Head and Neck Clinical and Radiographic Anatomy

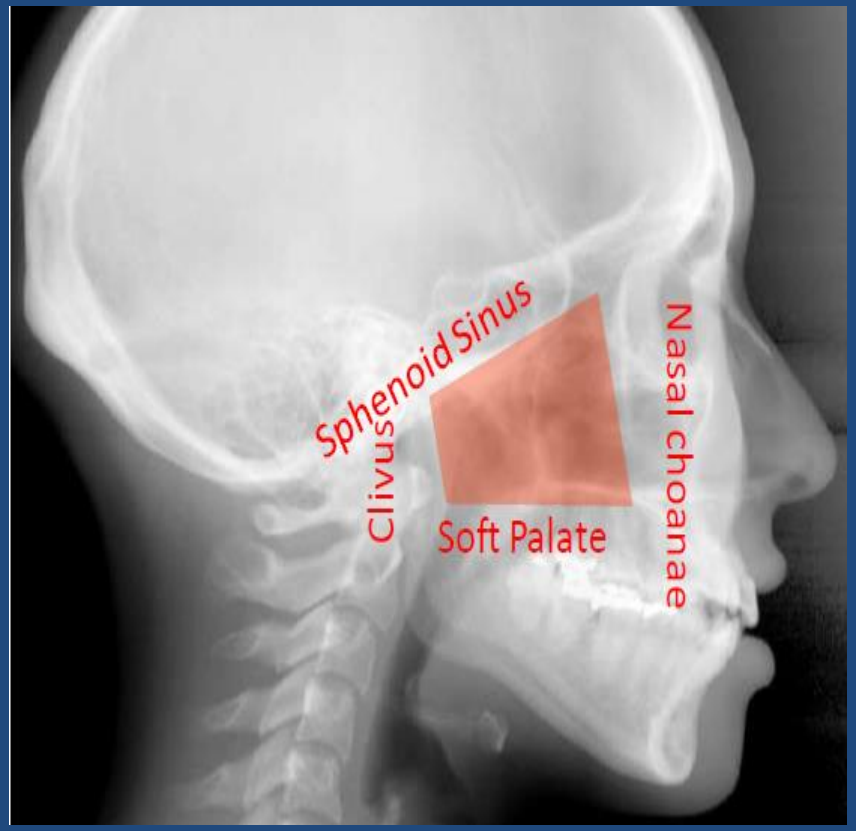
Arya Amini MD

Topics

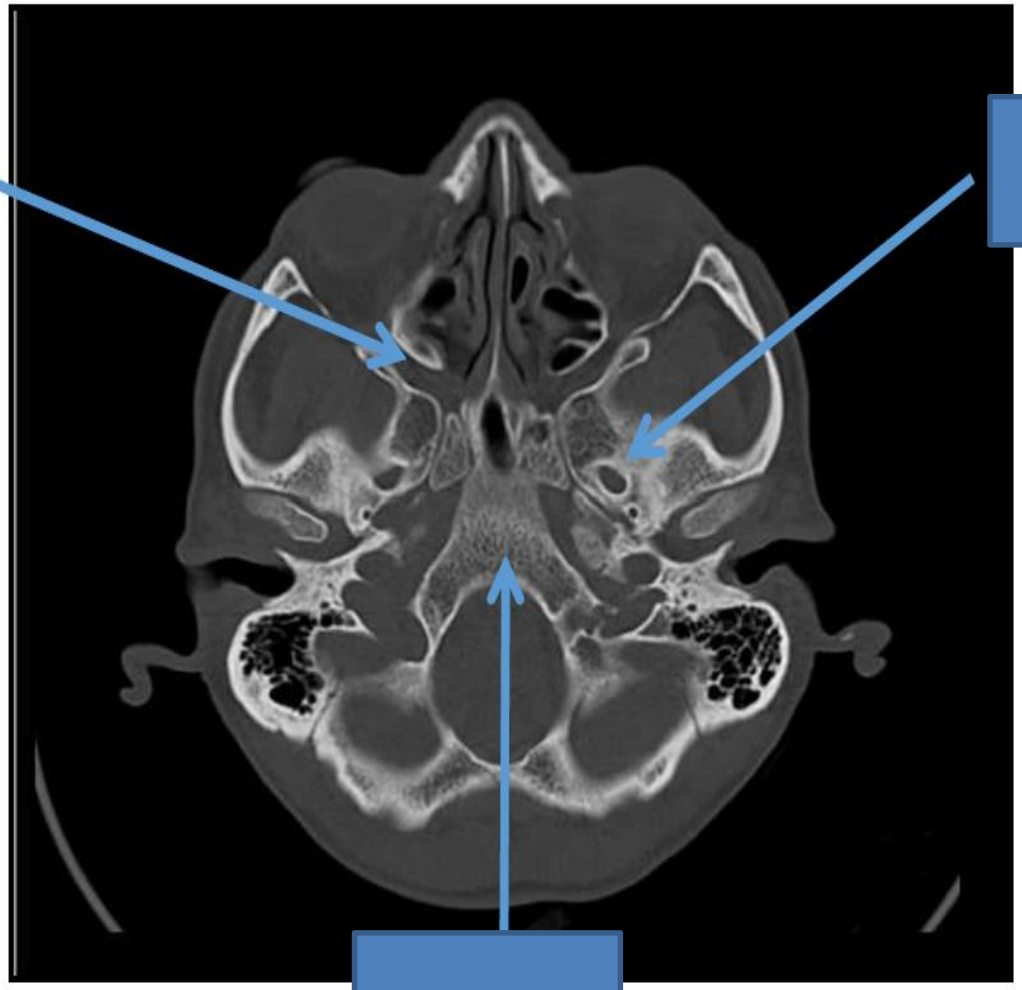
- Nasopharynx
- OC
- Paranasal
- Salivary
- Skin

Anatomy

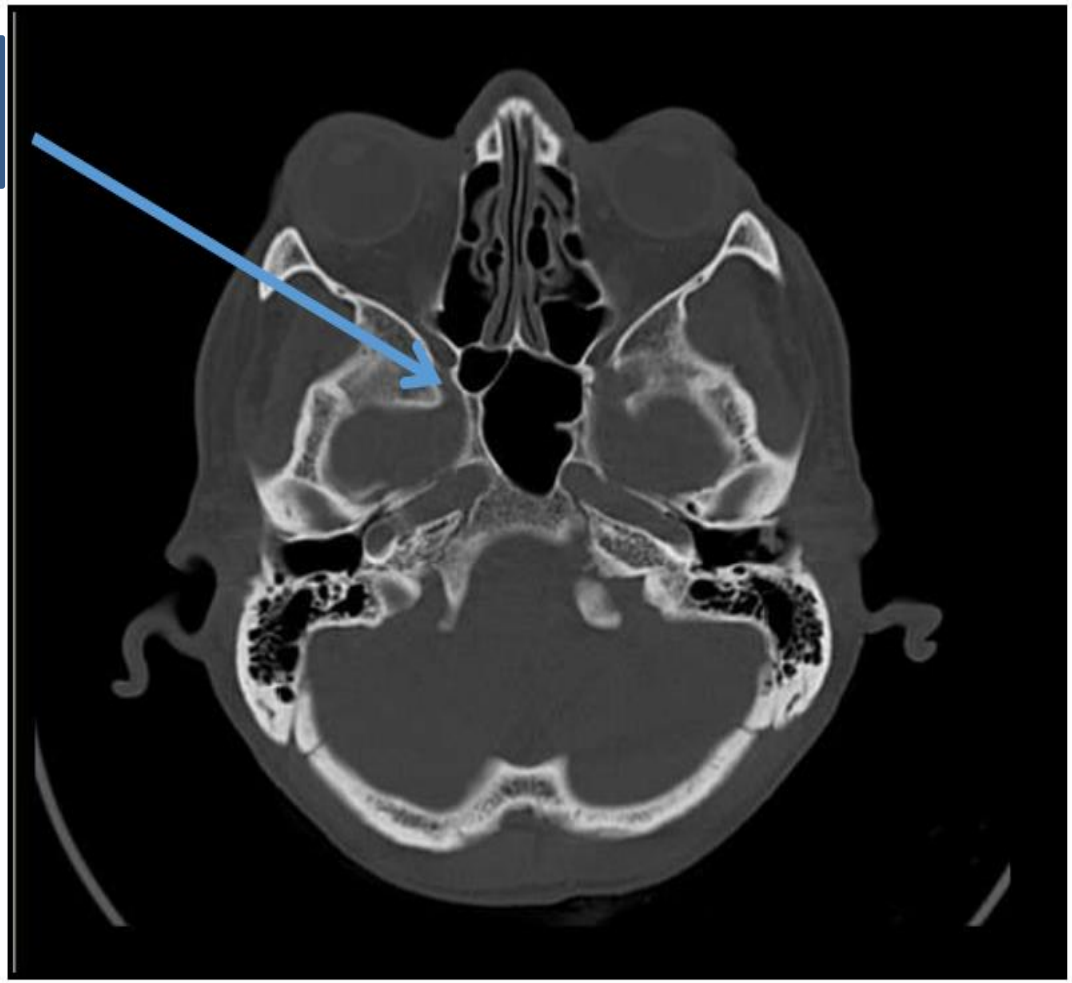
Nasopharynx: anatomy



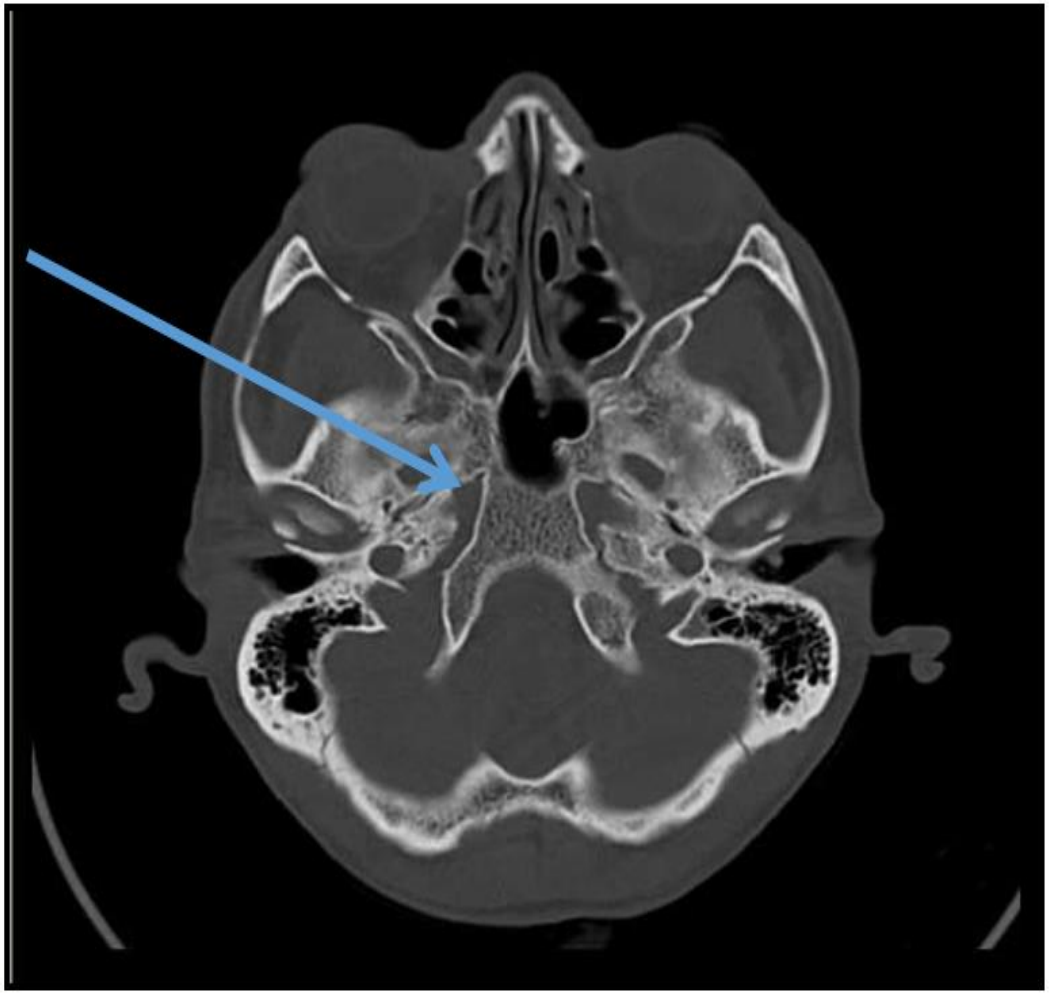
Base of Skull Anatomy



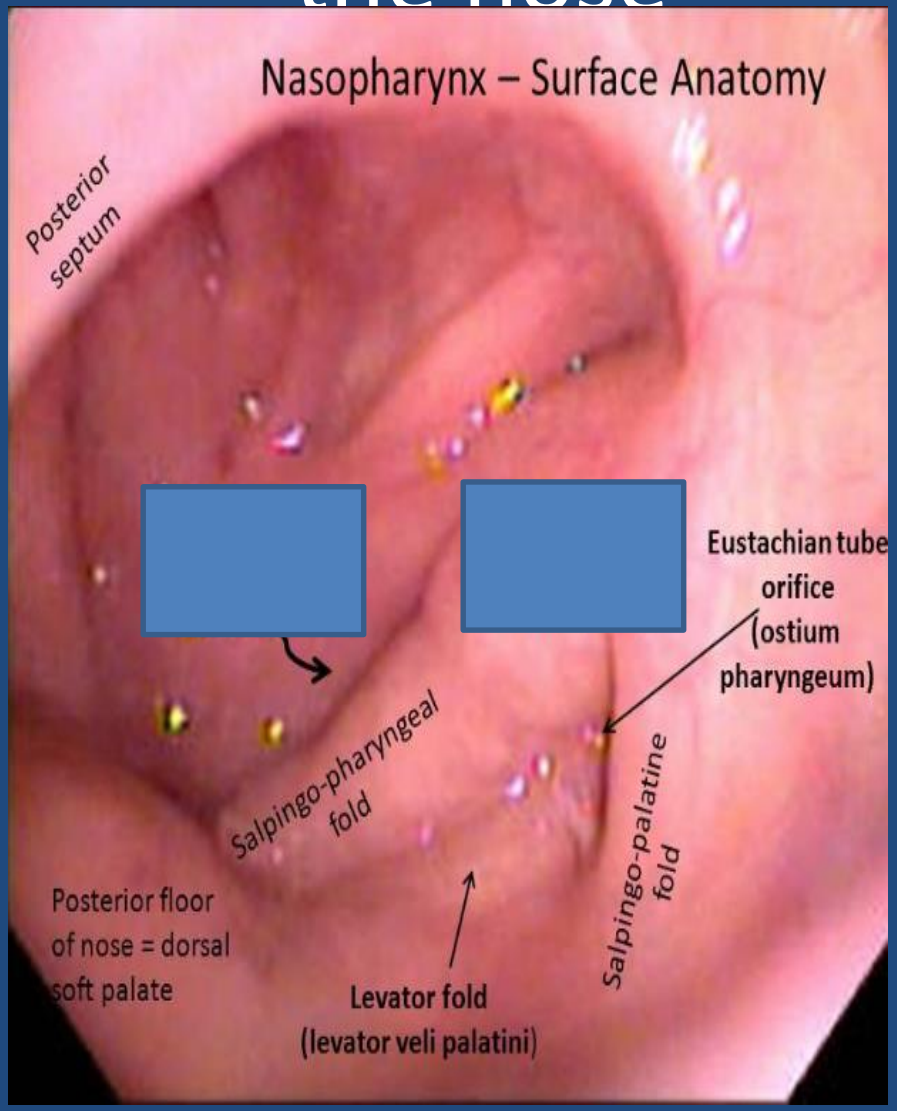
Base of Skull Anatomy

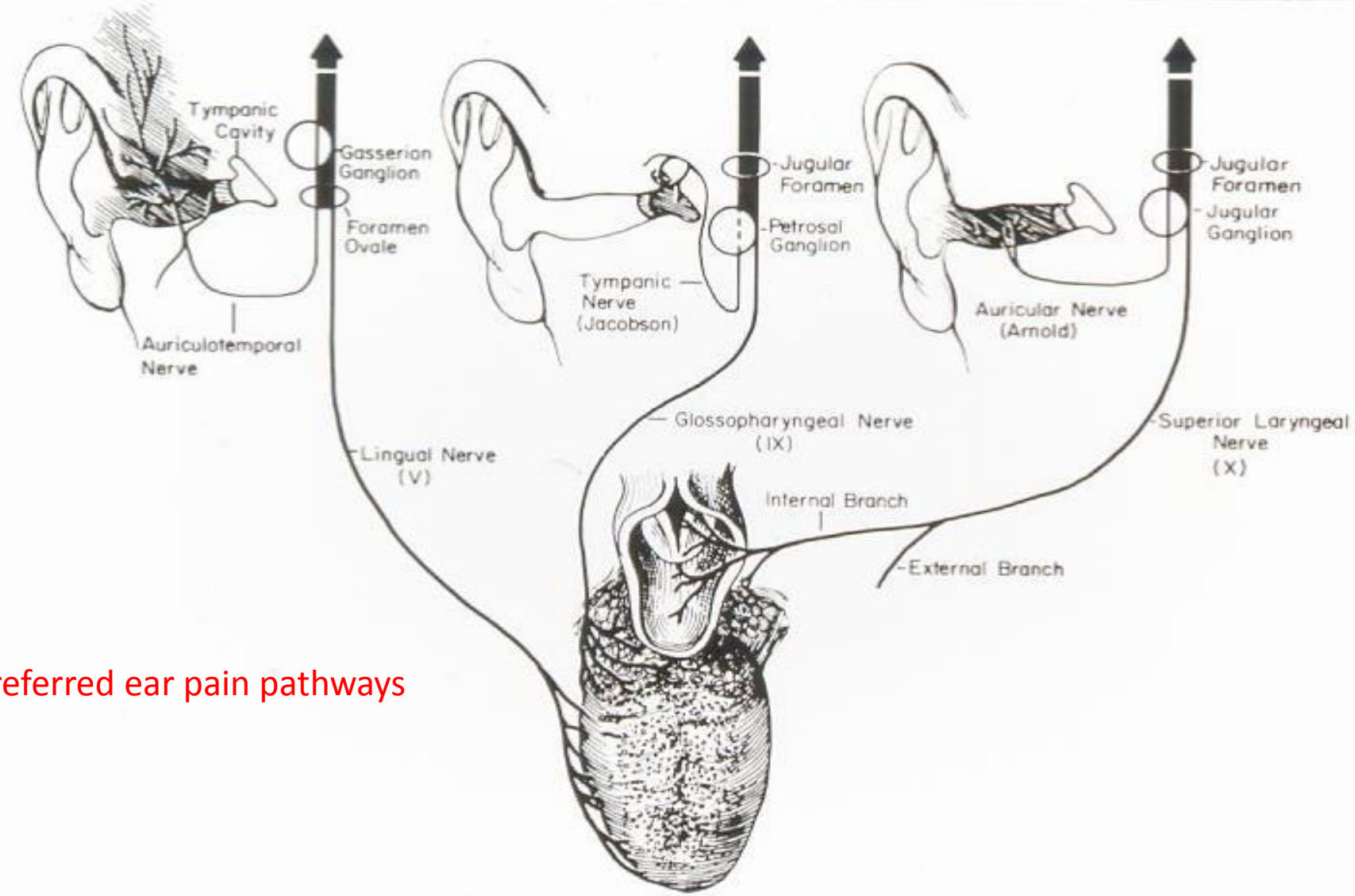


Base of Skull Anatomy



Anatomy (The Scope) – starting from the nose

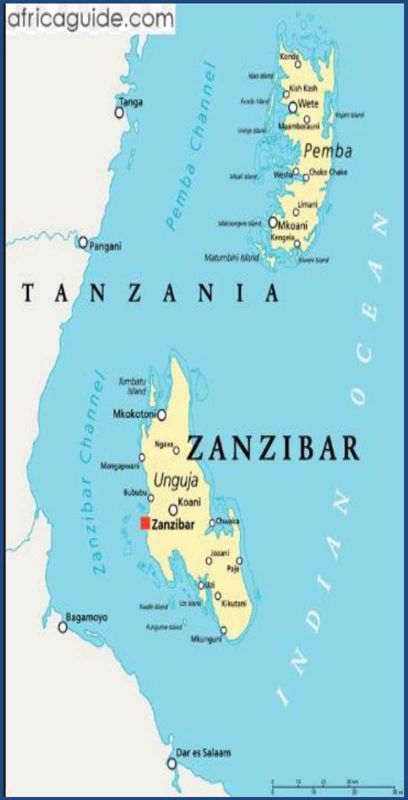


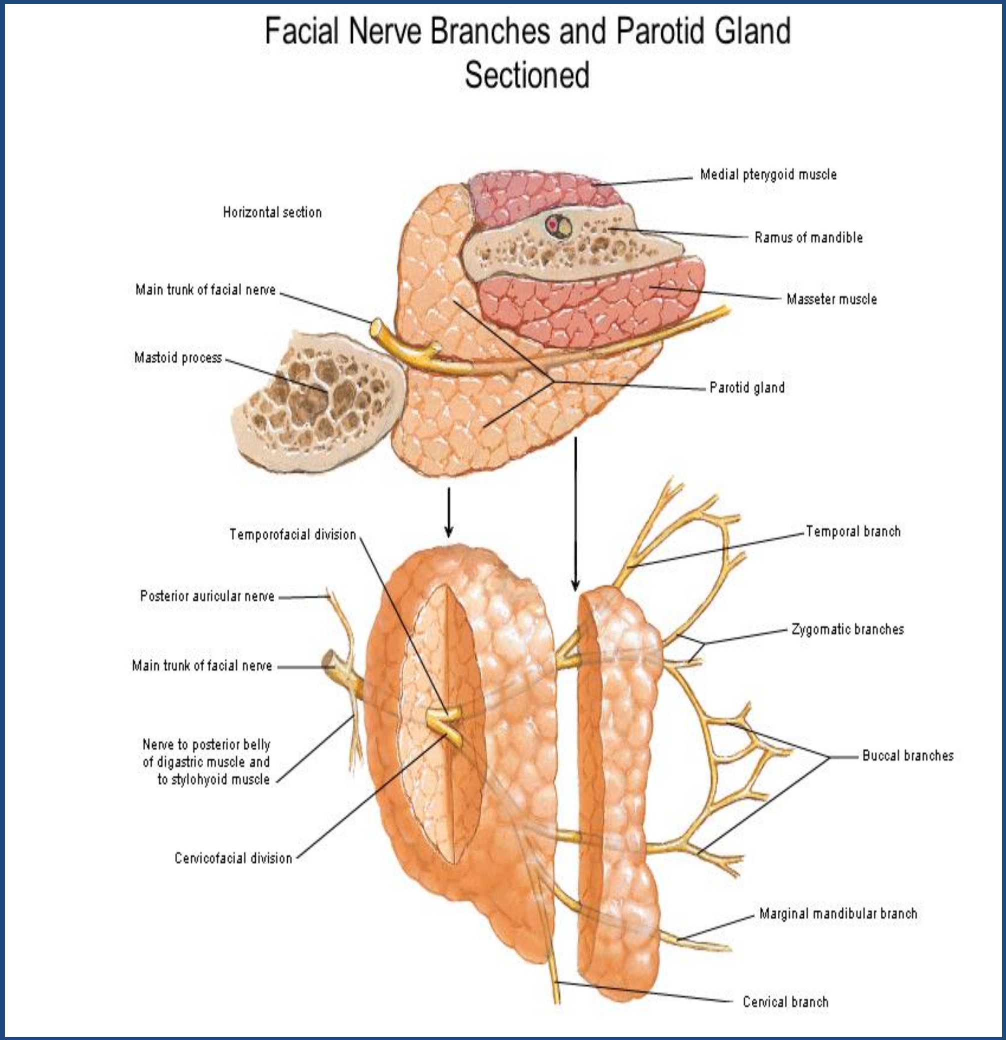


referred ear pain pathways

What are the branches of the facial nerve?

THE FACIAL NERVE AND ITS BRANCHES



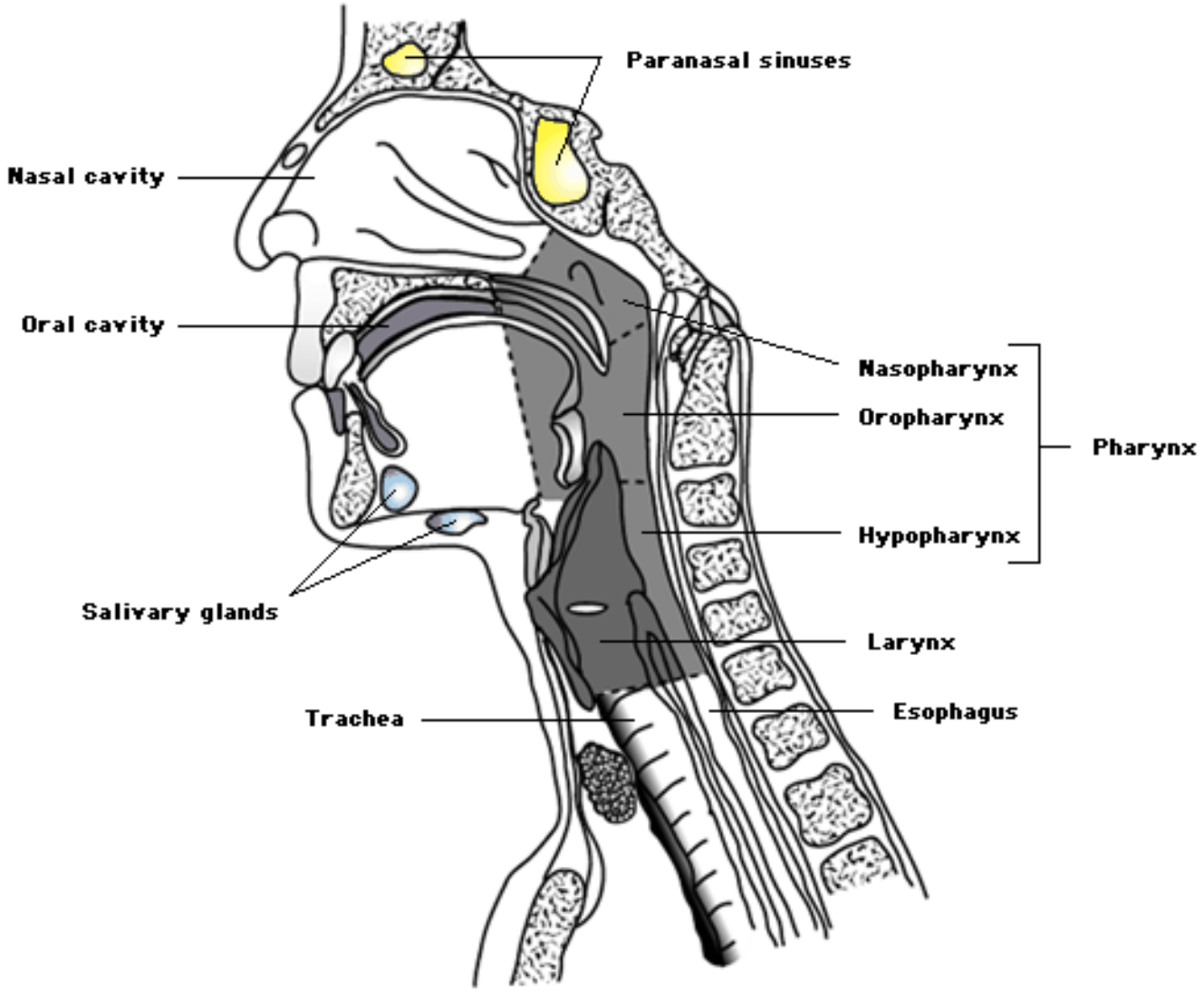


Temporal, Zygomatic, Buccal, Marginal Mandibular, Cervical

CN Syndromes

Syndrome	Involvement	CNs
Jacod's	Cavernous sinus (Petrosphenoidal)	II, III, IV, V_{1-2}, VI
Villaret's	Parapharyngeal LNs (retroparotidian)	IX-XII
Vernet's	Jugular foramen	IX – XI (not XII)

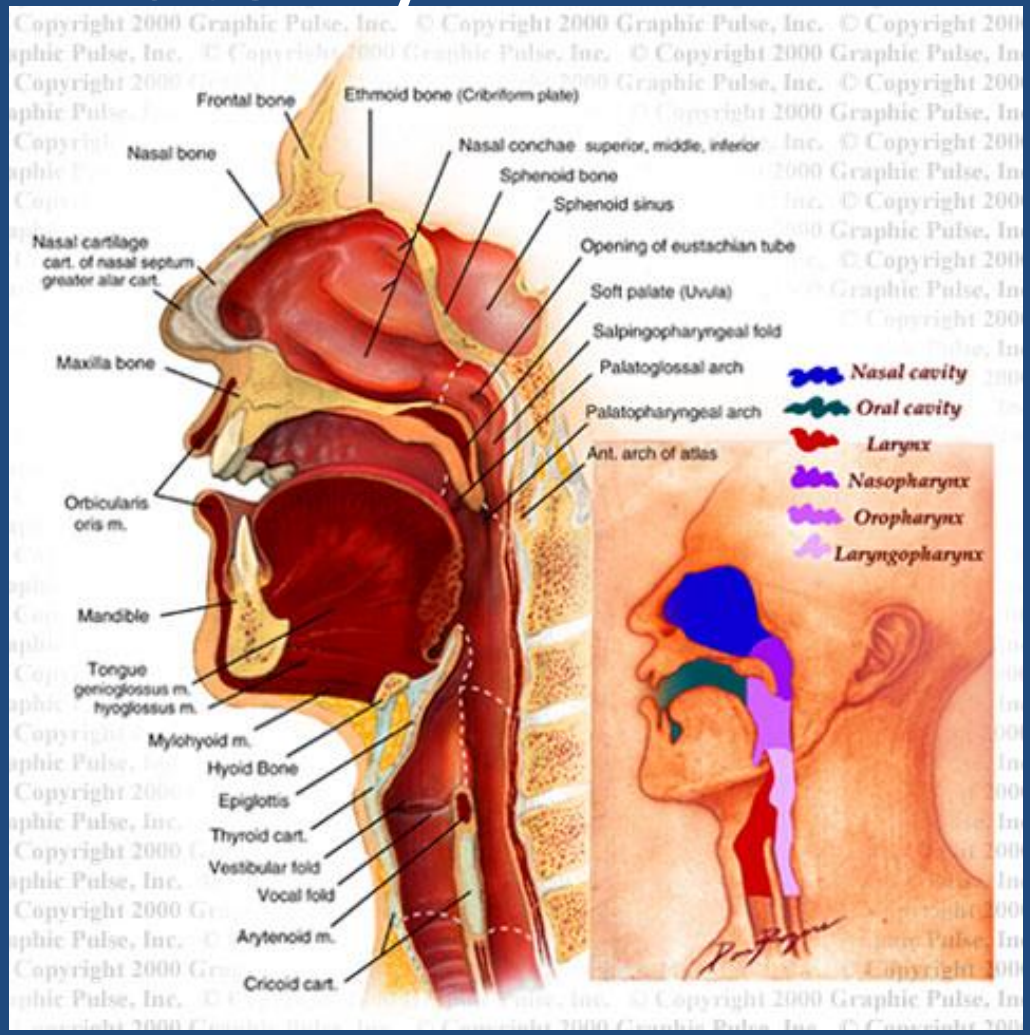
- **Trotter's triad**: Tumor in sinus of Morgagni near Eustacian tube and insertion of pharyngeus muscles to BoS – Not a nerve
  - Unilateral hearing loss
  - ↓Soft palate mobility
  - Mandibular pain


Paranasal sinuses
Nasal cavity
Oral cavity
Nasopharynx
Oropharynx
Pharynx
Hypopharynx
Salivary glands
Larynx
Trachea
Esophagus

H&N Anatomy

Subsites and Borders

- Nasal cavity: Vestibule to posterior aspect of nasal septum
- Paranasal sinuses
- Oral cavity: Lips to retromolar trigone/anterior 2/3 of tongue
- Nasopharynx: from posterior end of nasal septum to roof of soft palate.
- Oropharynx: Superior border = plane of superior surface of soft palate; inferior = superior surface of hyoid bone
- Hypopharynx: Pharynx from superior surface of hyoid to cricoid.
- Larynx: Supraglottic - epiglottis to false cords; Glottic - cords to 5mm below; Subglottic - 5mm below cords to level of cricoid



H&N Anatomy: Cranial Nerves

I - Smell (S only)

II - Sight (S only)

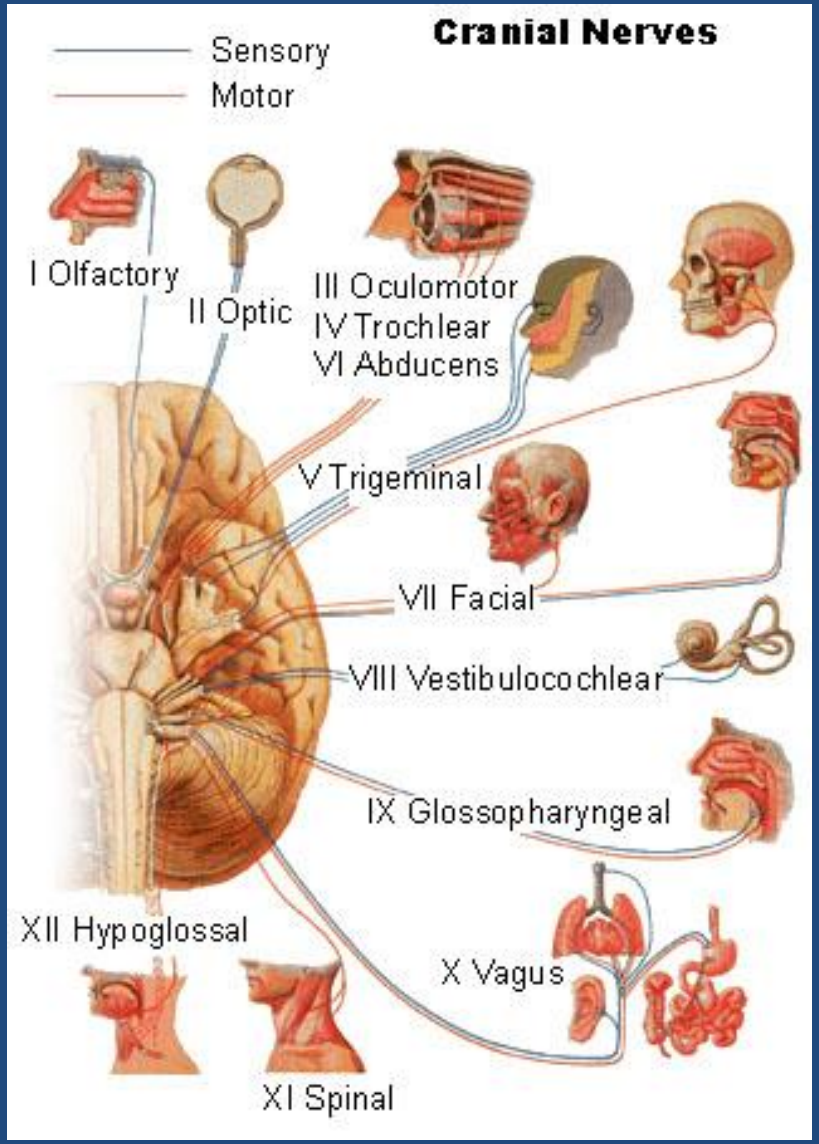
III - (M only) constriction of pupil, holding eyelid OPEN, superior rectus, medial rectus, inferior oblique (if CN III palsy, eye looks down and out).

