



Head & Neck skull lecture (3) Foramina of the skull

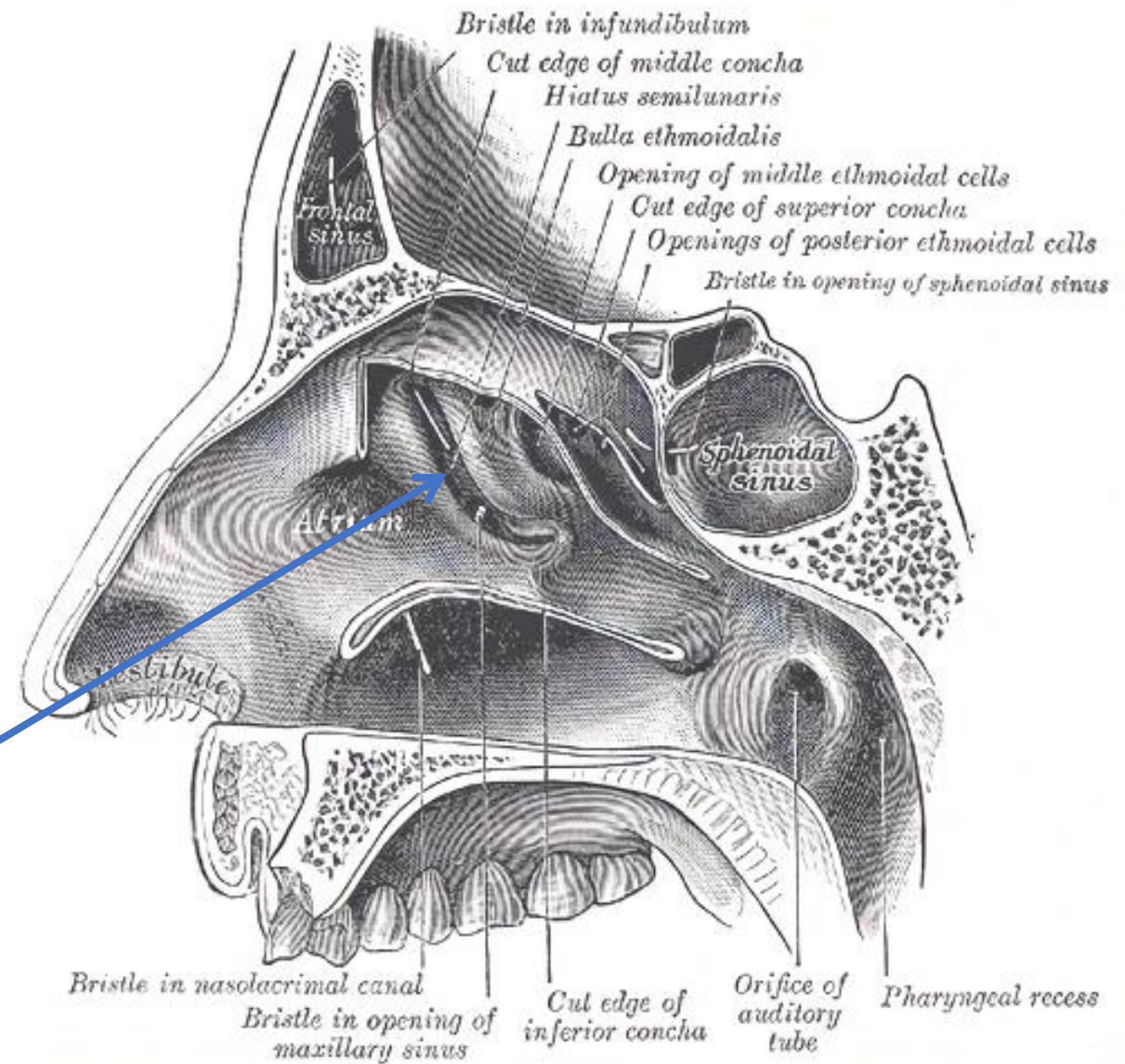
**Talib Jawad 14 march
2023**

Cranial Nerve Foramina

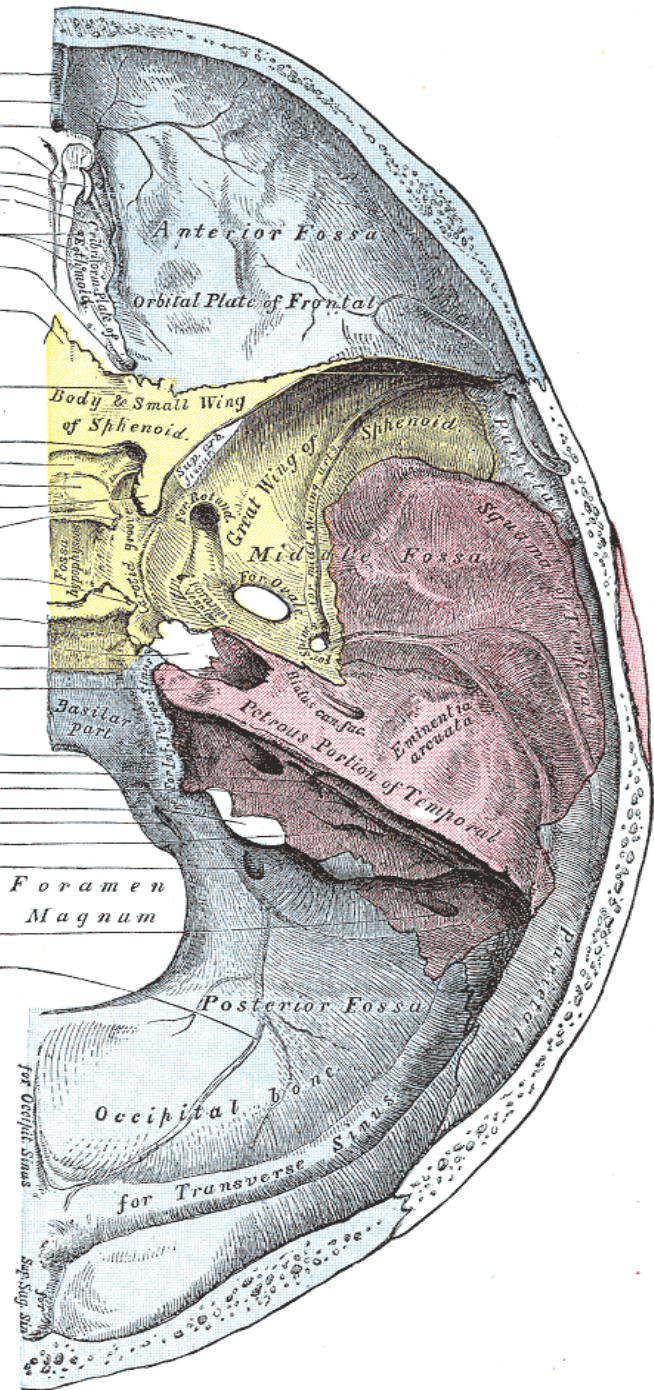
The foramina of the skull are most commonly considered in the context of the cranial nerves. In this section, we will discuss the foramina that transmit cranial nerves.

- In anatomy,
- a **canal** is a tubular passage or channel which connects different regions of the body.
- a **fissure** is a groove, natural division, deep furrow, elongated cleft, or tear in various parts of the body. It is also generally called a **sulcus**, but this term can also refer specifically to the analogous brain structure.
- a **meatus**, plural "meatus" or "meatuses", is a natural body opening or canal.

- a hiatus is a *natural fissure in a structure*. Examples include:
- Adductor hiatus opening between adductor m and femur bone
- Aortic hiatus opening in diaphragm
- Esophageal hiatus, the opening in the diaphragm through which the oesophagus passes from the thorax into the abdomen
- Greater petrosal nerve hiatus
- Maxillary hiatus
- Sacral hiatus
- Semilunar hiatus



Groove for super. sagittal sinus
 Grooves for anter. meningeal vessels
 Foramen cæcum
 Crista galli
 Slit for nasociliary nerve
 Groove for nasociliary nerve
 Anterior ethmoidal foramen
 Orifices for olfactory nerves
 Posterior ethmoidal foramen
 Ethmoidal spine
 Olfactory grooves
 Optic foramen
 Chiasmatic groove
 Tuberculum sellæ
 Anterior clinoid process
 Middle clinoid process
 Posterior clinoid process
 Groove for abducent nerve
 Foramen lacerum
 Orifice of carotid canal
 Depression for semilunar ganglion
 Internal acoustic meatus
 Slit for dura mater
 Groove for superior petrosal sinus
 Jugular foramen
 Hypoglossal canal
 Aquæductus vestibuli
 Condylloid foramen



Cribriform plate
 Olfactory n (CNI)

Optic canal
 Optic n (CNII)

Superior orbital fissure
 Oculomotor n (CNIII)
 Trochlear n (CNIV)
 Ophthalmic n (CNV₁)
 Abducens n (CNVI)

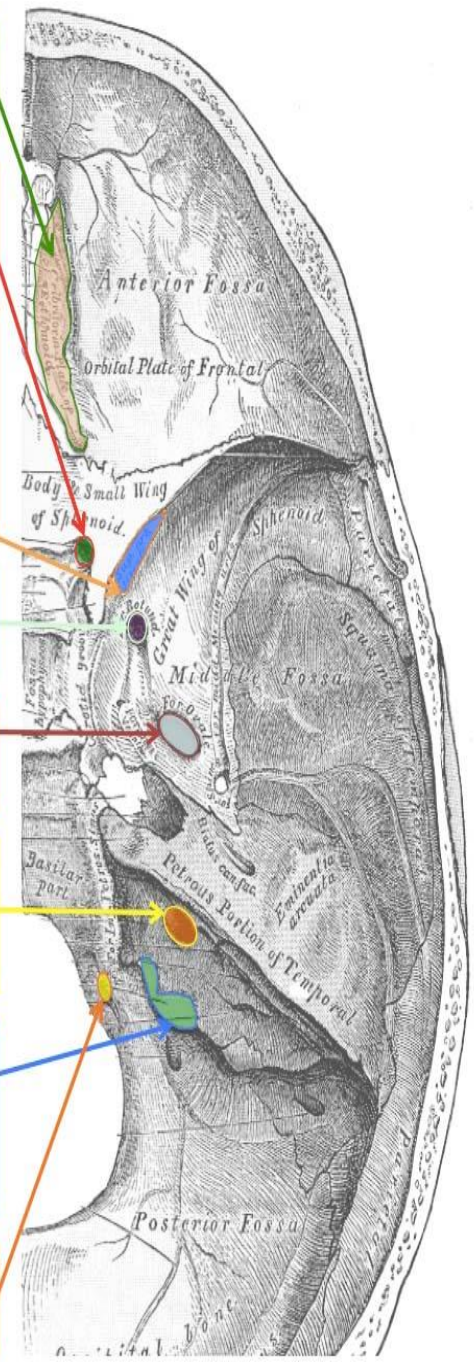
Foramen rotundum
 Maxillary n (CNV₂)

