



GI HISTOLOGY

LAB (1)



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Histology Lab GIS part1

we'll discuss the histology of:

1. Oral cavity:

- a) lip
- b) tongue
- c) salivary glands

2. Esophagus

Oral cavity

Histology of the **lips** (A mucocutaneous junction)

Recall from Anatomy that the lips are divided into 3 parts:

1) **Oral part** (inside the oral cavity) (Mucosal surface)

→ Epithelium: stratified squamous non-keratinized aka mucosa

-has labial glands (mucous glands)

2) **Red part** (transitional zone) (Vermilion zone)

Contains large number of capillaries → **RED**, Rich in nerve terminals
that's why it's very sensitive

→ Epithelium: stratified squamous para-keratinized (modified skin)

-NO HAIR FOLLICLES, NO SEBACEOUS GLANDS, NO SWEAT GLANDS (that's why we call it modified skin)

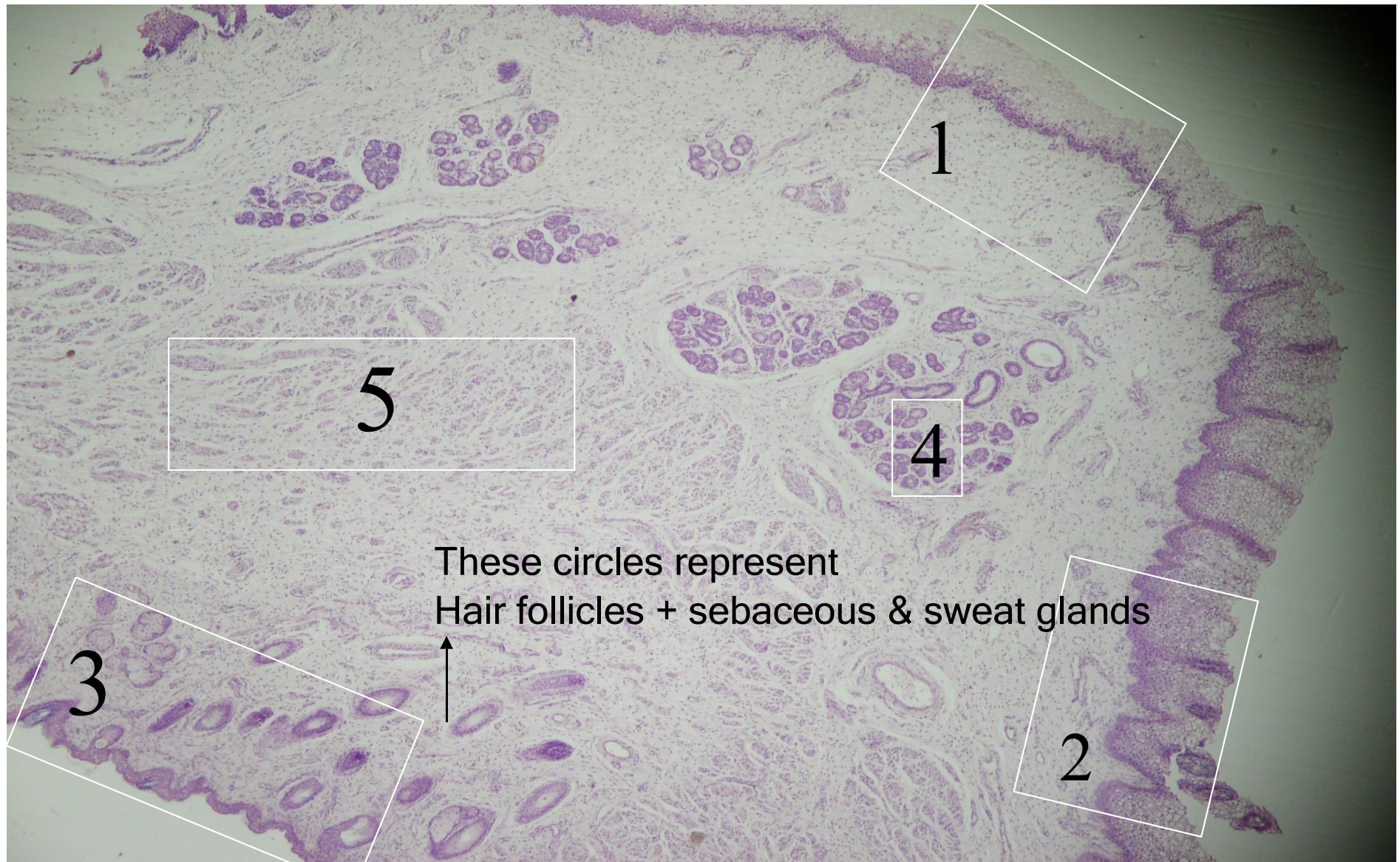
3) **Outer part** (skin)

→ Epithelium: stratified squamous keratinized + hair follicles + sebaceous & sweat glands

**Don't forget that the tissue layers of the lips are: Mucosa, submucosa, skeletal muscle & skin

Sagittal section of LIP

1 Oral mucosa 2 red margin



1. Oral part

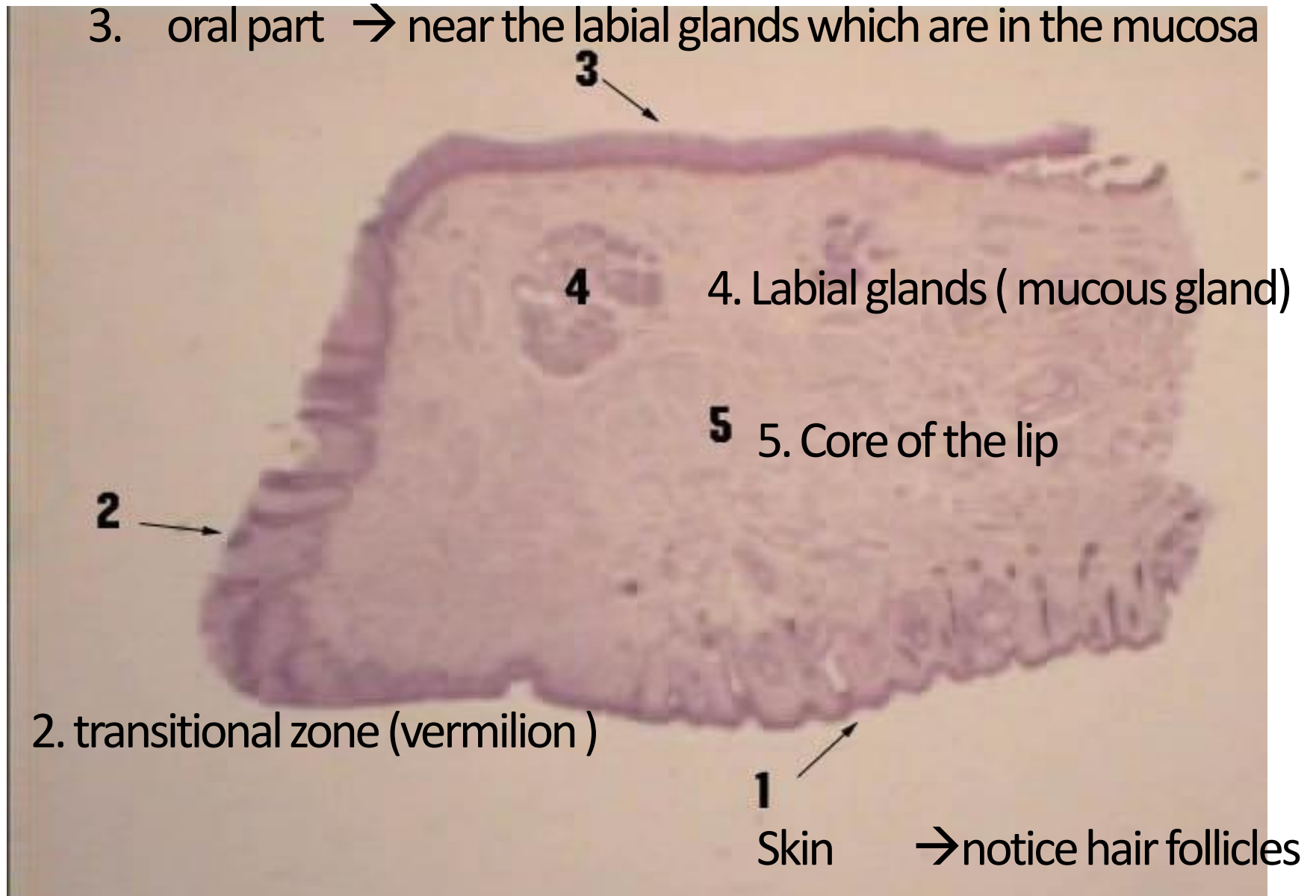
2. transitional zone (vermilion)

3. skin

4. Labial glands (mucous gland)

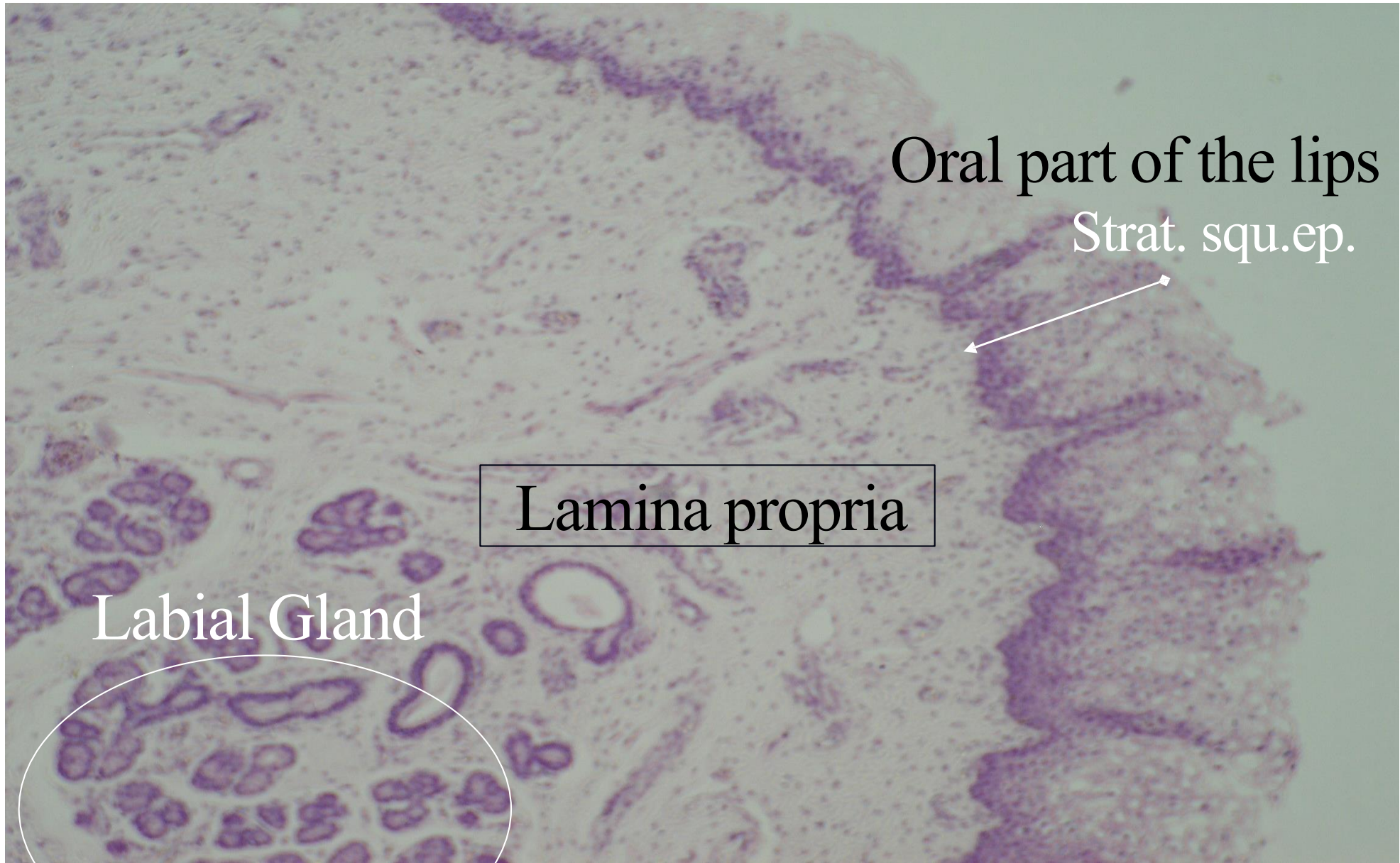
5. Core of the lip: striated muscle → orbicularis oris

Test yourself 😊 Sagittal (longitudinal) section of LIP



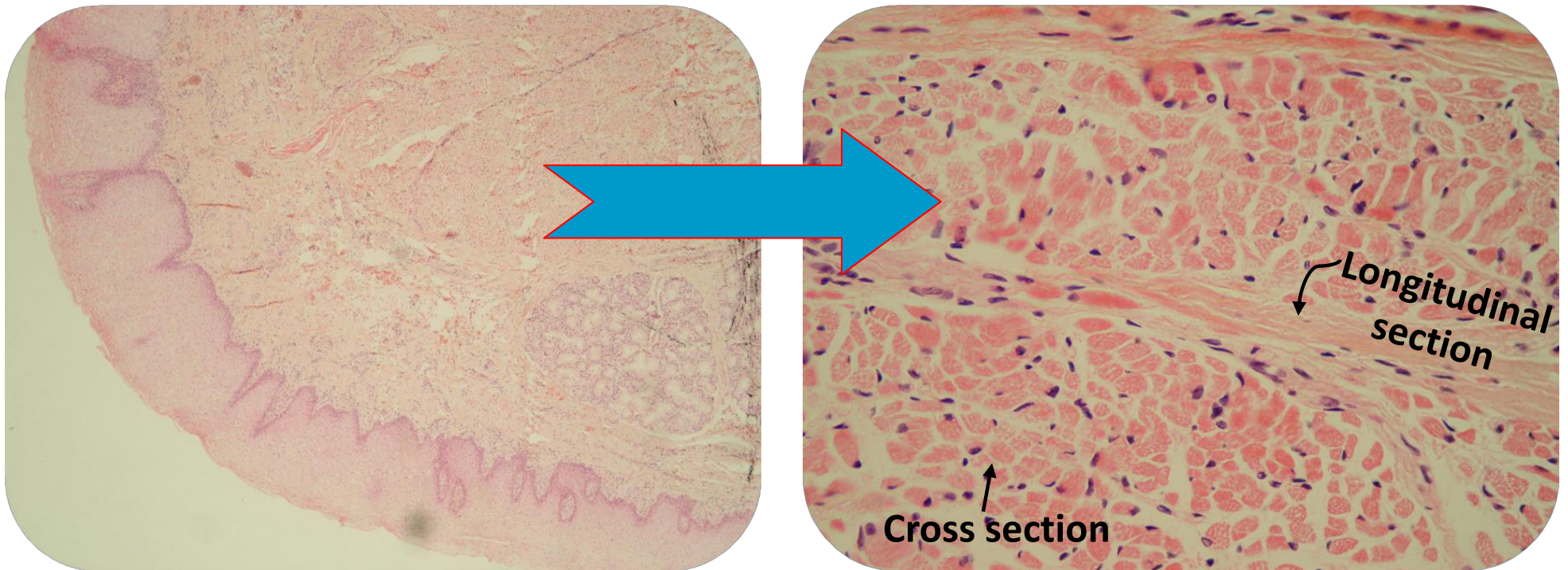
Oral mucosa part

labial seromucous (minor salivary gland)



Core of lips: fine, striated skeletal muscle which is orbicularis oris

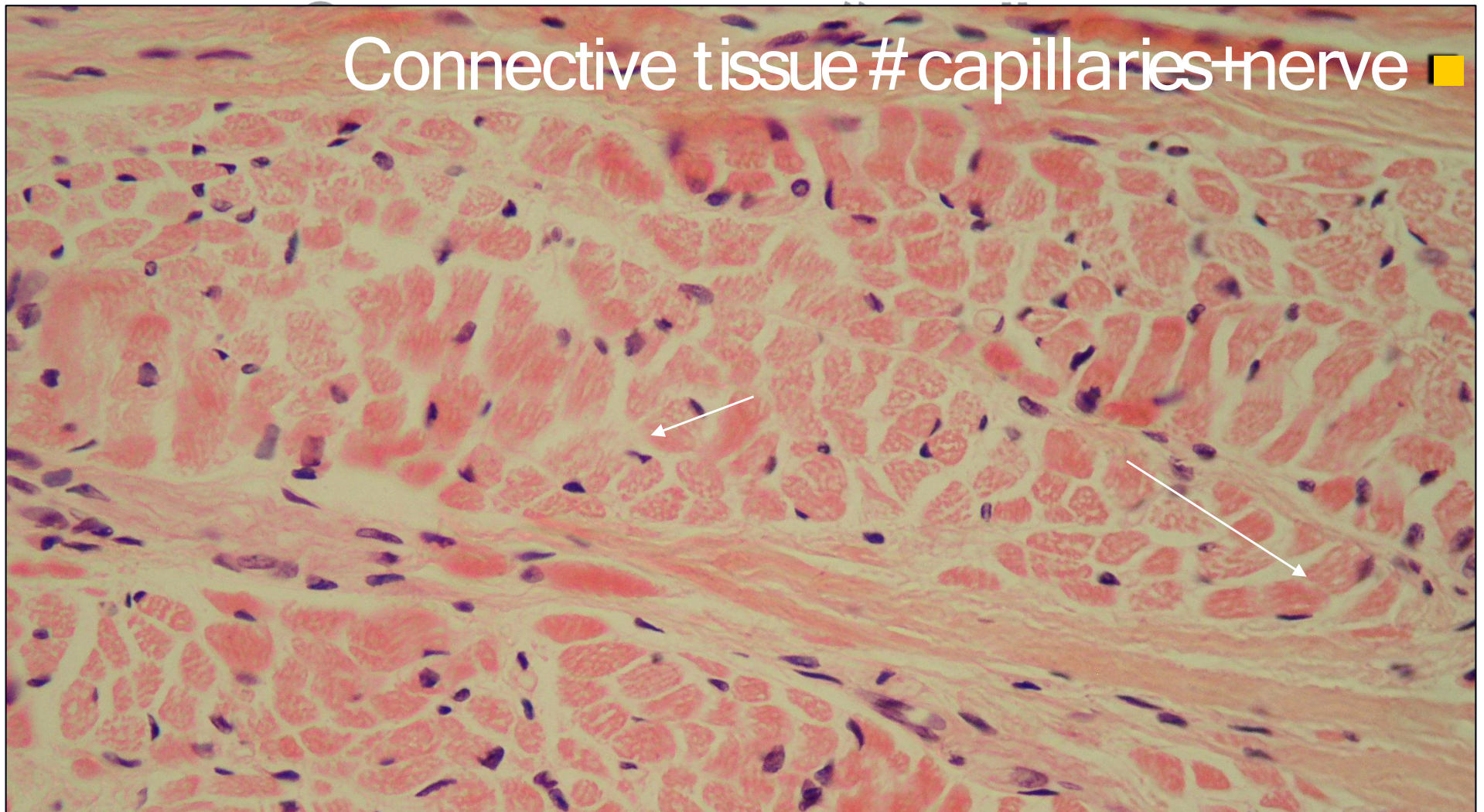
Orbicularis oris has circular fibers & is innervated by the facial nerve
Function: works as a sphincter



Skeletal Muscles are characterized by: Multiple, flattened,
peripheral nuclei

Always Striated muscle = peripheral & multiple nuclei

Fine skeletal muscle in core of lip

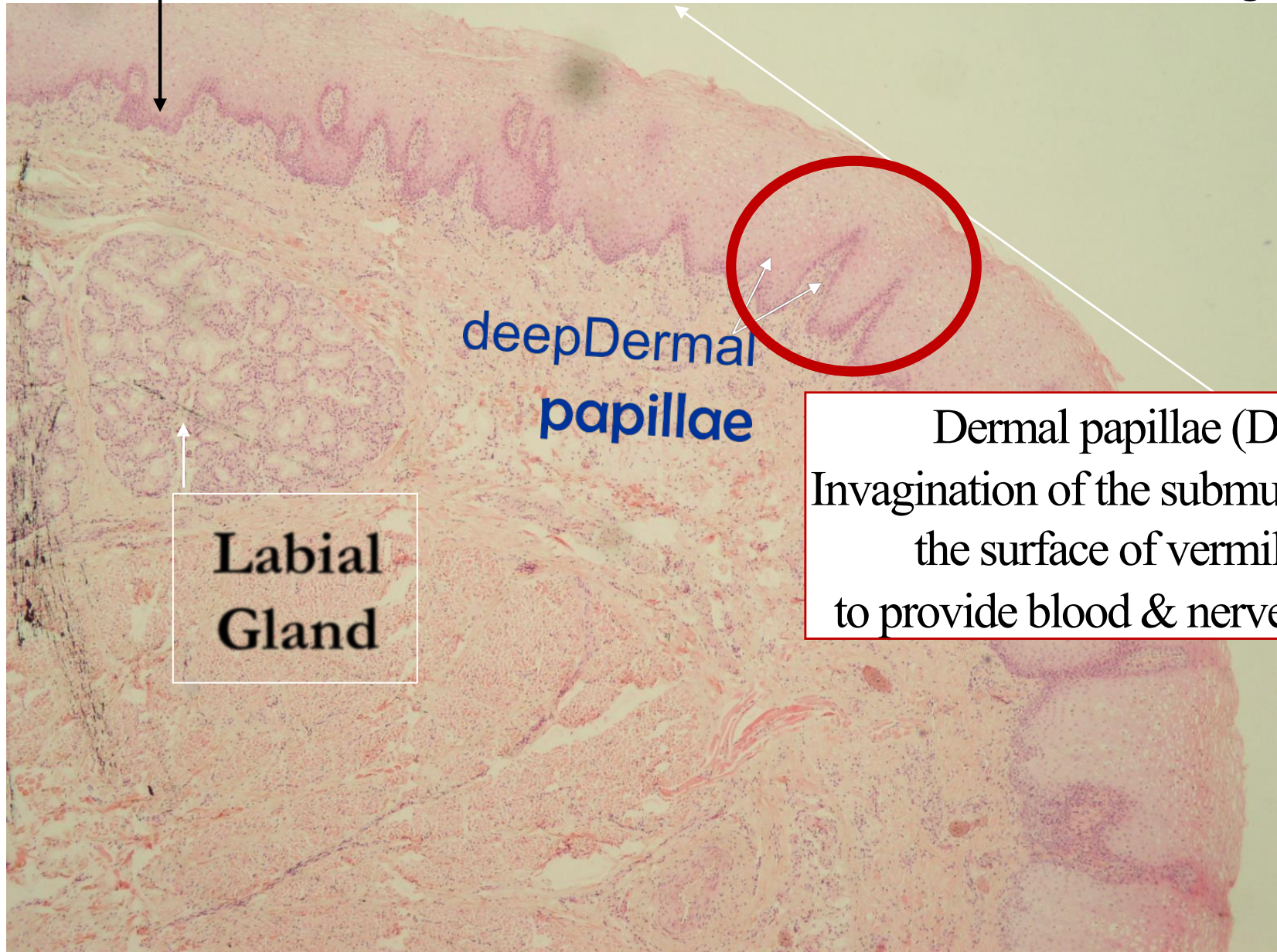


You can see the Multiple, flattened, peripheral nuclei of skeletal muscles

Vermilion (transition zone)

Para-keratinized epithelium

Modified skin because → no hair follicle, no sweat glands

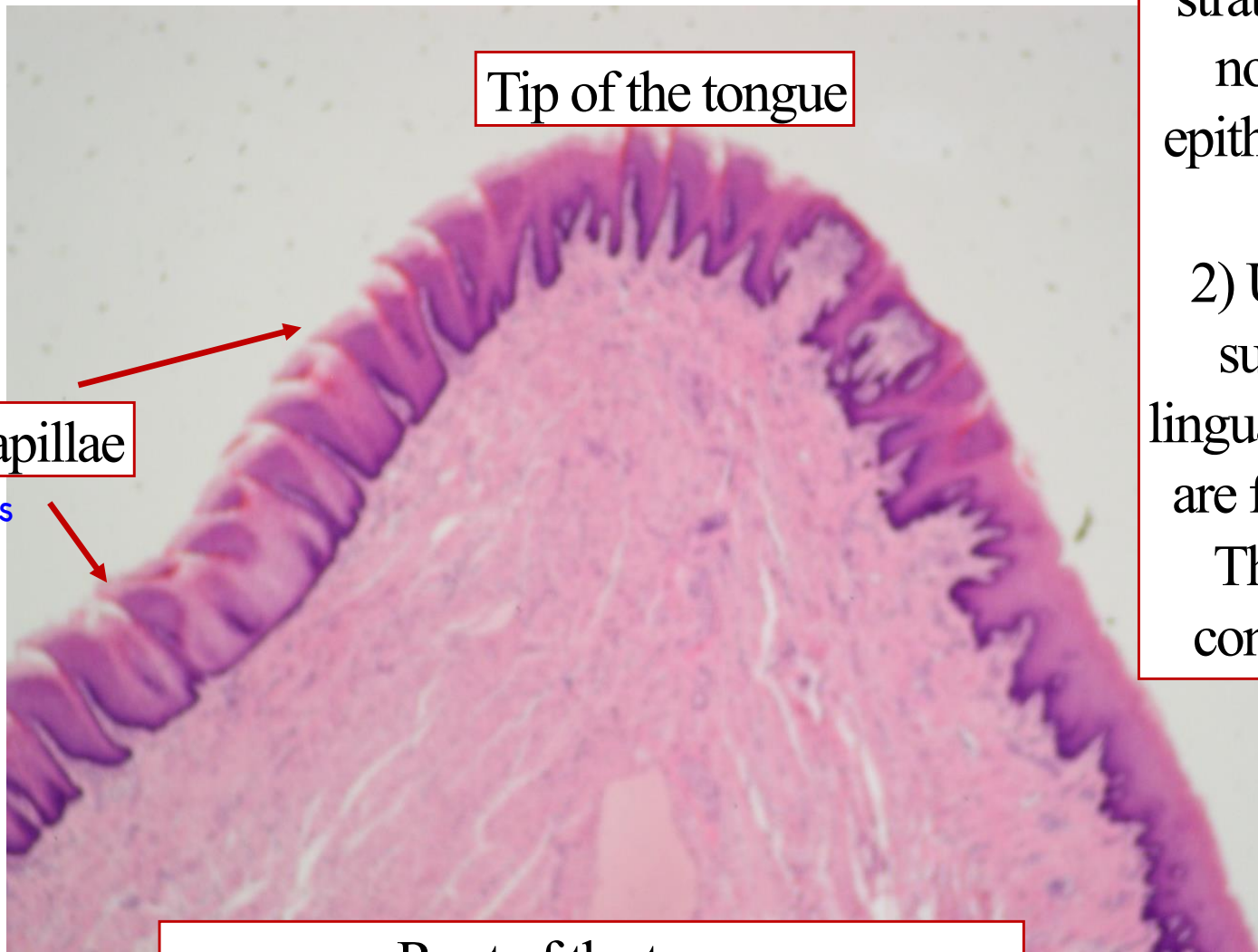


deep Dermal
papillae

Labial
Gland

Dermal papillae (DP)
Invagination of the submucosa into
the surface of vermilion
to provide blood & nerve supply