IV - (M only) superior oblique (palsy = verticle diplopia with eye deviated upward)

V - (M and S) muscles of mastication and sensation of face.

VI - (M only) lateral rectus - causes medial deviation of eye and horizontal diplopia.

VII - (M and S) motor of face, taste of ant 2/3 of tongue also to non-parotid salivary glands.



H&N Anatomy: Cranial Nerves

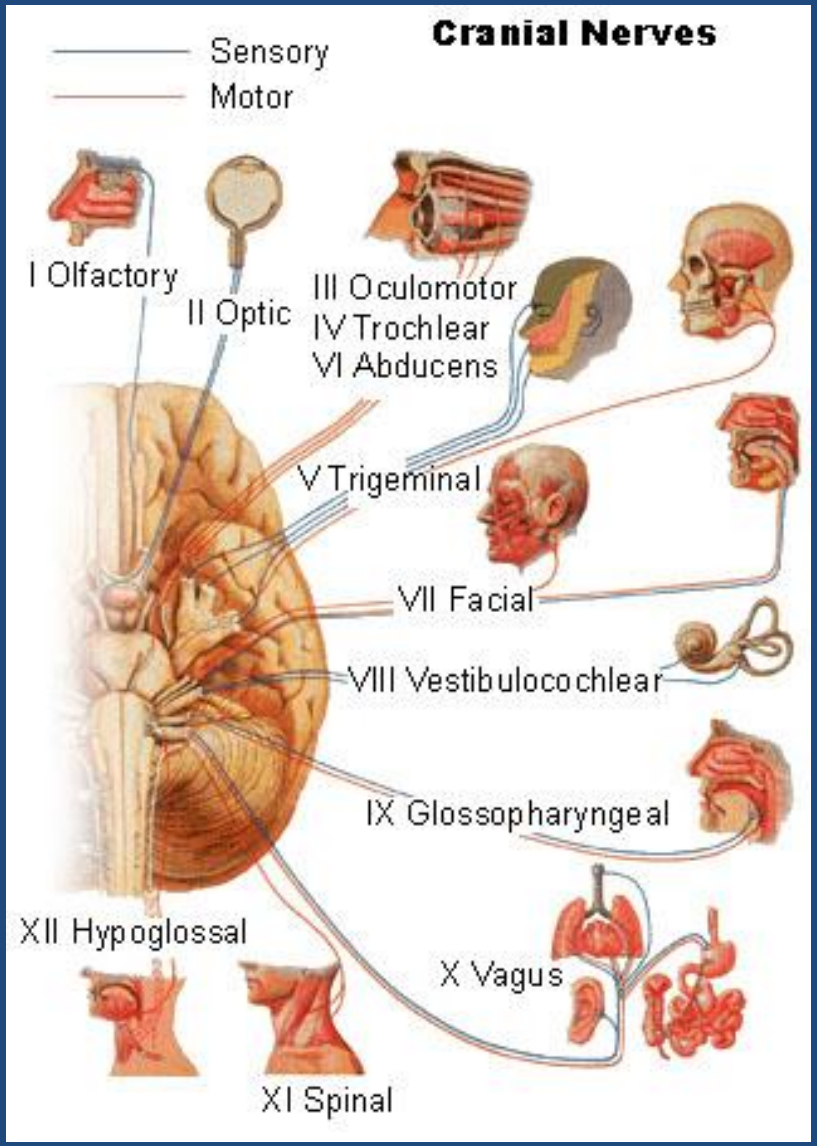
VIII - (S only) hearing and equilibrium

IX - (M and S) palate raise, swallowing, sensation of palate, taste post 1/3

X - (M and S) motor of pharynx/larynx, parasympathetic innervation of viscera.

XI - (M only) sternocleidomastoid and trapezius

XII - (M only) tongue (loss of function lead to tongue deviation to the side of the lesion).



H&N Anatomy 7: BOS and CNs Test

Superior orbital fissure
- III, IV, V1 (opthalmic), VI

Optic foramen
- II and optic artery

Foramen rotundum
- V2

Foramen ovale
- V3

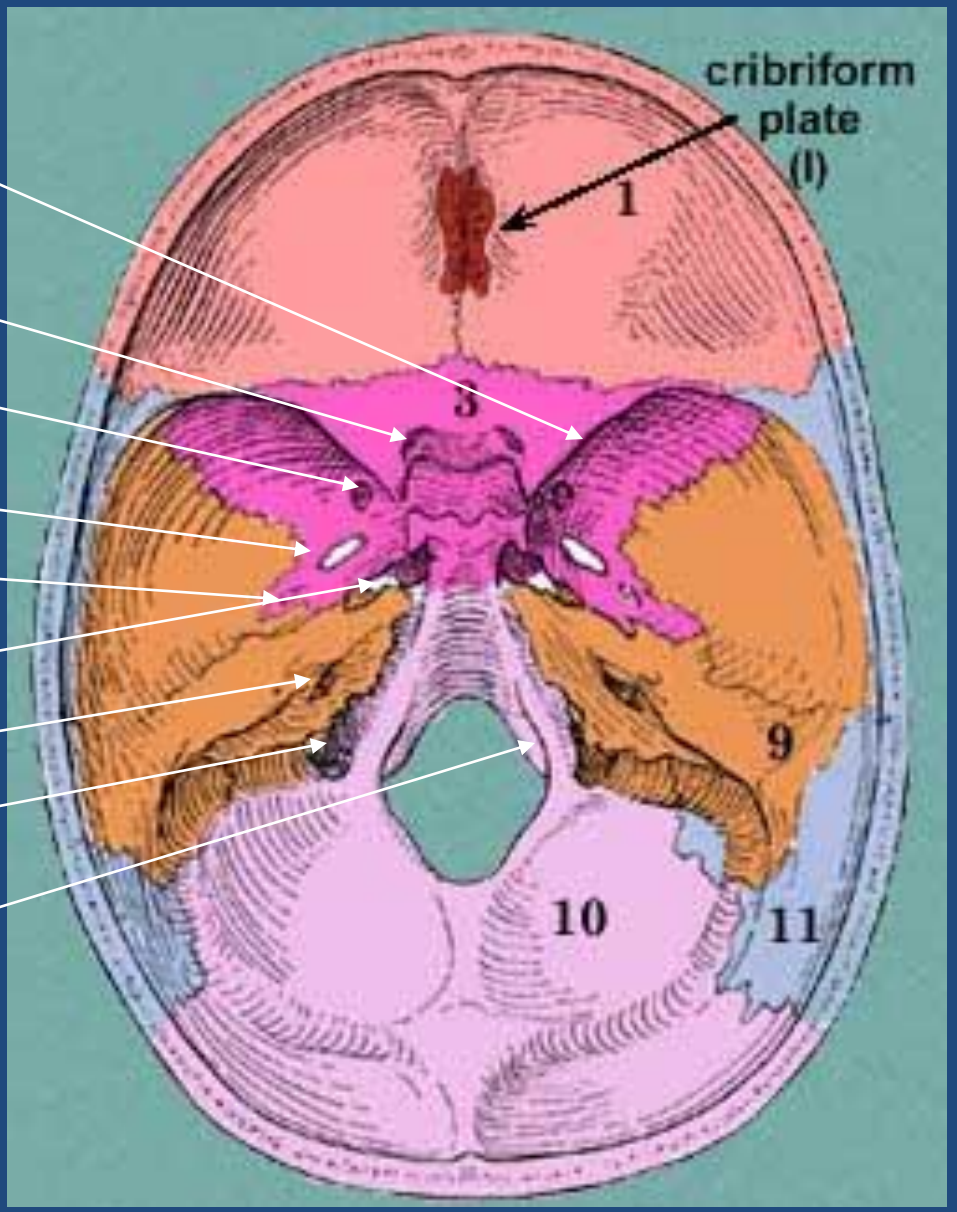
Foramen spinosum
- Middle meningeal artery passes into skull

Foramen lacerum

Internal acoustic meatus
- VII, VIII

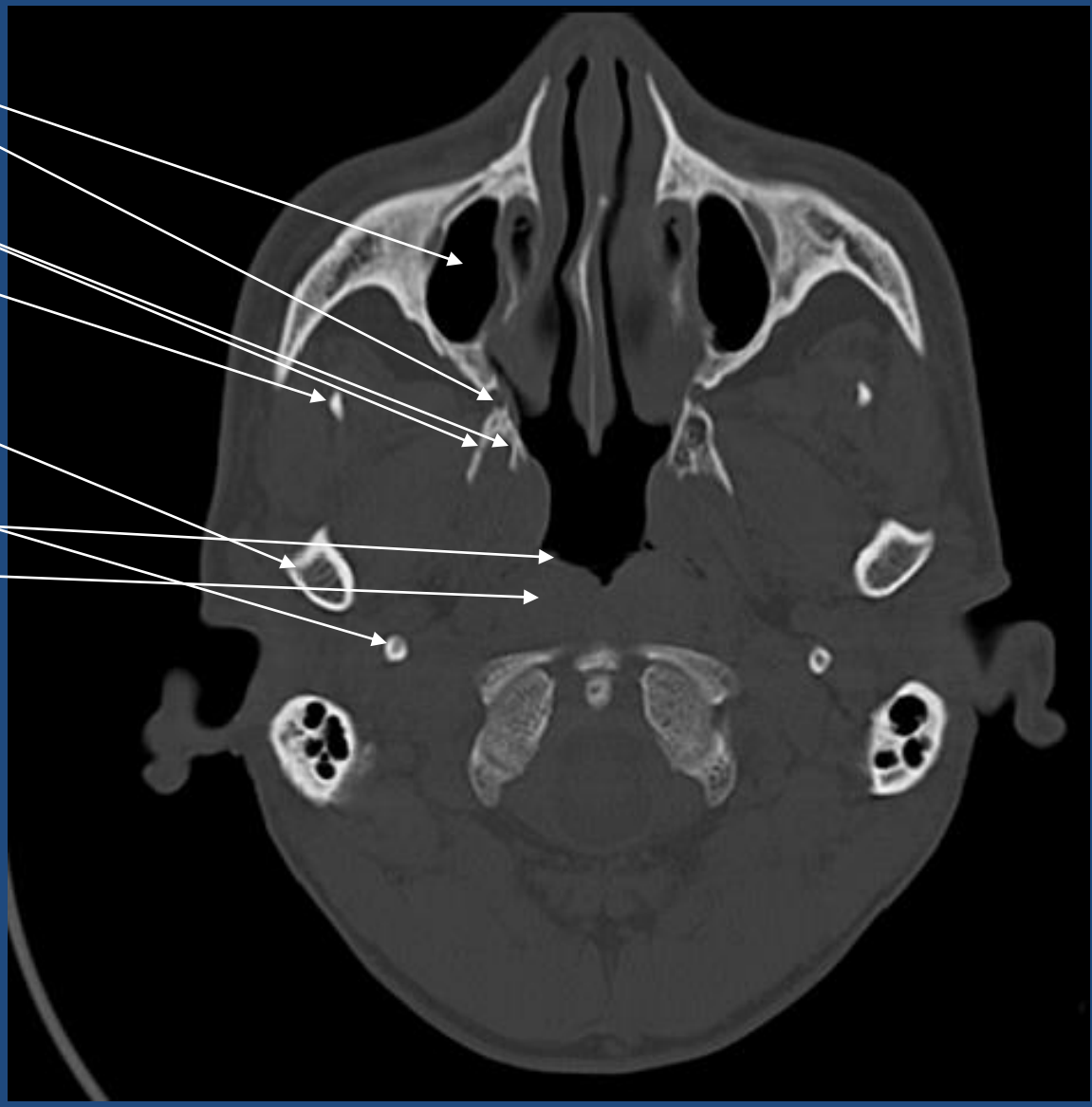
Jugular foramen
- IX, X, XI, sigmoid sinus

Hypoglossal canal
- XII



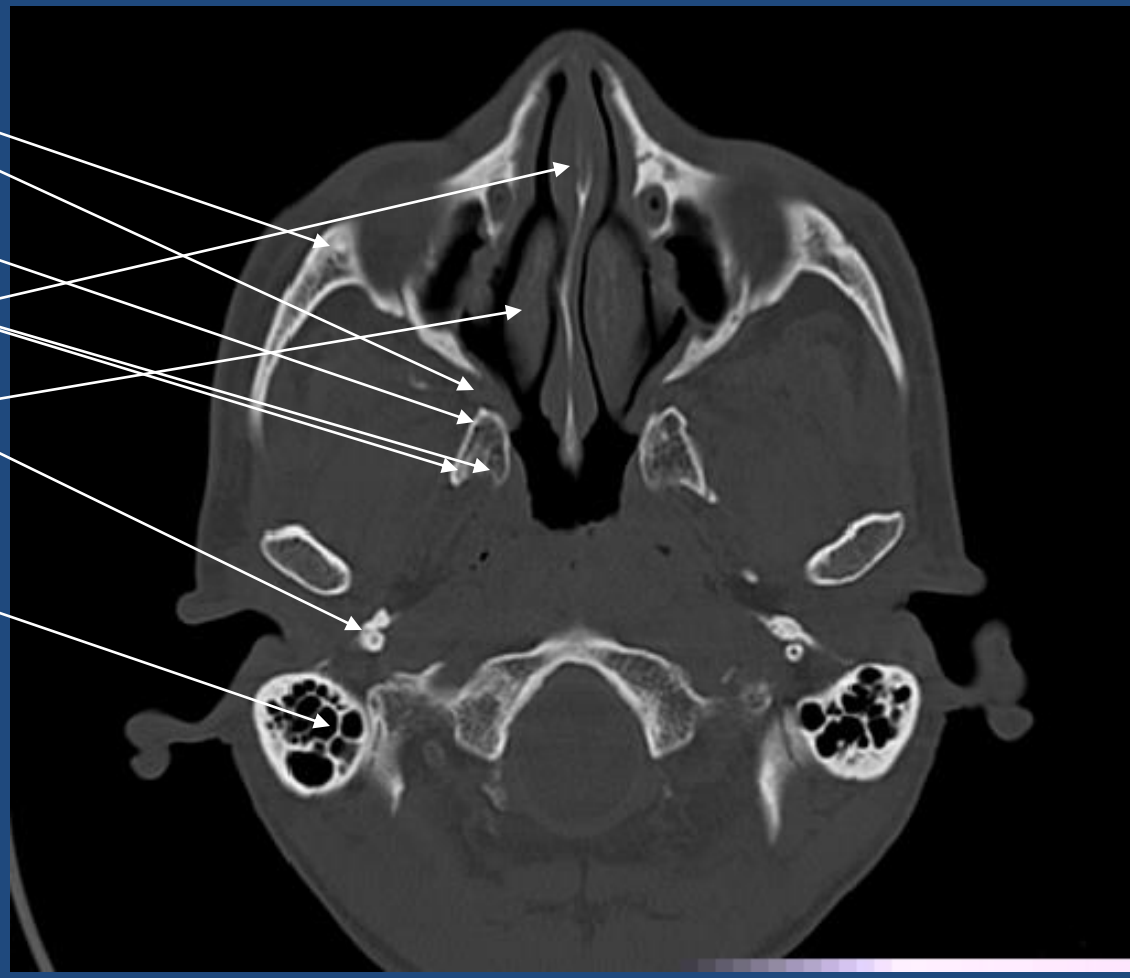
H&N Anatomy 8: CT Skull Base Test

- Maxillary sinus
- Pterygopalatine fossa
- Pterygoid plates
- Mandible - coronoid process
- Mandibular condyle
- Styloid Process
- Nasopharynx
- Retropharyngeal nodal region



H&N Anatomy 9: CT Skull Base Test

- Zygomatic bone (of maxilla)
- Pterygopalatine fossa
- Pterygoid process
- Pterygoid plates
- Styloid process
- Nasal Septum
- Nasal concha
- Mastoid air cells



H&N Anatomy 10: CT Skull Base Test

Inferior orbital fissure

Foramen ovale

- V3

Foramen spinosum

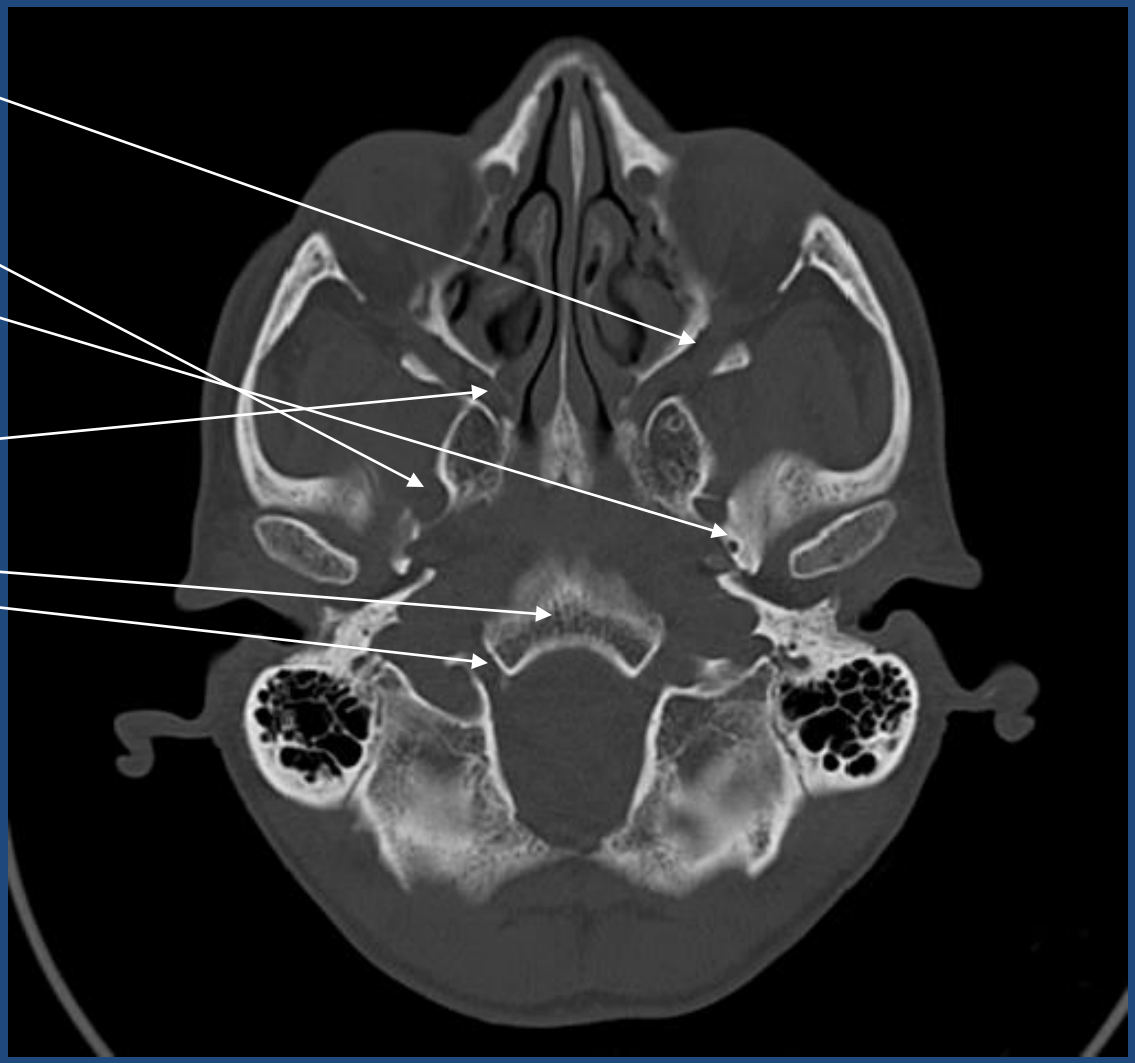
- Middle meningeal artery

Pterygopalatine fossa

Clivus

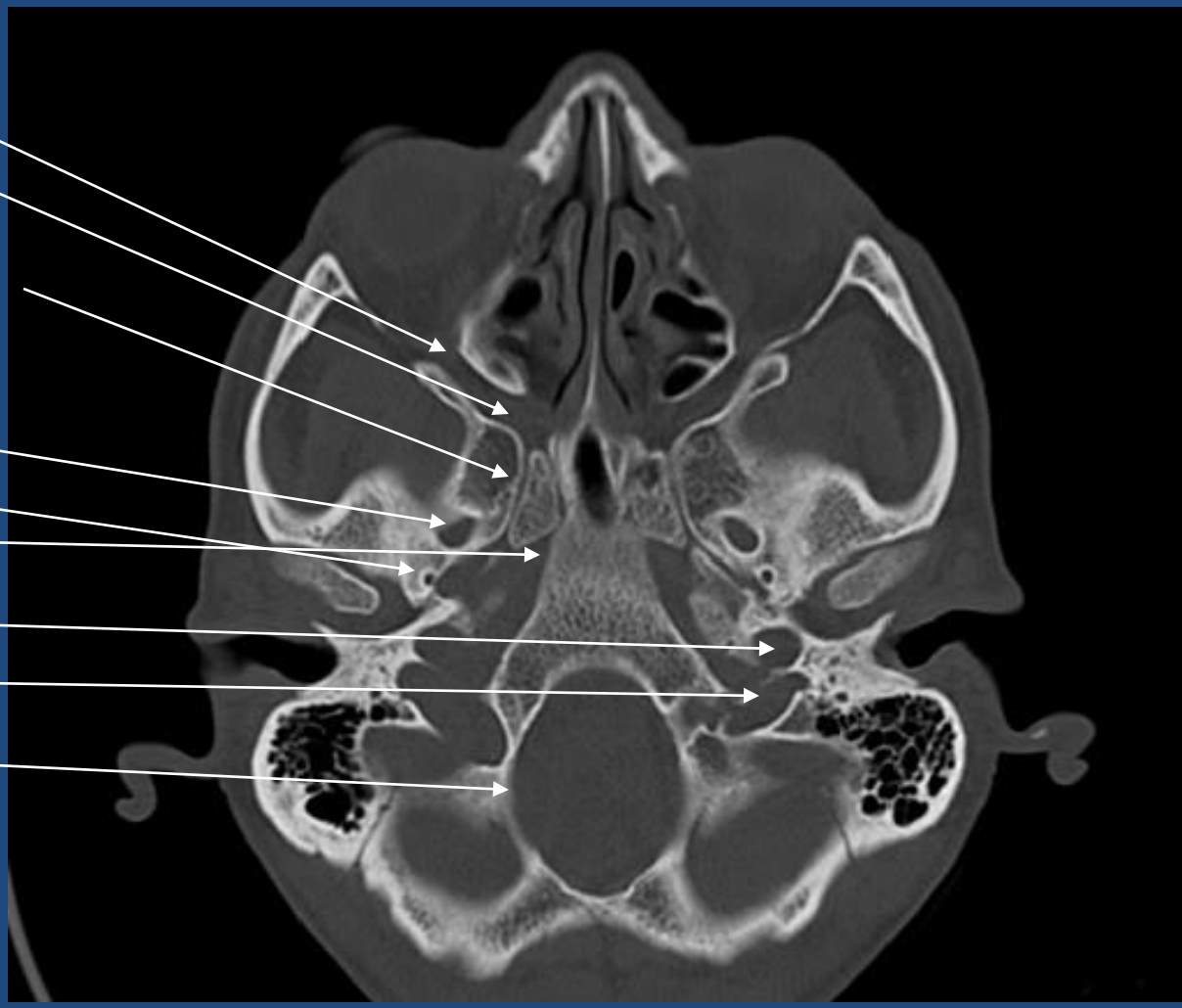
Hypoglossal canal

- XII



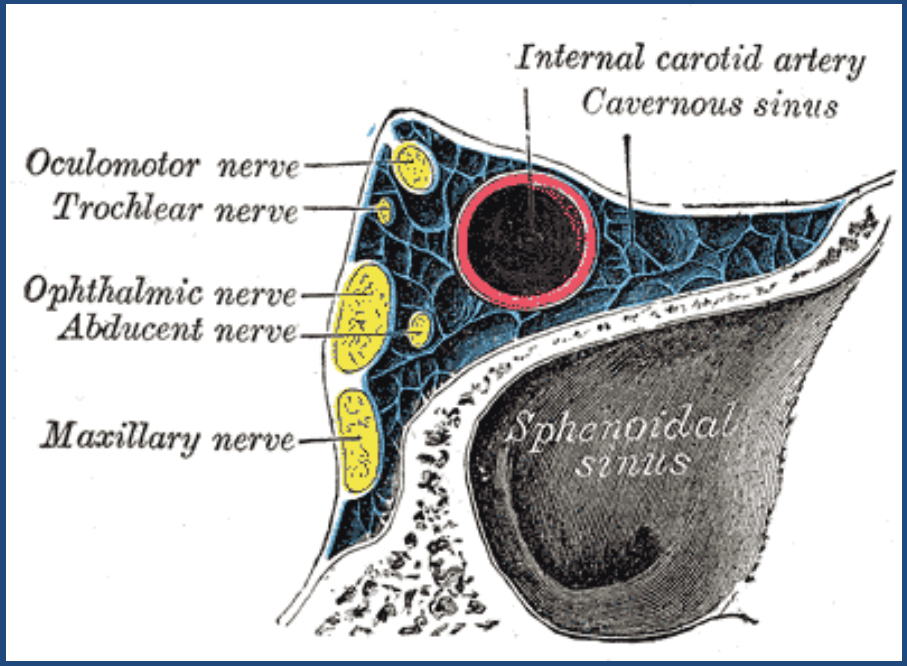
H&N Anatomy 11: CT Skull Base Test

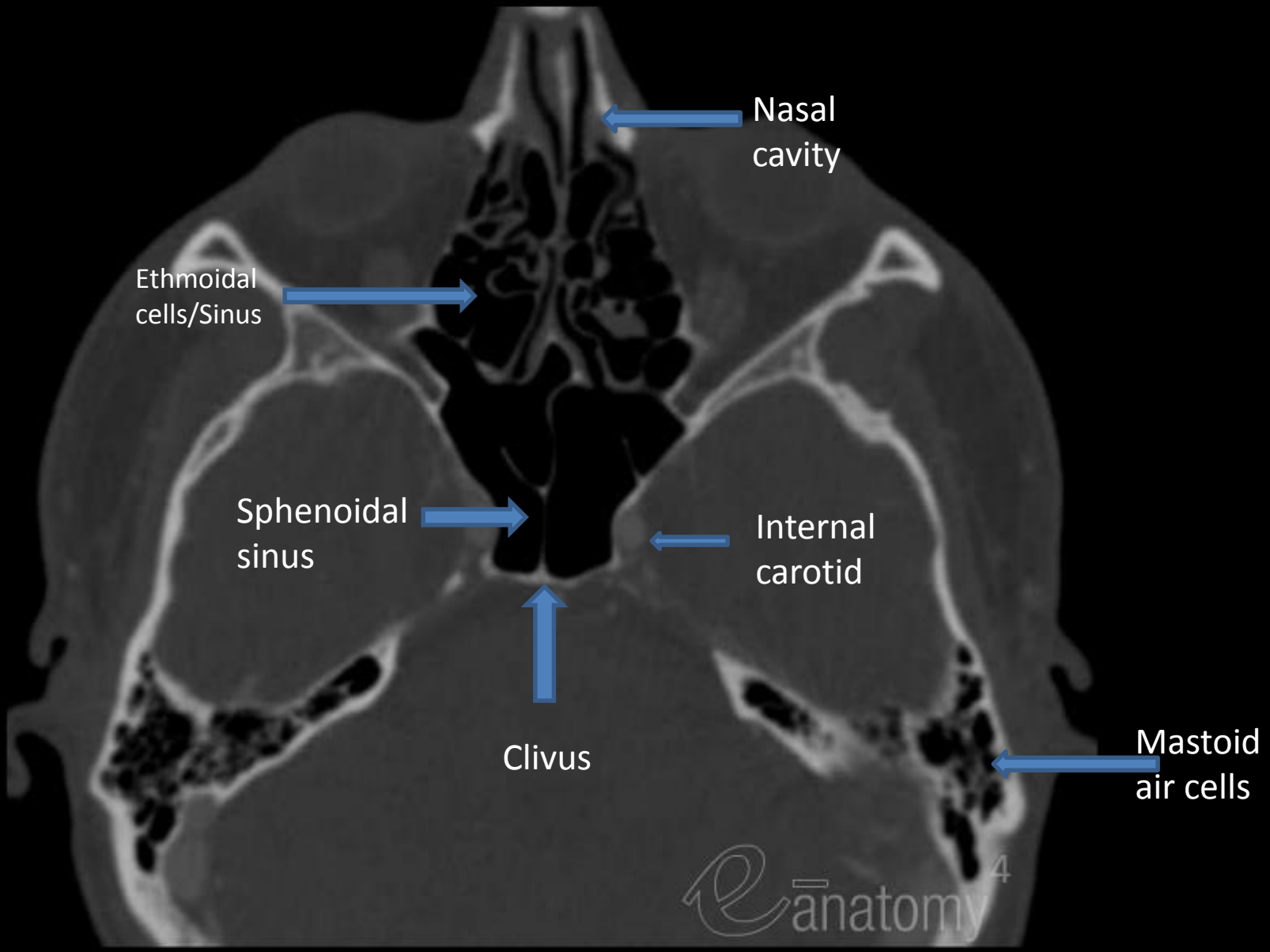
- Inferior orbital fissure
- Pterygopalatine fossa
- Pterygoid canal (aka vidian canal - contains pterygoid A and N)
- Foramen ovale
- Foramen spinosum
- Foramen lacerum
- Carotid canal
- Jugular foramen
- Foramen Magnum