Foramen Ovale
 Mandibular n (CNV₃)

Internal acoustic meatus
 Facial n (CNVII)
 Vestibulocochlear n (CNVIII)

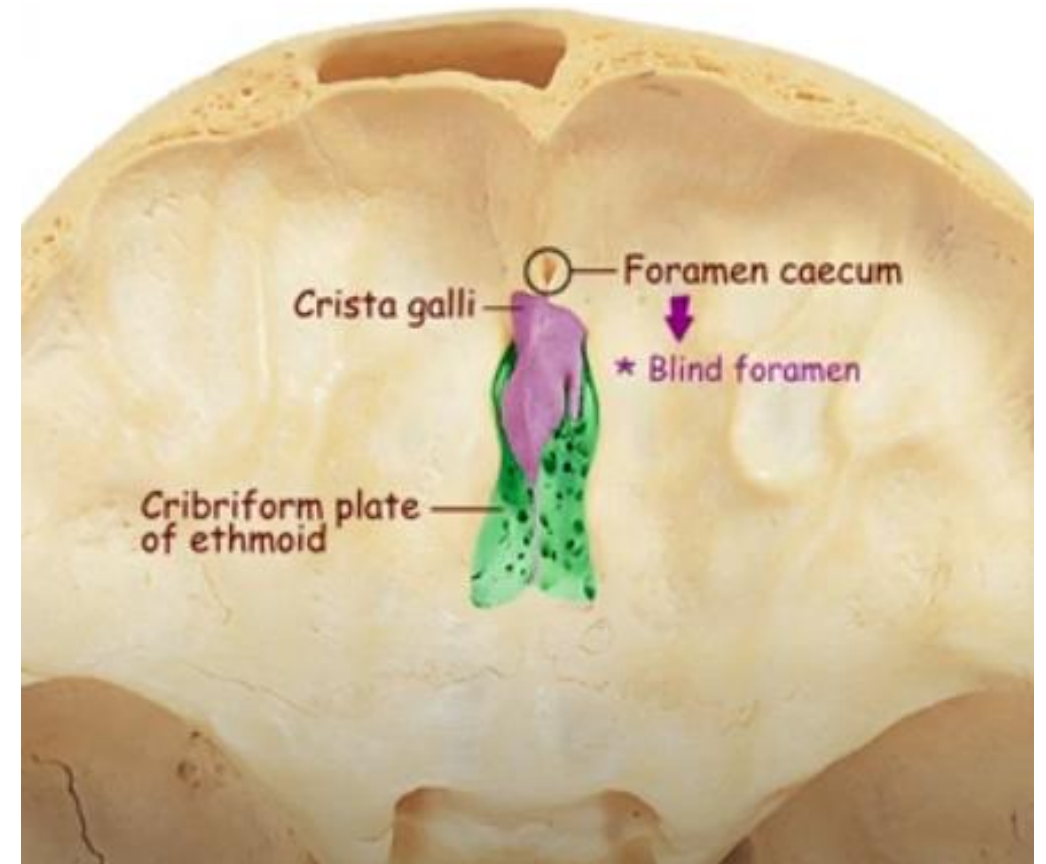
Jugular foramen
 Glosopharyngeal n (CNIX)
 Vagus n (CNX)
 Accessory n (CNXI)

Hypoglossal canal
 Hypoglossal n (CNXII)



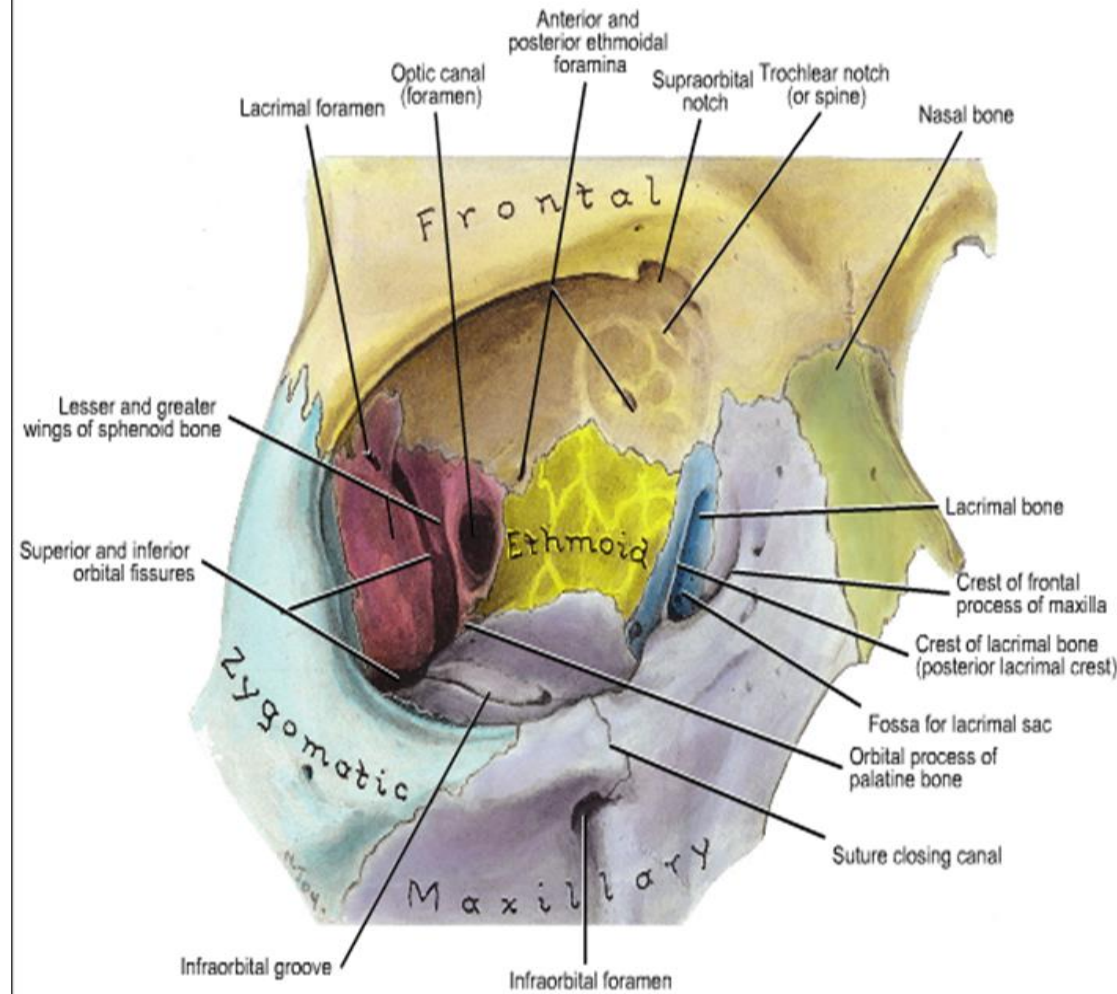
Cribriform Foramina

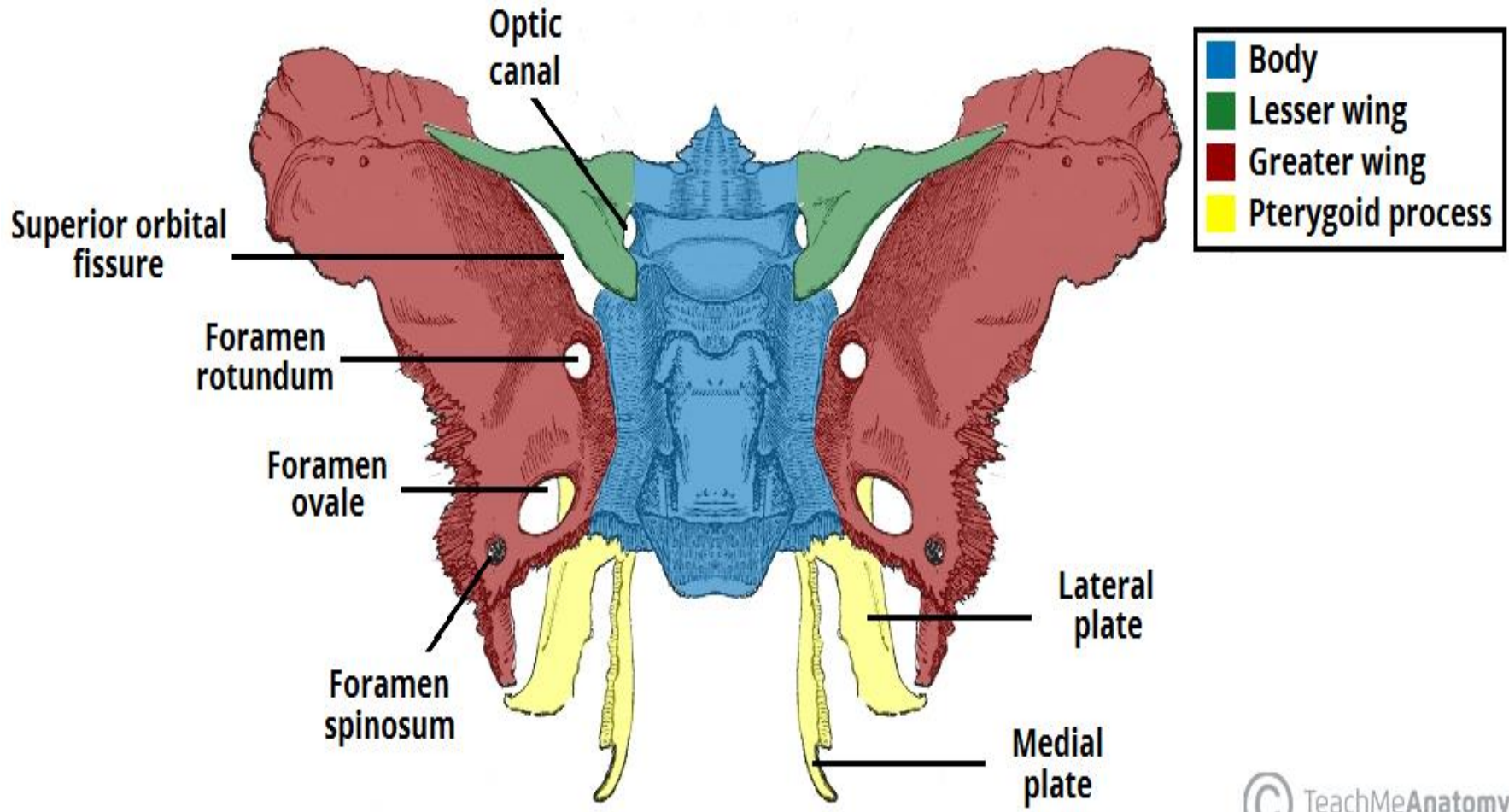
- **The cribriform foramina refer to numerous perforations in the cribriform plate of the ethmoid bone. They connect the anterior cranial fossa with the nasal cavity.**
- **These foramina allow the passage of axons of the olfactory nerve from the olfactory epithelium of the nose into the anterior cranial fossa where they communicate with the olfactory bulb.**



