

DISCUSSION SESSION: GROSS ANATOMY

ONN BLOCK

Sunday, Feb 7, 2021

Discuss Branchial Arches, Neck

BRANCHIAL ARCHES

Know – Branchial cartilages, muscles, nerves, pouches

Clinical Branchial Cleft Syndromes

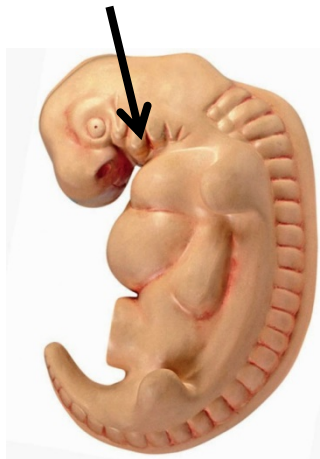
ALSO NOT DERIVED FROM BRANCHIAL ARCHES

Abnormalities of Thyroid development

DEVELOPMENT OF BRANCHIAL ARCHES

EMBRYOLOGICAL DEVELOPMENT

FORM GILLS IN FISH

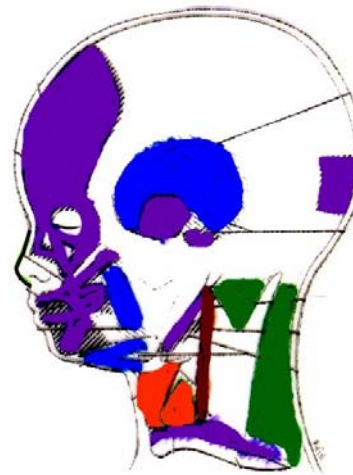


~4 weeks

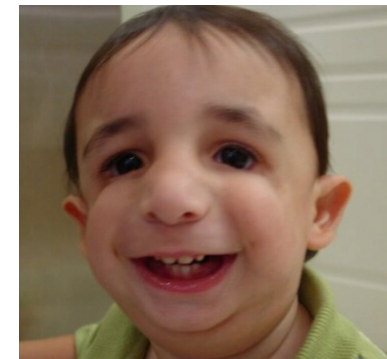


~11 weeks

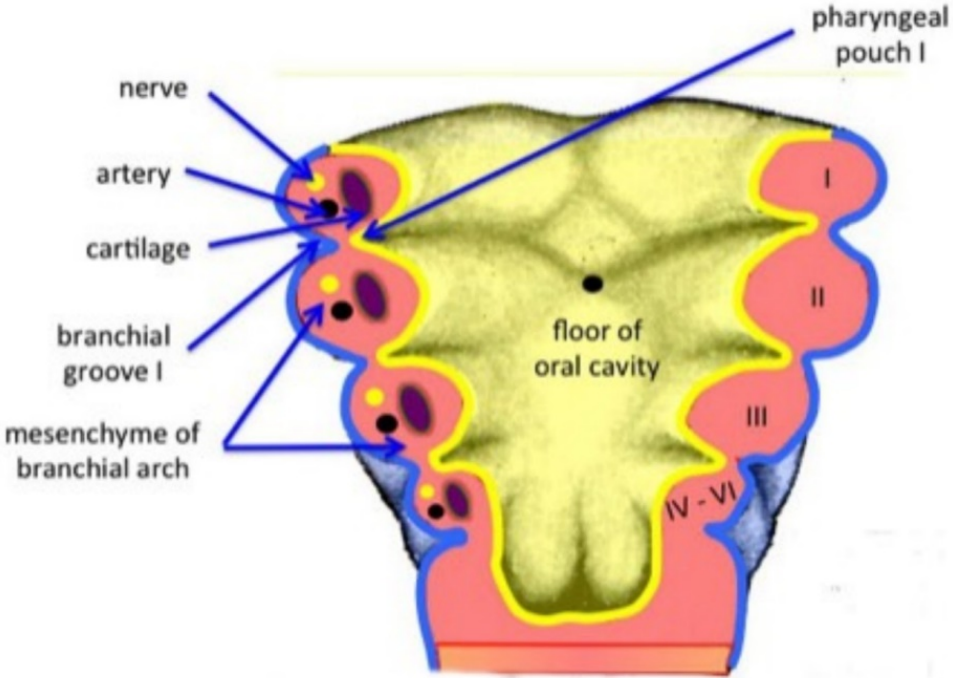
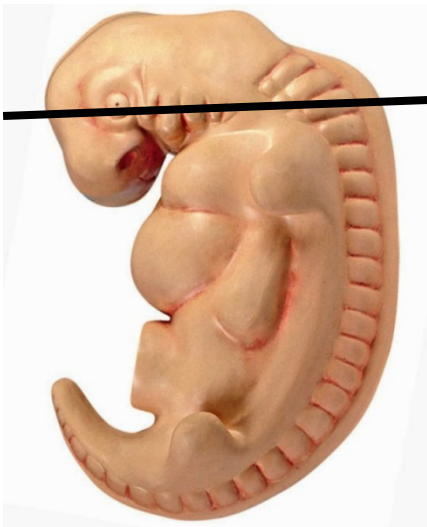
ANATOMY



CLINICAL SYNDROMES



BRANCHIAL ARCHES HAVE CARTILAGES, MUSCLES, ARTERIES



**FORM - CLEFTS ON OUTSIDE (ECTODERM)
POUCHES ON INSIDE (ENDODERM)**

CHART OF BRANCHIAL ARCH DERIVATIVES FROM FIRST AID - MEMORIZE

Branchial arch derivatives				
ARCH	CARTILAGE	MUSCLES	NERVES ^a	ABNORMALITIES/COMMENTS
1st branchial arch	<p>Maxillary process → Maxilla, zygomatic bone</p> <p>Mandibular process → Meckel cartilage → Mandible, Malleus and incus, sphenomandibular ligament</p>	<p>Muscles of Mastication (temporalis, Masseter, lateral and Medial pterygoids), Mylohyoid, anterior belly of digastric, tensor tympani, anterior 2/3 of tongue, tensor veli palatini</p>	CN V ₃ chew	<p>Pierre Robin sequence – micrognathia, glossoptosis, cleft palate, airway obstruction</p> <p>Treacher Collins syndrome – neural crest dysfunction → mandibular hypoplasia, facial abnormalities</p>
2nd branchial arch	<p>Reichert cartilage: Stapes, Styloid process, lesser horn of hyoid, Stylohyoid ligament</p>	<p>Muscles of facial expression, Stapedius, Stylohyoid, platysma, posterior belly of digastric</p>	CN VII (facial expression) smile	
3rd branchial arch	<p>Greater horn of hyoid</p>	<p>Stylopharyngeus (think of stylopharyngeus innervated by glossopharyngeal nerve)</p>	CN IX (stylopharyngeus) swallow stylishly	
4th–6th branchial arches	<p>Arytenoids, Cricoid, Corniculate, Cuneiform, Thyroid (used to sing and ACCCT)</p>	<p>4th arch: most pharyngeal constrictors; cricothyroid, levator veli palatini</p> <p>6th arch: all intrinsic muscles of larynx except cricothyroid</p>	<p>4th arch: CN X (superior laryngeal branch) simply swallow</p> <p>6th arch: CN X (recurrent/inferior laryngeal branch) speak</p>	<p>Arches 3 and 4 form posterior 1/3 of tongue; arch 5 makes no major developmental contributions</p>

KNOW THIS FOR STEP 1

BREAK DOWN TO COMPONENT IN LECTURE HANDOUT

STRUCTURES DERIVED FROM BRANCHIAL ARCHES

ARCH/NERVE	SKELETAL	LIGAMENTS	MUSCLES
First (V)	1) Malleus 2) Incus	1) Ant. ligament of malleus 2) Sphenomandibular ligament	1) Muscles of Mastication 2) Tensor tympani 3) Tensor palati 4) Mylohyoid 5) Ant. belly of Digastric
Second (VII)	1) Stapes 2) Styloid process 3) Hyoid bone - lesser horn, upper half of body	Stylohyoid ligament	1) Muscles of Facial Expression 2) Stapedius 3) Stylohyoid 4) Post. belly of Digastric
Third (IX)	Hyoid bone - greater horn, lower half of body	-----	Stylopharyngeus
Fourth (X)	Cartilages of Larynx	-----	1) All muscles of Larynx 2) All muscles of Pharynx (except Stylopharyngeus) 3) All muscles of Soft Palate (except Tensor palati)
Sixth (XI)	-----	-----	1) Sternocleidomastoid 2) Trapezius

CHART OF BRANCHIAL ARCH DERIVATIVES FROM FIRST AID - MEMORIZE

PRACTICE QUESTION CLINICAL VIGNETTE



A young child is brought to a pediatrician by his parents. The child (photo above) shows micrognathia (small mandible) and downward slanting eyes. Tests of auditory function indicate a hearing loss. The physician suspects that the child has Treacher-Collins syndrome, a congenital disorder associated with malformation of structures that develop in association with the first branchial arch. Which of the following structures normally develops with the first branchial arch and could have been malformed to cause the hearing loss?

- A. Auditory tube
- B. Cochlea
- C. Malleus and Incus
- D. Vestibulocochlear nerve
- E. Stapes

MUSCLES AND NERVES = BRANCHIOMOTOR MUSCLES FROM CRANIAL NERVES HANDOUT (INCANTATION)

10) BRANCHIOMOTOR - voluntary motor to skeletal muscles of face, ear, pharynx and neck that are derived from branchial arches.