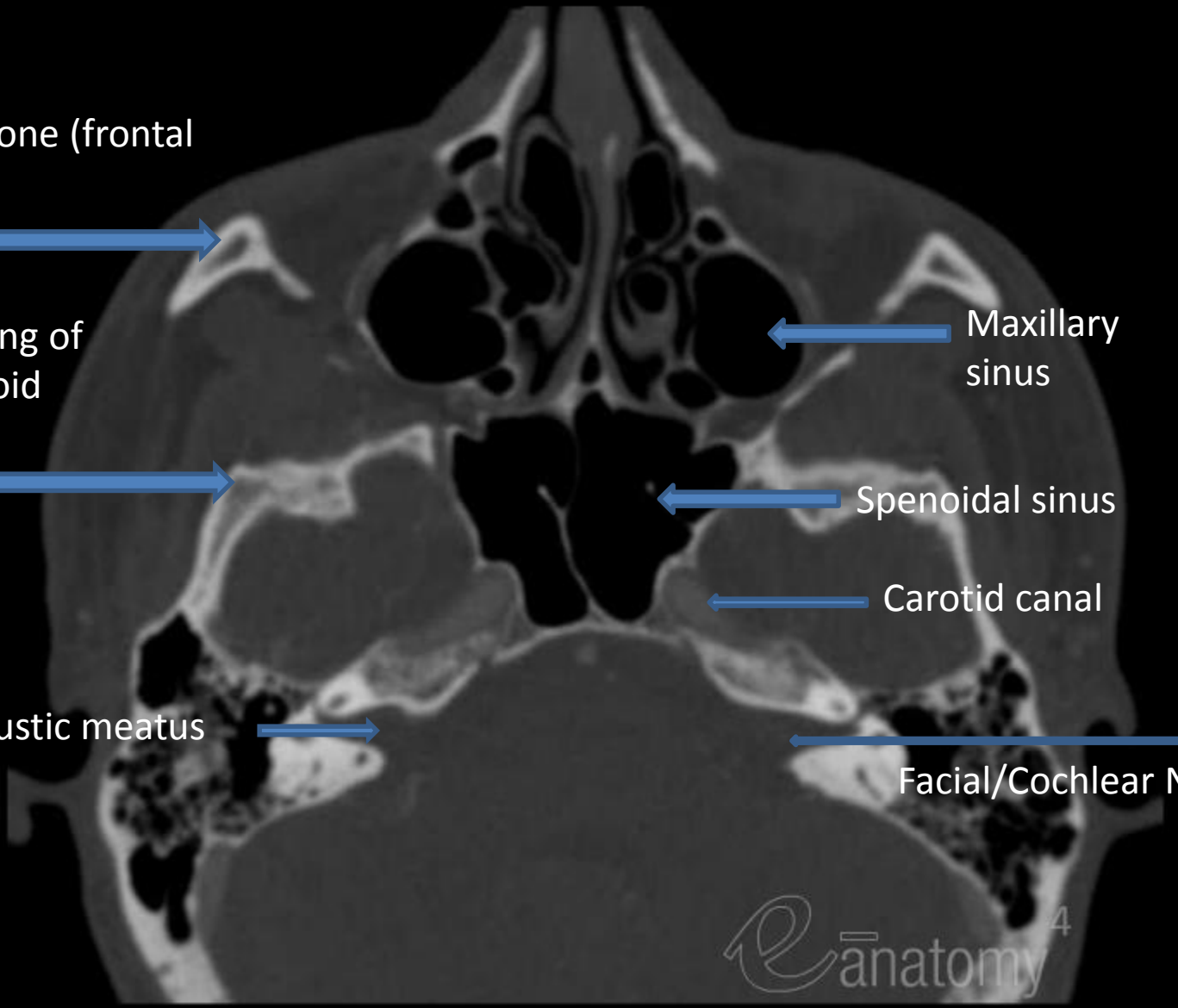


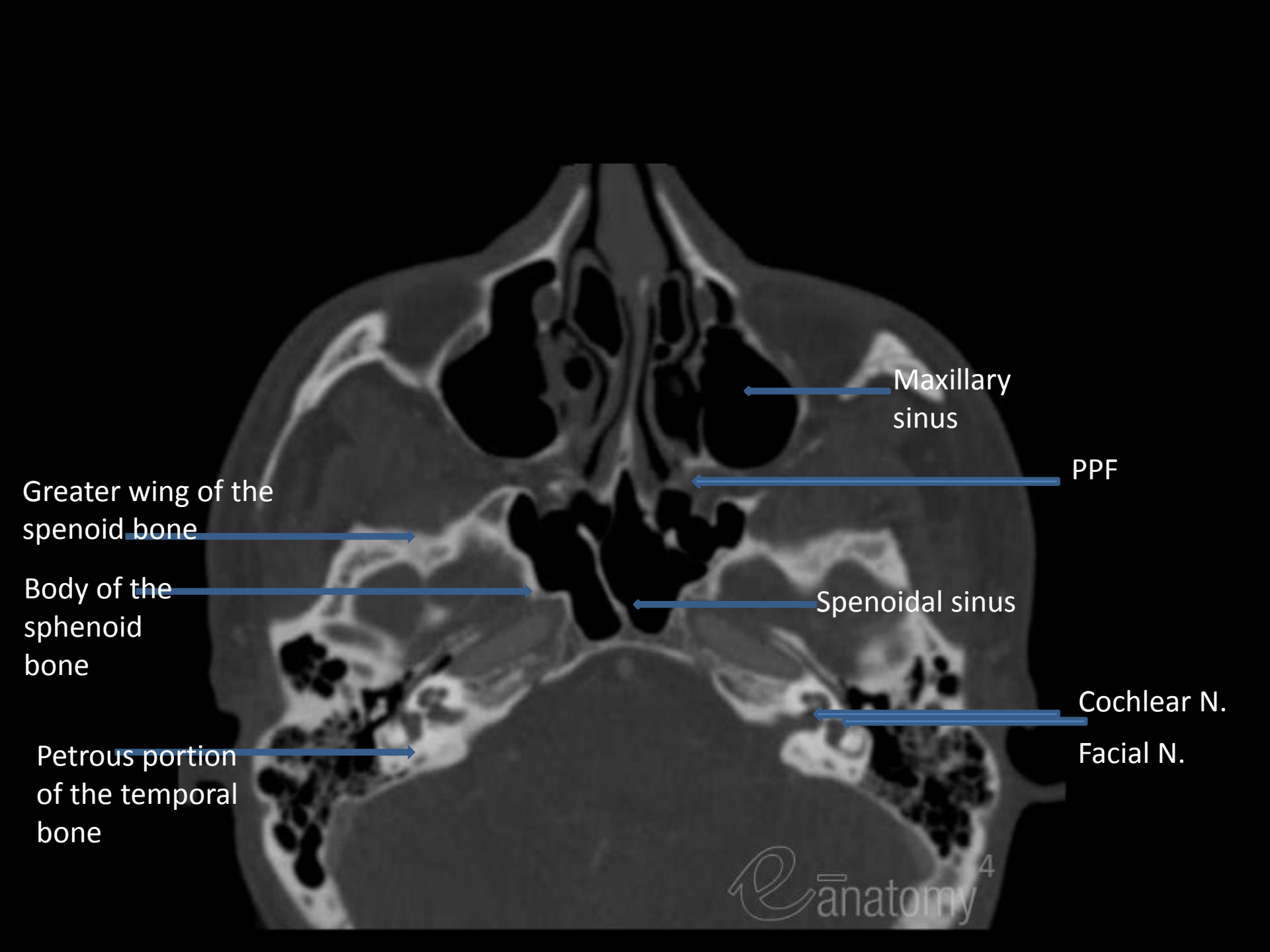
H&N Anatomy 12: Cavernous Sinus Contents

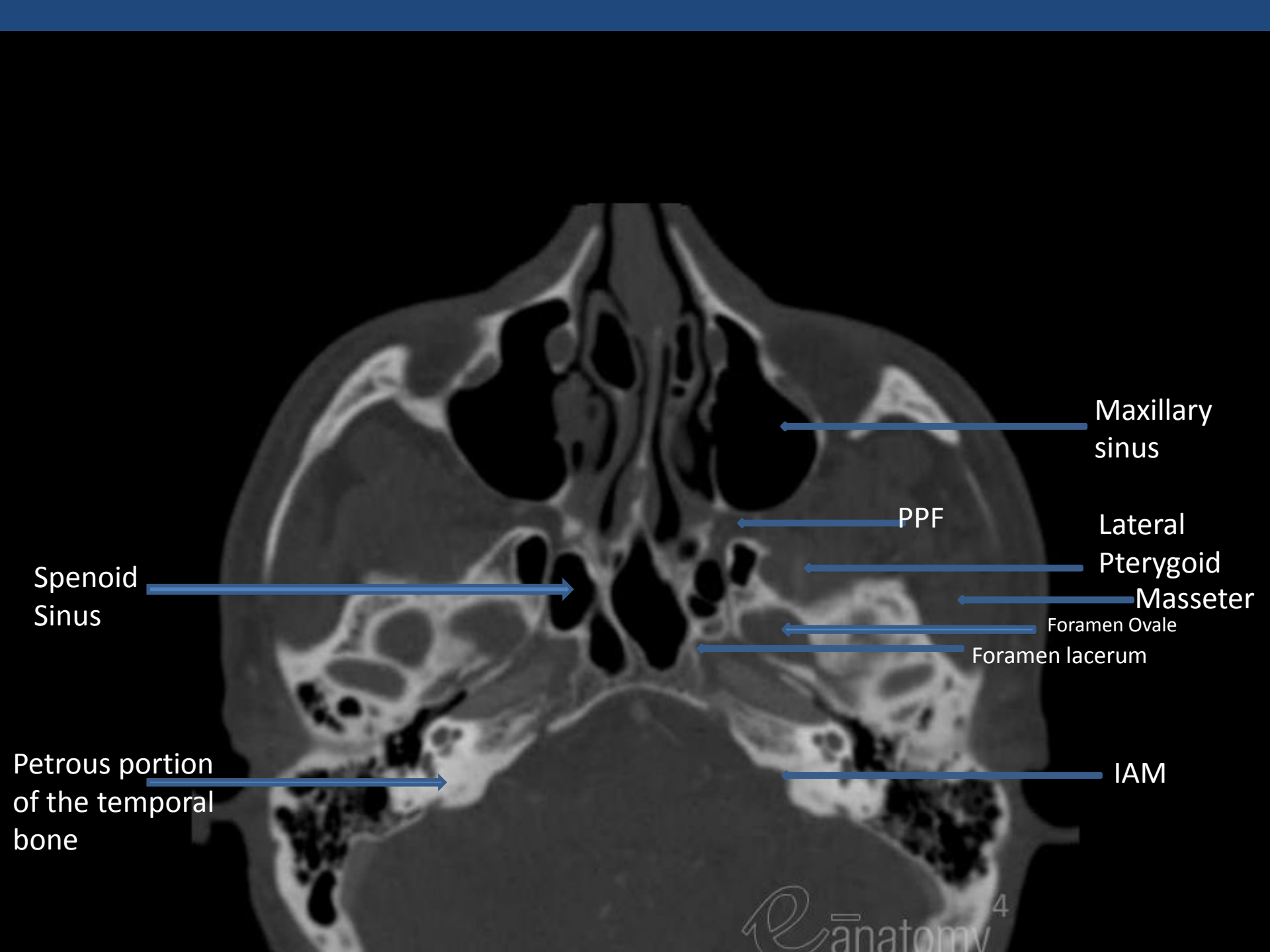
- Internal carotid artery
- CN III, IV, V1, V2, VI

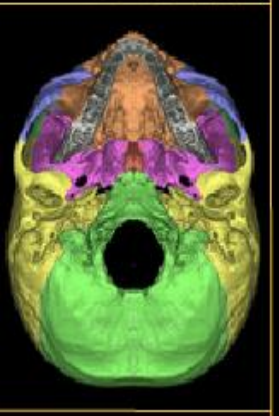


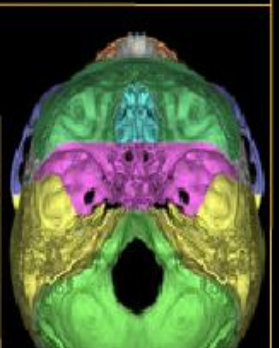

Nasal cavity
Ethmoidal cells/Sinus
Sphenoidal sinus
Internal carotid
Clivus
Mastoid air cells
anatomy


Zygomatic bone (frontal process)
Greater wing of the sphenoid bone
Maxillary sinus
Spenoidal sinus
Carotid canal
Internal acoustic meatus
Facial/Cochlear Nerve
anatomy


Maxillary sinus
PPF
Greater wing of the spenoid bone
Body of the sphenoid bone
Spenoidal sinus
Cochlear N.
Facial N.
Petrous portion of the temporal bone
anatomy


Maxillary sinus
PPF
Lateral Pterygoid
Masseter
Foramen Ovale
Foramen lacerum
Spenoid Sinus
Petrous portion of the temporal bone
IAM





Maxillary sinus

Masseter

Soft palate

Medial pterygoid

Ramus of mandible

Nasopharynx

Parotid

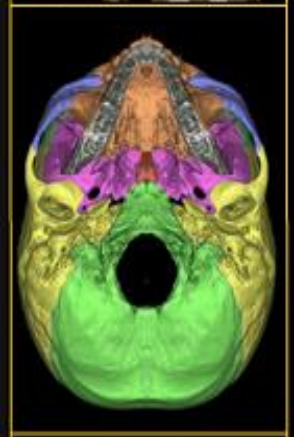
Atlas

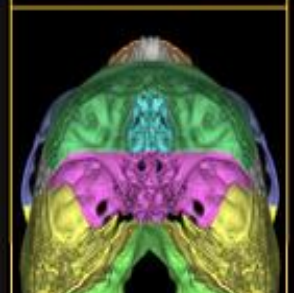
Axis

Ext. Carotid

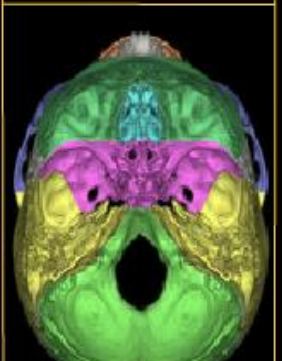
Int. Carotid

Int Jug Vein

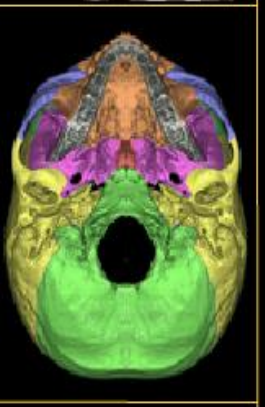


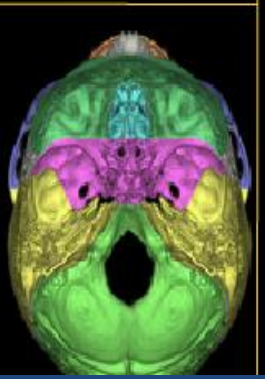



Body of Tongue
Masseter
Ramus of Mandible
RP node
Palantine Tonsil
Soft Palate
Medial Pterygoid
Superior Constrictor




Tongue
Palatopharyngeal arc
Palantine Tonsil
Sup. Constrictor
Partoid
Atlas C1
Axis C2
Vertebral artery





