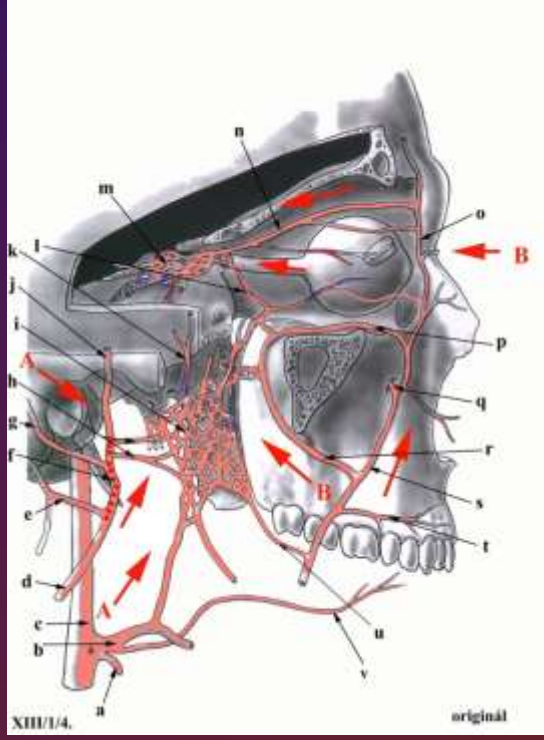
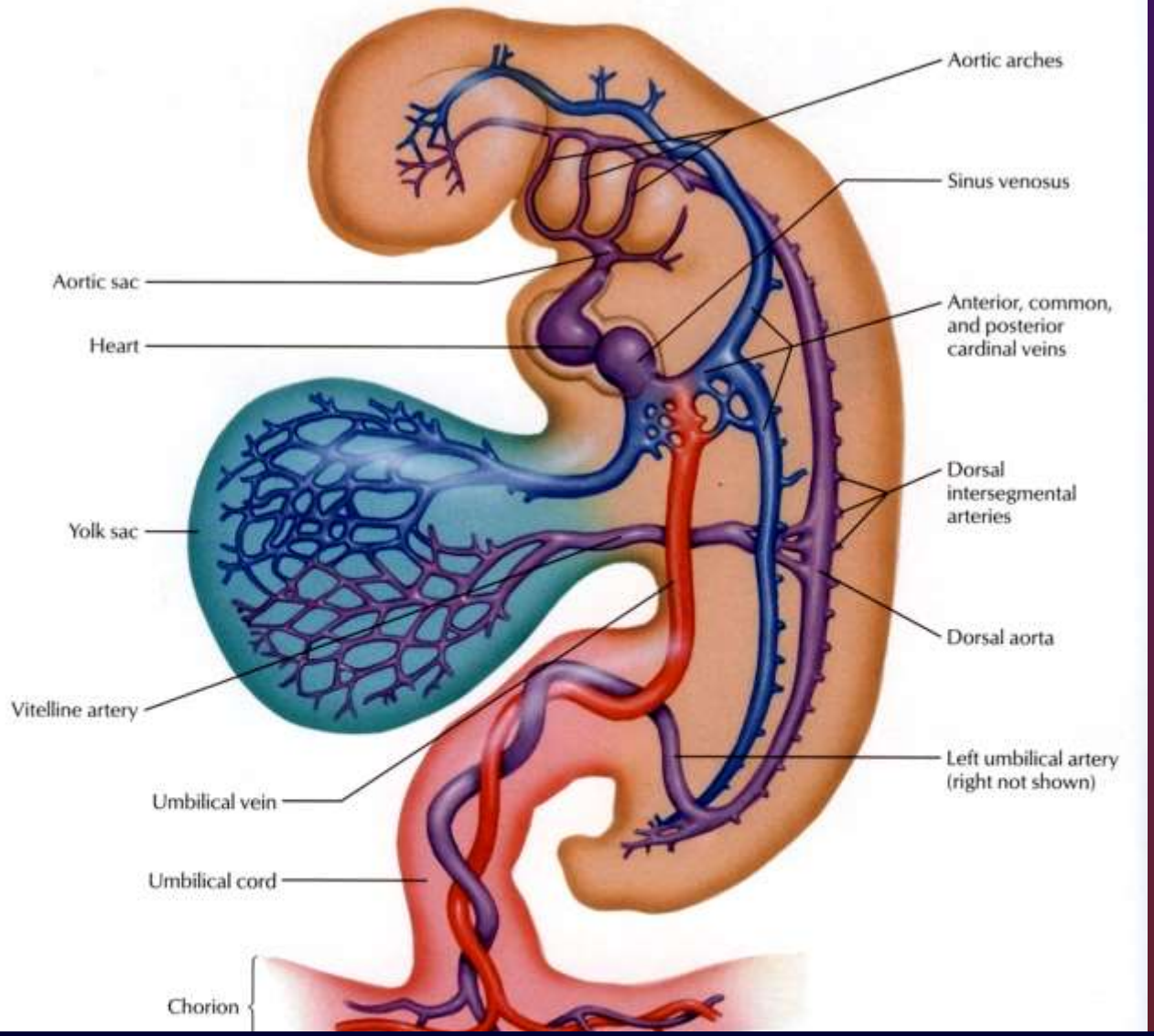
Arteria carotis externa, arteria subclavia, vena jugularis interna and its tributaries, thyroid gland, parathyroid glands



By

Ivo Klepáček



Development of the vascular system

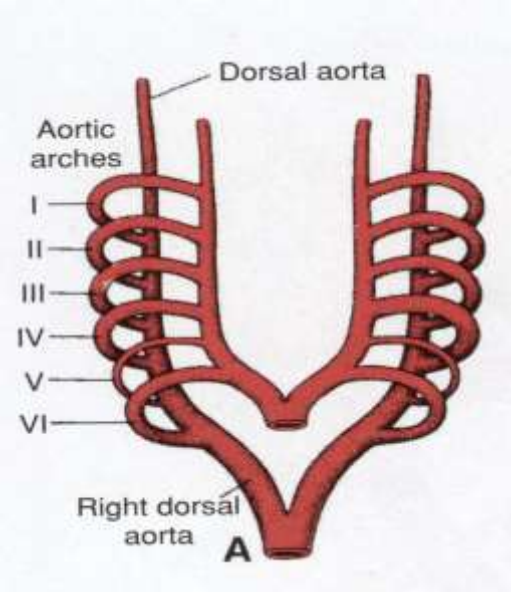
Day 27

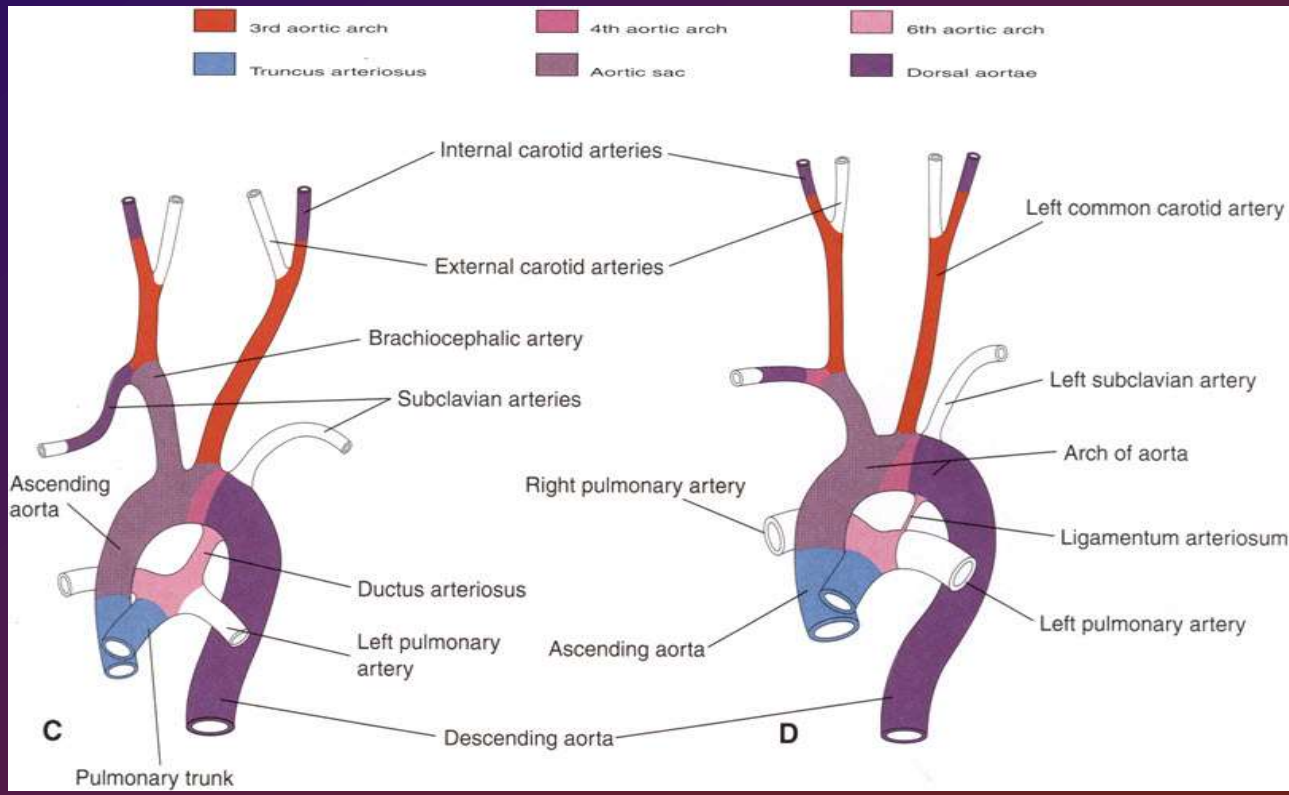
Three vascular systems are finally formed:

Intraembryonic (cardinal); aortic sac (later gives rise aortic arches)

Vitelline (aa. + vv.)

Placental (umbilical aa. + vv.)





1st – maxillary artery

2nd – hyoid, stapedial aa.

3rd – common carotid a. and first part of the internal carotid a., external carotid a.

4th – part of the subclavian aa. some of intersegmental arteries

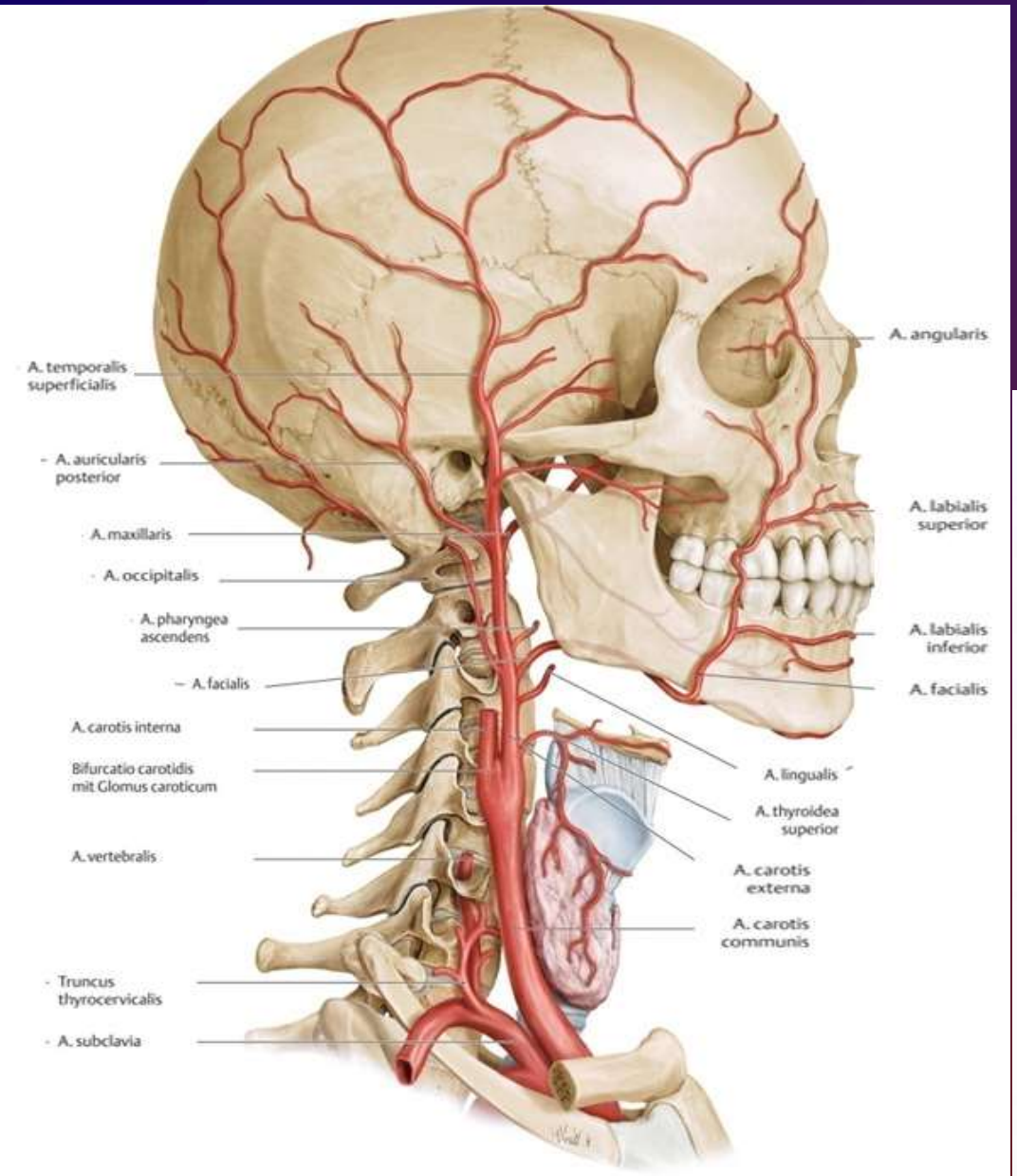
Main arteries

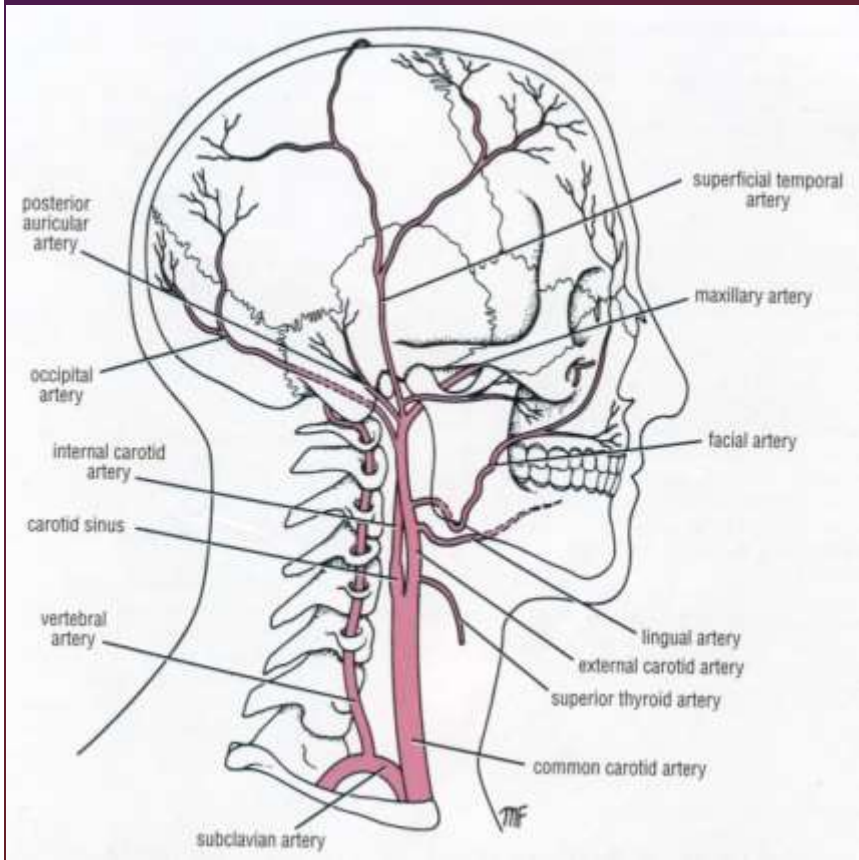
Common Carotid artery (left)

Brachiocephalic trunk (right)

