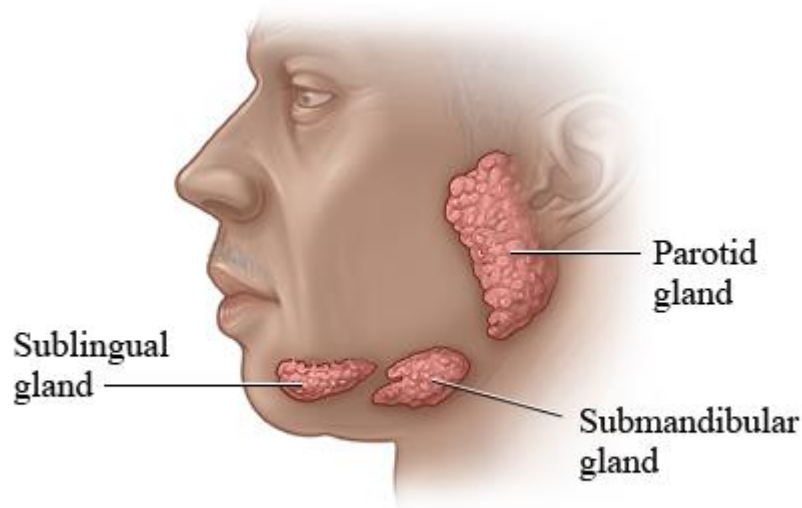


Practice 2

Major salivary glands TMJ, Methods

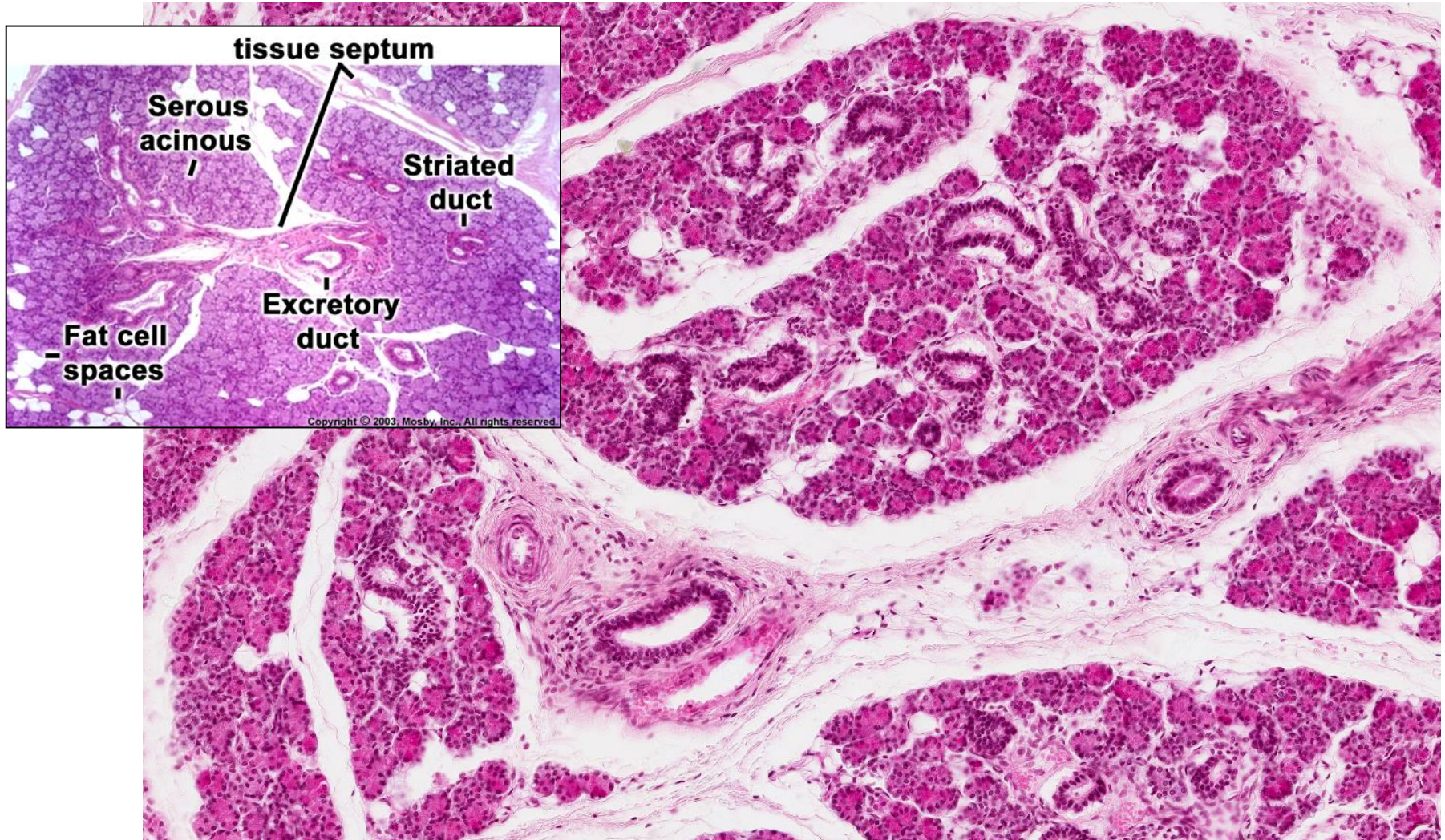


Structure of salivary glands

Ligaments – capsule, septa, connective tissue

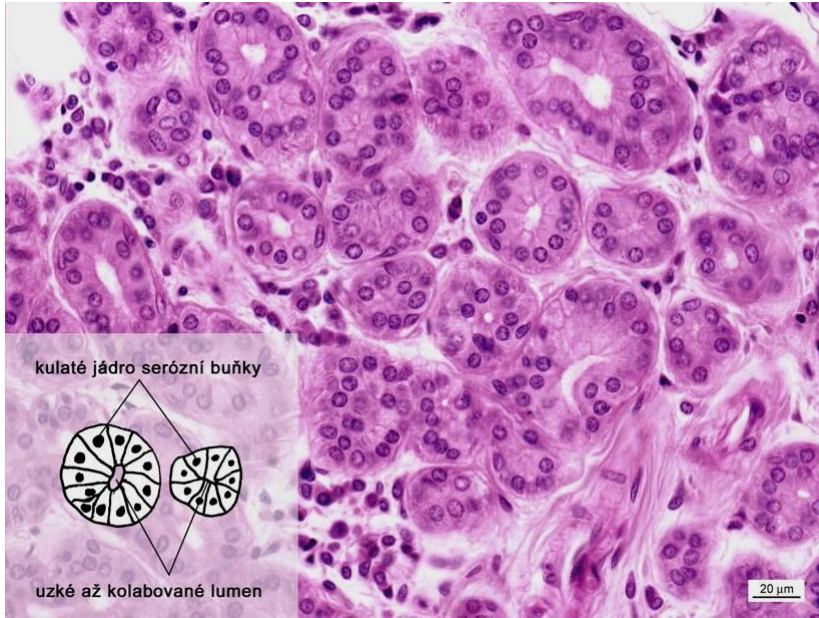
Parenchyma – lobules

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



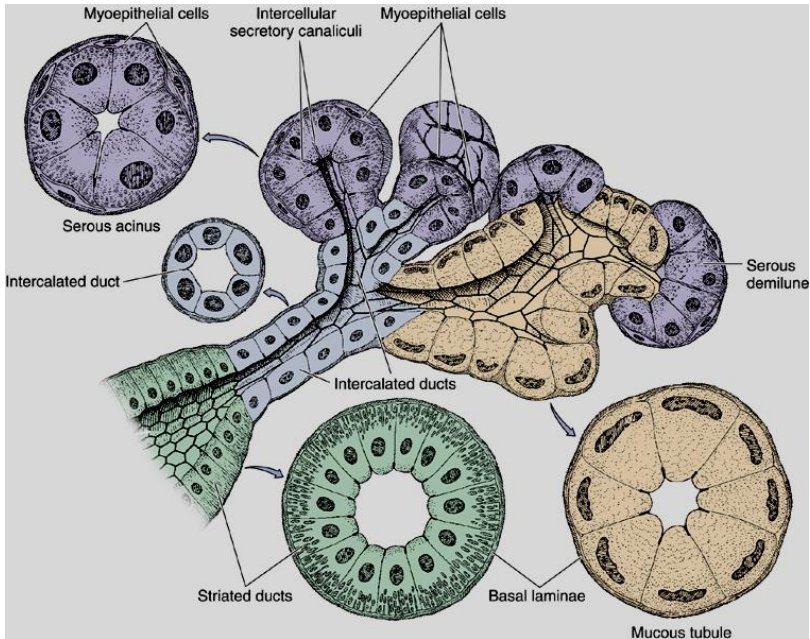
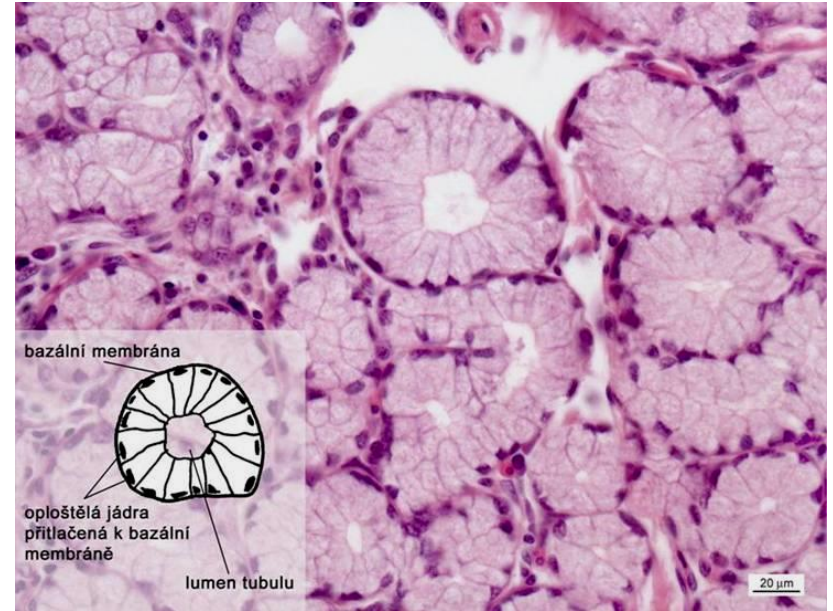
Serous acini