Optic Canal and Foramen

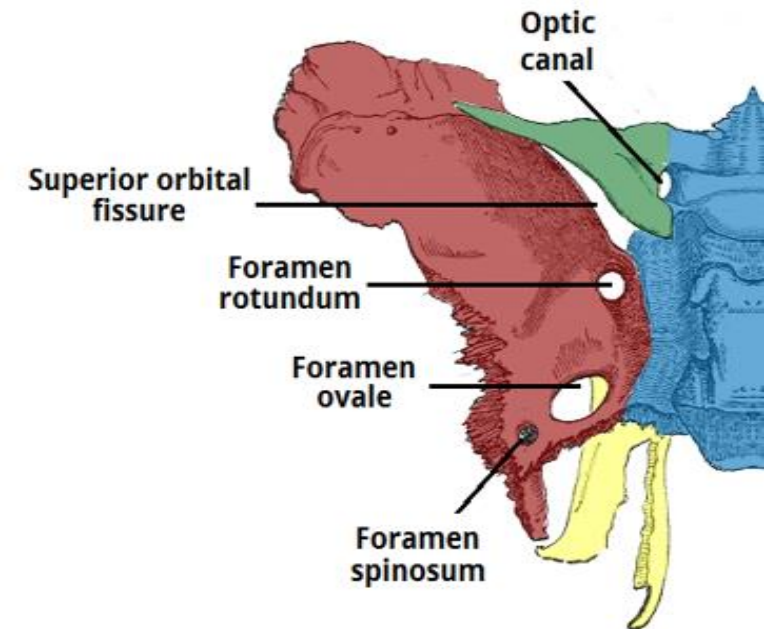
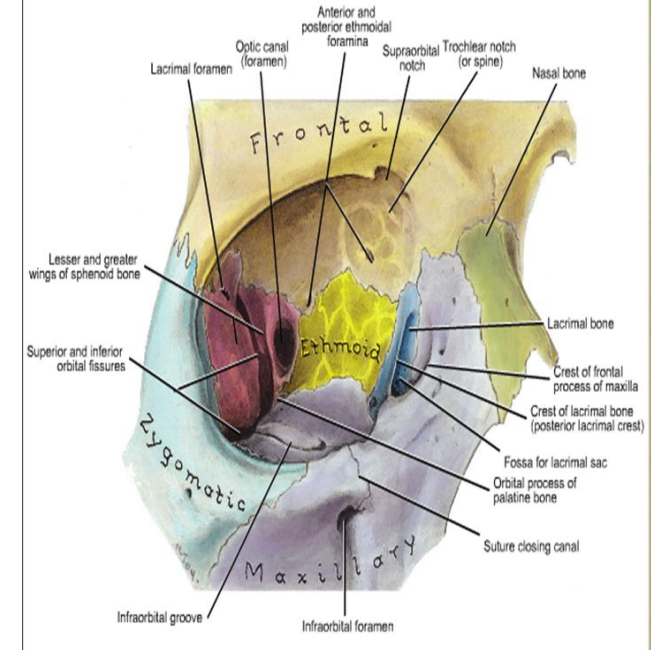
- The optic canal permits the passage of the **optic nerve** (CN II) and the **ophthalmic artery** into the bony orbit.
- It is bounded **medially by the body of the sphenoid**, and **laterally by the lesser wing of the sphenoid bone**





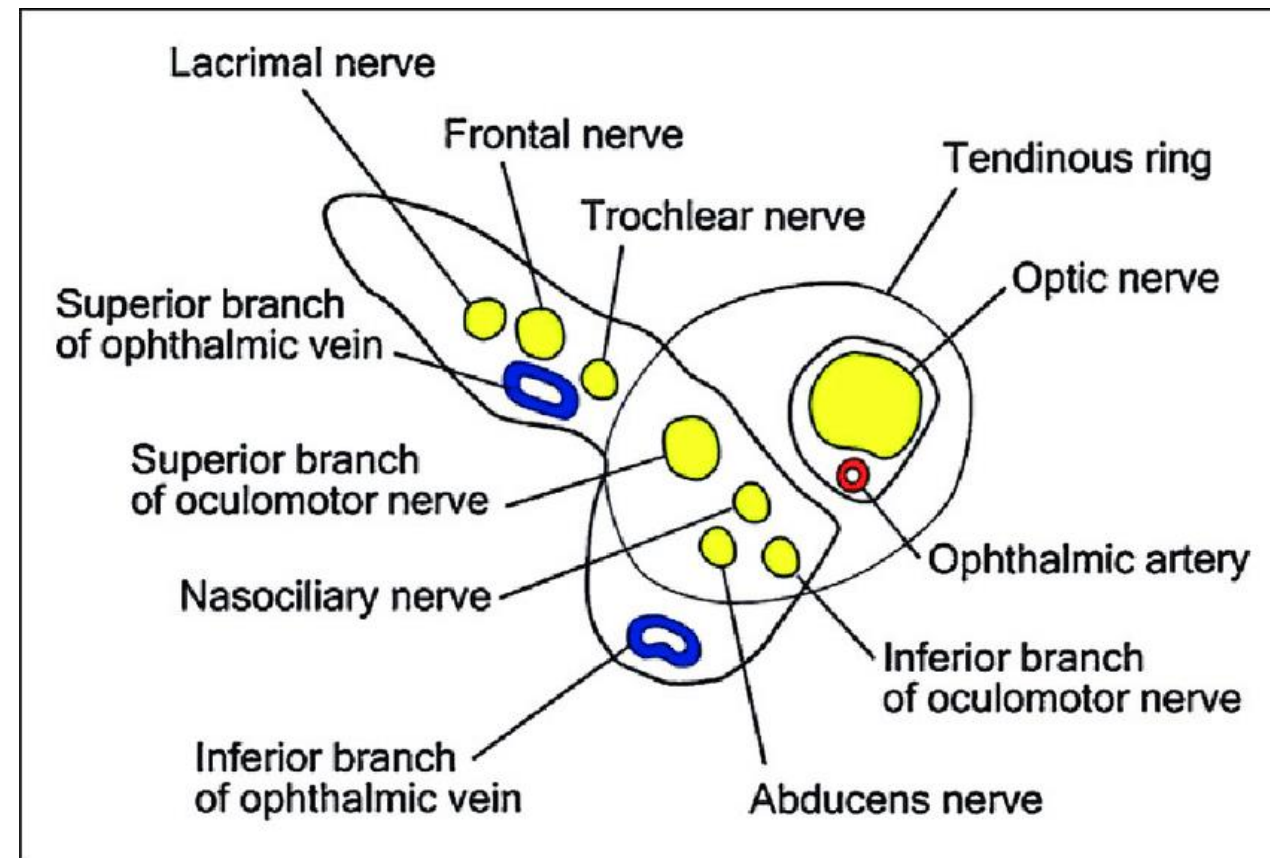
Superior Orbital Fissure

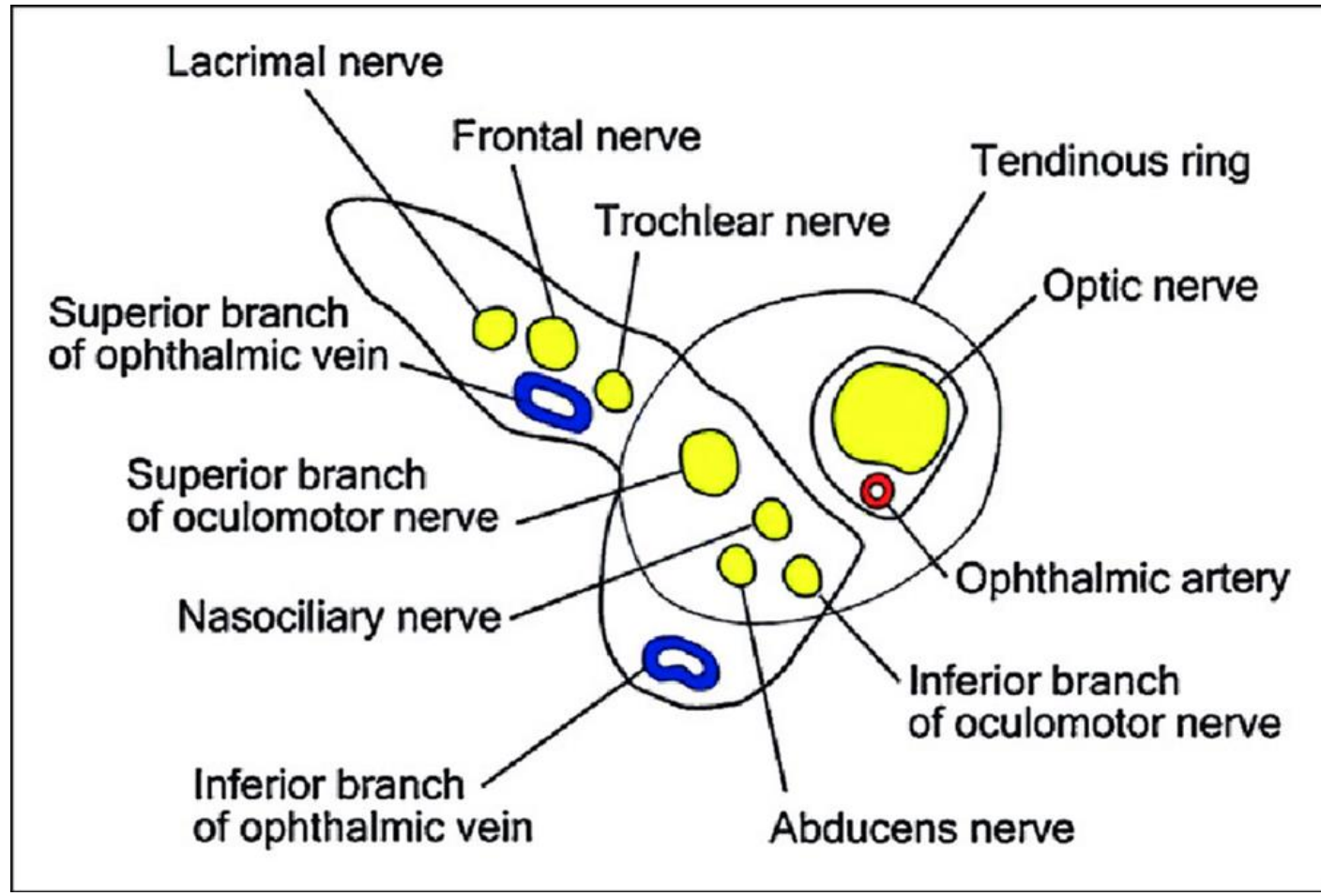
- **The superior orbital fissure is a cleft that opens anteriorly into the orbit, and enables communication between the cavernous sinus and the apex of the orbit**
- **It is bordered superiorly by the lesser wing and inferiorly by the greater wing of the sphenoid bone.**



