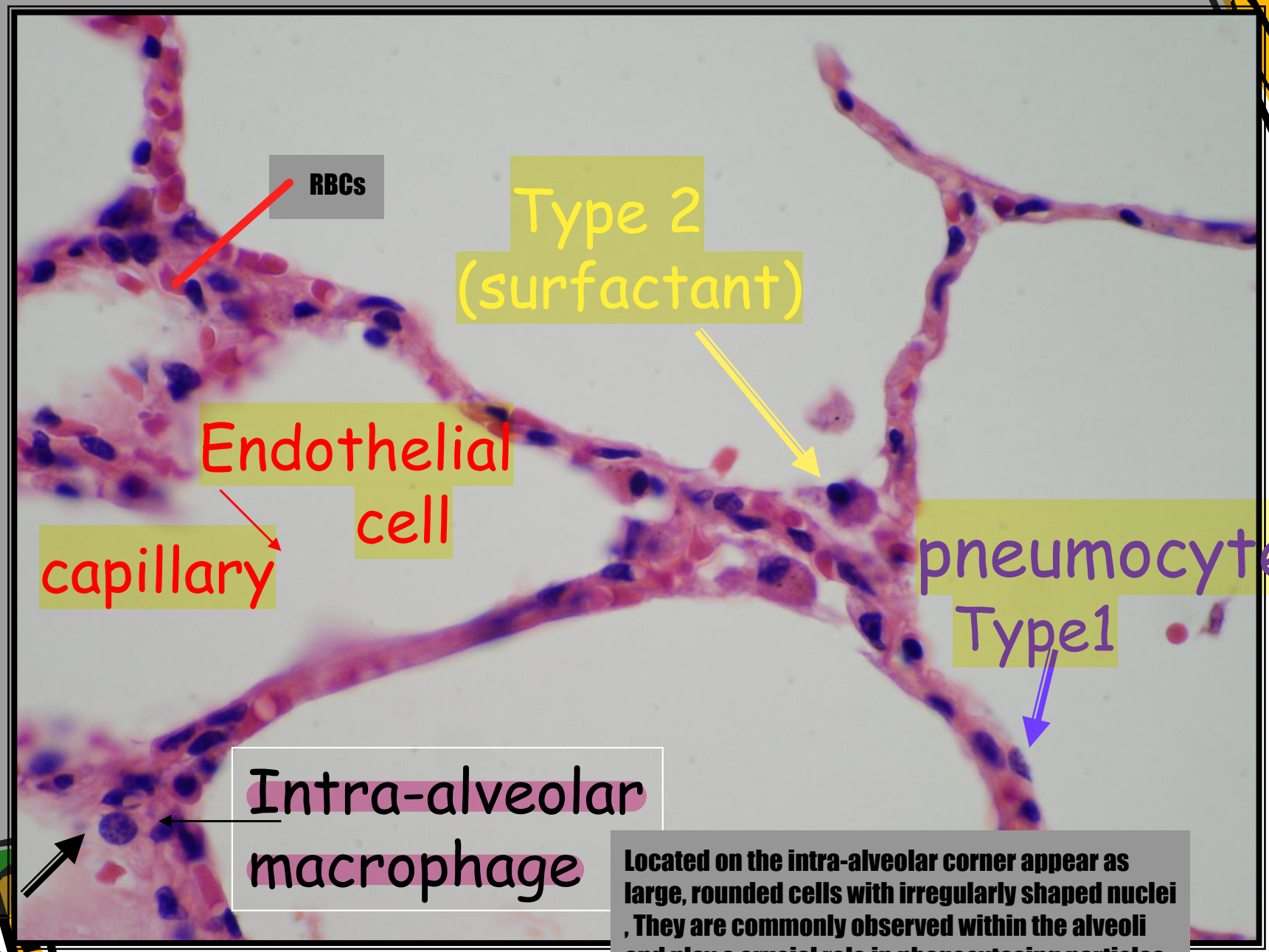
Interalveolar septum (wall) = interstetium = connective tissue + capillary .