BM, myoepithelial and serous cells

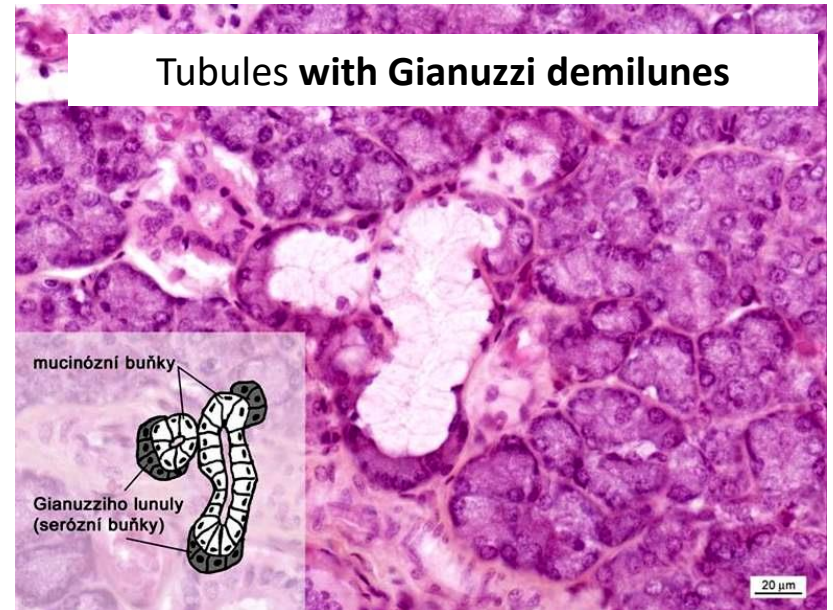


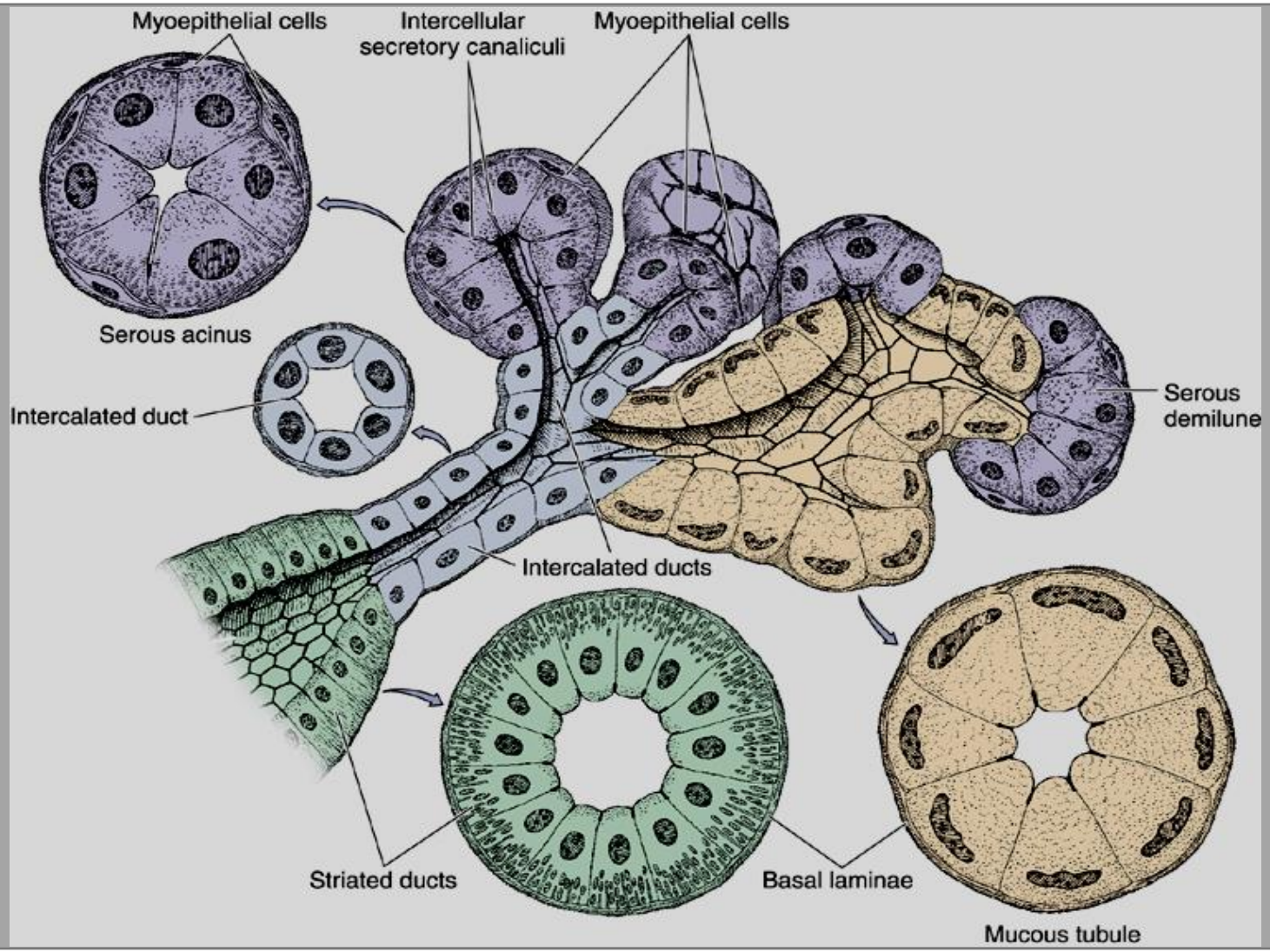
Mucinous tubules

BM, myoepithelial and mucinous cells



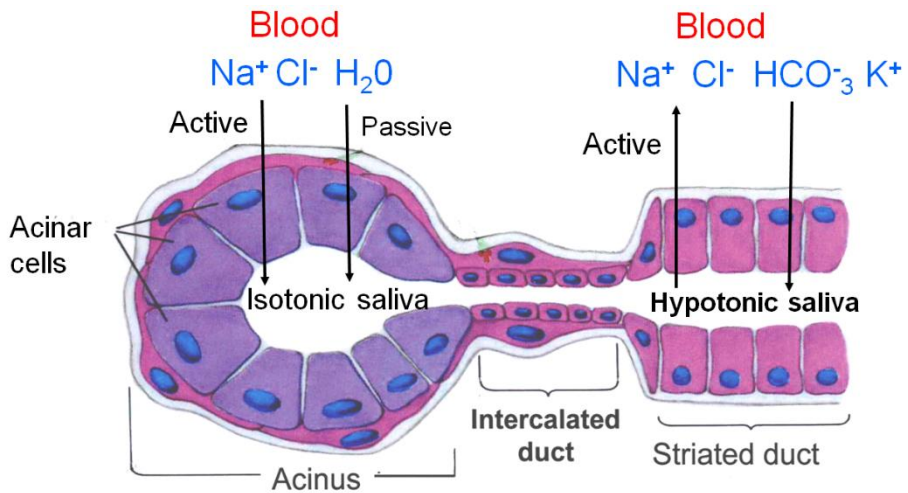
Tubules with Gianuzzi demilunes

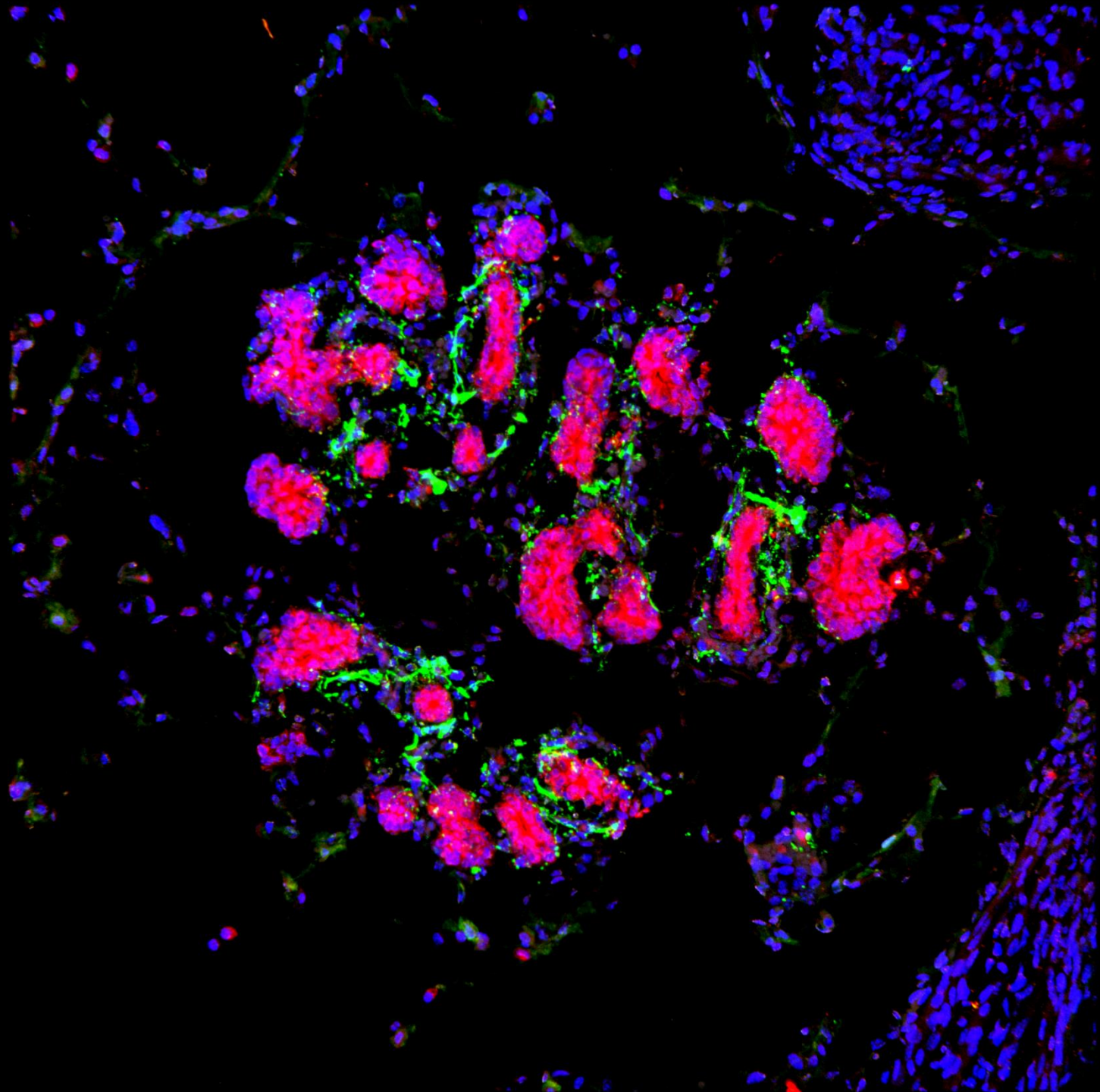




Myoepithelial cells

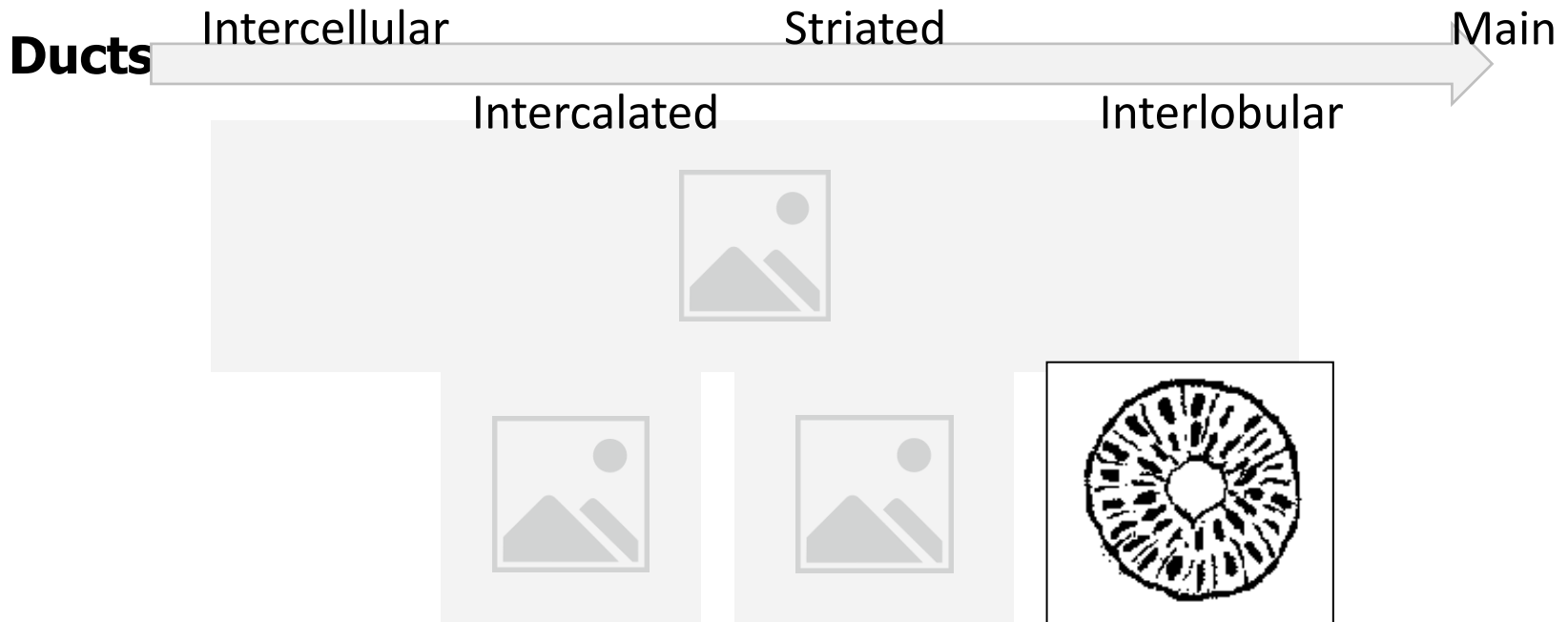
- Contraction
- Desmosomes
- Vegetative control





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 septs*)
- **Main** (*stratified columnar ep.*)



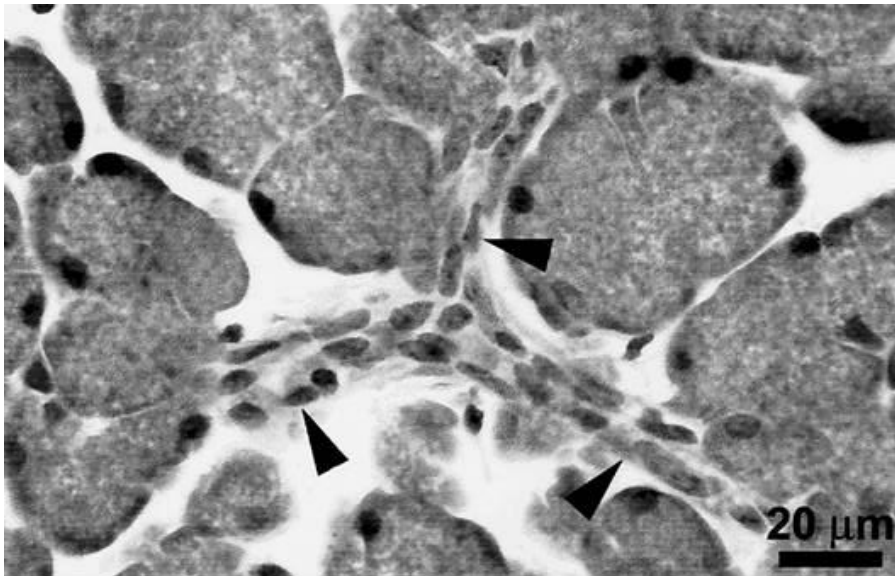
Intercalated ducts

Narrow and thin-walled channel, collapsed on slides

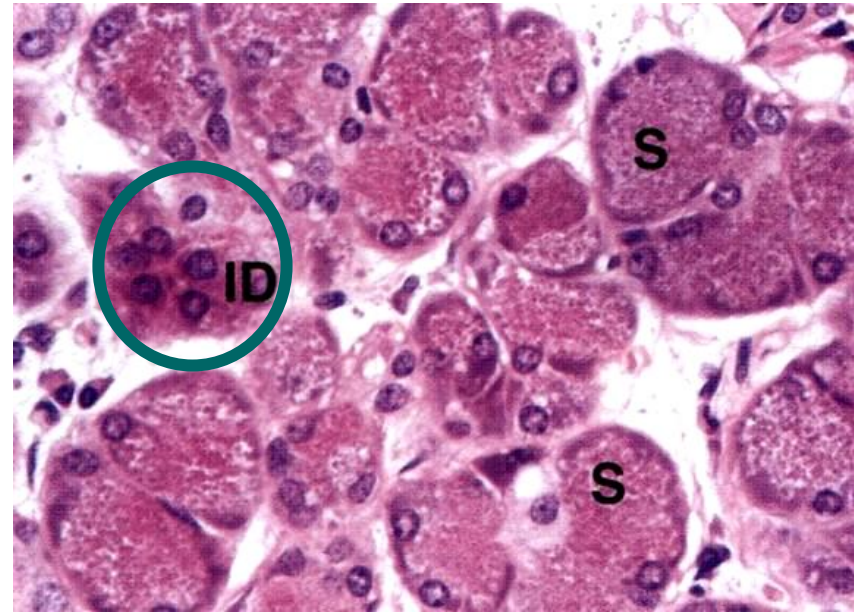
Wall: basal membrane, myoepithelial cells and simple squamous to low cubic ep.

Numerous in serous type of glands

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



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Striated ducts

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

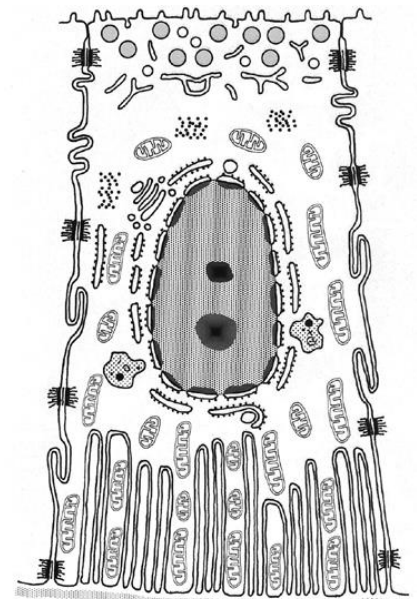
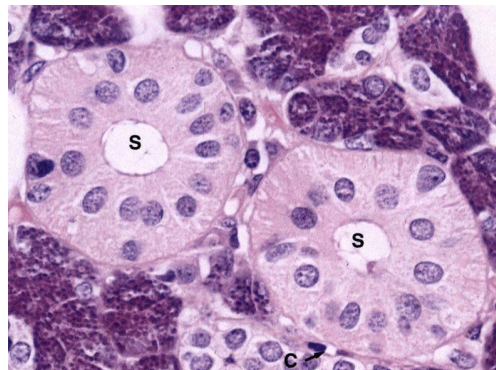
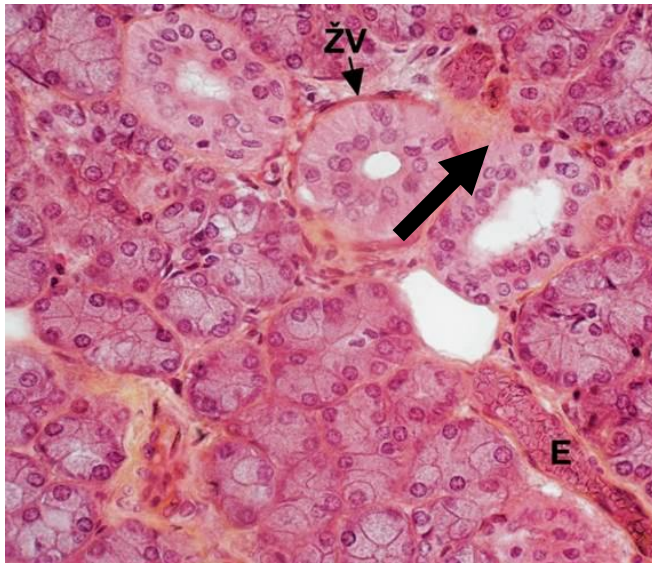
Wall: Basal membrane and simple cuboidal/low columnar ep.

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

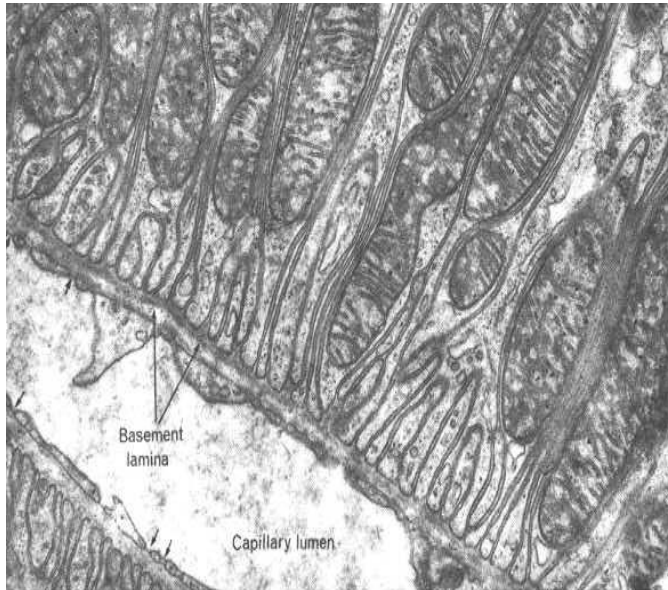
In the cytoplasm of cytokeratin filaments

The cells of striated ducts regulate the content of water and electrolytes (Na^+ , K^+ , Cl^- , Ca^{2+} , Mg^{2+} , HCO_3^-) in the secretion.

Resorption of Na^+ , and Cl^-
Secretion of K^+ and HCO_3^-
nerve control

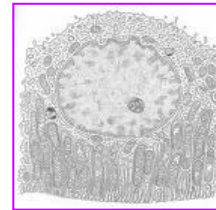


Striated duct – basal labyrinth

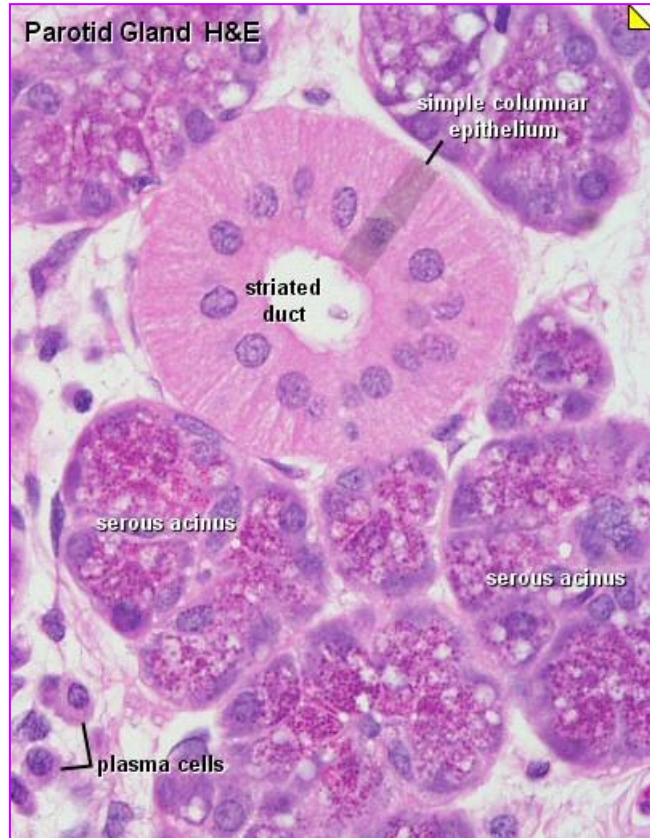


Base of epithelial cell:

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

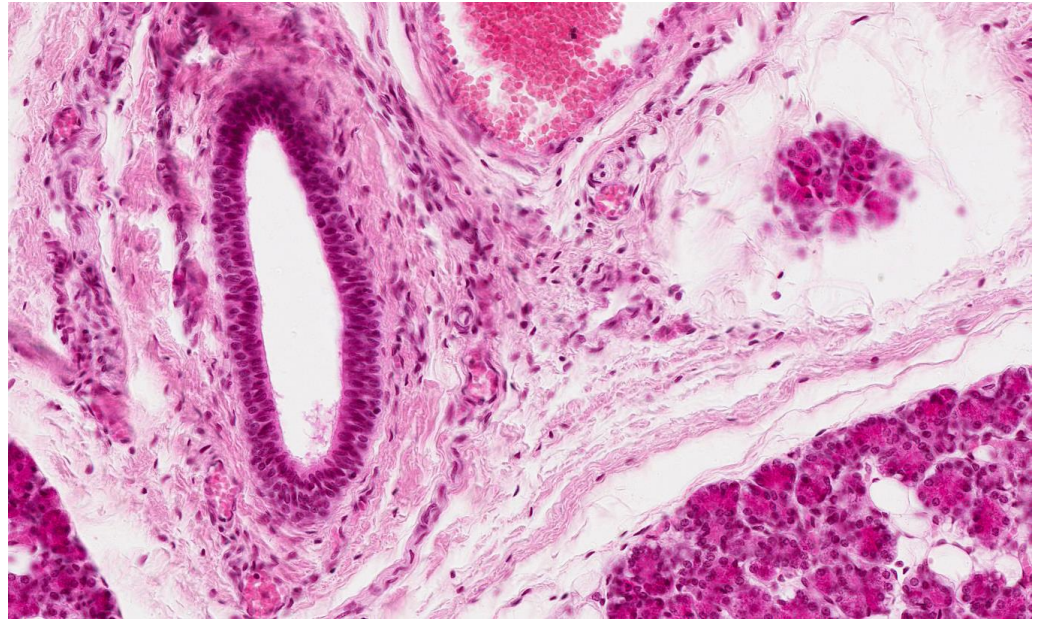
Main ducts

Stratified columnar ep. with goblet cells

Ductus parotideus

Ductus submandibularis

Ductus sublinguales (major et minores)