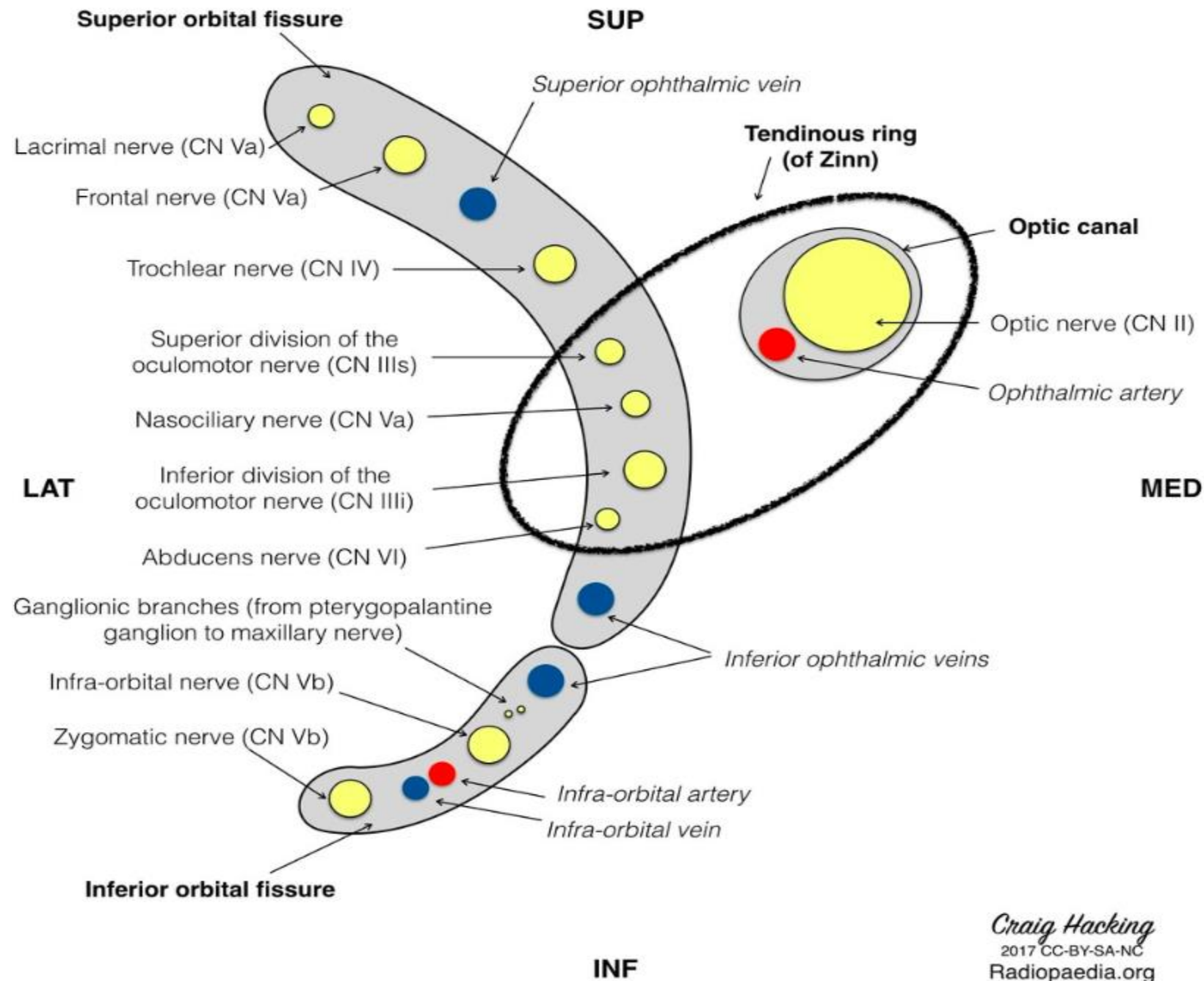
• **Superior orbital fissure : transmits (from superior to inferior):**

1. **Lacrimal nerve**
2. **Frontal nerve – branch of ophthalmic nerve of trigeminal nerve (CN V)**
3. **Superior ophthalmic vein**
4. **Trochlear nerve (CN IV)**
5. **Superior division of the Oculomotor nerve (CN III)**
6. **Nasociliary nerve – branch of ophthalmic nerve of trigeminal nerve (CN V)**
7. **Inferior division of the Oculomotor nerve (CN III)**
8. **Abducent nerve (CN VI)**
9. **A branch of the Inferior ophthalmic vein**



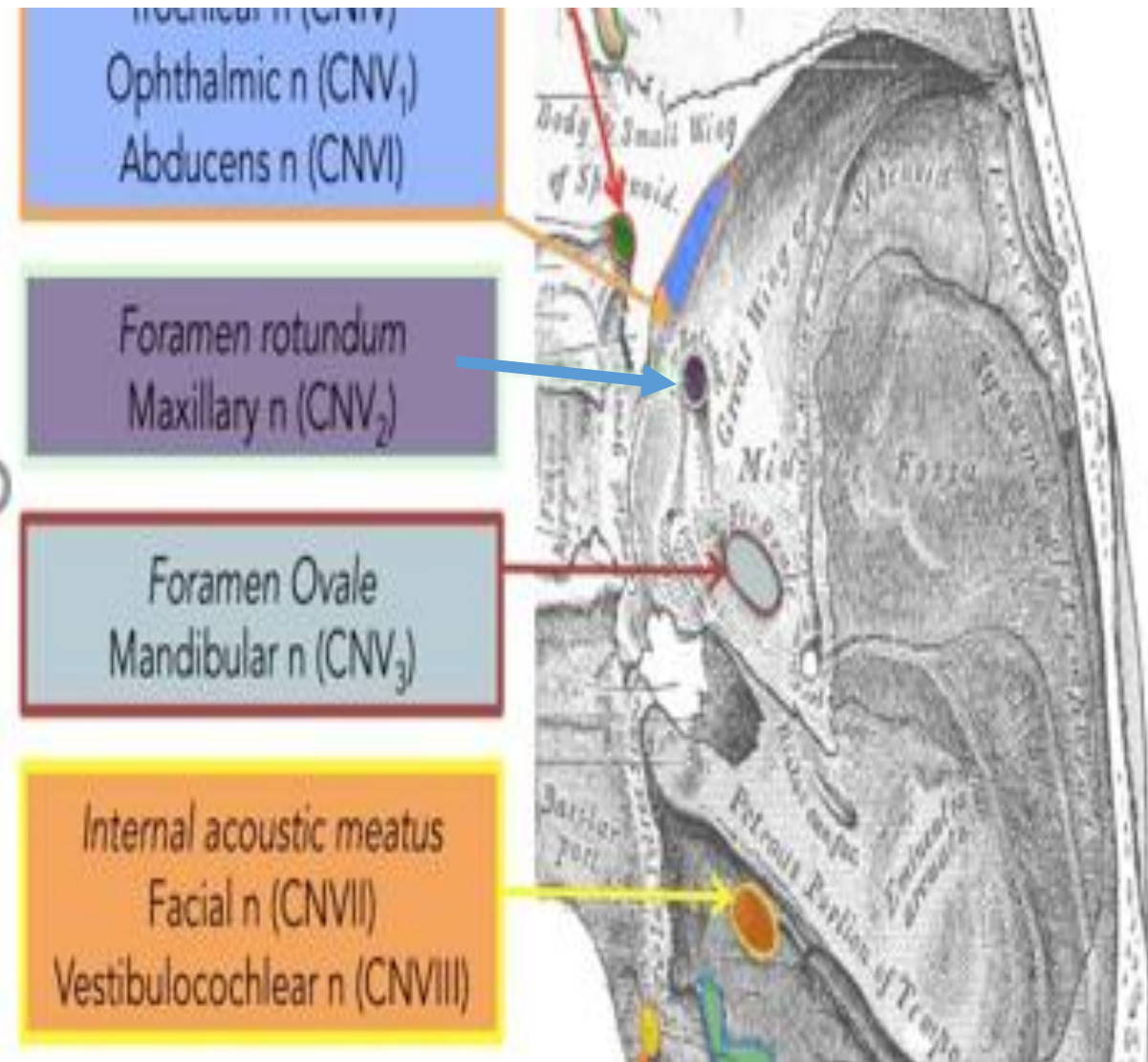


ORBITAL APEX



Foramen Rotundum

- The **foramen rotundum** is located at the base of the greater wing of the sphenoid, inferior to the superior orbital fissure.
- It provides a connection between the middle cranial fossa and the pterygopalatine fossa. The **maxillary nerve** (branch of the trigeminal nerve, CN V) passes through this foramen.