<u>Nerve</u>	<u>Innervates</u>
V (Trigeminal) (all in V3)	muscles of mastication mylohyoid tensor tympani tensor palati anterior belly of digastric
VII (Facial)	muscles of facial expression stylohyoid posterior belly of digastric stapedius
IX (Glossopharyngeal)	stylopharyngeus
X (Vagus)	all muscles of pharynx (except stylopharyngeus) muscles of larynx all muscles of palate (except tensor palati)
XI (Accessory)	sternocleidomastoid trapezius

FOCUS ON CLINICAL: BRANCHIAL POUCHES, GROOVES, MEMBRANES

POUCH	FORMS	CLINICAL
First	1) Auditory tube 2) Tympanic cavity	First Branchial 'Cleft' cyst - tract linked to external auditory meatus
Second	Lining (crypts) of palatine tonsils	Second Branchial 'Cleft' cyst - tract linked to tonsillar fossa (palatine tonsils)
Third	1) Inferior parathyroid gland 2) Thymus	Third Branchial 'Cleft' cyst - tract at thyrohyoid membrane or piriform recess
Fourth	1) Superior parathyroid gland 2) C-cells of Thyroid	does not form
Sixth (XI)	-----	-----

Note: Cysts and fistuli - in lateral neck are **anterior to Sternocleidomastoid muscle**

CLEFT	FORMS
First	External Auditory Meatus

MEMBRANE	FORMS
First	Tympanic membrane

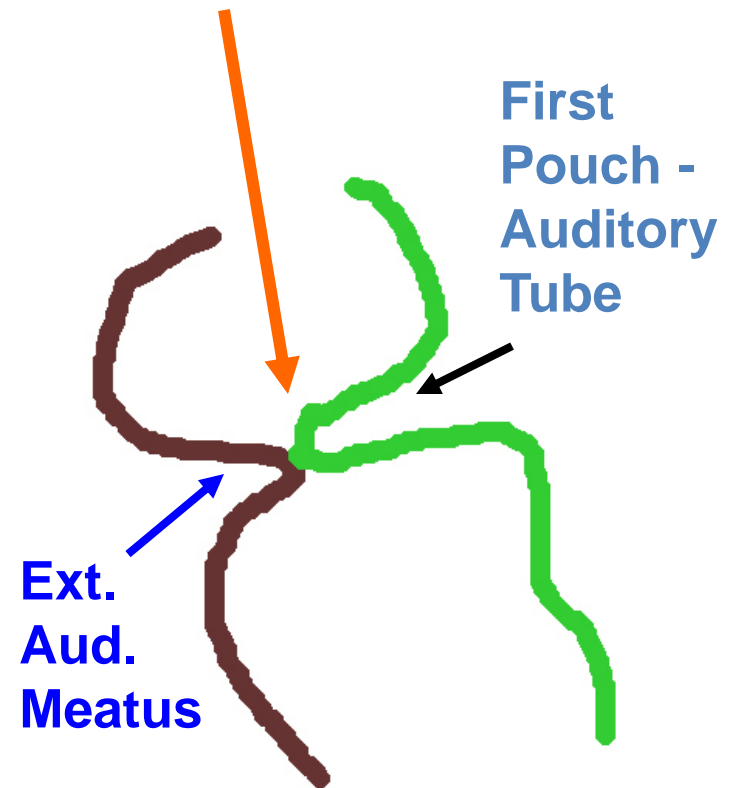
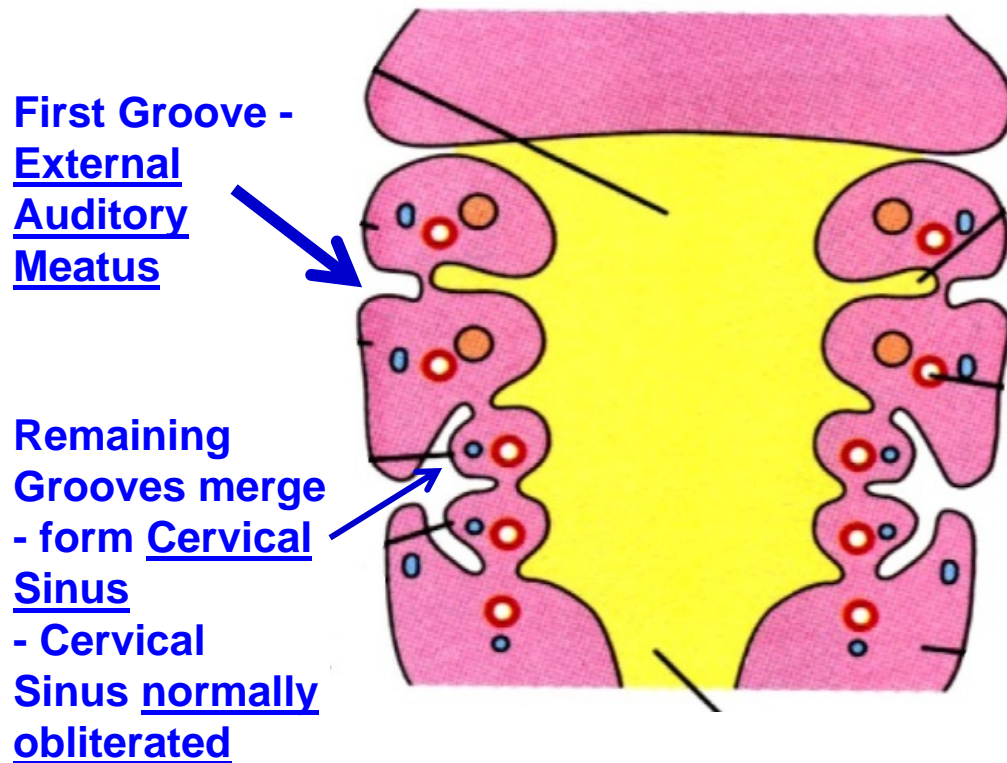
NOTE: CLEFT = GROOVE