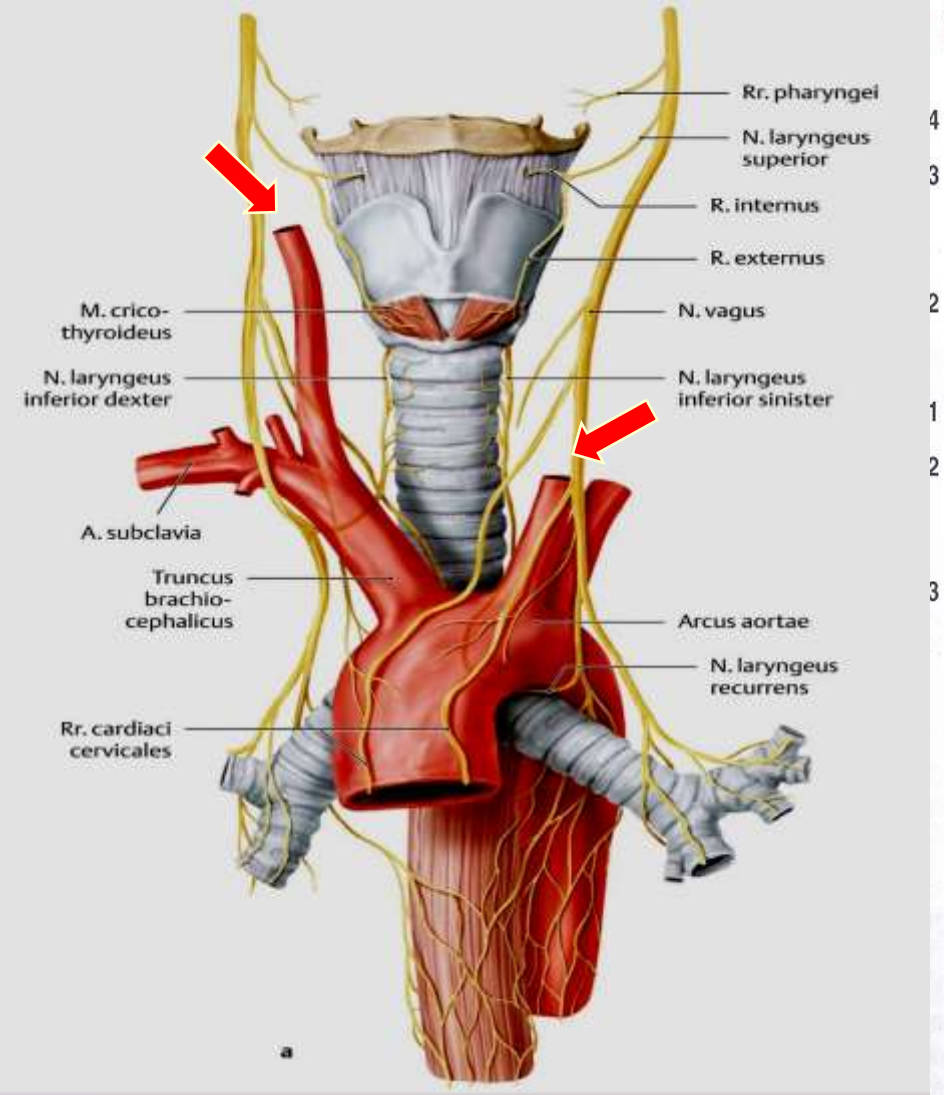
Internal Carotid artery

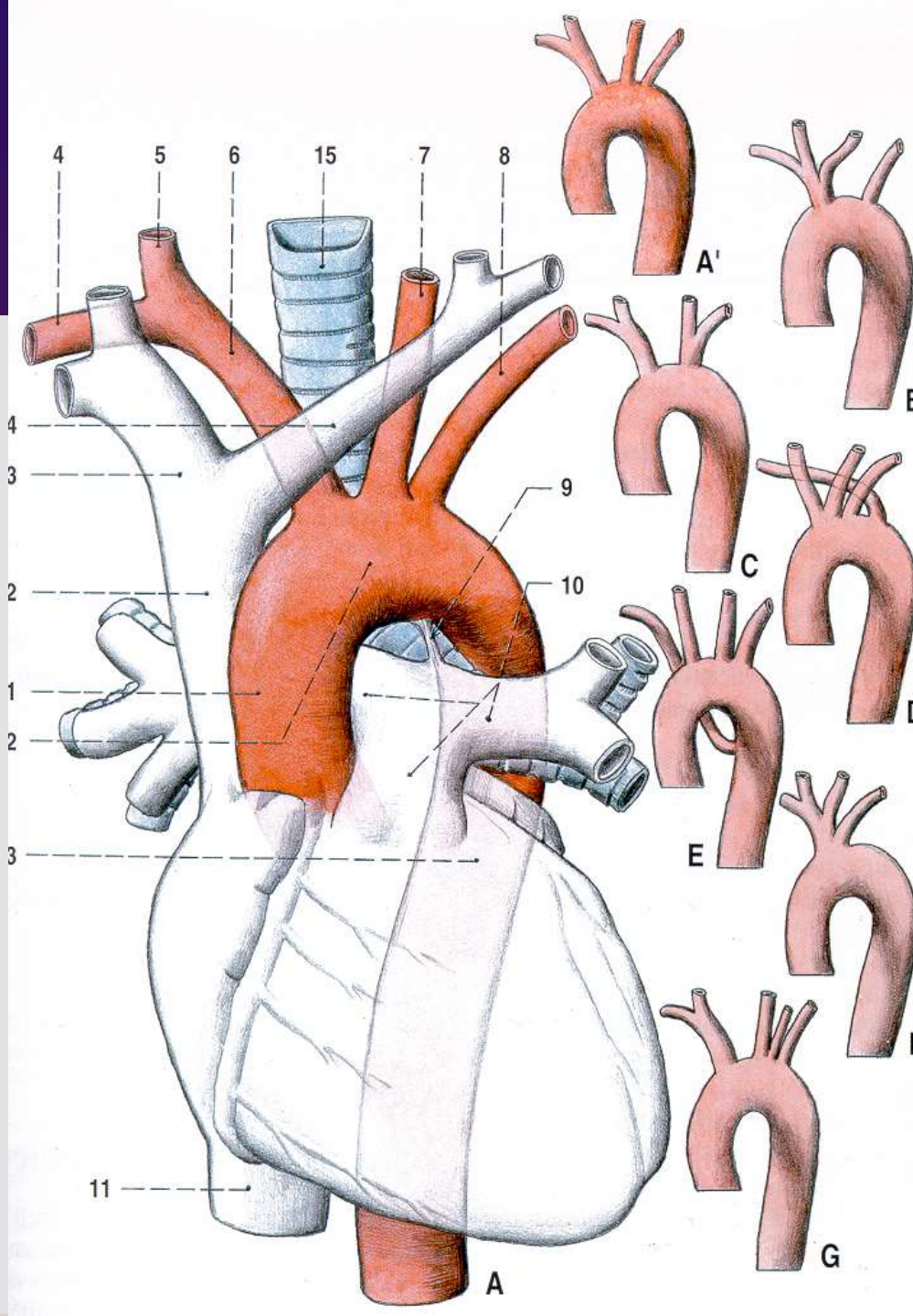
External Carotid artery

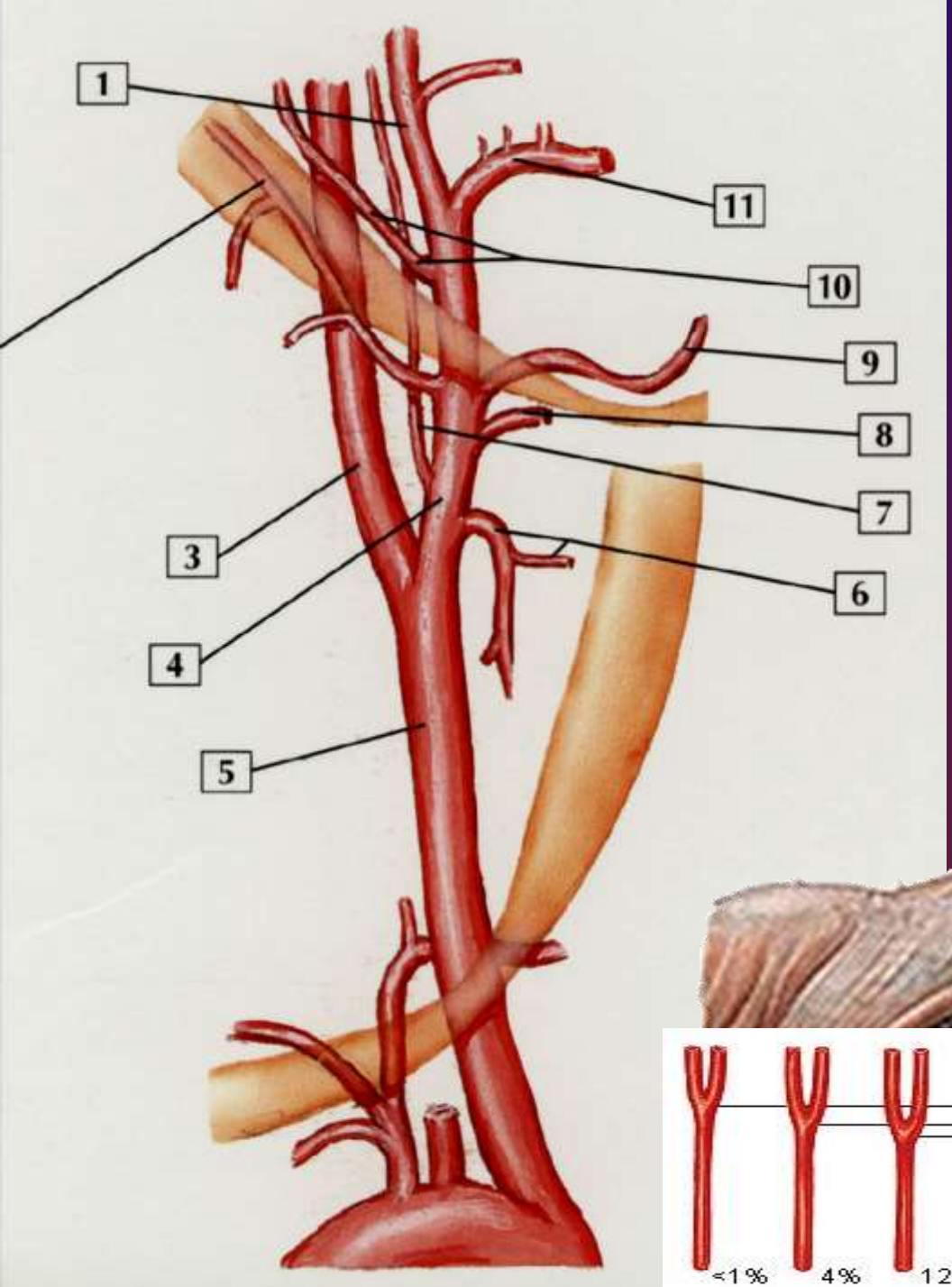




Variations of the aortic arch branches

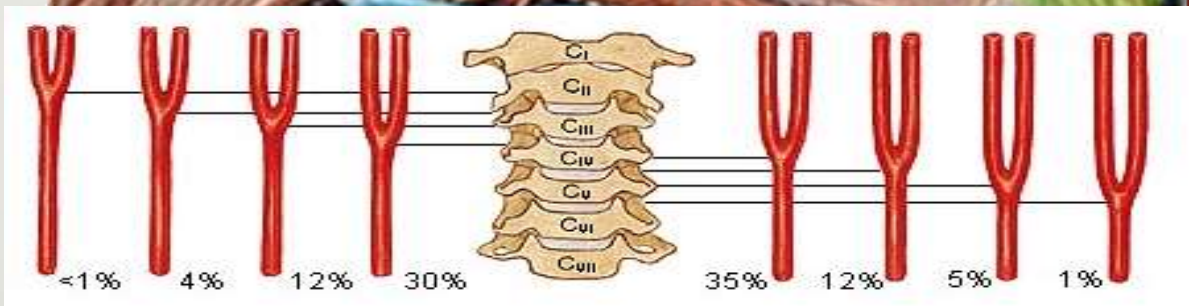




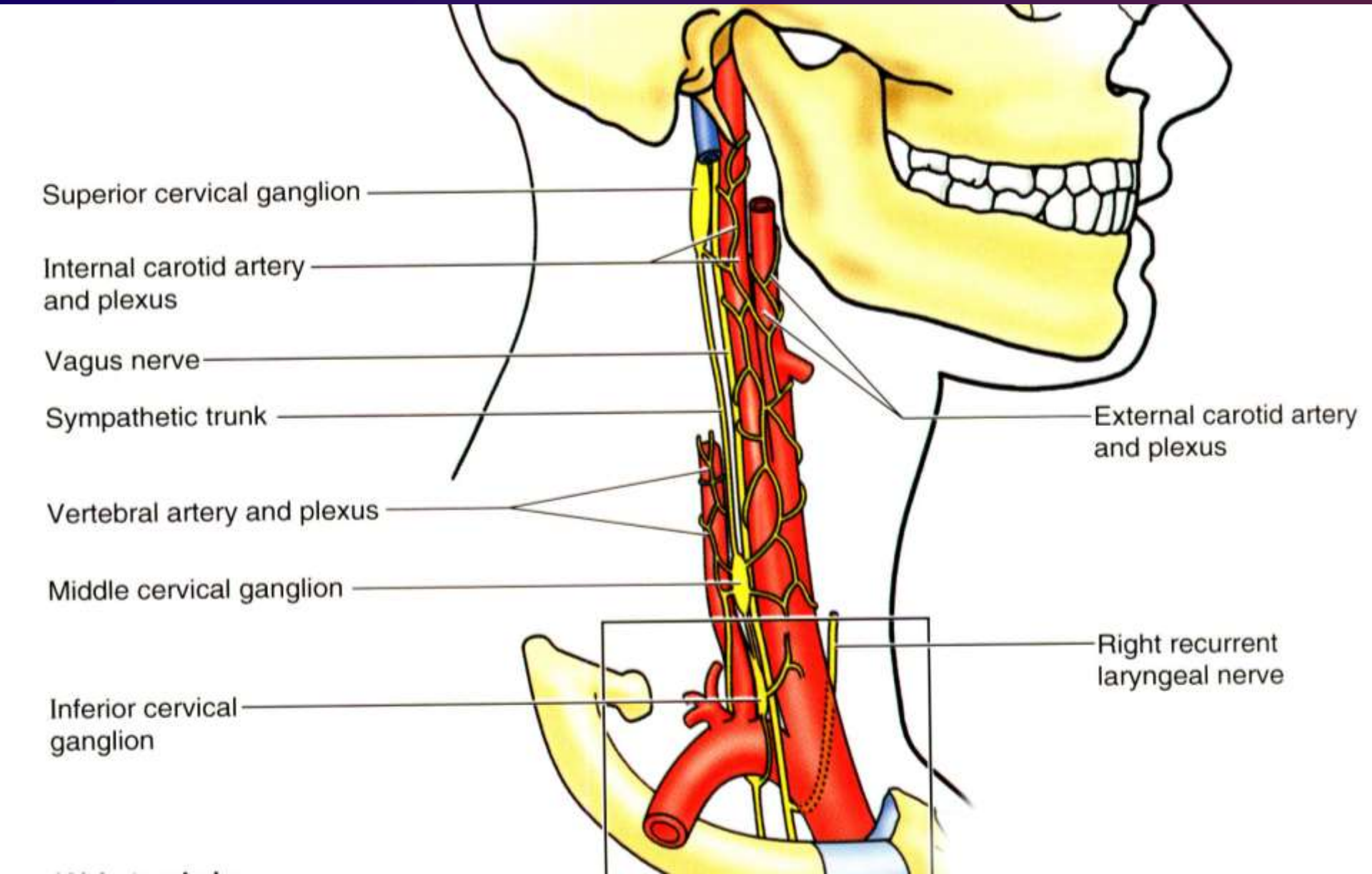


Fascia pretrachealis a **CCA**

Pretracheal fascia and CCA



Sympathetic nerve trunks



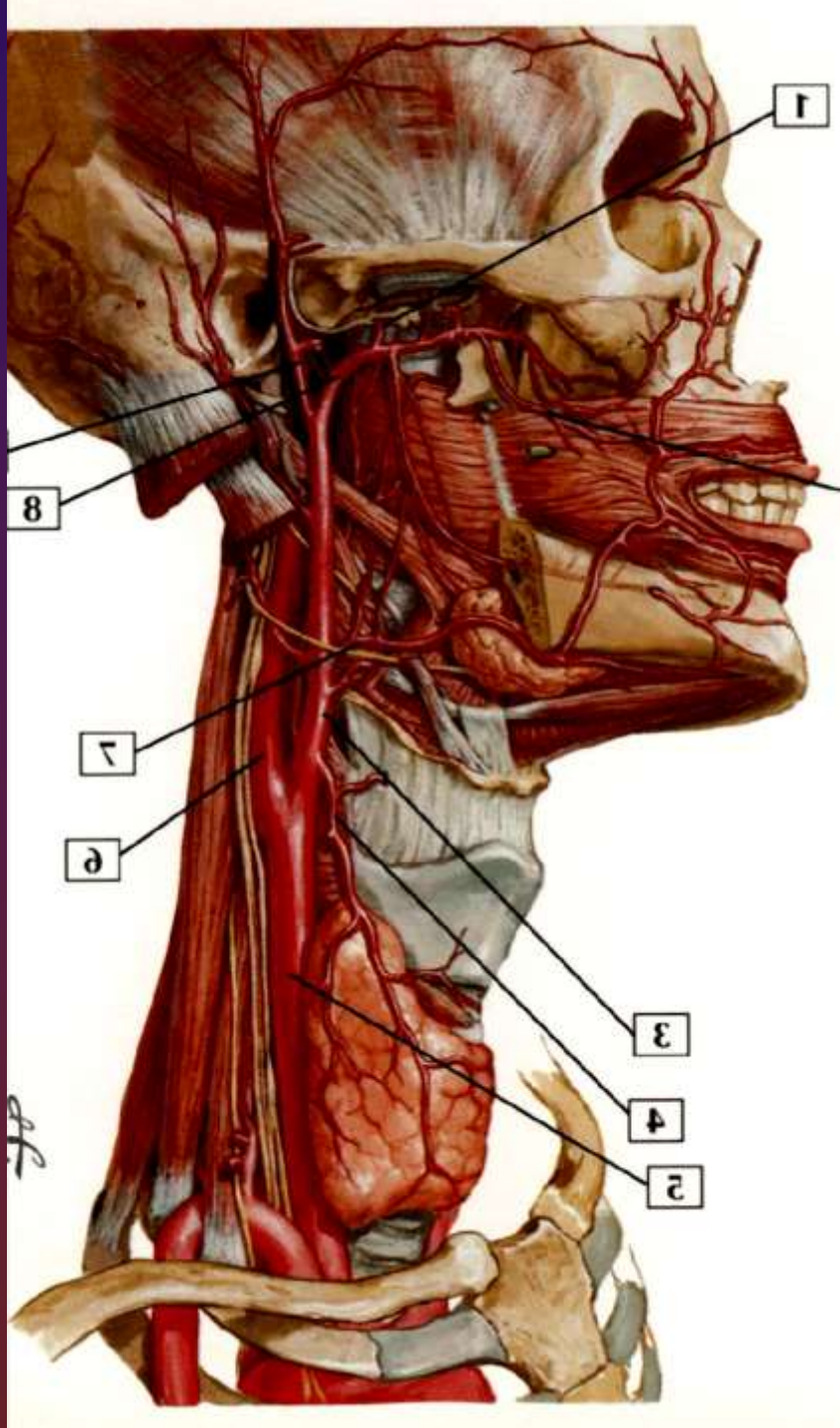
Common carotid artery

Anterolaterally – skin, fascia, sternocleidomastoid muscle, sternohyoid, sternothyroid, superior belly of the omohyoid

Posteriorly – transverse process of the C4 vertebrae, prevertebral muscles, sympathetic trunk

Medially – wall of the pharynx and larynx, trachea, esophagus, the lobe of the thyroid gland

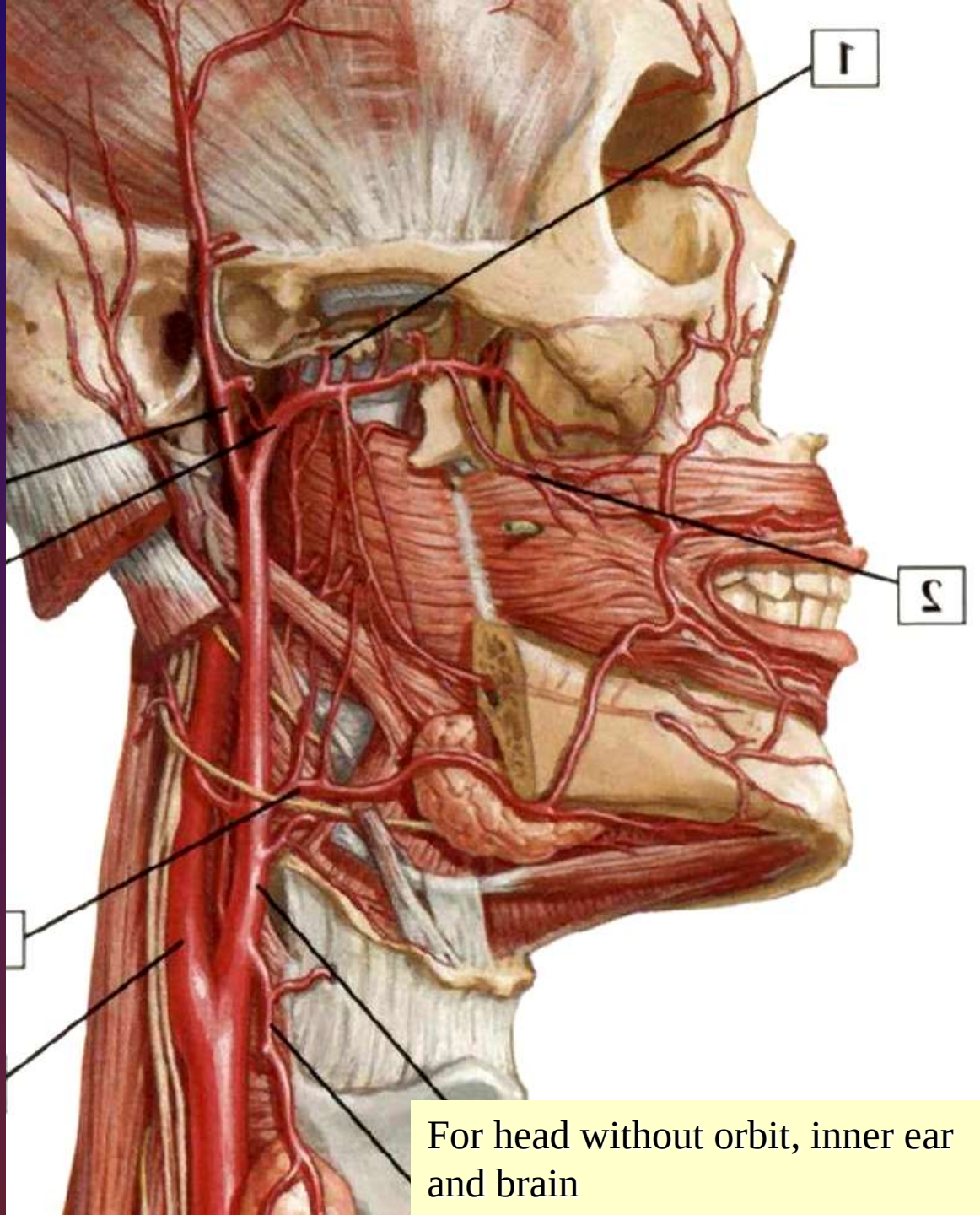
Laterally – the internal jugular vein, vagus nerve (posterolaterally)



External carotid artery ECA

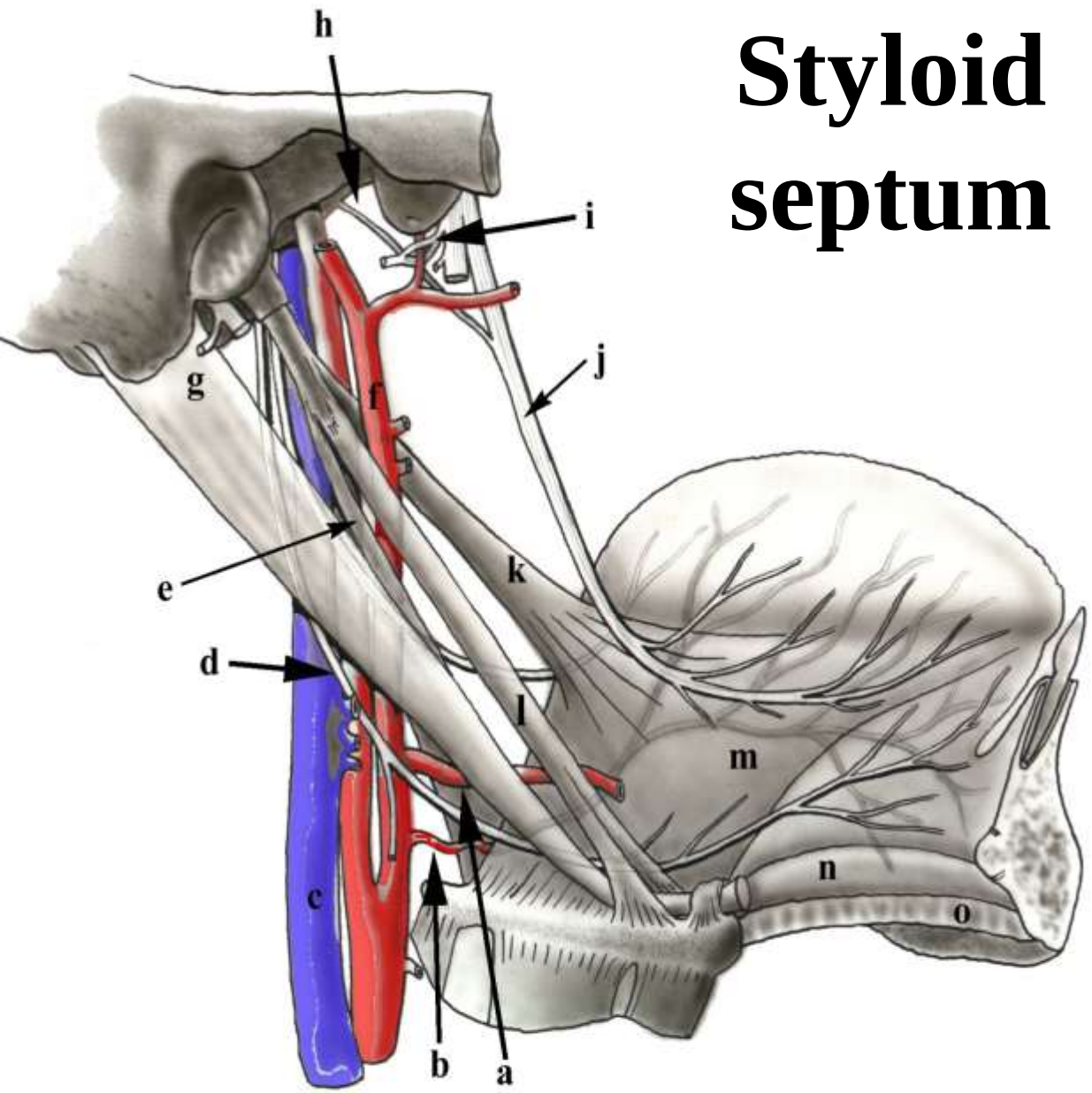
Anterolaterally – sternocleidomastoid muscle, XII. nerve, within parotid gland is crossed by VII. nerve, fascia, skin

Medially – wall of the pharynx, internal carotid artery, stylopharyngeus, pharyngeal branch of the vagus



For head without orbit, inner ear and brain

Styloid septum

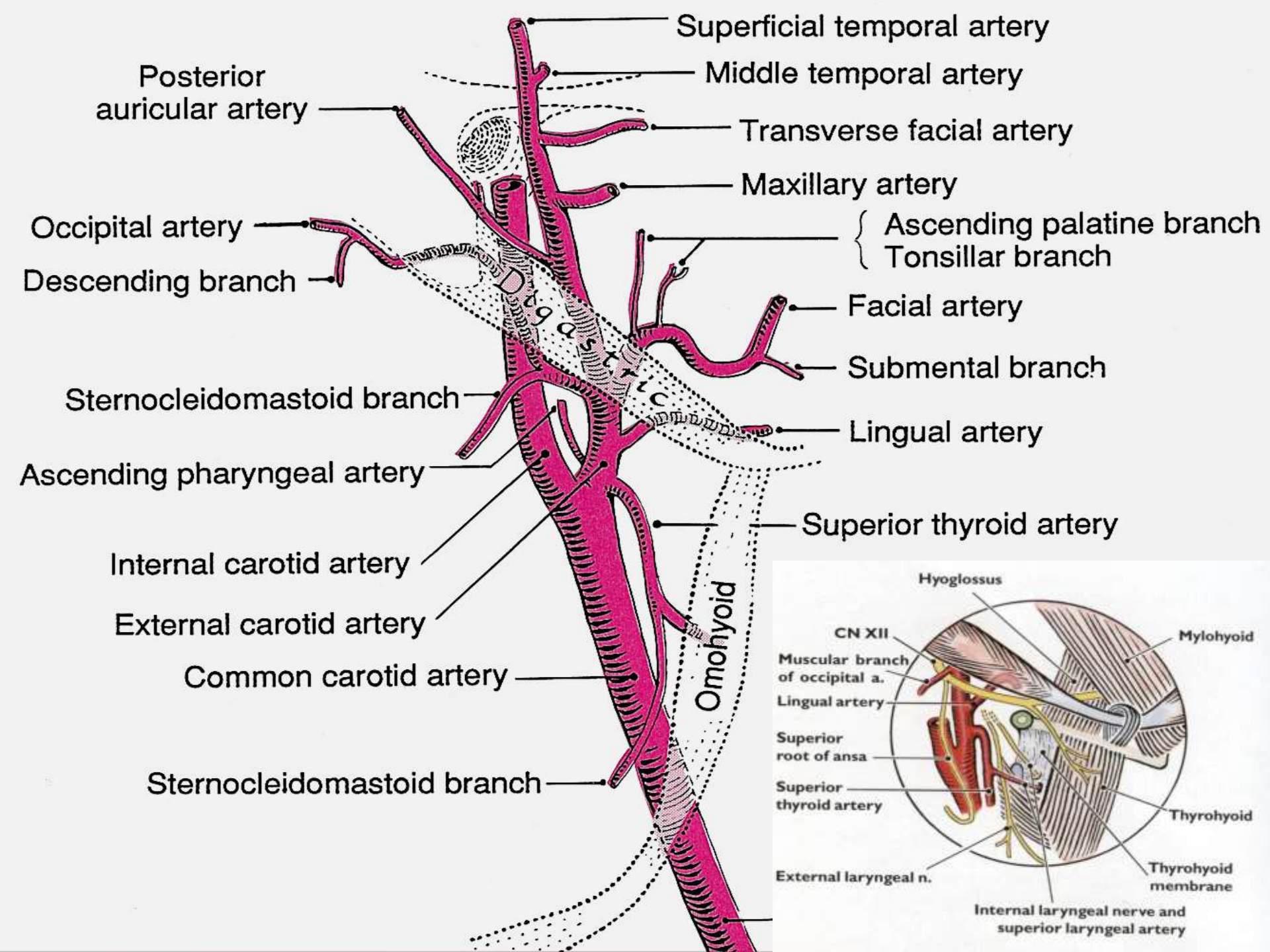


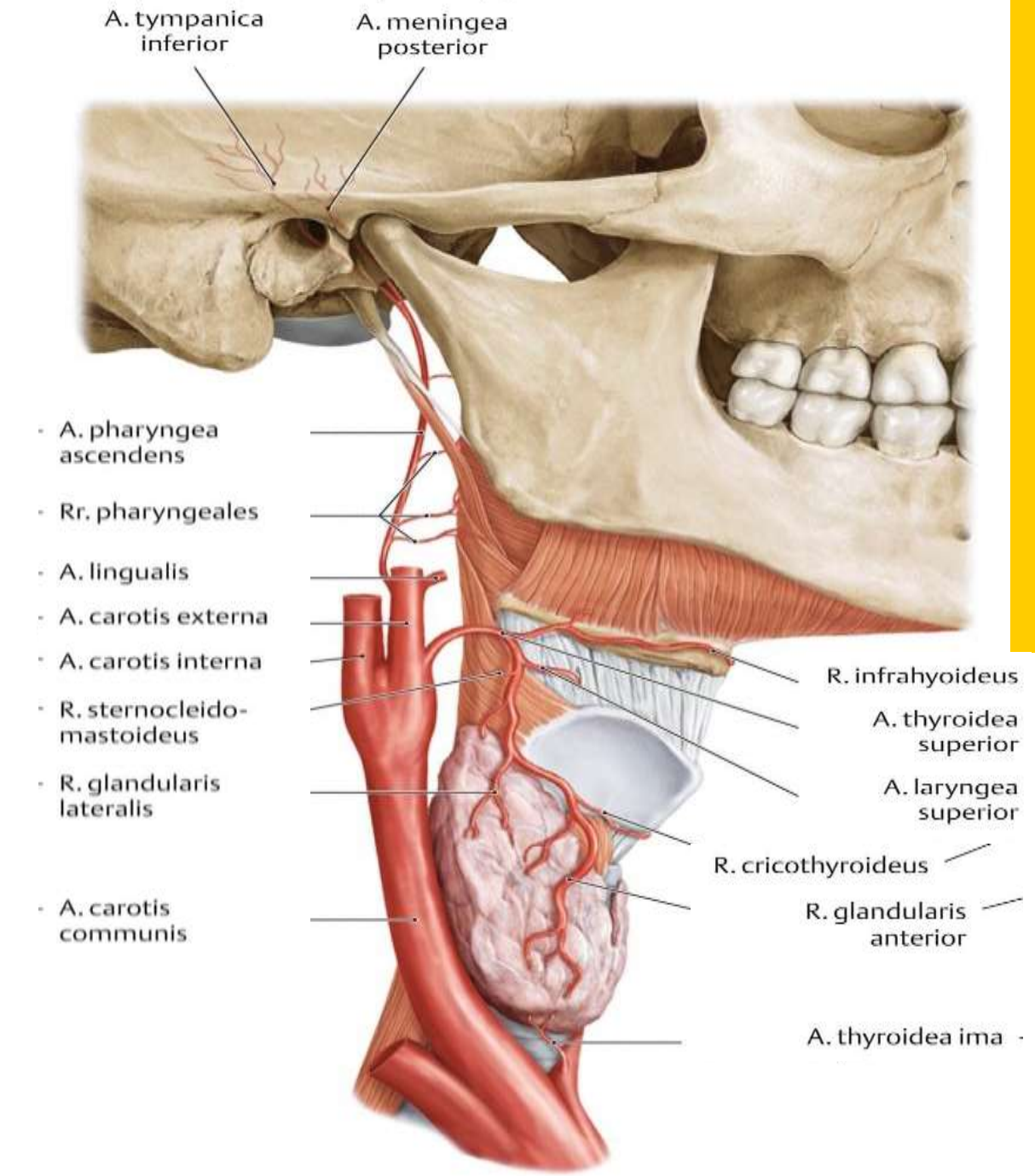
Internal jugular vein

lies dorsally and lateraly from internal carotid artery behind m. m. stylohyoideus and styloglossus

External carotid artery

lies ventrally and laterally from internal jugular vein between m.stylohyoideus and styloglossus


Superficial temporal artery
Middle temporal artery
Posterior auricular artery
Transverse facial artery
Maxillary artery
Occipital artery
Ascending palatine branch
Tonsillar branch
Descending branch
Digastric
Facial artery
Submental branch
Sternocleidomastoid branch
Lingual artery
Ascending pharyngeal artery
Superior thyroid artery
Internal carotid artery
External carotid artery
Omohyoid
Common carotid artery
Sternocleidomastoid branch
Hyoglossus
CN XII
Mylohyoid
Muscular branch of occipital a.
Lingual artery
Superior root of ansa
Superior thyroid artery
Thyrohyoid
External laryngeal n.
Thyrohyoid membrane
Internal laryngeal nerve and superior laryngeal artery

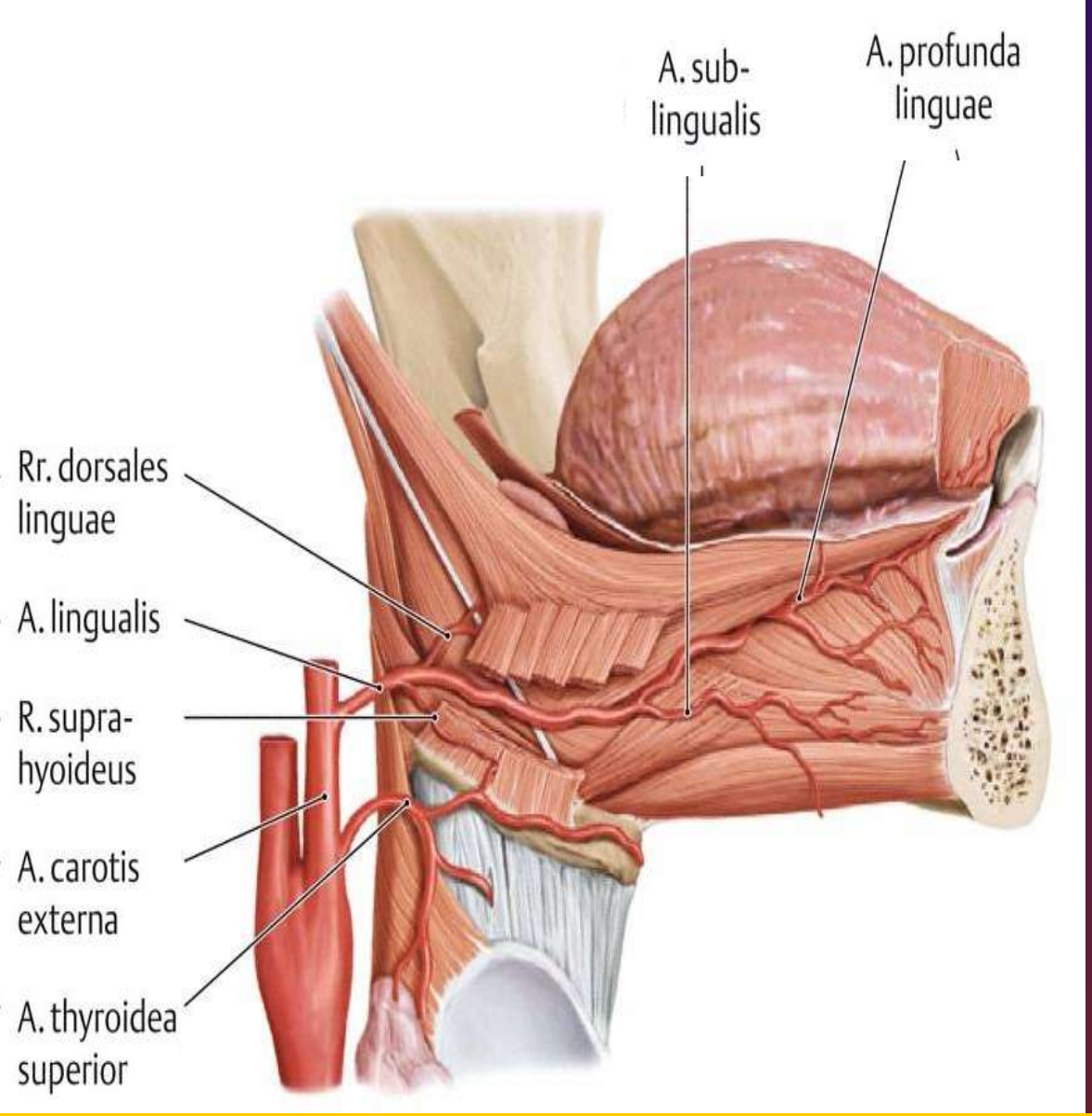


Superior thyroid a.,

Arteria thyroidea superior

For thyroid gland,;
Ventral branch anastomoses with the same contralateral opposite artery ;
Dorsal branch anastomoses with inferior thyroid a.,

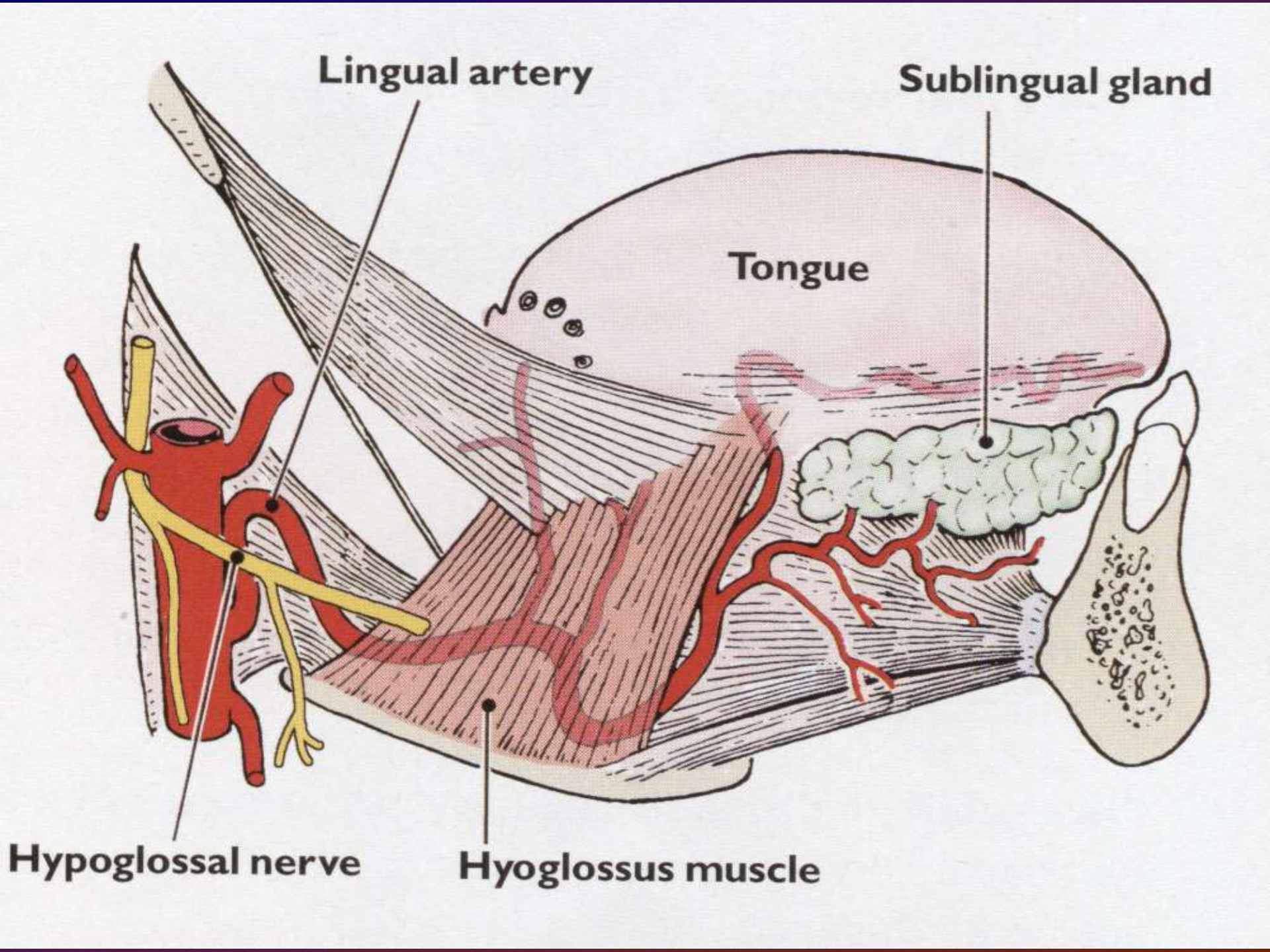
- glandular branches
- superior laryngeal a.,
- muscular branches



