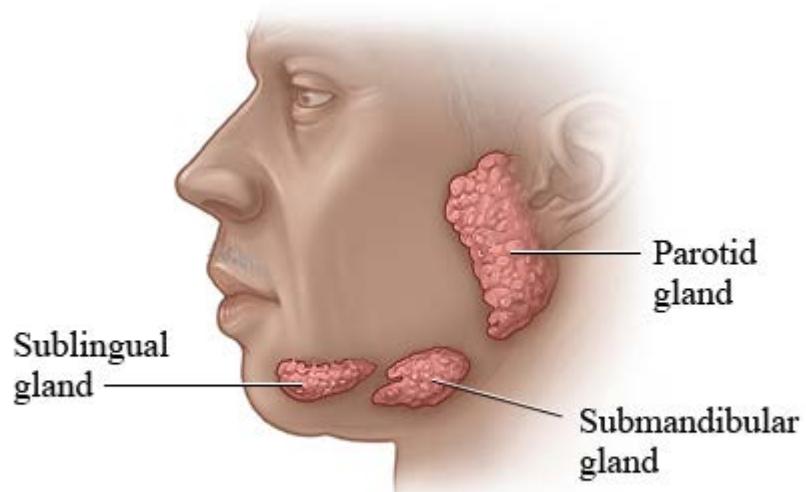


# Practice 2

## Major salivary glands TMJ, Methods

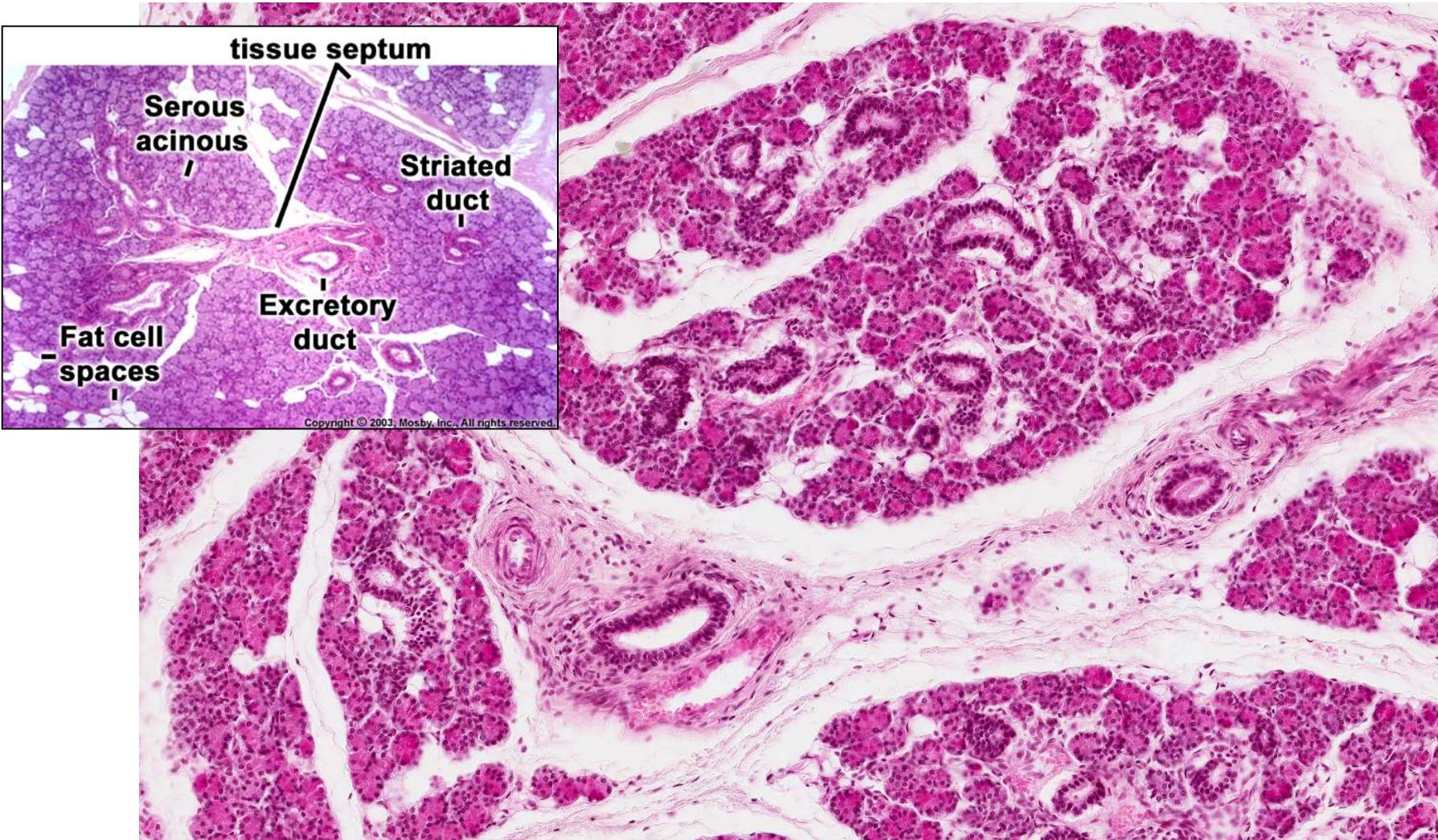


# Structure of salivary glands

Ligaments – capsule, septa, connective tissue

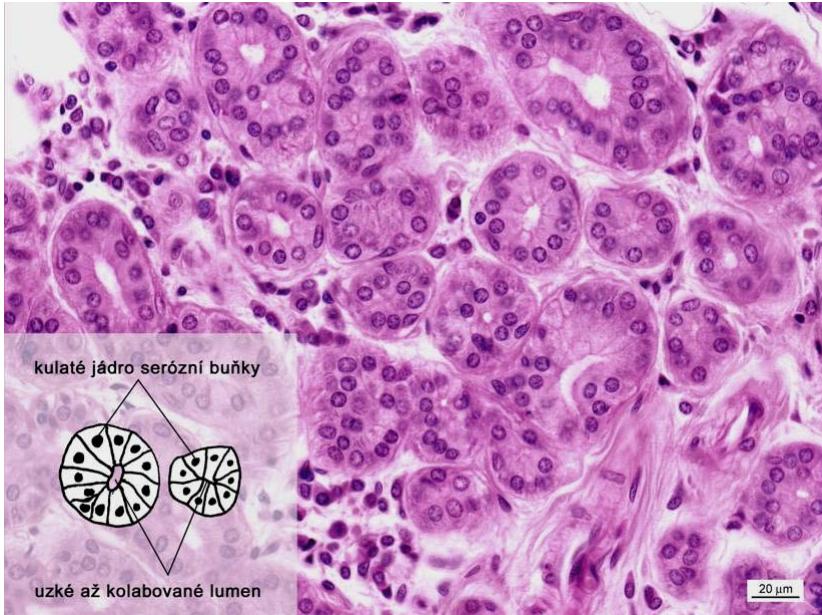
Parenchyma – lobules

- secretory compartments: serous acins, mucinous tubules or tubules with Gianuzzi lunules
- ducts: intercalated and striated ducts (interlobular and main in v septa between lobules)



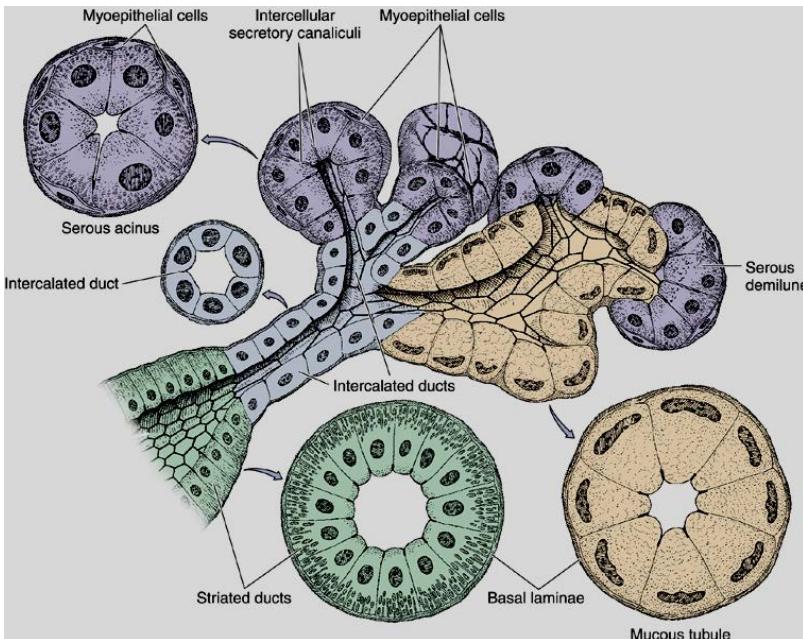
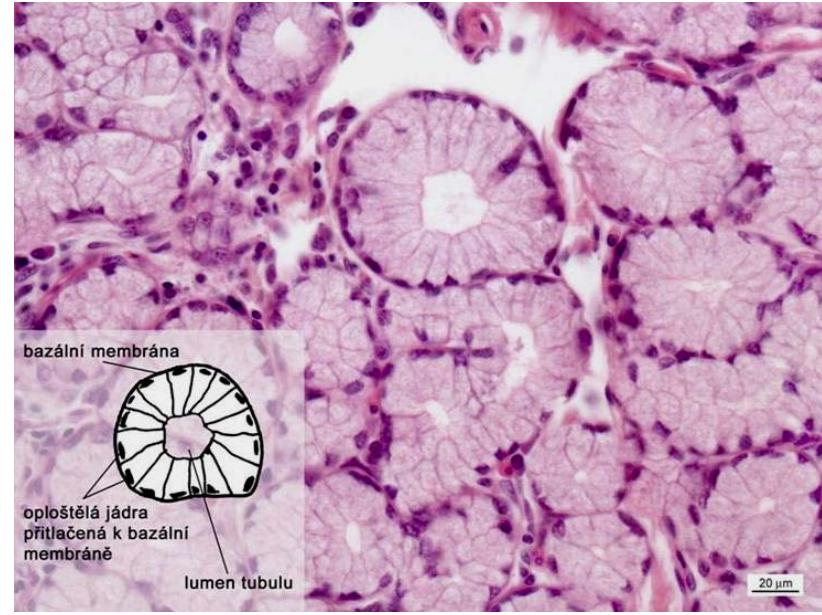
## Serous acini