Tongue : dorsal surface



Tip of the tongue

Filiform Papillae

Stratified squamous
Parakeratinized
epithelium

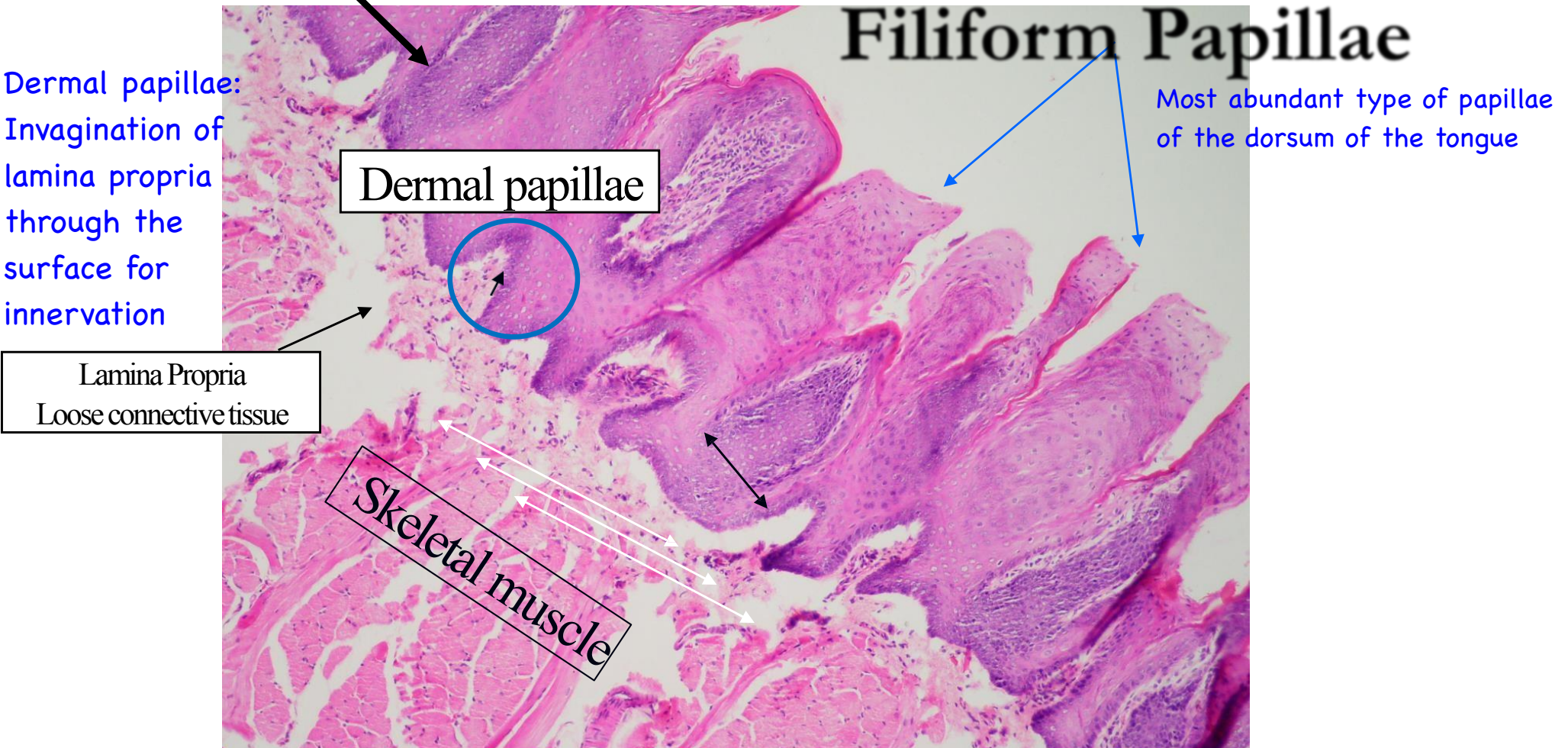
Why parakeratinized?
Because after injury
& regeneration
it does NOT go back
to its normal shape

Root of the tongue
Attached to epiglottis of larynx

The tongue has two surfaces:
1) Lower surface that's covered by stratified squamous non-keratinized epithelium (mucosa)
And
2) Upper (dorsal) surface that has lingual papillae which are filiform papillae
That does NOT contain taste buds

Dorsal surface of the tongue

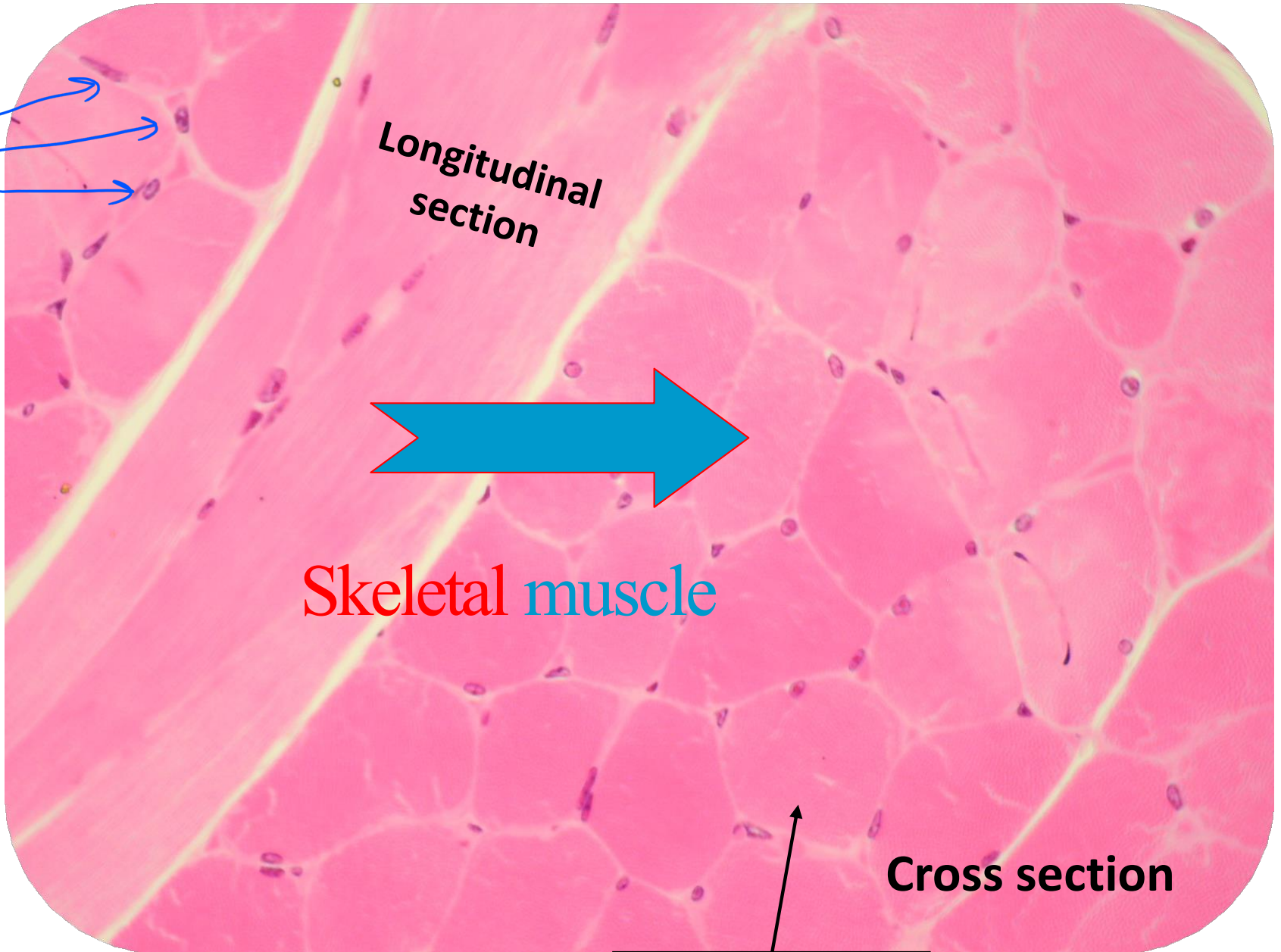
Epithelium stratified squamous para-keratinized, why **para**?
Because once its injured, the epithelium doesn't regenerate back into the original state



Core of the tongue is striated muscles since it's a muscular organ formed by intrinsic & extrinsic muscles

Notice the peripheral nuclei of skeletal muscles

Peripheral nuclei



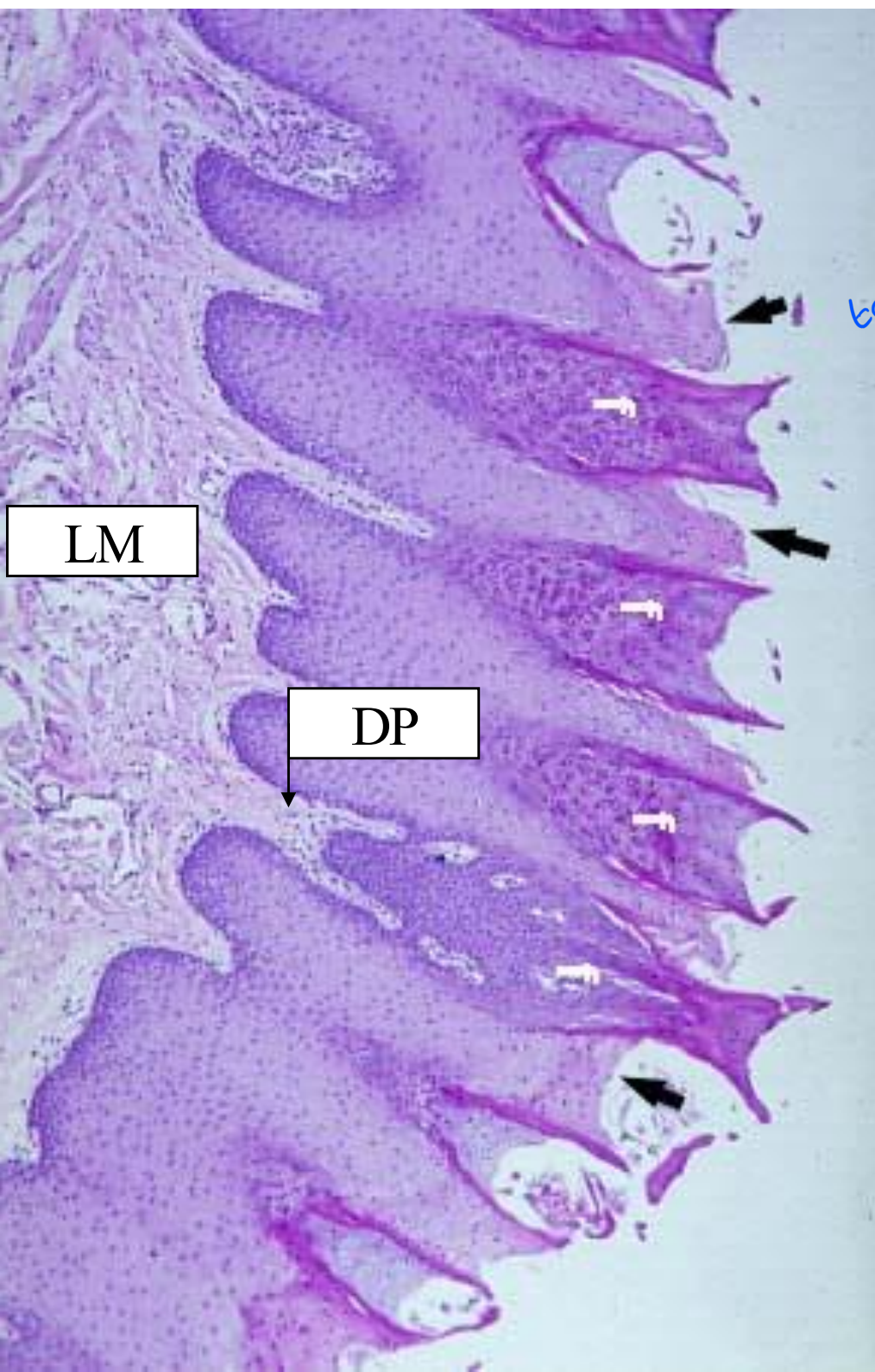
Longitudinal section

Skeletal muscle

Cross section

Muscle Fiber

You can differentiate between skeletal and smooth muscles
Smooth : spindle in shape with 1 central nucleus
Skeletal : cylindrical, multinucleated



Filiform Papillae

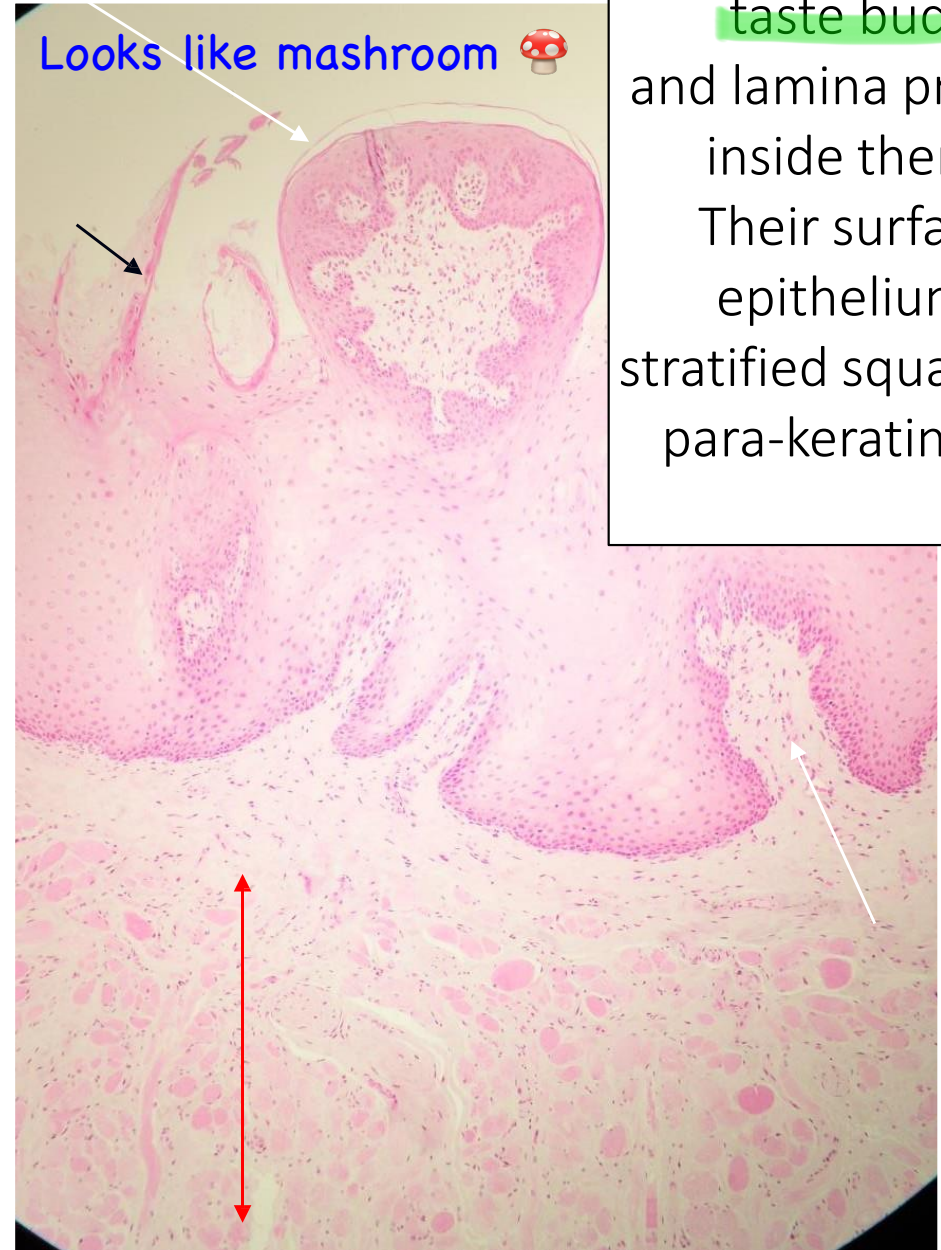
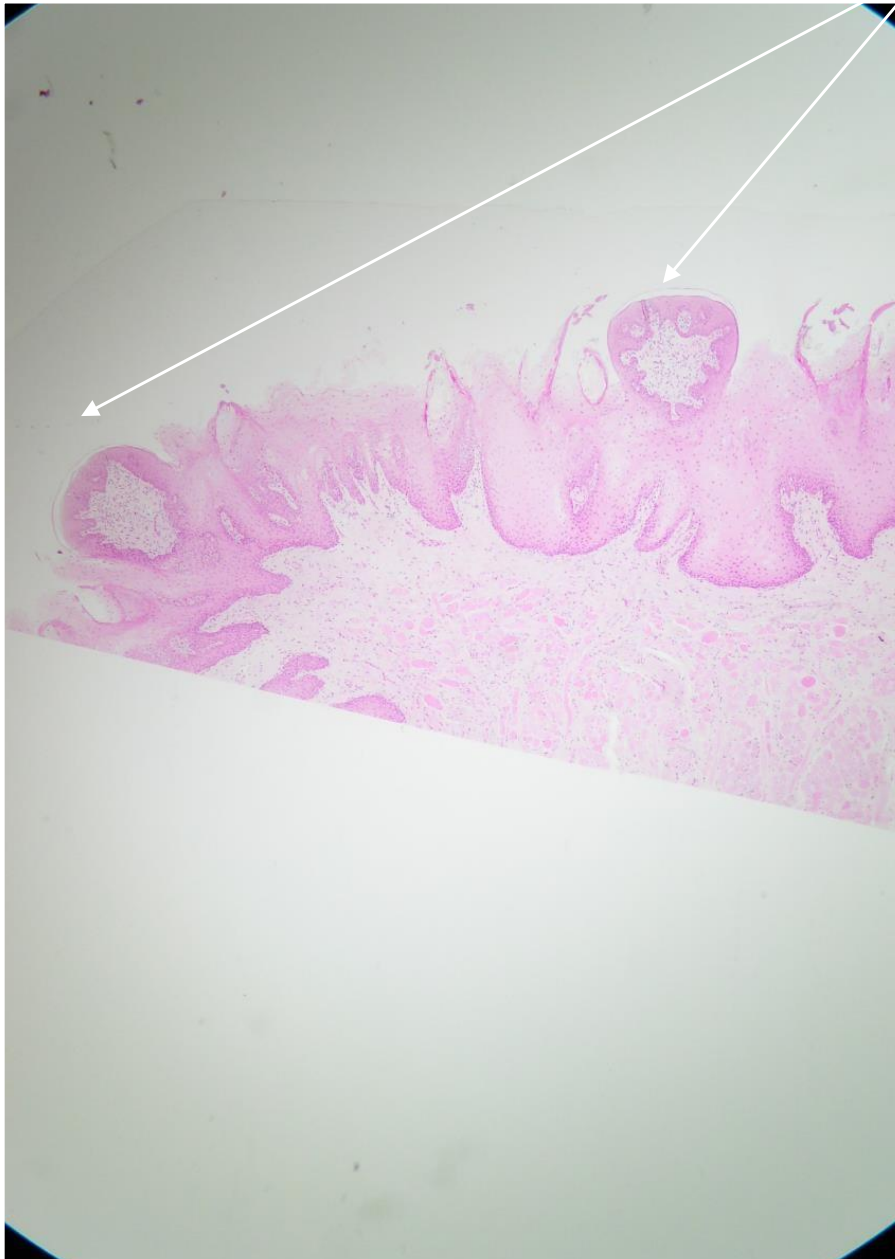
Are lingual papillae that are devoid of taste buds, present on the dorsal surface of the tongue

→ Notice their projections (arrows)

The Laminal propria (**LM**) creates invagination into the surface of the papillae to provide blood & nerve supply
These invaginations are called dermal papillae (**DP**)

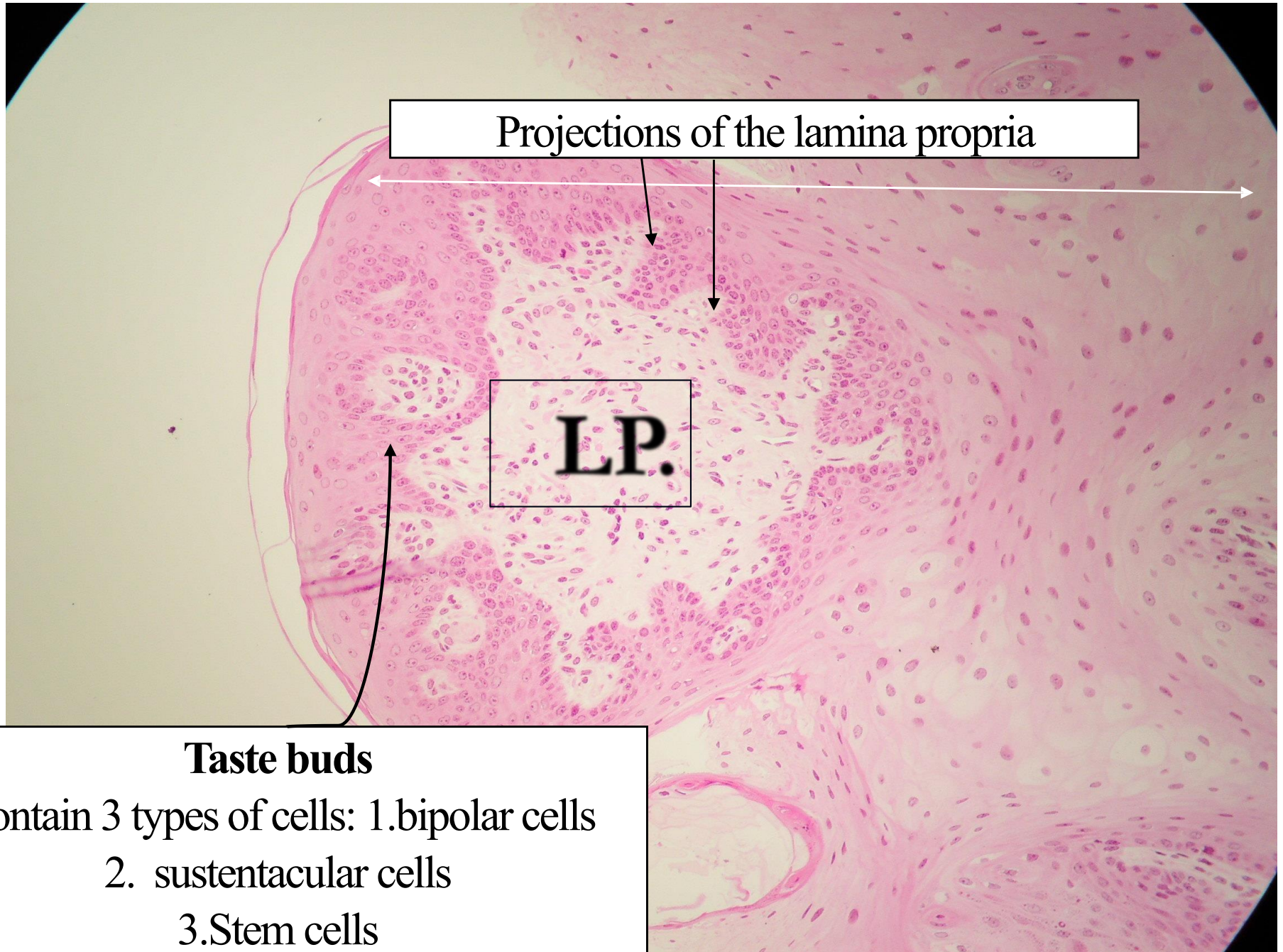
Fungiform papilla

Less abundant on the dorsal surface of the tongue



These papillae have taste buds and lamina propria inside them. Their surface epithelium: stratified squamous para-keratinized

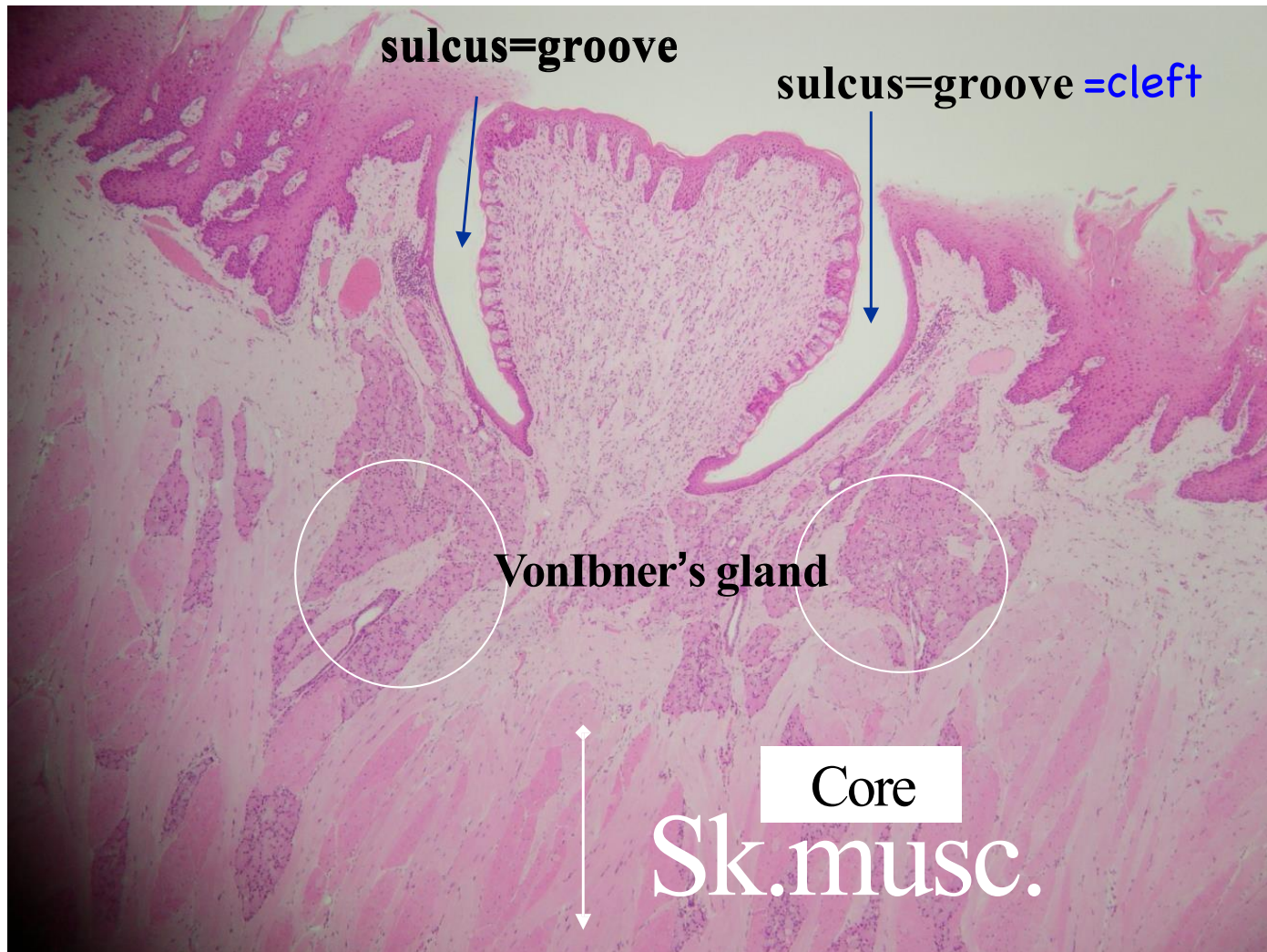
Str. Squa.Ep..



3rd type of papillae present in Tongue:

the most important papillae of all

Circumvallate Papilla



- Surrounded by a circular groove.