BRANCHIAL GROOVES (CLEFTS) AND MEMBRANES

Only First Branchial Groove and Membrane Normally form Structures in Adult

First Groove - External Auditory Meatus

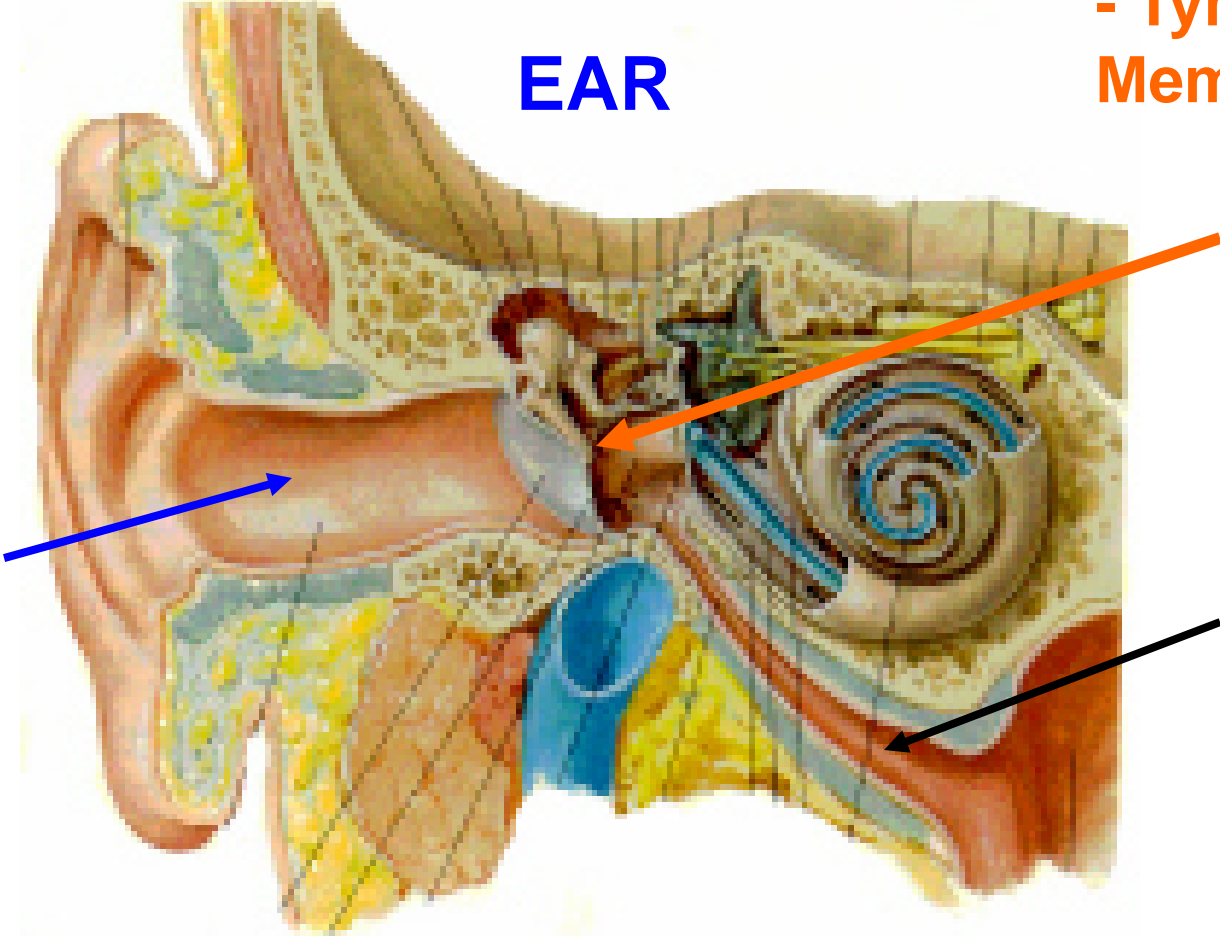
First Membrane = Tympanic Membrane



EAR

First Membrane
- Tympanic
Membrane

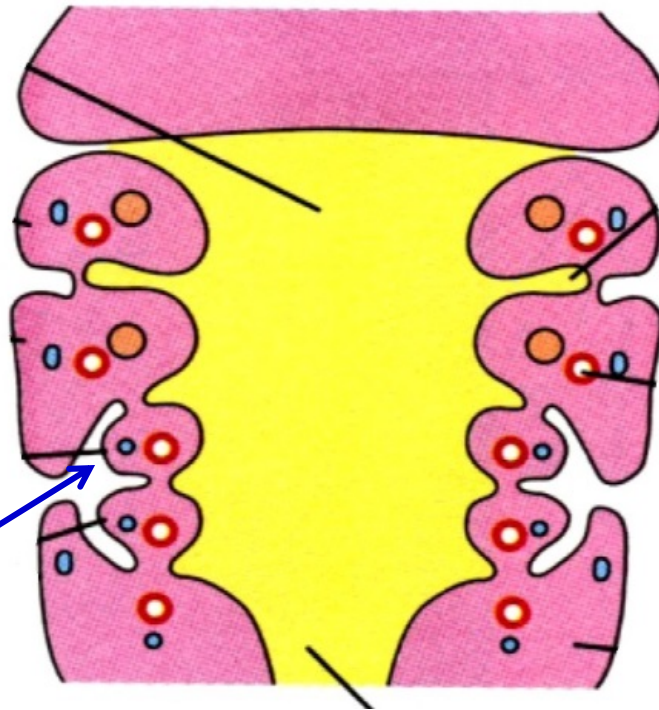
FIRST
GROOVE -
Ext. Aud.
Meatus



FIRST
POUCH -
Auditory
Tube,
Tympanic
Cavity

BRANCHIAL GROOVES

Other Grooves develop in longer depression
Cervical Sinus



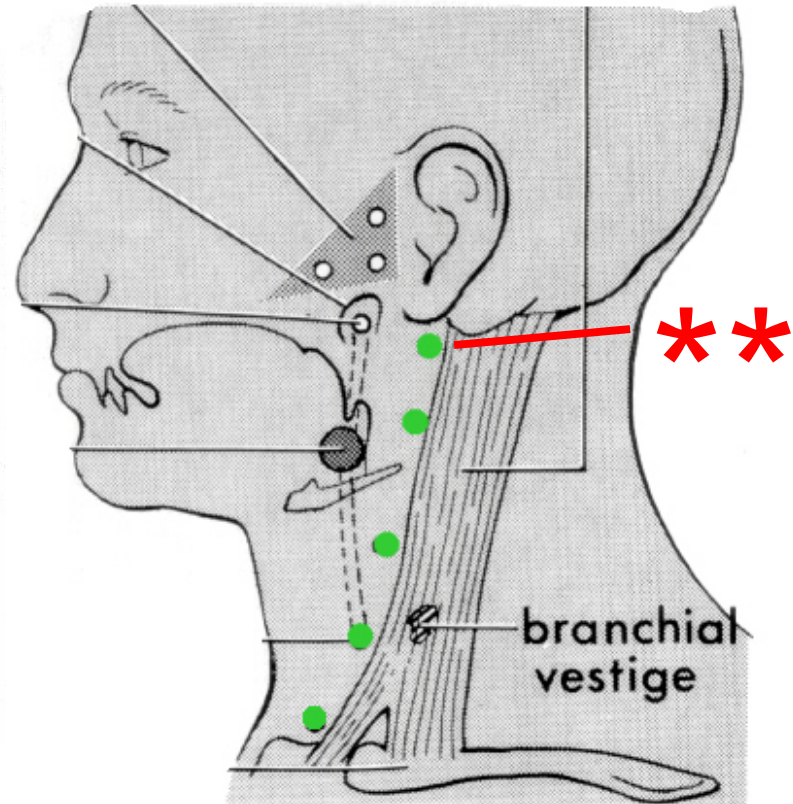
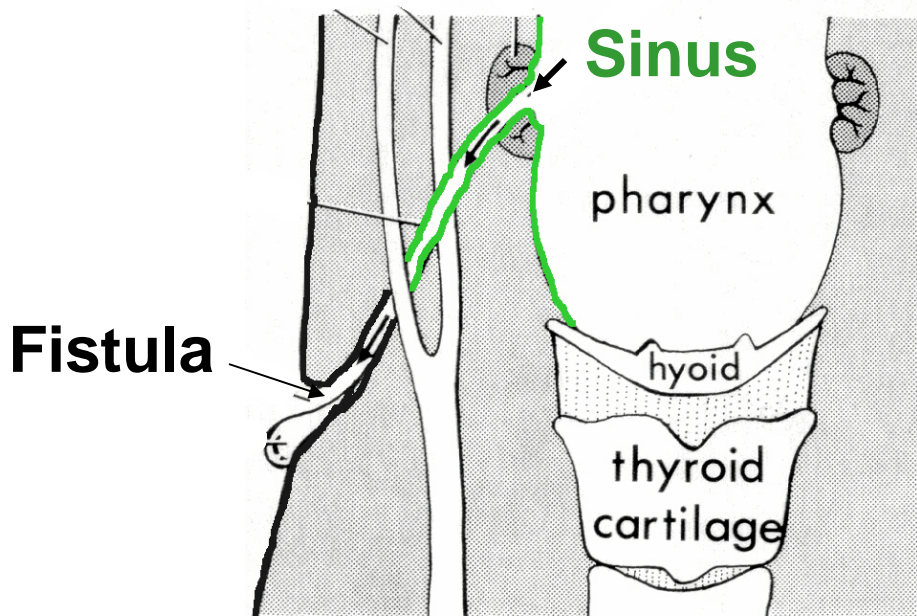
Remaining
Grooves merge
- form Cervical
Sinus
- Cervical
Sinus normally
obliterated

Note:
Cervical
sinus
normally
obliterated
but
can persist

BRANCHIAL ANOMALIES

Branchial Sinus = Blind pouch from Pharynx

Branchial Fistula = Channel, often connecting Pharynx to skin of neck; usually passes Anterior to Sternocleidomastoid, between Int. and Ext. Carotid A.



FIRST BRANCHIAL POUCH SYNDROME – channel to External Auditory Meatus

PRACTICE QUESTION CLINICAL VIGNETTE

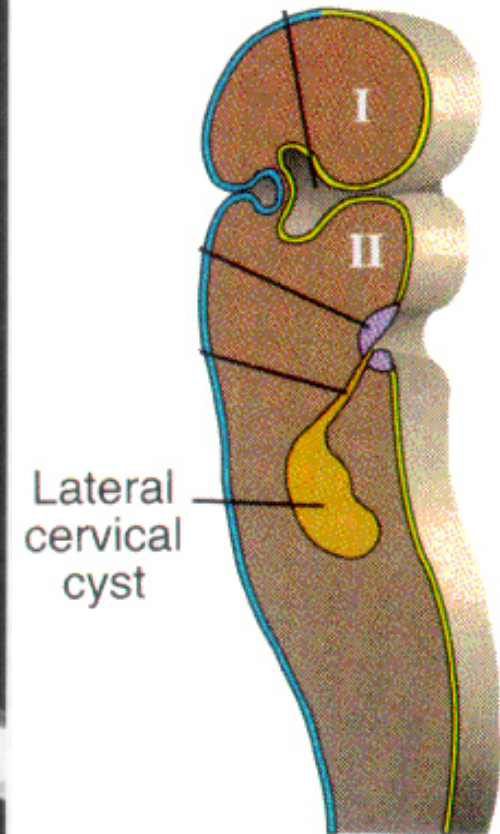
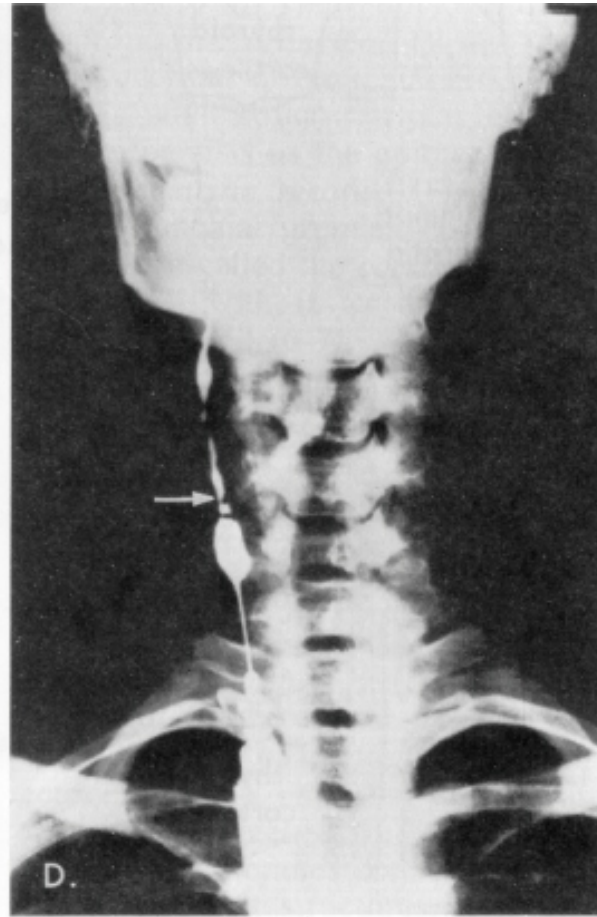


A 24 year old woman develops a mass in her neck (see photo above). The mass is located immediately anterior to the sternocleidomastoid muscle. The physician suspects that this condition has result from a branchial cyst. During surgery, the mass is found to be connected to a tract that extends superiorly and medially. The tract is most likely to be connected to which of the following structures?

- A. Middle meatus of the nasal cavity
- B. Pharyngeal tonsil
- C. Tonsillar fossa (palatine tonsils)
- D. Lingual tonsil
- E. Mandibular fossa

SECOND BRANCHIAL POUCH SYNDROME

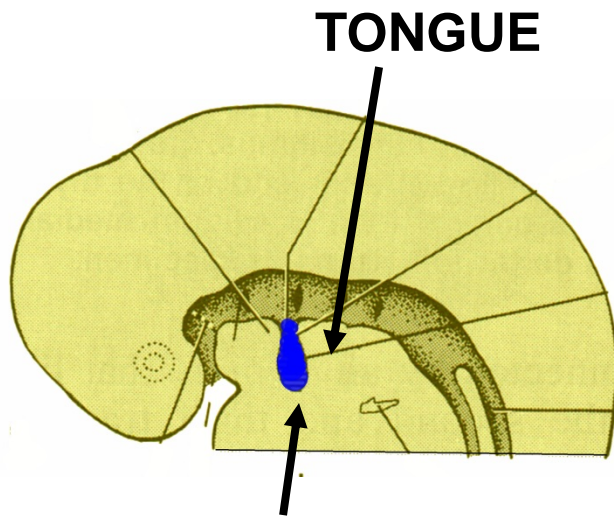
SECOND BRANCHIAL POUCH FORMS CRYPTS (LININGS)
OF PALATINE TONSILS



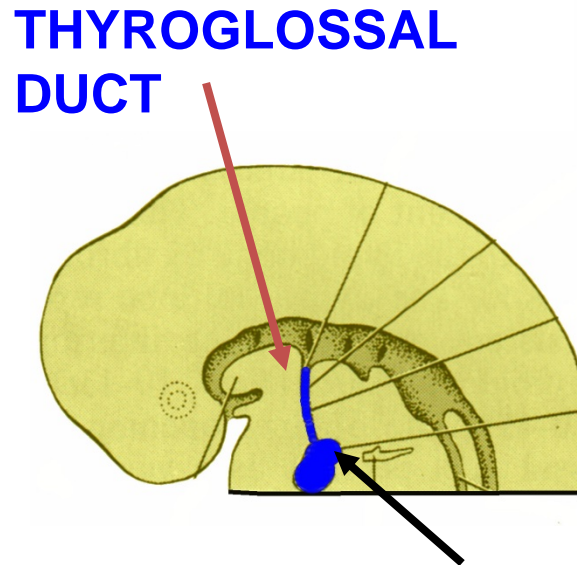
Branchial Fistula - drains to neck

Branchial Cyst
often remnant
of Cervical Sinus

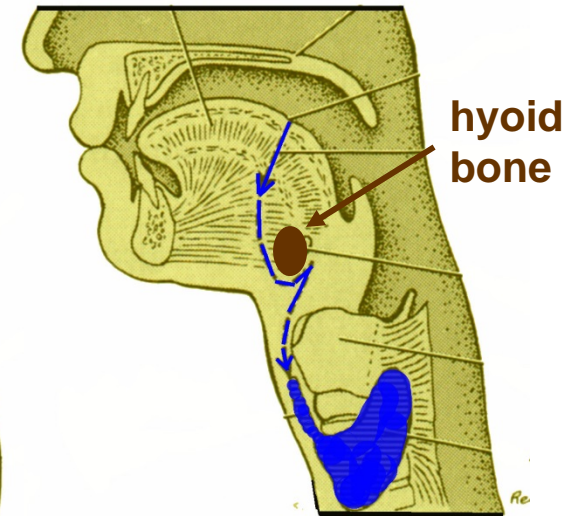
DEVELOPMENT OF THYROID



1) Thyroid start as Median endodermal Thickening on floor of pharynx at **future junction of anterior 2/3 and posterior 1/3 of tongue (marked by Foramen Cecum)**

