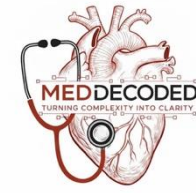


بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



HISTOLOGY

MID | Lecture 8b

Glands-lab

وَلَقَدْ خَلَقْنَا الْإِنْسَانَ وَنَعَلَهُمَّا تَوْسُوسًا بِهِ نَفْسُهُ وَنَحْنُ أَقْرَبُ إِلَيْهِ مِنْ حَبْلِ الْوَرِيدِ

Reviewed by :

Hala Marei

Dareen Alhababseh



Color coding used in the modified:



Black: the original slides



Maroon: the doctor's explanation/words



Gray: additional information and explanation



Red: important information

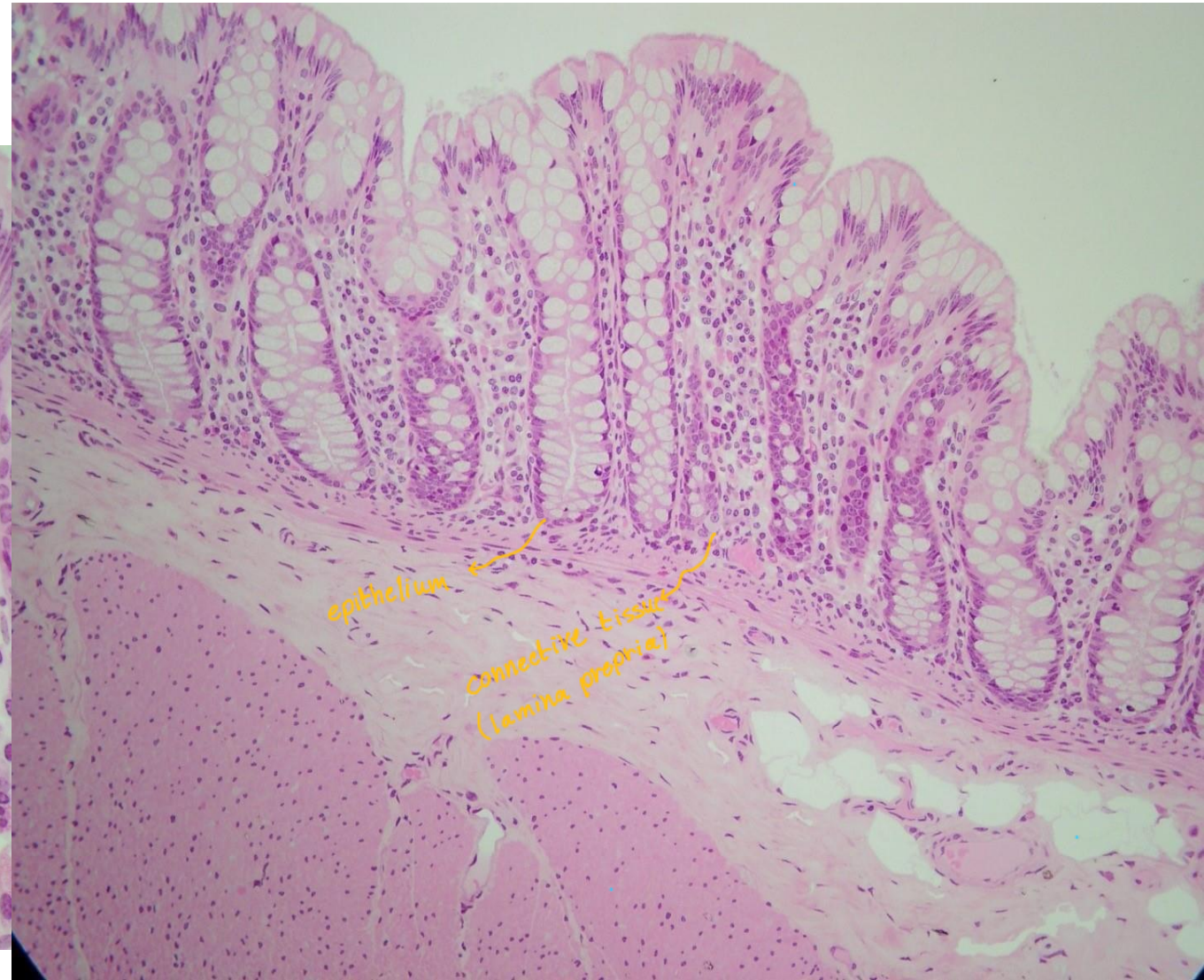
SIMPLE TUBULAR GLAND

This can be seen in the Intestines

The duct



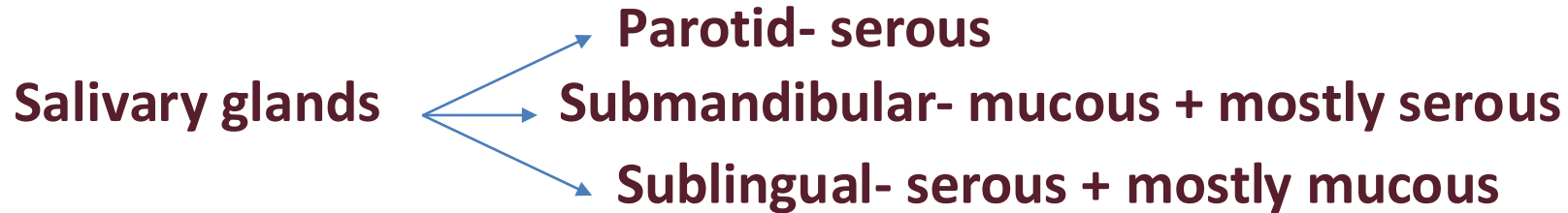
This is simple glands, one gland has one opening.
and from the washed out appearance and basally located nucleus
this is (mucous tubules) .
tubular = produce mucous (mostly)



Some information by the doctor

During development, epithelium evaginated the connective tissue and created and those glands.

So these secretory gland will secret their products to the surface via the simple ducts.(the gland in the above slide)



Extra info: in simple glands you can see the whole gland but in compound glands you see it as a highly organized structure but you can't see the entire one

Tubular acini :
المقصود فيها المفروض
mucous tubules
لكن الدكتور لسيب ما
مجهول كانت تحكيهم
tubular acini
فالحننا كتبنا زي ما حكنت

Simple branched alveolar

SEBACEOUS GLAND

microscopic glands found in your hair follicles that secrete sebum

The basal cells keep doing mitosis, one of the daughter cells stays and the other differentiates to join the apical ones to be dead filled with the secretory product, and then secreted out of the gland

The sebaceous glands has the holocrine secretion mode. the cells near to the duct are more mature . the more mature they are the more they are dead cells filled with the secretory product (sebum) so they will be expelled from the gland



ExPELLING OF MATURE FAT CELLS TO THE OUTSIDE -> OPENED AT THE SHAFT

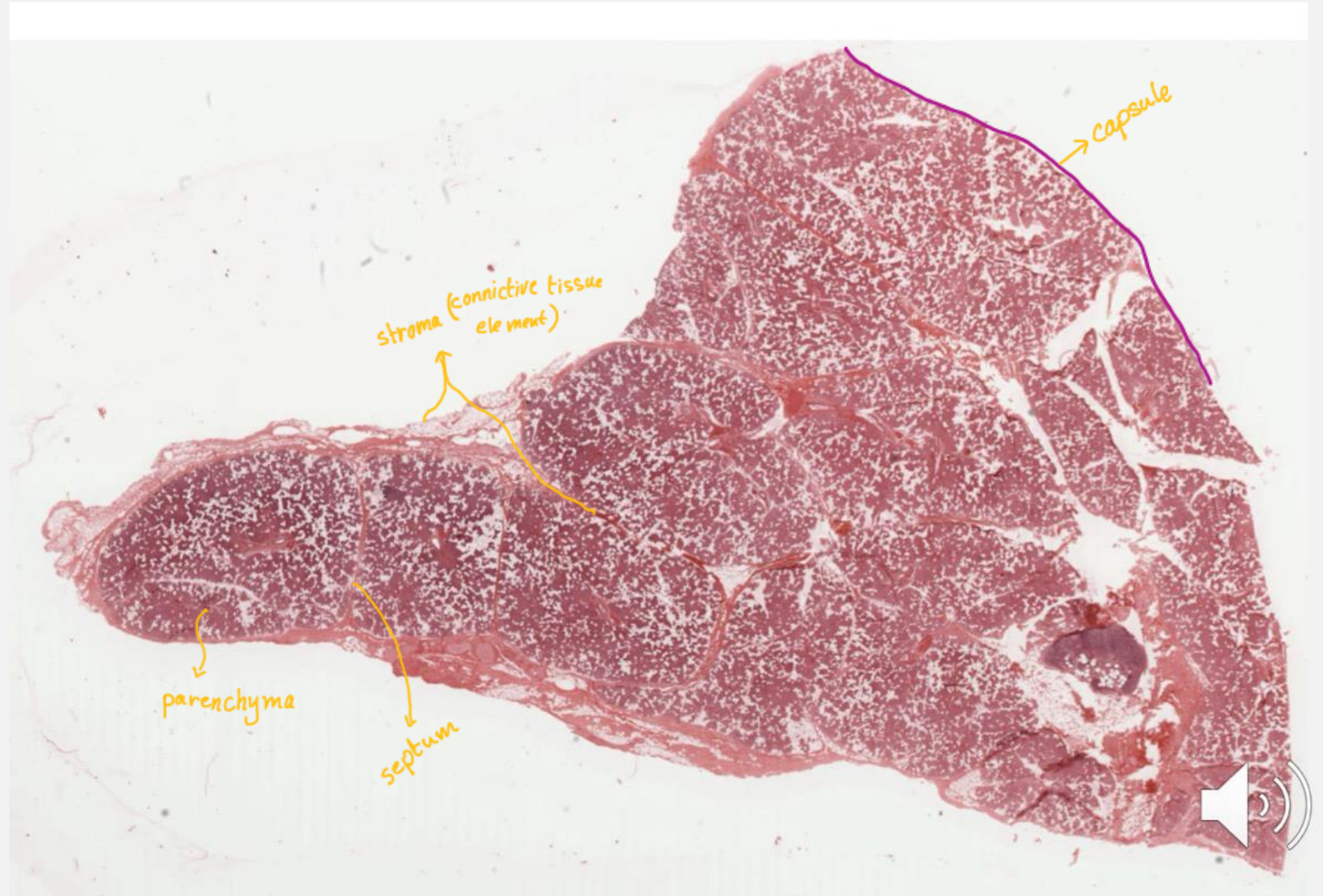
SECRETORY CELL

duct

PAROTID GLAND

The parenchyma is the epithelial derived part which means it is the secretory in addition to the ducts