Since both of the circumvallate papillae & the groove are circular in shape, they appear shallow because this is a longitudinal section

- Circumvallate papilla has taste buds present on its lateral side, medial to the groove

- von Ibner's gland duct opens in the groove, it releases serous secretions to dissolve materials we taste

Test yourself 😊

Taste bud

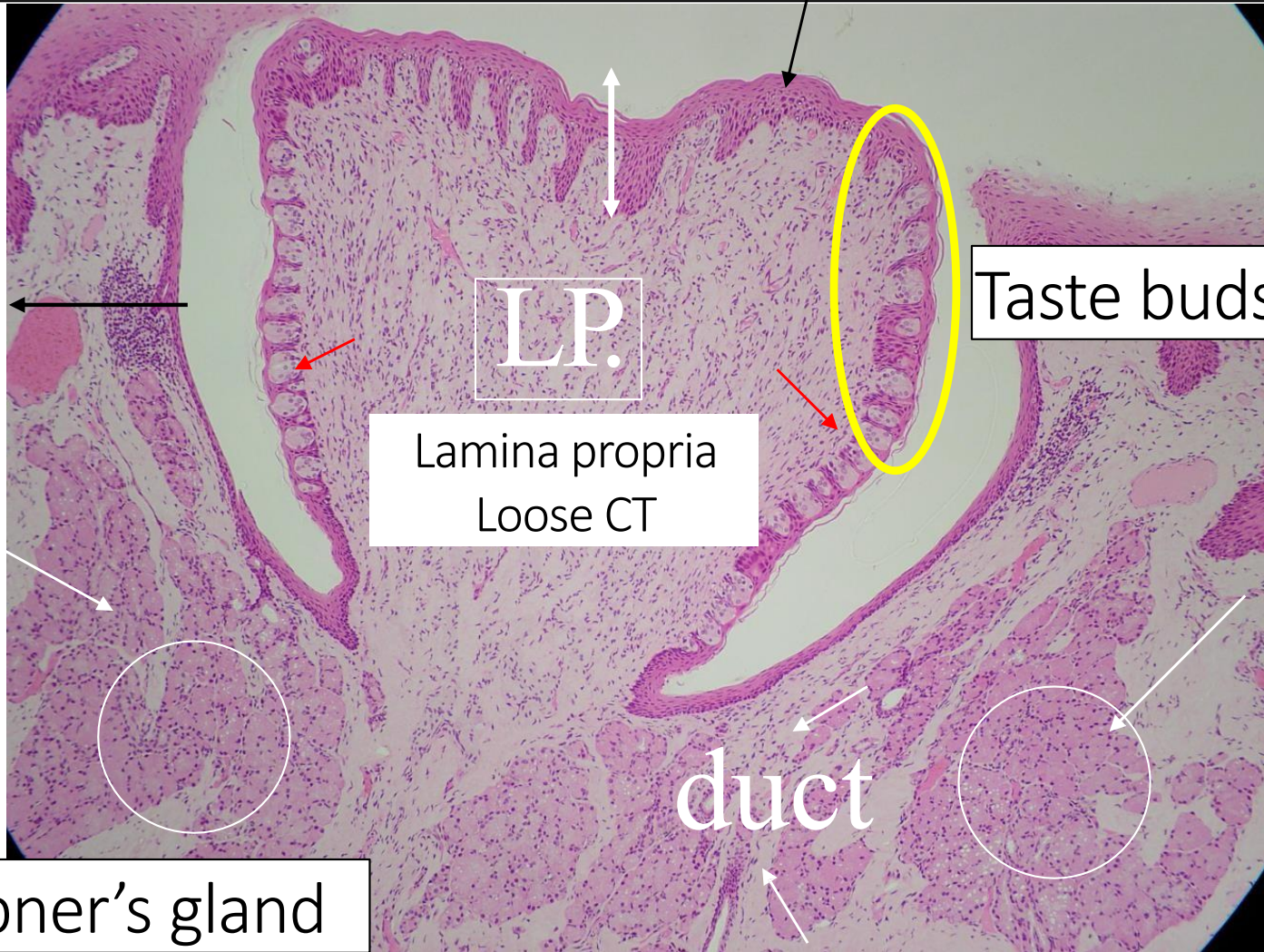
Side note:
The lining
epithelium of the
groove's surface is
stratified squamous
non-keratinized
(mucosa)



Answers

Circumvallate papilla

Surface epithelium: stratified squamous para-keratinized



sulcus=groove

LP.

Lamina propria
Loose CT

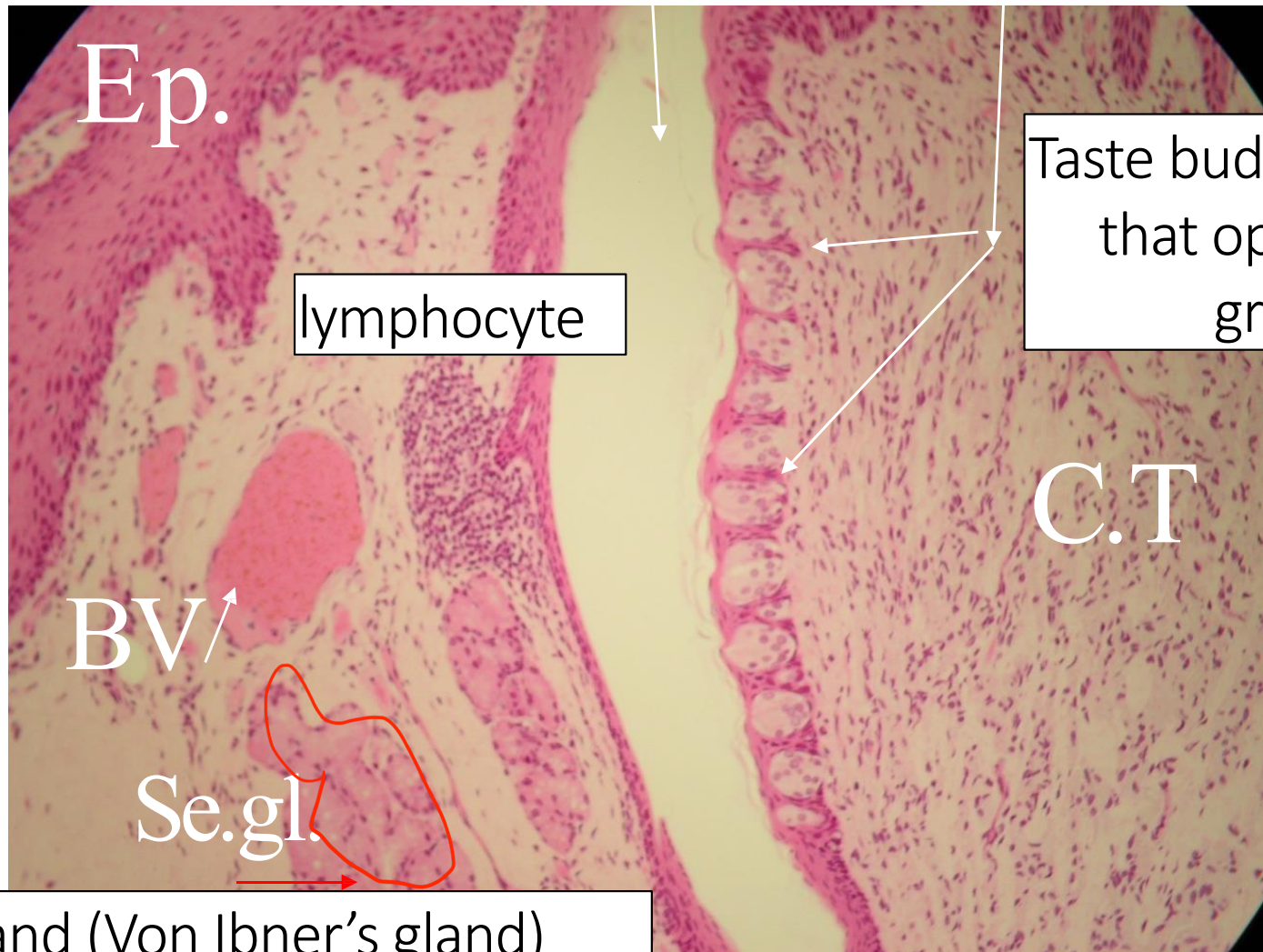
Taste buds

duct

Von Ebner's gland

Histology of Taste buds

Serous gl. sulcus Taste bud



Taste buds have pores that open to the groove

lymphocyte

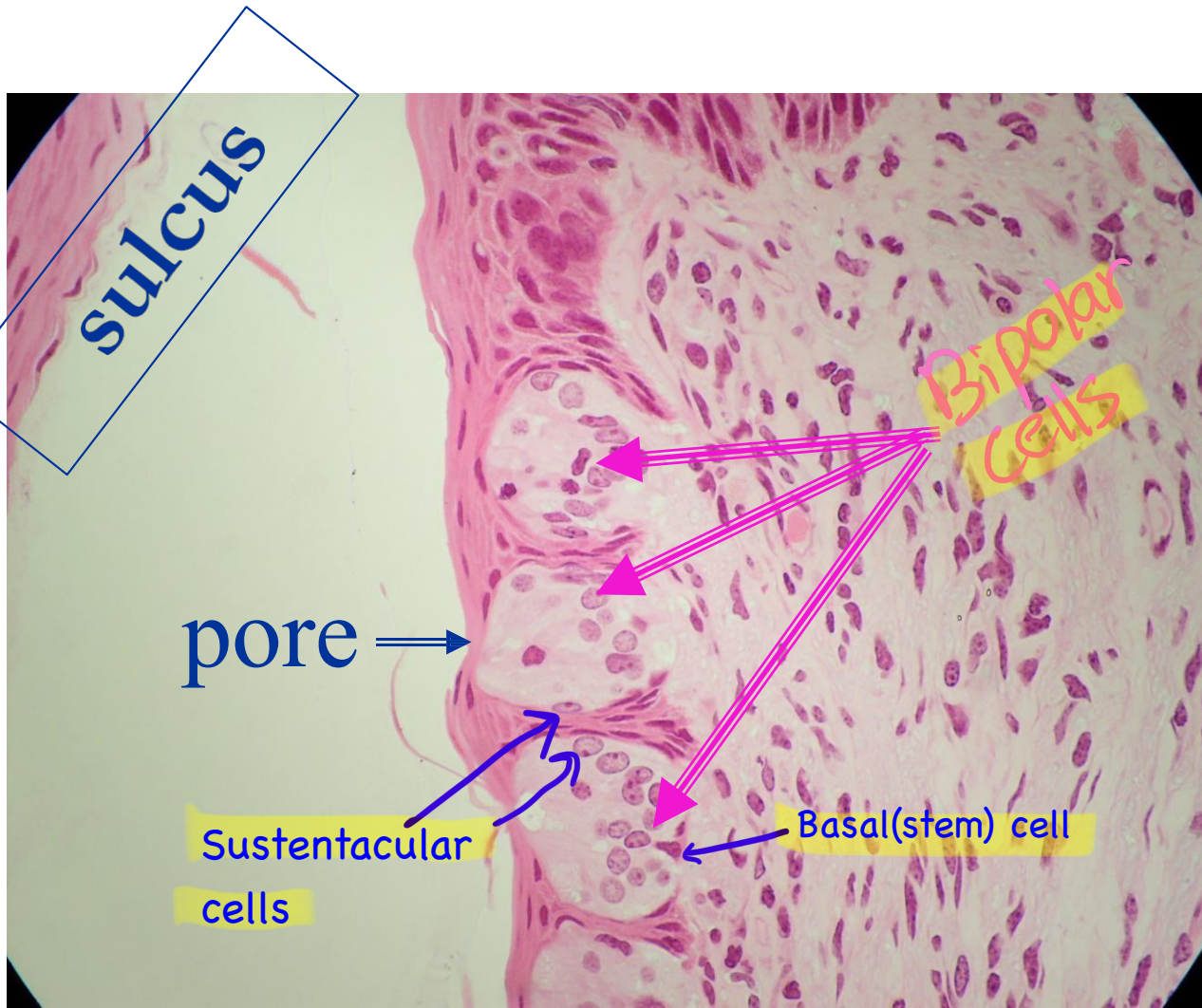
C.T

BV

Se.gl.

Serous gland (Von Ebner's gland) opens to the bottom of the sulcus

Taste bud



Cells of the taste bud

Bipolar cells (Neural cells)

Located at the center, have hairlets that connect it to the pore & at the base the cells are connected to nerve fibers.

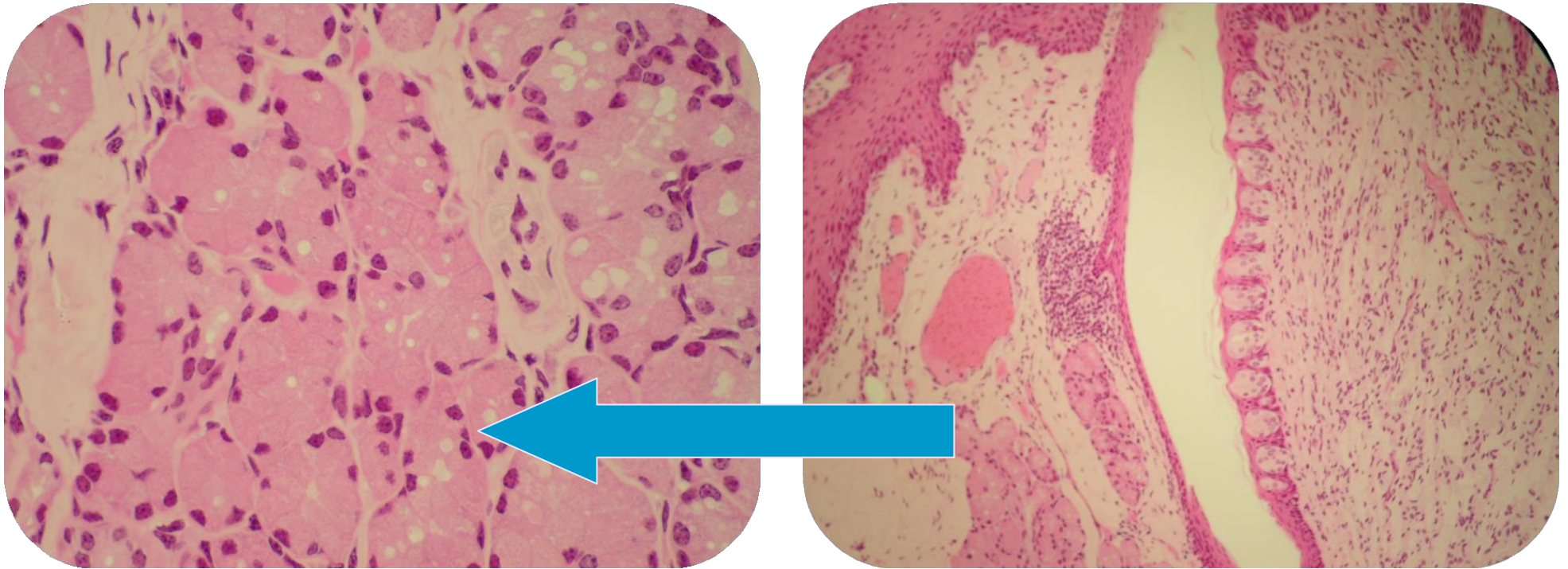
Function of bipolar cells:

Covert chemical impulse to electrical and transduce it to the centers in the brain

To recognize sour, sweet, bitter tastes

On the lateral side lies the sustentacular cells (supportive cells) & on the base stem cells are located

VonIbner's gland=minor gland



Von Ibner's Gland:

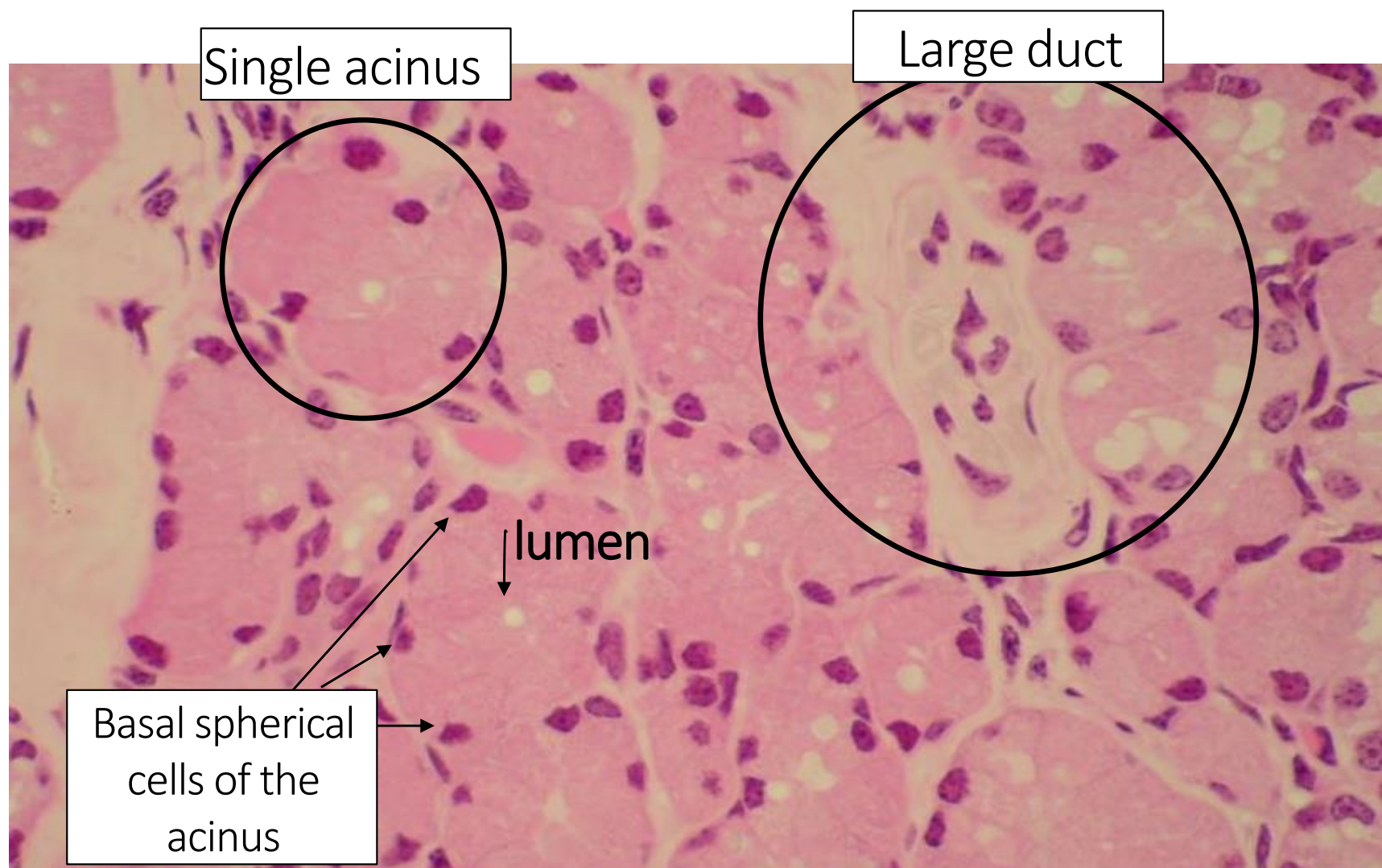
- Minor salivary gland, releases serous secretions.
- Composed of multiples serous acini, each acinous has a central lumen & cells that has spherical basal ganglia and its apex directed towards the lumen, the boundaries between the cells are ill-defined.
- The gland drains its secretions via a large duct that opens at the bottom of the sulcus.

The doctor mentioned that we can differentiate between:

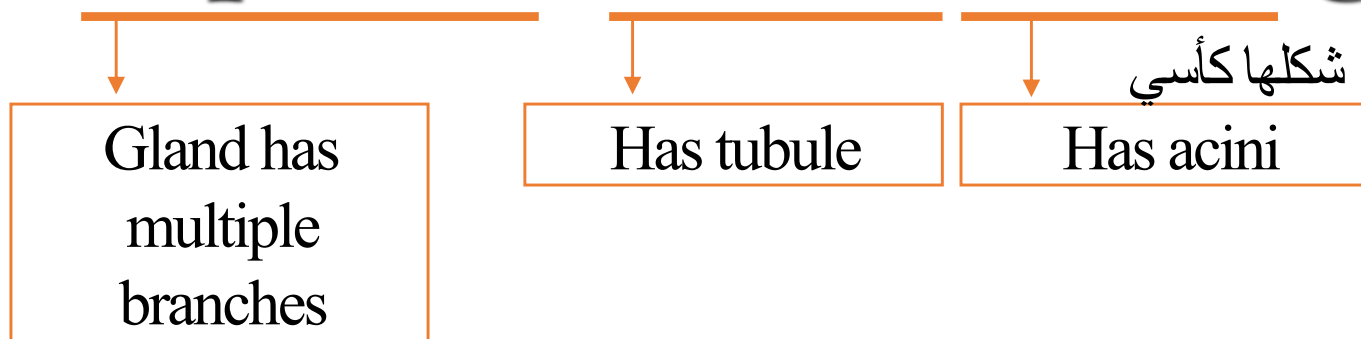
Serous acini -> basal rounded nuclei

Mucous acini -> flattened nuclei

Serous acinus



Salivary glands:=major gland compound tubuloacinar gland

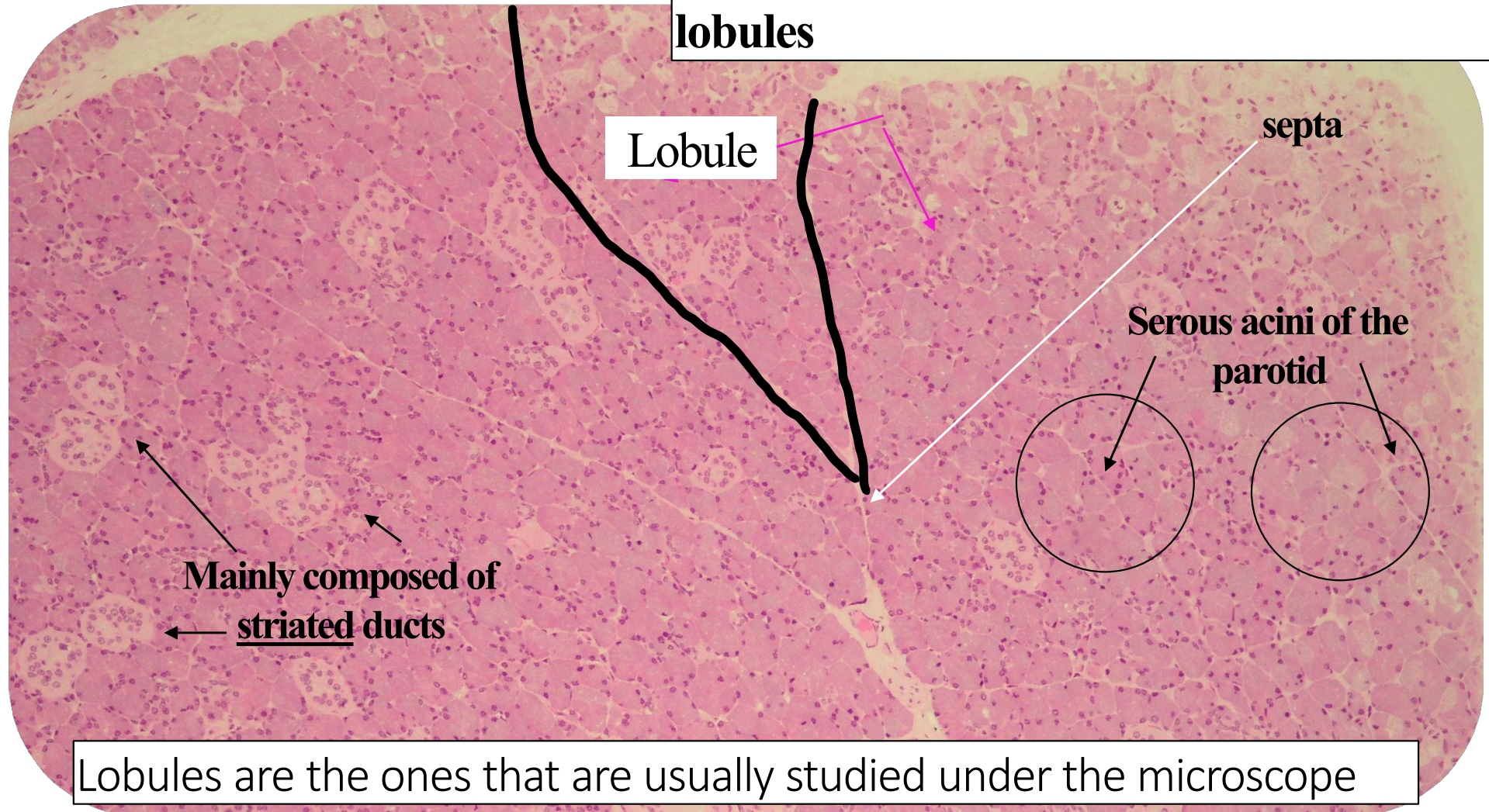


With parenchyma & stroma

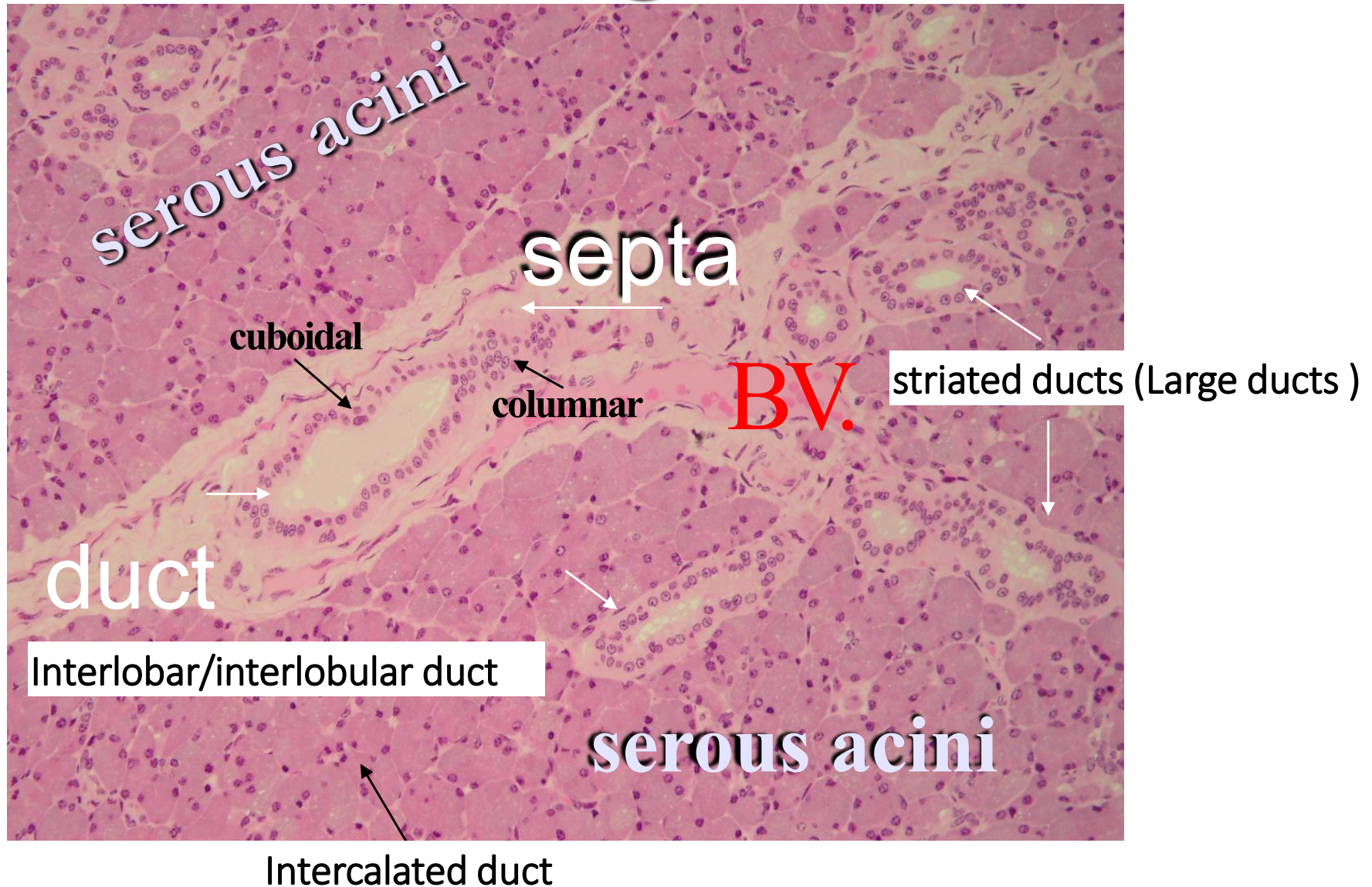
Remember the 3 major salivary glands are:
Parotid, submandibular & sublingual