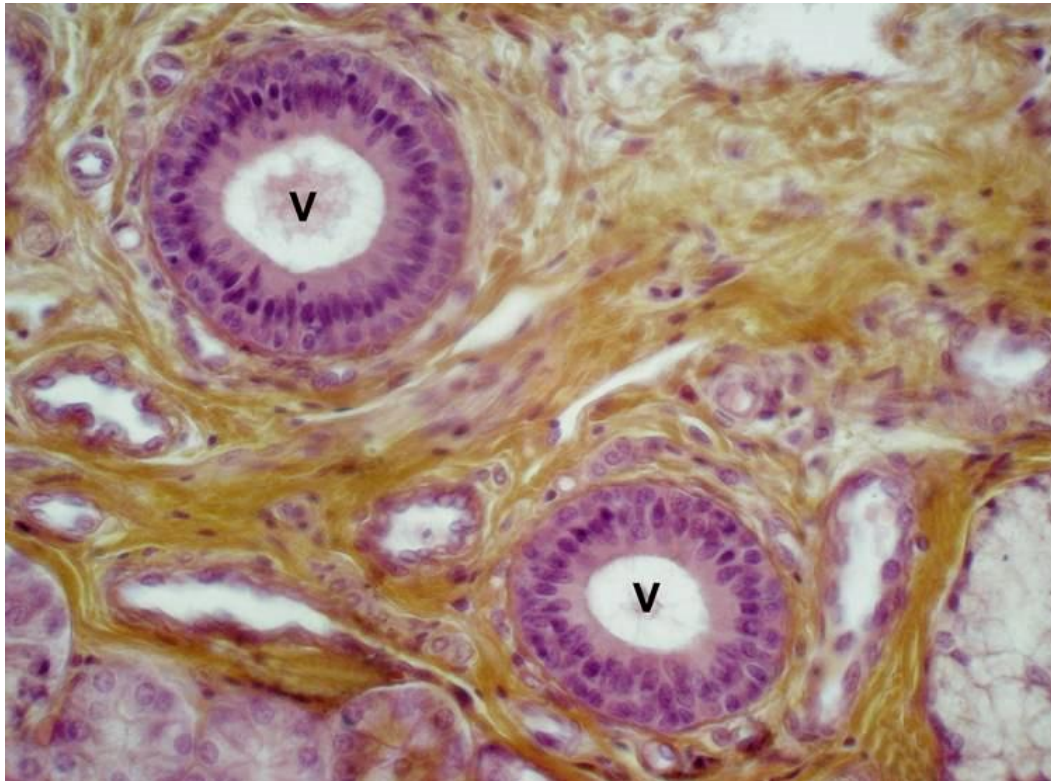


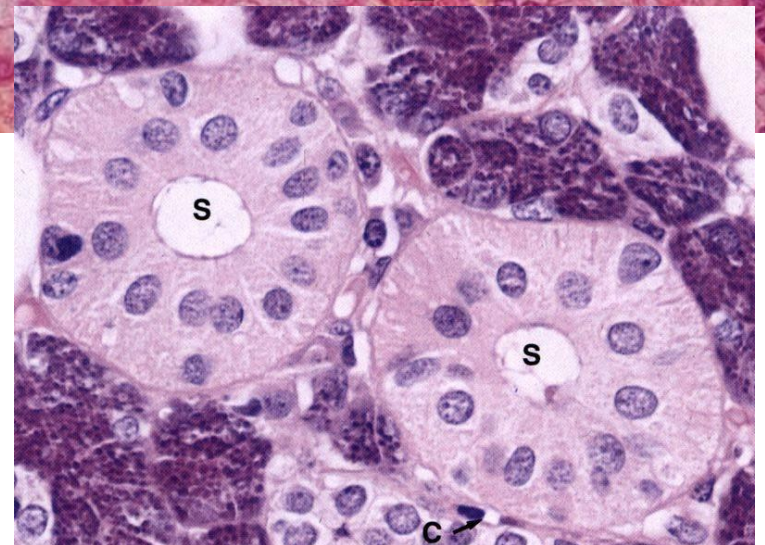
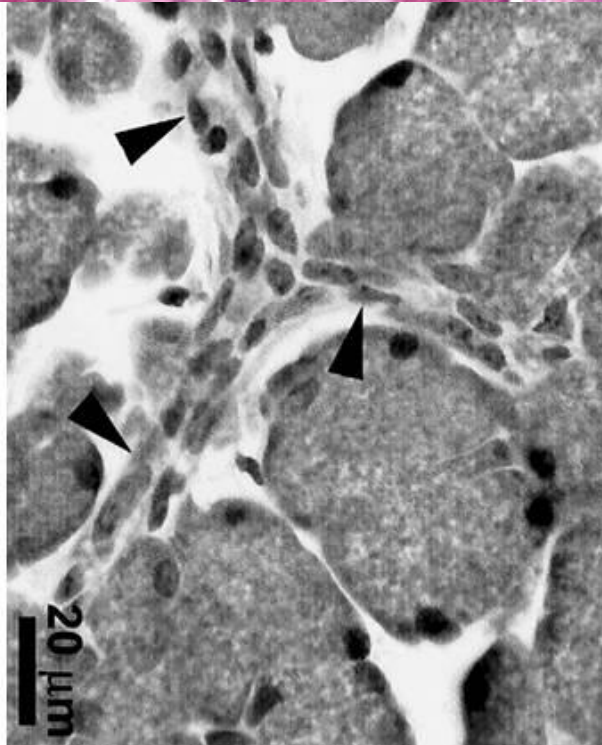
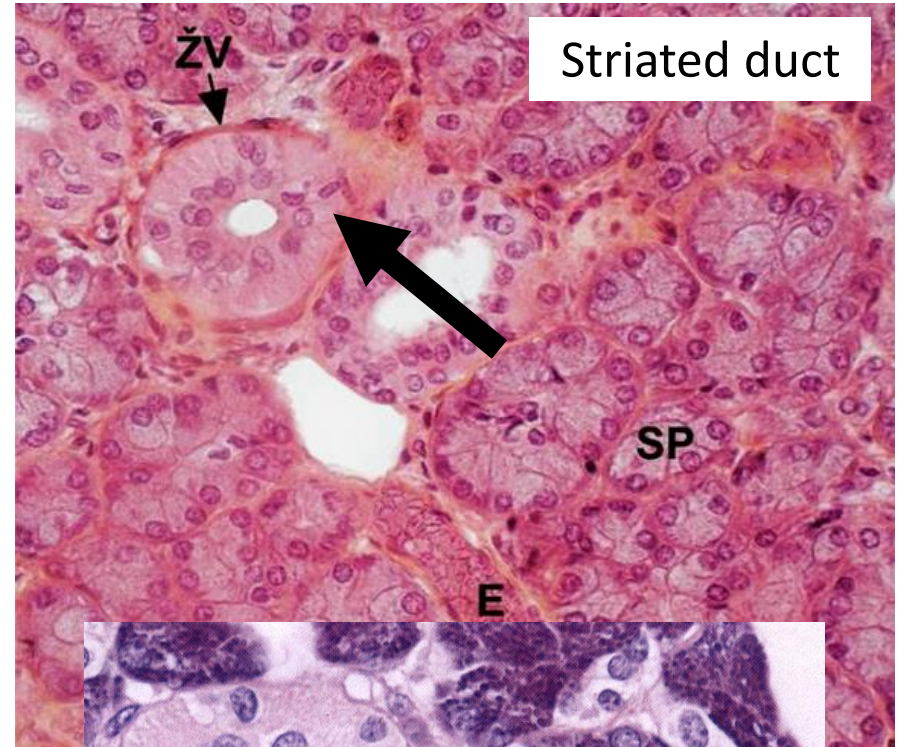
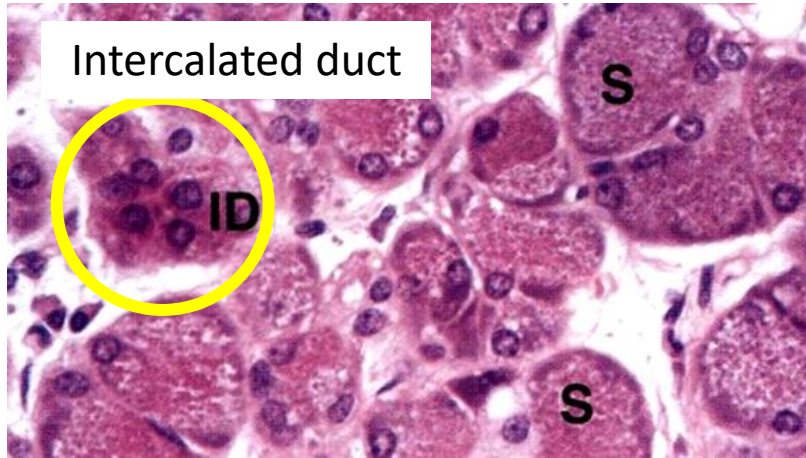
Main ducts

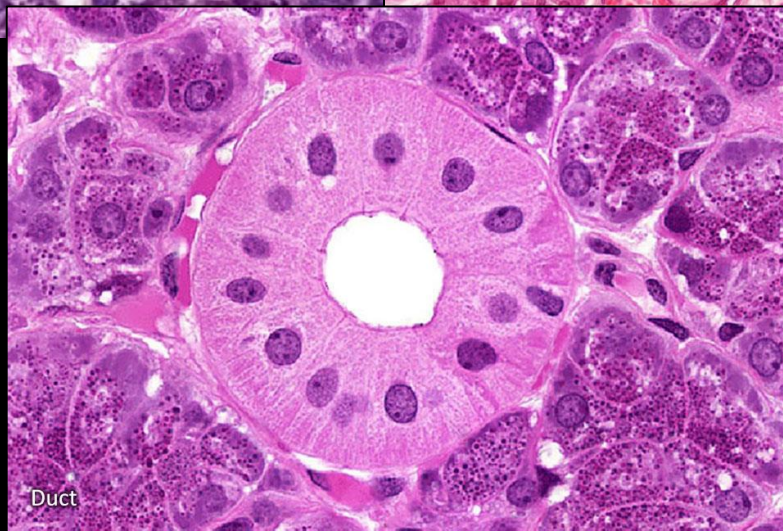
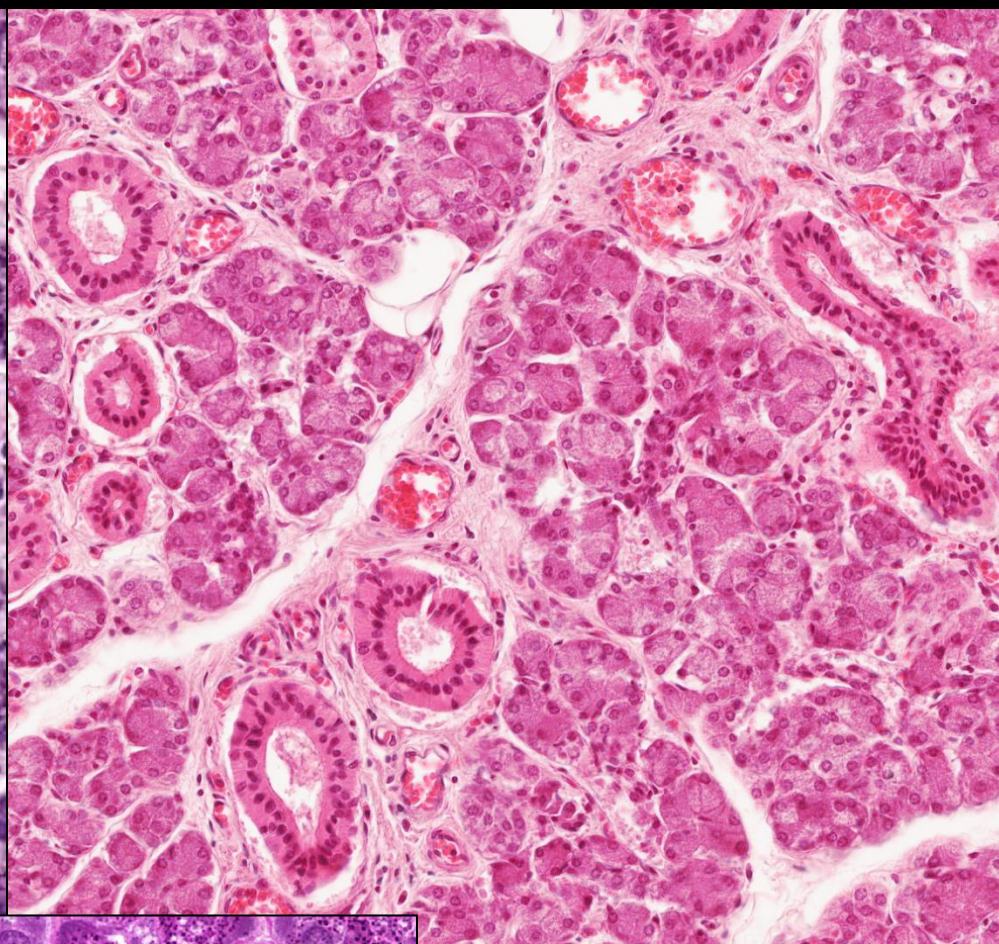
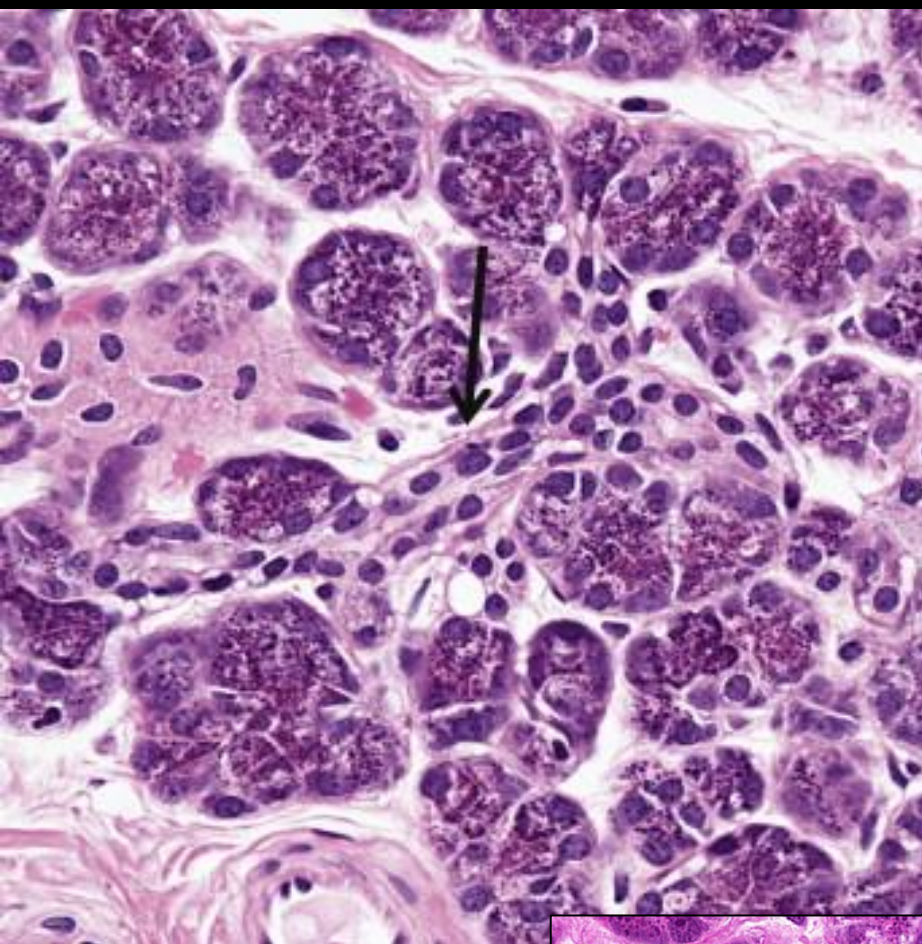
Stratified columnar ep.

In epithelium **Goblet cells**

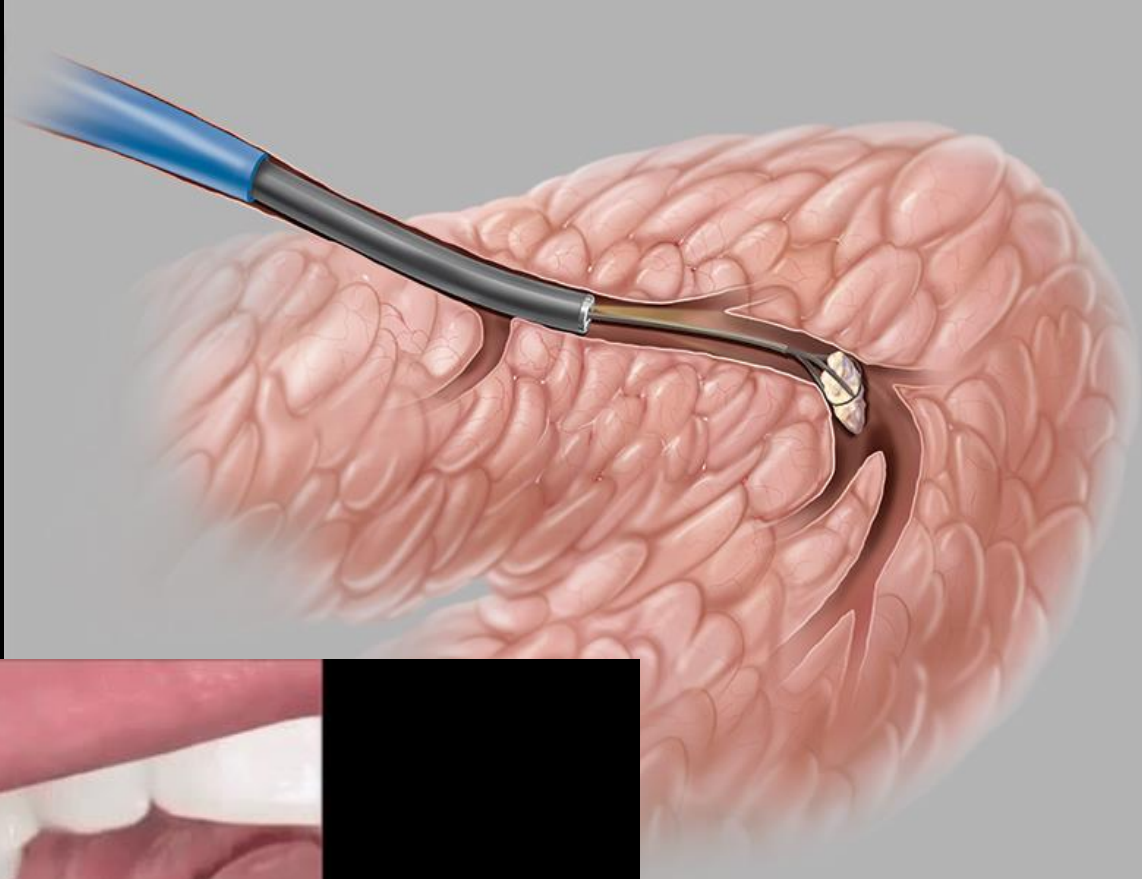
Wall supported by the dense collagenous connective tissue and smooth muscle cells







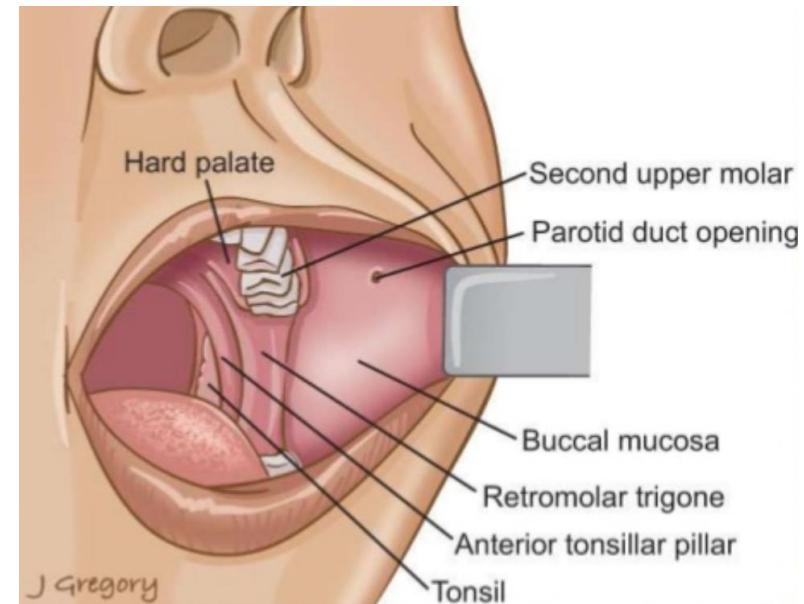
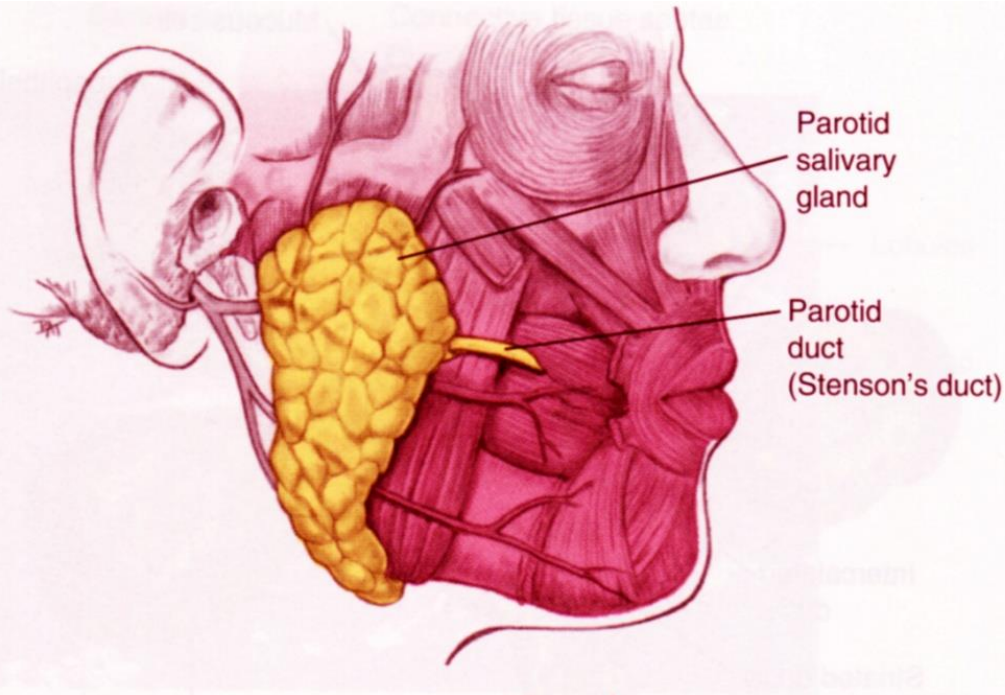
Sialendoscopy