BM, myoepithelial and serous cells

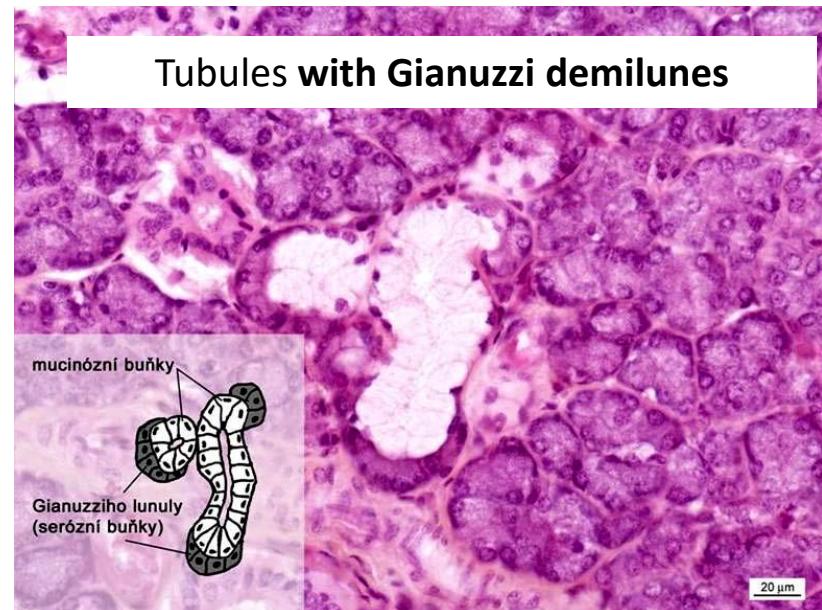


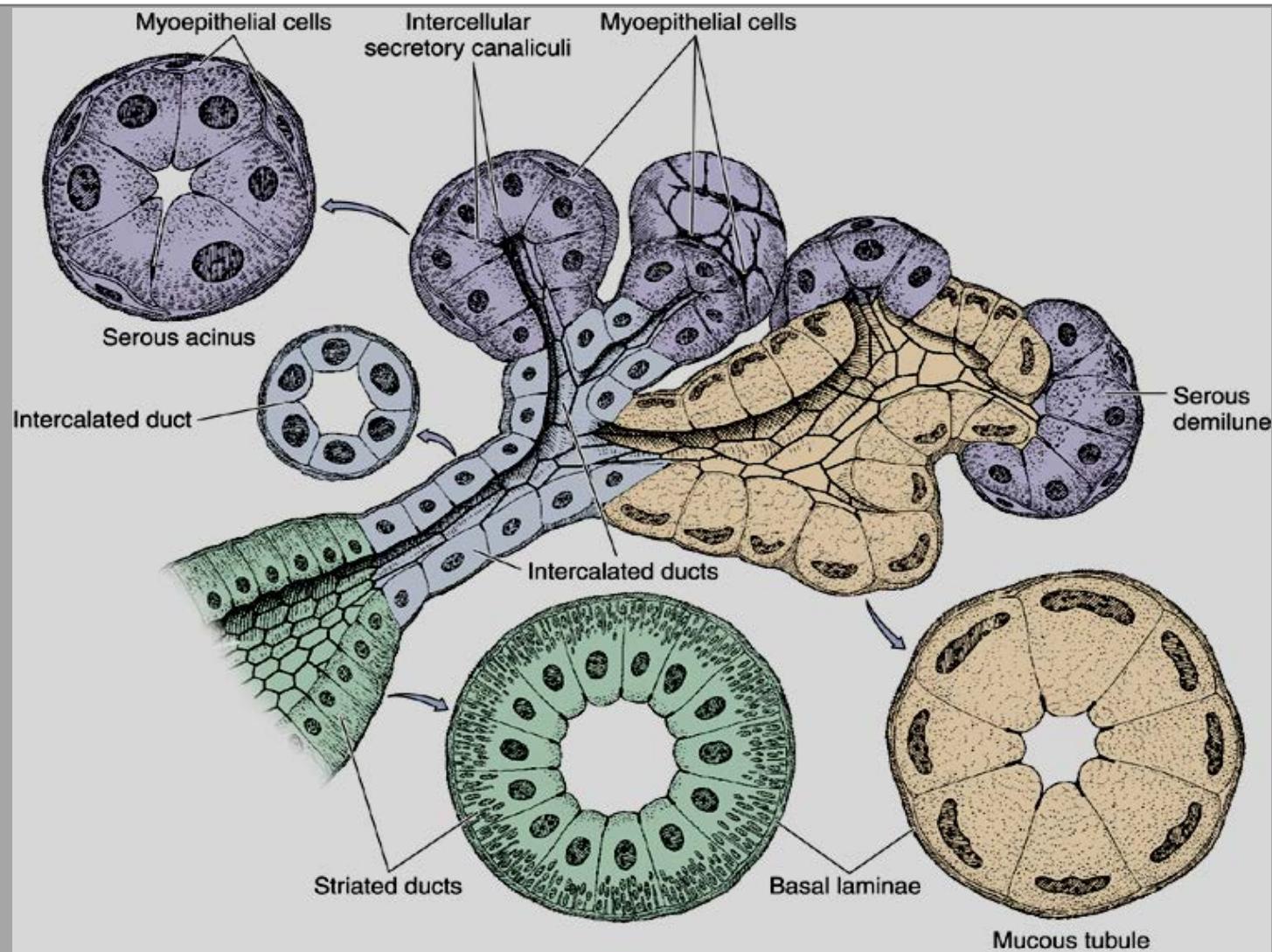
## Mucinous tubules

BM, myoepithelial and mucinous cells



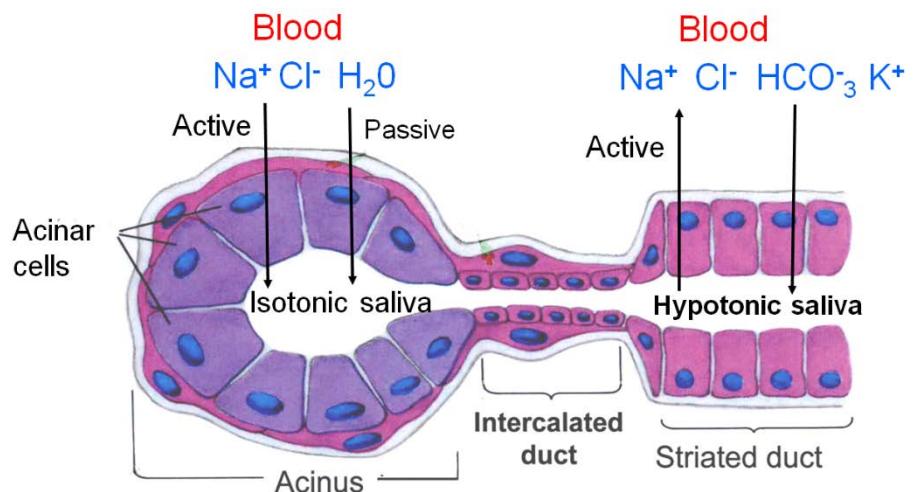
## Tubules with Gianuzzi demilunes

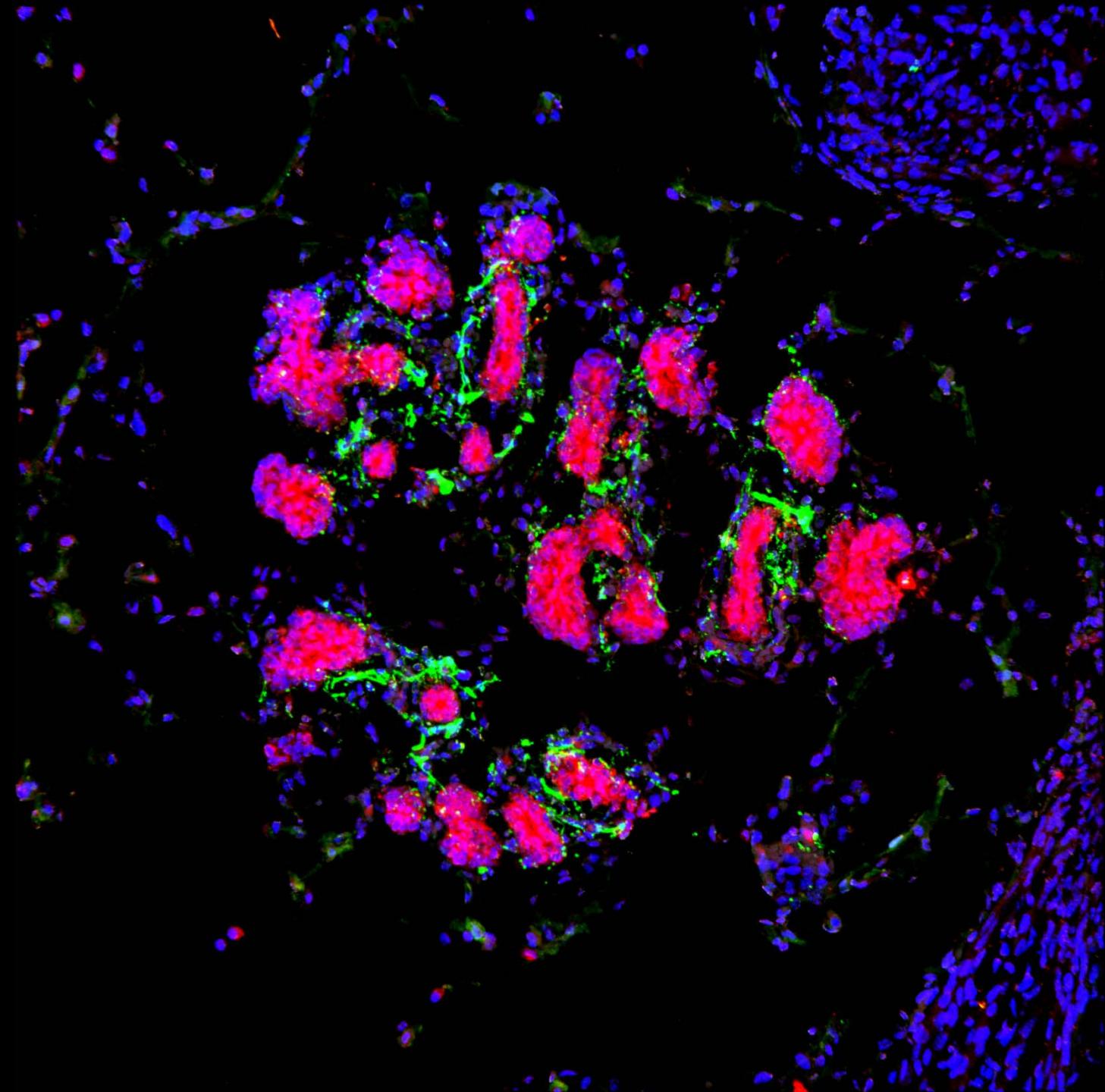




# Myoepithelial cells

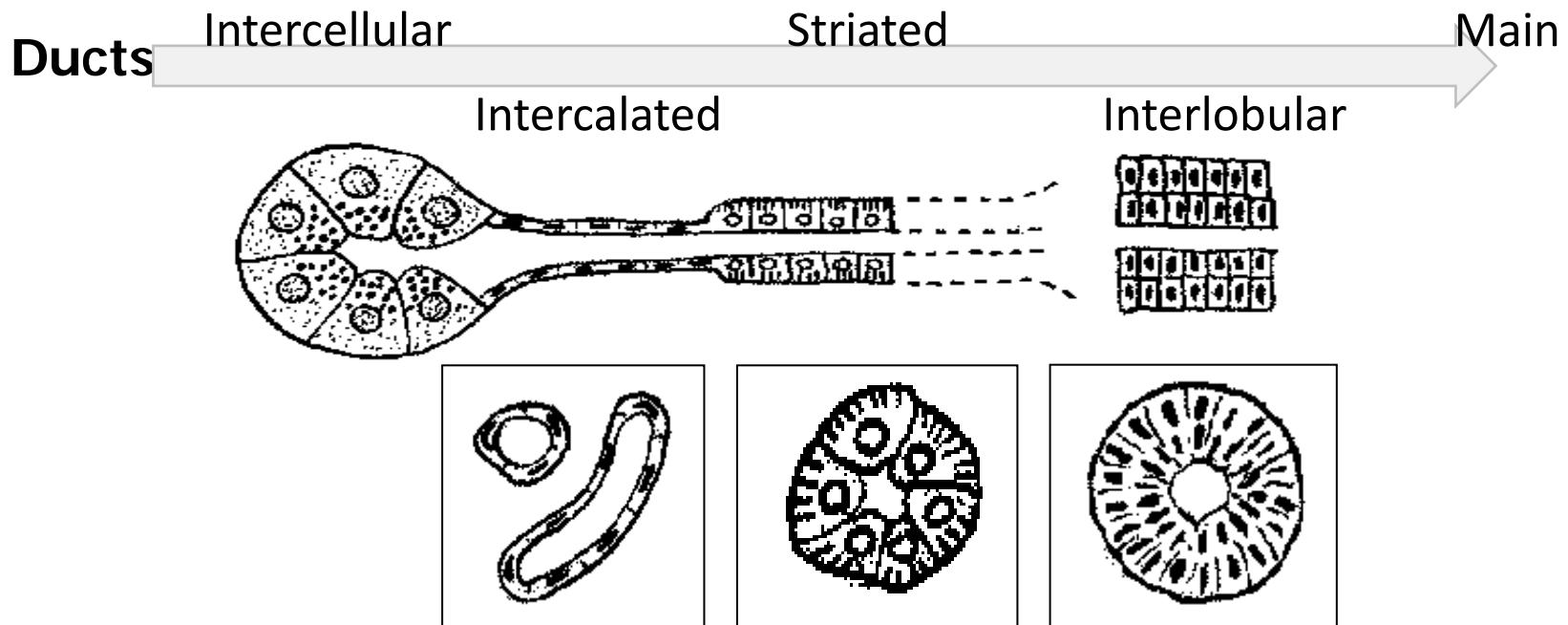
- Ectomesenchymal origin
- Contraction
- Desmosomes
- Vegetative control





# Salivary ducts types

- **Intercellular** (*they do not have their own wall, intercellular space*)
- **Intercalated** (*simple squamous ep., only serous and mixed glands*)
- **Striated** (*simple cuboidal/low columnar ep.; basal labyrinth → striation*)
- **Interlobular** (*simple – stratified columnar ep., in septa*)
- **Main** (*stratified columnar ep.*)



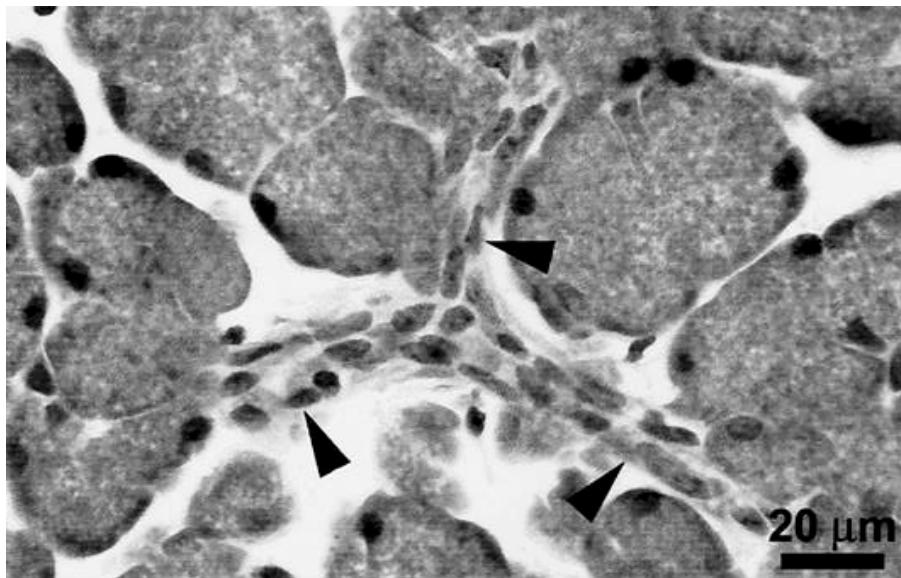
# Intercalated ducts

Narrow and thin-walled channel, collapsed on slides

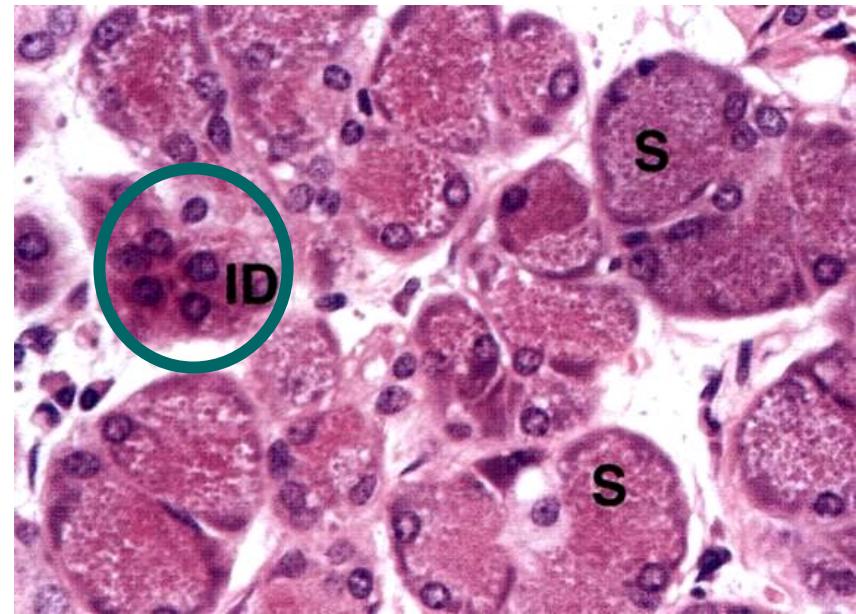
Wall: basal membrane, myoepithelial cells and simple squamous to low cubic ep.

Numerous in serous type of glands

**(cells of intercalated ducts secrete to saliva macromolecular substances: lysozym + lactoferrin)**



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# Striated ducts

Wider than the intercalated ducts (easy to find), usually in the middle of lobe

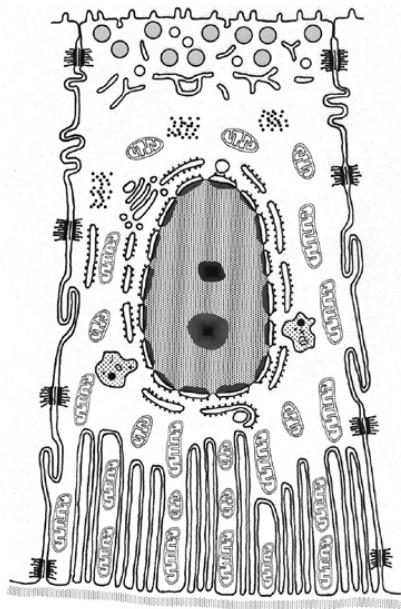
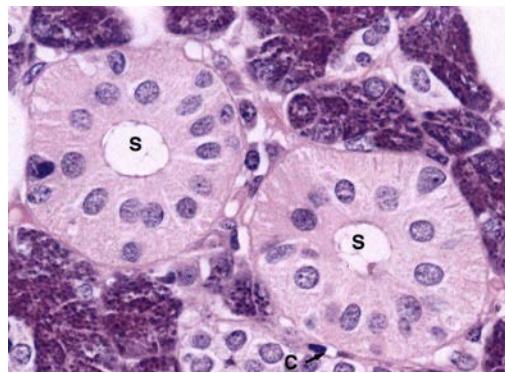
**Wall:** Basal membrane and simple cuboidal/low columnar ep.

**Microvilli on apexes and an bases characteristic striation (basolateral labyrinth)**

In the cytoplasm of cytokeratin filaments

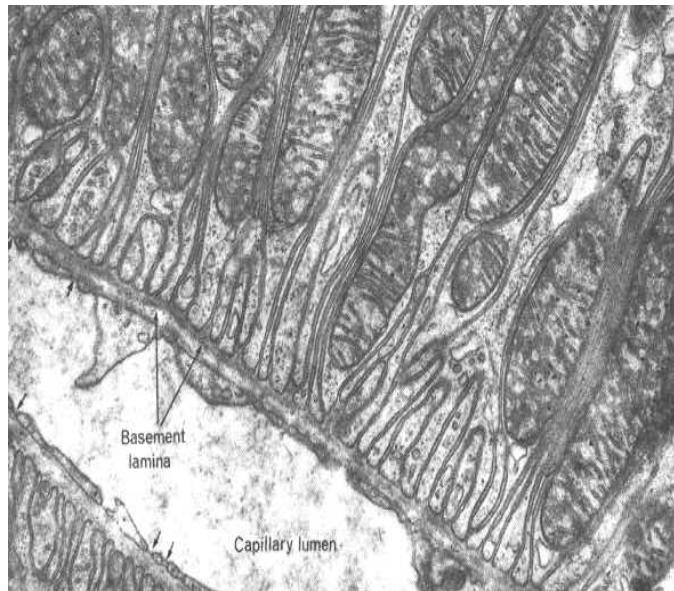
The cells of striated ducts regulate the content of water and electrolytes ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{HCO}_3^-$ ) in the secretion.

**Resorption of  $\text{Na}^+$ , and  $\text{Cl}^-$   
Secretion of  $\text{K}^+$  and  $\text{HCO}_3^-$   
nerve control**



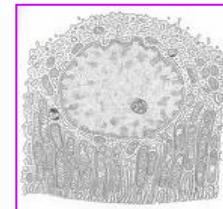
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## Striated duct – basal labyrinth

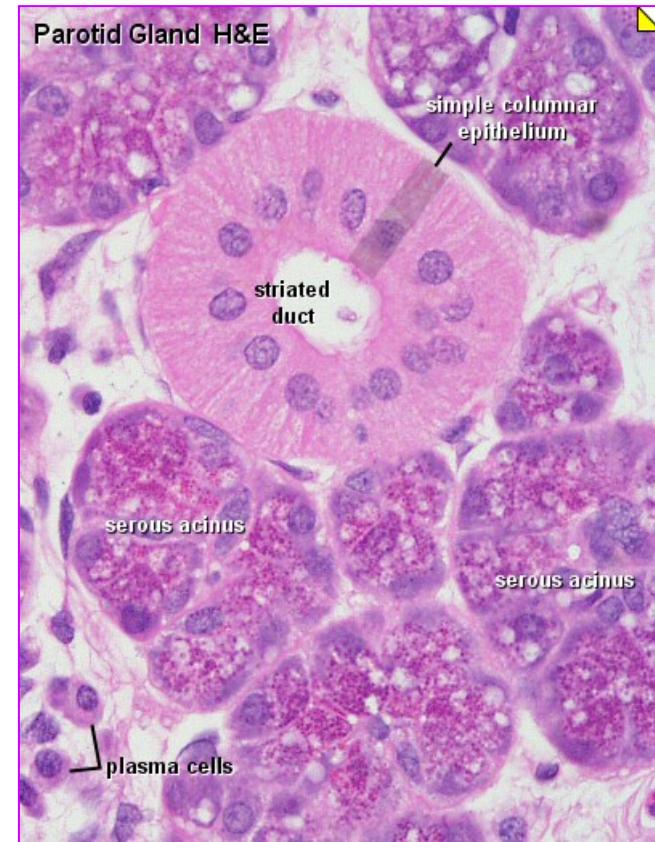


### Base of epithelial cell:

Invagination of cytoplasmic membrane,  
numerous mitochondria



***Epithelial cell***



## Interlobular and main ducts

### Interlobular ducts

Located in fibrous septae between the lobes (columnar or stratified columnar epithelium)

They are formed by the **connection of several striated ducts**

Lined by a **high single-layer columnar** and in the terminal sections also **a stratified columnar** epithelium