Parotid gland:

Characterized by having two capsules, inner & outer
the inner capsule sends connective tissue septa that divides the gland into lobes & lobules



Parotid gland: serous gland



Exam question: what are the two ducts present in lobules

Intercalated vs. **striated** ducts in lobules

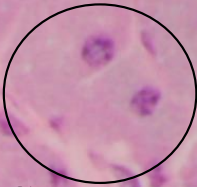
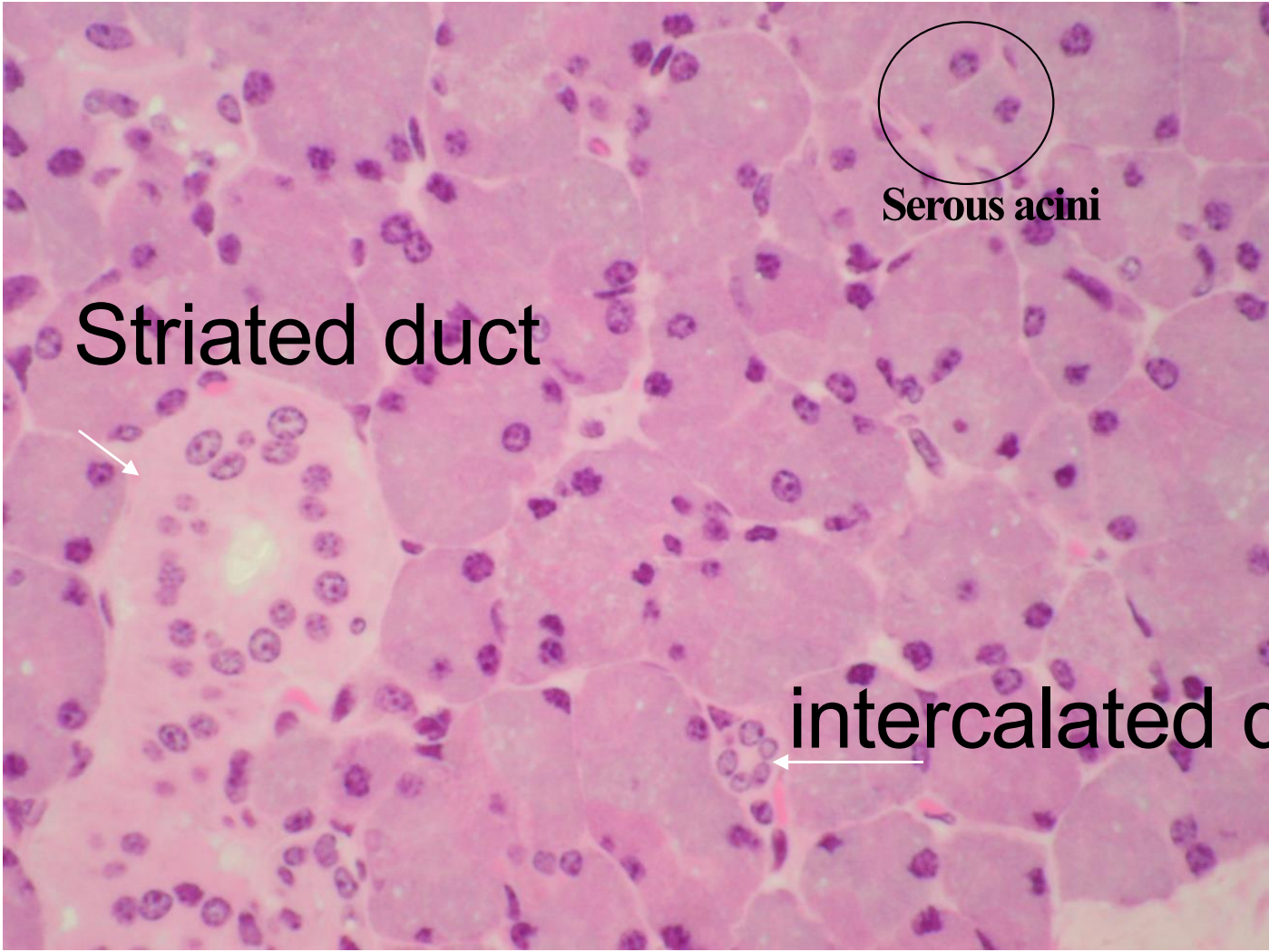
- **Striated ducts** appear pale in histological sections.
- larger in size, has large lumen, large number of nuclei, composed of more than 8 cells
- **Simple** cuboidal cells with rounded nuclei

- **Intercalated ducts** are small in size, narrow lumen, 5-7 cells

Interlobar/interlobular duct (between the lobes & lobules)

- Has larger lumen than striated ducts
- Lining Epithelium: **Stratified Cuboidal**, distally the epithelium changes into **columnar**, and eventually at the **main** excretory parotid duct the epithelium becomes **stratified squamous non-keratinized**

Striated & intercalated (Intralobular duct)



Serous acini

Striated duct

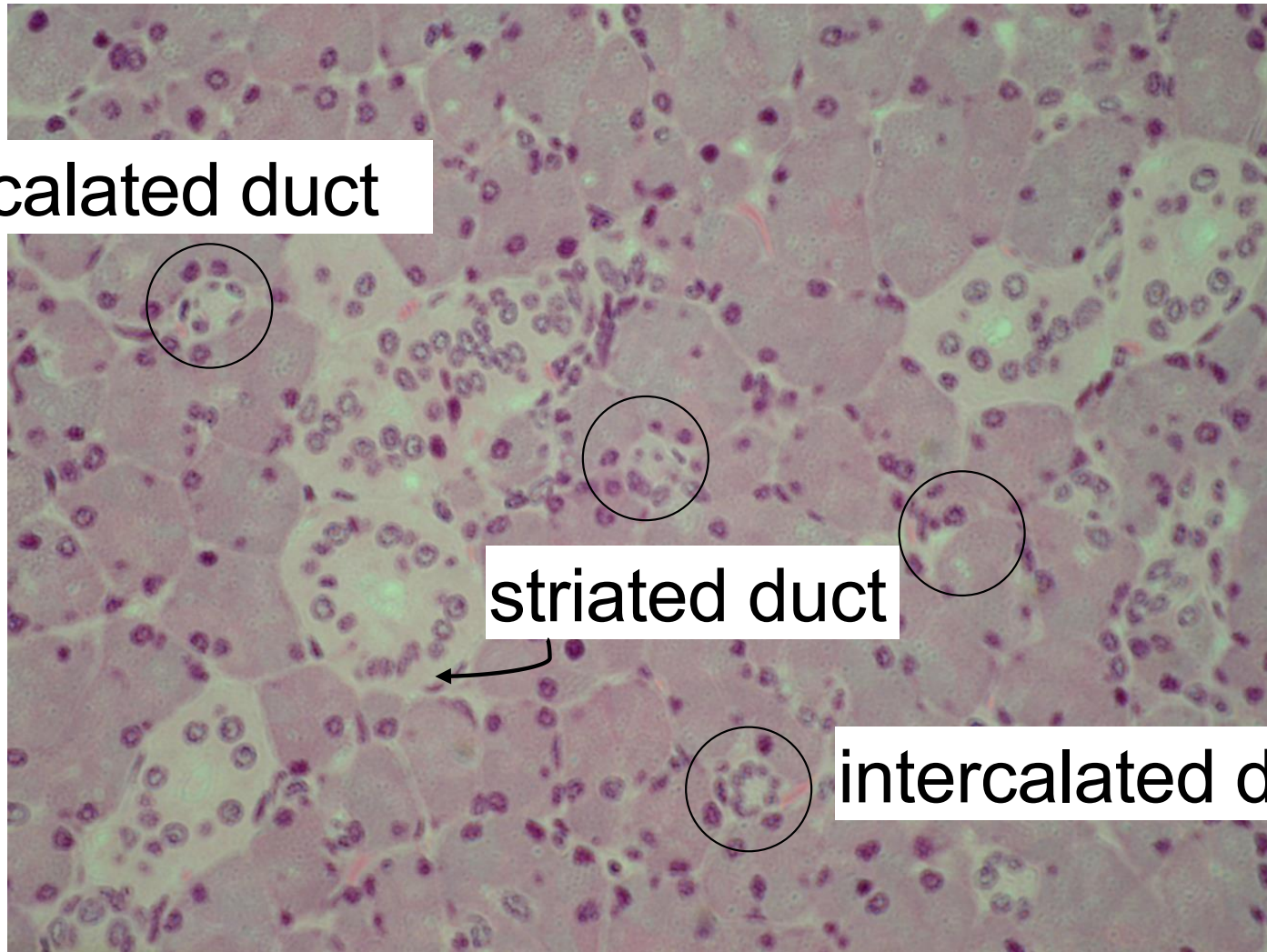


intercalated duct



ALL the circled ducts are intercalated ducts

intercalated duct

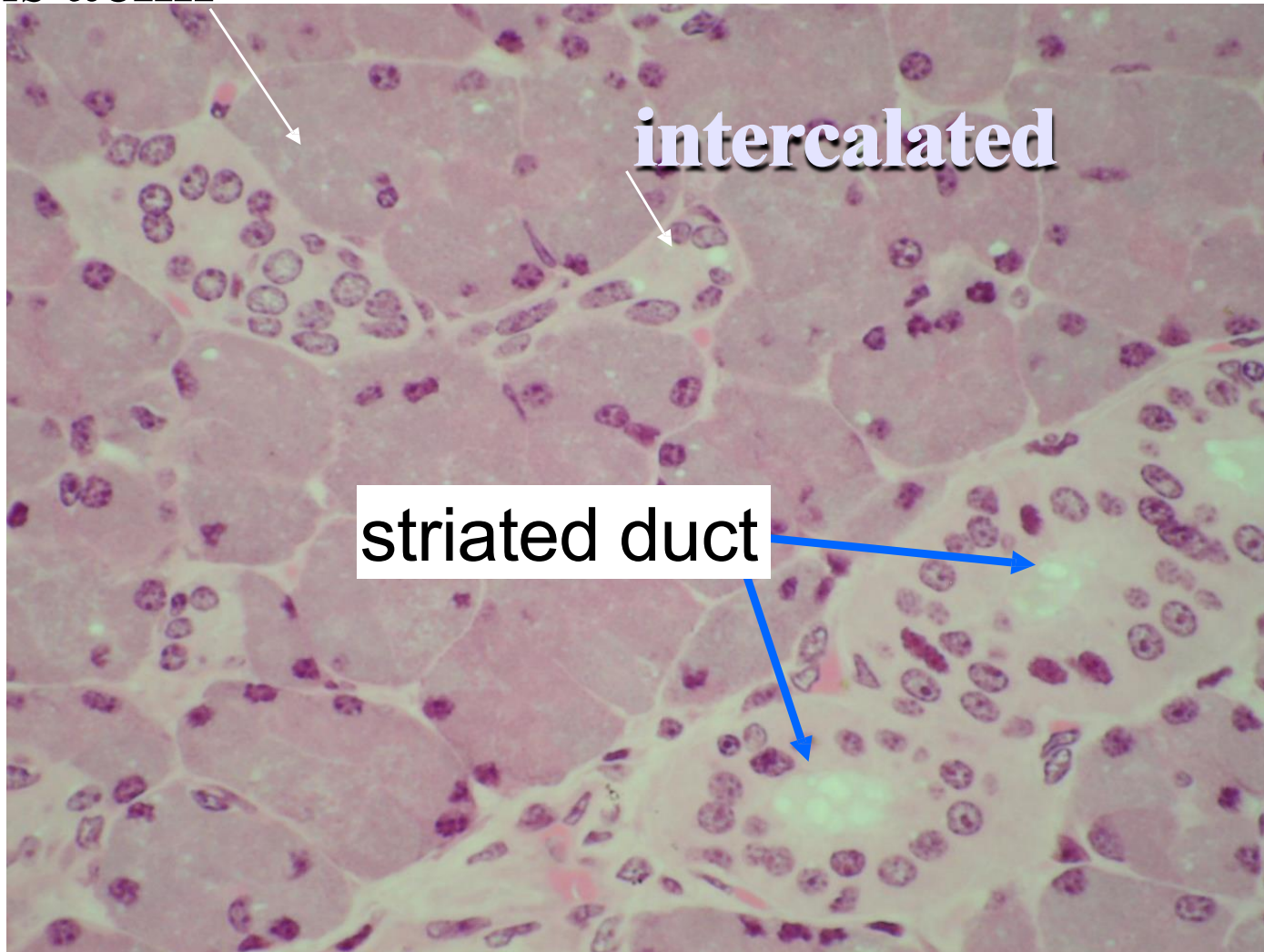


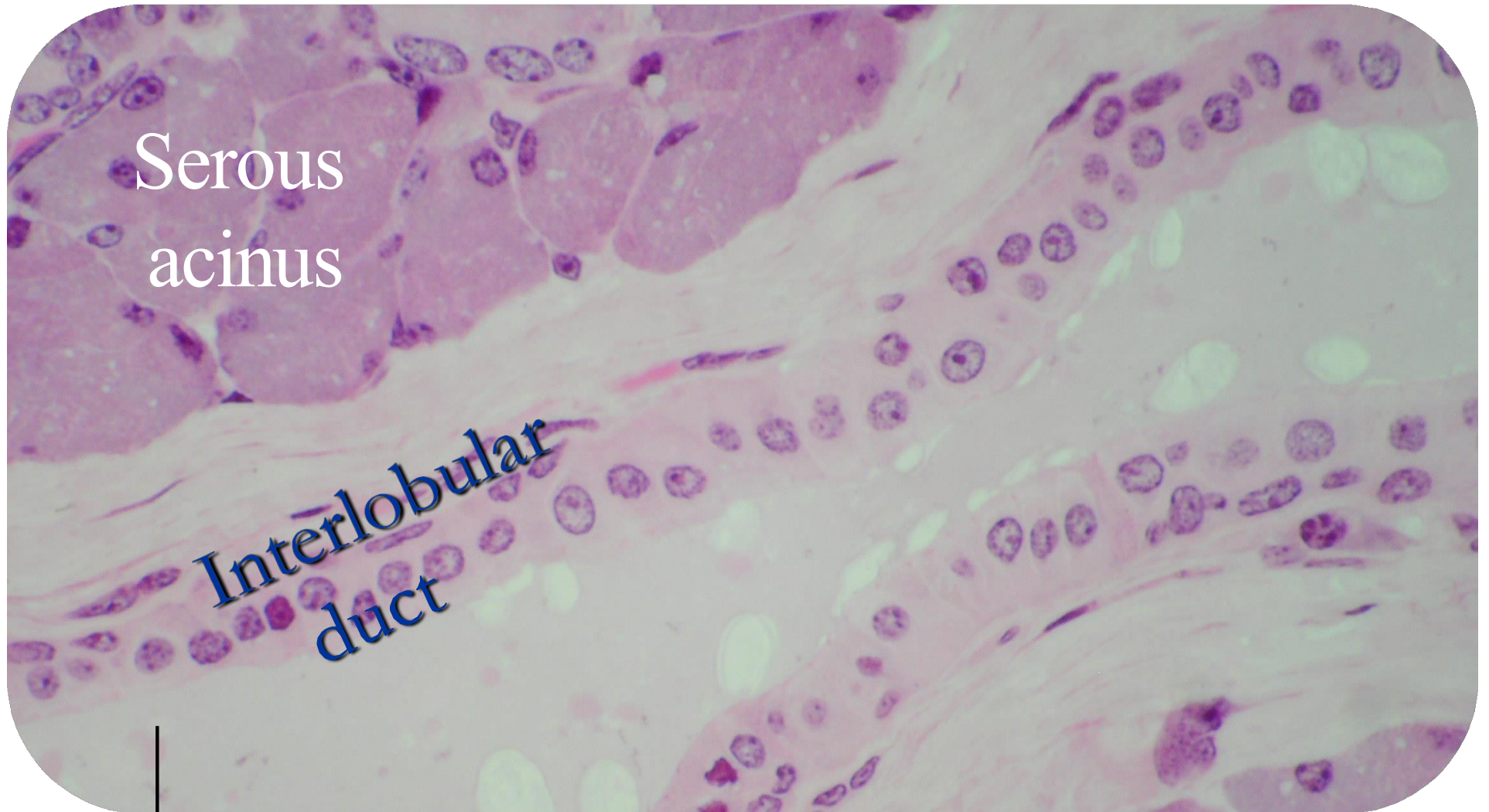
striated duct

intercalated duct

Interlobular duct

Serous acini



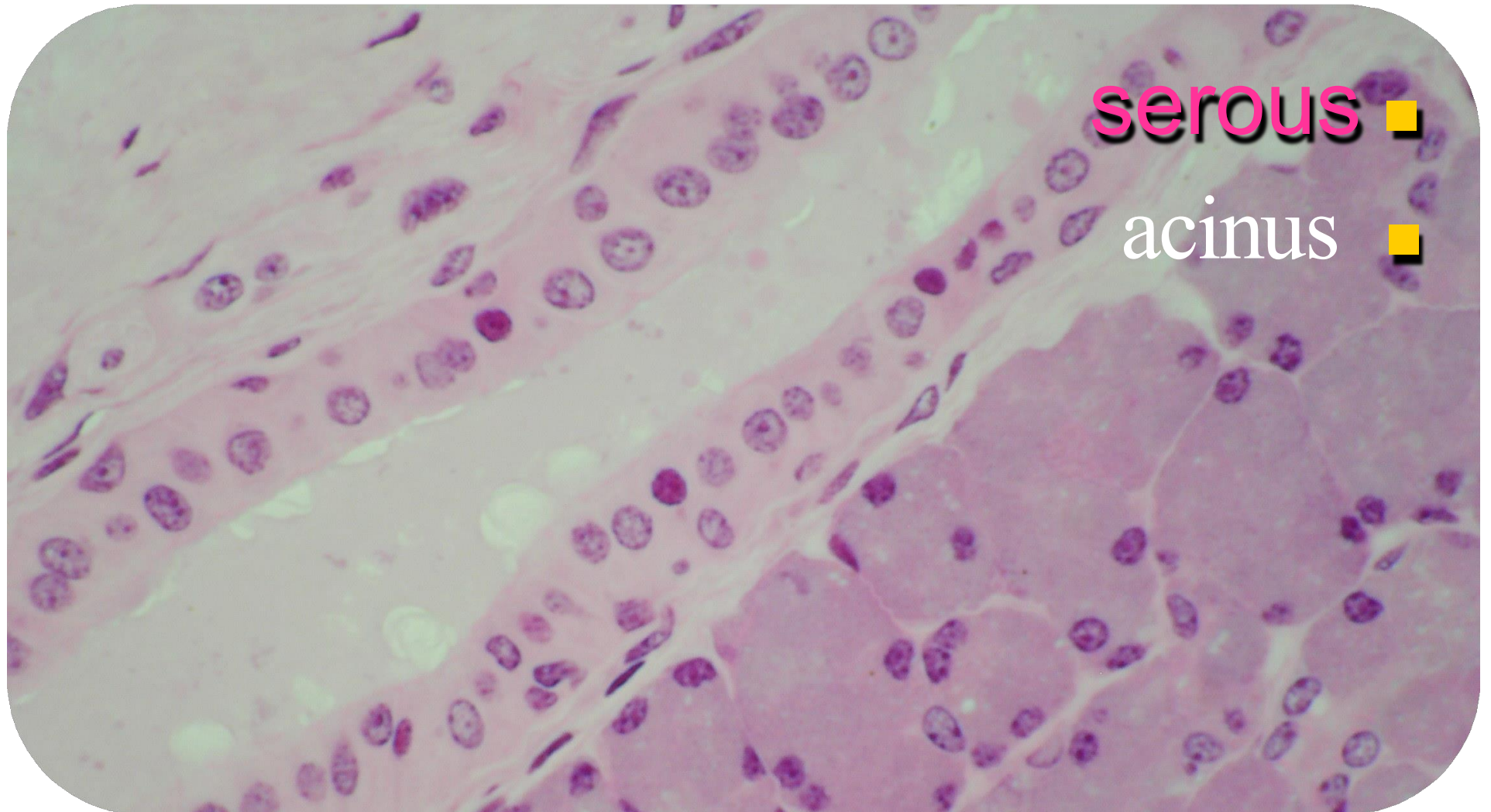


Serous
acinus

Interlobular
duct

Large duct with large lumen
Lined by two layers of cuboidal
cells → **stratified**

Interlobular duct (excretory)



Has 3 colors:

White : mucus acini, it secretes mucus so mucin dissolves and gives the white color

Light pink : the duct

Dark pink : serous acini

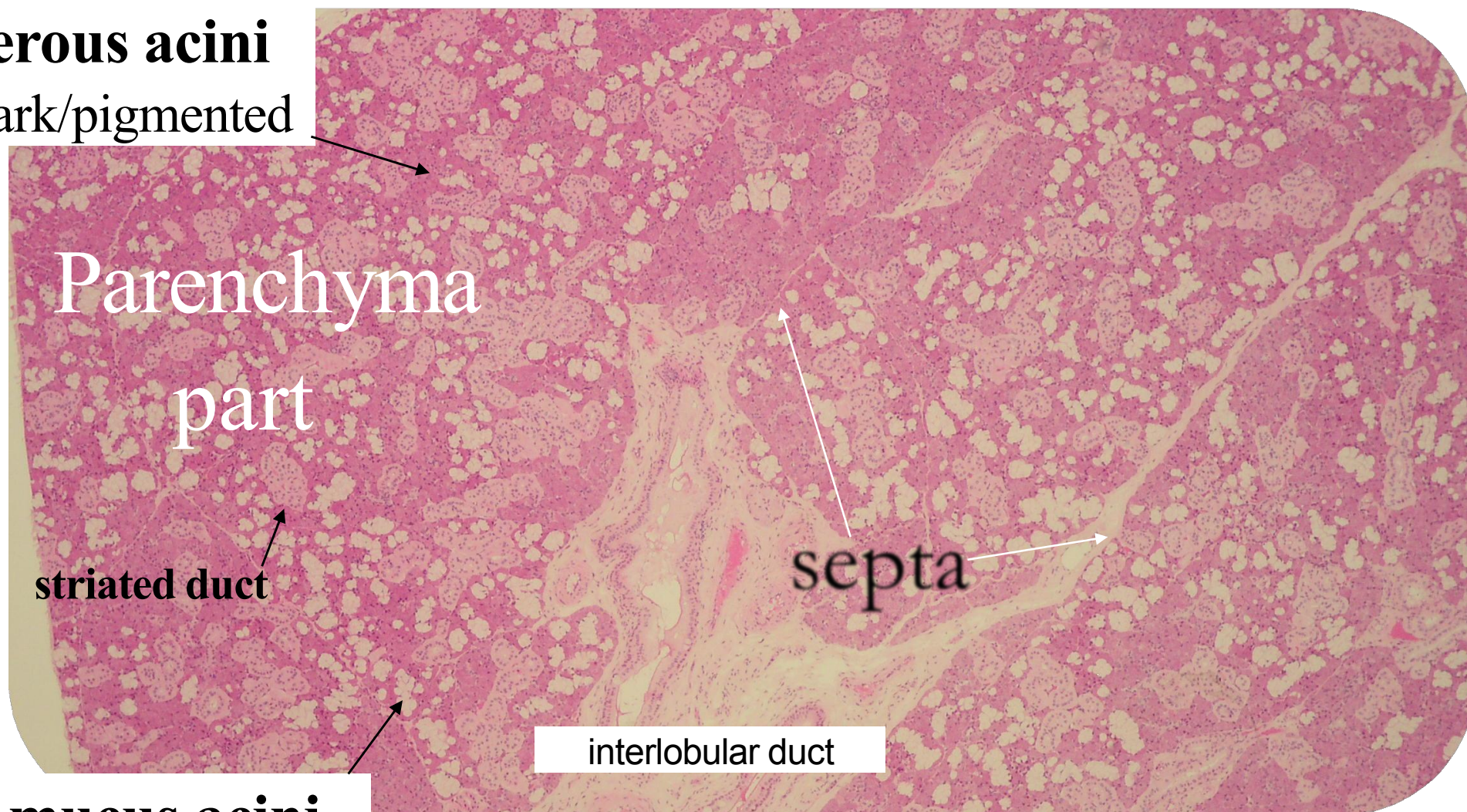
Submandibular gland

Mixed gland: mucus & serous secretion

said to be a complicated gland because it has a **large** number of striated ducts

