PDF version of the AIG
- Animations removed.
- Videos will not work.
- Some content does not convert to PDF

We advise you to use the PDF version as an overview but view the full version while studying.



Face

Anatomy Interactive Guide

Mary Piscura, Claire Werner, PhD Candidates

Evan Goldman, PhD

Quick links:

Overview & dissection instructions
Nose
Surface anatomy
Muscles of the face by region
Nervous supply
Parotid gland
Facial nerve
Arterial supply
Venous drainage
Lymphatics

Run this in presentation mode!

PennState College of Medicine

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Learning Objectives

By the end of the AIG and associated labs, students should be able to:

- Distinguish the bony landmarks that are important for muscle attachments and structural integrity.
- Differentiate between muscles that allow for mastication, facial expressions/emotions, and unconscious behaviors, as well as their innervation.
- Describe the vascular supply, venous drainage, and lymphatic drainage of the face.
- Demonstrate surface anatomy structures of the face.
- Discuss clinical correlates associated with the face, such as in the case of a stroke.

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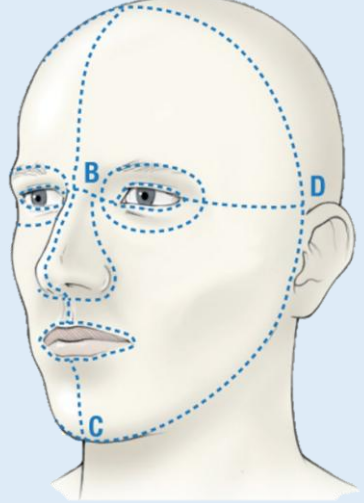
OVERVIEW

- This AIG covers the muscles of the face that control facial expression. These are all innervated by the facial nerve.
- The AIG will also continue from the “triangles of the neck” AIG with a more detailed view of the branches of the external carotid artery and will add details of the venous drainage of the face.
- Other structures of the face, including the parotid gland and an overview of the lymphatic drainage of the region will be covered.



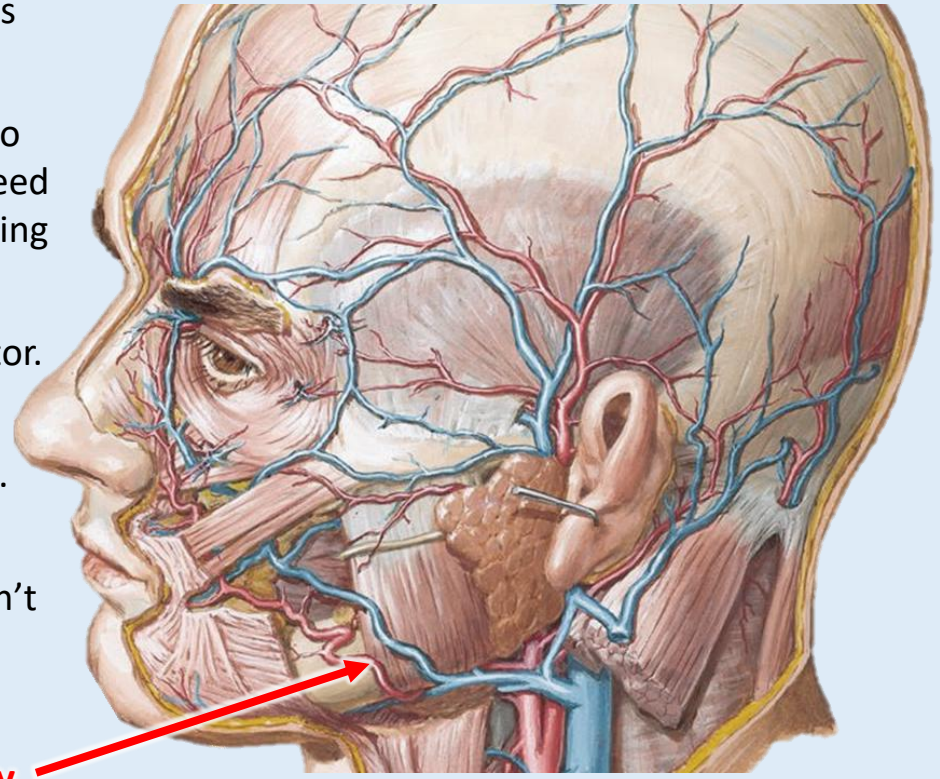
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DISSECTION INSTRUCTIONS





- You may use a scalpel to make cuts in the skin of the face. The image to the right is from Grant's dissector. You may use Grant's dissect for this dissection! The epidermis is extremely thin in some areas (e.g. around the eyes – especially the eyelids). Only cut through the *epidermis* with a scalpel.
- Use the scalpel as little as possible. You will INEVITABLY cut through nerves and vessels with a scalpel. You have been warned.
- Most nerves and vessels run within the superficial fascia and are difficult to find. There will be a lot of blunt dissection/scissor spread. You will also need to do a fair amount of cutting with scissors. RECOGNIZE what you are cutting so you don't cut nerves and vessels.
- If your dissection looks like the image to the right, you are a GREAT dissector. Be the GREAT dissector you always wanted to be!
- Use images the entire time to understand where muscles, nerves, etc. run. Impress us.
- Interestingly, the facial artery is very large but often is cut by students. Don't accidentally cut through the facial artery!



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Brief Review: Bones of the External Skull



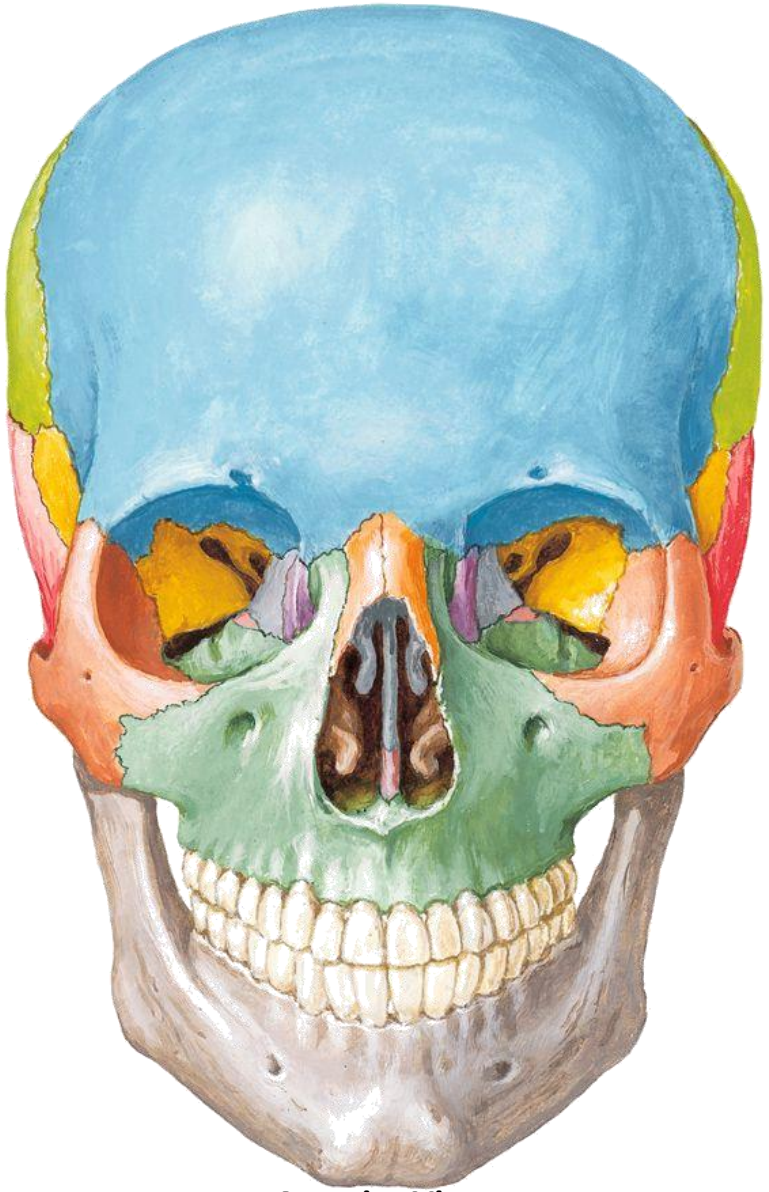
Image: Netter, Atlas of Human Anatomy, 6th ed.

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Review: Bones of the External Skull



Anterior View
Image: Netter, Atlas of Human Anatomy, 6th ed.

Let's first review some bones that serve as sites of muscle attachment and contribute to the individual differences in our facial features:

CLICK on the frontal bone, found on the picture to the left.

Good! Now, ***click*** on the mandible.

Try again!

Correct. ***click*** on either of the zygomatic bones to your left.

Great – next, ***click*** on the maxilla.

Awesome! Finally, ***click*** on the nasal bones.

Well done!

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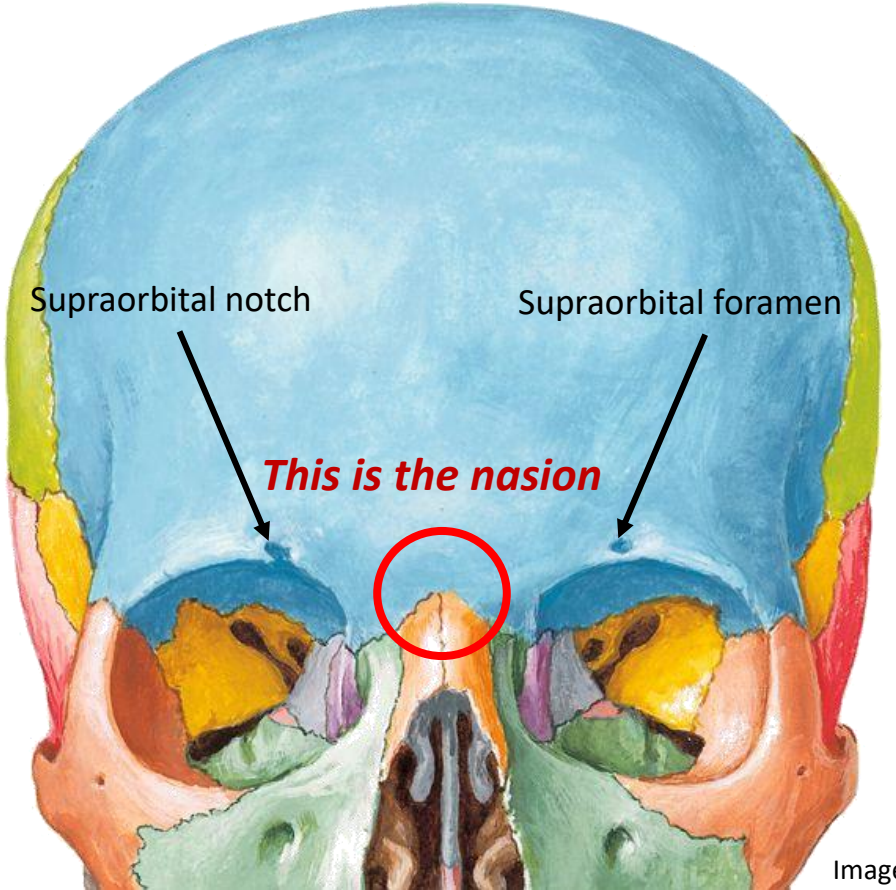
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Review: Bones of the External Skull

CLICK on the **supraorbital notch** of the frontal bone:

No, please try again Click on the notch on the right!

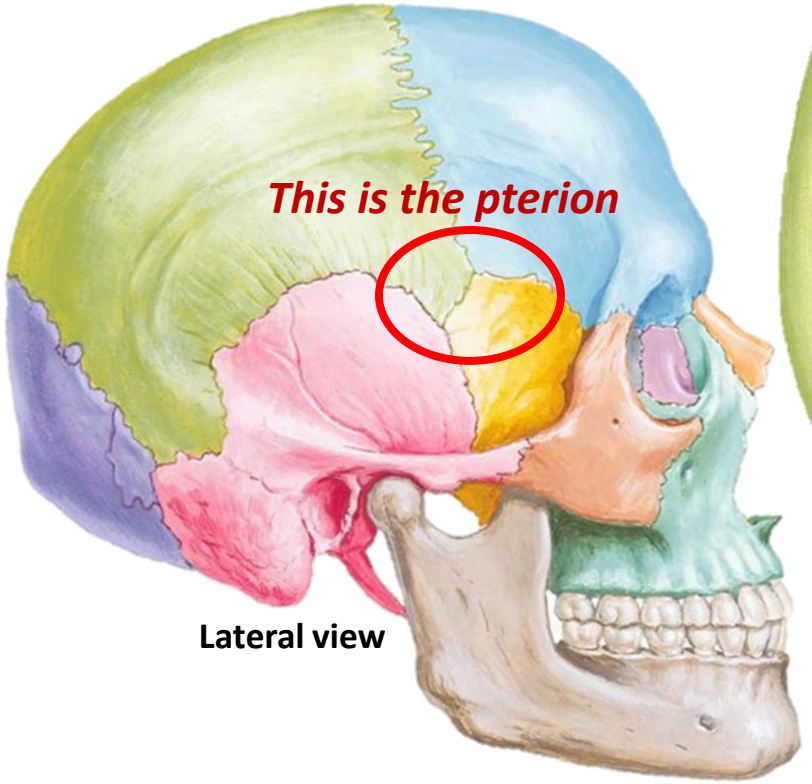
Good! Remember a foramen is a hole. A notch is an incomplete hole. The supraorbital notch, when complete, is called the supraorbital foramen!



The frontal bone has named points where sutures of different bones meet.

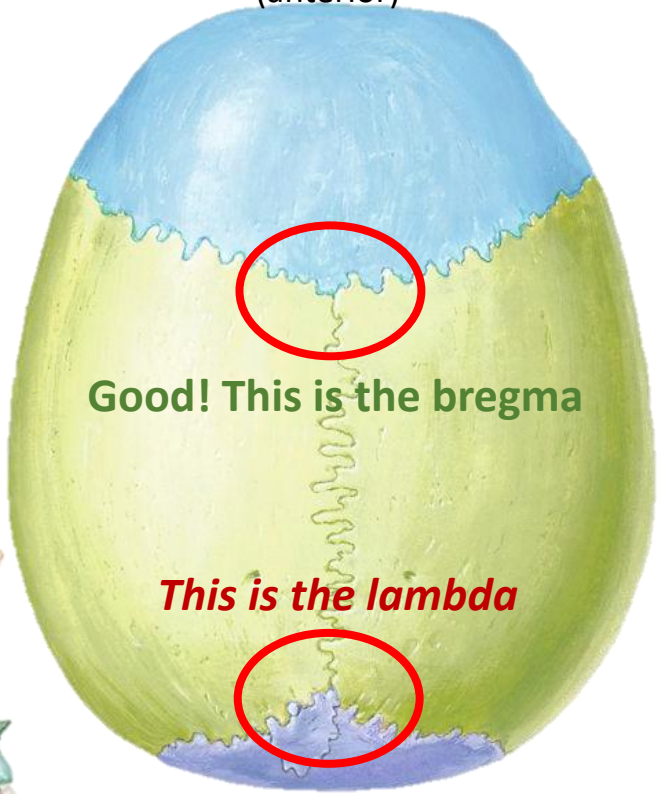
CLICK on the red circle that is indicating the "***bregma***".

Try again!



Lateral view

(anterior)



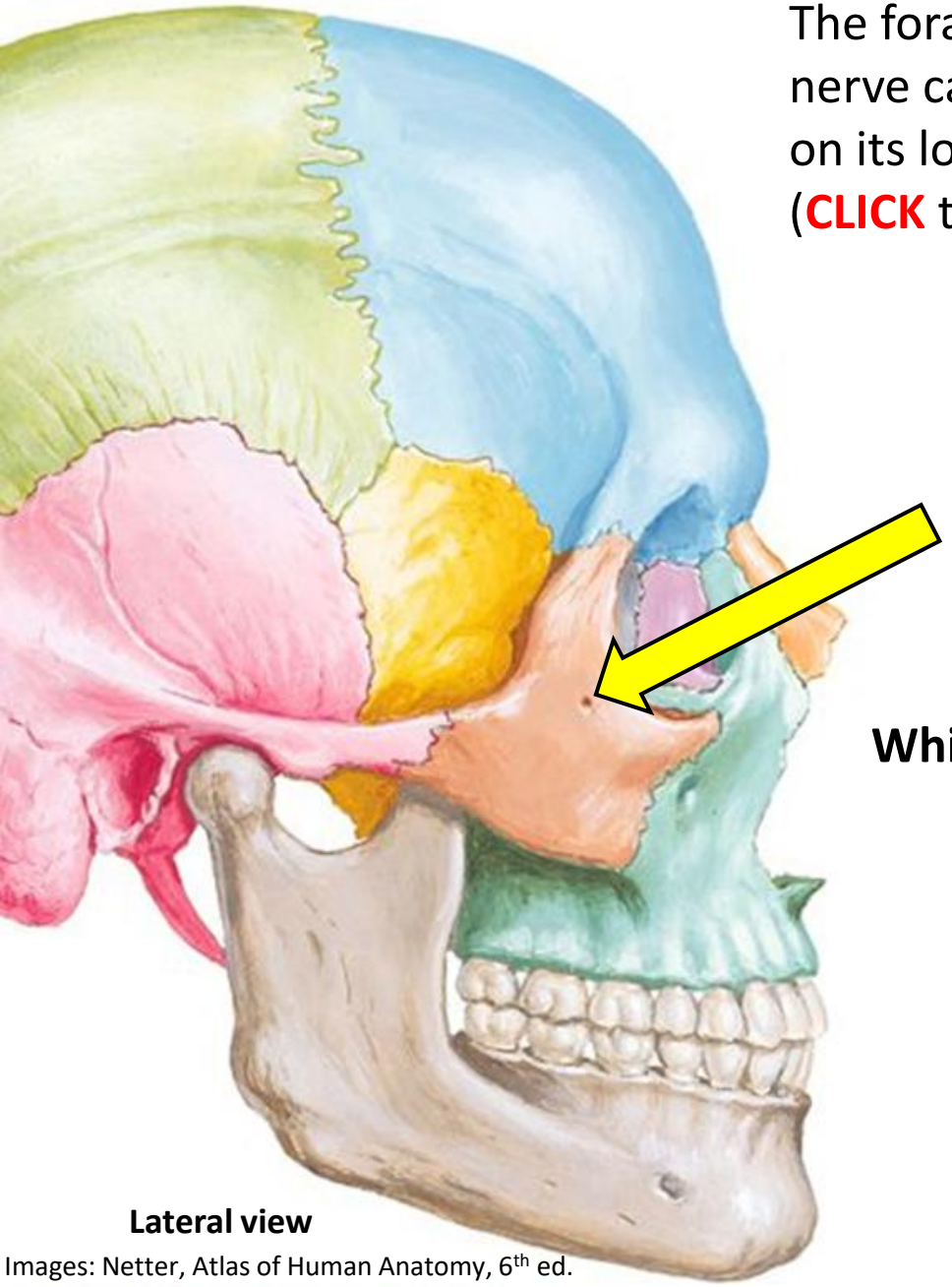
(posterior)

Superior view

Images: Netter, Atlas of Human Anatomy, 6th ed.

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Review: Bones of the External Skull



Lateral view

Images: Netter, Atlas of Human Anatomy, 6th ed.

The foramen indicated by the arrow, as we will learn, allows passage of a nerve carrying sensory information from the face back to the brain. Based on its location, **what is the name of this foramen *and* associated nerve?** (**CLICK** to answer):

a) Mental ✗

b) Zygomaticotemporal ✗

c) Zygomaticofacial ✓

d) Infraorbital ✗

e) Auriculotemporal ✗

Which statement is correct? (**CLICK** to answer):

a) The zygomatic process of the zygomatic bone and the temporal process of the temporal bone create the zygomatic arch ✗

b) The zygomatic process of the temporal bone and the temporal process of the zygomatic bone create the zygomatic arch ✓

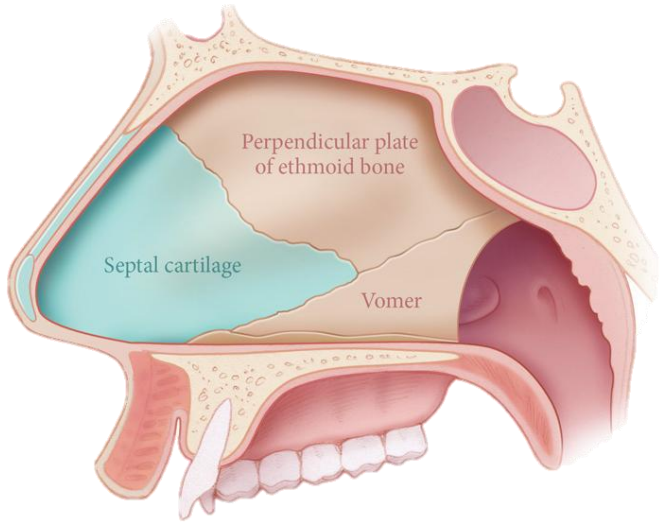
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Bones/Cartilage of the Skull: The Nose

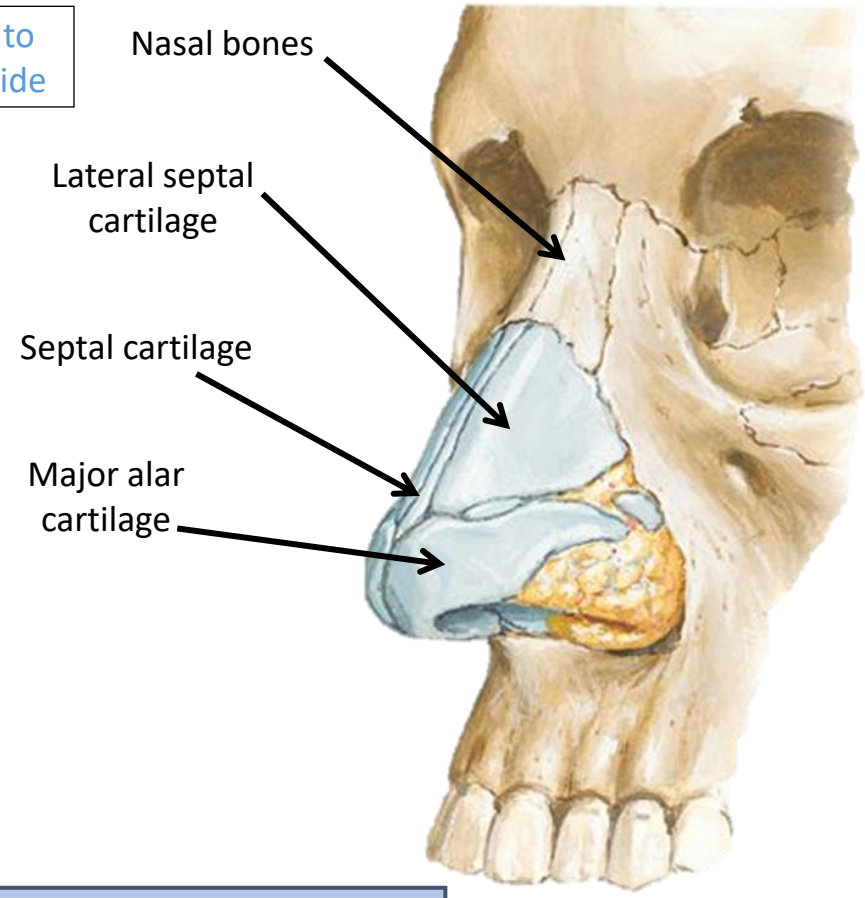
Use arrow keys to move through slide



Lateral view: Bisection of nose
Image: Stanford Health Care, Web, 2019

Two nasal bones contribute to the structure of the bridge of the nose, the remainder is comprised of cartilage and connective tissue.

The septal cartilage, along with the vomer and perpendicular plate of the ethmoid bone, form the nasal septum.



Anterolateral view
Image: Netter, Atlas of Human Anatomy, 6th ed.