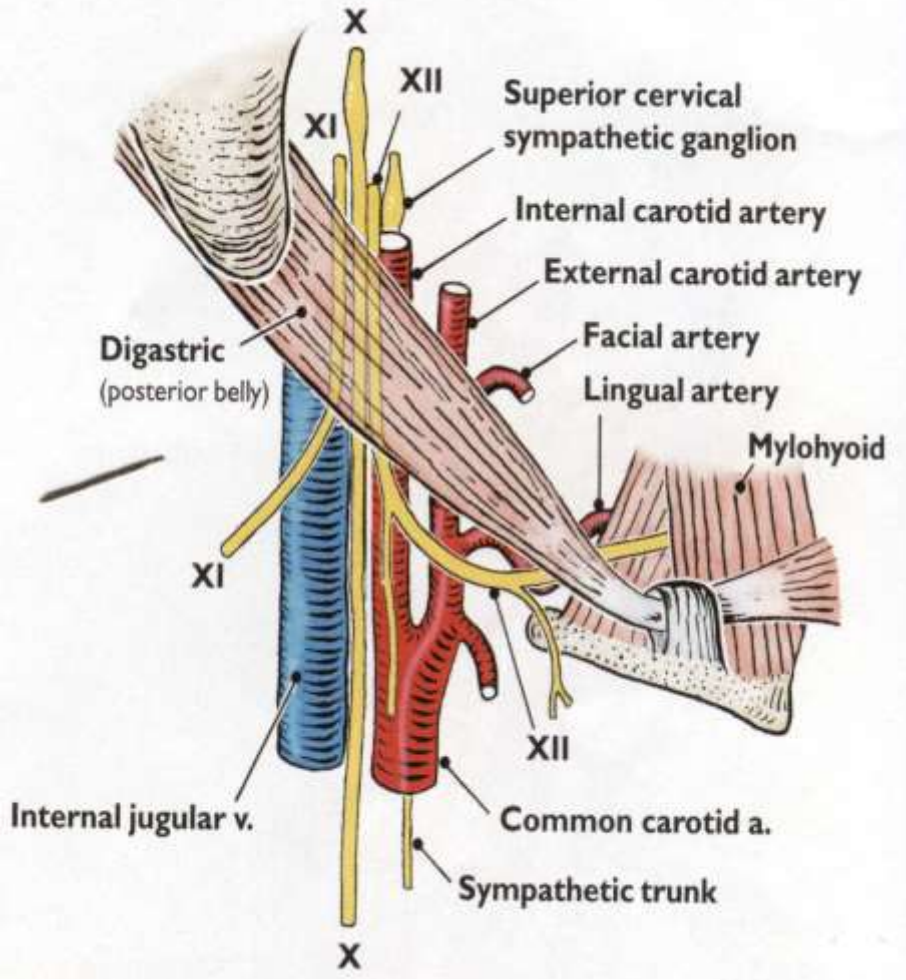
For tongue;

- Suprahyoid branch
- Sublingual a. (for sublingual gland)
- Dorsal lingual branches (from tongue root to epiglottis)
- a. profunda linguae (deep lingual a. – for intraglossal muscles; it proceeds to frenulum linguae)

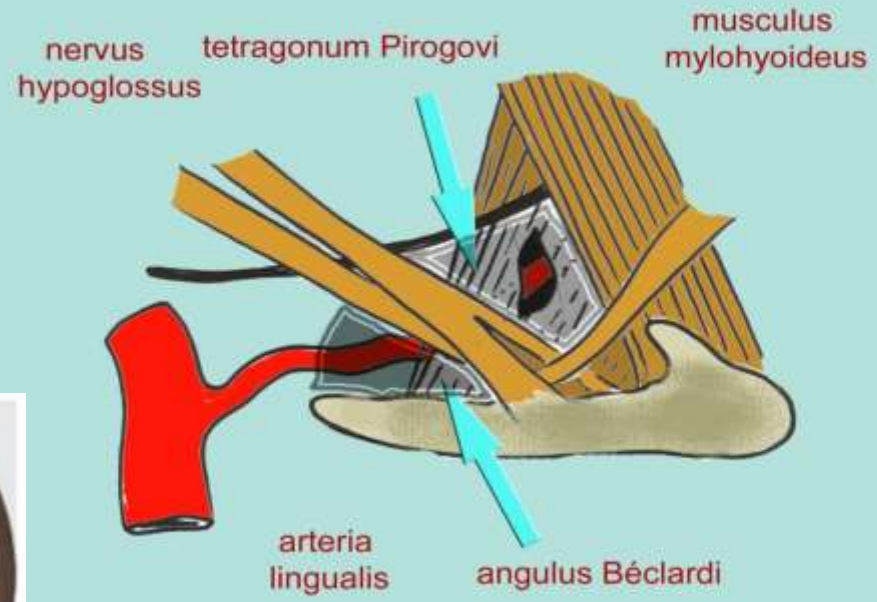
Arteria lingualis - inside paralingual canal (canalis paralingualis)

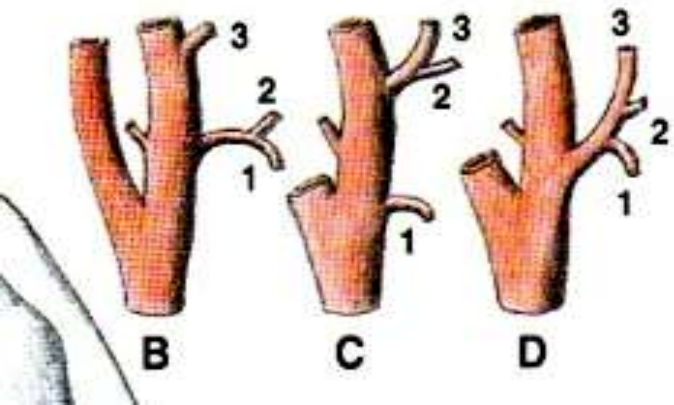

Lingual artery
Sublingual gland
Tongue
Hypoglossal nerve
Hyoglossus muscle

Trigonum Pirogovi
(Pirogoff ´triangle)
Angulus Béclardi
(Béclard´ angle)



Pierre Augustin Béclard,
French anatomist (*1785- †1825)

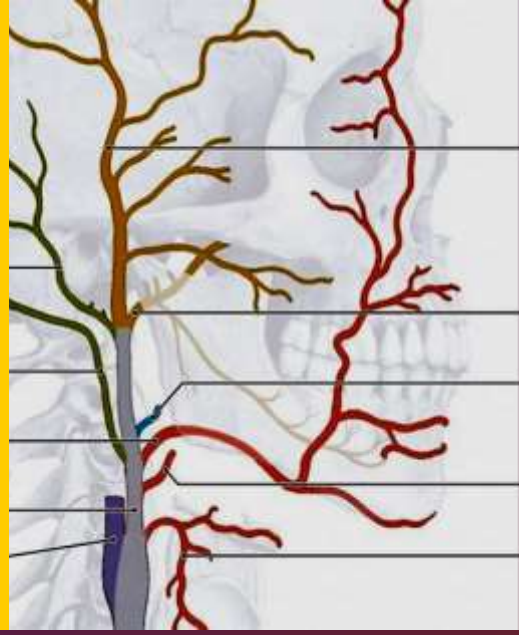




N. Pirogov

Nikolaj Ivanovič, Pirogov,
Russian surgeon (*1810 - †1881)

Facial artery
Arteria facialis



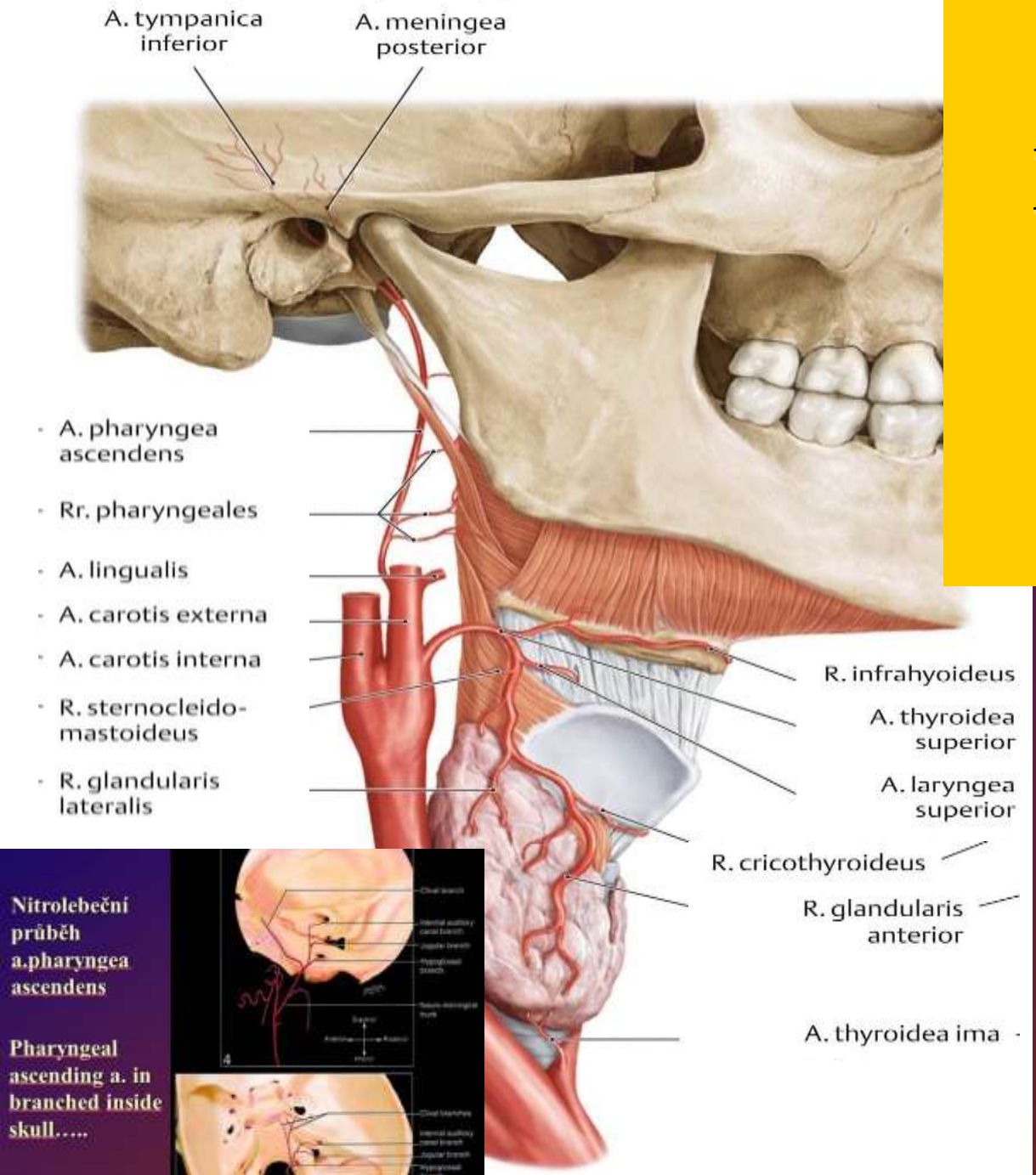
For neck and face;

- Ascending palatine a. (for soft palate and palatine tonsil)
- Glandular branches (for submandibular gland)
- Submental a. (for mylohyoid a., anterior belly of digastric m.)

- Superior and inferior labial aa. (they form circle around rima oris)
- alaris nasi m.
- angularis m.

Superior pharyngeal a.,

Arteria pharyngea ascendens

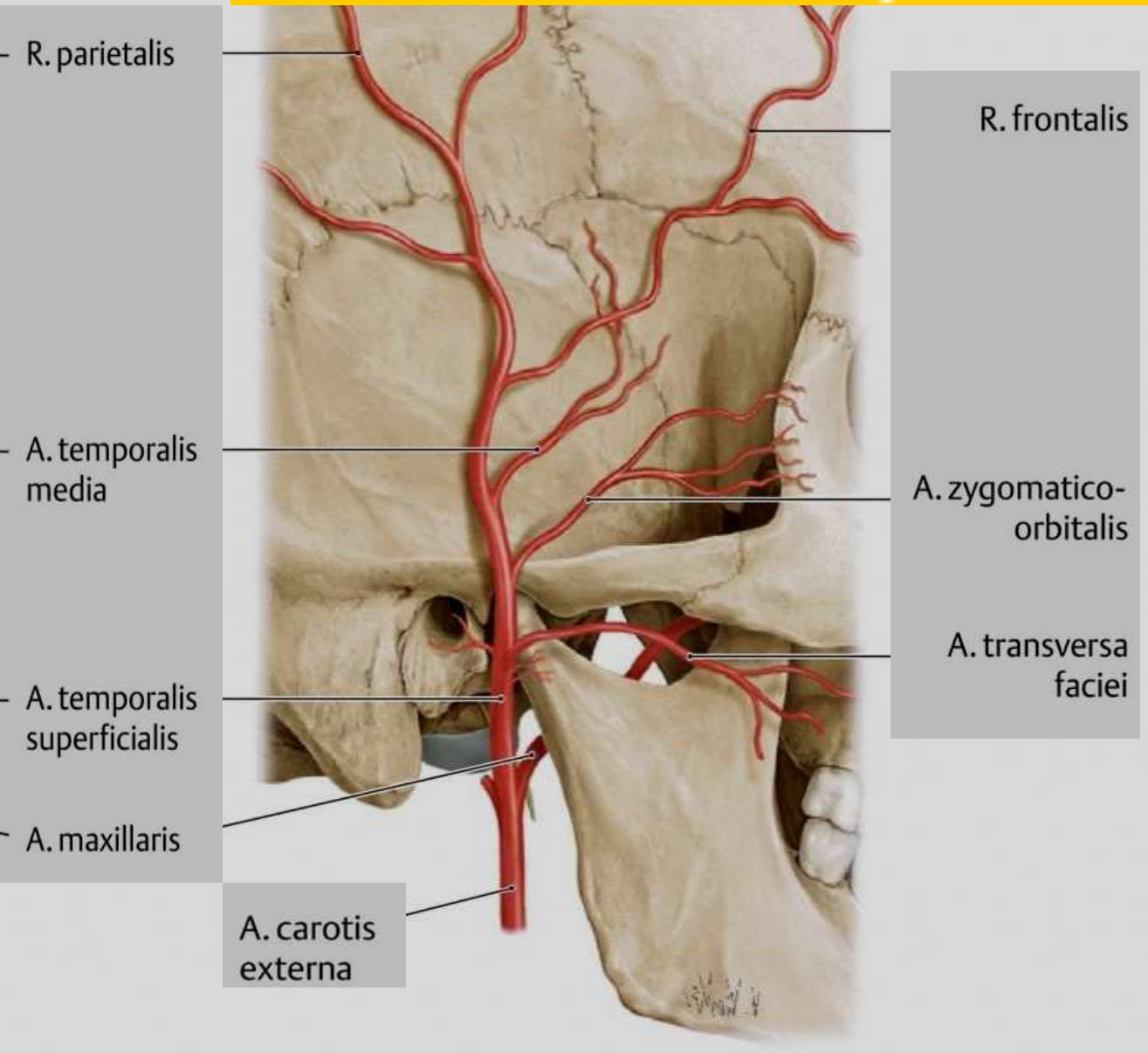


The very thin artery, supplies pharynx

pharyngeal branches (for truncus sympathicus, vagus, n. hypoglossus and pharynx)

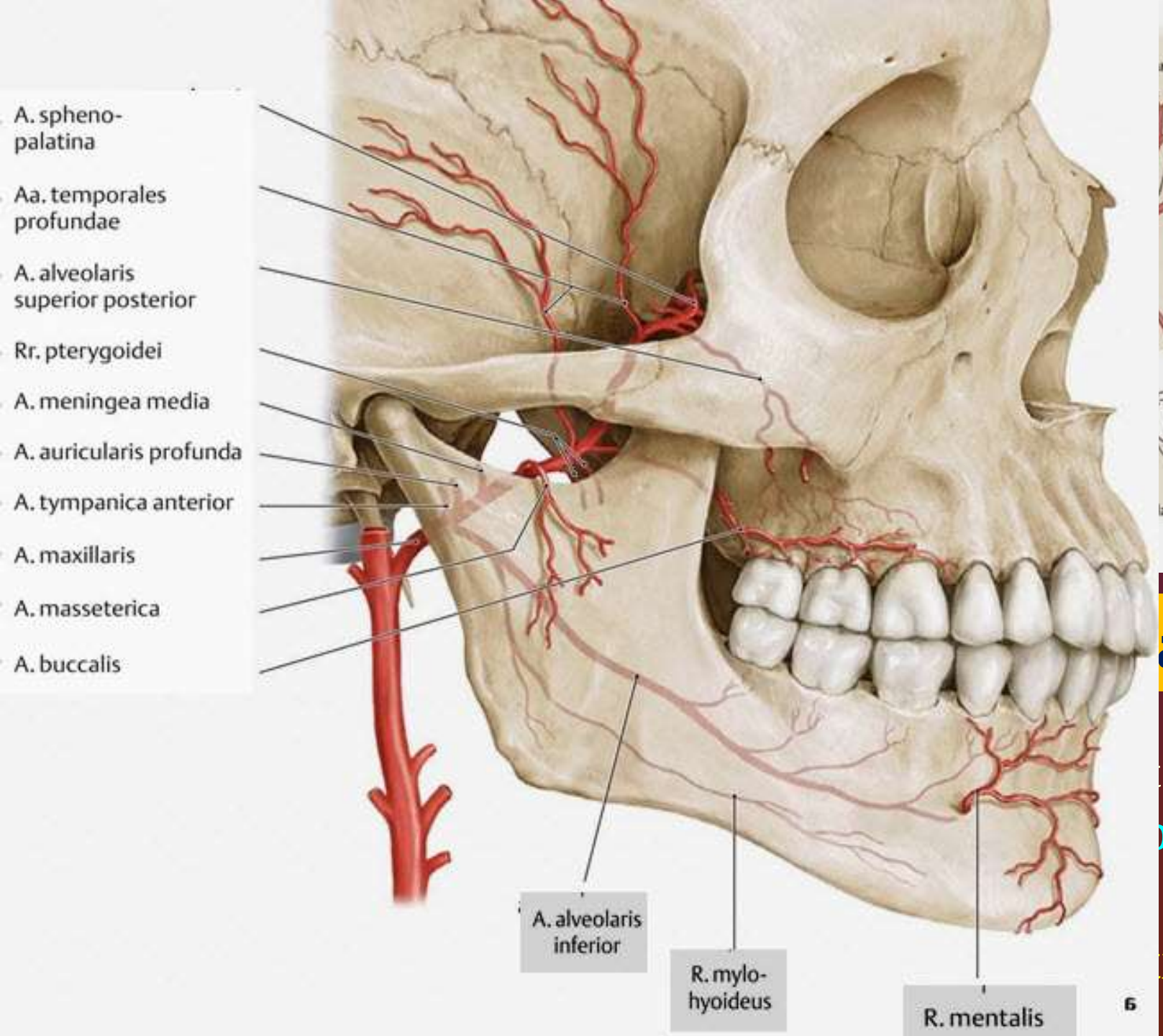
- Meningeal branches (for dura mater)
- inferior tympanic artery (for tympanic cavity)

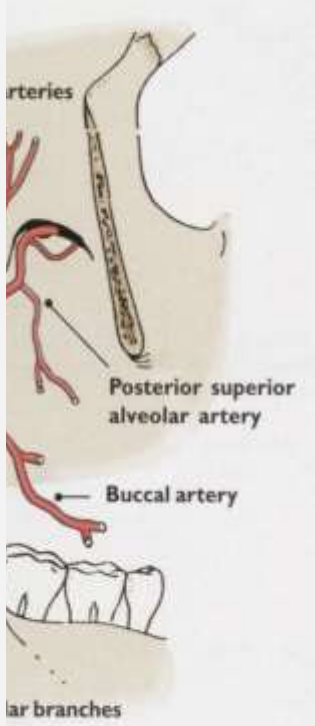
Superficial temporal artery
Arteria temporalis superficialis



For gl. parotis, TMJ, m. orbicularis oculi, m. temporalis;

- glandular branches transversa faciei (for mimic muscles)
- rr. auriculares anteriores (capsule of TMJ)
- a. zygomaticoorbitalis
- a. temporalis media
- frontal branches
- parietal branches



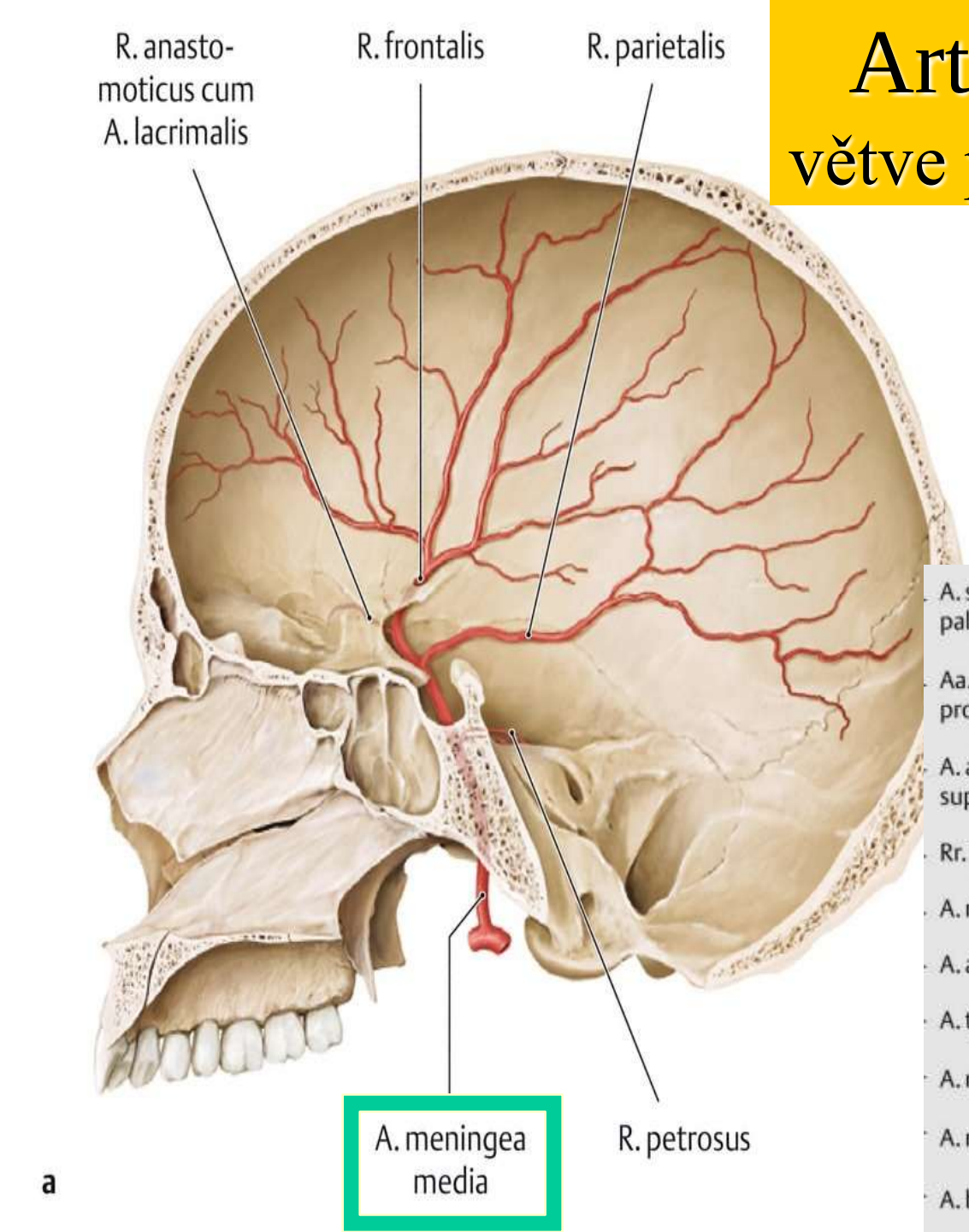


artery

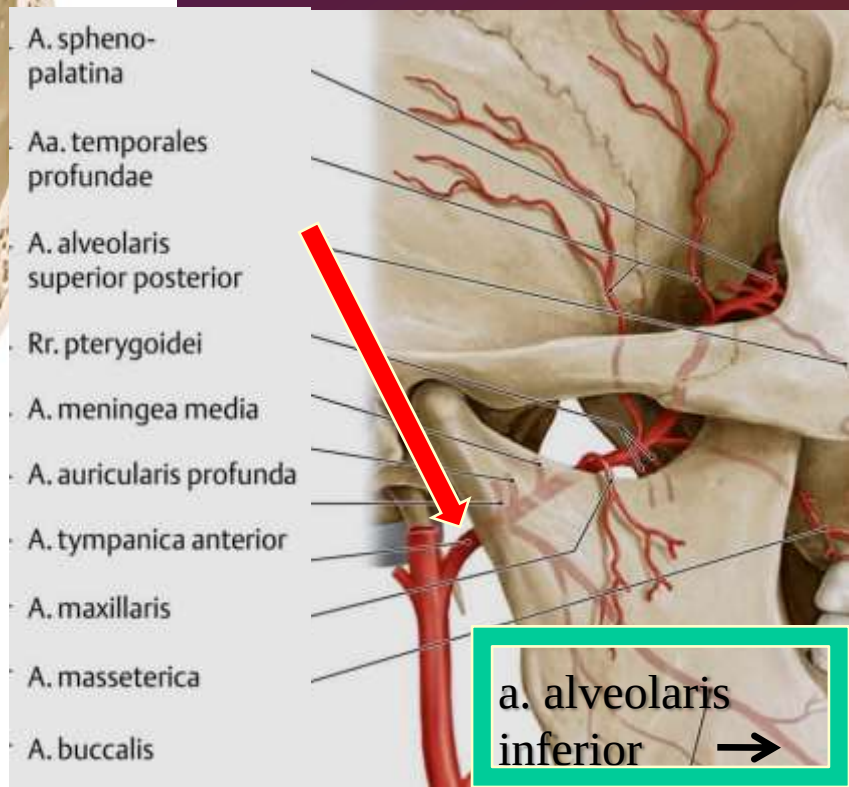
s (parts):
ular

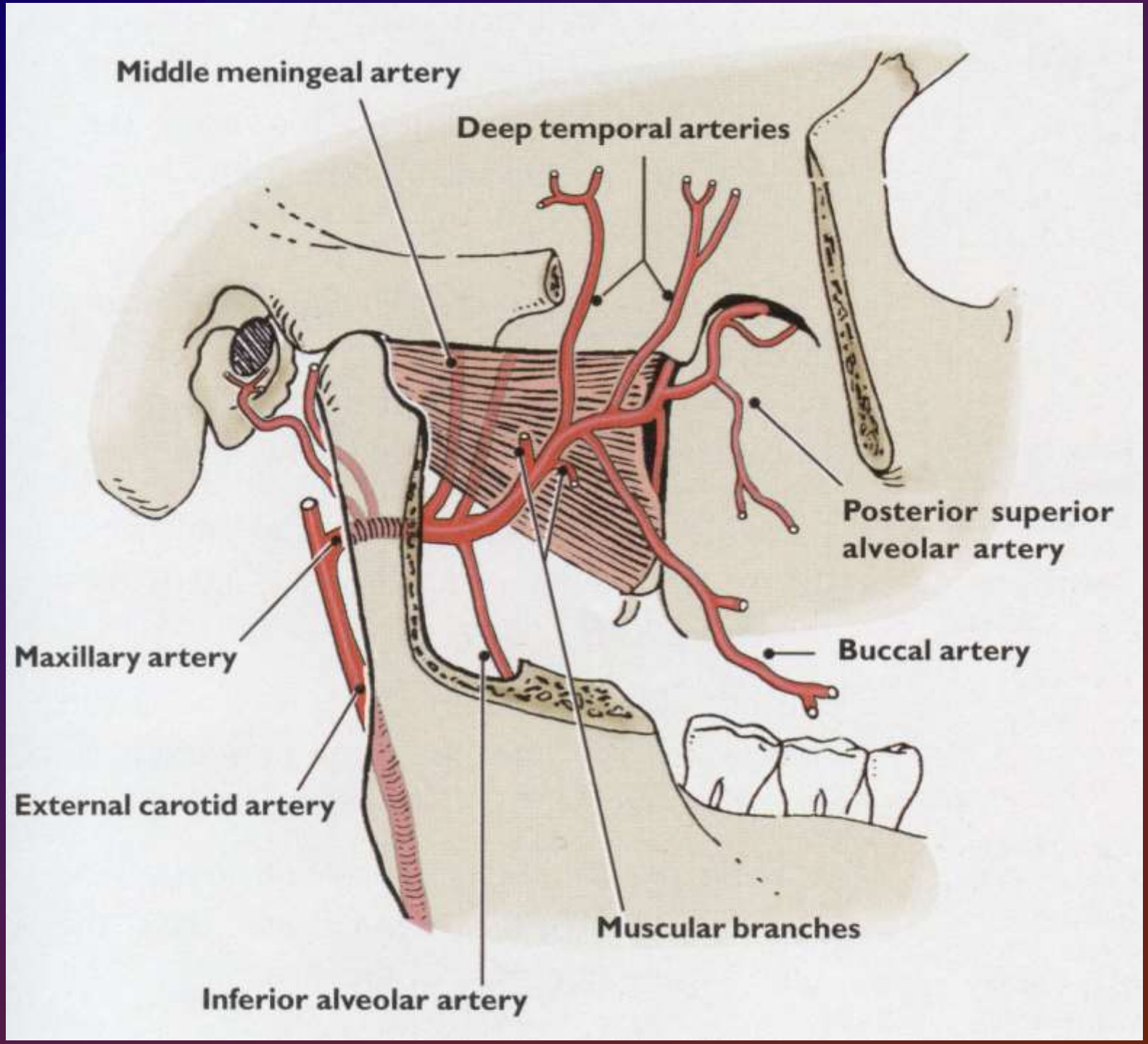
ine

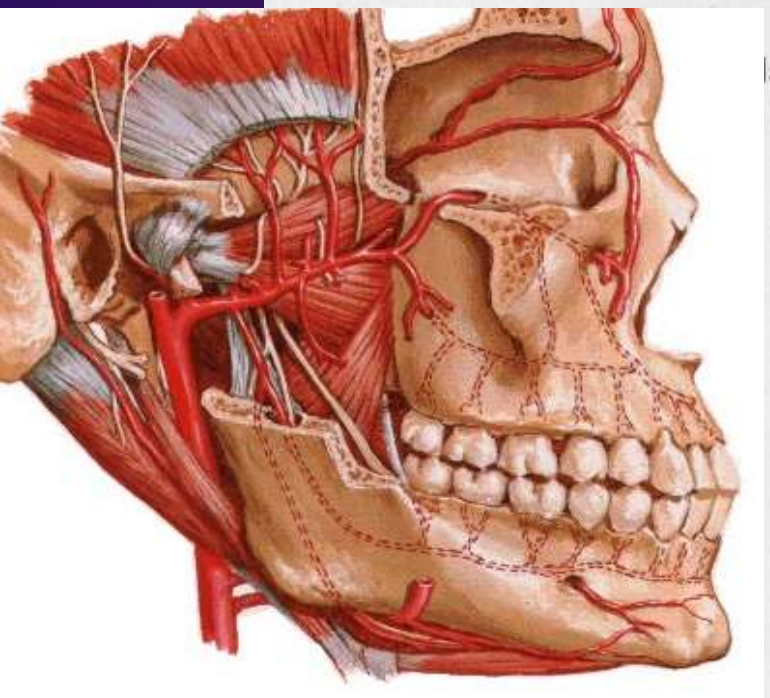
Arteria maxillaris – větve pars retromandibularis