Serous acini

Dark/pigmented



Parenchyma
part

striated duct

septa

interlobular duct

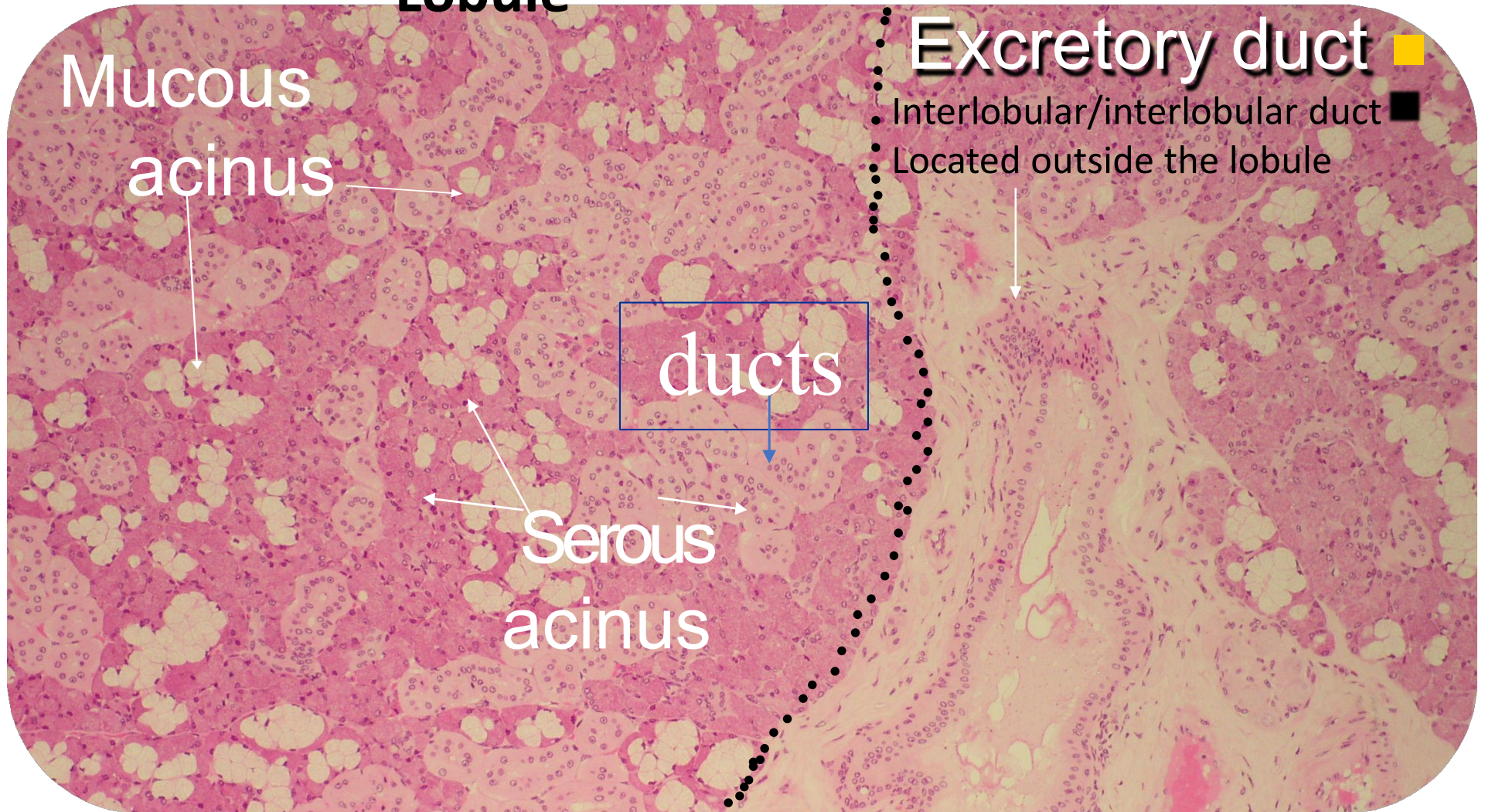
mucus acini

White/light

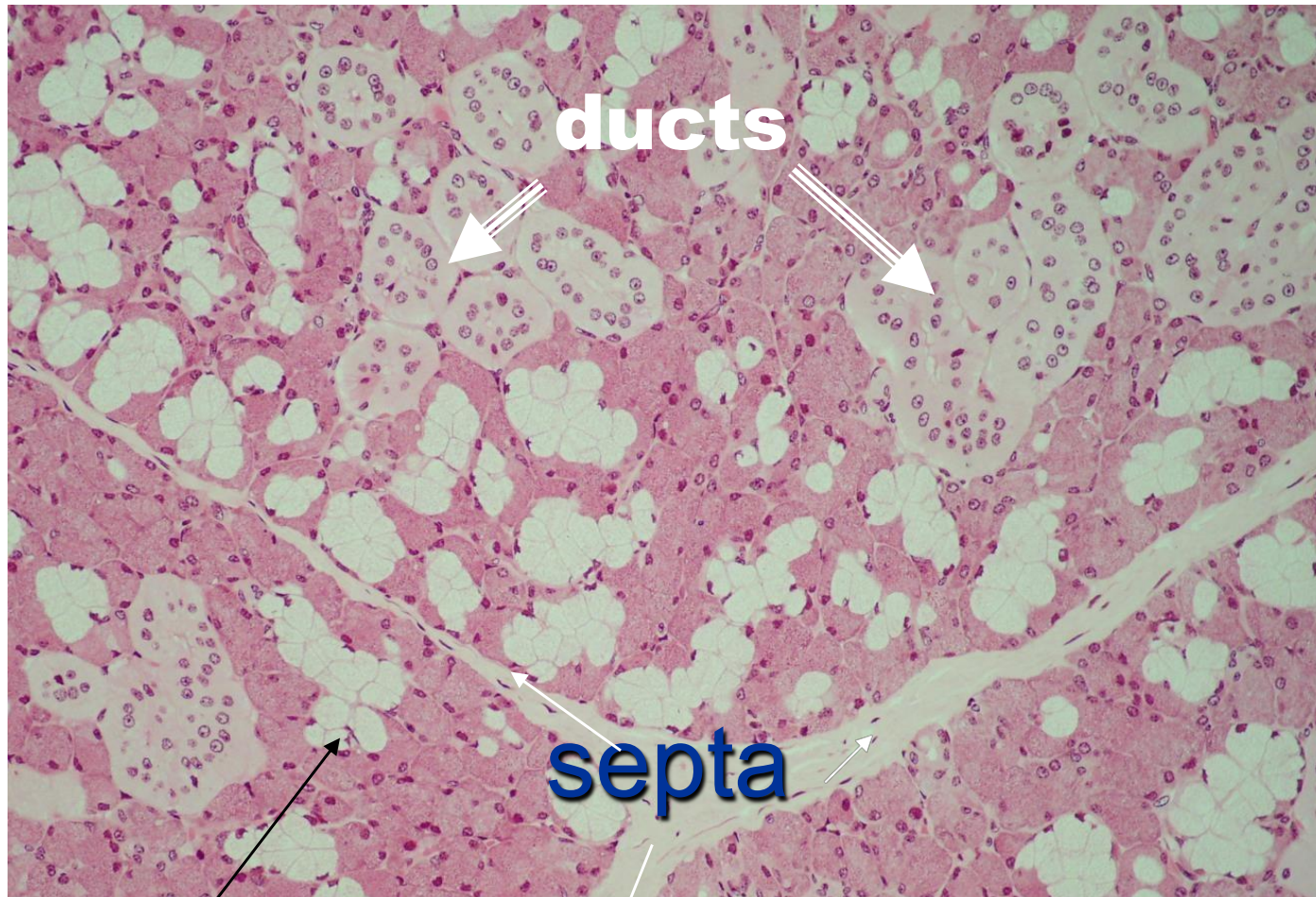
****Has intercalated ducts but not prominent**

Seromucous gland(mixed)

Lobule



Submandibular gland



mucus acini

Foamy appearance because the mucus gets dissolved during histological preparation of the slide, the boundaries between cells are apparent in contrast to boundaries between cells in the serous acini in which were ill-defined



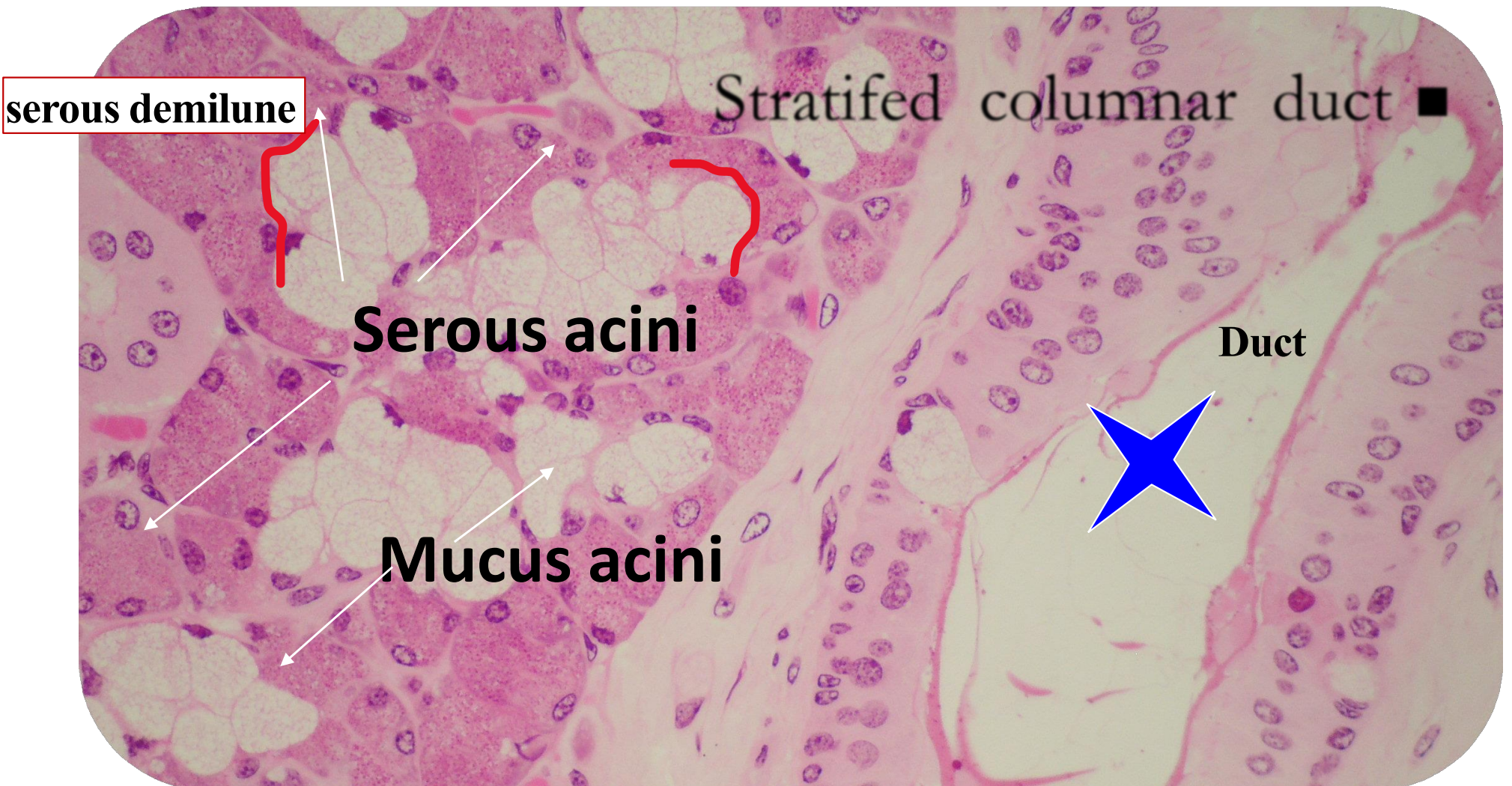
**striated
duct**

This histological micrograph shows a section of a salivary gland. The tissue is stained with hematoxylin and eosin (H&E). The image displays several key features: a striated duct, serous acini, and mucous acini. The striated duct is characterized by its highly folded, brush border (microvilli) on the apical surface, which gives it a striated appearance. The serous acini are composed of cells with a granular cytoplasm and a central nucleus. The mucous acini are characterized by their foamy appearance, which is due to the presence of mucinogen granules in the cytoplasm. The ducts are lined by a simple cuboidal epithelium.

serous acini

mucus acini
In foamy appearance

The submandibular gland has **serous demilune** where serous acini overlies mucus acini like a cap only present in submandibular & sublingual glands since they're mixed and absent in parotid because its only a serous gland.



Serous demilune

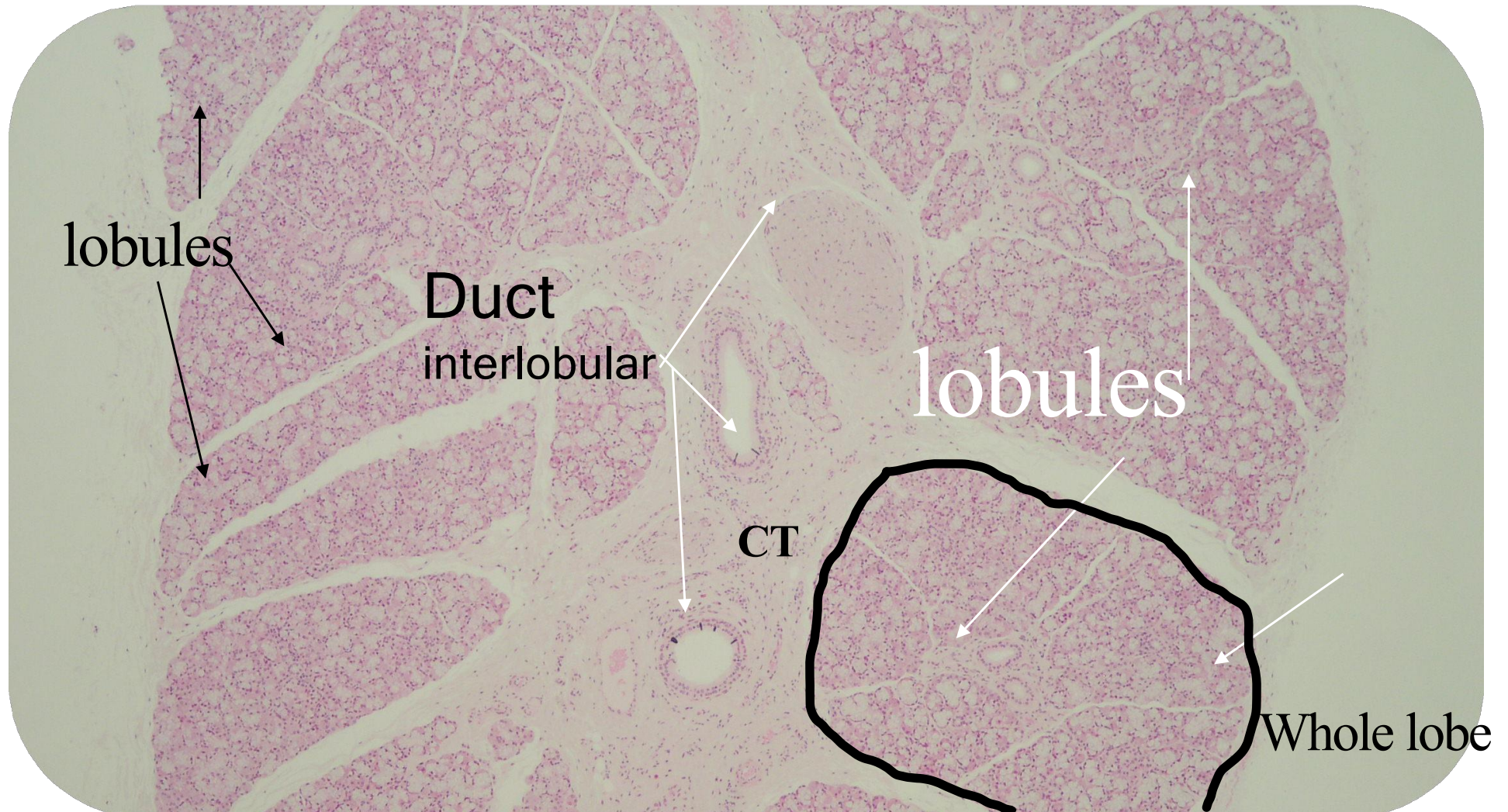
Serous acini overlying mucus acini



Compound tubular gland

Sublingual gland

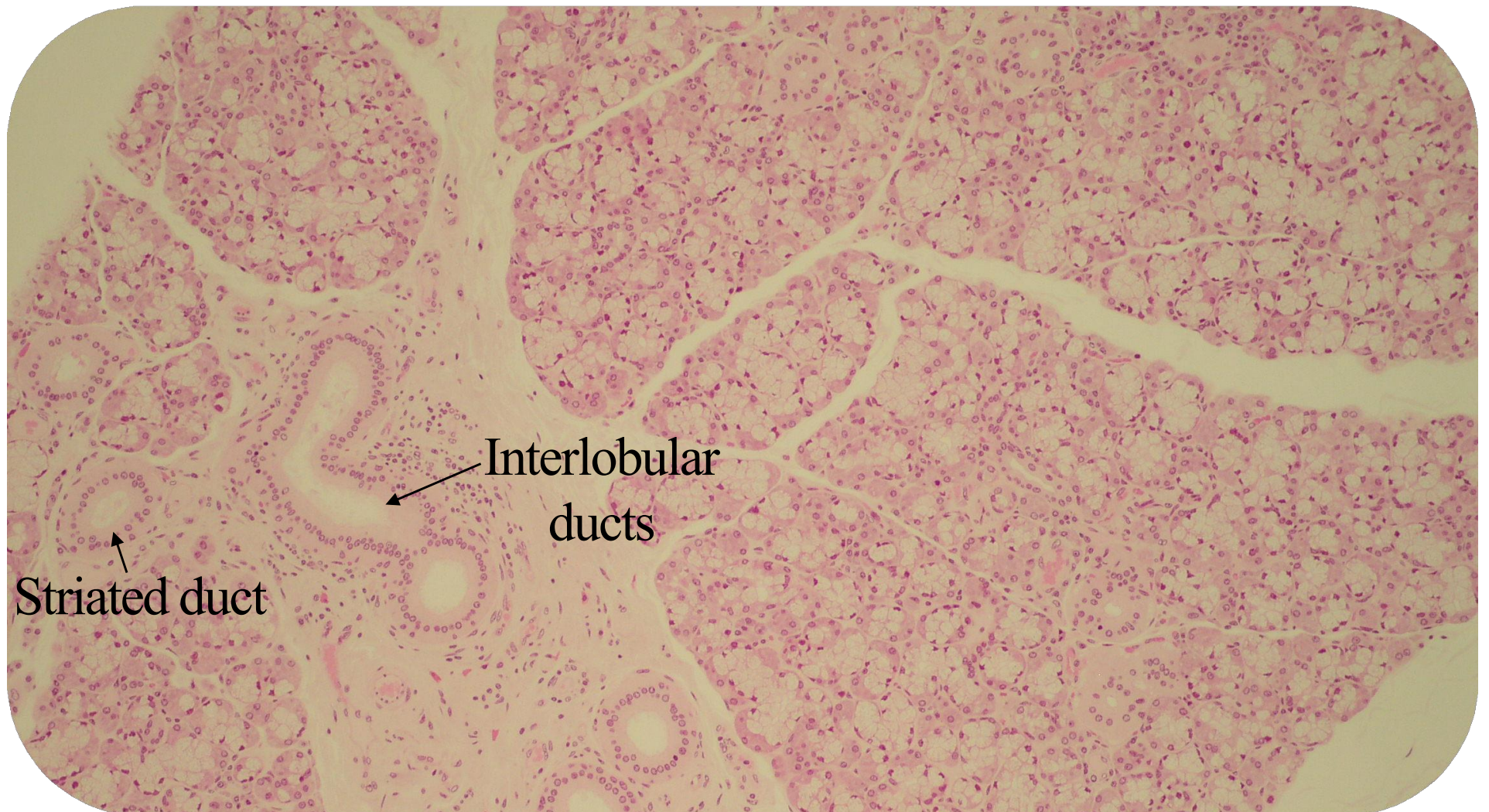
Mucous (mostly) gland



The capsule is divided into lobules by Connective tissue (CT)

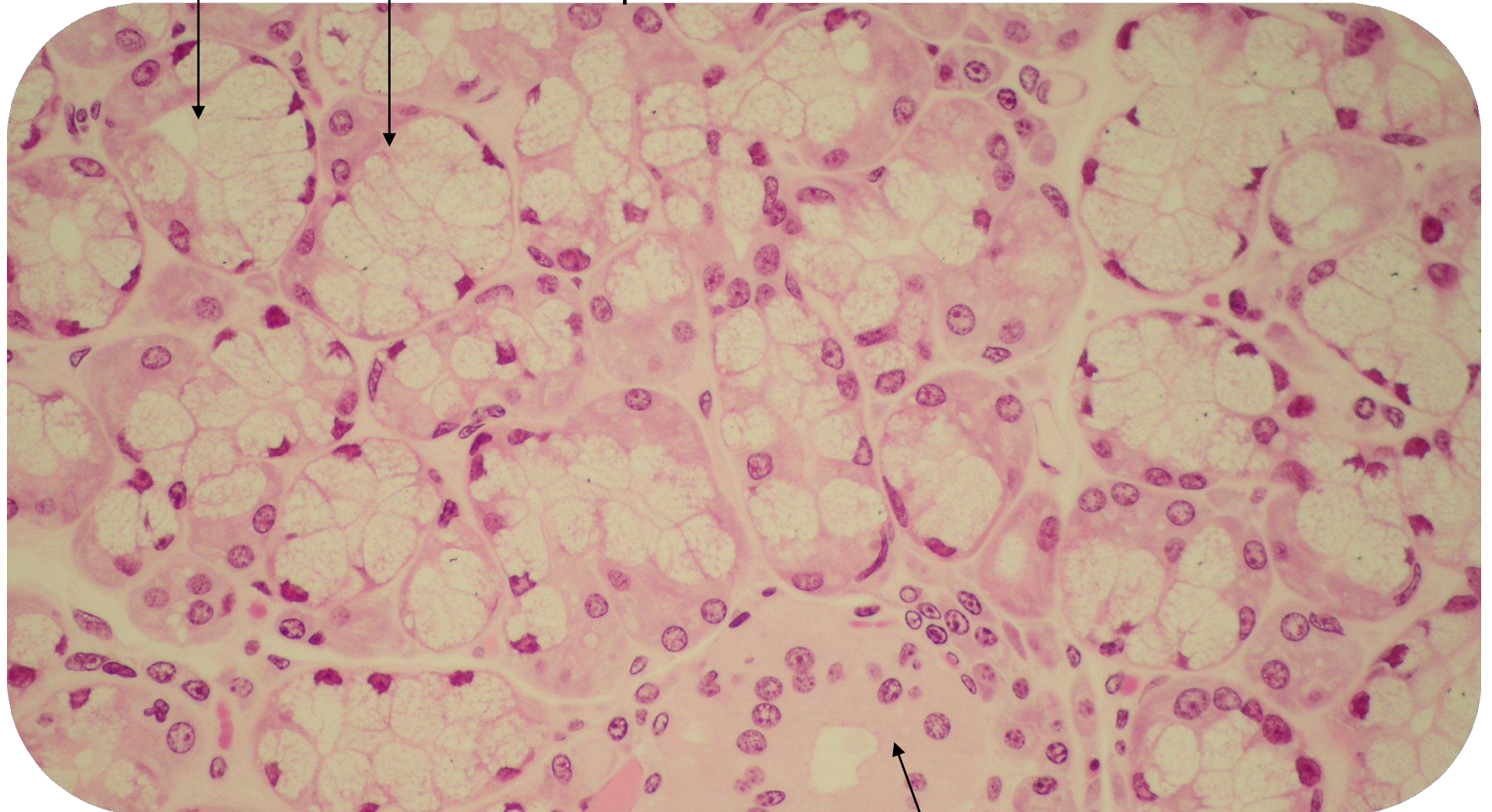
compound tubuloacinar gland

The sublingual gland is mostly mucus, but to a lesser extent it also has serous acini. Inside the lobules there are striated ducts & intercalated ducts, less in number than submandibular.



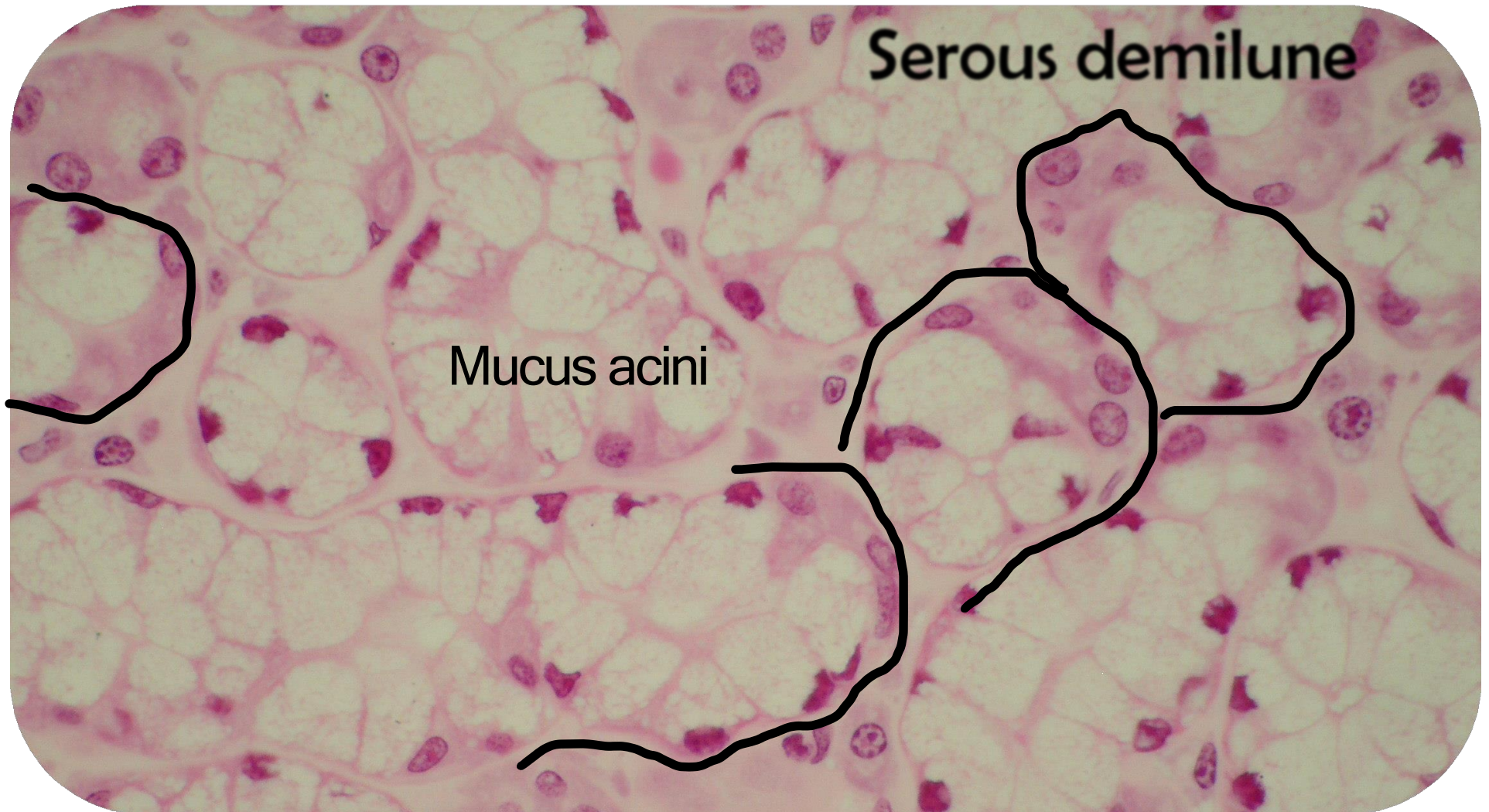
As you can see mucus acini is dominant (foamy appearance)

The basal nuclei in mucus acini is **flattened** whereas in serous it is spherical

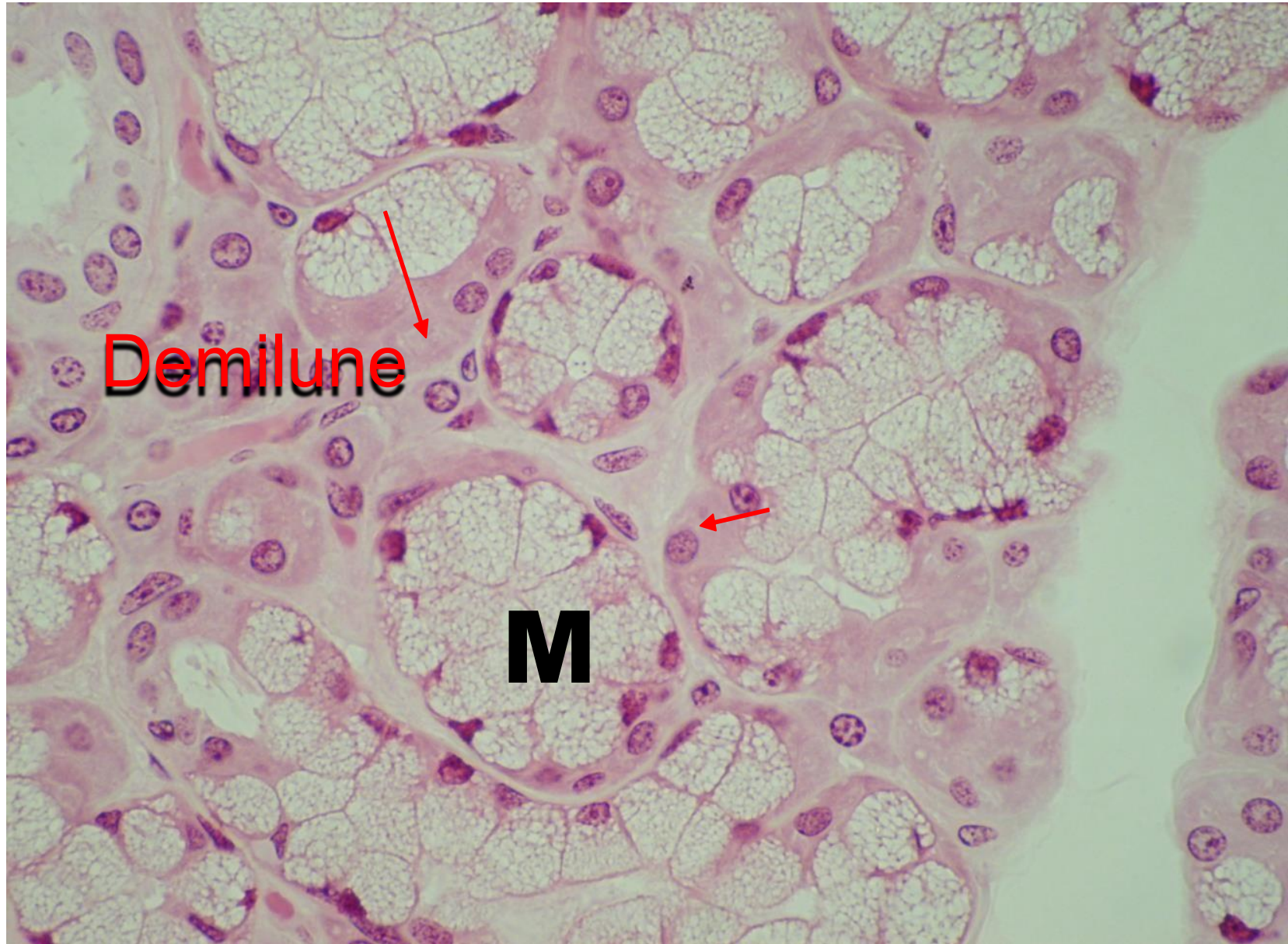


Striated duct

Since the **sublingual** is a mixed gland, it has serous demilune; a cap of serous acini surrounding mucus acini. But also, to a lesser extent in comparison to submandibular