Sublingual Gland

Platysma

BOT

Submandibular gland

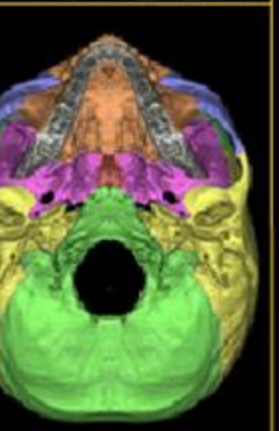
Epiglottis

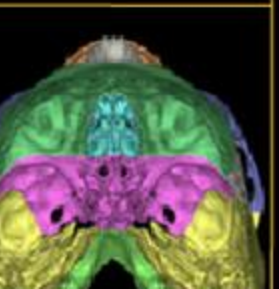
RP Node

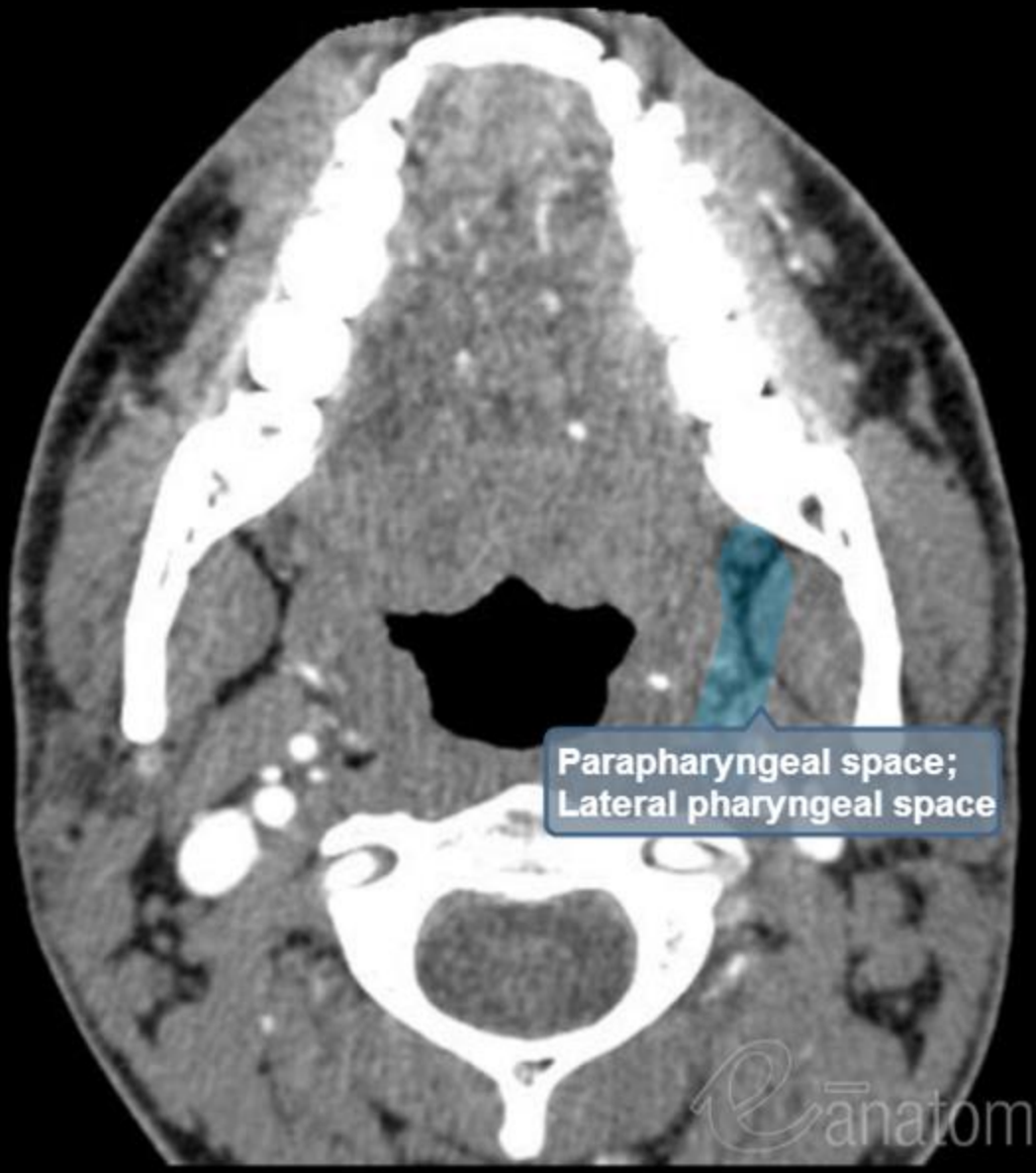
JD Node

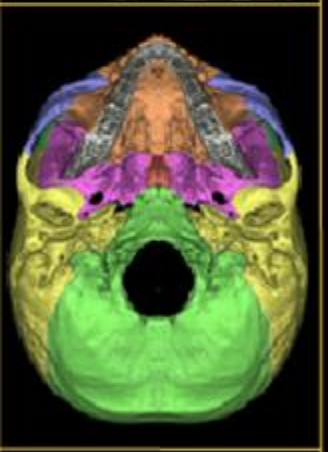
Post Pillar of Tonsil

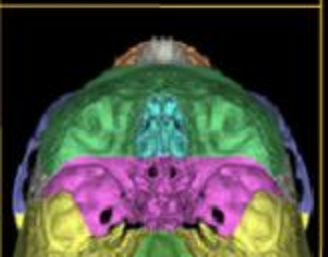
Superior/Middle constrictor

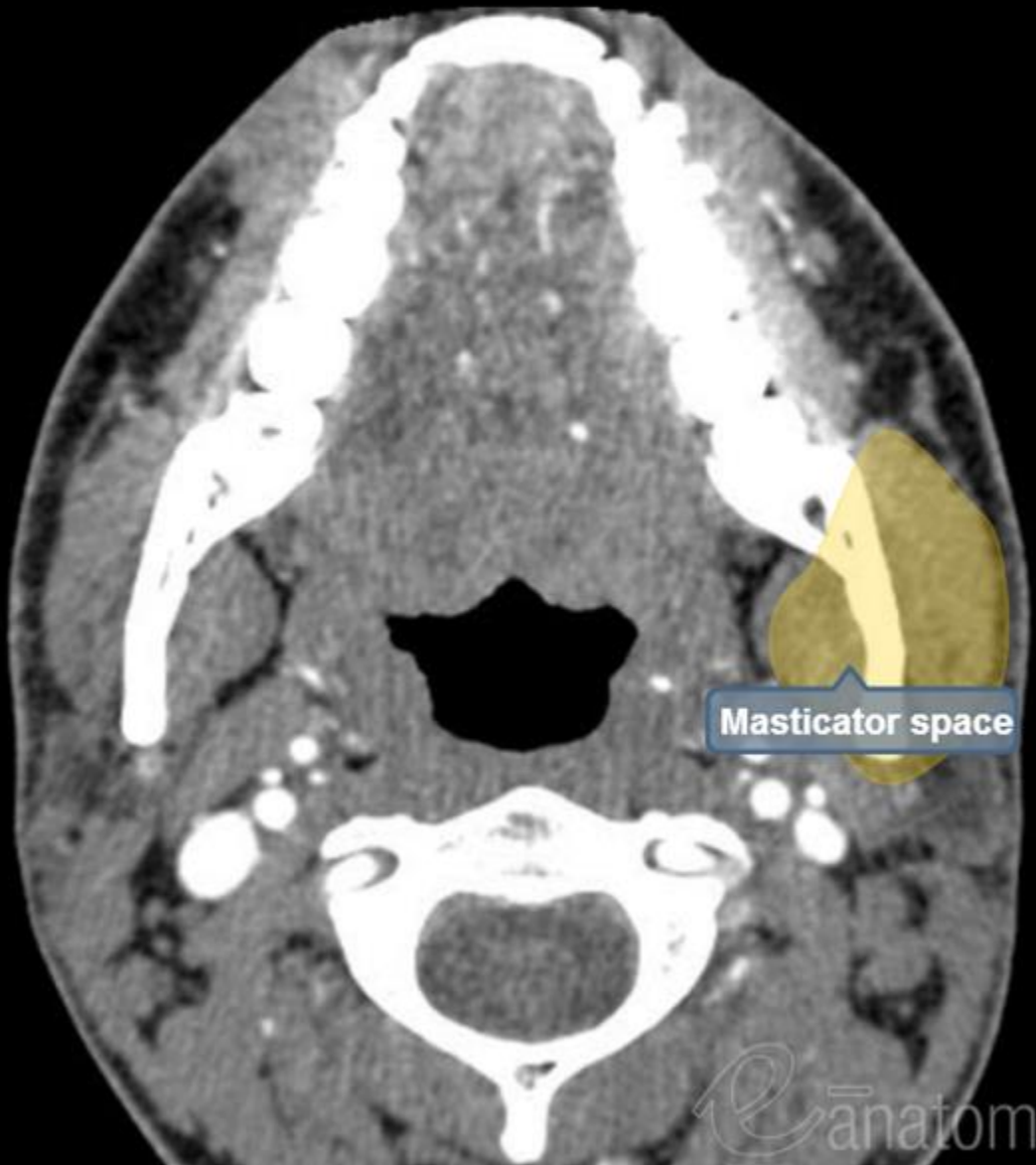


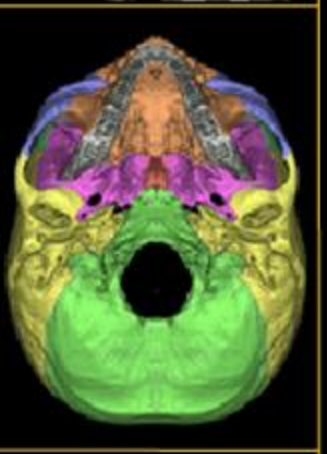


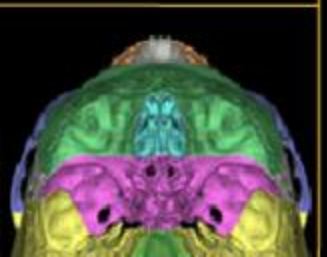

Parapharyngeal space;
Lateral pharyngeal space

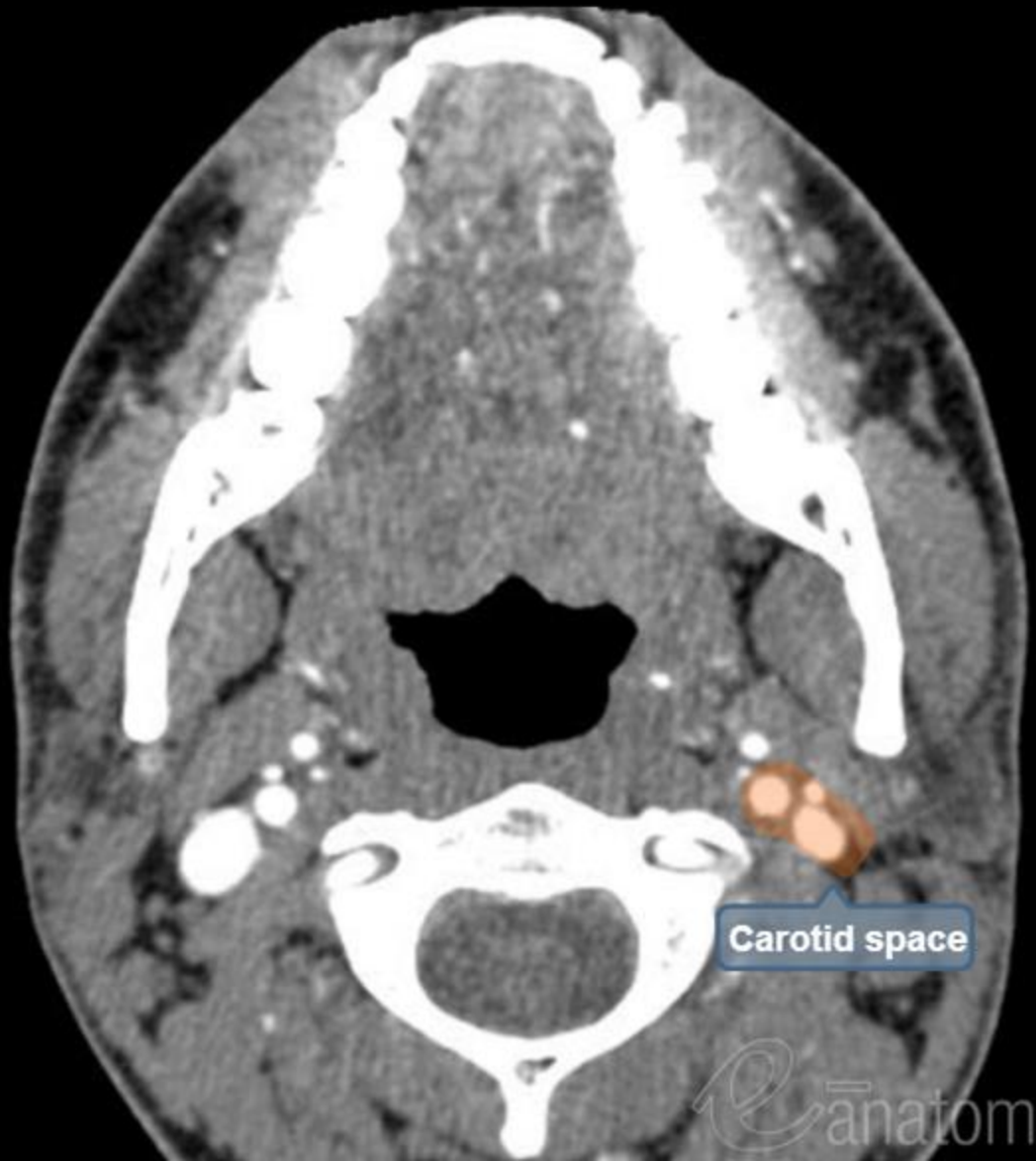


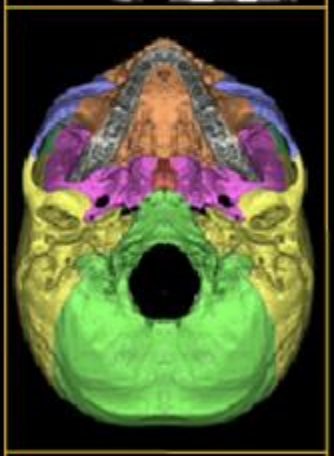


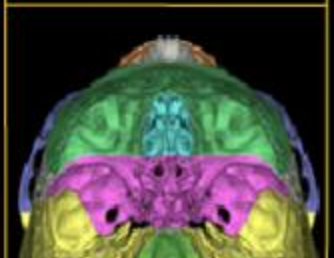

Masticator space



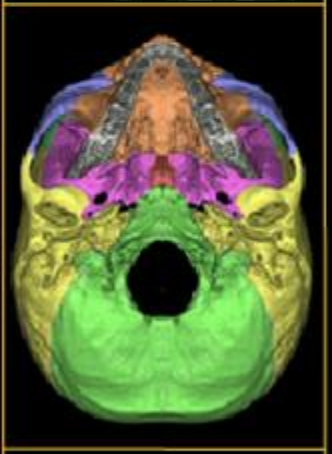


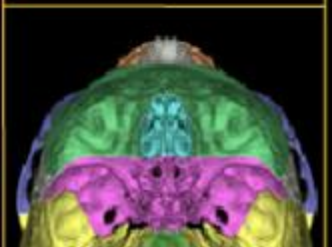

Carotid space

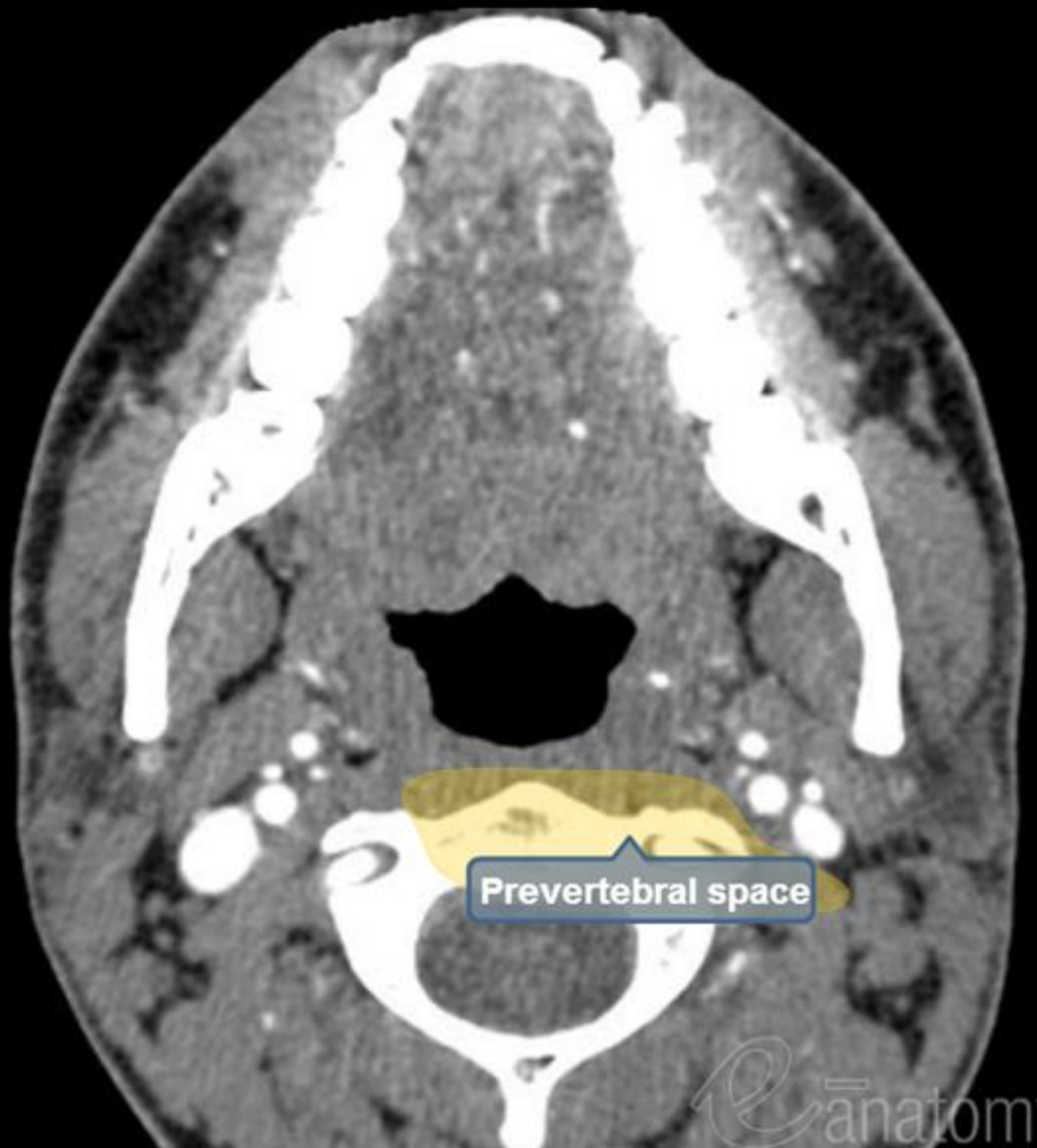


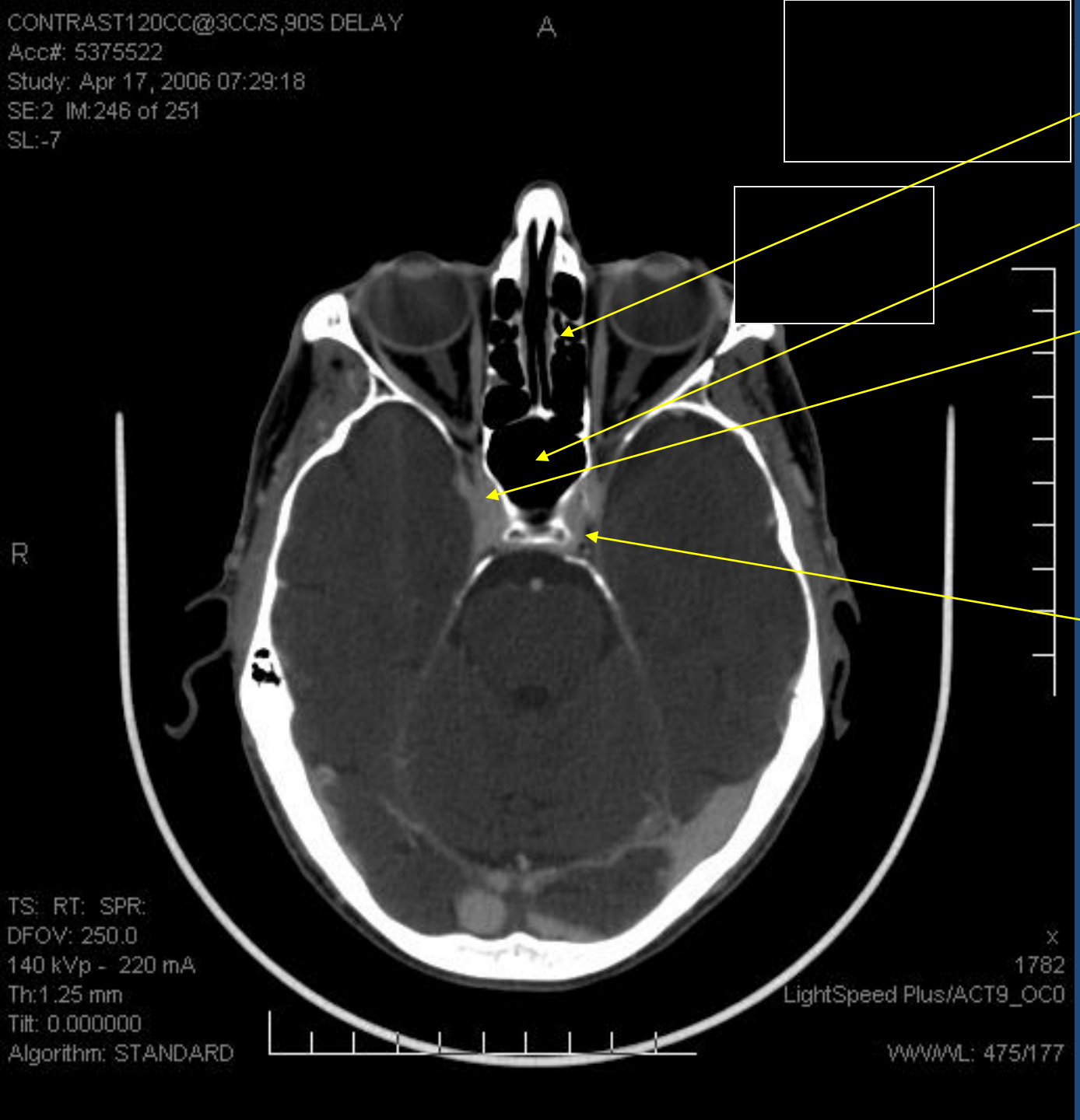



Mucosal pharyngeal space






Prevertebral space

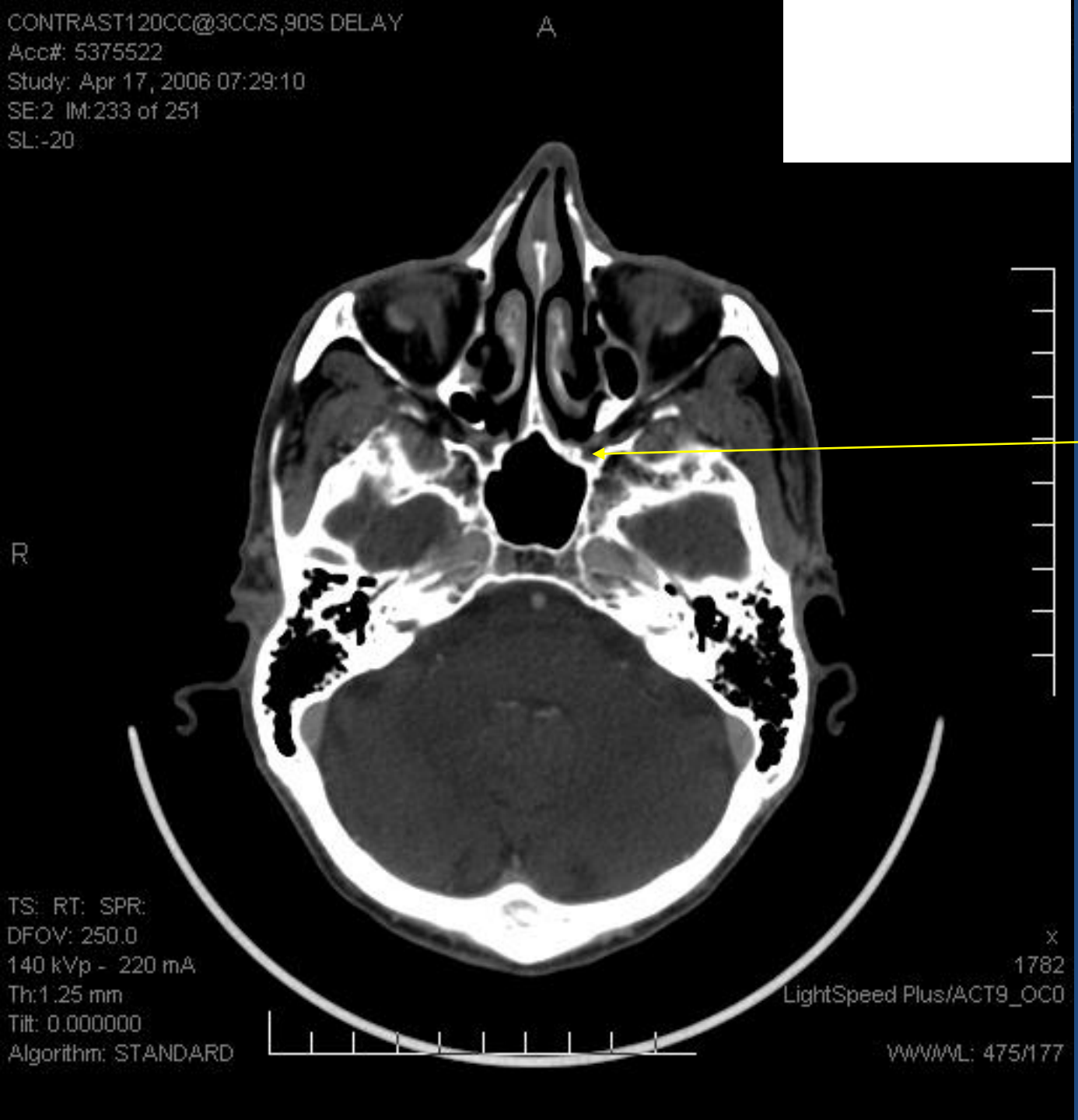


Ethmoid Sinus

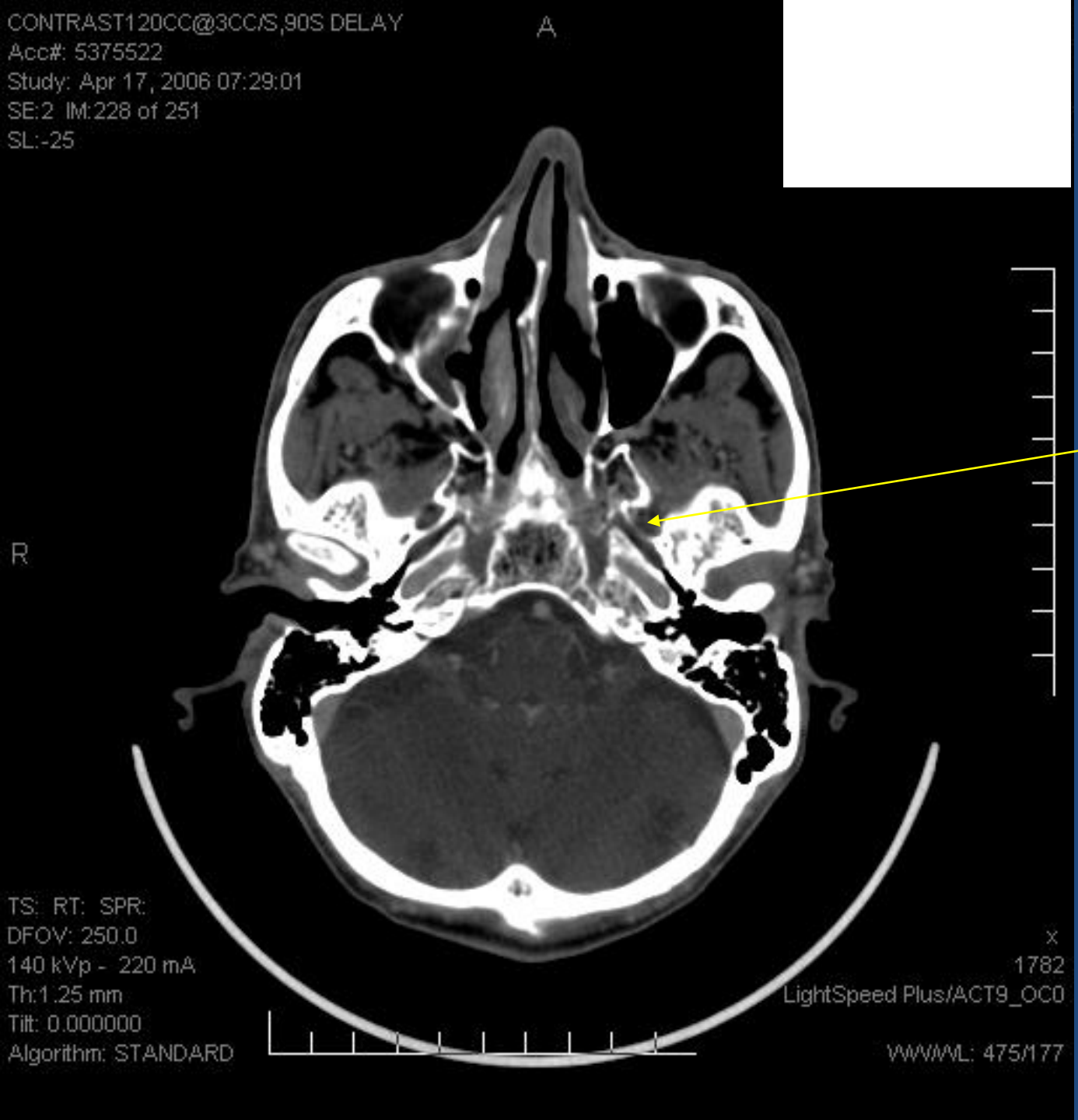
Sphenoid Sinus

Cavernous Sinus
- III
- IV
- V1-Opthalmic
- V2-Maxillary
- VI-Abducens

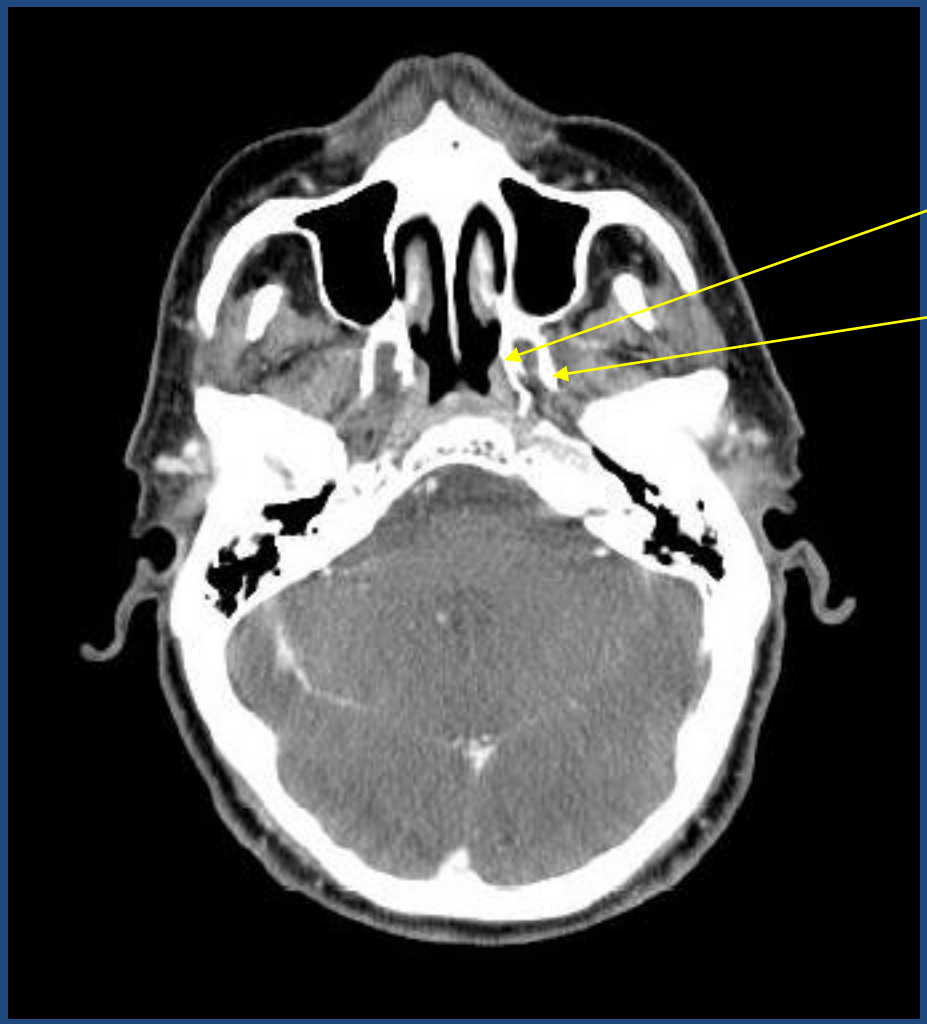
Trigeminal ganglion (Meckel's Cave

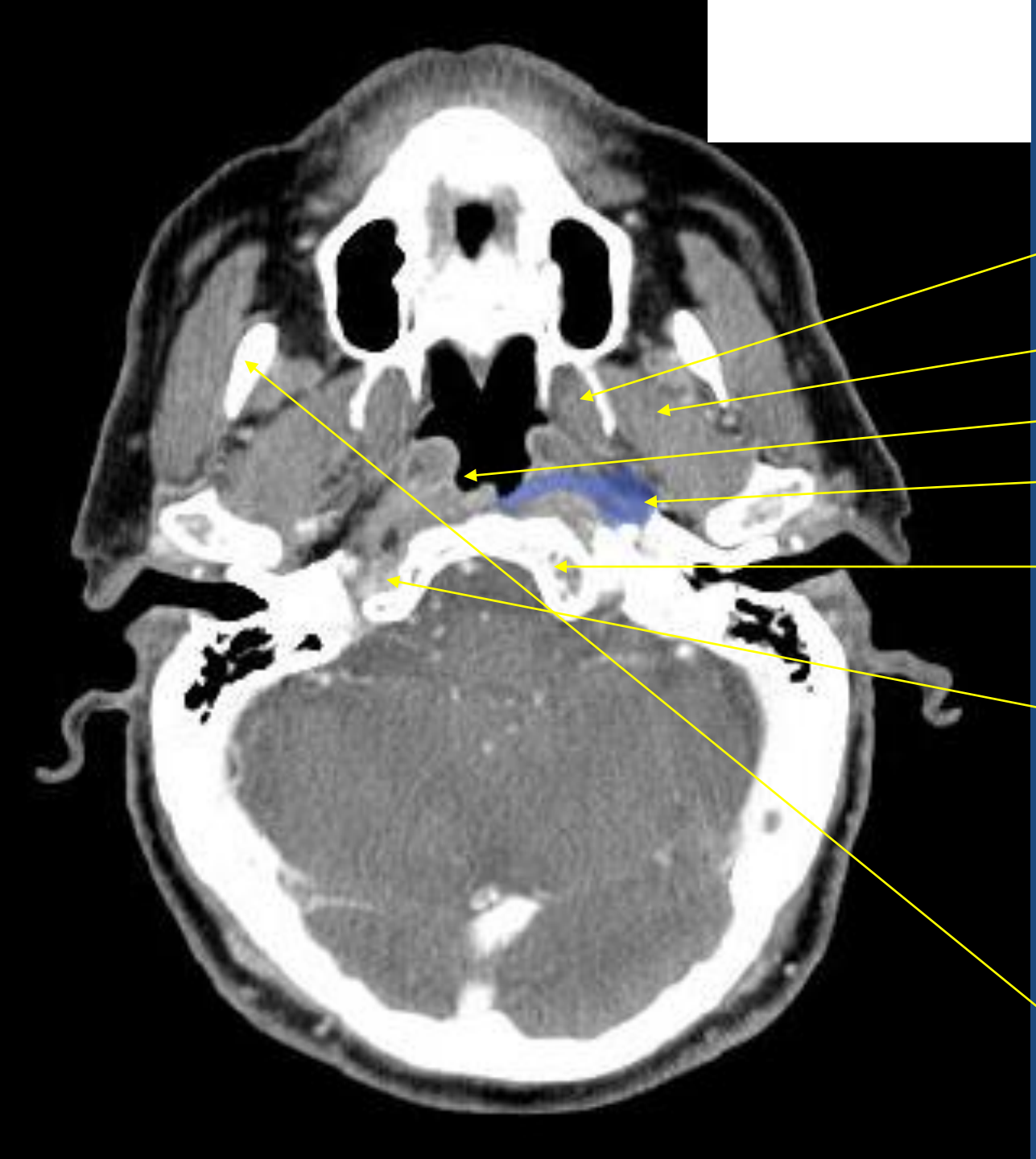


Foramen Rotundum
V2



Foramen Ovale V3


Medial Pteygoid plate
Lateral Pterygoid Plate

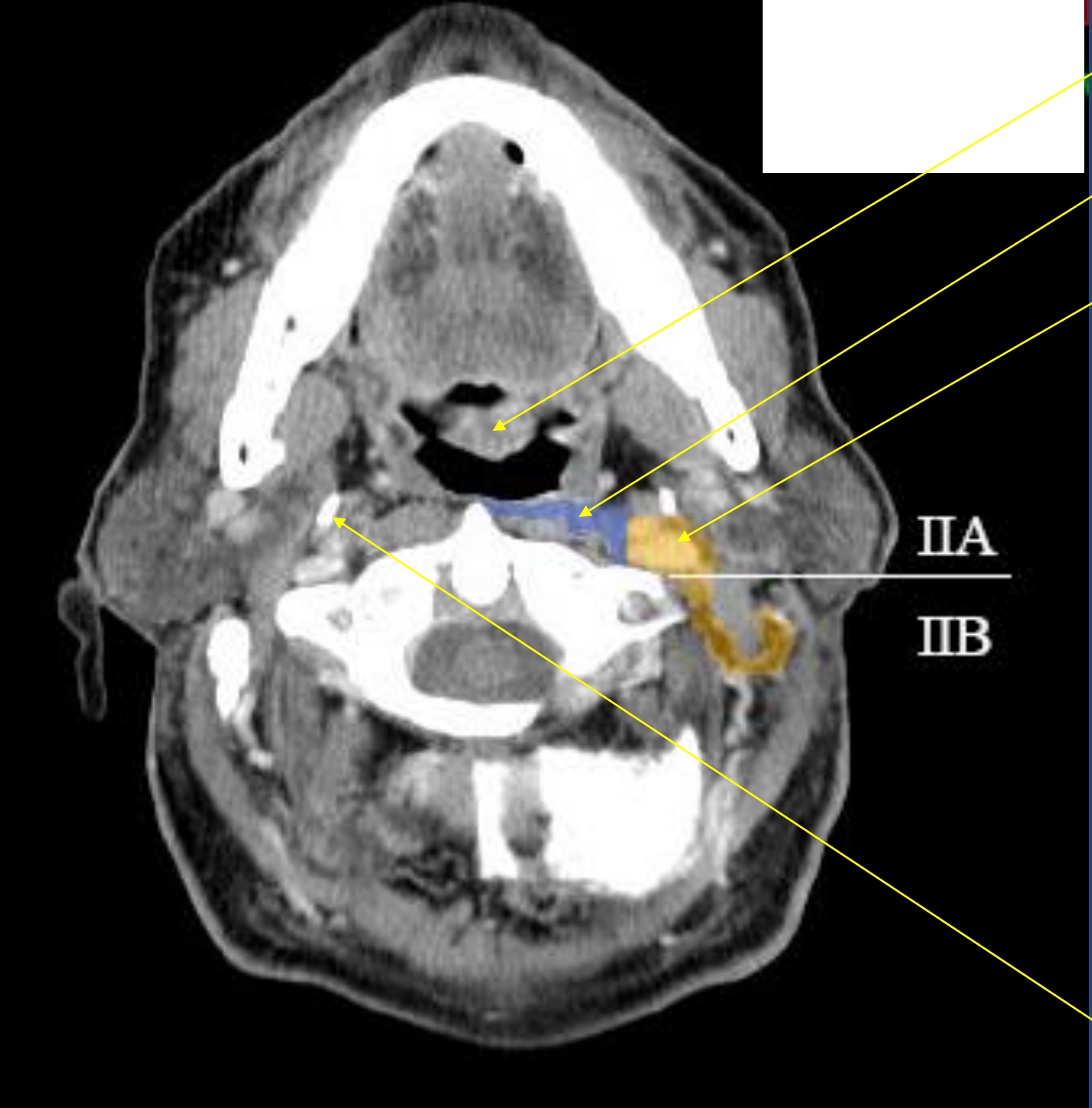

Medial Pterygoid
Lateral Pterygoid
Fossa of Rosenmueller
Retropharyngeal Nodes
Clivus
Jugular Fossa
Coronoid Process of the mandible

Reteropharyngeal Nodes

- Base of skull-sup
- Cranial edge of the body of hyoid bone-inf
- Fascia under the pharyngeal mucosa-ant
- Prevertebral m. (longus colli, longus -post capitis)
- Medial edge of the internal carotid Artery-lat

Midline-med

Longus capitis muscle



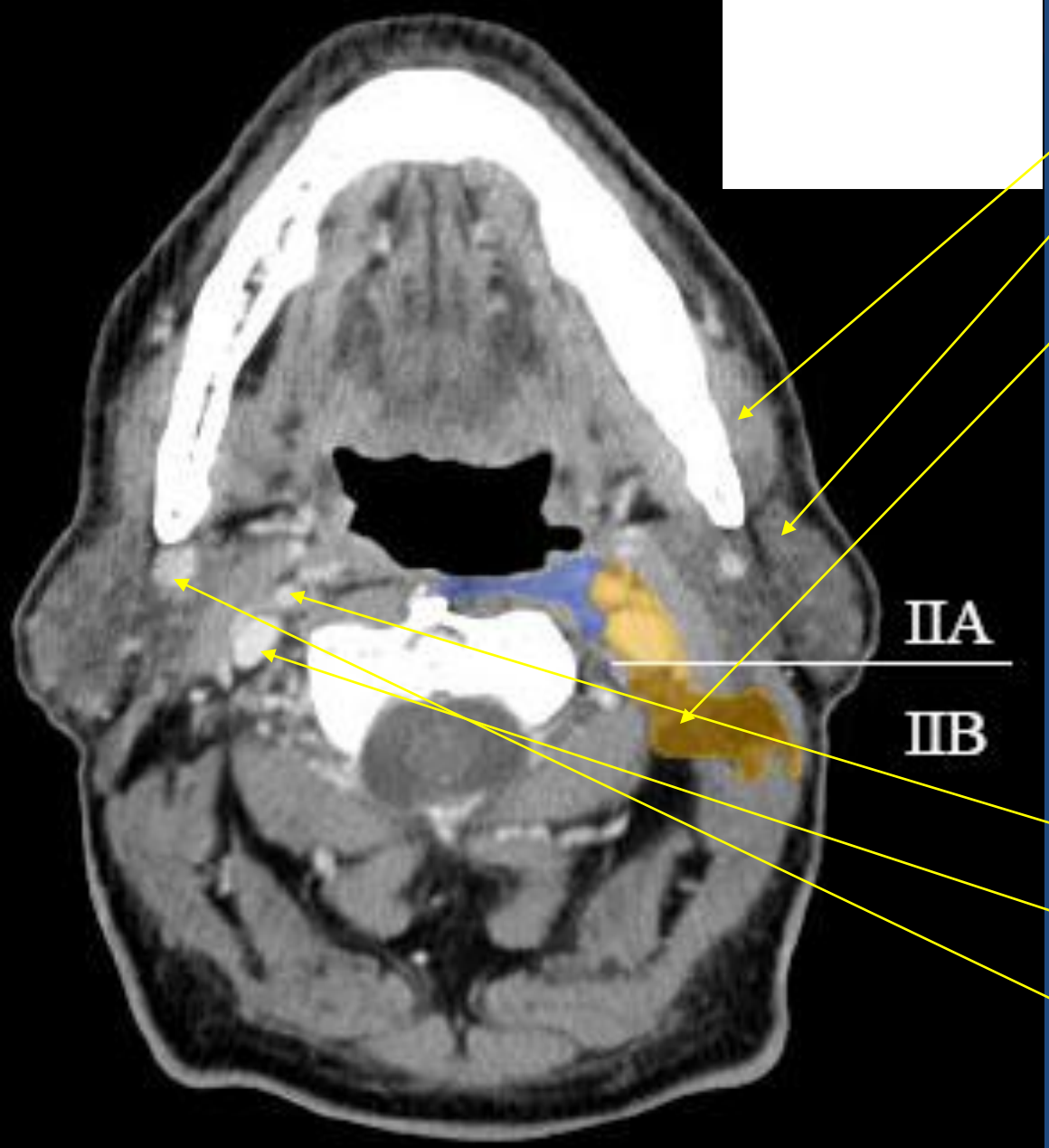
Soft Palate/Uvula

Retropharyngeal Nodes

Level IIA

- Caudal edge of lateral process of C1-sup
- Caudal edge of the body of hyoid bone-inf
- Post. edge of submandibular gland; ant.edge of int. carotid artery; post. edge of post. belly of digastric m.-ant
- Post. Border of int. jugular vein-post
- Medial edge of sternocleidomastoid-lat
- Medial edge of int. carotid artery, paraspinal (levator scapulae) m.-medial

Styloid Process



Masseter

Parotid

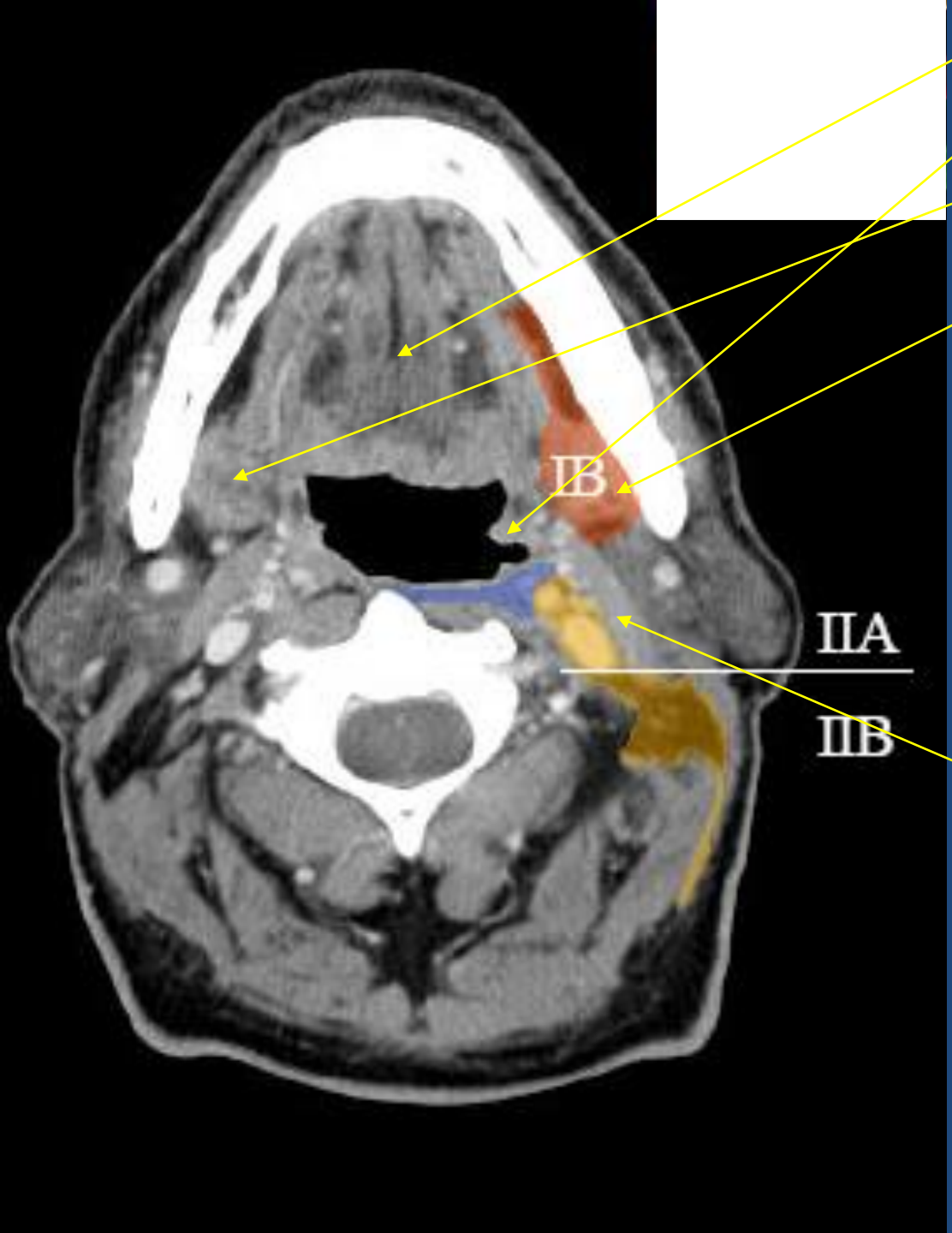
Level IIB

- Caudal edge of lateral process of C1-sup
- Caudal edge of the body of hyoid bone-inf
- Post. Border of int. jugular vein-ant
- Post. border of the sternocleidomastoid m.-post
- Medial edge of sternocleidomastoid-lat
- Medial edge of int. carotid artery, paraspinal (levator scapulae) m.-med

Facial a. vs. internal carotid a?