Internal Acoustic Meatus

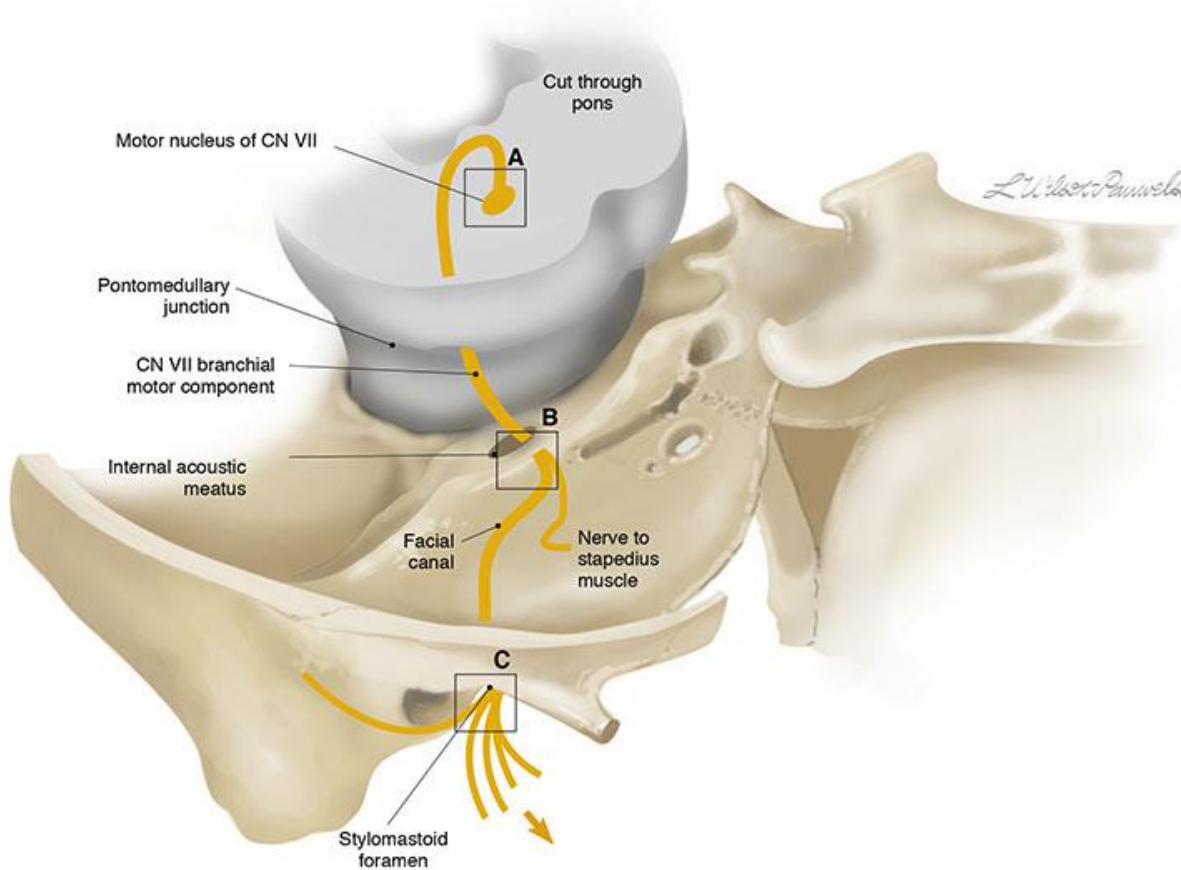


Figure VII-13 Lower Motor Neuron Lesions (LMNLs) affecting the branchial motor axons in A, pons, B, internal acoustic meatus, and C, stylomastoid foramen (brainstem is elevated)

- The **internal acoustic meatus** is a bony passage located within the petrous part of the temporal bone.
- The canal connects the posterior cranial fossa and the inner ear, transporting neurovascular structures to the auditory and vestibular apparatus. The **facial** and **vestibulocochlear** nerves pass through the internal acoustic meatus, alongside the vestibular ganglion and labyrinthine artery.

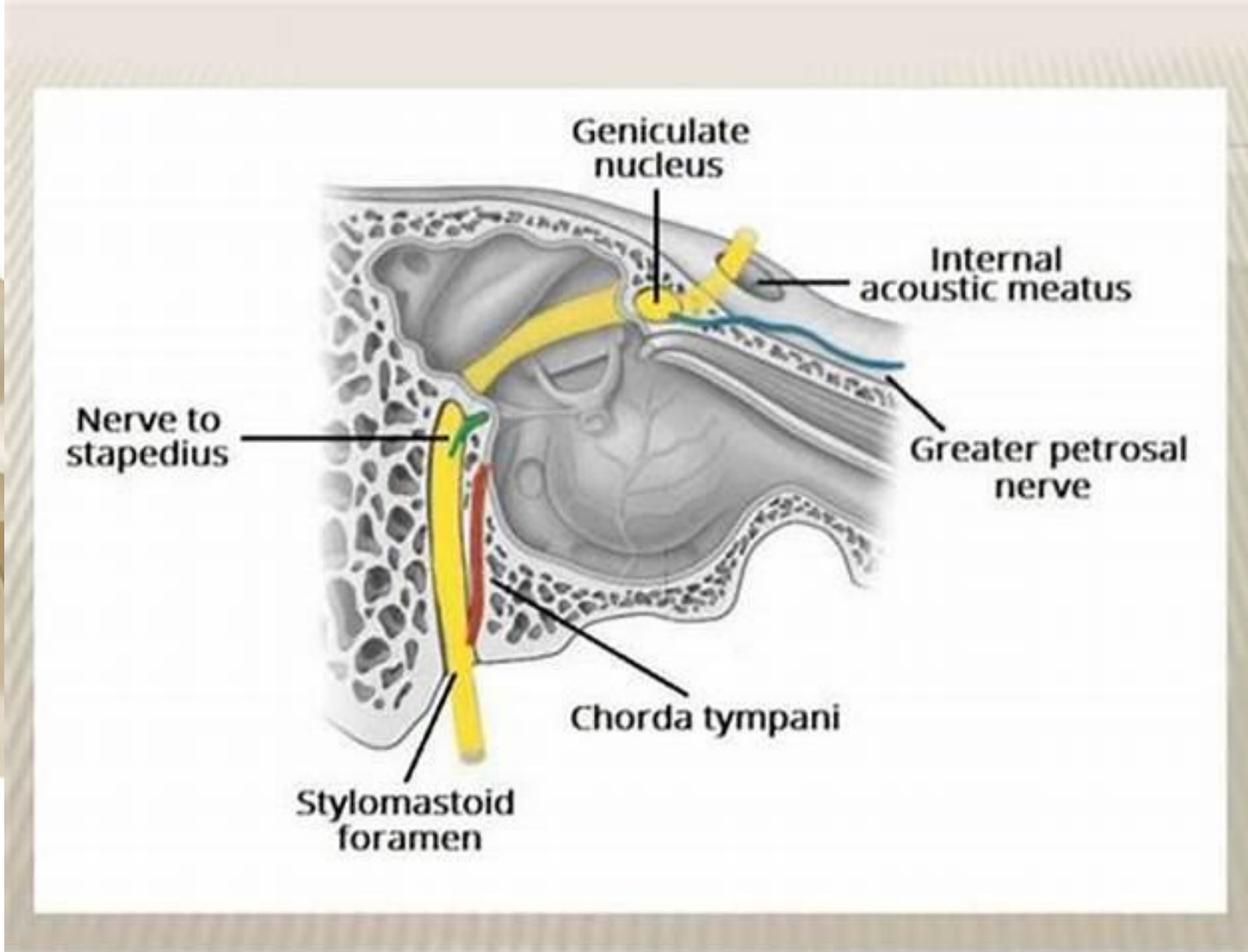
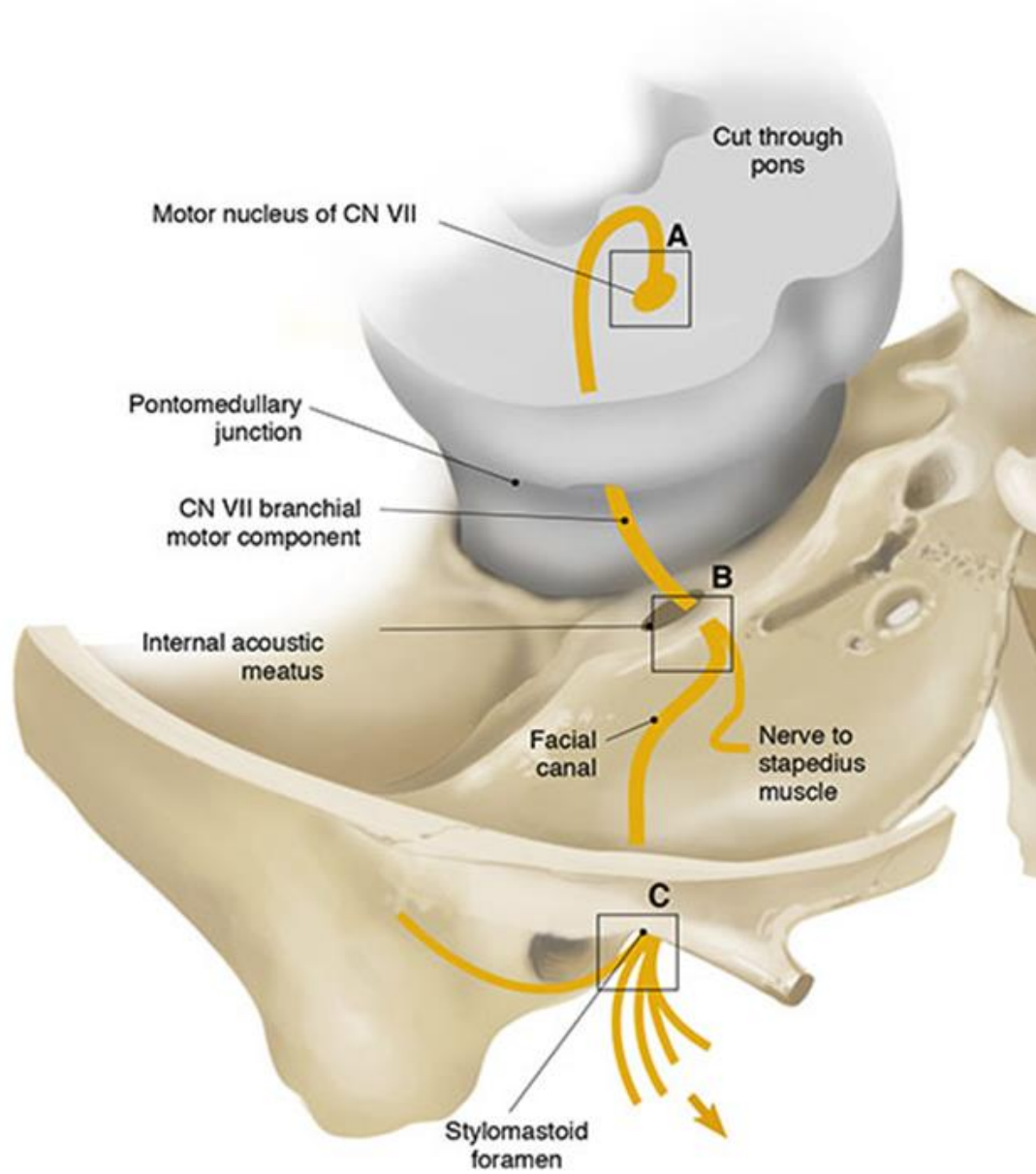


