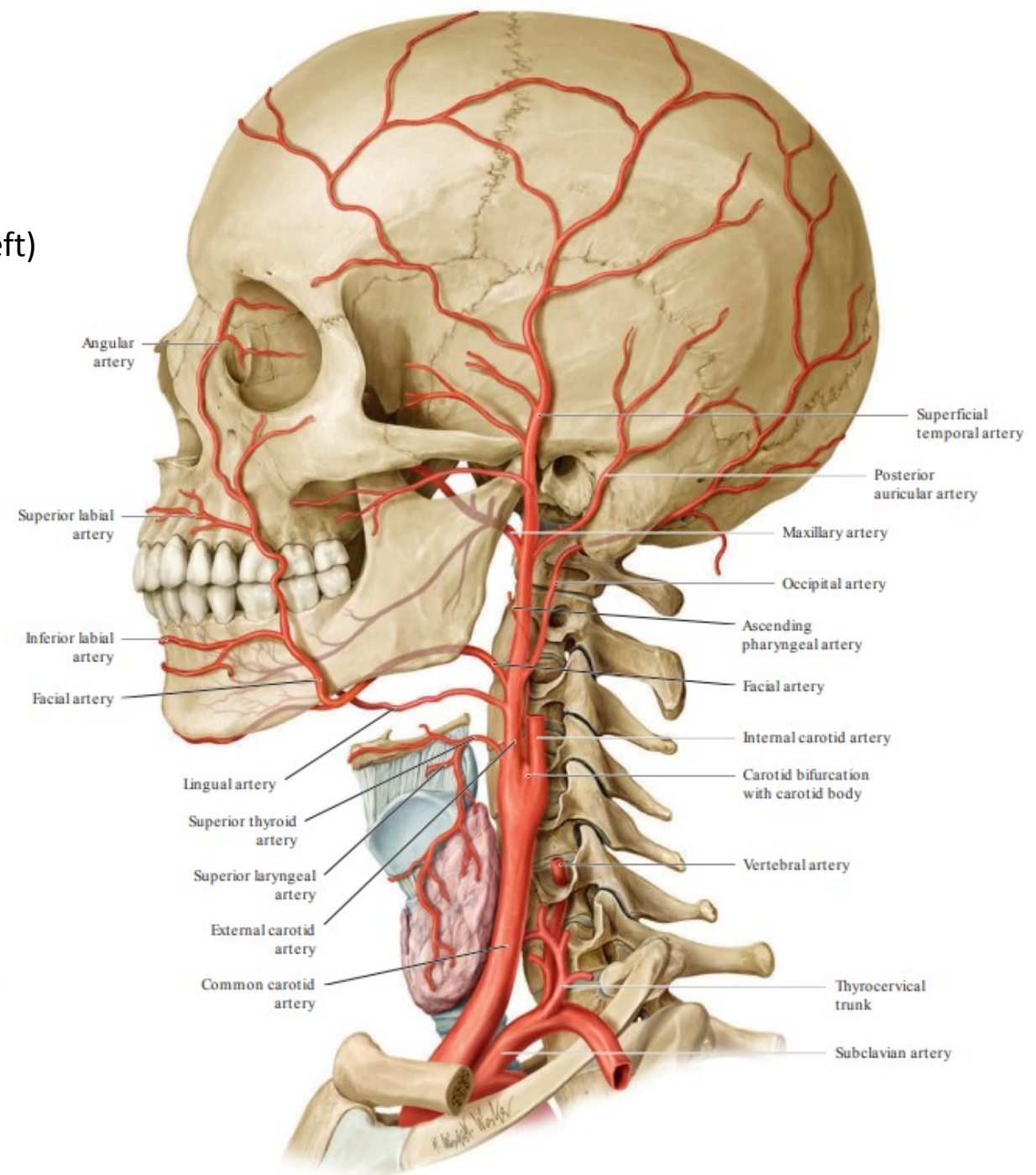
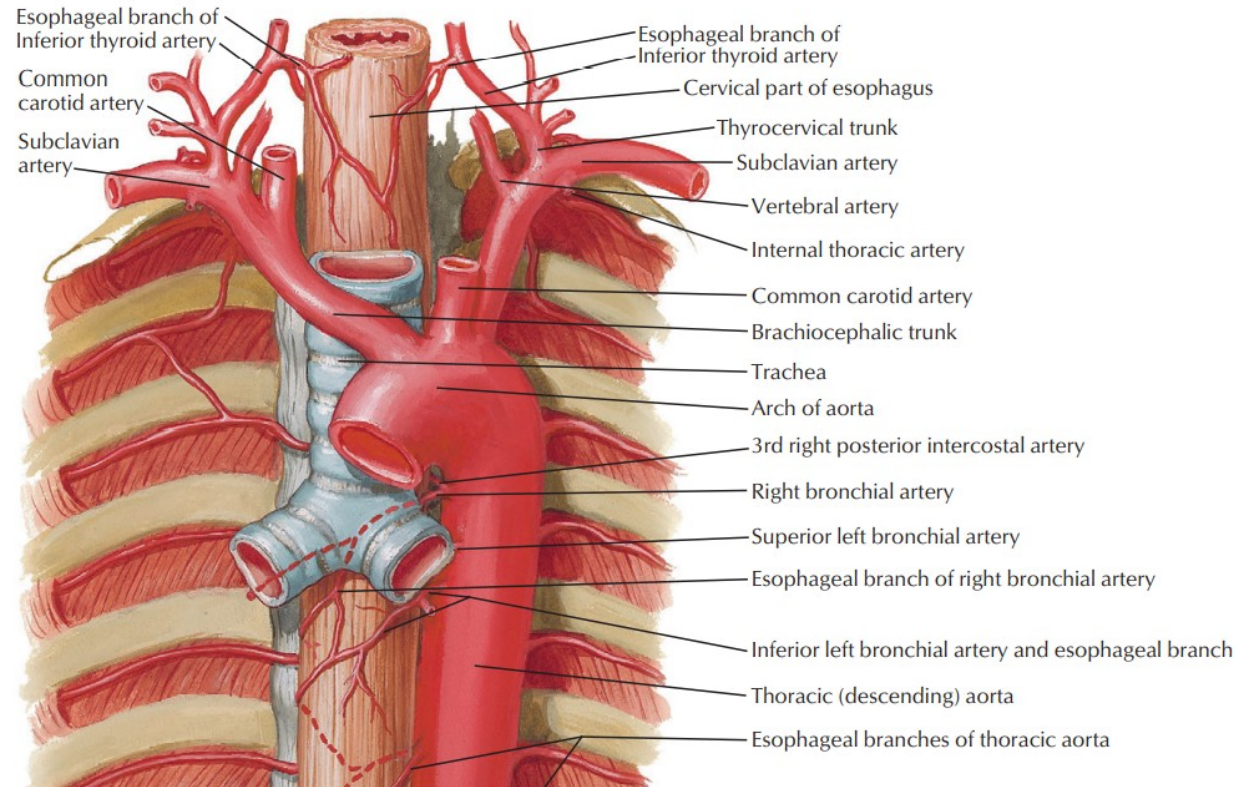
A microscopic image of a plant stem cross-section, showing a central vascular cylinder with several vascular bundles. Each bundle contains a primary xylem, a vascular cambium, and a primary phloem. The surrounding tissue consists of cortical cells and a pith. The image is stained with a blue dye, likely toluidine blue, which highlights the cell walls and the structure of the vascular bundles.

Clinical anatomy of head and neck vessels, Lymphatic drainage

MUDr. Erik Kročka

COMMON CAROTID ARTERY

- main artery of head and bigger part of the brain
- most often branch of brachiocephalic trunk (right) and aortic arch (left)
- without branches usually



The carotid bifurcation → side predilection of an atherosclerosis

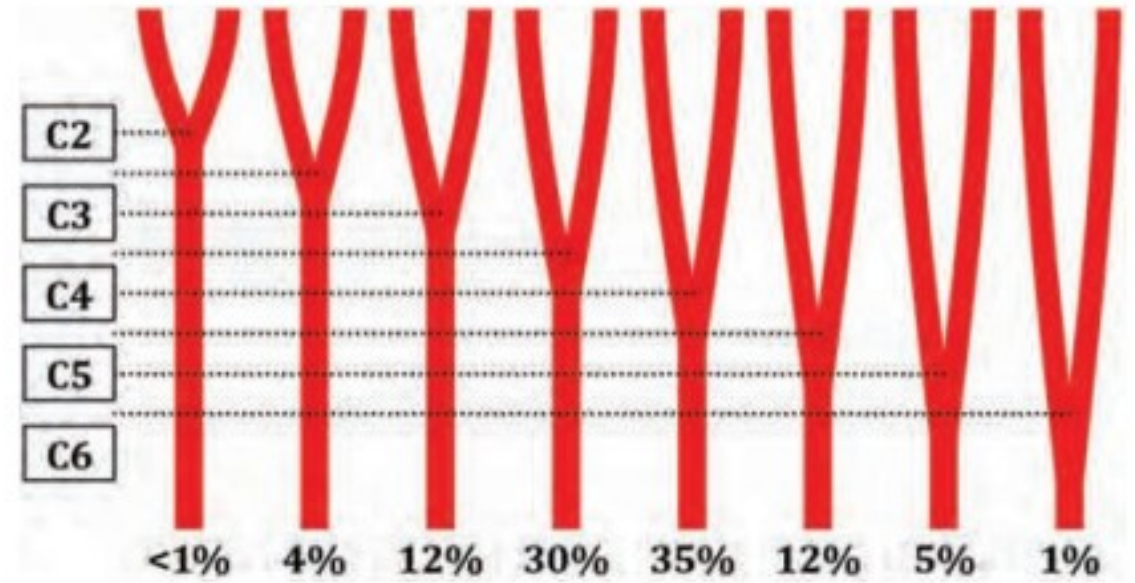
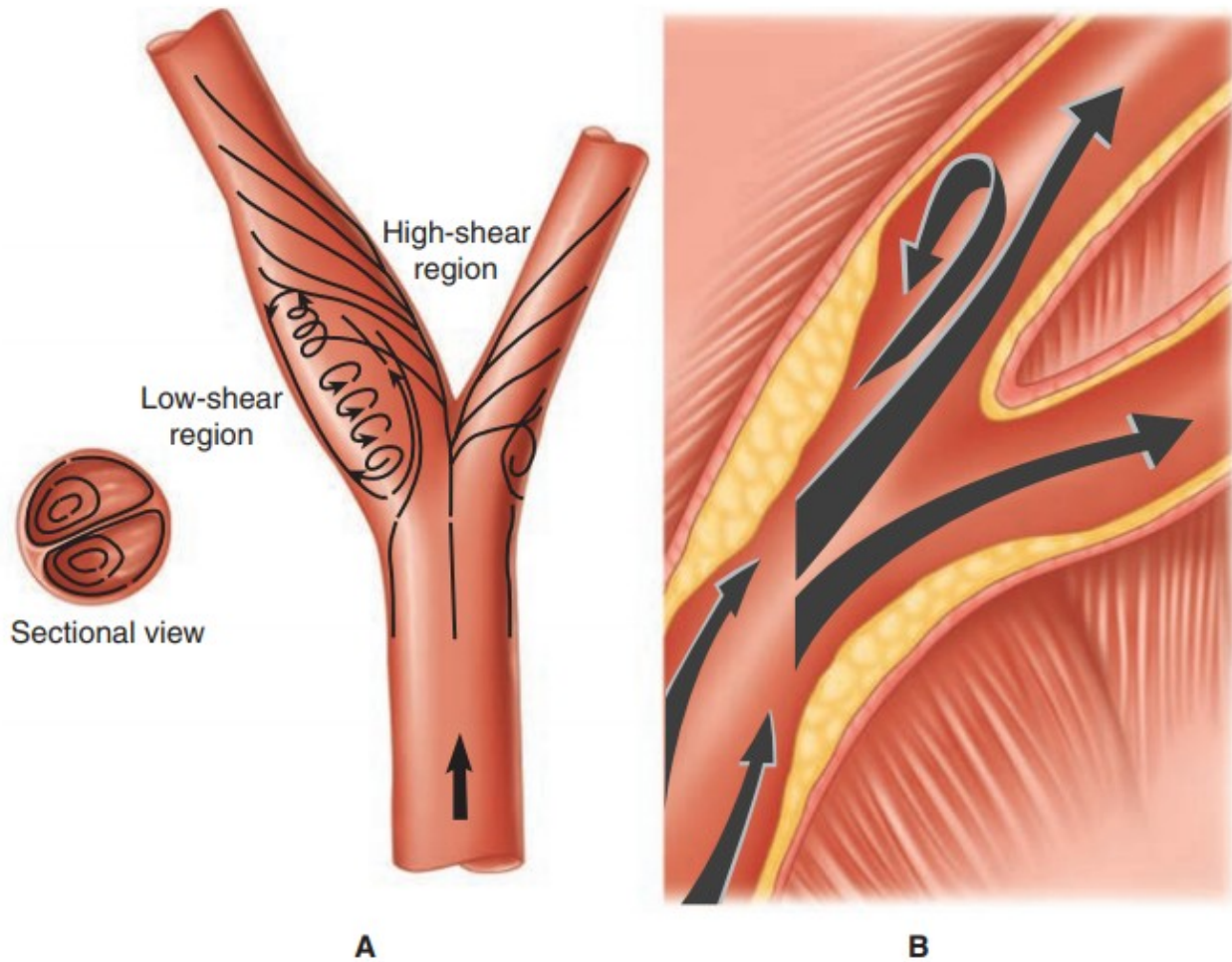


Figure 47.1 Illustration showing the bifurcation of the common carotid artery.

Figure 23-14. **A.** The carotid bifurcation is an area of low flow velocity and low shear stress. As the blood circulates through the carotid bifurcation, there is separation of flow into the low-resistance internal carotid artery and the high-resistance external carotid artery. **B.** The carotid atherosclerotic plaque typically forms in the outer wall opposite to the flow divider due in part to the effect of the low shear stress region, which also creates a transient reversal of flow during the cardiac cycle.

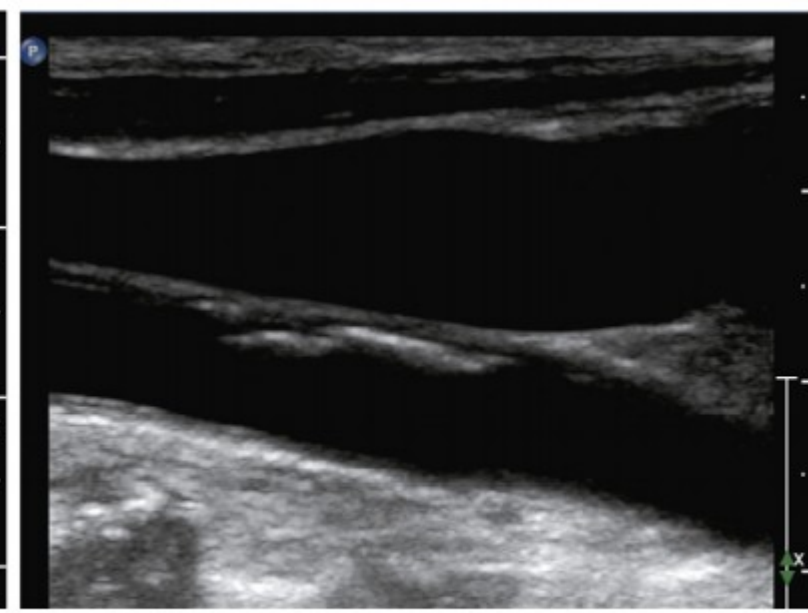
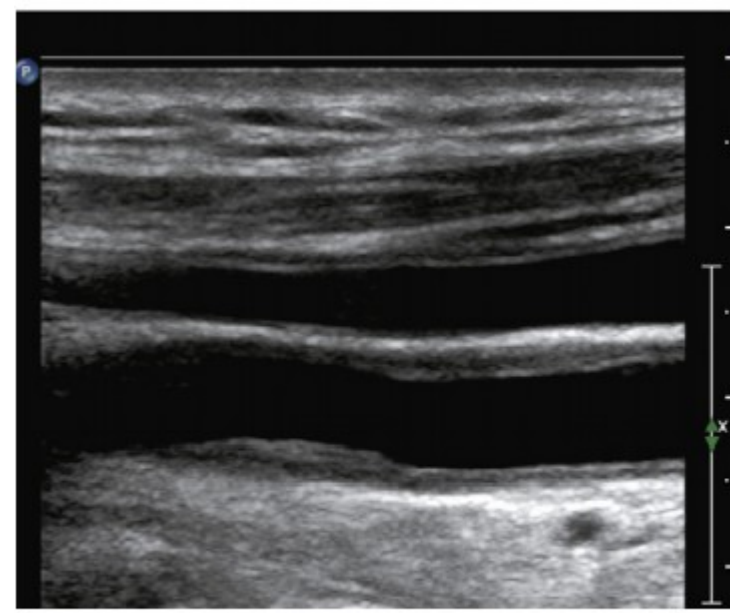
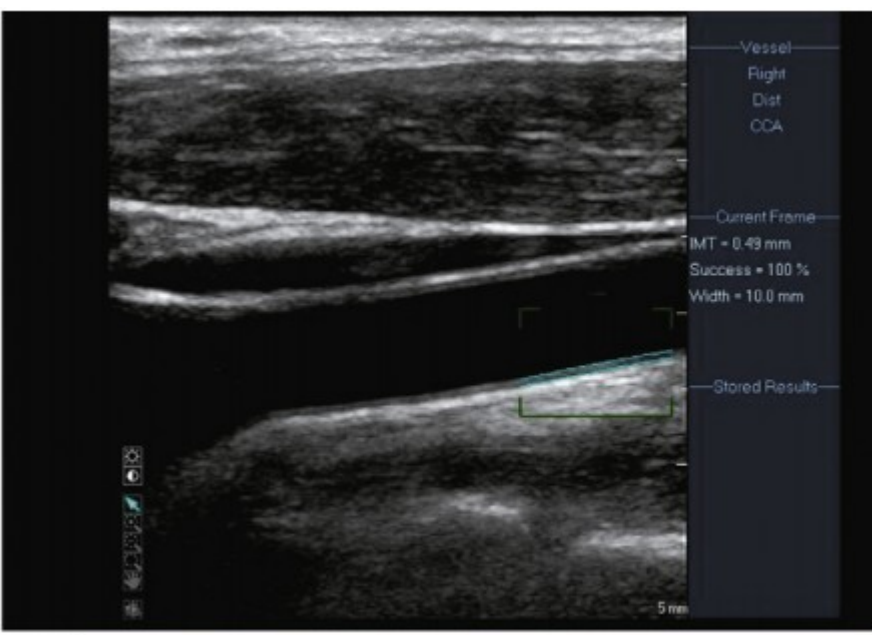
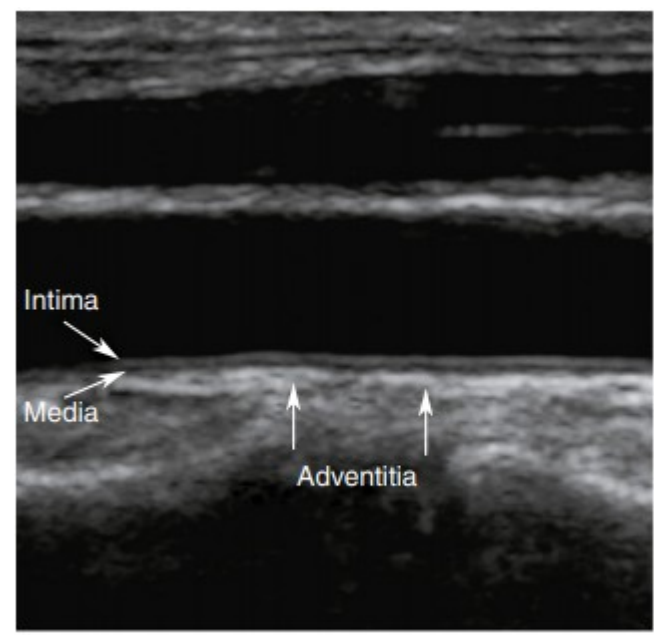
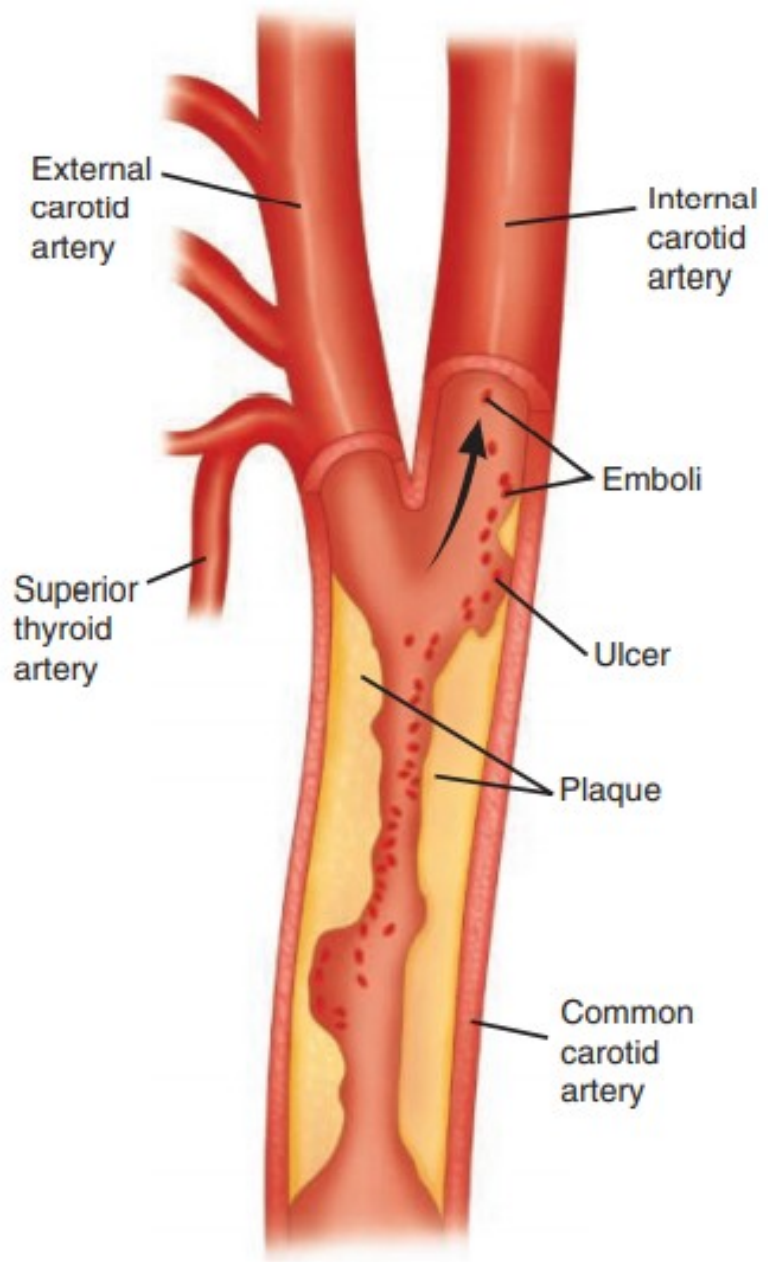


FIGURE 5-2 Normal intima-media thickness (IMT) appearance (*top left*), IMT measurement example (*top right*), fatty streak (*bottom left*), and a homogenous hyperechoic nonstenosing plaque (*bottom right*).

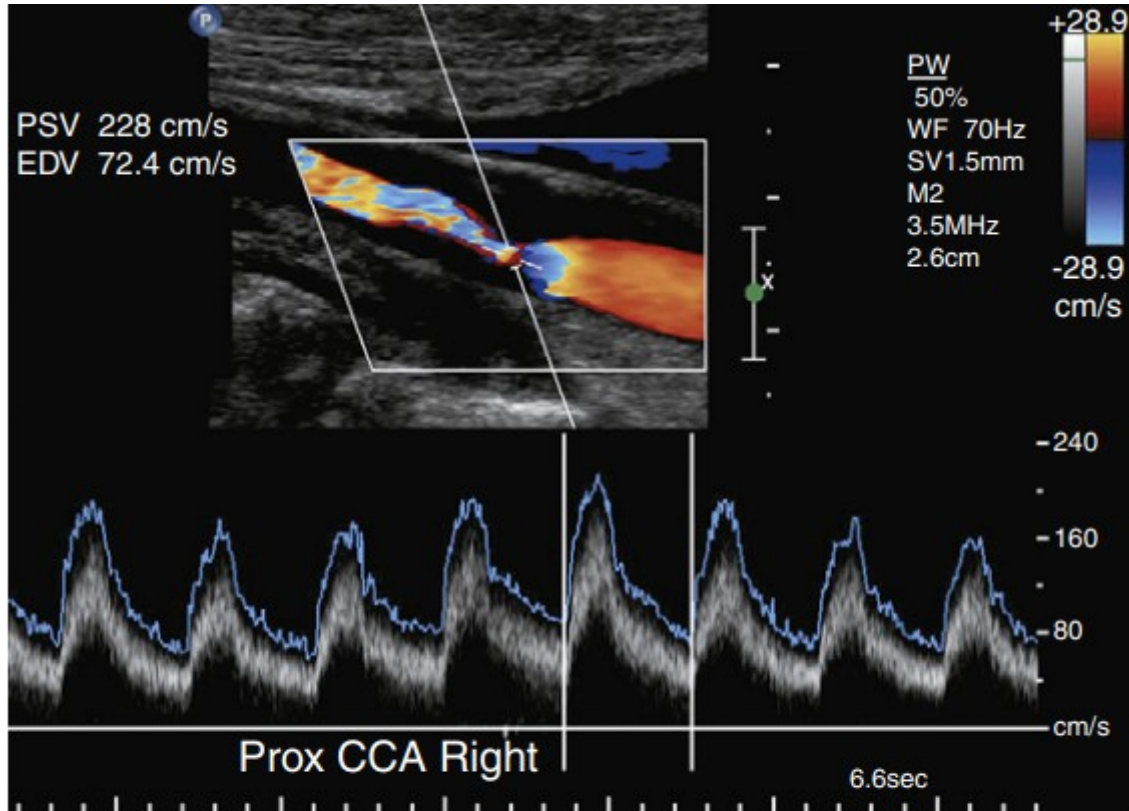


FIGURE 5-6 Hypoechoic (echolucent) plaque causing a significant internal carotid artery stenosis. Note the Doppler velocity tracing with a narrow spectral window, indicating that the sample site is at the point of maximal narrowing.

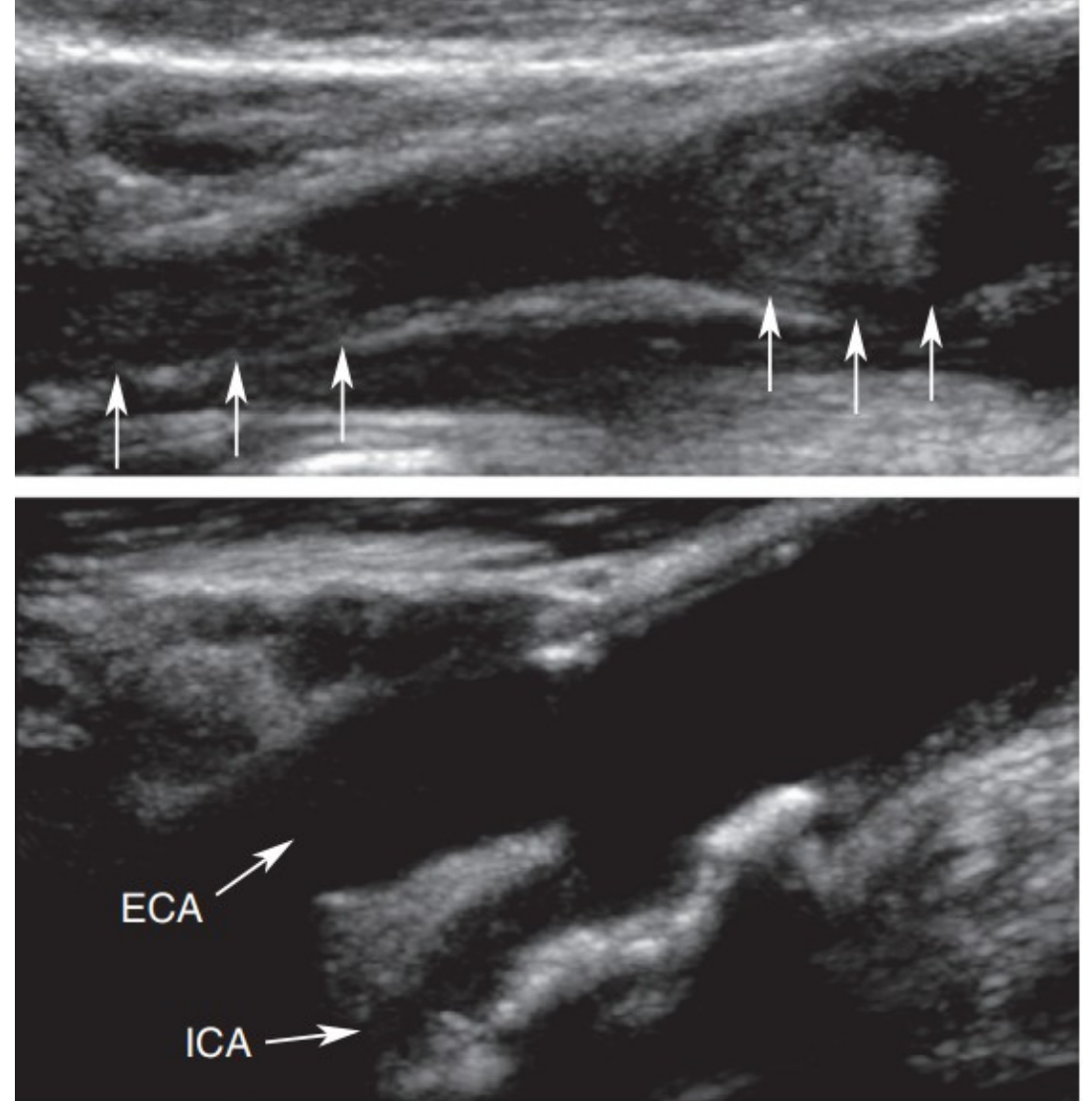


FIGURE 5-8 Acute (*top*) thromboembolic internal carotid artery (ICA) occlusion. Note intima-media thickness preservation between mixed echogenic parts of a thrombus (*arrows*), and normal ICA lumen size. Chronic (*bottom*) ICA occlusion with vessel collapse and fibrosis. ECA, external carotid artery.

CAROTID ENDARTERECTOMY

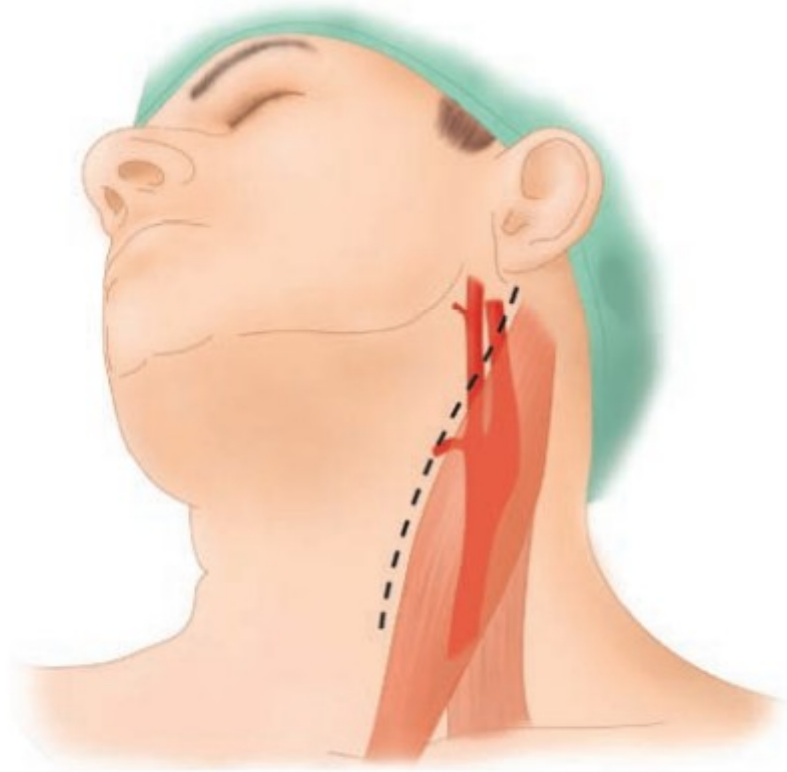


Figure 23-17. To perform carotid endarterectomy, the patient's neck is slightly hyperextended and turned to the contralateral side. An oblique incision is made along the anterior border of the sternocleidomastoid muscle centered on top of the carotid bifurcation.

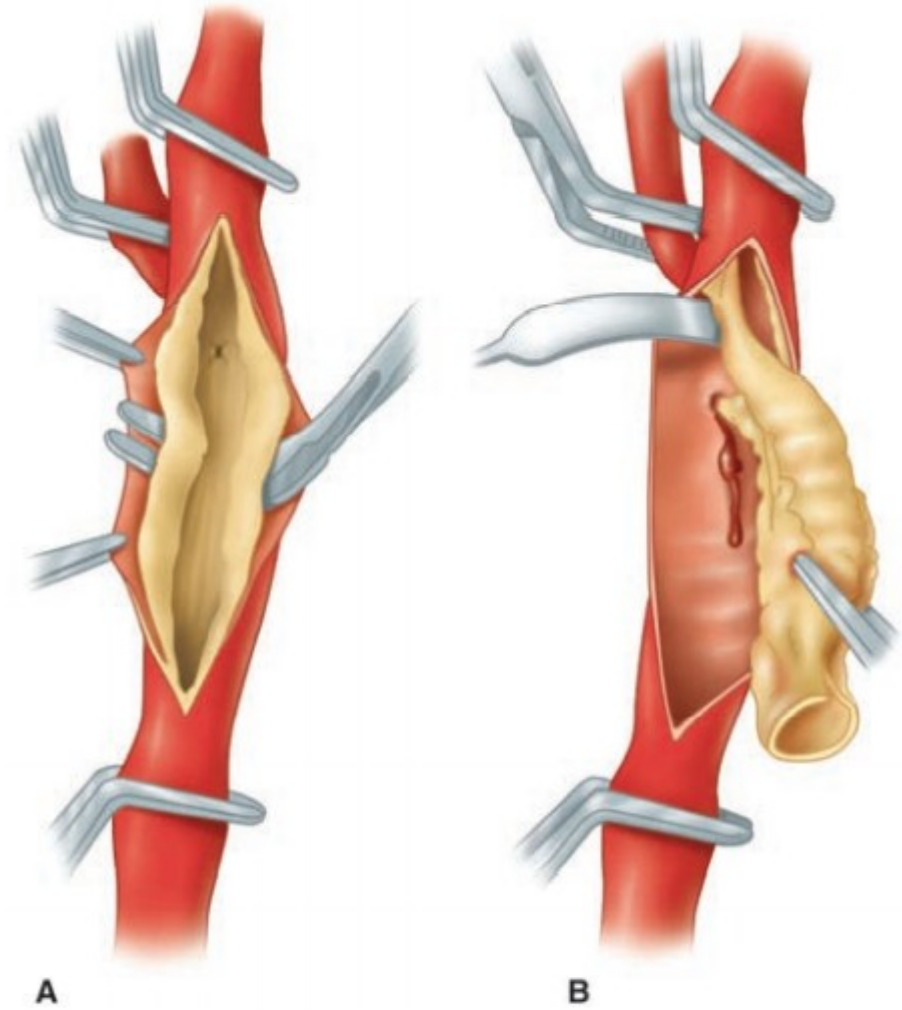


Figure 23-18. **A.** During carotid endarterectomy, vascular clamps are applied in the common carotid, external carotid, and internal carotid arteries. Carotid plaque is elevated from the carotid lumen. **B.** Carotid plaque is removed, and the arteriotomy is closed either primarily or with a patch angioplasty.