- a. auricularis profunda
- a. tympanica anterior
- **a. meningea media**
- **a. alveolaris inferior**




Middle meningeal artery
Deep temporal arteries
Posterior superior alveolar artery
Maxillary artery
Buccal artery
External carotid artery
Muscular branches
Inferior alveolar artery



Nerves to temporalis

Sphenopalatine artery
entering pterygopalatine fossa

Nerve to masseter

Auriculotemporal nerve

Buccal nerve
(branch of V_3)

Chorda tympani

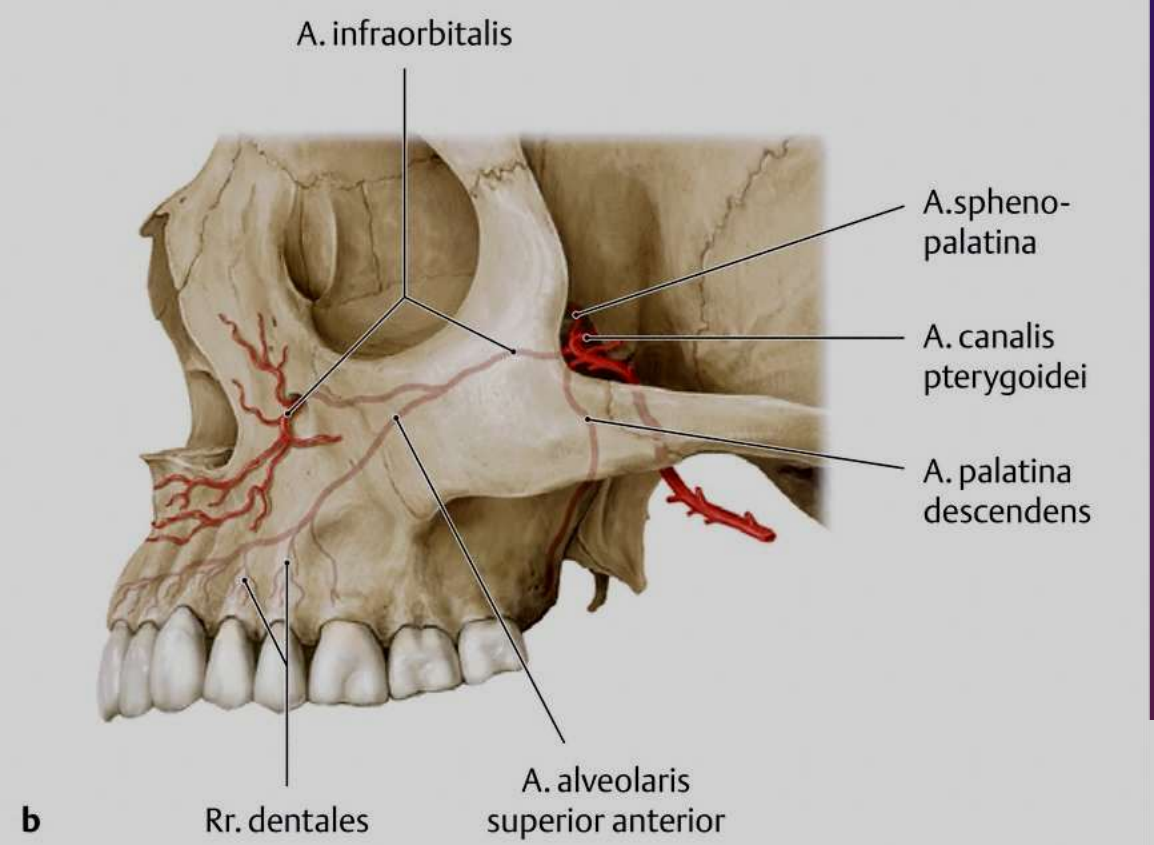
lary artery

Inferior alveolar nerve

Lingual nerve

Medial pterygoid muscle

Nerve to mylohyoid and digastric



- Superior posterior alveolar a.
- Infraorbital a.
- Palatine descendens a.:

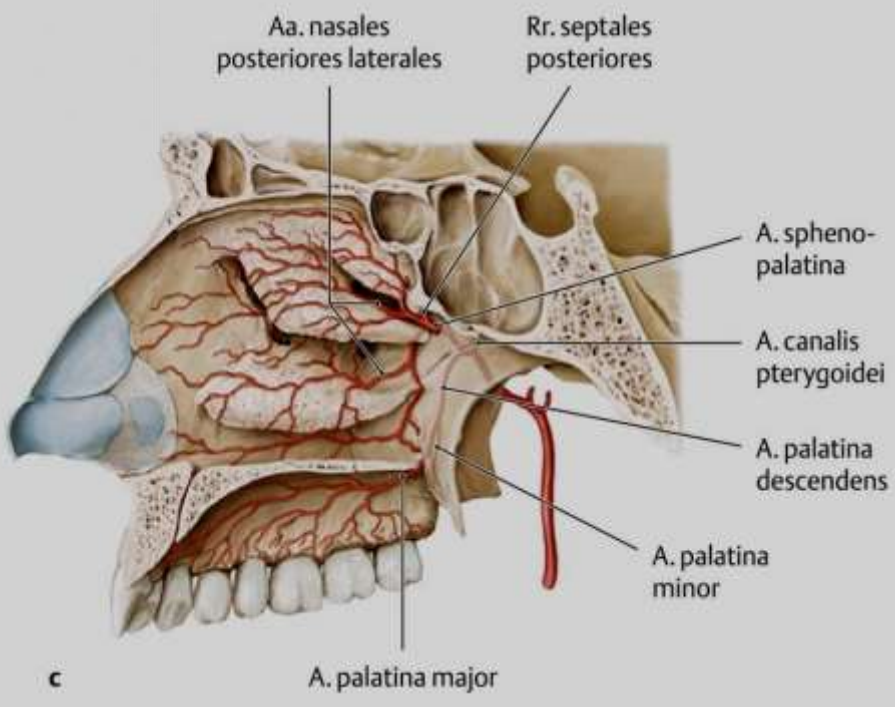
a. palatina major et minores

a. canalis pterygoidei

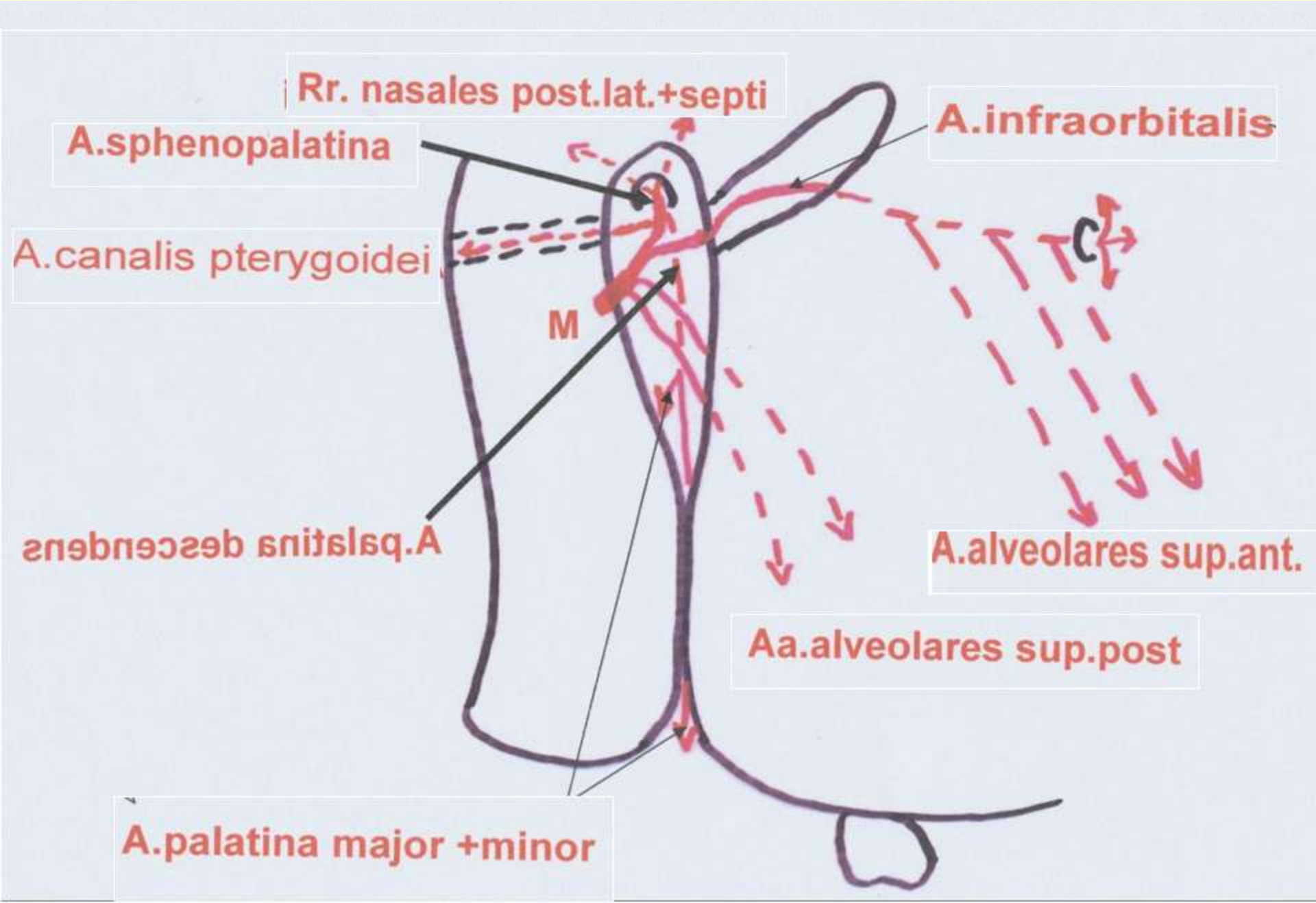
- a. sphenopalatina:

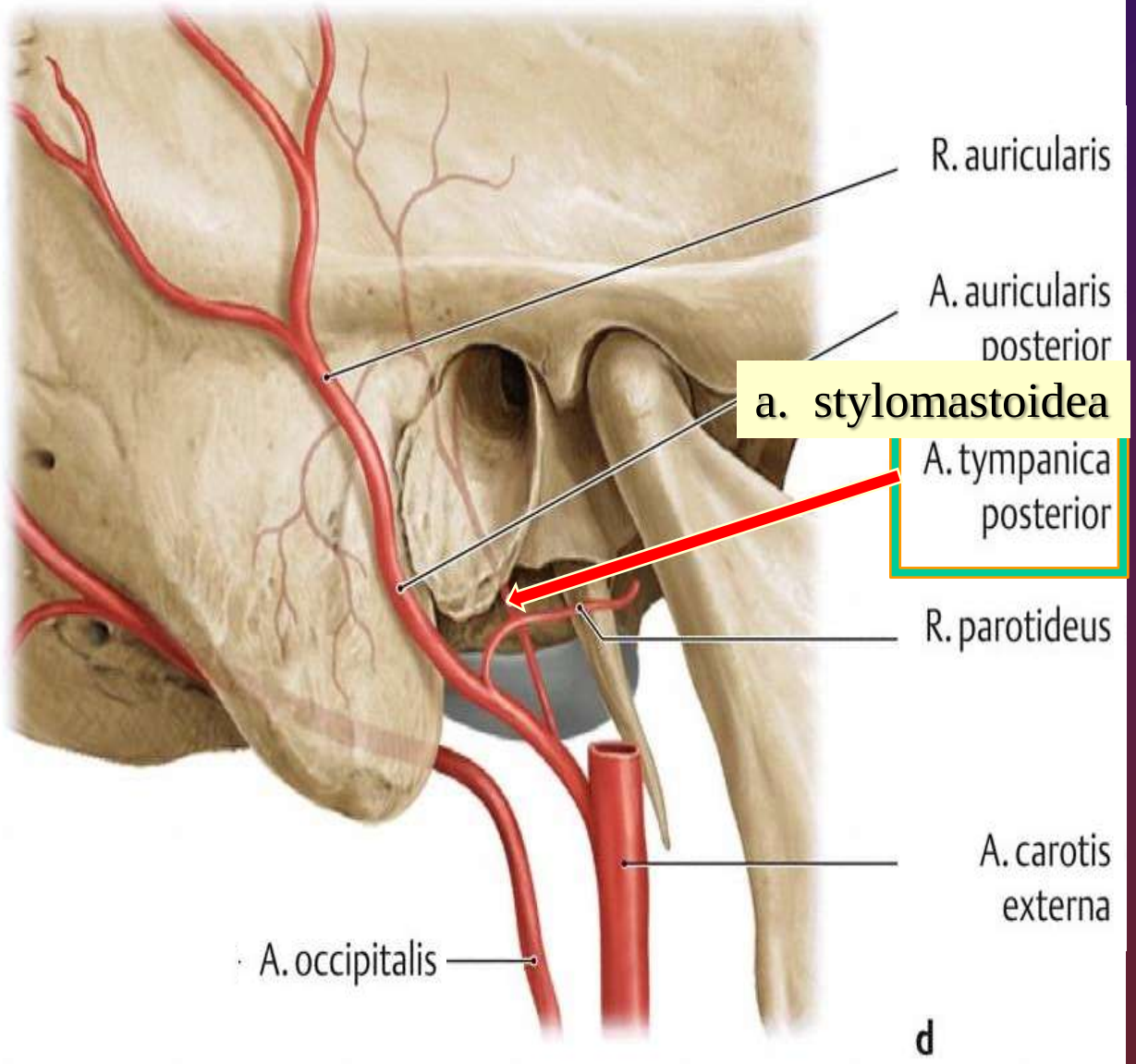
a. nasales posteriores laterales et nasales posteriores septales

Arteria maxillaris – branches from pterygopalatinous part



Branches of the maxillary artery; pterygopalatine part





For soft meningeal membranes;

- Occipital branches
- Sternocleidomastoid brr. (sternocleidomastoid a. – crosses arcus nervi hypoglossi)
- Auricular br.
- Mastoid ale br. (for dura mater near mastoid canal)
- Meningeal brr. (for dura mater near for. jugulare)

- Stylomastoid a. (for cavum tympani, canales semicirculares and cellulae mastoideae;
- Posterior tympanic a. supplies cavum tympani)

Occipital artery + posterior auricular a.
Arteriae occipitalis + auricularis posterior

Aa. caroticotympanicae		A. carotis interna
A. stylomastoidea		A. auricularis posterior
A. tympanica inferior	←	A. pharyngea ascendens
A. auricularis profunda		A. maxillaris
A. tympanica posterior	←	A. stylomastoidea
A. tympanica superior	←	A. meningea media
A. tympanica anterior	←	A. maxillaris

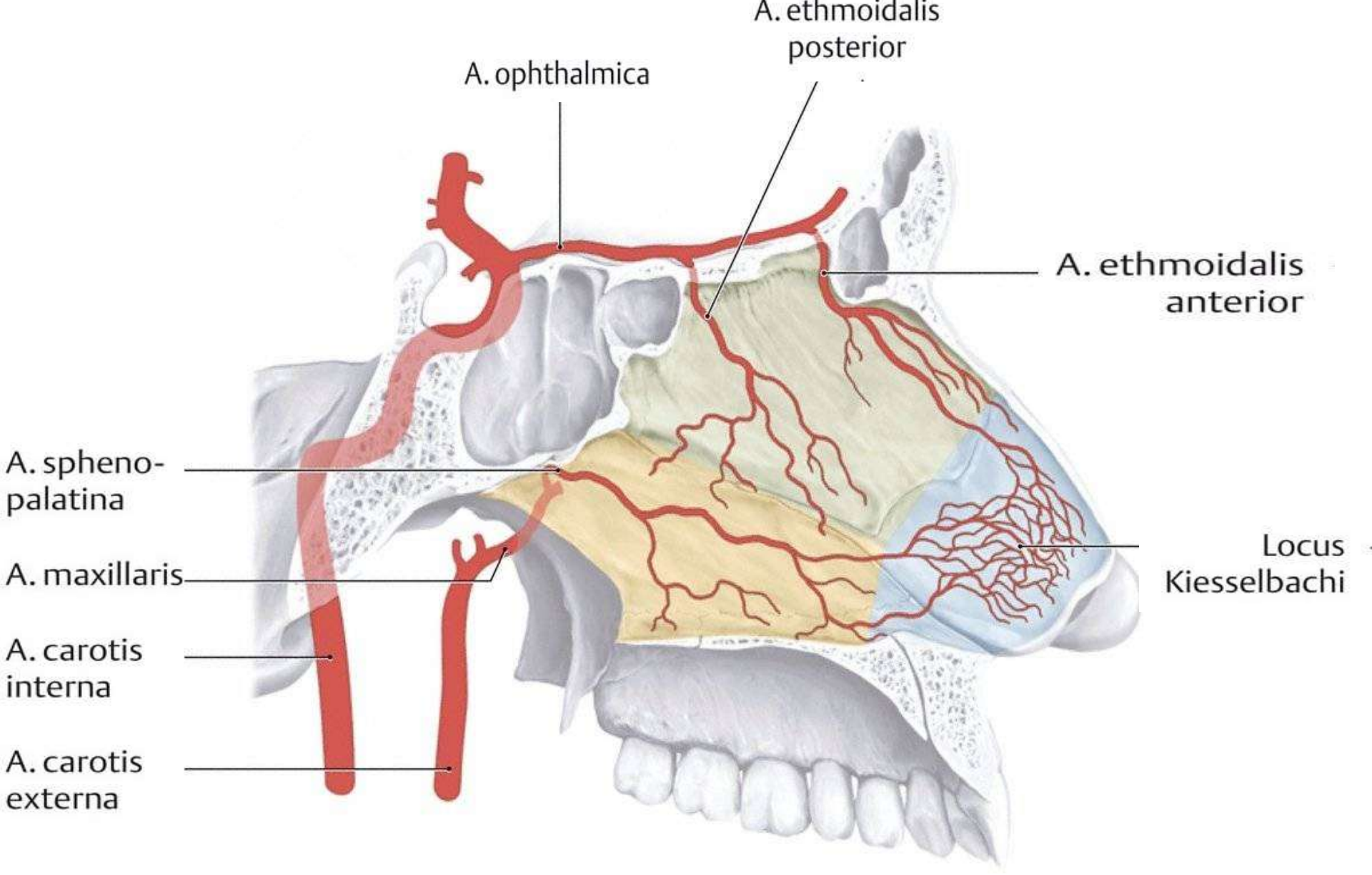
Internal carotic artery ICA

Carotic sinus (baroreceptor)

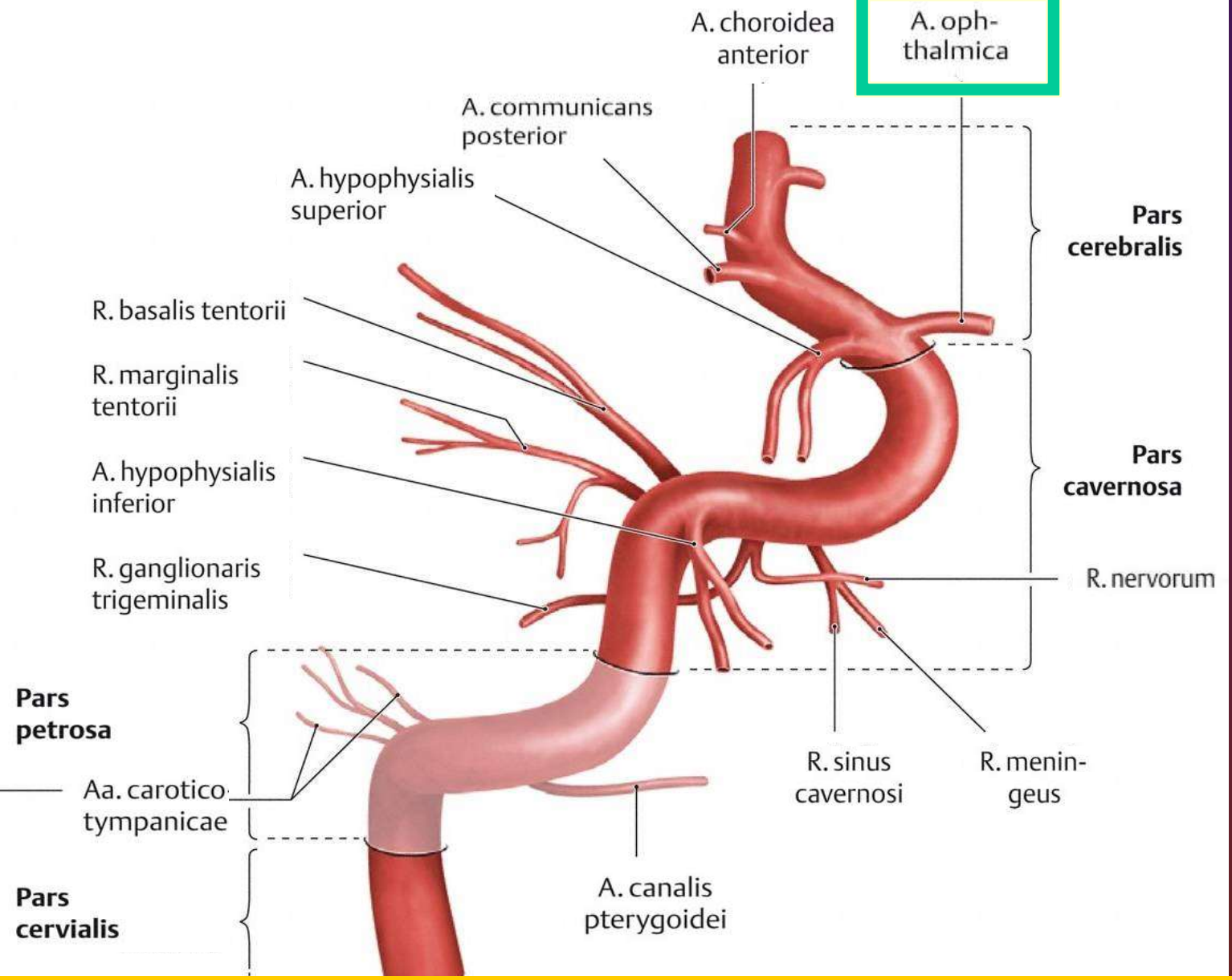
- **Cervical part** – sinus caroticus, no branches
- **Petrous part** – caroticotympanic aa.
- **Cavernous part** – meningeal branch, hypophysial br. ganglionic trigeminal inferior brr.
- **Cerebral part** – ophtalmic a., (right angle), superior hypophysial a., communicans posterior a., choroid anterior a.
- **Terminal branches:**
  - **Anterior cerebral a.**
  - **Medial cerebral a.**

Carotic siphon

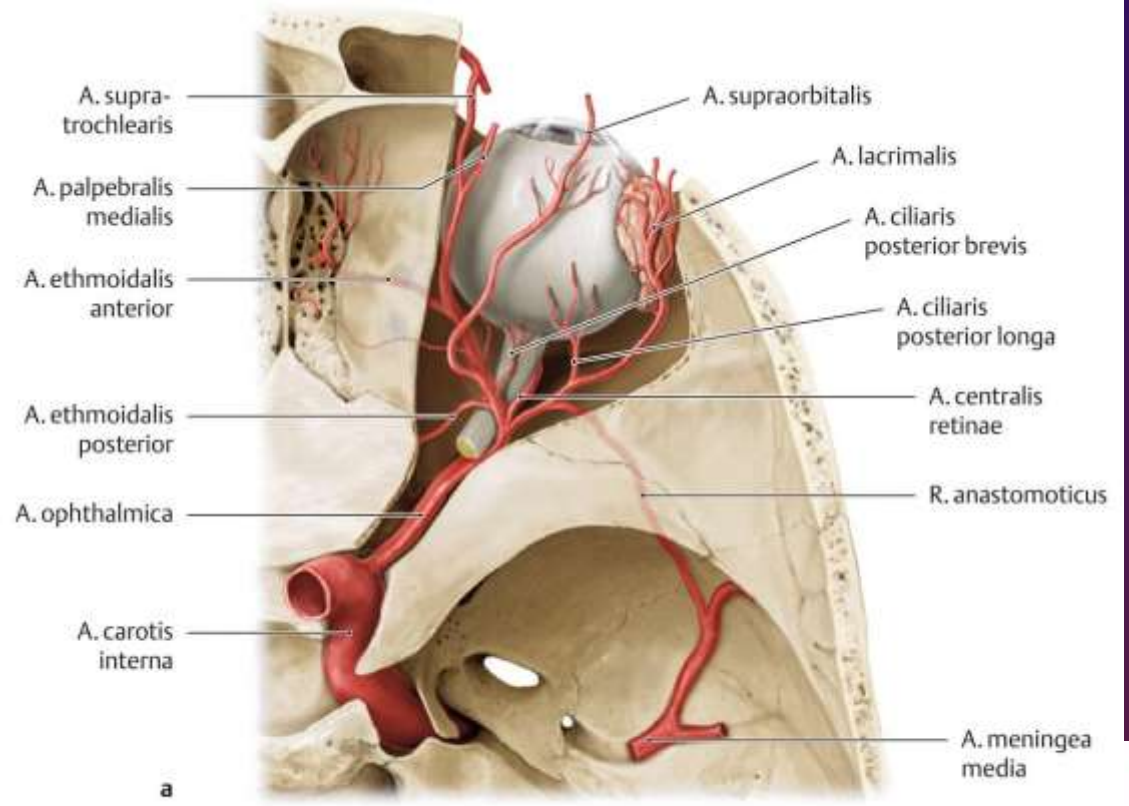
Willis´ circle (circulus arteriosus cerebri *Willisi)*