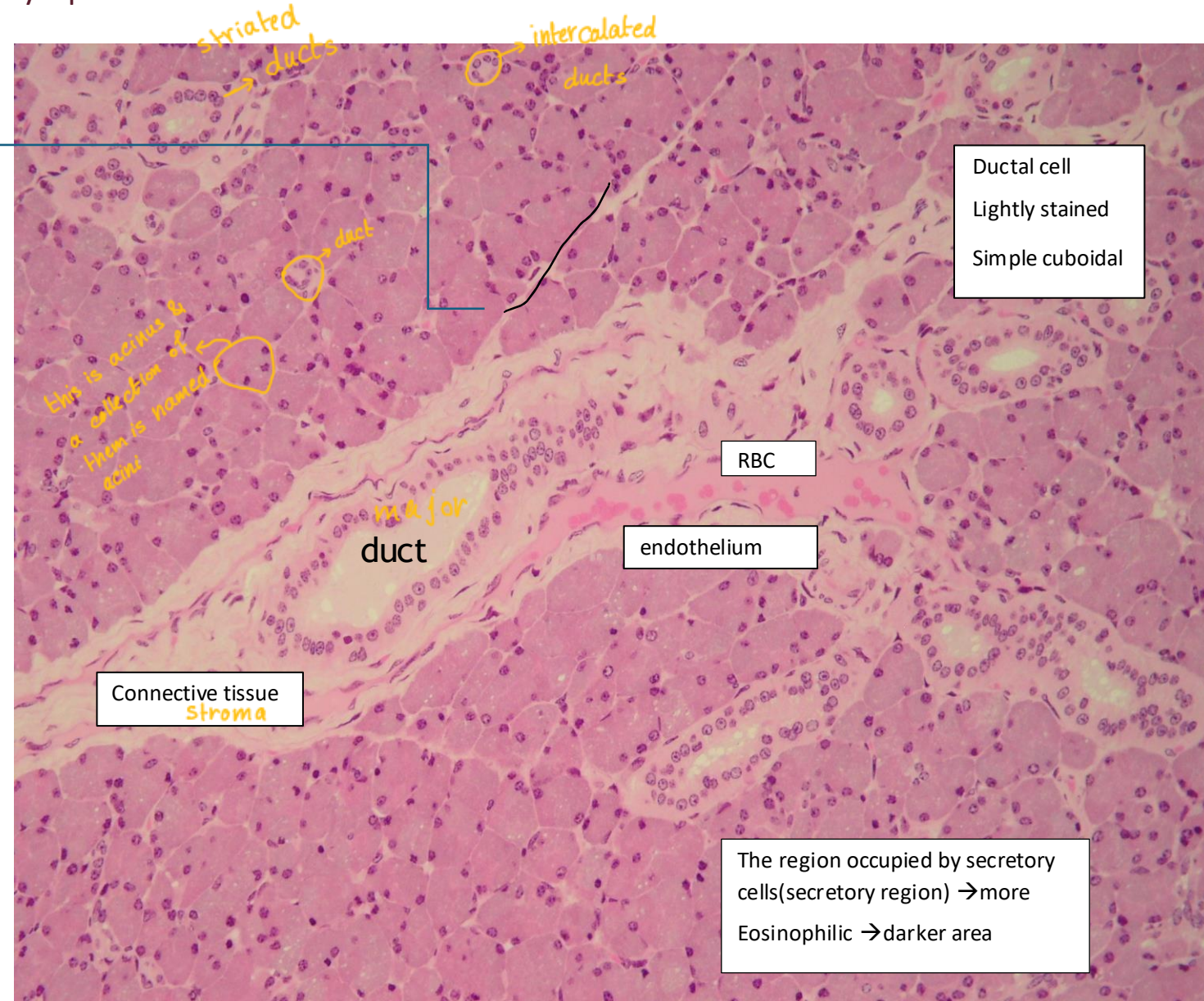
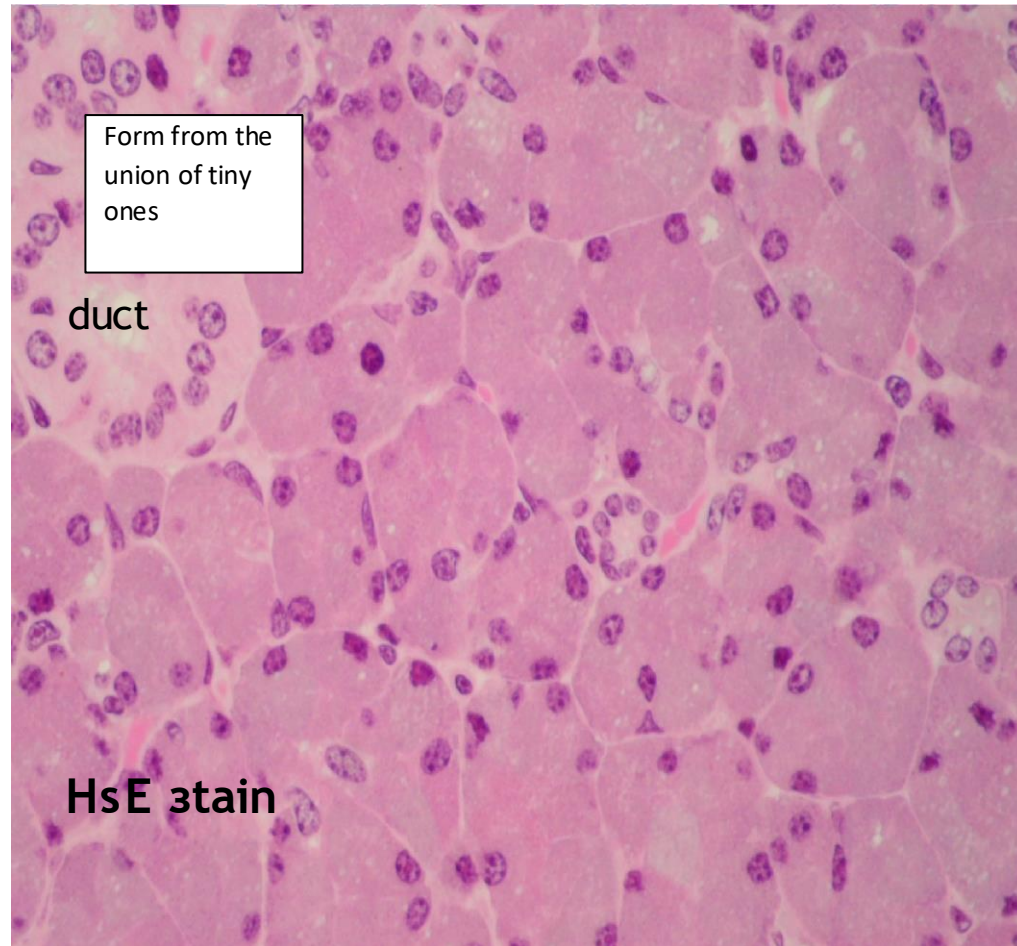
The septum are extensions from the connective tissue on the surface to the inside to further compartmentalize the glands and creating a smaller parts in the major glandular tissue



PAROTID

no washed-out structures, only pinkish structures, so it is a purely serous gland

Their cytoplasm stain more basophilic this is because the tiny granules are filling the cytoplasm and most of their in nuclei are a bit rounded



More or less : إلى حد ما

PAROTID

Adipocytes

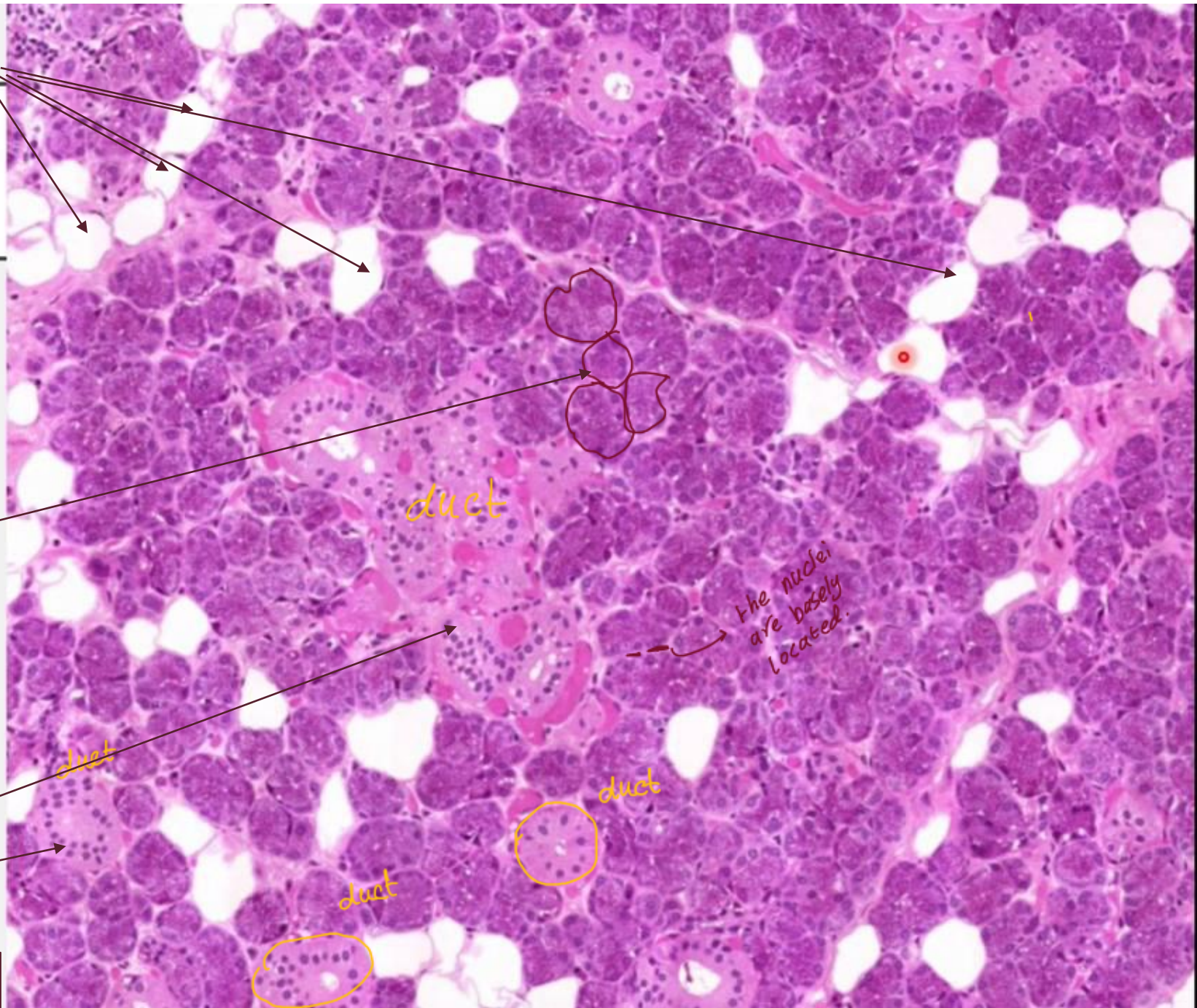
This is another image of the parotid gland. It looks totally different from what we have seen before. These whitish spaces are not actually spaces – they are cells. And if you recall, the only type of cells that always appear this way are adipocytes. So, these are actually adipocytes within the parotid gland. Is this normal? Yes, it is. It's an aging process. So, the older we get, the more fat cells (adipocytes) we have in our glandular tissue. It is the same in both exocrine and endocrine glands.

All of these tiny acini are simply secretory acini. How can we tell which type they are – serous or mucous? So far, we have seen serous acini. We say that these cells are more or less they are pyramidal, which also applies here. The nuclei are basally located, and that is quite clear in all of them. And the cytoplasm is more or less basophilic. So, they are serous acini.