Reconstructive Surgery

Broken noses and deviated septa are very common. Septoplasty/rhinoplasty may be needed to improve breathability or for cosmetic purposes, which often involves removal or relocation of cartilage. In fact, rhinoplasty is the most common facial surgery (American Society of Plastic Surgeons 2018).



https://www.ohniww.org/deviated-septum-surgery/

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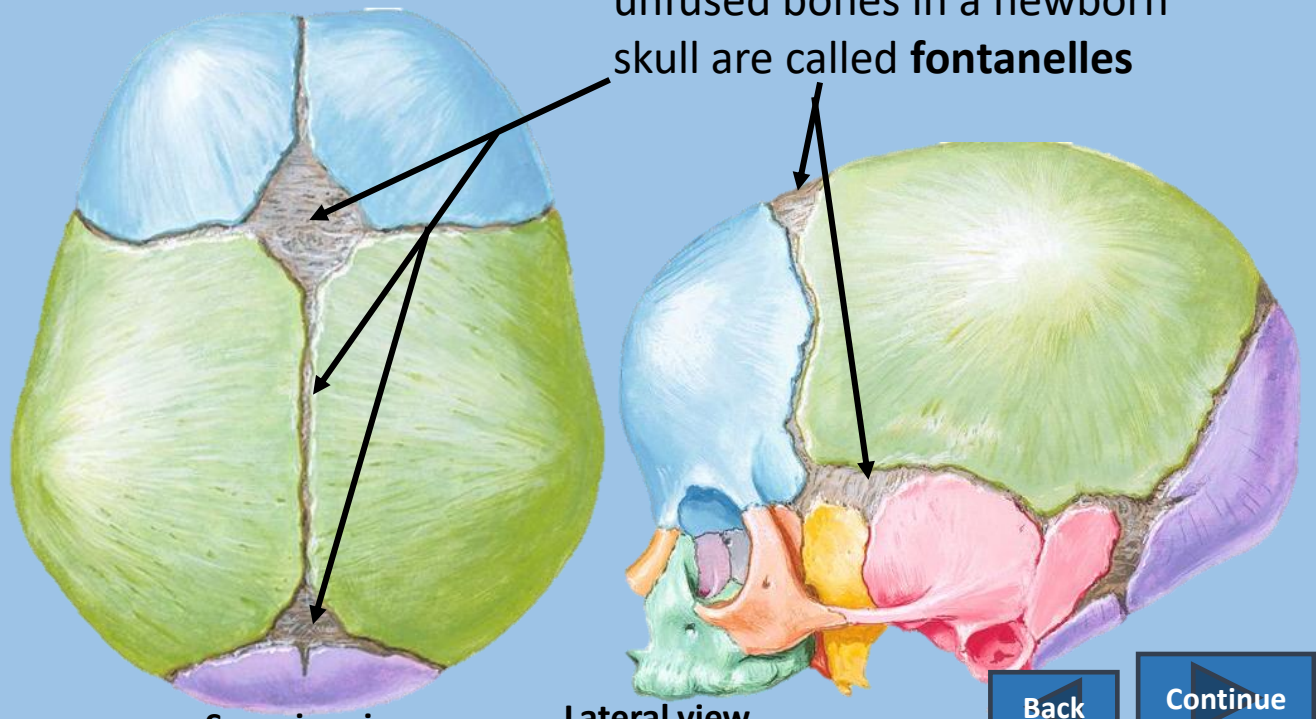
Clinical Correlate: Plagiocephaly

The bones of the skull in newborns are not fused until ~3 months of age. This allows some flexibility of the skull during childbirth, which is beneficial for both the newborn and the mother. Due to this flexibility, however, babies heads are prone to plagiocephaly – also called “flat head syndrome”.

To prevent this, parents are told to give their newborn “tummy time”, which is time spent laying on their stomachs, allowing for proper development. Plagiocephaly is extremely common and may even correct itself depending on severity.



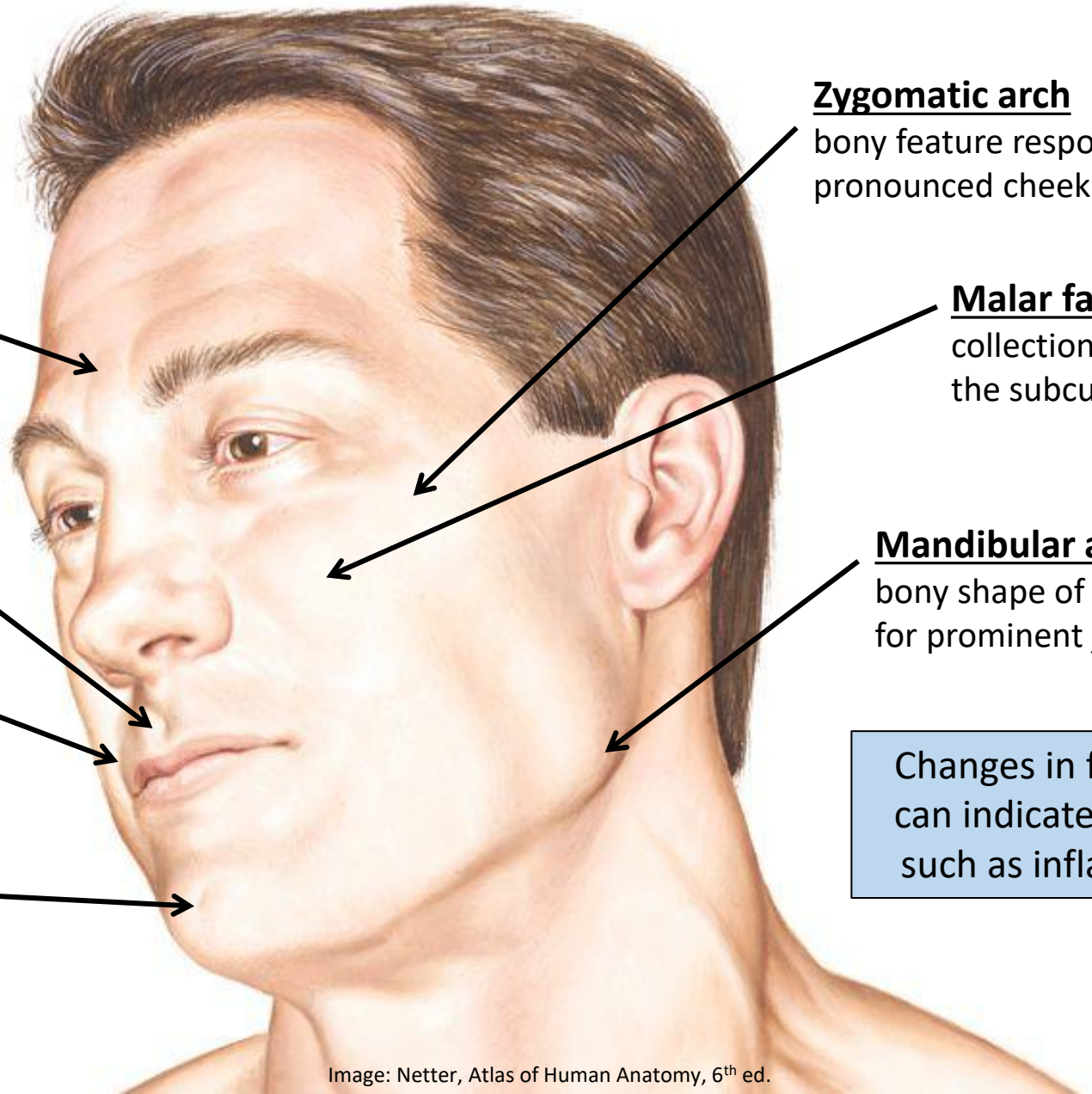
https://www.medicaldaily.com/baby-flat-head-how-reverse-rising-tide-plagiocephaly-247444



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Surface Anatomy

CLICK the right arrow on your keyboard to bring up anatomical features, and **PALPATE** them on yourself:



Glabella
bony landmark of frontal bone between eyebrows

Philtrum
indentation of skin above the upper lip

Nasolabial sulcus
crease from the corners of the mouth to the nose, more pronounced when smiling

Mental protuberance
bony projection of mandible that can be palpated through skin

Zygomatic arch
bony feature responsible for pronounced cheek bones

Malar fat pad
collection of fat in the cheeks found in the subcutaneous layer

Mandibular angle
bony shape of mandible responsible for prominent jaw line

Changes in facial surface anatomy can indicate underlying problems, such as inflammation or a stroke.

Image: Netter, Atlas of Human Anatomy, 6th ed.

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Facial Layers

Use arrow keys to move through slide

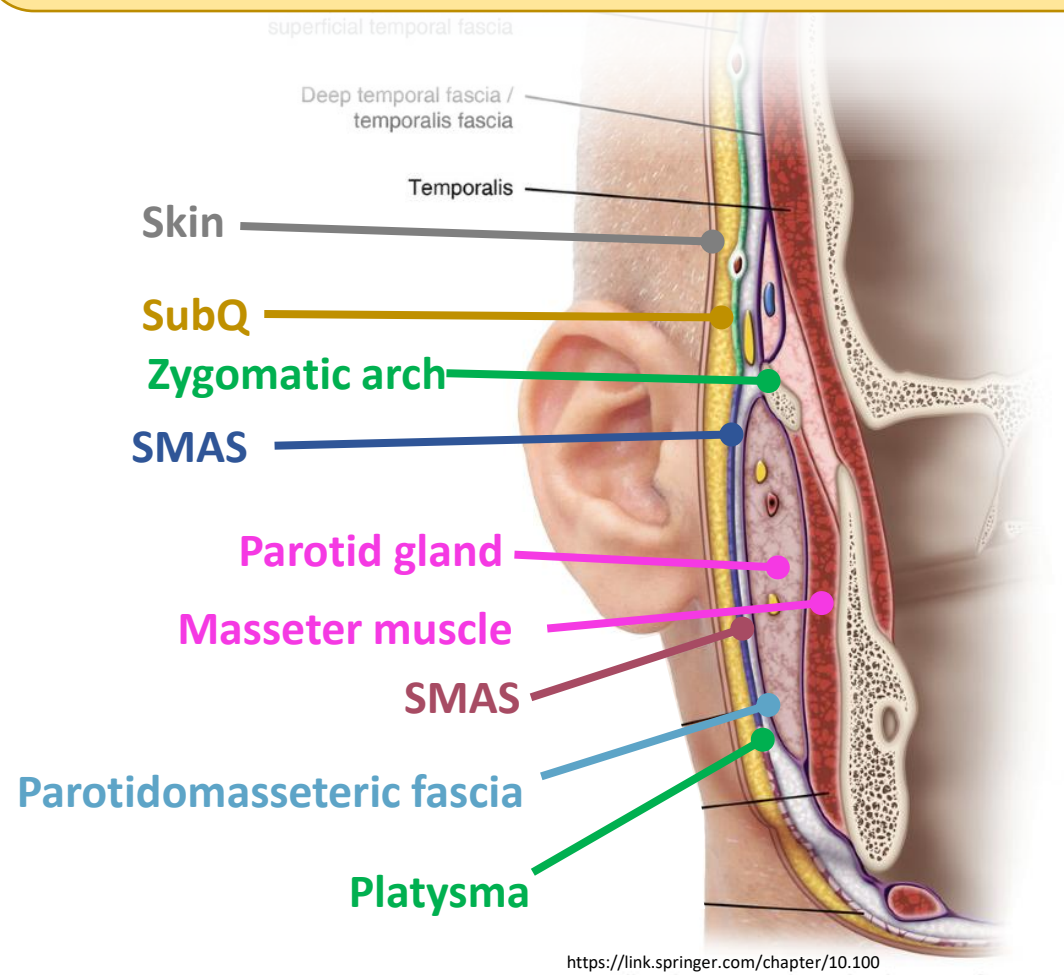
There are four fascial layers of the face:

1. Skin
2. Subcutaneous tissue
3. Superficial musculo-aponeurotic system (SMAS)
4. Parotidomasseteric fascia

SMAS does not cover the entire head/neck. It is only present from the top of the **platysma** to the **zygomatic arch**.

The **parotidomasseteric facia**, just deep to the SMAS is only present over the **parotid gland** and **masseter muscle**.

The **SMAS** (superficial musculo-aponeurotic system) lies just superficial to the numerous muscles of facial expression (not shown on this image). Essentially, when the muscles contract, they pull on SMAS fascia which then helps distribute the movement to the overlying subQ and skin.



https://link.springer.com/chapter/10.1007/978-981-15-2321-2_8

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Facial Layers

Use arrow keys to move through slide

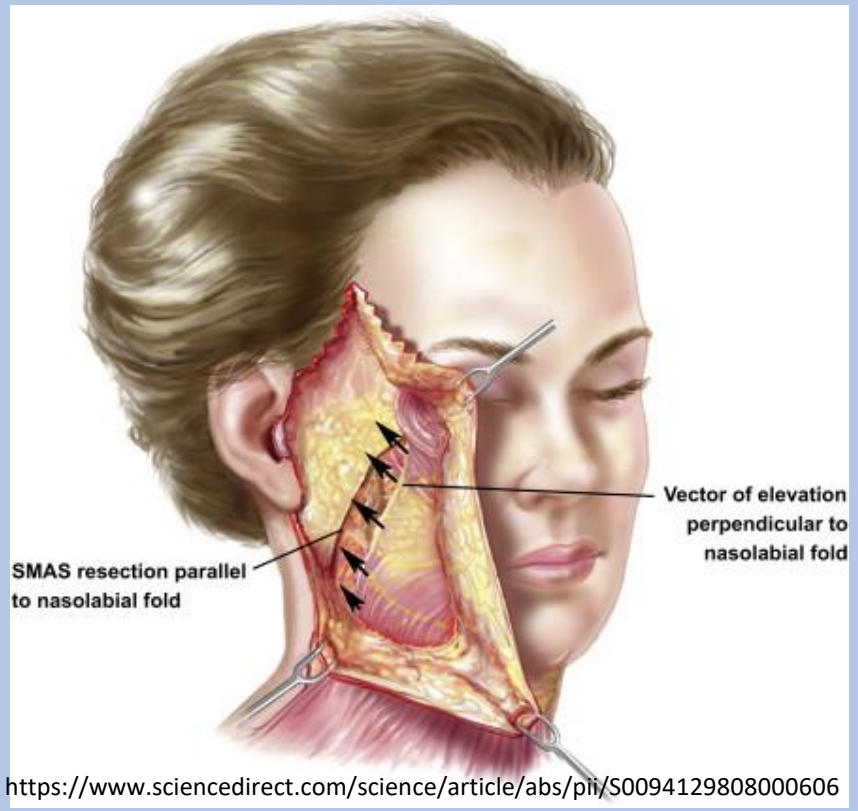
1. Skin
2. Subcutaneous tissue
3. Superficial musculo-aponeurotic system (SMAS)
4. Parotidomasseteric fascia



https://www.linkedin.com/pulse/face-lift-surgery-rhytidectomy-dr-faizal-anwar-dr-faizal-anwar/

Face-lift (rhytidectomy)

The superficial Musculo-aponeurotic system is tightened by suturing a folded or excised area of the SMAS. Alternatively, the SMAS can be raised and vertically sutured. The result is elevation of the midface in the vertical plane. Click here to see examples



https://www.sciencedirect.com/science/article/abs/pii/S0094129808000606



https://richmondent.com/facial-plastics/rhytidectomy-face-neck/

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Musculature

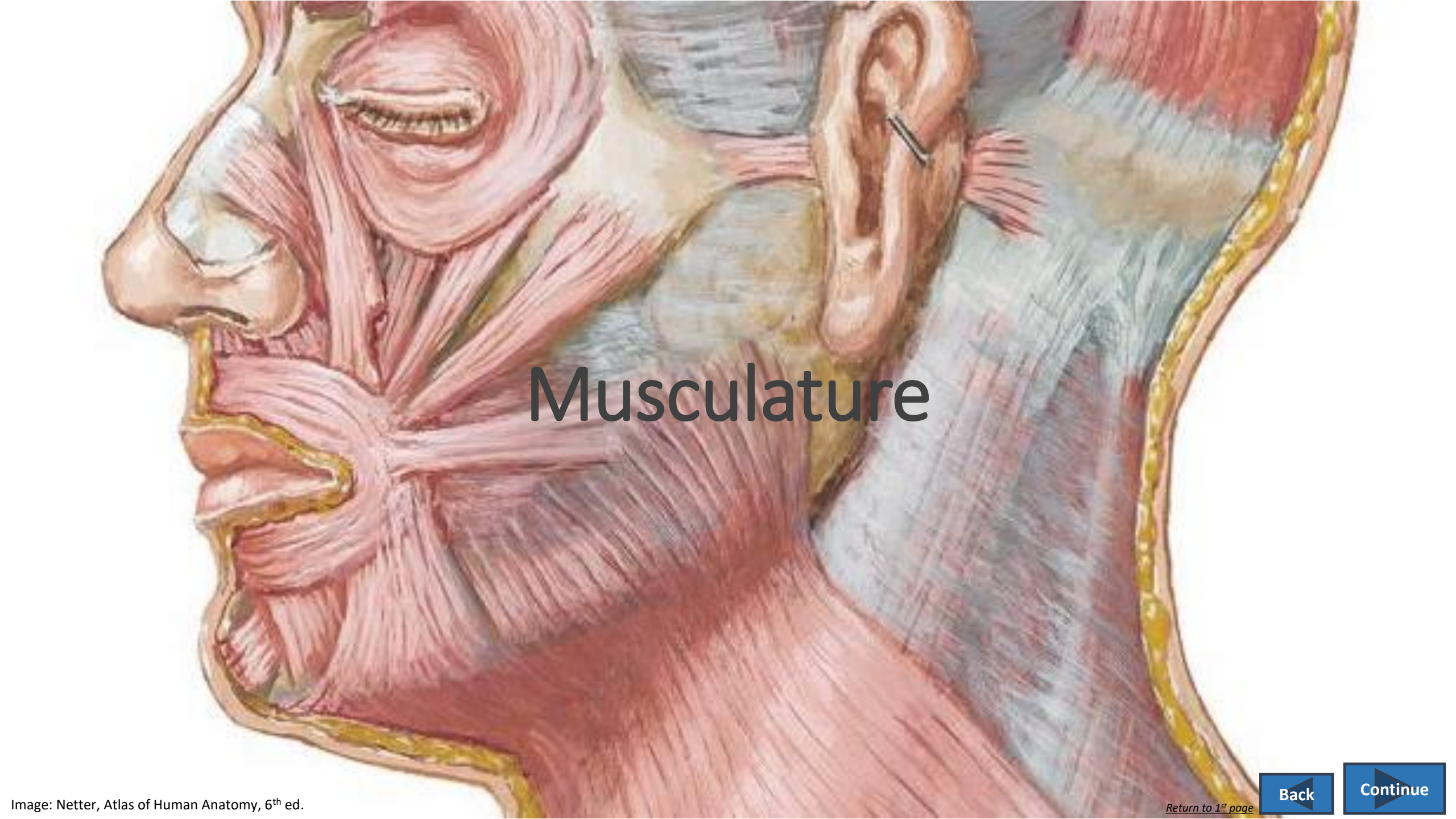


Image: Netter, Atlas of Human Anatomy, 6th ed.

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Muscles of the Face

Use arrow keys to move through slide

Face musculature can be categorized by ***function*** (facial expression, mastication) or ***region*** (frontal, occipital, temporal, orbital, nasal, and oral). This AIG will explore musculature by region while highlighting functionality:

	FACIAL EXPRESSION	MASTICATION
INNERVATION	CNVII (Facial)	CNV3 (Mandibular division of Trigeminal)
ATTACHMENTS	Osteo-dermal connectivity	Osteo-osteo connectivity
EMBRYOLOGY	2nd Pharyngeal Arch	1st Pharyngeal Arch
FUNCTION	Communication	Breaking down food
MUSCLES	A lot ☺	Temporalis, masseter, lateral and medial pterygoids

Any muscle that crosses a joint will act on that joint. **What joints are crossed when we make facial expression?** Try and think of an answer before you continue:

CLICK HERE for the answer

Muscles of facial expression have osteo-dermal (bone to skin) connectivity. This means that the attachments do not cross joints in a way that acts on the joint, but rather, the facial muscles function by pulling on skin.

You will notice a recurring theme of this lecture is that muscles of facial expression are innervated by CN VII, while muscles of mastication are innervated by CN V3

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Muscles: Frontal/Occipital Region

https://giphy.com/gifs/robin-williams-U6qToqciyBT1K



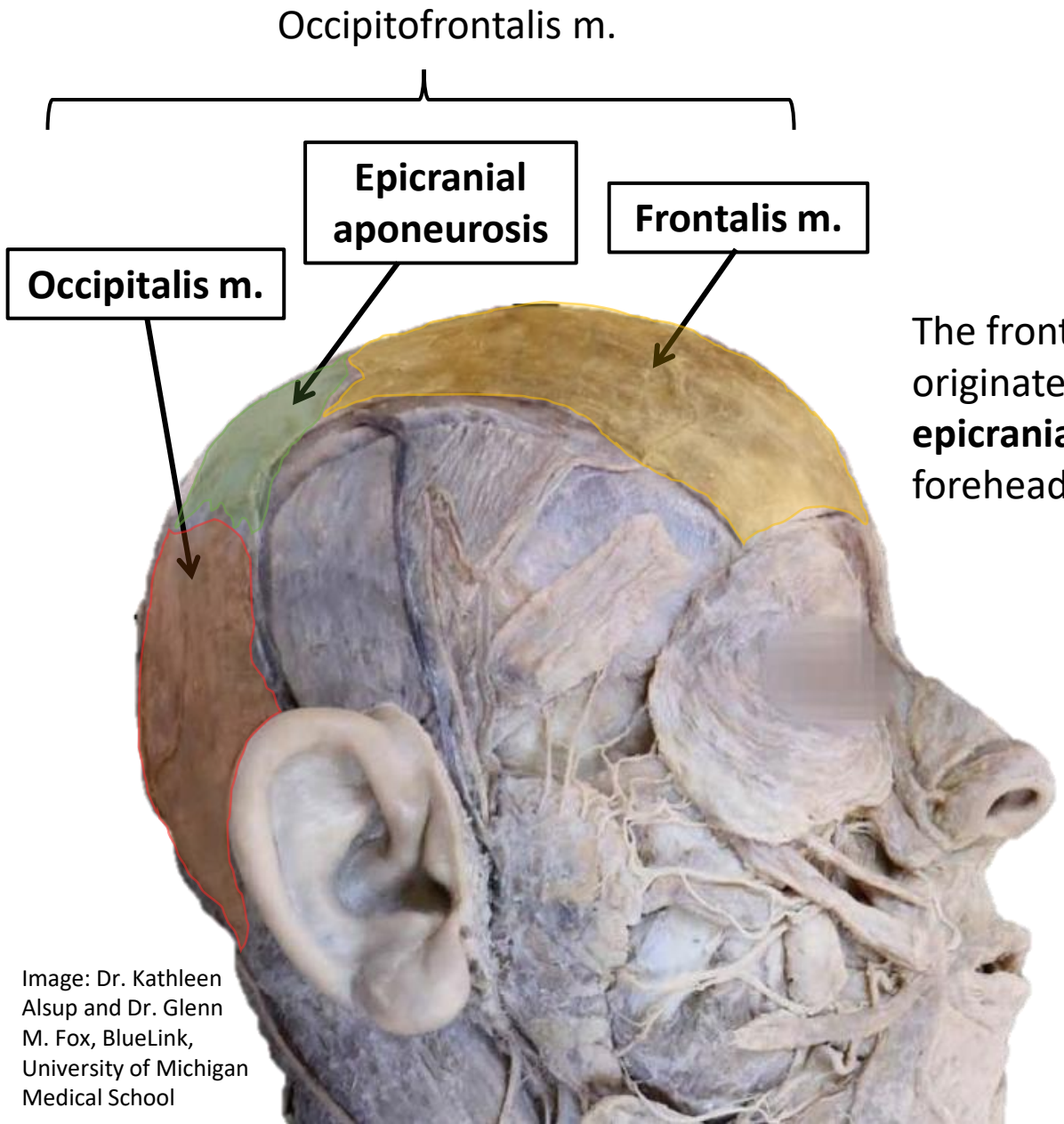


Image: Dr. Kathleen Alsup and Dr. Glenn M. Fox, BlueLink, University of Michigan Medical School

The frontal belly of occipitofrontalis, also referred to as the **frontalis muscle**, originates from the skin of the eyebrows and inserts onto the fibrous **epicranial aponeurosis**. This attachment allows the muscle to wrinkle the forehead and raise the eyebrows, just as Robin Williams is doing above.