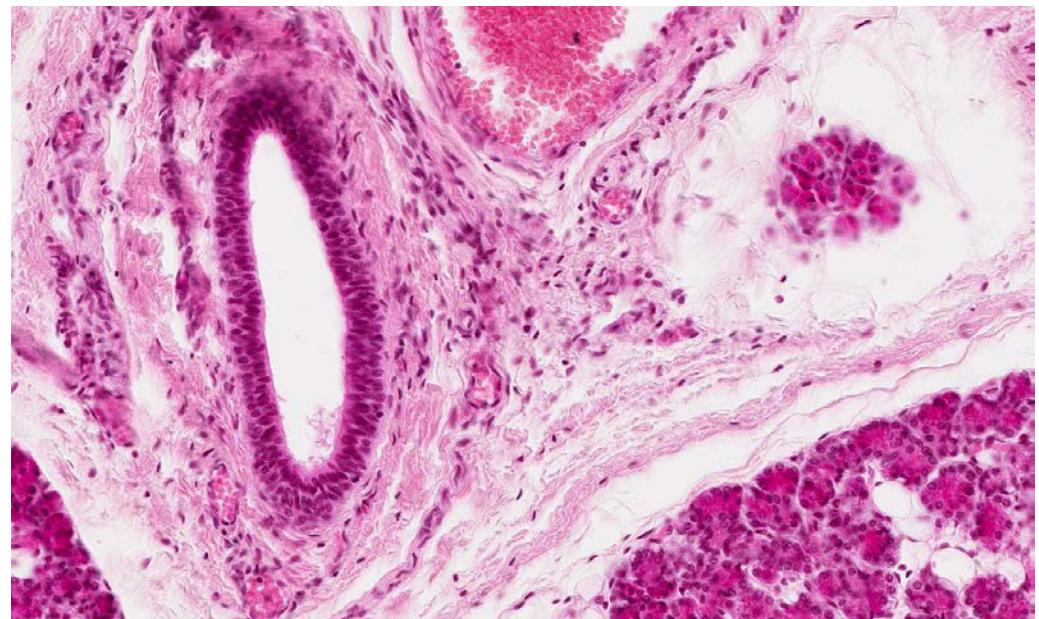
### Main ducts

Stratified columnar ep. with goblet cells

*Ductus parotideus*

*Ductus submandibularis*

*Ductus sublinguaes (major et minores)*

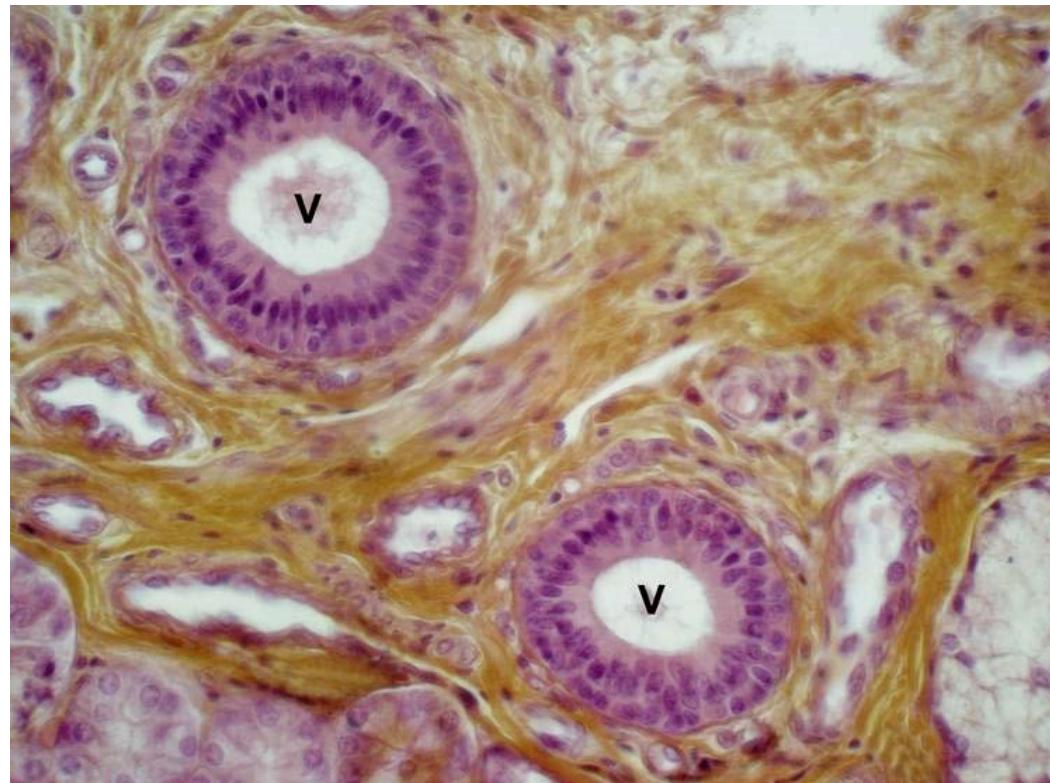


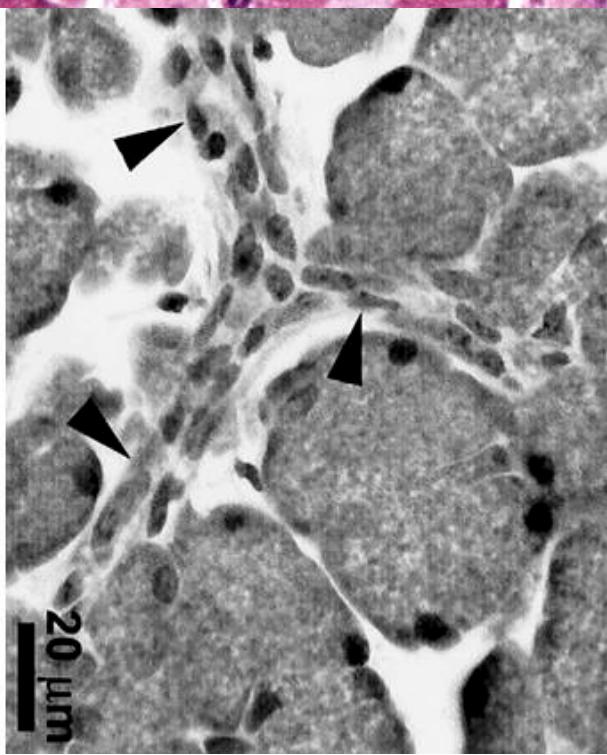
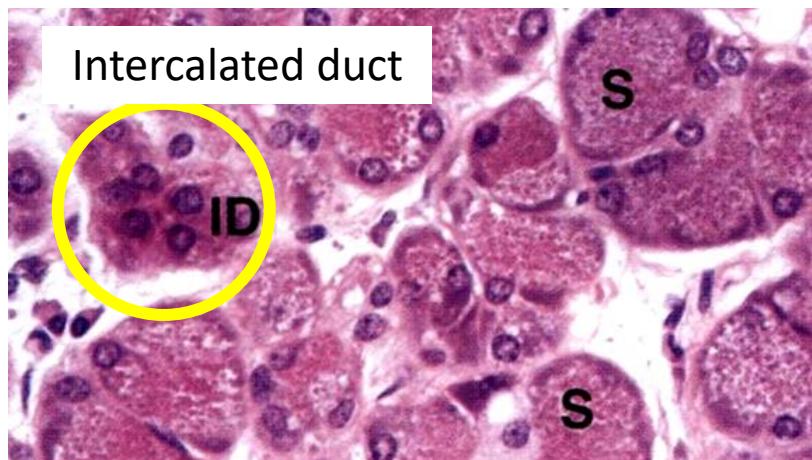
# Main ducts

Stratified columnar ep.

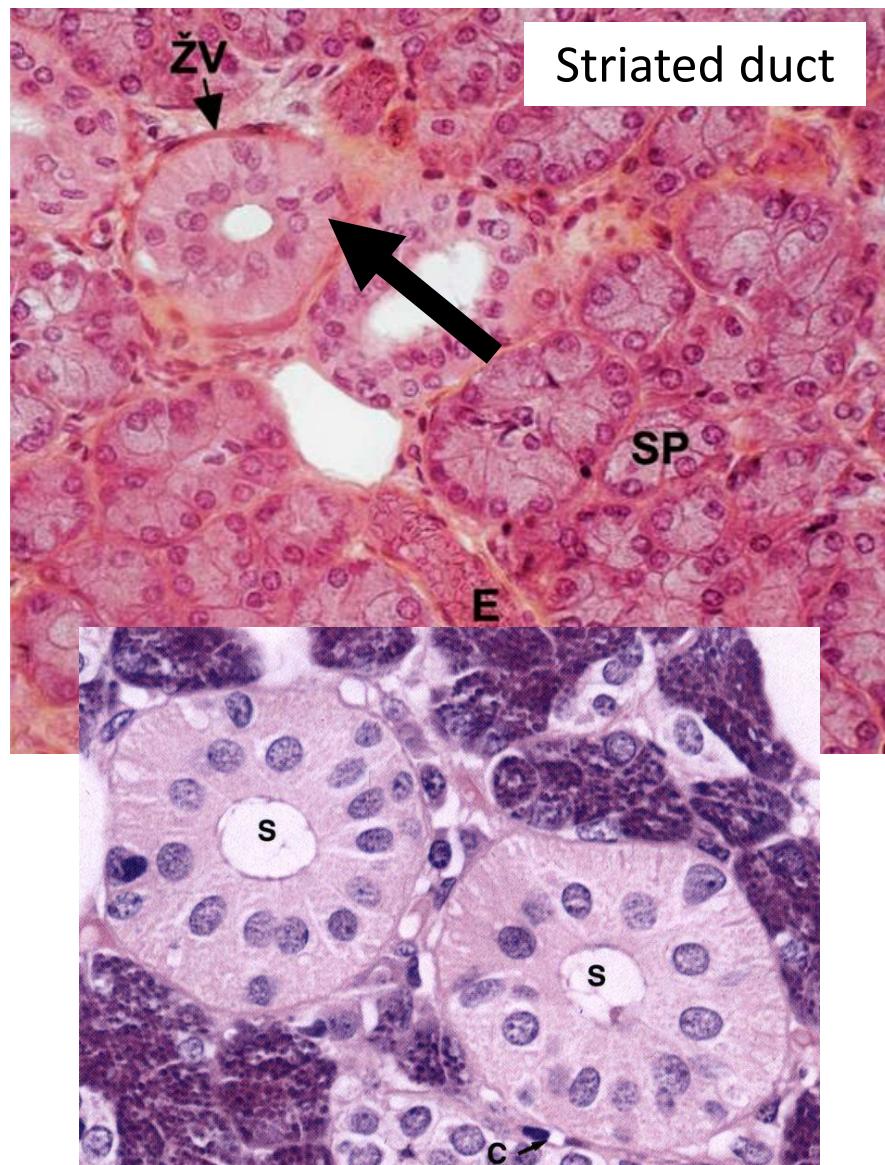
In epithelium Goblet cells

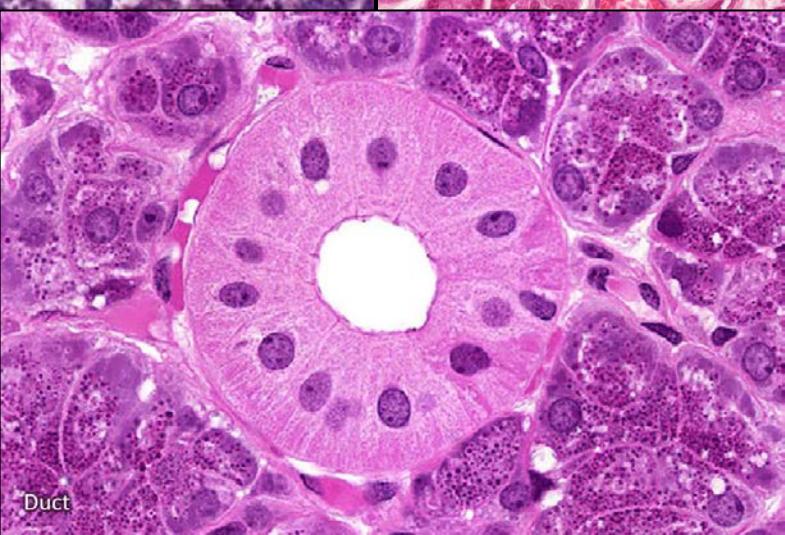
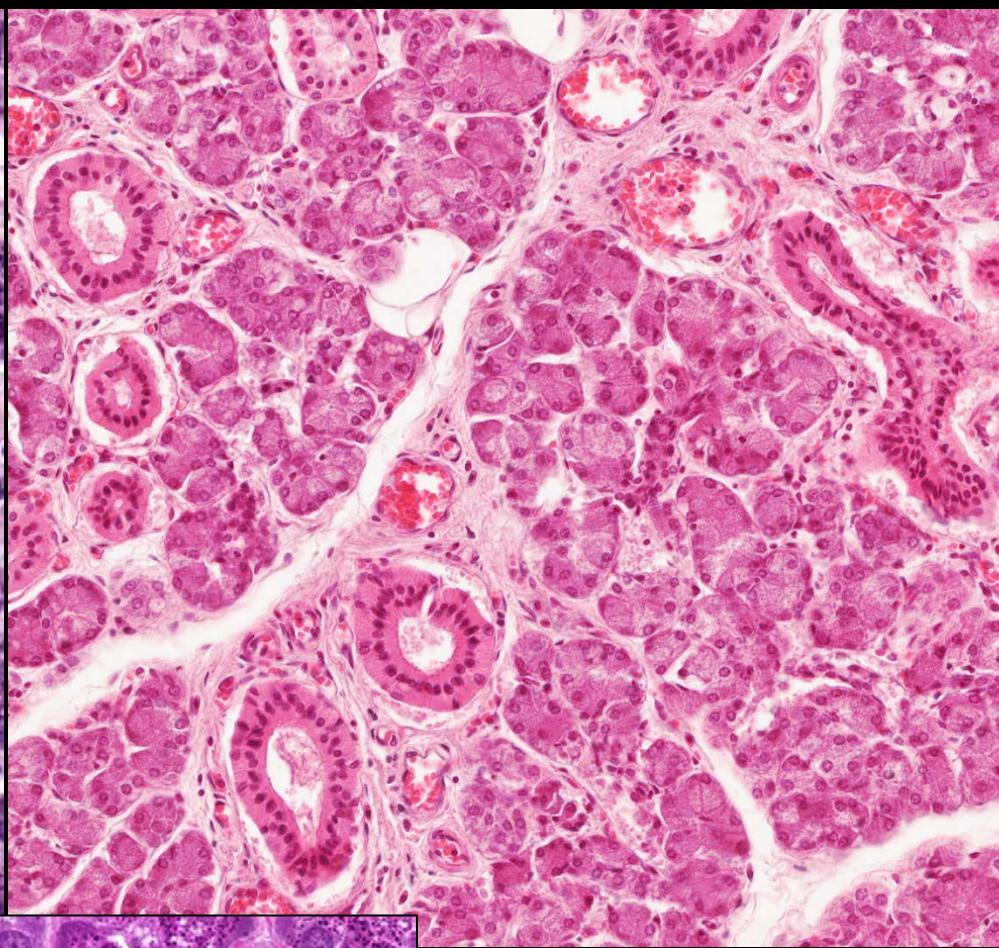
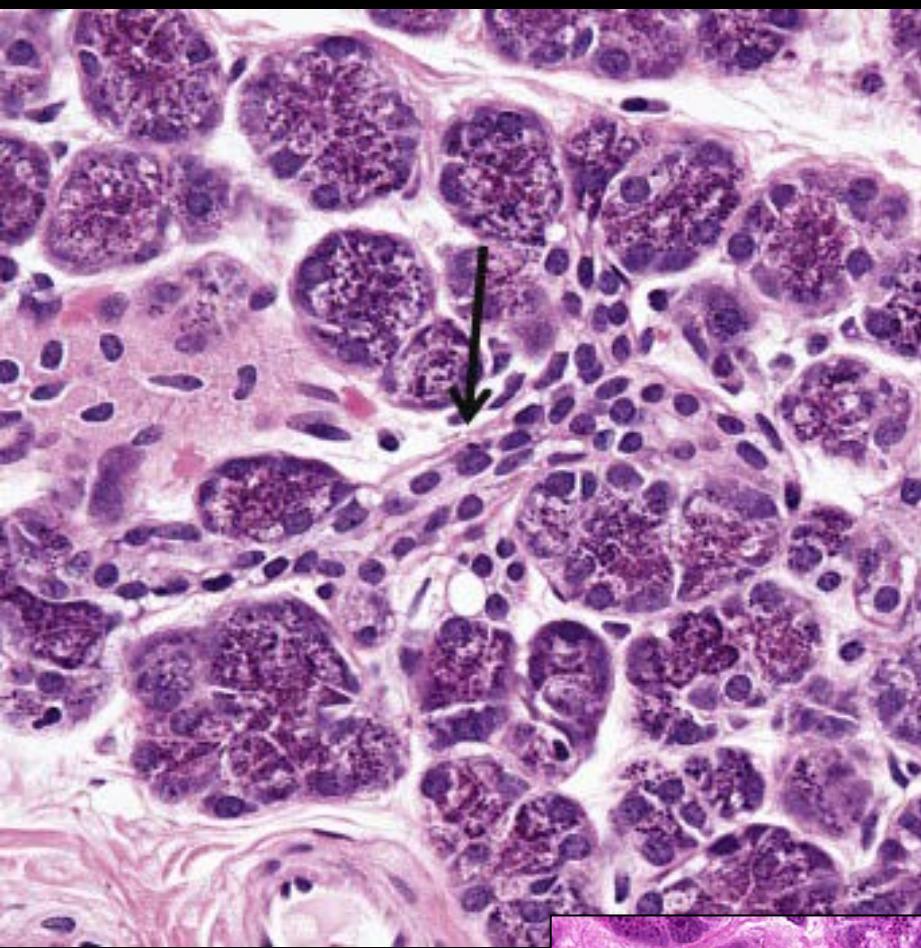
Wall supported by the dense collagenous connective tissue and smooth muscle cells



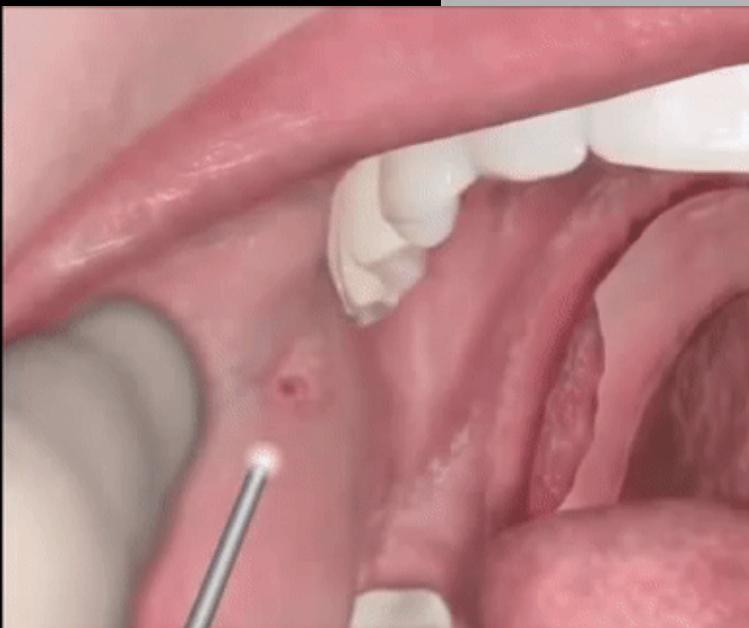
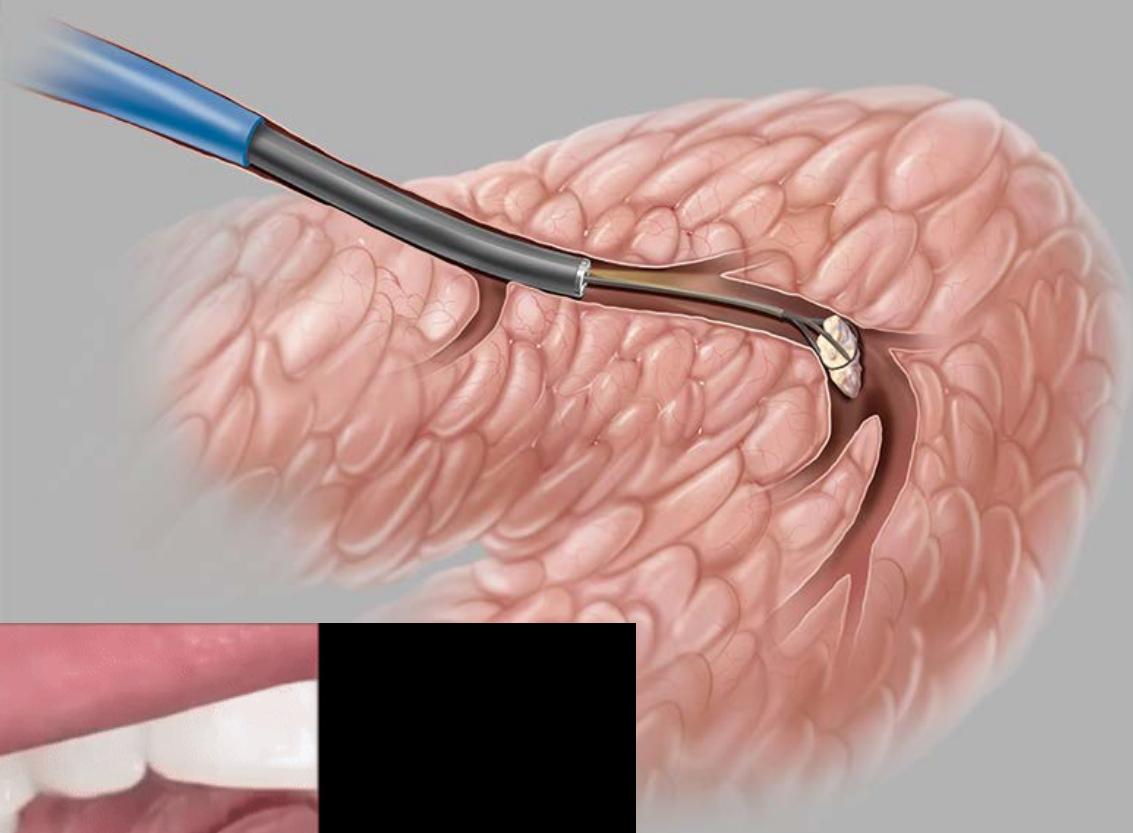