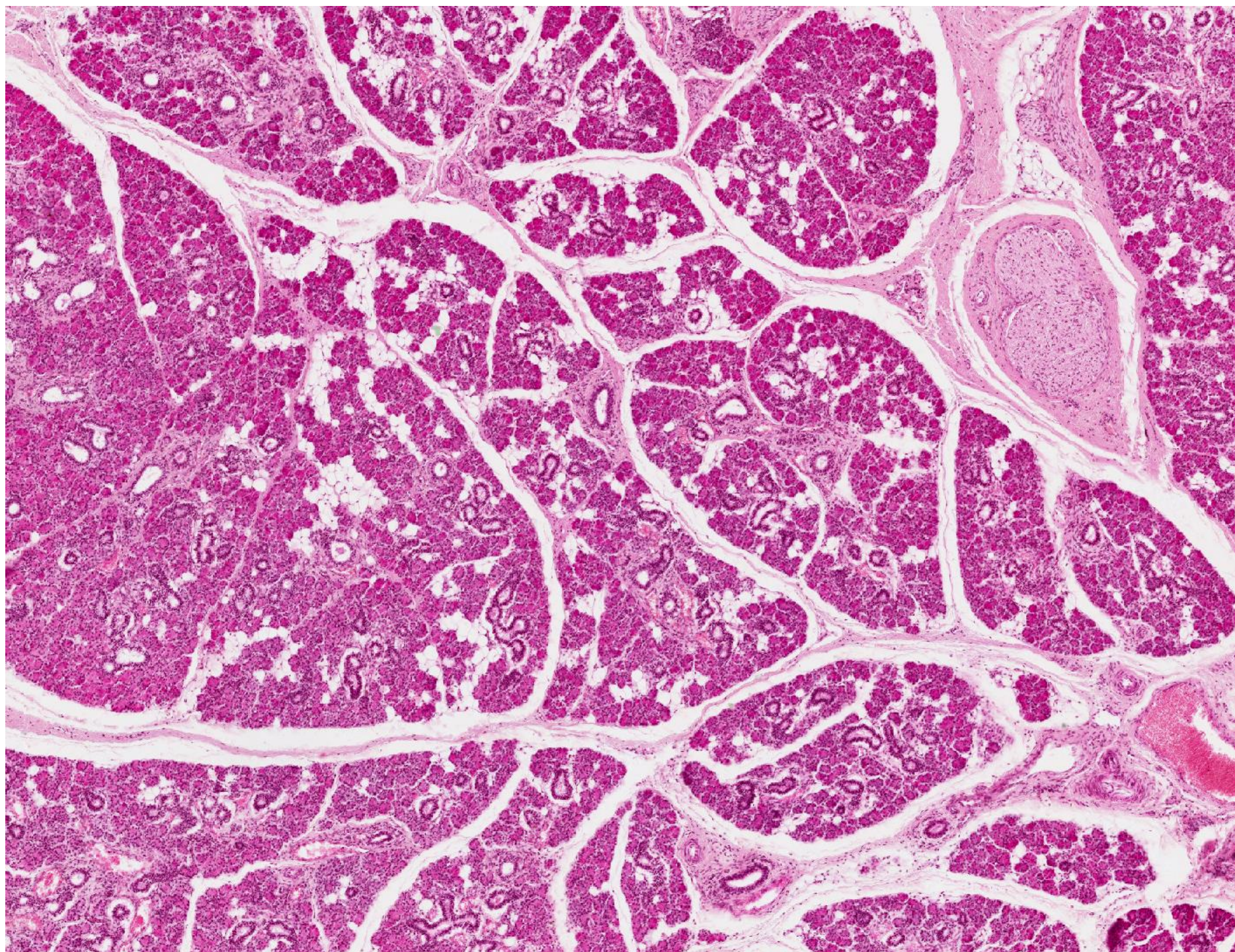


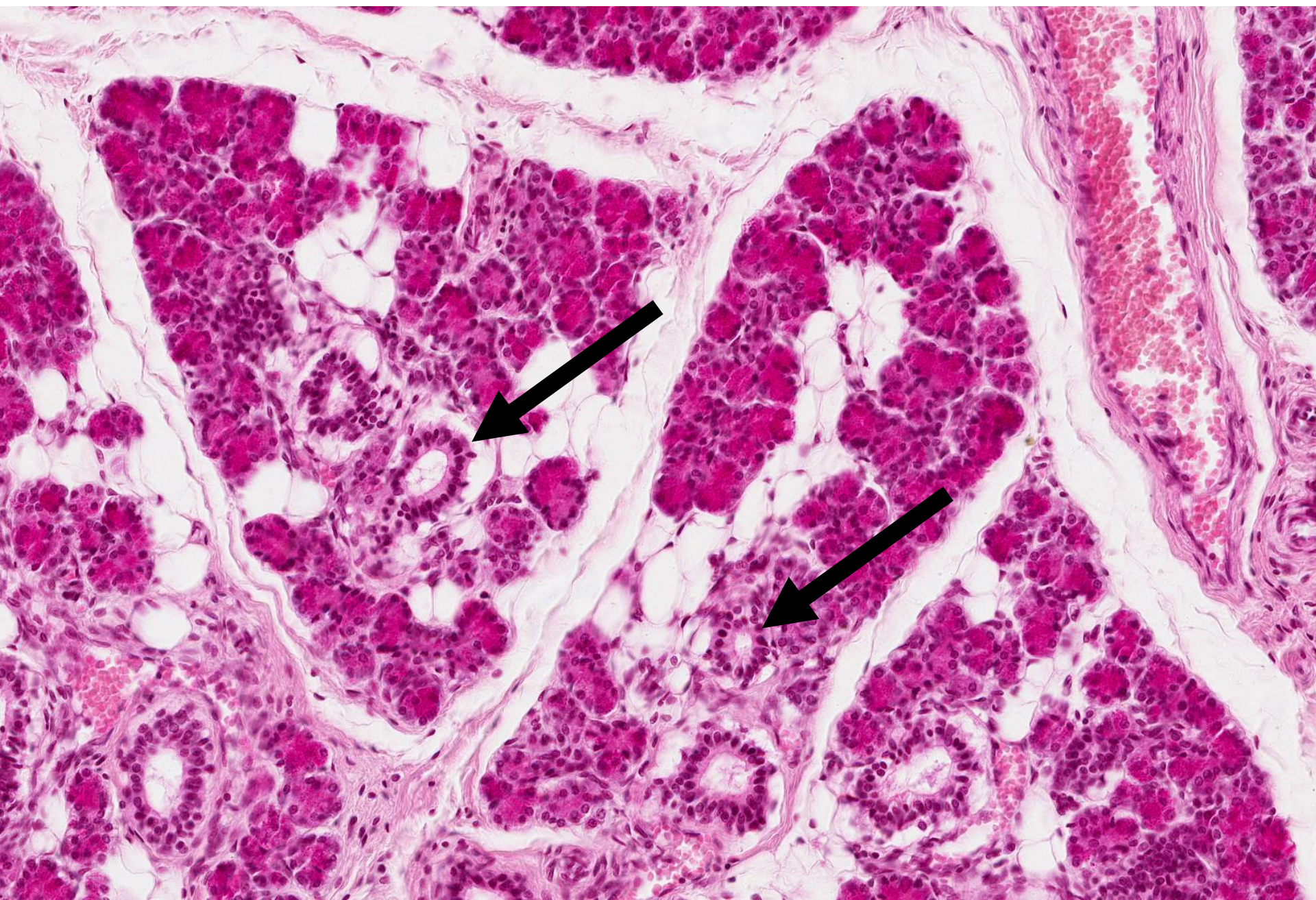
To help treat this problem obstructive stones can be removed from the parotid salivary duct. A miniature endoscope is introduced through the duct to locate the stone or stones in a procedure called sialendoscopy.

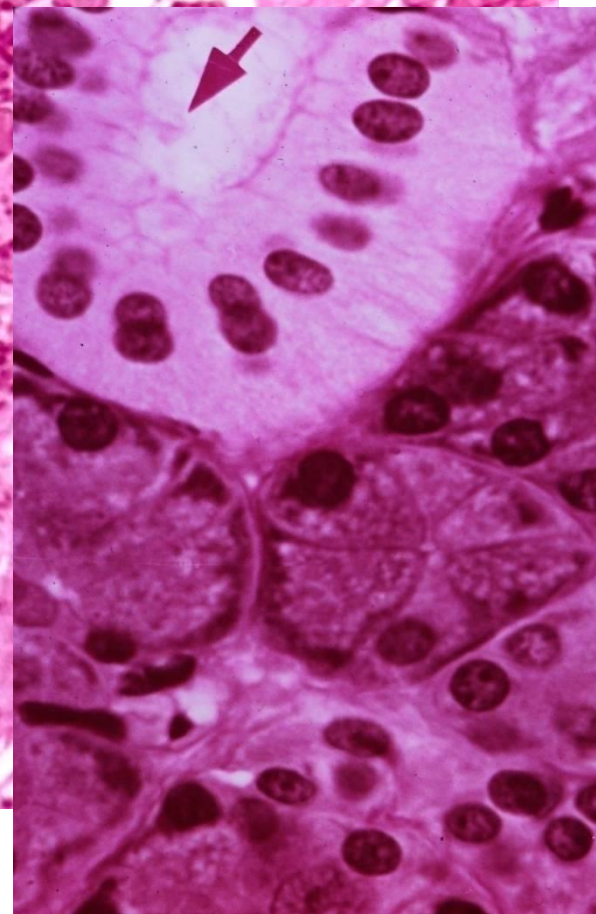
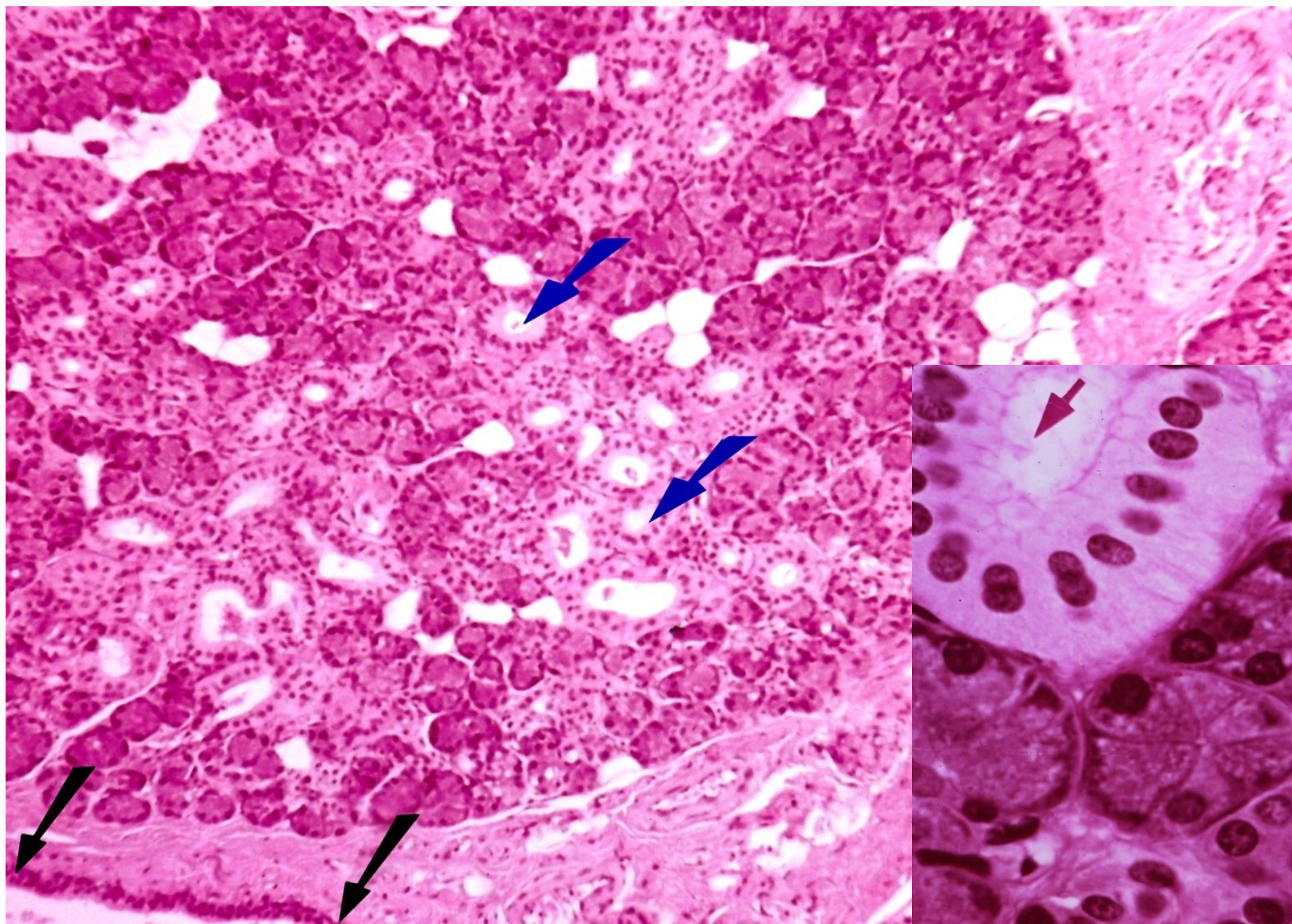
Glandula parotis

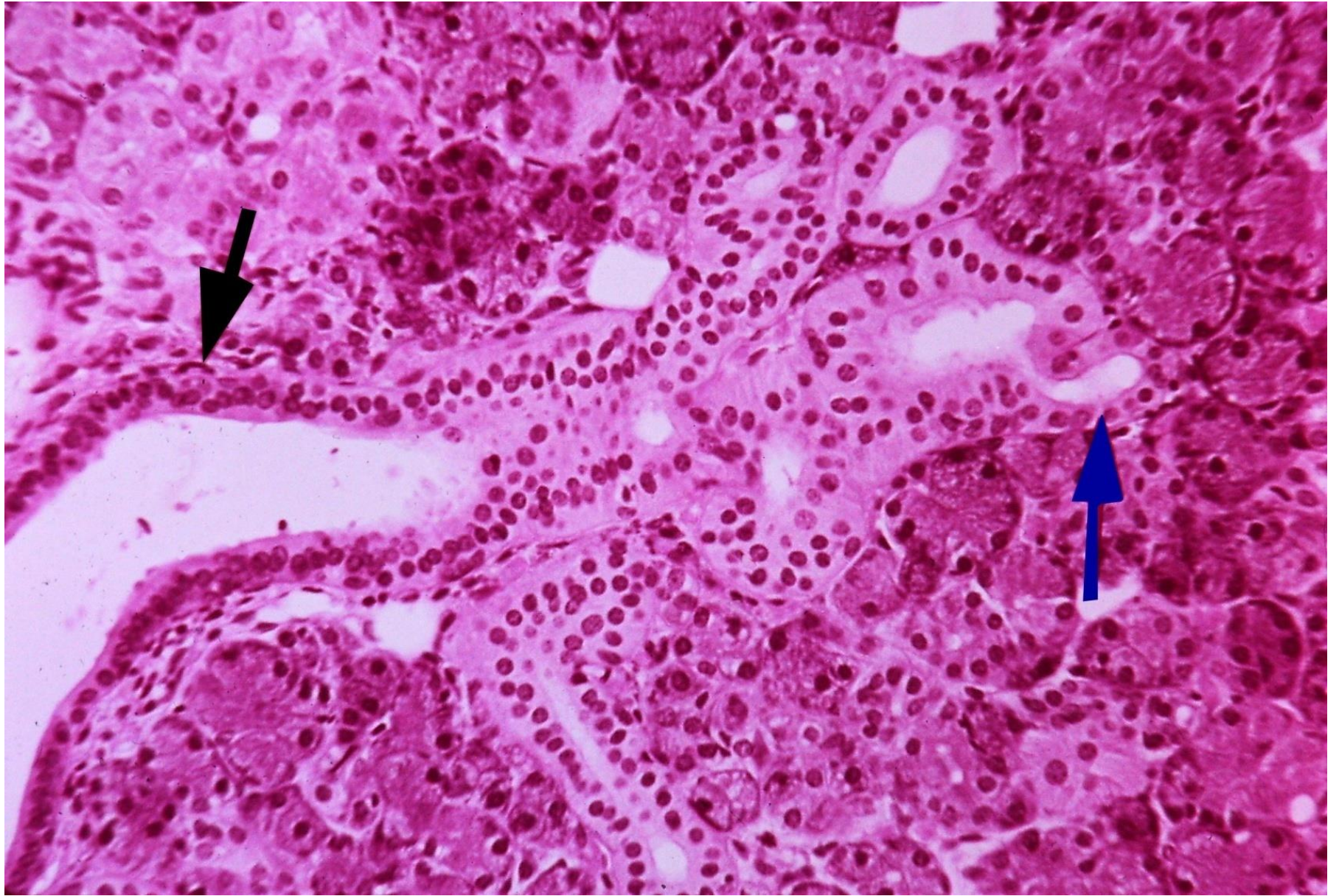
- **SEROUS** gland
- 14 - 28 g
- capsule, septa and lobules
- Serous acini, ducts: **long** intercalated ducts, **numerous** of striated ducts
- **ductus parotideus (Stenoni)** - 2. upper molar (Steno/Stensen, Niels)
- adipocytes