INTERNAL CAROTID ARTERY

Petrous segment

Caroticotympanic arteries

Cavernous segment

Tentorial basal branch

Tentorial marginal branch

Meningeal branch

Branches to nerves

Branches to trigeminal ganglion

Capsular branches (cavernous sinus)

Inferior hypophyseal artery

Cerebral segment

Superior hypophyseal artery

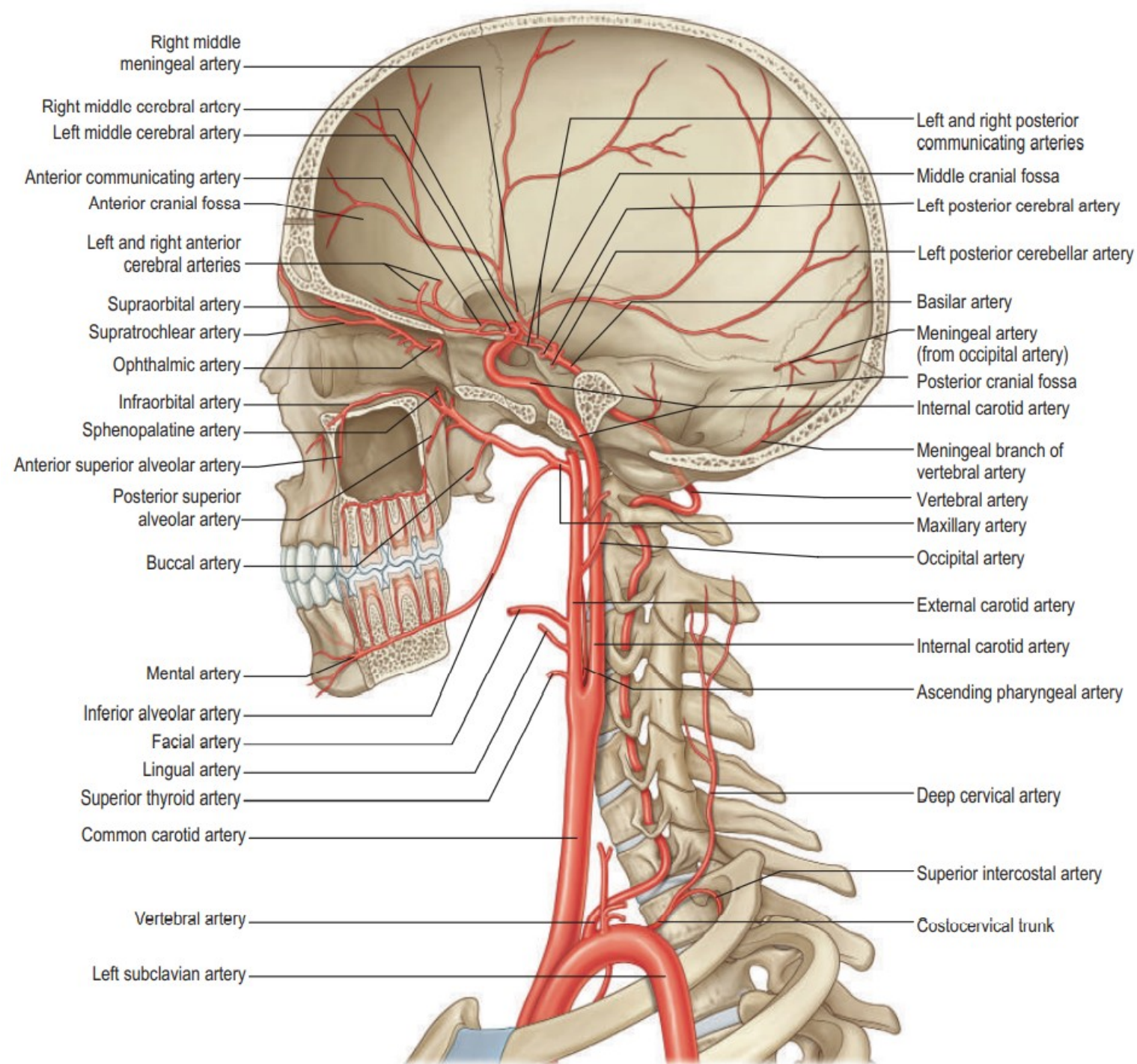
Ophthalmic artery

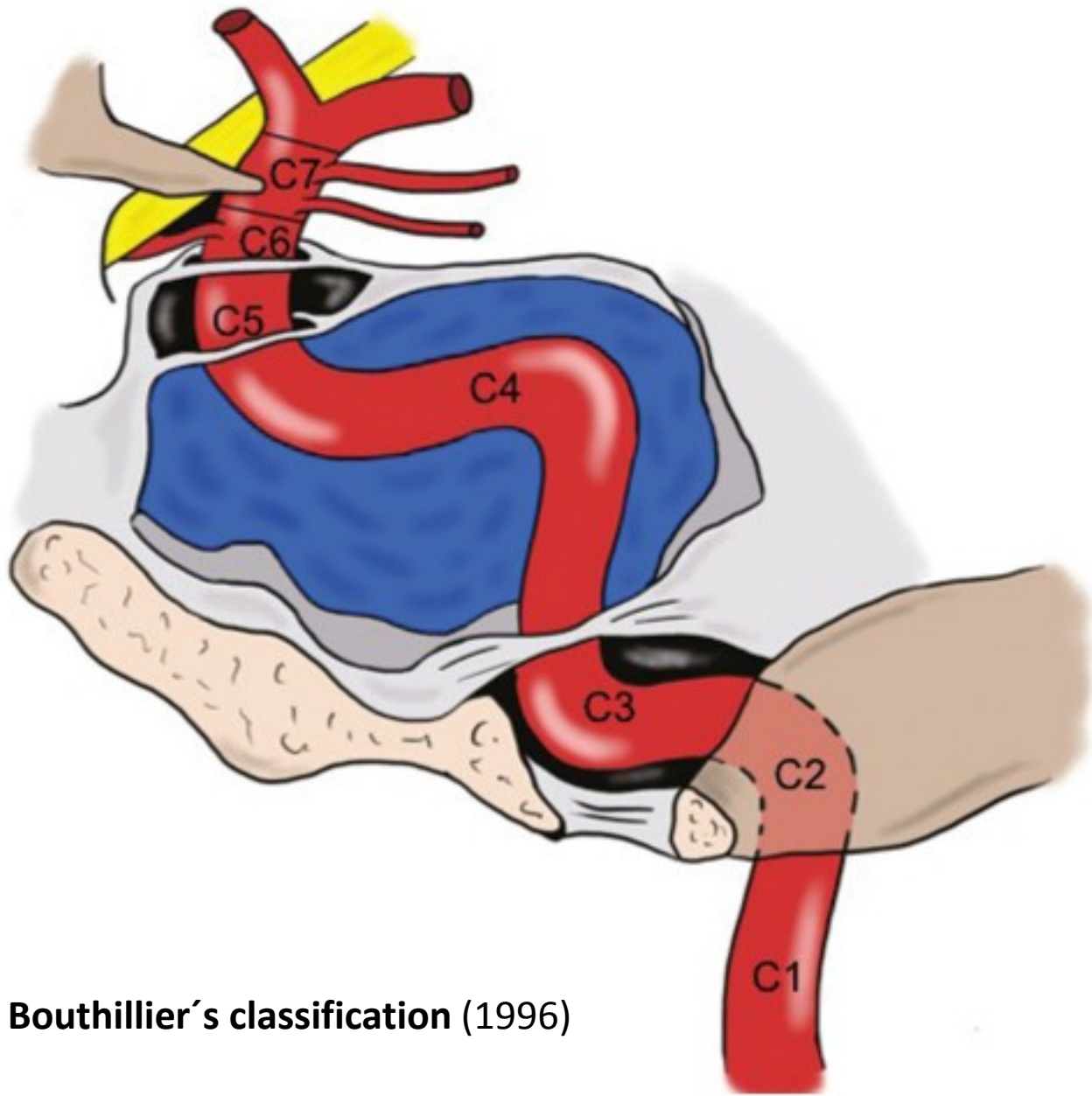
Anterior choroidal artery

Anterior cerebral artery

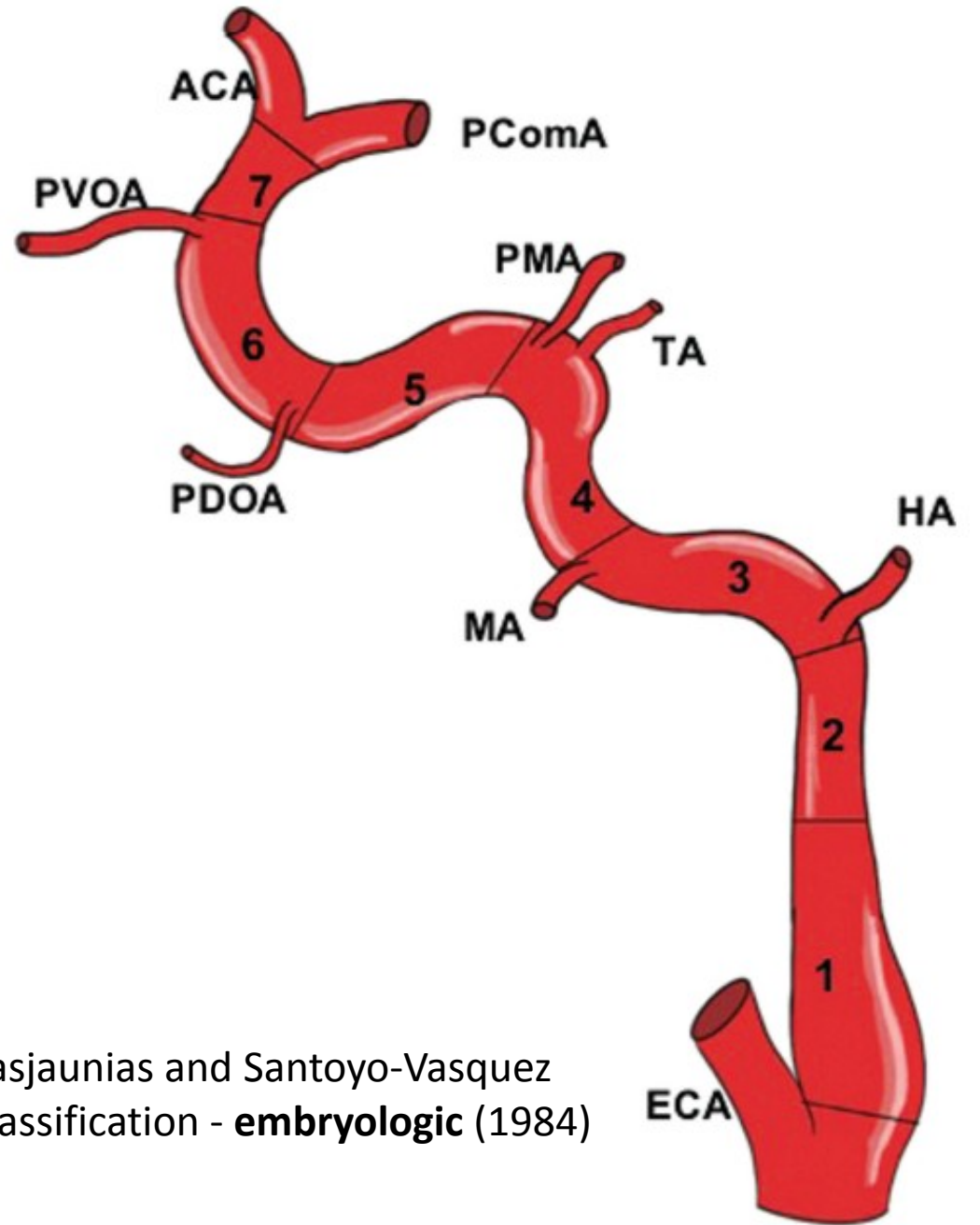
Middle cerebral artery

Posterior communicating artery





Bouthillier's classification (1996)



Lasjaunias and Santoyo-Vasquez classification - embryologic (1984)

C1 (cervical segment)

- without branches

C2 (petrosus segment)

- Caroticotympanic arteries
- Artery of pterygoid canal

C3 (lacerum segment)

- without branches
- (or artery of pterygoid canal)

C4 (cavernous segment)

- Meningohypophyseal trunk (MHT)
- Inferolateral trunk (ILT)
- Capsular arteries

C5 (clinoid segment)

- without branches

C6 (ophthalmic segment)

- Ophthalmic artery
- Superior hypophyseal artery

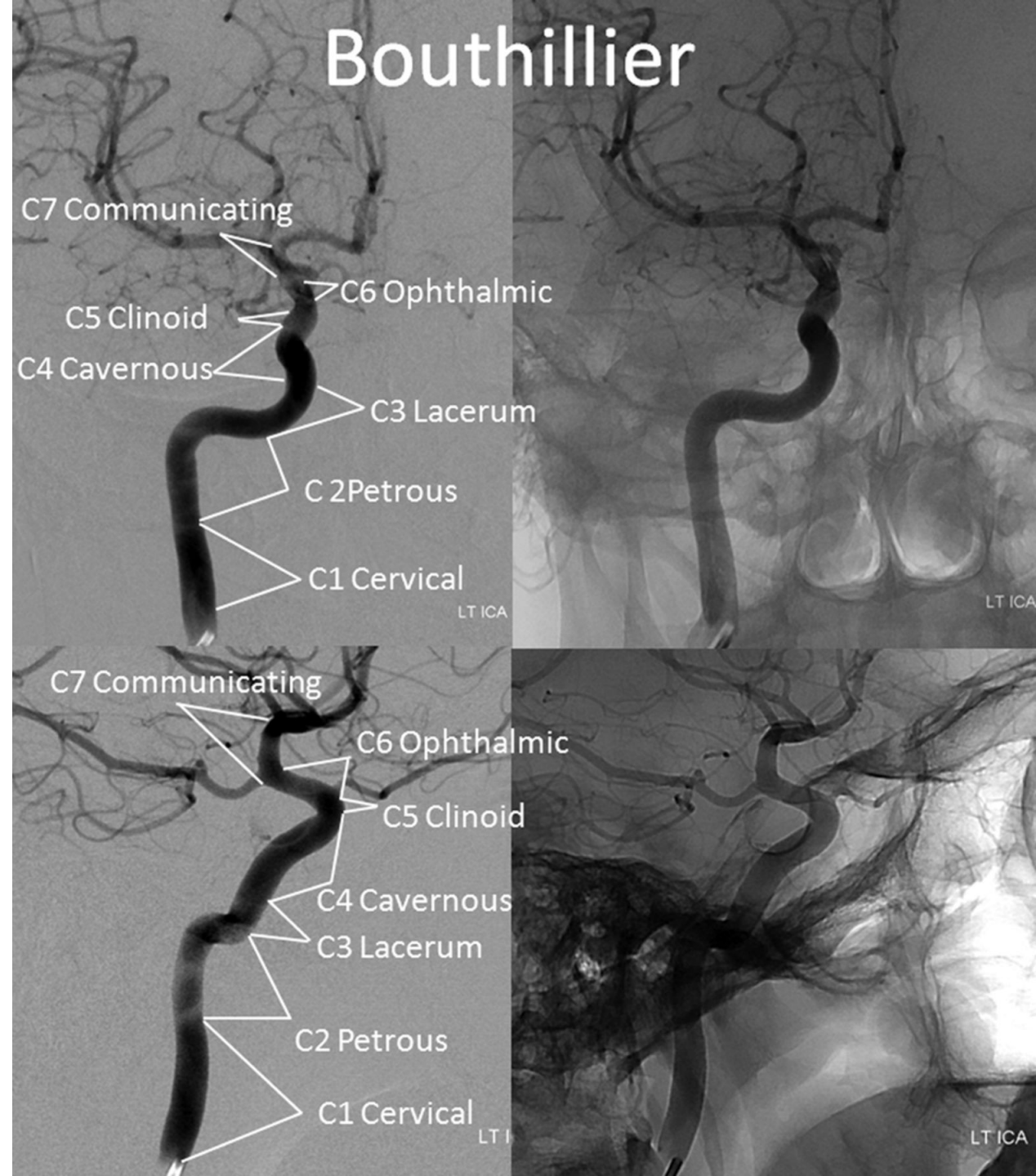
C7 (communicating segment)

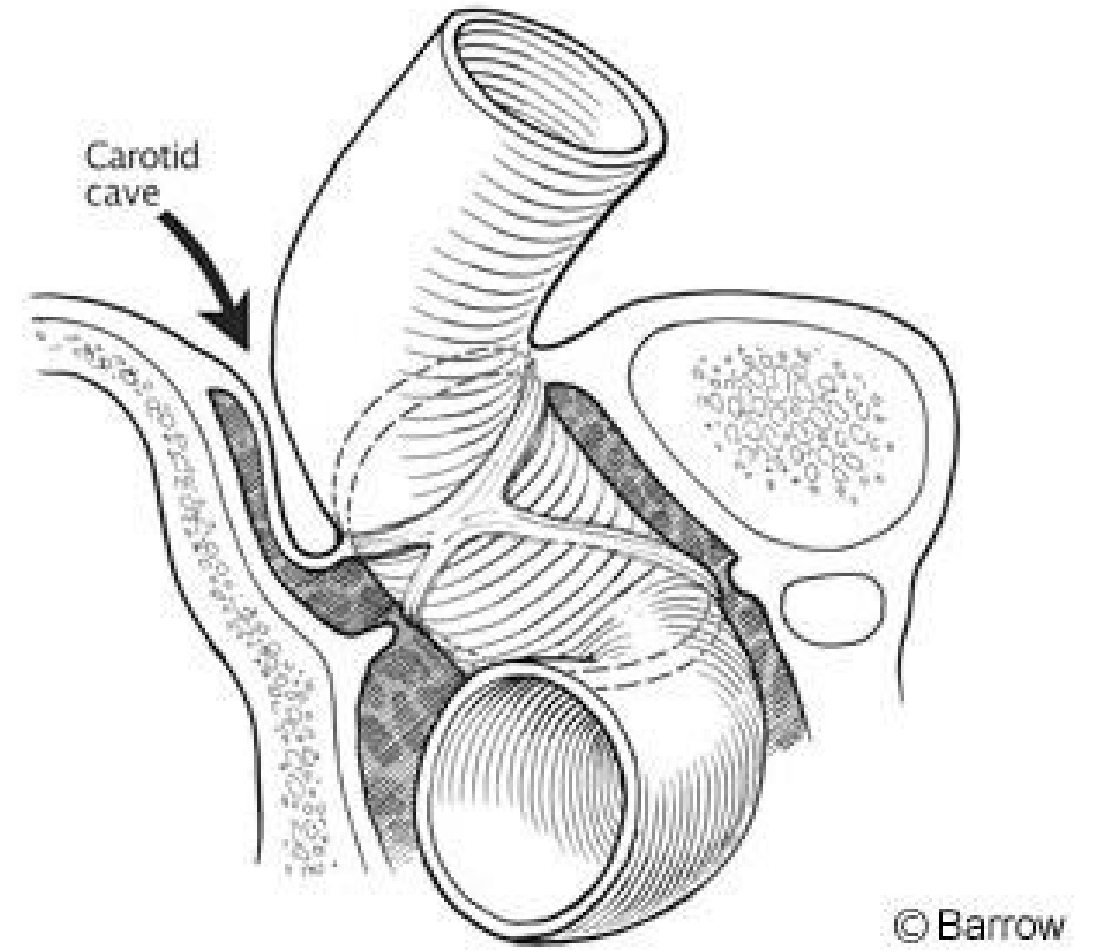
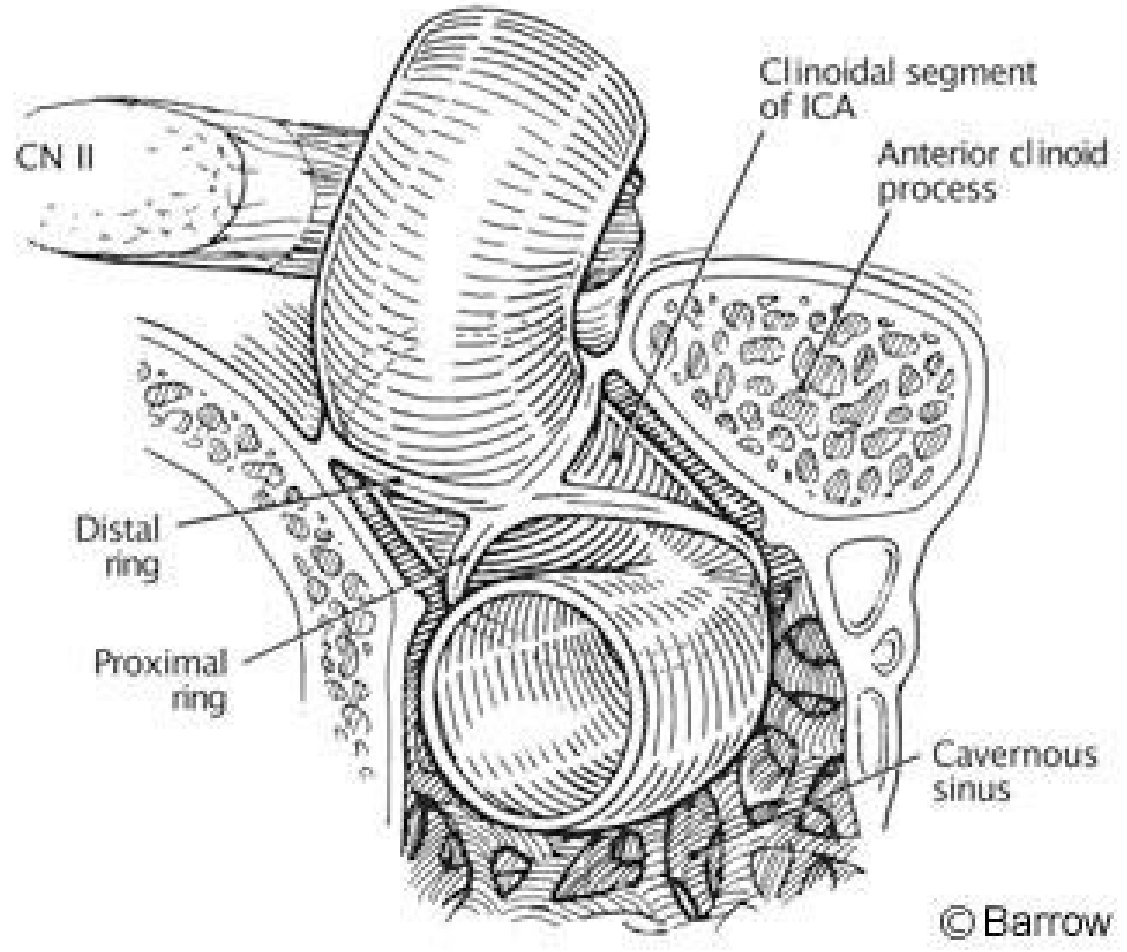
- Anterior choroidal artery
- Posterior communicating artery

extradural

intradural

Bouthillier





C5 segment aneurysm

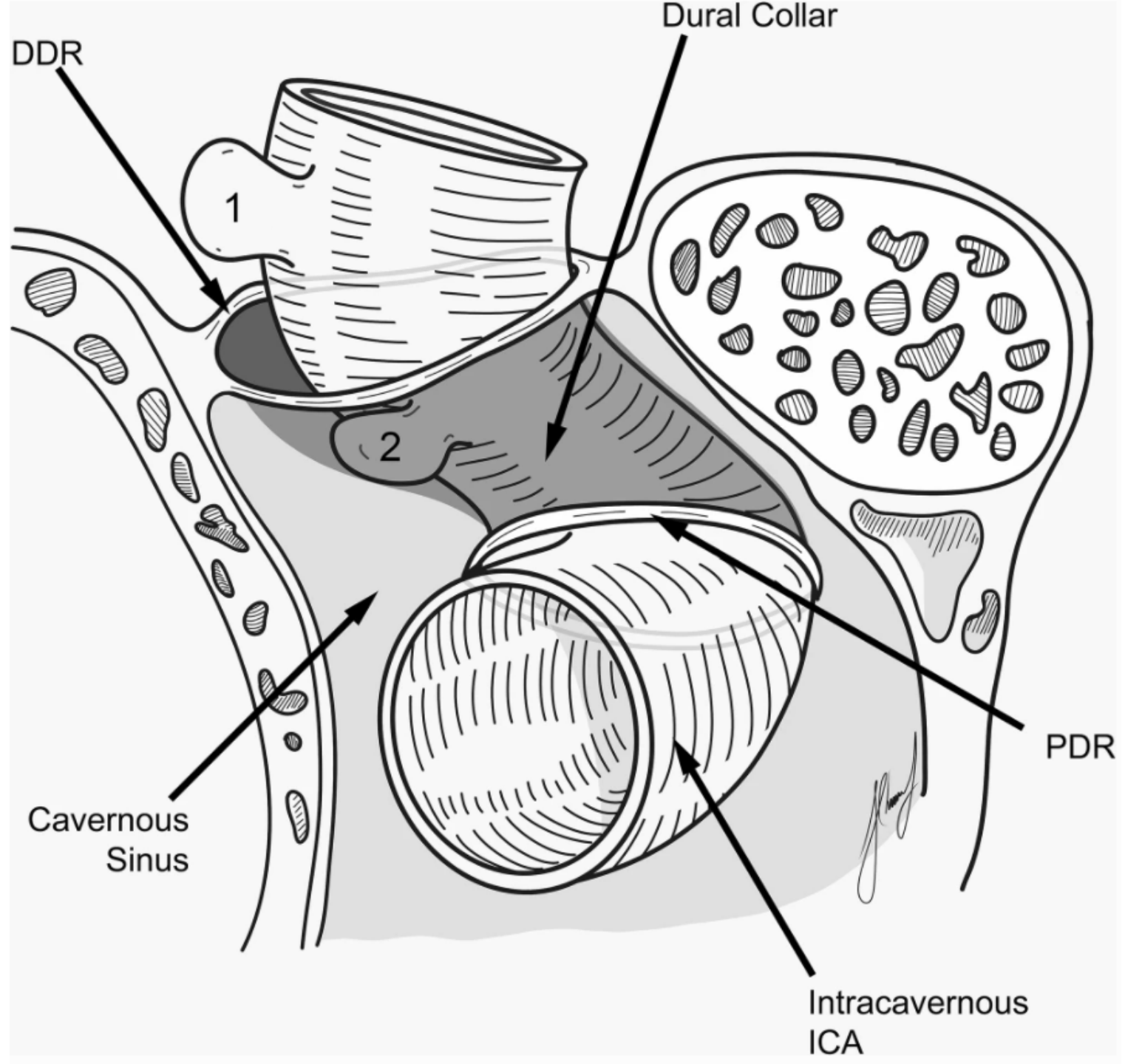
Intradural aneurysm: above DDR

- risk of subarachnoid hemorrhage (SAH)

Extradural aneurysm: under DDR



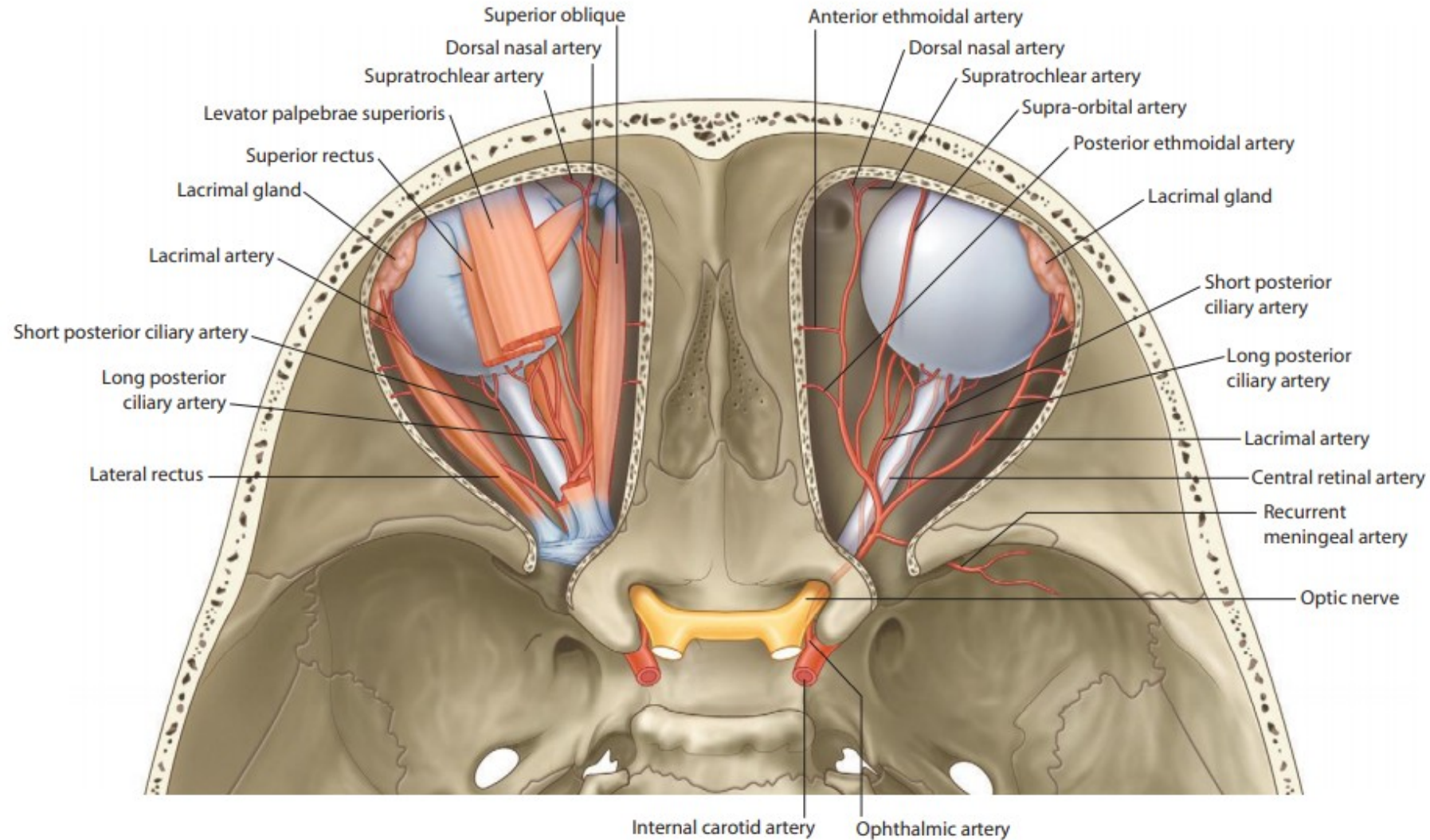
CONVENTIONAL BOUNDARY
(existence of „Carotid cave“!)