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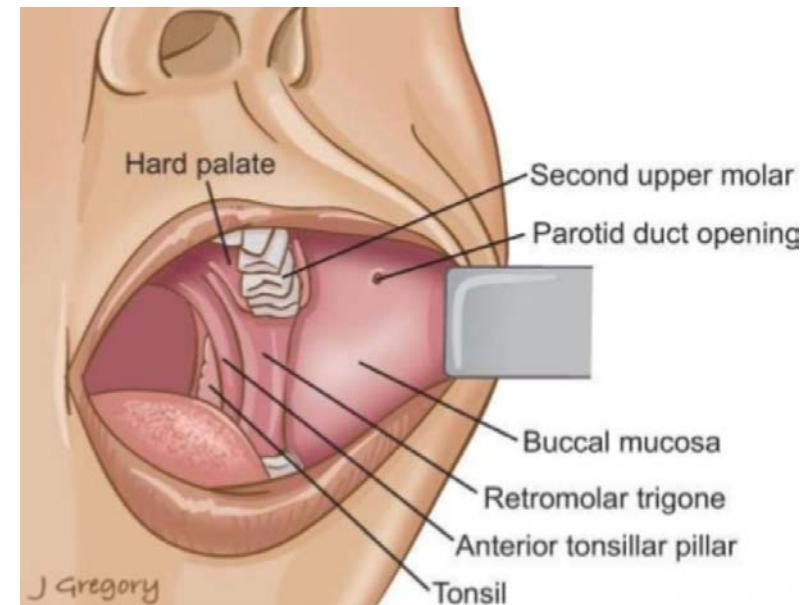
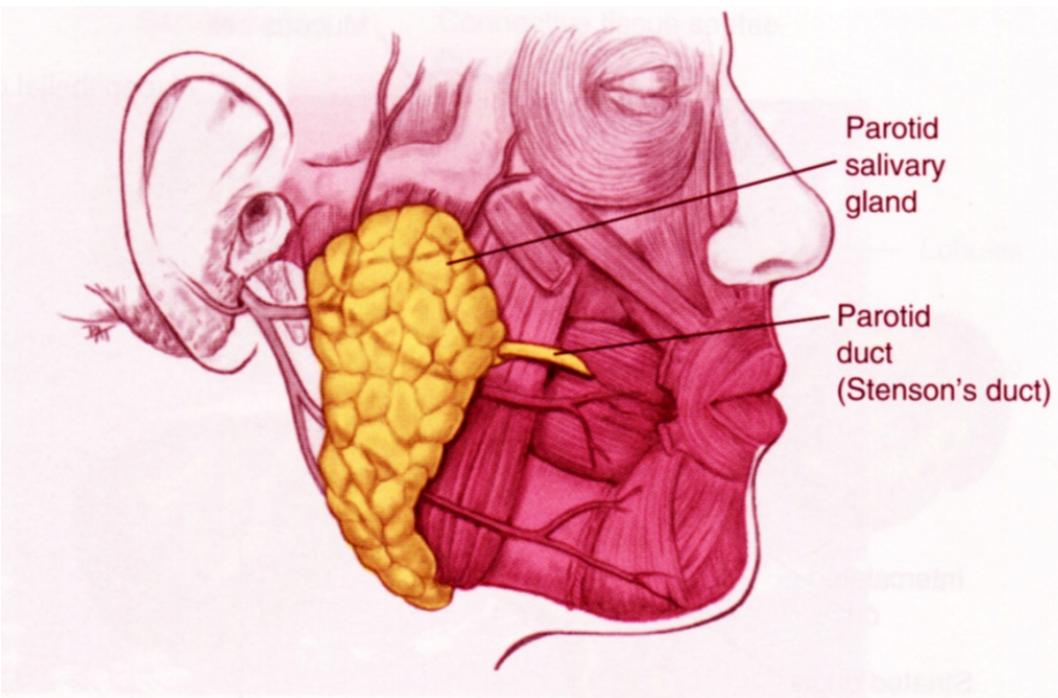
# Sialendoscopy

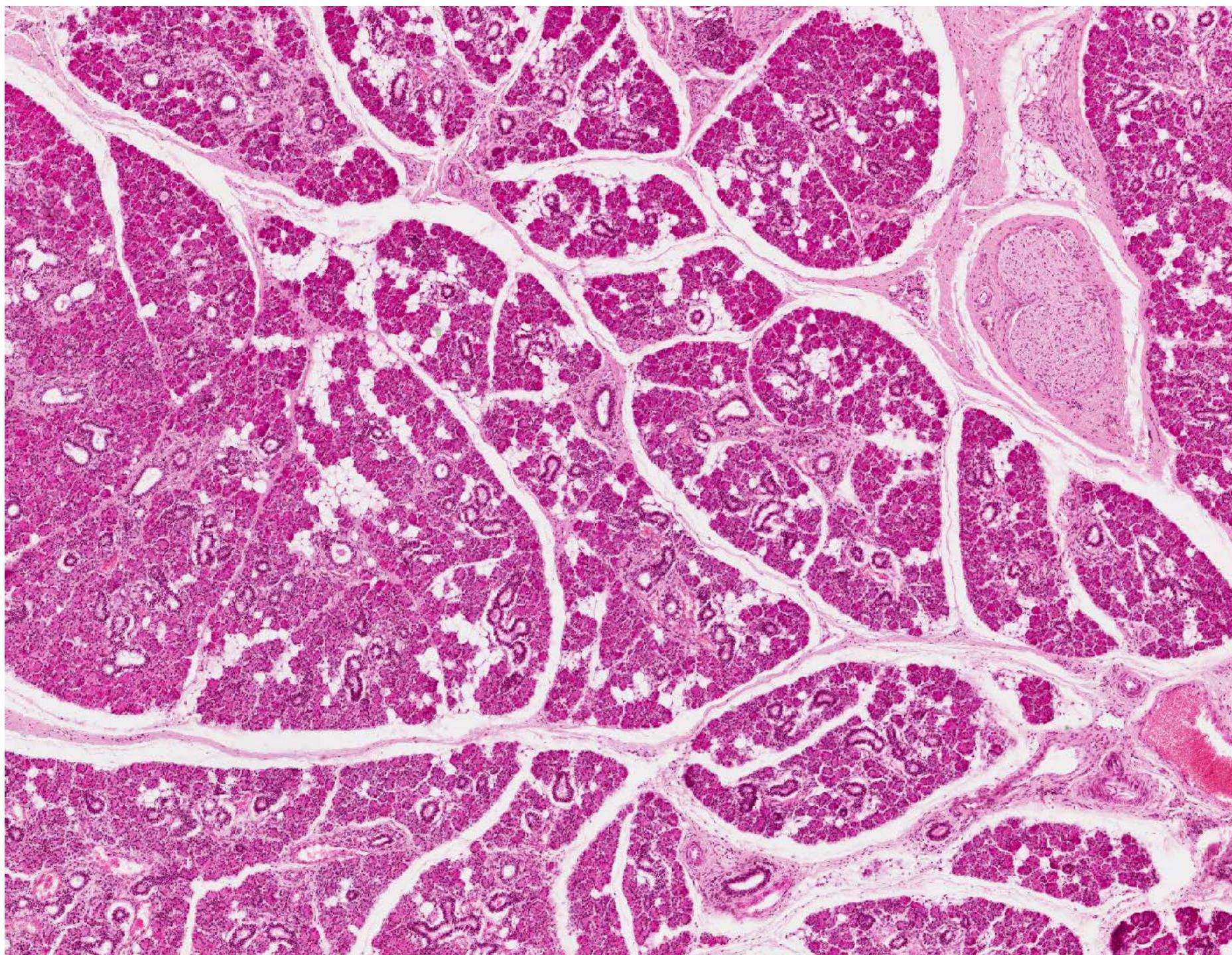


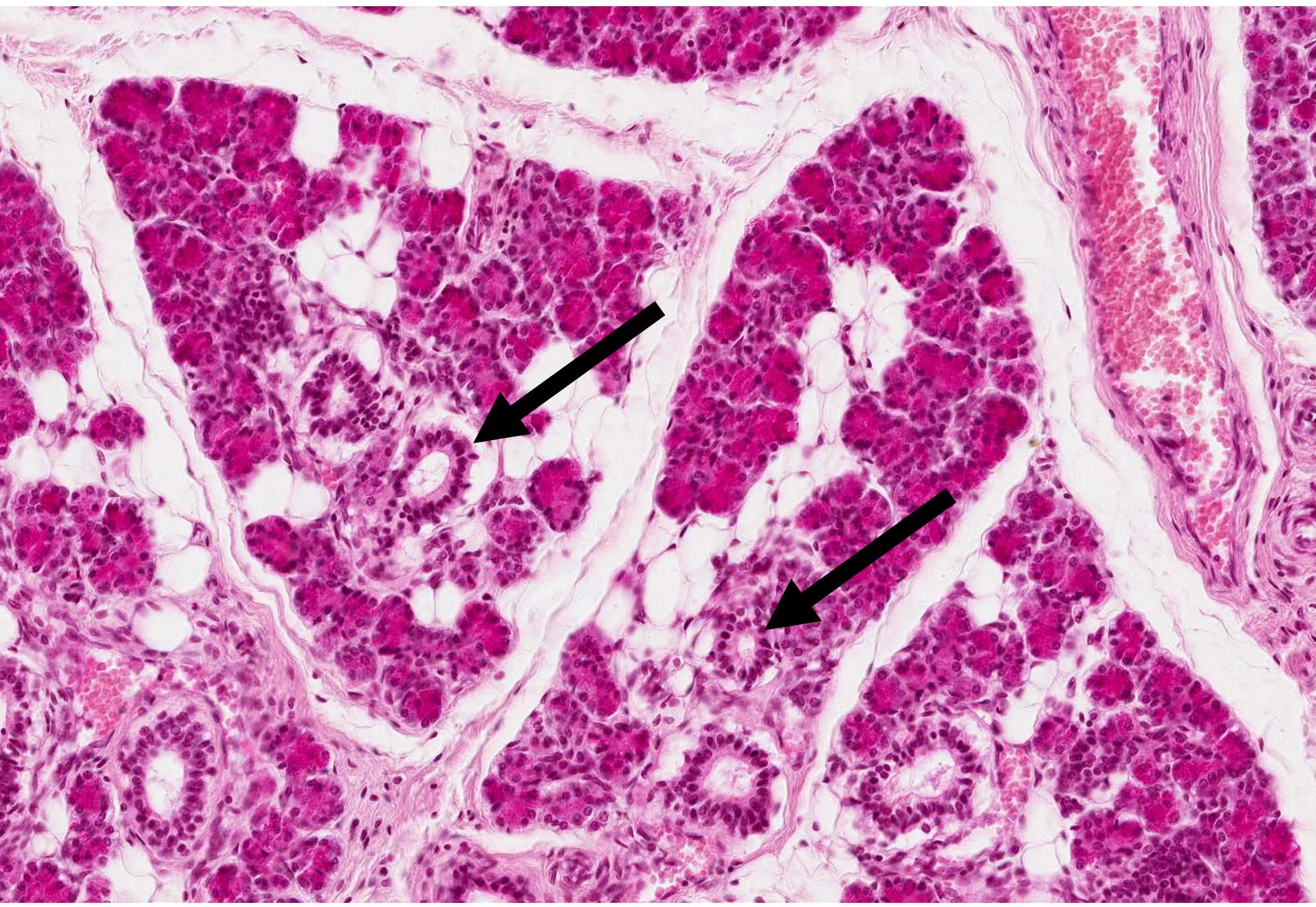
To help treat this problem obstructive stones can be removed from the parotid salivary duct. A miniature endoscope is introduced through the duct to locate the stone or stones in a procedure called sialendoscopy.

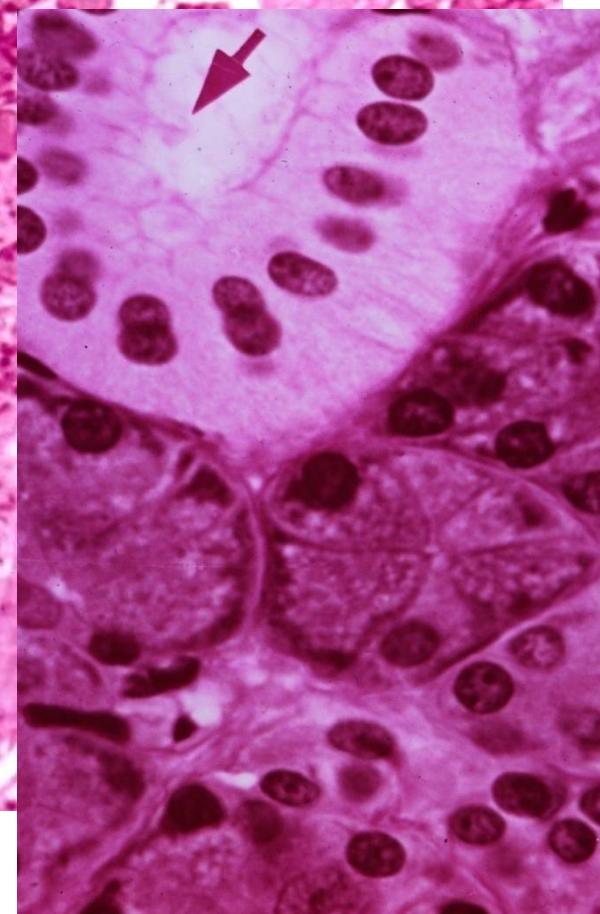
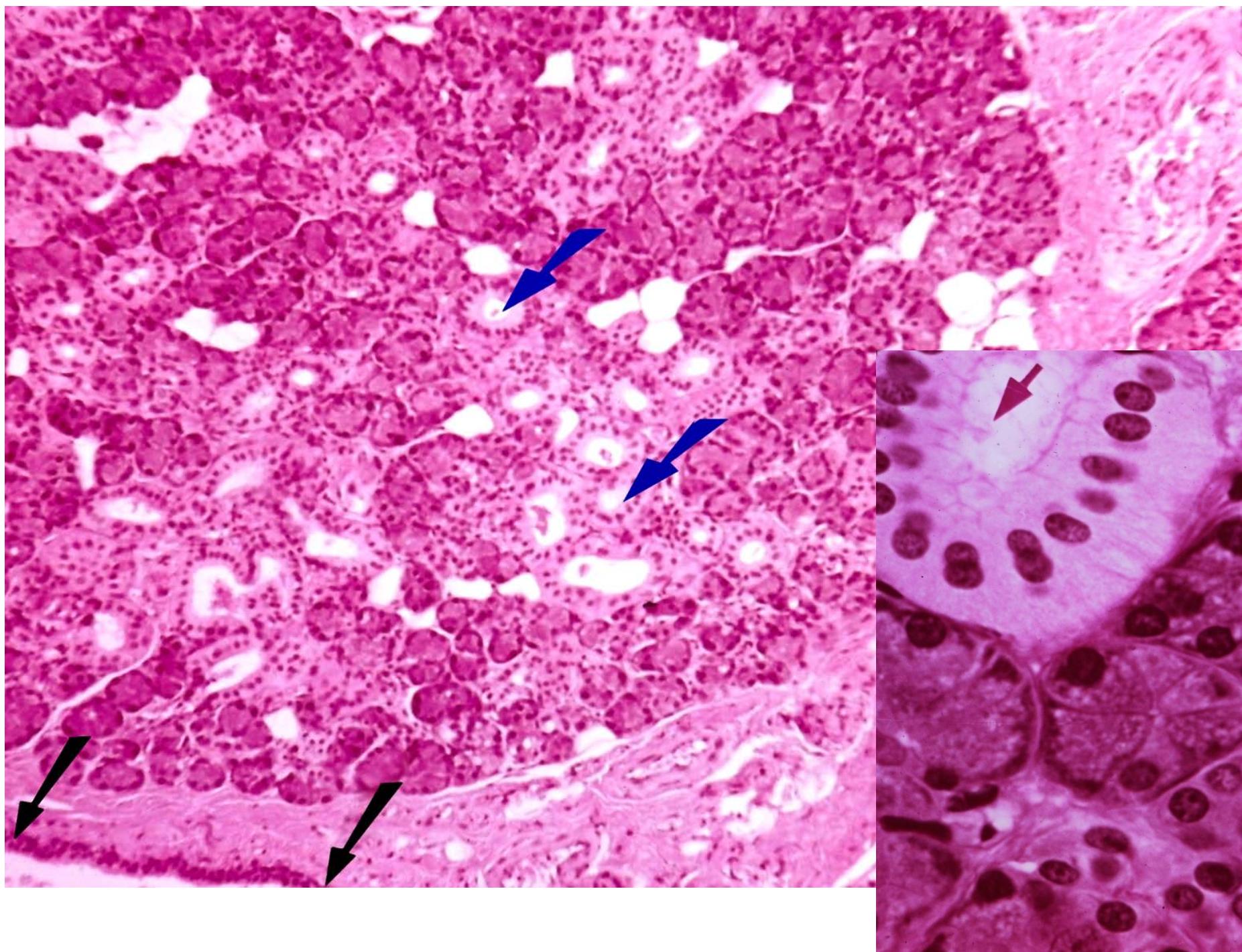
# Glandula parotis

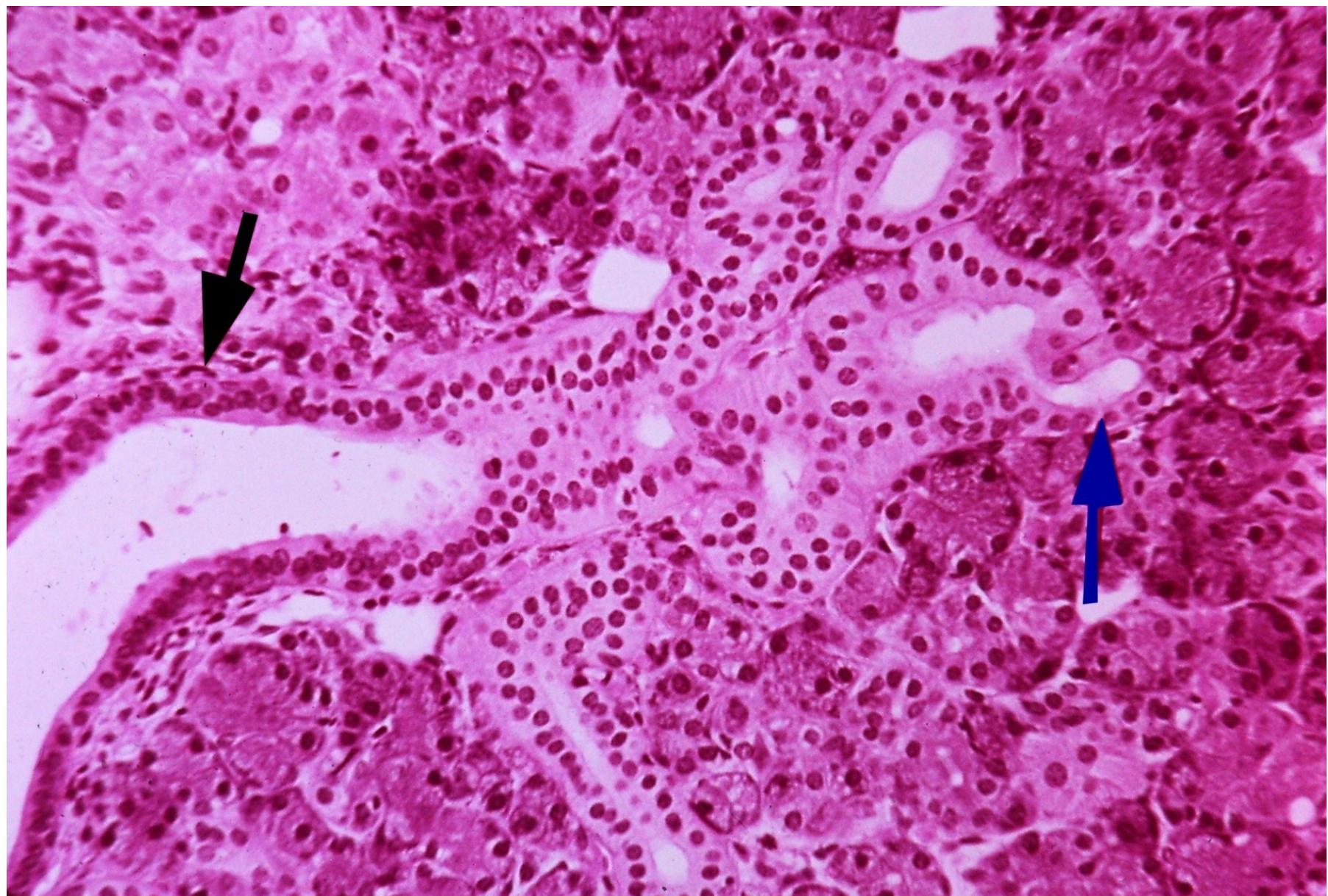
- SEROUS gland
- 14 - 28 g
- capsule, septa and lobules
- Serous acini, ducts: long intercalated ducts, numerous of striated ducts
- **ductus parotideus (Stenoni)** - 2. upper molar (Steno/Stensen, Niels)
- adipocytes