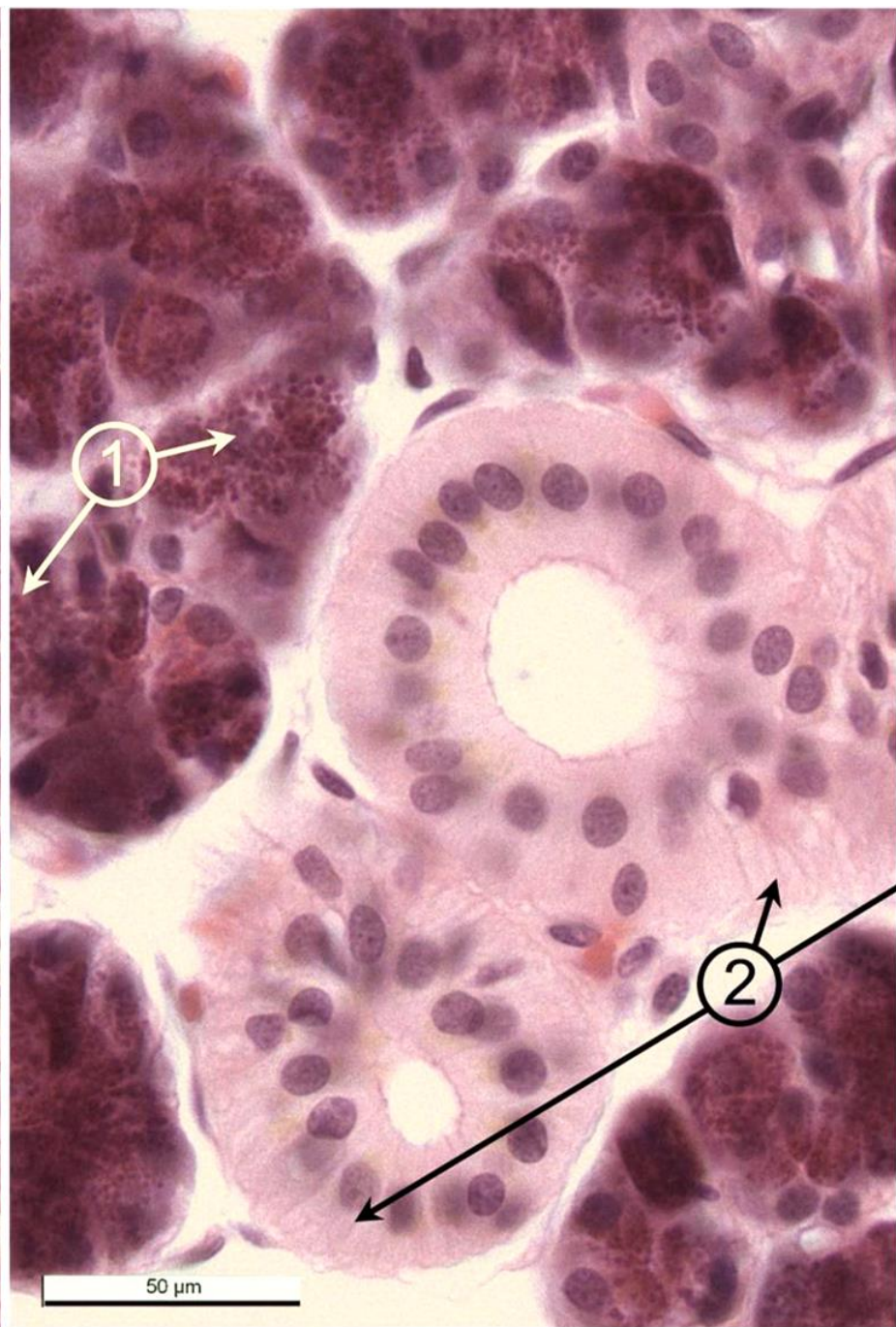
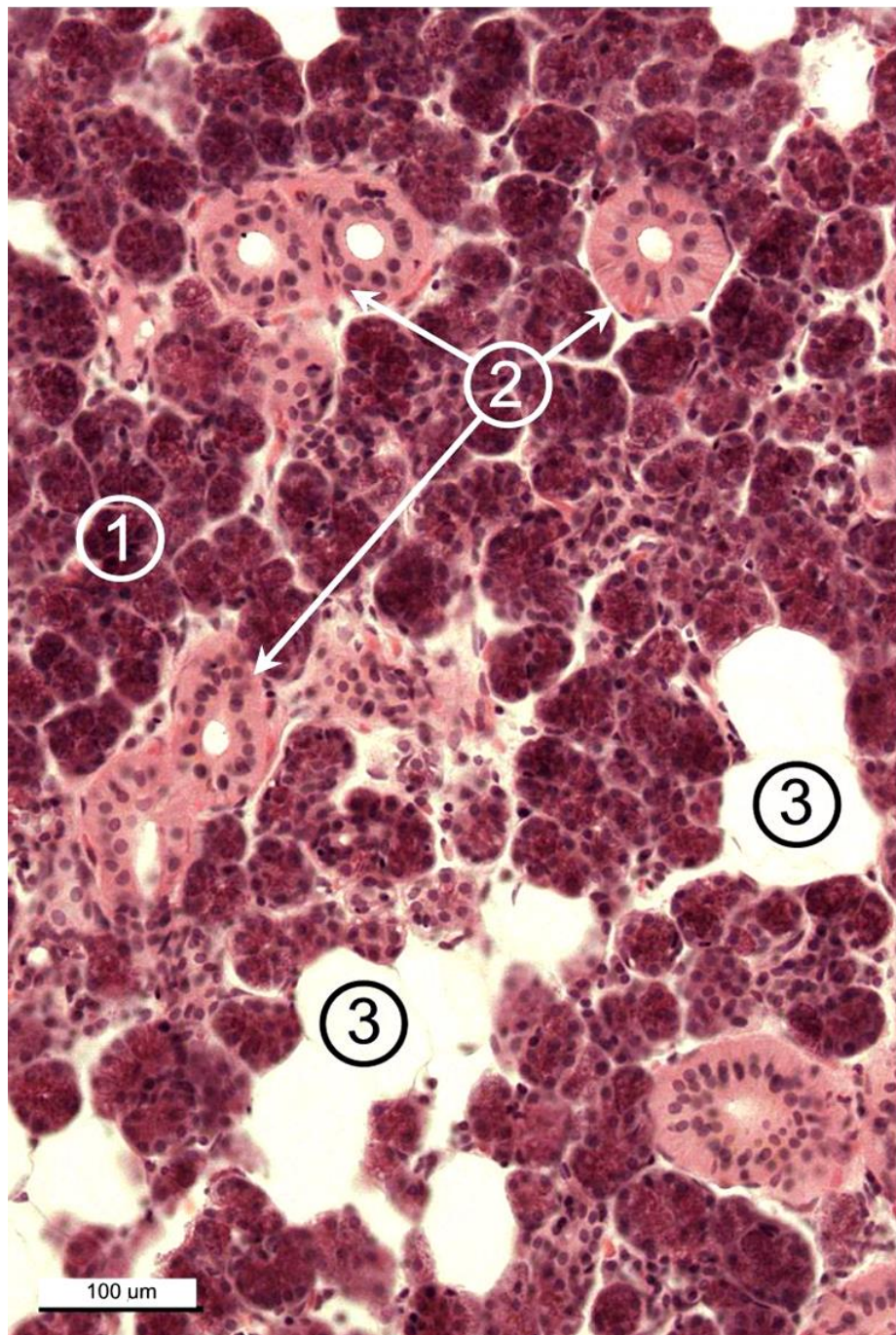