Internal carotid a. vs. internal jugular vein?.

External carotid a. vs. retromandibular vein?



Oral Tongue

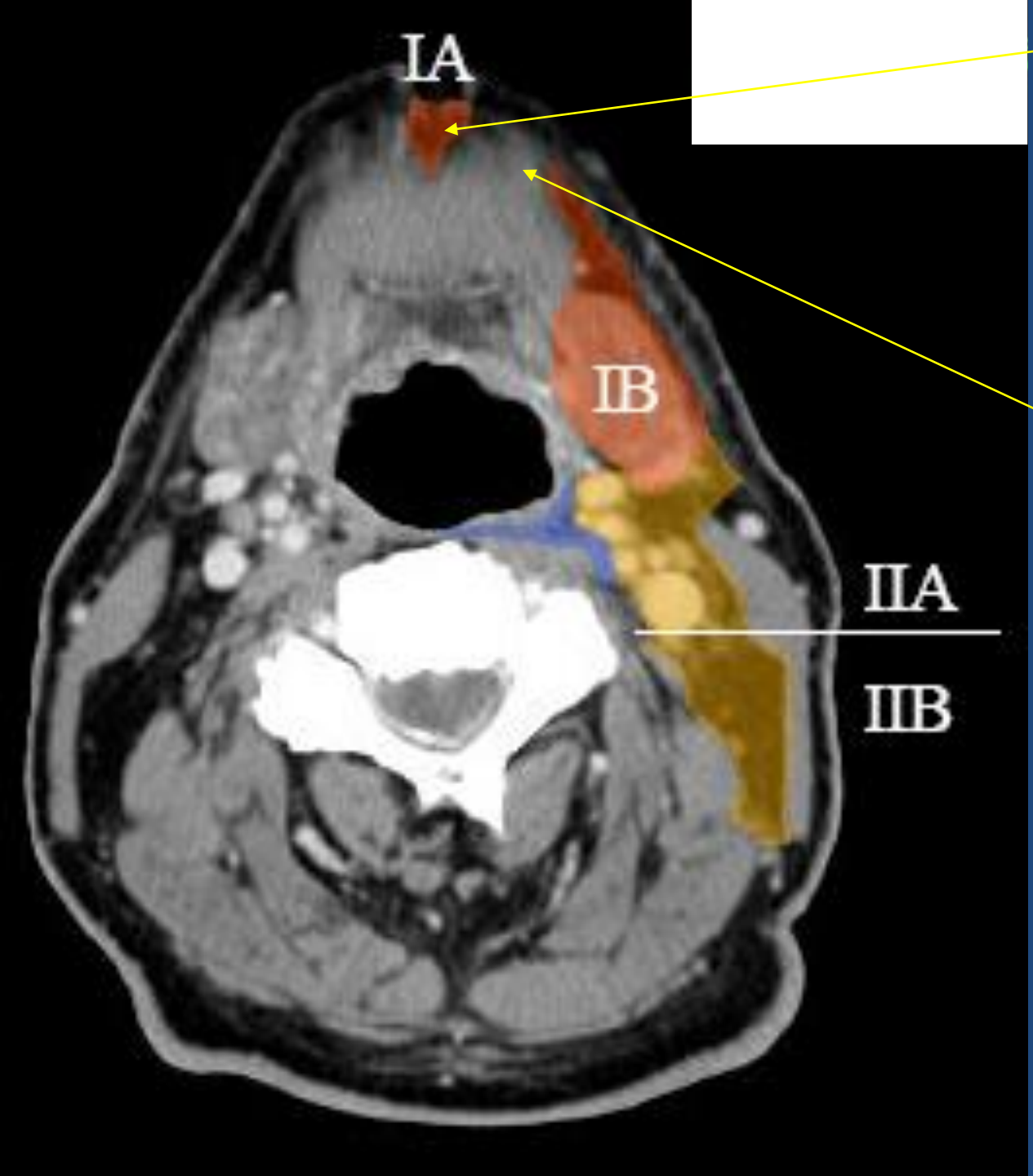
Tonsil

Submandibular gland

Level IB

- Mylohyoid m., cranial edge of submandibular gland-sup
- Plane through central part of hyoid bone - inf
- Symphysis menti, platysma m.-ant
- Posterior edge of submandibular gland - post
- Basilar edge / innerside of mandible, platysma m., skin - lat
- Lateral edge of ant. belly of digastric m. - med

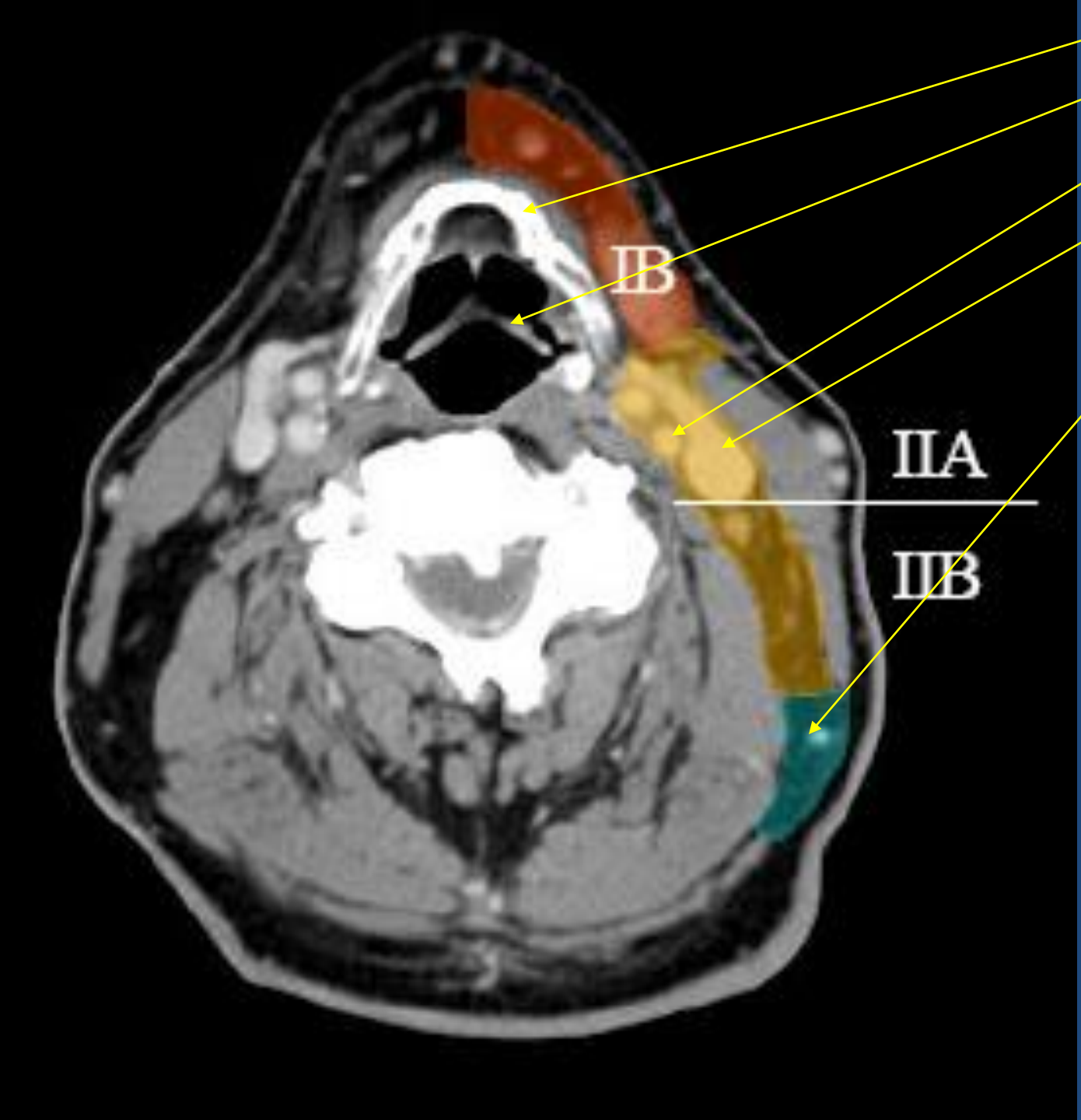
Posterior Belly Digastric m.



Level IA

- Geniohyoid m., plane tangent to basilar edge of mandible - sup
- Plane tangent to body of hyoid bone - inf
- Symphysis menti, platysma m. - ant
- Body of hyoid bone - post
- Medial edge of ant. belly of digastric m. - lat

Anterior belly Digastric m.



Hyoid Bone

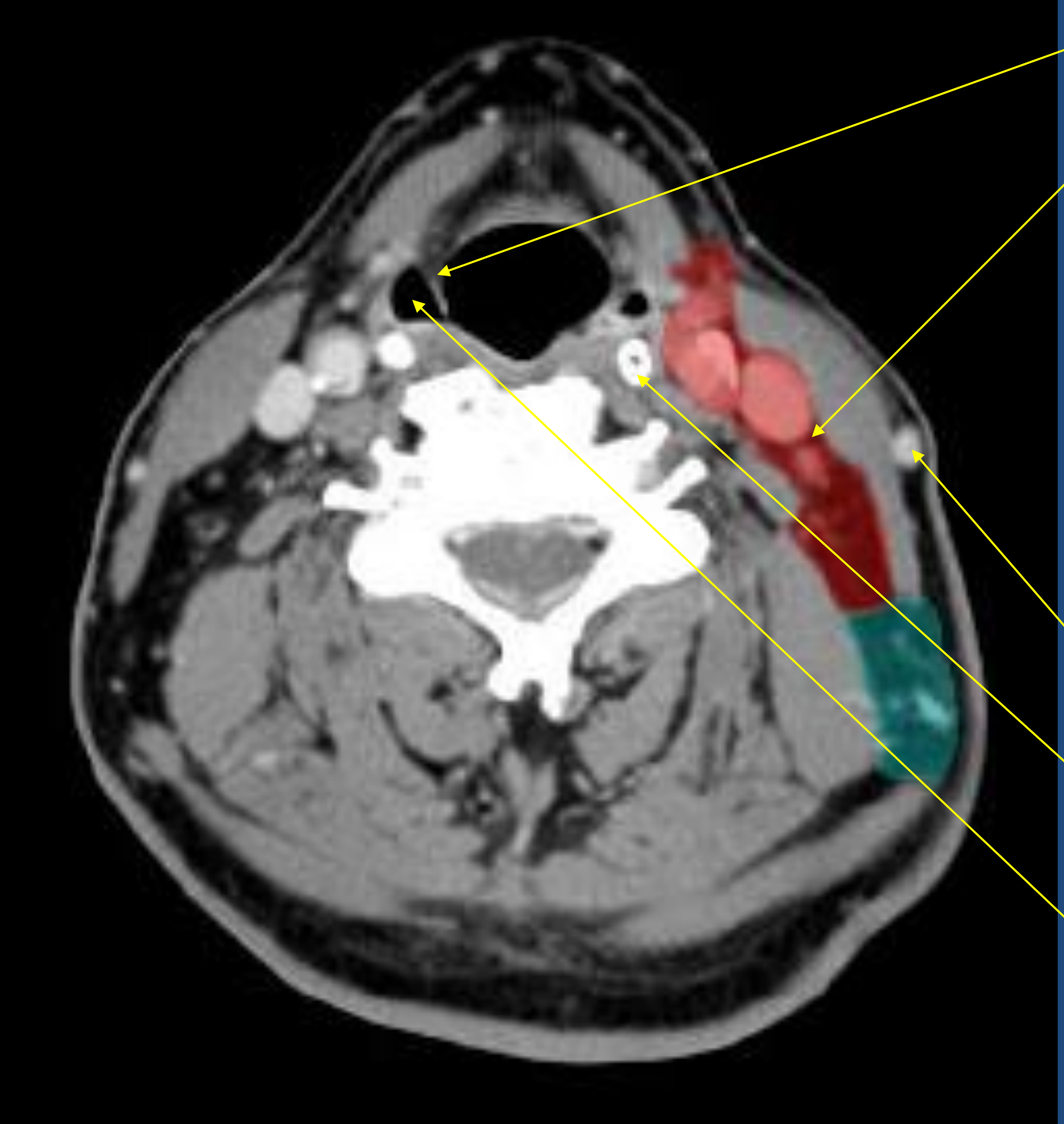
Epiglottis

Common Carotid a.

Internal Jugular v.

Level V

- Cranial edge of body of hyoid bone - sup
- CT slice encompassing the transverse cervical vessels[b-] inf
- Post. edge of the sternocleidomastoid m. - ant
- Ant. border of the trapezius m. - post
- Platysma m., skin - lat
- Paraspinal (levator scapulae, splenius capitis) m. - med



Aryepiglottic fold

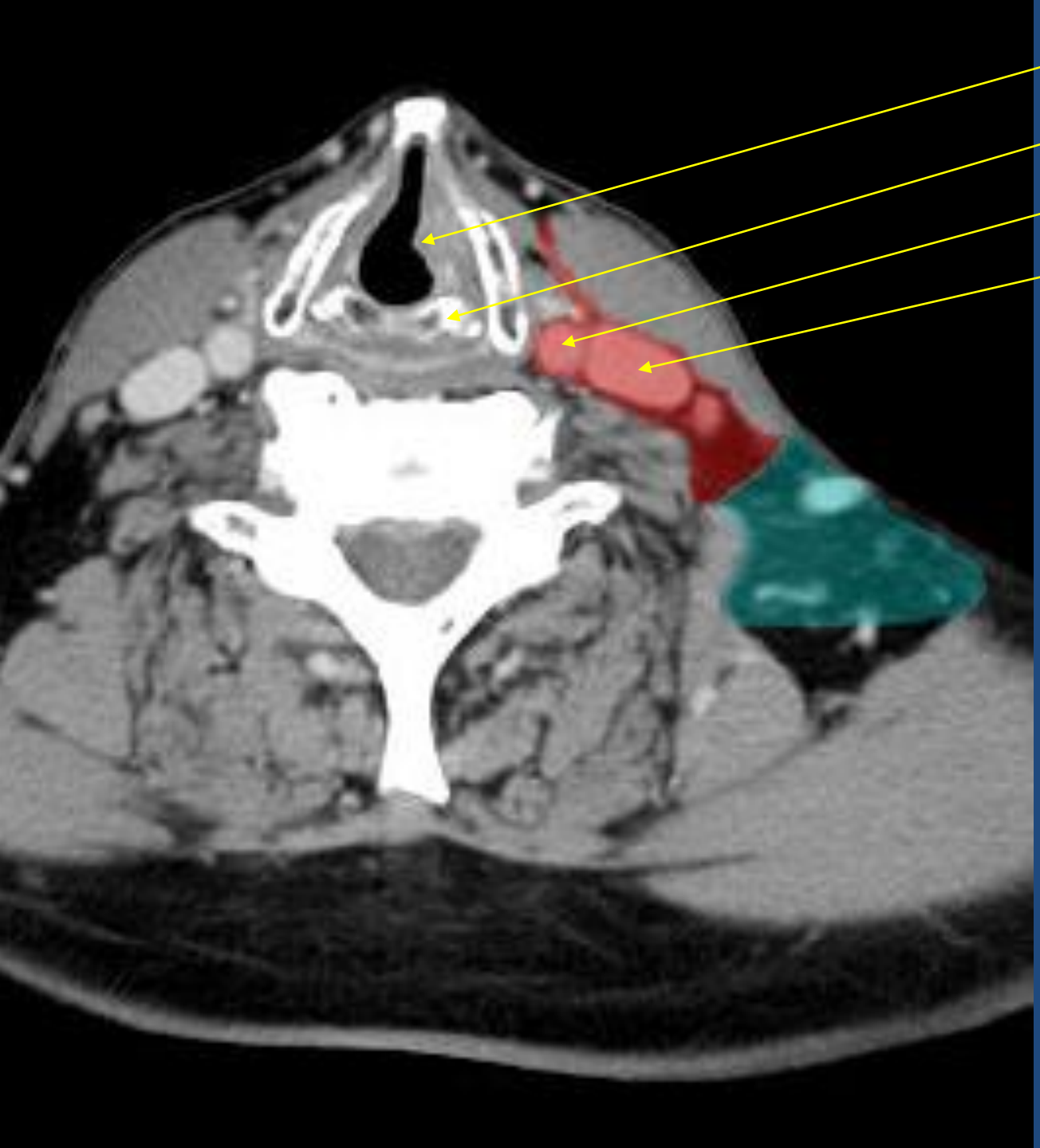
Level III

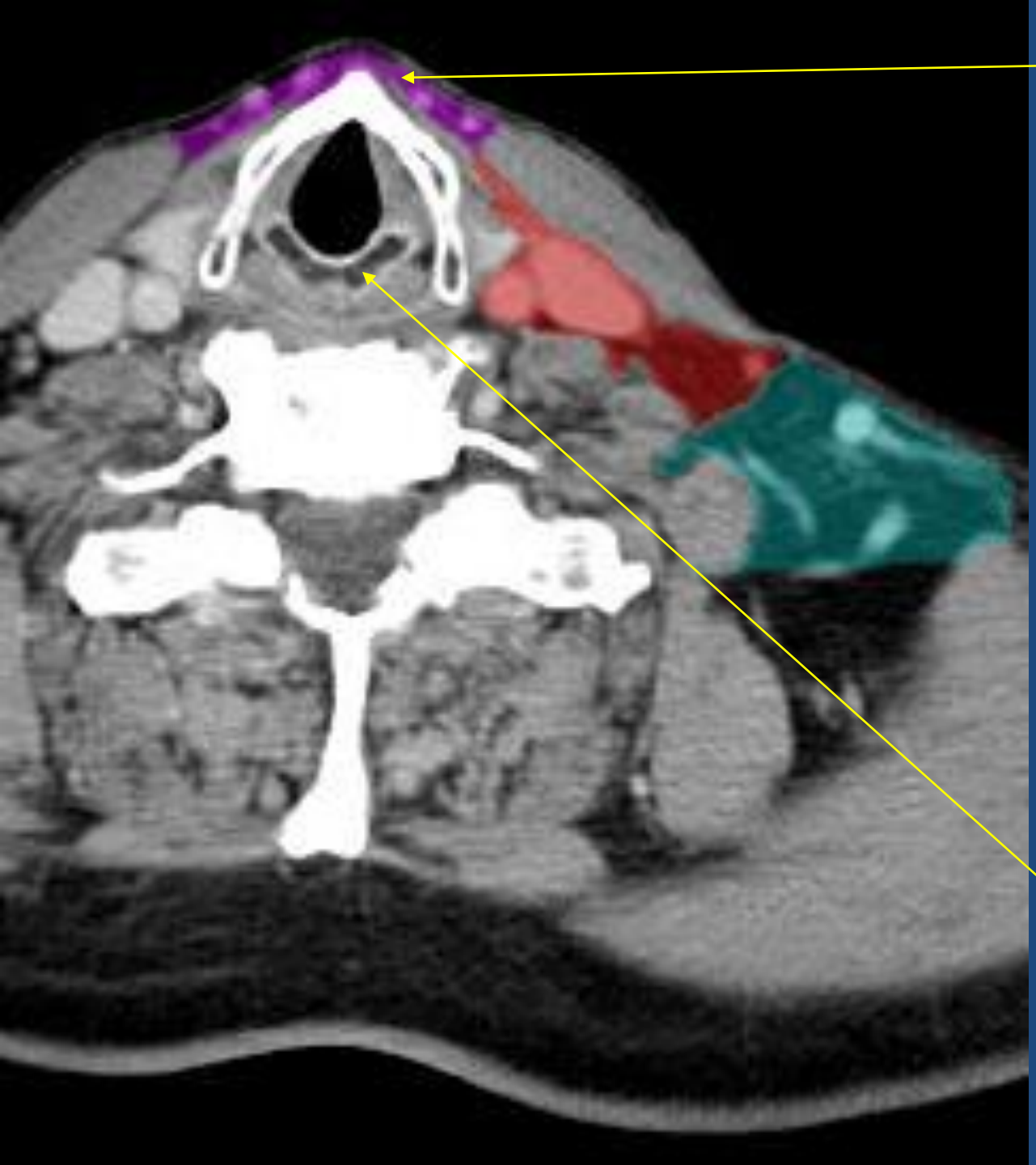
- Caudal edge of the body of hyoid bone - sup
- Caudal edge of cricoid cartilage - inf
- Postero-lateral edge of the sternohyoid m.; ant. edge of sternocleidomastoid m. - ant
- Post. edge of the sternocleidomastoid m.- post
- Medial edge of sternocleidomastoid - lat
- Int. edge of carotid artery, paraspinal (scalenius) m

External Jugular v.

Superior horn Thyroid Cartilage

Piriform Sinus

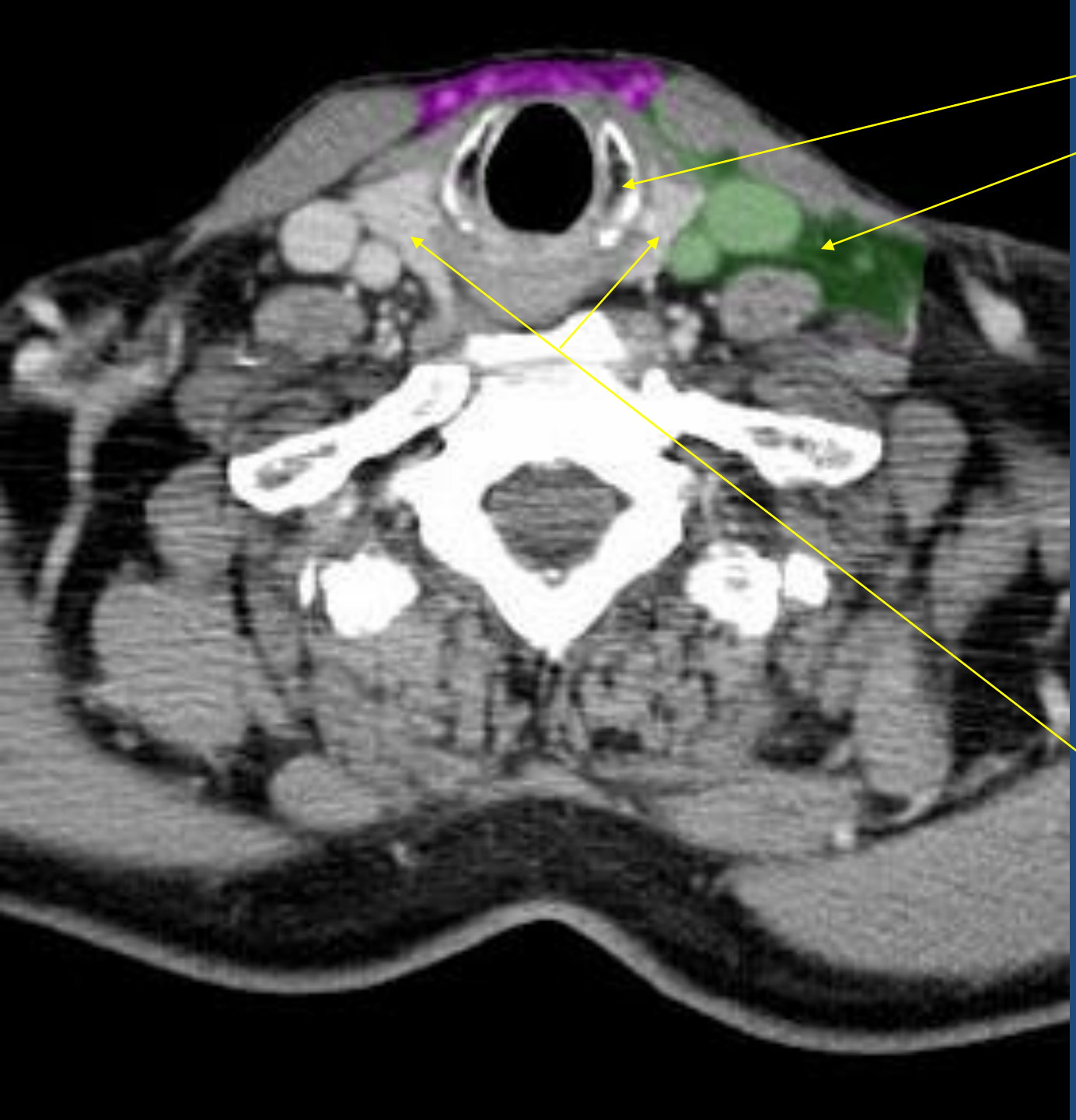

True Vocal Cord
Arytenoid Cartilage
Common Carotid a.
Internal Jugular v.