Serous glands
The nuclei are basally located and it is basophilic

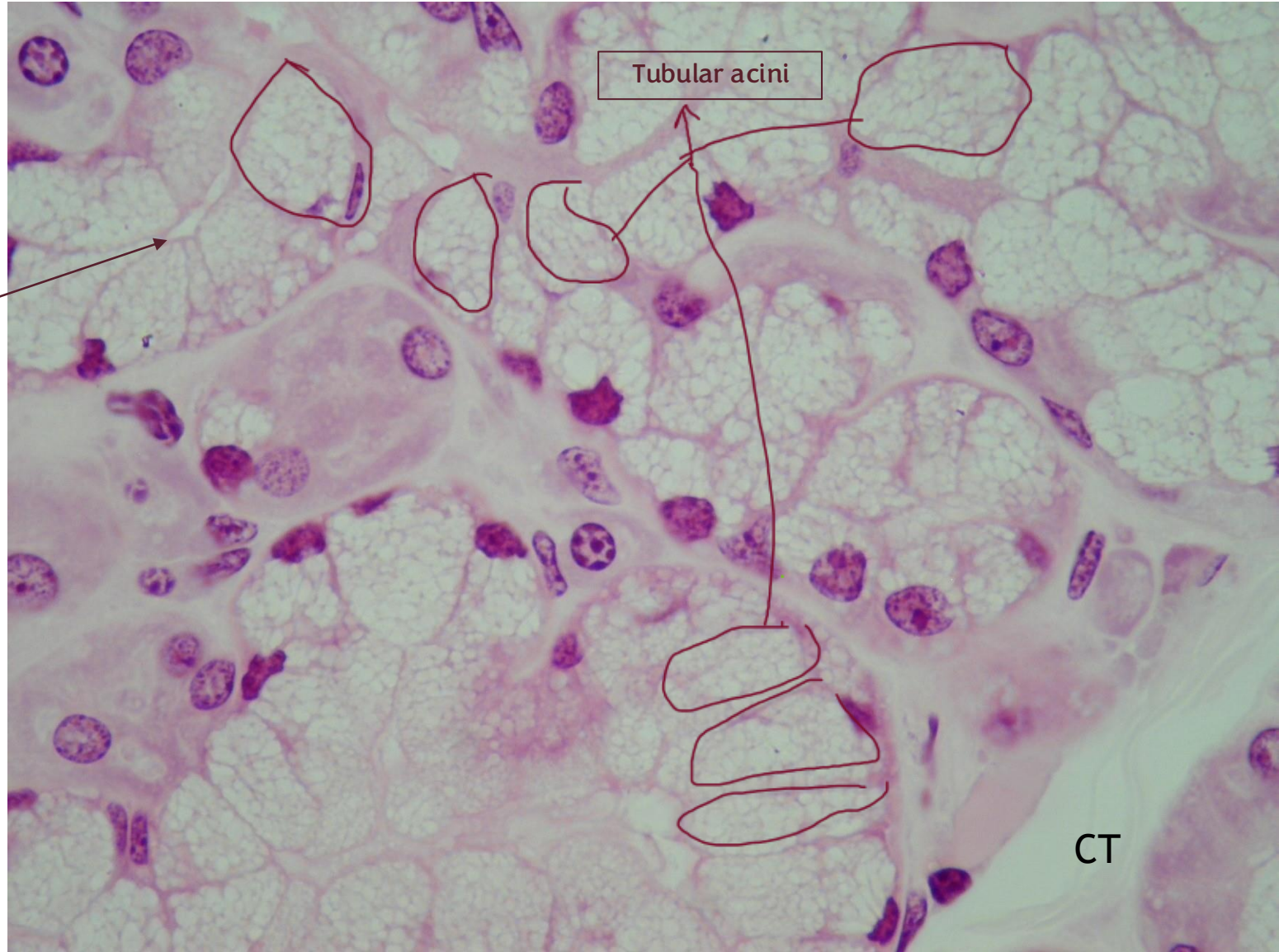
Let's move to the next structure. What are those? Now, the cytoplasm shows an eosinophilic kind of staining. The nuclei are rounded and centrally located. Here we can see the lumen. So, they are all ducts.

The ducts
The nuclei are rounded and it locates in the center and we can see the lumen and it is more eosinophilic



COMPOUND TUBULAR

Seen in sublingual glands in the GI tract



Compound tubular means that these glands have a complex duct system and the secretory portion is tubular.

In humans, we have two salivary glands that have tubular acini: the submandibular and the sublingual.

However, these two are both compound tubuloalveolar, which means you will see both tubular acini and alveolar acini.

So they are considered mixed-type glands.

In some animals, such as mice, they actually have pure alveolar acini, so their glands are simply compound tubular.

This is what we are looking at here, so all of these are simply tubules or tubular acini.

How can I tell?

The cytoplasm is filled with mucin.

These mucin, as you can see, are highly hydrated, and whatever is left stains very faintly eosinophilic.

This faint staining is actually the determining of the protein structure in the mucin.

We can actually identify and differentiate the lumen of this gland.

If you pay attention, the nuclei are usually more or less basally located.

Compound = complex duct system Tubular = mucous tubules

so it is an example of pure mucous-secreting cells

**it is not pure 100% but most of it are mucous tubules, with some serous acini scattered here in there.* acinus: collection of secretory cells mucous secretion = thick fluid serous secretion = watery fluid

Tubular → Vacuoles are filled with mucus & more washed out

They resemble goblet cells due to mucin content, but are not goblet cells

COMPOUND TUBULOALVEOLAR

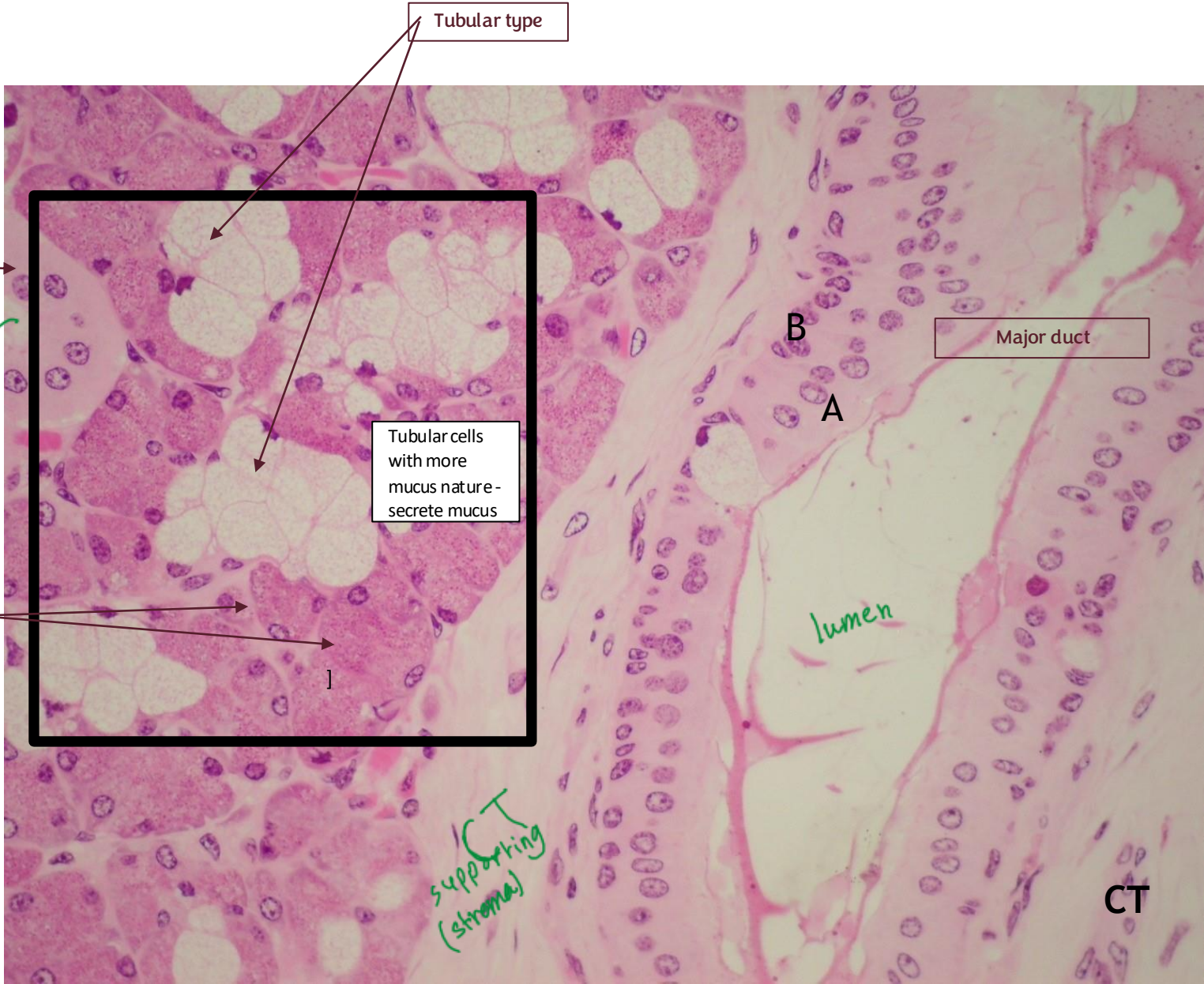
Now we have another totally different image, but we can clearly differentiate this tissue from the ones before.
 Why? Because we simply have two types : serous type and tubular type.
 Do we have ducts? Absolutely. We have this major duct over here, and a smaller one just in the corner.
 So those are tubular acini:
 *Typical foamy appearance
 *Basally located nuclei (flattened on one side)
 *Serous ones: the granules inside are visible
 *Cells are mostly basally located, with rounded nuclei, and the cytoplasm is more basophilic , more or less pyramidal cells.

Now, if you look at the ductal part:
 *Simply eosinophilic cytoplasm
 *Centrally located rounded nuclei
 *Lumen is clear

Now again, this is a major duct, which we can tell because it is stratified.
 This is the lumen, which is quite clear, and around it is the supporting stroma , which supports the secretory portion of this gland.

This is a section from the submandibular gland (the second largest of the three main salivary glands).
 compound: because it is a complex duct
 tubular = mucous tubules
 alveolar = serous acini