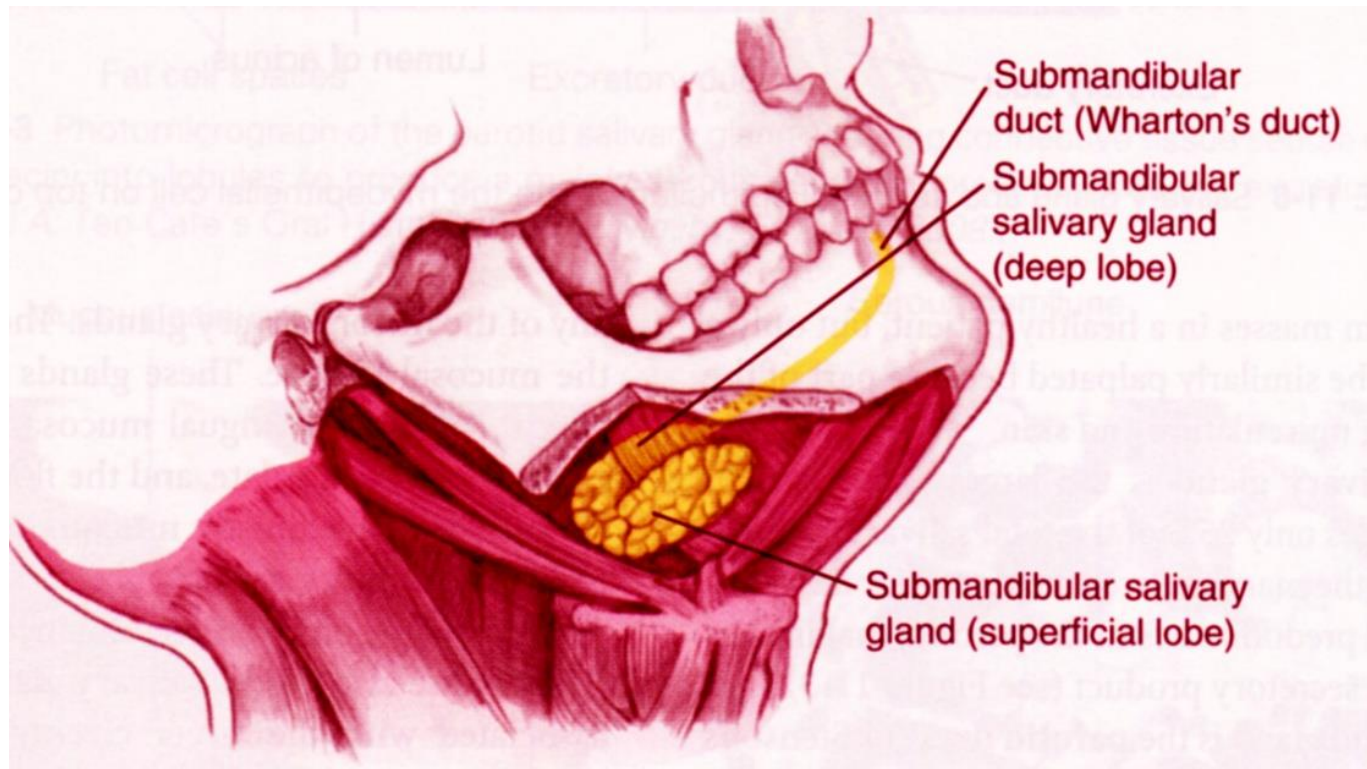


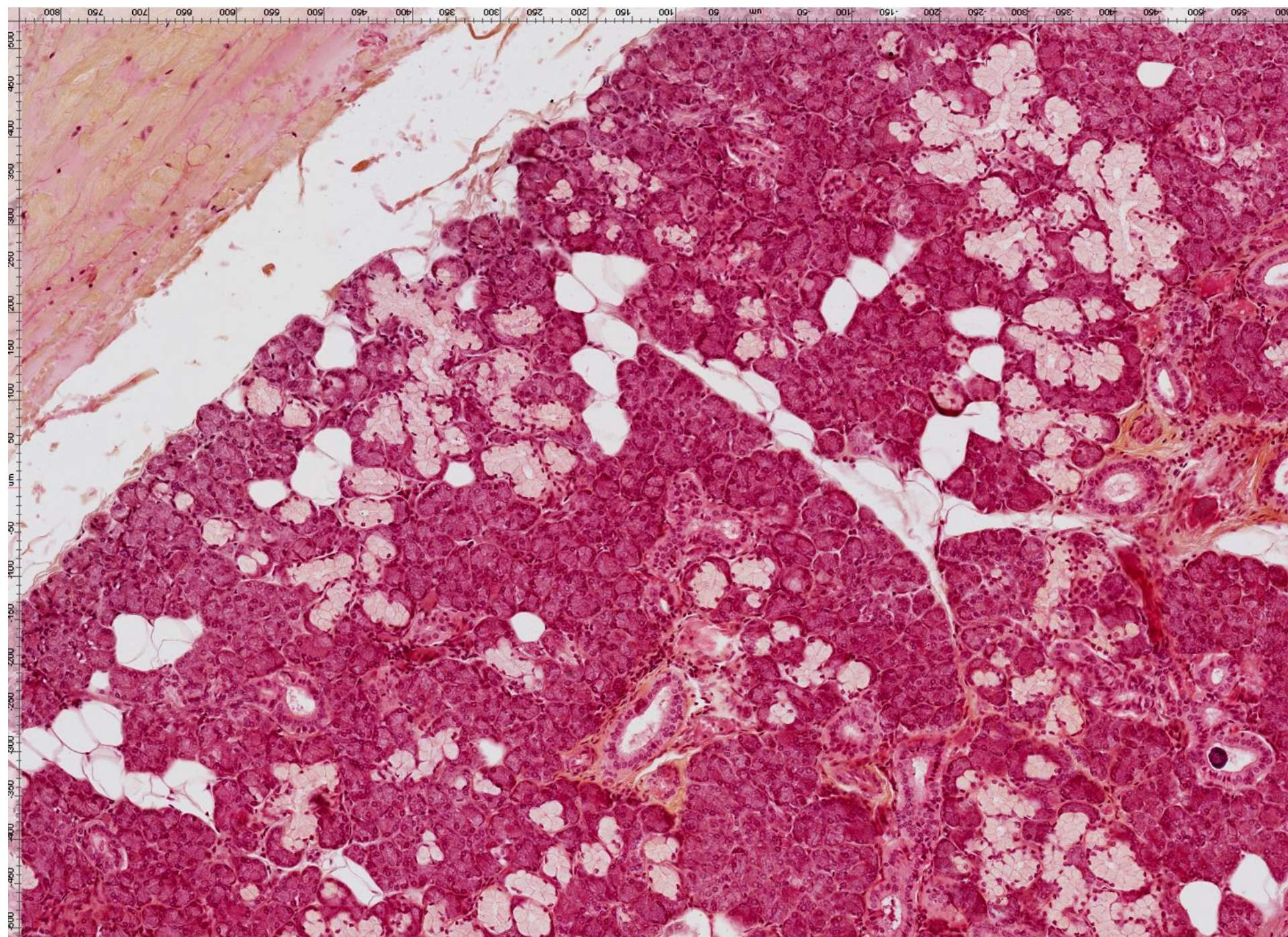


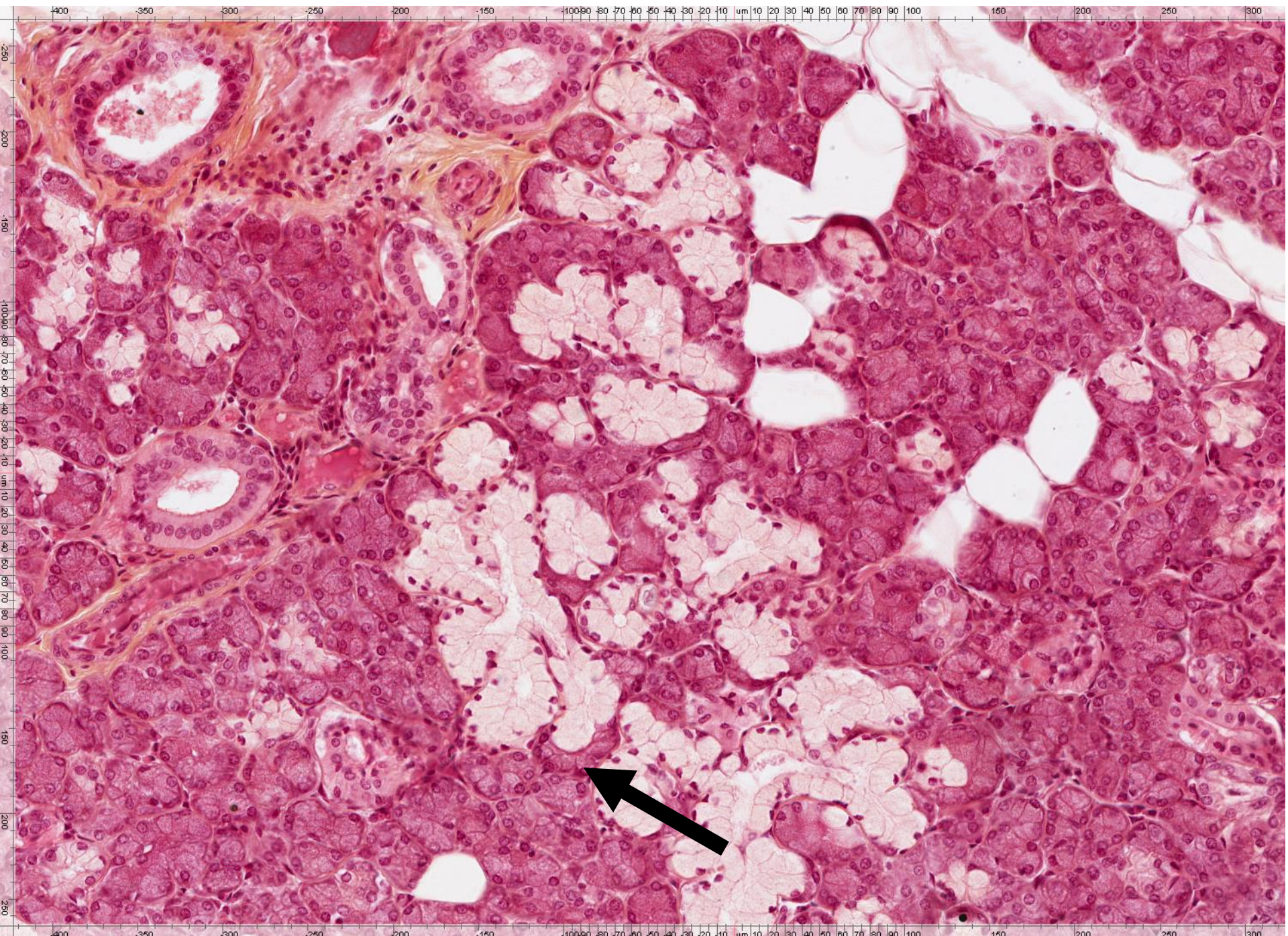


Glandula submandibularis

- **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**



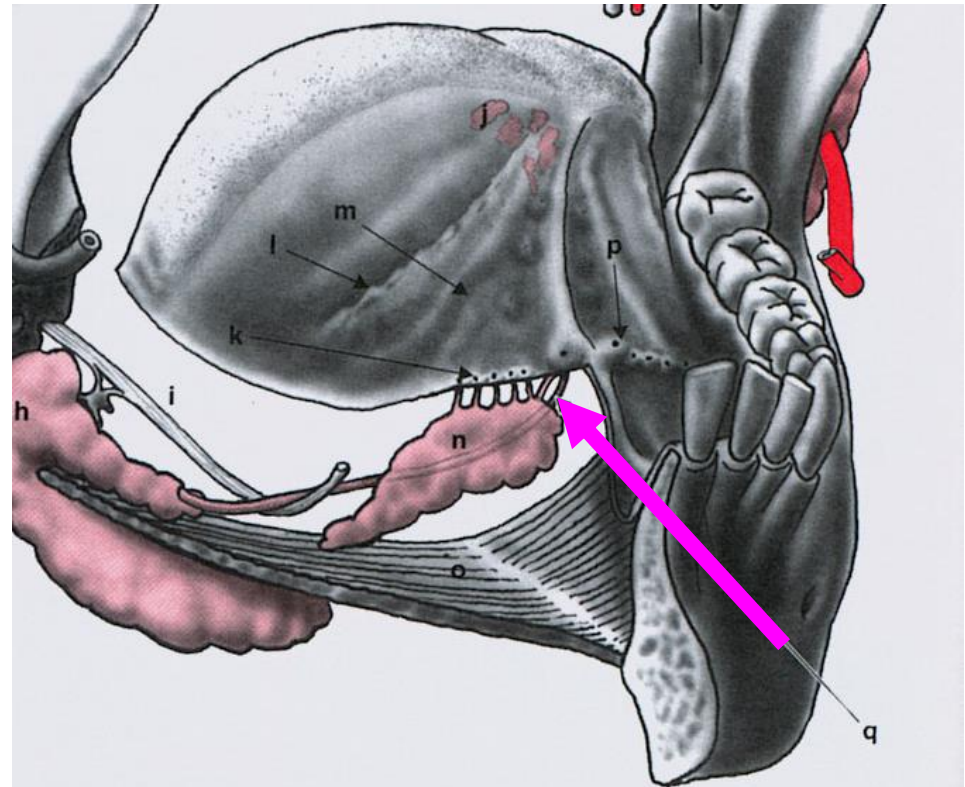


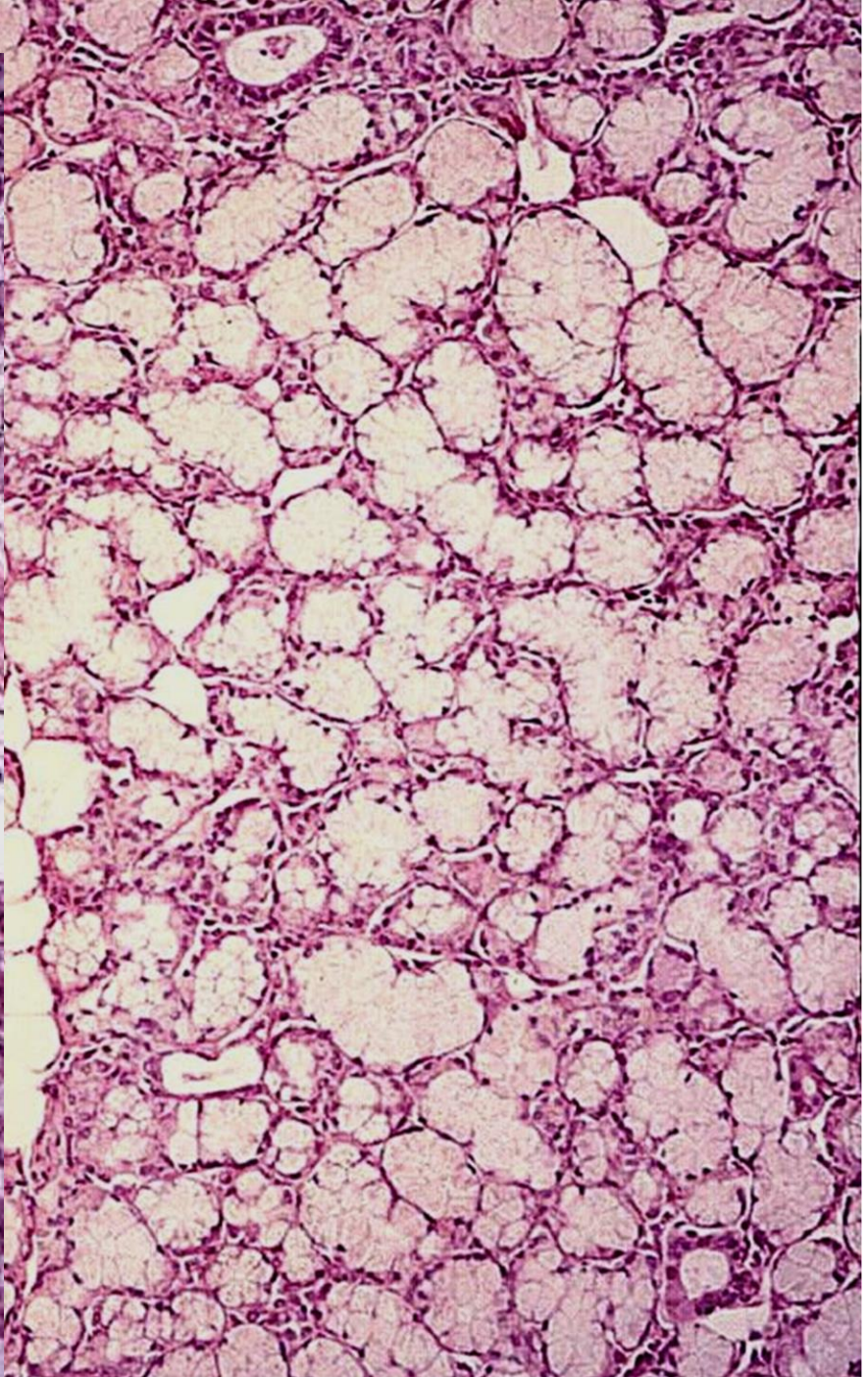
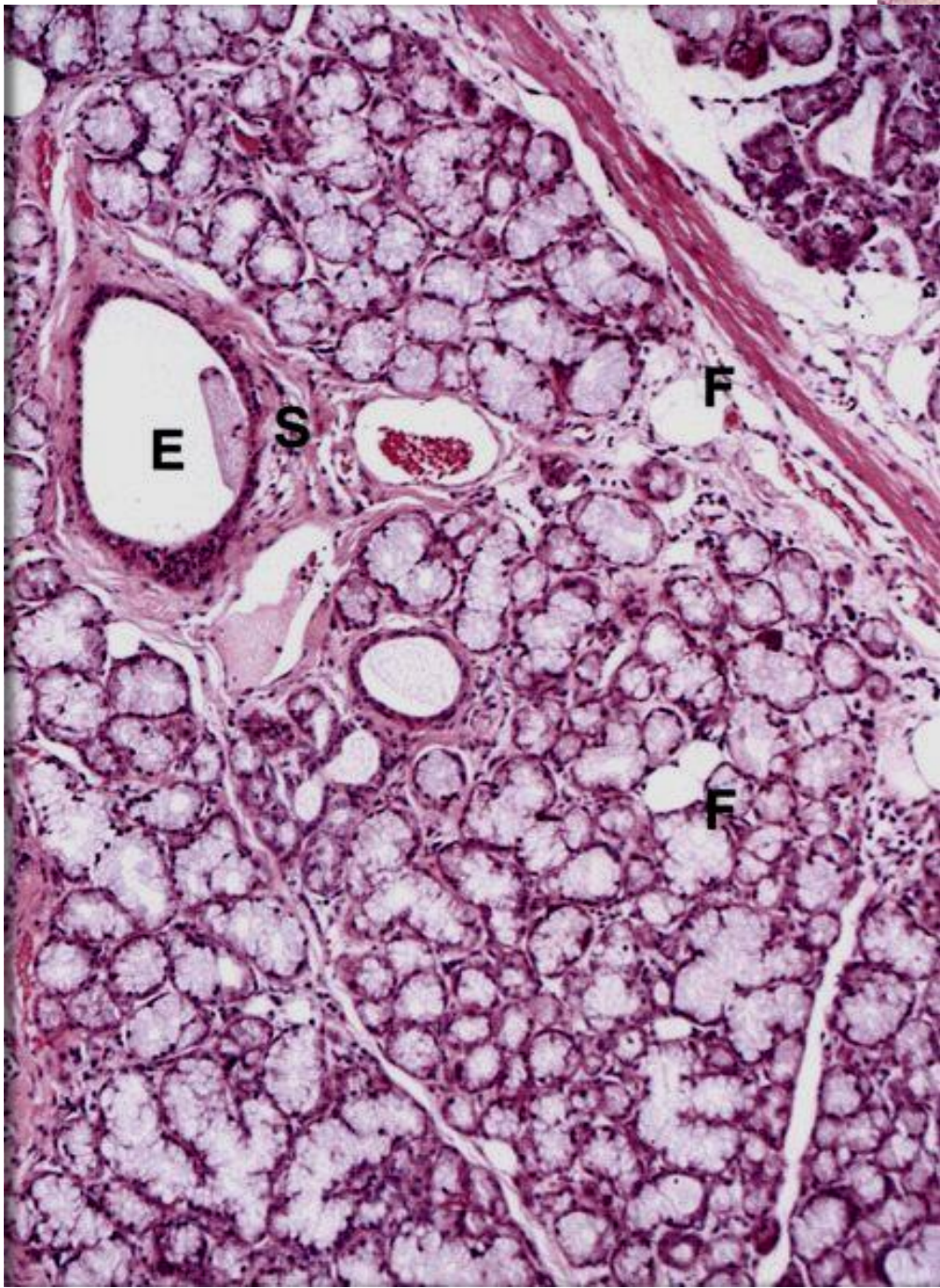


Glandula sublingualis

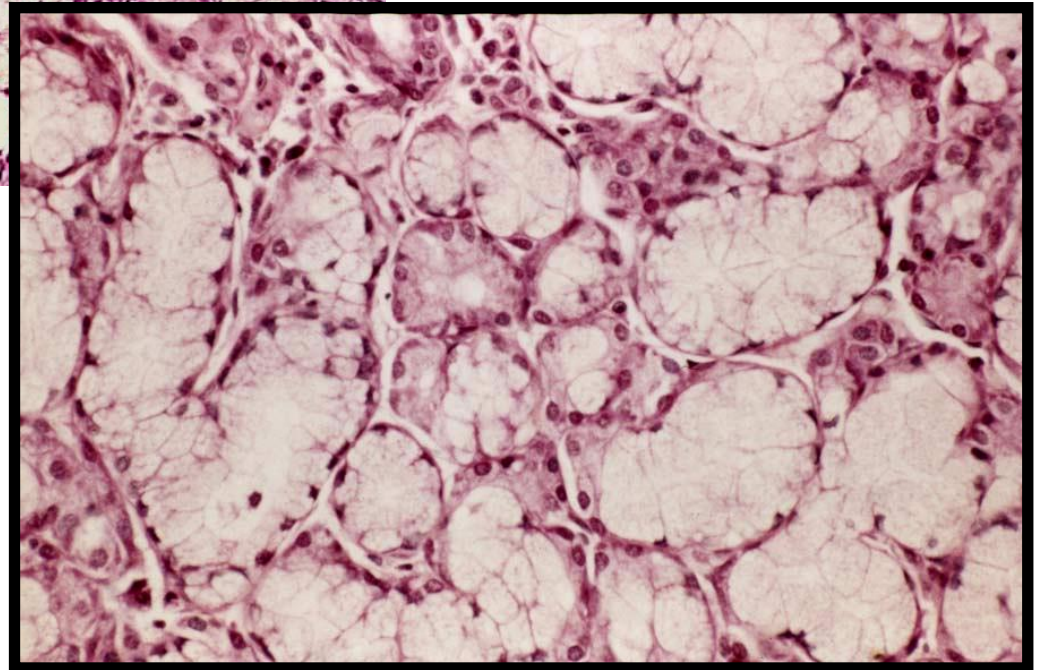
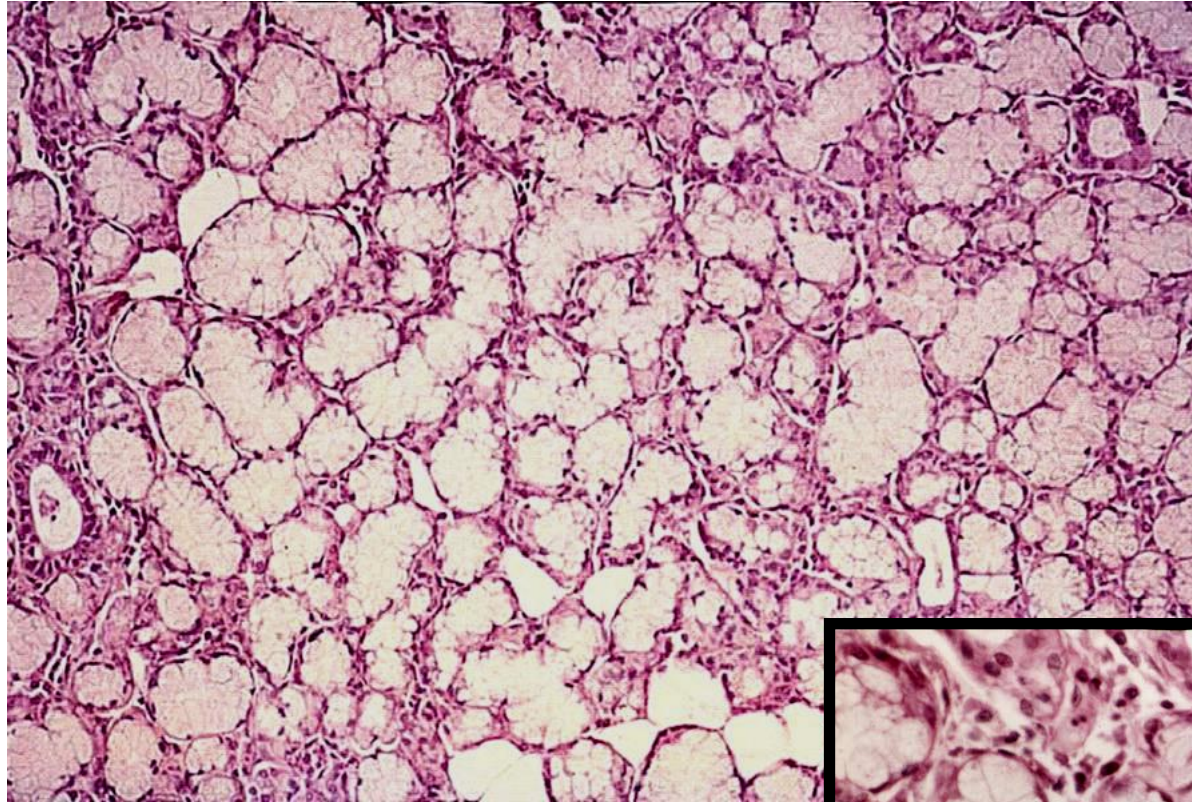
- **MIXED** tuboalveolar gland, predominantly **MUCOUS**
- 2g
- located on the floor of the mouth on mylohyoid muscle near the midline
- Mucinuous tubules, **serous acini are rare**, instead of them: **Gianuzzi demilunes**
- Intercalated ducts are missing, striated ducta are present, but are reduced in number and short

- **ductus sublingualis major** (Bartholini)
- **ductus sublinguales minores** (Rivini) along the crest of the plica sublingualis