ACI has anastomoses with maxillary artery in nasal septum

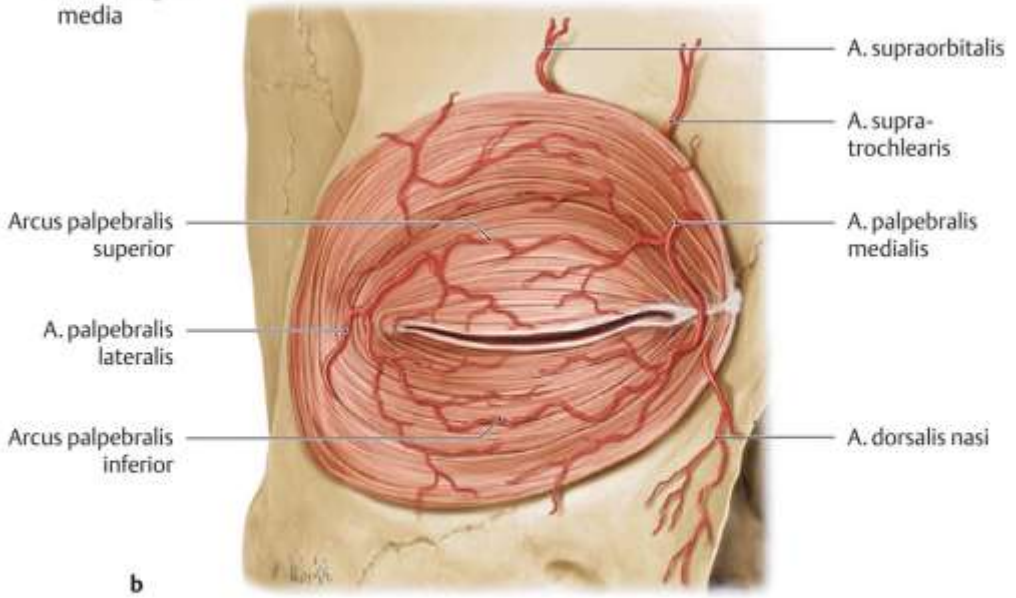


Arteria carotis interna – intracranial branches

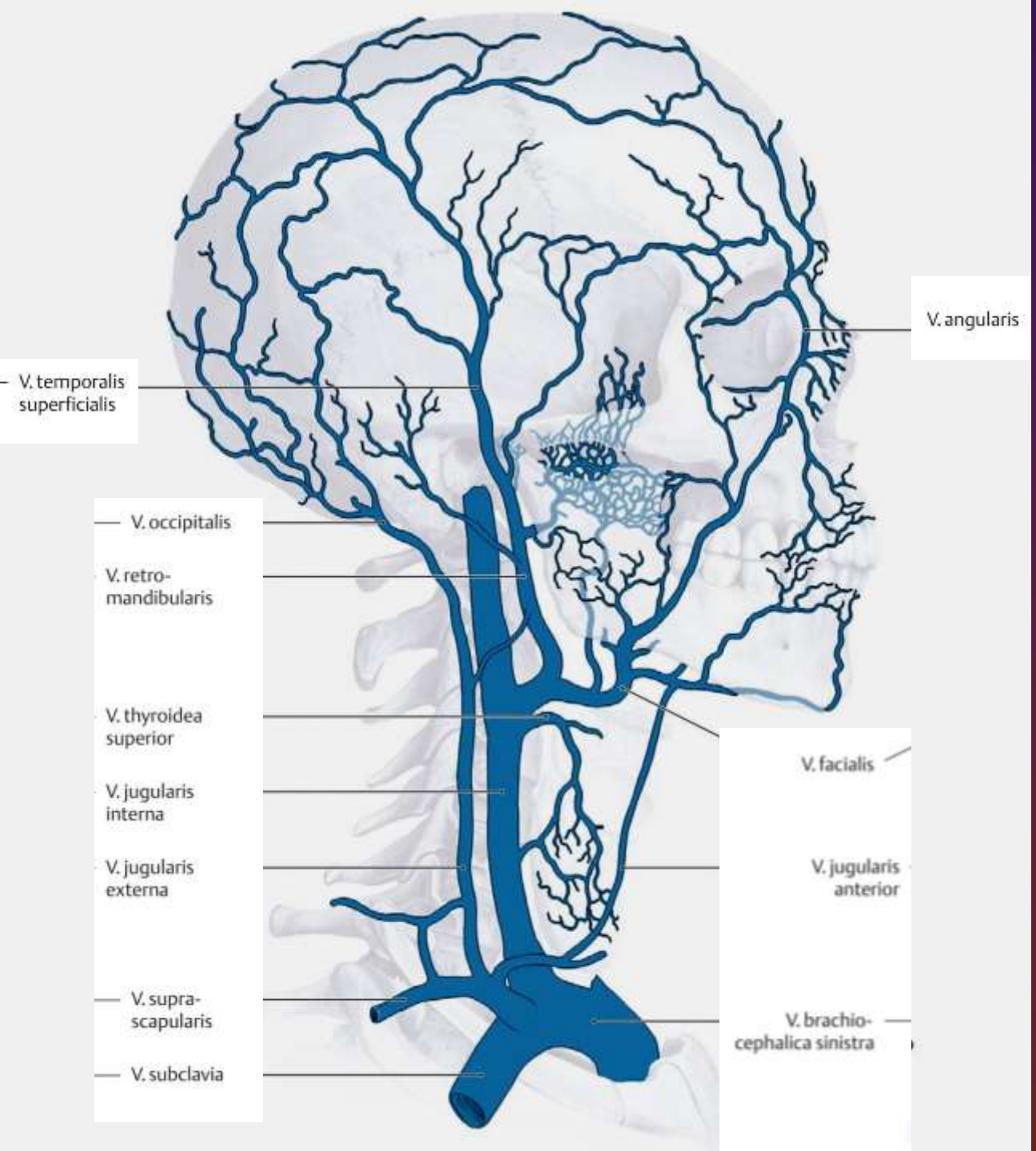


B A. ophthalmica

Ophtalmic artery
Arteria ophtalmica



B A. ophthalmica

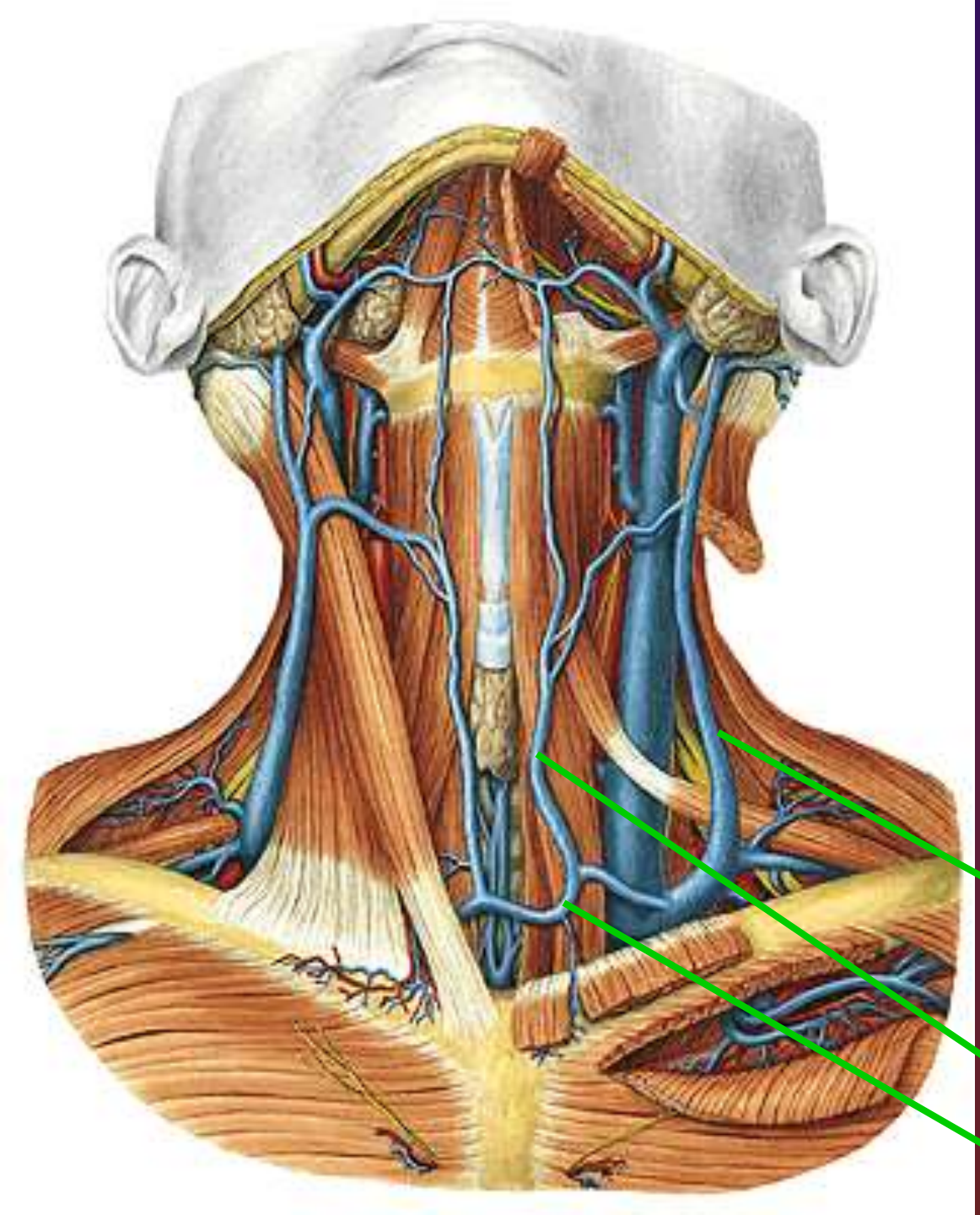


Superficial veins:

external jugular, anterior jugular and branches

Deep veins (profundae):

Pterygoid plexus
Plexus pterygoideus
Internal jugular



superficial veins

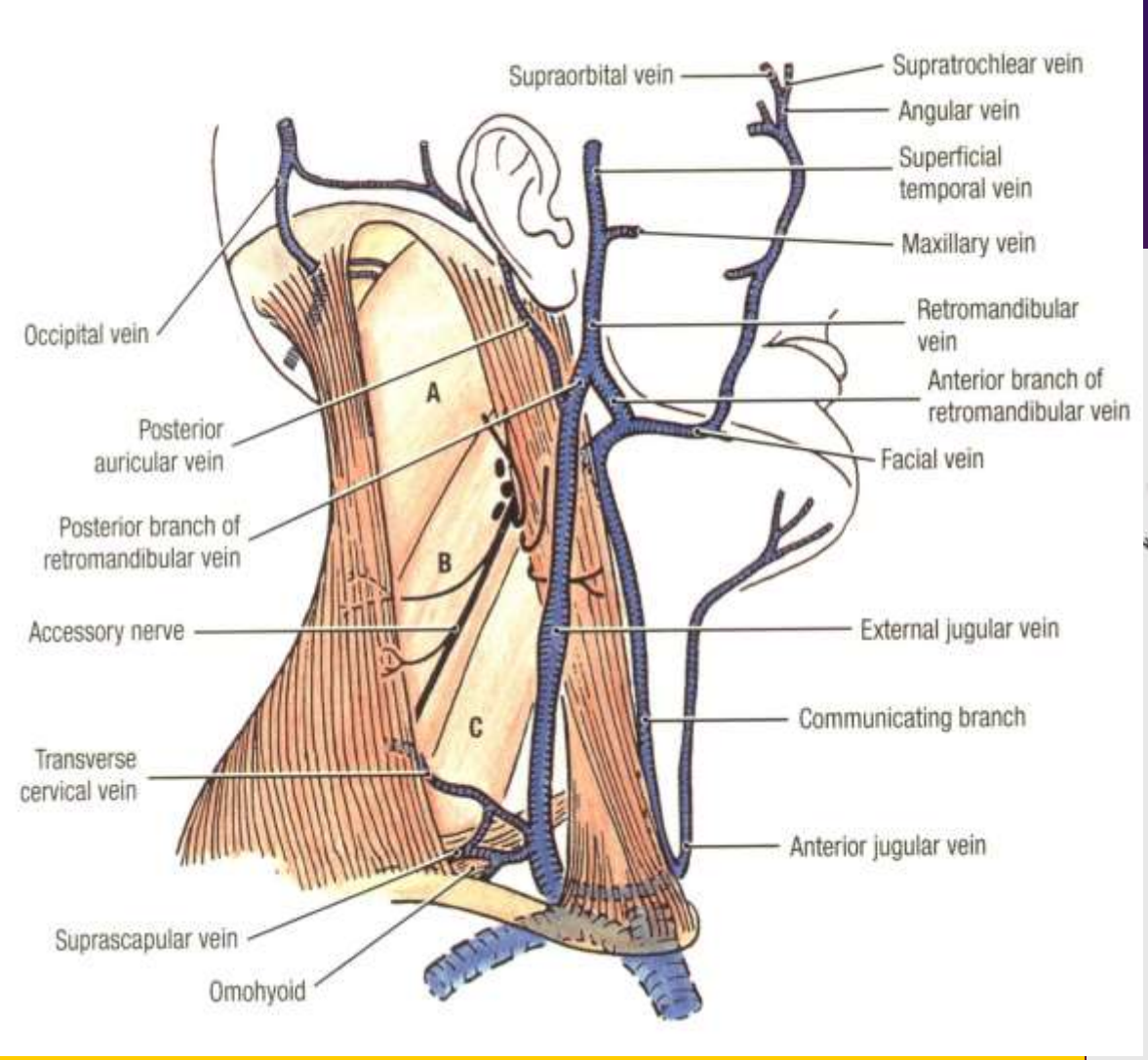
External jugular vein

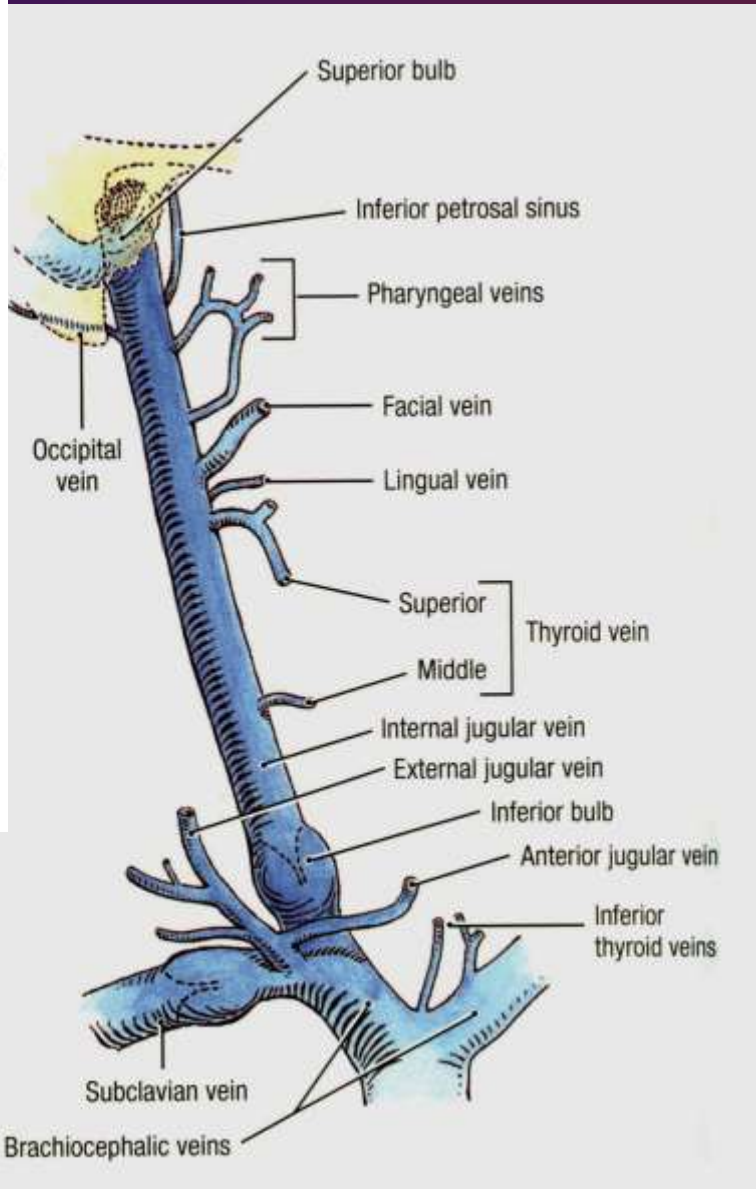
Anterior jugular vein

Venous jugular arch

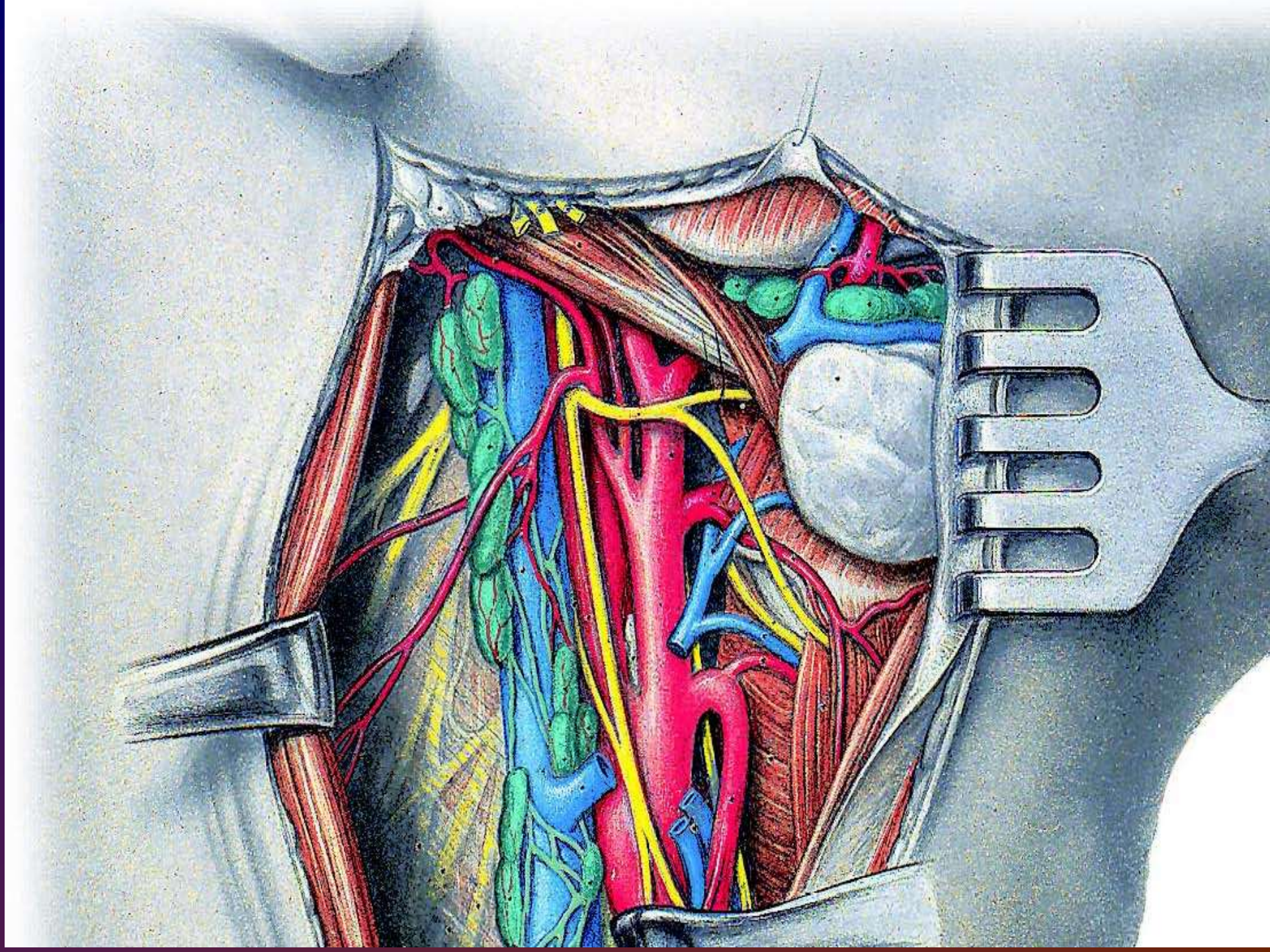
deep veins

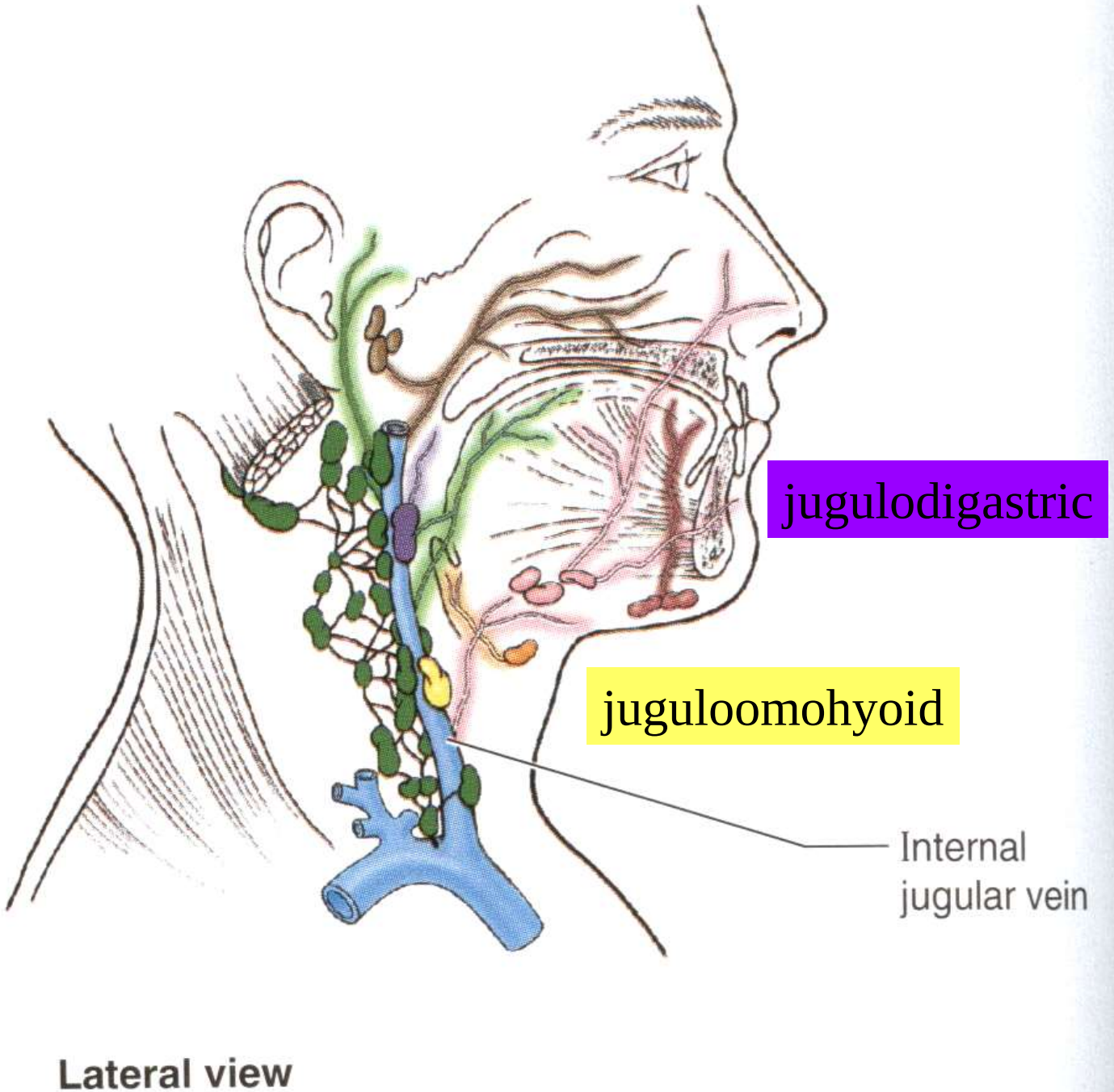
Internal jugular vein





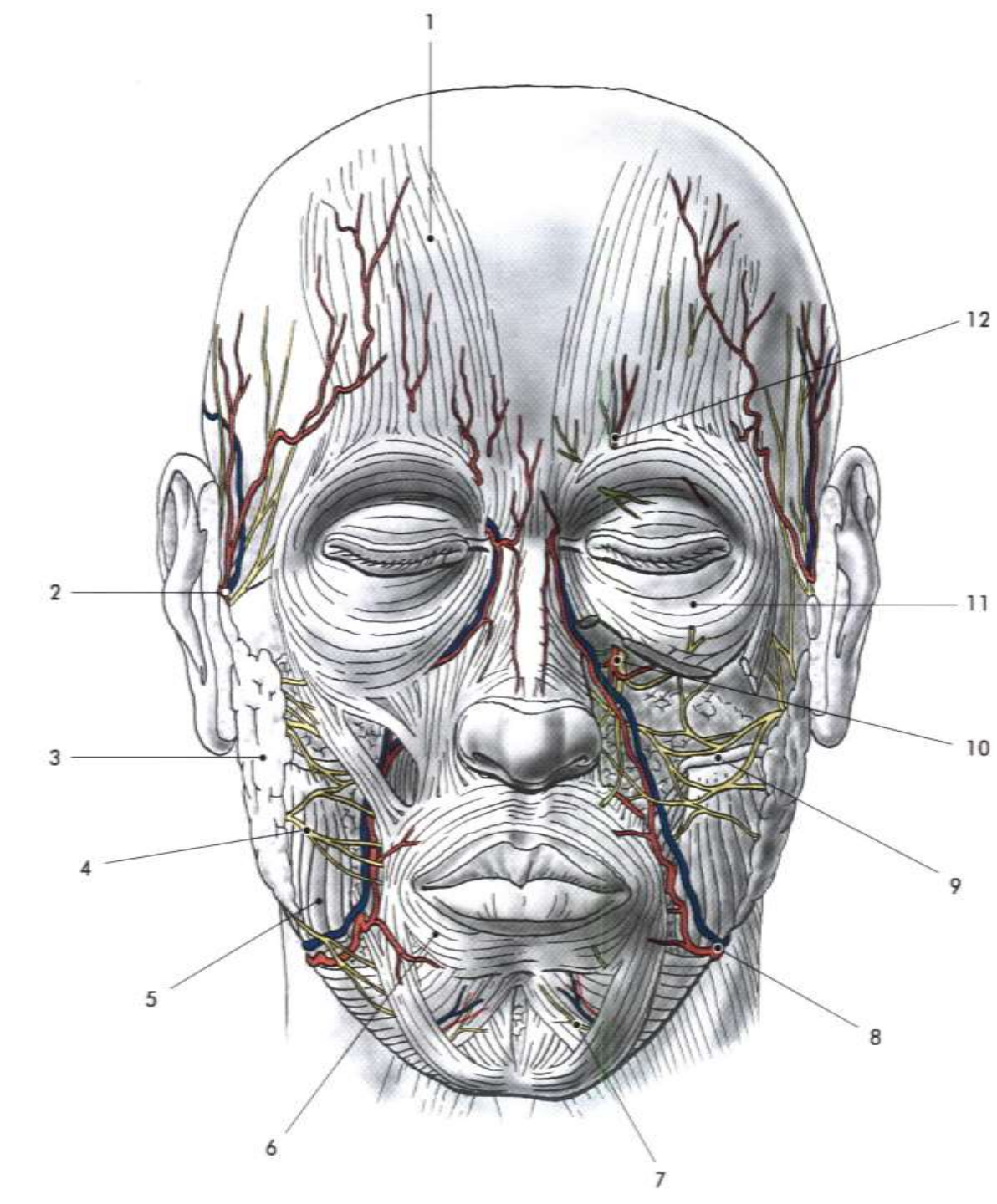
Internal jugularis vein; external jugular vein