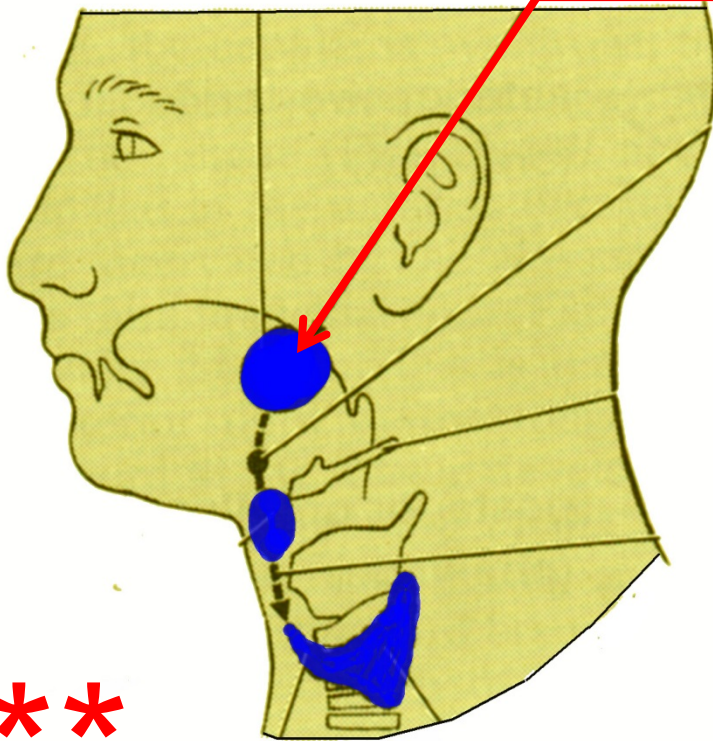


2) Elongates to form Thyroid Diverticulum; descends ant. to hyoid bone and larynx
3) Thyroglossal duct connects Diverticulum to Foramen cecum

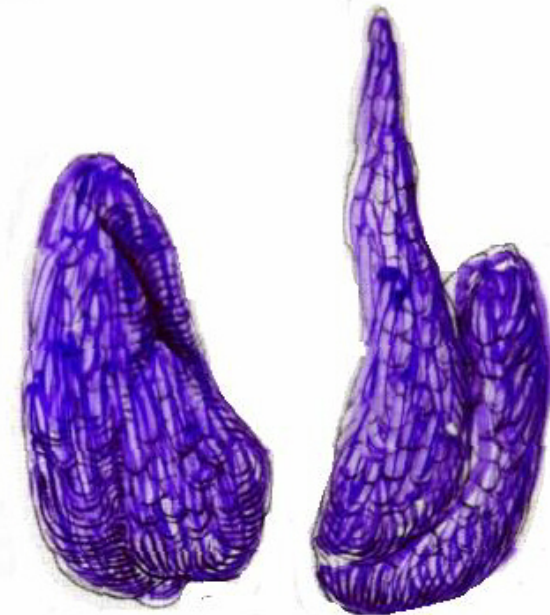


CONGENITAL MALFORMATIONS

LINGUAL THYROID* - gland in tongue



Thyroglossal Duct Remnants - can form thyroid tissue (cysts) along path (midline, ant. to hyoid, larynx)



C. PYRAMIDAL LOBE. ABSENCE OF ISTHMUS

Pyramidal Lobe - 50% of people; attached to hyoid by fibrous strand; no clinical problems

LINGUAL THYROID* - Thyroid gland in tongue



AT: Junction of anterior 2/3 and posterior 1/3 of tongue

NECK

Know Carotid Artery (Internal, External Carotid Arteries)

Muscles: Torticollis, contracture of sternocleidomastoid,
face directed to opposite side

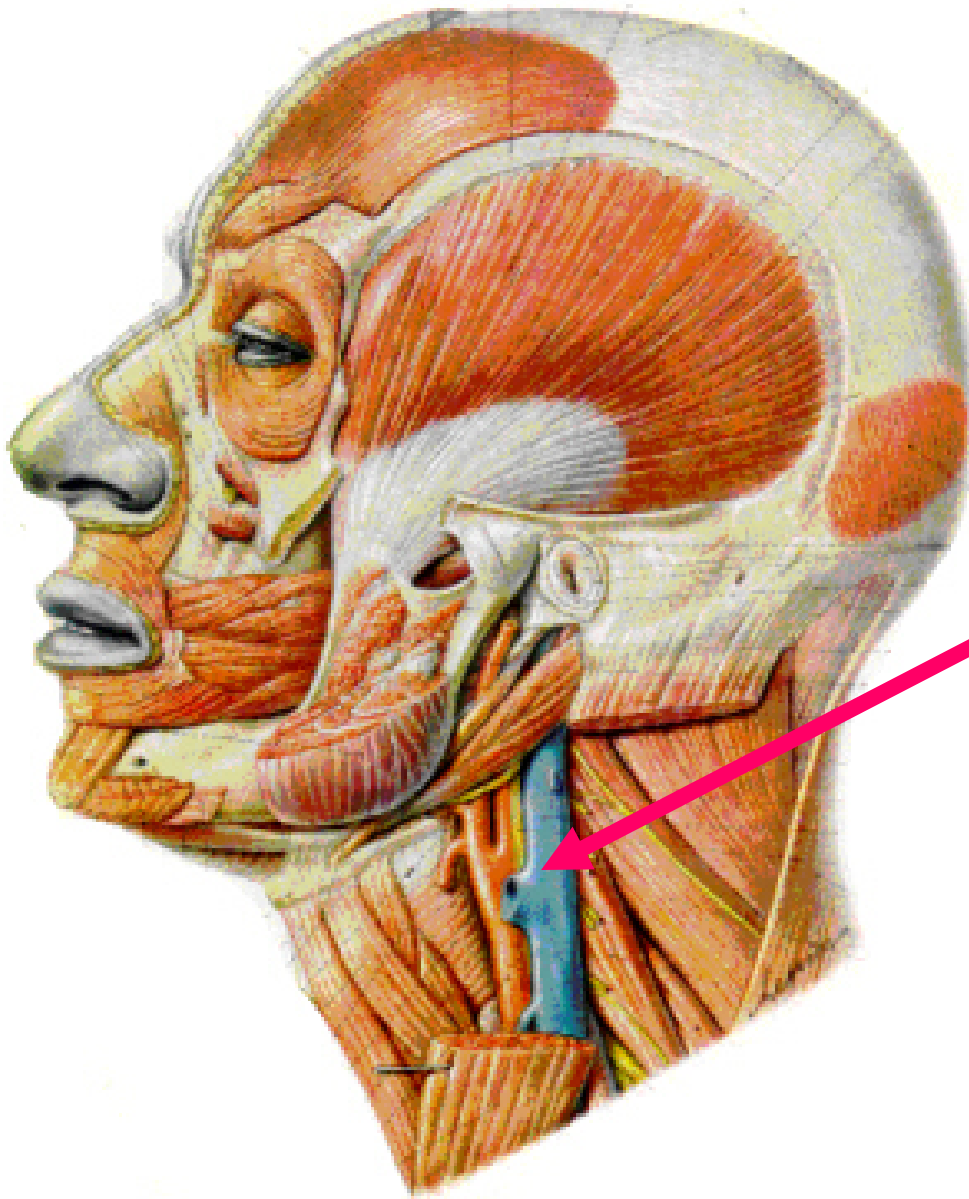
Wounds, surgery to neck damage Phrenic nerve

Pyramidal lobe variant of Thyroid gland no clinical problems
but important in thyroid surgery

Carotid angiogram Superior Thyroid artery

3. LATERAL COMPARTMENT - CAROTID SHEATH

CLINICAL **



Lateral Compartment-
lateral and posterior to
pharynx

Contained in Carotid
Sheath

1) Common and Internal
Carotid arteries; 2)
Internal jugular vein, 3)
Vagus nerve

Note: Sympathetic chain
is posterior to (NOT IN)
Carotid Sheath

A. MUSCLES OF NECK - NOT ATTACHED TO HYOID - move head and neck

1. STERNO-CLEIDOMASTOID

O - Two heads: 1) Manubrium of sternum; 2) Clavicle (L. root - cleido) - medial 1/3

I - Mastoid process of temporal bone

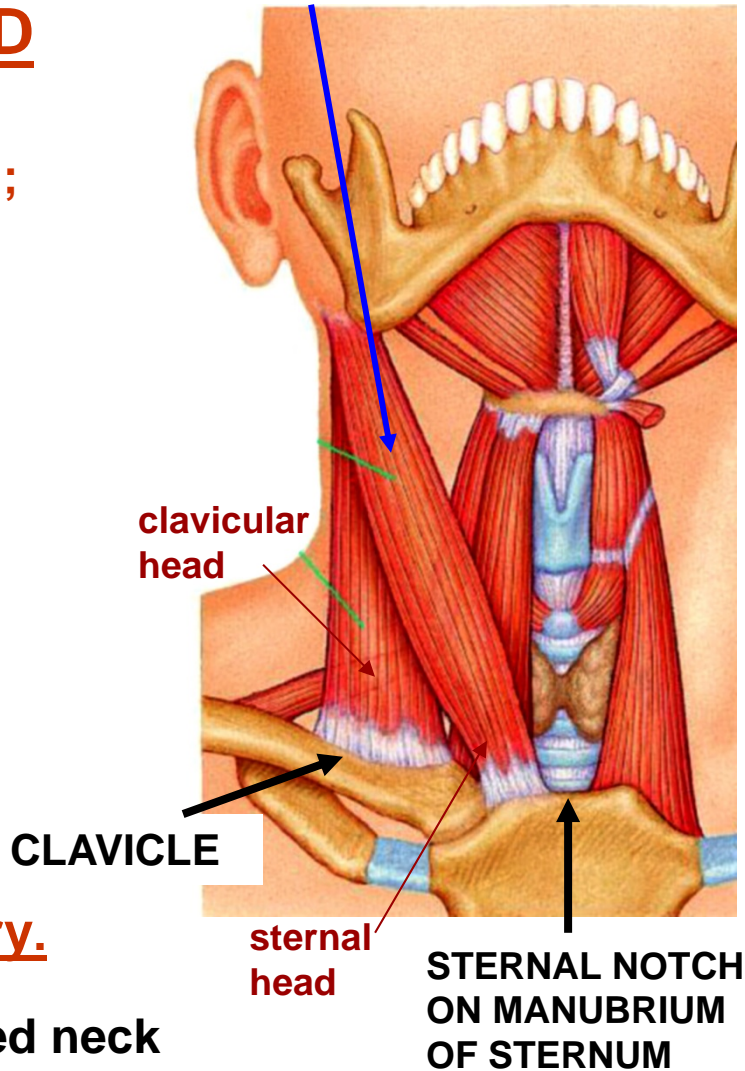
Act - bilateral - flex head; unilateral rotate head, face directed to opposite side