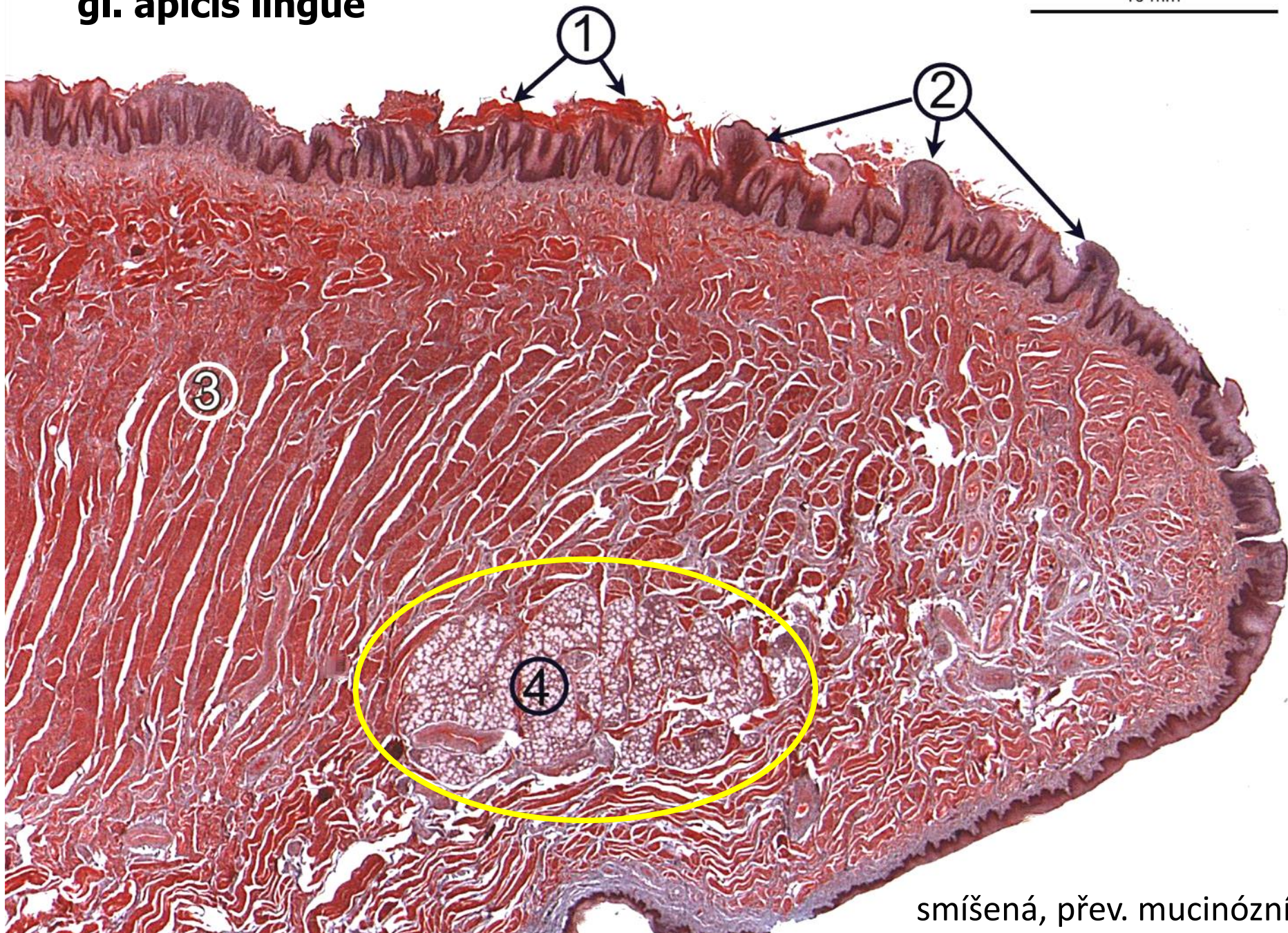


gl. sublingualis

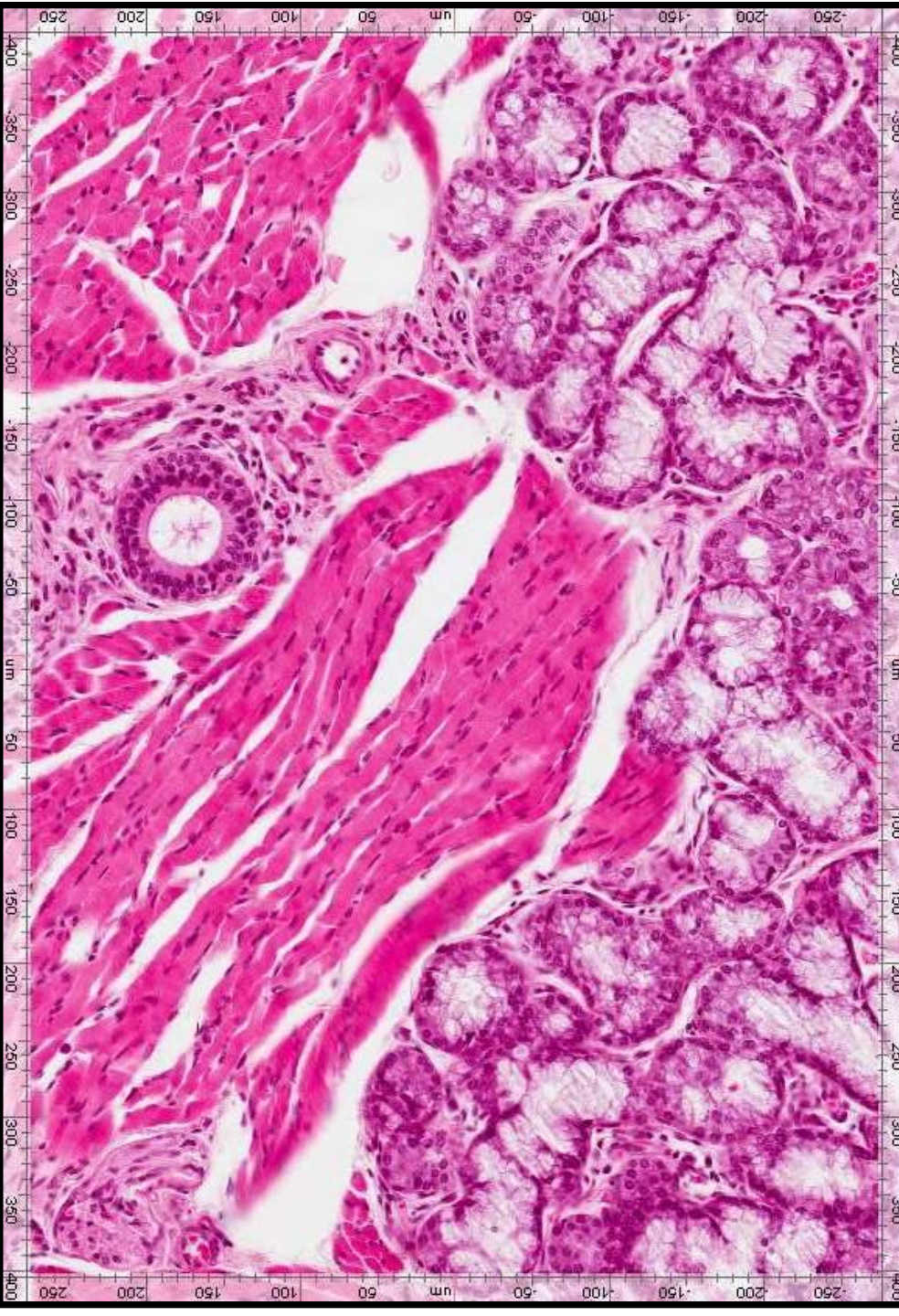
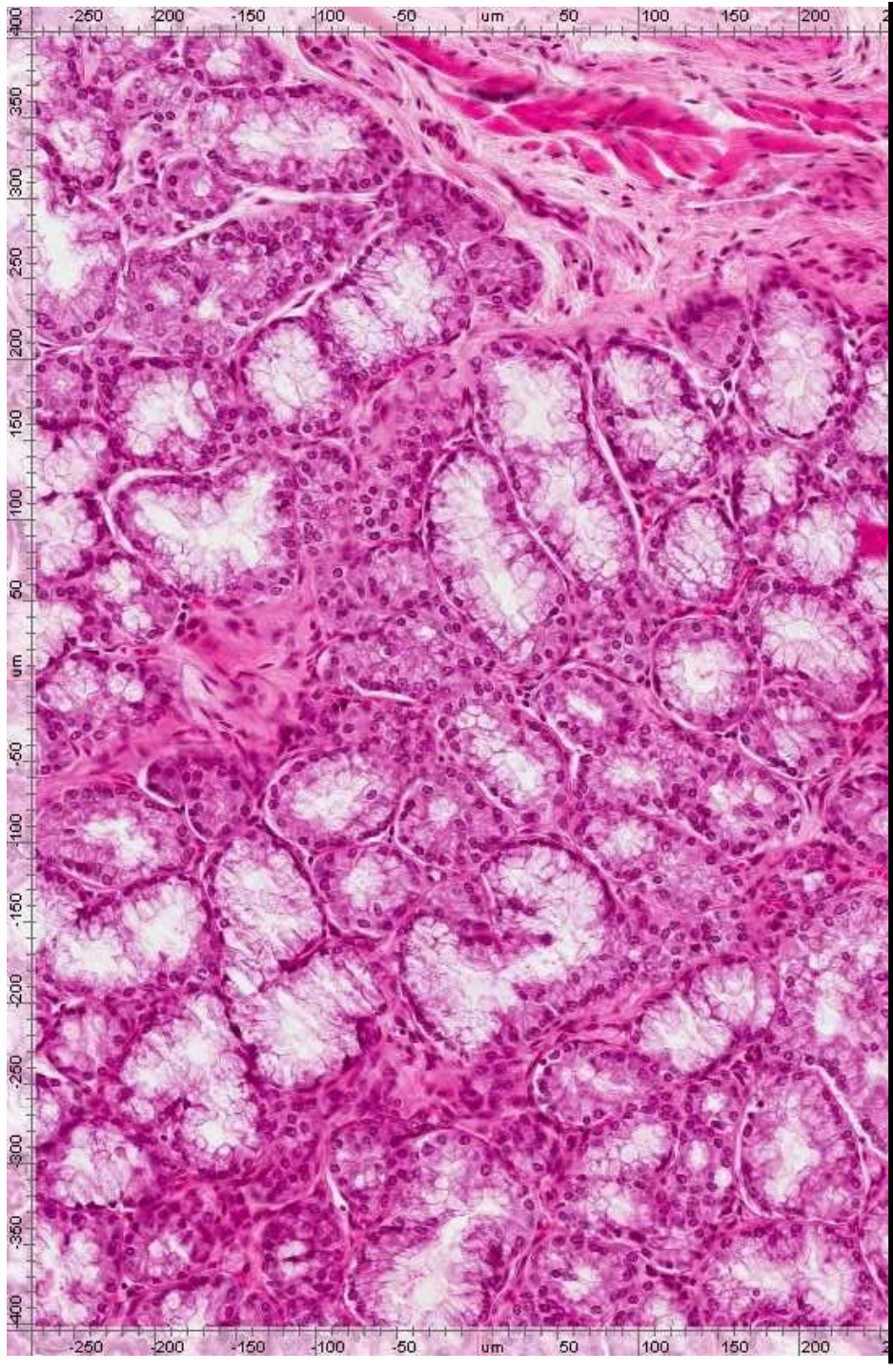


gl. apicis lingue

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
		GL. PAROTIS	serous	MAJOR
Palate	hard	gll. palatinae (glandular zone)	mucinous	minor
	soft	gll. palatinae	mucinous	minor
Tongue	Apex	gl. apicis linguae (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		GL. SUBMANDIBULARIS	mixed, pred. serous	MAJOR
		GL. SUBLINGUALIS	mixed, pred. mucinous	MAJOR

Comparison of the hard tooth tissues (and lamellar bone)

	Enamel	Dentin	Cementum	Lamellar bone
Colour	White (to light blue)	Ivory	Brown-yellow	Brown-yellow
Inorganic (%)	96 (86)	70 (45)	61 (33)	45 (23)
Organic (%)	1 (2)	20 (30)	27 (31)	30 (37)
H₂O (%)	3 (11)	10 (25)	12 (36)	25 (40)
Collagen fibres	NO	YES (perpendicular to the dentinal tubules)	YES (in all directions)	YES (same direction in lamellas)
Cells	Ameloblasts (missing in adults)	Odontoblasts (on the pulpal side of dentin)	Cementoblasts (cementocytes)	Osteoblasts (osteocytes)
Blood vessels	NO	NO	NO	YES (in Haversian canals)
Nerves	NO	YES (on entry of dentinal tubules)	NO	YES (in Haversian canals)

Procedures used to study the microscopic structure of teeth

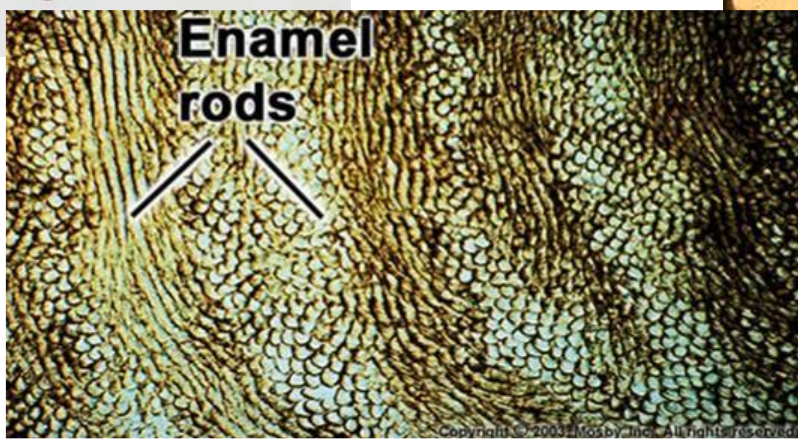
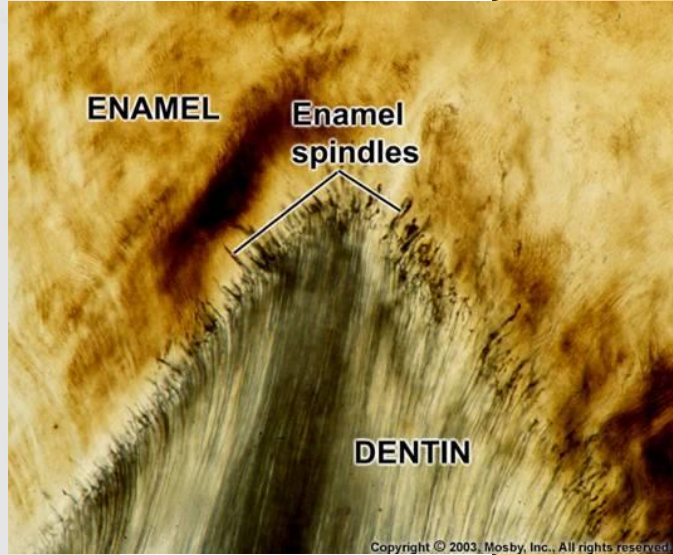
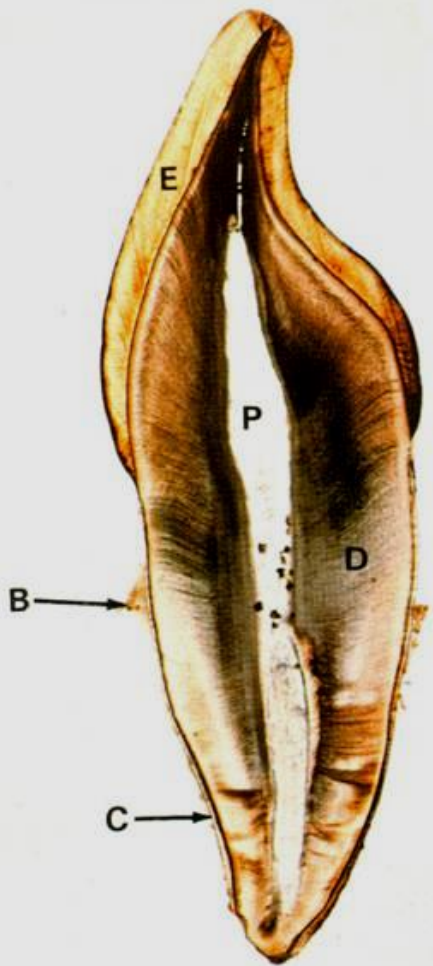
2 basic methods of hard tissue processing are used in **light microscopy**:

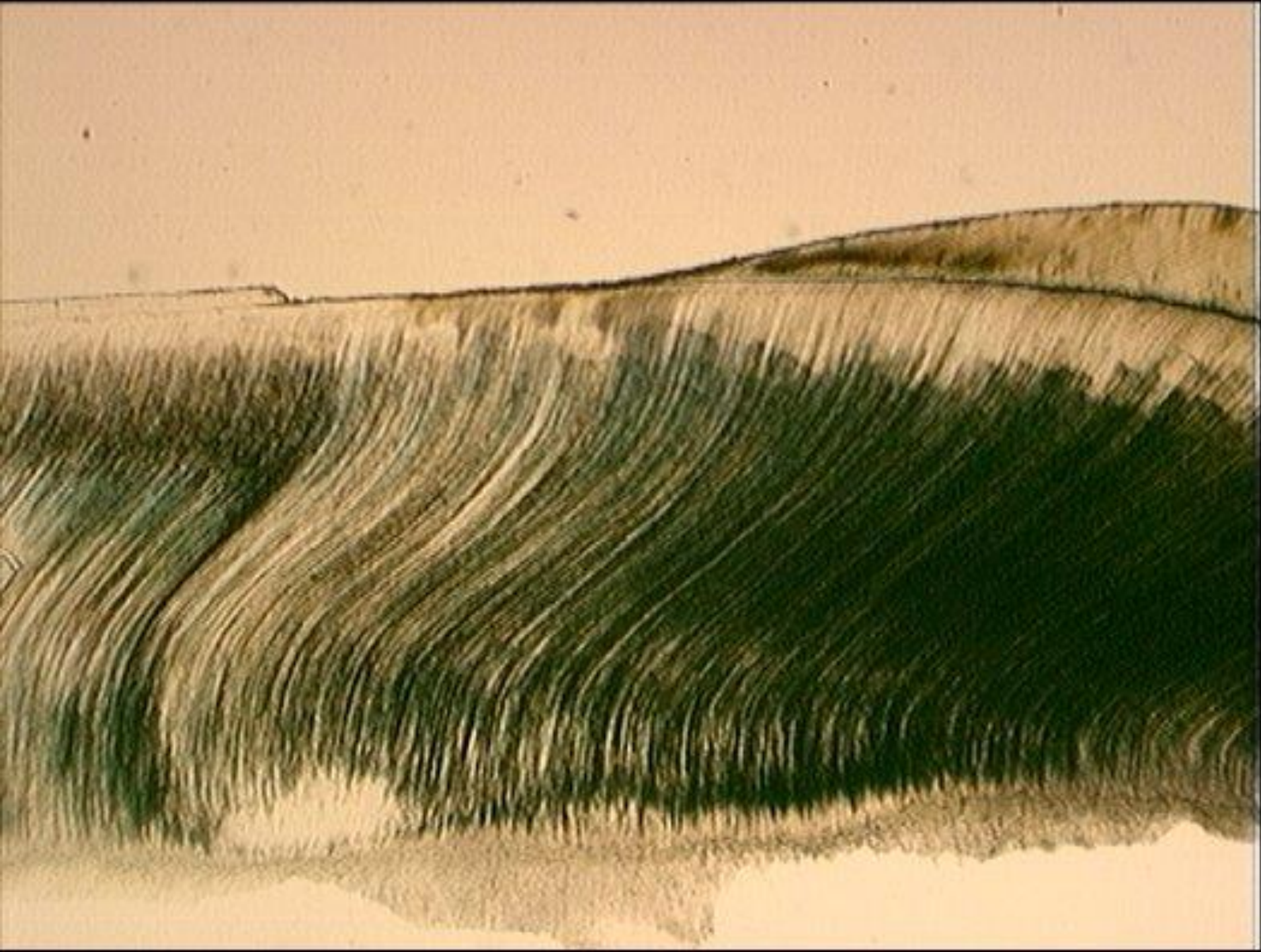
1. **Ground sections**
2. **Decalcified samples (and staining)**

1. Ground sections

50 - 70 μm discs made by grinding







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**

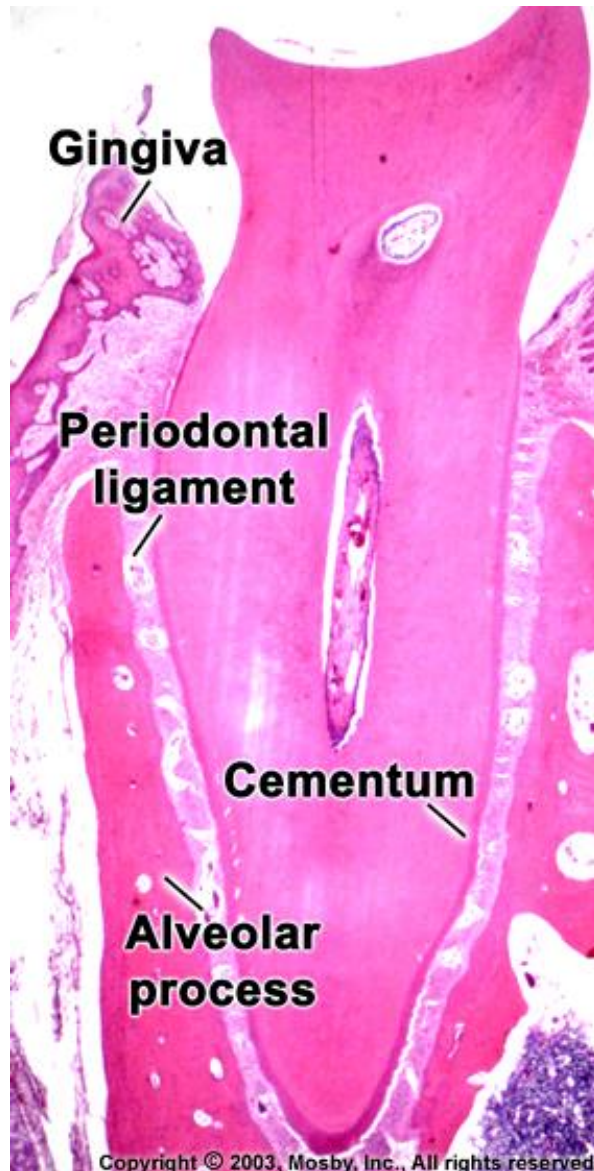
Decalcification agents:

- **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 docalcified tooth

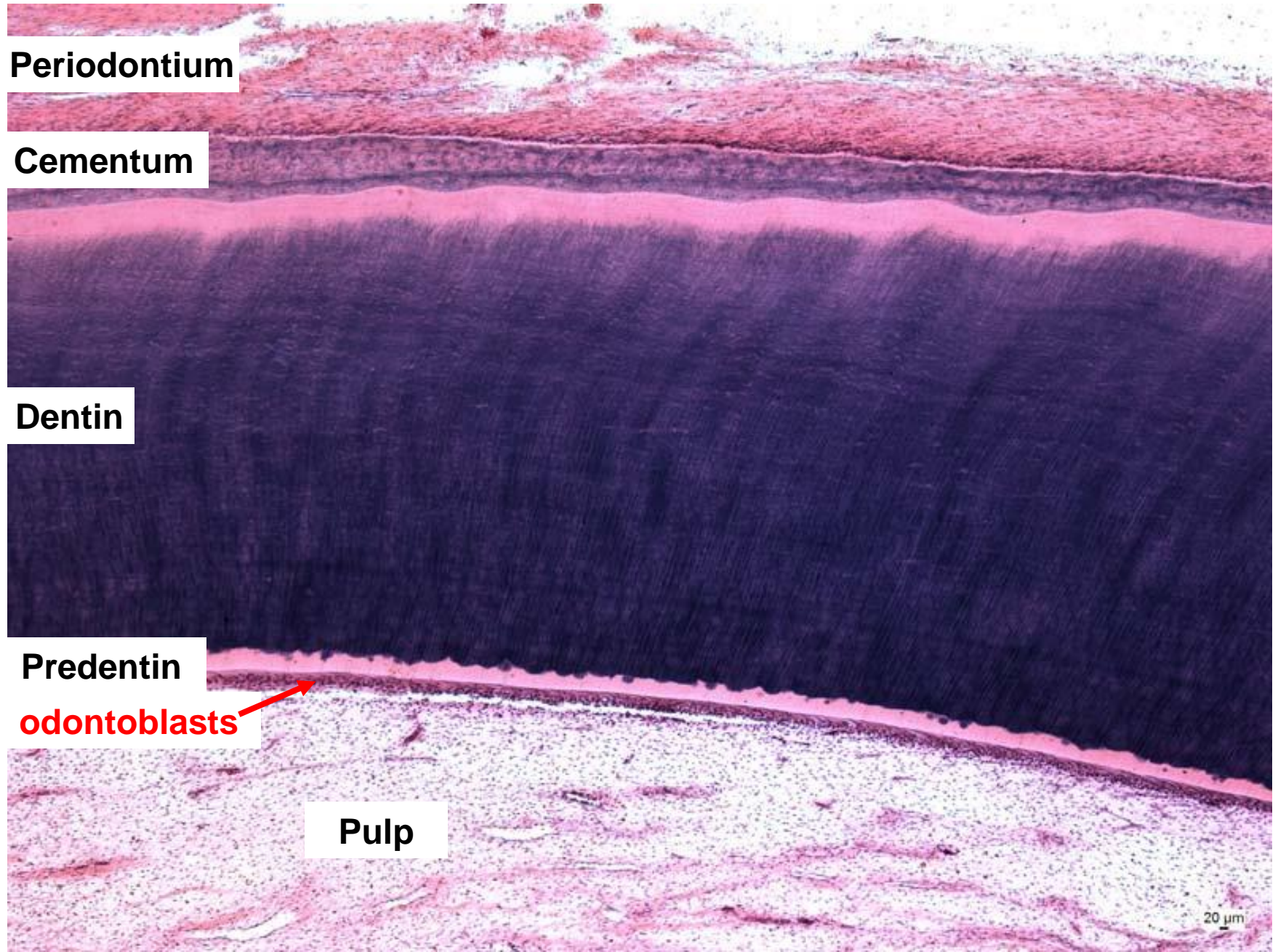


!