The frontalis muscle is innervated by the temporal branch of the facial nerve, but what innervates the **occipitalis muscle**?
**CLICK on the text to answer:

temporal branch of CNVII	occipital branch of CNVII	posterior auricular nerve
Try again – the temporal branch does not course posteriorly	**Try again – this branch does not exist**	**Correct!**

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Muscles: Temporal Region

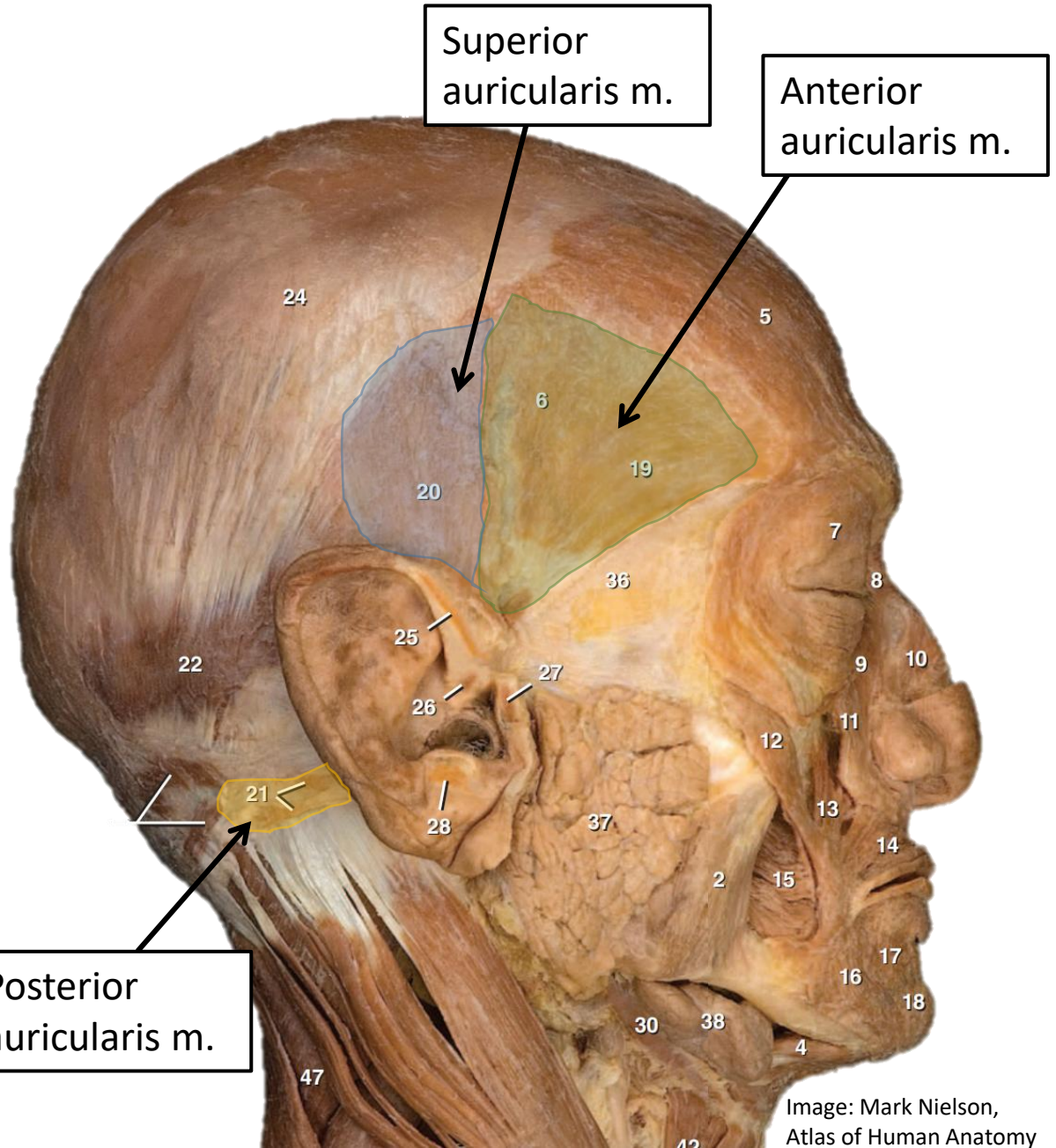


Image: Mark Nielson, Atlas of Human Anatomy

There are three superficial muscles of the temporal region:

- Anterior auricularis m.
- Superior auricularis m.
- Posterior auricularis m.

Can you or any of your classmates wiggle your ears?

Regardless of your answer, you all likely have the same musculature. The difference is that those that can wiggle their ears (as Mr. Bean is doing below) are able to consciously activate these muscles.



https://giphy.com/gifs/wiggle-gif-5dqJaOzcQ80rS

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Muscles: Temporal Region

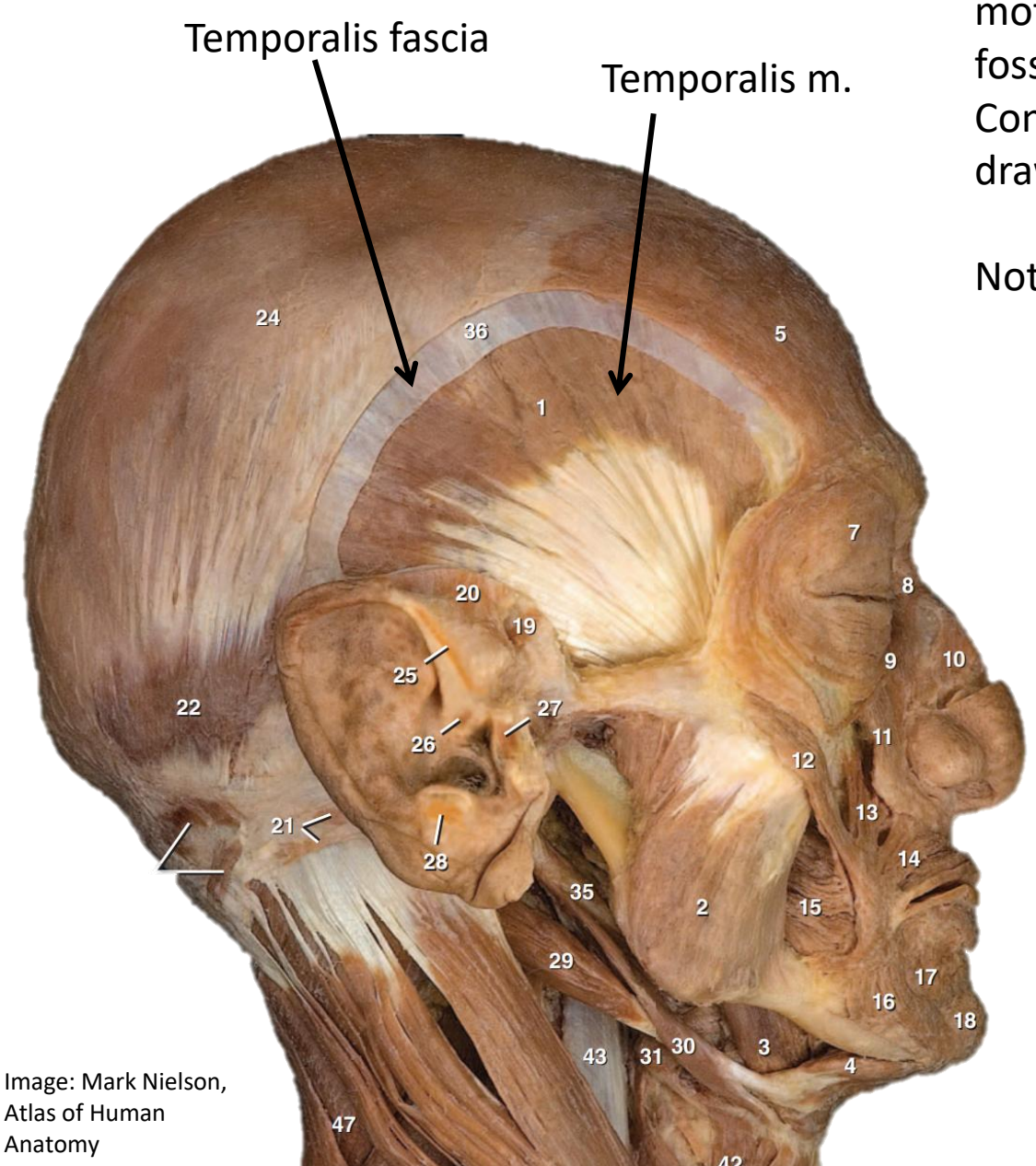


Image: Mark Nielson, Atlas of Human Anatomy

The **temporalis muscle** has a masticatory function and receives motor innervation from CN V3. It originates on the temporal fossa, inserting onto the coronoid process of the mandible. Contraction of the temporalis muscle elevates the mandible and draws the jaw posteriorly.

Notice that the muscle is covered with **temporalis fascia**.

Temporalis fascia is continuous with what fascial layer?

(CLICK the answer) (as shown when discussing fascial layers of the face)

Parotidomasseteric fascia (PM fascia)	**Correct!**
Superficial musculoaponeurotic system (SMAS)	**Try again**
Subcutaneous fibroadipose tissue (SubQ)	**Try again**

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Muscles: Orbital Region

The **orbicularis oculi muscle**, comprised of an orbital and a palpebral portion, encircles the superficial orbit.

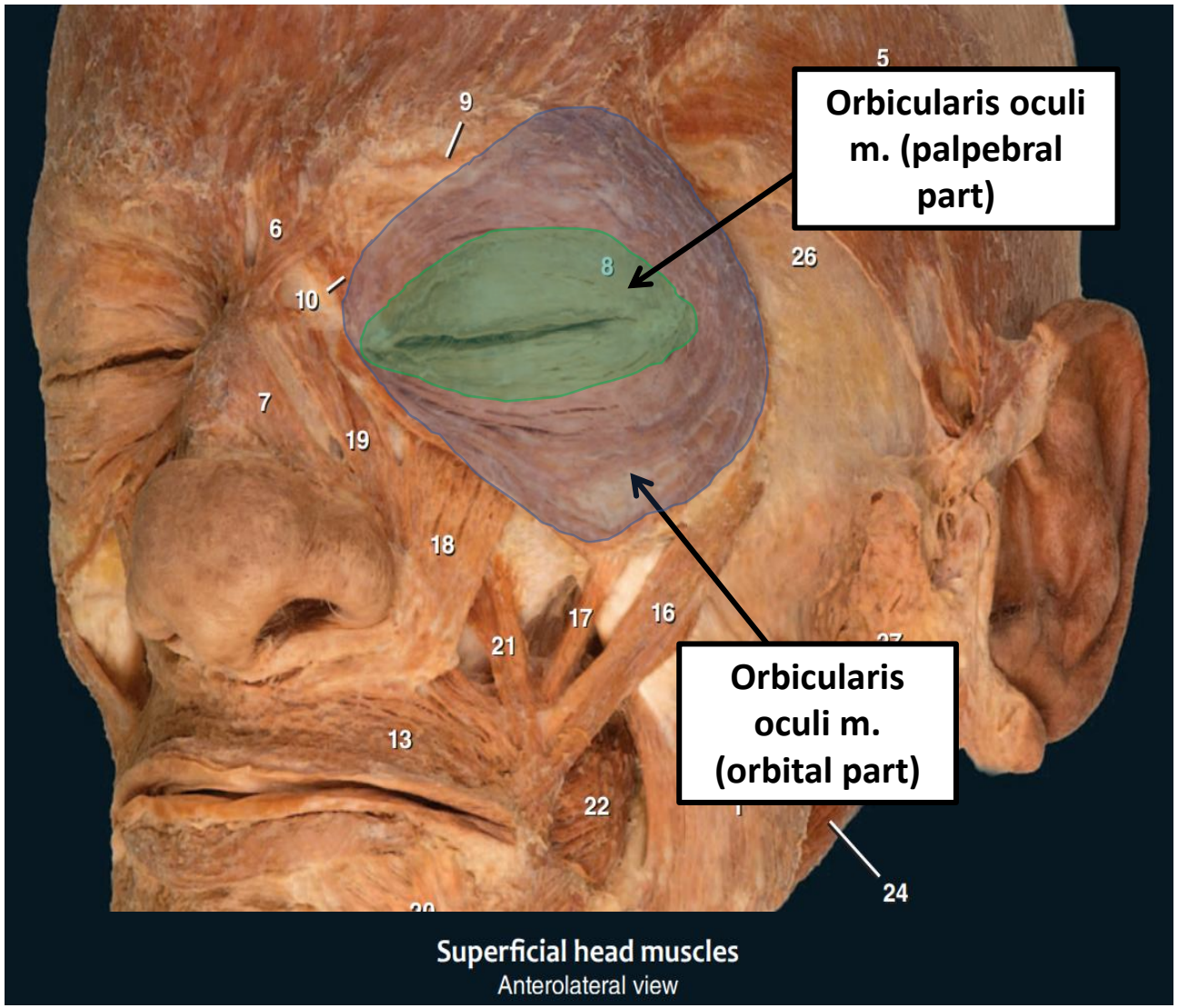
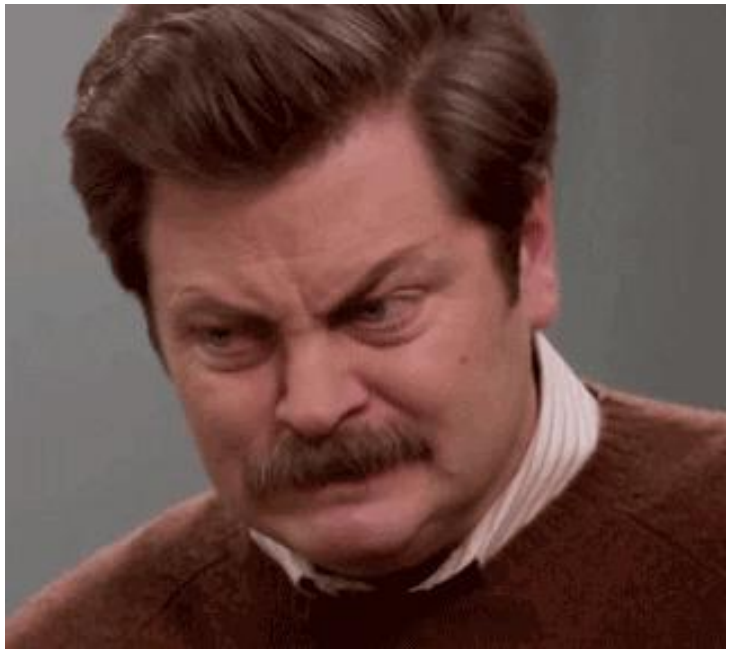


Image: Mark Nielson, Atlas of Human Anatomy

The **orbital part** of the orbicularis oculi tightly closes the eye when constricted. Feel this on your face by squinting your eye and feeling the skin around your orbit constricting.

The **palpebral part** of orbicularis oculi is much thinner and responsible for assisting in blinking.



https://giphy.com/gifs/wVcNP3TnXbl84/embed

Observe to the left as Ron Swanson activates the orbital part of orbicularis oculi in order to squint. He is also using his corrugator supercilii muscle to furrow his brows.

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Muscles: Orbital Region

Image: Dr. Kathleen Alsup and Dr. Glenn M. Fox, BlueLink, University of Michigan Medical School

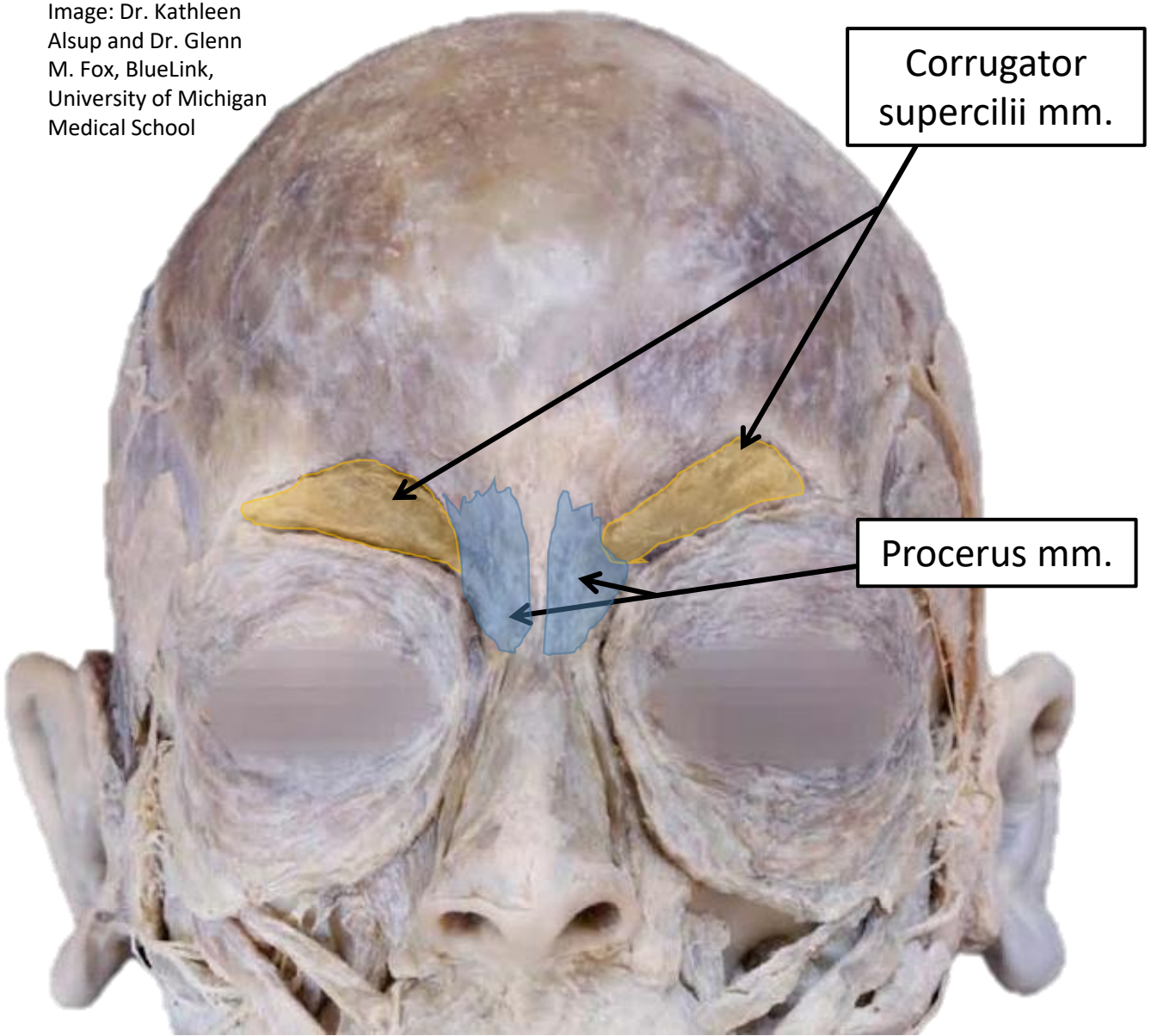


Image: Grant's Atlas of Anatomy, 13th ed.



Corrugator supercilii

Procerus + transverse part of nasalis

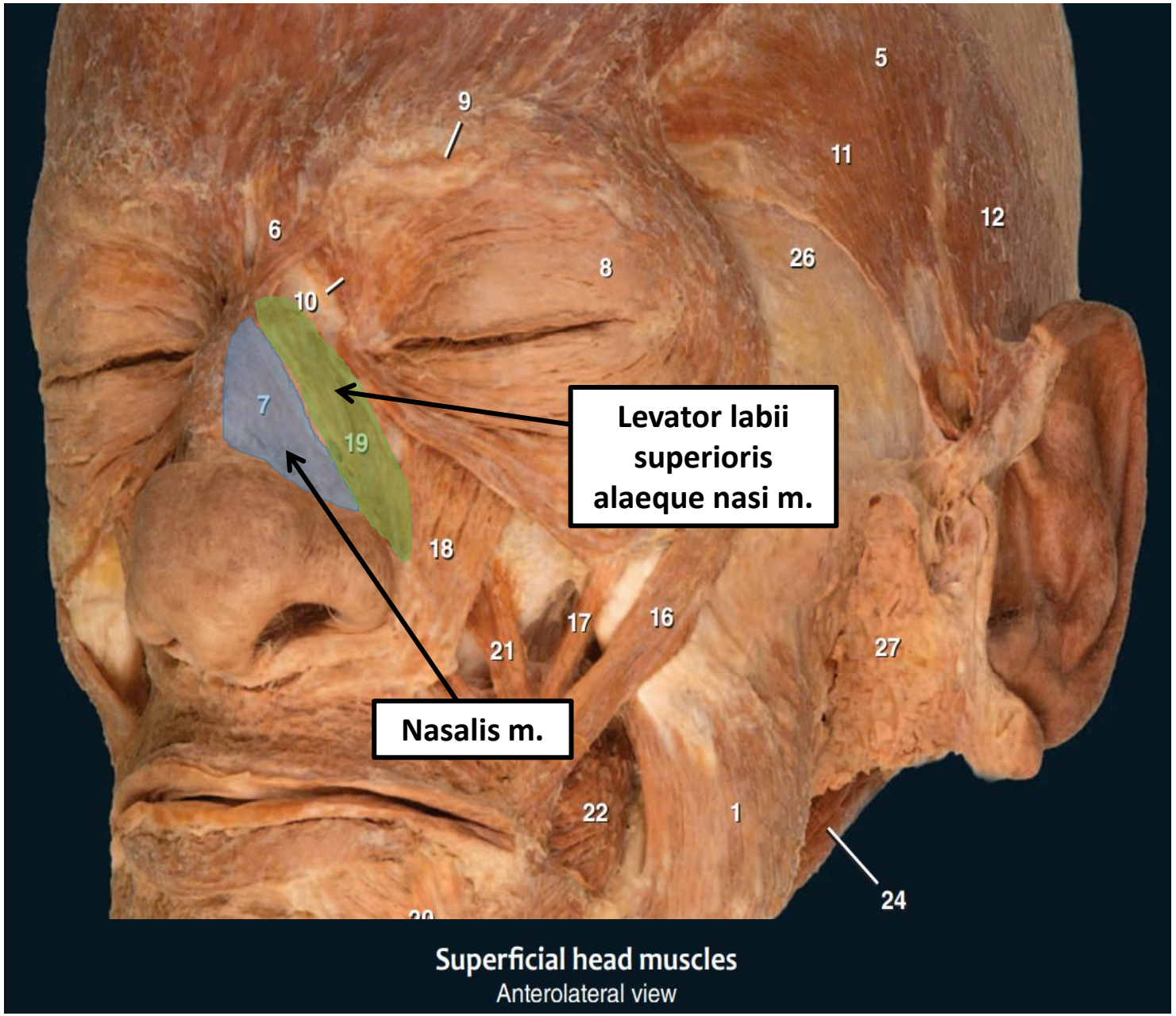
The **corrugator supercillii muscles** are responsible for pulling the eyebrows inward, as one does when they are confused. The **procerus muscles**, on the other hand, pull the medial aspect of the eyebrow inferiorly and the skin of the nose superiorly, creating horizontal wrinkles between the eyes. An example of facial expression using the procerus muscle is smelling rotten food.

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Muscles: Nasal Region

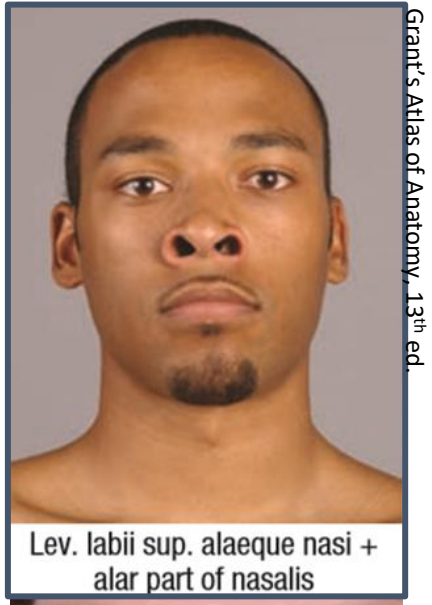


Mark Nielson, Atlas of Human Anatomy

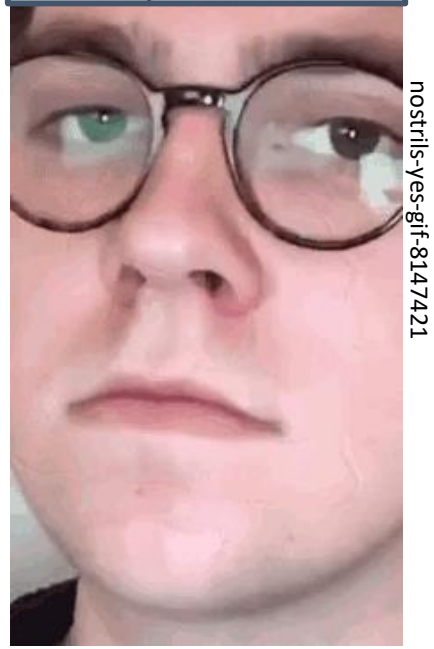
Levator labii superioris alaeque nasi (what a mouthful!) and **nasalis muscles** both assist in flaring of the nostrils.