Level VI

- Caudal edge of body of thyroid cartilage-sup
- Sternal manubrium- inf
- Skin; platysma m. - ant
- Separation between trachea and esophagus[d] - post
- Medial edges of thyroid gland, skin and ant.-medial edge of sternocleidomastoid m. - lat

Cricoid Cartilage

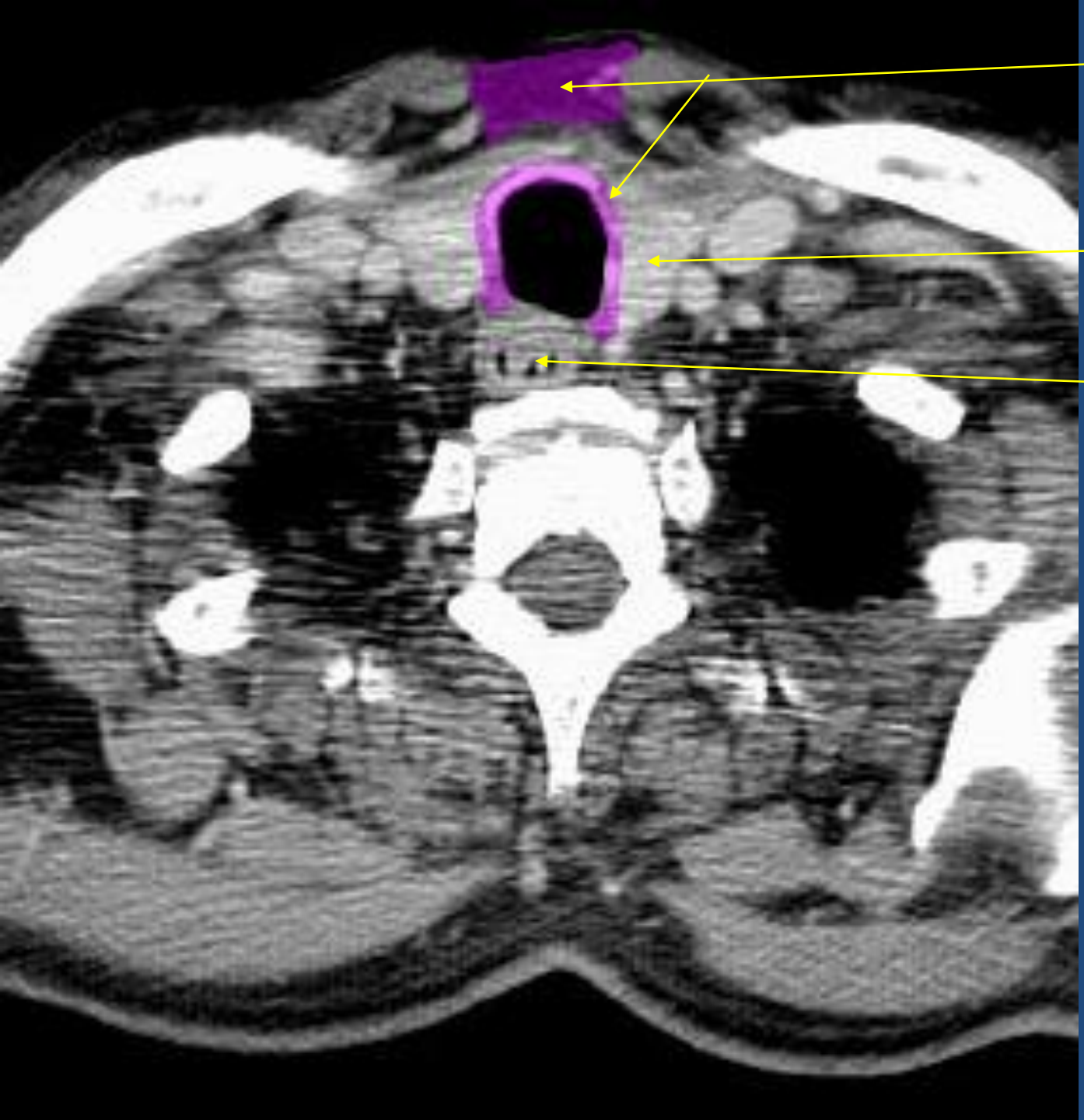


Cricoid cartilage

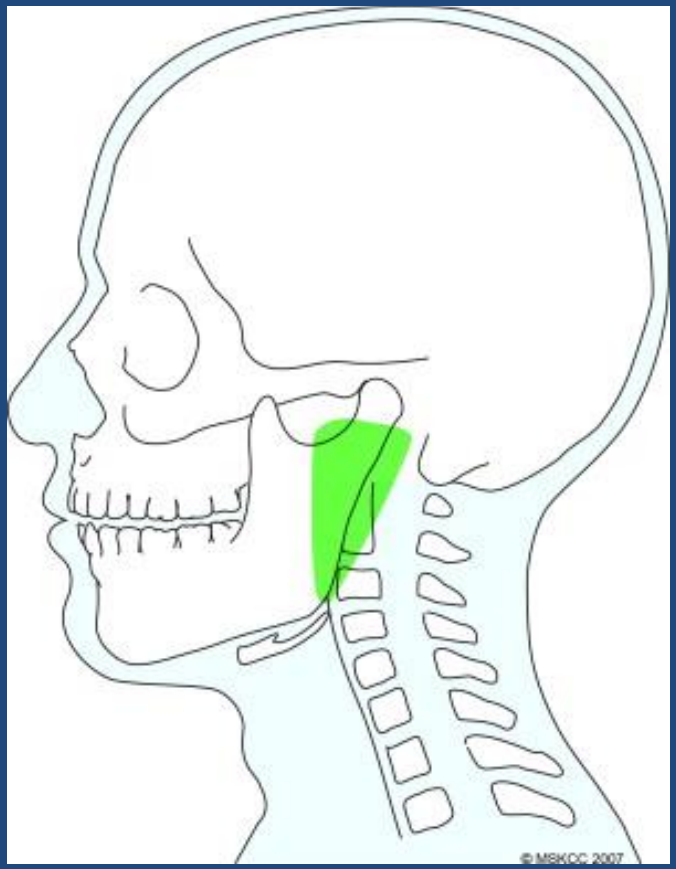
Level IV

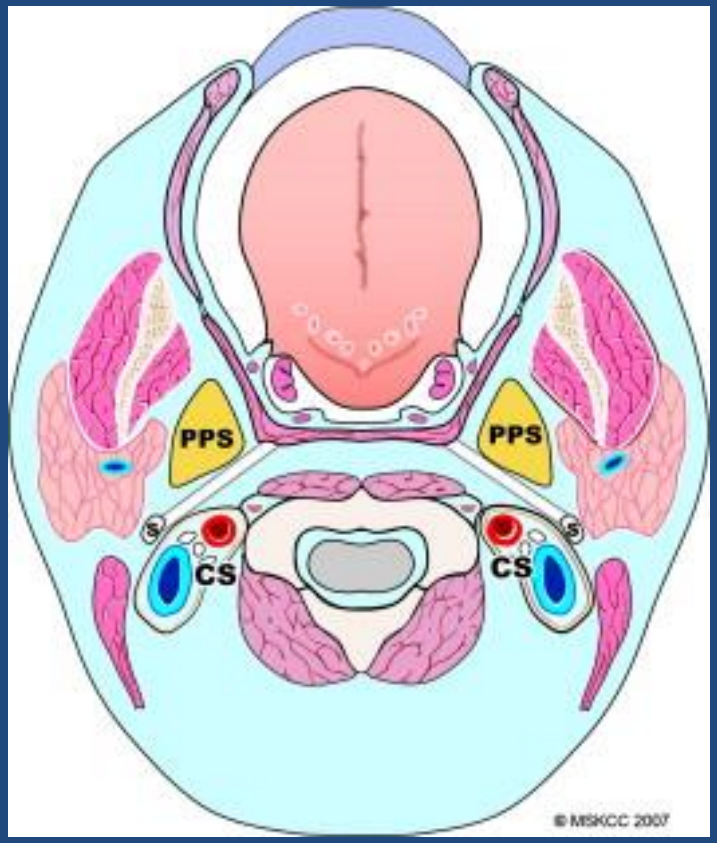
- Caudal edge of cricoid cartilage - sup
- 2 cm cranial to sternoclavicular joint - inf
- Anteromedial edge of sternocleido-mastoid m - ant
- Post. edge of the sternocleidomastoid m. - post
- Medial edge of sternocleidomastoid - lat
- Medial edge of internal carotid artery, paraspinal (scalenius) m. - med

Thyroid Gland

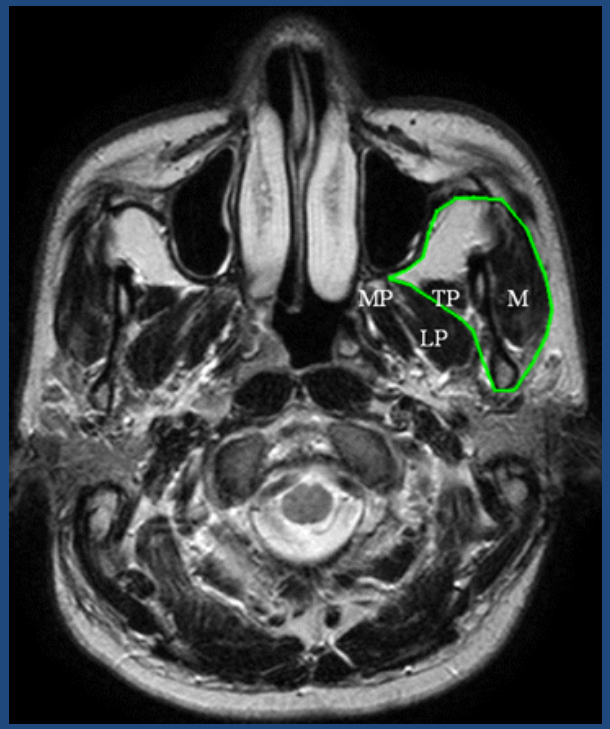

Level VI
Thyroid
Esophagus

Parapharyngeal Space



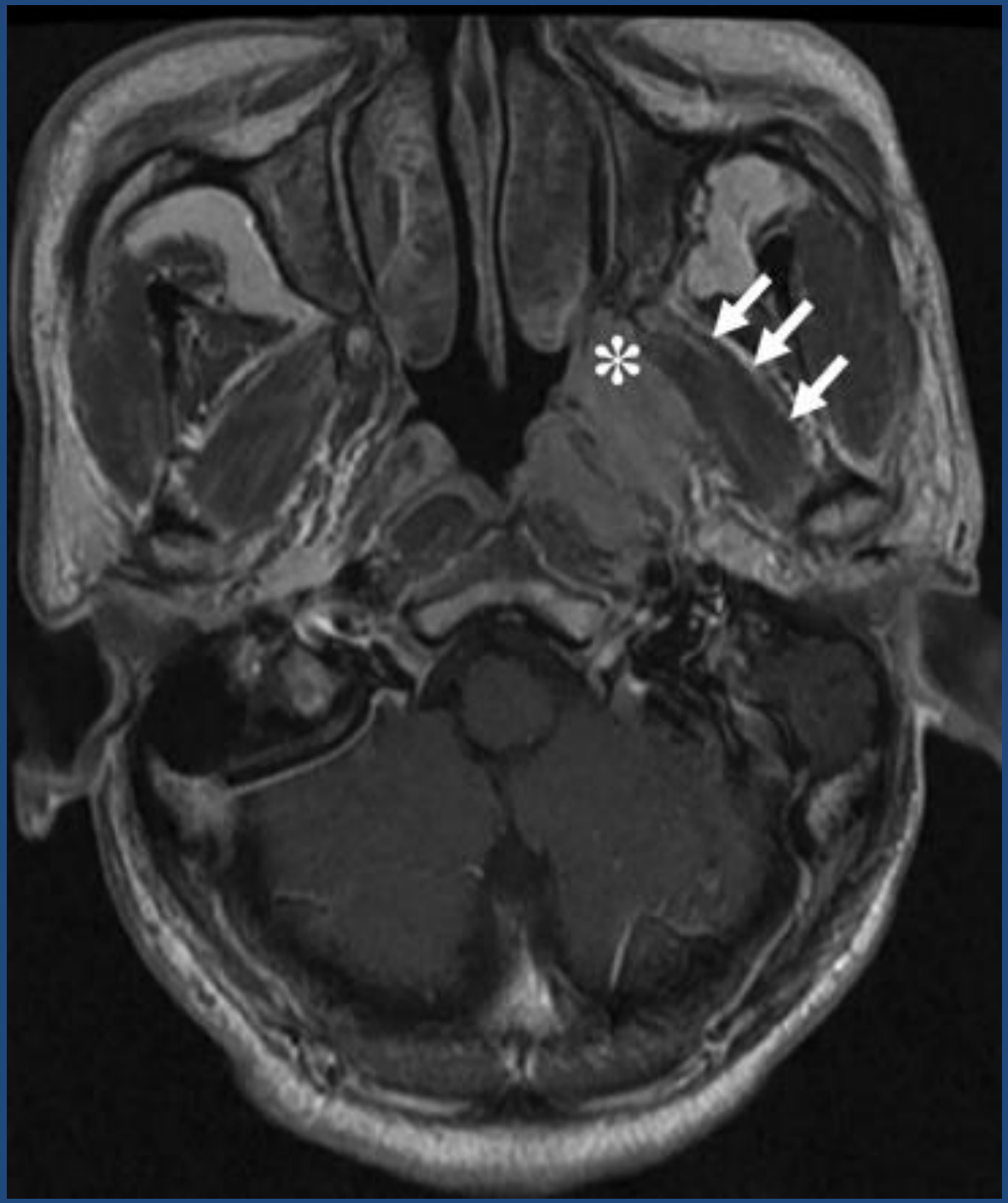


Masticator Space



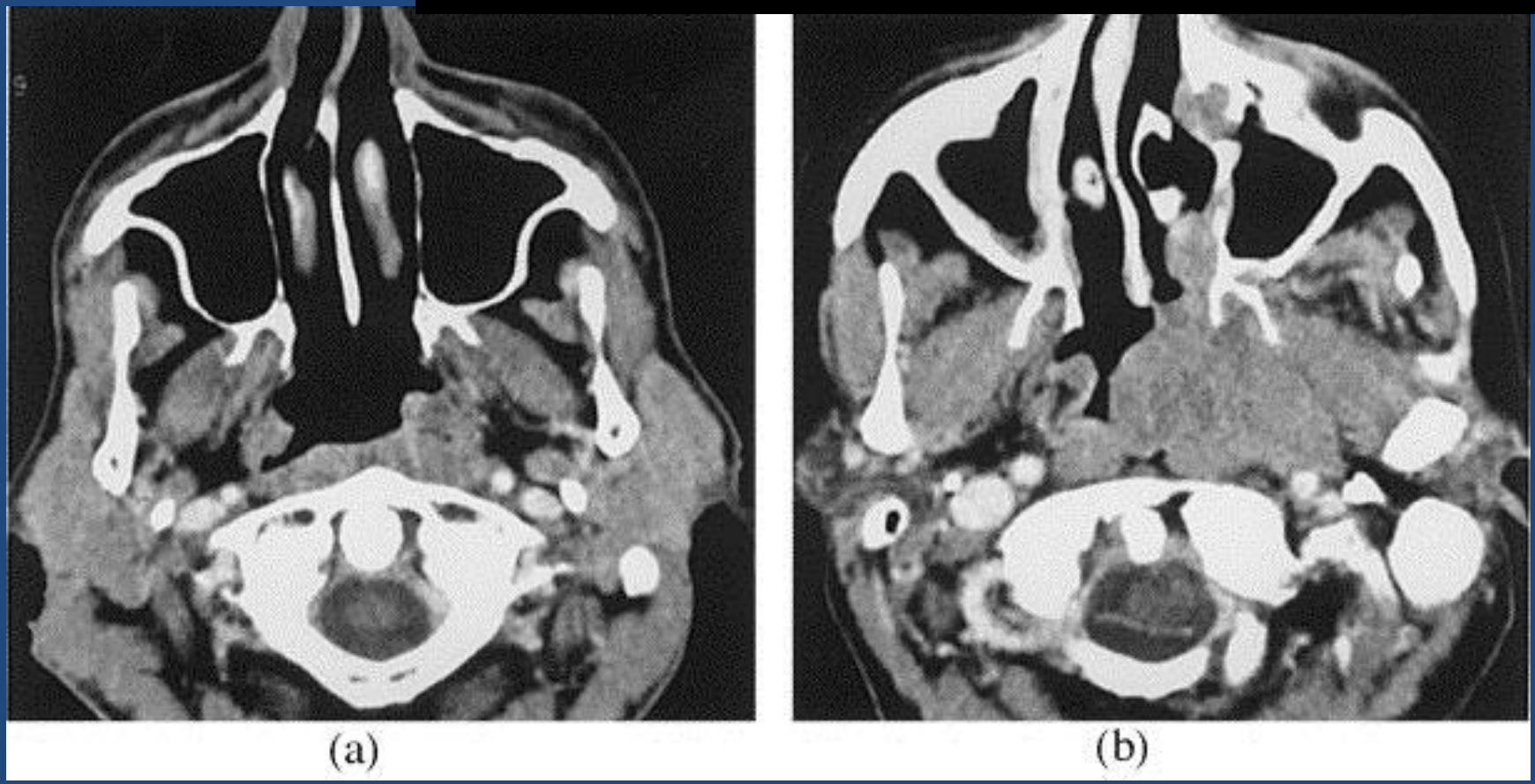
- Green – masticator space
- LP= lateral pterygoid
- M=masseter
- MP= medial pterygoid muscle
- TP=temporalis muscle

Green – old AJCC defintion – not anatomic
Now – includes all and ramus of the mandible, third division of CN V as it passes through FO, into the suprahydoid neck



a. Small stage T tumor 12 mm originating at the fossa of Rosenmuller

b. Big stage T4 tumor. Nasopharyngx carcinoma infiltrating the paraphyngeal space, prevertebral and pterygoid muscles growing into the nasal cavity



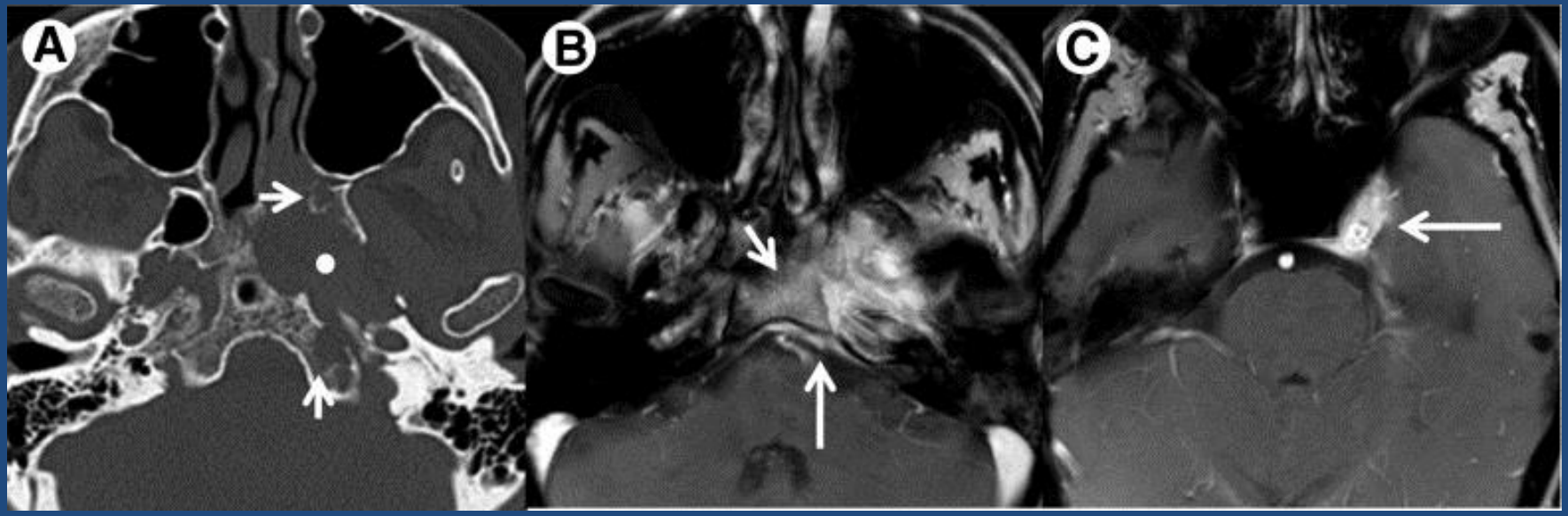
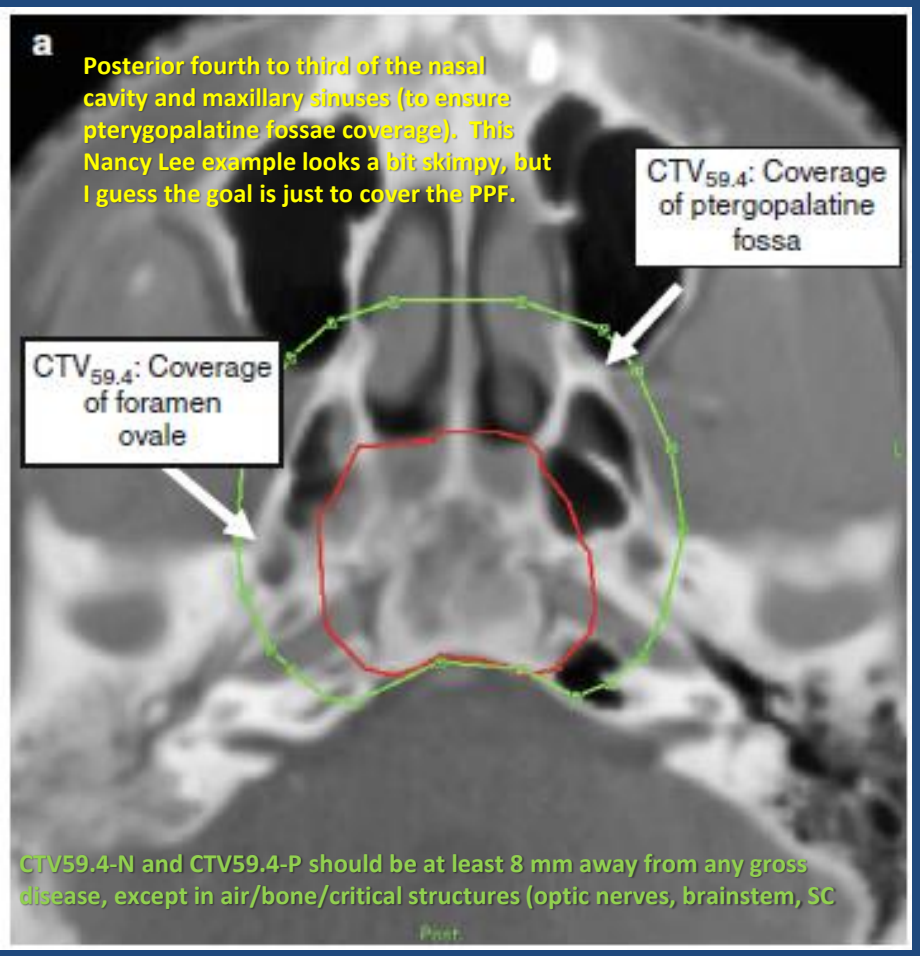
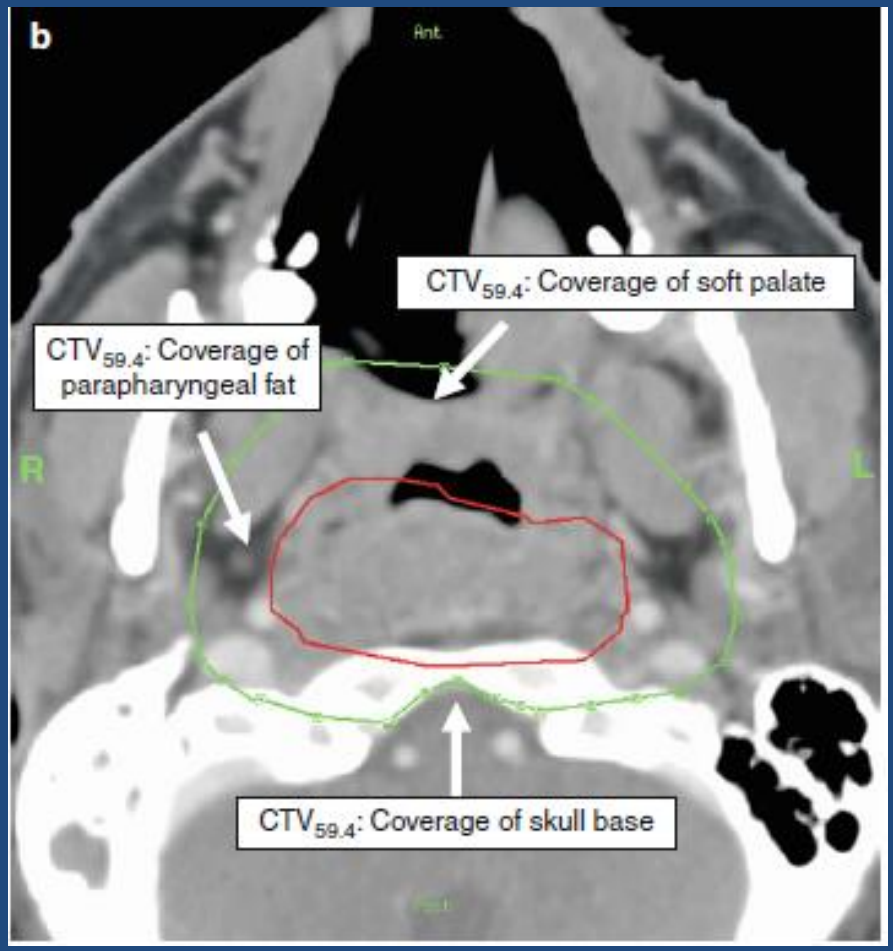
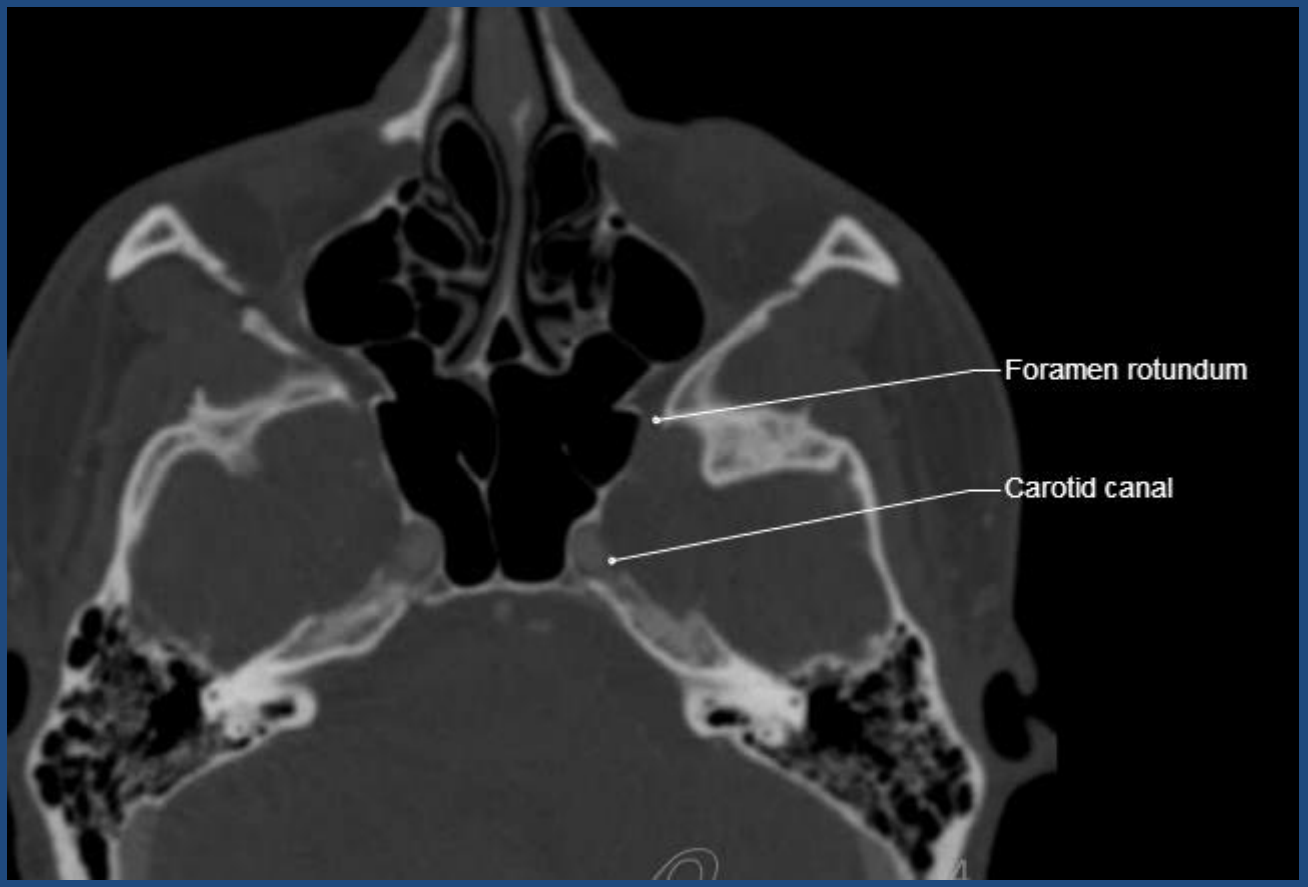


Figure A – mass with involvement of the pterygoid process and the clivus (arrows) : T3 (bony structures)

Figure B and C – Different patient with petroclival junction involvement and abnormal enhancement of clivus (short arrow) with intracranial extension (long arrows) T4

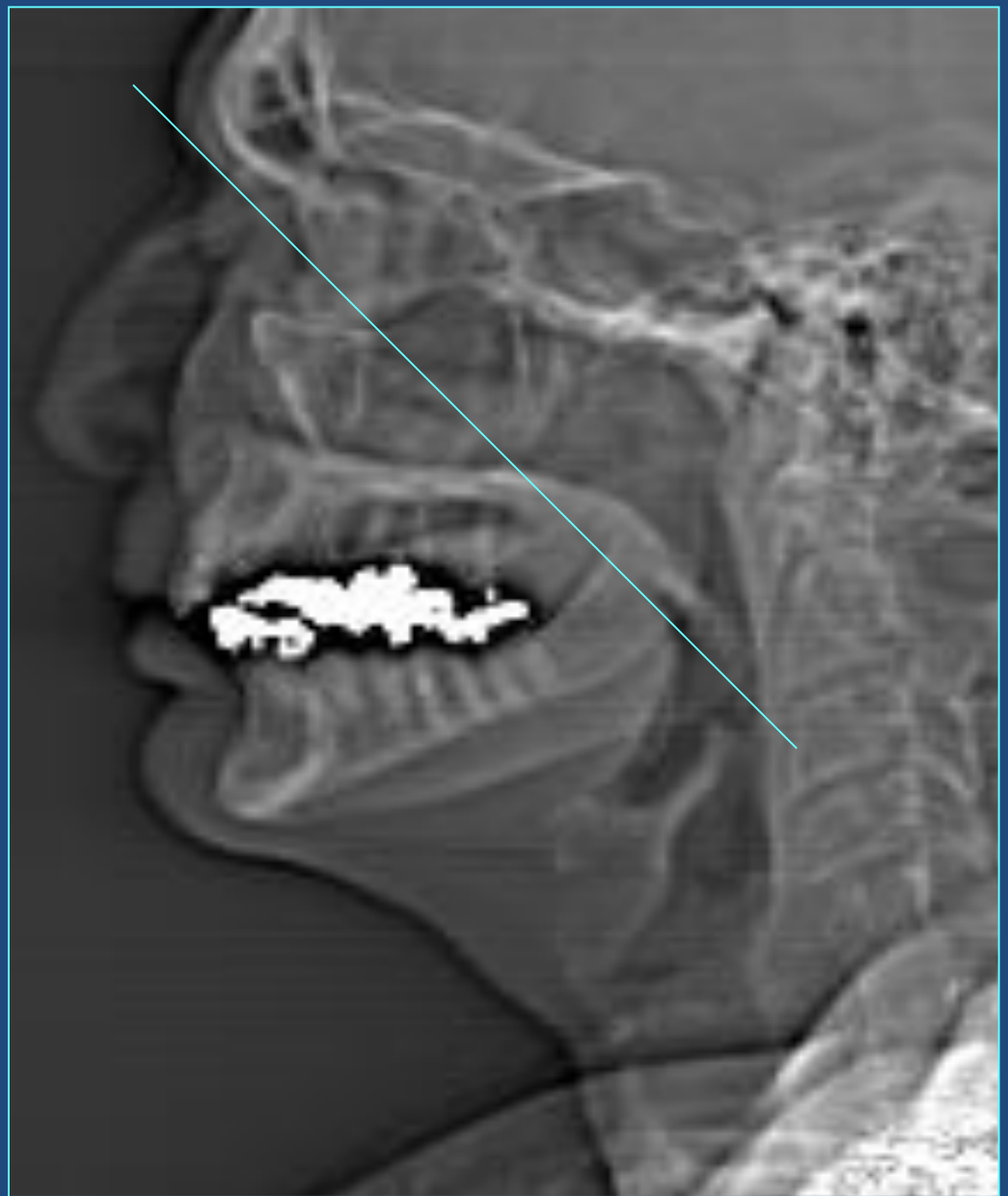

a
Posterior fourth to third of the nasal cavity and maxillary sinuses (to ensure pterygopalatine fossae coverage). This Nancy Lee example looks a bit skimpy, but I guess the goal is just to cover the PPF.
CTV59.4: Coverage of ptergopalatine fossa
CTV59.4: Coverage of foramen ovale
CTV59.4-N and CTV59.4-P should be at least 8 mm away from any gross disease, except in air/bone/critical structures (optic nerves, brainstem, SC


b
Ant.
CTV59.4: Coverage of soft palate
CTV59.4: Coverage of parapharyngeal fat
R
L
CTV59.4: Coverage of skull base