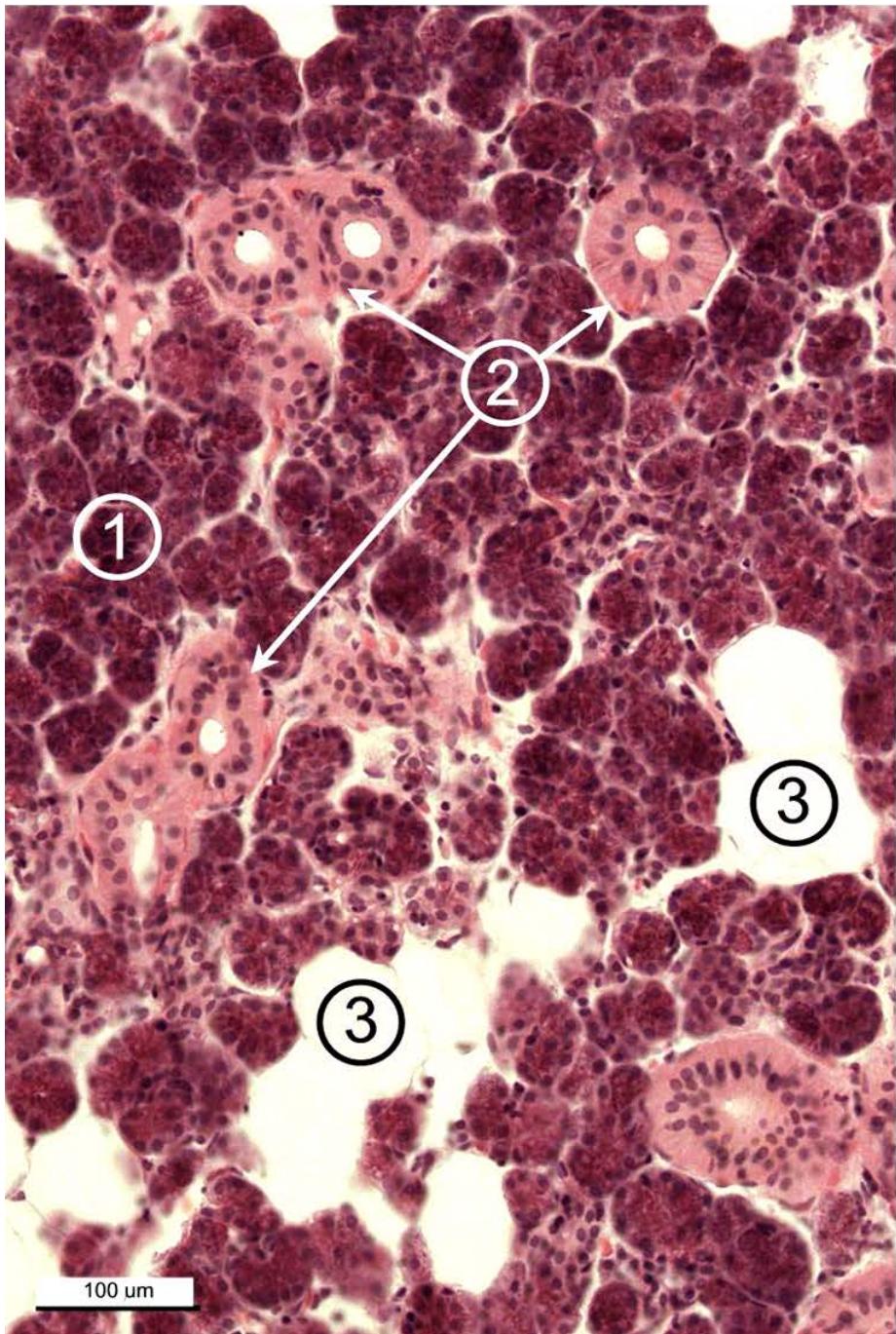






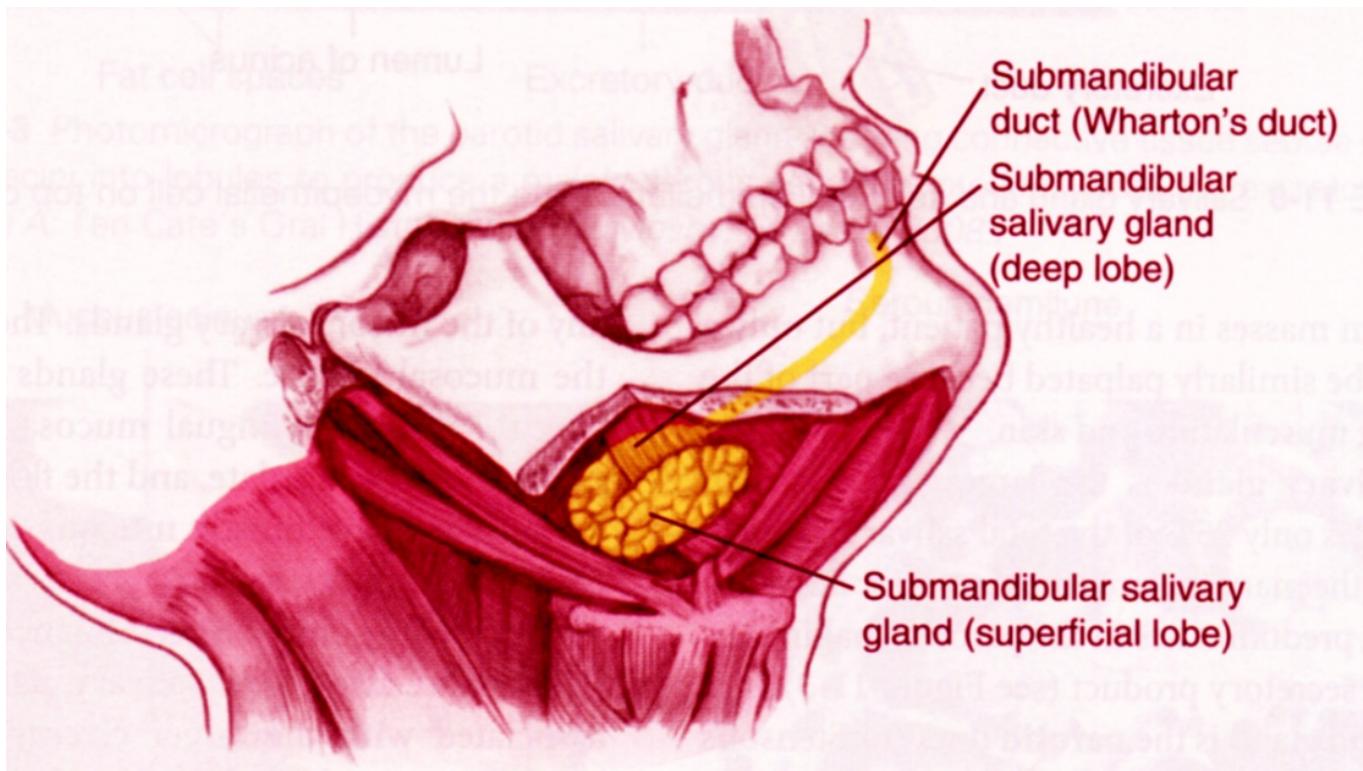


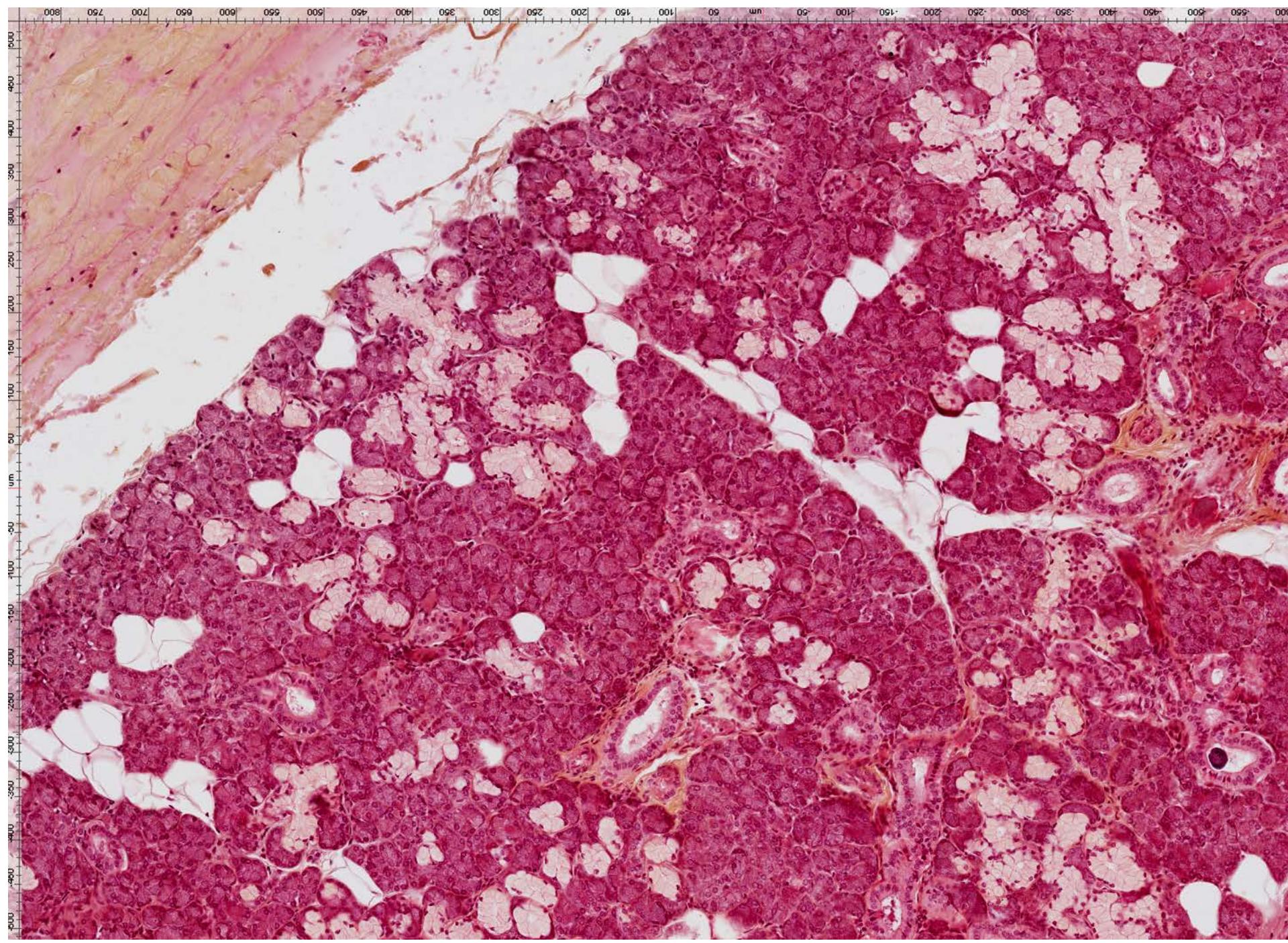


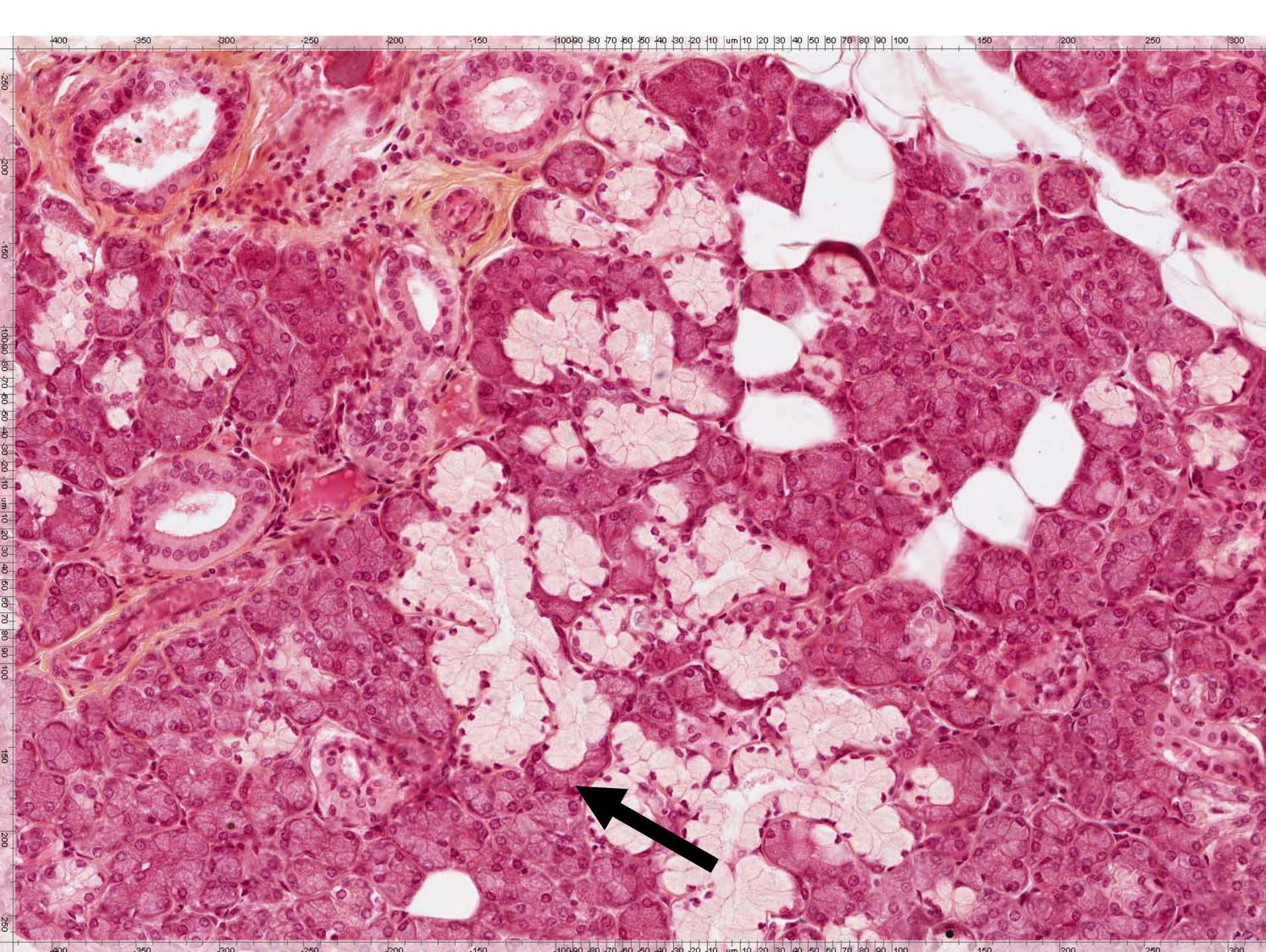


## Glandula submandibularis

- **MIXED** tuboalveolar gland, predominantly **SEROUS**
- 10-15 g
- serous acini - 80 %, rest are mucinous tubules with **Gianuzzi demilunes**
- intercalated and striated ducts
- **ductus submandibularis (Whartoni)** - frenulum linguae