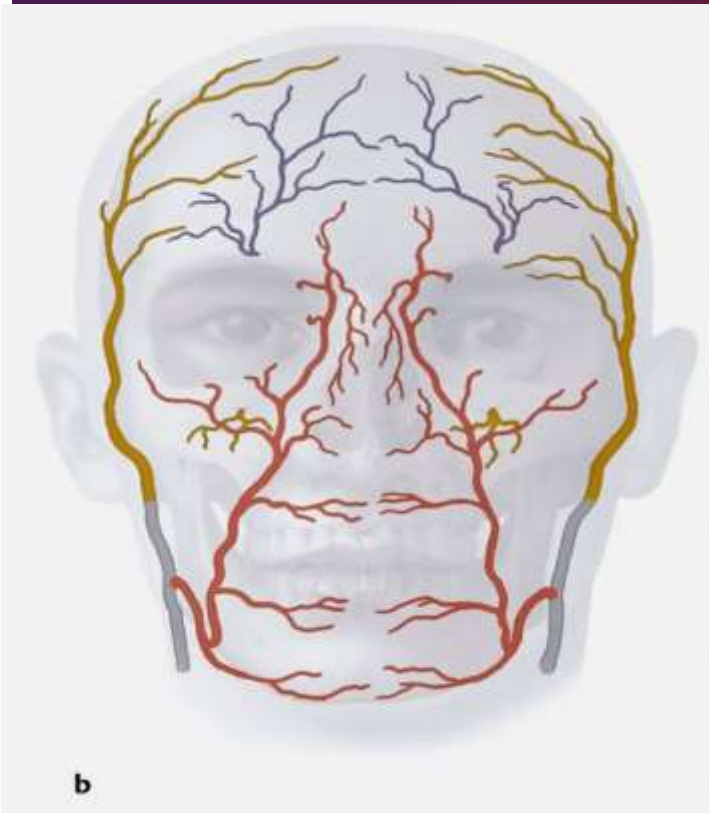




Lateral view

Facial vein
Vena facialis



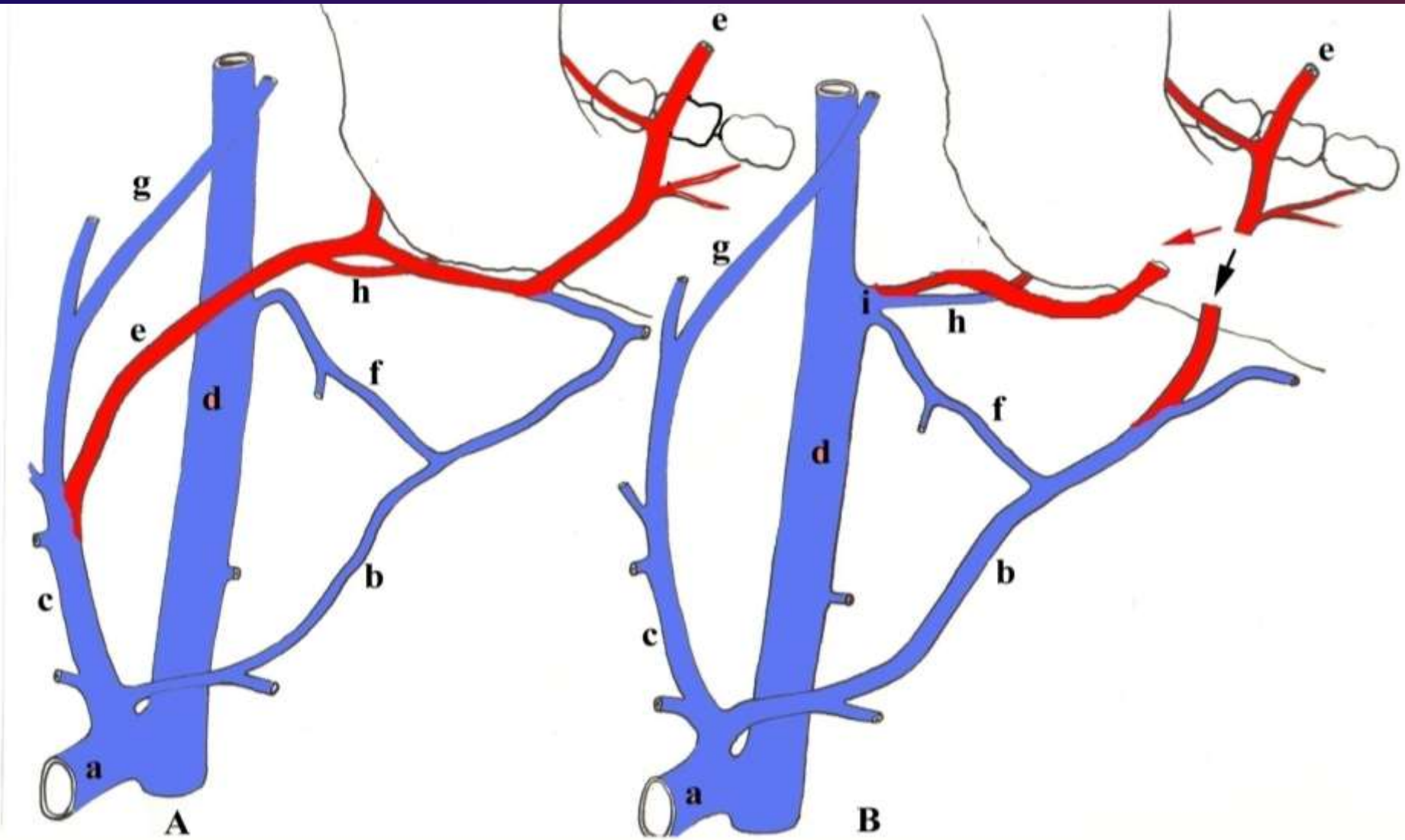


Vena facialis can be open to from:

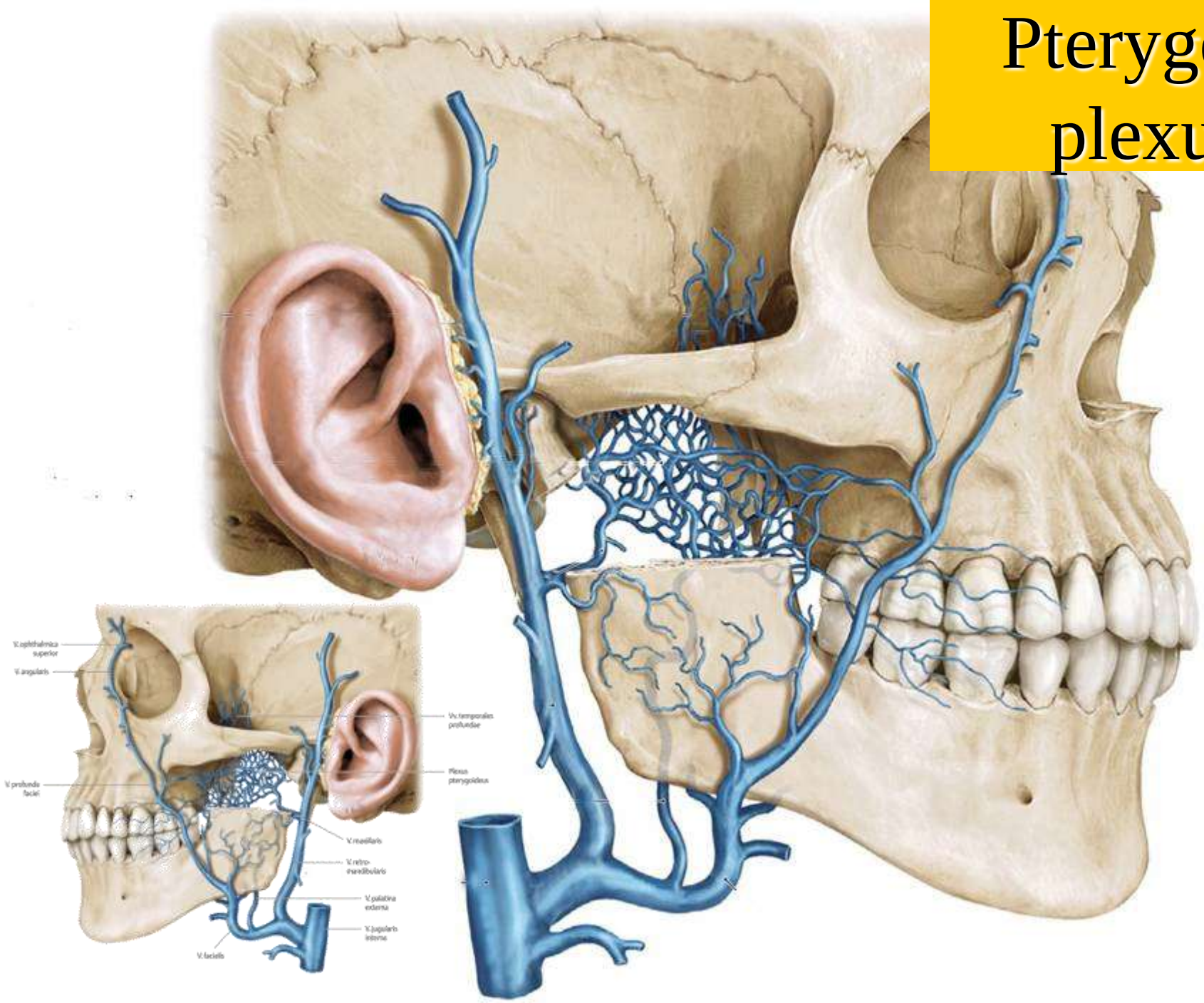
Vena jugularis externa

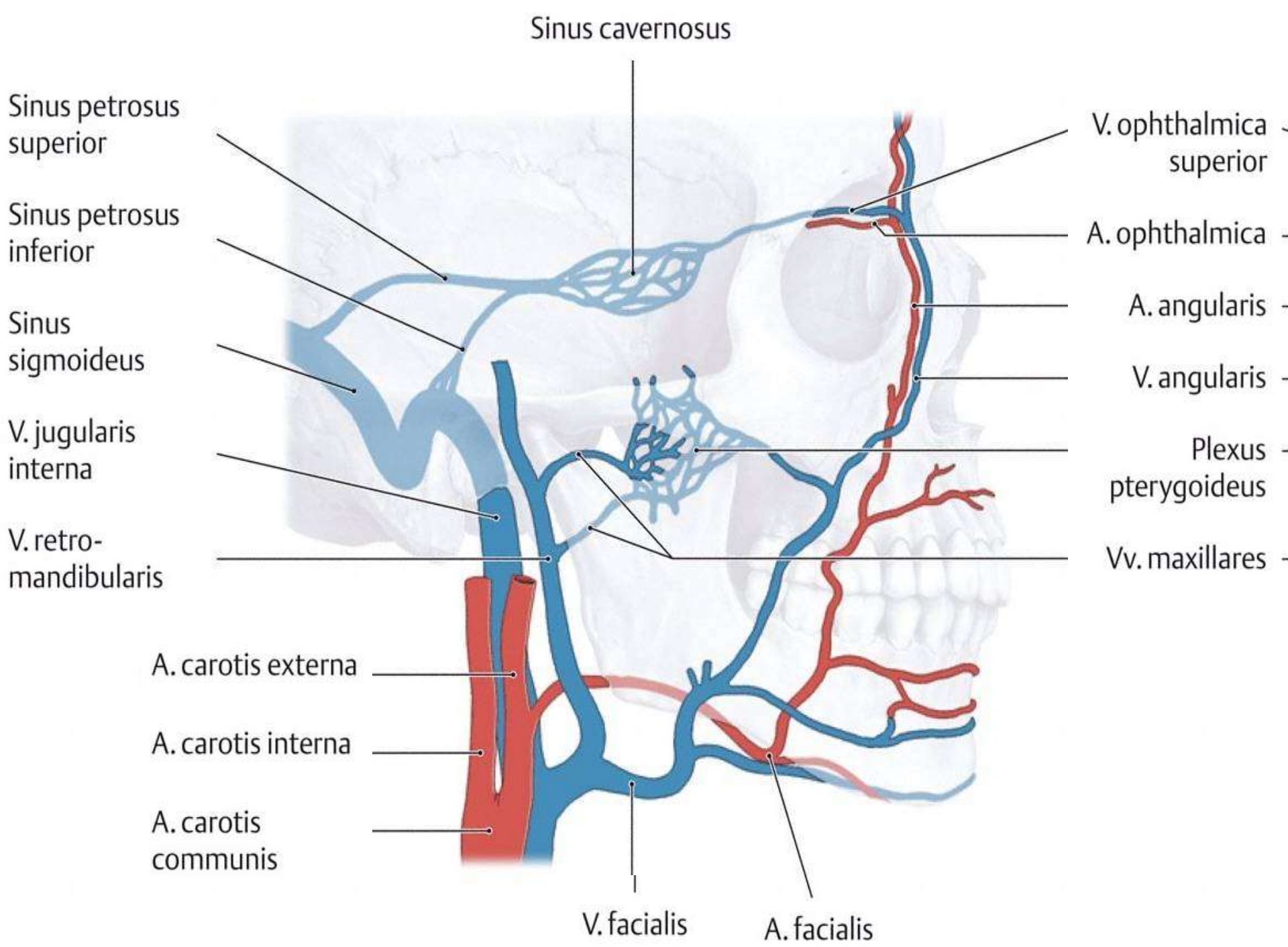
Vena jugularis interna

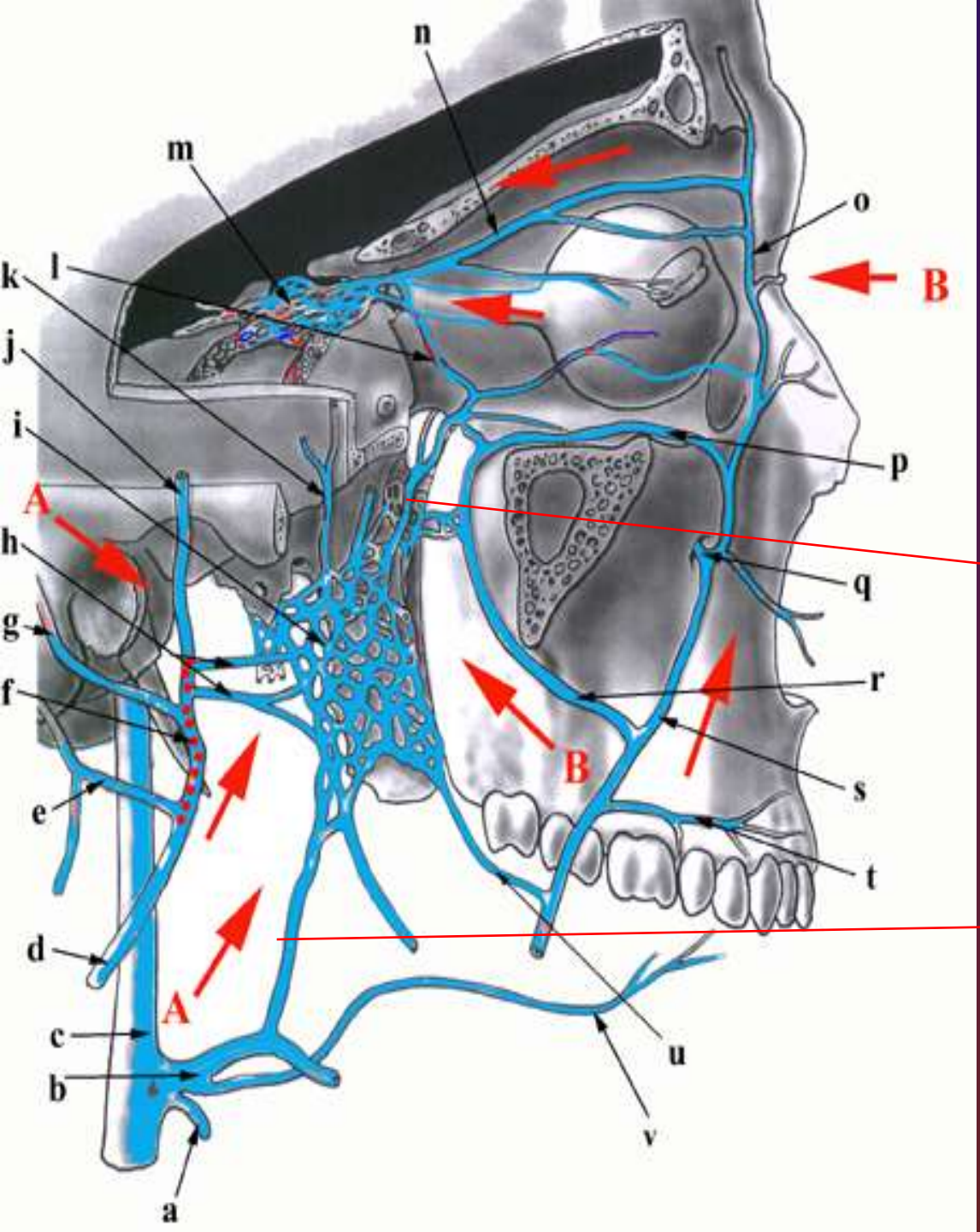
Vena jugularis anterior



Pterygoid plexus




Sinus cavernosus
Sinus petrosus superior
Sinus petrosus inferior
Sinus sigmoideus
V. jugularis interna
V. retro-mandibularis
V. ophthalmica superior
A. ophthalmica
A. angularis
V. angularis
Plexus pterygoideus
Vv. maxillares
A. carotis externa
A. carotis interna
A. carotis communis
V. facialis
A. facialis



Pterygoid venous plexus

and its tributaries:

n superior ophtalmic

p inferior ophtalmic

n infraorbital

vein to pterygoid plexus

(through foramen ovale – rete)

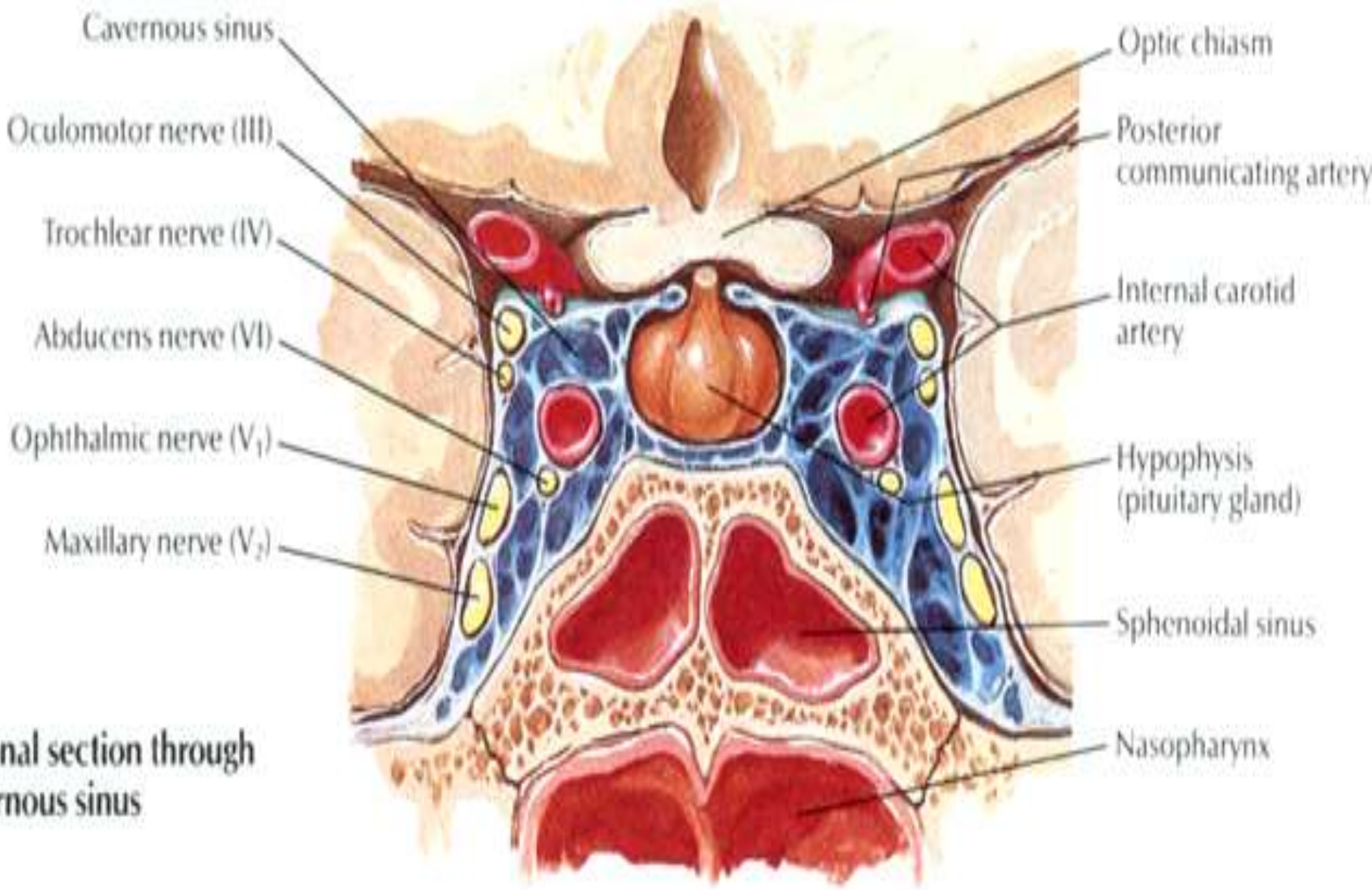
r deep facial

u buccal

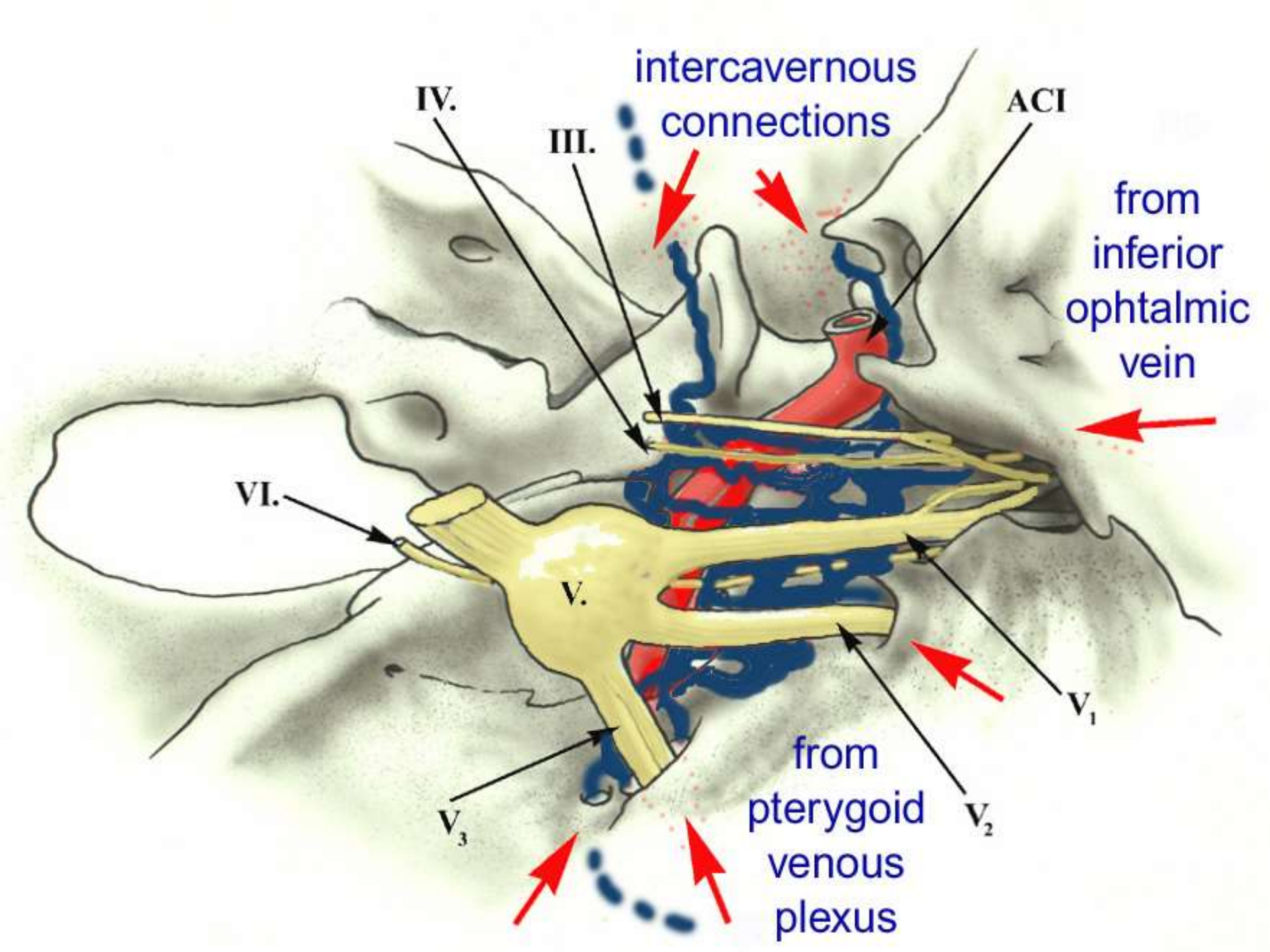
inferior alveolar vein

... retromandibular vein

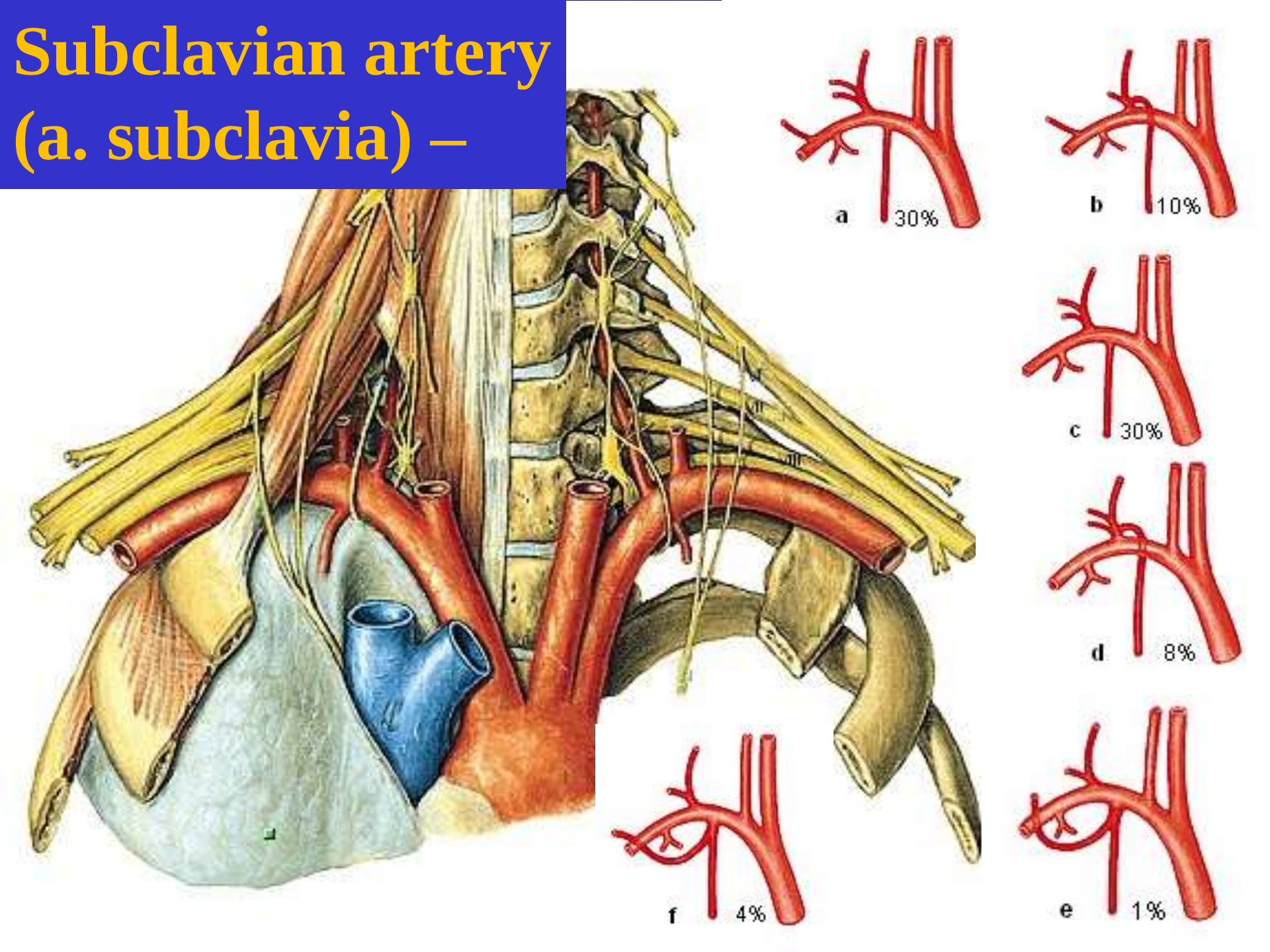
h maxillary veins



Coronal section through cavernous sinus


intercavernous
connections
IV.
III.
ACI
from
inferior
ophtalmic
vein
VI.
V.
V1
V2
V3
from
pterygoid
venous
plexus

Subclavian artery (a. subclavia) –



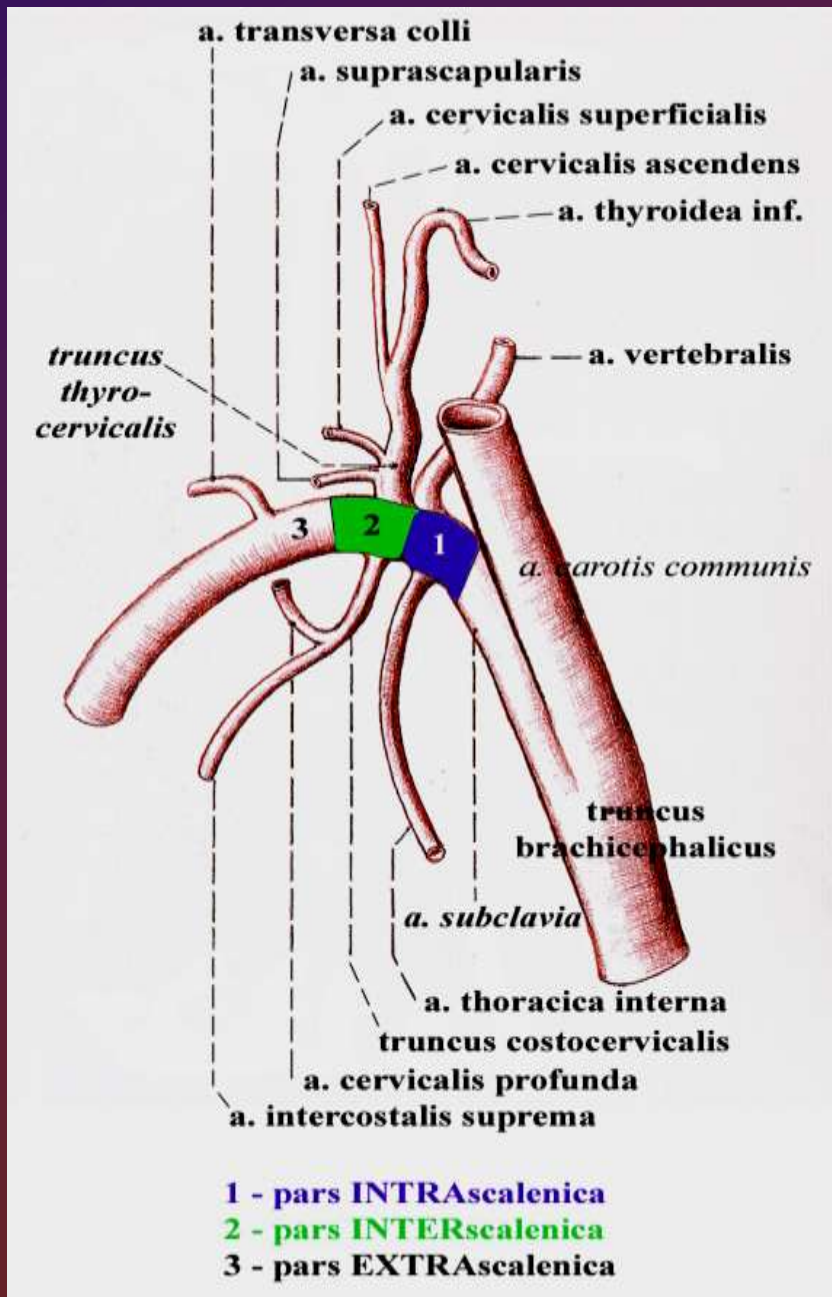
Subclavian artery (a. subclavia) – relations and branches