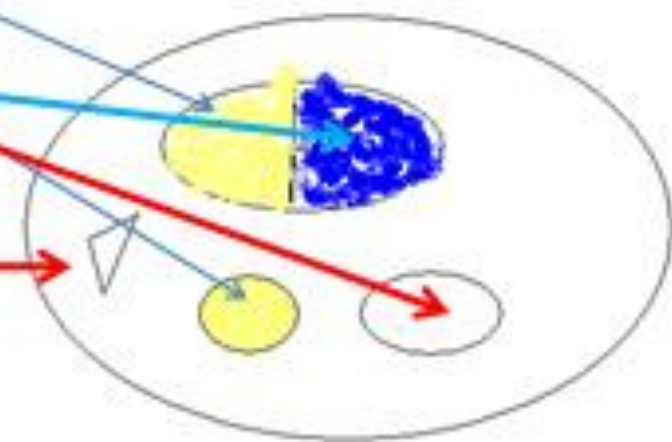
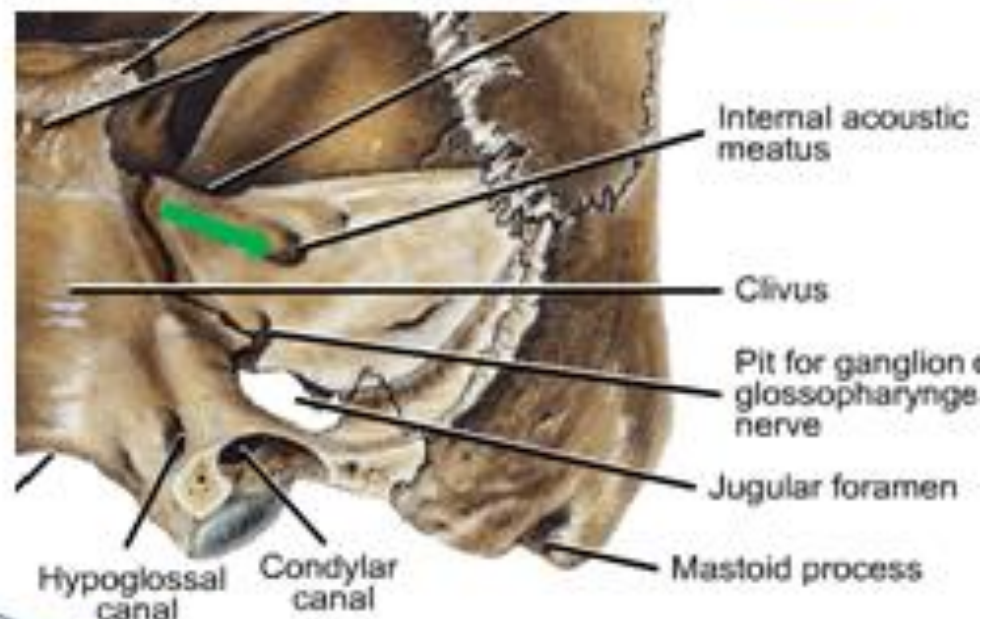
Figure VII-13 Lower Motor Neuron Lesions (LMNLs) affecting the branchial motor axons in A, pons, B, internal acoustic meatus, and C, styloid mastoid foramen (brainstem is elevated)

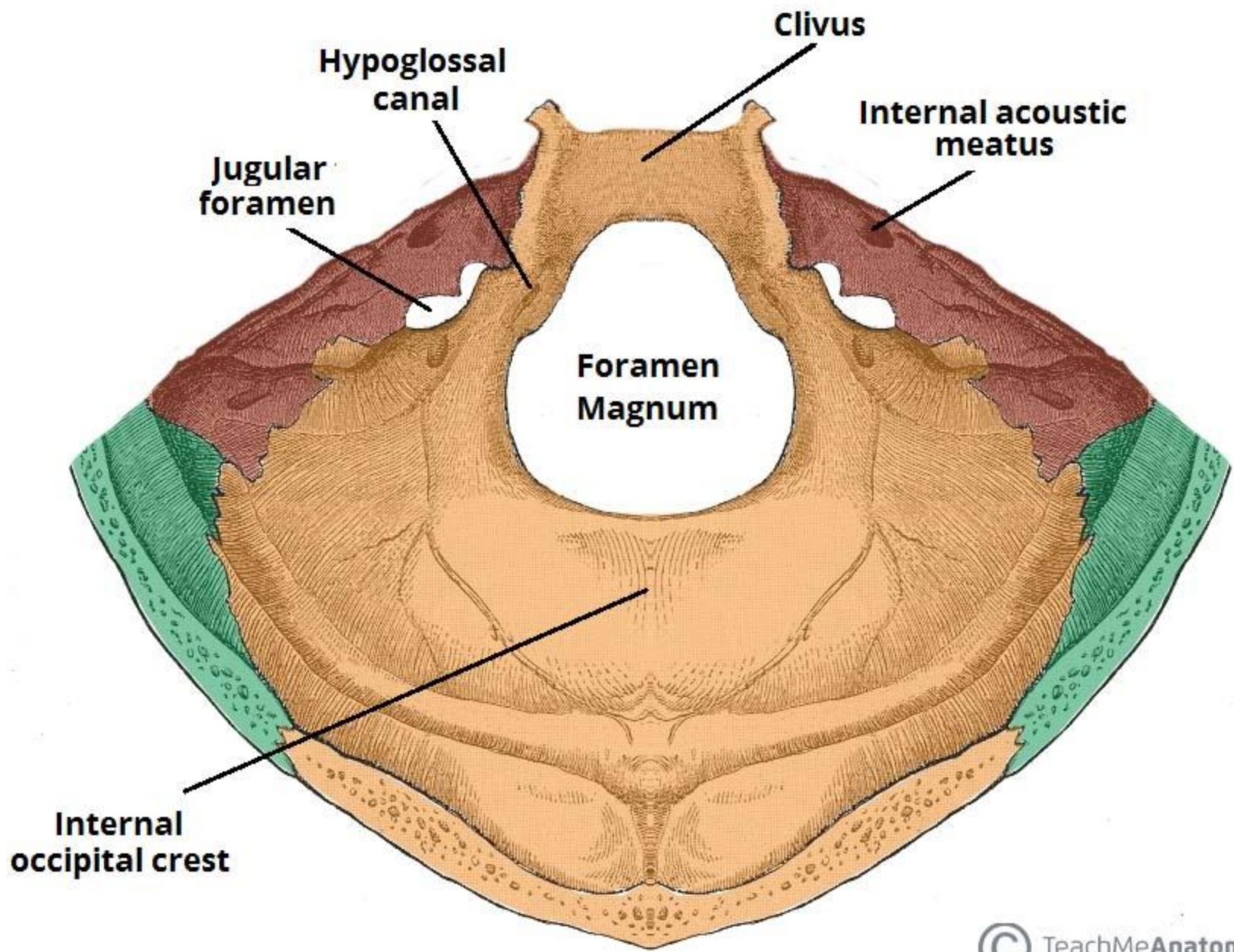
□ Internal acoustic meatus : posterior surface to Petrous bone ;

transmit :

- a. Vestibul+
- b. cochler nerve
- c. Facial sensory and motor
- C- labyrinthine artery