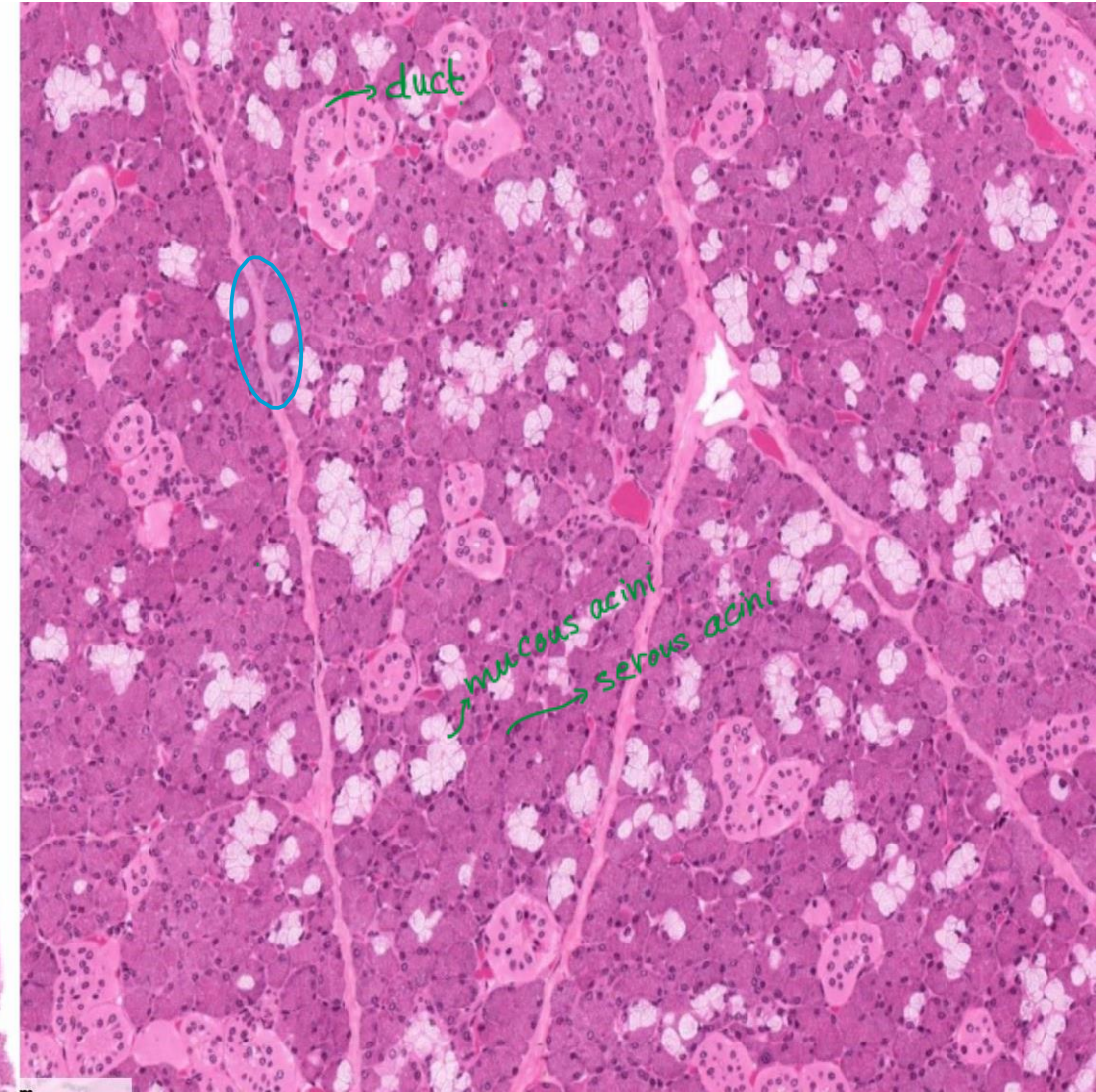
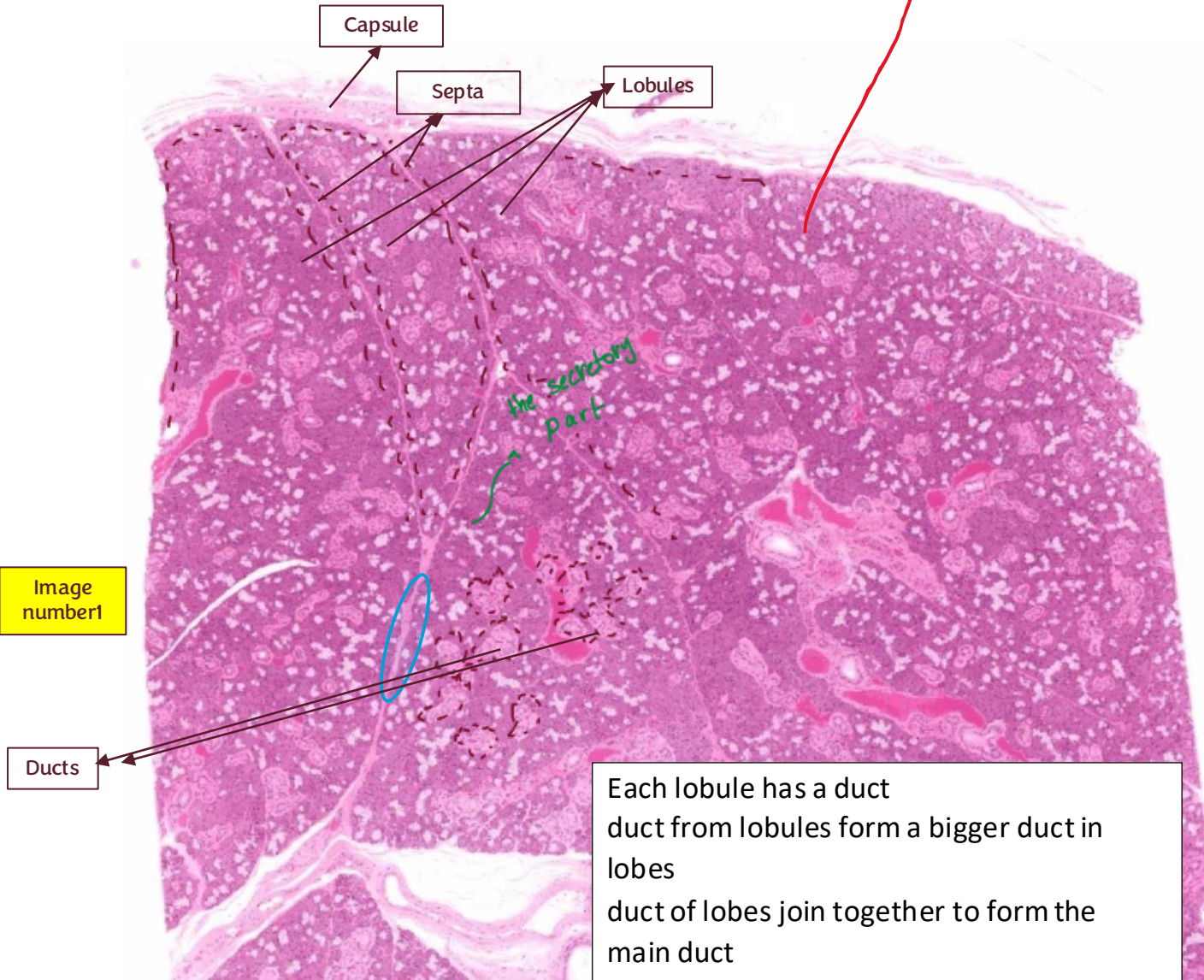
This is a major duct (excretory duct) with stratified cuboidal forming it.
 The duct is surrounded by connective tissue.



SUBMANDIBULAR GLAND

the second largest of the three main salivary glands

This is a major salivary gland (major exocrine gland), and when we say that means we will have what is called the capsule (connective tissue structure that surrounds & protects the exocrine cells). Capsule sends septa to further divide the gland into smaller (lobes) and smaller (lobules) compartments



Here we see the second type of gland, which is the submandibular gland.
Previously, we were looking at part of a mixed gland, but here we are focusing on it more clearly.

Image number 1 :

At low magnification, we can identify the capsule, which sends septa inward, dividing the gland into lobules.

At this magnification, we can differentiate between:

The ducts, which stain more or less eosinophilic

The tubular (mucous) secretory portions, which appear pale whitish/grayish

The serous secretory portions, which are more basophilic

So:

The grayish (mucous) and basophilic (serous) areas represent the secretory portions

The more eosinophilic structures represent the duct system

All of these structures (ducts + secretory units) together form the parenchyma of the gland.

On the other hand:

The capsule

The connective tissue

The septa

All of these are part of the stroma

Image number 2 :

At higher magnification, we can still see the stroma, including the septa.

Now, let's focus mainly on the parenchyma, since the stroma is supporting almost everything here.

We can identify:

Ducts: they have a more eosinophilic cytoplasm, with centrally located nuclei, and a clear lumen

Mucous acini: appear whitish to grayish, with basally located, flattened nuclei

Serous acini: more basophilic, with rounded, basally located nuclei

Also, at this magnification, we can clearly observe the cytoplasmic granules, especially in the serous acini

SUBMANDIBULAR GLAND

Serous cells usually they have lots of granules ,which contains the secretory product , they travel to the apical surface then there content will be released .

This is a higher magnification of the previous gland.
we see here three different structures (different in the staining)
whitish: mucus tubules
pinkish : ducts
very pinkish : serous acini



This is a higher magnification, so we can better appreciate the differences in eosinophilia and basophilia between the structures.

We can identify both the ducts and the secretory portions.

Now, how do we differentiate between serous and mucous acini?

* The serous acini are the ones that stain more or less basophilic so they appear darker

→ You can clearly see the cytoplasmic granules, which contain the secretory products

→ The cells are pyramidal in shape, with rounded, basally located nuclei

* The mucous acini appear whitish to grayish

→ The cells are usually taller

→ The nuclei are flattened and darkly stained, located at the base

COMPOUND TUBULOALVEOLAR

Again, at a higher magnification, we can clearly identify:


- * The ducts
- * The tubular (mucous) acini
- * And the remaining darker structures are the serous acini

Now, sometimes we observe this structure here. What is it?

When you look closely, you'll notice that these are serous cells, but they are located adjacent to a mucous (tubular) acinus. These serous cells form a cap-like structure over the mucous acinus. They are actually part of the same acinus, but we give them a specific name:

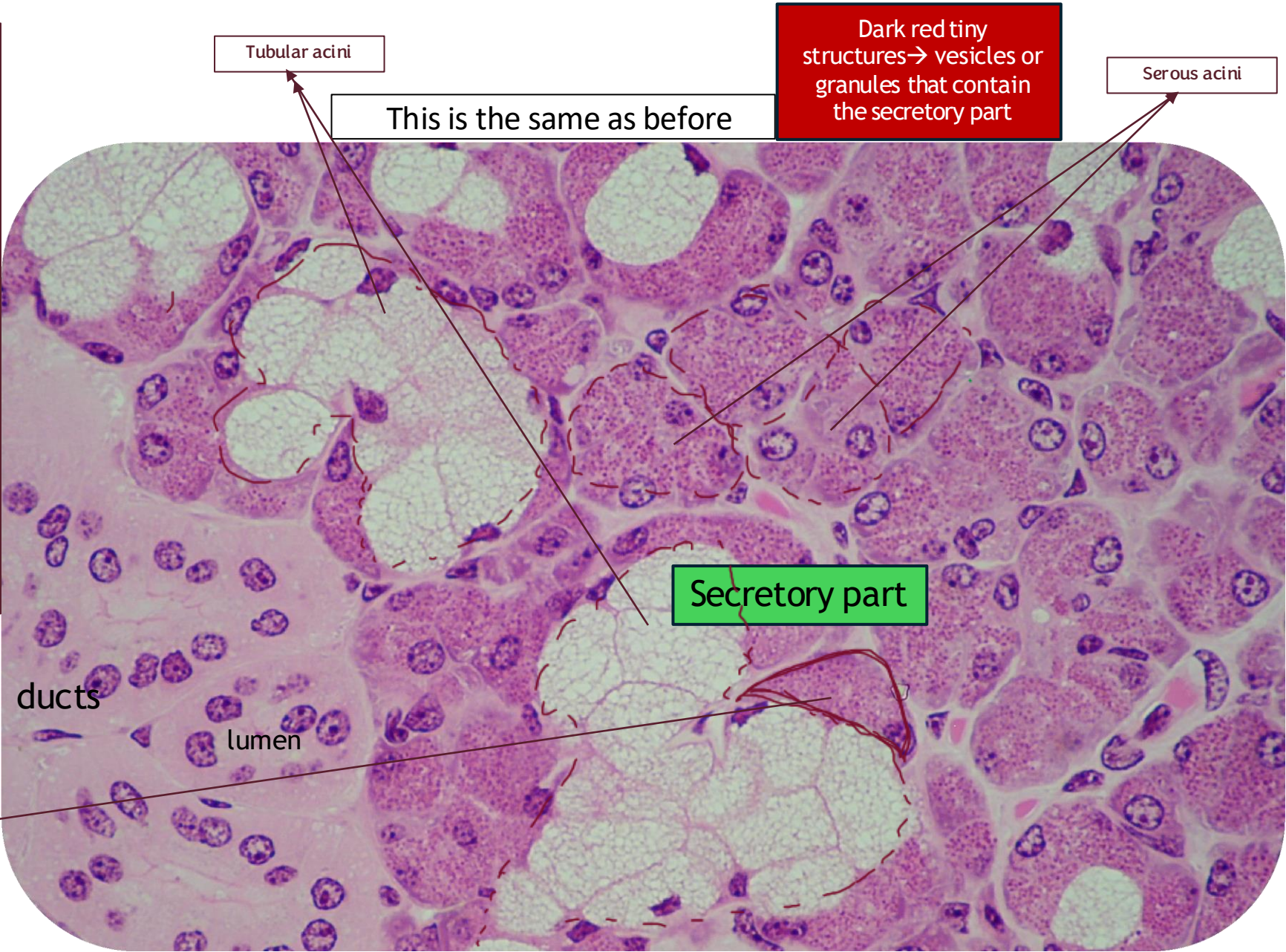
→ They are called serous demilunes

When these serous cells secrete, their secretions mix with the mucous secretions, and both are then carried together into the same duct system.

This is a serous acinus, but note that it is not complete, it is related to the mucous tubule and it does capping for mucous tubules, it looks like a (crescent moon ).

This is called serous demilunes

The alveolar part is more watery with bigger nuclei than the tubular



SEROUS DEMILUNES

Higher magnification , and you can see the granny felling of the serous cells.