(MASTOID MOVES TOWARD STERNUM)

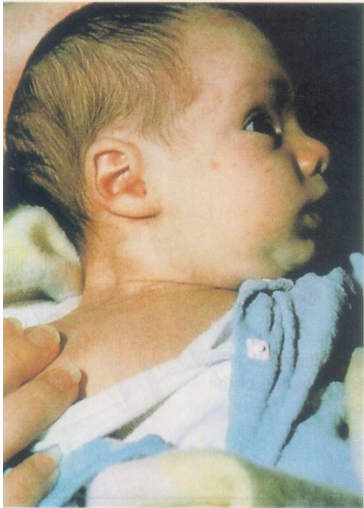
Inn - CN XI Accessory.

TORTICOLLIS = twisted neck

MOST IMPORTANT LANDMARK IN NECK



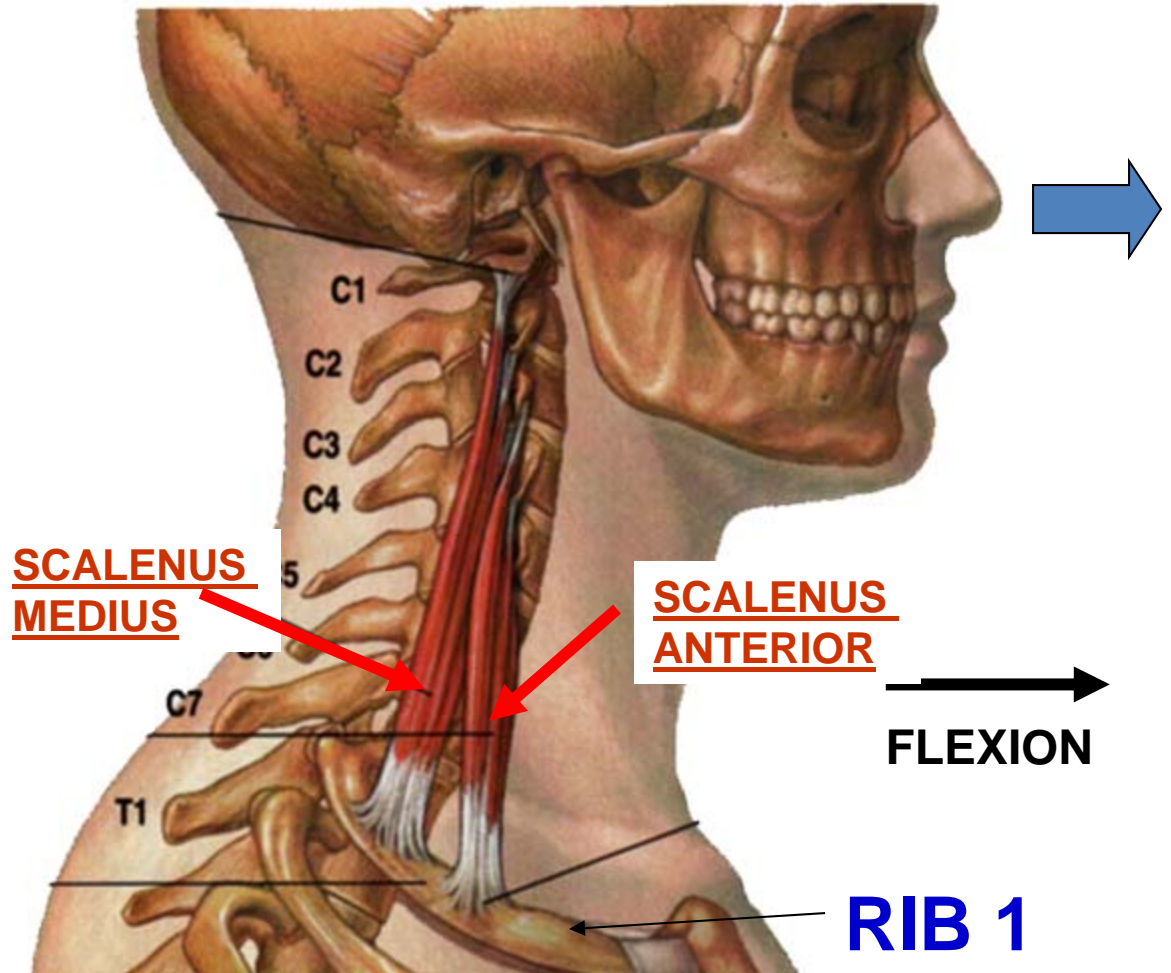
ACTION - PULL MASTOID TOWARD STERNUM



* TORTICOLLIS – Contracture of Sternocleidomastoid (congenital or acquired); face to opposite side

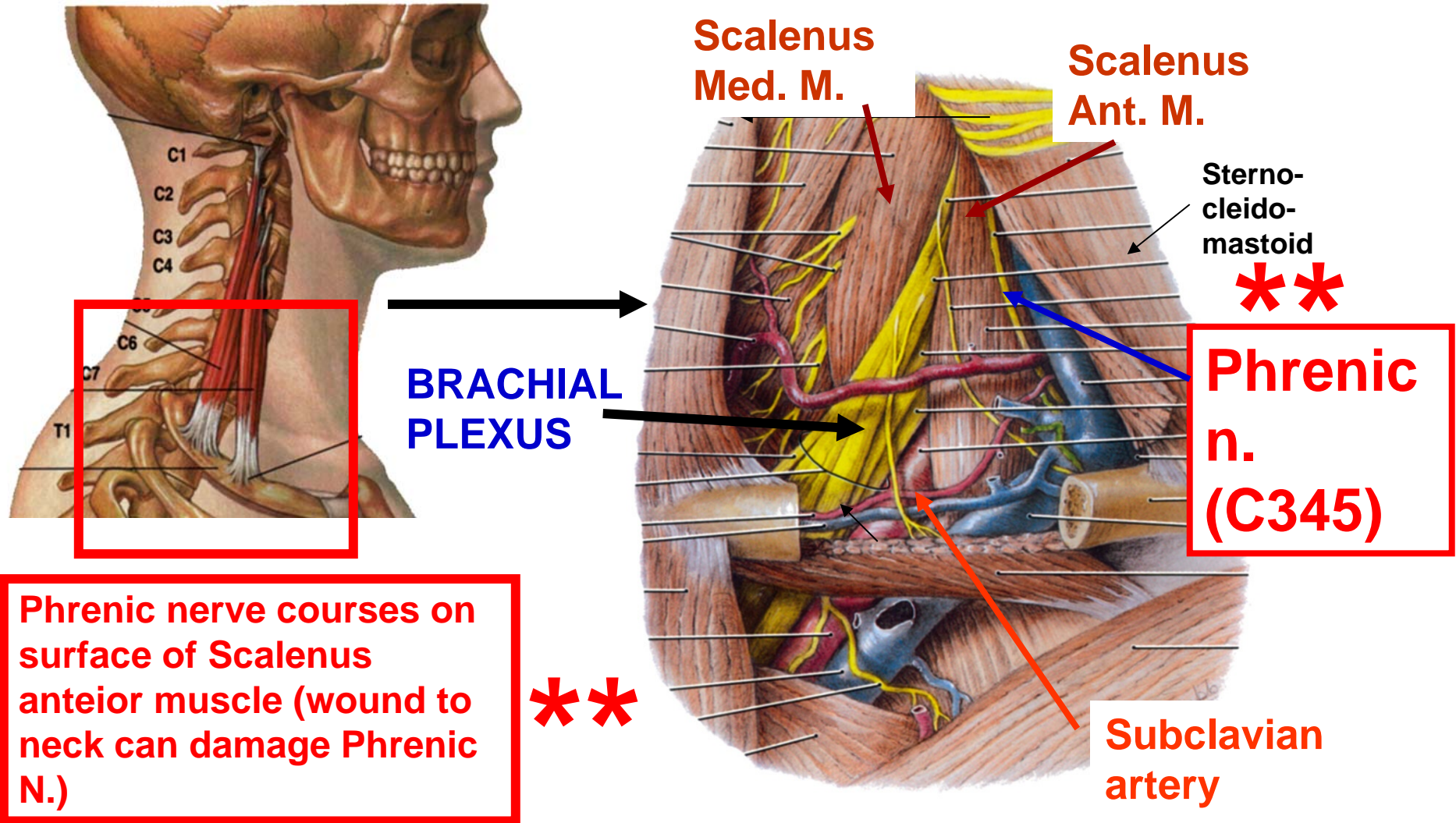
MUSCLES OF NECK – SCALENUS MUSCLES

SCALENUS
ANTERIOR
AND
SCALENUS
MEDIUS



SCALENUS ANTERIOR AND SCALENUS MEDIUS ARE IMPORTANT LANDMARKS

- **Brachial Plexus**, Subclavian Artery pass between Scalenus Ant. and Med.;
- **Phrenic nerve** (to Diaphragm) **courses on Scalenus Anterior**