While flaring of nostrils is often associated with expressing anger, widening of the nostrils is also important after strenuous exercise to allow a larger airway.

You can try this on yourself by placing your fingers over your nostrils while taking a quick and deep breath.


Lev. labii sup. alaeque nasi + alar part of nasalis

Grant's Atlas of Anatomy, 13th ed.



https://tenor.com/view/martin-lid-legend-nostrils-yes-gif-8147421

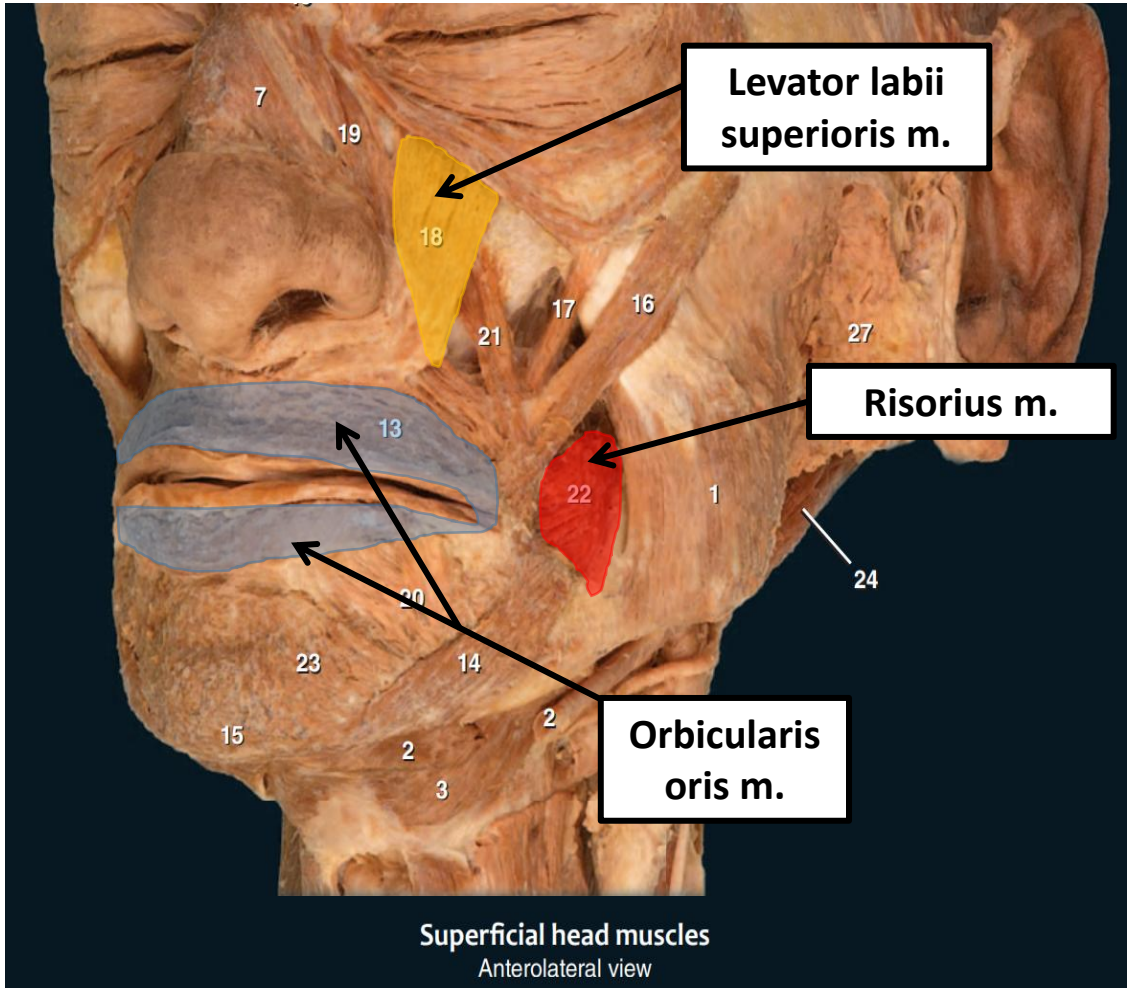
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Muscles: Oral Region

****CLICK on each animated image to learn what muscle is being used:**



Mark Nielson, Atlas of Human Anatomy

https://giphy.com/gifs/dr-house-glPHLqBcvaENy

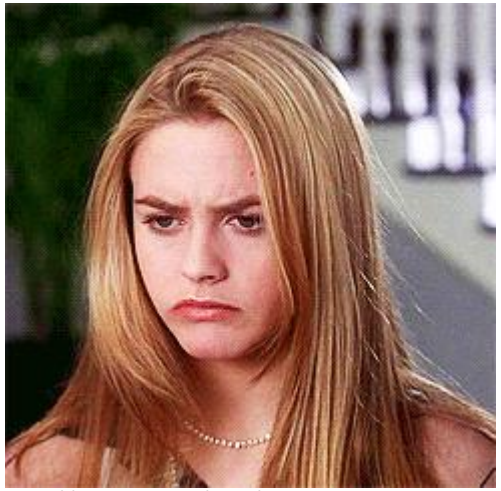


The **risorius muscle** can be thought of as the "awkward face maker", in that it pulls the corners of the mouth laterally into a strange, almost-smile. Dr. House does a great job portraying contraction of this muscle.

We have the **orbicularis oris muscle** to thank (or blame) for the infamous "duck face", as it puckers/protrudes the lips. For this reason, orbicular oris is referred to as the "kissing muscle". As pictured here, notice Kylie Jenner making the duck face.



https://giphy.com/gifs/kendall-jenner-s-3gtI9mbfvVV8A



https://giphy.com/gifs/clueless-gFRT3LsUSvAqY

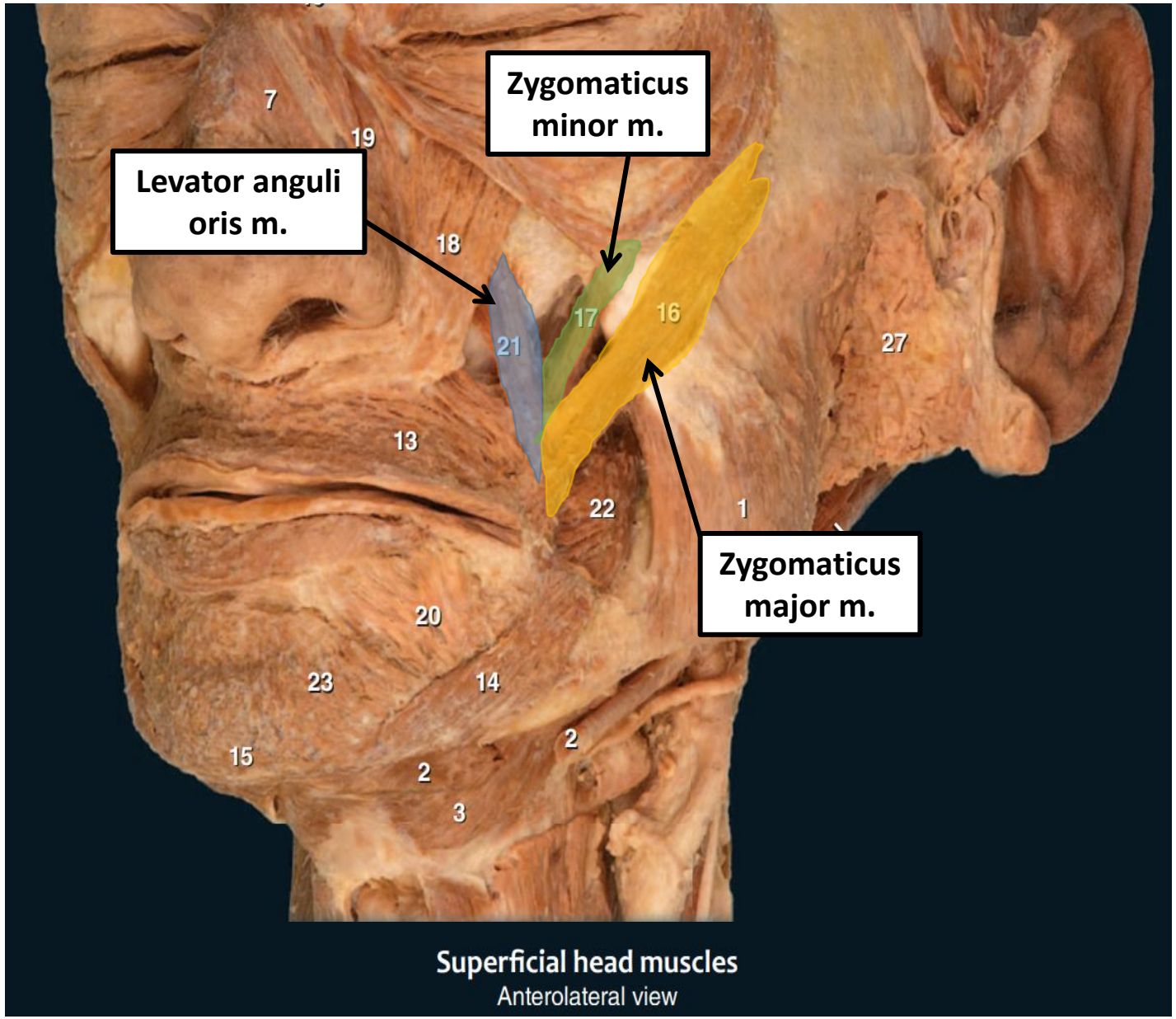
The **levator labii superioris muscle** can be seen contracting as Cher from *Clueless* raises her upper lip in disgust/frustration.

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Muscles: Oral Region



Mark Nielson, Atlas of Human Anatomy

https://giphy.com/gifs/mancity-n41KoOSAtsOK4LL7oh



Levator anguli oris, **zygomaticus minor**, and **zygomaticus major** all raise the corner of the mouth, as one does when smiling.

Observe above as the soccer play smiles very big. The cheeks appear to get larger as these muscles contract due to shortening of the muscle and tightening of skin around the malar fat pad.

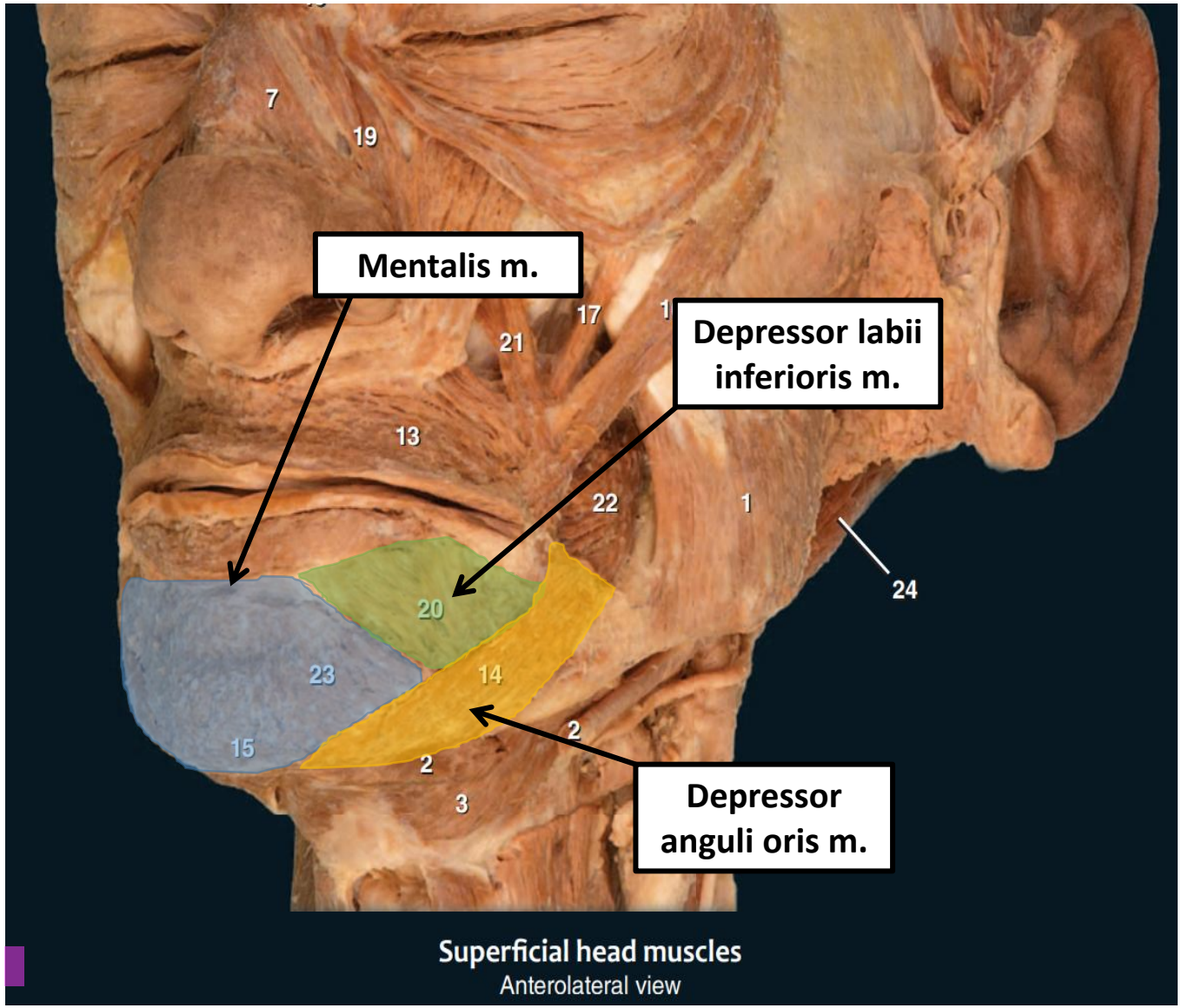
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Muscles: Oral Region

The **mentalis muscle** draws the bottom lip outward, as one does when they pout. The bilateral **depressor labii inferioris muscle** pulls the skin around the lower lip inferiorly. **Depressor anguli oris** moves on the corner of the mouth downward, creating a more aggressive frown.



Mark Nielson, Atlas of Human Anatomy

Have you heard the saying, "it takes more muscles to frown than it does to smile?" **Based on what you've learned, what action do you think recruits more muscles? (CLICK to answer)**





It depends! While most people usually use more muscles to smile, these muscles are stronger since they are typically used more. Likewise, humans typically frown less and therefore have weaker depressors.



https://giphy.com/gifs/sad-zooey-deschanel-frown-PBg4dv4zf4bwA

Here, Jessica Day from *New Girl* depresses the corners of her mouth and protrudes her bottom lip using these muscles

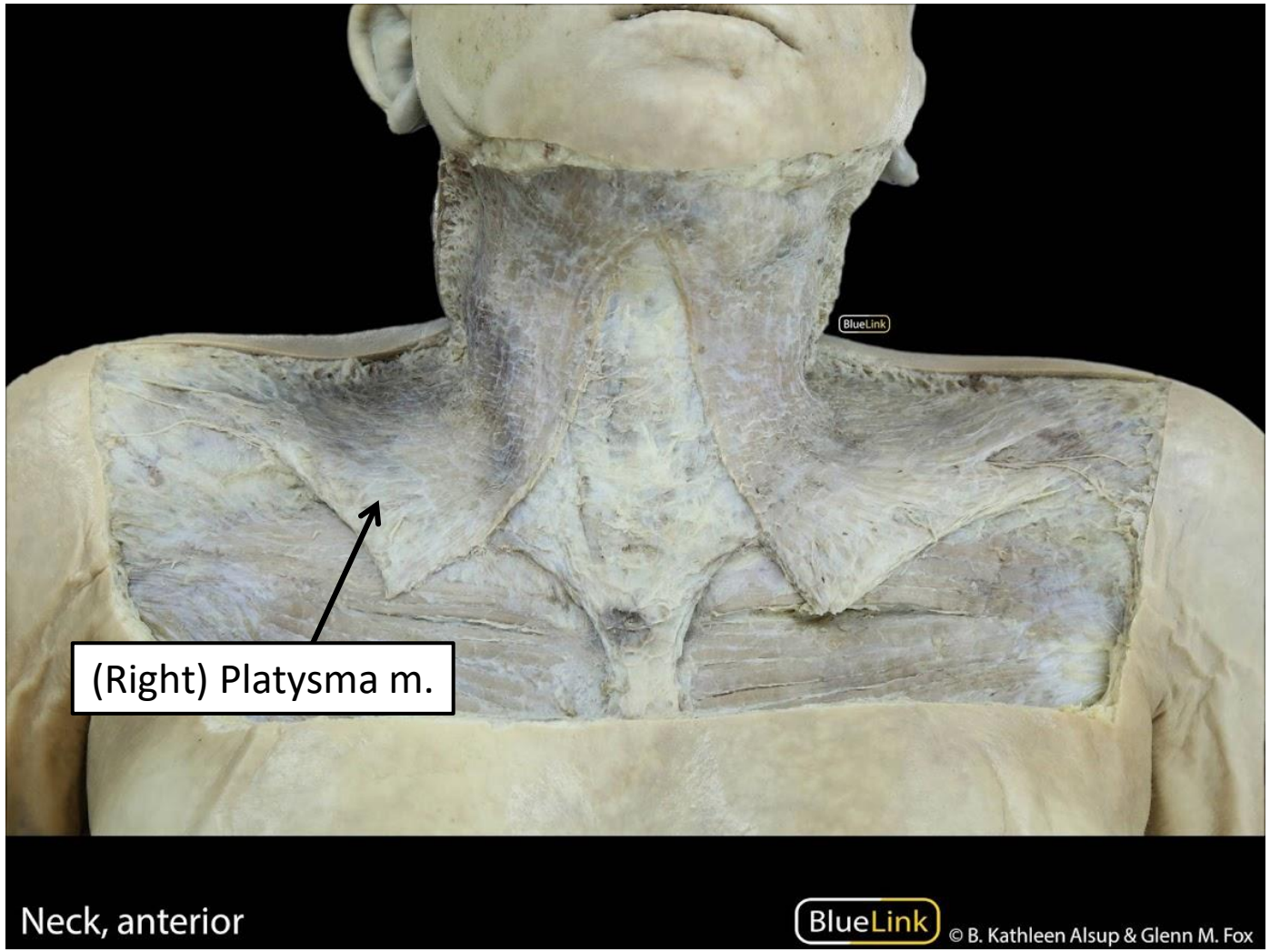
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Muscles: Platysma

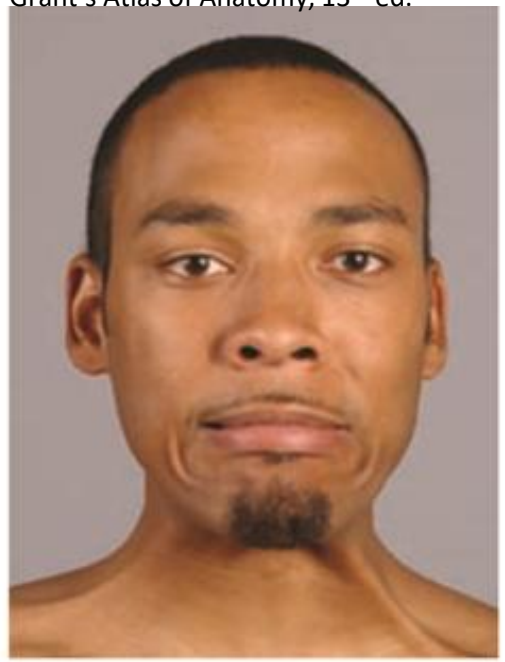
Platysma: notice that it attaches to the skin of the mouth and jaw. Contraction of the platysma results in tension of the anterior neck and pulling skin around the mandible inferiorly.



Based on the anatomy of the nerves described previously, which nerve innervates the platysma?
(**CLICK** to answer)

- Mandibular branch of CNVII ✖
- Cervical branch of CNVII ✓
- Supraclavicular nerve ✖

Grant's Atlas of Anatomy, 13th ed.



Platysma

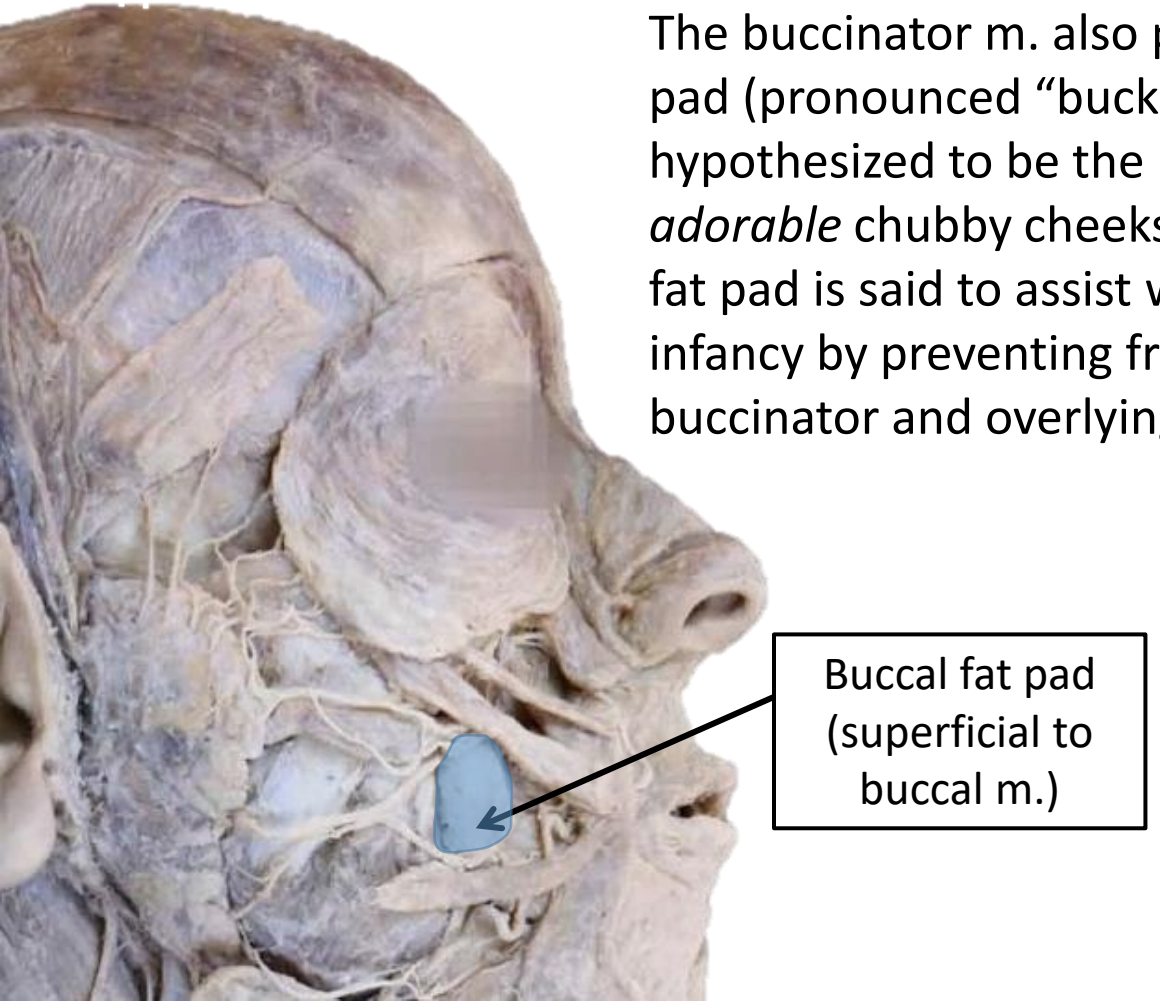
Although the platysma isn't dissected with the other muscles of the face, you can remember its innervation in that it is a muscle of facial expression

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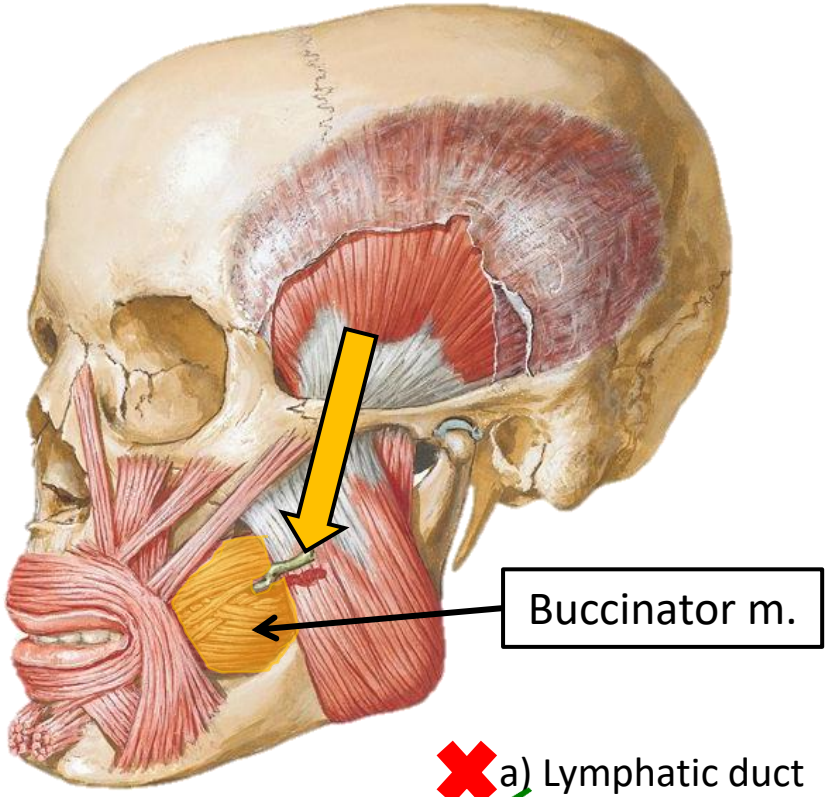
Muscles: Oral Region

The parotid duct pierces the **buccinator muscle** (pronounced “buck-sin-ator”) in order to secrete saliva into the oral cavity. The buccinator muscle is responsible for drawing the cheeks inward to create suction and keep food in the oral cavity, as one does when drinking out of a straw.