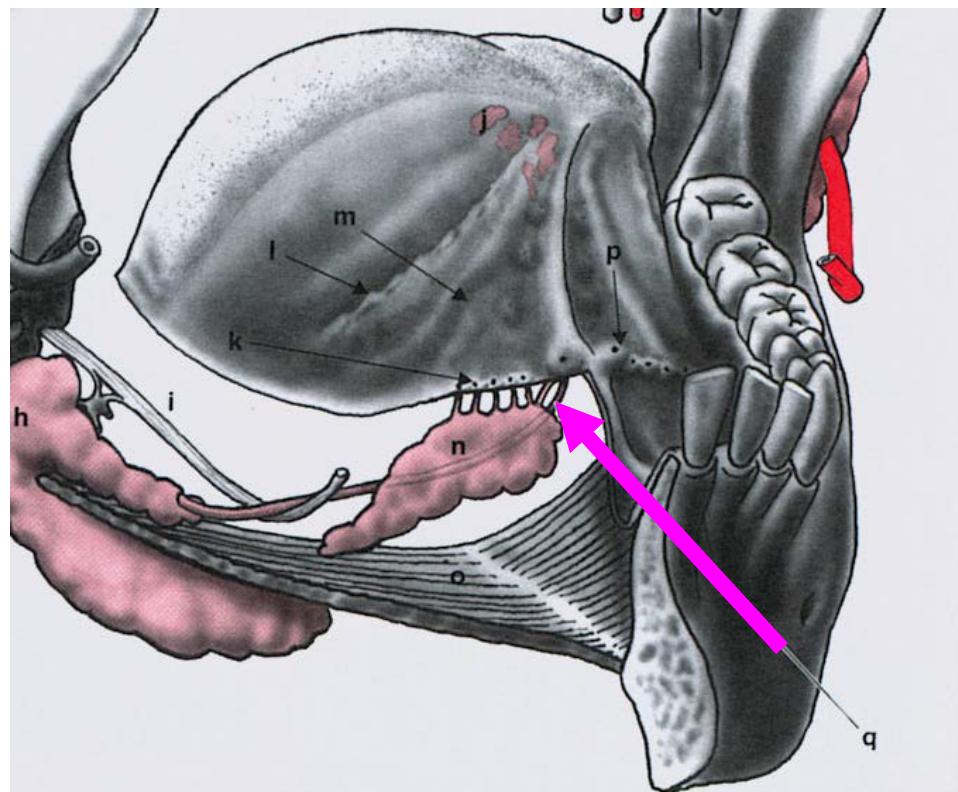


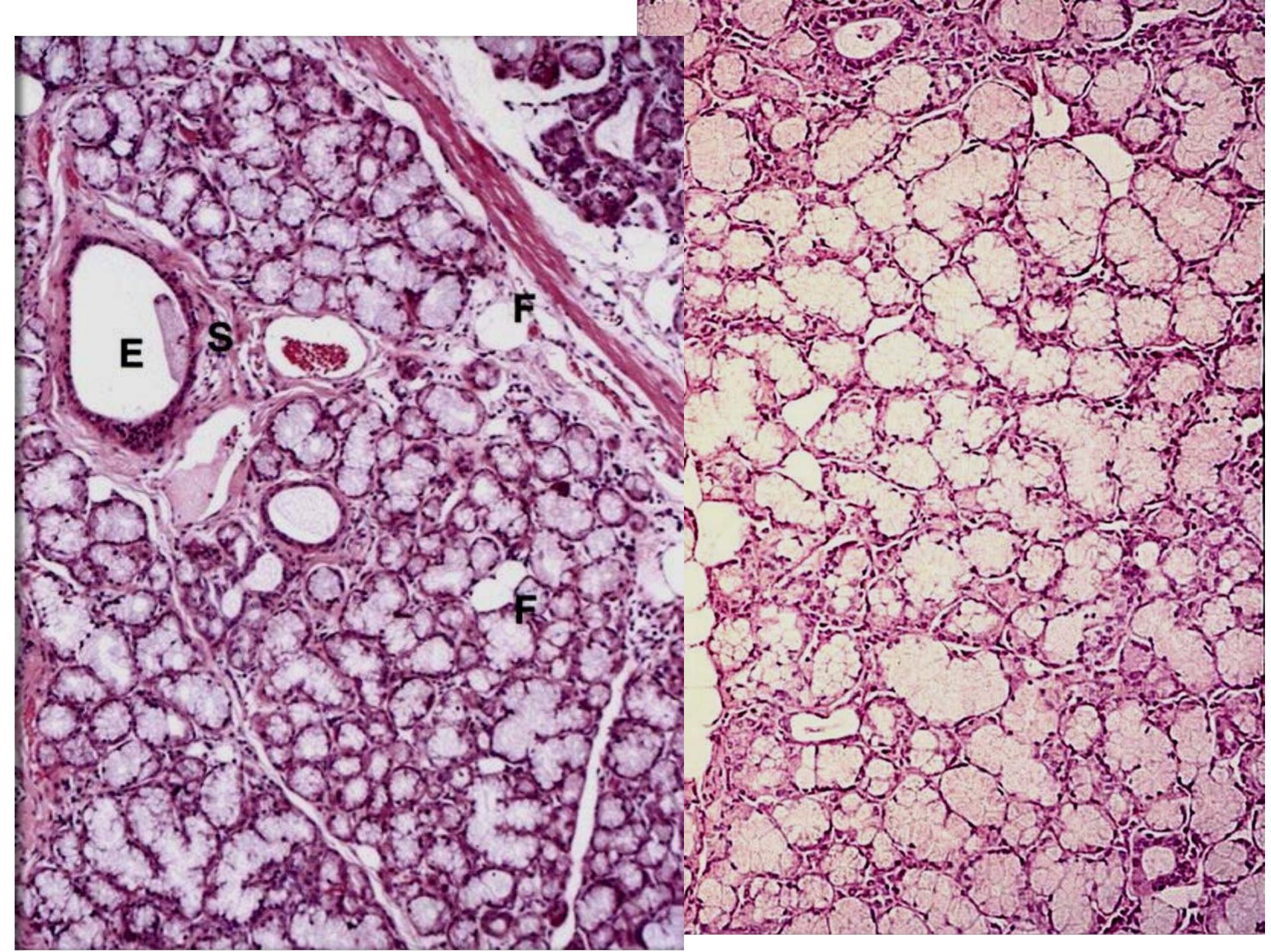




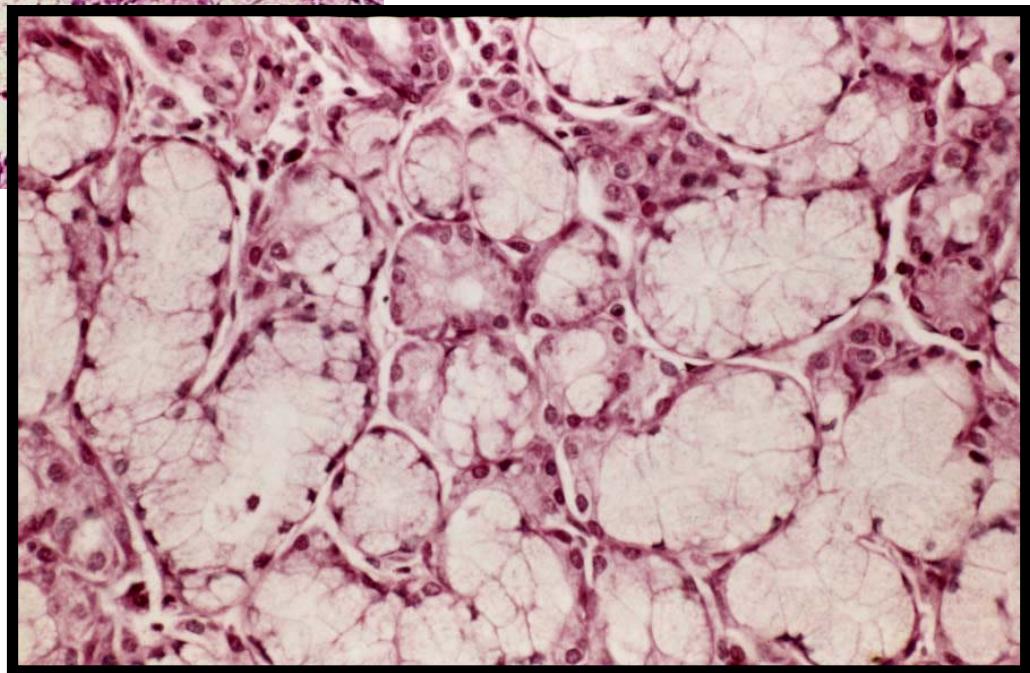
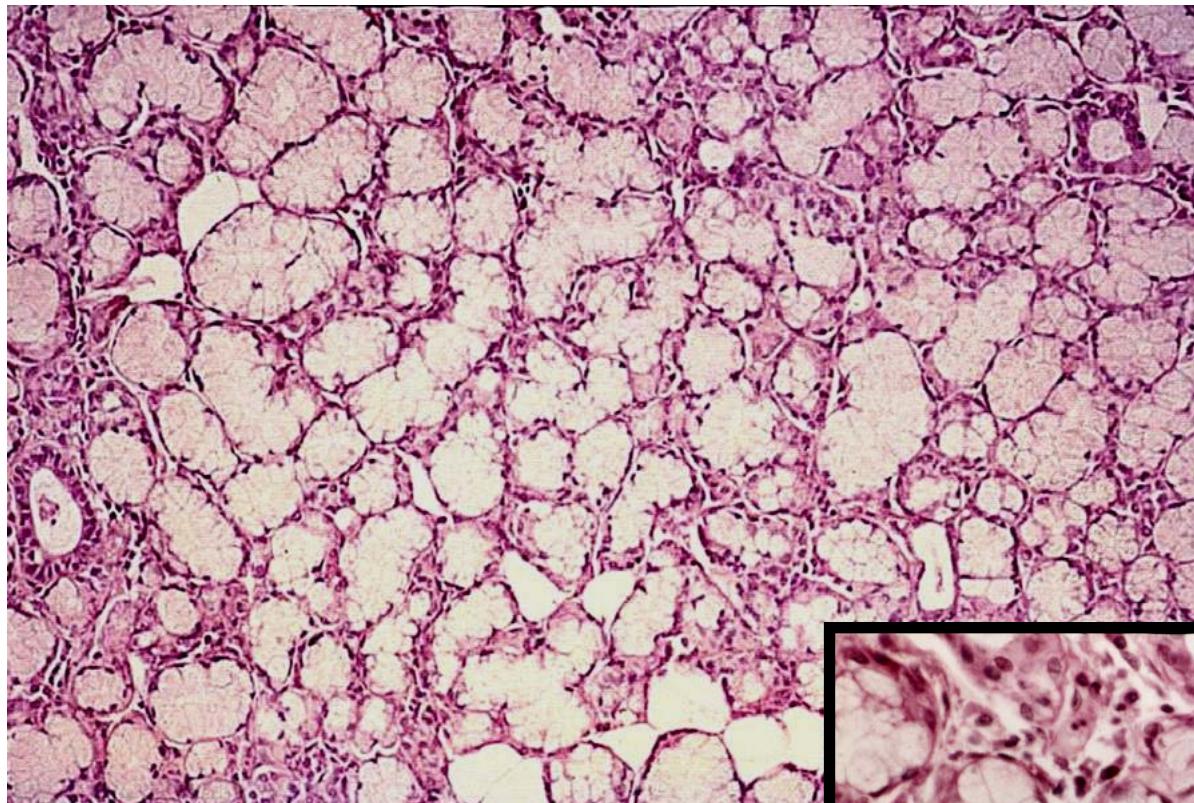
## Glandula sublingualis

- **MIXED** tuboalveolar gland, predominantly **MUCOUS**
- 2g
- located on the floor of the mouth on mylohyoid muscle near the midline
- Mucinous tubules, **serous acini** are rare, instead of them: **Gianuzzi demilunes**
- Intercalated ducts are missing, striated ducta are present, but are reduced in number and short
- **ductus sublingualis major** (Bartholini)
- **ductus sublinguales minores** (Rivini) along the crest of the plica sublingualis



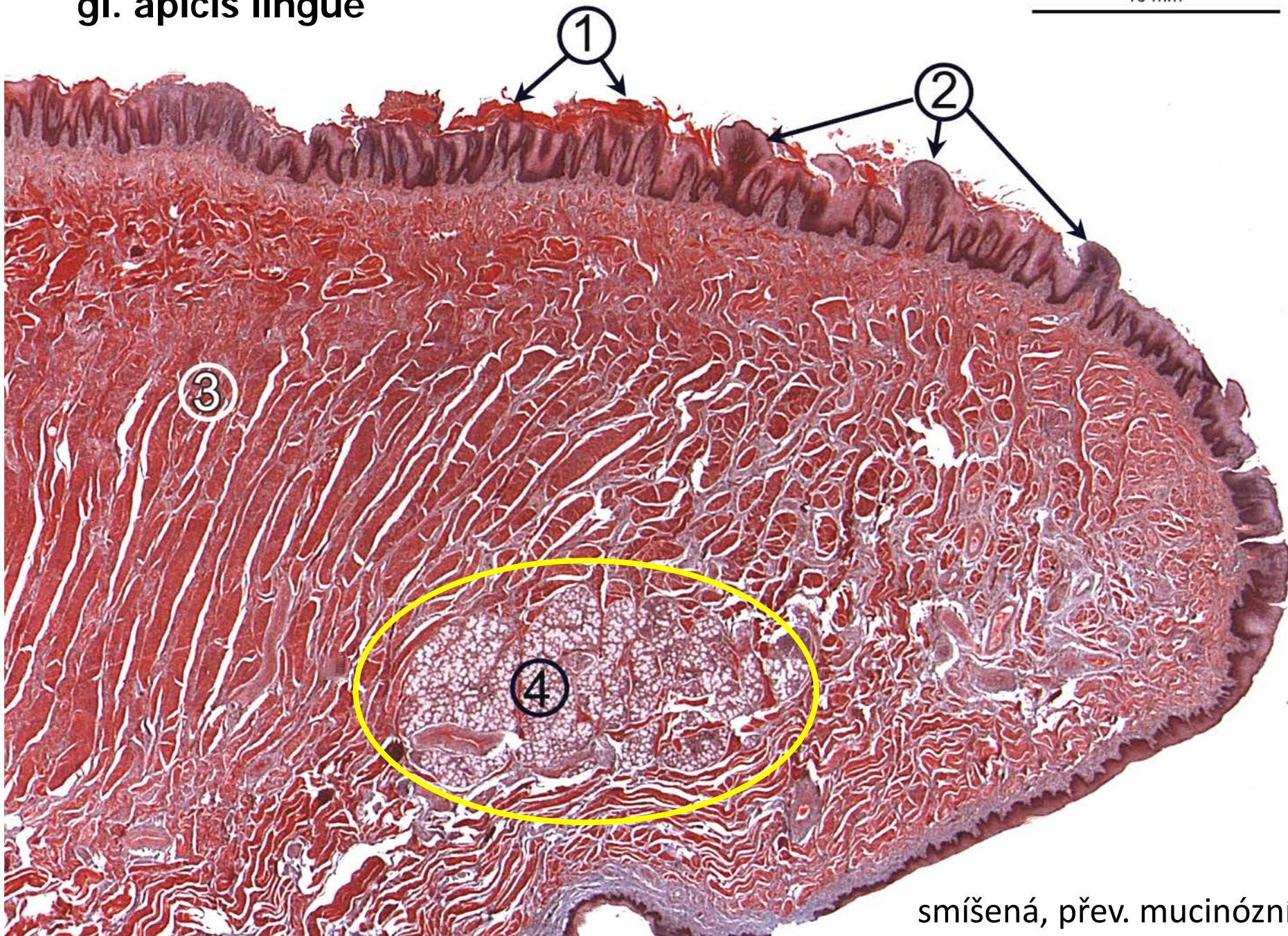


**gl. sublingualis**

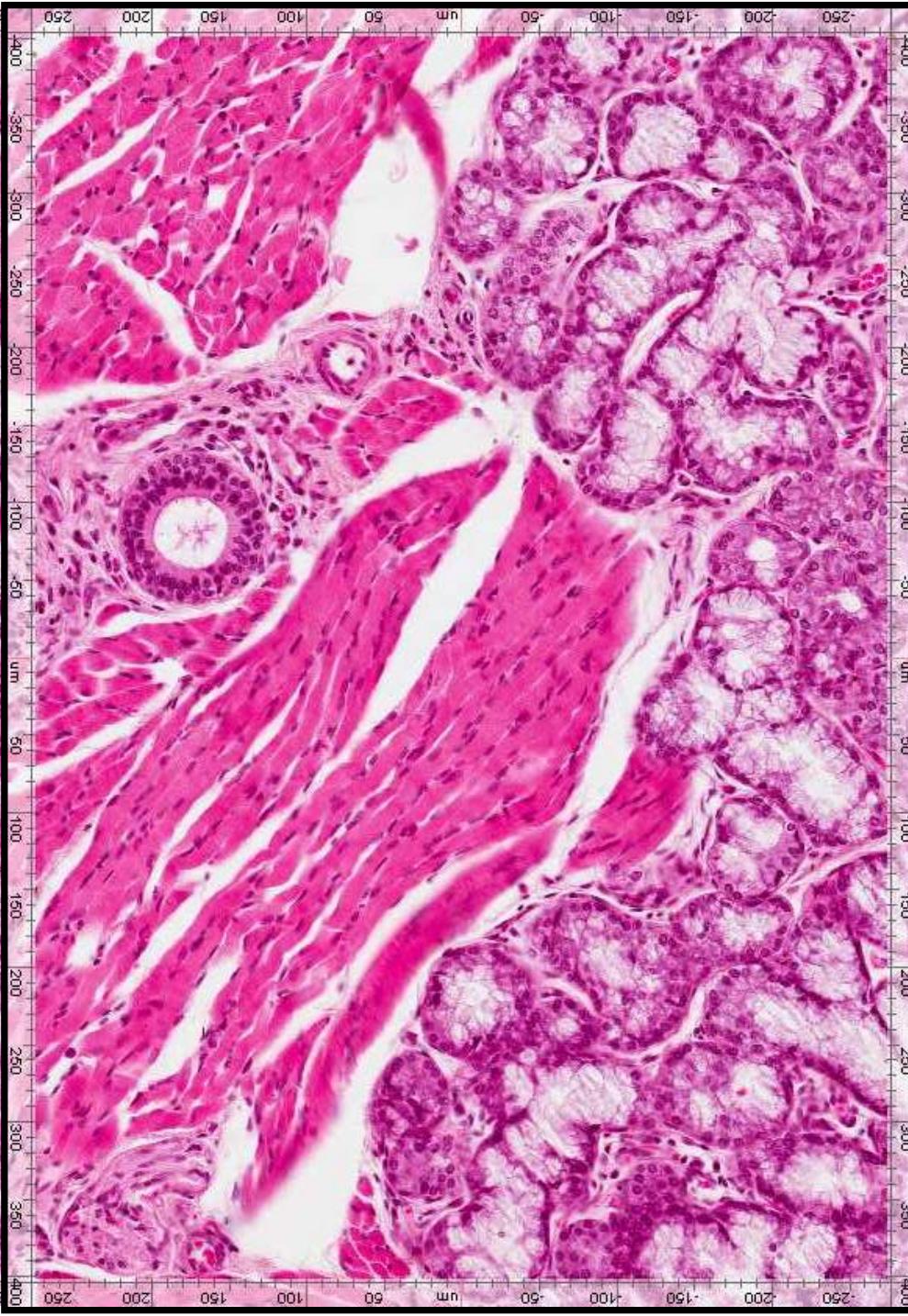
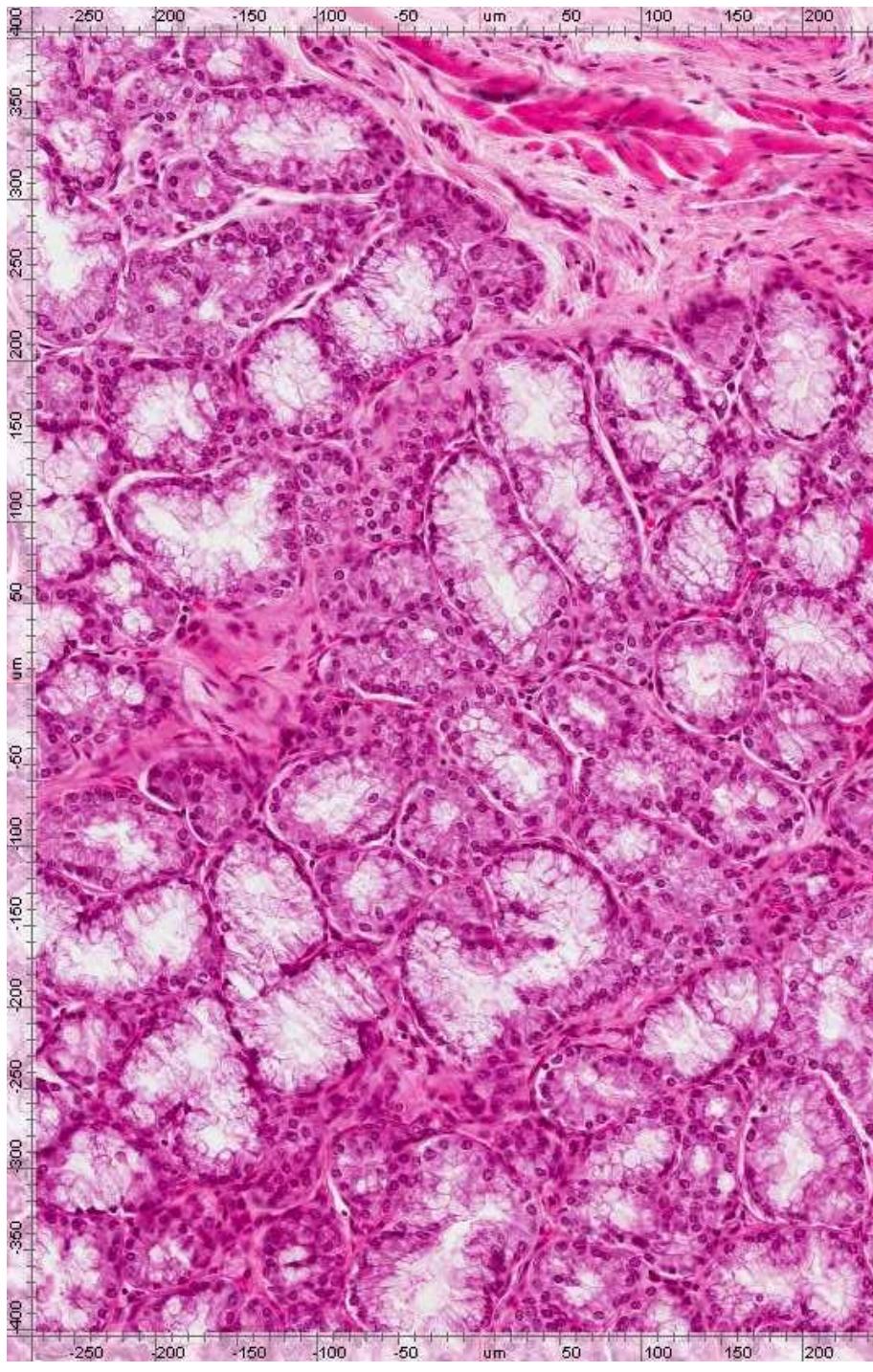