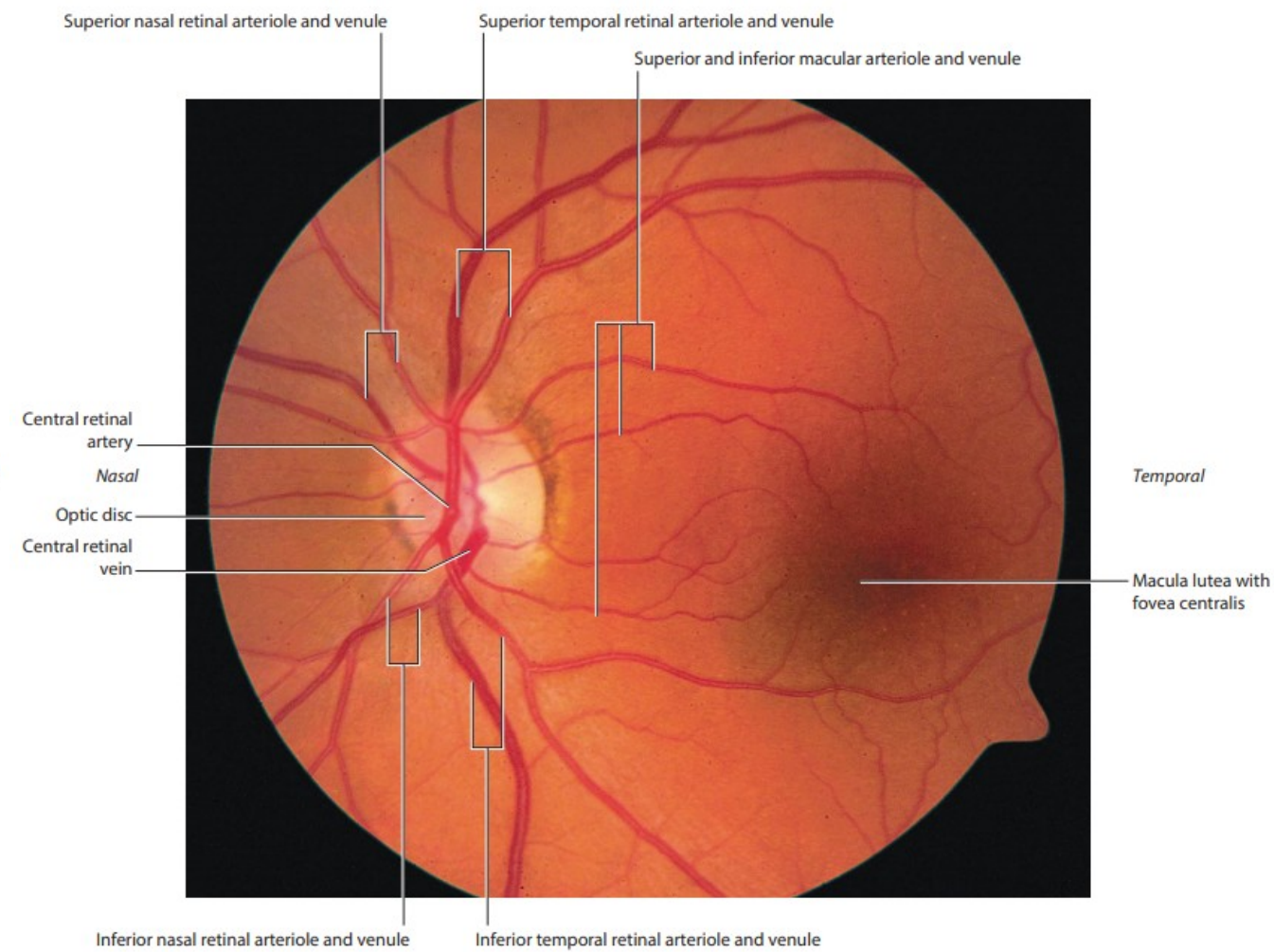
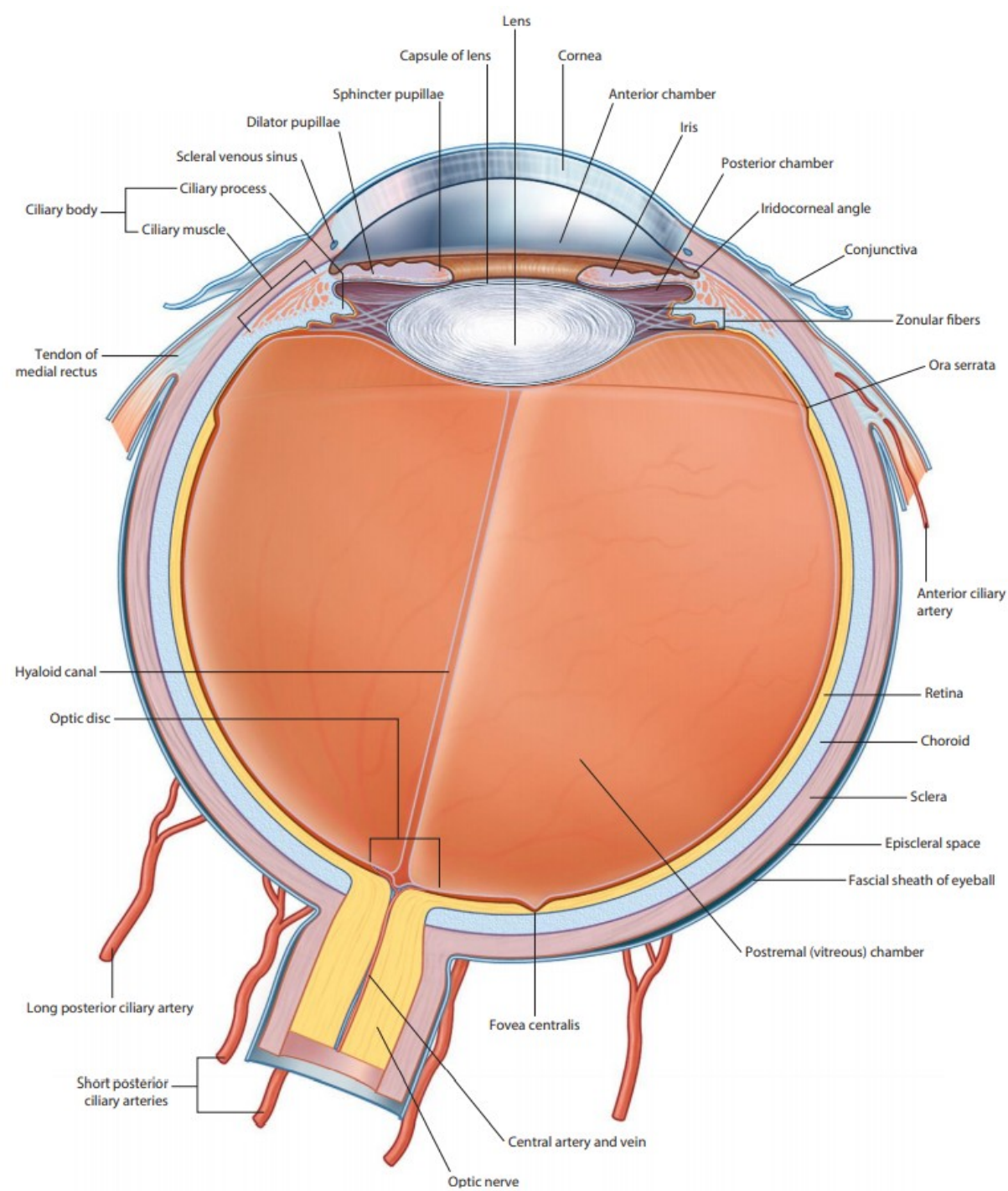


ARTERIES OF THE ORBIT

Ophthalmic artery

- Central retinal artery
- Lacrimal artery
 - Anterior ciliary arteries
 - Lateral palpebral arteries
- Short posterior ciliary arteries
- Long posterior ciliary arteries
- Anterior ciliary arteries
- Muscular arteries
- Supraorbital artery
- Posterior ethmoidal artery
- Anterior ethmoidal artery
 - Anterior meningeal branch
- Medial palpebral arteries
- Supratrochlear artery
- Dorsal nasal artery





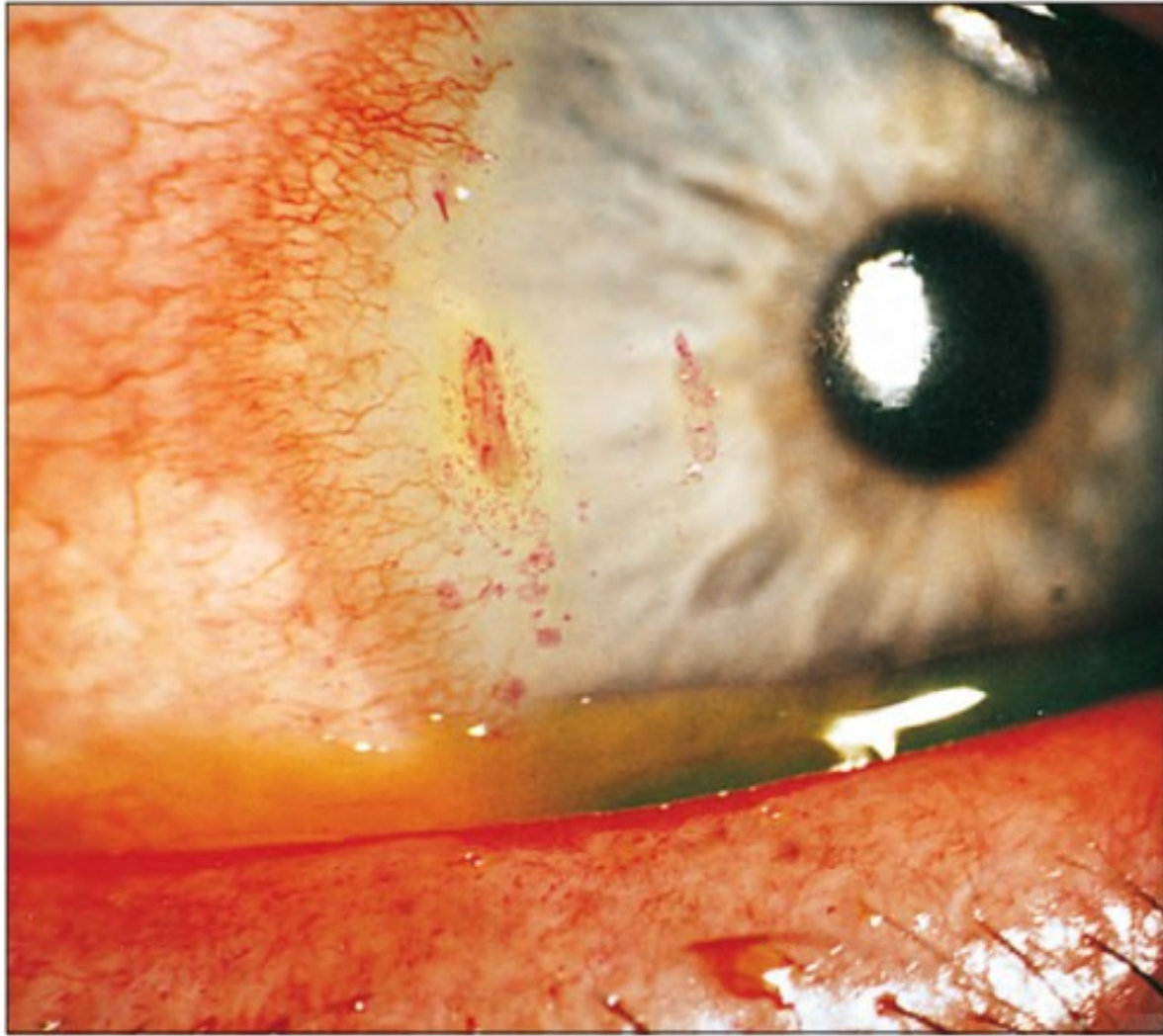
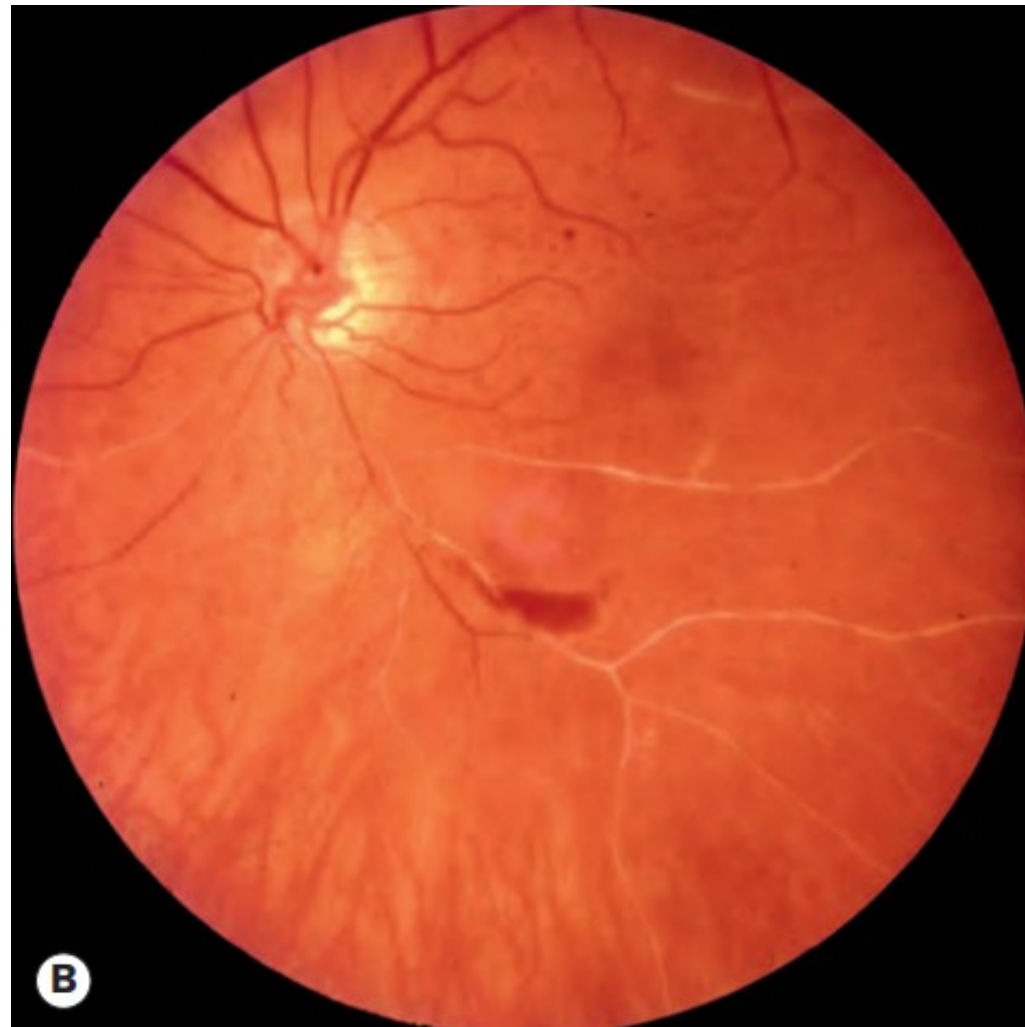


FIG. 36.12 Keratoconjunctivitis sicca.



FIG. 36.3 Chronic uveitis in a patient with oligoarticular juvenile idiopathic arthritis: "white eye" uveitis.

RETINAL ARTERY OCCLUSION



VERTEBRAL ARTERY

Cervical branches

Spinal branches

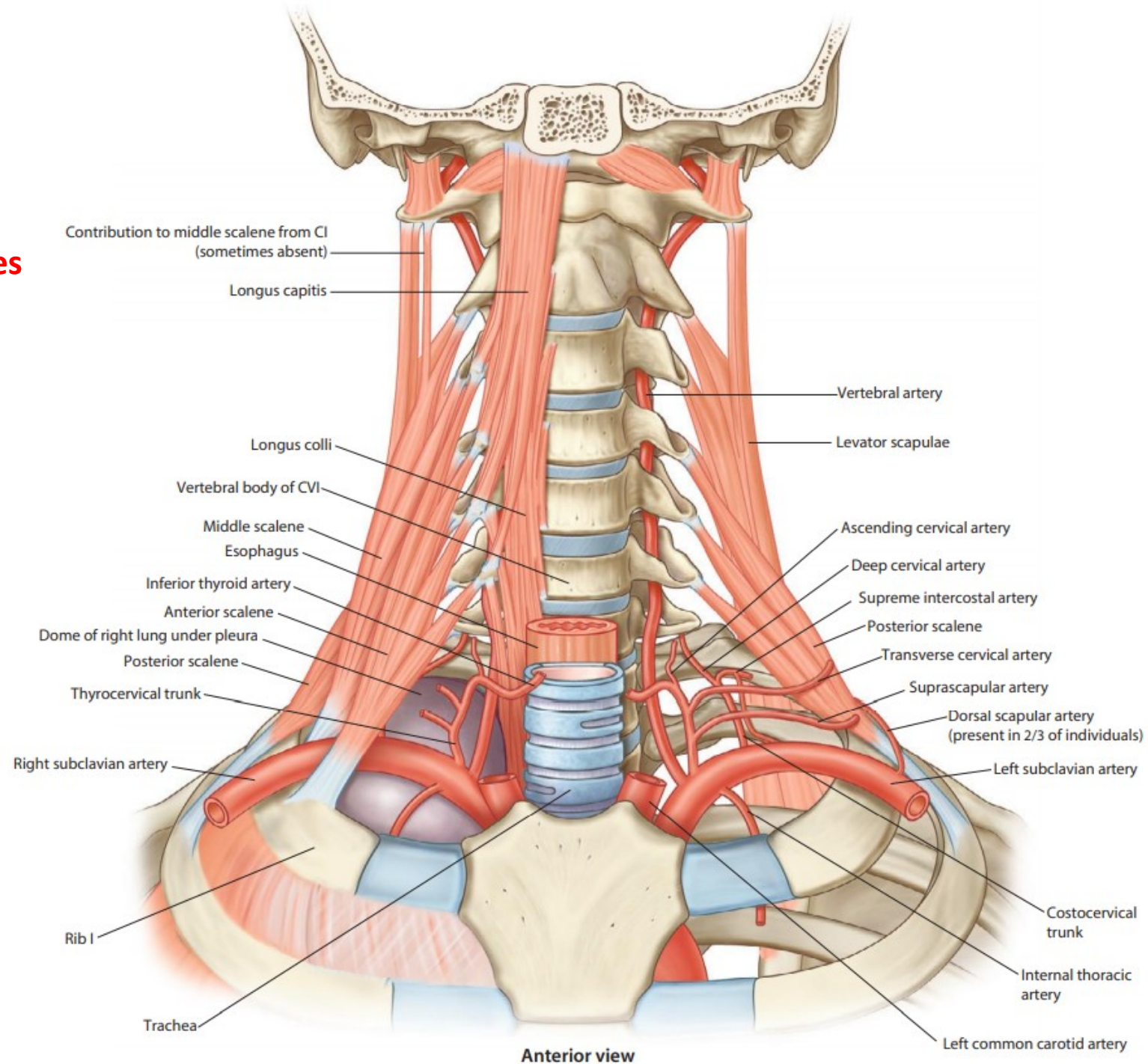
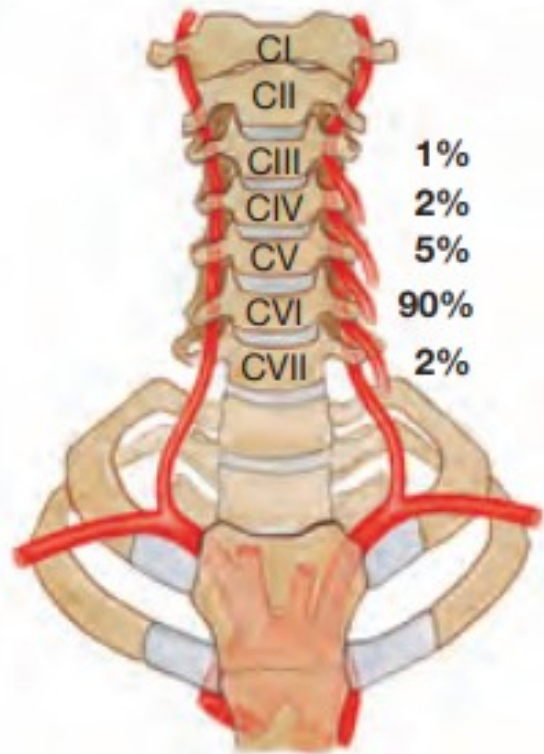
Muscular branches

Meningeal branches

Cranial branches

Basilar artery

Posterior cerebral arteries



Parieto-occipital
branch of
left posterior
cerebral artery

Calcarine
branch of
left posterior
cerebral artery

Superior vermian
artery

Lateral
marginal
branch

Tonsillohemispheric
branch

Posterior inferior
cerebellar artery

Right posterior cerebral artery

Posterior lateral
choroidal artery

Posterior cerebral
artery

Superior cerebellar
artery

Optic nerve (CN II)

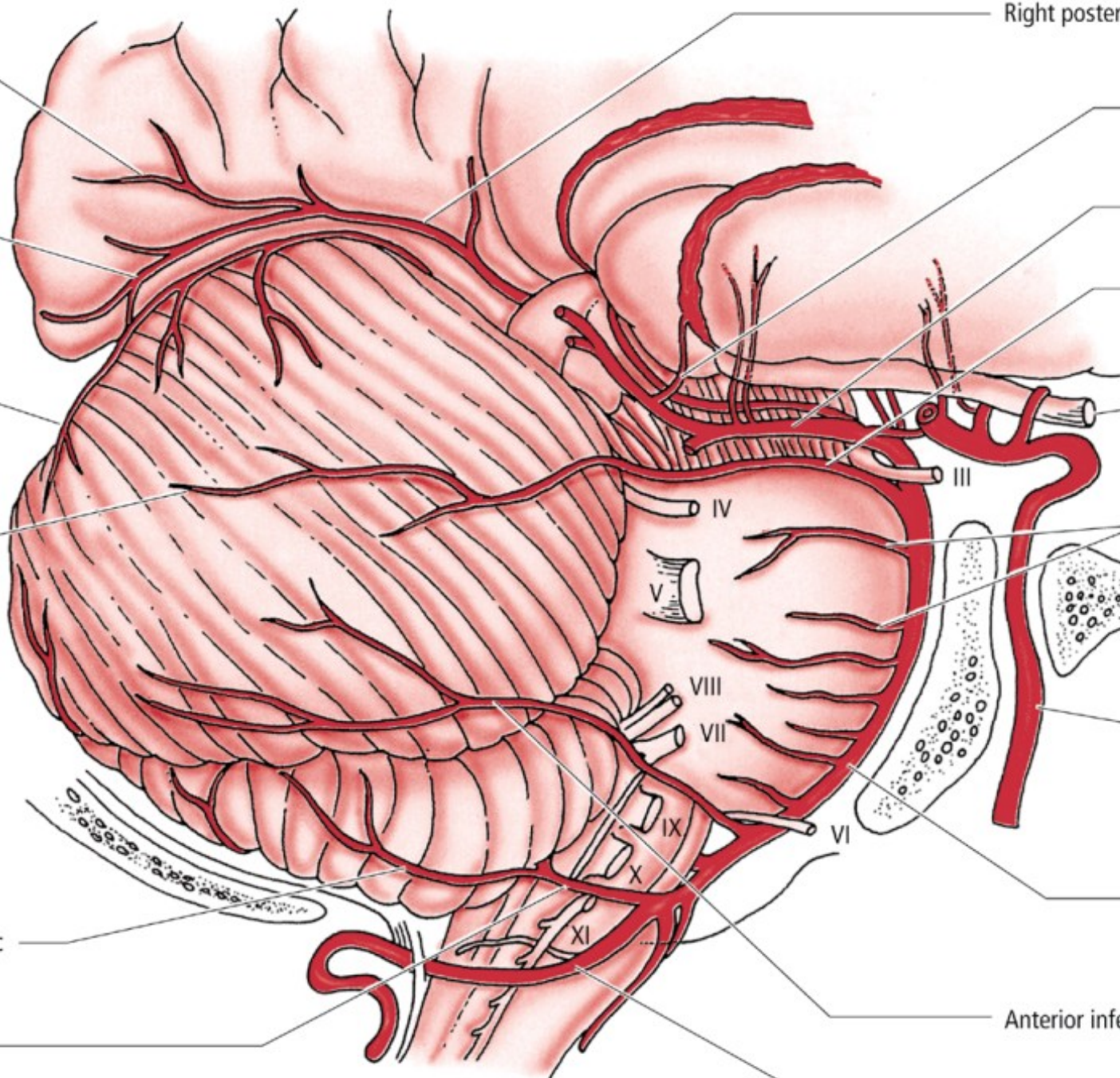
Pontine arteries
(circumferential) with
paramedian branches

Right internal
carotid artery

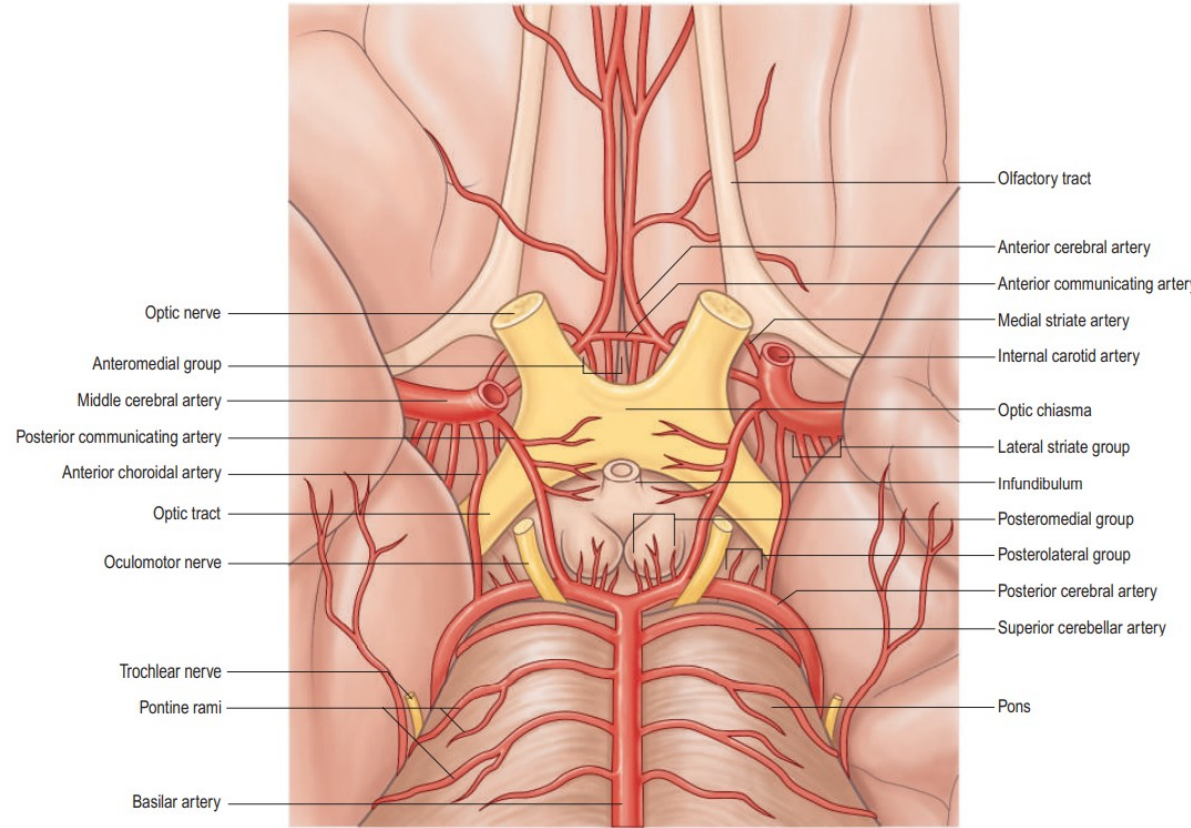
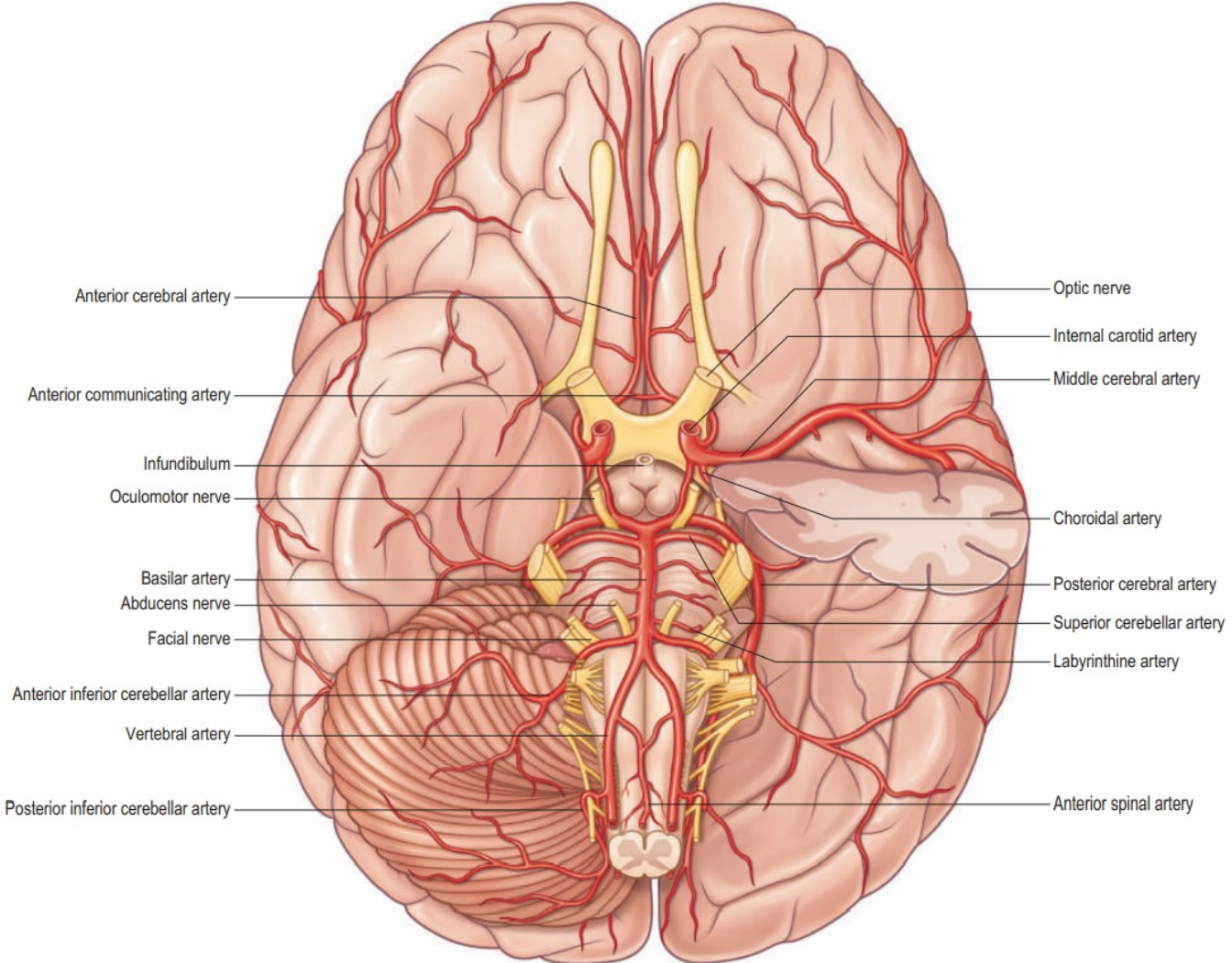
Basilar artery

Anterior inferior cerebellar artery

Right vertebral artery



CIRCULUS ARTERIOSUS CEREBRI WILLISI

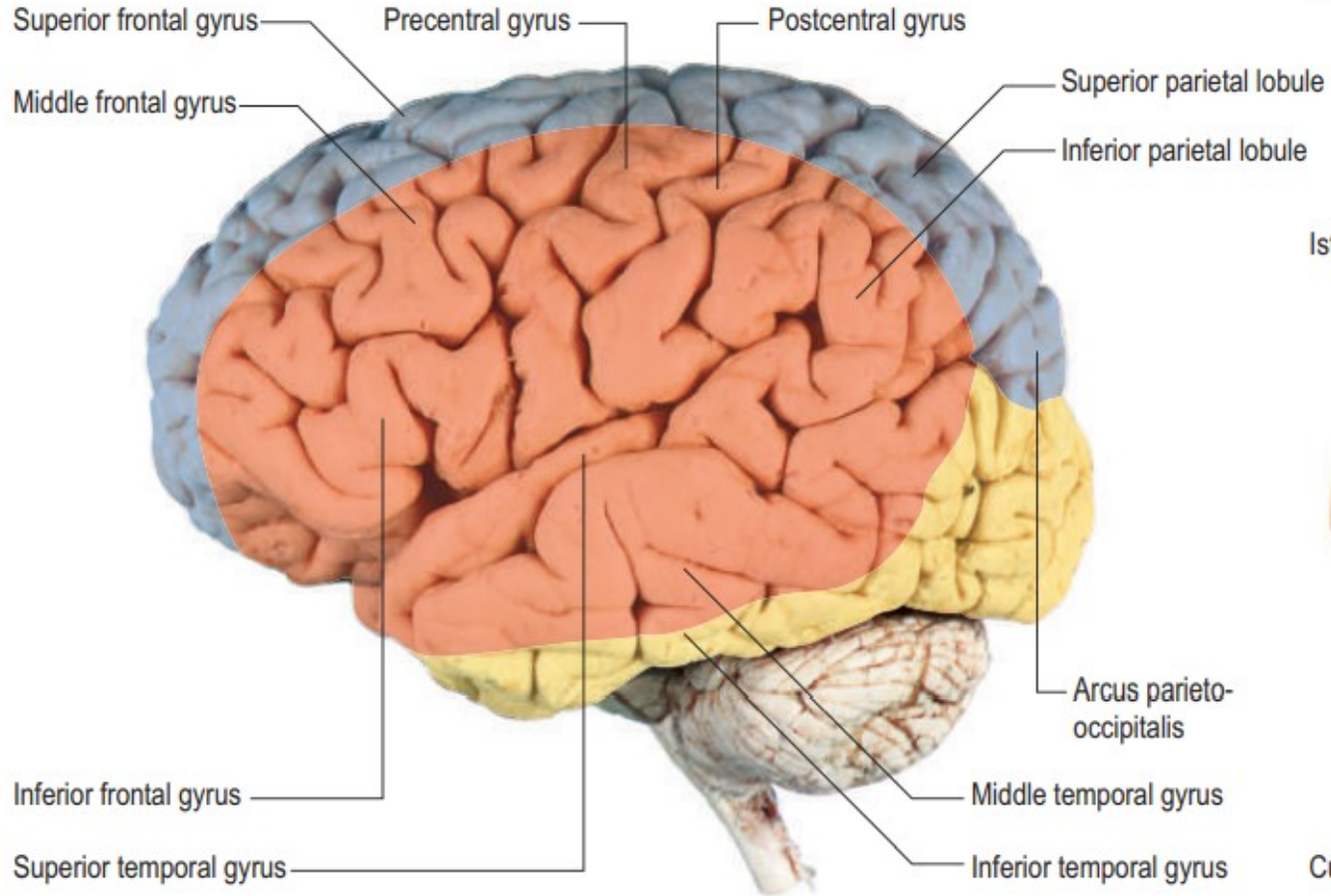


ARTERIAL SUPPLY OF THE BRAIN

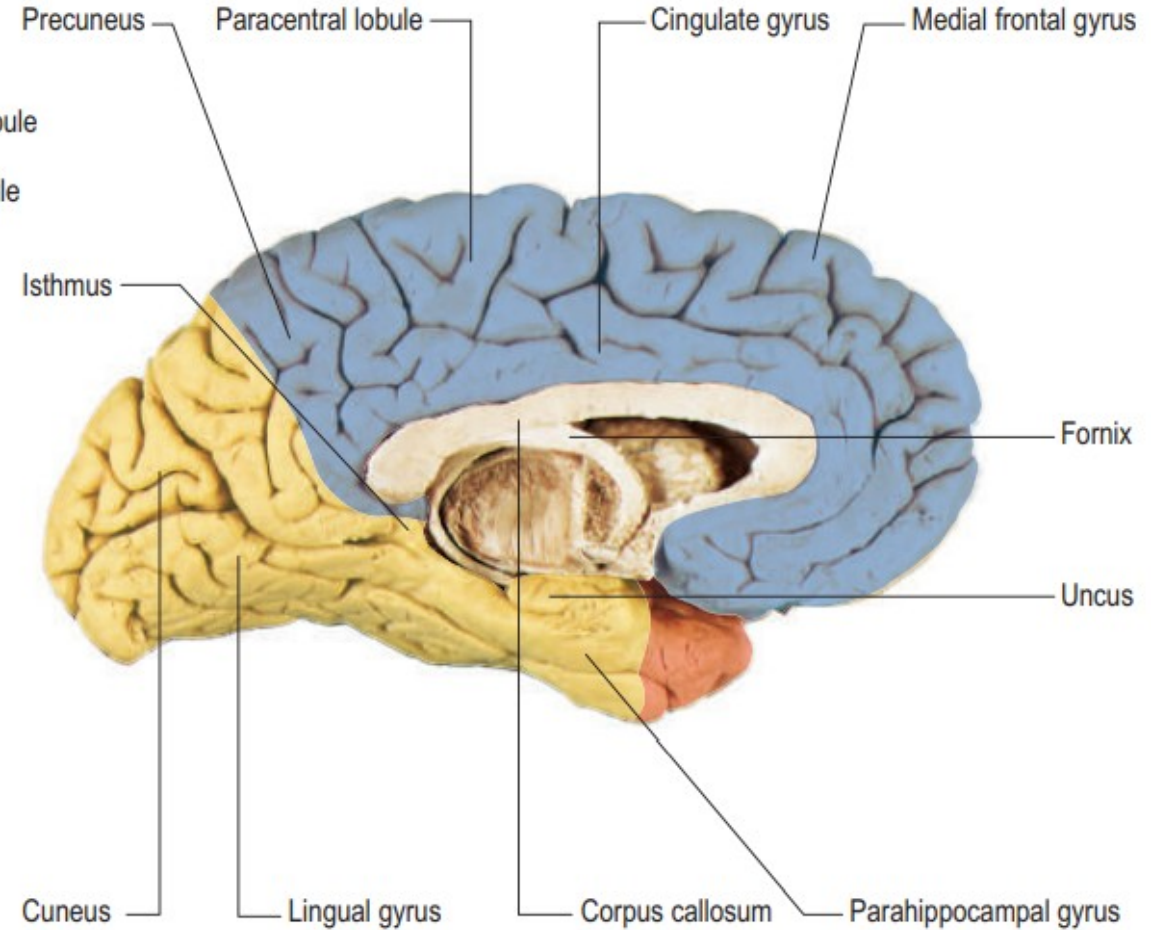
Anterior 2/3 → internal carotid artery

Posterior 1/3 → vertebral artery

A



B



Area supplied by anterior cerebral artery Area supplied by middle cerebral artery Area supplied by posterior cerebral artery

Fig. 19.5 The arteries supplying the left cerebral hemispheres. **A**, Lateral surface. **B**, Medial surface.