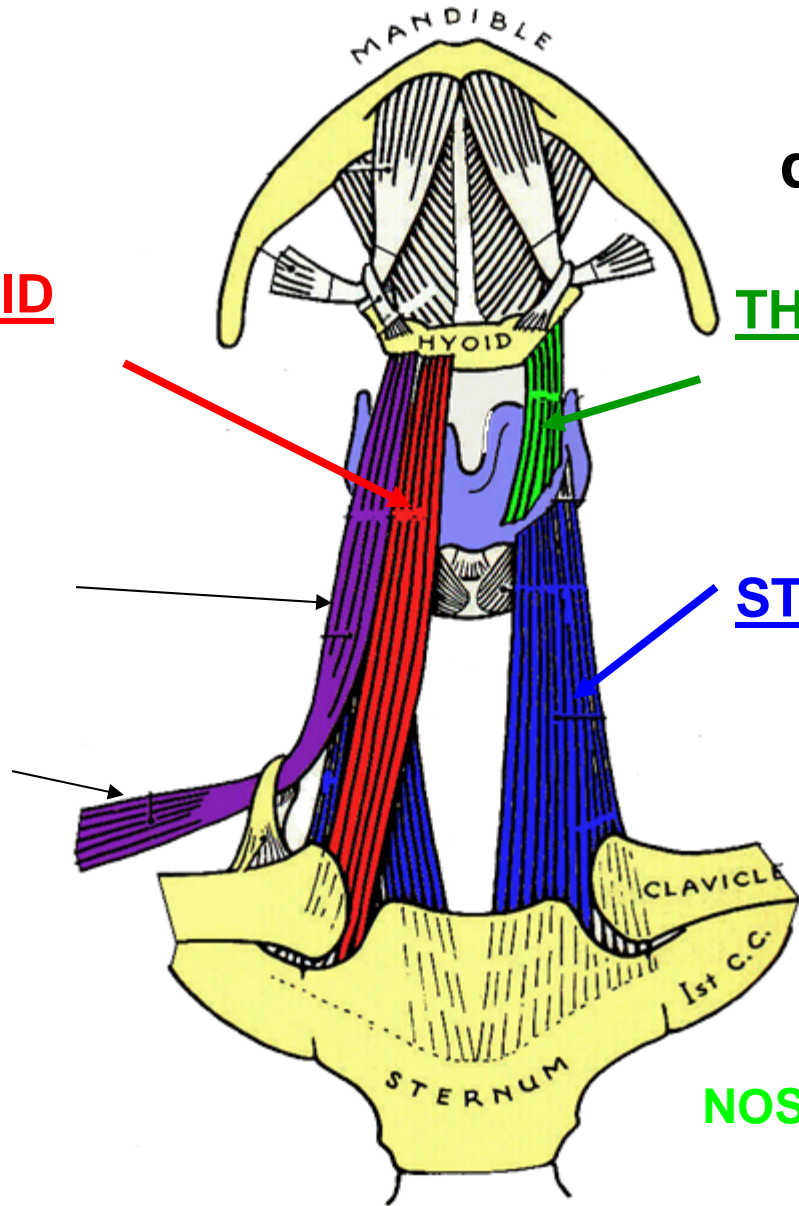
INFRAHYOID MUSCLES - DEEPER

STERNOHYOID

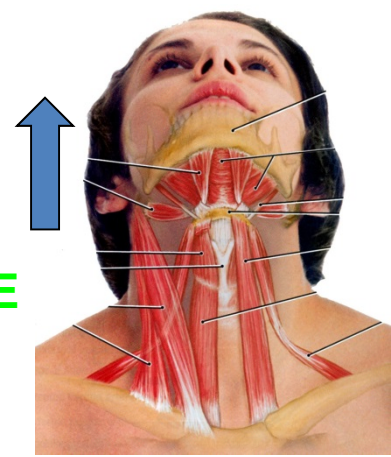
THYROHYOID

OMOHYOID

STERNOCLAVICULAR



deeper



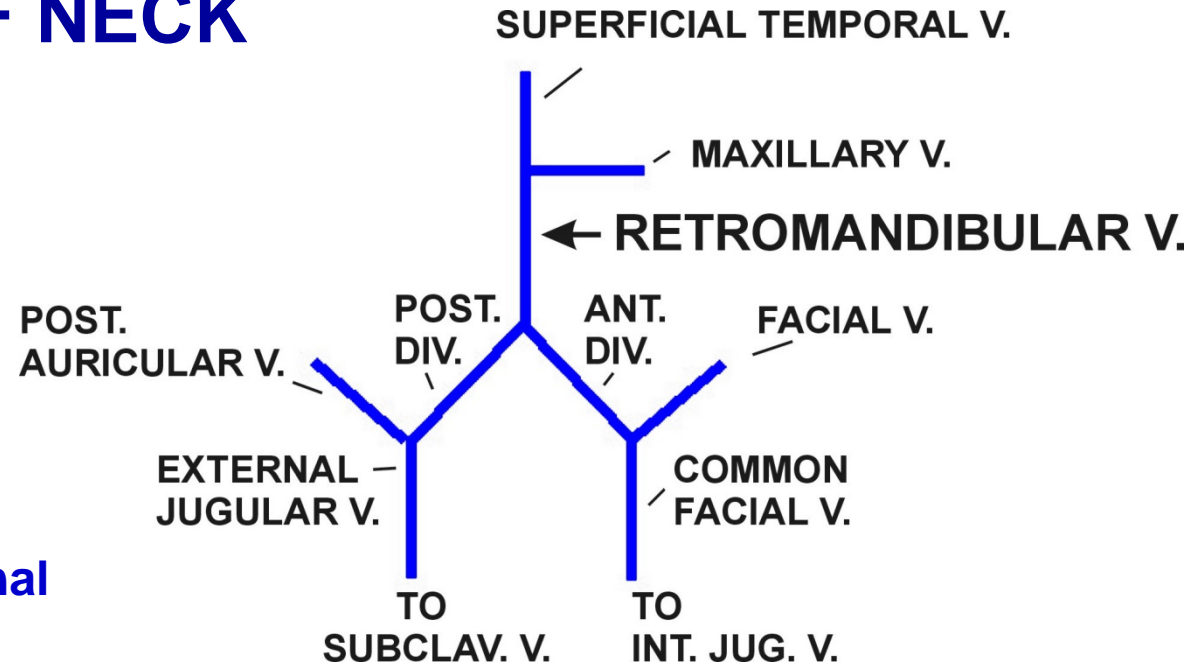
ORIENT -
HEAD
TILTED
BACK

NOSE

VEINS OF NECK



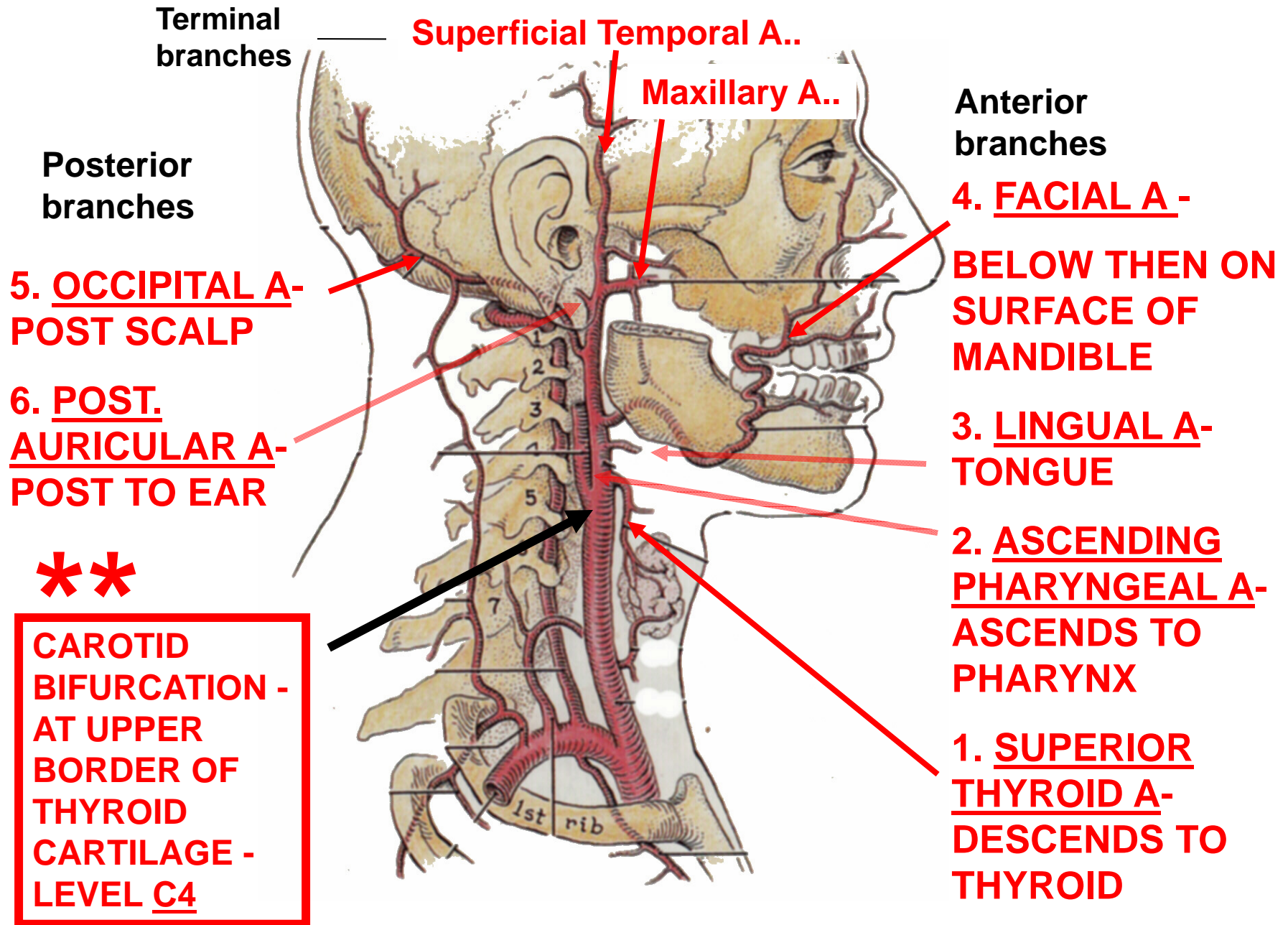
Large External Jugular V.