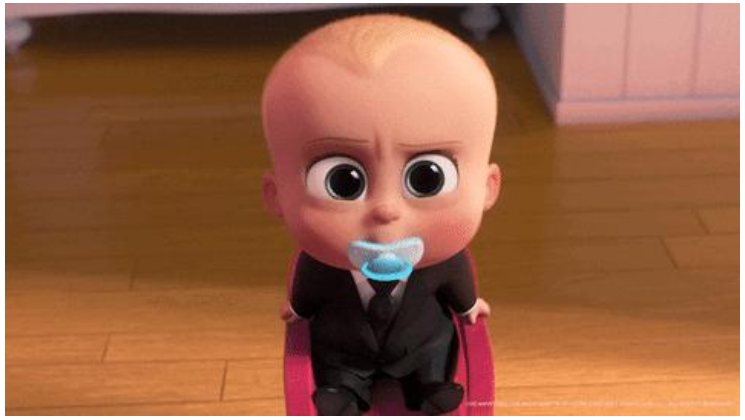
The buccinator m. also possesses a buccal fat pad (pronounced “buckle”), which is hypothesized to be the reason behind the *adorable* chubby cheeks that babies have. The fat pad is said to assist with suckling during infancy by preventing friction between the buccinator and overlying musculature.



What is the arrow is referring to?



- ✗ a) Lymphatic duct
- ✓ b) Parotid duct
- ✗ c) Facial vein
- ✗ d) Cystic duct
- ✗ e) Transverse temporal vein



https://giphy.com/gifs/dreamworks-alec-baldwin-dreamworks-animation-boss-baby-SAIJVbtYwb9zylEPDz

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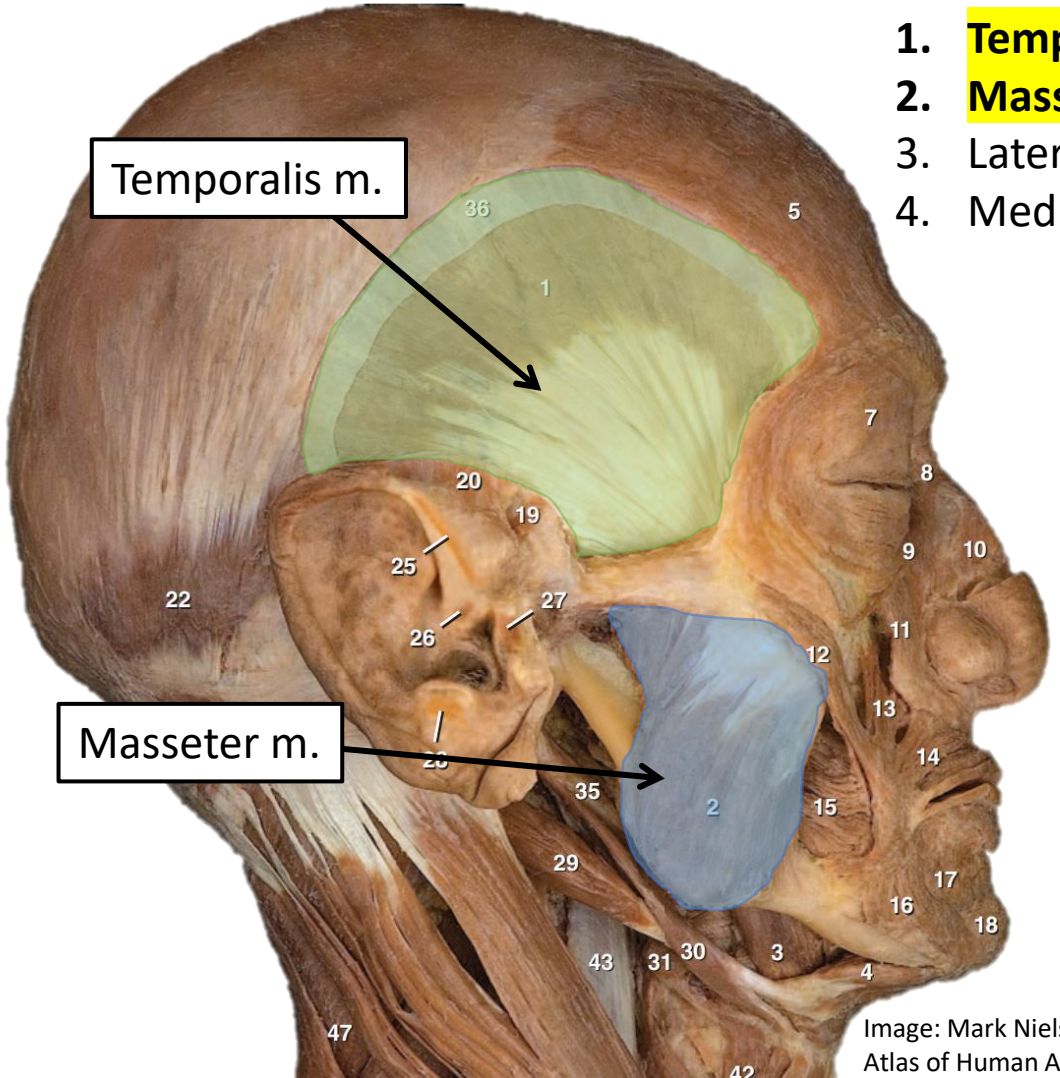
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Muscles of Mastication

https://giphy.com/gifs/thats-so-raven-old-disney-the-awkward-moment-KQS3zjDesBGpO



There are four muscles of mastication, or chewing and breaking down food. Two of them will be identified in the dissection of the face:



1. **Temporalis m.**
2. **Masseter m.**
3. Lateral pterygoid m.
4. Medial pterygoid m.

} not visible in face dissection alone

The temporalis muscle elevates the jaw and draws it posteriorly (retraction). It is able to do both actions due to its diagonal orientation.

The masseter muscle originates on the zygomatic arch and inserts on the mandibular ramus, which makes it a strong elevator of the jaw. Based on the slight angle of pull, it also functions to draw the jaw forward (protraction, protrusion).

REMINDER:

While the muscles of facial expression were innervated by the facial nerve (CNVII), the muscles of mastication are innervated by the mandibular division of the trigeminal nerve (CNV3).

Image: Mark Nielson, Atlas of Human Anatomy

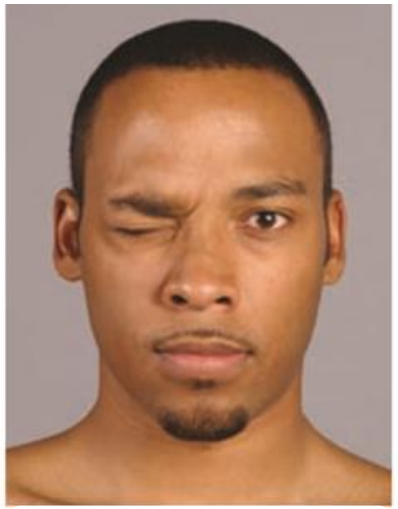
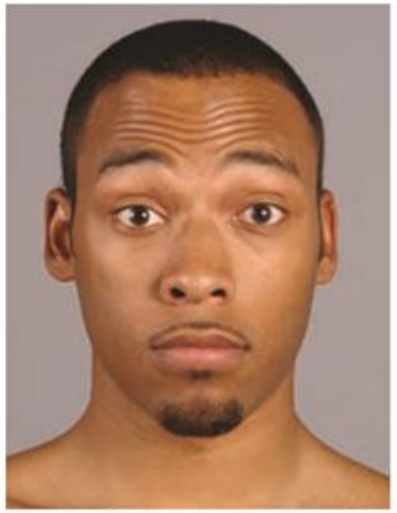
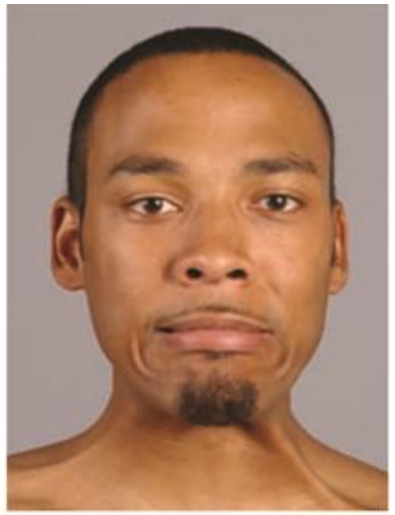
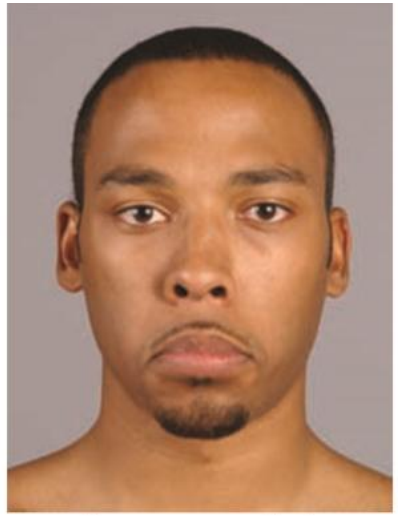
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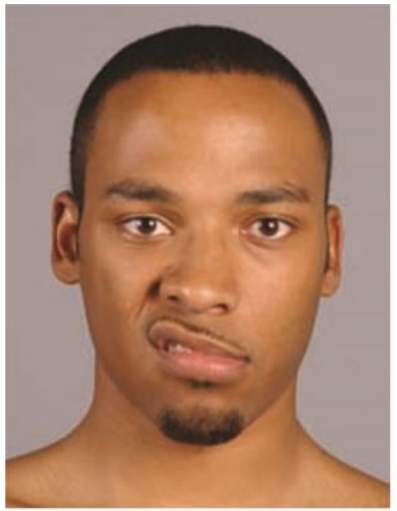
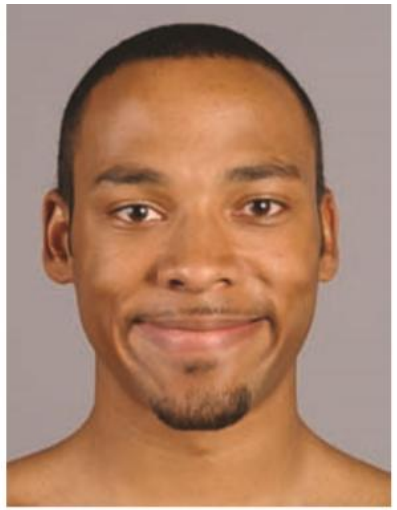
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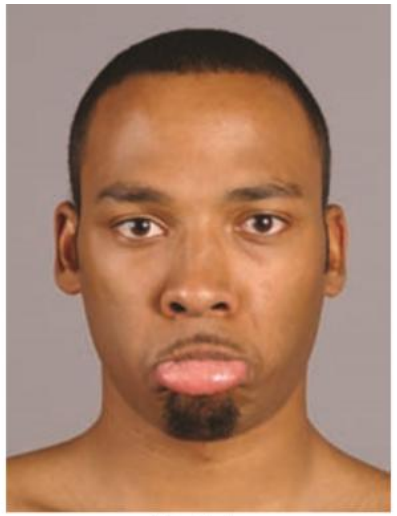
Muscles of Facial Expression Review:

CLICK on the picture that best displays use of the orbicularis oculi muscle:

Great job! Now, CLICK on the picture that best displays use of the mentalis muscle:



You got it!

Images: Grant's Atlas of Anatomy, 13th ed.

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Nervous Supply

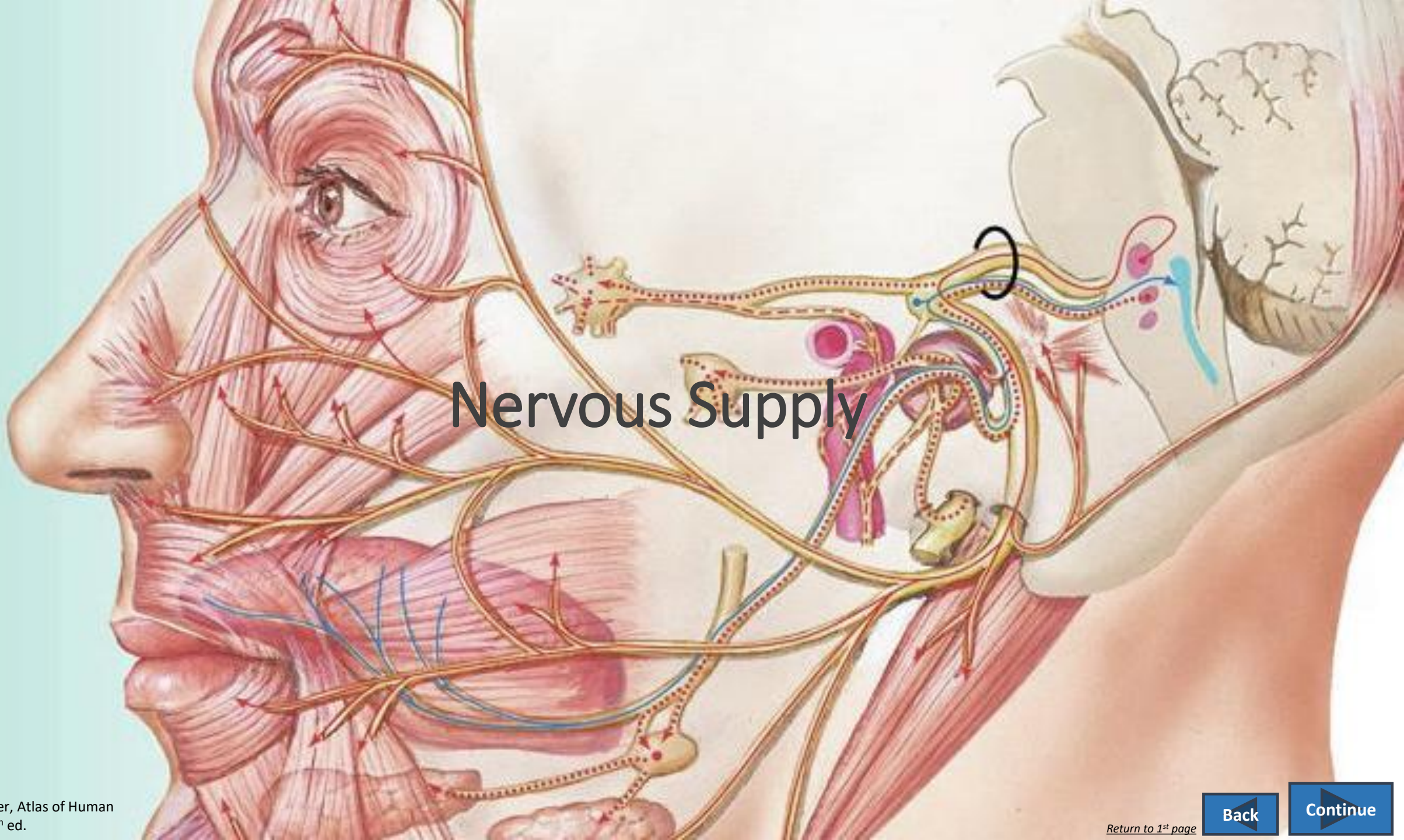


Image: Netter, Atlas of Human Anatomy, 6th ed.

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Cutaneous Innervation of the Face

Use arrow keys to move through slide

Cutaneous nerve supply (sensory) of the face is provided by the fifth cranial nerve, the **trigeminal nerve (CNV)**. This nerve possesses three named divisions:

V1: Ophthalmic – sensory only
V2: Maxillary – sensory only
V3: Mandibular – sensory and motor

Notice that each division has several branches, identified based on the location that it supplies.

Don't forget about sympathetic fibers. These are *motor* fibers involved in vasoconstriction, sweating, and innervation of erector pili muscles. The sympathetic fibers hitchhike along the cutaneous nerves.
Note: on an exam when we ask "which nerve innervates the…", we are referring to the named sensory or motor nerve, not the sympathetic fibers.

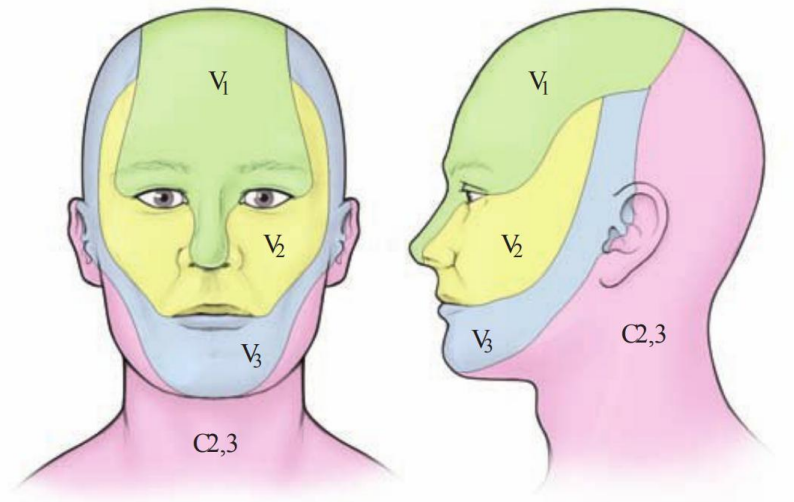


FIGURE 7.14 ■ Cutaneous nerve distribution of the head and neck.

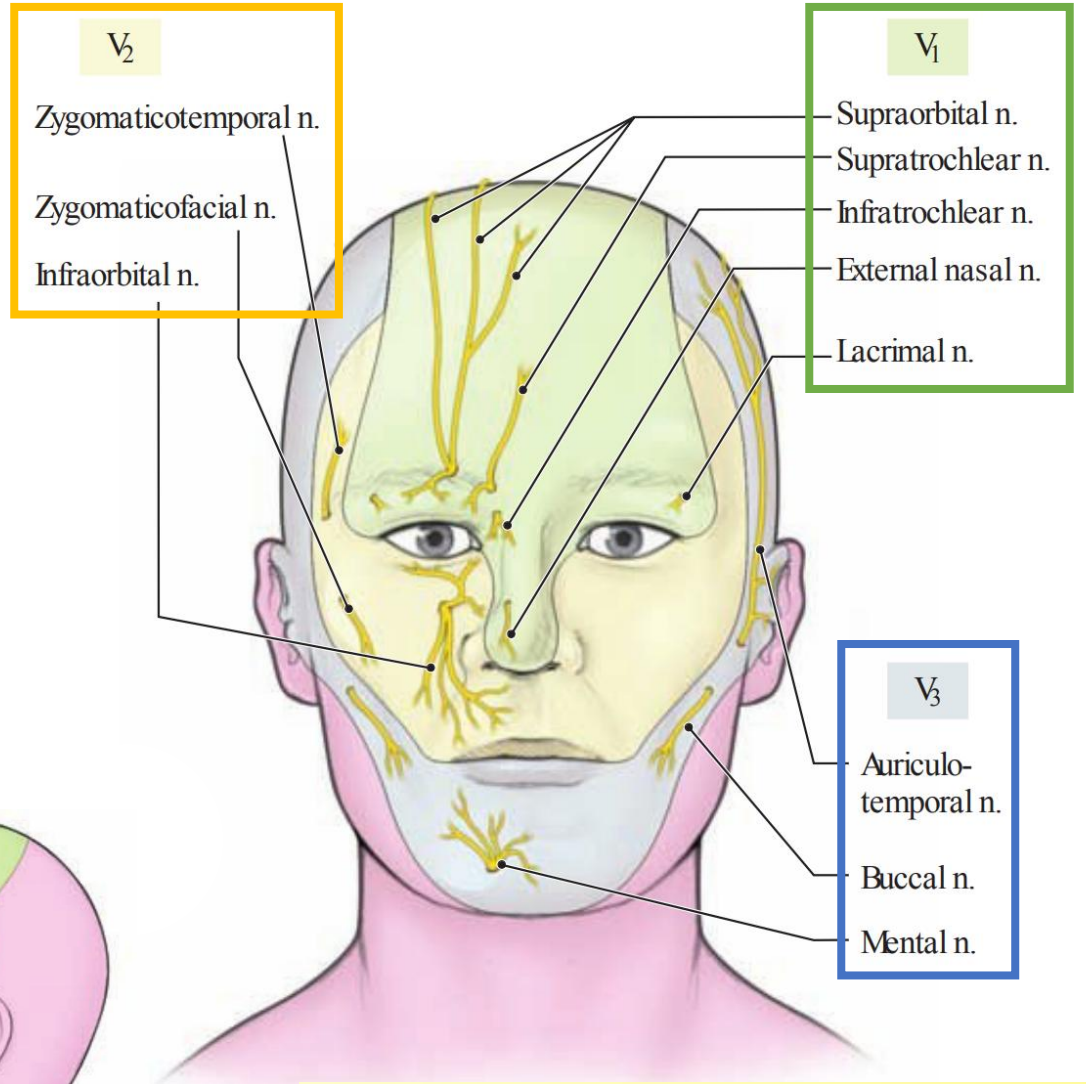


FIGURE 7.22 ■ Cutaneous nerves of the face.

Images: Tank, P. Grant's dissector. 16th ed.

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The Parotid Gland

parotid = para (around) + otic (ear)

Parotid glands: The largest of three paired salivary glands (the others being the submandibular and sublingual). The parotids are located on the lateral aspect of each mandibular ramus. The Parotid gland is enclosed by the parotid sheath (a named portion of parotidomasseteric fascia).

Saliva is produced by the parotid gland and secreted into the oral cavity by way of the **parotid duct**, the opening of which is called the parotid papilla.