ANEURYSMS IN THE CIRCLE OF WILLIS

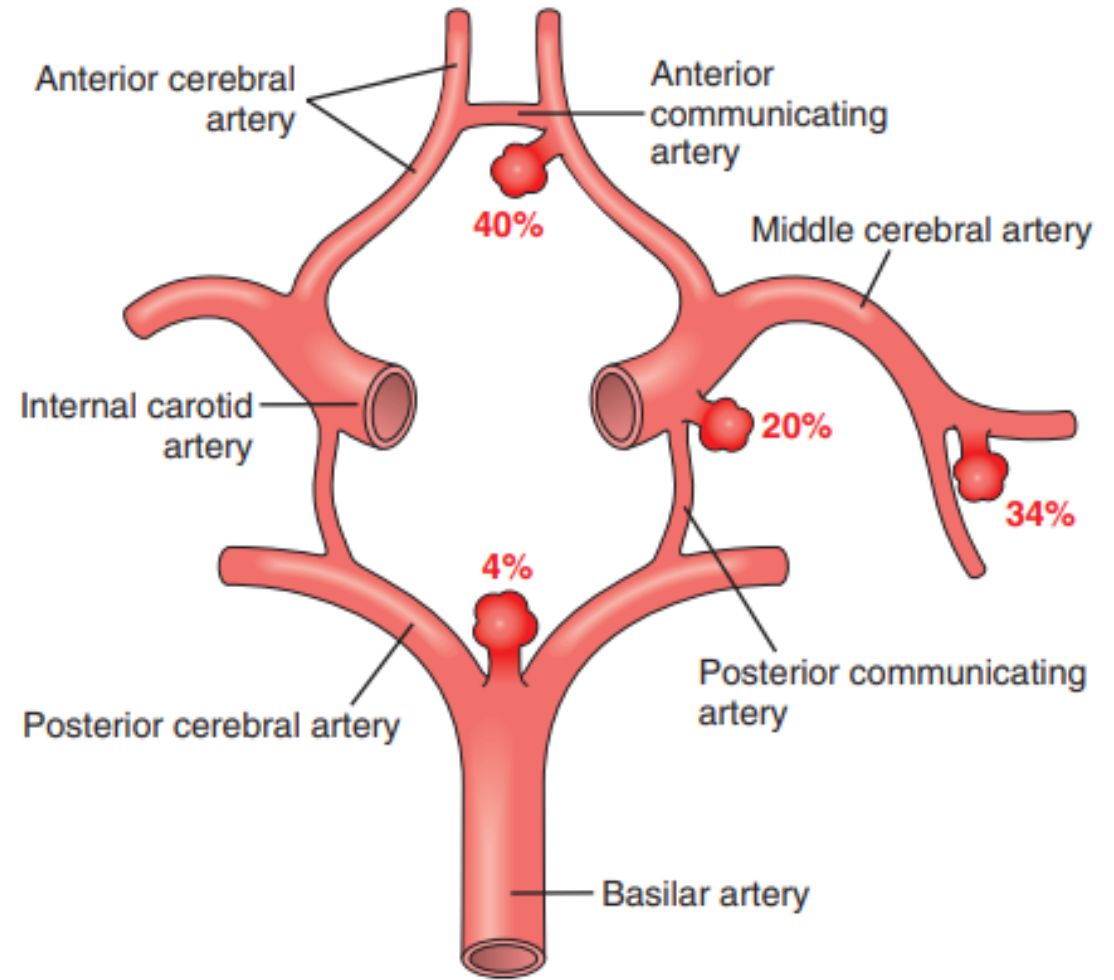
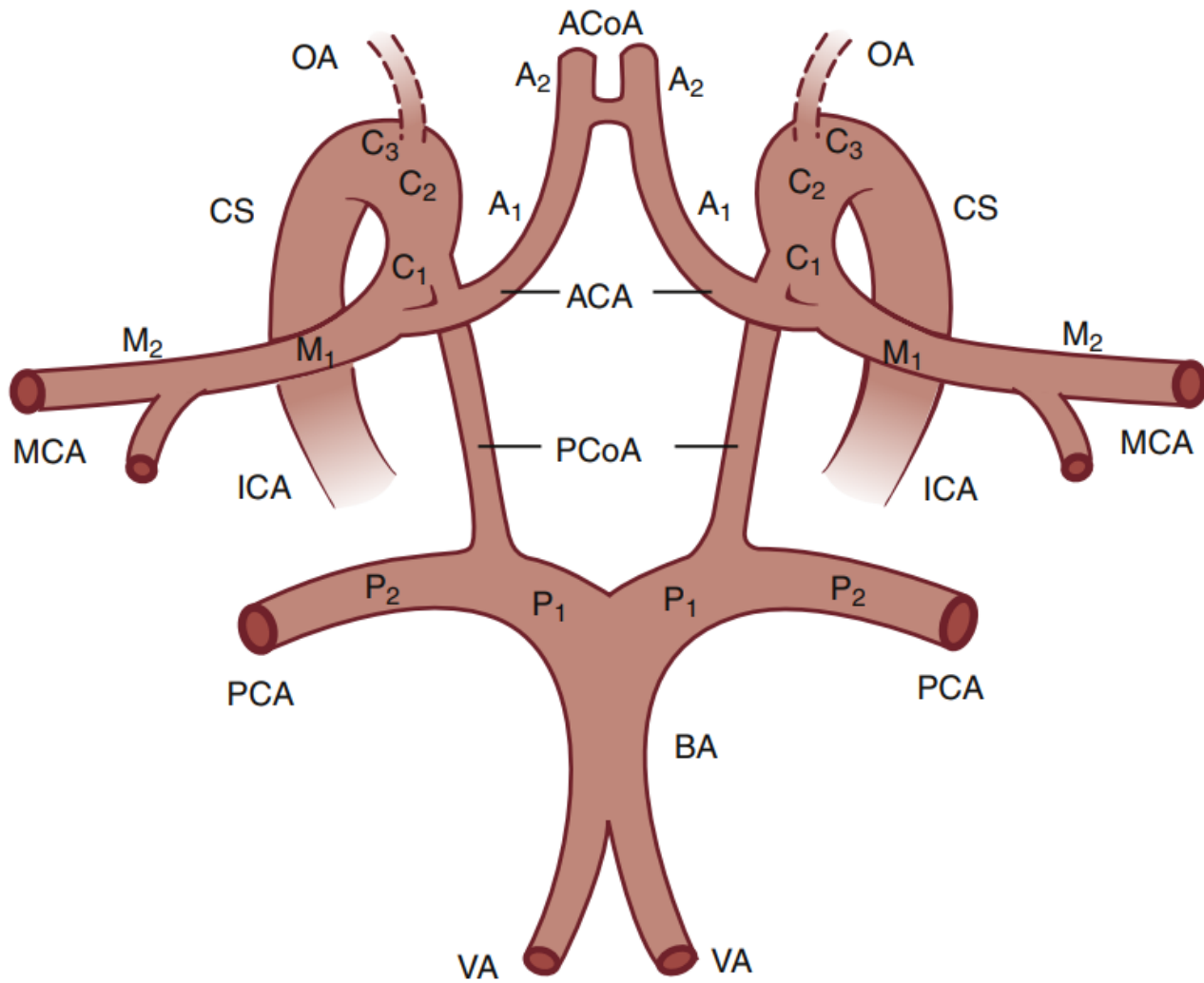


Figure 28-19 Common sites of saccular (berry) aneurysms in the circle of Willis.

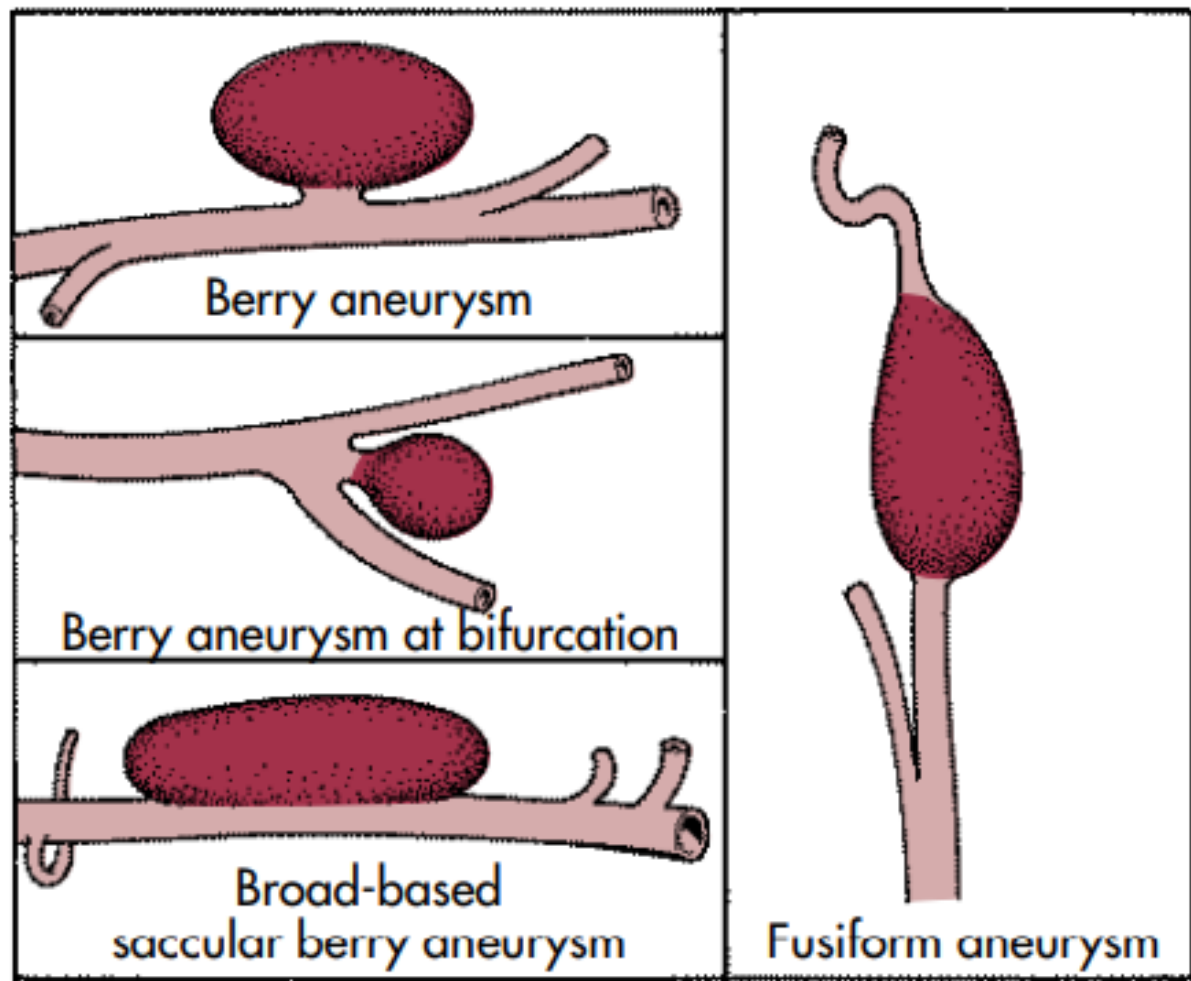
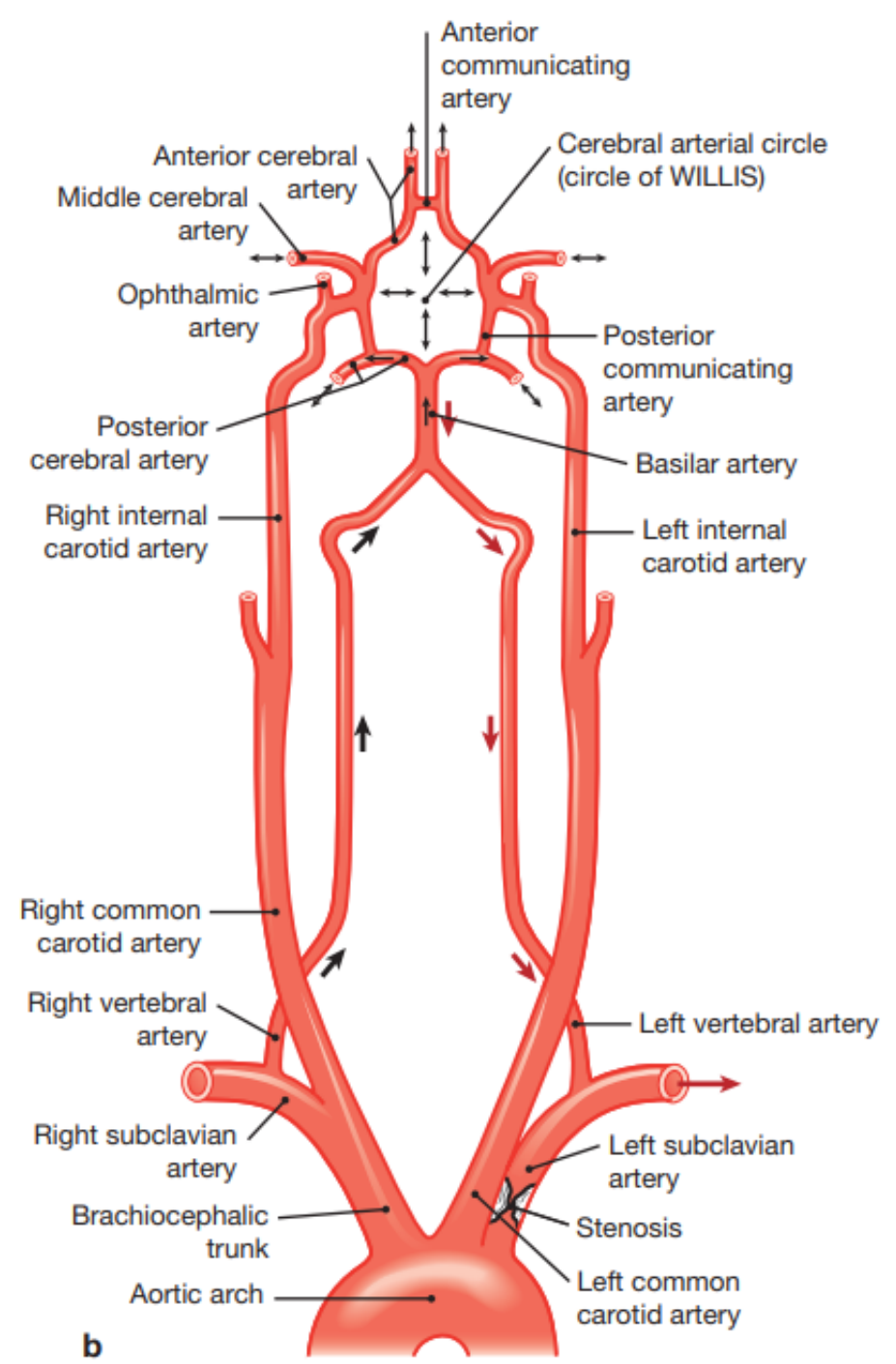
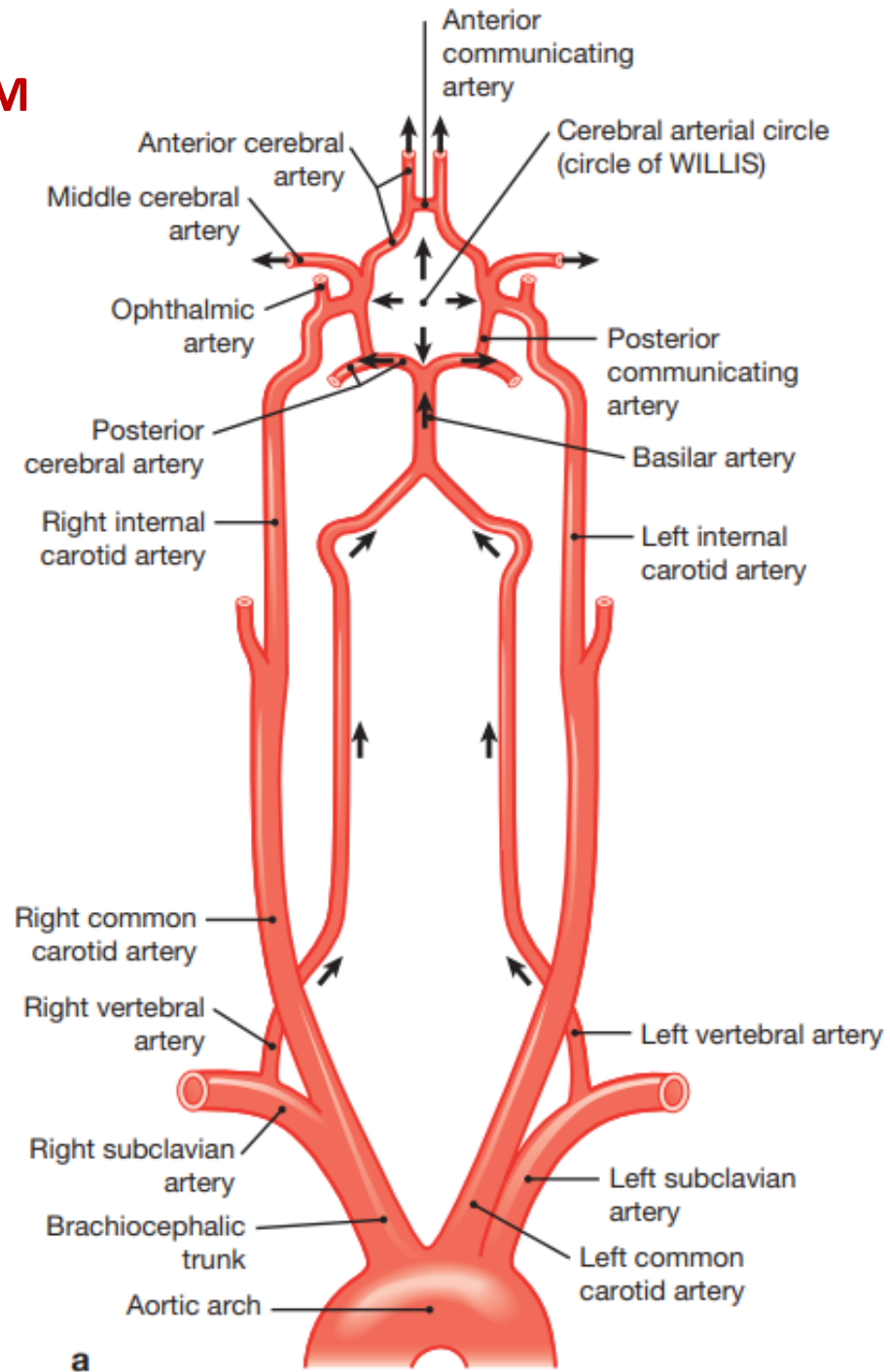


FIGURE 18-18 Types of Aneurysms.



FIGURE 18-19 Berry Aneurysm, Angiogram. In this lateral view with contrast filling a portion of the cerebral arterial circulation can be seen a berry aneurysm (*arrow*) involving the middle cerebral artery of the circle of Willis at the base of the brain. (From Klatt EC: *Robbins and Cotran atlas of pathology*, Philadelphia, 2006, Saunders.)

SUBCLAVIAN STEAL SYNDROME



EXTERNAL CAROTID ARTERY

Ventral branches

Superior thyroid artery

Lingual artery

Facial artery

Medial branches

Ascending pharyngeal artery

Dorsal branches

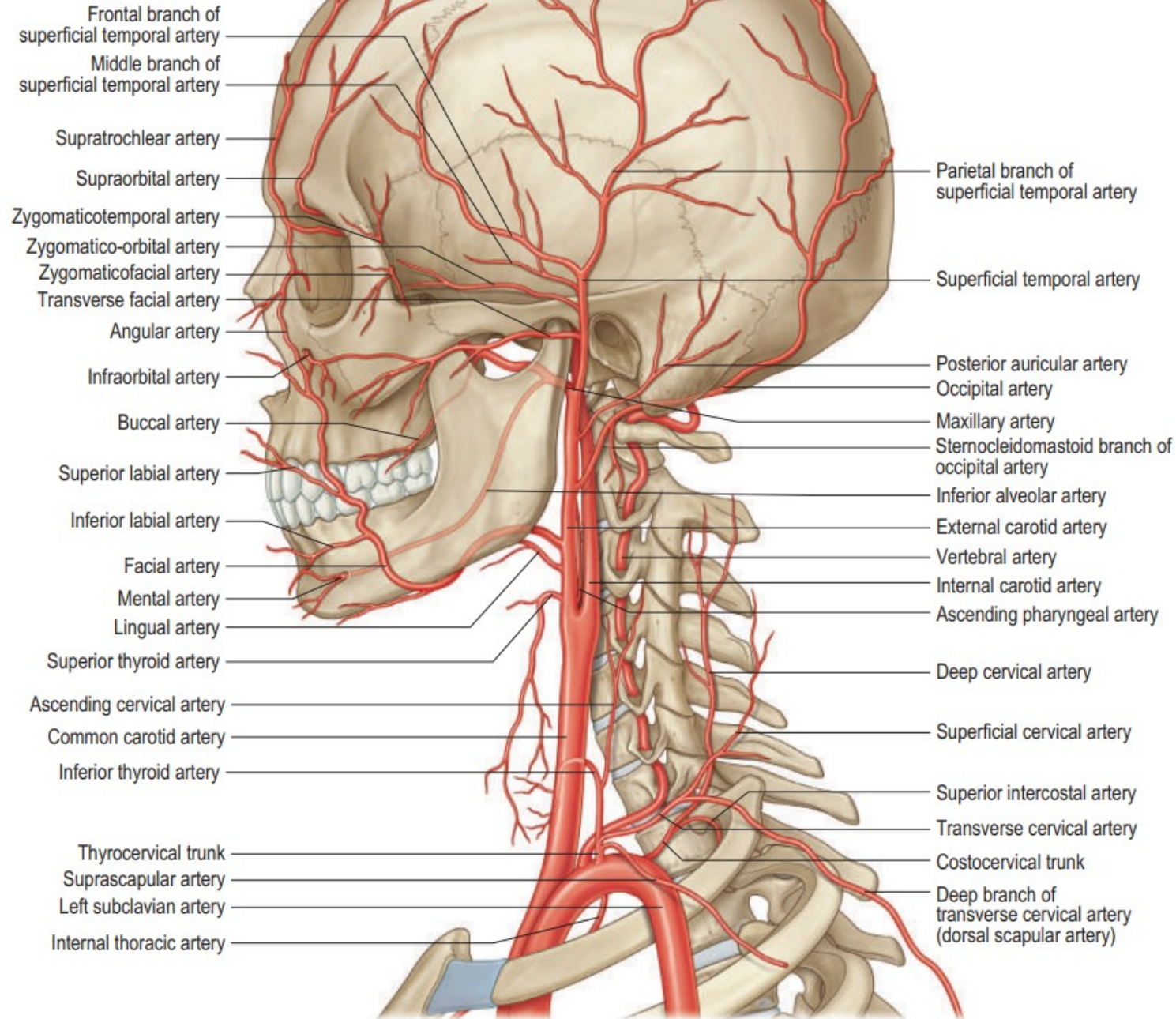
Occipital artery

Posterior auricular artery

Terminal branches

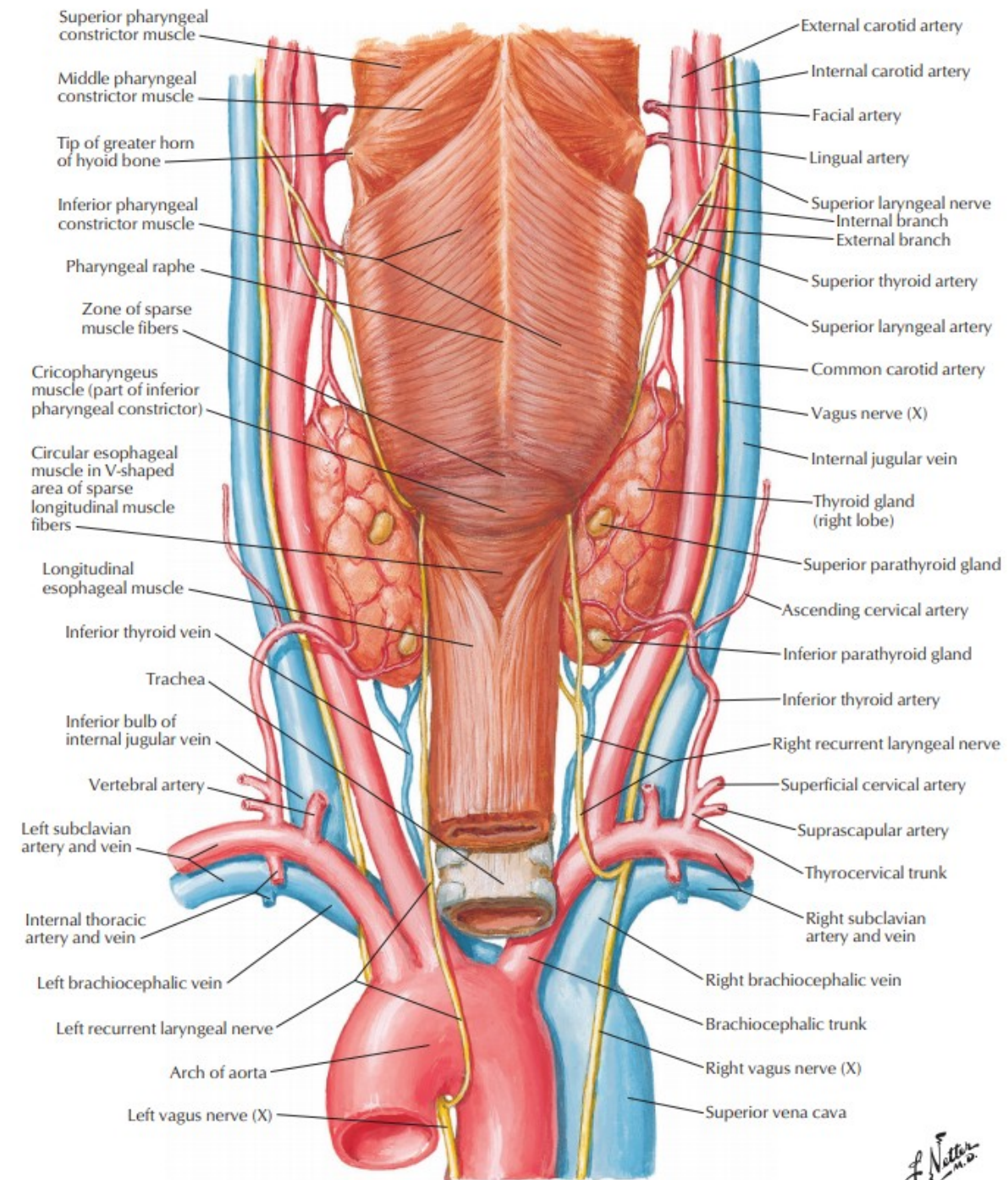
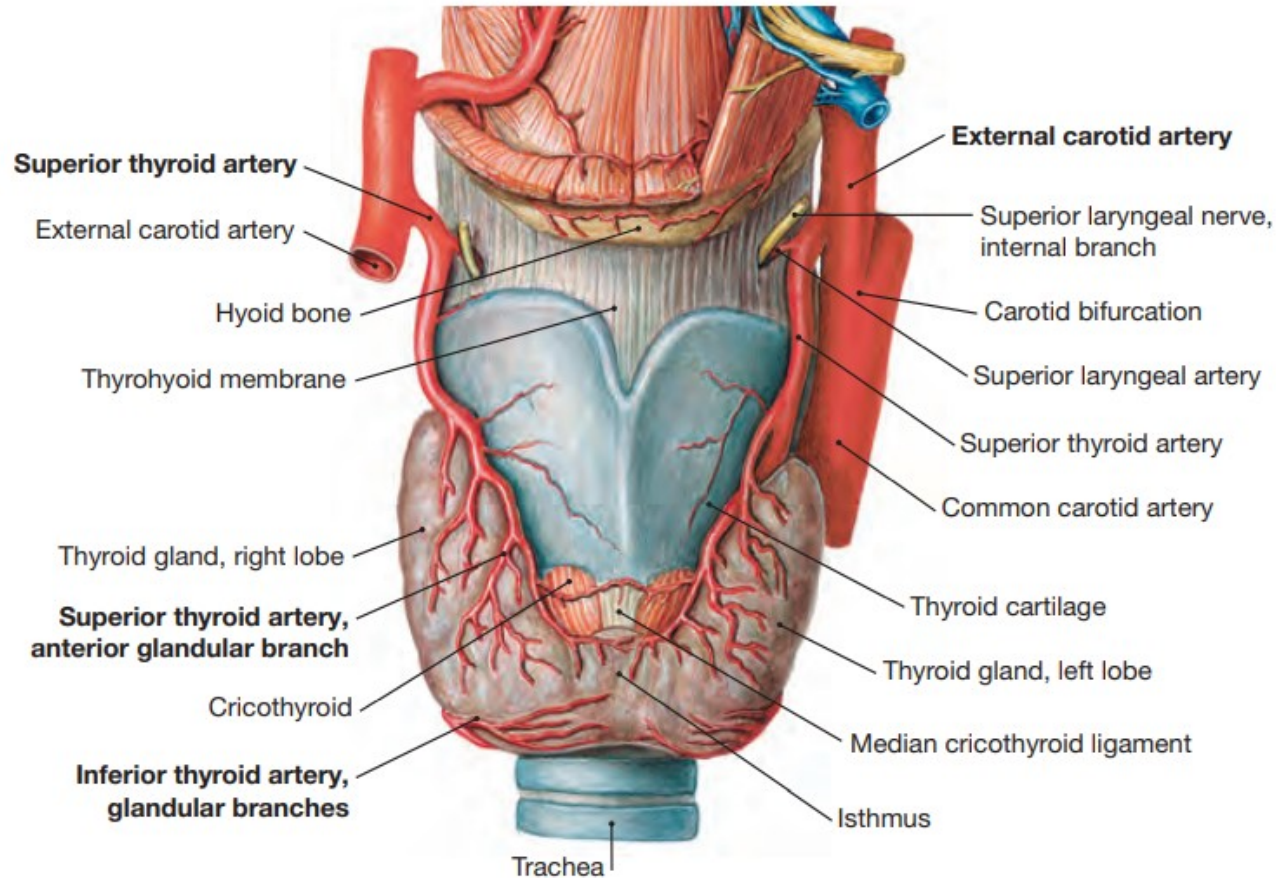
Maxillary artery

Superficial temporal artery



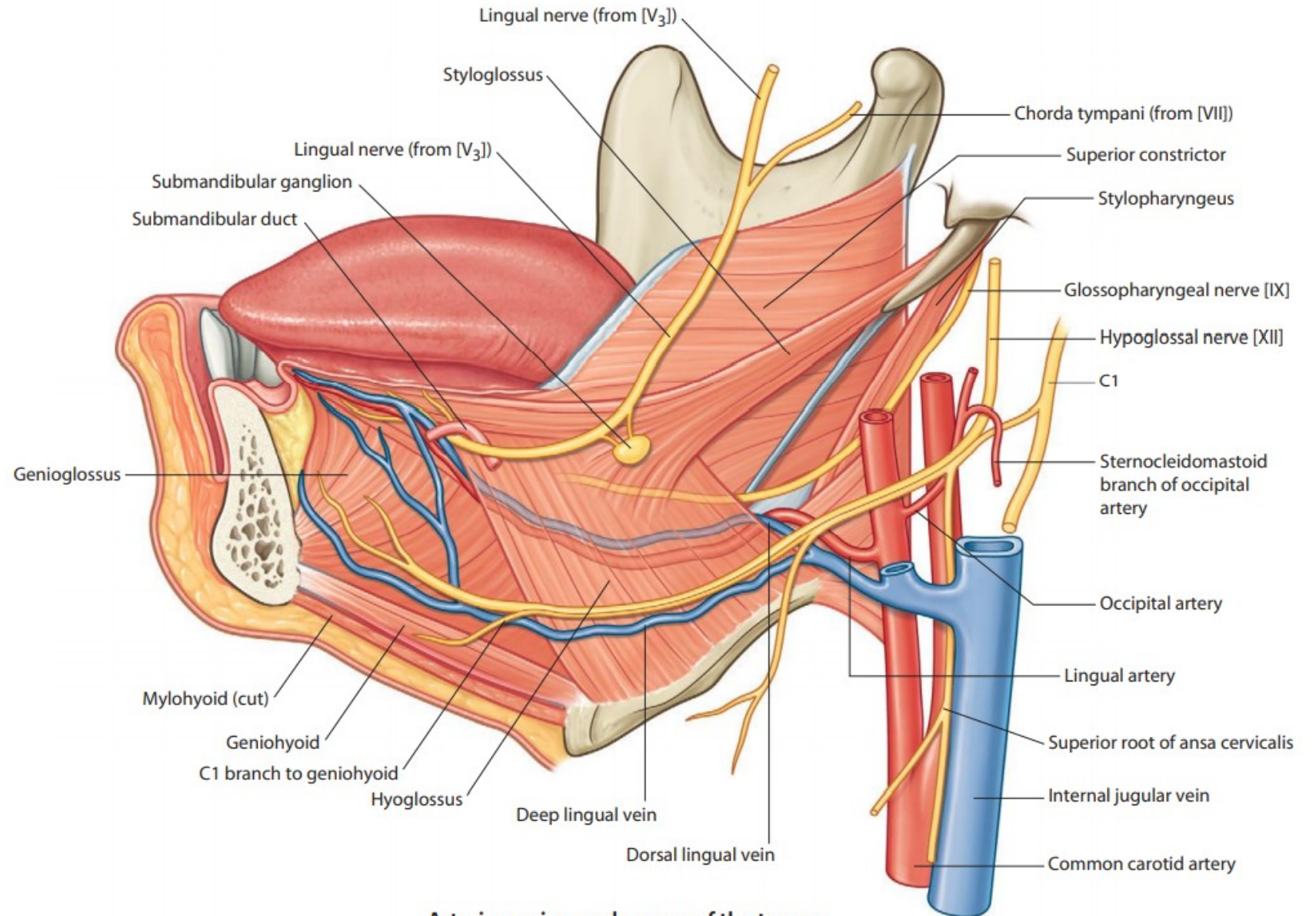
SUPERIOR THYROID ARTERY

- Superior laryngeal artery
- Cricothyroid artery
- Infrahyoid branch
- Sternocleidomastoid branch
- Glandular branches (anterior, lateral and posterior)