# gl. apicis lingue

10 mm



smíšená, přev. mucinózní



Location	Name		Type	Size
Lips	gll. labiales sup. et inf.		mixed, pred. mucinous	minor
Cheeks	gll. buccales		mixed, pred. mucinous	minor
	gll. molares (retromolares)		mixed, pred. mucinous	minor
	<b>GL. PAROTIS</b>		serous	<b>MAJOR</b>
Palate	hard	gll. palatinae (glandular zone)	mucinous	minor
	soft	gll. palatinae	mucinous	minor
Tongue	Apex	gl. apicis lingue (Blandini-Nuhni)	mixed, pred. mucinous	minor/ major
	Terminal sulcus	gll. Ebner's (gll. papillae vallatae)	serous	minor
	Base	gll. Weber's (gll. linguales post.)	mucinous	minor
Floor of the mouth	<b>GL. SUBMANDIBULARIS</b>		mixed, pred. serous	<b>MAJOR</b>
	<b>GL. SUBLINGUALIS</b>		mixed, pred. mucinous	<b>MAJOR</b>

## Comparison of the hard tooth tissues (and lamellar bone)

	Enamel	Dentin	Cementum	Lamellar bone
<b>Colour</b>	White (to light blue)	Ivory	Brown-yellow	Brown-yellow
<b>Inorganic (%)</b>	96 (86)	70 (45)	61 (33)	45 (23)
<b>Organic (%)</b>	1 (2)	20 (30)	27 (31)	30 (37)
<b>H<sub>2</sub>O (%)</b>	3 (11)	10 (25)	12 (36)	25 (40)
<b>Collagen fibres</b>	NO	YES (perpendicular to the dentinal tubules)	YES (in all directions)	YES (same direction in lamellas)
<b>Cells</b>	<b>Ameloblasts</b> (missing in adults)	<b>Odontoblasts</b> (on the pulpal side of dentin)	<b>Cementoblasts</b> (cementocytes)	<b>Osteoblasts</b> osteocytes
<b>Blood vessels</b>	NO	NO	NO	YES (in Haversian canals)
<b>Nerves</b>	NO	YES (on entry of dentinal tubules)	NO	YES (in Haversian canals)

# Procedures used to study the microscopic structure of teeth

2 basic methods of hard tissue processing are used in **light microscopy**:

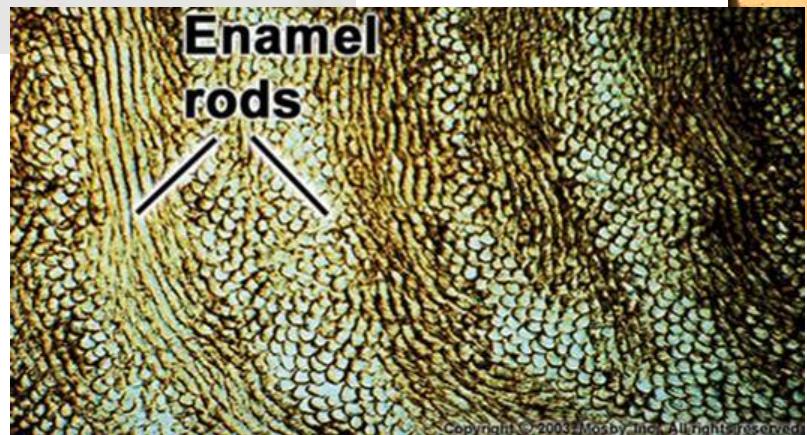
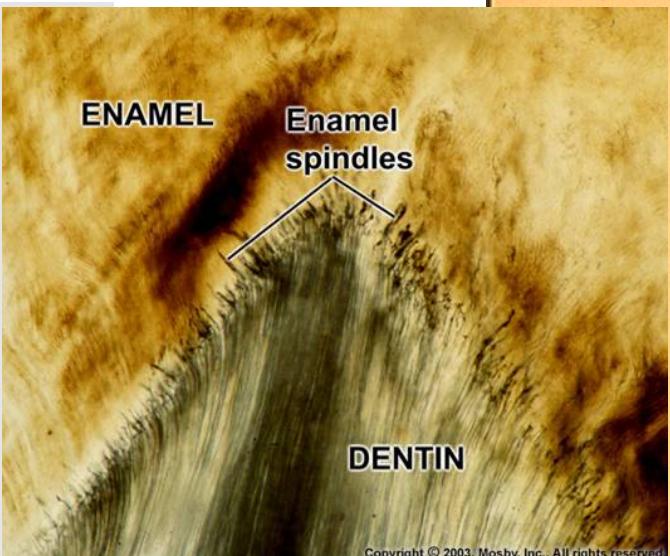
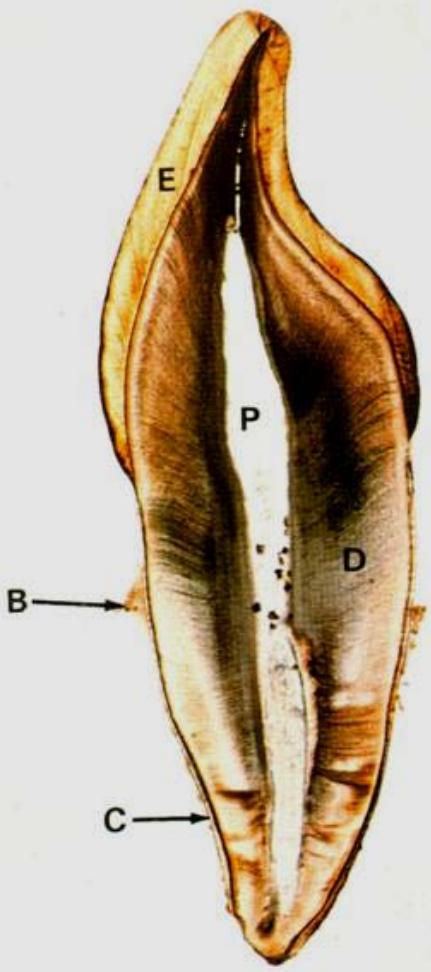
- 1. Ground sections**
- 2. Decalcified samples (and staining)**

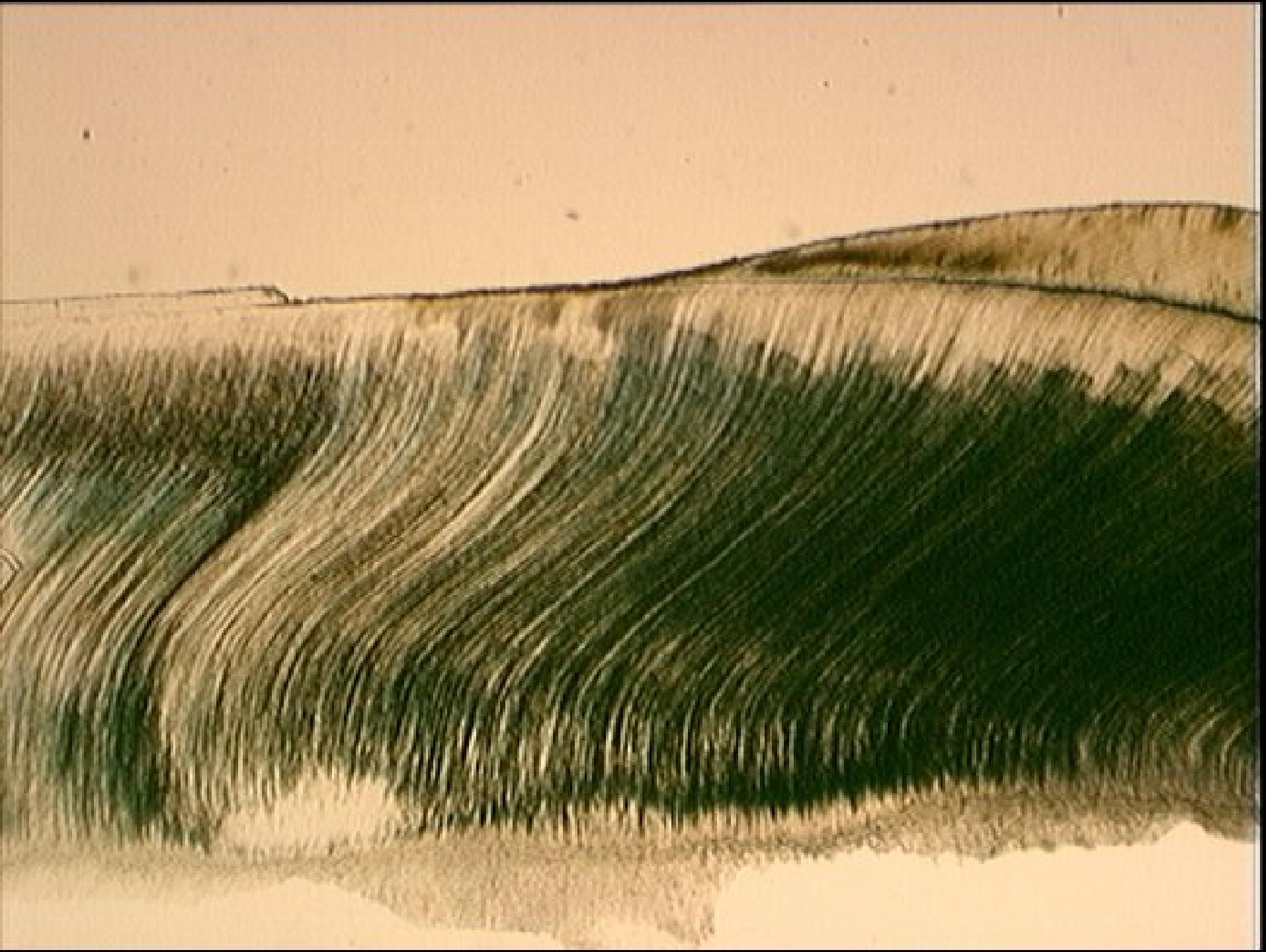
## 1. Ground sections

50 - 70  $\mu\text{m}$  discs made by grinding

*(saw, carborundum wheel, fine grinders, abrasive powders and pastes during grinding, the disc must be water-cooled, the finished cut is sealed in a Canadian balm, which heats up when mounted above the flame - so all the cavities and channels are preserved in the cut-out The preparation of the cut-out requires !*







## 2. Stained sections of **decalcified tooth**

Long preparation: decalcification of the tooth, embedding, staining

**Decalcification:** decalcification agents convert insoluble calcium salts (phosphate and carbonate) to water-soluble salts. The time required for decalcification depends on the size of the object and the type of decalcifying fluid: **from several days to weeks and months**

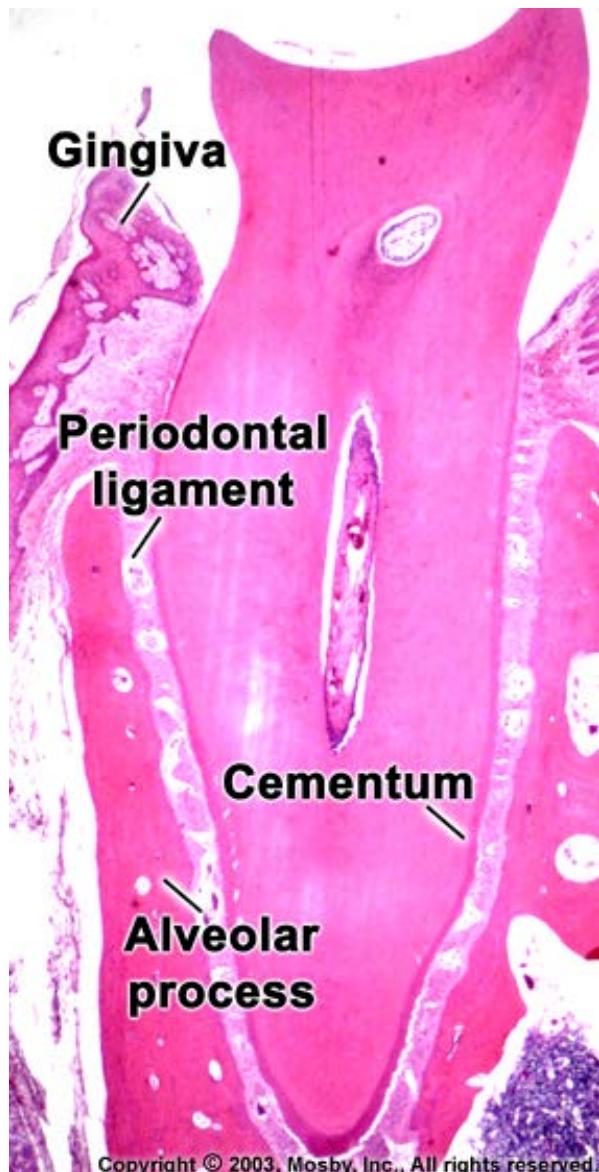
**Decalcification agents:**

- **Acids** (e.g. 5% nitric acid, 5% trichloroacetic acid and 22-23% formic acid) - **1 week**
- **Chelating agents – EDTA:** **4 weeks - 3 months**  
preserves well the structure of the tissue and enable the staining

**Embedding** – paraffin, resins

**Sectioning** – cryotome, microtome (decalcified); staining

## Stained slice of decalcified tooth

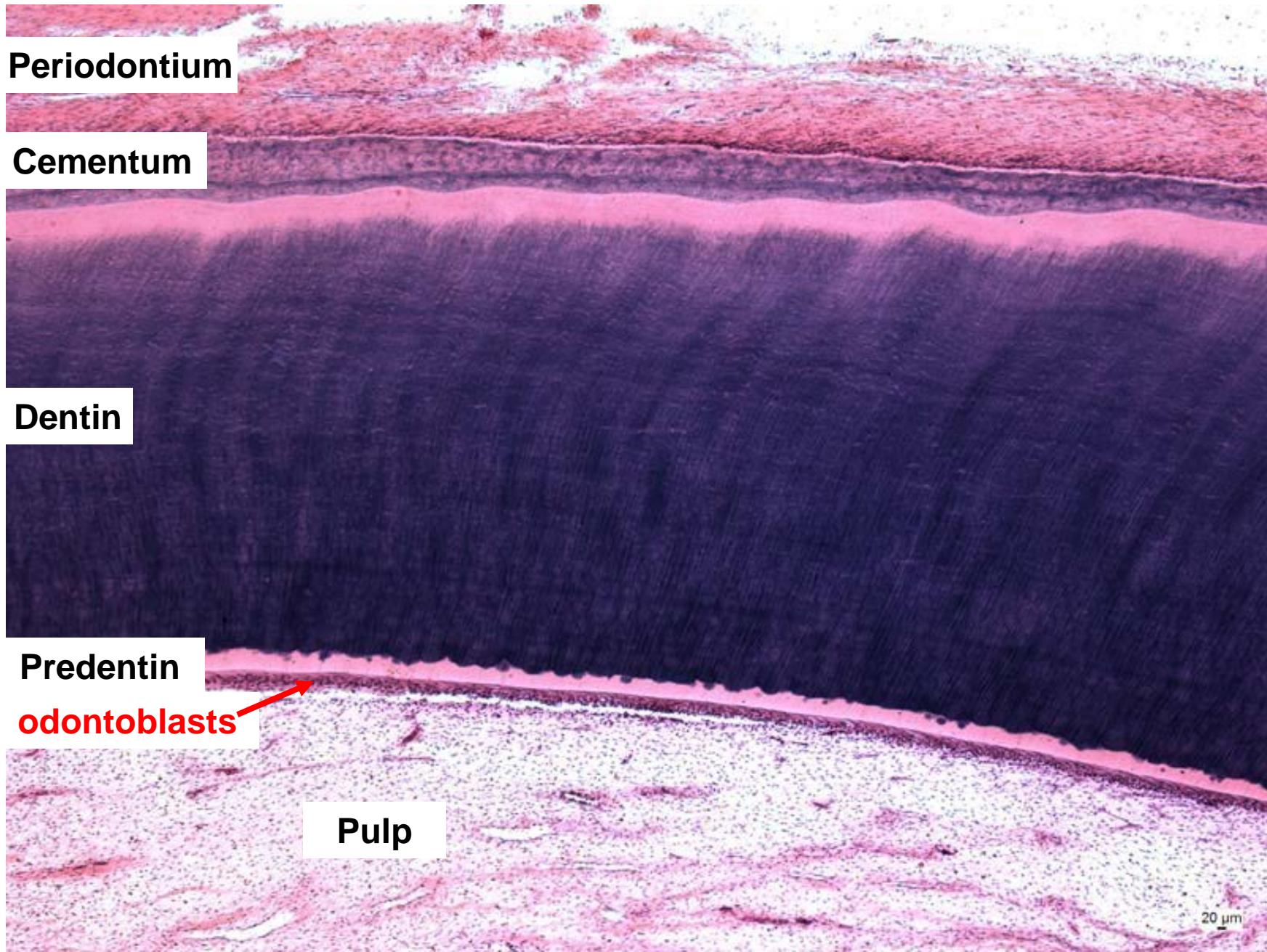


!