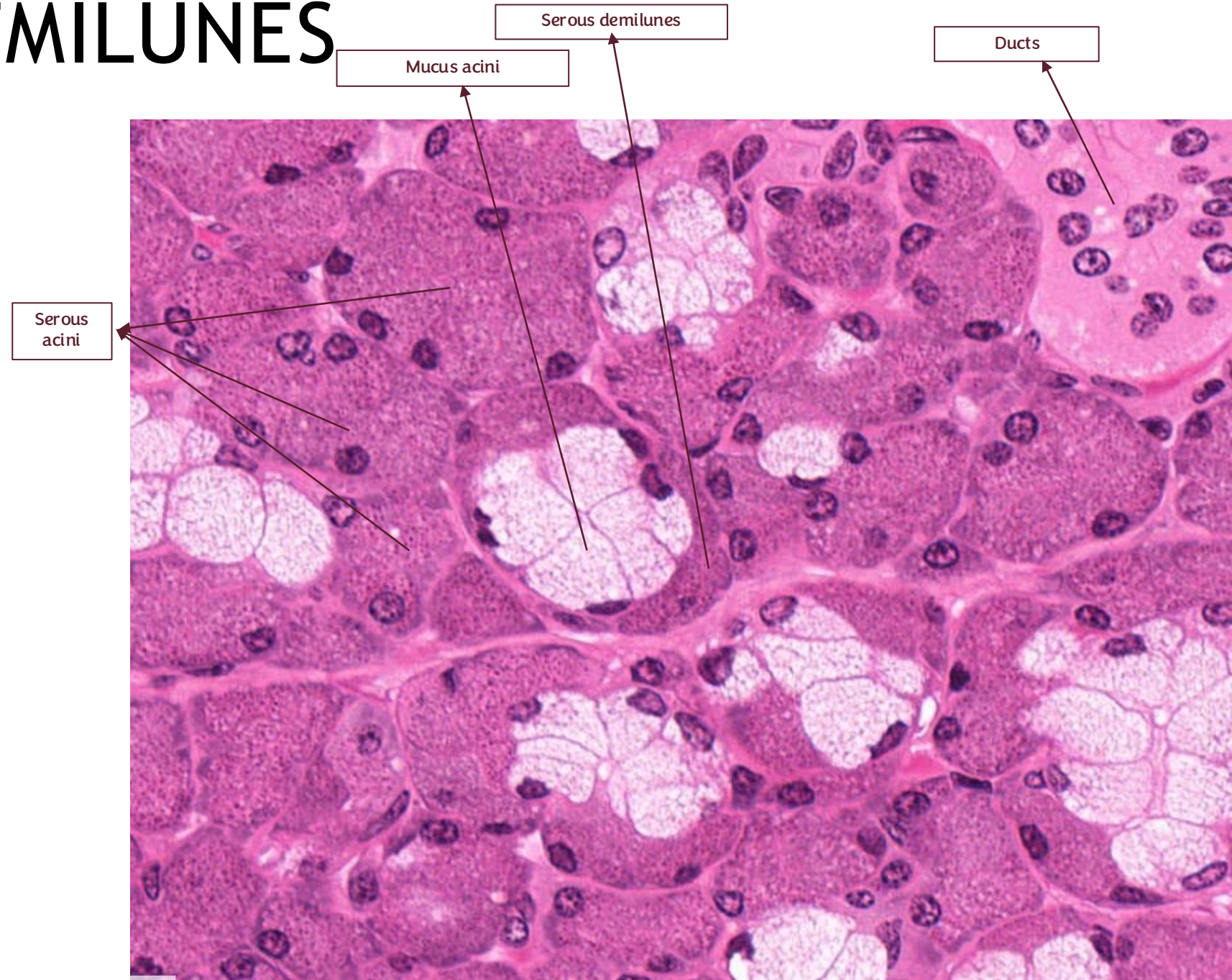
how to distinguish the mucous cells :

- 1 washed out appearance
- 2 more basally located nucleus
- 3 more flattened nucleus

So this is an example of mixed gland (serous&mucous)

and a compound gland (complex duct system)

*all major glands ,such as this one , are considered compound glands .



SUBLINGUAL GLAND

The sublingual gland is another major salivary gland. It is a mixed gland (compound tubuloalveolar), but at this magnification we can clearly see that the whitish/grayish areas are more prevalent than the darker ones.

This is correct because:

- * The gland contains more mucous (tubular) acini than serous acini
- * So, although it is mixed, the majority is mucous

This is the opposite of the submandibular gland, where:

- * The secretion is predominantly serous
- * And it contributes more than two-thirds of the saliva

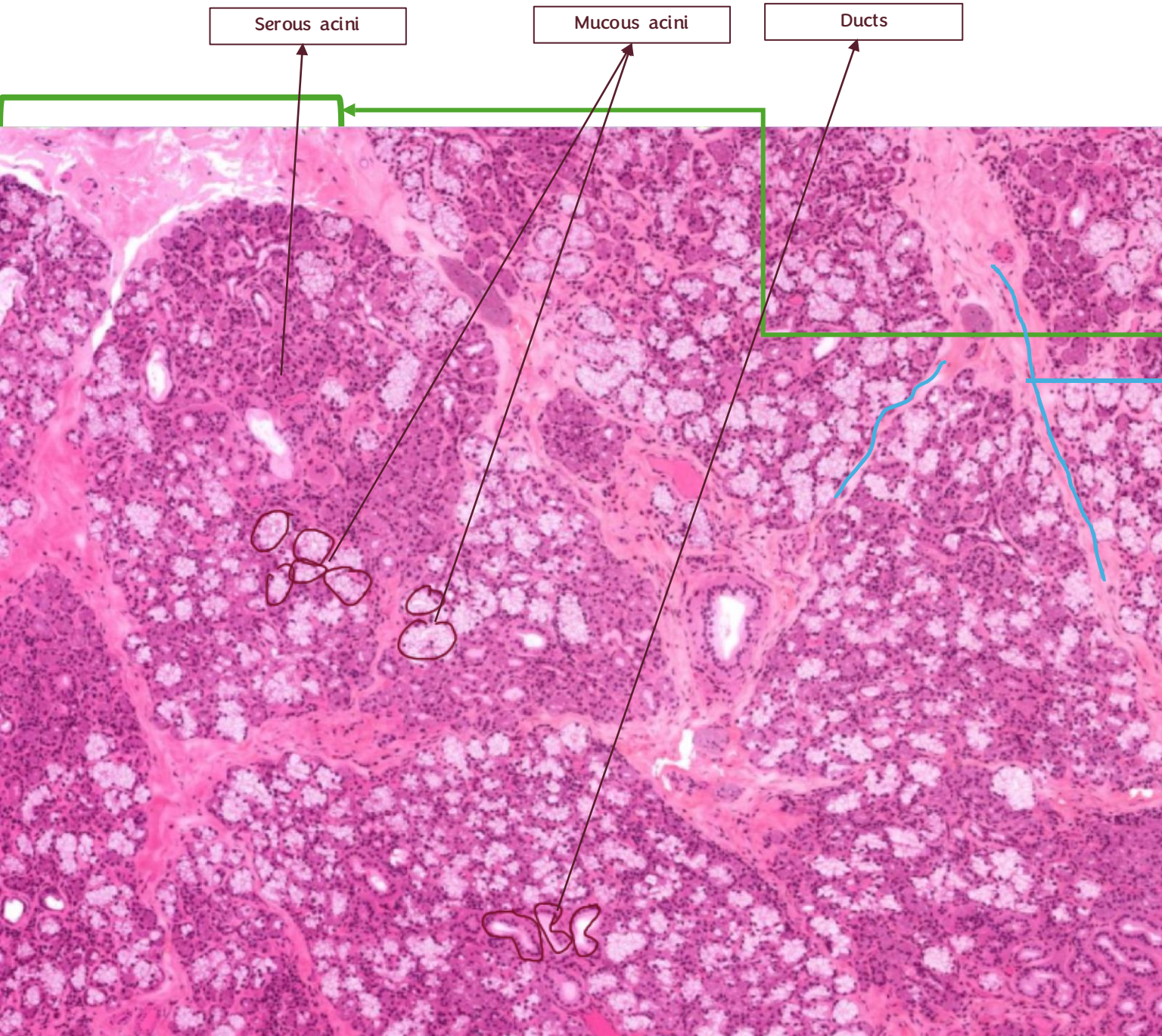
Can we distinguish other elements? Yes – the stroma:

- * There is a capsule on the outside
- * The capsule sends septa inward
- * These septa divide the gland into lobes and lobules



Sublingual G

The smallest of three salivary glands



Serous acini

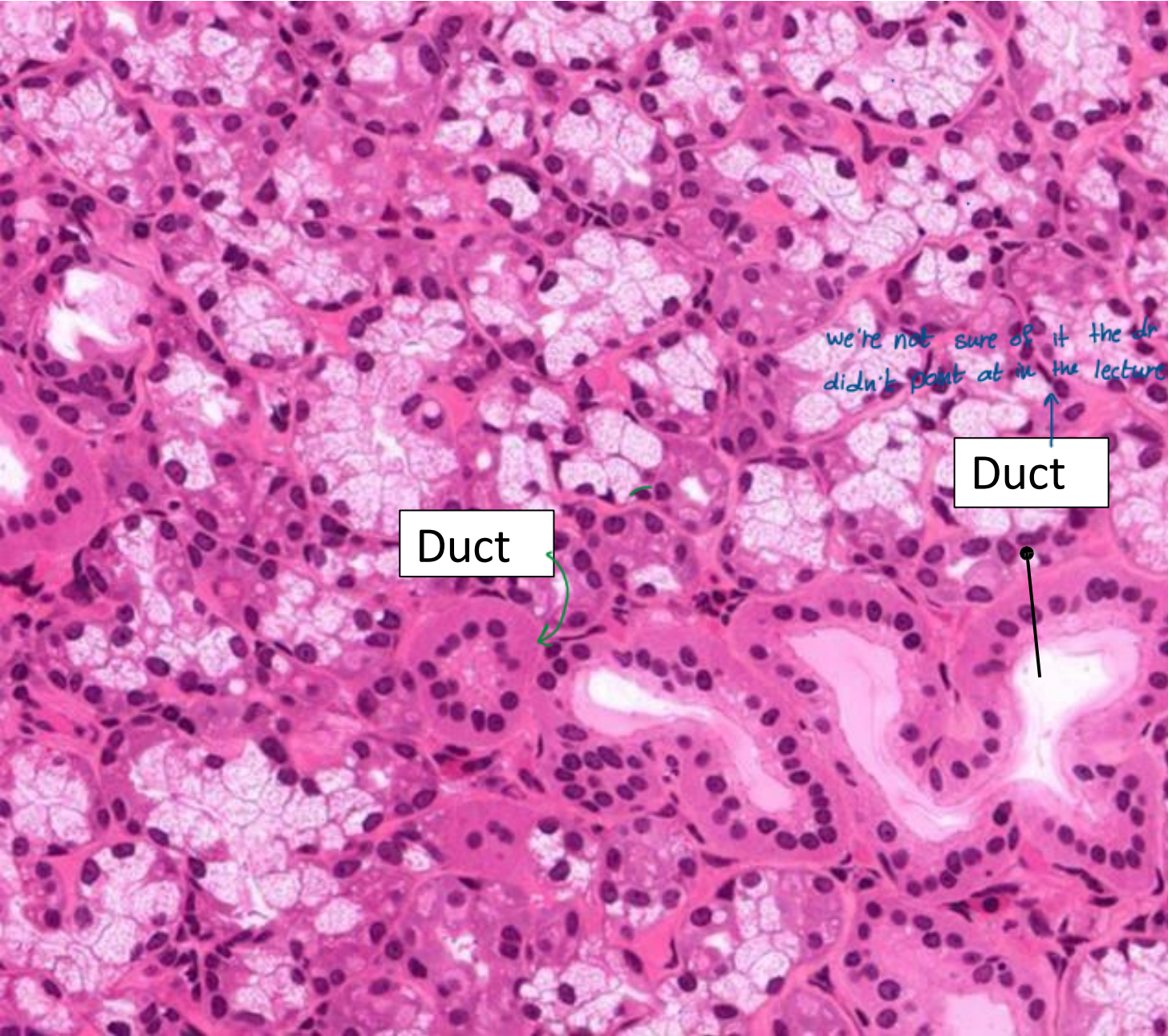
Mucous acini

Ducts

At higher magnification, it is quite clear that the Capsule stroma separates the different components of the gland.
The whitish/grayish areas represent the mucous acini
The darker structures interspersed between them are the serous acini.
We can also distinguish the ducts, as their lumen is relatively clear and visible.
so it is a mixed gland
but it has more mucus tubules than serous acini

Sublingual G

- This is a higher magnification we can see mucous tubules:
 - 1 Have washed-out appearance
 - 2 more basally located nucleus
 - 3 more flattened nucleus
- compared to the serous acini cells.