LINGUAL ARTERY

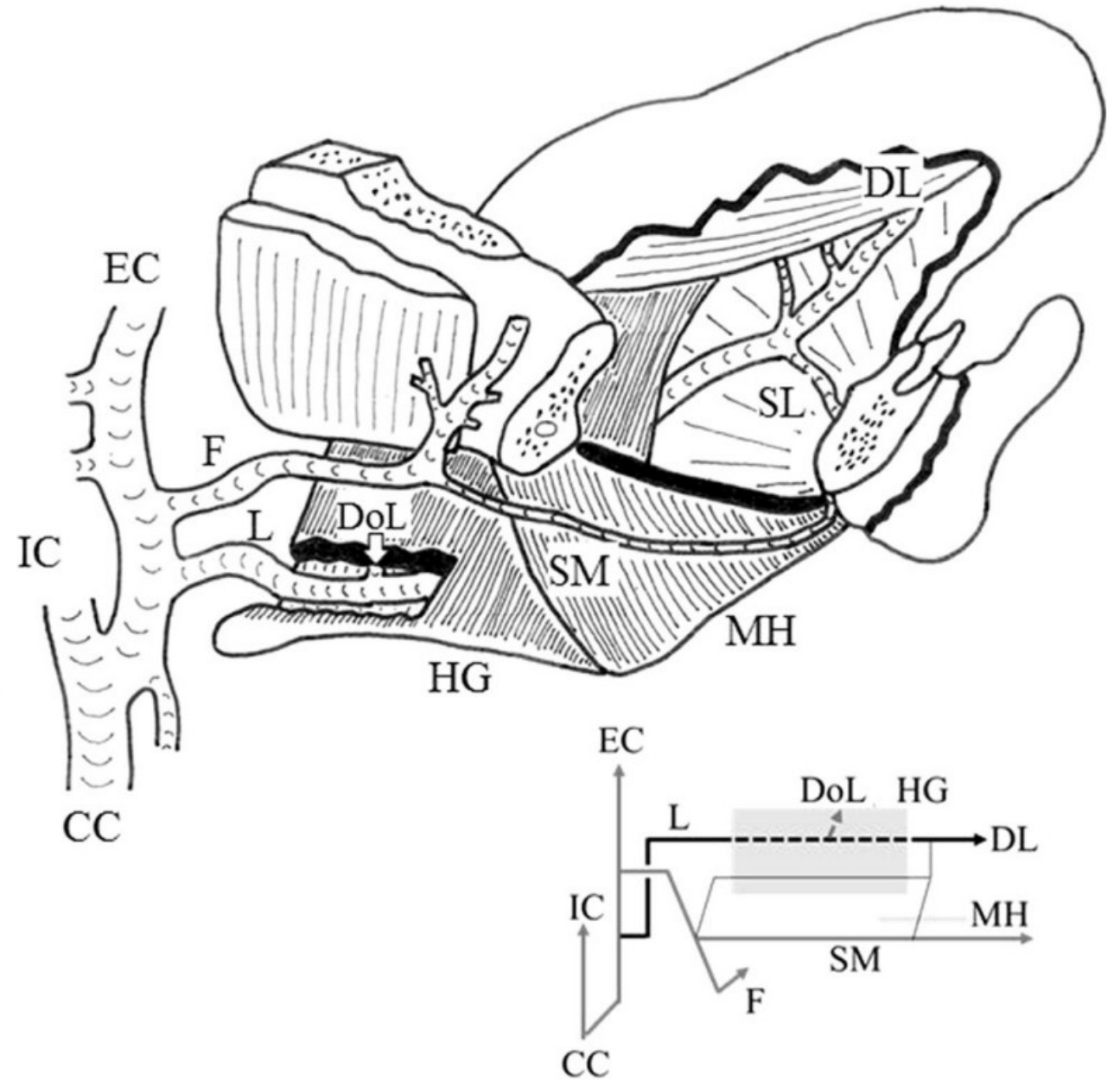
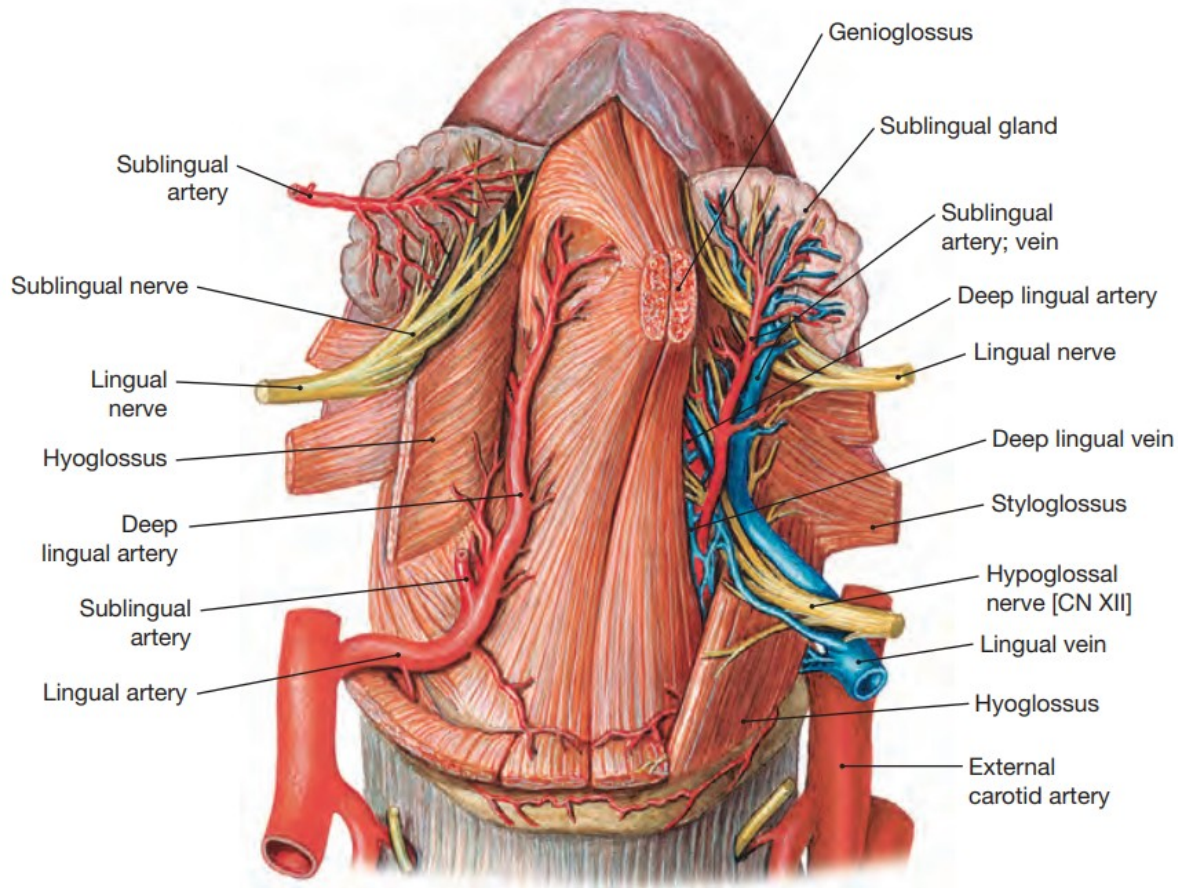
- **Suprahyoid branch**
- **Sublingual artery**
- **Dorsal lingual branches**
- **Deep lingual artery**

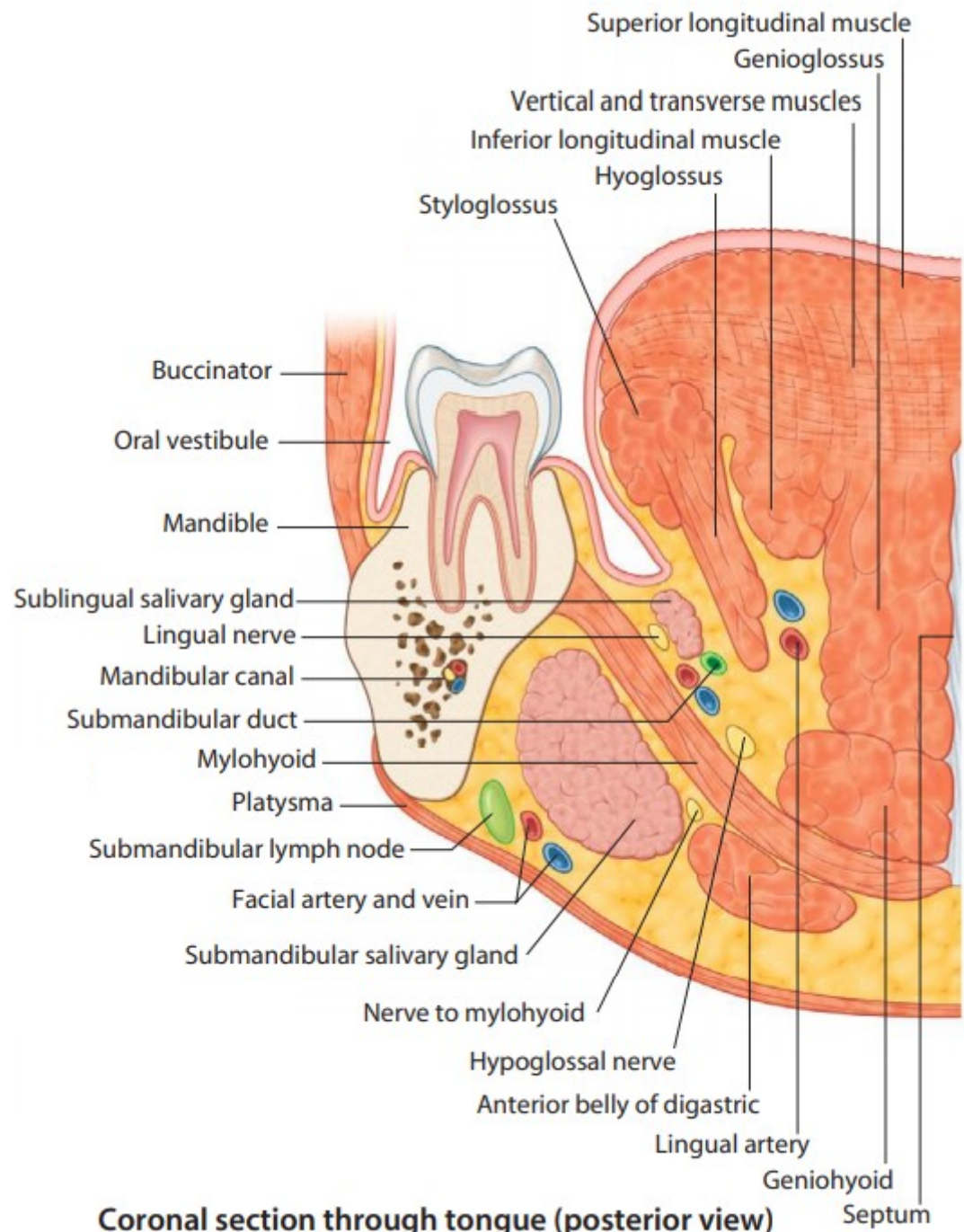


Arteries, veins, and nerves of the tongue

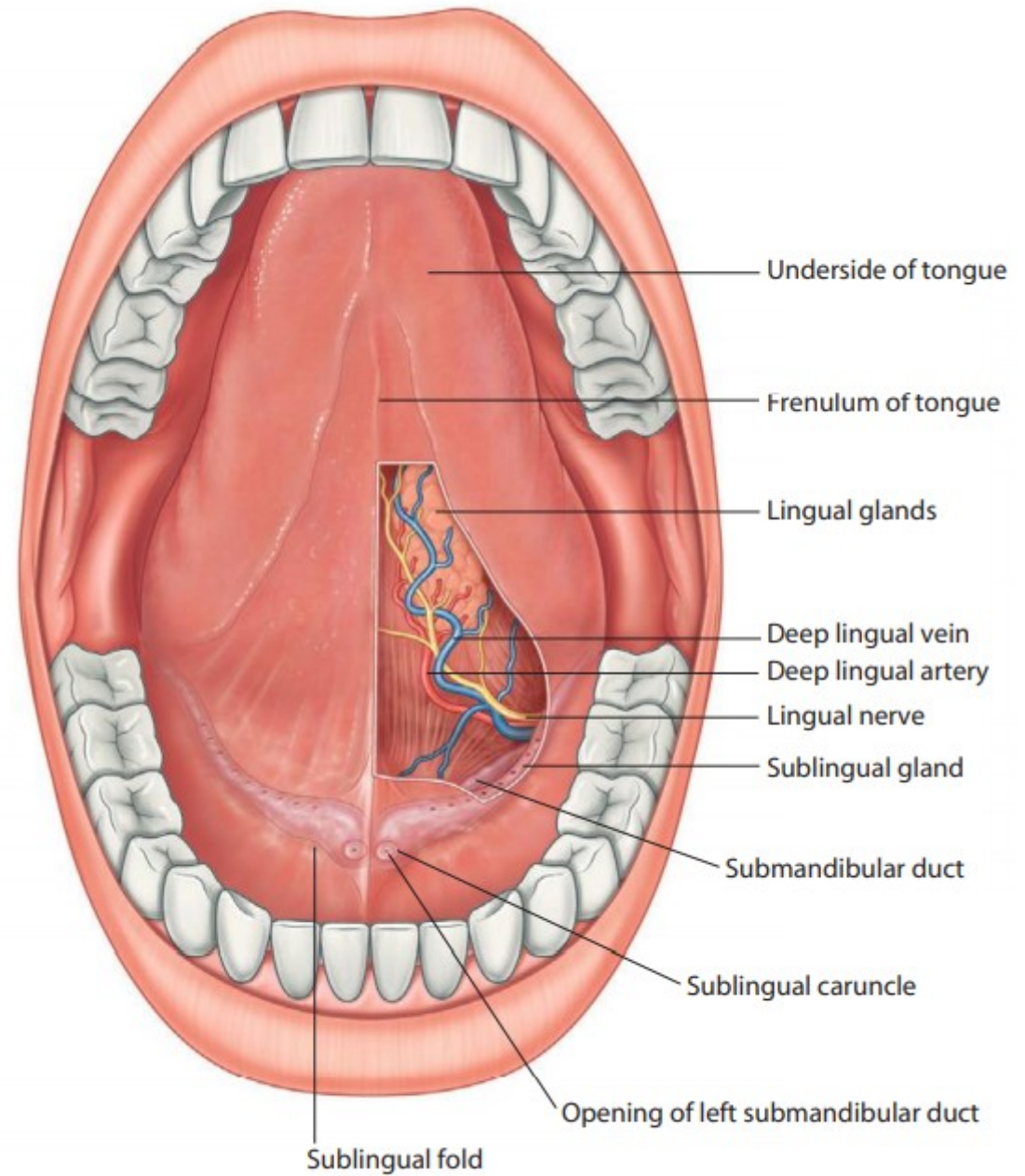
Lingual artery - M type

- the main route type
- courses between hyoglossus and genioglossus muscles





Coronal section through tongue (posterior view)



Inferior surface of tongue and floor of oral cavity

The lingual artery ligation

1. The Béclard's angle

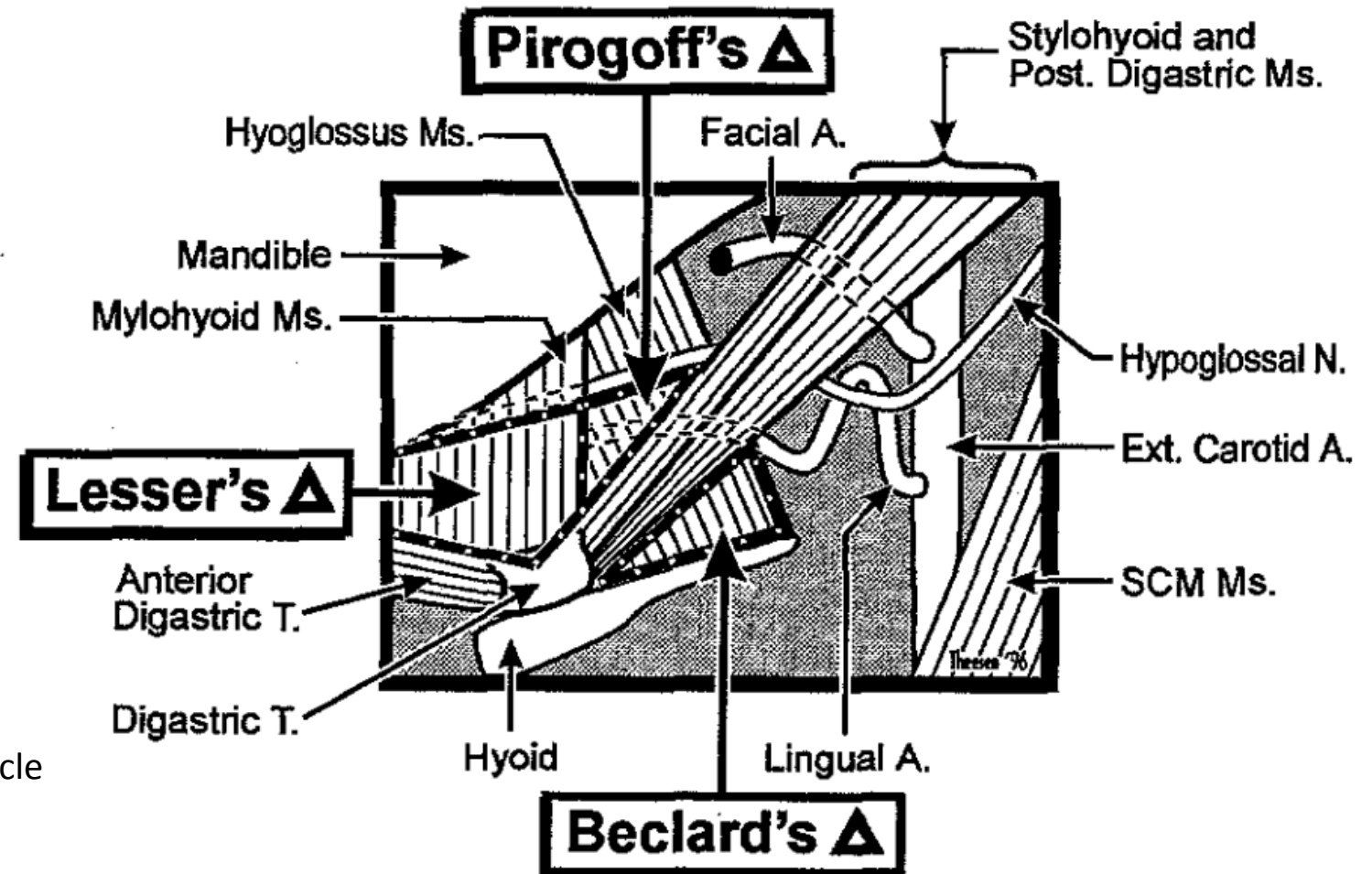
- caudal: the greater horn of the hyoid bone
- cranial: the posterior belly of the digastric muscle

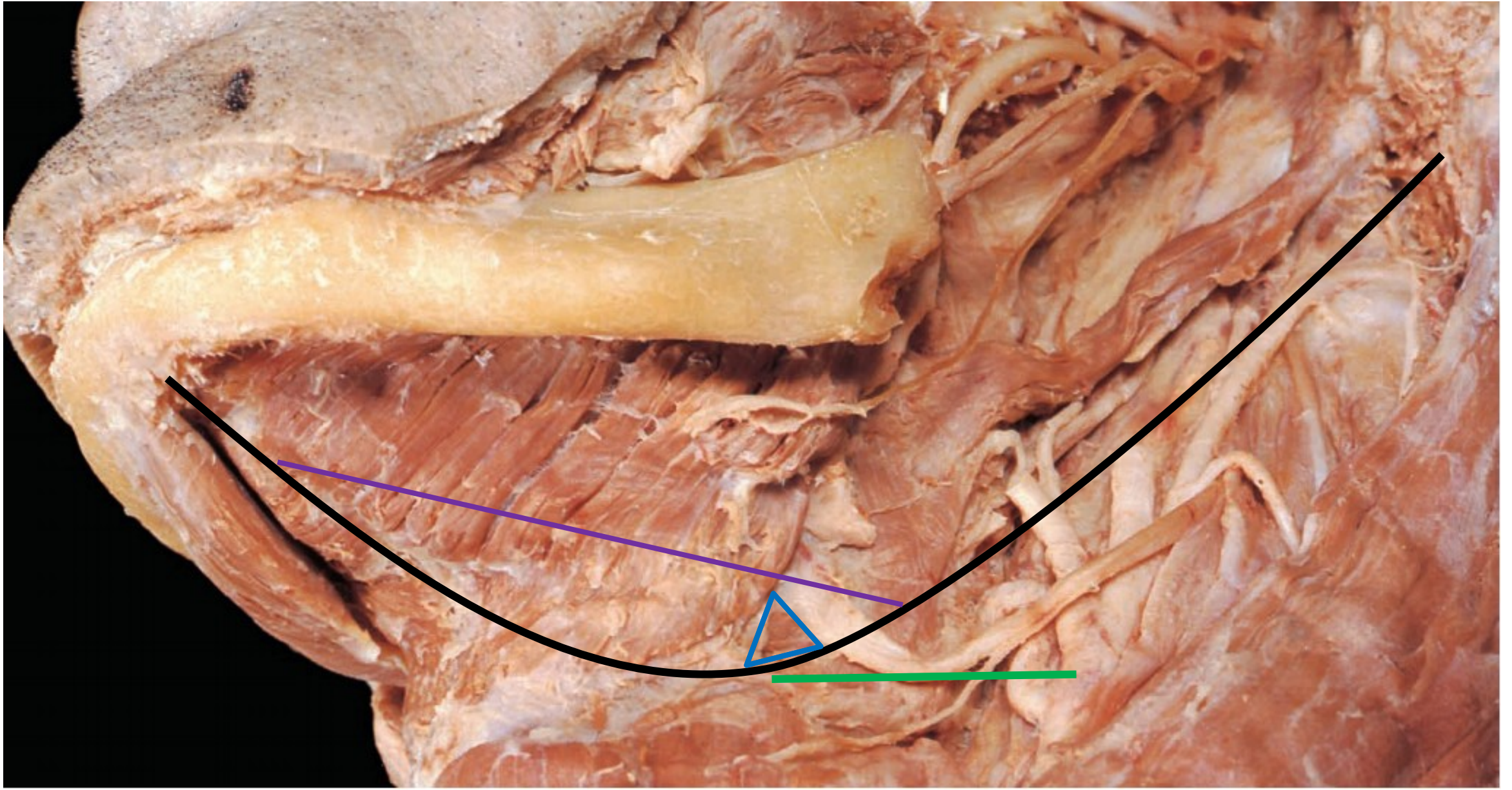
2. The Pirogov triangle

- the posterior border of the mylohyoid muscle
- the intermediate tendon of the digastric muscle
- hypoglossal nerve

3. The Lesser's triangle

- hypoglossal nerve
- the anterior and posterior belly of the digastric muscle





BEHCET'S DISEASE

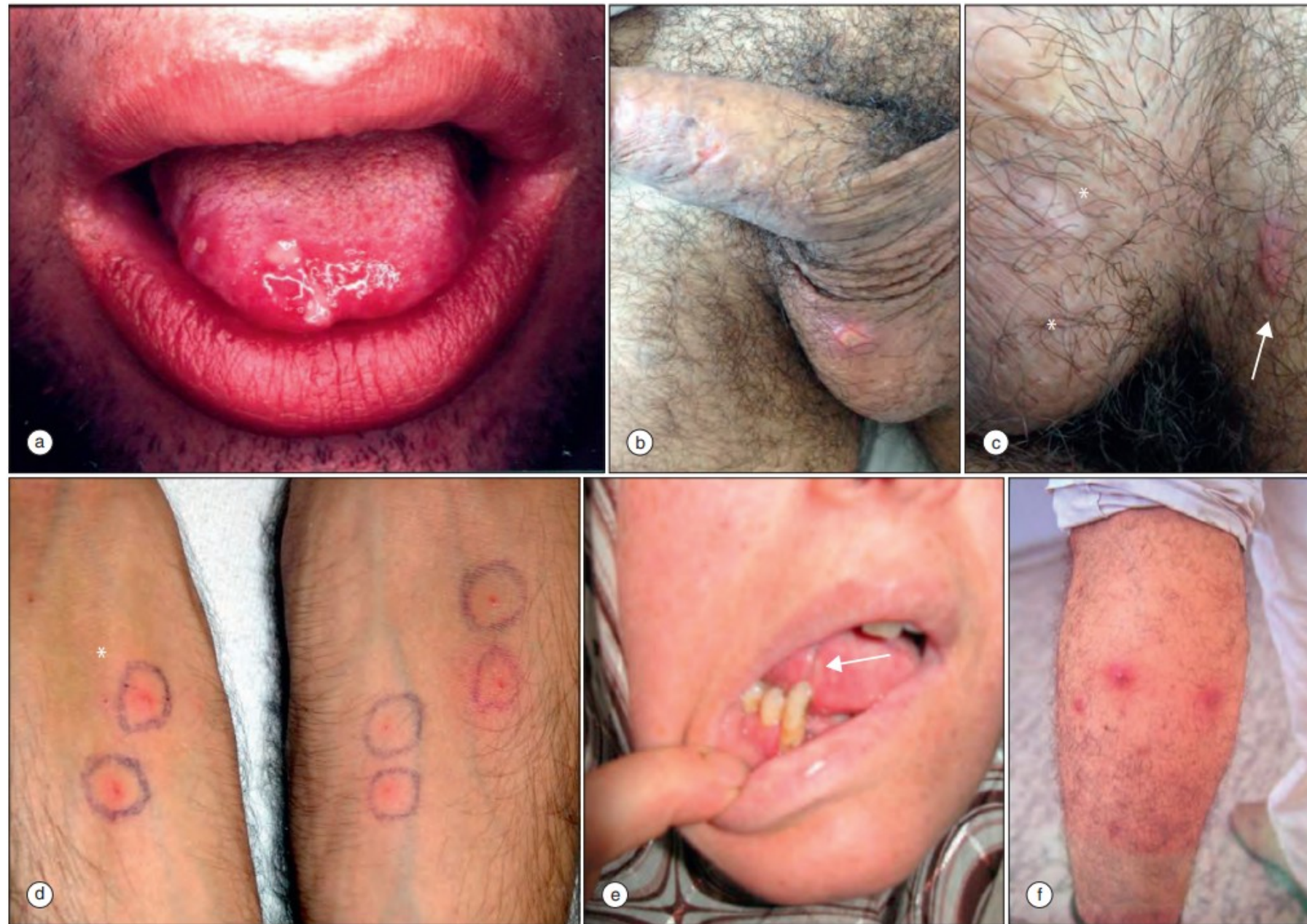
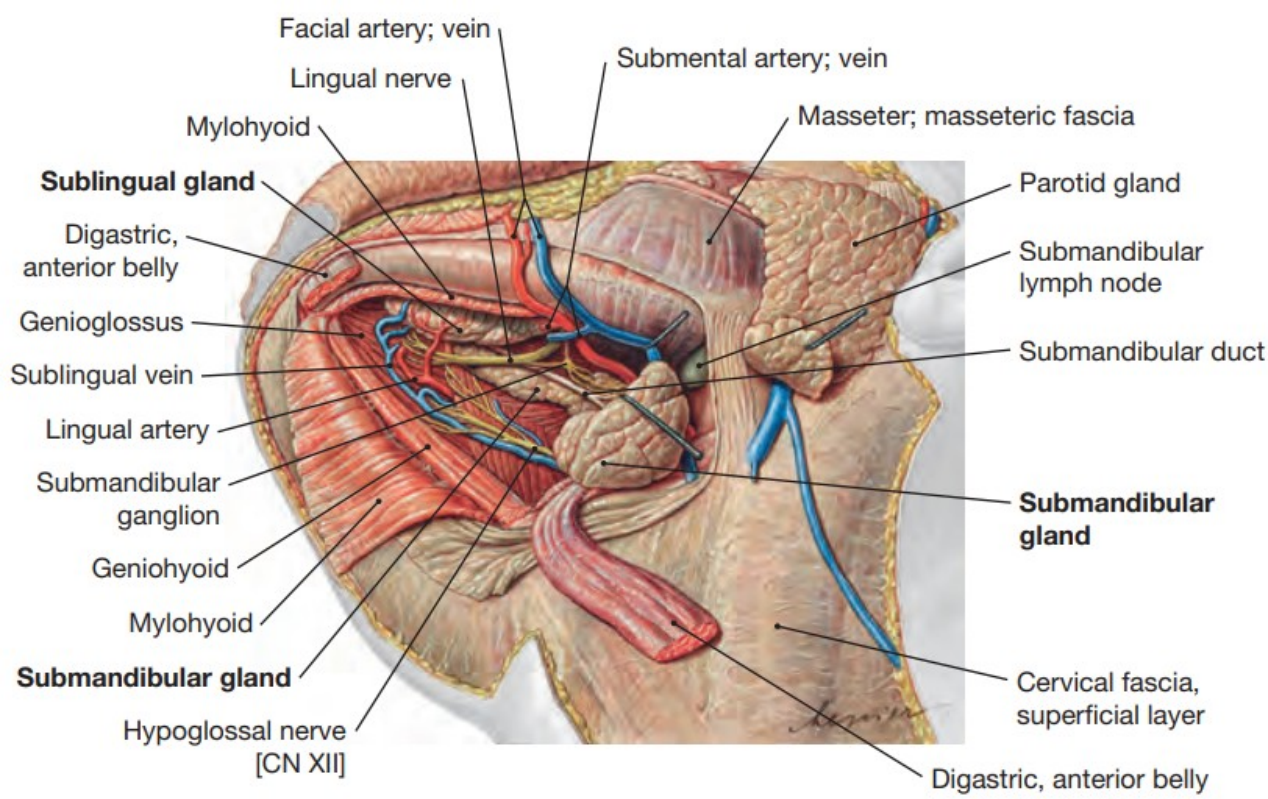
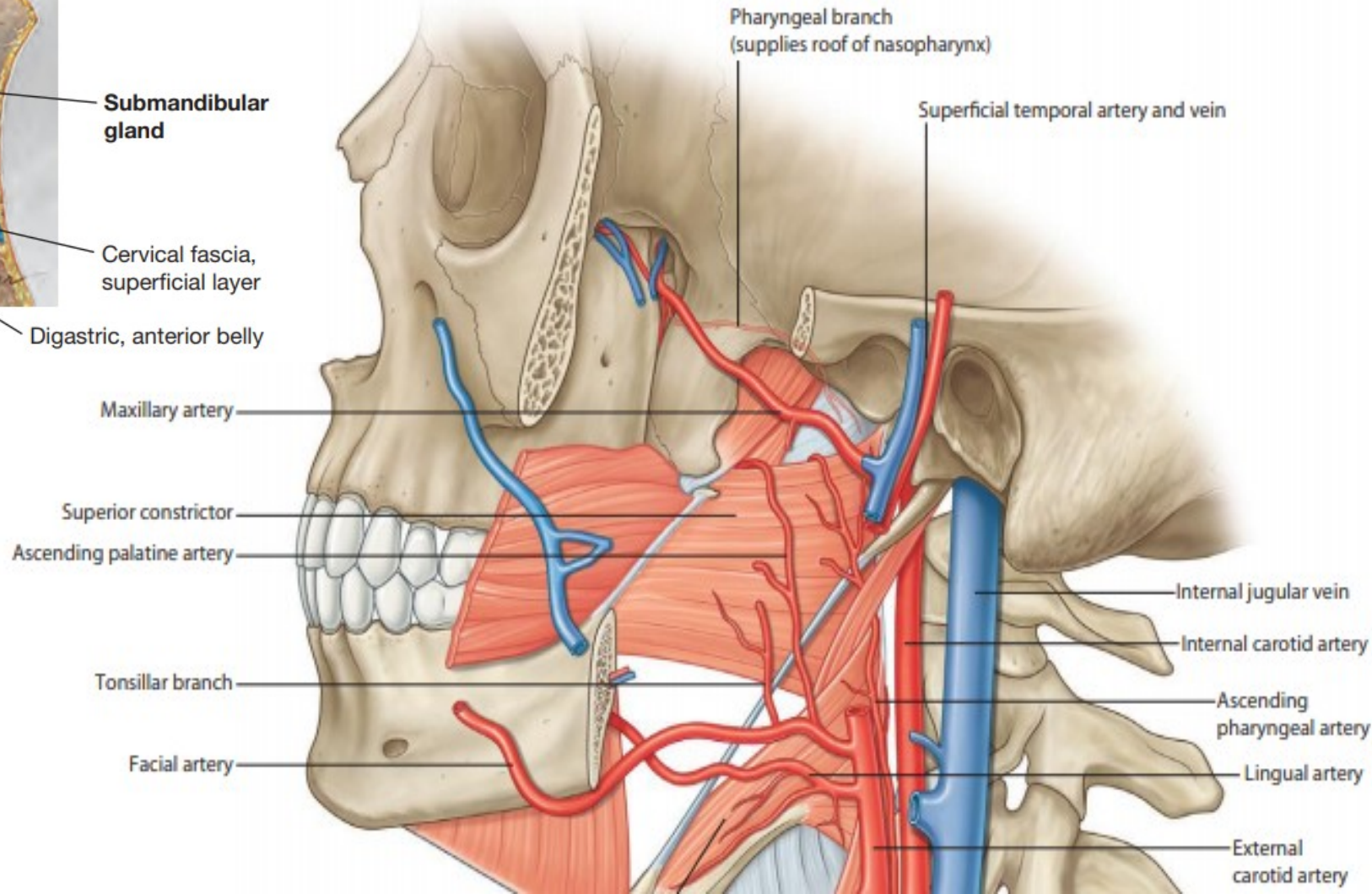


FIG. 167.1 Mucocutaneous manifestations of Behçet disease. **(a)** Oral aphthous ulcers. **(b)** Genital ulcers in the scrotum and skin of the shaft of the penis. **(c)** Ulcers in the groin (*arrow*) and scars of previous ulcers in the scrotum (*asterisks*). **(d)** Skin pathergy response in the forearm as erythematous pustule (*asterisk*) or papule at the needle prick sites at 48 hours. **(e)** Pathergic tongue ulcer (*arrow*) induced by dental trauma. **(f)** Papulopustular lesions in the calf.