Foramen rotundum
Carotid canal

Draw/name the important theoretical plane for the maxillary sinus

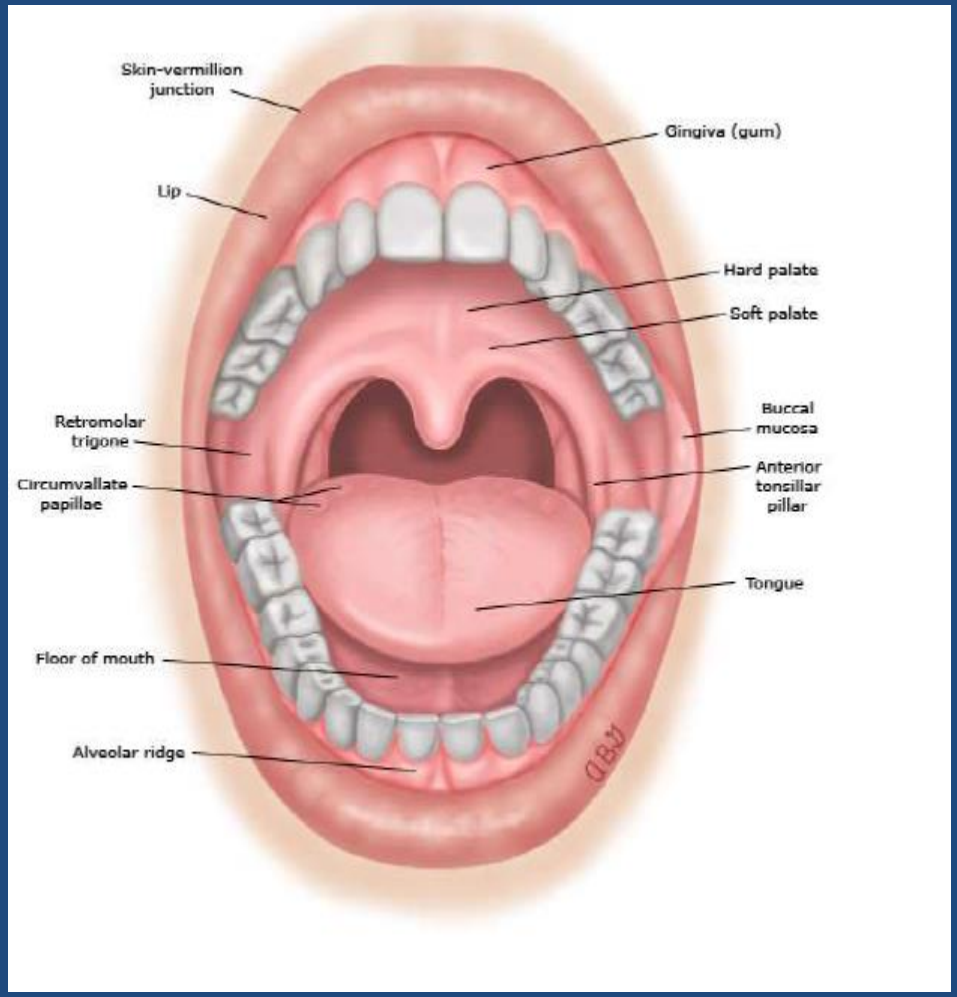
Ohngren’s line



- Suprastructure
- Infrastructure

Oral Cavity

- Lips
- Oral tongue (ant 2/3)
- Floor of Mouth
- Retromolar trigone
- Buccal mucosa
- Hard palate
- Gingiva/alveolar ridge

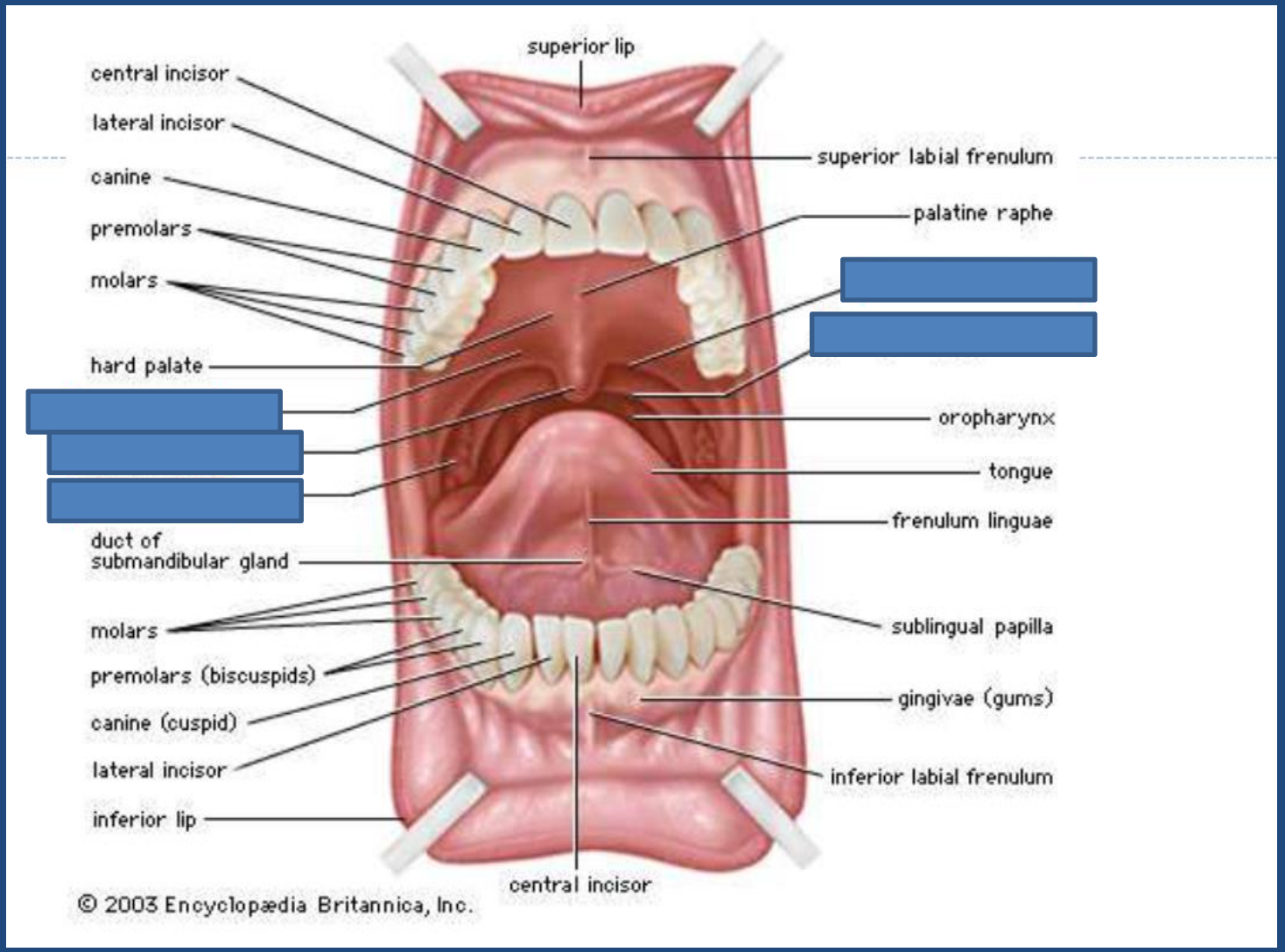


Oropharynx

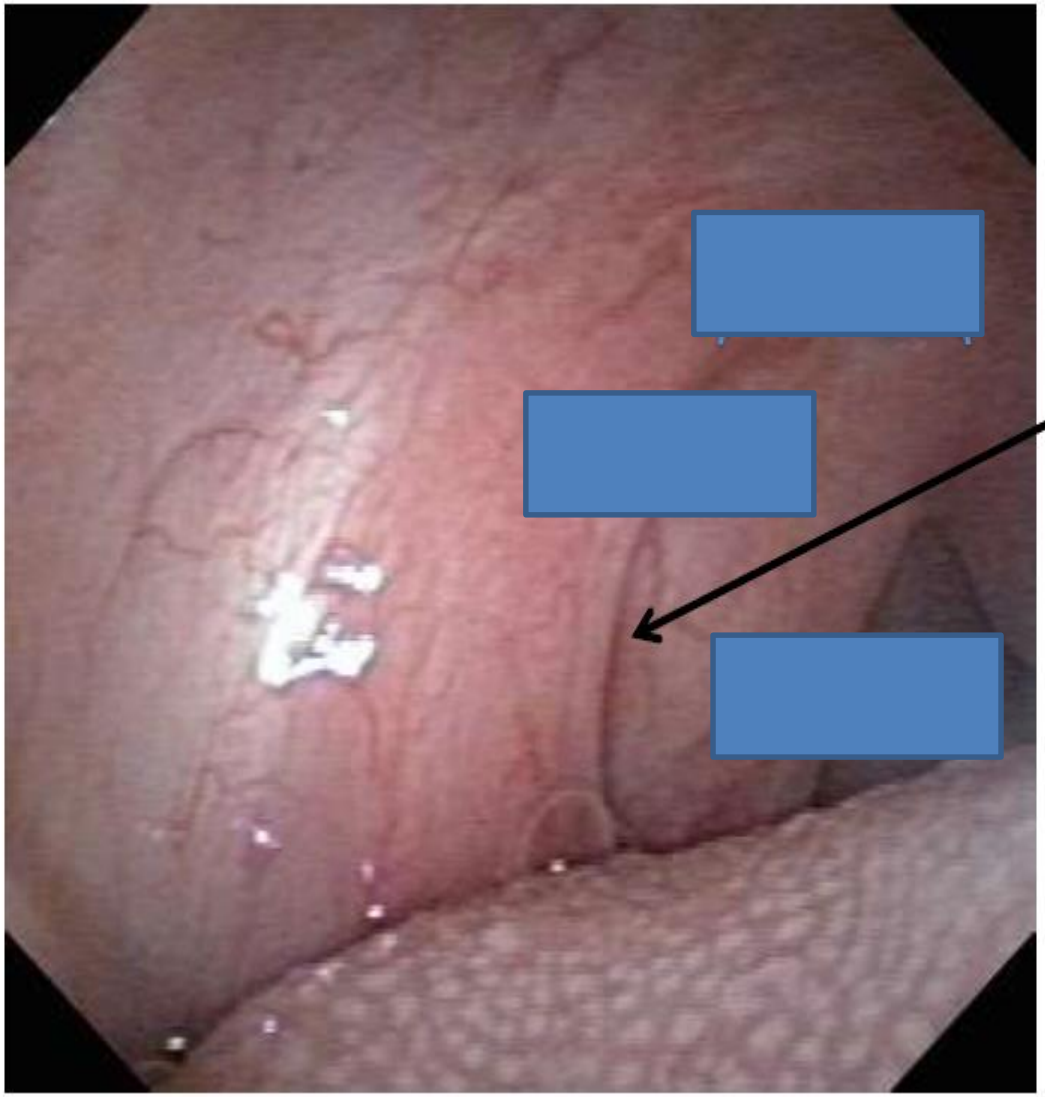
Case

- 57 man, never smoker, who recently noted a left neck mass

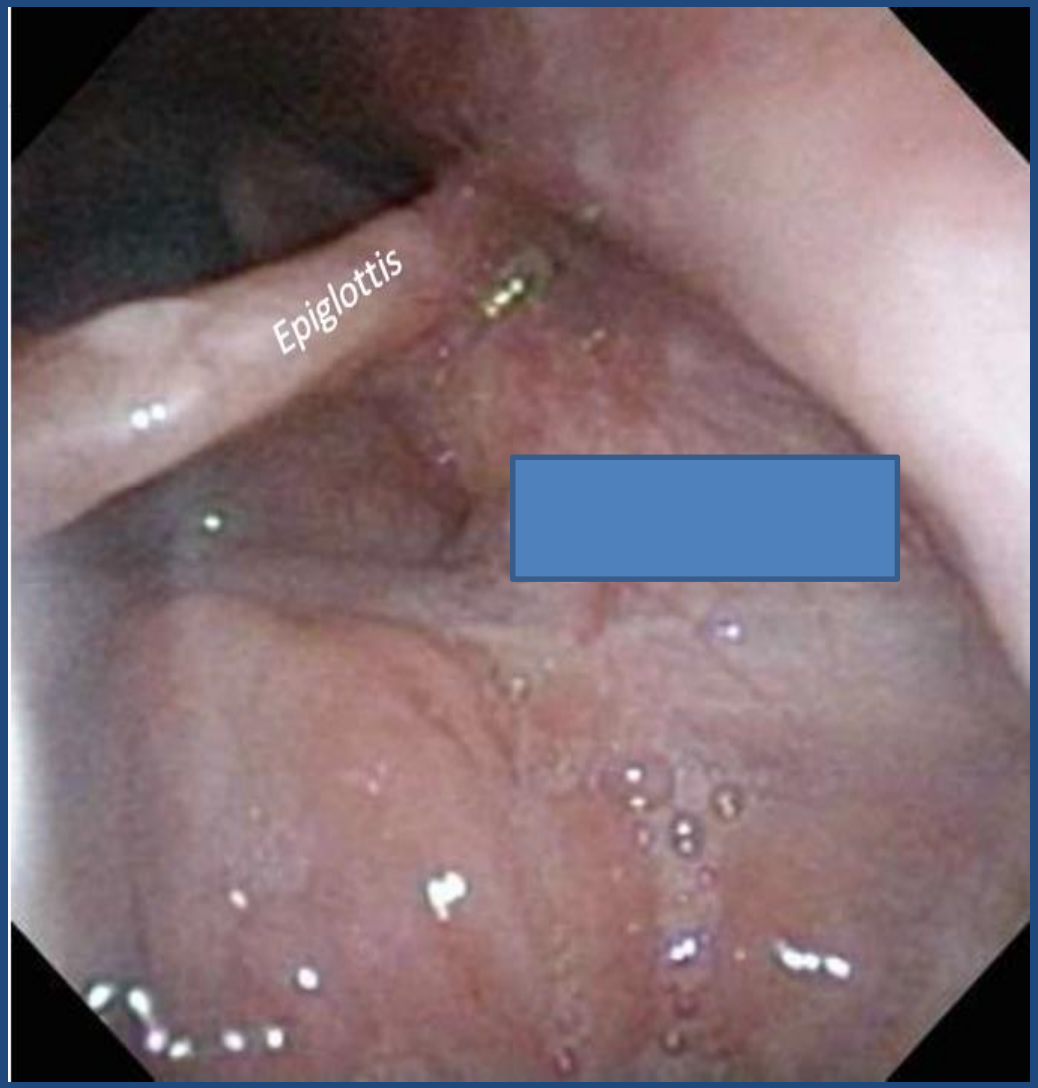
Oropharynx Anatomy



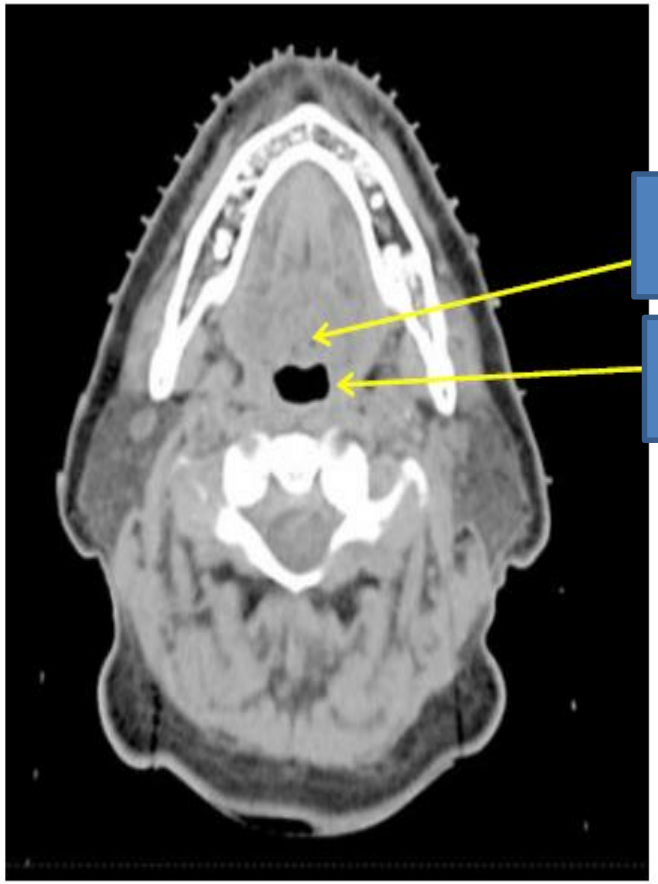
Oropharynx (anatomy)



Oropharynx (anatomy)



Oropharynx (anatomy)



Larynx Cancer Anatomy

What are the subsites of the supraglottis?

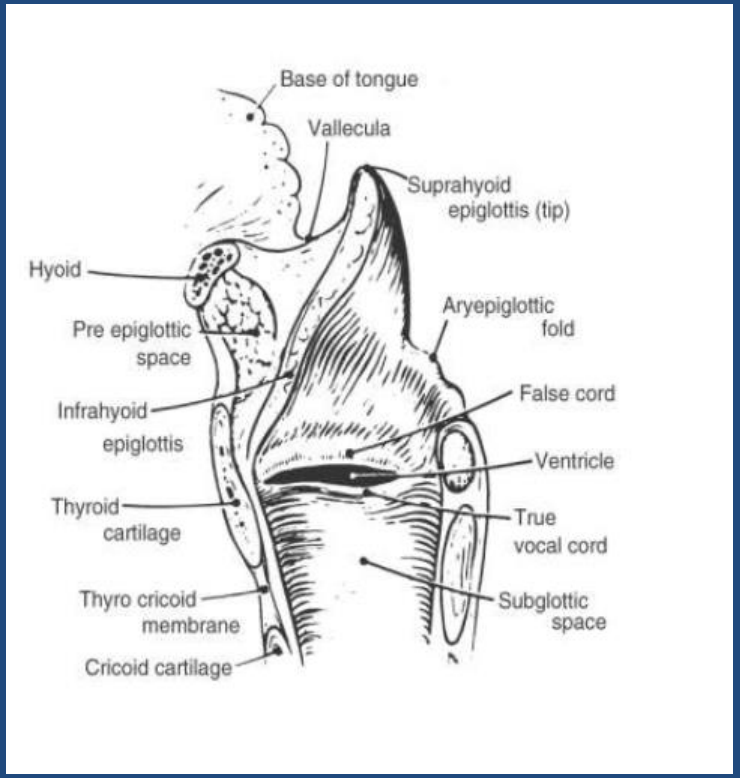
Suprahyoid and infrahyoid epiglottis, arytenoids, AE folds, False cords

What structure(s) define the glottis?

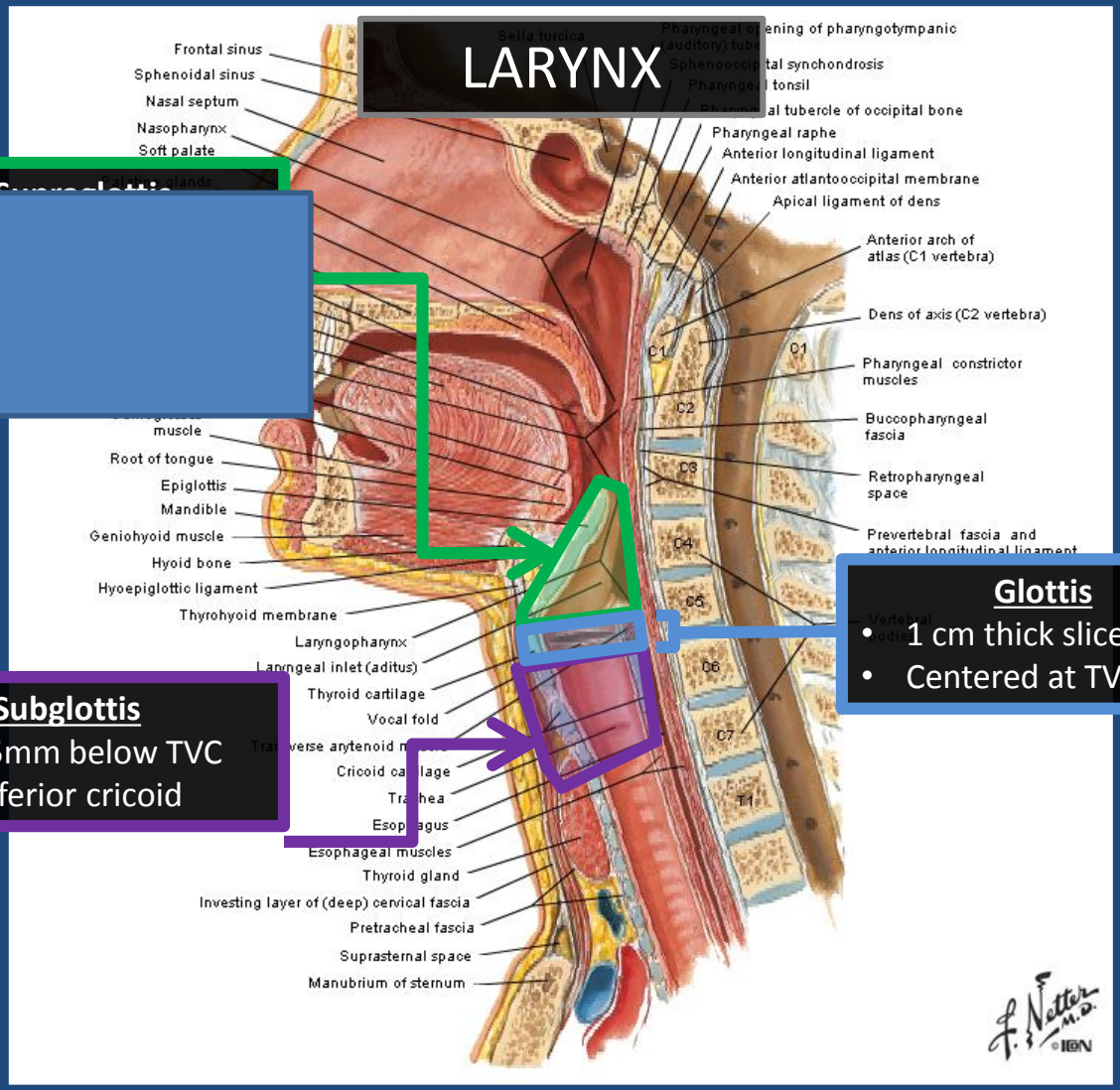
True vocal cords

Definition of the subglottis?

5 mm below glottis to bottom of cricoid



LARYNX



Glottis

- 1 cm thick slice
- Centered at TVCs

Subglottis

- Sup: 5mm below TVC
- Inf: Inferior cricoid

Larynx Cancer Anatomy

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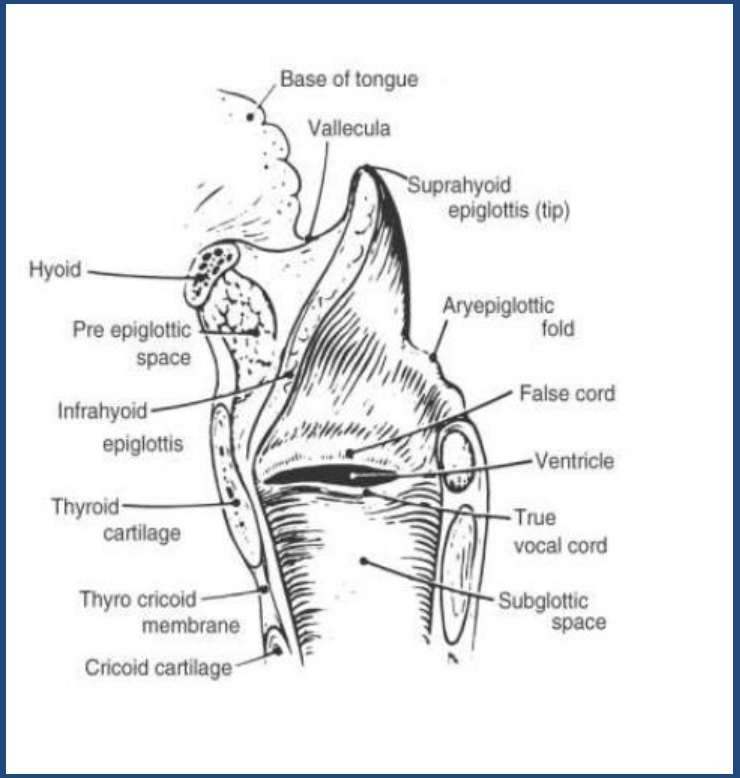
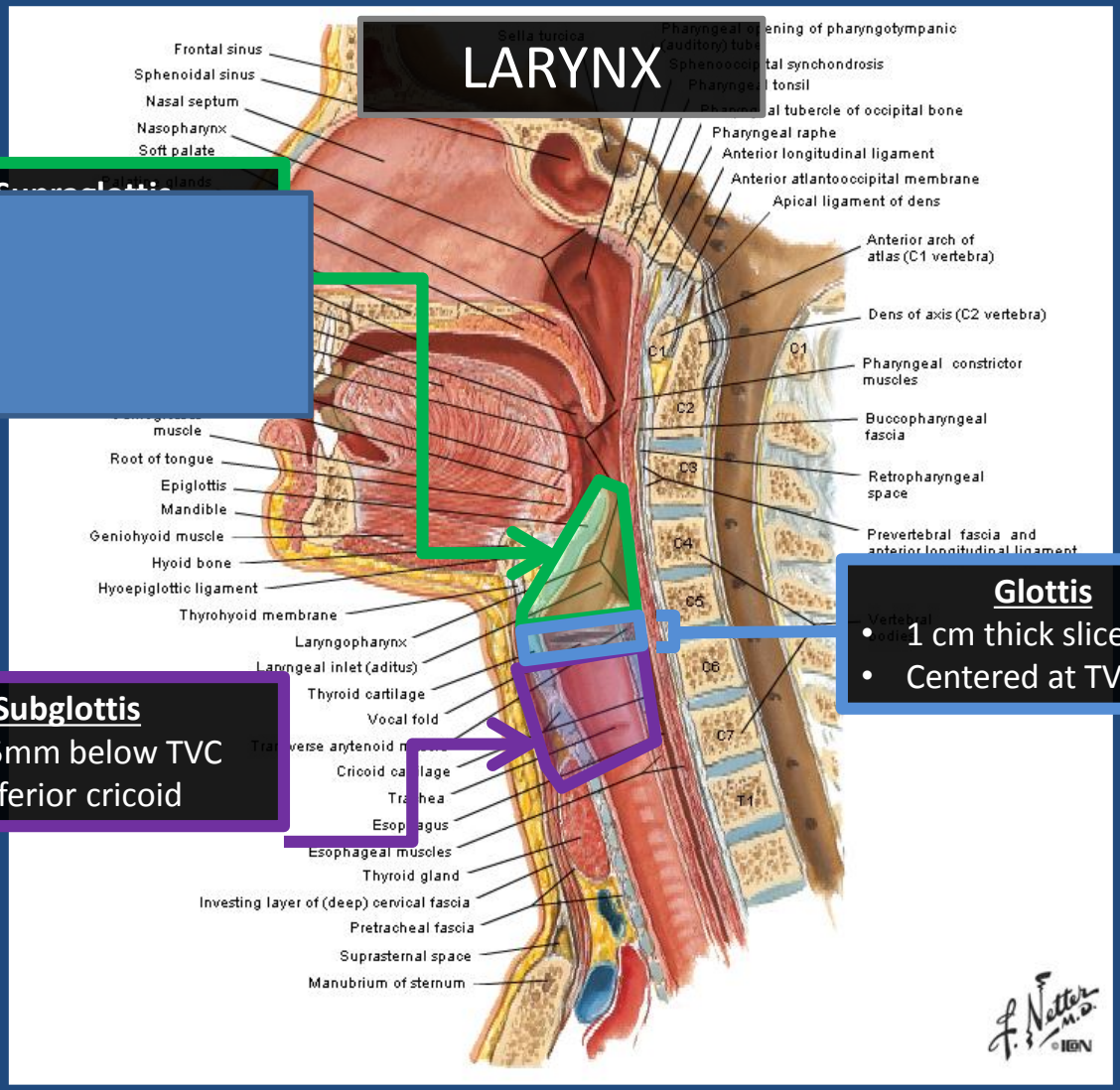


LARYNX



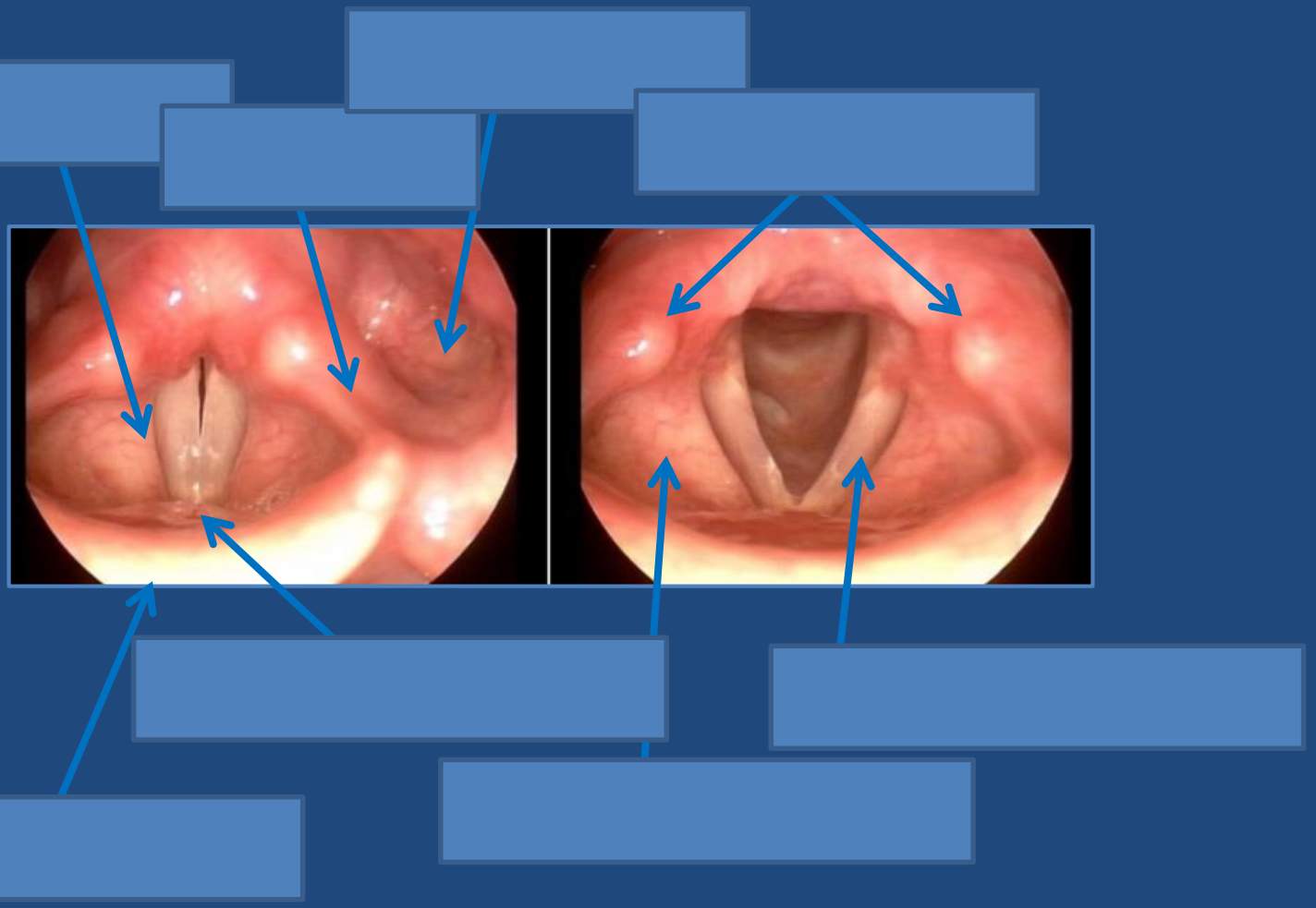
Glottis

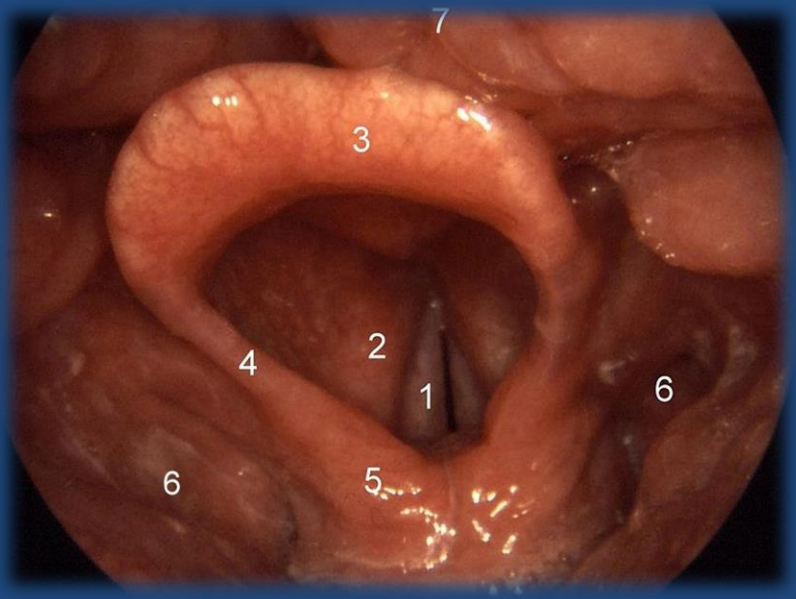
- 1 cm thick slice
- Centered at TVCs

Subglottis

- Sup: 5mm below TVC
- Inf: Inferior cricoid

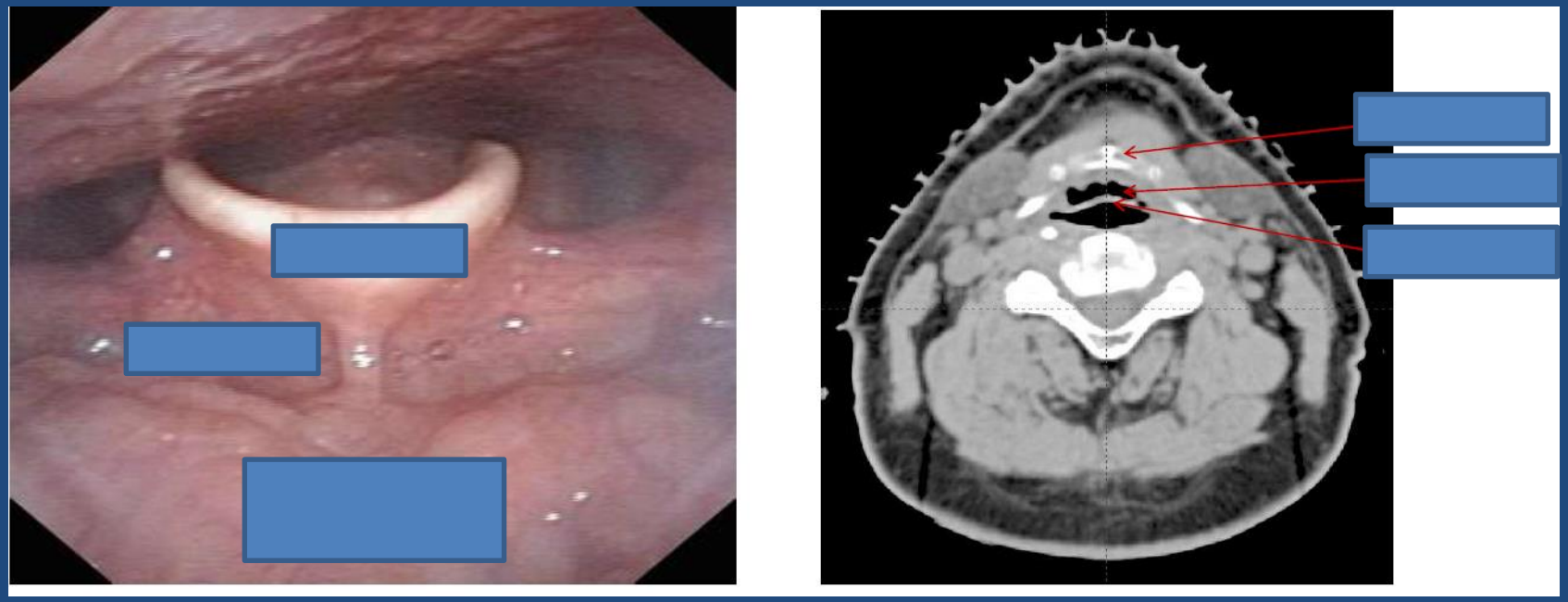
Anatomy (The Scope) – down a little further