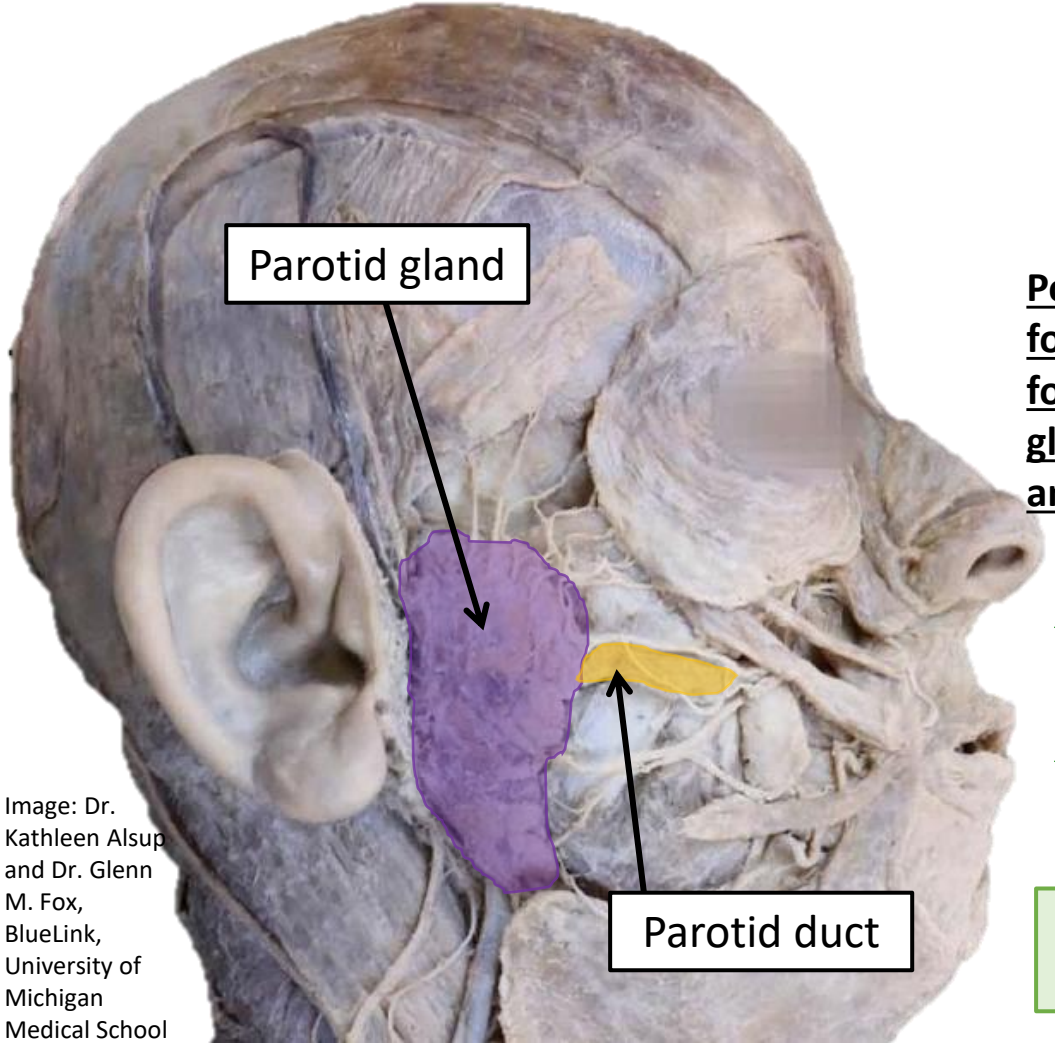
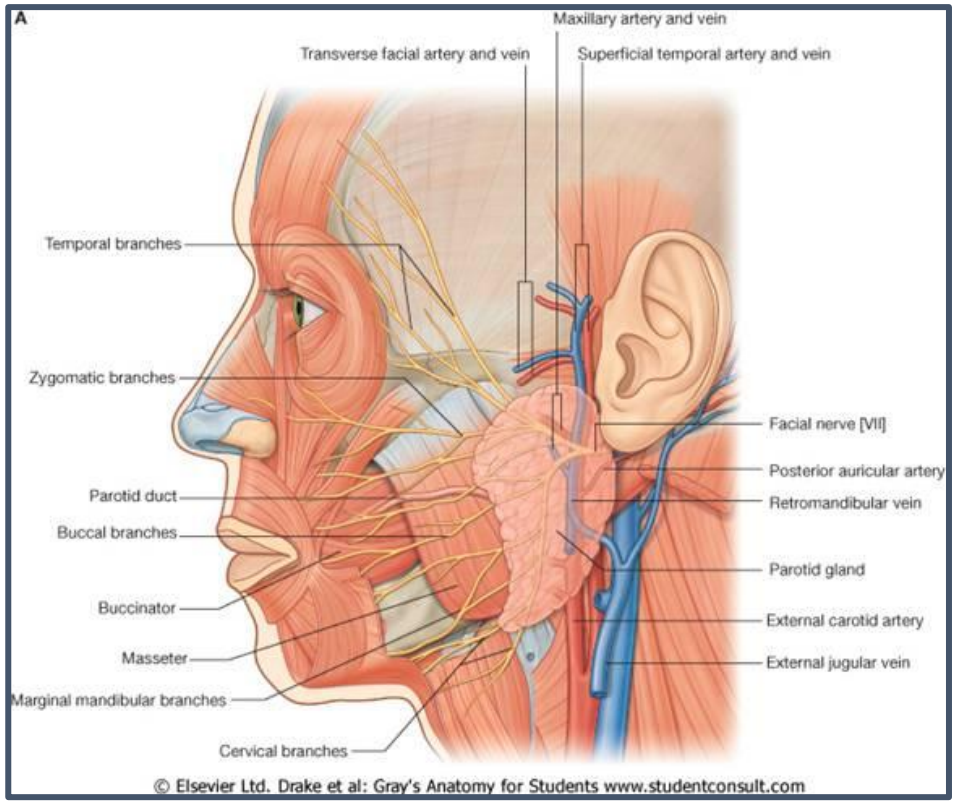


Image: Dr. Kathleen Alsup and Dr. Glenn M. Fox, BlueLink, University of Michigan Medical School

Portions of which of the following do you think can be found within the parotid gland? (Hint: more than one answer)

- ✓ a) Facial nerve
- ✓ b) External carotid artery
- ✓ c) Superficial temporal artery
- ✓ d) Maxillary artery
- ✓ e) Retromandibular vein

CLICK here when you think you have clicked all correct answer(s)



Correct, portions of each of these structures are often found in the parotid gland.

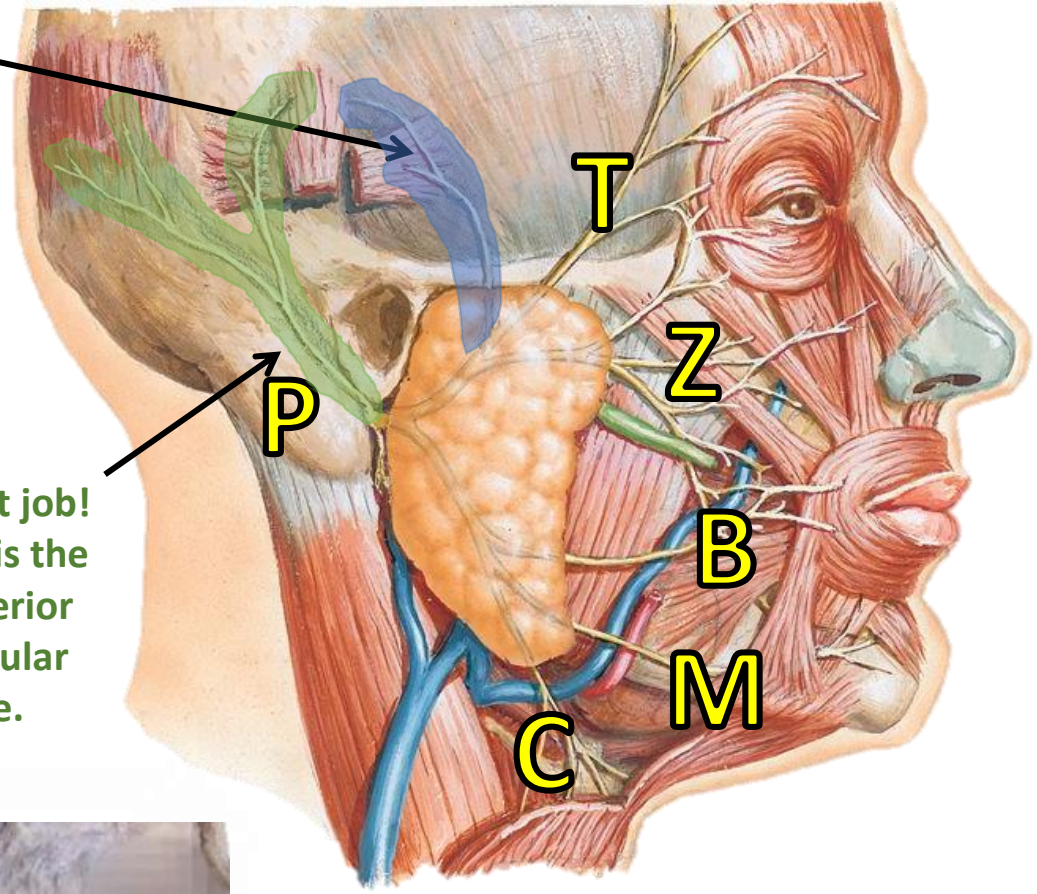
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The Facial Nerve (CNVII)

This is anterior to the ear, and is a temporal branch



Great job! This is the posterior auricular nerve.

The **facial nerve** has six named branches. Use the following to remember their order from superior to inferior:

MNEMONIC	BRANCH
Two	Temporal
Zombies	Zygomatic
Bit	Buccal
My	Marginal Mandibular
Cat's	Cervical
Paw	Posterior auricular

Images: Netter's Atlas of Human Anatomy, 6th ed.

The sixth branch, the posterior auricular nerve, differs from the other branches in that it is found posterior to the ear. Knowing this, **CLICK on the posterior auricular nerve** on the image to the right.



Image: Dr. Kathleen Alsup and Dr. Glenn M. Fox, BlueLink, University of Michigan Medical School

In the lab…
The branches of the facial nerve are quite small. The main branch can be found in a deep dissection just anterior to the ear (above). The nerve quickly forms a plexus within the parotid gland

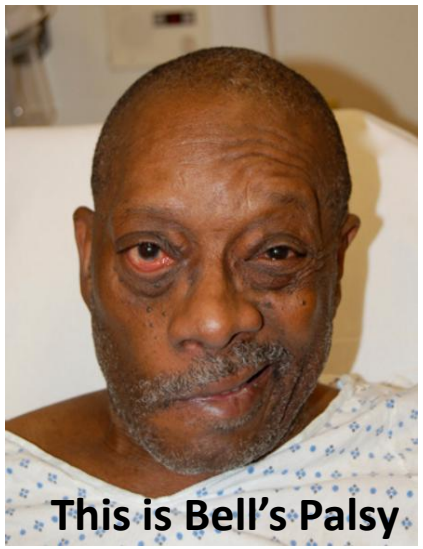
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Clinical Correlate: Facial Paralysis

CLICK on the following image that shows an individual who has likely experienced a stroke:

Hint: if facial weakness is isolated to the **lower face** then it is most likely due to a stroke

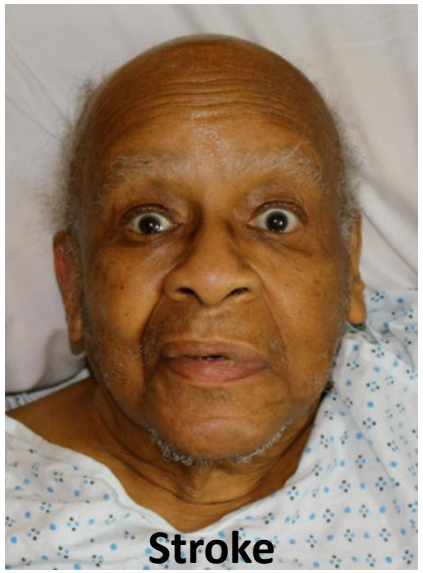


Bell's Palsy = acute unilateral peripheral facial nerve palsy.

(Click here to show that this patient is smiling. Click again to hide).

The two most common causes of acute facial paralysis = **Bell's Palsy** and **ischemic stroke.**

Both present unilaterally. Bilateral presentations are very rare.



Correct, this is a stroke.

Ischemic stroke = occlusion of artery supplying the brain

An explanation of why a stroke usually does not affect the upper face is given on the next few slides

https://www.jems.com/2014/05/07/differentiating-facial-weakness-caused-b/

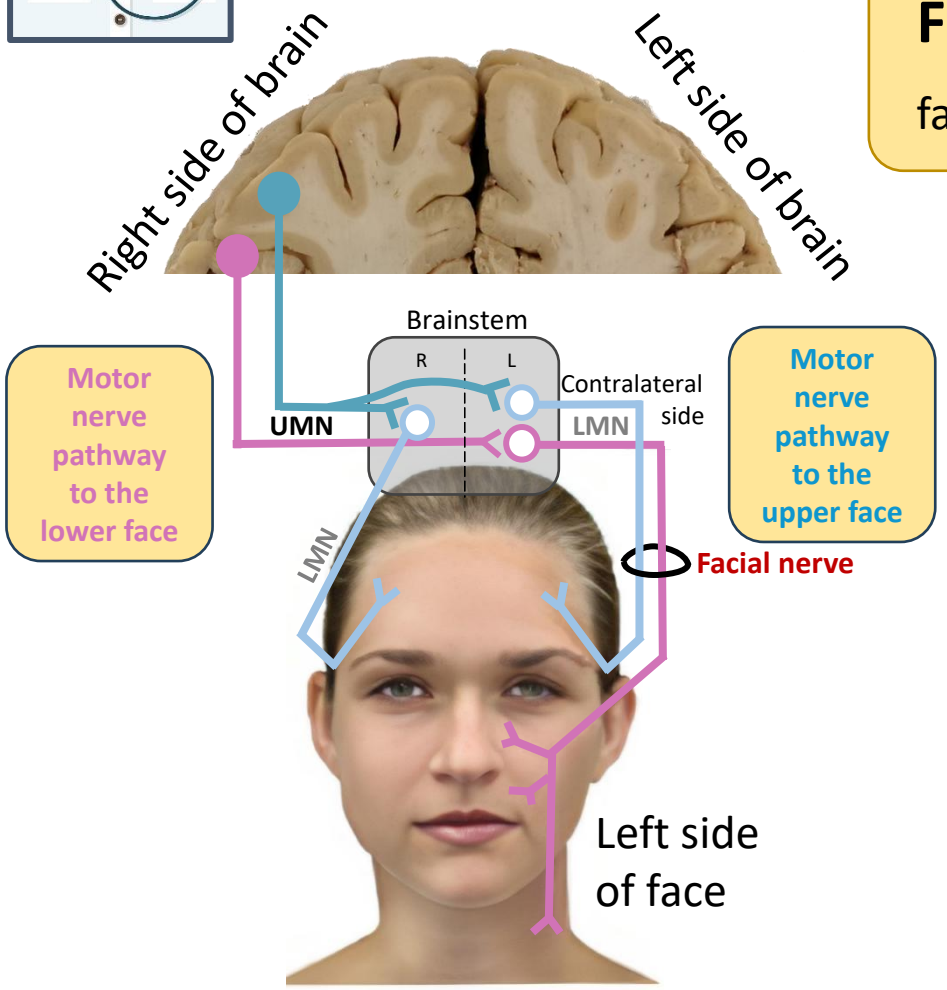
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Clinical Correlate: Facial Paralysis



First…to understand the presentation of a cortical ischemic event affecting the face, you will need to understand the **NORMAL Facial Nerve Pathway:**

Lower face innervation: **Upper motor neurons (UMN)** travel from the cortex to the brainstem where they cross over (decussate), then synapse on **lower motor neurons (LMN)** that innervate the contralateral face.

Upper face innervation: Nerves to the upper face travel from the cortex to the brainstem where they synapse with LMN. Some of the fibers decussate to supply the contralateral face and some remain on the same (ipsilateral) side.

In other words, as you can see in this image, each side of the brain innervates both the Left and Right sides of the **upper face**!

All the fibers to the face travel together in the **facial nerve**

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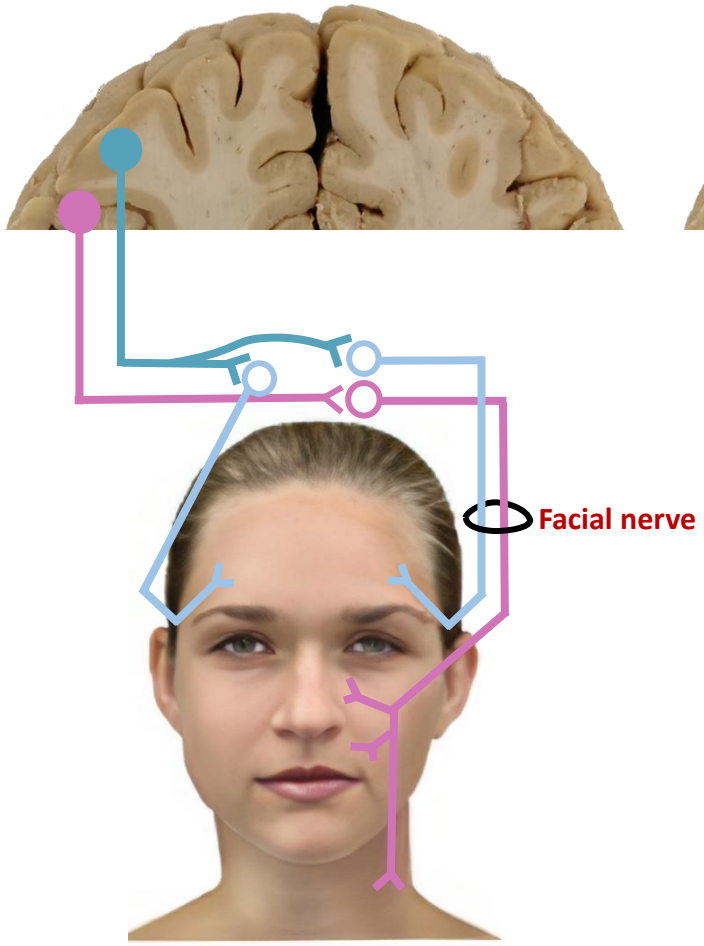
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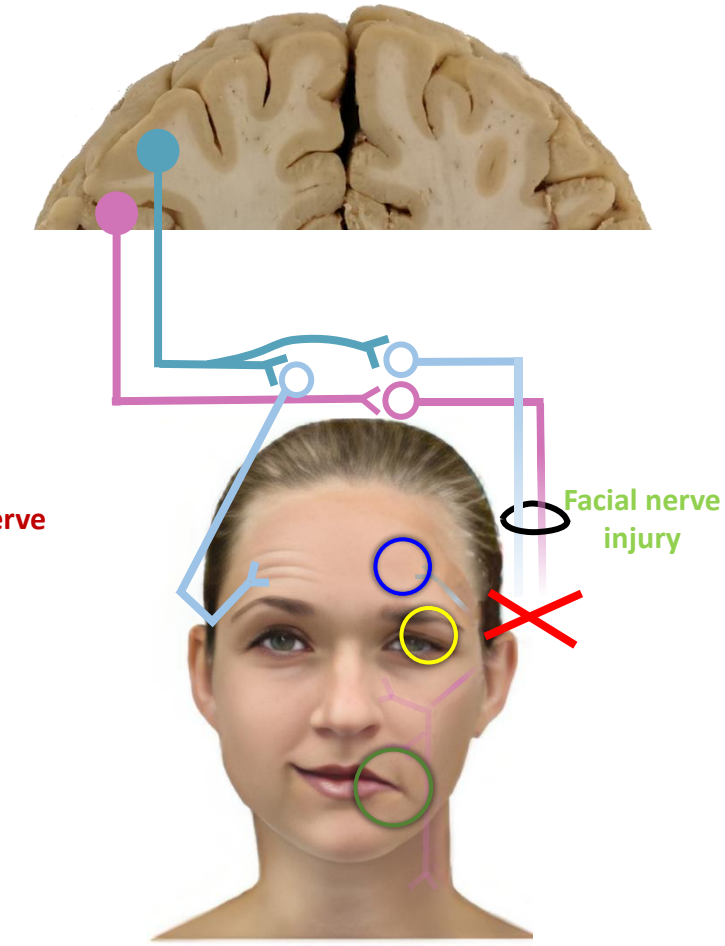


Clinical Correlate: Facial Paralysis

NORMAL FACIAL NERVE



FACIAL NERVE INJURY



During physical exam you ask the patient to smile. The result is:

- Flaccid lower face (left side)
- Drooping eye (left side)
- No lines on forehead (left side)

What is your diagnosis? (Click to continue)

This is a facial nerve injury (e.g. Bell's Palsy): all fibers within the damaged facial nerve are affected. Result: weakness of the ipsilateral **upper** and **lower** face

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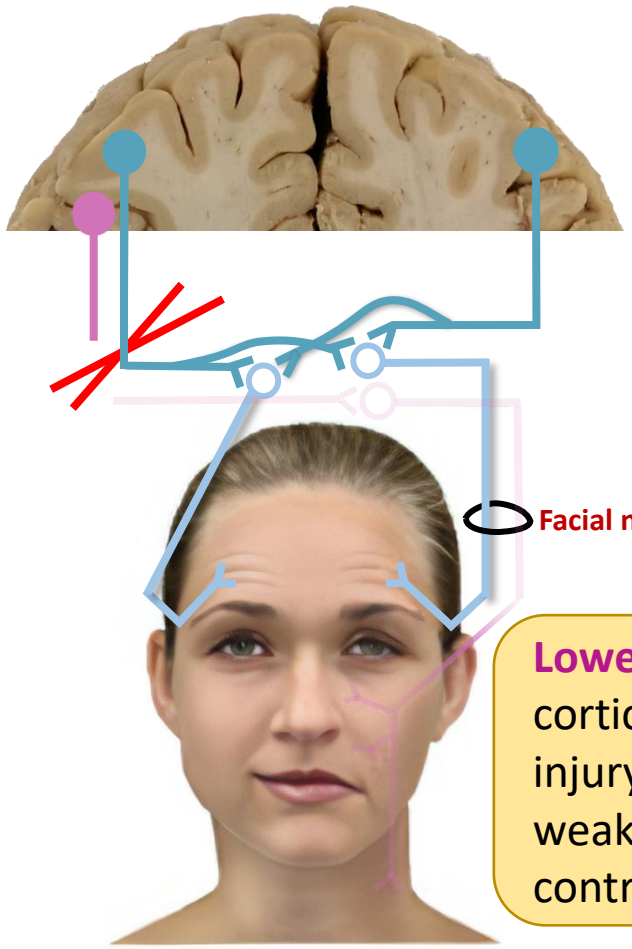
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Clinical Correlate: Facial Paralysis – Stroke

NORMAL FACIAL NERVE

FACIAL NERVE INJURY

STROKE



Lower face:
cortical/internal capsule injury results in weakness in the contralateral lower face

- Normally, *each side* of the upper face receives signals from **BOTH sides of the brain**.
- With a one-sided **stroke** (e.g. **stroke within the RIGHT internal capsule**), the whole upper face still receives innervation from the left side of the brain so the upper face looks normal. Click to continue

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Arterial Supply

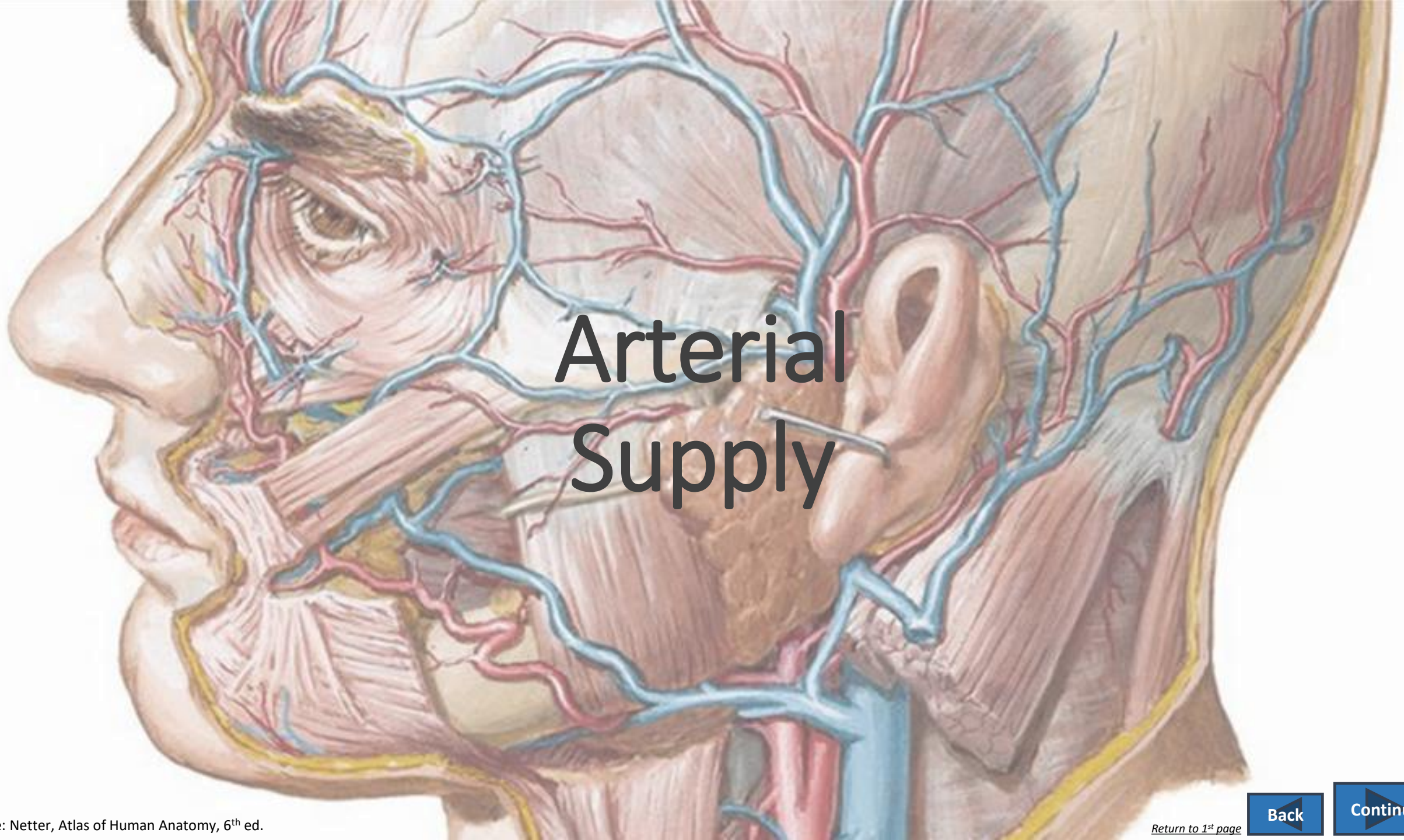


Image: Netter, Atlas of Human Anatomy, 6th ed.