Parts and trunci

- sulcus arteria subclaviae pulmonis
- apertura thoracis superior
- sulcus arteriae subclaviae costae primae
- fissura scalenorum

branches exhibit variations

- *(thoracic outlet syndrom)*
- *steal phenomenon* (a. vertebralis)

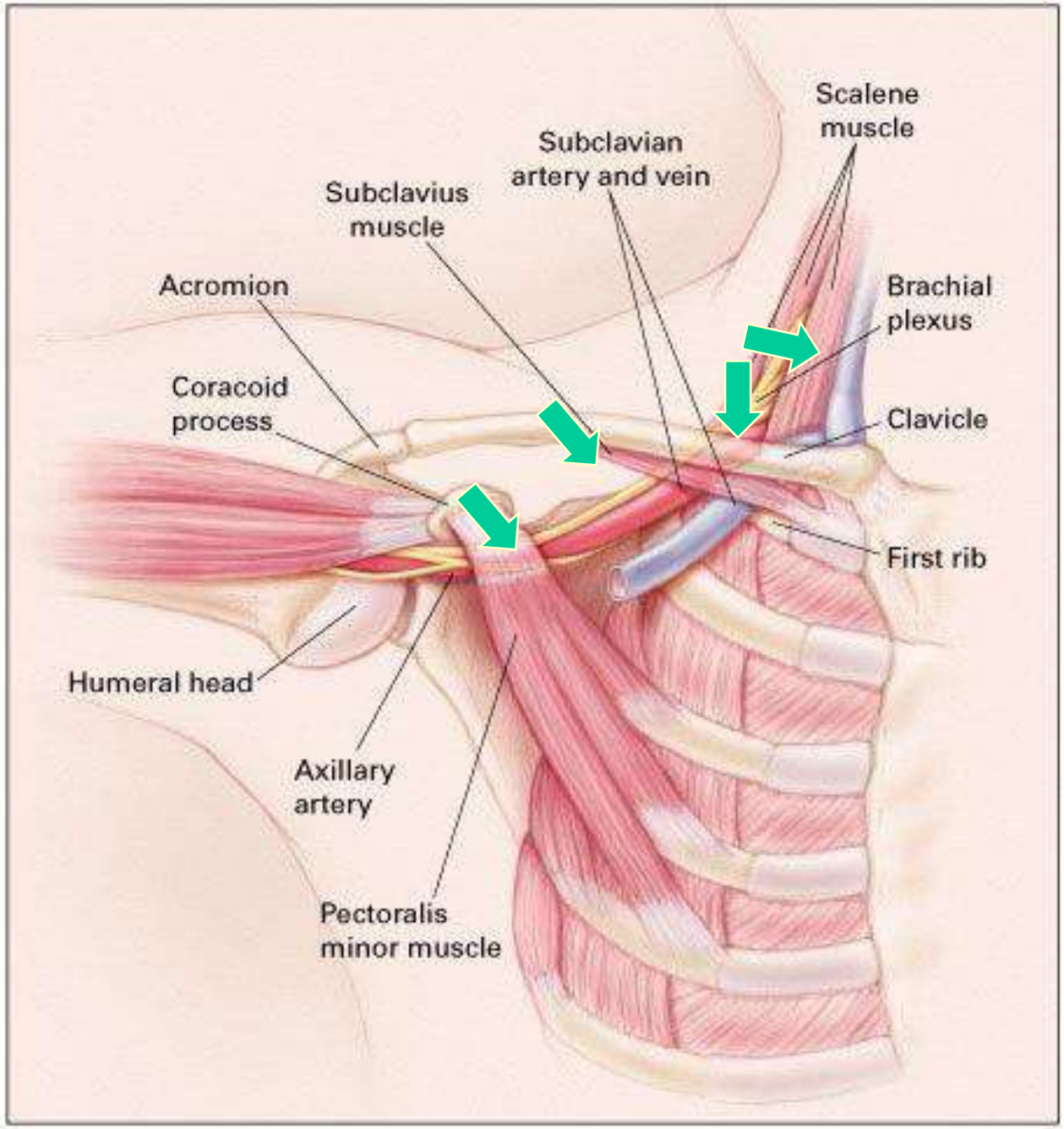


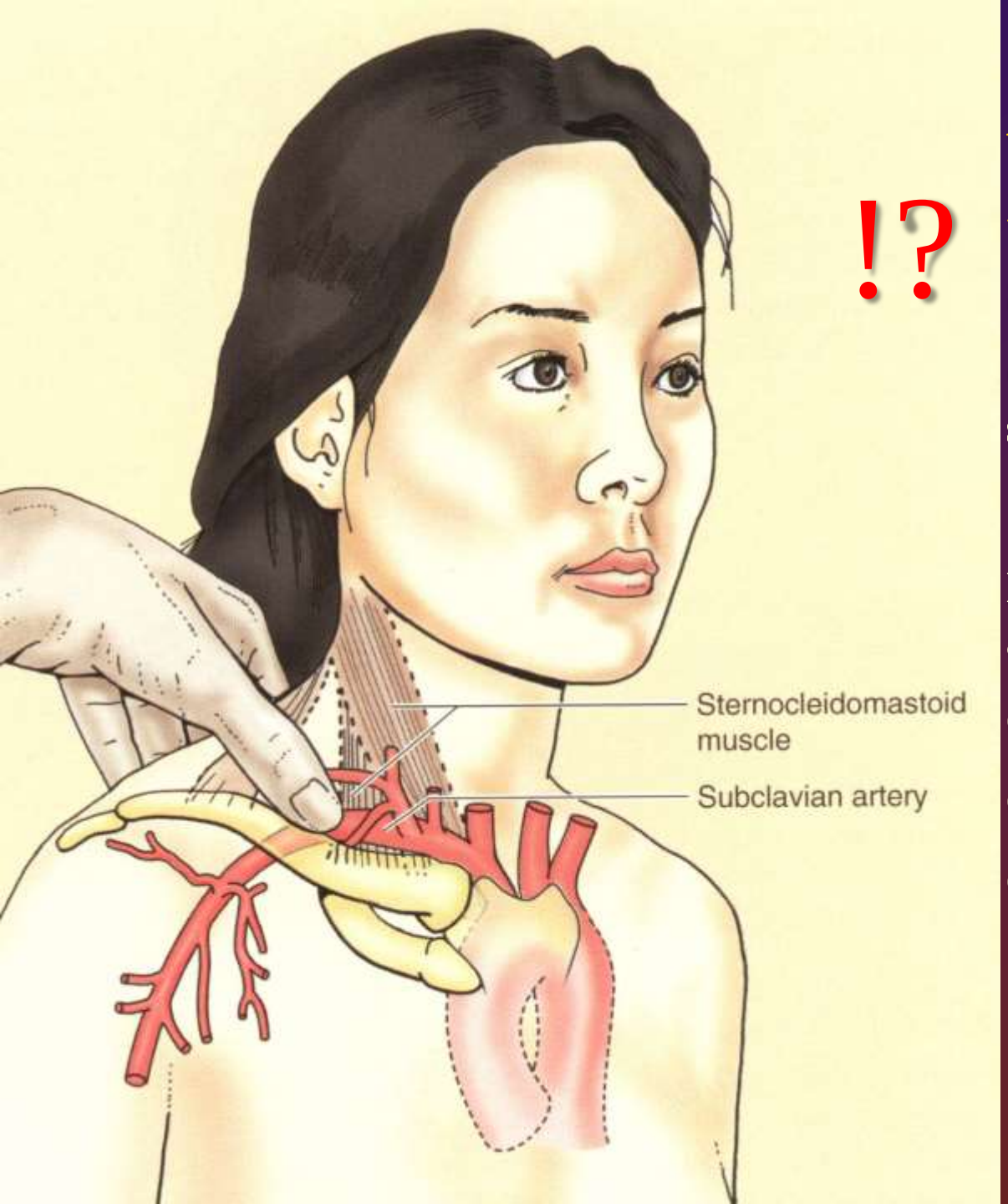
Arteria subclavia

Arteria vertebralis
Truncus thyrocervicalis
Truncus costocervicalis
arteria thoracica interna

Where you can compress subclavian a.:

A) Neck rib
B) mm.scaleni (m.scalenus minimus)
C) Costoclavicular space
D) Insertio of m.pectoralis minor





Anterior triangle importances

Subclavian opulse

Compression or ligation of the subclavian artery

Ligation of the external carotid artery

Carotid endarterectomy

Carotid pulse

Carotid artery palpation

Vertebral artery

- **Prevertebral part**

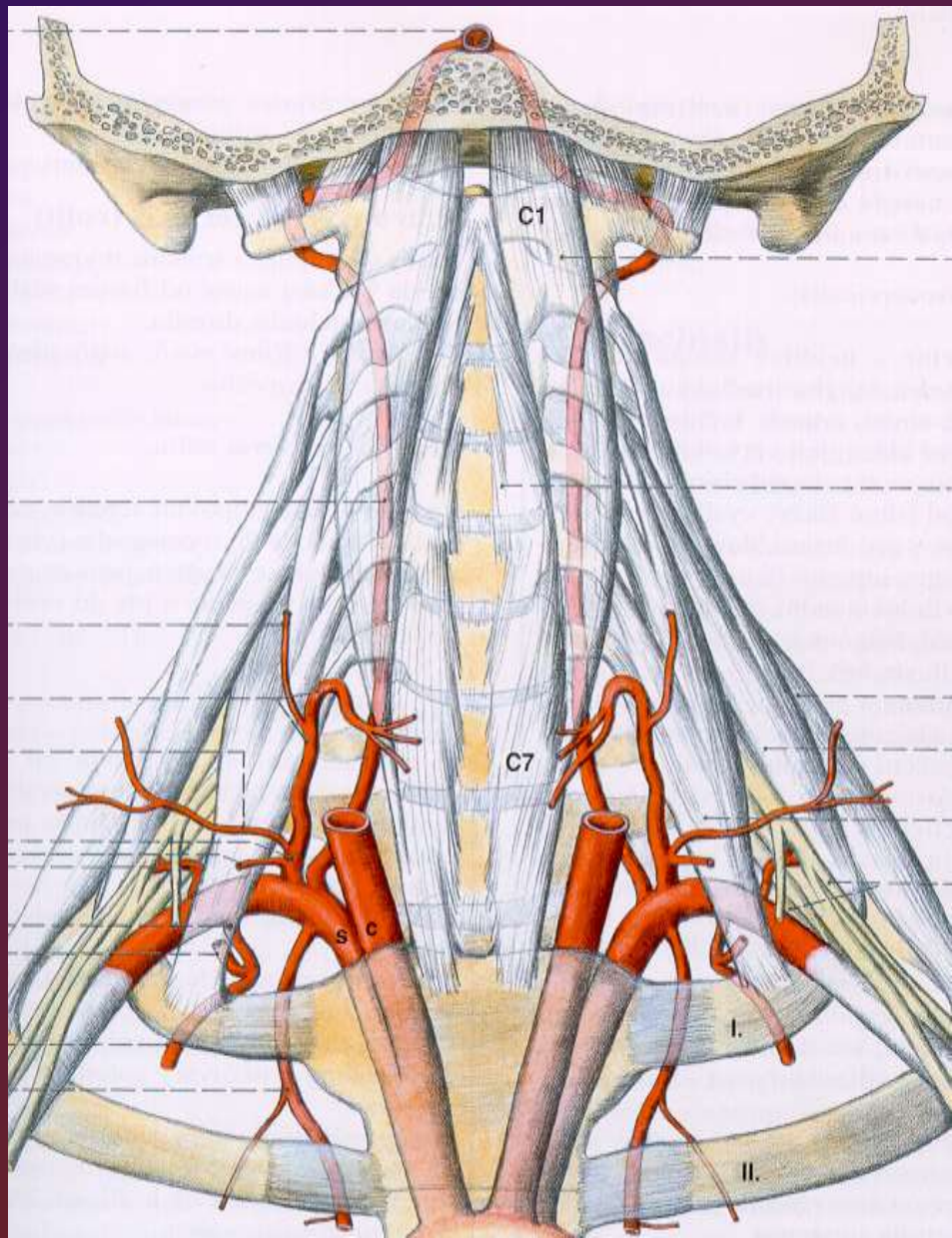
Cervical or transverse part

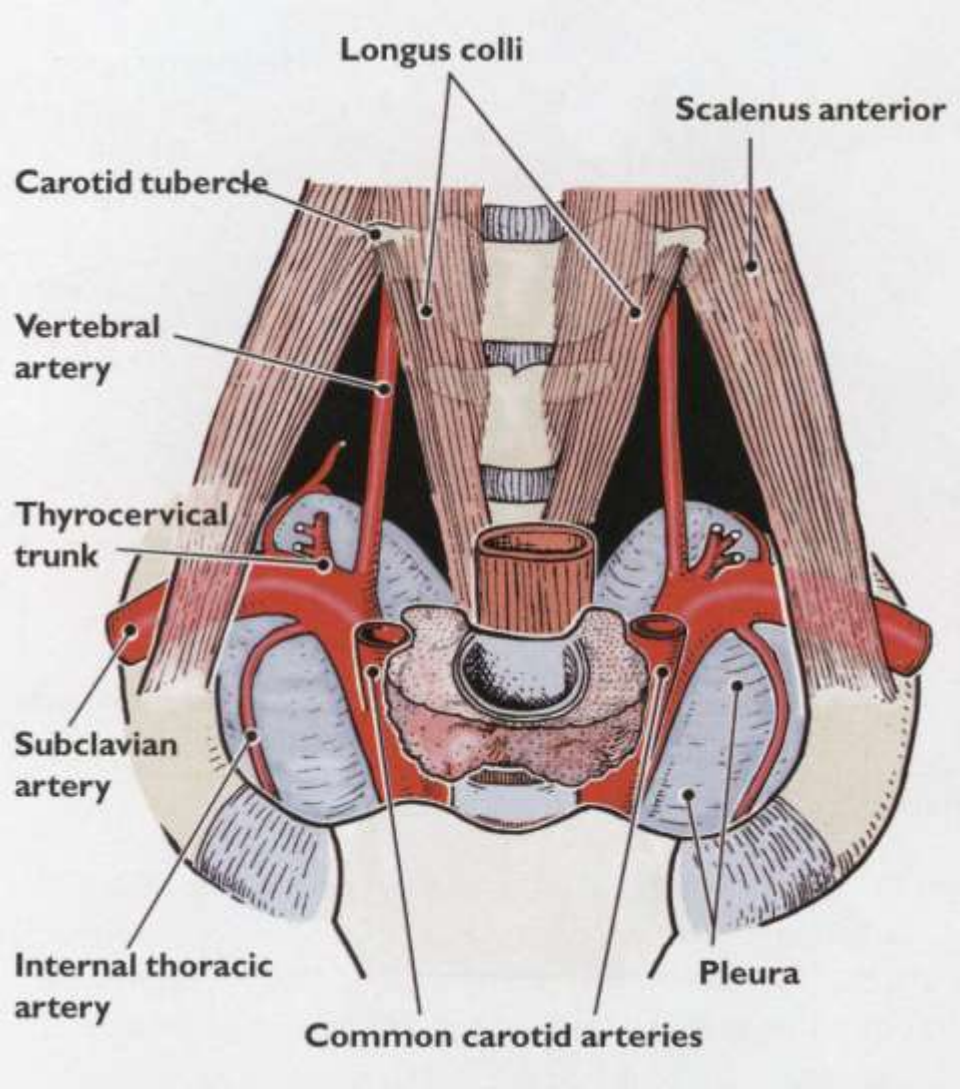
(C6-C1) → Spinal and muscular branches

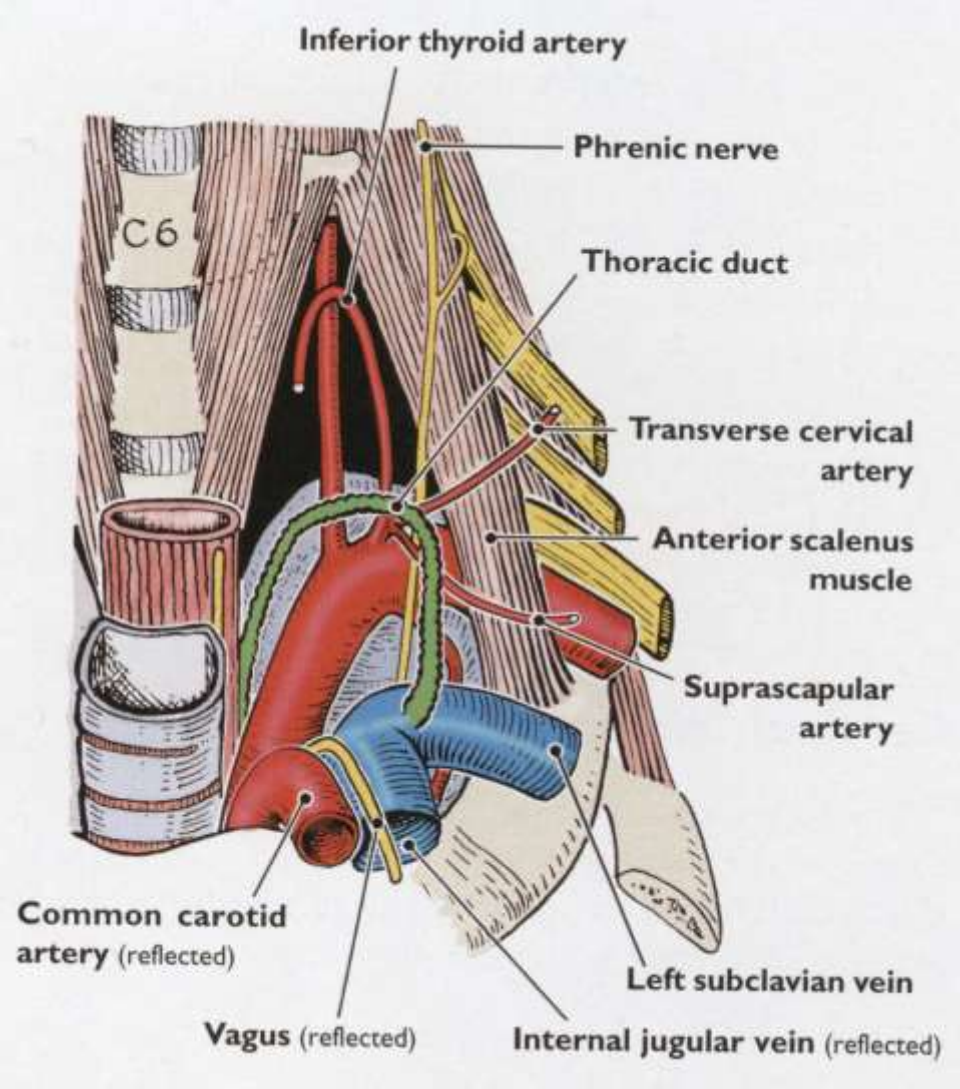
- **Atlantic part** – sulcus a.v., membrana

atlantooccipitalis post., foramen occipitale magnum

- **Intracranial part**
  - Meningeal brr. a. inferior posterior cerebellar brr. (→ a. spinalis post.)
  - Ant. spinalis branches

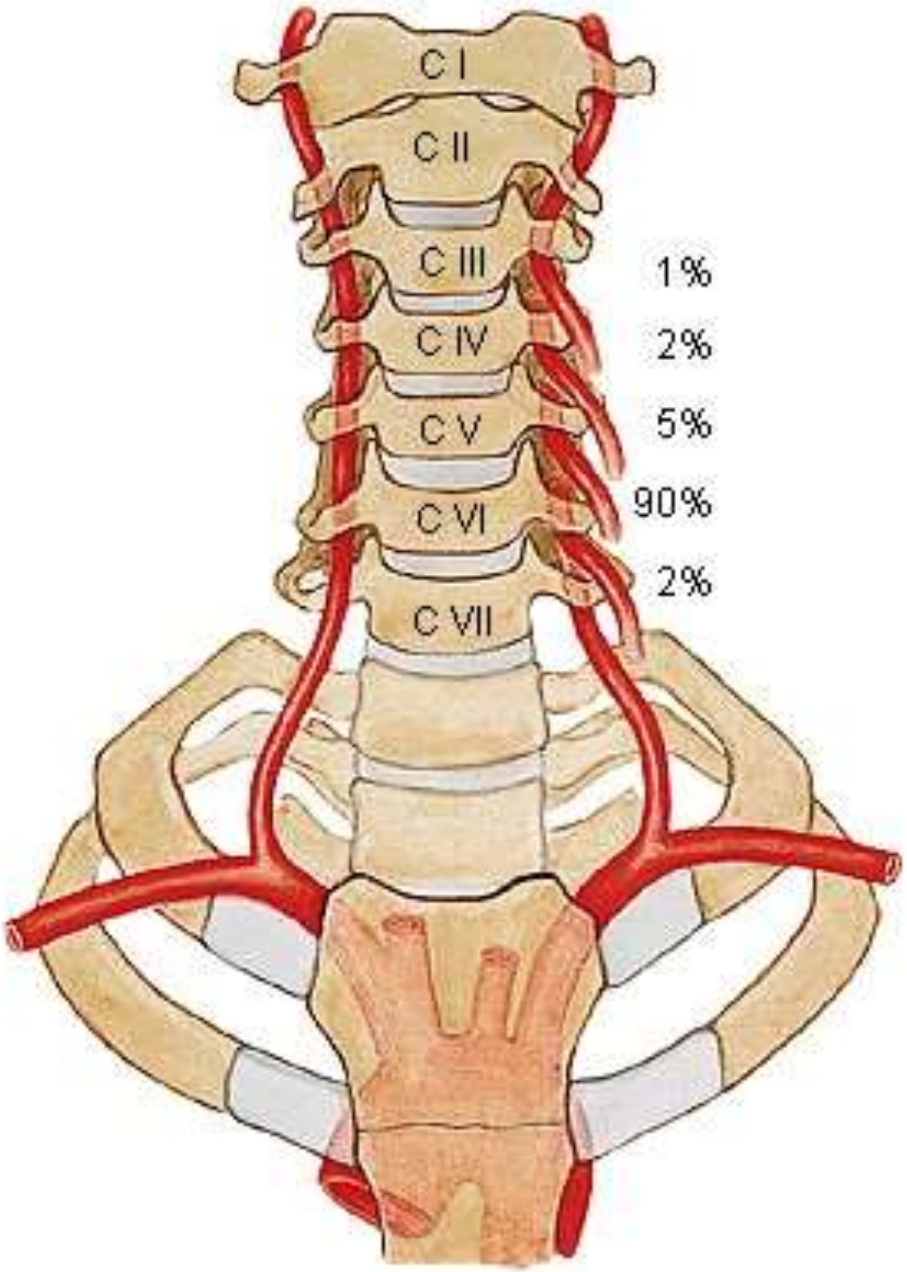


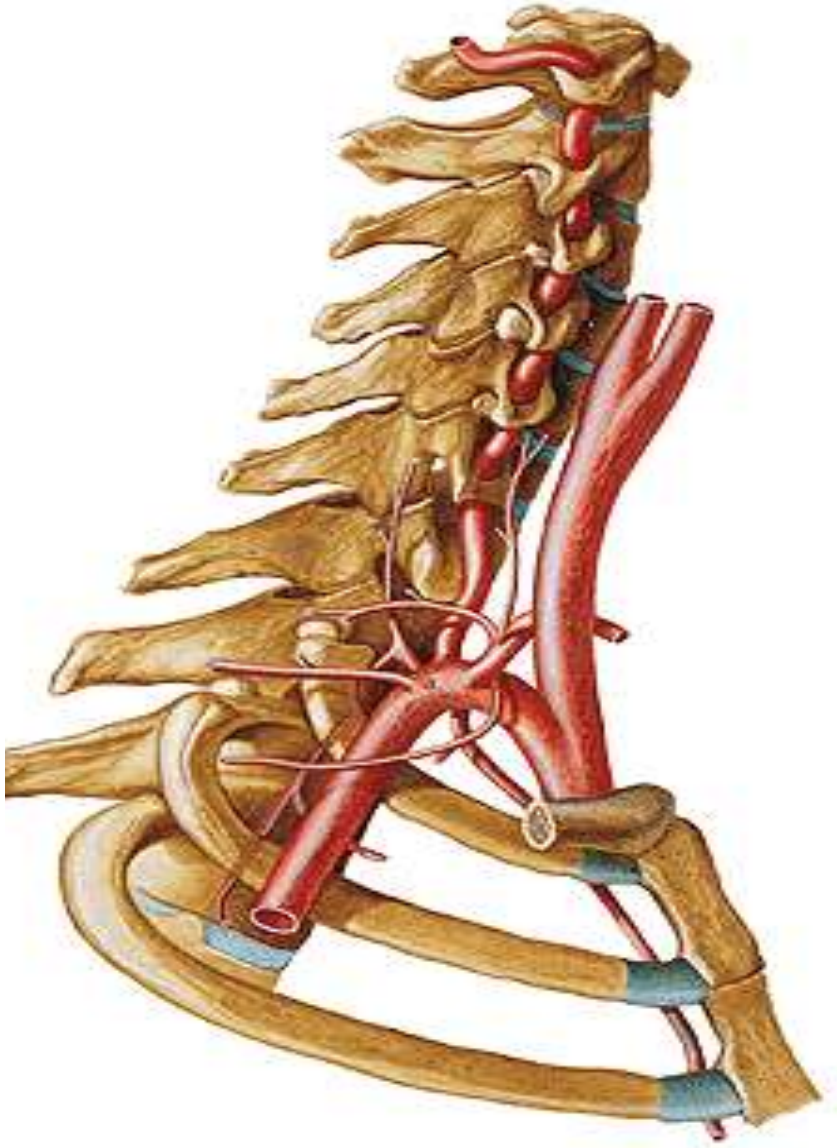


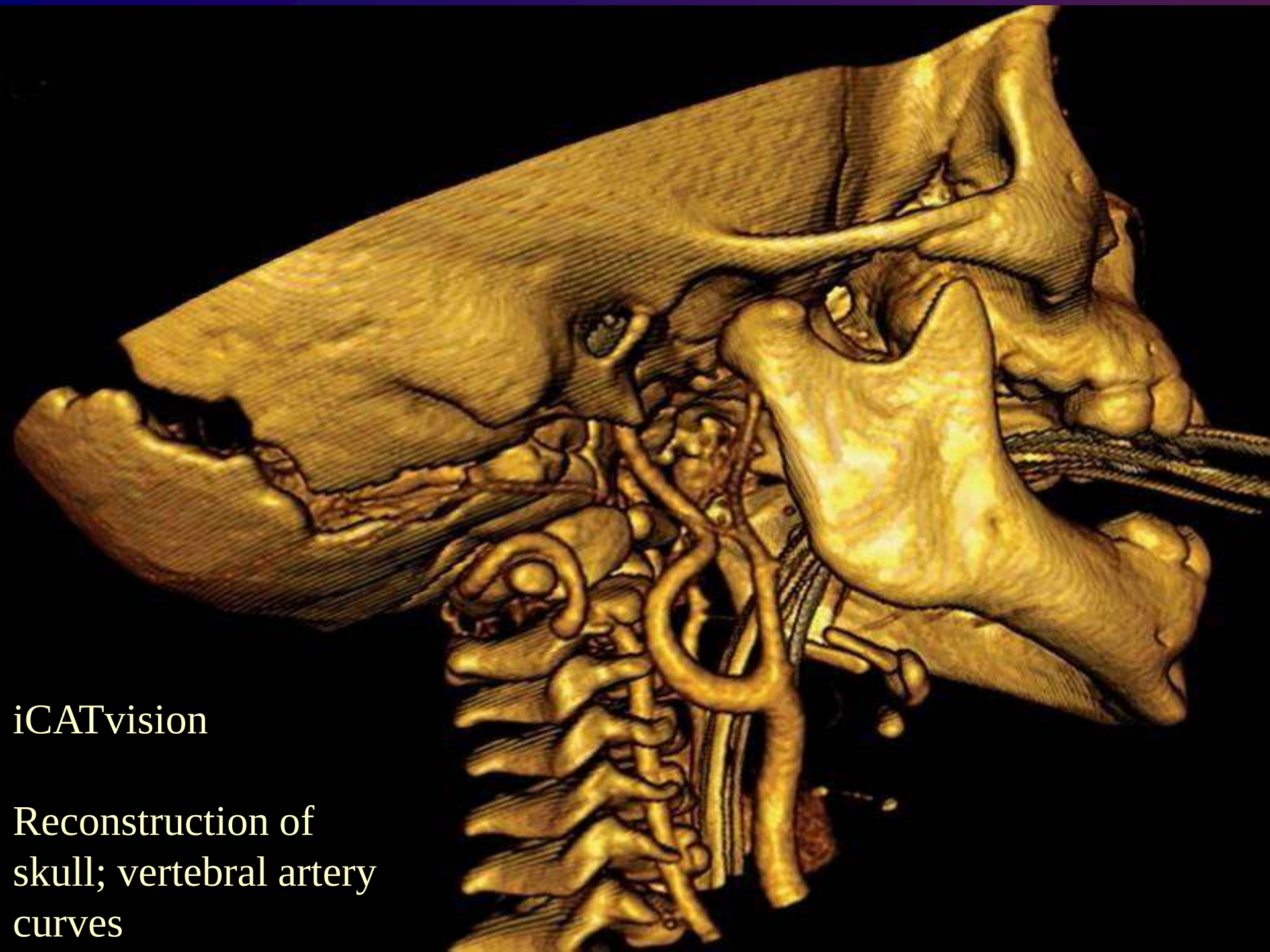


Trigonum scalenovertebrale
Scalenovertebral triangle

a. vertebralis

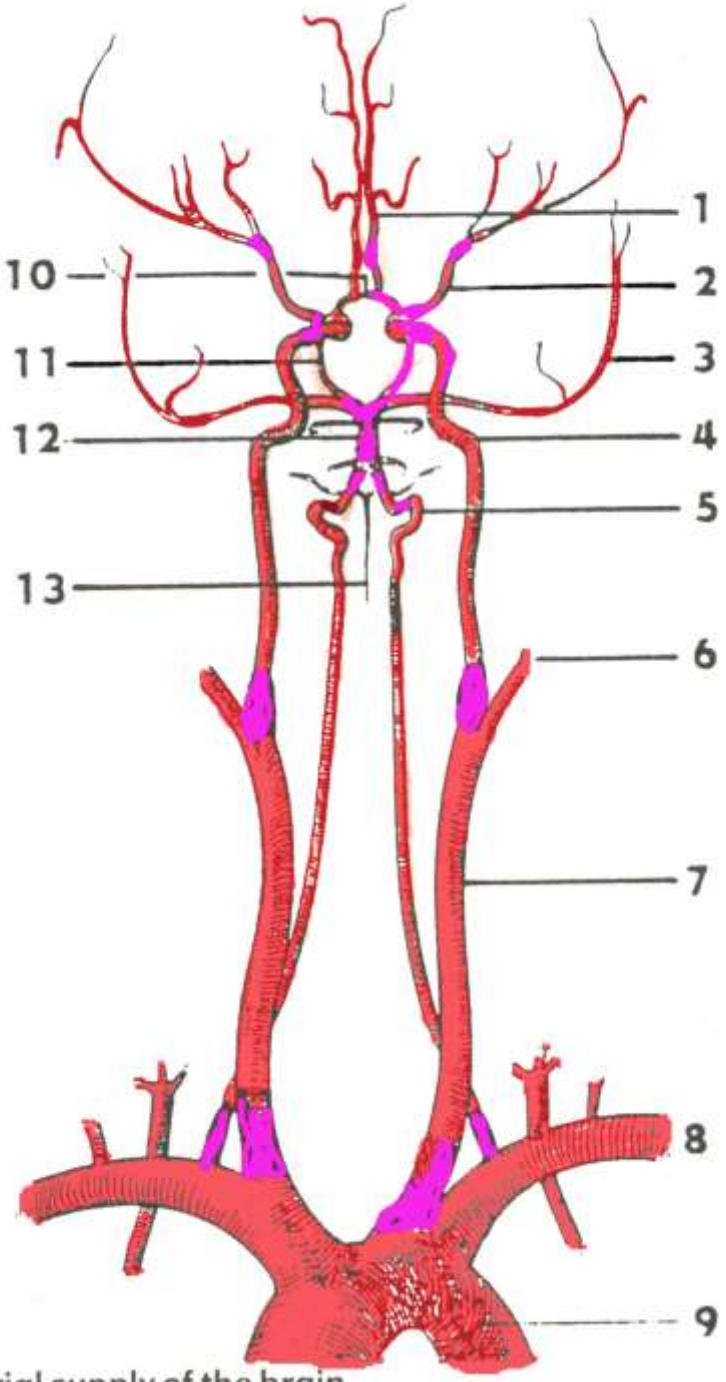






iCATvision

Reconstruction of skull; vertebral artery curves



Arterial supply of the brain.