Soft tissues are not preserved on ground sections

Enamel is missing on decalcified teeth

Tooth - root





Sulcus gingivalis

Gingiva libera (1)

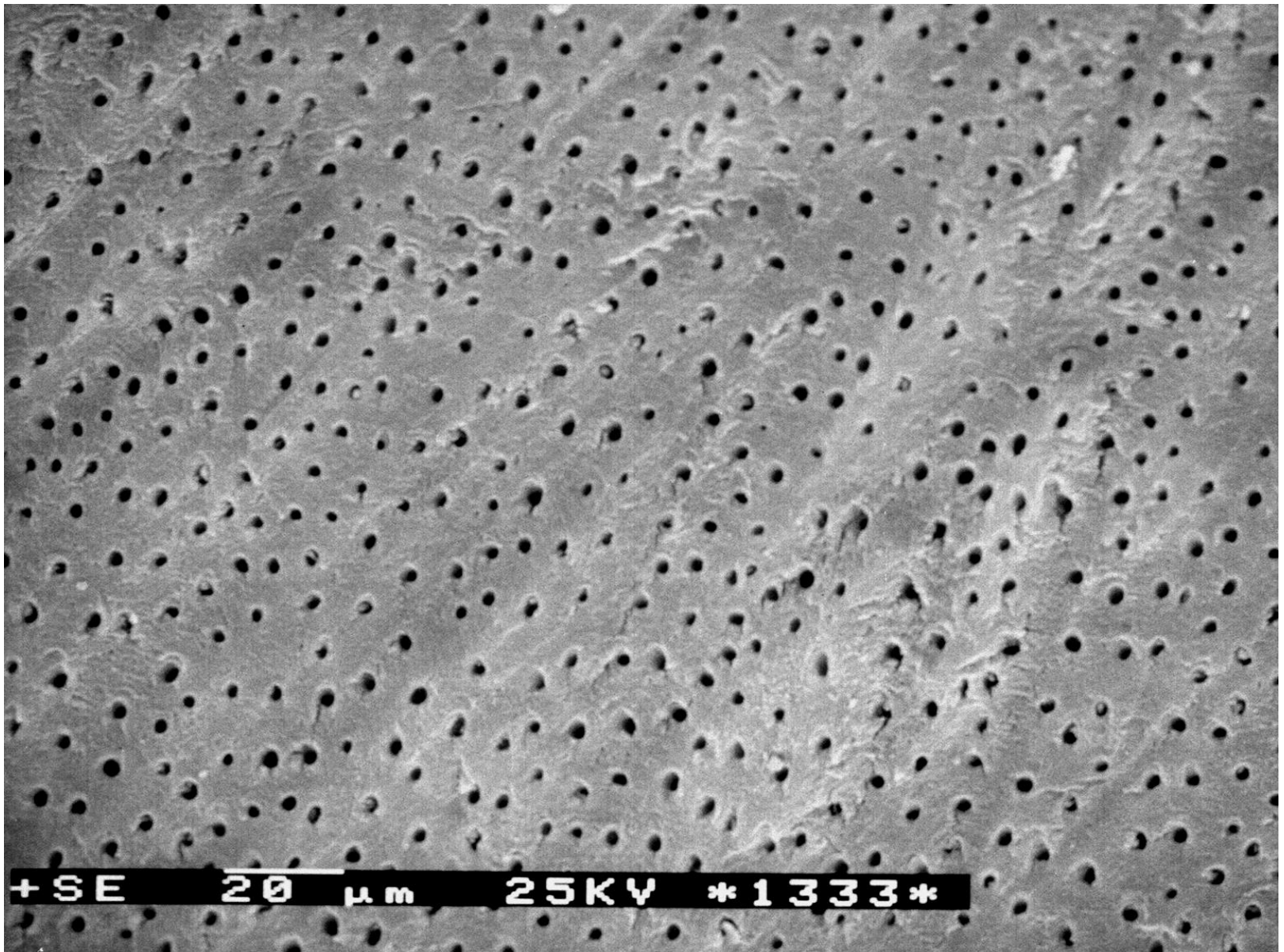
Gingiva affixa (2)



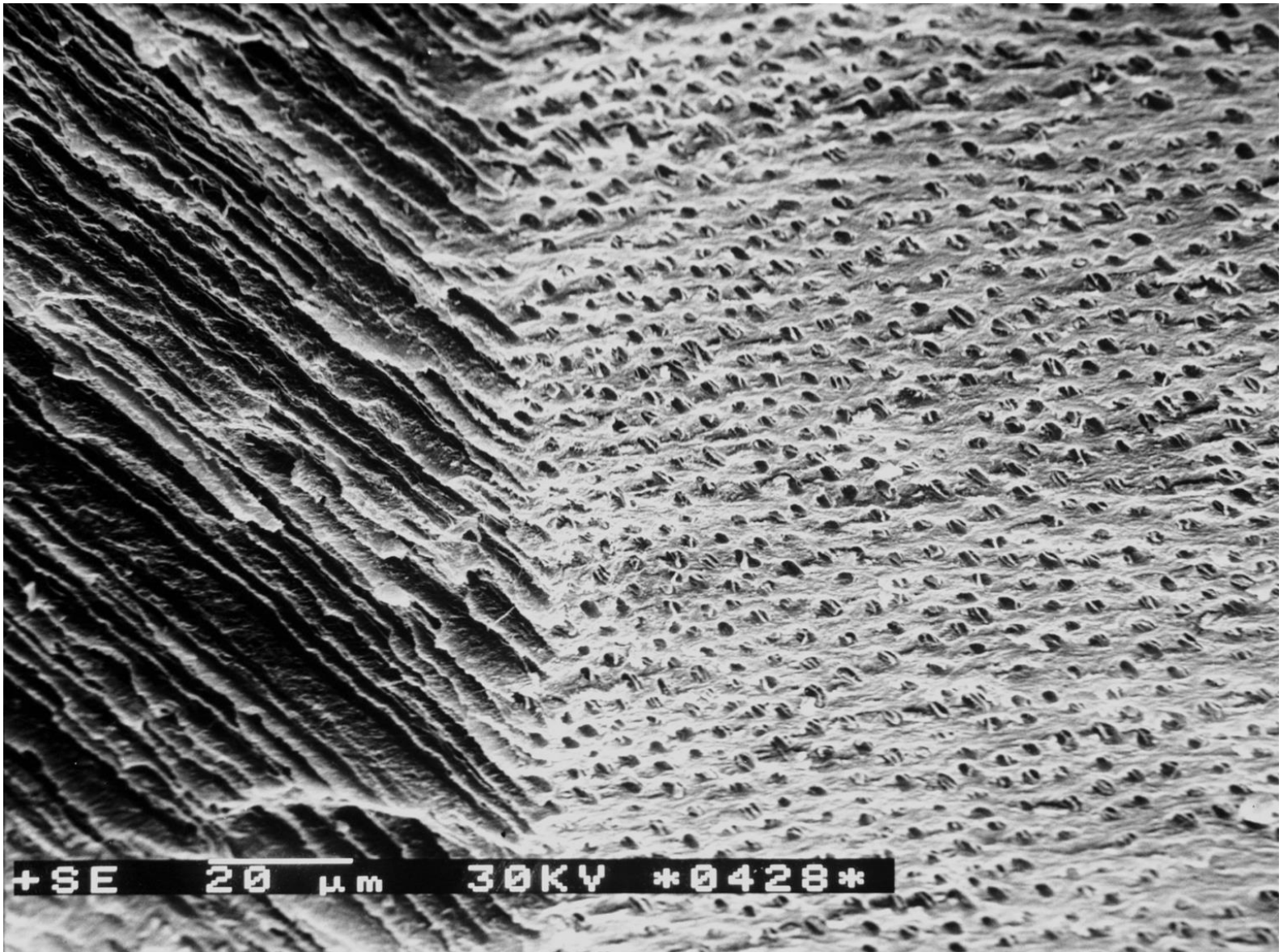
marginal gingiva

attached gingiva

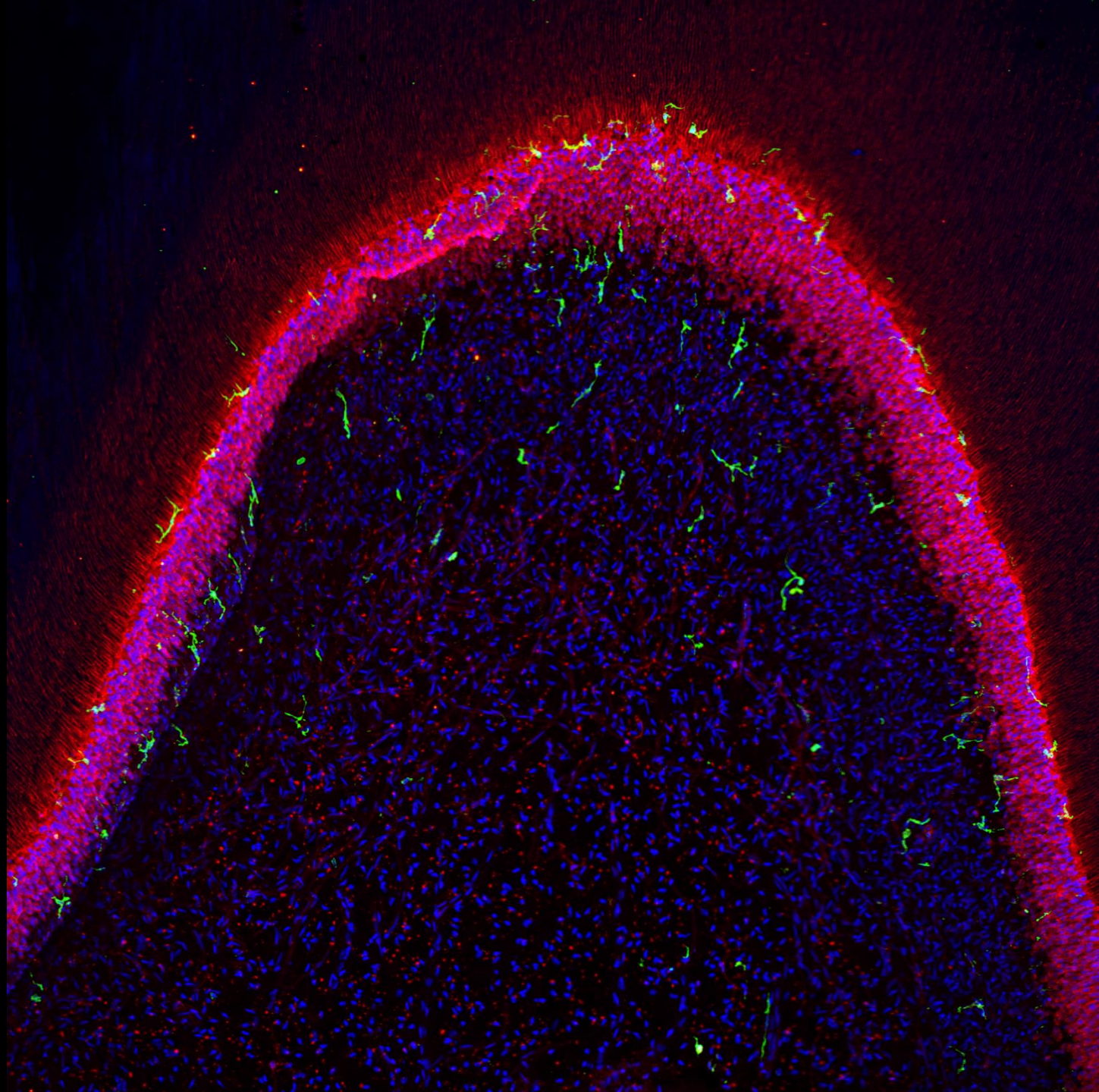
mucosa

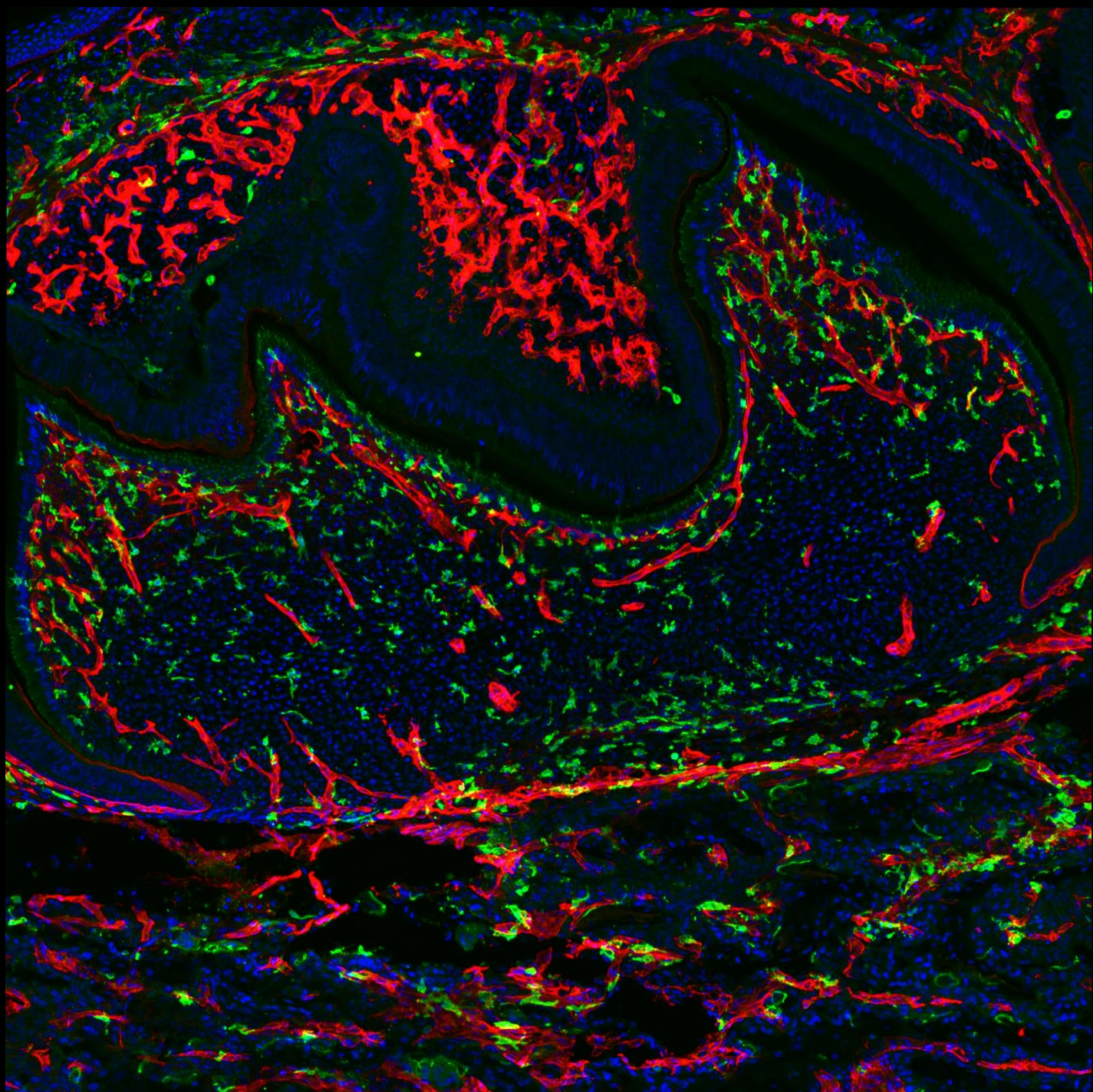


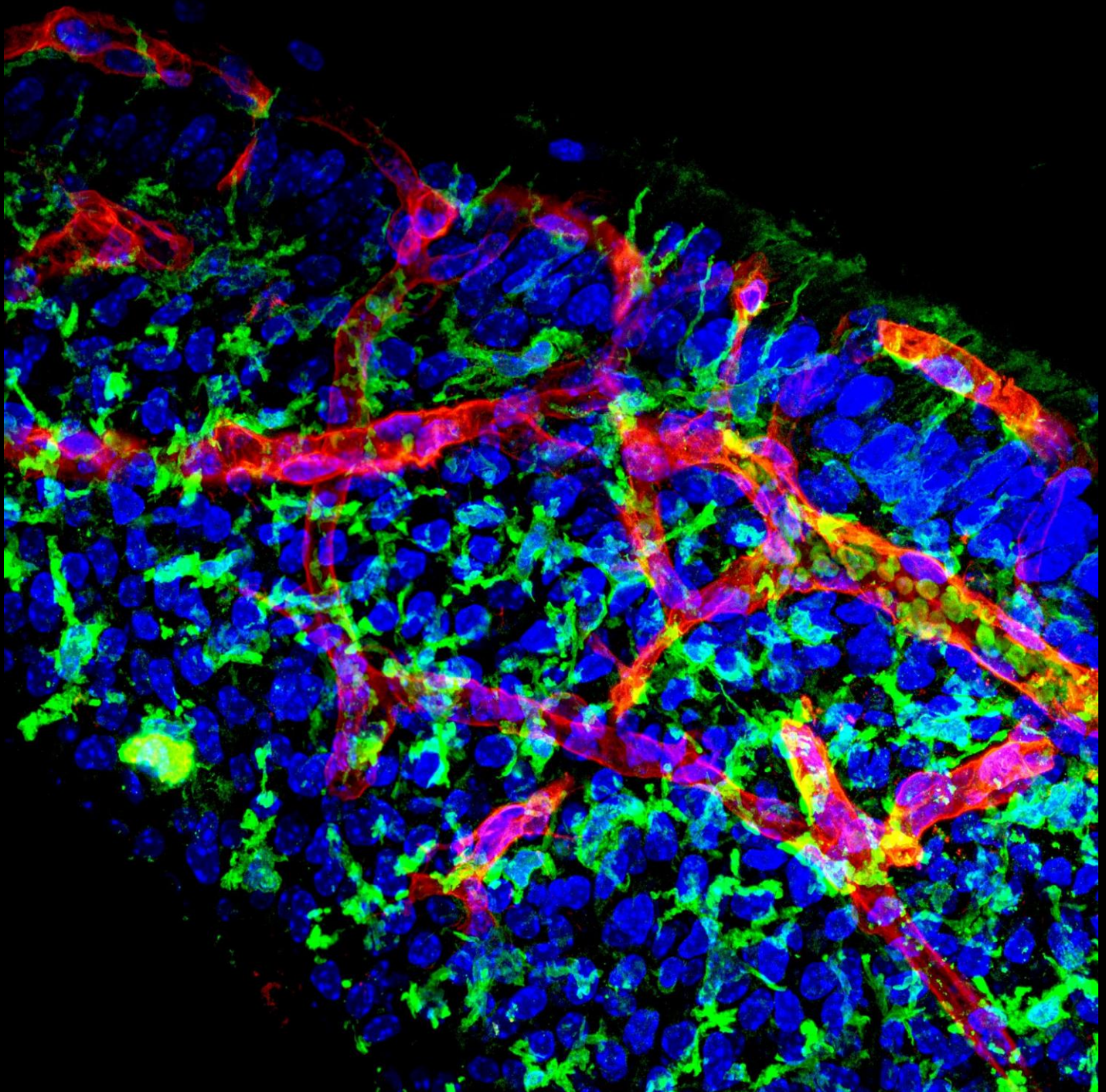
Dentin, SEM, 1 500x



Dentin, SEM, 1 500x







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 linguae (Blandini-Nuhni)	smíšená, přev. mucinózní	malá/ velká
		žlásky Ebnerovy (gll. papillae vallatae)	serózní	malé
		žlásky Weberovy (gll. linguales post.)	mucinózní	malé
Dno dutiny ústní		GL. SUBMANDIBULARIS	smíšená, přev. serózní	VELKÁ
		GL. SUBLINGUALIS	smíšená, přev. mucinózní	VELKÁ