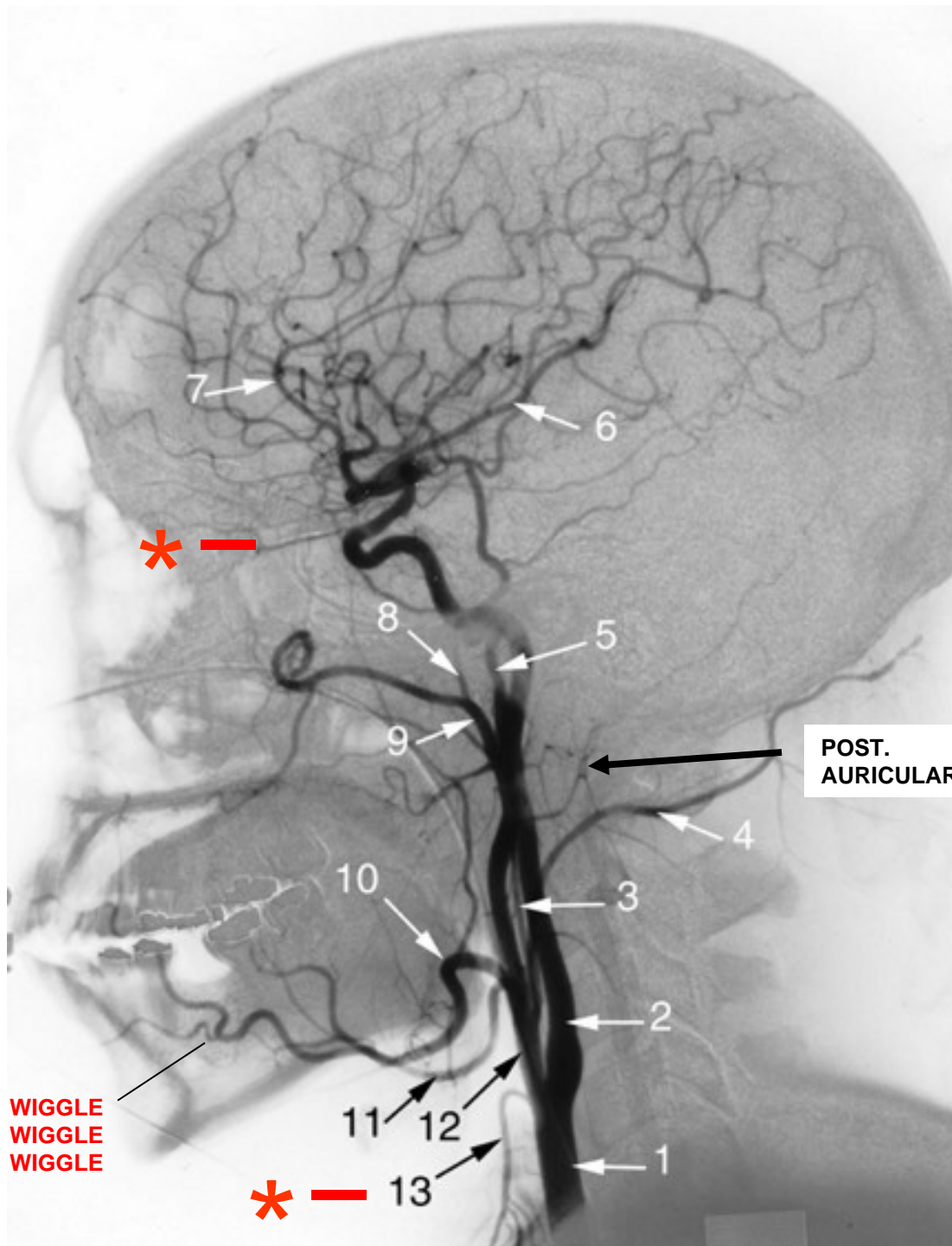


Large Anterior Jugular V.

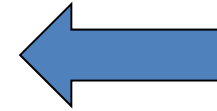
EXTERNAL JUGULAR V. - ON SURFACE OF STERNOCLEIDOMASTOID; NOT IN CAROTID SHEATH
INTERNAL JUGULAR V. - DEEP TO STERNOCLEIDOMASTOID; IN CAROTID SHEATH

EXTERNAL CAROTID ARTERY





NOSE



**KNOW THIS
SLIDE**

1. COMMON CAROTID
2. INTERNAL CAROTID
3. ASCENDING PHARYNGEAL
4. OCCIPITAL
5. SUPERFICIAL TEMPORAL
6. MIDDLE CEREBRAL
7. ANTERIOR CEREBRAL
8. MIDDLE MENINGEAL
9. MAXILLARY
10. FACIAL
11. LINGUAL
12. EXTERNAL CAROTID

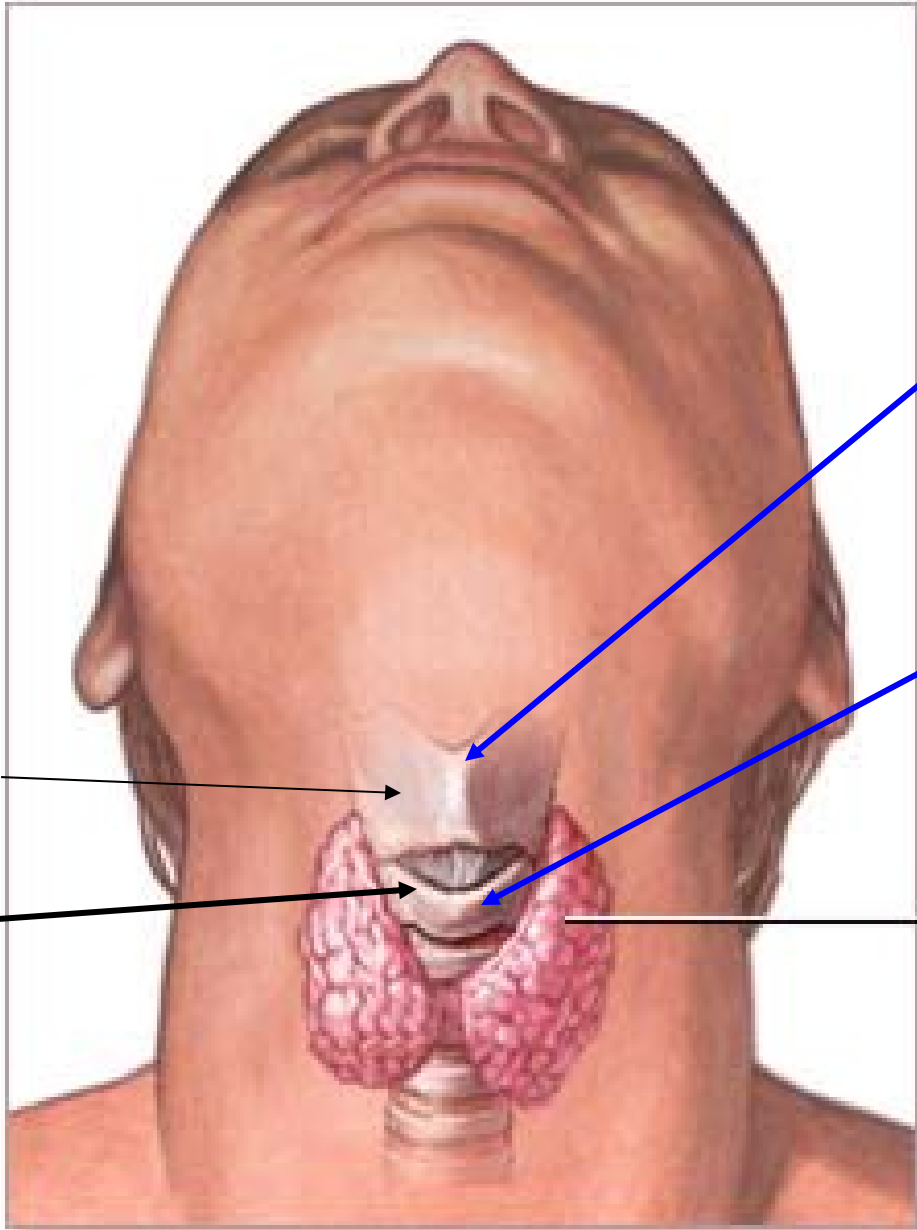
13. SUPERIOR THYROID

*- OPHTHALMIC ARTERY
ARISING FROM CAROTID
SIPHON



WIGGLE
WIGGLE
WIGGLE

*- 13



PALPATE

PLATE

**RING
BELOW**

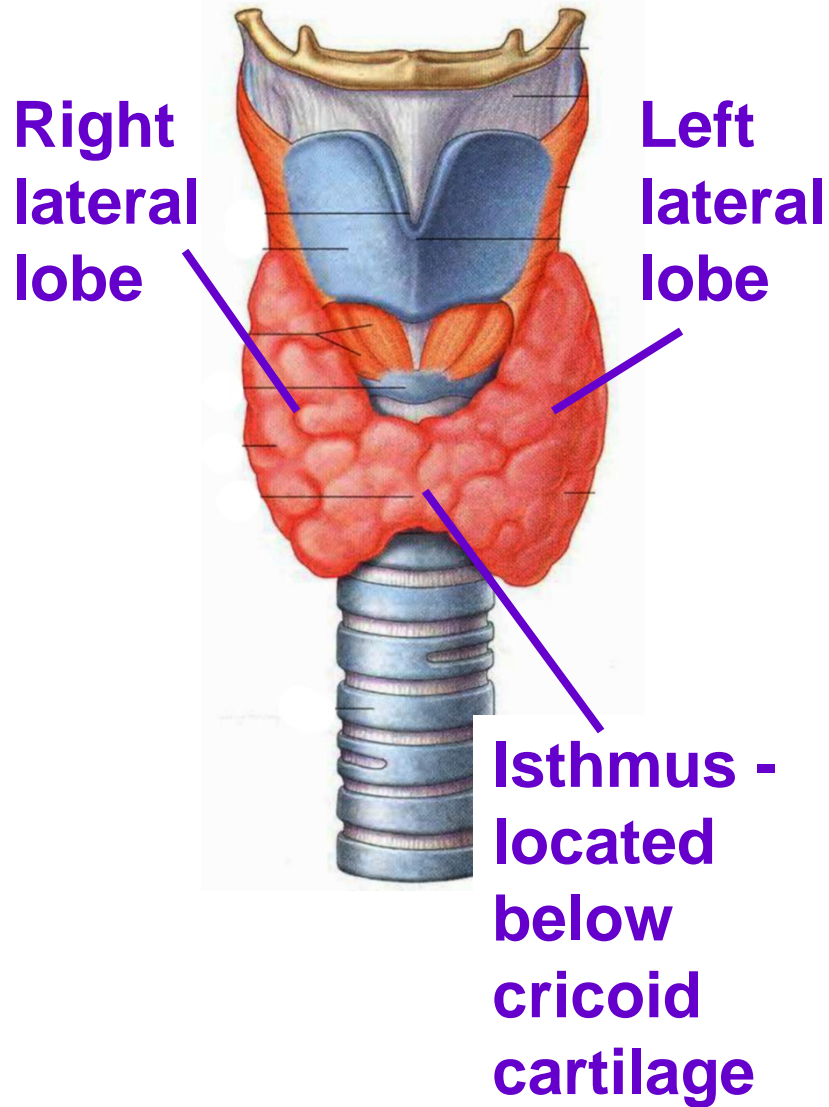
**LARYNGEAL
PROMINENCE
(ADAM'S APPLE)
OF THYROID
CARTILAGE**