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The External Carotid Artery

After giving off six branches, the **external carotid artery** terminates as two arteries, the **maxillary** and **superficial temporal artery**.

The six branches (listed from inferior to superior branching):

1. superior thyroid a.
2. ascending pharyngeal a.
3. lingual a.
4. facial a.
5. occipital a. (may branch off before the lingual or facial a)
6. posterior auricular a.

The next slide lists some key features of each branch that will help you identify them!

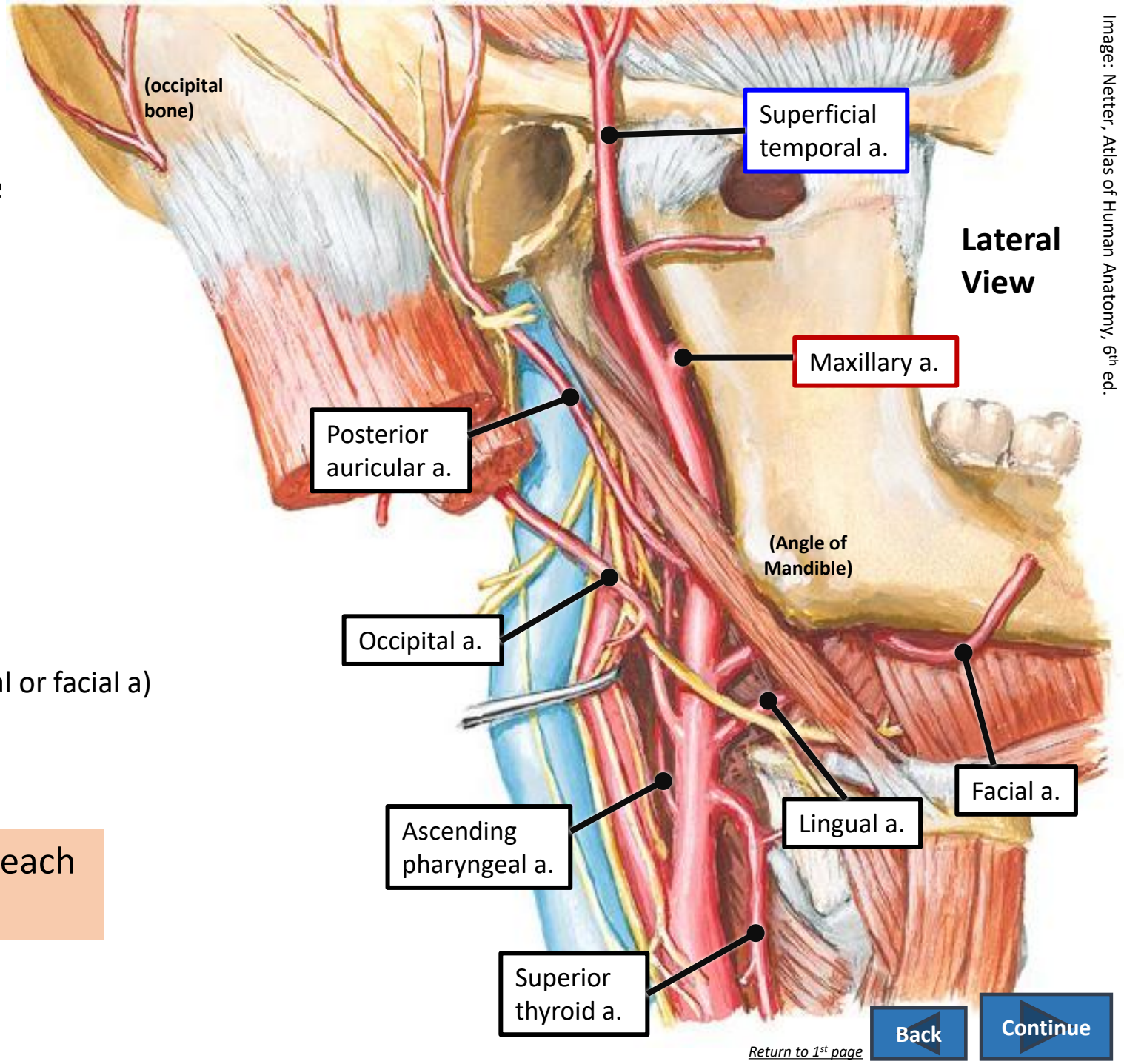


Image: Netter, Atlas of Human Anatomy, 6th ed.

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The External Carotid Artery

1. superior thyroid a. Drops inferiorly to supply the thyroid
2. ascending pharyngeal a. Difficult to find; it arises medially and lies deep to the external carotid
3. lingual a. passes anteriorly towards the tongue
4. facial a. rides up over the mandible at the posterior edge of the mouth
5. occipital a. runs posteriorly
6. posterior auricular a. runs posteriorly and ascends behind the ear

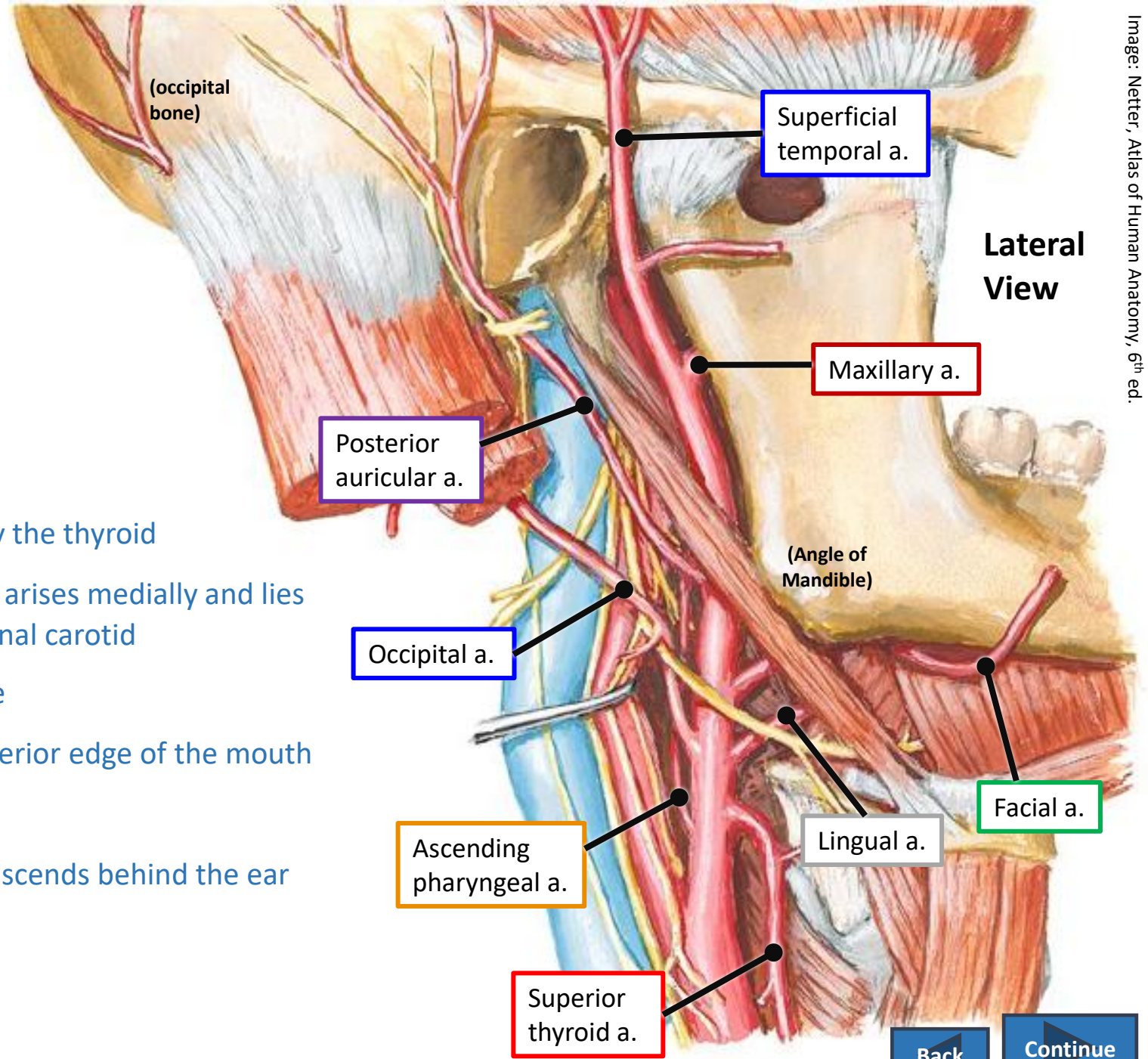


Image: Netter, Atlas of Human Anatomy, 6th ed.

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Arterial Supply of the External Skull

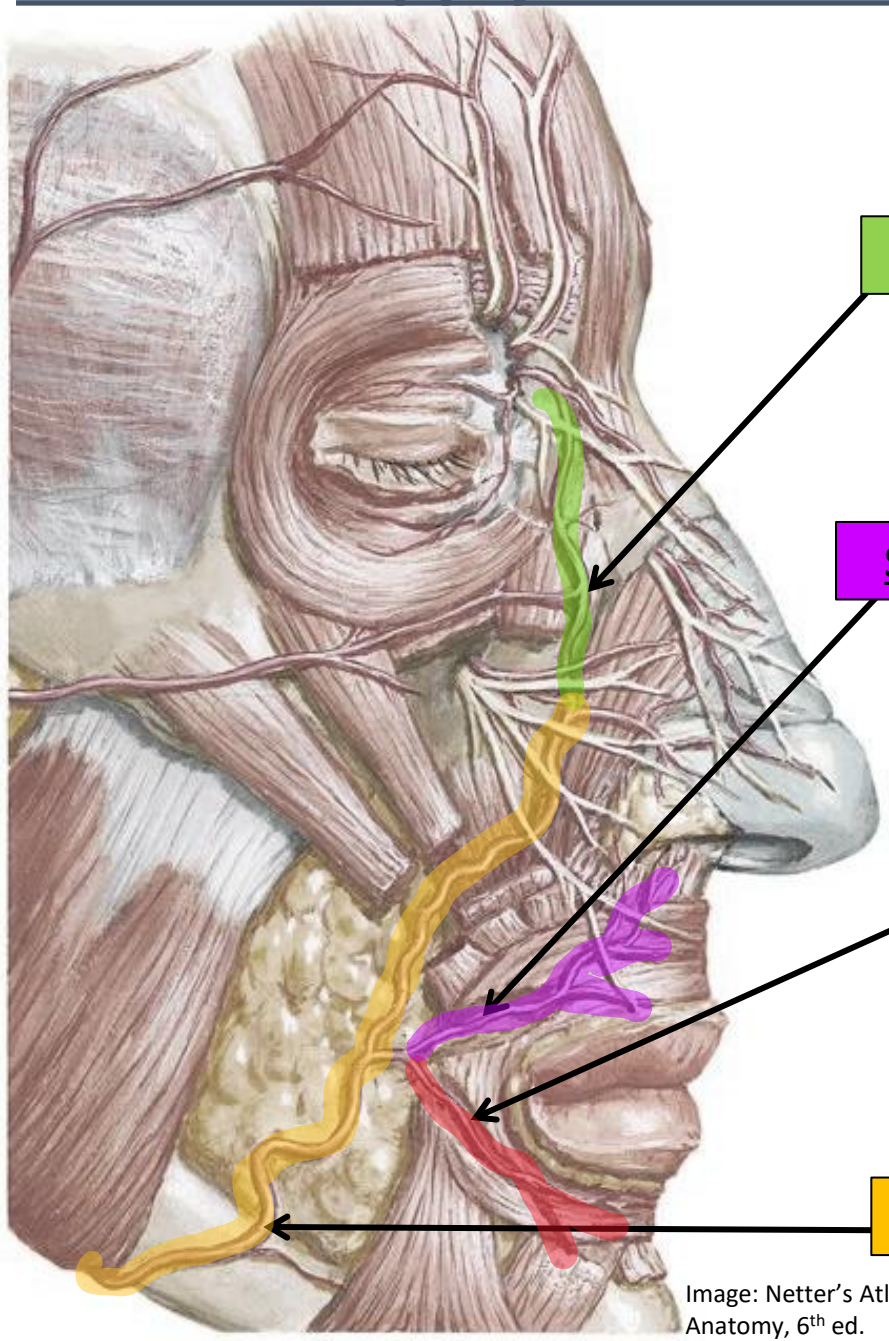


Image: Netter's Atlas of Human Anatomy, 6th ed.

Angular a.

The **angular artery** is a direct continuation of the facial artery, which changes name at the level of the lateral nose.

Click me!

Superior labial a.

Likewise, the **superior labial artery** supplies the superior aspect of the external mouth. This diagram shows the superior/inferior labial arteries sharing a common trunk, although they may also branch independently (inferior labial first).

Click me!

Inferior labial a.

The **inferior labial artery** is the first branch of the facial artery, supplying the inferior aspect of the external mouth.

Click me!

Facial a.

The **facial artery** is a branch of the external carotid artery, and is known for its tortuous appearance. It emerges from the inferior border of the mandible and is typically found more anterior/medial to the facial vein.

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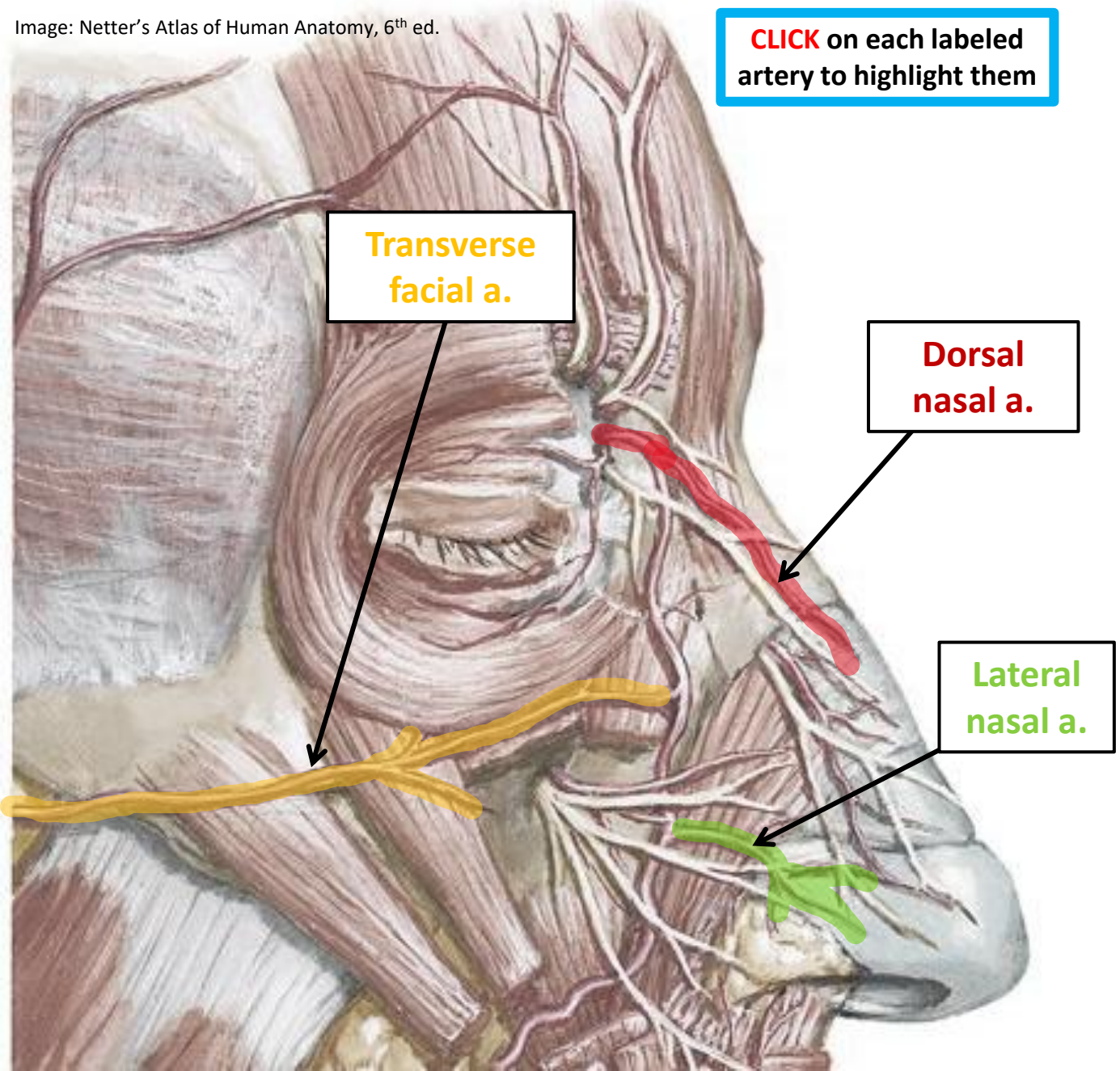
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Arterial Supply of the External Skull: Nasal Region

Image: Netter's Atlas of Human Anatomy, 6th ed.

CLICK on each labeled artery to highlight them



Medially to the eye, the **dorsal nasal artery** anastomoses with the angular artery. The dorsal nasal artery is a termination of the ophthalmic artery, a branch of the internal carotid artery.

The **transverse facial artery** arises from the superficial temporal artery, coursing anteromedially to form a communication with the angular artery.

The facial artery gives off the **lateral nasal artery** at the inferior aspect of the nose.

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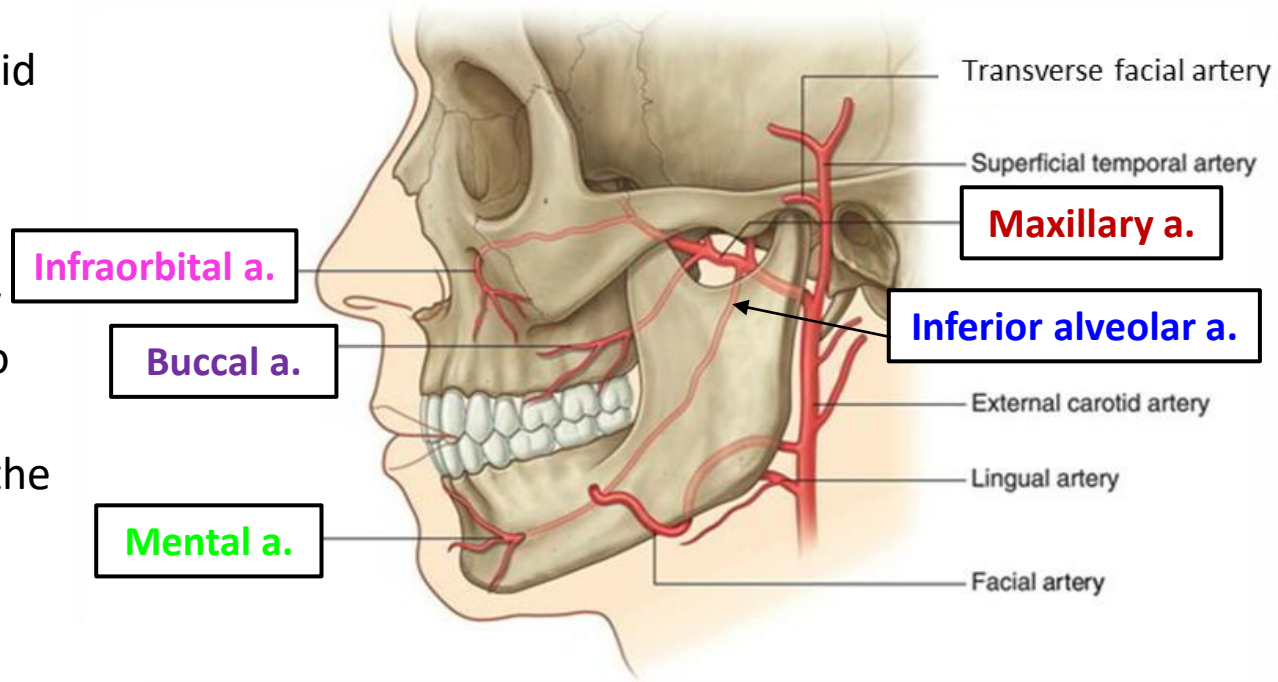
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Arterial Supply of the External Skull: Maxillary Artery

Use arrow keys to move through slide

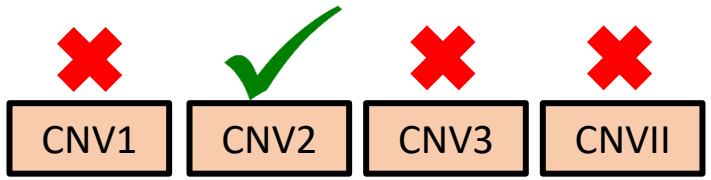
Image obtained from: https://www.earthslab.com/anatomy/transverse-facial-artery/



The **maxillary artery** is a terminal branch of the external carotid artery. The following branches of the **maxillary artery** supply the face:

- The **inferior alveolar artery** branches off the maxillary artery, traveling inferiorly and anteriorly (it passes into the ramus of the mandible with the inferior alveolar nerve). When the artery exits the mental foramen of the mandible, the artery is then referred to as the **mental artery**. We will see this artery when the mandible is removed.
- The **buccal artery** supplies the buccinator muscle, as well as skin of the cheek.
- The **infraorbital artery** exits the infraorbital foramen along with the infraorbital nerve.

REVIEW: What cranial nerve does the infraorbital nerve branch from? *(**CLICK** to answer)*



Correct! The supraorbital nerve, on the other hand, branches from CN V1. The supraorbital nerve is a continuation of the frontal nerve.

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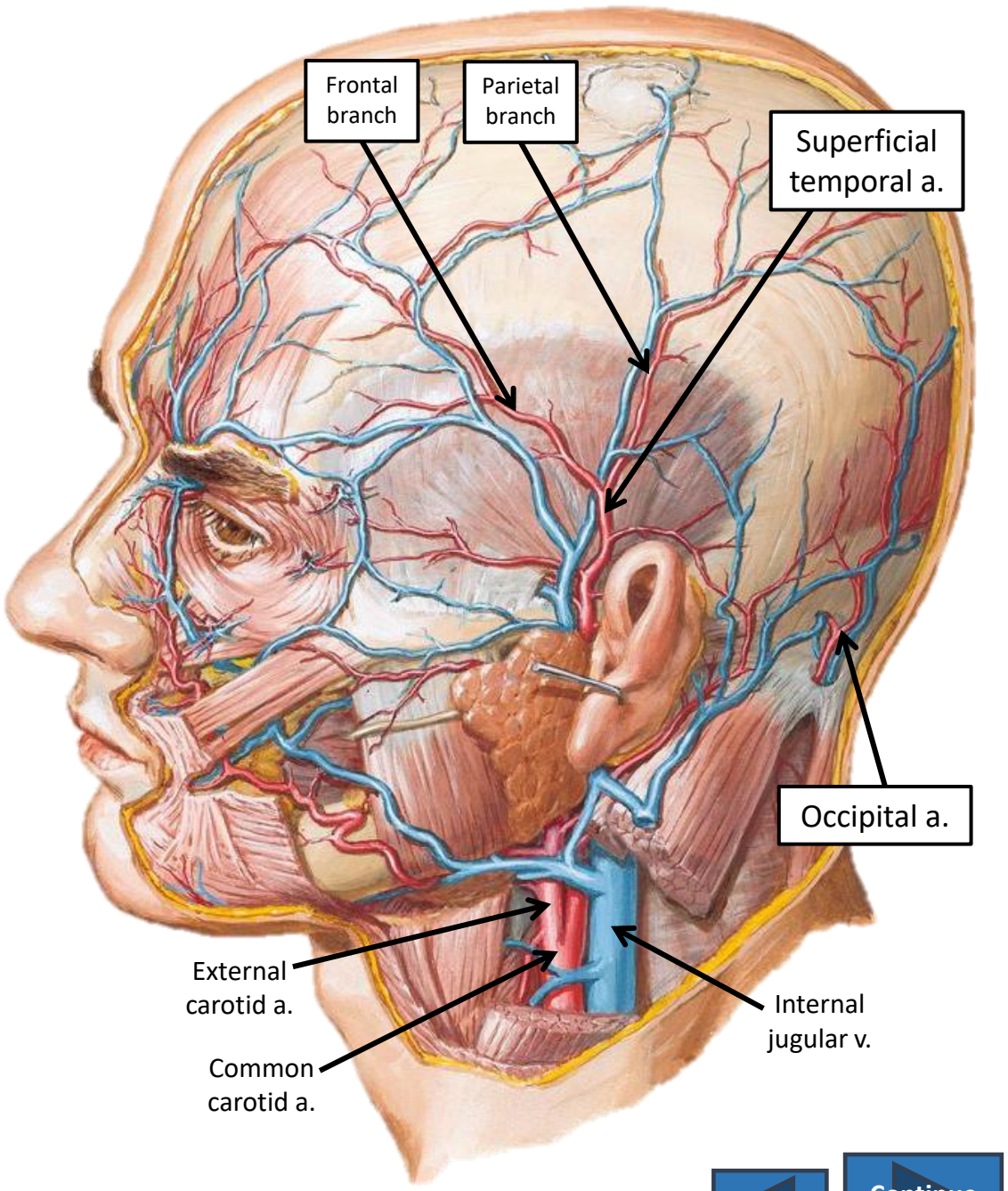
Arterial Supply of the External Skull

Use arrow keys to move through slide

The other terminal branch of the external carotid artery, the **superficial temporal artery**, supplies the superior and lateral skull/scalp via its **frontal** and **parietal** branches.