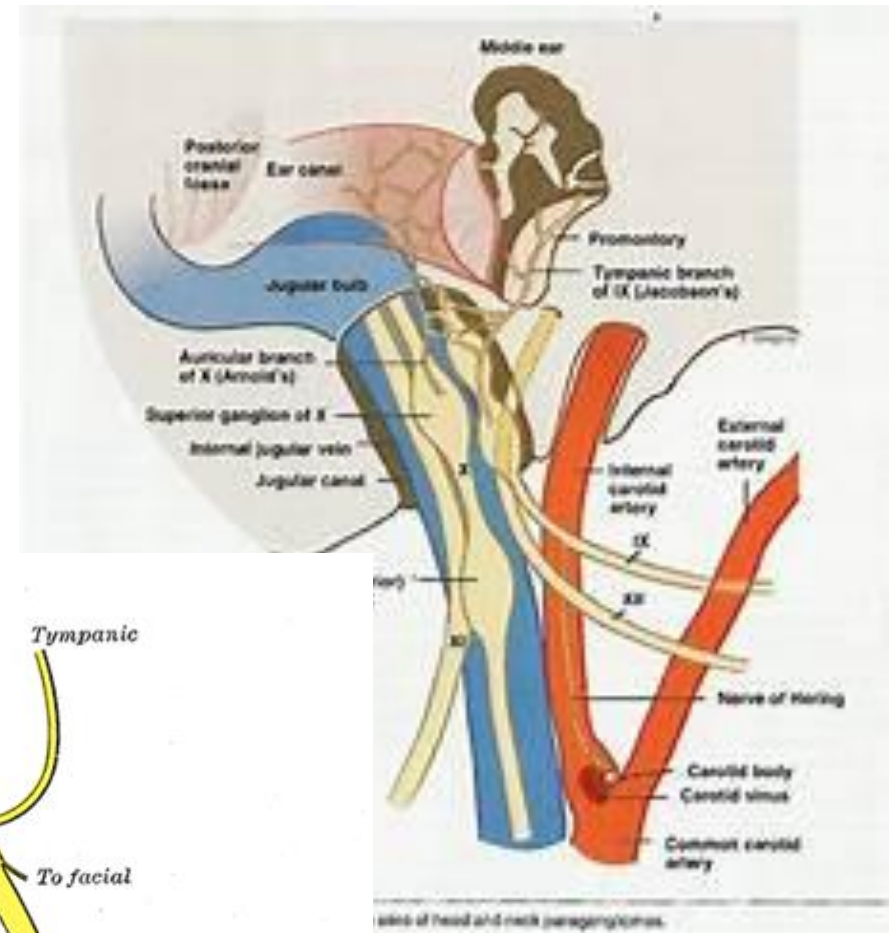
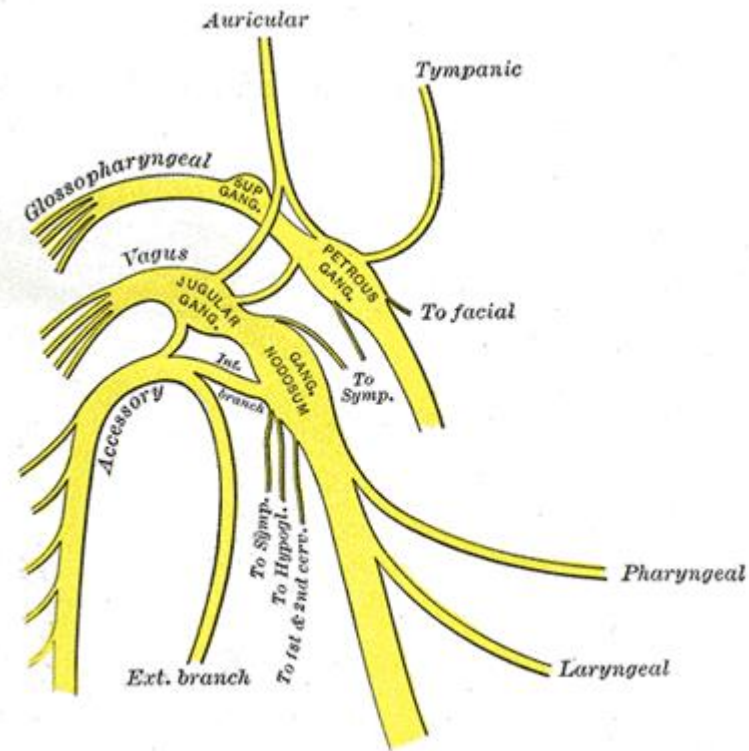
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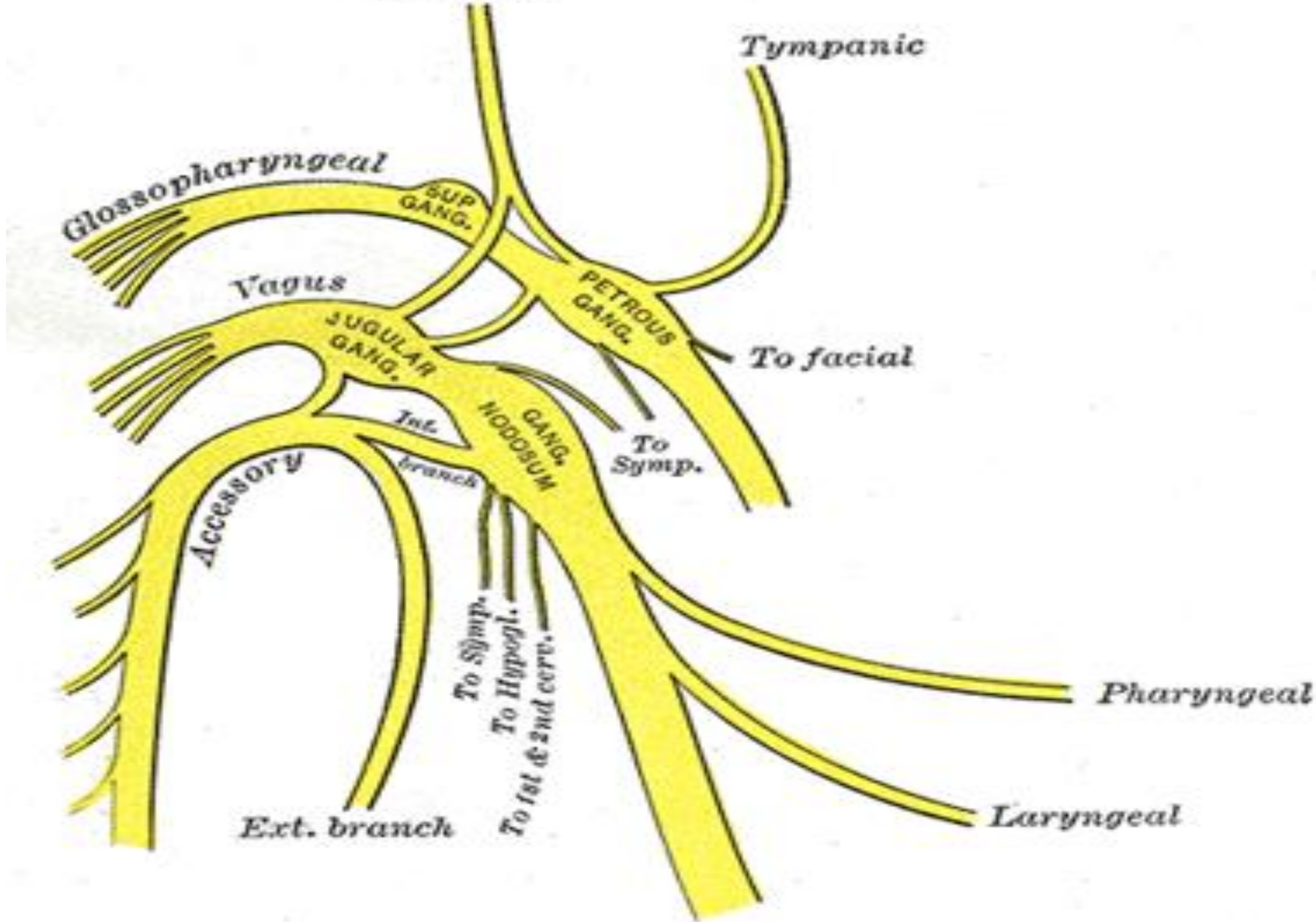




Jugular Foramen

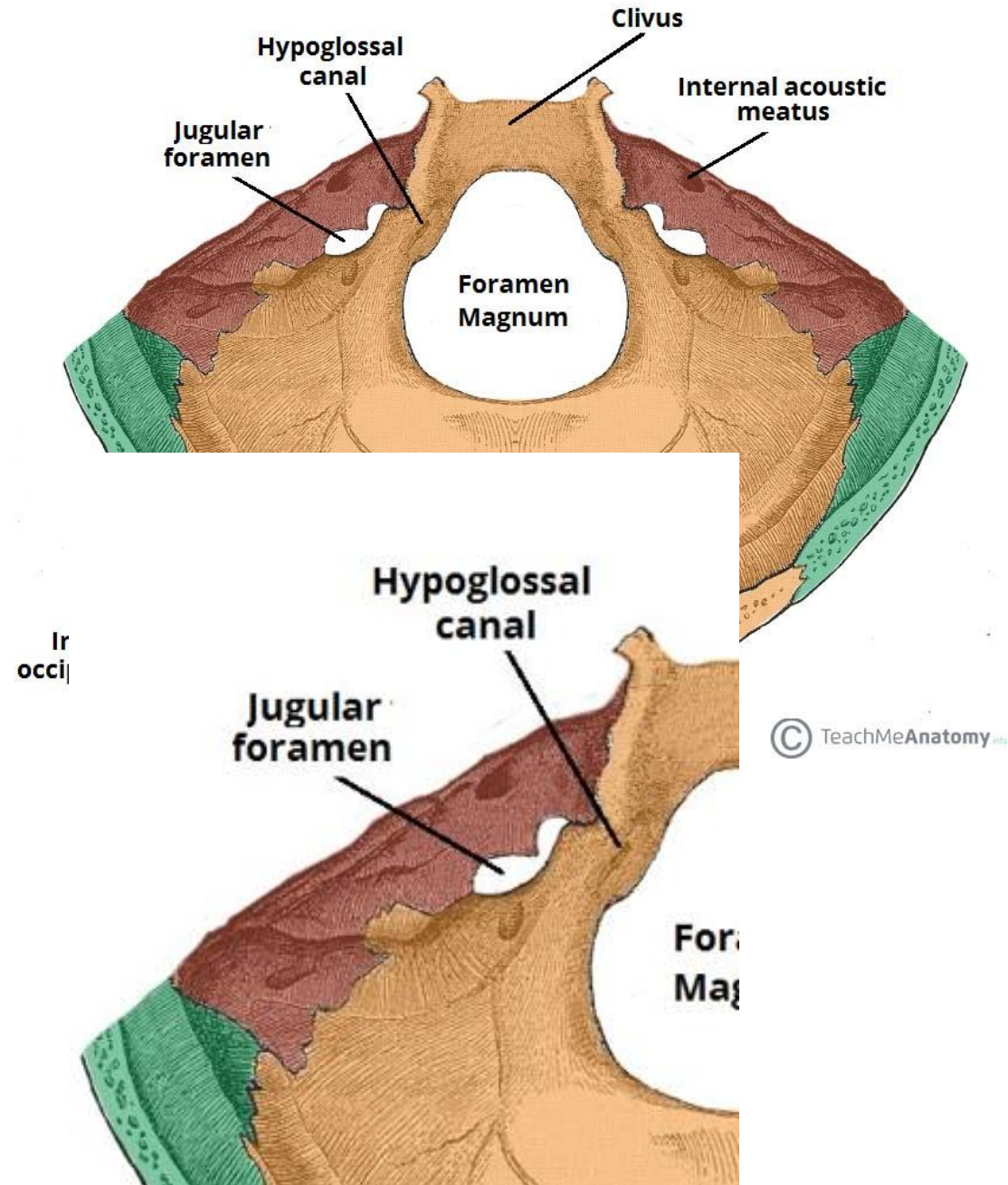
- The **jugular foramen** is formed anteriorly by the petrous part of the temporal bone and posteriorly by the occipital bone.
- It can be considered as three separate compartments with their respective contents:
- **Anterior** – contains the inferior petrosal sinus (a dural venous sinus).
- **Middle** – transmits the glossopharyngeal nerve, vagus nerve and cranial part of the accessory nerve.
- **Posterior** – contains the sigmoid sinus, and transmits meningeal branches of occipital and ascending pharyngeal arteries.





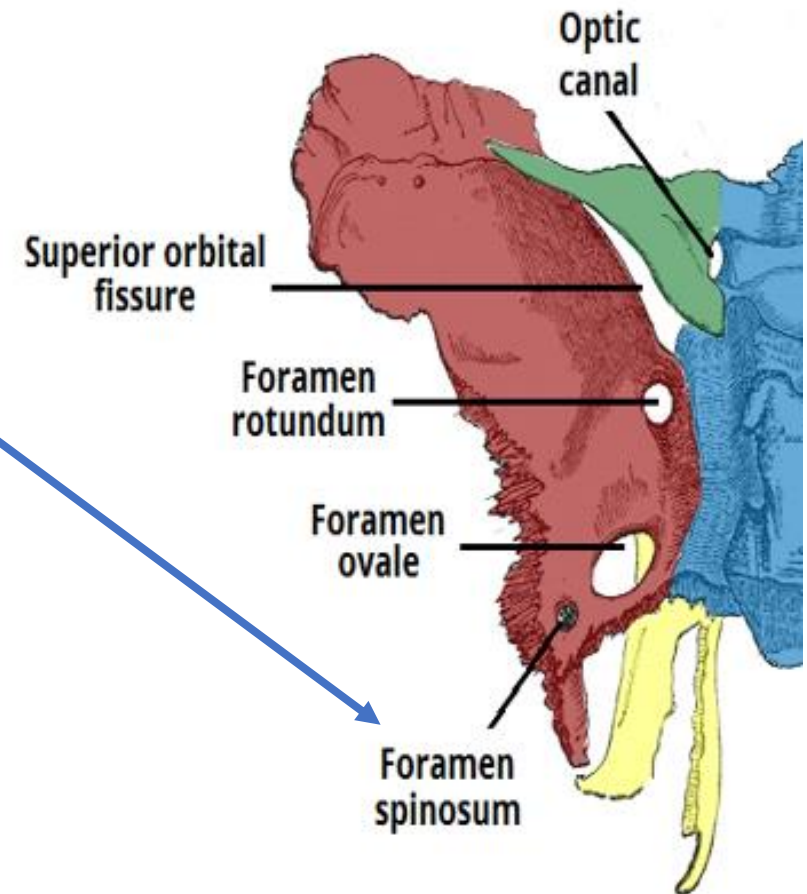
Hypoglossal Canal – CN XII

- The hypoglossal canal is located in the occipital bone, through which the hypoglossal nerve (CN XII) passes to exit the posterior cranial fossa.