**CRICOID
CARTILAGE**

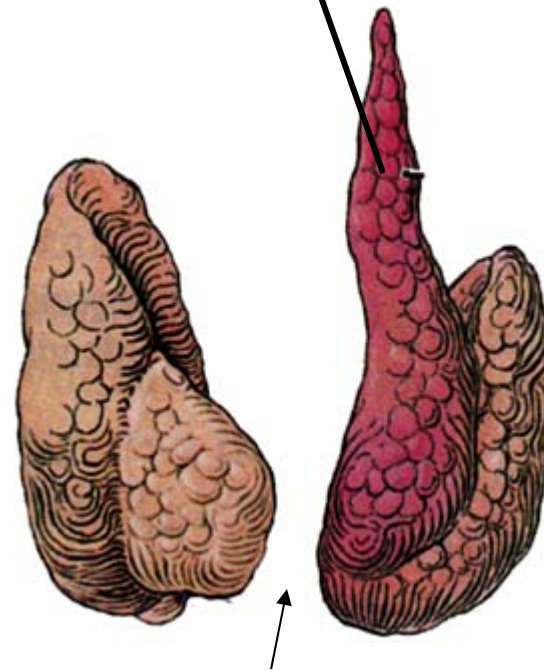
Thyroid gland

THYROID GLAND

Normal variations common

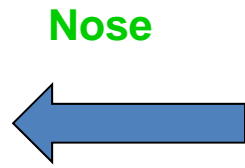


Pyramidal lobe - when present often attached to hyoid bone by fibrous strand



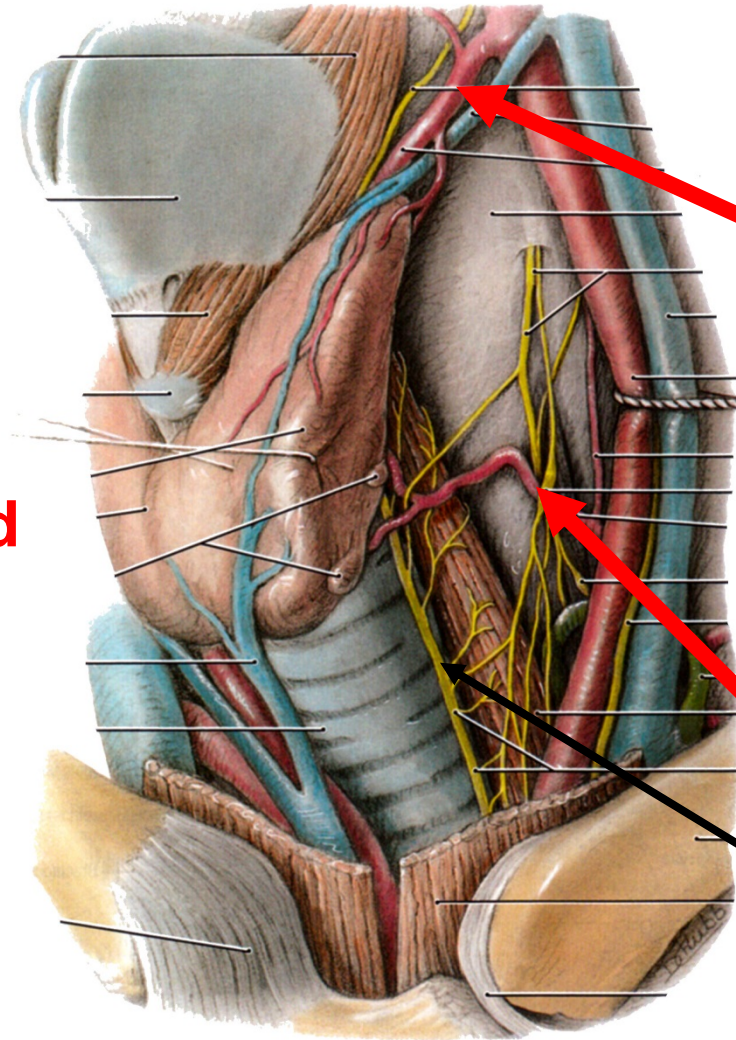
Absence of Isthmus

THYROID GLAND - ARTERIAL SUPPLY



Very vascular-arteries accompanied by nerves

**



FROM EXT. CAROTID

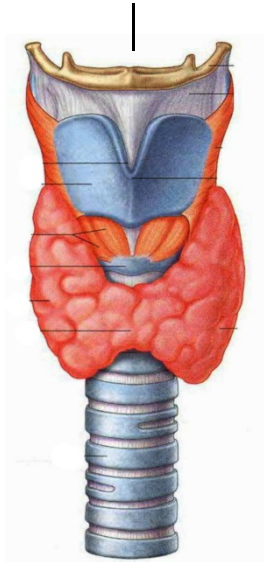
a) Sup. Thyroid artery (courses with Sup. Laryngeal n.)

FROM THYRO-CERVICAL TRUNK

b) Inf. Thyroid artery (courses with Recurrent Laryngeal n.)

Clinical: In thyroid surgery care taken not to damage Recurrent Laryngeal Nerve; paralyze all muscles of Larynx (except Cricothyroid) on one side; patient has only hoarse voice or whisper.

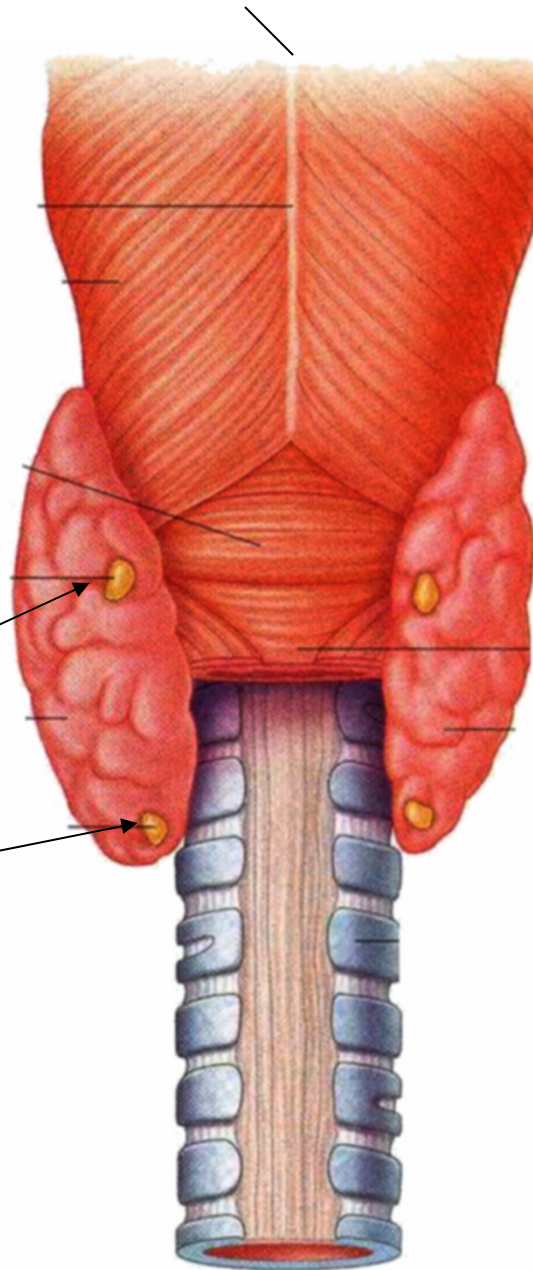
ANT. VIEW



Superior
parathyroid
gland

Inferior
parathyroid
gland

POSTERIOR VIEW



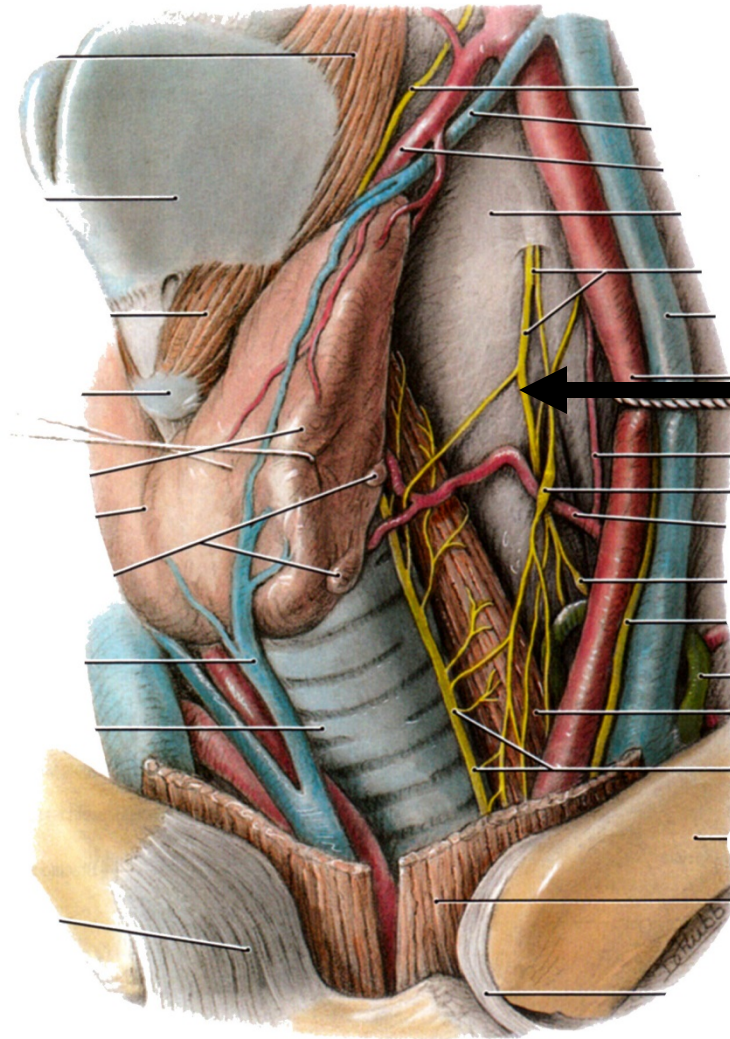
PARATHYROID GLANDS

- 4 small
bodies (2
on each
side)
located
posterior
to or
within
Thyroid
gland

Nose



SYMPATHETIC CHAIN



**

Sympathetic trunk- deep to
(not in)
Carotid Sheath