FACIAL ARTERY

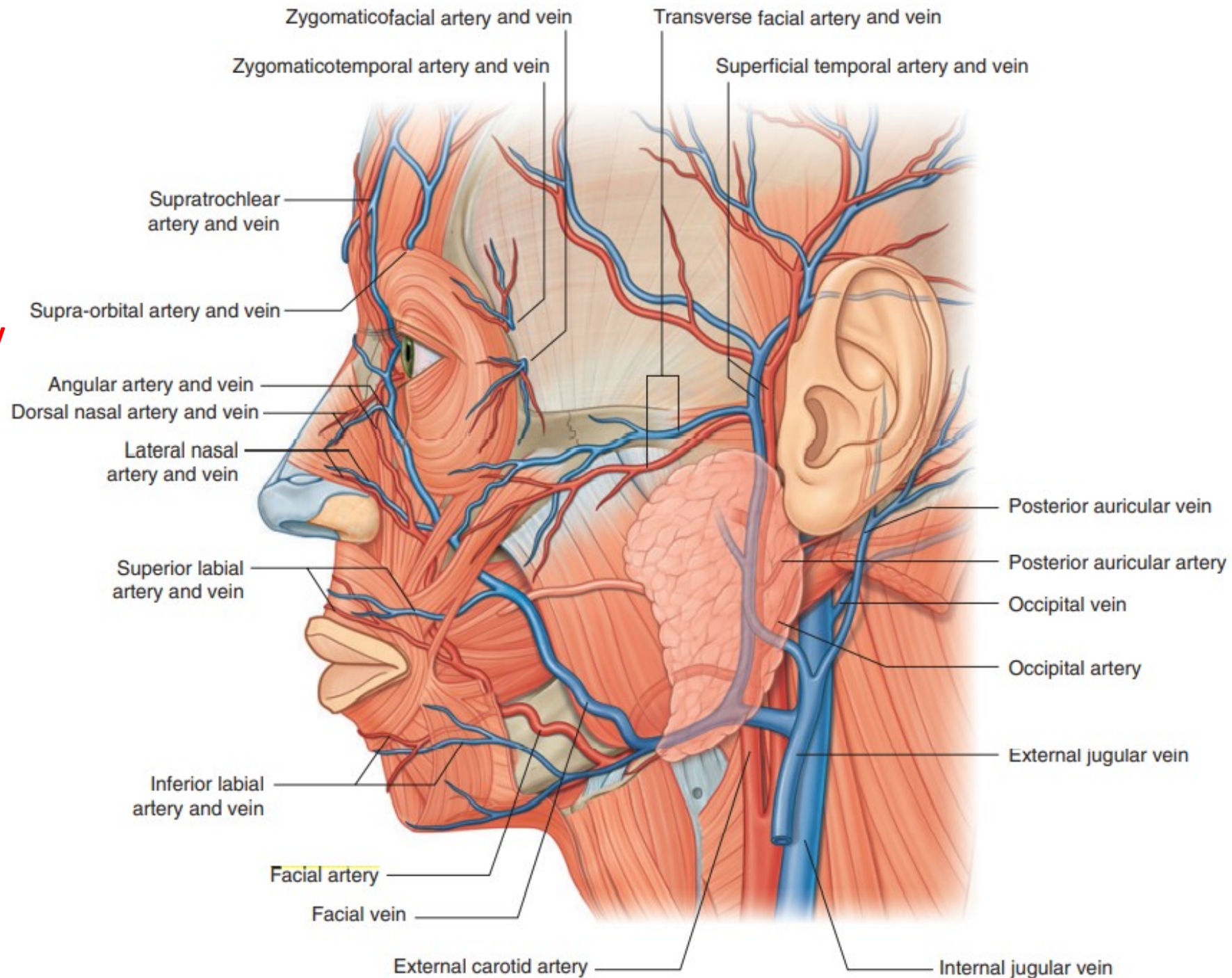


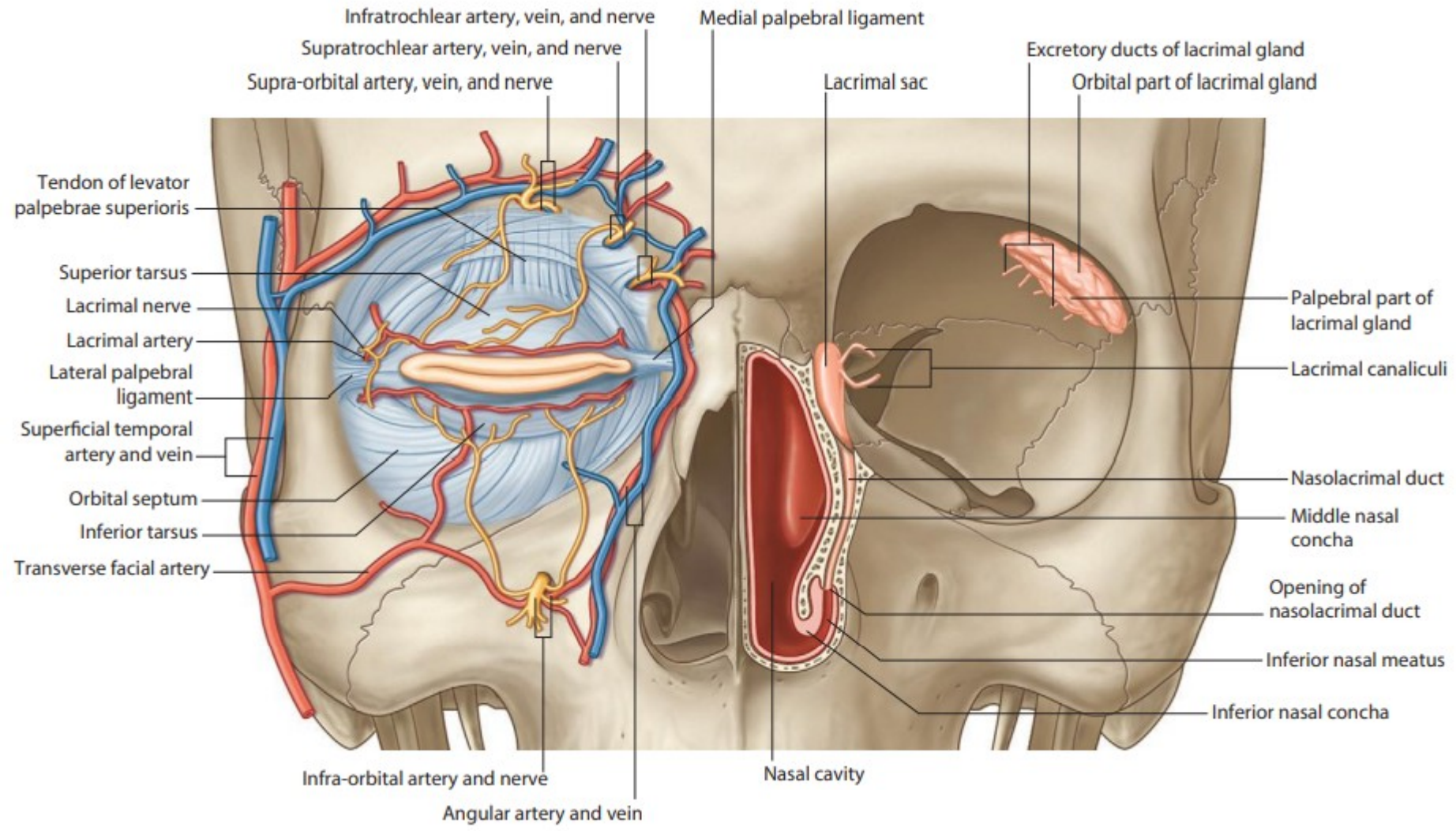
- **Ascending palatine artery**
- **Submental artery**
- **Tonsillar branch**
- **Glandular branches**
- **Superior and inferior labial artery**
- **Lateral nasal branch**
- **Angular artery**



FACIAL ARTERY

- Ascending palatine artery
- Submental artery
- Tonsillar branch
- Glandular branches
- Superior and inferior labial artery
- Lateral nasal branch
- Angular artery



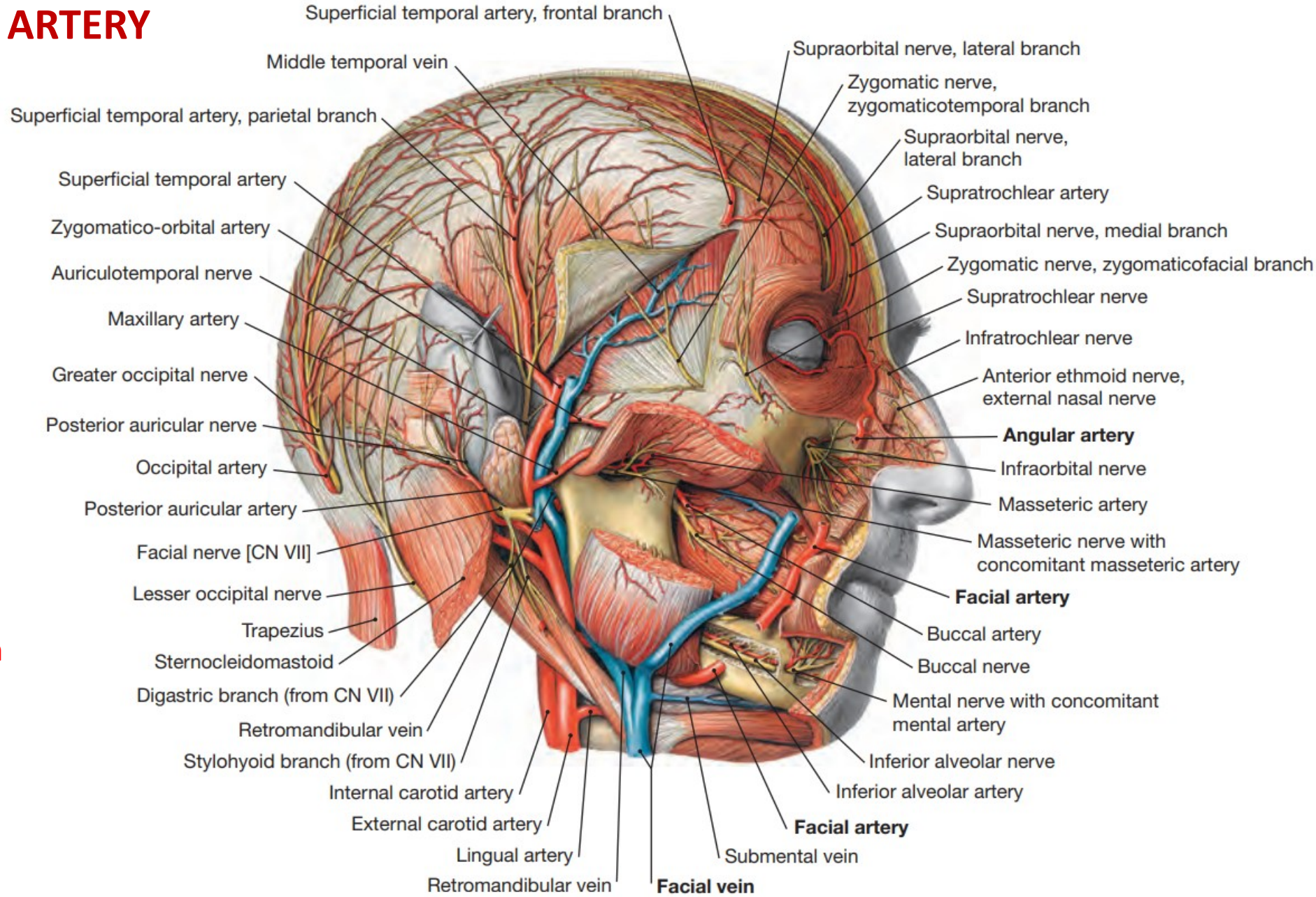


POSTERIOR AURICULAR ARTERY

- Muscular branches
- Glandular branches
- Auricular branch
- Stylomastoid artery
 - Posterior tympanic artery
 - Mastoid branches
 - Stapedial branch
- Occipital branch

OCCIPITAL ARTERY

- Sternocleidomastoid branch
- Auricular branch
- Mastoid (meningeal) branch
- Occipital branches



ASCENDING PHARYNGEAL ARTERY

- Pharyngeal branches
- Posterior meningeal artery
- Inferior tympanic artery

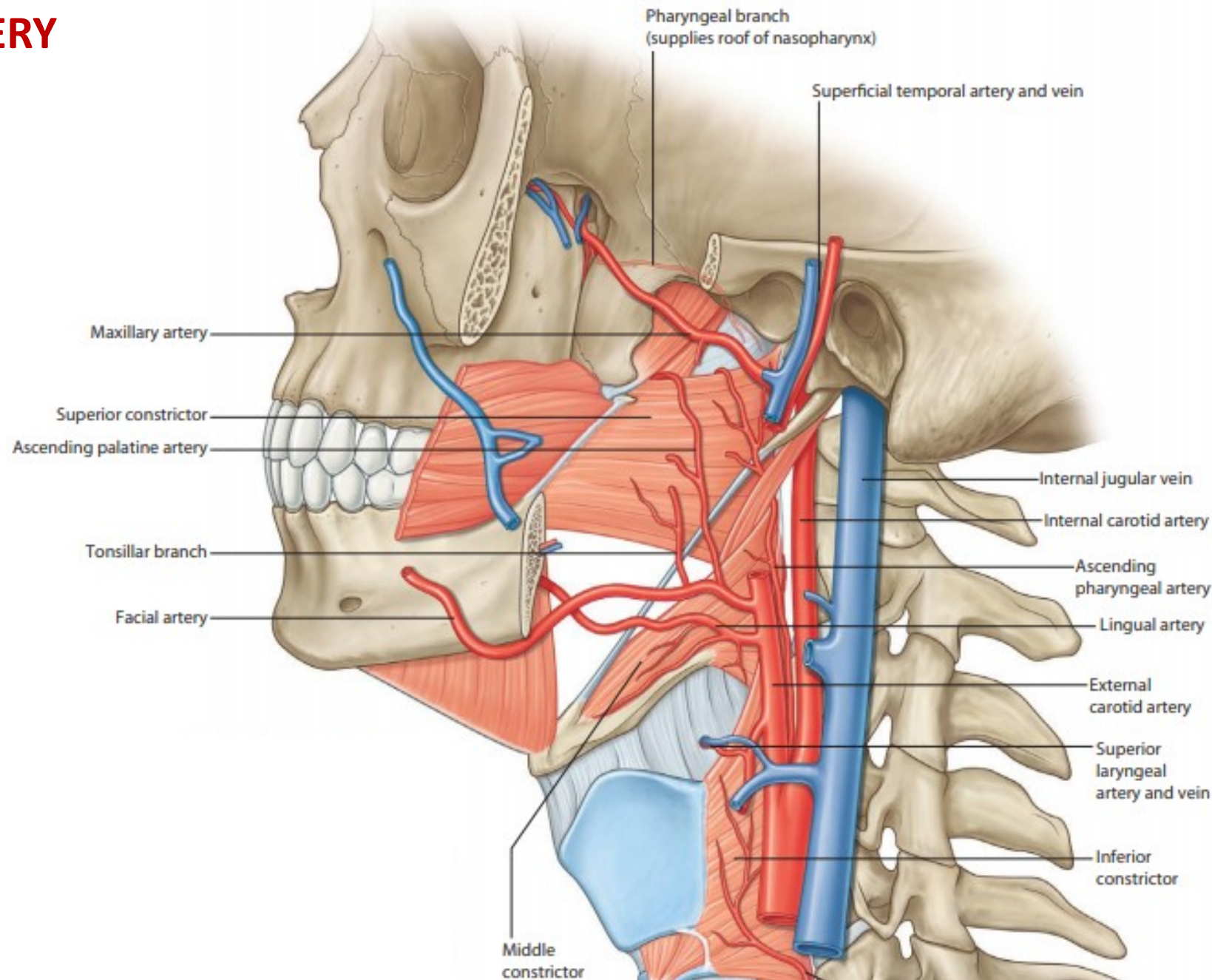
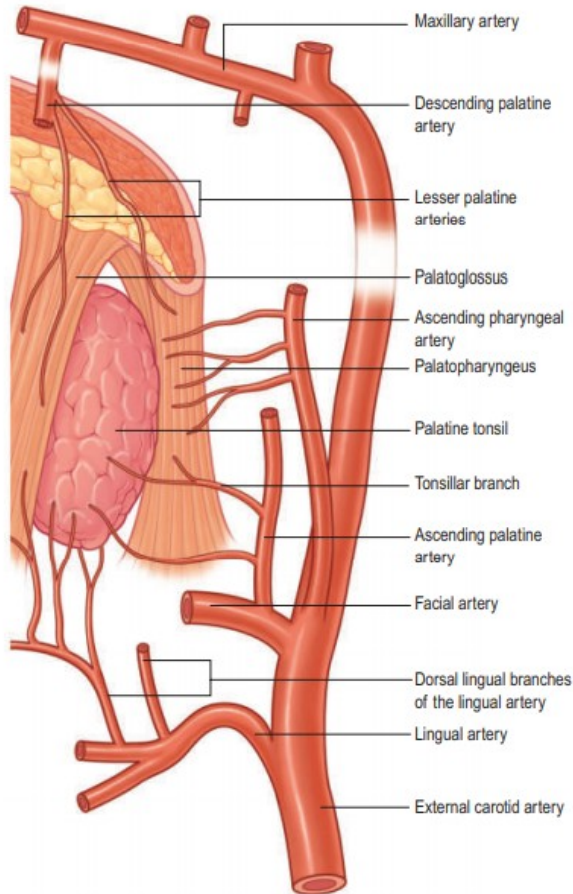
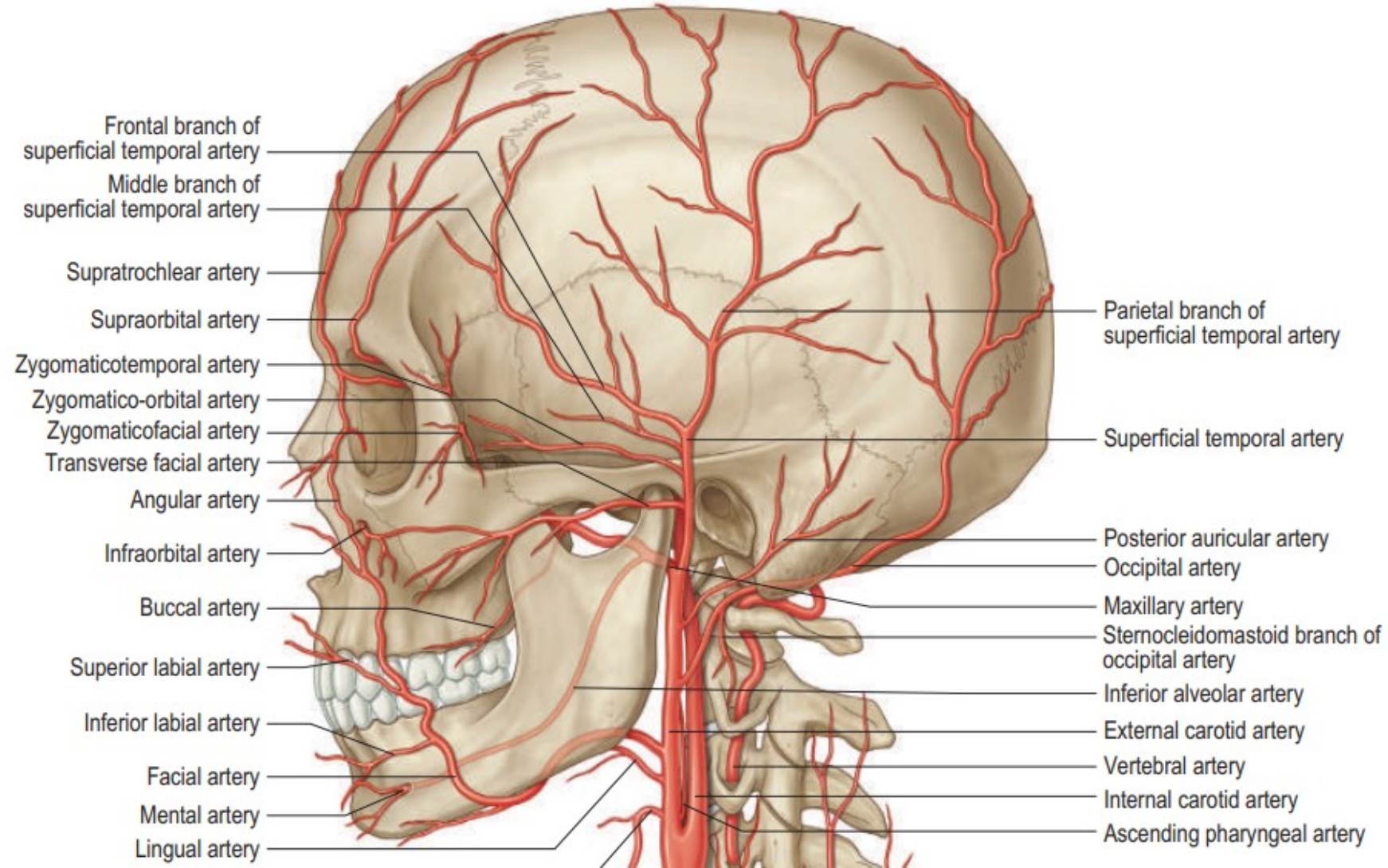


Fig. 34.7 The arterial supply to the palatine tonsil.

SUPERFICIAL TEMPORAL ARTERY

- **Parotid branches**
- **Transverse facial artery**
- **Anterior auricular branches**
- **Zygomatico-orbital artery**
- **Middle temporal artery**
- **Frontal branch**
- **Parietal branch**



TEMPORAL ARTERITIS



Fig. 4.28 Prominent temporal artery in arteritis temporalis (giant-cell arteritis, arteritis temporalis Horton).

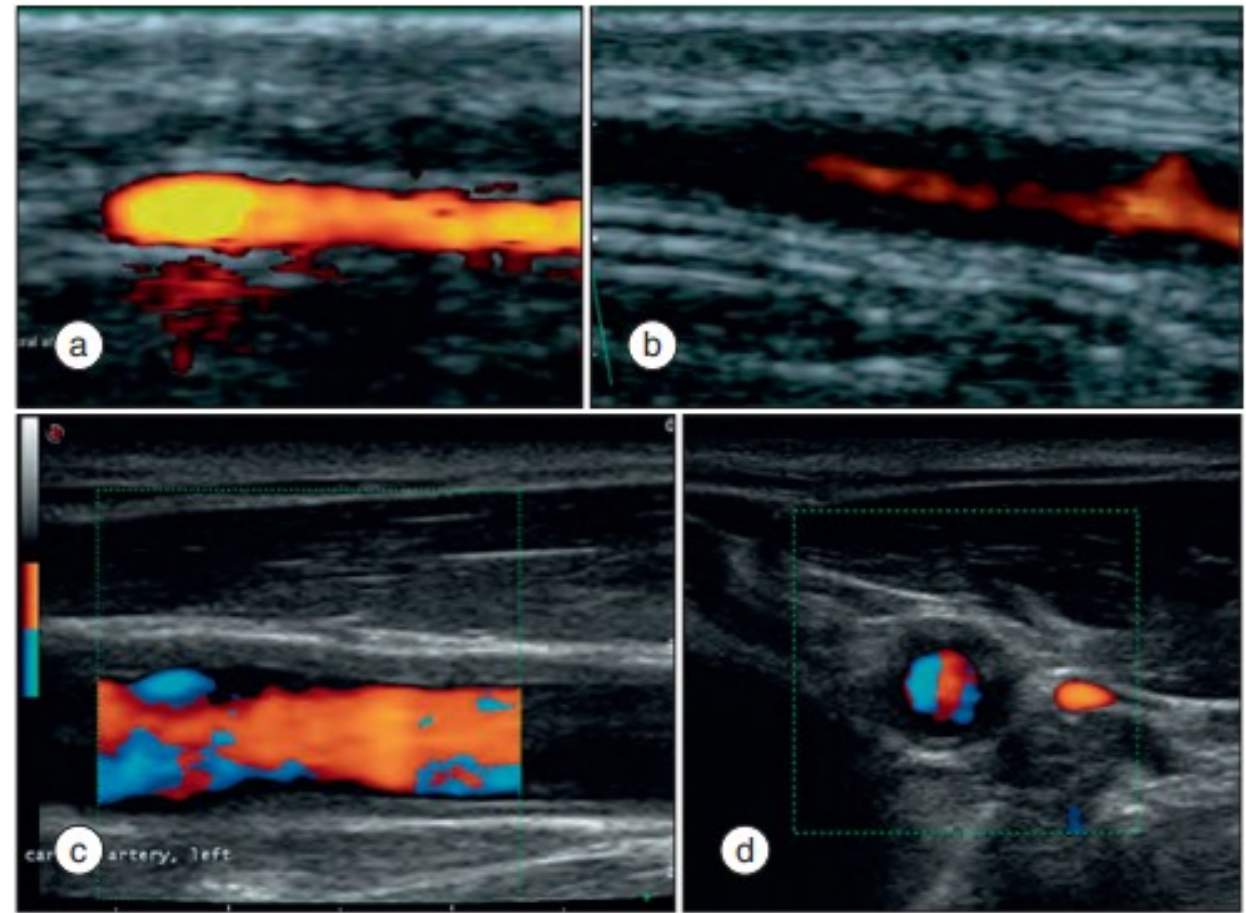


FIG. 48.12 Temporal arteritis and large-vessel giant cell arteritis. **(a)** Normal temporal artery after temporal artery biopsy. The artery lumen is patent with no stenosis, and the vessel wall is hyperechoic and of normal thickness (confirmed on histologic analysis). **(b)** Temporal arteritis. The artery shows a narrowed lumen and thickened hypoechoic arterial wall. **(c)** Arteritis of the carotid artery. A skip lesion is seen on longitudinal view with hypoechoic arterial wall thickening. **(d)** Transverse view of the carotid artery showing the halo sign, a circumferential hypoechoic thickening of the arterial wall.

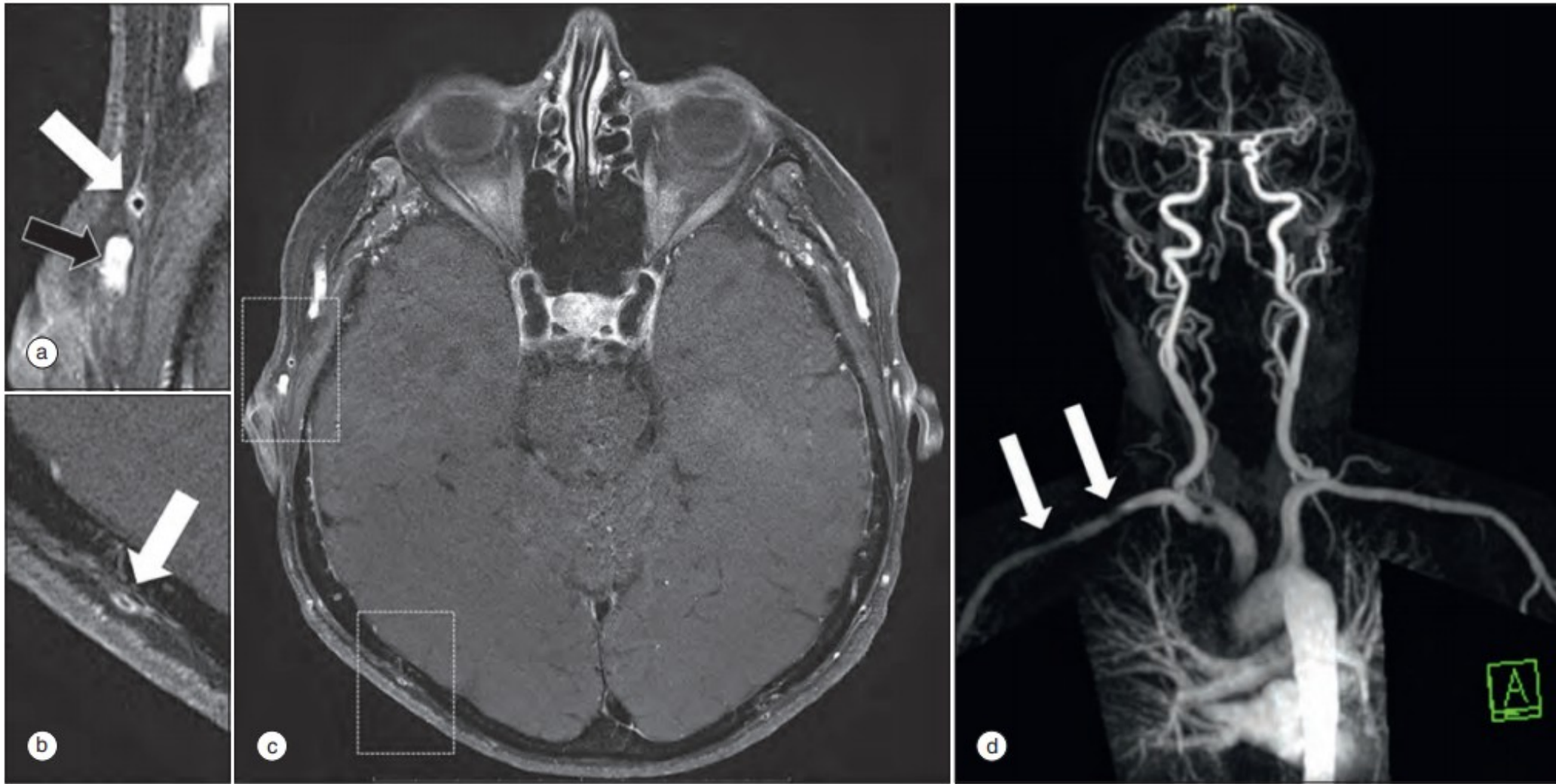


FIG. 166.5 High-resolution cranial magnetic resonance imaging of a 72-year-old woman with giant cell arteritis (GCA) readily reveals inflammatory mural thickening and contrast enhancement of the right superficial temporal artery (*white arrow* in enlargement in **a**) and right superficial occipital artery (*white arrow* in enlargement in **b**). Please note missing signal within the artery's lumen because of high arterial flow, the so-called flow void phenomenon. Because of its slower venous flow, the concomitant right superficial temporal vein (*dark arrow* in enlargement **a**) displays homogeneous contrast and no flow void phenomenon. By depicting the entire cranial circumference, the superficial temporal and occipital arteries and their branches can be assessed within one single scan (**c**). (**d**) Magnetic resonance angiography of the supraaortic arteries in the same patient as in the previous image displays segmental inflammatory stenoses of the right subclavian artery. (*a–d*, Courtesy of Dr. T.A. Bley, Universität Würzburg, Germany.)