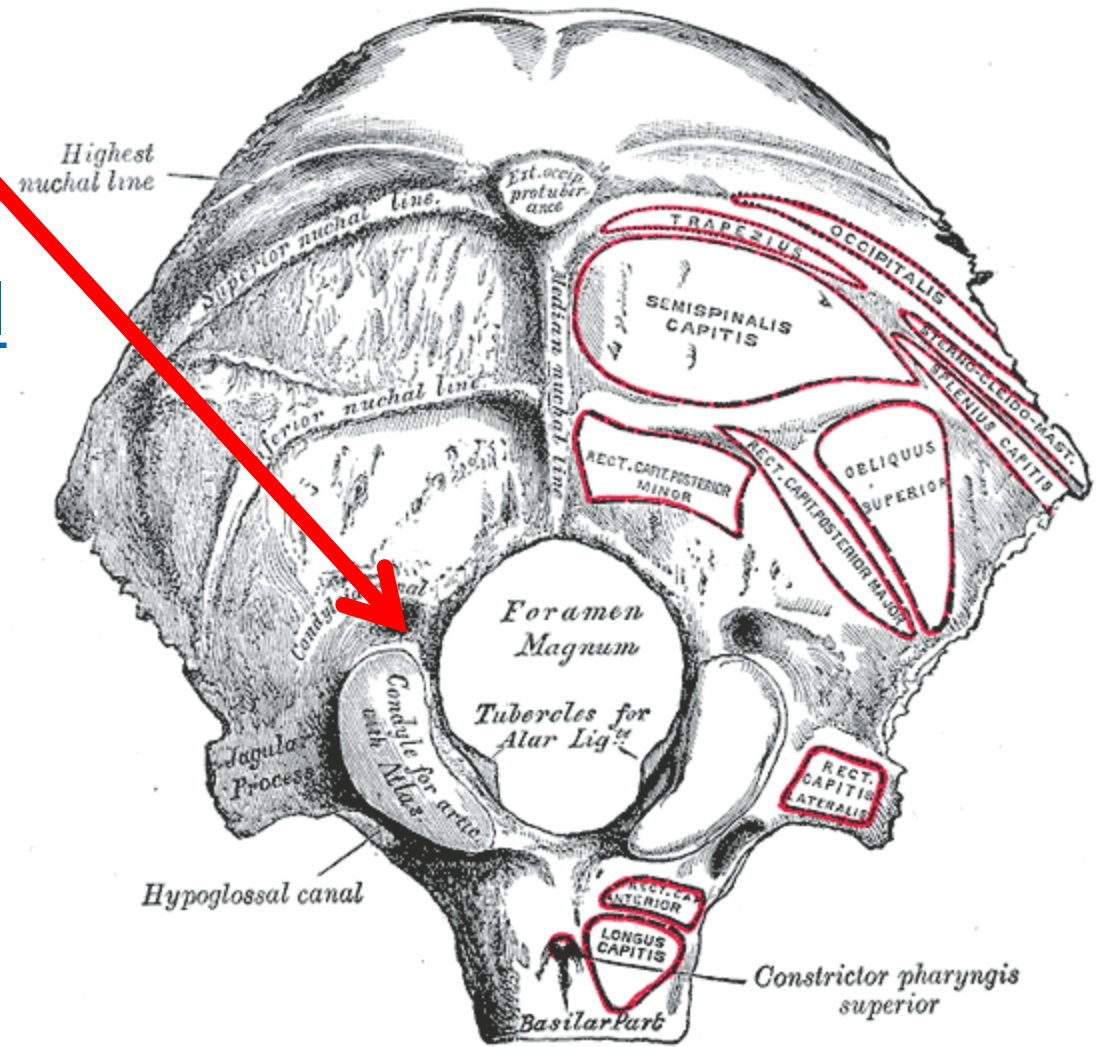


Foramen Spinosum

- The **foramen spinosum** is located within the middle cranial fossa, laterally to the foramen ovale.
- It allows the passage of the **middle meningeal artery**, the middle meningeal vein and the meningeal branch of CN V₃.

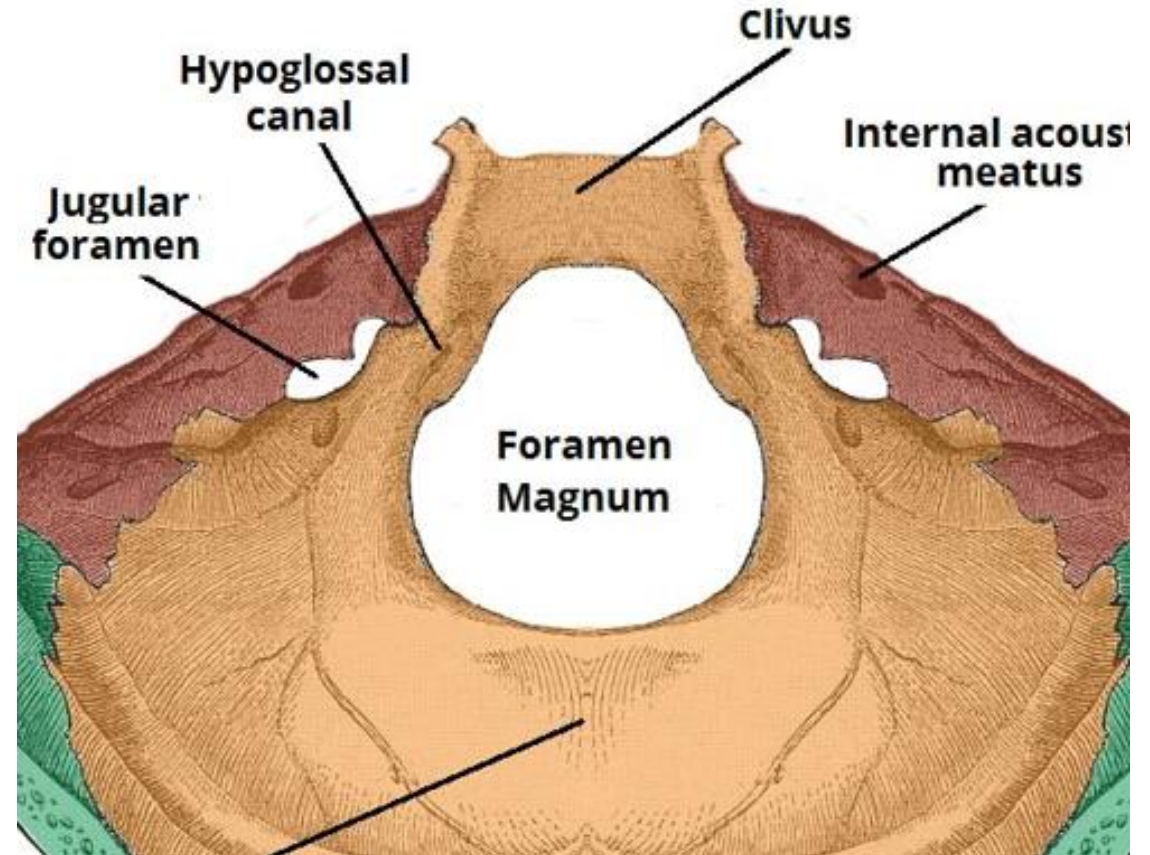


The **condylar canal** (or **condyloid canal**) is a canal in the condyloid fossa of the lateral parts of occipital bone behind the occipital condyle. Through the **condylar canal**, the occipital emissary vein connects to the venous system including the suboccipital venous plexus, occipital sinus and sigmoid sinus. It is not always present, and can have variations of being a single canal or multiple smaller canals in cluster



Other Foramina

- **Foramen Magnum**
- The **foramen magnum** is the largest of the cranial foramina.
- It lies in the occipital bone within the posterior cranial fossa, and allows the passage of the **medulla** and **meninges**, the **vertebral arteries**, the **anterior and posterior spinal arteries** and the **dural veins**.
- The spinal division of the **accessory nerve** ascends through the foramen magnum to join the cranial division. Once combined, the completed nerve exits through the **jugular foramen** as described above.



ForamenStructures ConductedCranial FossaCranial Bone

Cribriform foramina in cribriform plate

- Olfactory nerve (CN I)
- Anterior ethmoidal nerv

Anterior cranial fossa

Ethmoid bone

Optic canal

- Optic nerve (CN II)
- Ophthalmic artery

Middle cranial fossa

Sphenoid bone

- Lacrimal nerve
- Frontal nerve- branch of ophthalmic nerve of trigeminal nerve (CN V)
- Superior ophthalmic vein
- Trochlear nerve (CN IV)
- Superior division of the oculomotor nerve (CN III)
- Nasociliary nerve- branch of ophthalmic
- Inferior division of the oculomotor nerve
- Abducens nerve (CN VI)
- A branch of the Inferior ophthalmic vein

Middle cranial fossa

Sphenoid bone

Superior orbital fissure

Foramen rotundum

- Maxillary branch of trigeminal nerve (CN V₂)

Middle cranial fossa

Sphenoid bone

Foramen ovale

- Mandibular branch of trigeminal nerve (CN V₃)

Middle cranial fossa

Sphenoid bone

Foramen spinosum

- Middle meningeal artery
- Middle meningeal vein
- Meningeal branch of CN V₃

Middle cranial fossa

Sphenoid bone

Internal acoustic meatus

- Facial nerve (CN VII)
- Vestibulocochlear nerve (CN VIII)
- Vestibular ganglion
- Labyrinthine artery

Middle cranial fossa

Petrous part of temporal bone

Jugular foramen

- Glossopharyngeal nerve (CN IX)
- Vagus nerve (CN X)
- Accessory nerve (CN XI)
- Jugular bulb
- Inferior petrosal and sigmoid sinuses

Posterior cranial fossa

Anterior aspect: Petrous portion of the temporal
Posterior aspect: Occipital bone

Hypoglossal canal

- Hypoglossal nerve (*CN XII*)

Posterior cranial fossa

Occipital bone

Foramen magnum

- Vertebral arteries
- Medulla and meninges
- CN XI (spinal division)
- Dural veins
- Anterior and posterior spinal arteries

Posterior cranial fossa

Occipital bone