- in the very thin wall we have (capillary/air blood barrier) for gases exchange

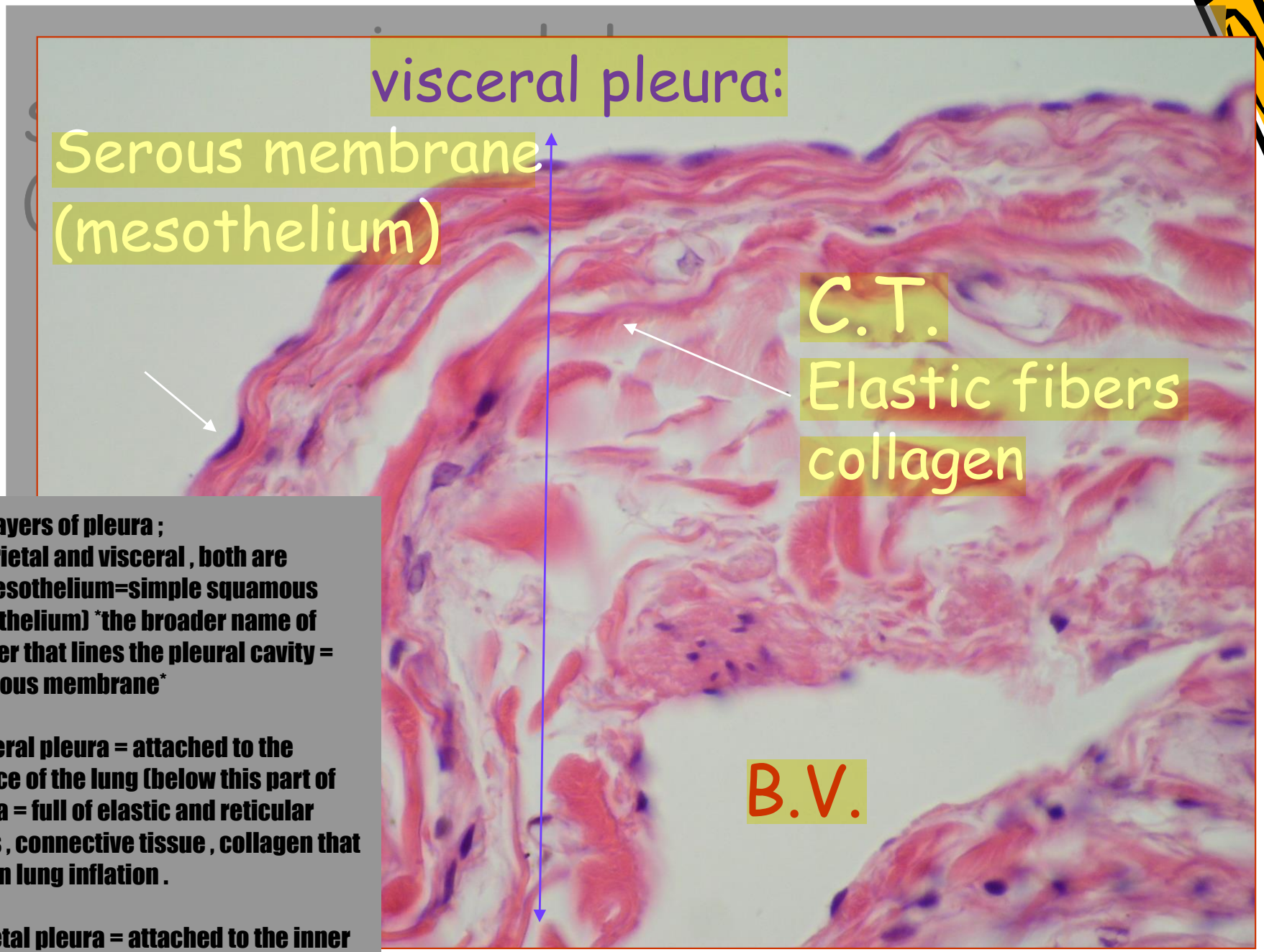
Alveolar septum epithelial cells:-

- Alveolar cell type 1 = simple squamous cells (flattened) (no RBCs around it)
- Alveolar cell type 2 = large cell ; cuboidal nucleus , secretes surfactant
- Once you see RBCs - this is the endothelium





Located on the intra-alveolar corner appear as large, rounded cells with irregularly shaped nuclei , They are commonly observed within the alveoli and play a crucial role in phagocytosing particles and debris to maintain respiratory function.