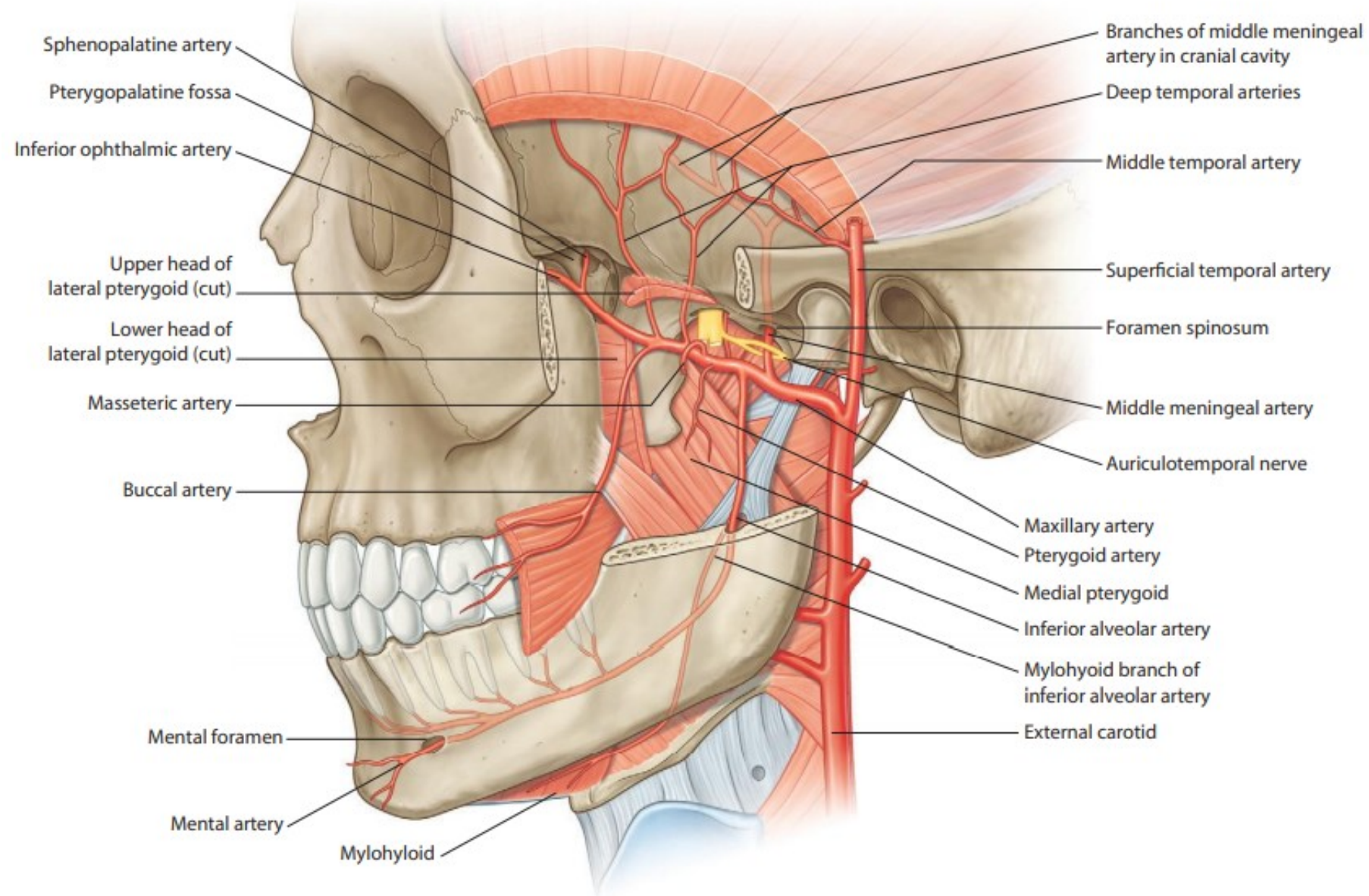
MAXILLARY ARTERY

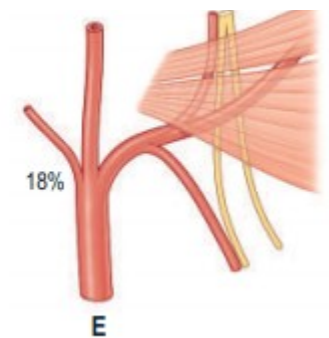
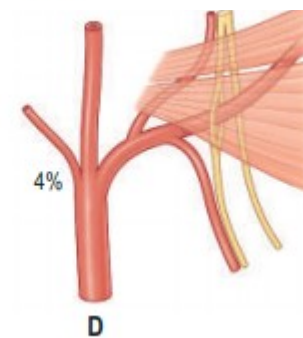
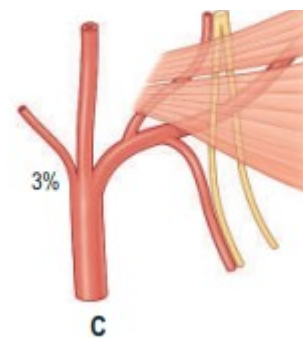
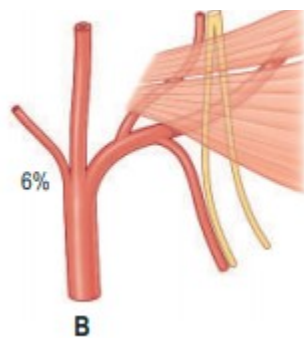
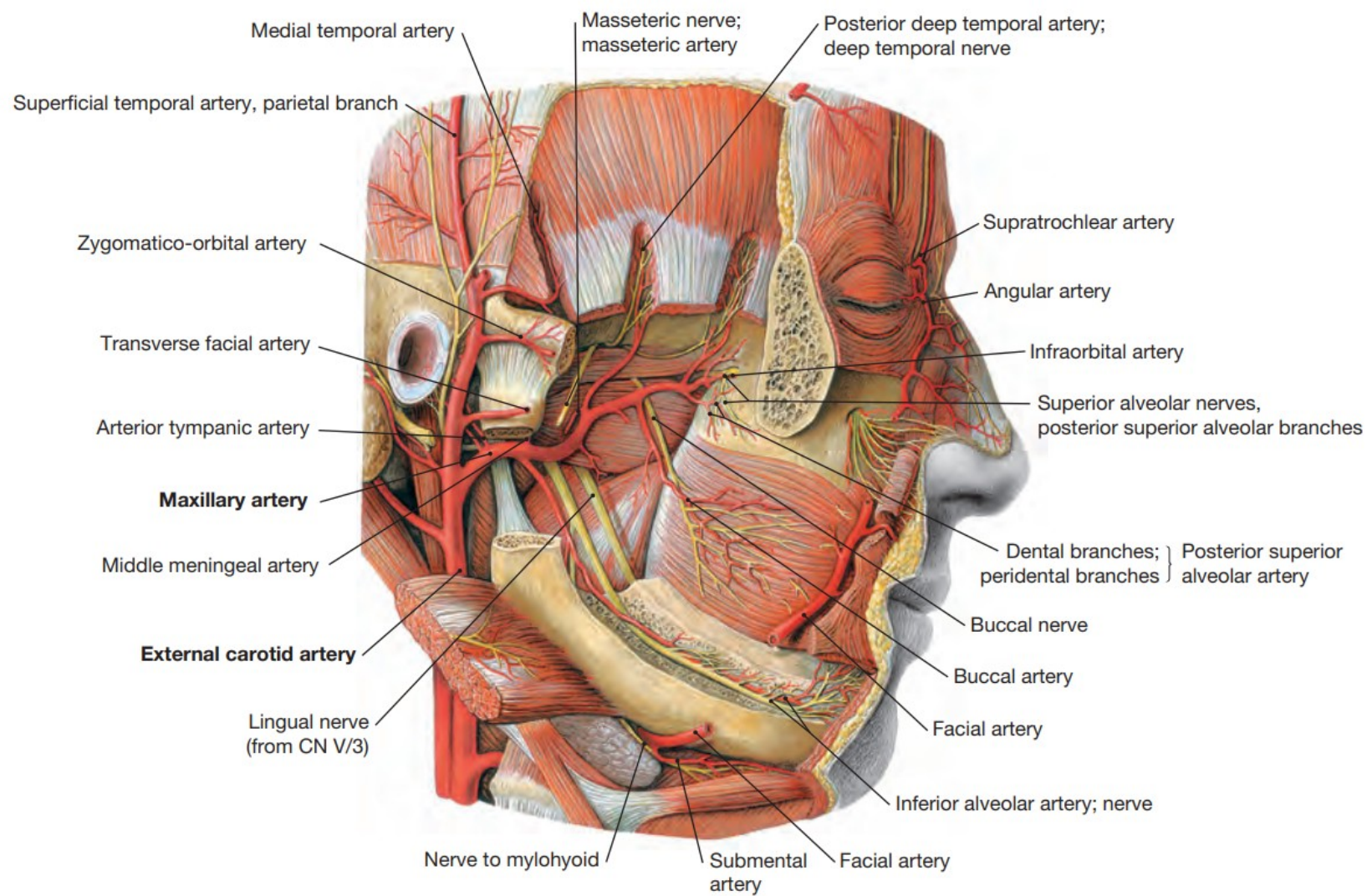
1. MANDIBULAR PORTION

- **Deep auricular artery**
- **Anterior tympanic artery**
- **Middle meningeal artery**
 - Frontal branch
 - Parietal branch
 - Orbital branch
 - Superior tympanic artery
- **Inferior alveolar artery**
 - Mylohyoid branch
 - Dental branches
 - Gingival branches
 - Mental artery

2. PTERYGOID PORTION

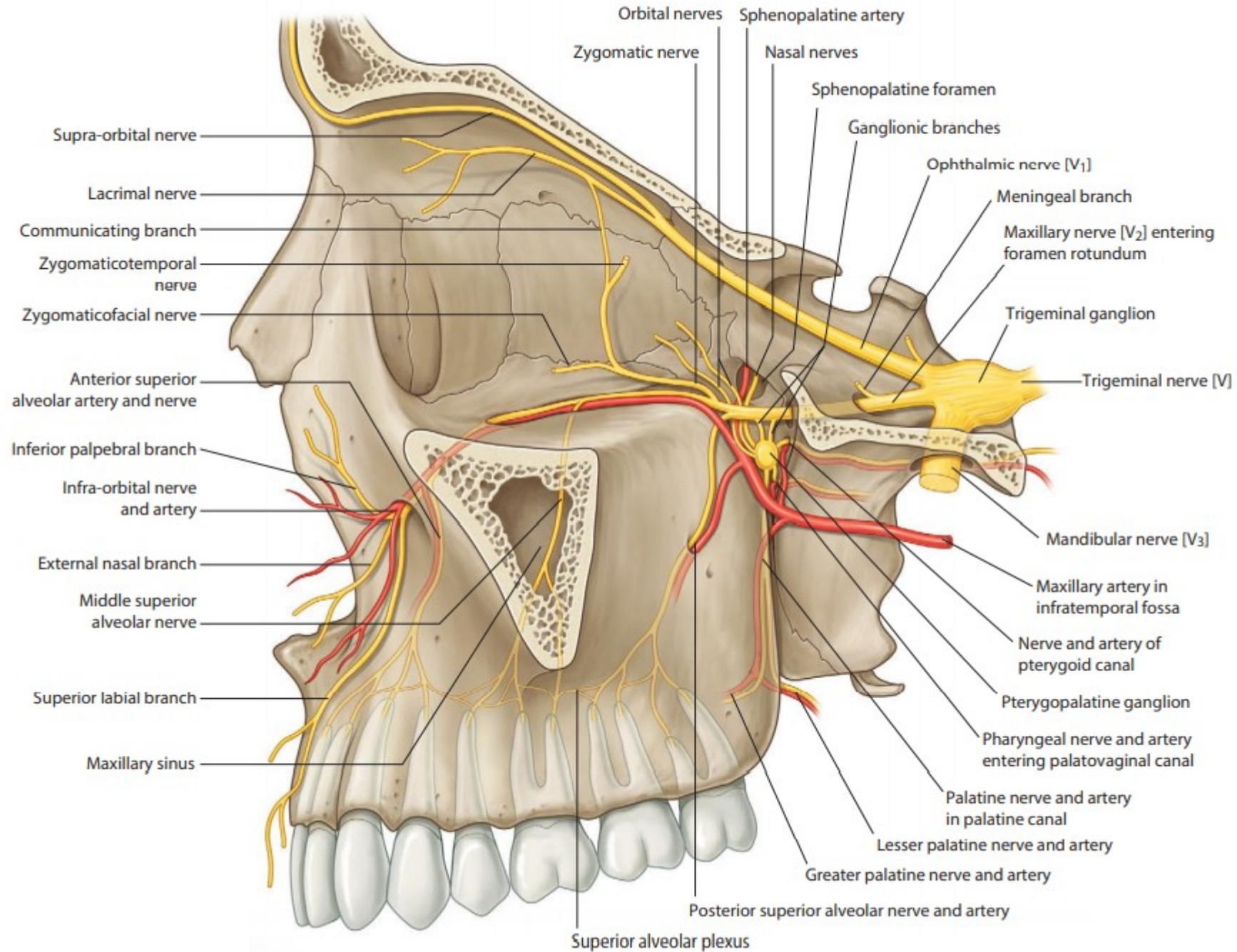
- **Masseteric artery**
- **Pterygoid arteries**
- **Deep temporal arteries**
- **Buccal artery**

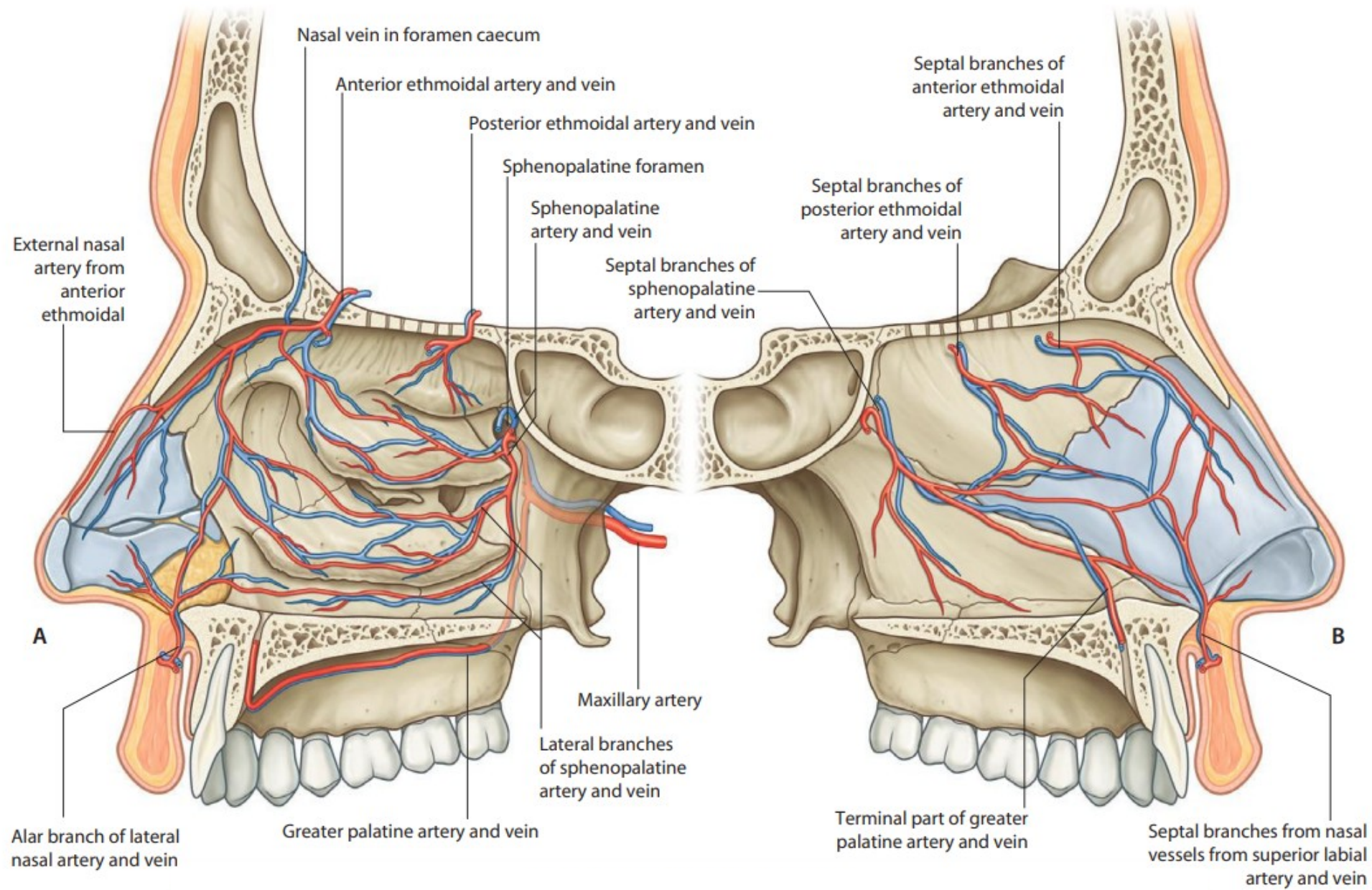




3. PTERYGOPALATINE PORTION

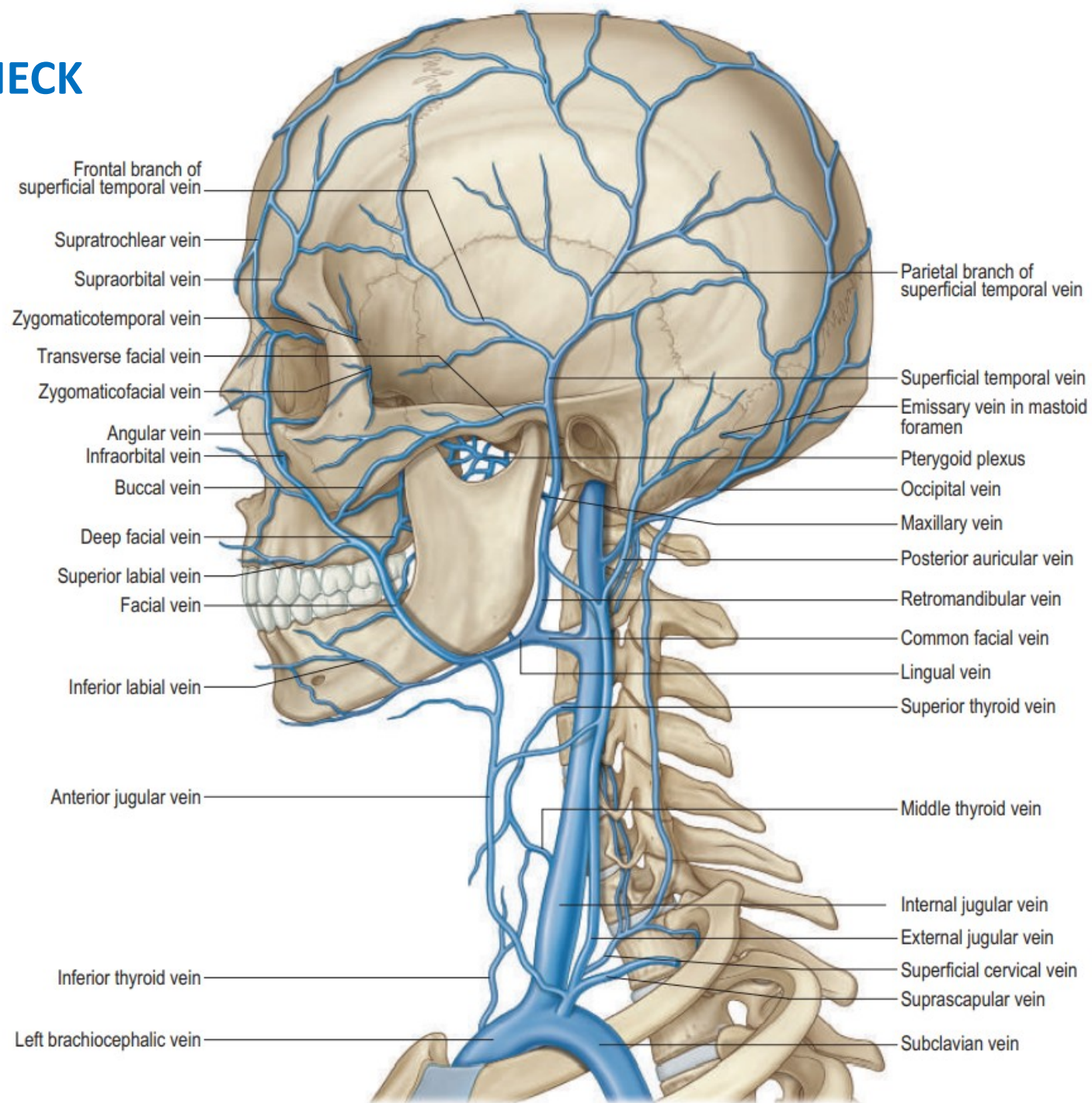
- **Posterior superior alveolar artery**
 - Dental branches
 - Gingival branches
- **Infraorbital artery**
 - Anterior superior alveolar arteries
 - Dental branches
 - Gingival branches
- **Artery of pterygoid canal**
- **Descending palatine artery**
 - Greater palatine artery
 - Lesser palatine arteries
- **Sphenopalatine artery**
 - Posterior lateral nasal arteries
 - Posterior septal branches
 - Nasopalatine branch

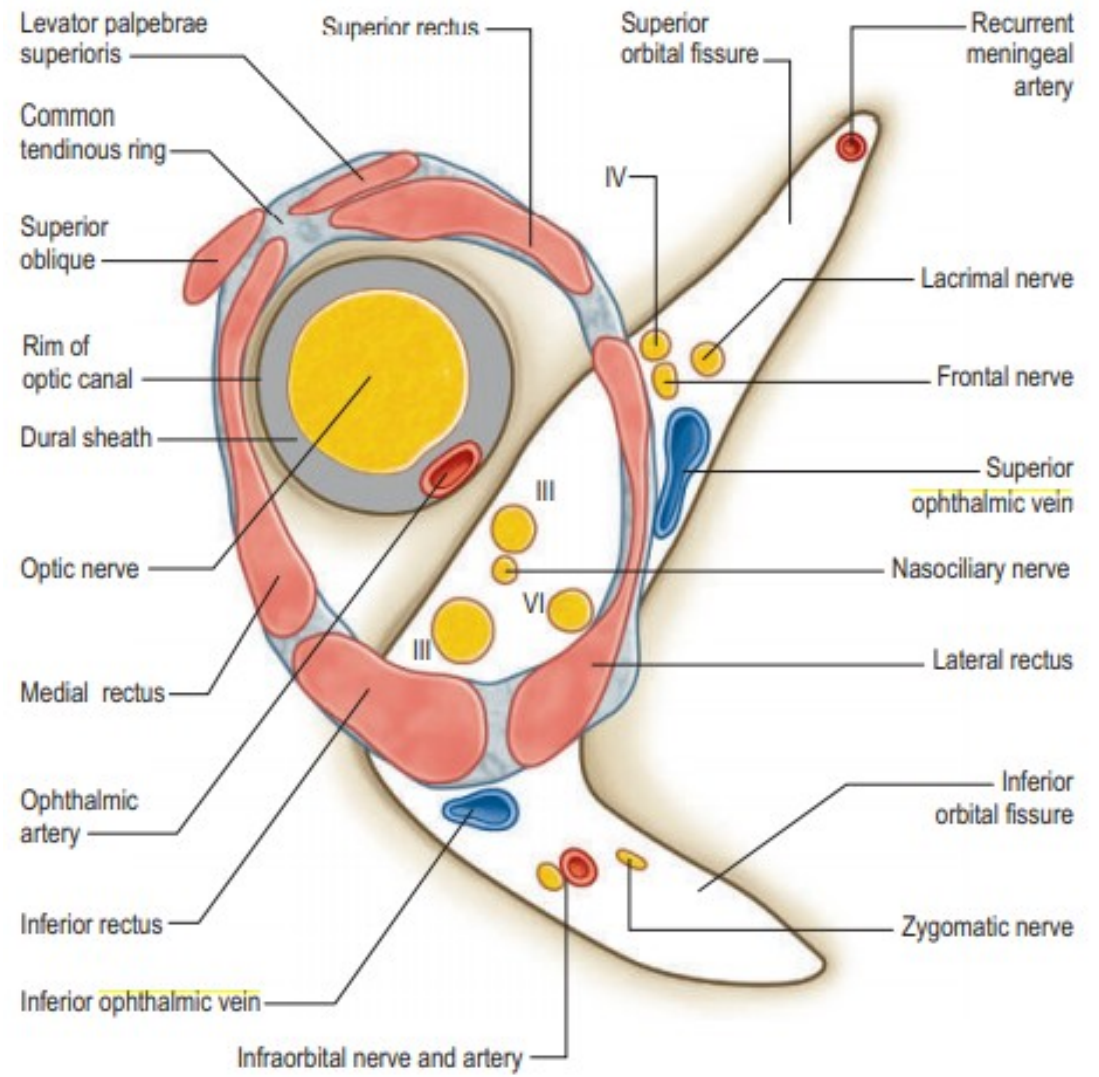
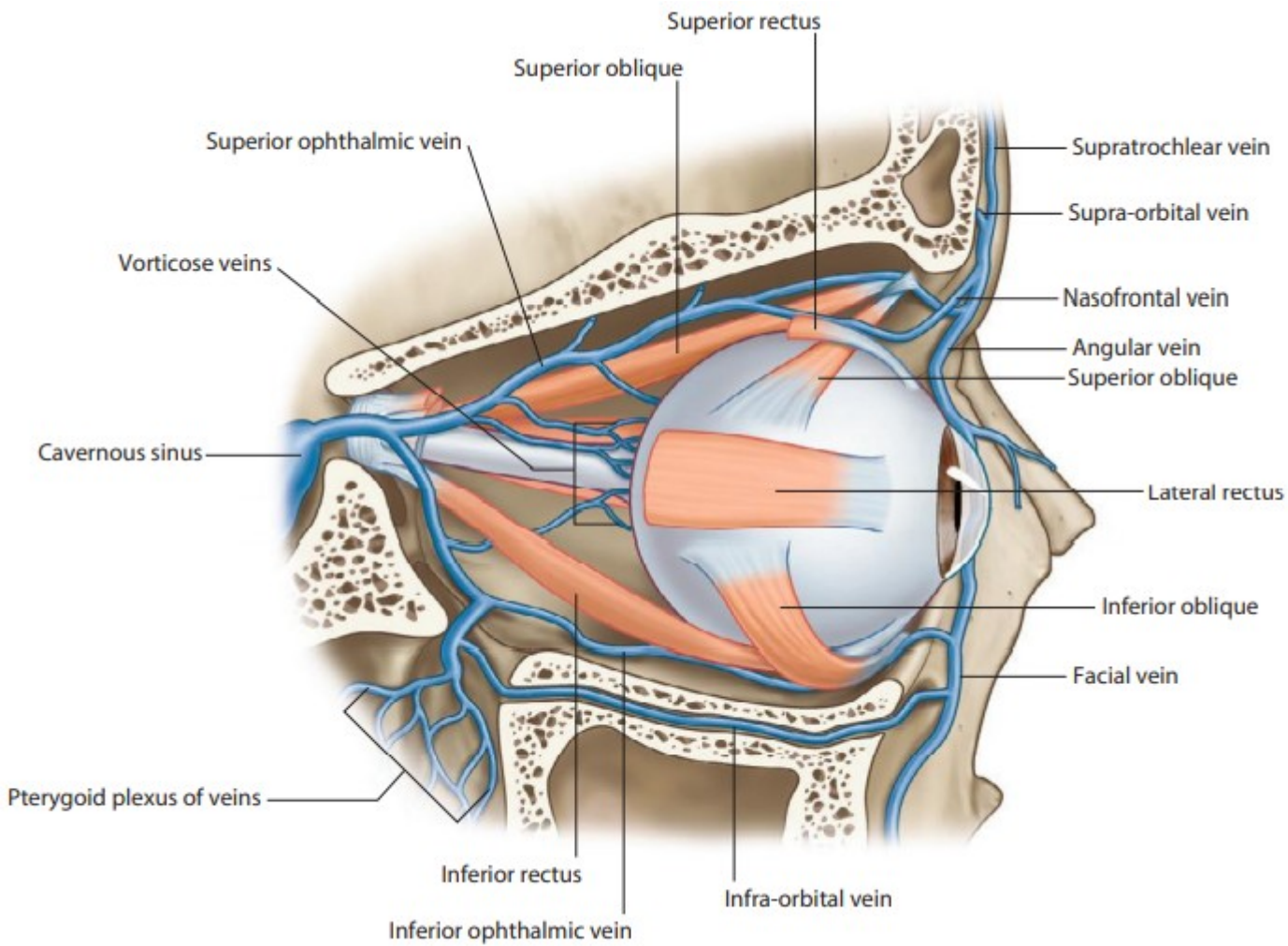




VENOUS DRAINAGE OF THE HEAD AND NECK

1. Cerebral veins
2. Meningeal veins
3. Dural venous sinuses
4. Diploic veins
5. Veins of labyrinth
6. **Emissary veins**
7. **Retromandibular vein**
 - Superficial temporal vein
 - Middle temporal vein
 - Transvers facial vein
 - Maxillary veins
8. **Ophthalmic veins**
9. **Pharyngeal veins**
10. **Facial vein**
11. **Lingual vein**
 - Sublingual vein
 - Vena comitans nervi hypoglossi
12. Superior thyroid vein
13. Middle thyroid vein
14. **External jugular vein**

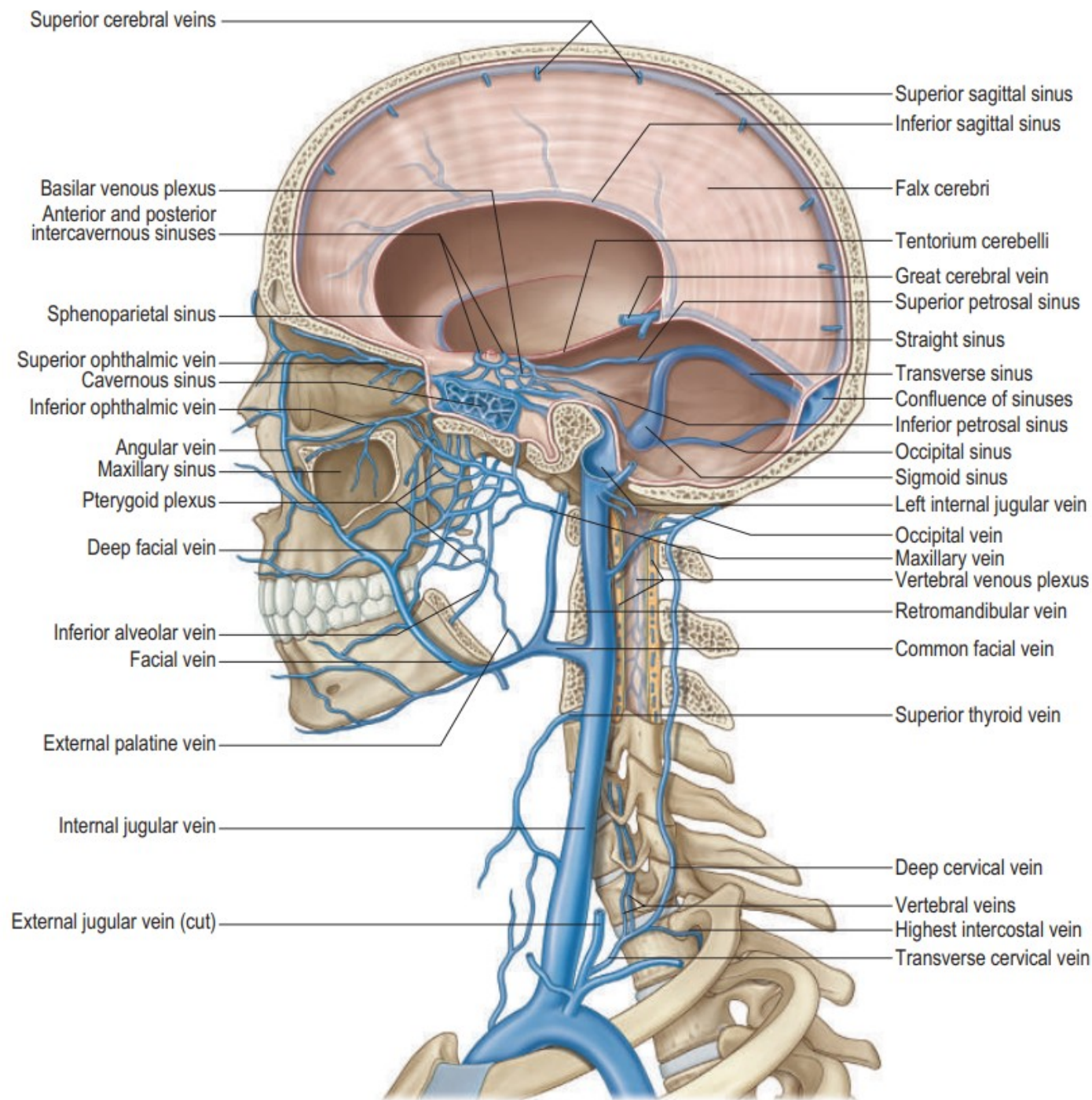
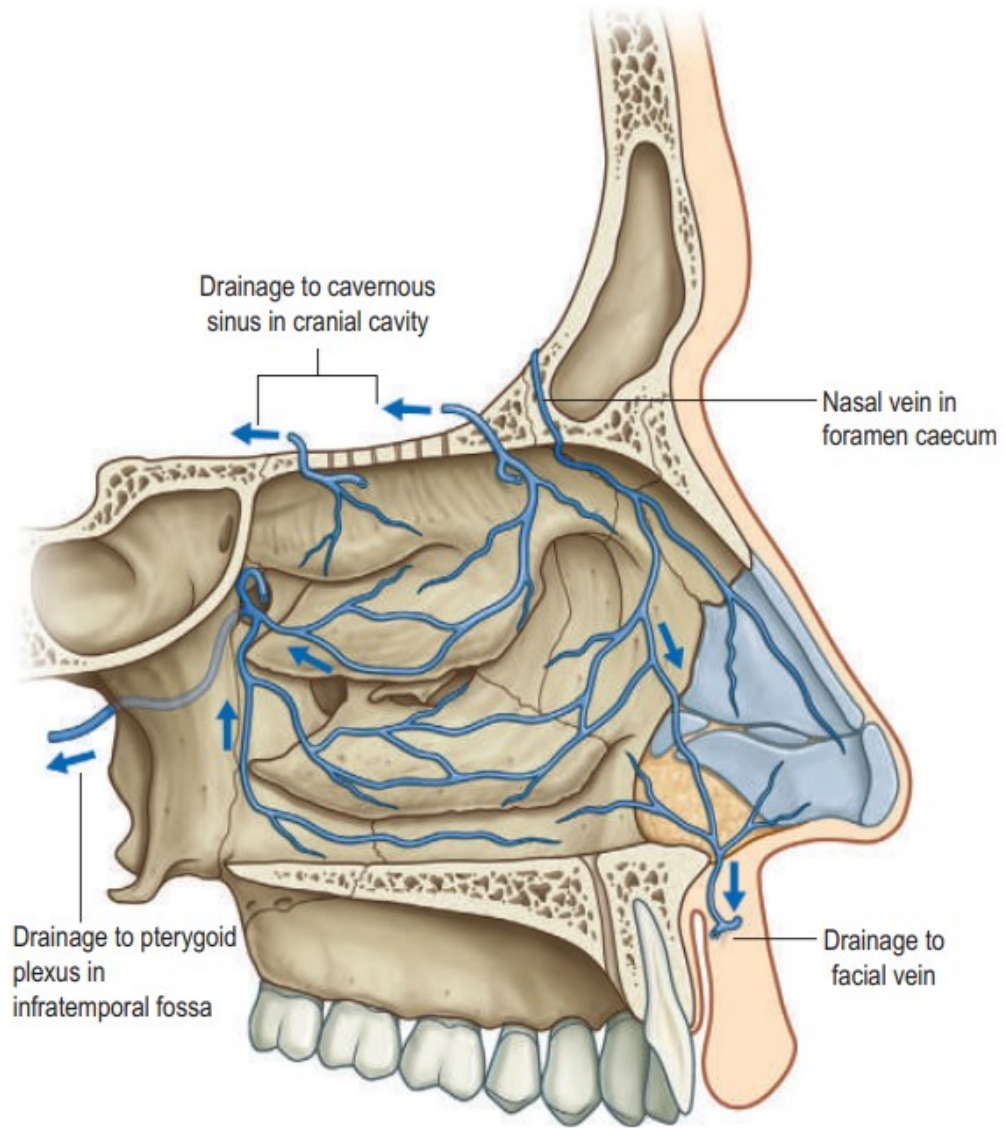




CENTRAL RETINAL VEIN OCCLUSION

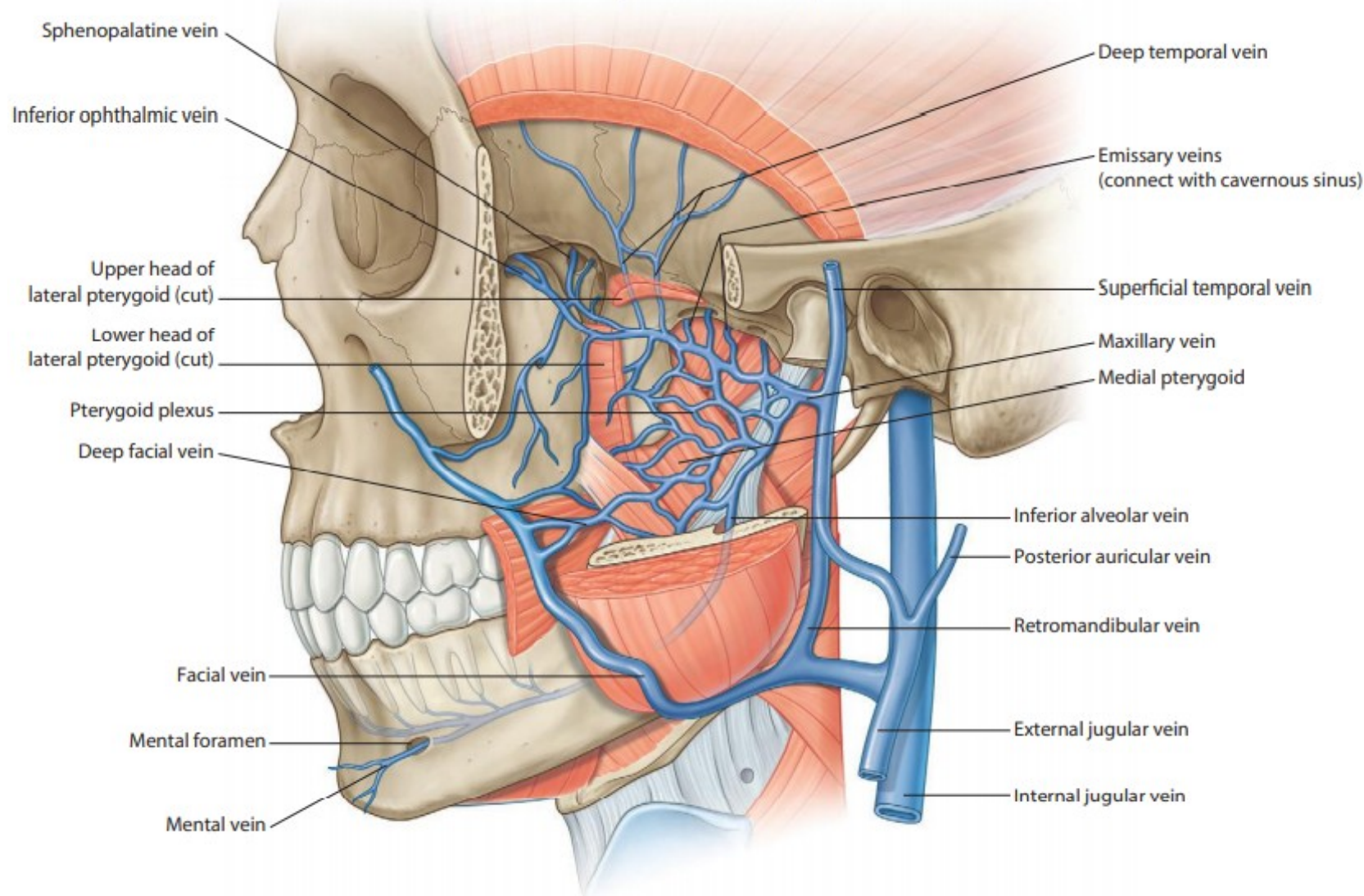


Fig. 13.29 Impending central retinal vein occlusion (A) before and (B) after spontaneous resolution