Soft tissues are not preserved on  
ground sections

Enamel is missing on decalcified  
teeth

# Tooth - root

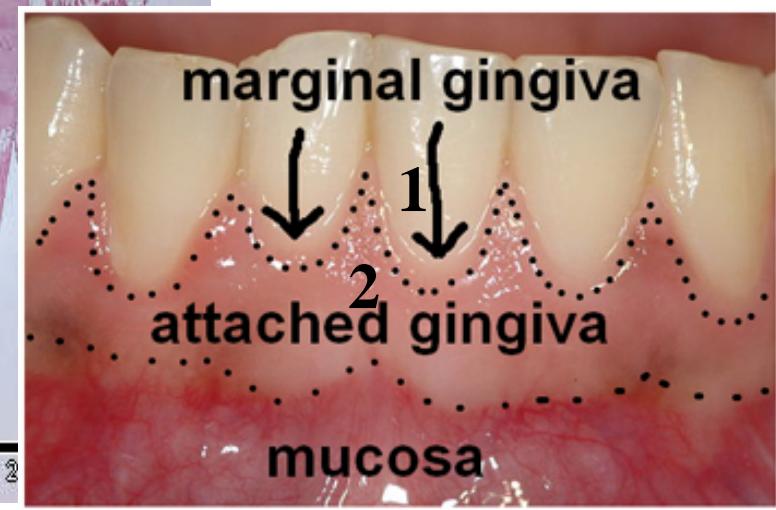




**Sulcus gingivalis**

**Gingiva libera (1)**

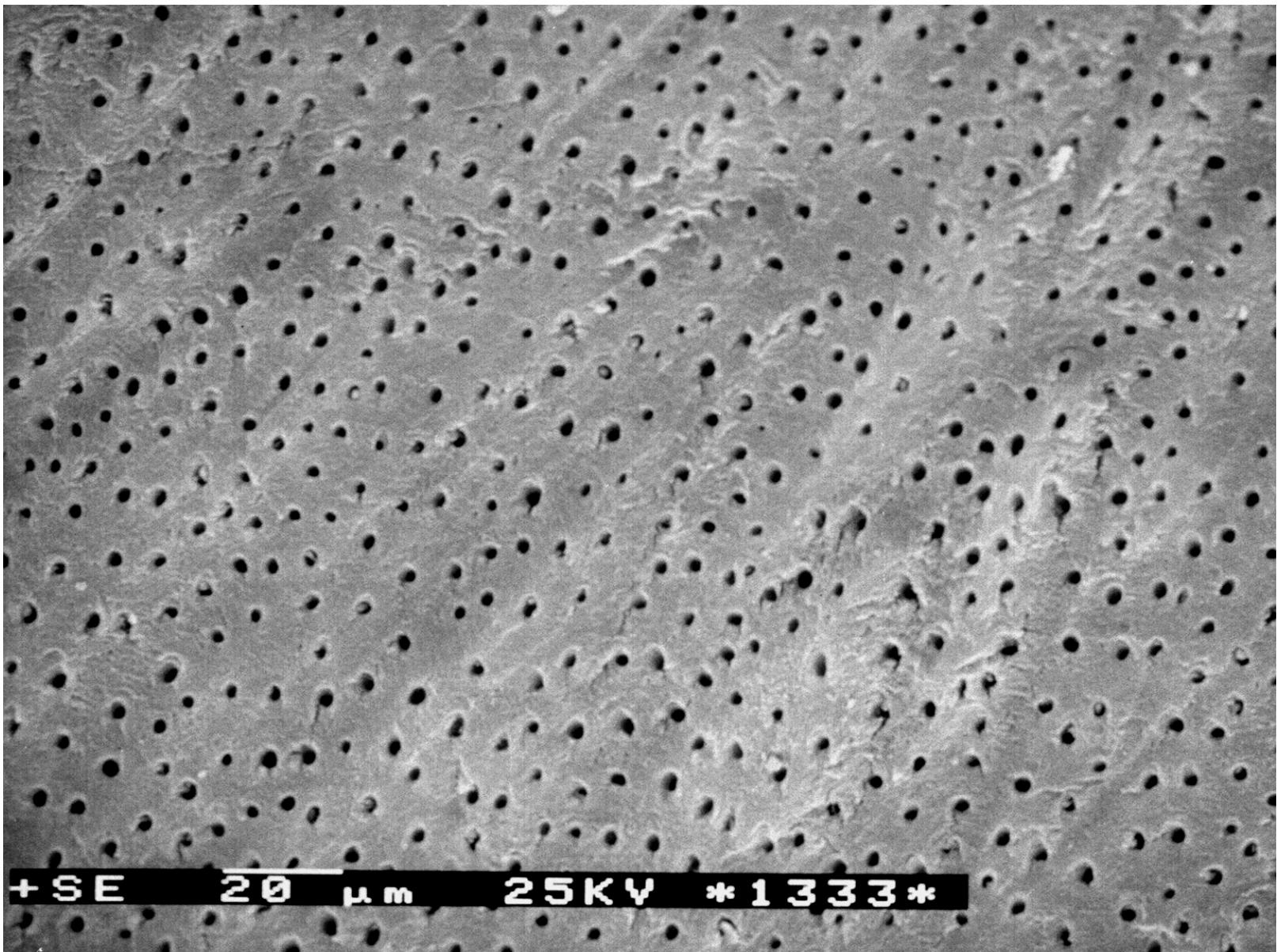
**Gingiva affixa (2)**



**marginal gingiva**

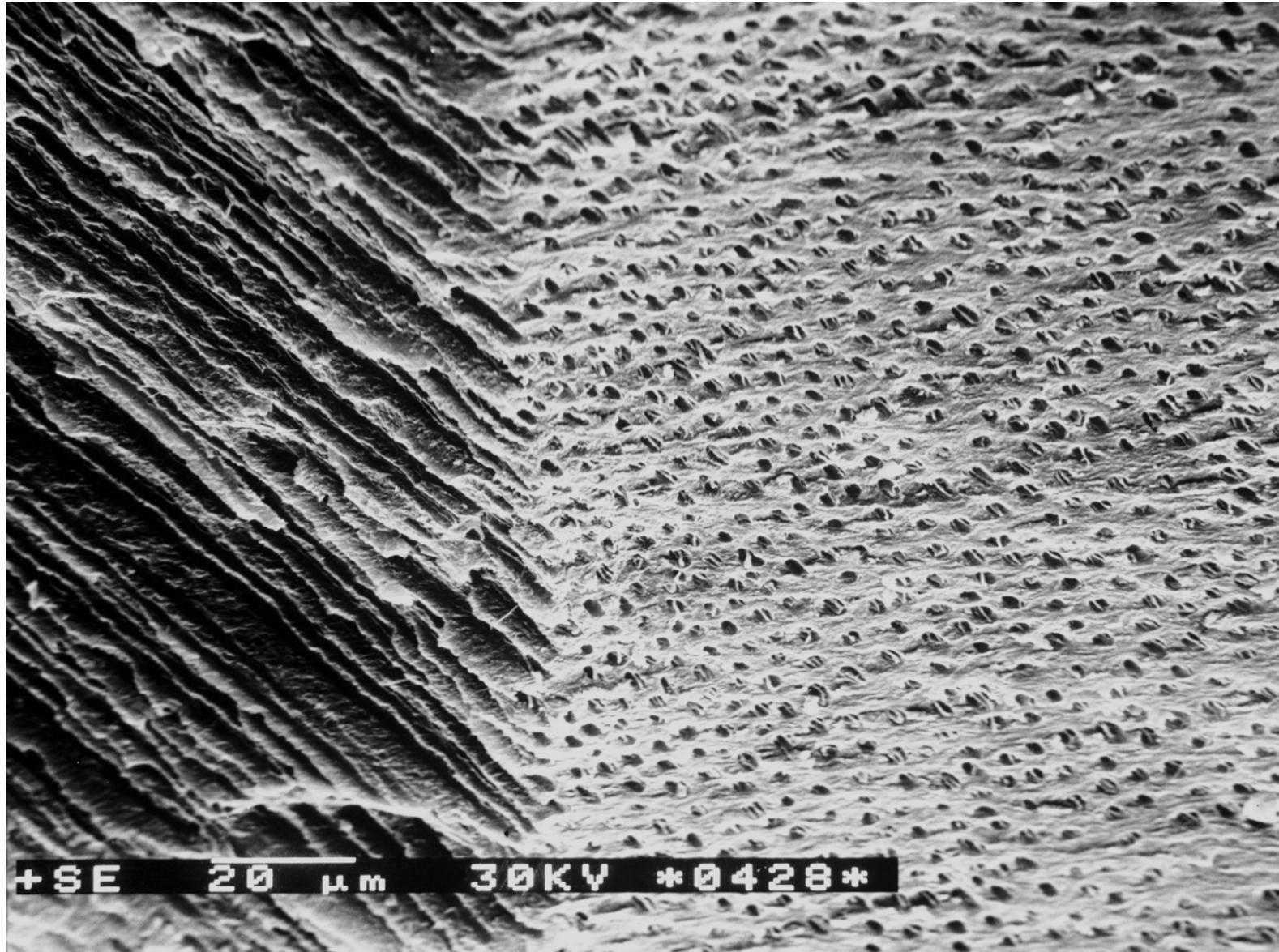
**1**  
**2**  
**attached gingiva**

**mucosa**

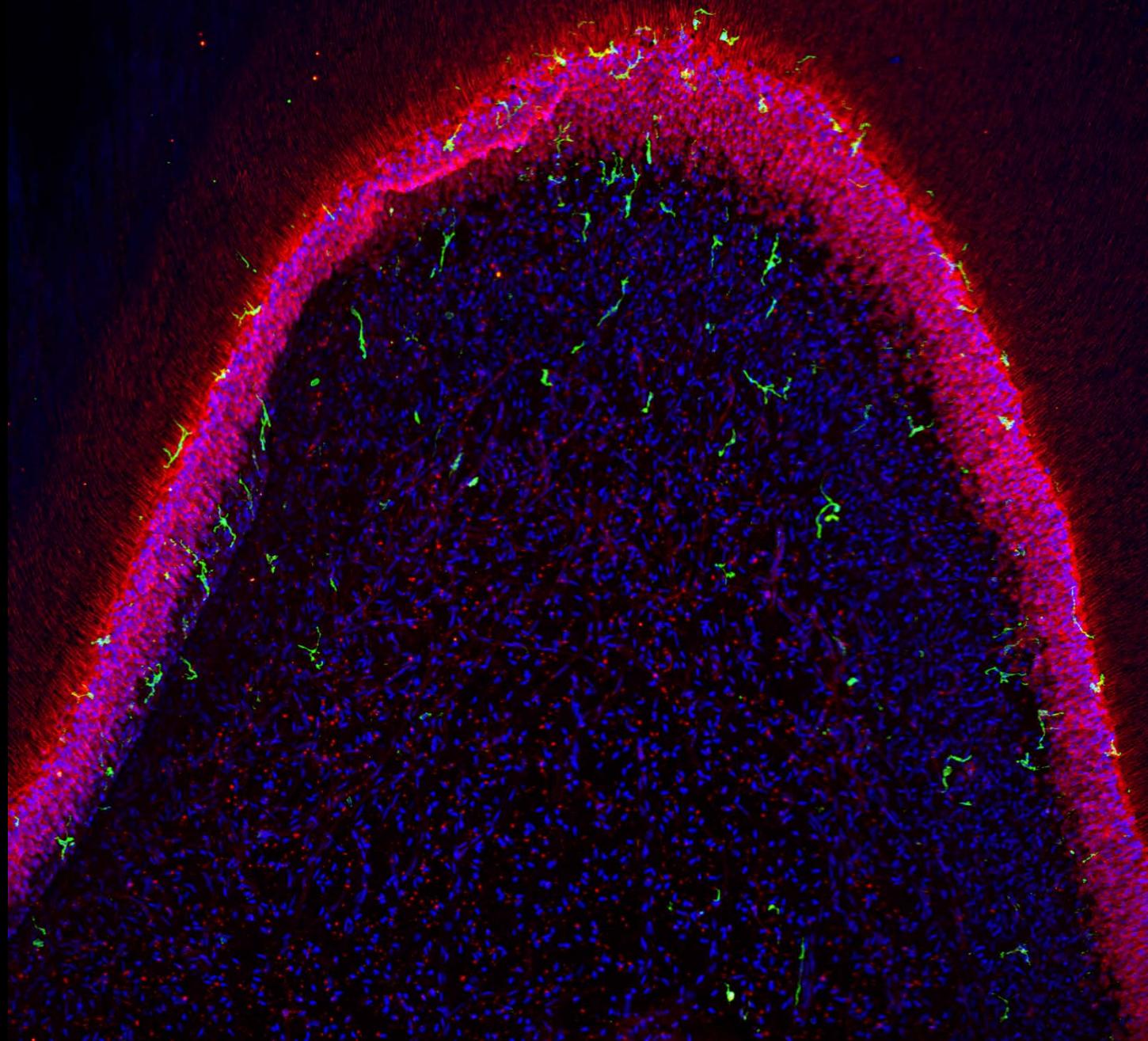


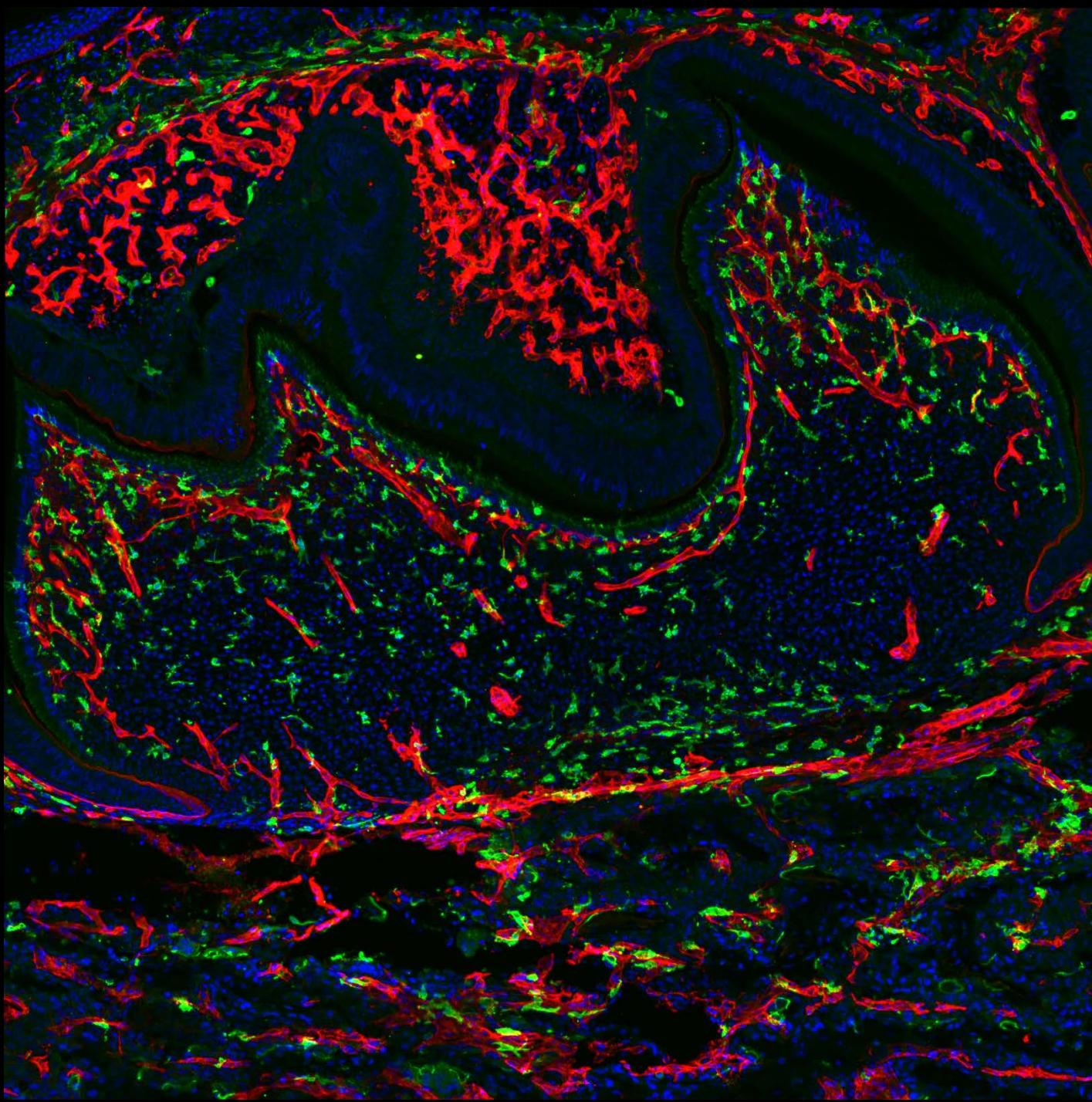
+ SE    20  $\mu\text{m}$     25KV \*1333\*

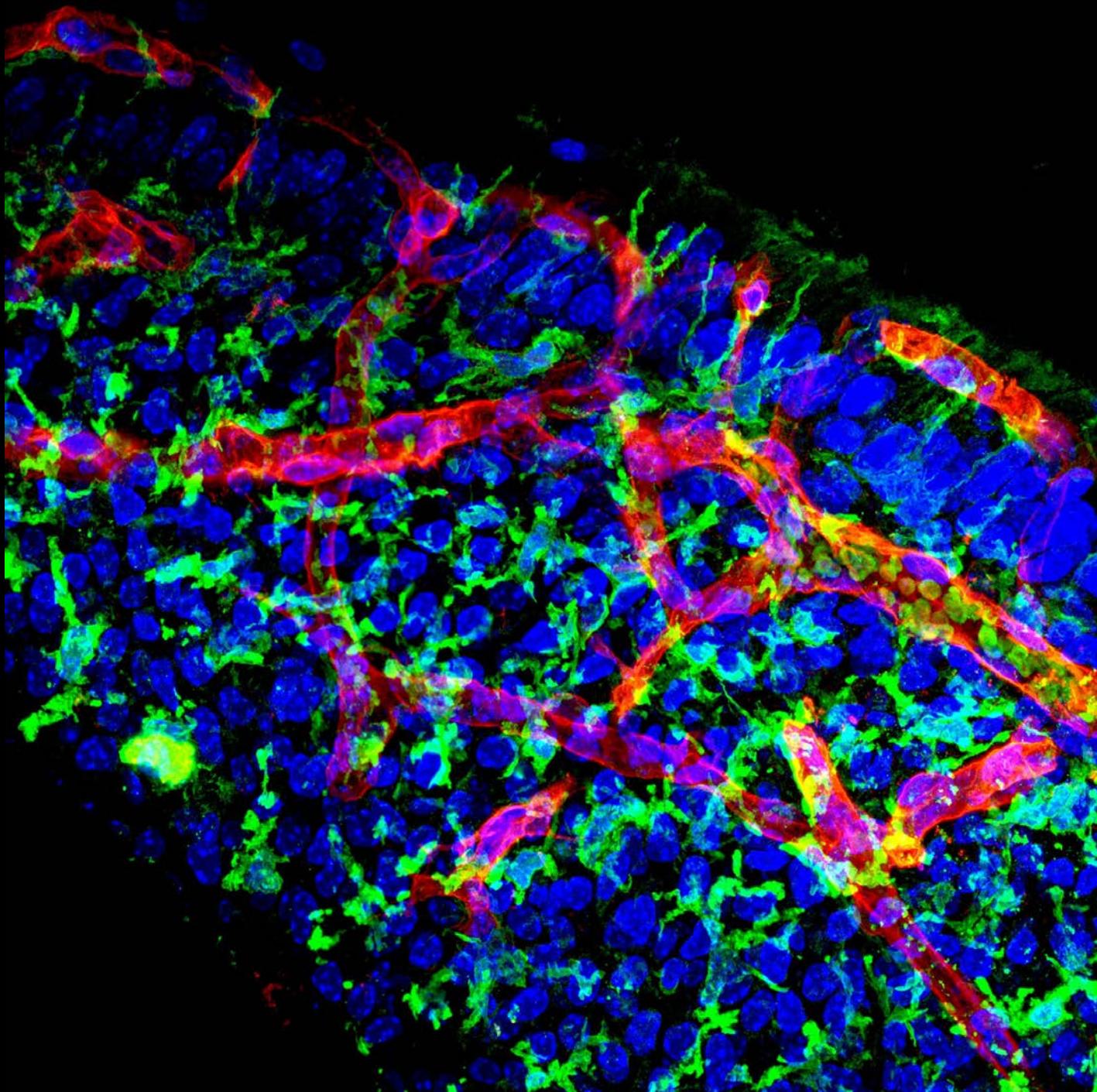
Dentin, SEM, 1500x



Dentin, SEM, 1500x







# Samples

gl. parotis	8
gl. submandibularis	9
gl. sublingualis	10
gl. apicis linguae	2

Lokalizace		Název	Typ	Velikost
Rty		gll. labiales sup. et inf.	smíšené, přev. mucinózní	malé
Tváře		gll. buccales	smíšené, přev. mucinózní	malé
		gll. molares (retromolares)	smíšené, přev. mucinózní	malé
		GL. PAROTIS	serózní	VELKÁ
Patro	tvrdé	gll. Palatinae (žlázová zóna )	mucinózní	malé
	měkké	gll. palatinae	mucinózní	malé
Jazyk		gl. apicis lingue (Blandini-Nuhni)	smíšená, přev. mucinózní	malá/ velká
		žlázky Ebnerovy (gll. papillae vallatae)	serózní	malé
		žlázky Weberovy (gll. linguales post.)	mucinózní	malé
Dno dutiny ústní		GL. SUBMANDIBULARIS	smíšená, přev. serózní	VELKÁ
		GL. SUBLINGUALIS	smíšená, přev. mucinózní	VELKÁ