You might notice that the ducts are not as strongly stained as the ones before, and that is true. So how can we distinguish them?

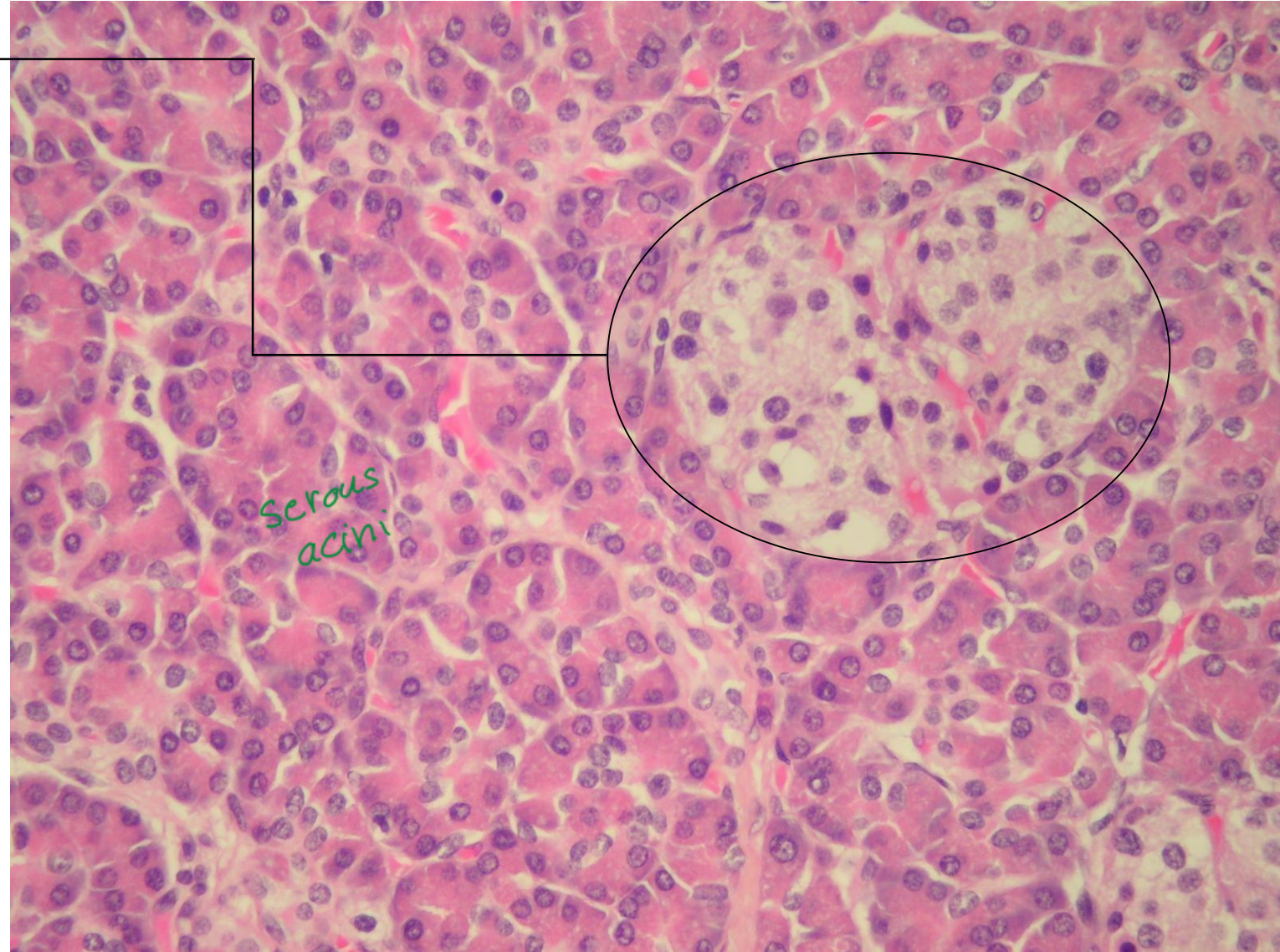
The key factors are:

- * The location of the nuclei (usually more centrally located in ducts)
- * The shape of the nuclei (more rounded)
- * The cytoplasm, which is relatively more eosinophilic compared to mucous acini, but less basophilic than serous acini

PANCREAS

This is the endocrine part of the pancreas .-> lightly stained langerhans islets

The rest is the exocrine part



The pancreas is primarily an exocrine gland, which means it has:

- * A secretory portion (acini)
- * A duct system

So, it is a compound gland.

However, what makes the pancreas unique is that it has both exocrine and endocrine components :

- *The exocrine part consists of serous acini
- *The endocrine part consists of the Islets of Langerhans

When we look at the acini:

- * They are serous acini
- * They are rich in organelles (especially for protein secretion)

At higher magnification, these features become more prominent

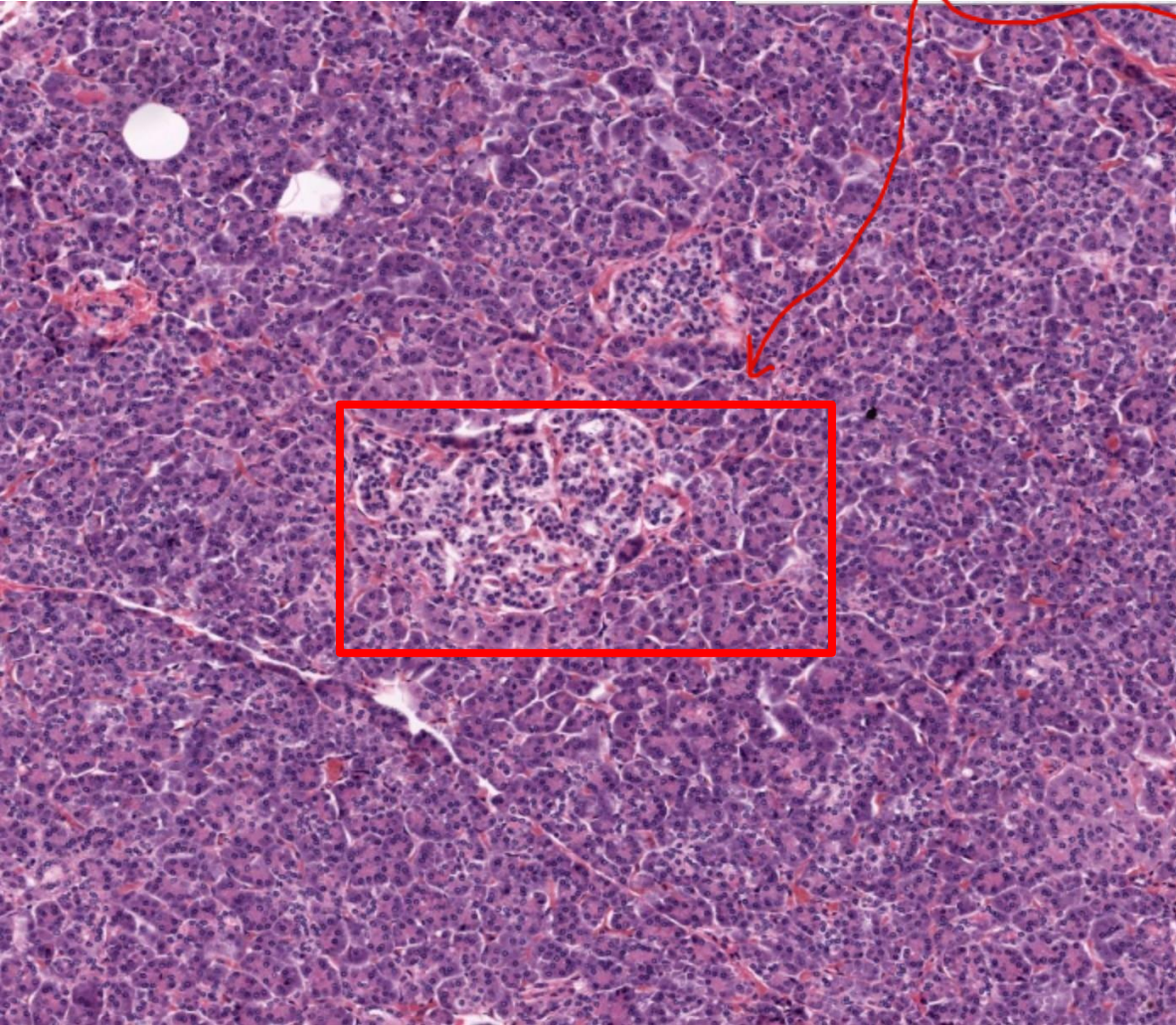
If we compare pancreatic cells to salivary gland cells:

- * The pancreatic acinar cells appear smaller
- * But they share similar criteria:

- *Pyramidal shape
- *Rounded, basally located nuclei

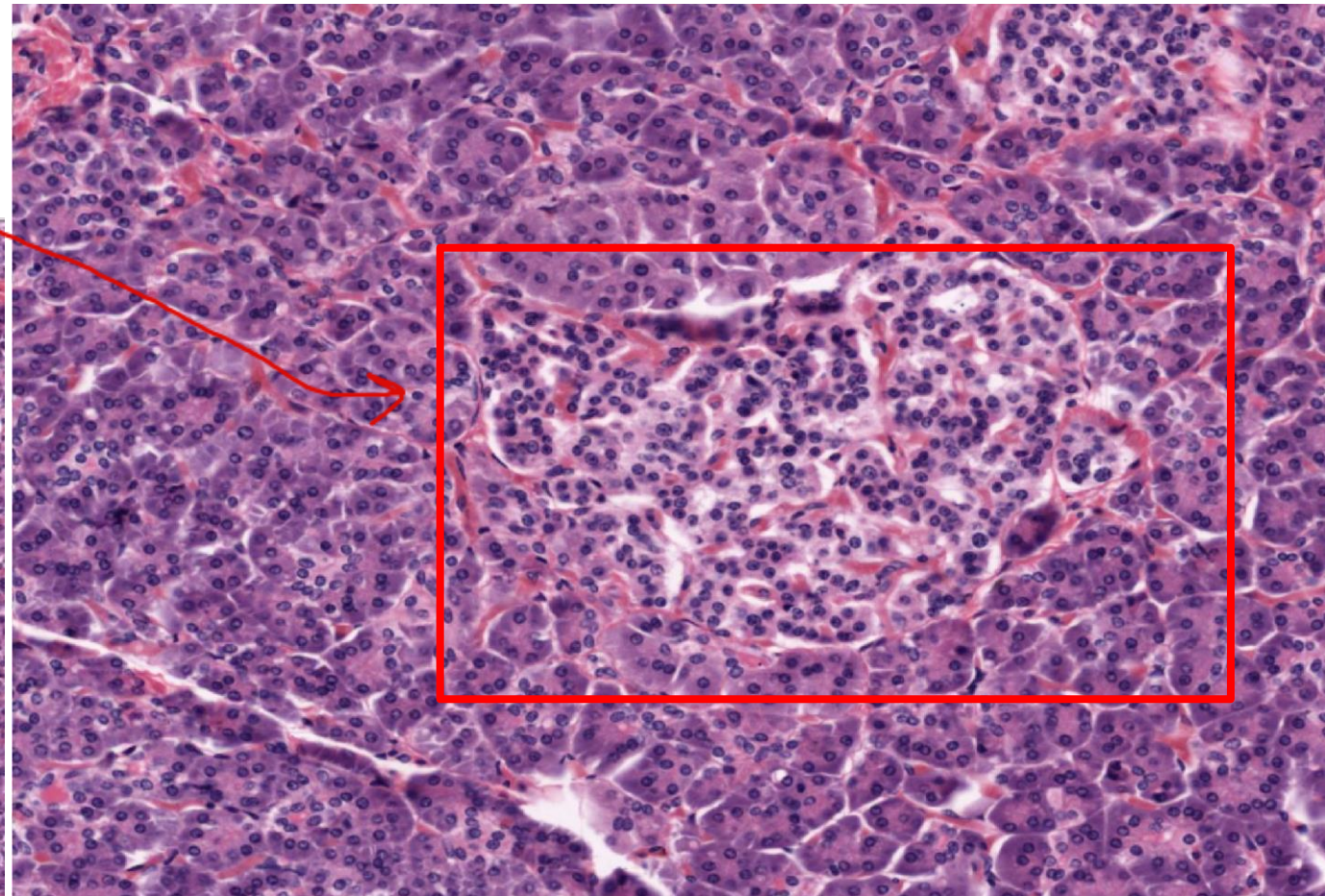
PANCREAS

**This is the
endocrine part
and the rest is
exocrine**



Lower magnification

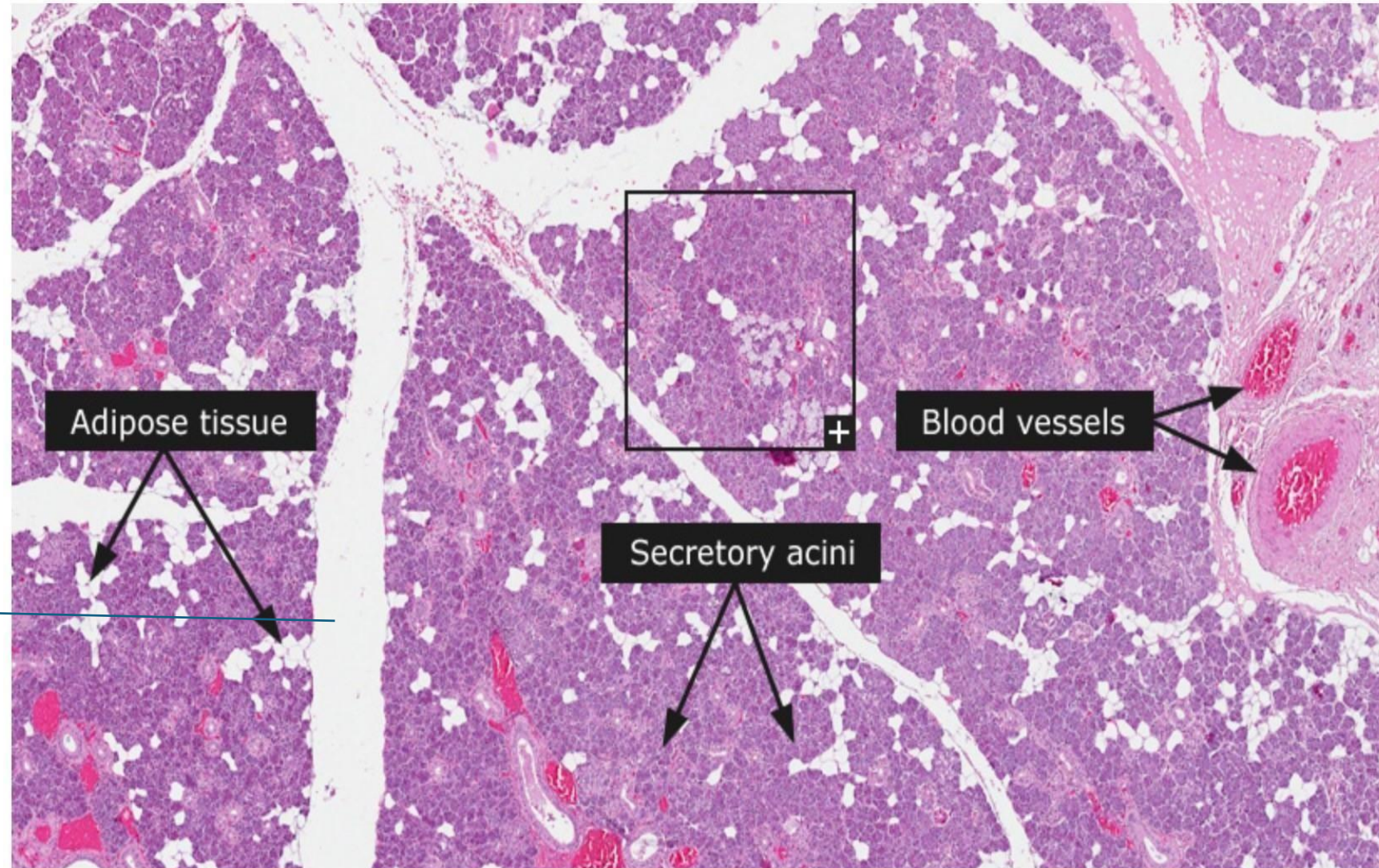
Higher magnification



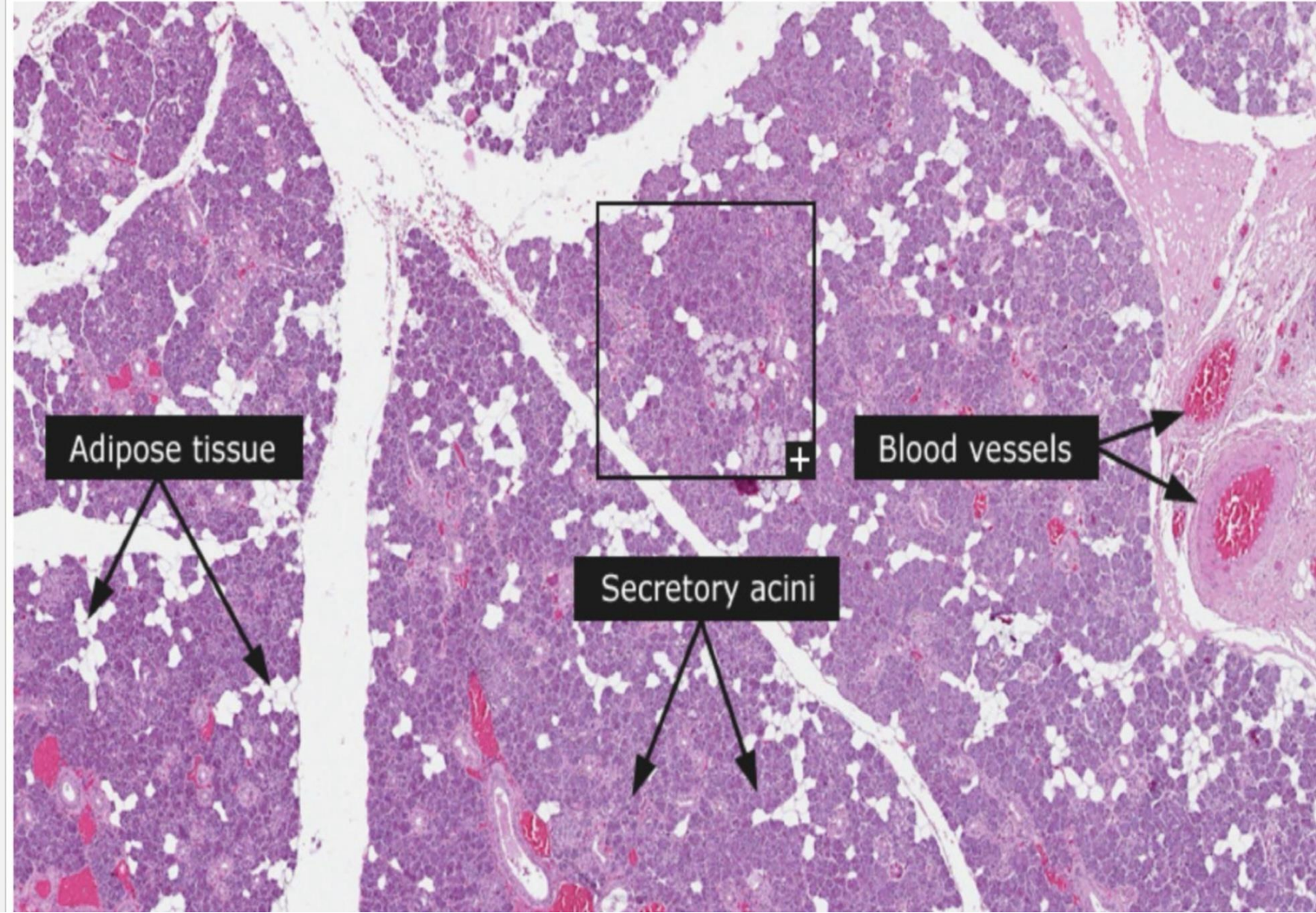
The pancreas is a unique gland , because it has exocrine portion (and it is of the serous type) and it has endocrine part , which is islands scattered through the tissue and they represent only about 5% of the pancreas.

This is also a major salivary gland (which is submandibular gland btw) at this magnification what would you say?
is it compound or simple?
Definitely ,this is compound (a complex duct system)