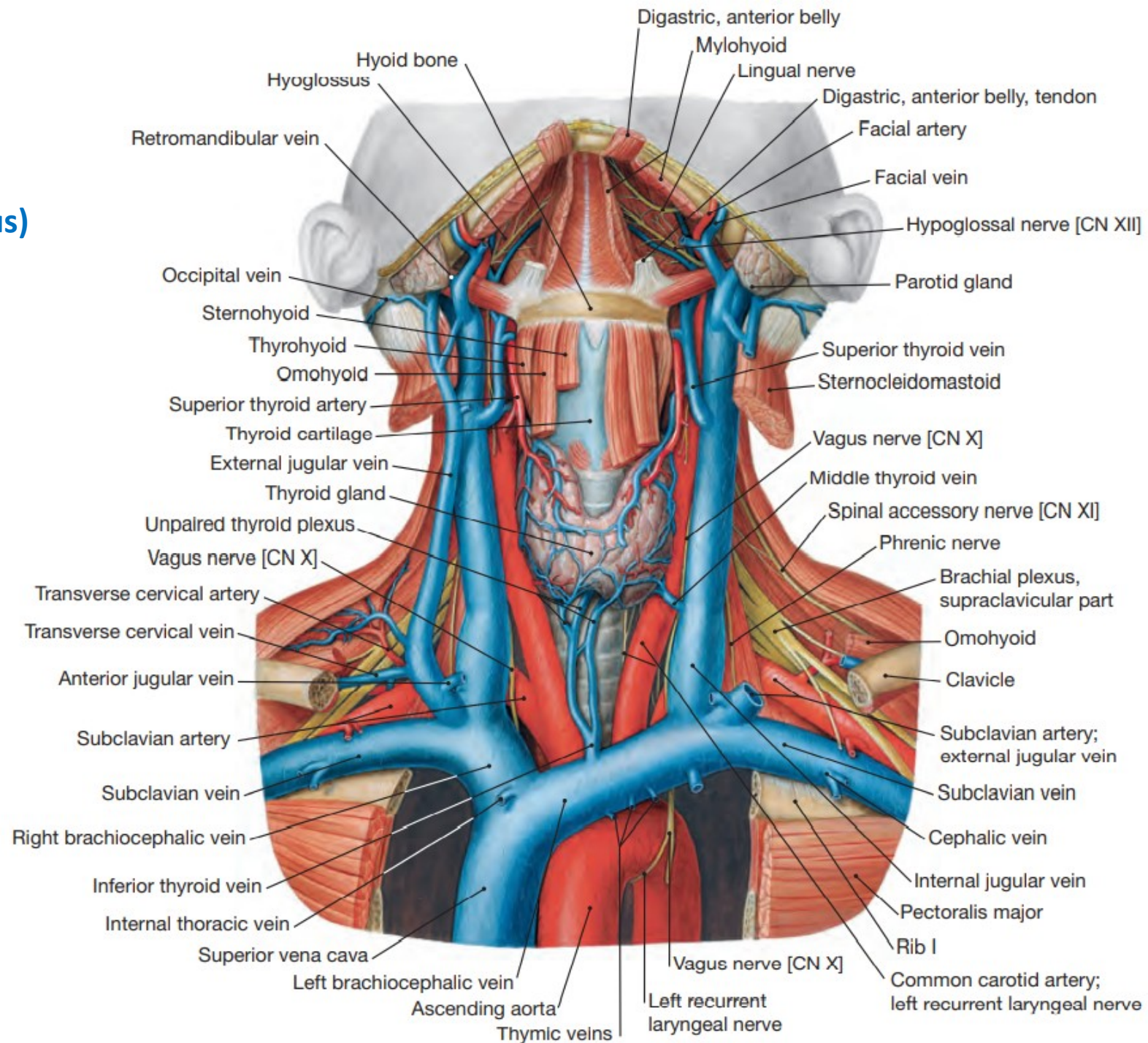
PTERYGOID PLEXUS

- Middle meningeal veins
- Venous plexus of foramen ovale
- Internal carotid venous plexus
- Venous shunt in the foramen rotundum
- Deep temporal veins
- Vein of pterygoid canal
- Anterior auricular veins
- Articular veins
- Tympanic veins
- Stylomastoid vein
- Parotid veins
- Pharyngeal veins
- Sphenopalatine vein
- Inferior ophthalmic vein
- Infraorbital vein
- Deep facial vein
- Descending palatine vein
- Posterior superior alveolar veins
- Inferior alveolar vein

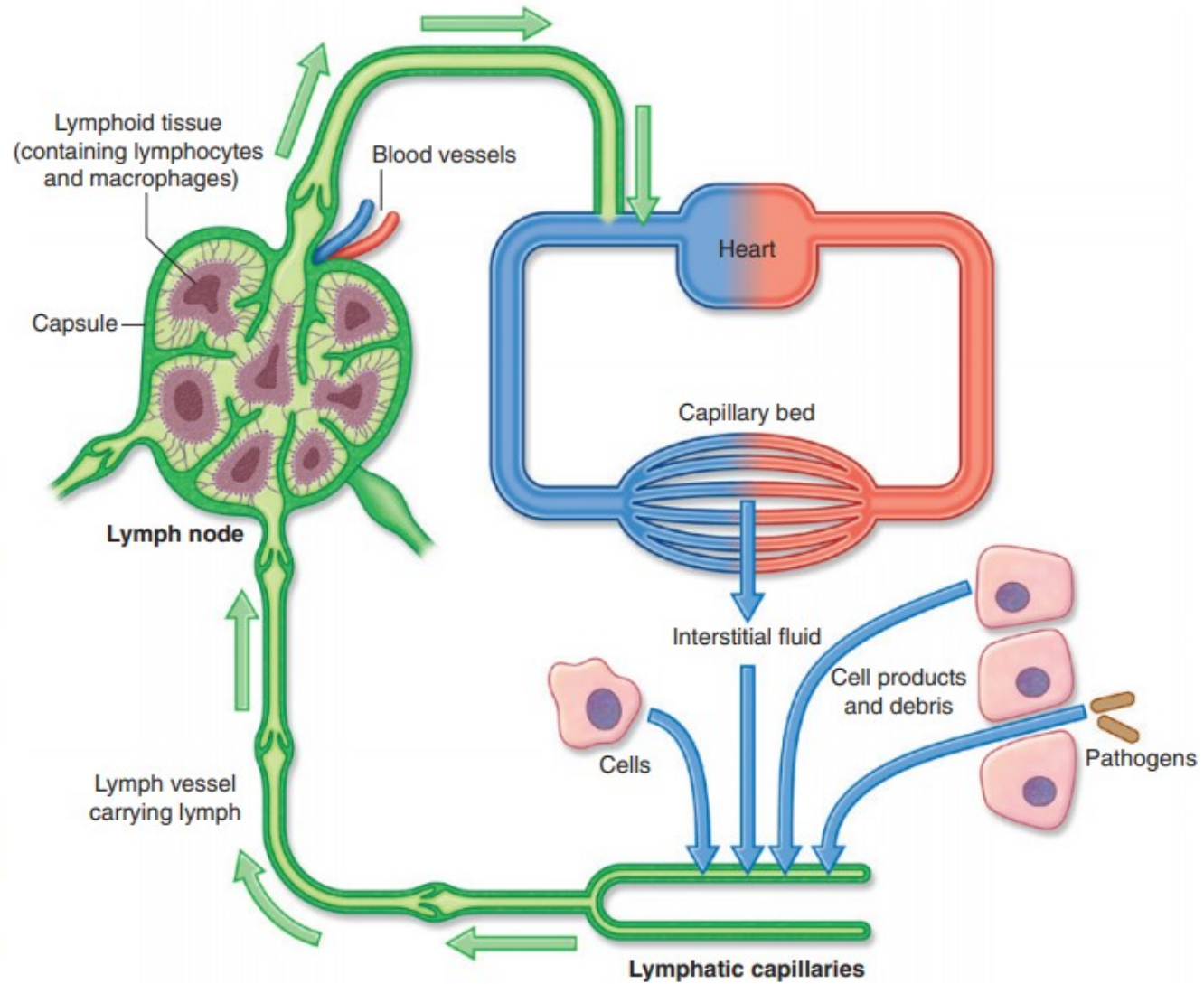
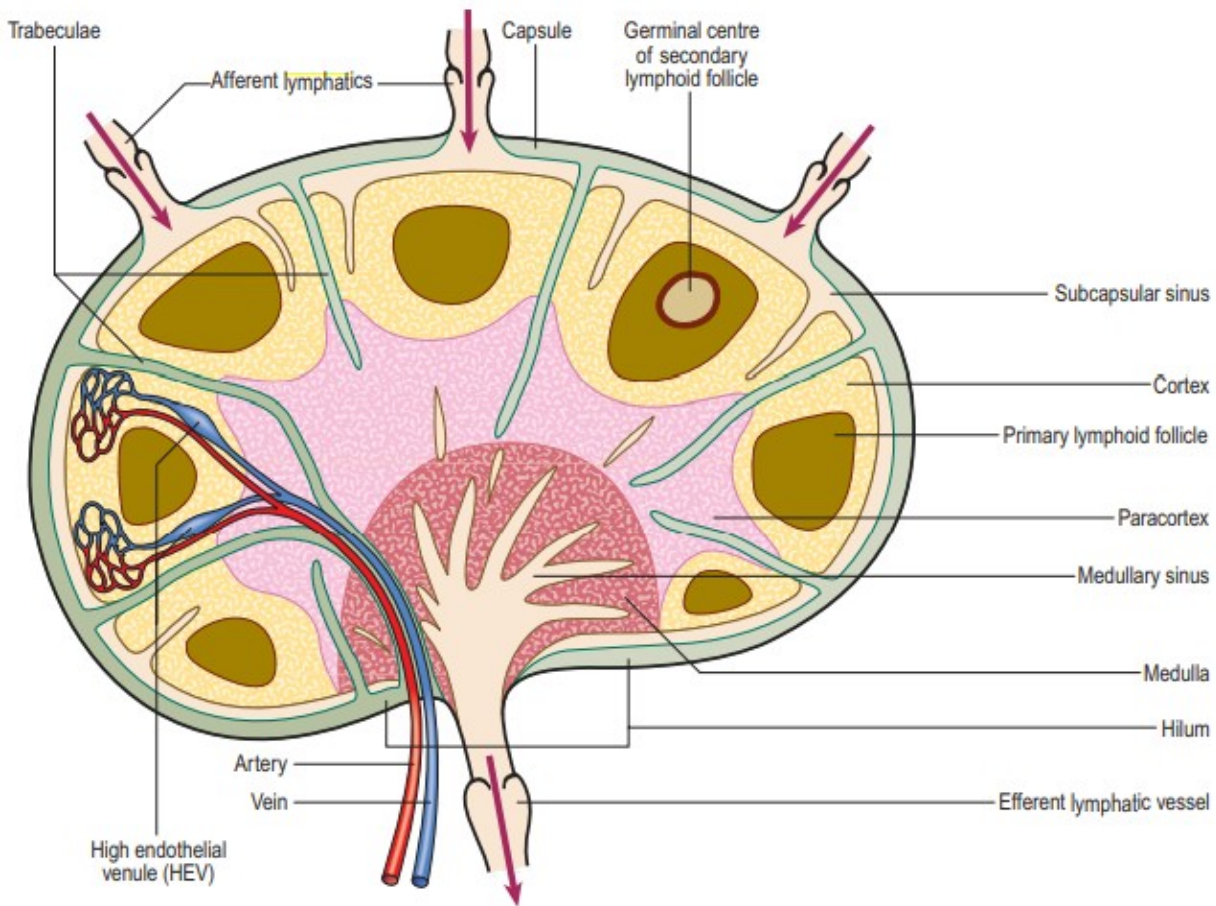


INTERNAL JUGULAR VEIN

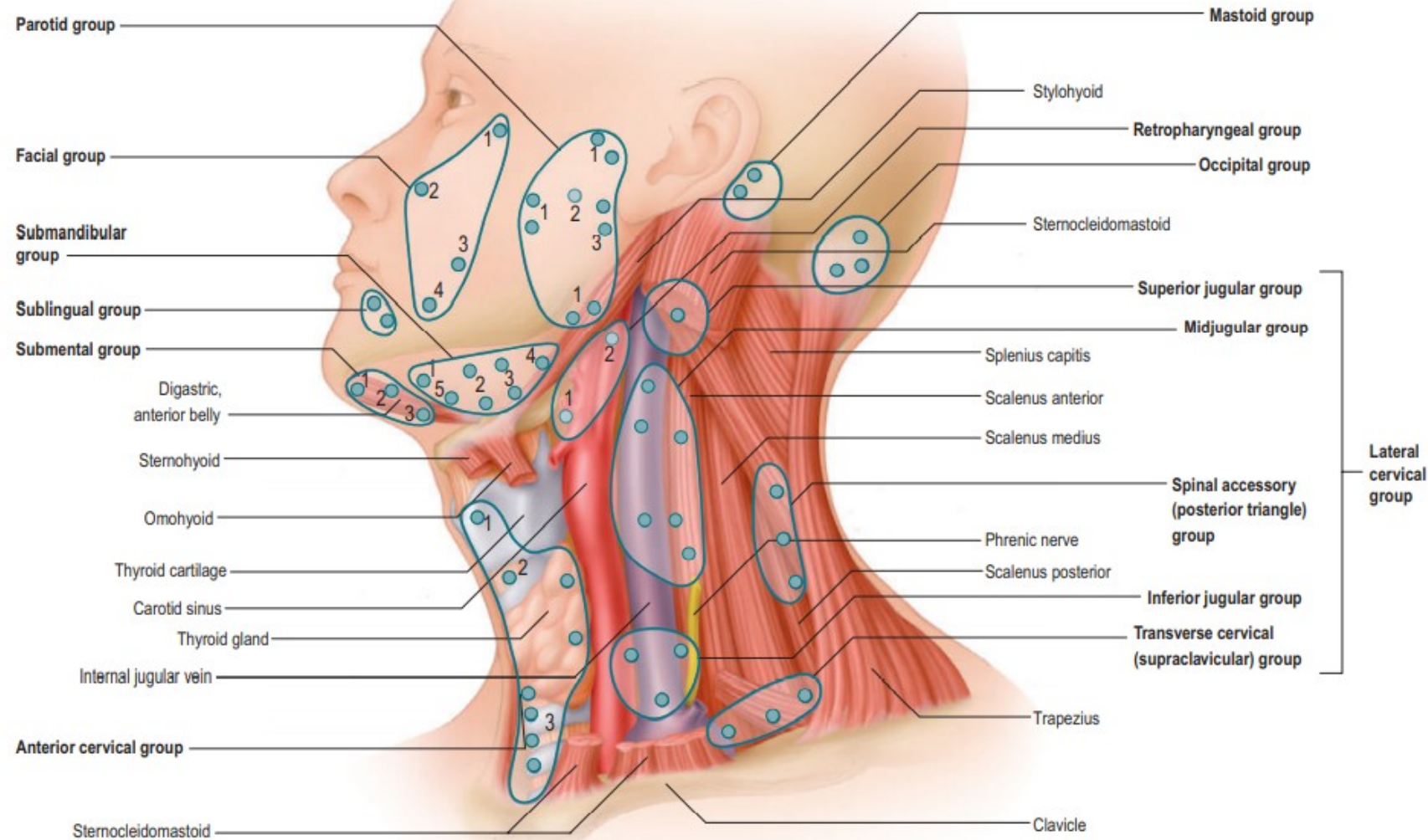
- Sigmoid sinus + Inferior petrosal sinus
- Pharyngeal veins (pharyngeal venous plexus)
- Retromandibular vein
- Facial vein
- Lingual vein
 - Sublingual vein
 - Vena comitans nervi hypoglossi
- Superior thyroid vein
 - Superior laryngeal vein
 - Sternocleidomastoid vein
- Middle thyroid vein (inconsistent)
- External jugular vein
 - Anterior jugular vein



LYMFATIC SYSTEM - OVERVIEW



OVERVIEW OF THE HEAD AND NECK LYMPH NODES



Facial group	1. Malar 2. Infraorbital 3. Buccinator 4. Inferior maxillary	Submandibular group	1. Preglandular 2. Prevascular 3. Retrovascular 4. Retroglandular 5. Intracapsular	Retropharyngeal group	1. Lateral 2. Medial
Parotid group	1. Subfacial, extraglandular 2. Deep intraglandular 3. Suprafacial	Submental group	1. Anterior 2. Middle 3. Posterior	Anterior cervical group	1. Superficial anterior jugular chain 2. Prelaryngeal 3. Pretracheal

LYMPH NODES OF THE HEAD

Occipital nodes

- afferents: scalp in the occipital region
- efferents: superficial cervical nodes and deep cervical nodes

Mastoid nodes

- afferents: scalp behind the auricle, posterior side of the auricle
- efferents: superficial cervical nodes and deep cervical nodes

Superficial and deep parotid nodes

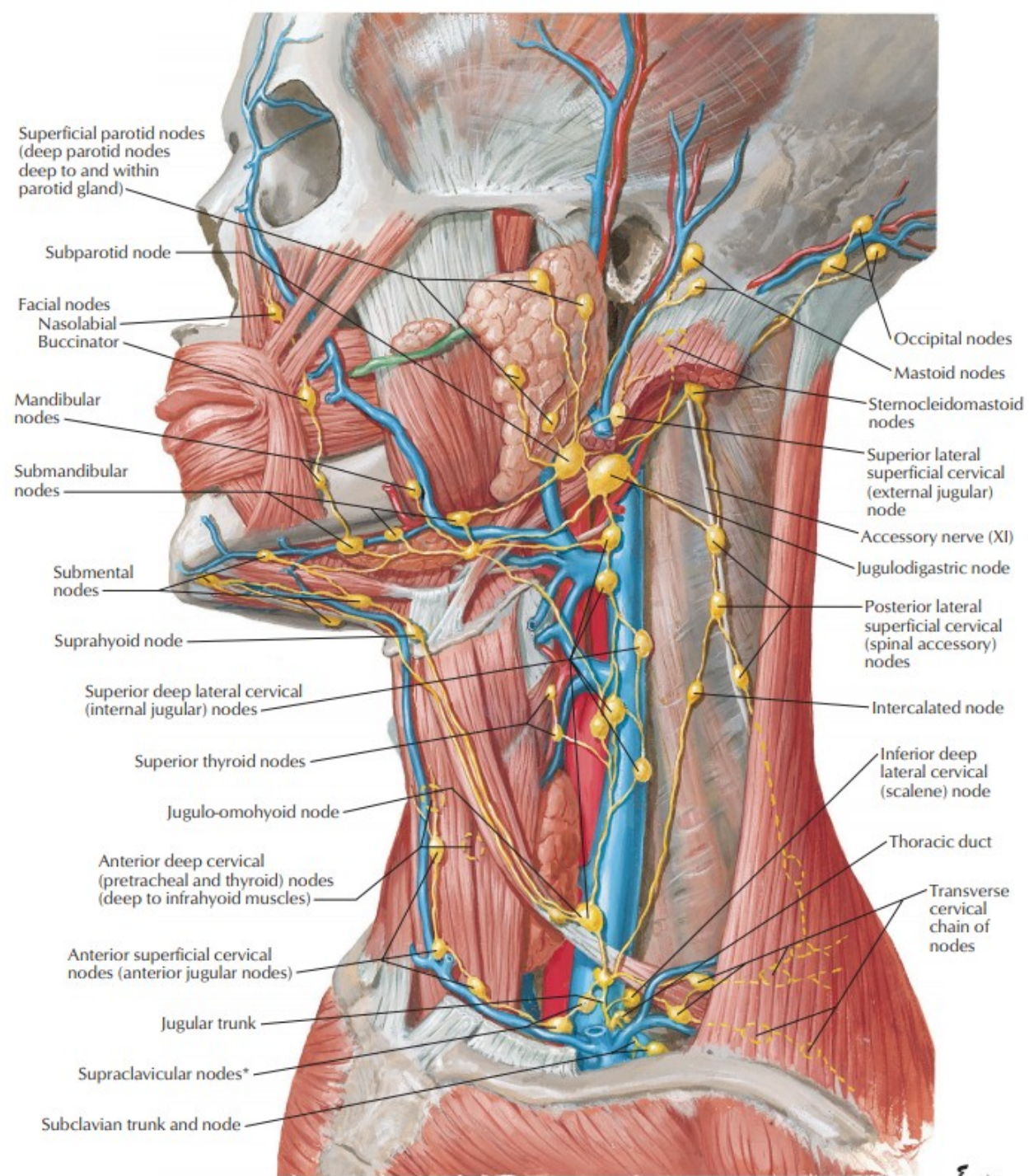
- afferents: scalp in the temporal and frontal region, lateral part of the eyelids, buccal region, anterior side of the auricle and external auditory meatus, middle ear, parotid gland, soft palate
- efferents: superficial cervical nodes and deep cervical nodes

Submandibular nodes

- afferents: lower eyelids, nose, upper lip, cheeks, paralingual region, hard palate, floor of mouth, teeth
- efferents: deep cervical nodes

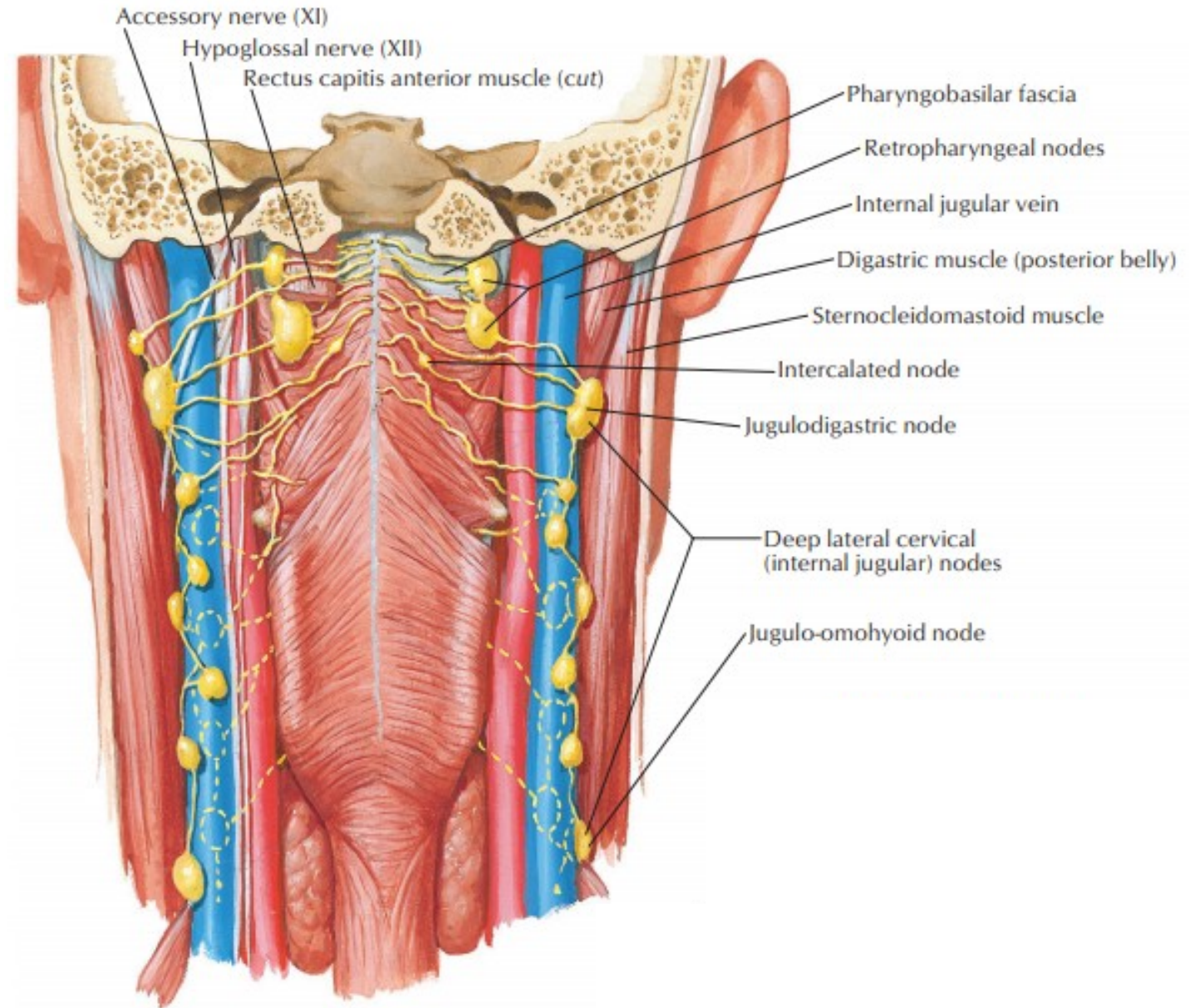
Submental nodes

- afferents: lower lip, chin, anterior floor of mouth, anterior teeth, tip of tongue
- efferents: superficial cervical nodes and deep cervical nodes



Nodi retropharyngei

- afferents: pharynx, middle ear, Eustachian tube, posterior and superior nasal cavity, paranasal sinuses
- efferents: nodi cervicales profundi



LYMPH FROM THE TONGUE

Apical collecting vessels

→ juguloomohyoid node or via submental nodes

External marginal collecting vessels

→ submental nodes

Internal marginal collecting vessels

→ internal jugular nodes from anterior tongue

→ jugulodigastric node from posterior tongue

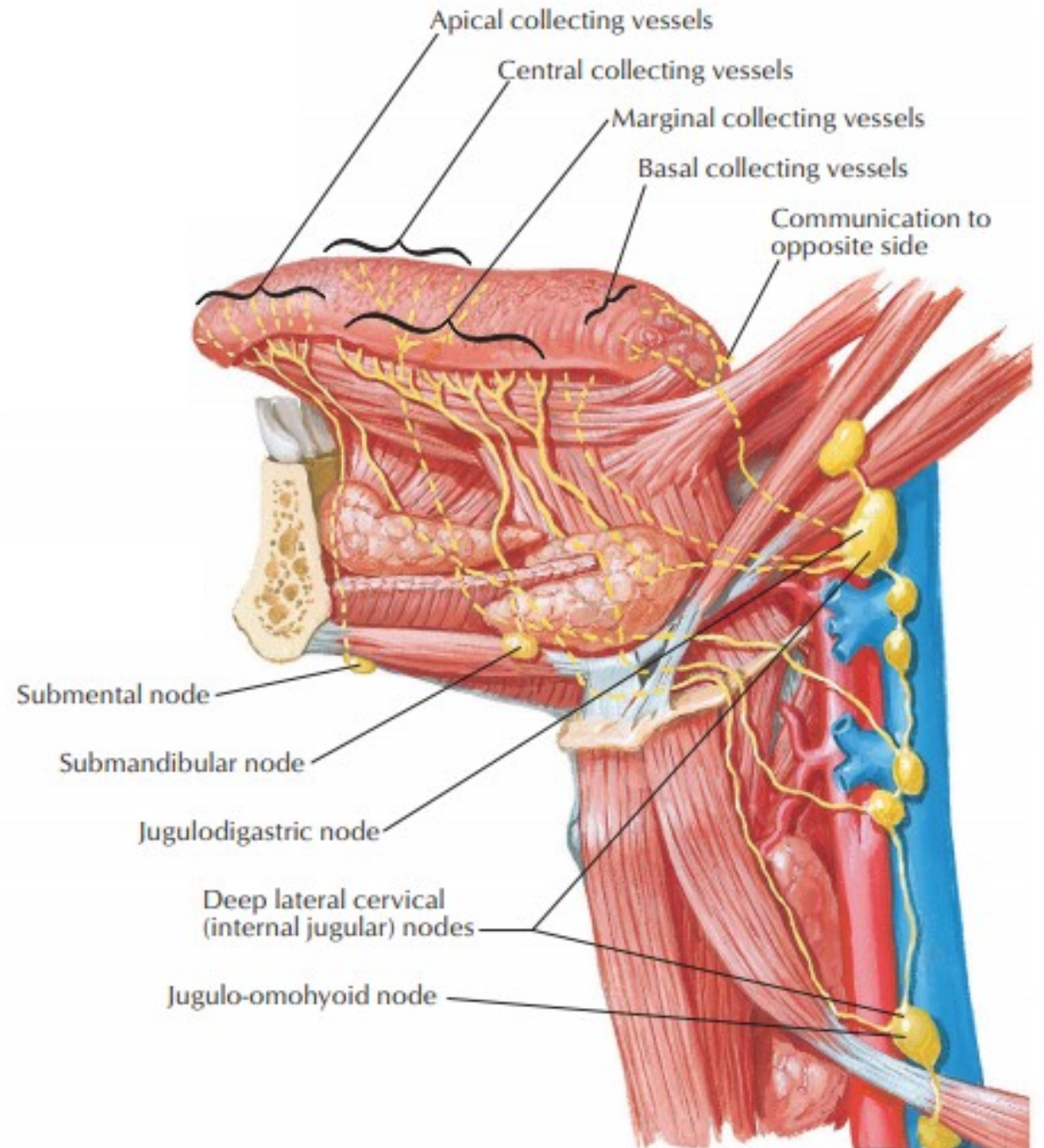
Central collecting vessels

→ submandibular nodes and juguloomohyoid node

Basal collecting vessels

→ internal jugular nodes and jugulodigastric node

+ lingual nodes in the lingual base



Lateral superficial cervical nodes

- external jugular nodes

Lateral deep cervical nodes

a. internal jugular nodes

- tonsillar node (Wood's node)
- jugulodigastric node (Küttner's node)

b. spinal accessory nodes

c. supraclavicular nodes

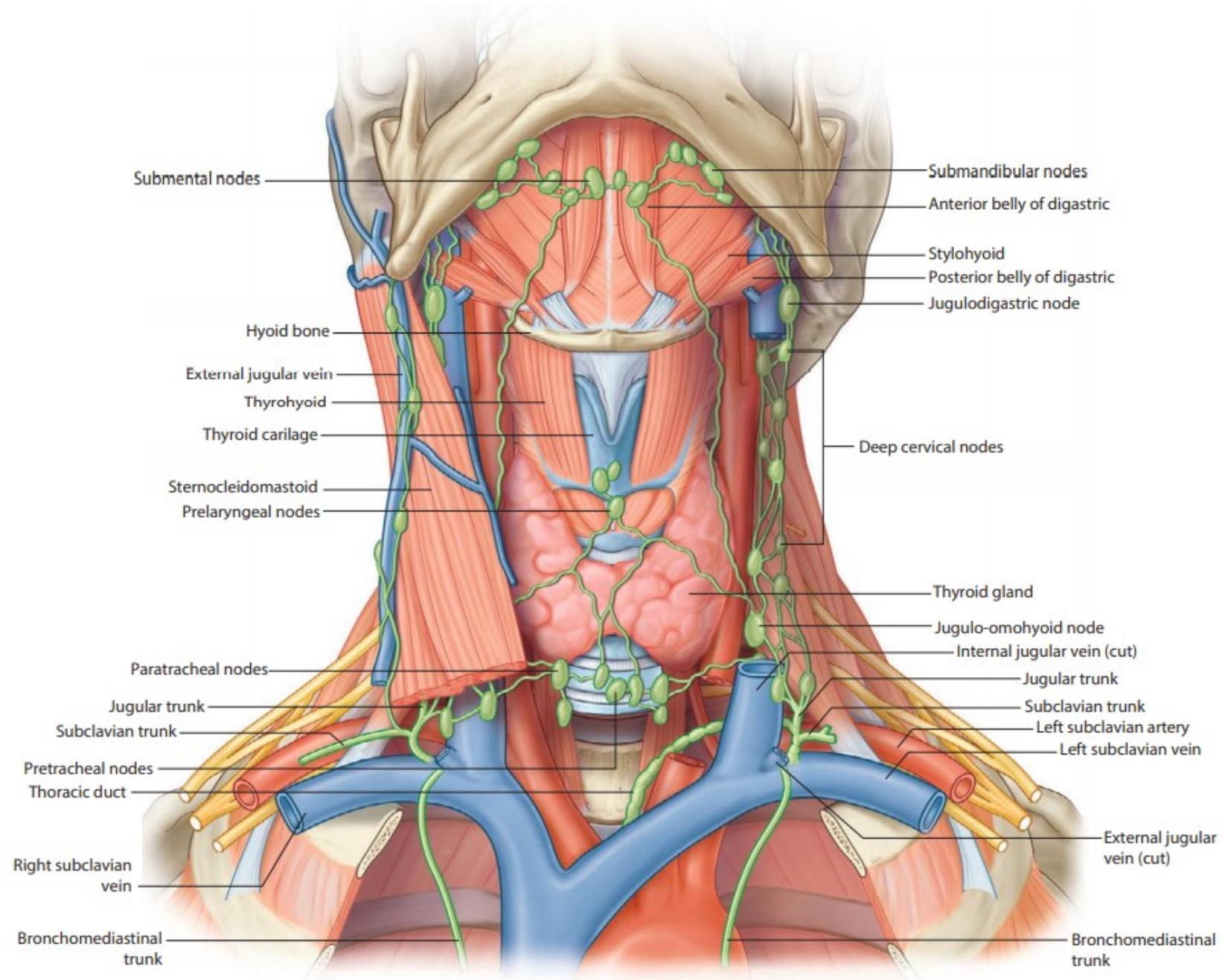
- Virchow's nodes on the left side

Anterior superficial cervical nodes

- anterior jugular nodes

Anterior deep cervical nodes

- prelaryngeal nodes
- thyroid nodes
- preglandular nodes
- pretracheal nodes
- paratracheal nodes



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