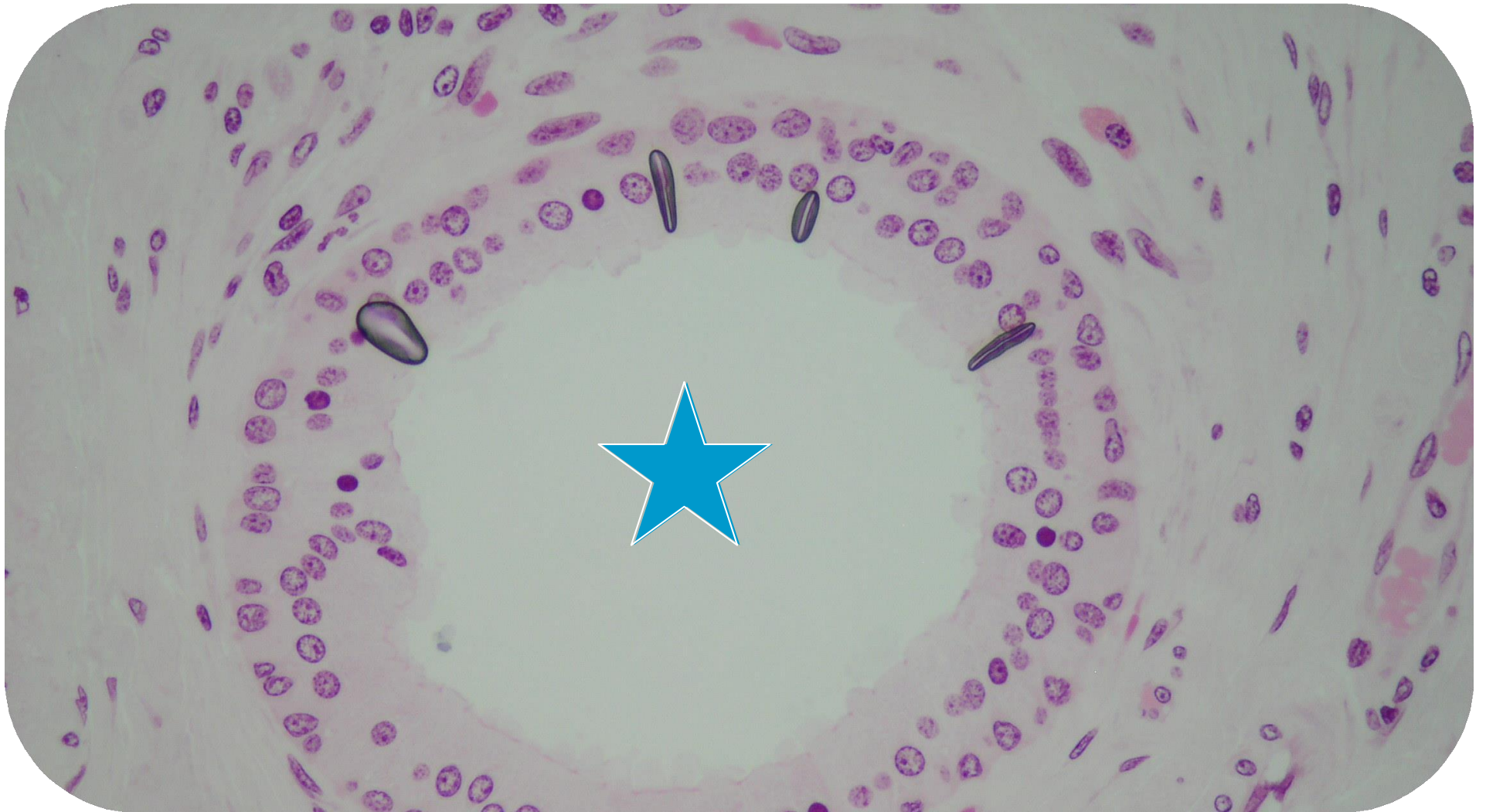
Sublingual gland



Interlobular duct

Large duct, lined by stratified cuboidal epithelium

As u can see here two layers of nuclei → stratified



Esophagus

- Has the same layers as the GI tract; mucosa, submucosa, muscular layer, and finally adventitia/serousa
- The Esophagus is divided into 3 thirds:
 1. **Upper** 1/3 → the muscularis externa is completely made of skeletal muscle
 2. **Middle** 1/3 → the muscularis externa is made of a mix of skeletal + smooth muscles
 3. **Lower** 1/3 → the muscularis externa is made of smooth muscle ONLY

*Histologically we can differentiate between these parts by looking at the muscularis externa

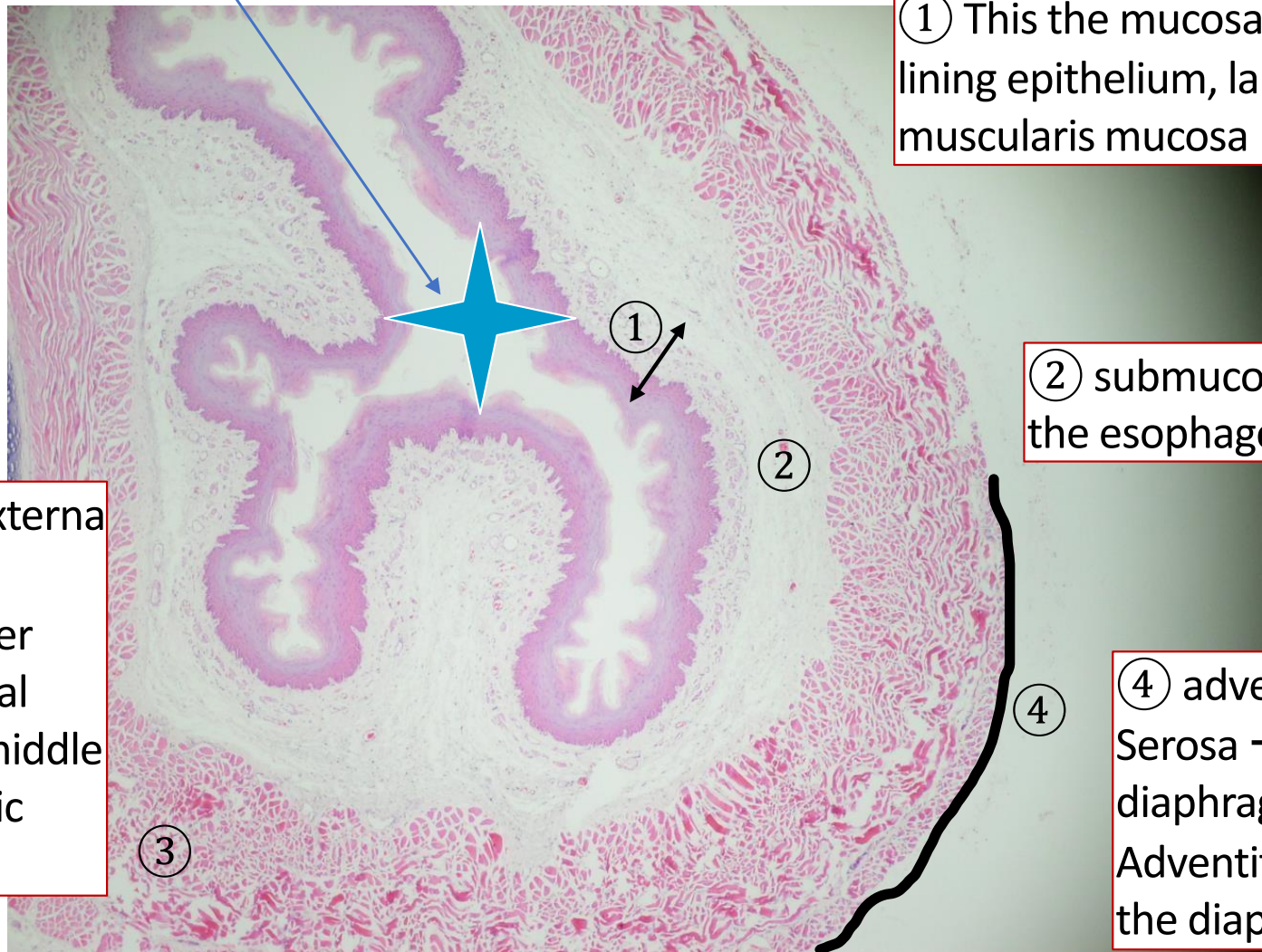
*Remember that the esophagus has two types of glands: **glands in the submucosa** called esophageal gland proper.

Plus, glands in the **lamina propria** called cardiac/gastric gland, common at the lower 1/3, before reaching the stomach.

The stomach also has gastric glands in its lamina propria.

Esophagus(star lumen)

The **lumen** of the esophagus is always collapsed and only opens when there's deglutition, swallowing or descending of bolus



① This the mucosa (3 layers) lining epithelium, lamina propria, muscularis mucosa

② submucosa that contains the esophageal gland proper

③ muscularis externa
Two layers:
Inner circular layer
Outer longitudinal
Separated by a middle layer of myenteric nerve plexus

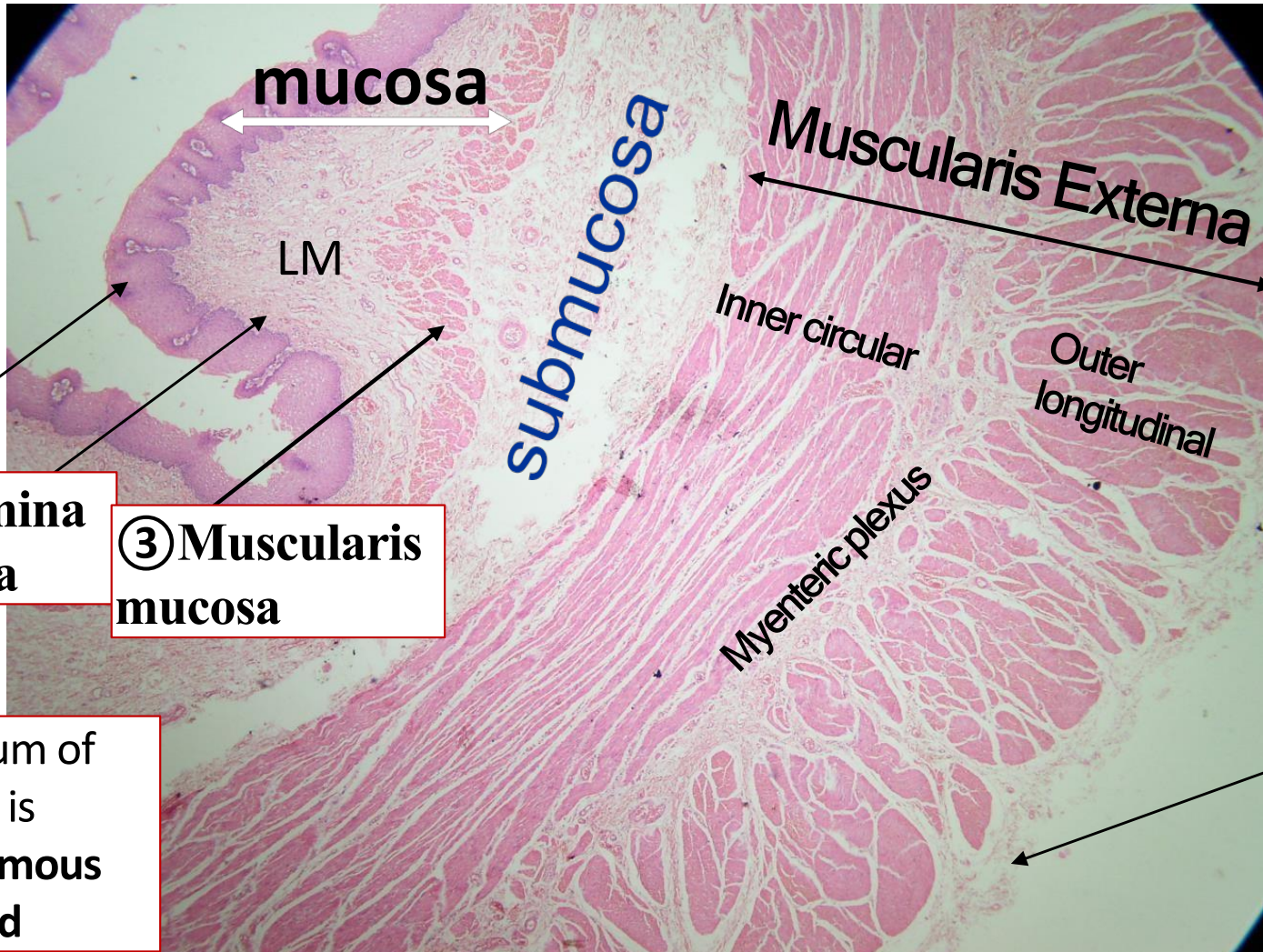
④ adventitia OR serosa
Serosa → below the diaphragm
Adventitia (CT) → above the diaphragm

Esophagus(lower third)

How did we know it's the lower 1/3?

By looking at muscularis externa layer, we notice that both (inner circular + outer longitudinal) layers are smooth muscle ONLY.

In smooth muscle the **nucleus** is **central**, **dot-like** in appearance, **irregular** in shape.



mucosa

LM

submucosa

Muscularis Externa

Inner circular

Outer longitudinal

Myenteric plexus

Serosa

Simple squamous epithelium

The 3 layers of Mucosa

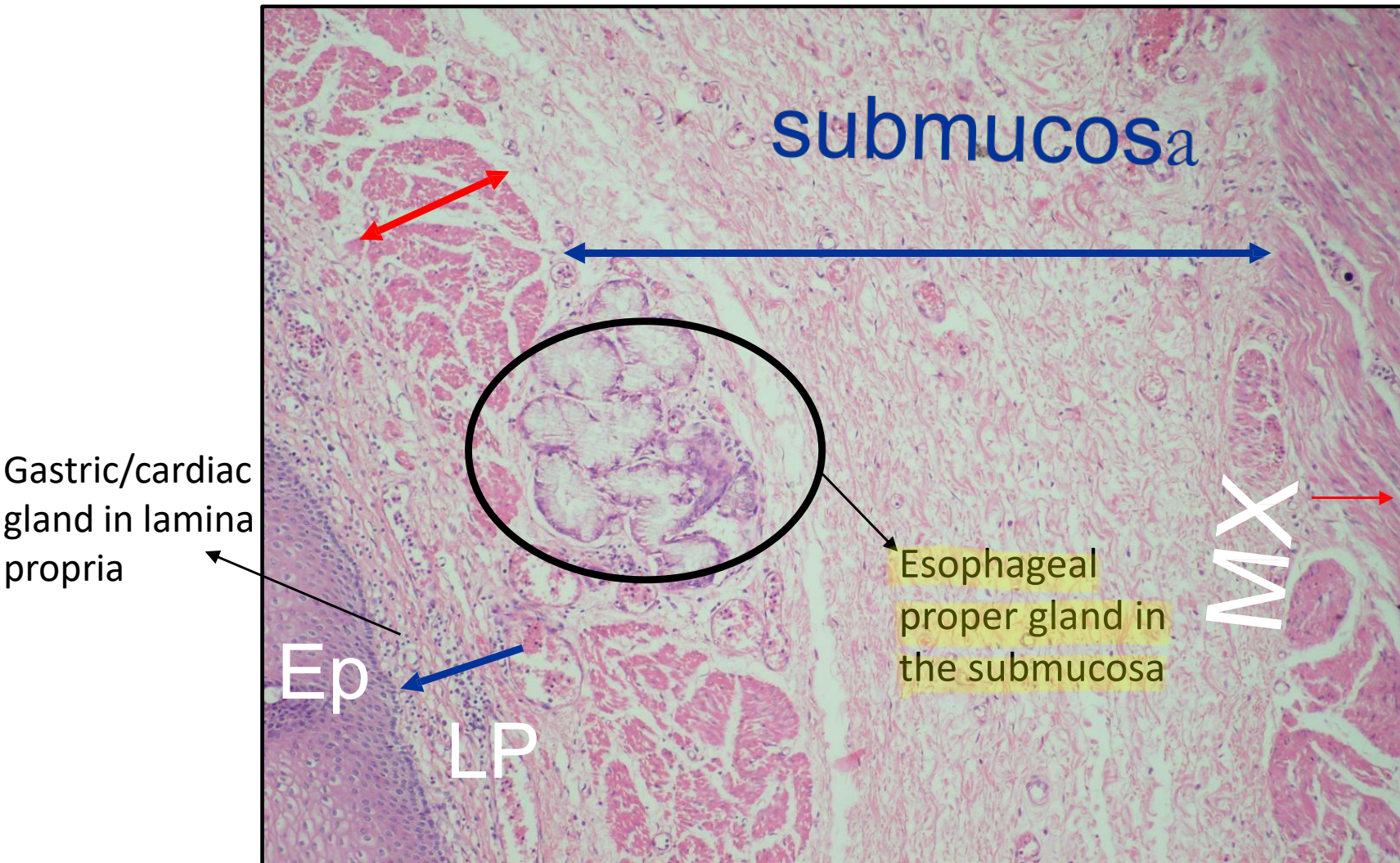
① lining epithelium

② Lamina propria

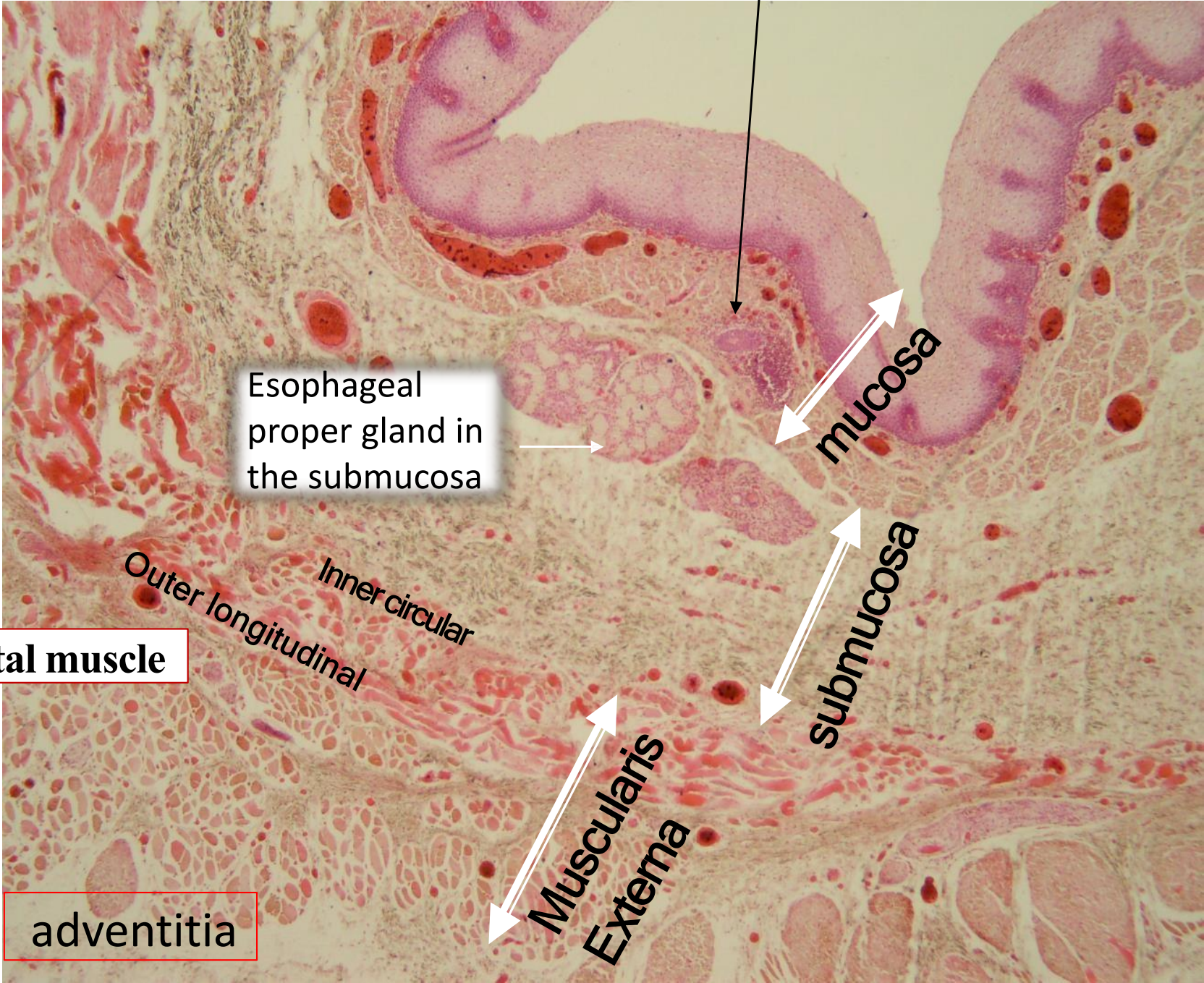
③ Muscularis mucosa

Lining epithelium of the esophagus is stratified squamous non-keratinized

Eosophageal proper gland muscularis mucosa



Lymphocyte



Esophageal proper gland in the submucosa

mucosa

submucosa

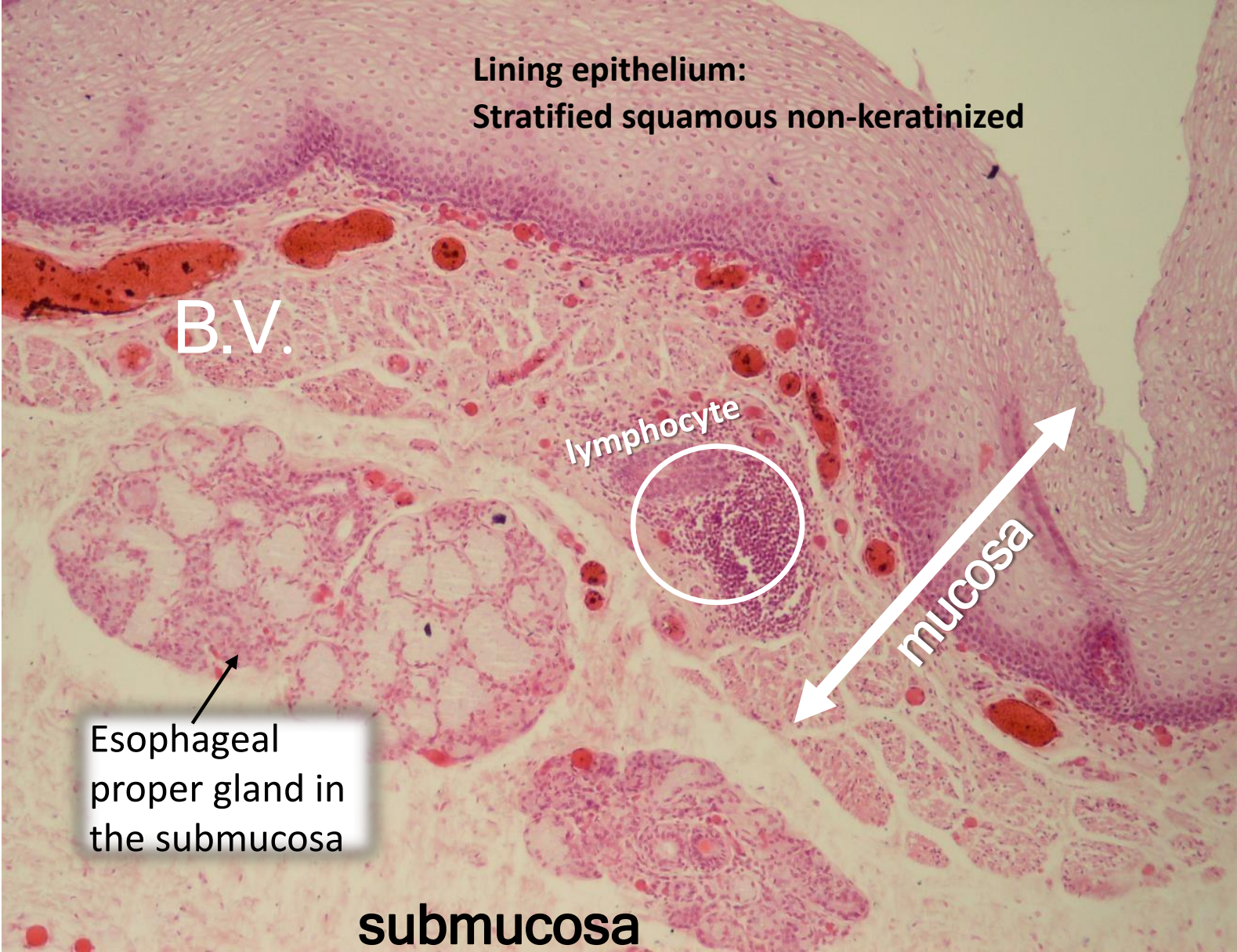
Muscularis Externa

Outer longitudinal
Inner circular

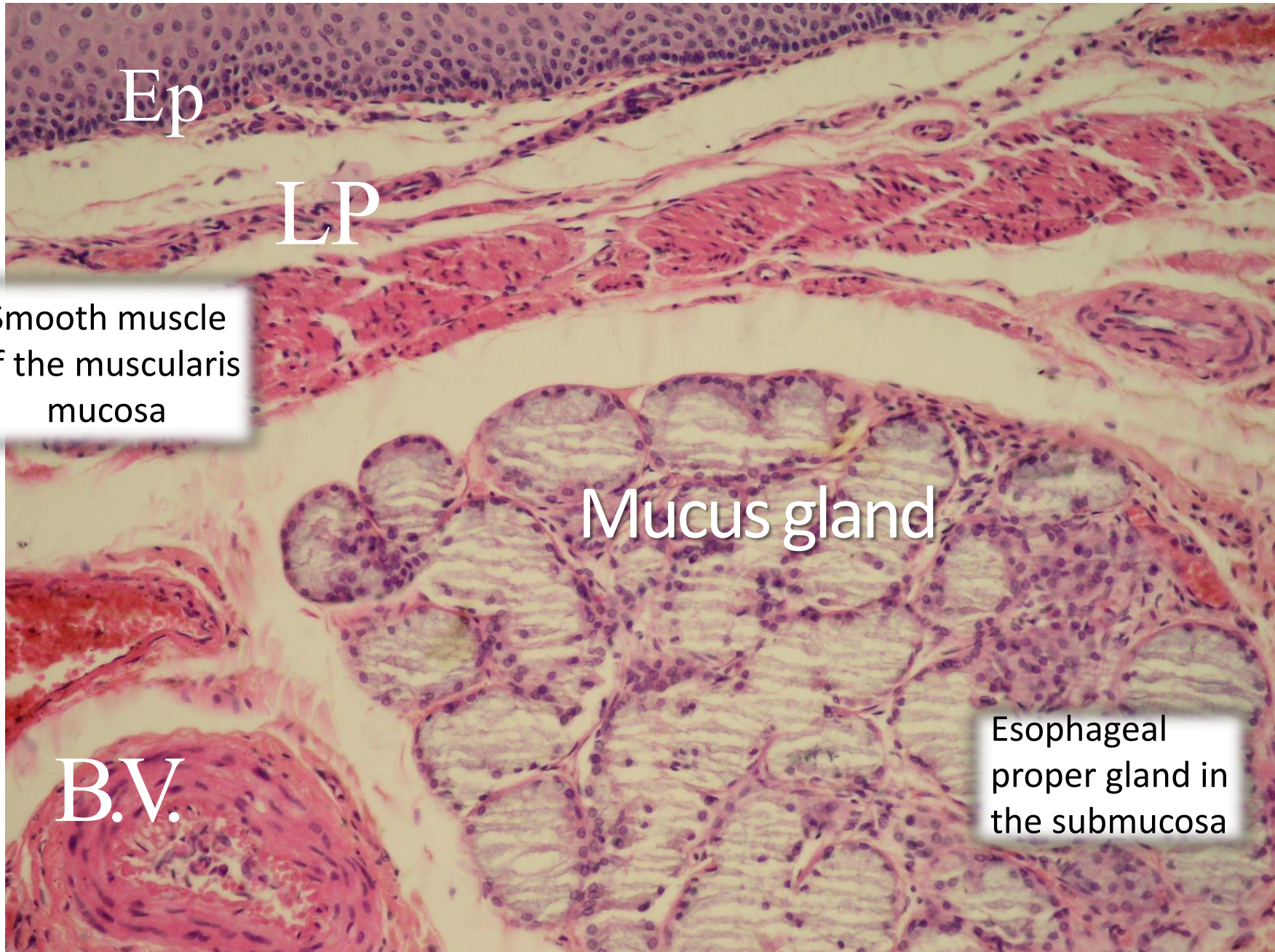
Skeletal muscle

adventitia

This is a zoomed in picture of the previous slide



Esophageal proper gland (in submucosa)