Blood source for brain:
Carotis interna 80%
Vertebralis 20%

1 – a. cerebri ant.,
2 – a. cerebri media,
3 – a. cerebri post.
4 – a. carotis int.,
5 – a. vertebralis,
6 – a. carotis externa,
7 – a. carotis communis,
8 – a. subclavia,
9 – arcus aortae,
10 – a. communicans anterior,
11 – a. communicans posterior,
12 – a. basilaris,
13 – a. spinalis anterior.

Arteria basilaris + circulus arteriosus cerebri

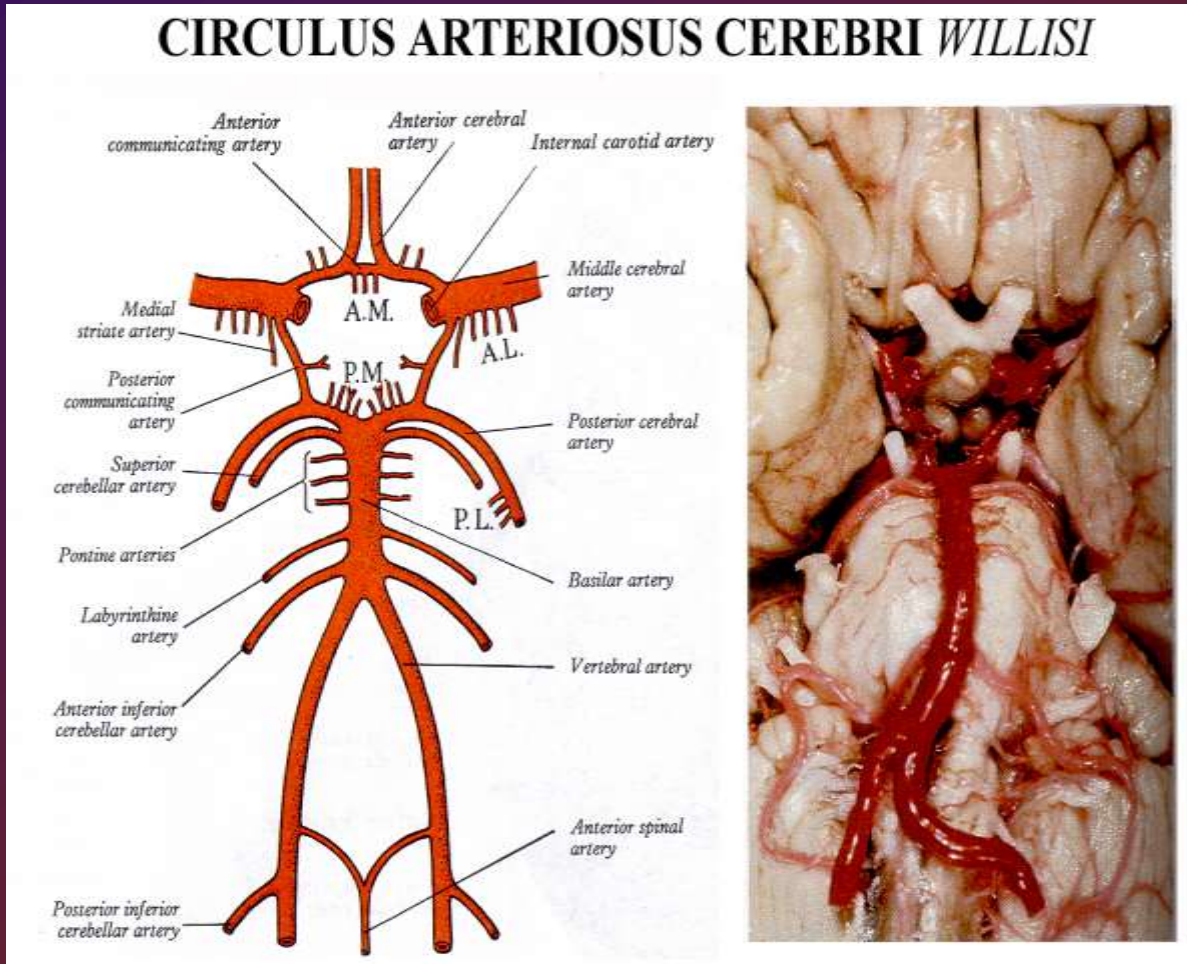
Thomas Willis (1621-1673), Engl. physician

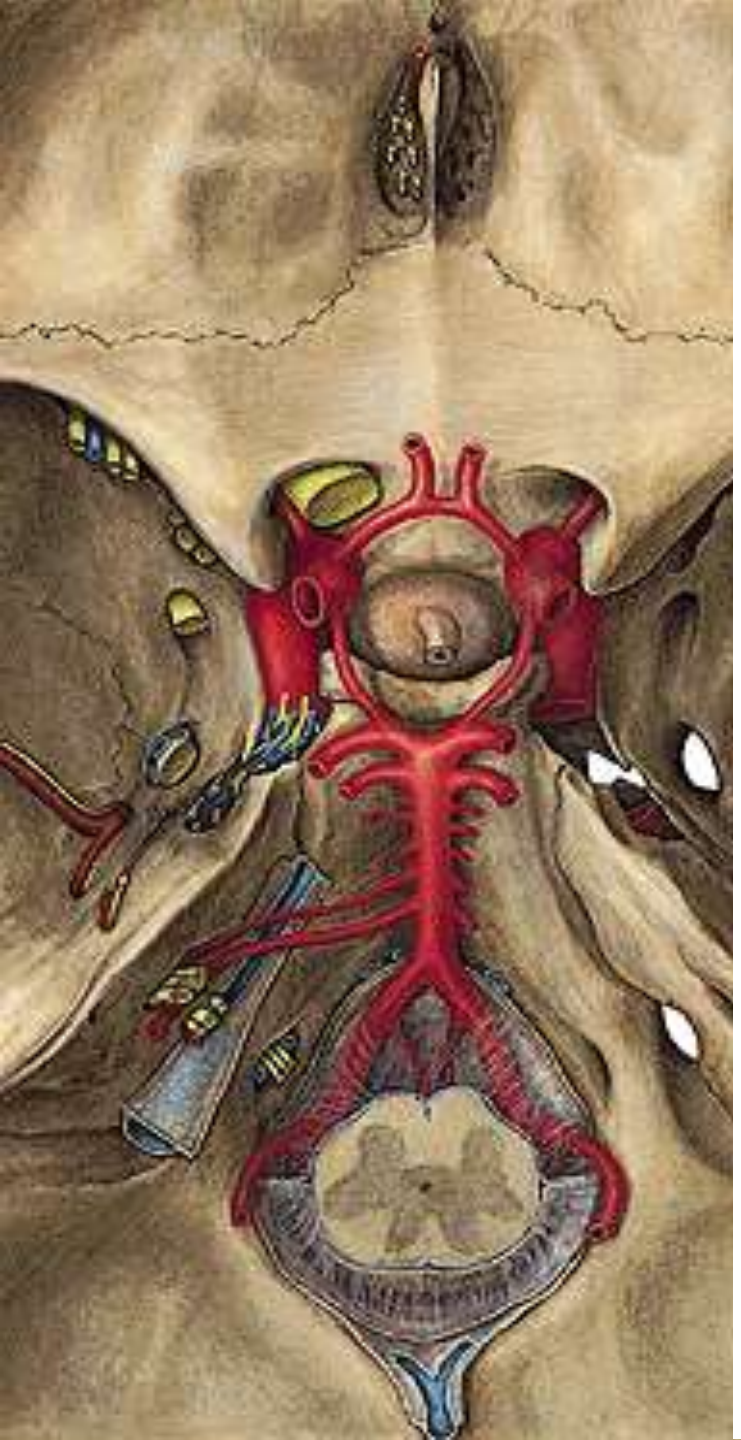
2 aa. vertebrales → **a. basilaris**

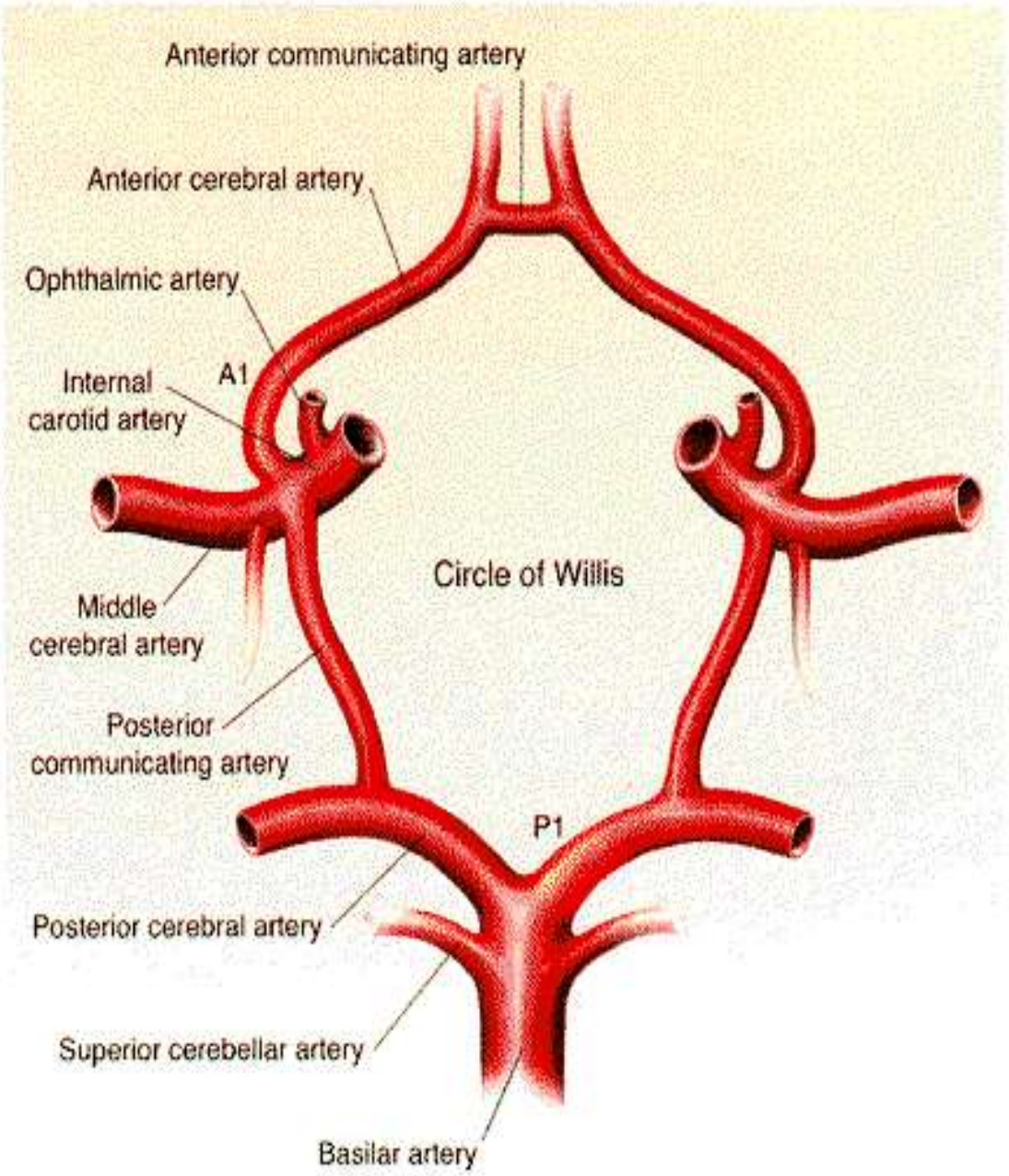
- a. inferior anterior cerebelli (→ a. labyrinthi)
- aa. pontis
- aa. mesencephalicae
- a. superior cerebelli

→ aa. cerebri posteriores

circulus arteriosus cerebri *Willisi*






Anterior communicating artery
Anterior cerebral artery
Ophthalmic artery
A1
Internal carotid artery
Middle cerebral artery
Circle of Willis
Posterior communicating artery
P1
Posterior cerebral artery
Superior cerebellar artery
Basilar artery

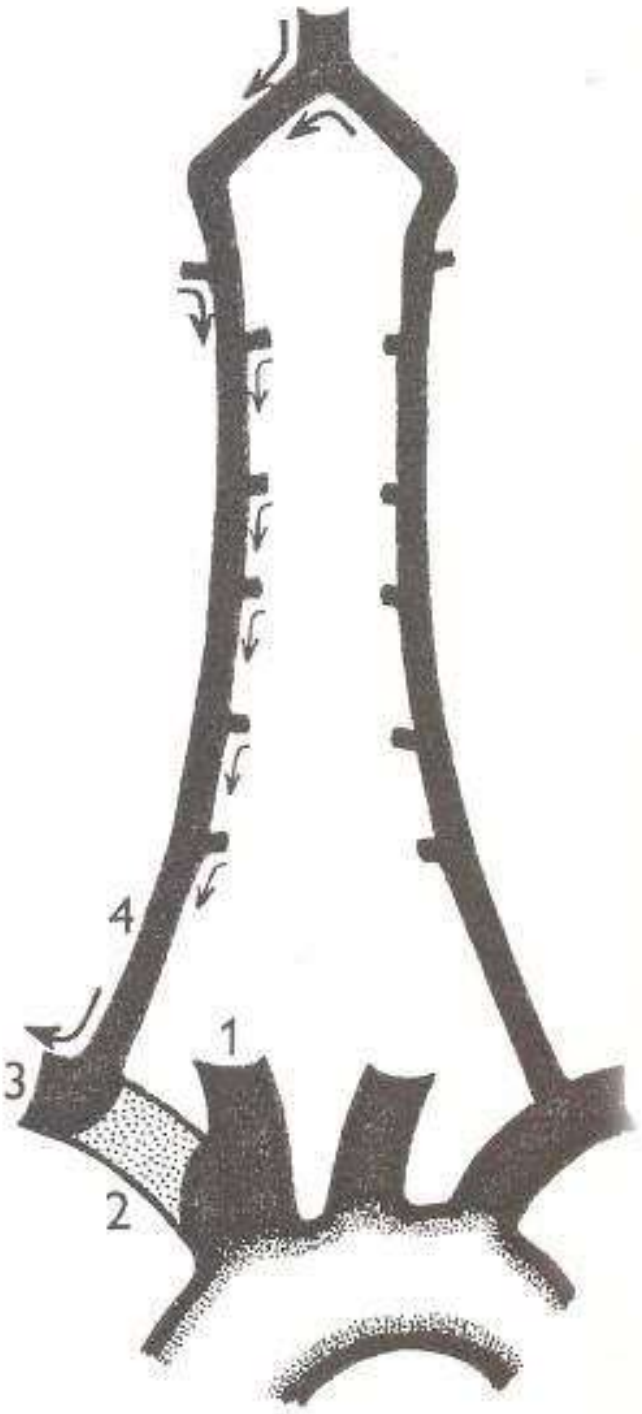
Syndrome „thievish“ subclavian a.

Ligature on a.subclavia:

• Subclavian a. “steals“ blood using vertebral artery for upper extremity

Diplopia, diziness, inconlopii, závratě, syncope, comatose

• Pulsation on irritated side, poor pulsation, low blood pressure



Shunts (collaterals) open during collapse of vertebral a.:

1-a.carotis communis

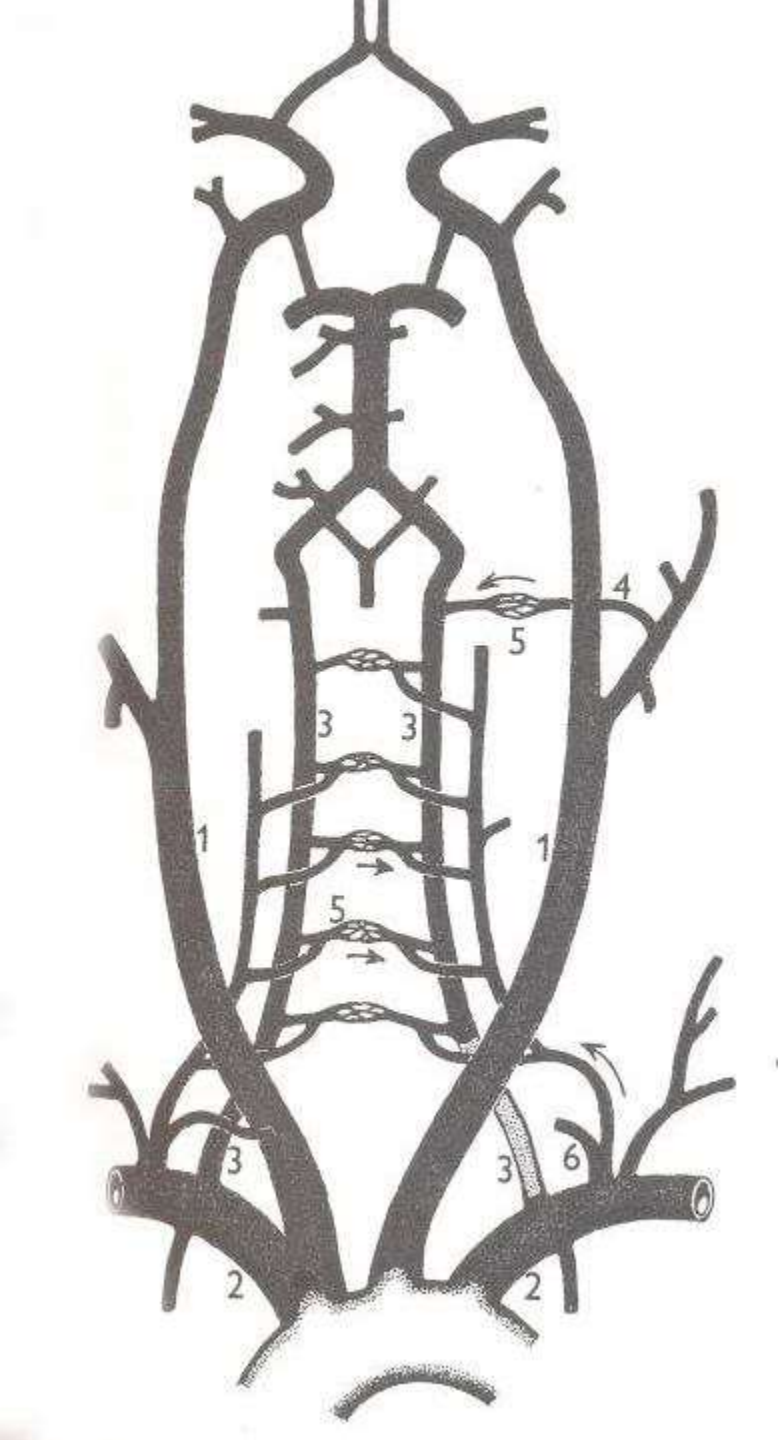
2-a.subclavia

3-a.vertebralis

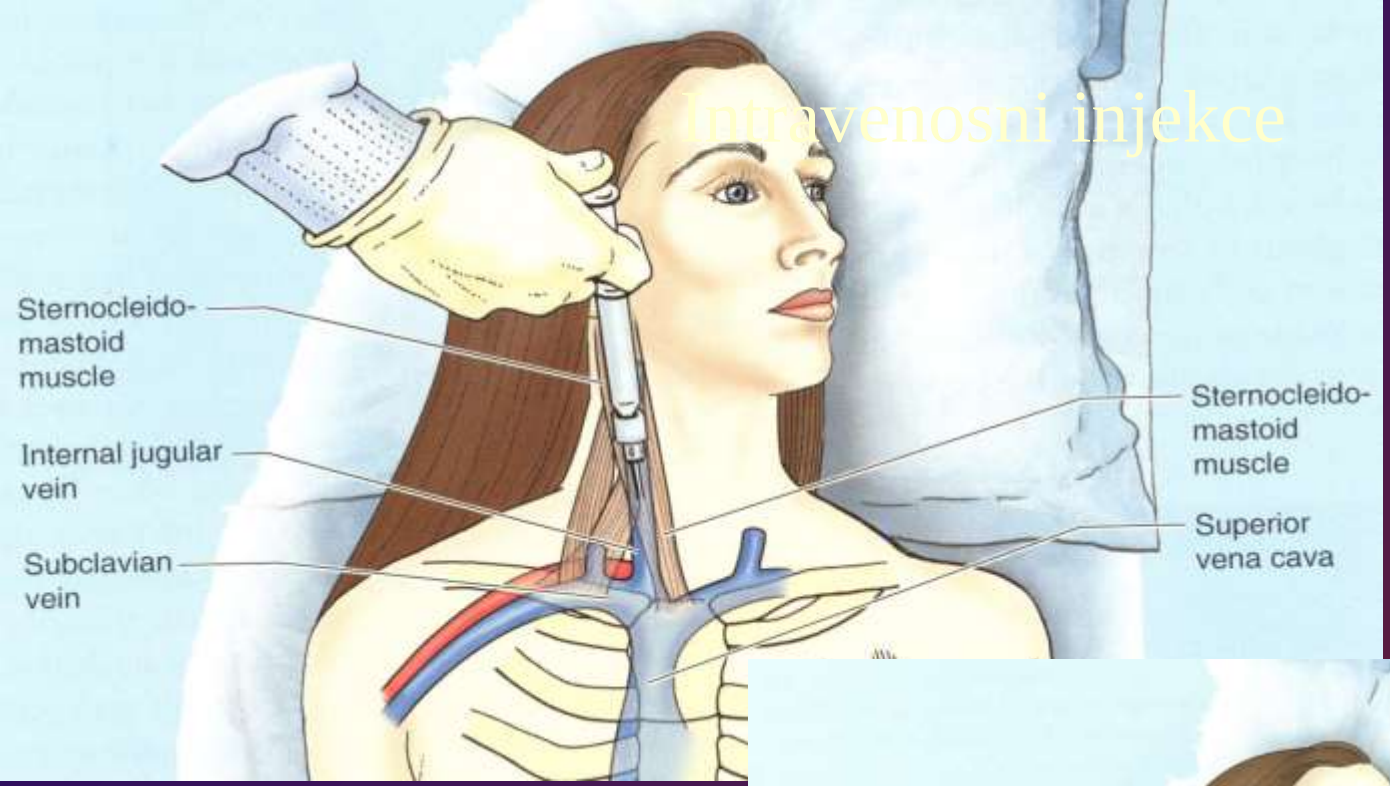
4-a.occipitalis

5-rami spinales et musculares

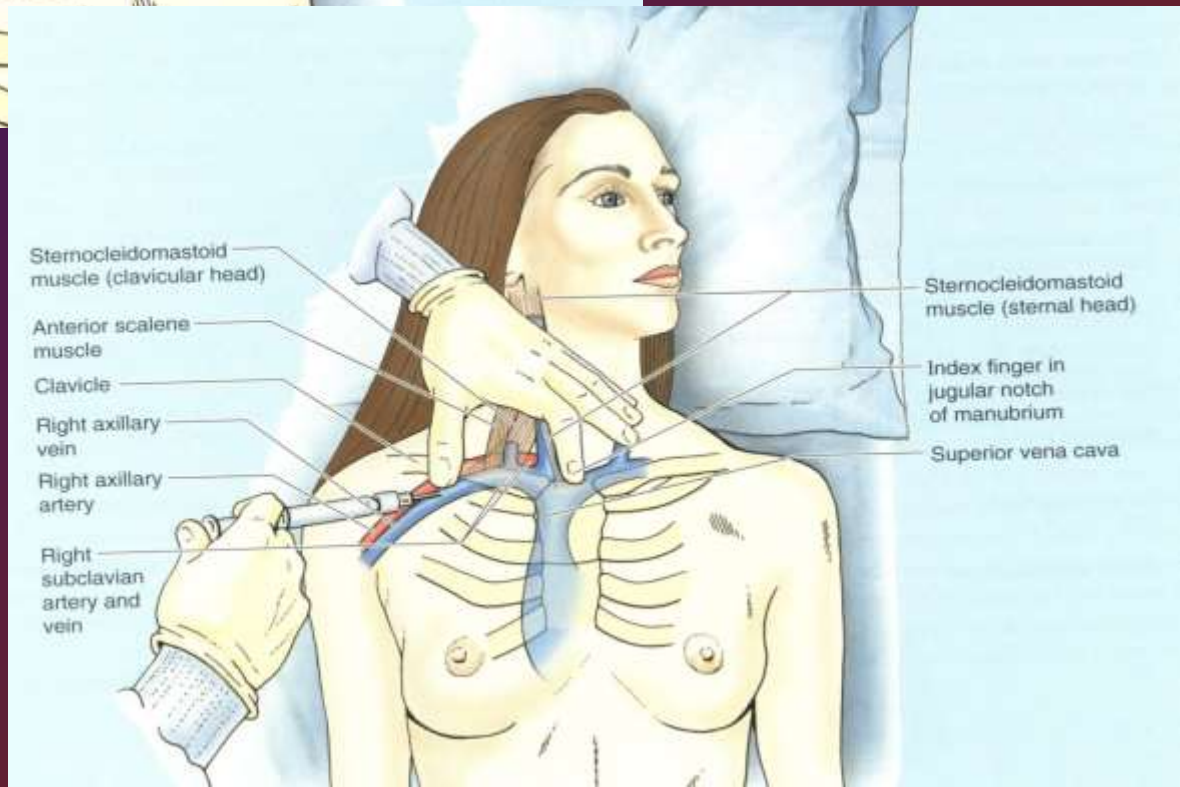
6-truncus thyrocervicalis



Intravenosni injekce



Intravenosni injekce
Intravenous injection



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- Lotfi Hacein-Beya,b, David L. Danielsa, John L. Ulmera, Leighton P. Marka, Michelle M. Smitha, James M. Strottmanna, Douglas Browna,b,c, Glenn A. Meyerb and Phillip A. Wackymc *American Journal of Neuroradiology 23:1246-1256, August 2002*

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