The **occipital artery** branches from the external carotid artery to supply the occipitalis muscle and the posterior skull/scalp.

Image: Netter, Atlas of Human Anatomy, 6th ed.



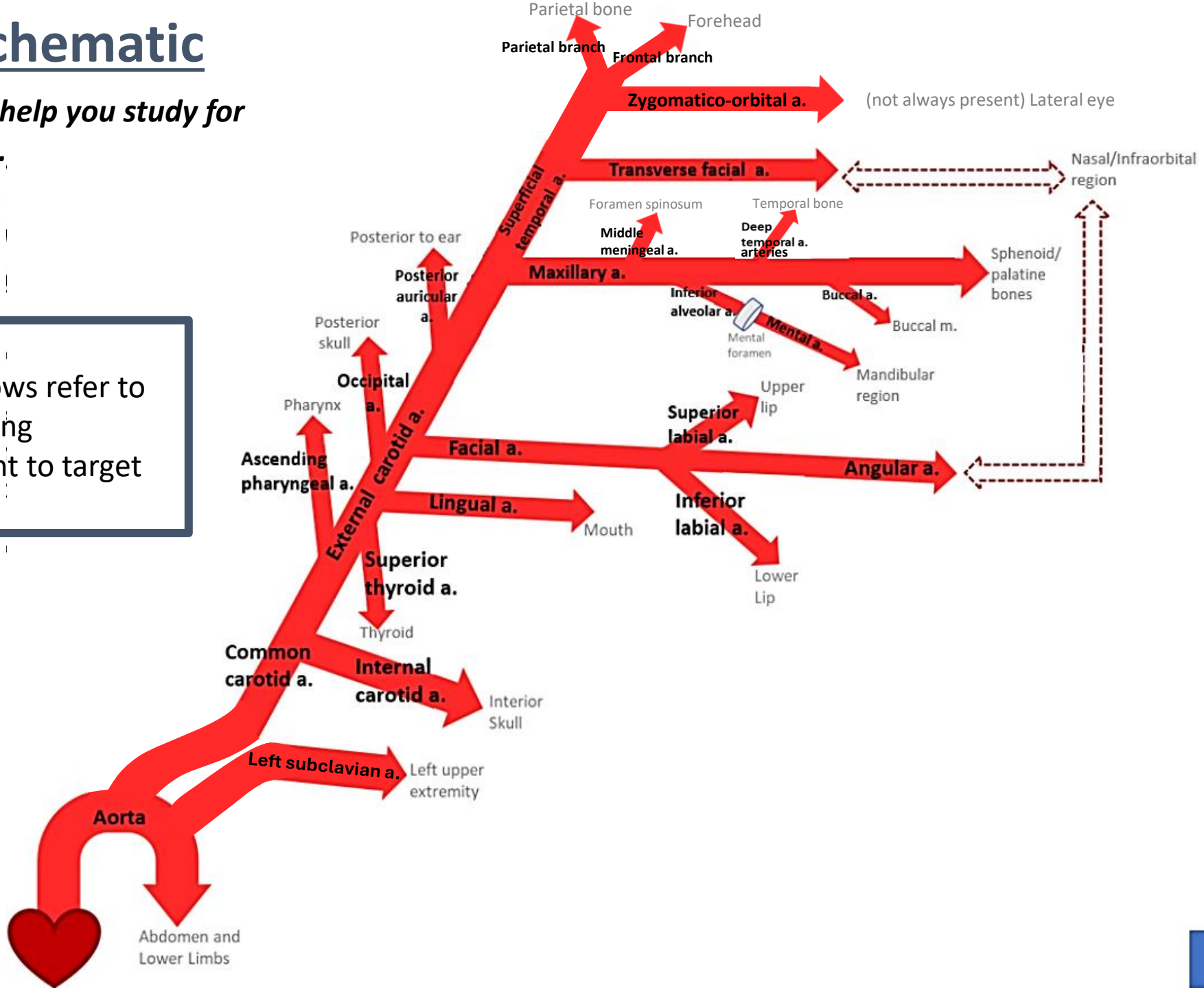
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Arterial Schematic

This slide may help you study for head and neck.

KEY:

- Dotted arrows refer to anastomosing
- Arrows point to target location



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Venous Drainage of the Face

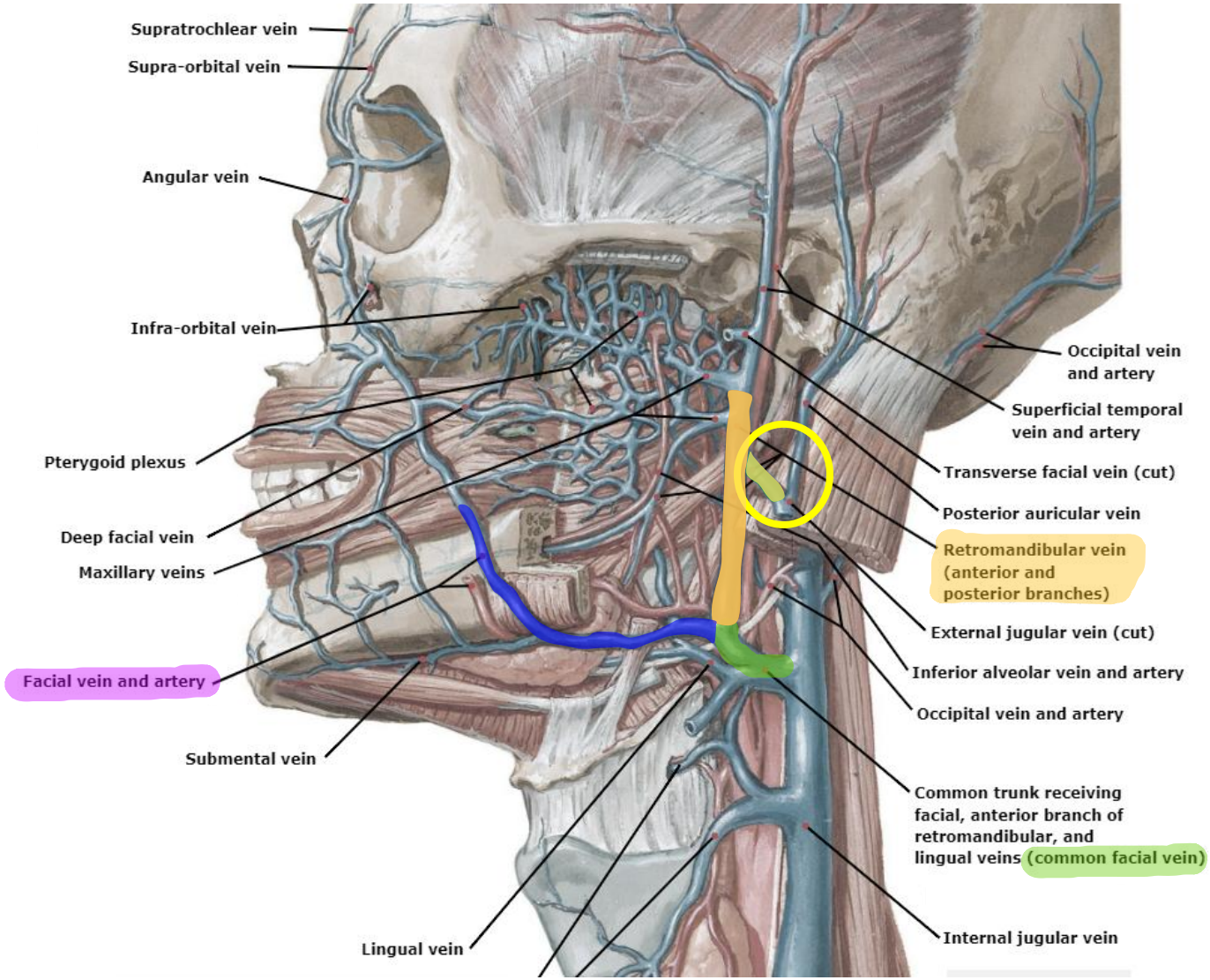
There are named veins that coincide with the arterial supply of the face, typically found next to the artery. While venous nomenclature is very similar to the arterial supply, there are two unique vessels to be aware of:

1. The **retromandibular vein** can be found inside the parotid gland. It drains blood from the superficial temporal and maxillary veins.

2. The **posterior branch** of the retromandibular vein drains into the external jugular vein.

3. The **anterior branch** of the retromandibular vein joins the **facial vein**, draining into and forming the **common facial vein**. Note that in this image, the lingual vein is also draining into the common facial vein. This branching is highly variable among individuals.

While unique branching patterns may be, some anatomy is fairly consistent. For example, the **facial artery** and **facial vein** are anterior to the masseter muscle.



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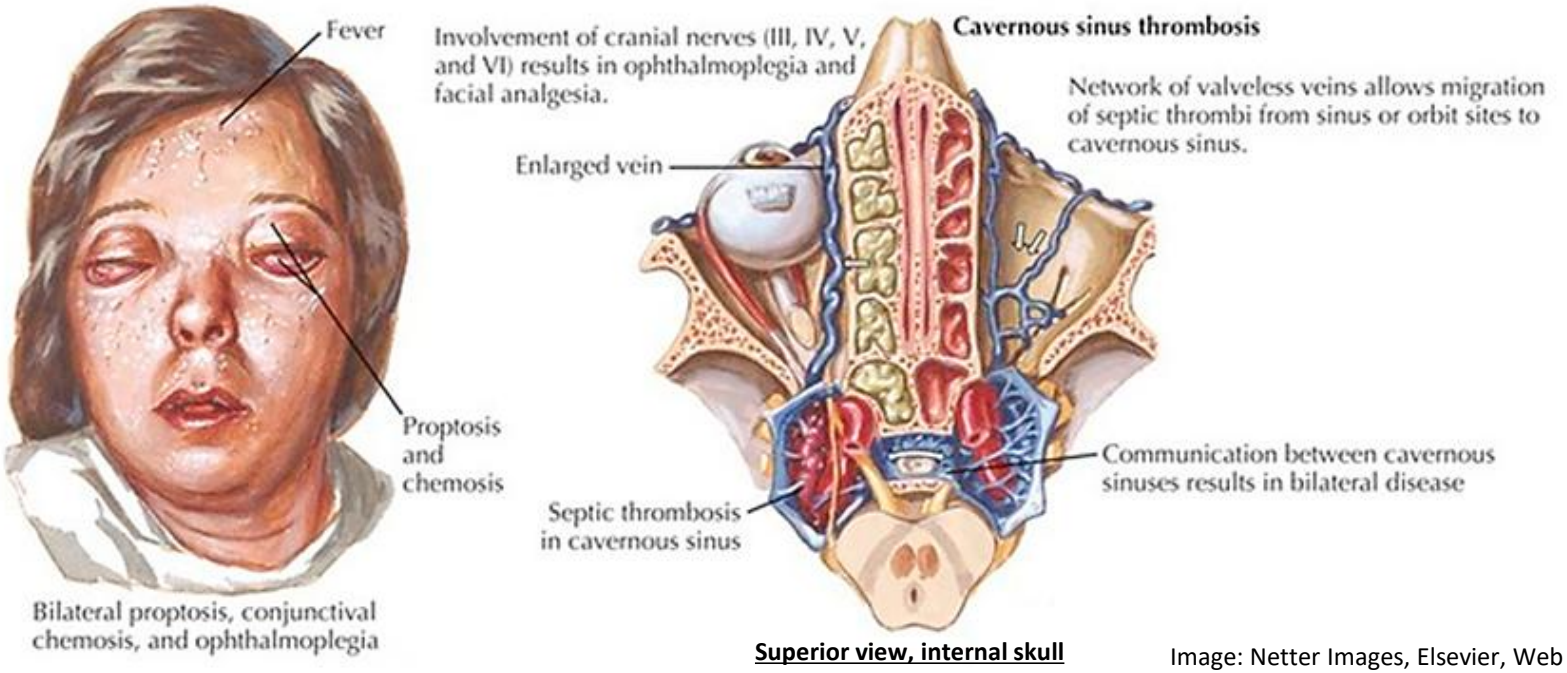


Clinical Correlate: Cavernous Sinus Thrombosis

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Anastomoses ensure proper perfusion and drainage of blood, but these communications also provide a route of infection from external to internal structures. One example is from the lip to the cavernous sinus.

Cavernous sinus thrombosis is presence of a blood clot in the cavernous sinus, resulting in poor blood return and consequently enlarged veins. This is often due to infection, as the clotting of blood is the body's defense mechanism to prevent further spread of the infection. Cavernous sinus thrombosis is very rare.



Superior view, internal skull

Image: Netter Images, Elsevier, Web

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Clinical Correlate: Cavernous Sinus Thrombosis

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The Danger Triangle of the face (~bridge of nose to corners of the mouth) is so named because infections can spread posteriorly via the venous system to enter the cavernous sinus.

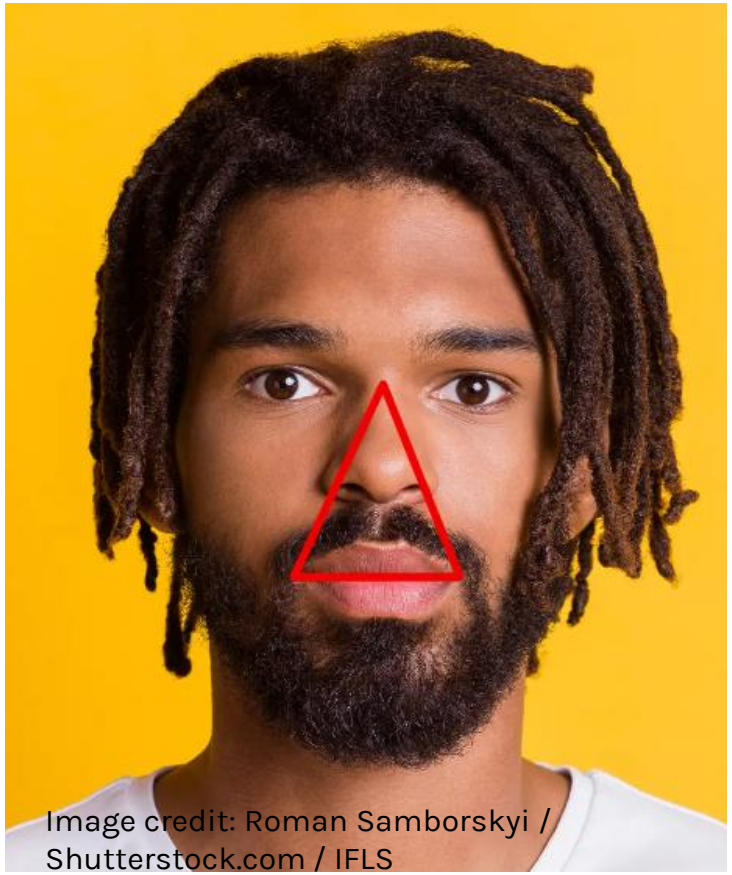
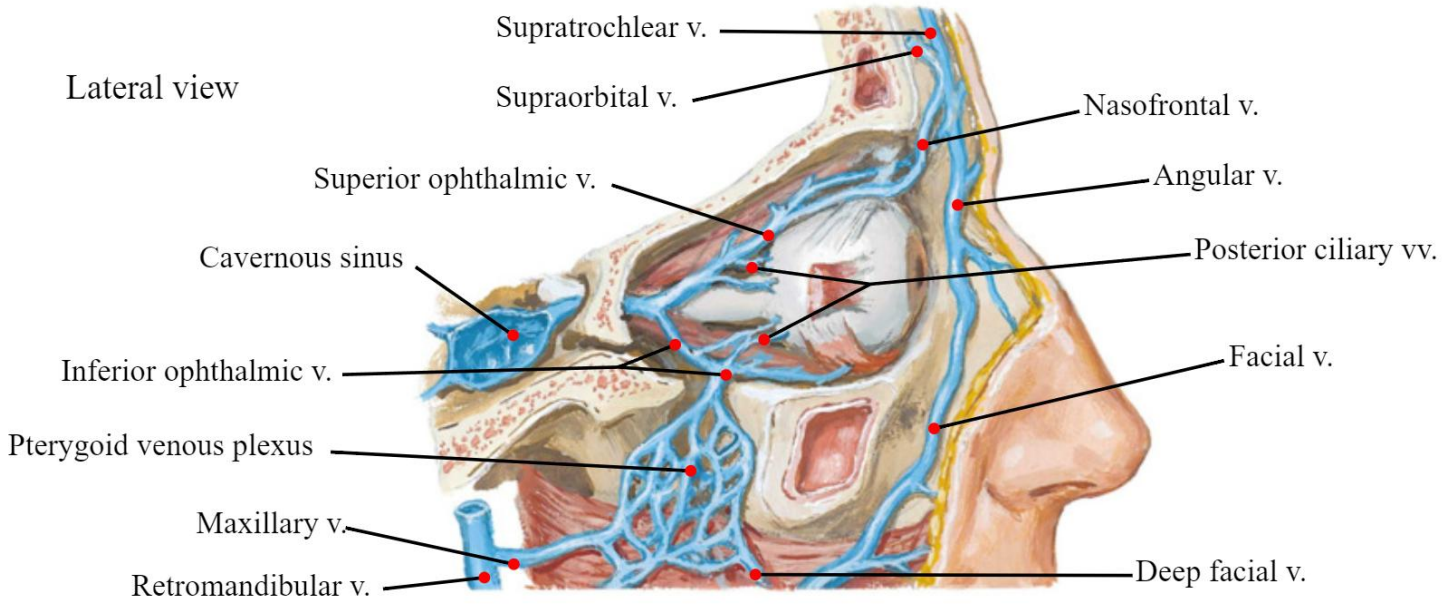


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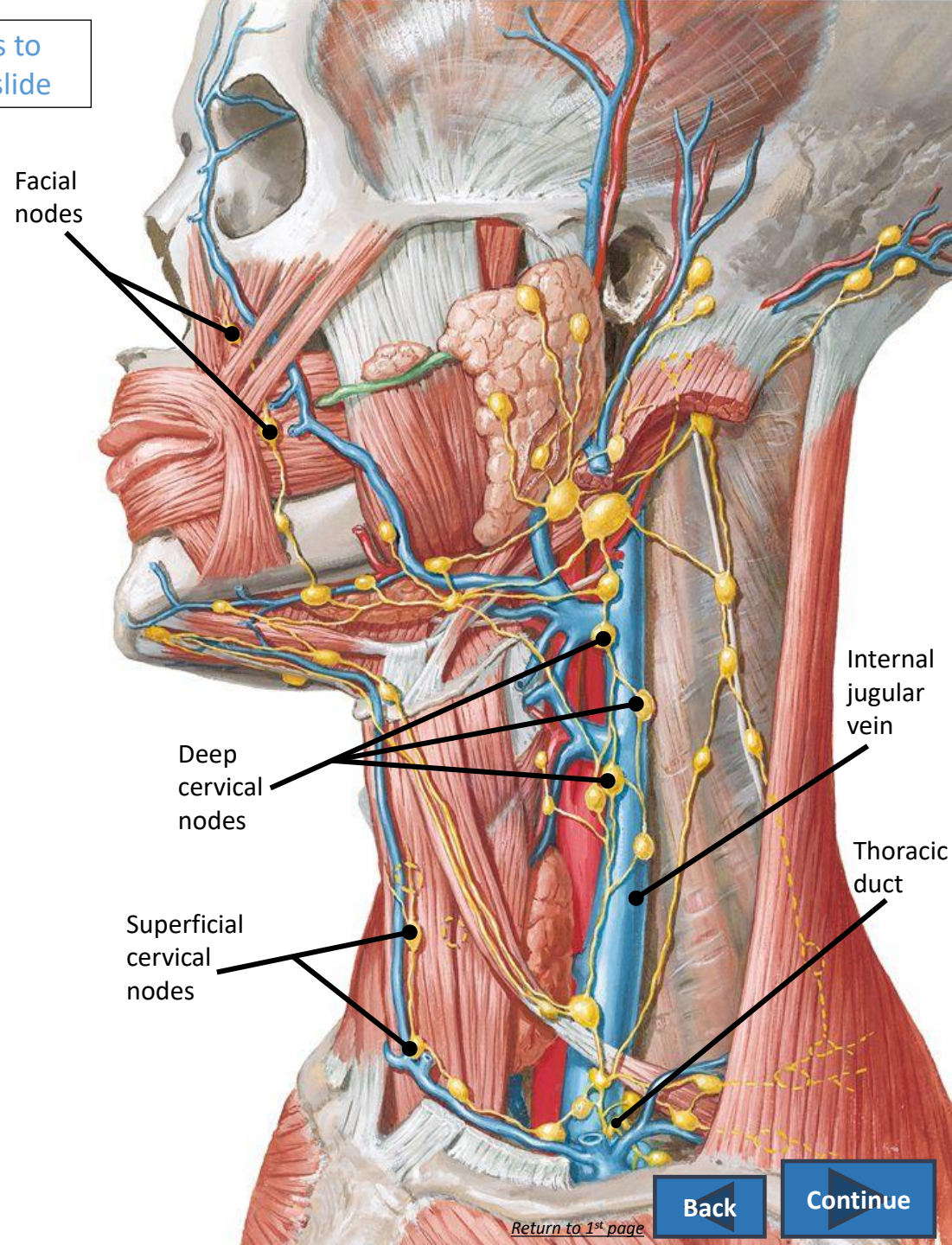
Lymphatic Drainage of the Face

Use arrow keys to move through slide

Facial and cervical lymph nodes are clustered in proximity to the internal jugular vein.

Lymph nodes of the face are drained into the superficial and deep cervical lymphatic vessels. On the left side, lymph from the head and neck is drained into the thoracic duct. On the right side, lymph is drained into the right lymphatic duct.

Swelling of lymph nodes is a symptom of an underlying cause, such as an autoimmune disorder or lymphedema.



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Clinical Correlate: Facial Reconstruction

Use arrow keys to move through slide

http://time.com/5466810/cameron-underwood-face-transplant/



Fun fact: The first partial face transplant took place in 2005, while the first full face transplant took place in 2010. (http://news.bbc.co.uk/2/hi/health/8639437.stm)

There are many reasons that patients undergo facial reconstruction, such as congenital defects or repairing damage caused by injury. Surgery may be recommended if the concern affects health, such as the septoplasty mentioned previously to correct difficulty breathing. Facial reconstruction may also be requested due to cosmetic interests expressed by the patient.

This patient suffered from a self-inflicted gun shot wound. After performing the necessary life-saving surgery, he was left with the resulting disfigurement.

Now, we can see the patient 20 months after a successful full-face transplant. Reconstruction of the maxillary bone, mandible, teeth, palate, and nasal passage were made possible due to a donor and a medical team with great understanding of facial anatomy. (https://nyulangone.org/news/nyu-langone-health-performs-its-second-face-transplant)

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Thank you for learning with us!



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