Ep

LP

Smooth muscle
of the muscularis
mucosa

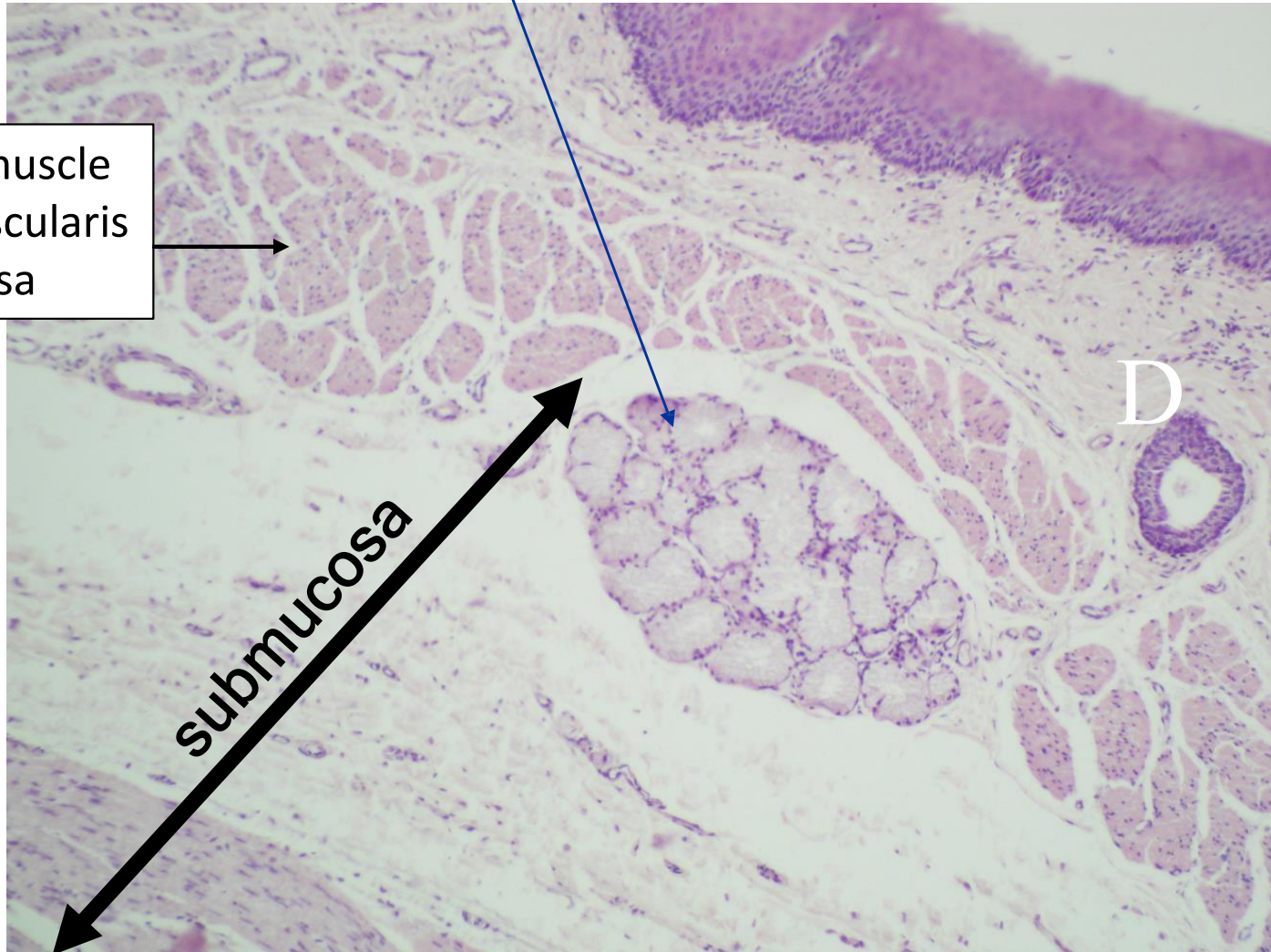
Mucus gland

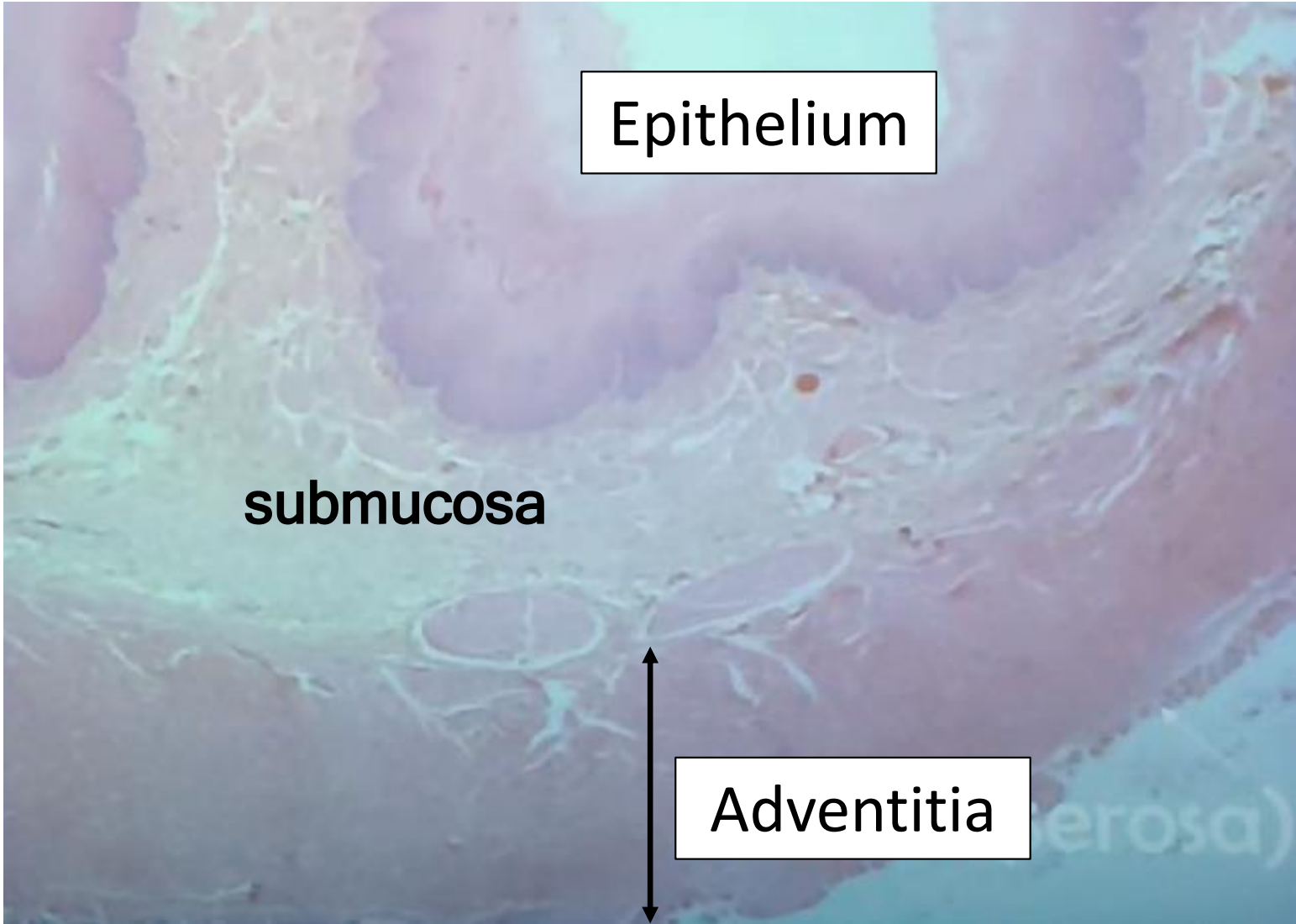
B.V.

Esophageal
proper gland in
the submucosa

Esophageal gland proper (in submucosa)

Smooth muscle
of the muscularis
mucosa





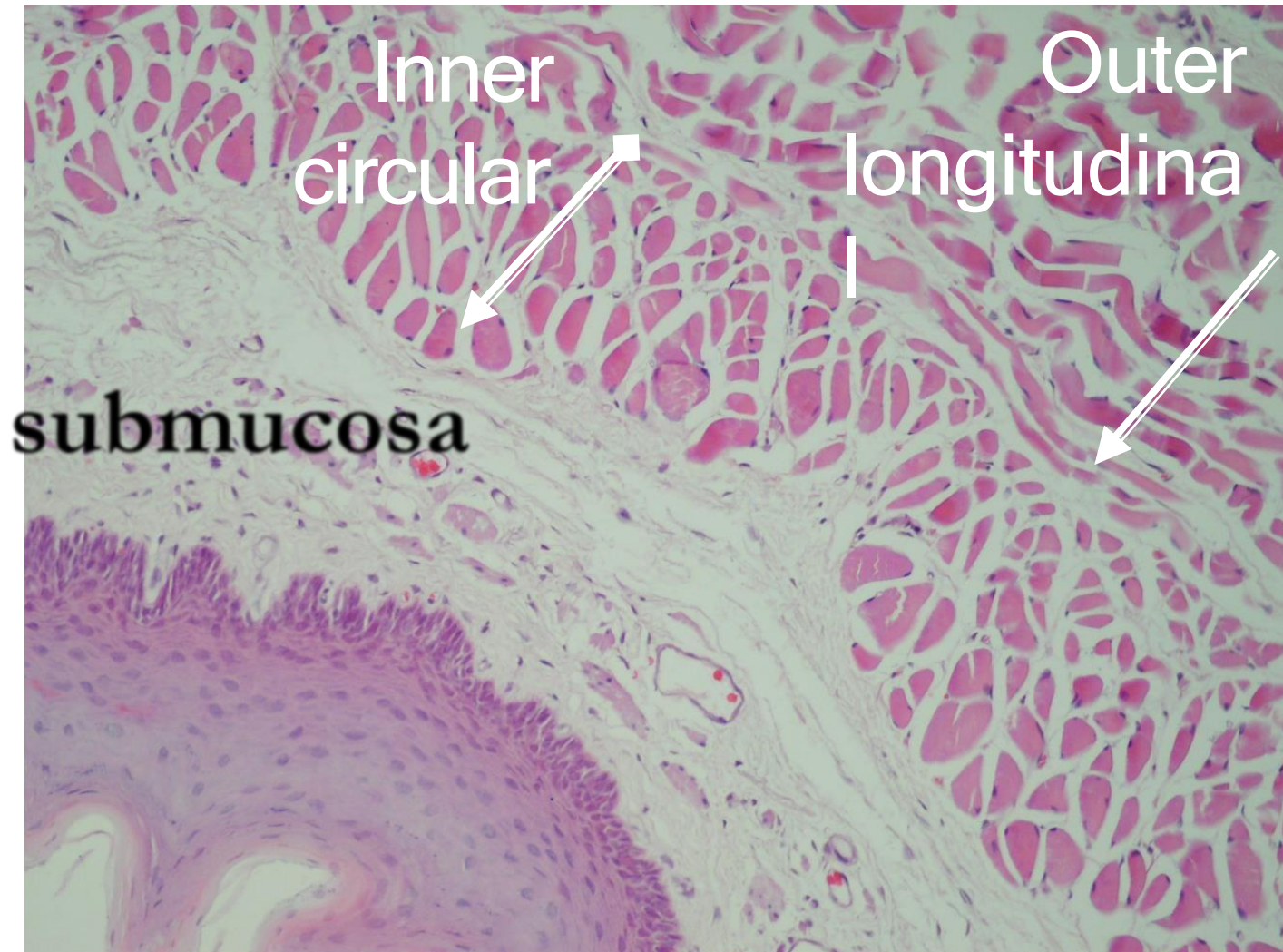
Epithelium

submucosa

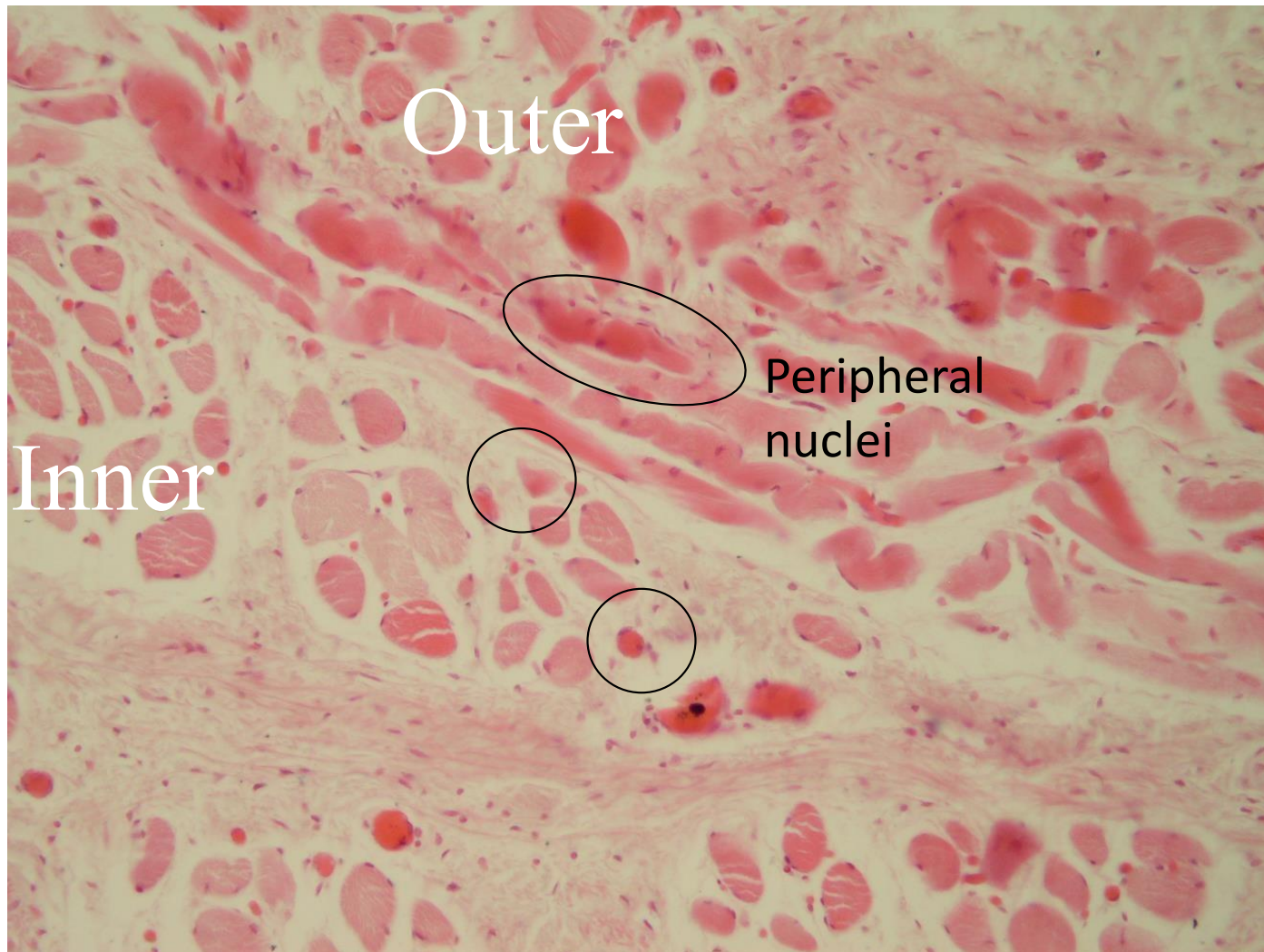
Adventitia (erosa)

Esophagus(upper third) skeletal muscle mus. ext.

By looking at muscularis externa layer, we notice that both (inner circular + outer longitudinal) layers are striated muscle ONLY, hence it's the upper 1/3 striated → skeletal muscle, the **nucleus is multiple, peripheral & flattened.**

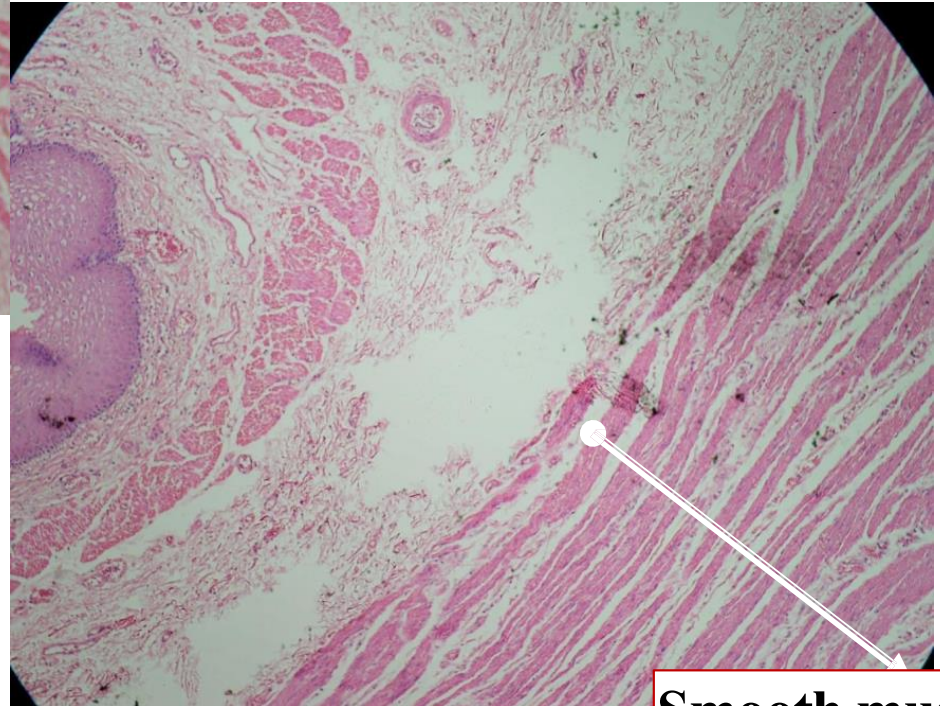


Skeletal mus.



Lower third(smooth muscle)

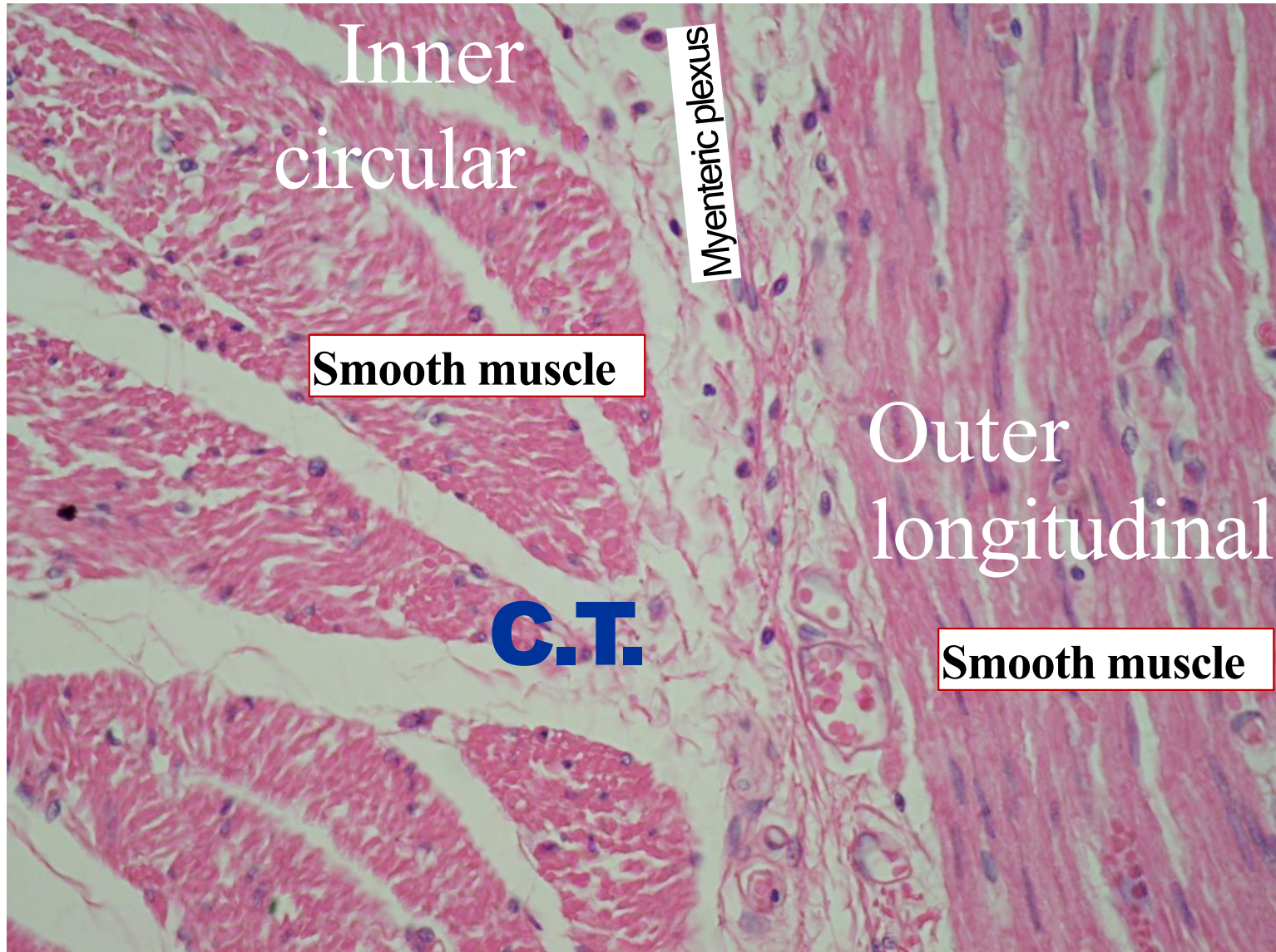
Smooth muscle



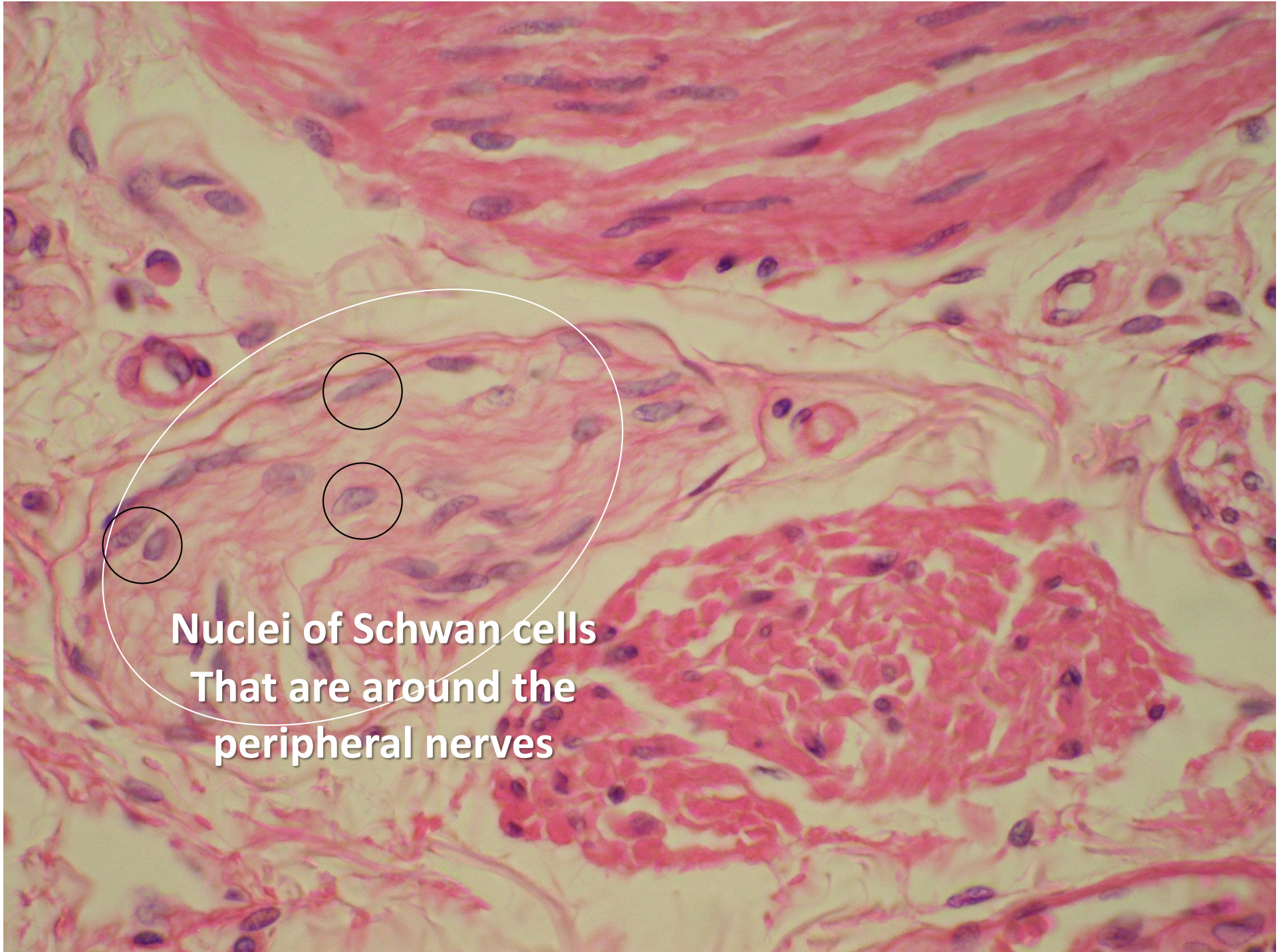
Smooth muscle

Lower third(smooth muscle)