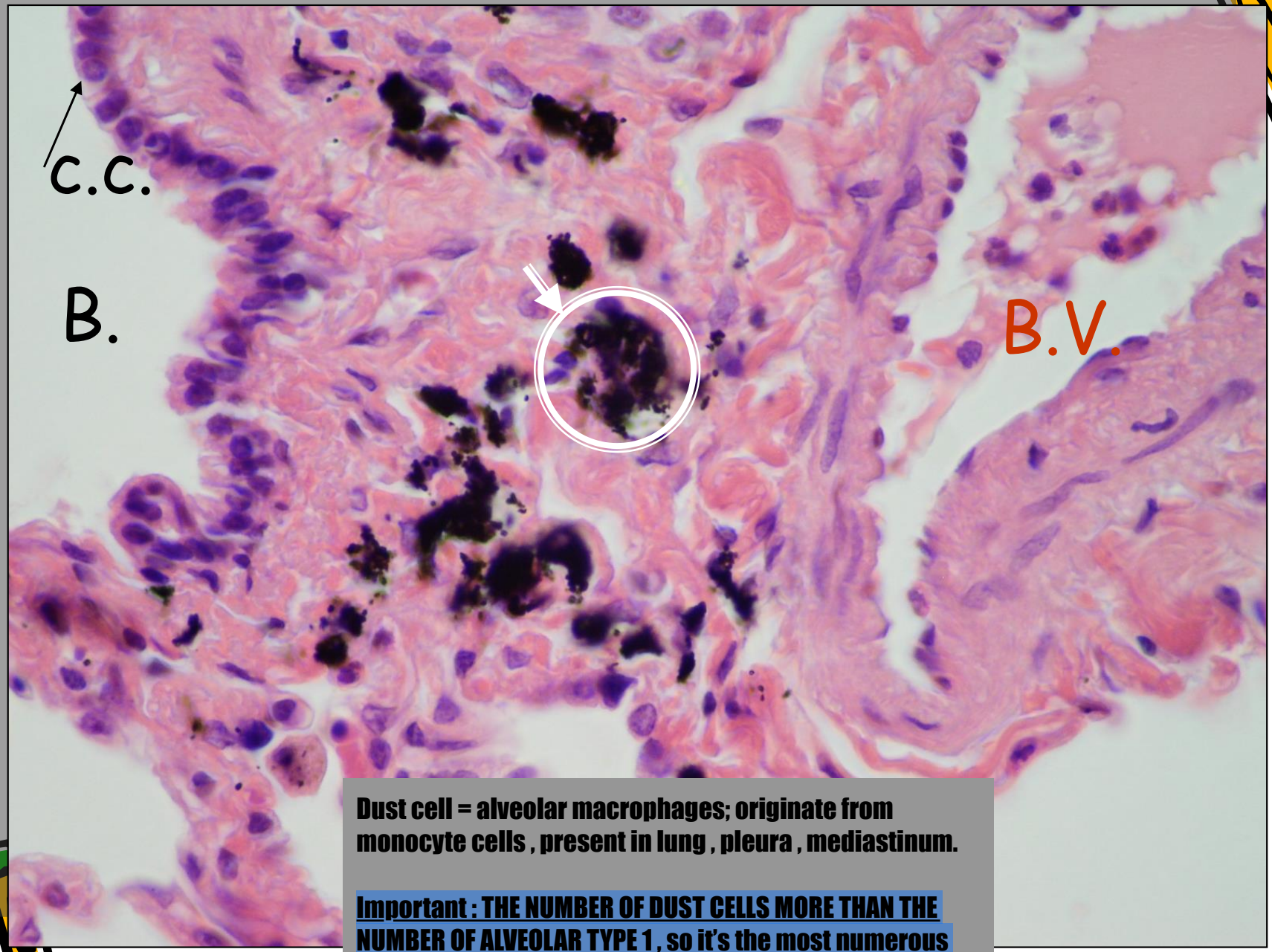
Two layers of pleura ;

- **parietal and visceral , both are (mesothelium=simple squamous epithelium) *the broader name of layer that lines the pleural cavity = serous membrane***

-Visceral pleura = attached to the surface of the lung (below this part of pleura = full of elastic and reticular fibers , connective tissue , collagen that help in lung inflation .

-Parietal pleura = attached to the inner surface of the thoracic cavity .

Alveolar macrophage= dust cells



Dust cell = alveolar macrophages; originate from monocyte cells , present in lung , pleura , mediastinum.

Important : THE NUMBER OF DUST CELLS MORE THAN THE NUMBER OF ALVEOLAR TYPE 1 , so it's the most numerous cell in the lung