This is a septum



SUBMANDIBULAR GLAND



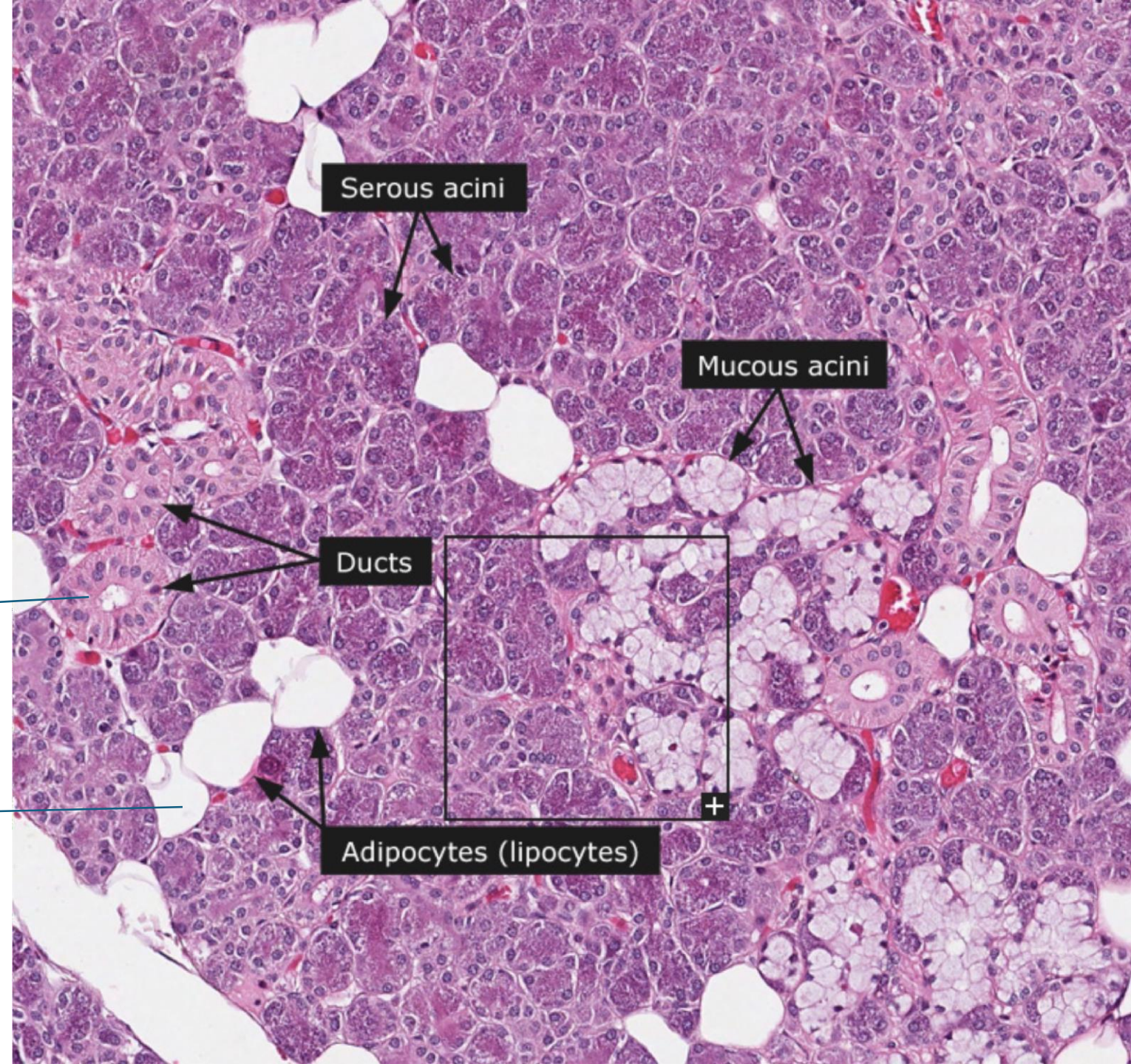
At higher magnification we do recognize different regions.

the darkly stained are : serous acini (their secretion is watery)

the likely stained (washed out appearance) : mucous acini tubules to be accurate (their secretion is thick)

Ducts with simple cuboidal epithelium.

The existence of Fat cells (adipocytes) in the salivary glands is a **sign of aging**

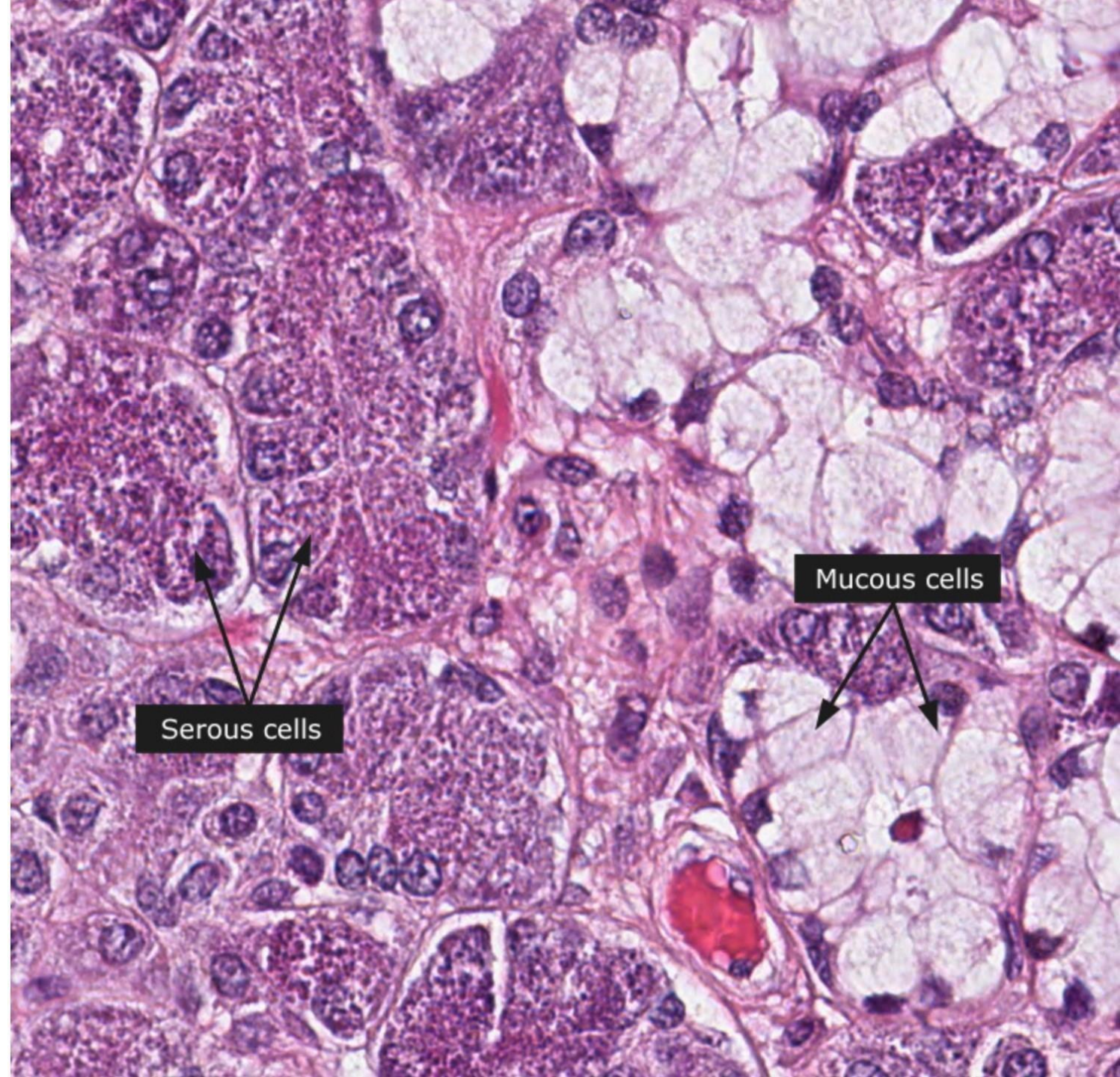


SUBMANDIBULAR GLAND

higher magnification, and you can see the granule within the cytoplasm.

Round nucleus for the serous cells

More or less flattened nucleus for the mucous cells, and more basally located (pushed to the very basal aspect of it)



PAROTID

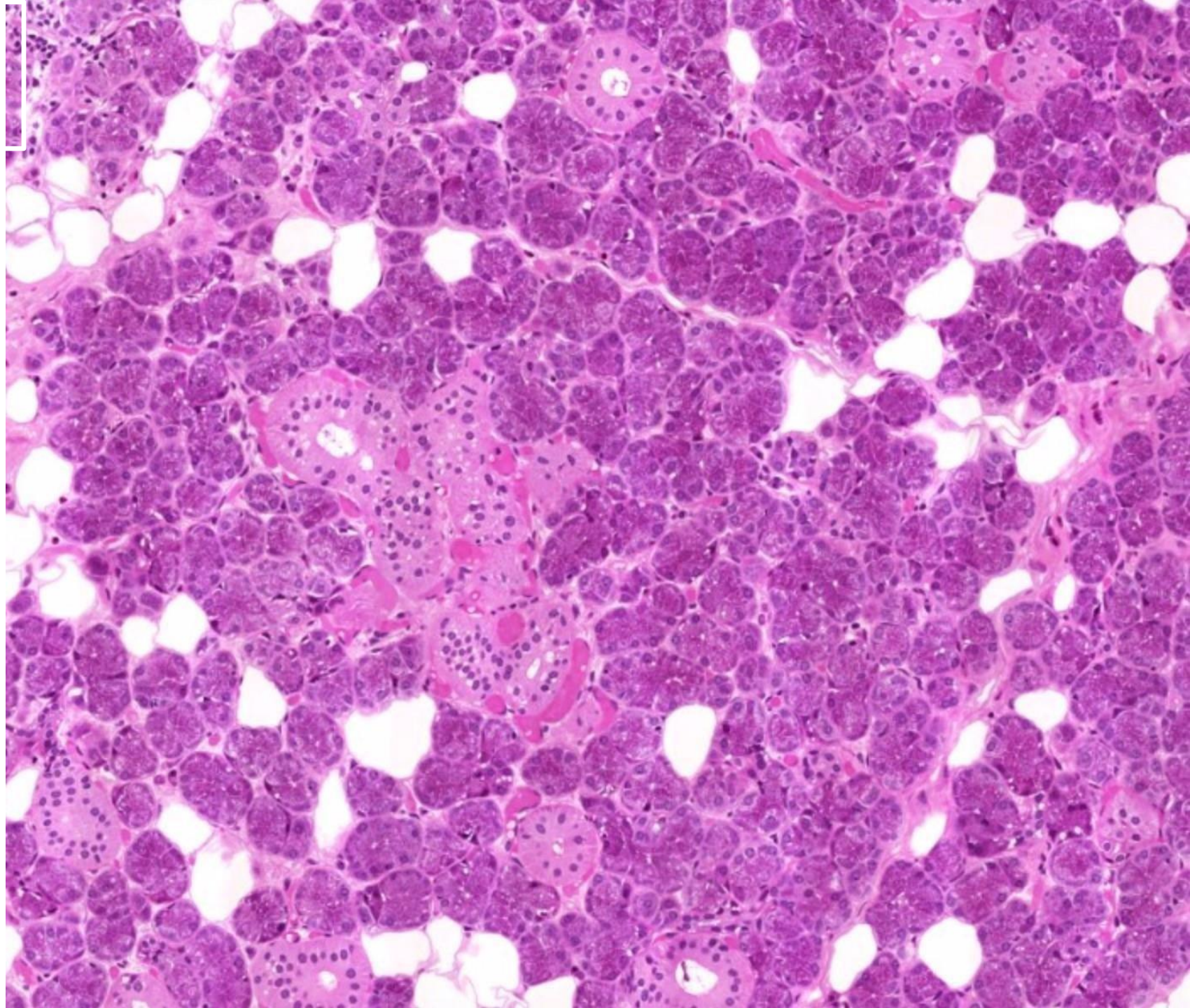
The largest of three salivary glands

We can see the very pinkish (kind of purple structures) these are serous acini .

but the white structures are these mucus tubules ??

no these are **fat cells (adipocytes)** their existence in the salivary glands is a sign of aging (Adipocytes increase with age but can normally be present)

So this is considered a serous gland (it has mainly serous)and it is kind of pure serous gland.



Check your study

<https://forms.gle/2b29qW39sajgXqwP7>

For any feedback, scan the code or click on it.



Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1	Slide 3	Stomach	Intestines
	Slide 8 (line 15)	These cells are more eosinophilic . They are pyramidal	These cells are more or less they are pyramidal , which also applies here.
	Slide 8(line 19)	And the cytoplasm is less basophilic	And the cytoplasm is more or less basophilic
	Slide 9 (line 20)	More basally	More or less basally
	Slide 10 (line 3) (Line 12)	We simply have two types of acini Additional sentence ->	We simply have two types More or less pyramidal cells
	Slide 12 (line 6)	Which stains more eosinophilic	Which stains more or less eosinophilic
	Slide 14 (line 5)	That stain more basophilic	That stain more or less basophilic
V1 → V2			

Additional Resources:

رسالة من الفريق العلمي:

Reference Used:
(numbered in order as cited in the text)

1. ***Dr. Ghada Abu Al-Ghanem's lectures***

ياربّ اجعل لنا في الأيام القادمة خيرًا ونورا،
وبلوغ غاية، واحتضان أمنية، وتيسير حال؛
فما ظننا بك إلا الحسّن، ولا طرقتنا غير بابك،
ولم نتوكل إلا عليك، يا مُسبّب الأسباب، يا
مُفتّح الأبواب، يا كريم يا وهّاب

If you find any mistake please scan the QR code
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