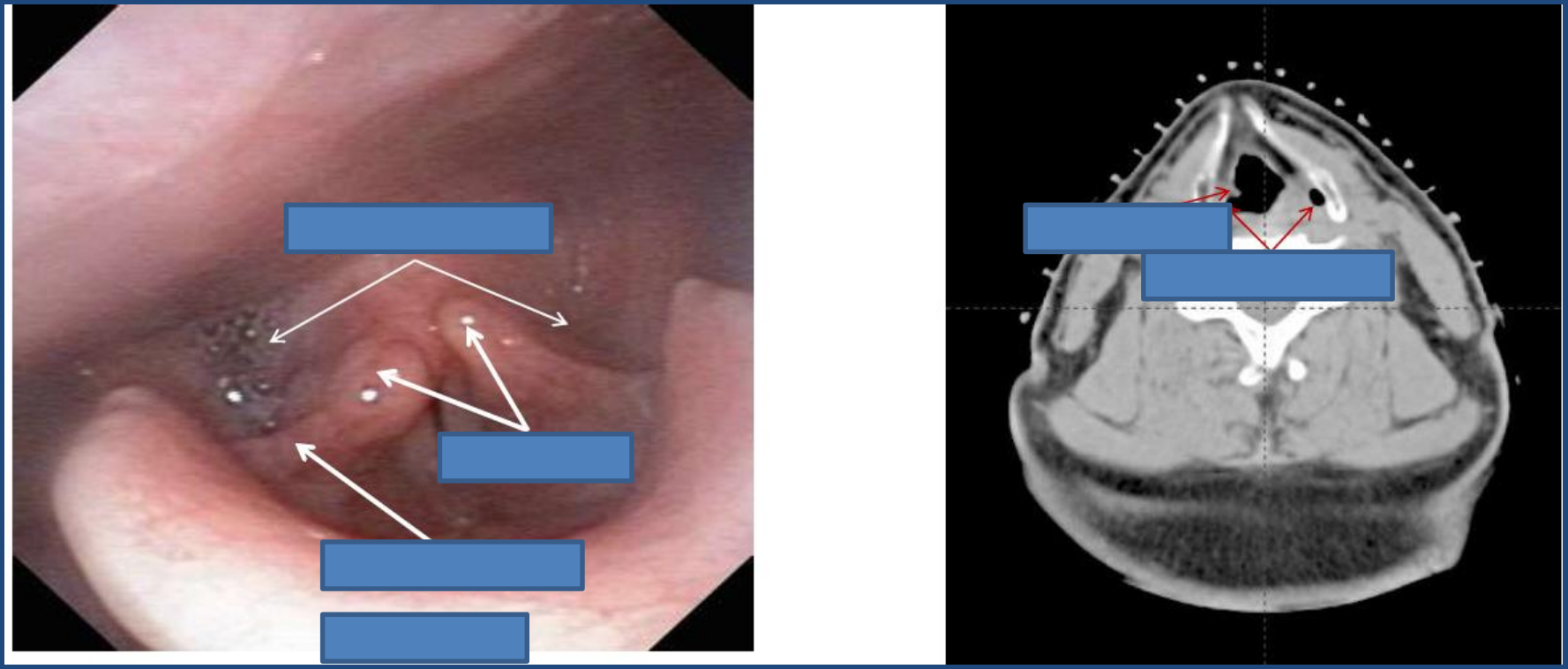


1.
2.
3.
4.
5.
6.
7.

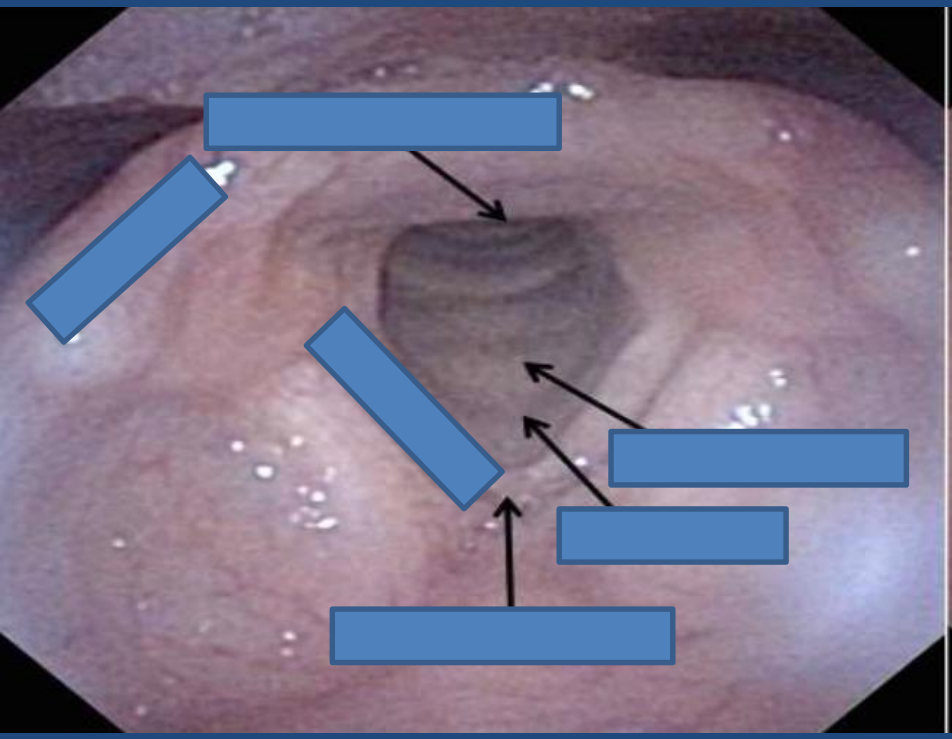
More anatomy ☹

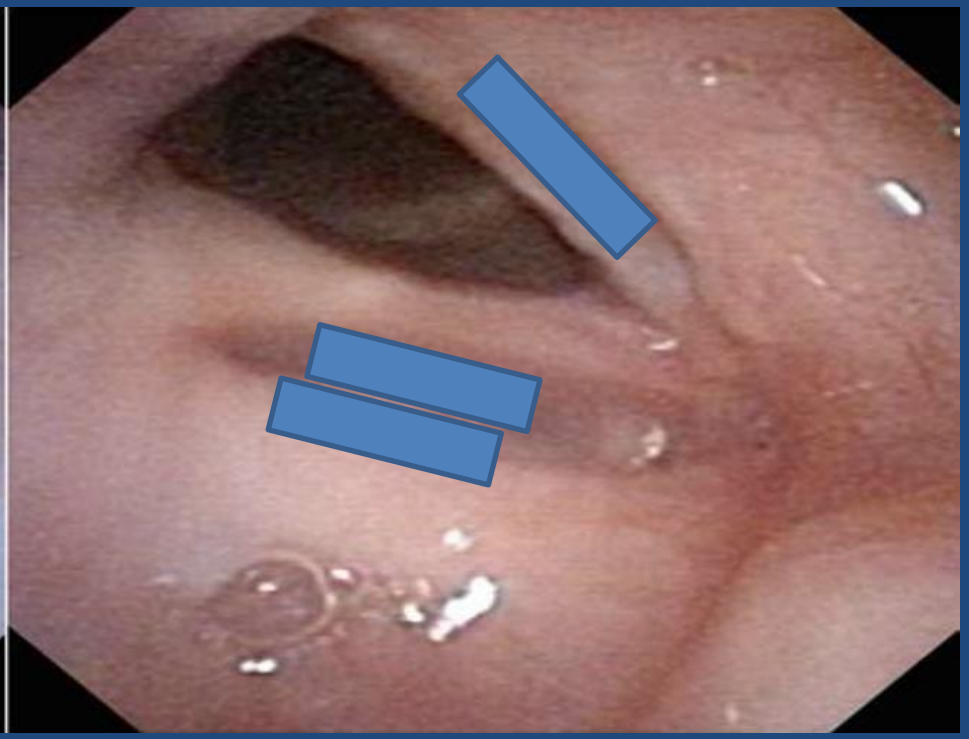


More anatomy ☹ ☹



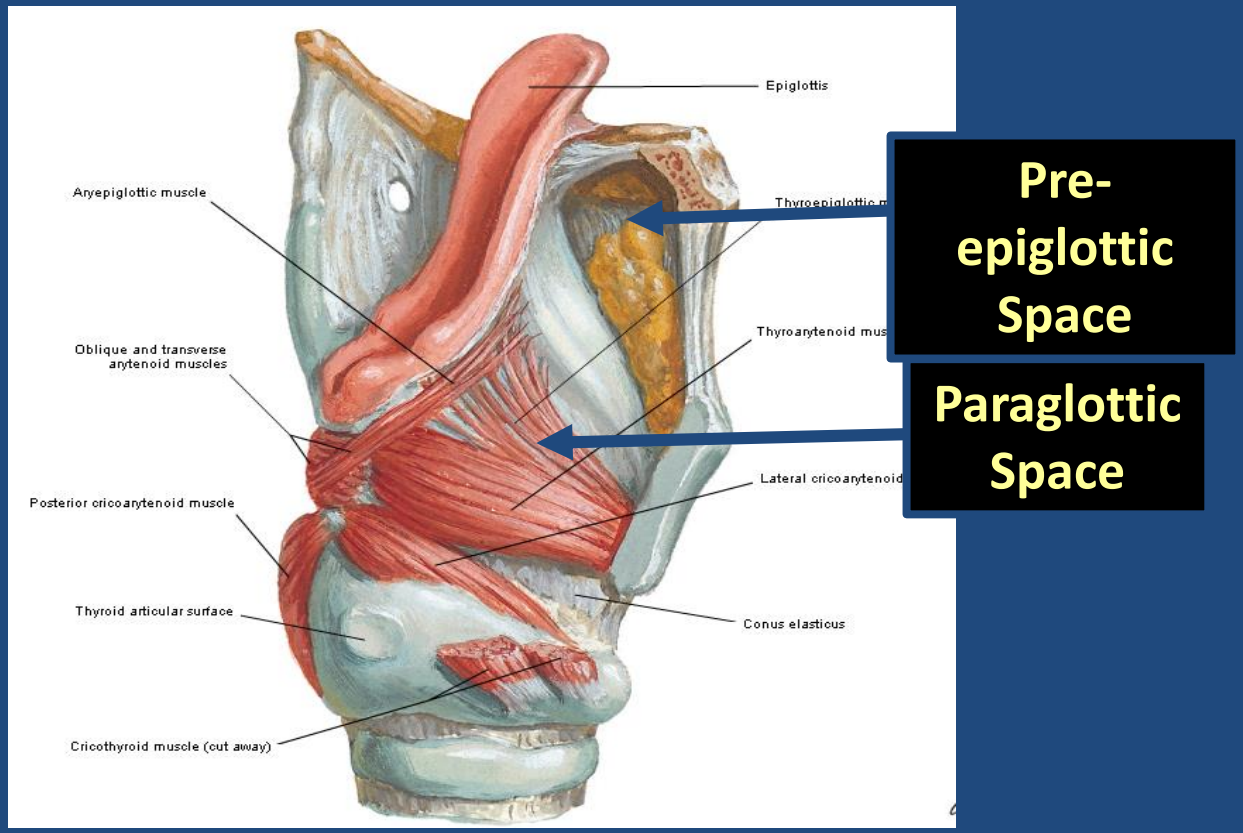
For the love of Pete, even more anatomy





Your killing me Larry, even more anatomy

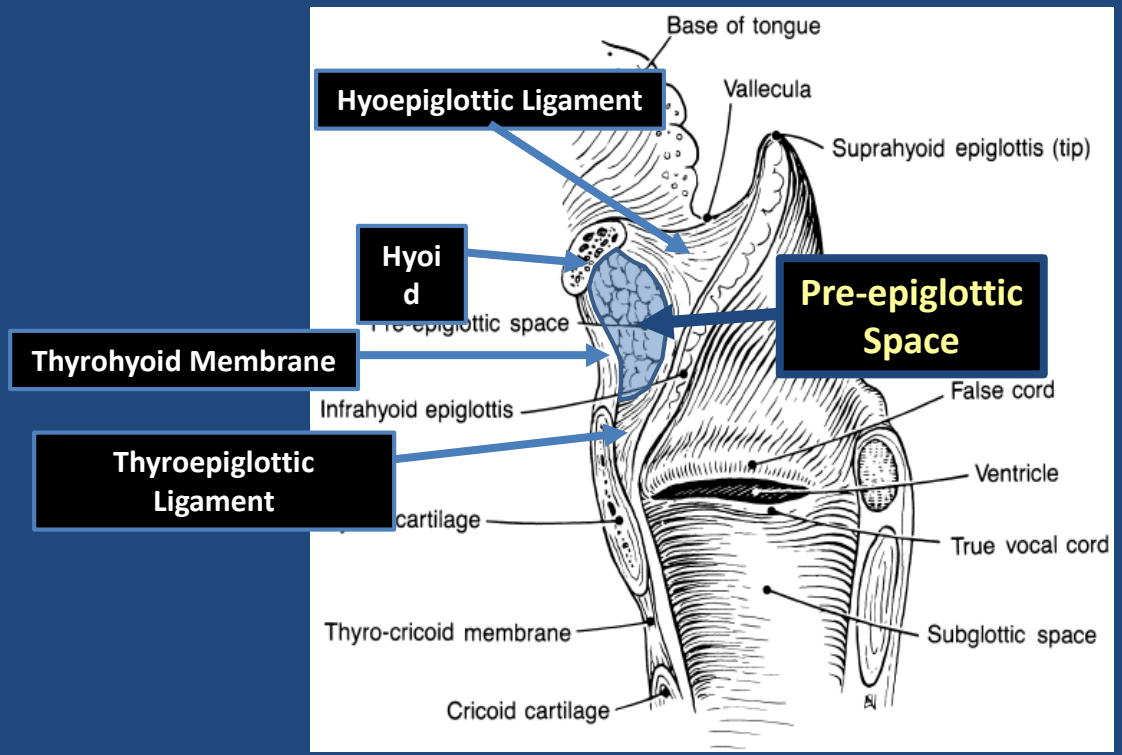
Pre-epiglottic space versus Paraglottic space



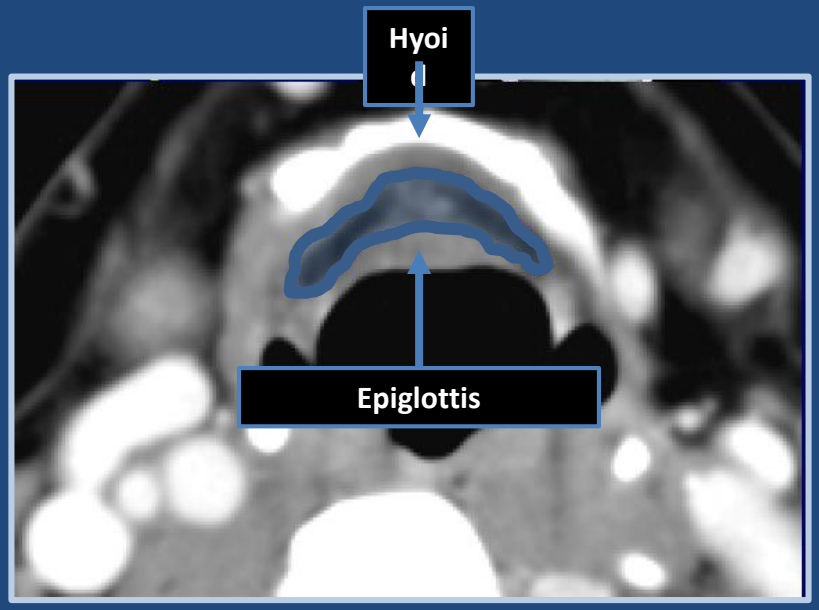
Pre-epiglottic Space

- **Midline fat space** anterior to the epiglottis.
- Forms inverted pyramid.
- Epiglottis has numerous fenestrations that allow anterior spread of laryngeal tumors (esp infrahyoid epiglottis tumors).
- Dehiscences in the thyrohyoid membrane created by superior laryngeal neurovascular bundle allow anterior extension of tumor from pre-epiglottic space into neck.

Pre-epiglottic Space

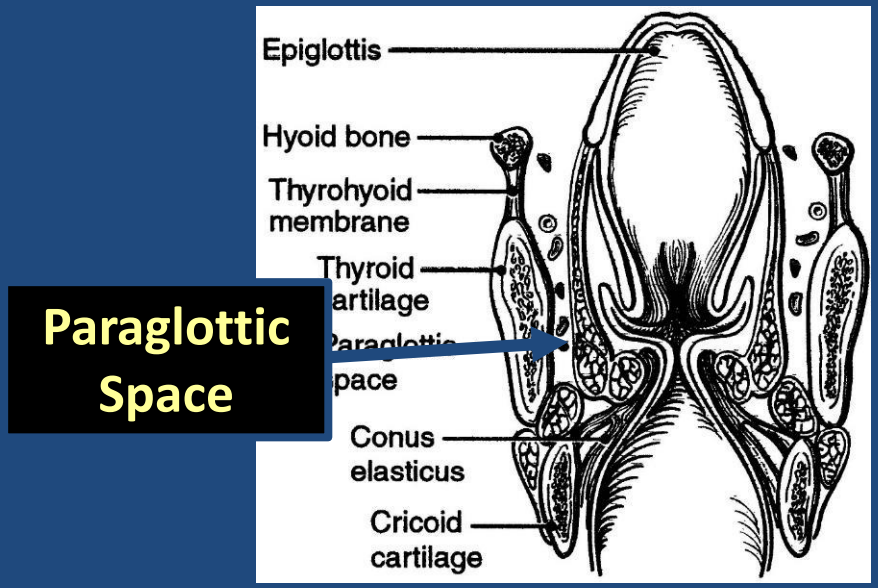


Pre-epiglottic Space

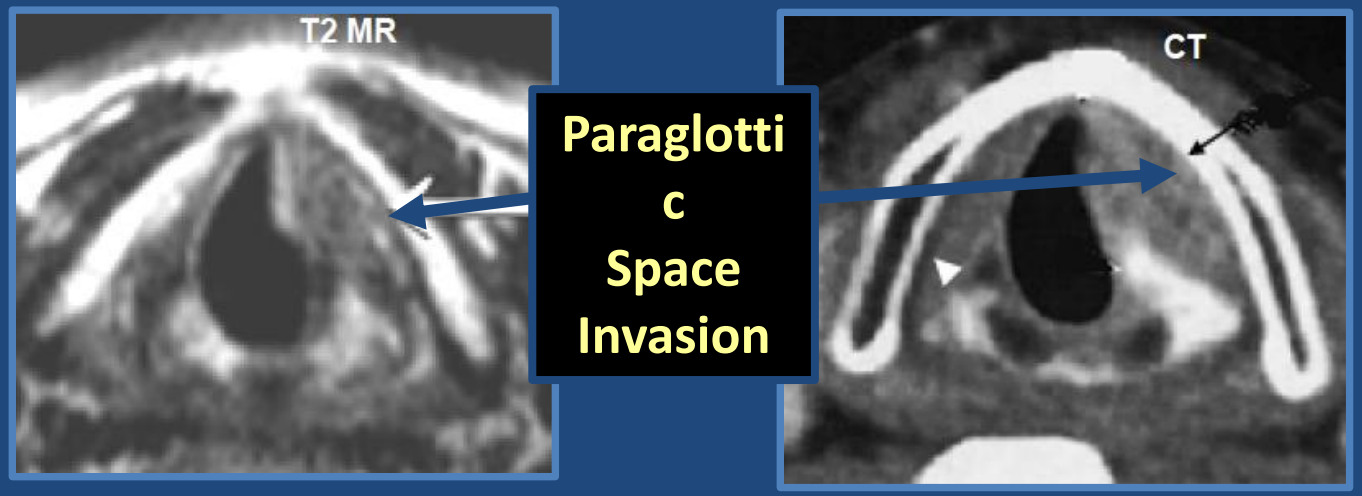


Paraglottic Space

- **Paired lateral narrow fat space** between TVC and thyroid ala.
- Forms lateral parts of horseshoe together with pre-epiglottic space.
- Involvement allows tumor fascial free access to all 3 laryngeal regions and to neck soft tissues



Paraglottic Space



Early stage management

Field Borders?

Superior:

thyroid notch

Inferior:

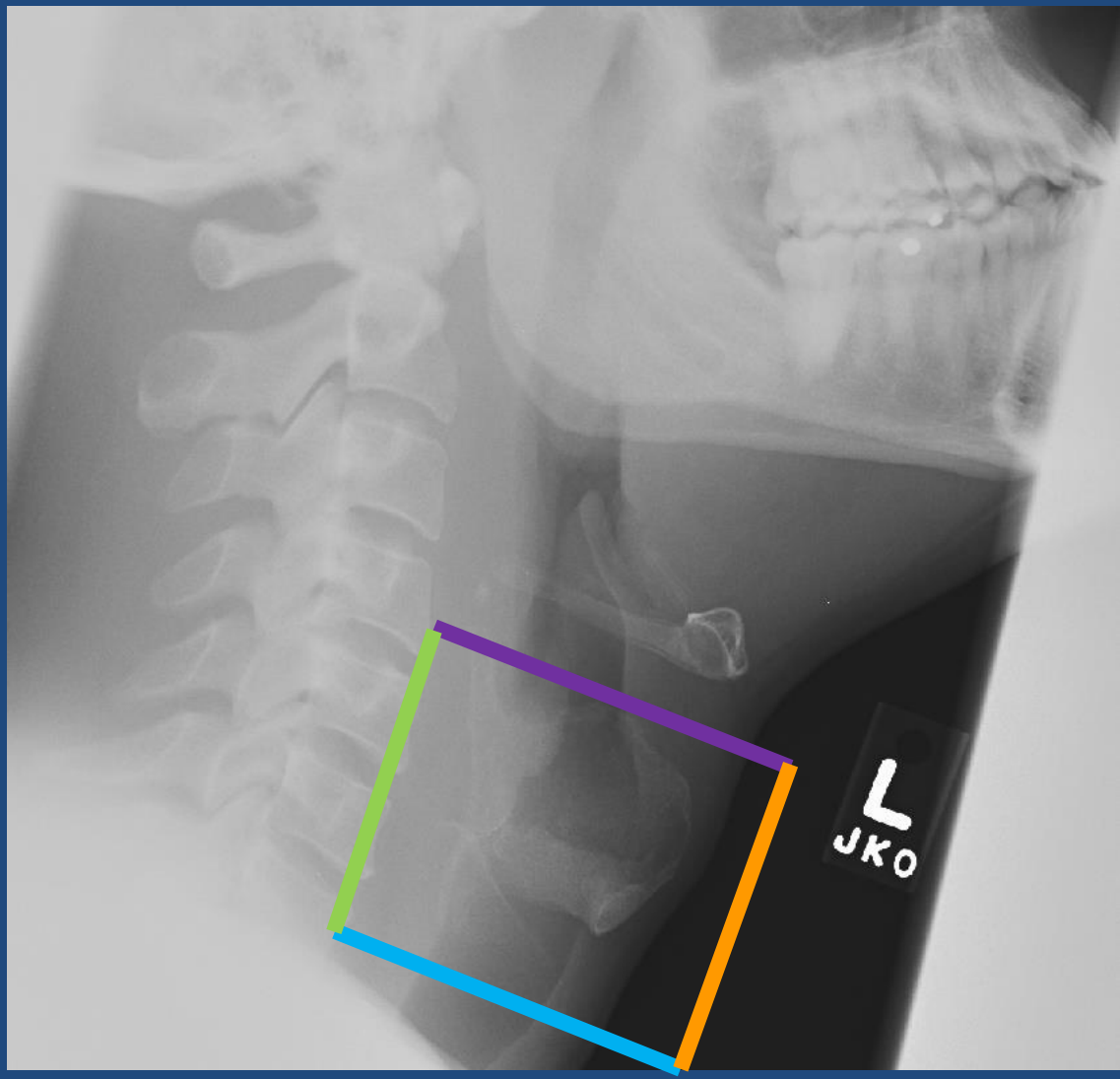
bottom cricoid

Anterior:

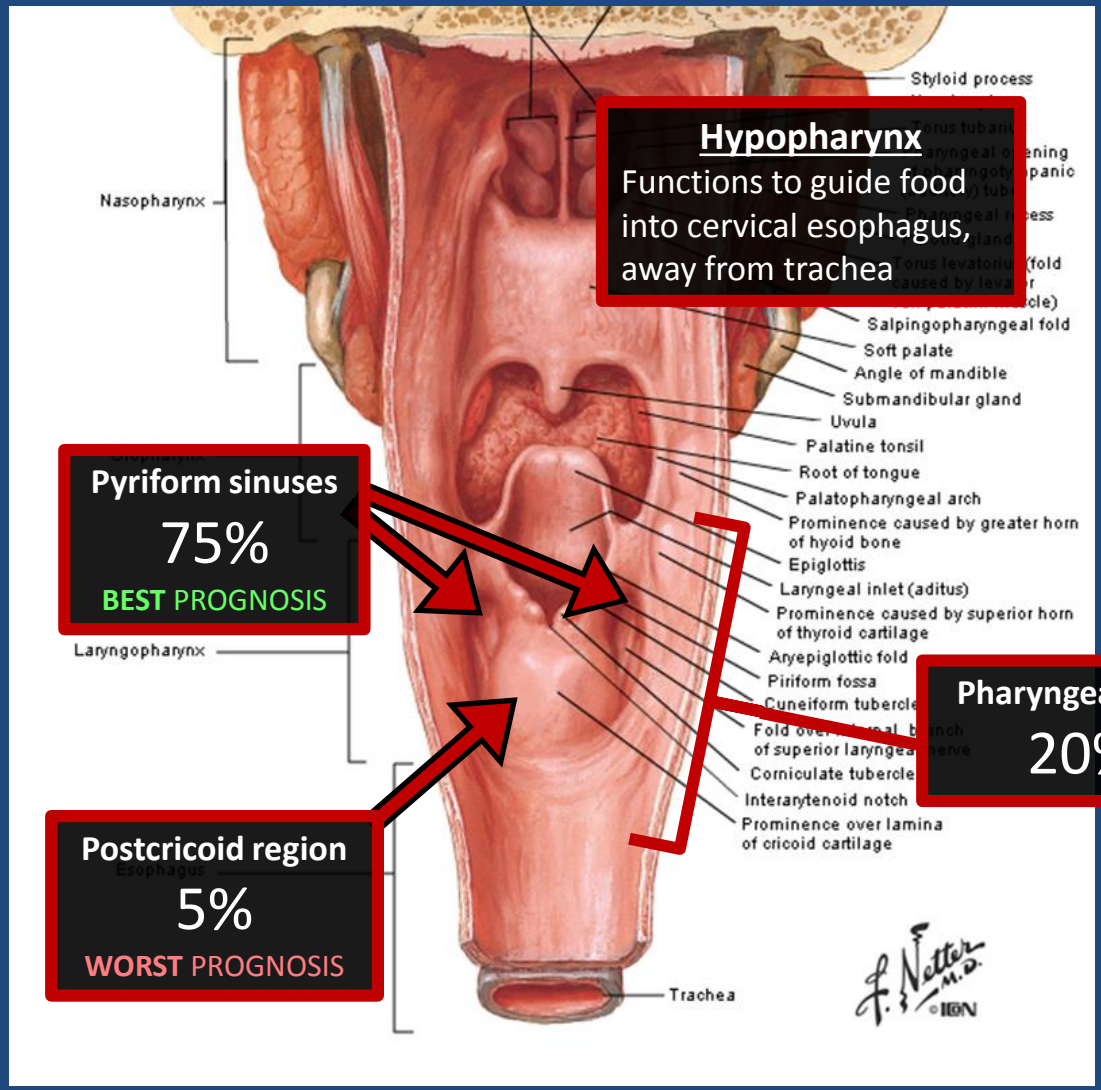
flash skin (1cm)

Posterior:

anterior aspect of vertebrae



Hypopharynx


Hypopharynx
Functions to guide food into cervical esophagus, away from trachea
Pyriform sinuses
75%
BEST PROGNOSIS
Postcricoid region
5%
WORST PROGNOSIS
Pharyngeal walls
20%
Nasopharynx
Laryngopharynx
Esophagus
Trachea
Styloid process
Salpingopharyngeal fold
Soft palate
Angle of mandible
Submandibular gland
Uvula
Palatine tonsil
Root of tongue
Palatopharyngeal arch
Prominence caused by greater horn of hyoid bone
Epiglottis
Laryngeal inlet (aditus)
Prominence caused by superior horn of thyroid cartilage
Aryepiglottic fold
Piriform fossa
Corniculate tubercle
Interarytenoid notch
Prominence over lamina of cricoid cartilage