Spindle shaped

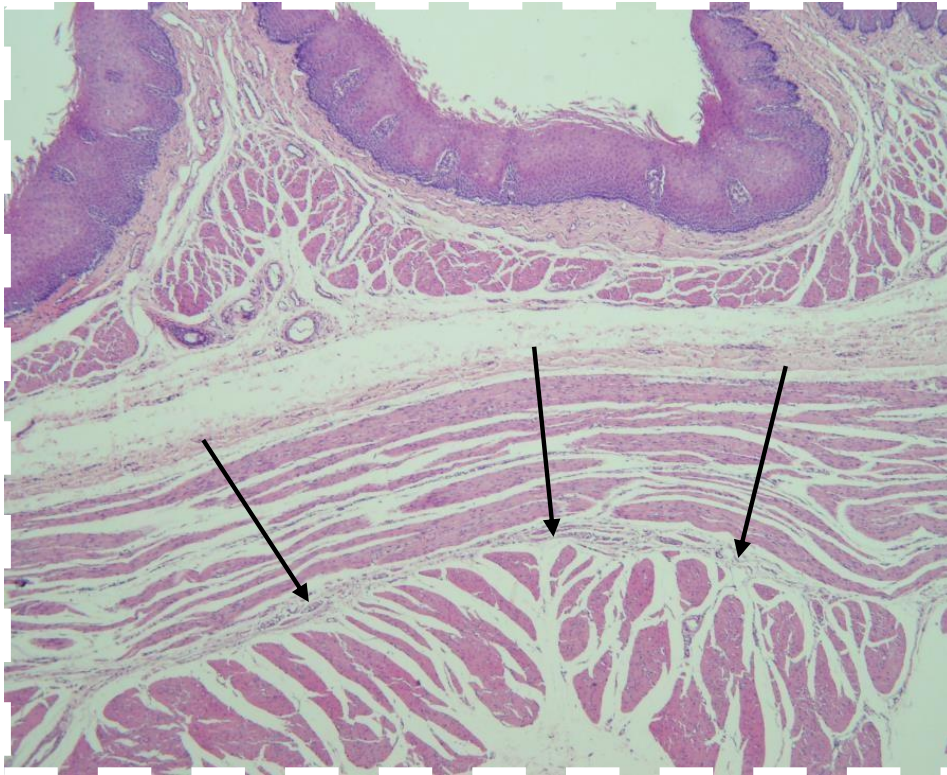


Nerve Fibers of Myenteric Plexus

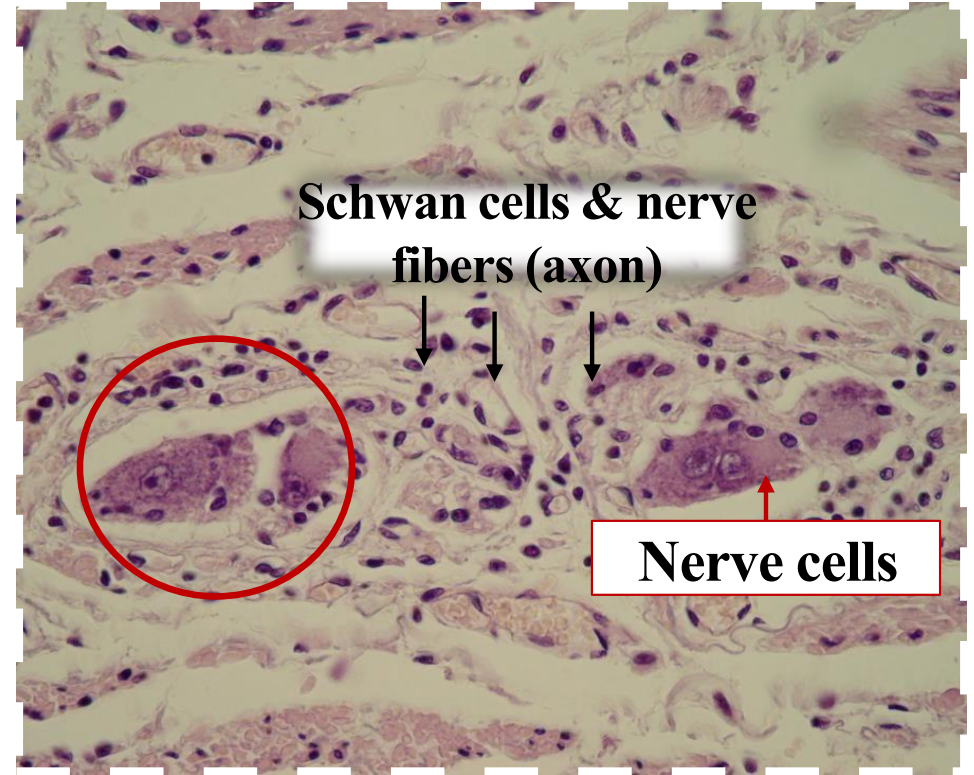


Nuclei of Schwann cells
That are around the
peripheral nerves

intramural Parasympathetic ganglion- (G.I.T.)

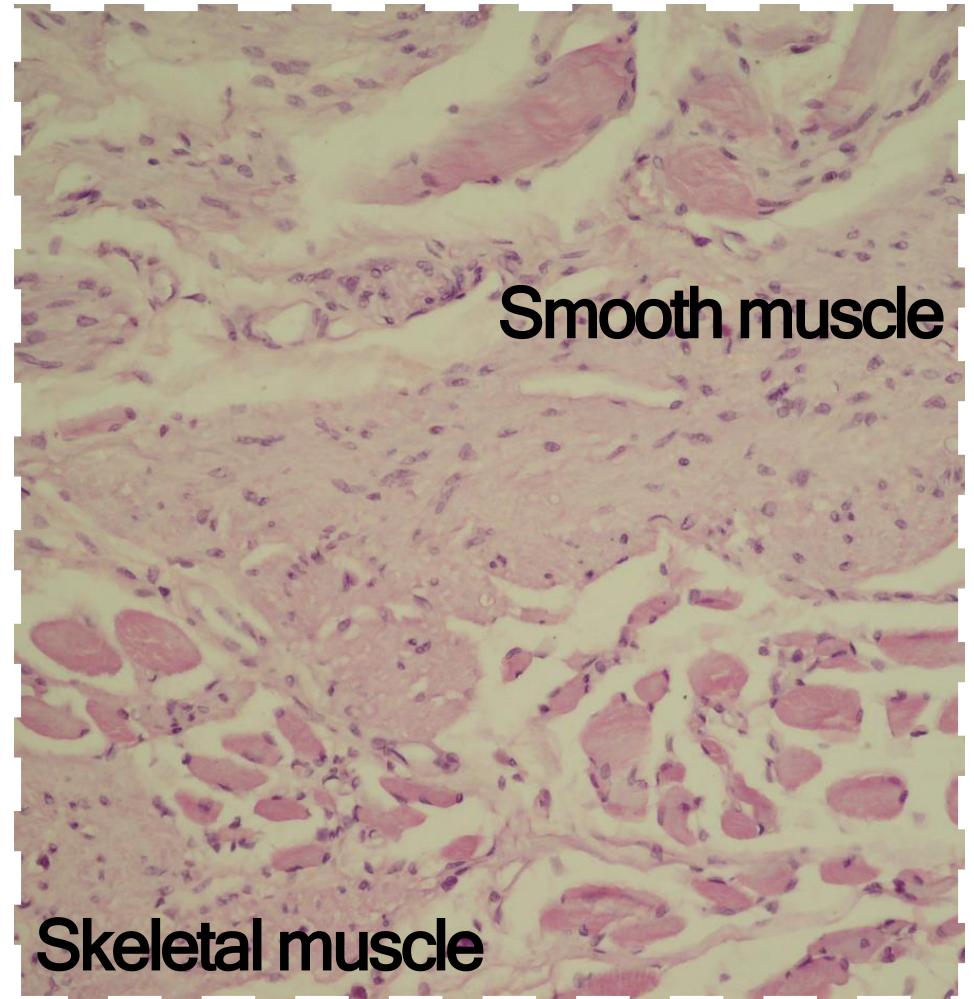
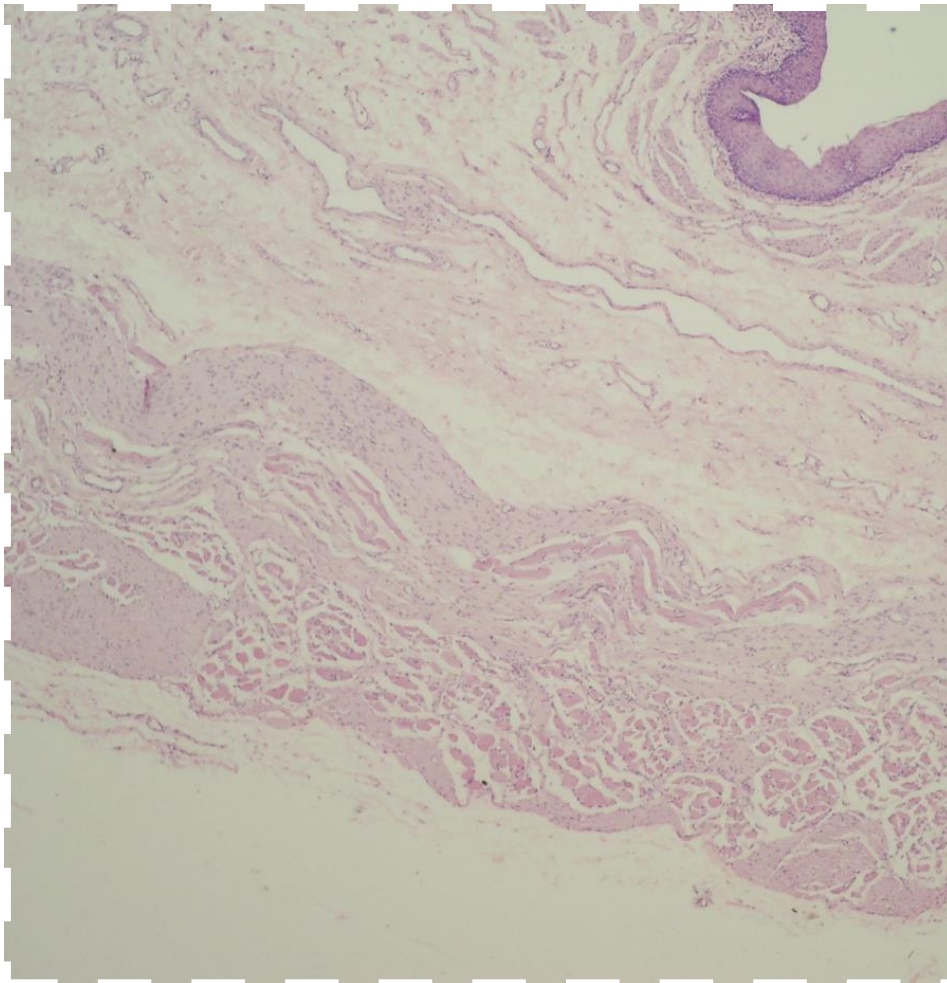


Myenteric plexus is located between the inner & outer layers of muscularis externa



Zoomed in picture of the area pointed at with arrows

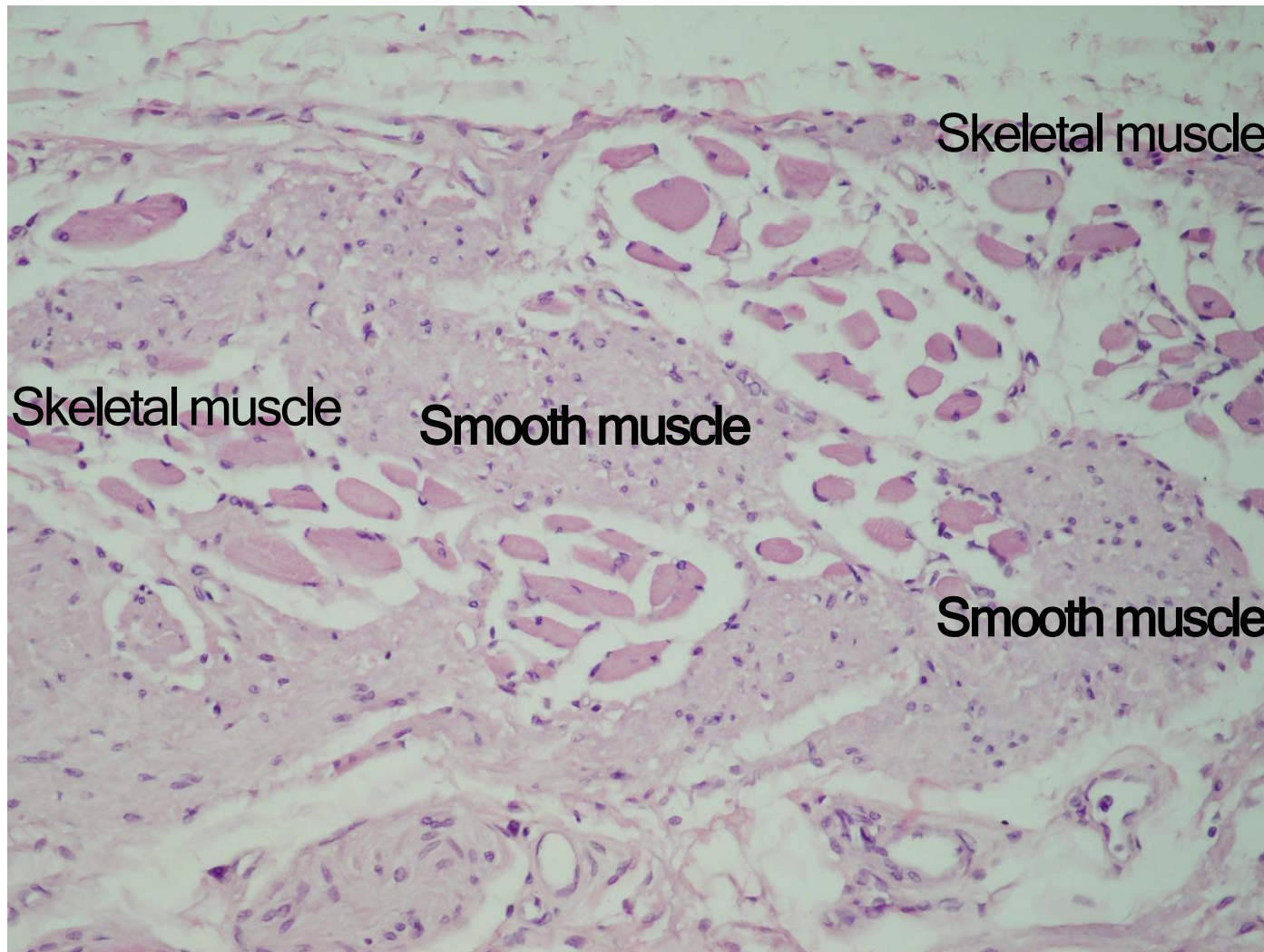
Mixed smooth & skeletal in mid. eOsooph.



Skeletal muscle

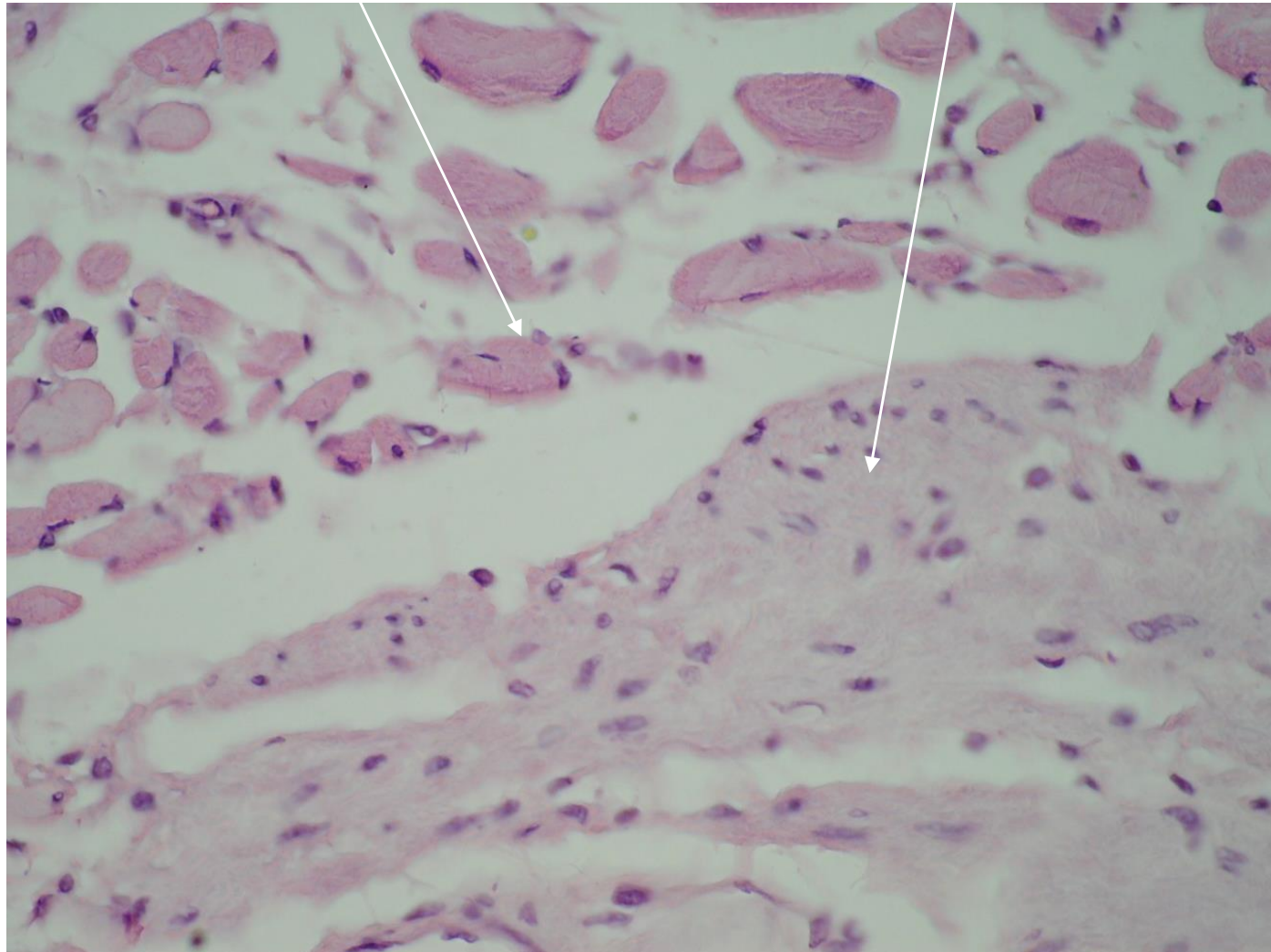
Mix between smooth & skeletal → middle 1/3 of esophagus

Smooth skeletal muscle



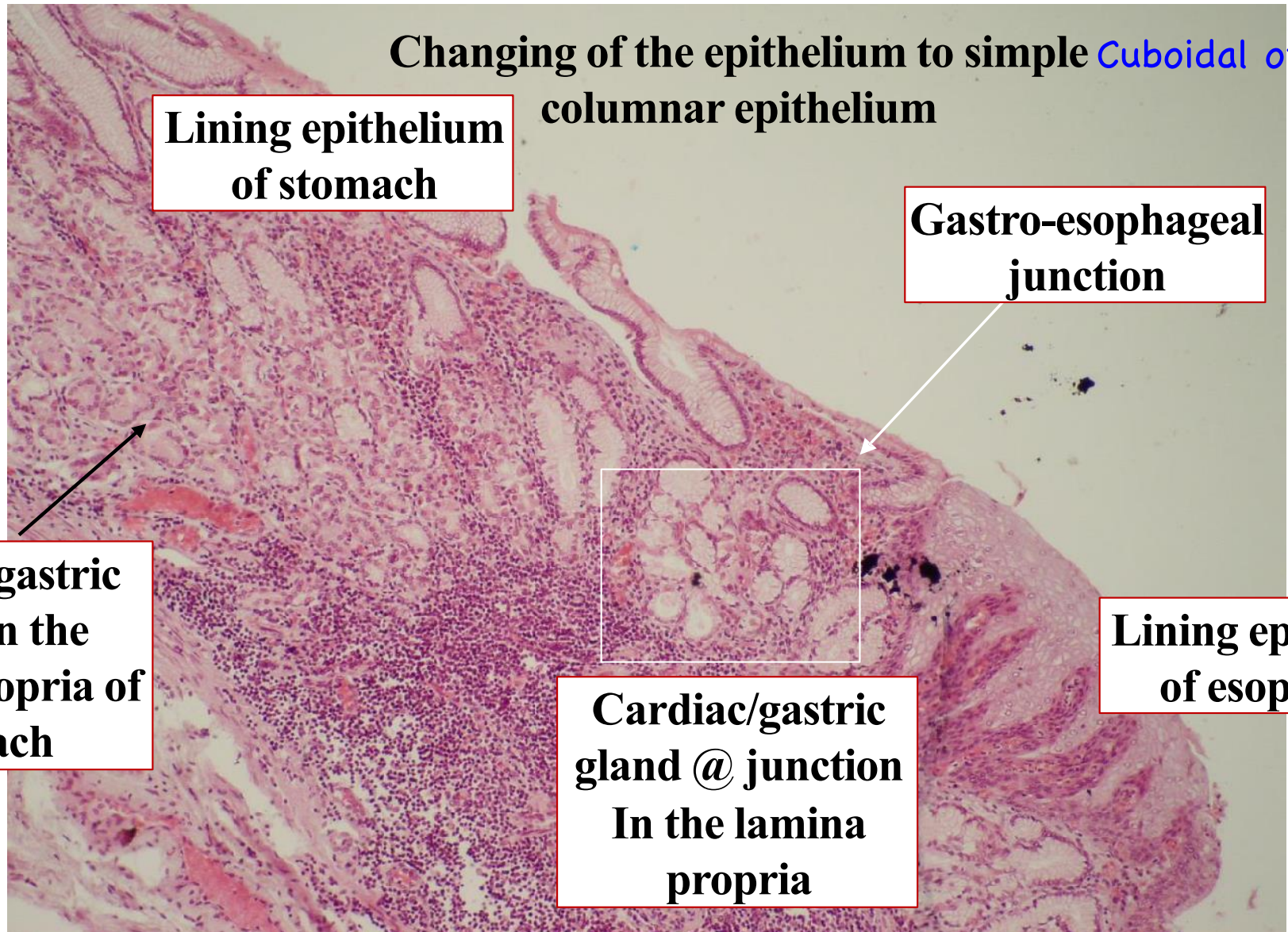
Mix between smooth & skeletal → middle 1/3 of esophagus

Mixed skeletal and smooth muscle



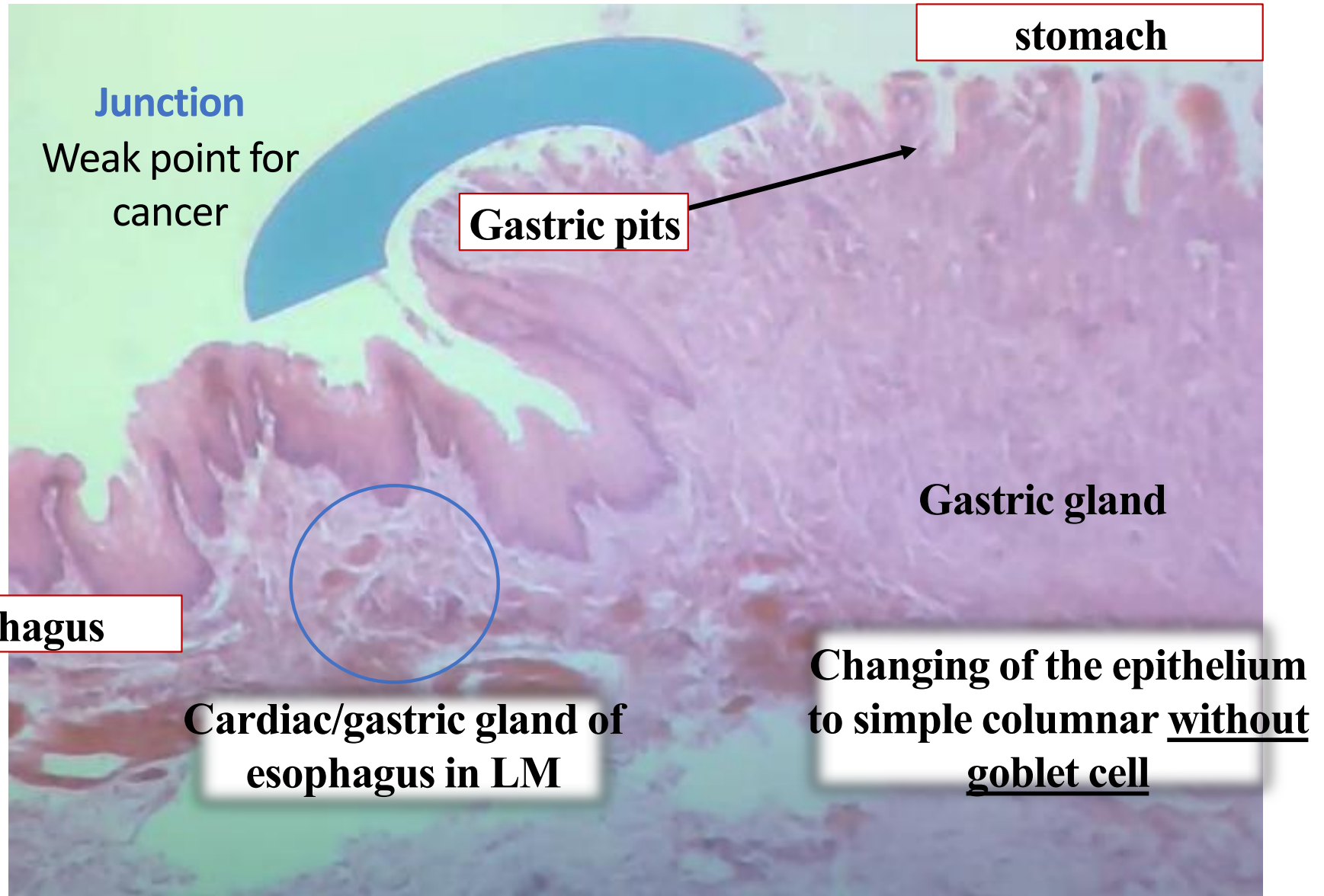
Cardiac gland in I.P. @ junction

Cardiac gland means → lower 1/3 of esophagus



Eosophago-gastric junction

The gastroesophageal junction is site of interest to Pathologists because it's a site of metaplasia, and is a site of common tumors (carcinoma) due to changes in epithelium



Eosophago-gastric junction

stomach

Gastric gland

lymphocyte

esophagus

G

Lymphocytes are scattered along the GI tract & aggregate in certain sites forming lymphatic nodules e.g. in pylorus

