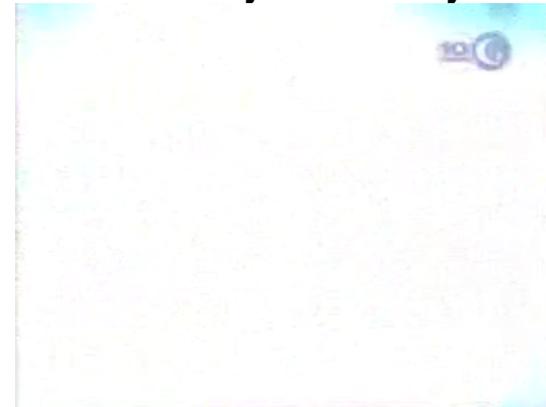


AACP INSTITUTE SLEEP MEDICINE AND DENTISTRY MINI-RESIDENCY

Anatomy of the TMJ and Upper Airway and their Relationships (made easy)

Cameron A. Kuehne, D.M.D., M.S.
Diplomate, American Board of Craniofacial Pain
Diplomate, American Board of Dental Sleep Medicine
Diplomate, American Board of Craniofacial Dental Sleep Medicine
Adjunct Faculty, Anatomy, Boise State University
Email: cameron@sleepidaho.com

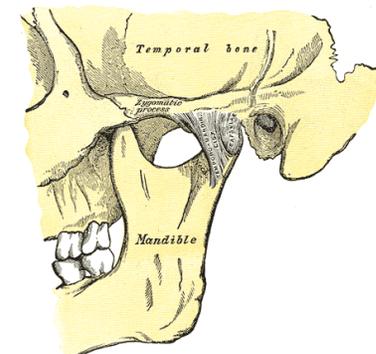
“Anatomy Made Easy”

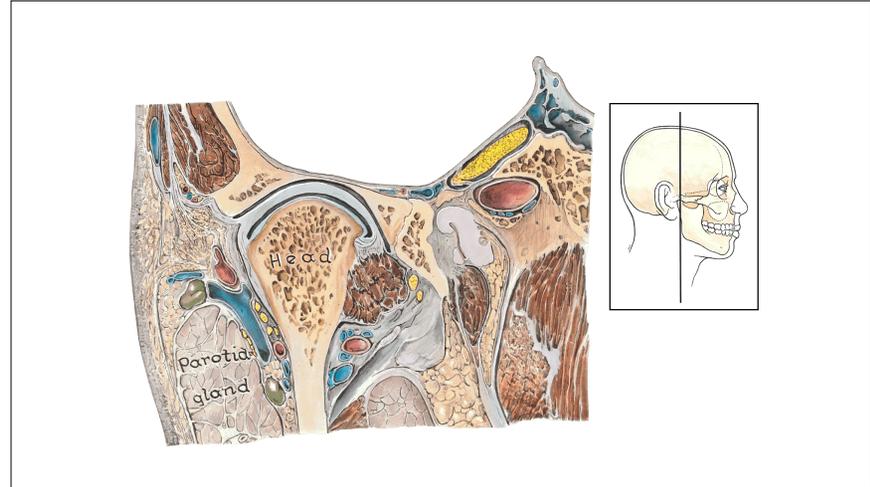


ANATOMY of the TMJ and associated structures

Jaw Joint

- TMJ (temporomandibular joint)
- Do I have TMJ?



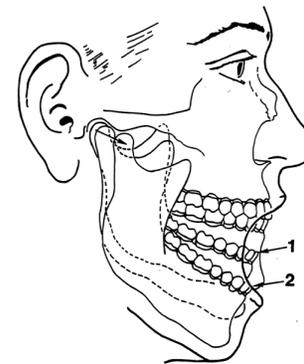


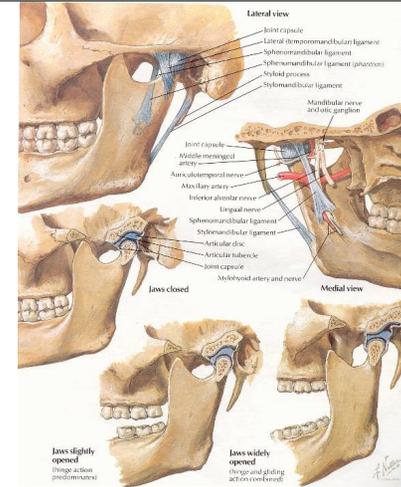
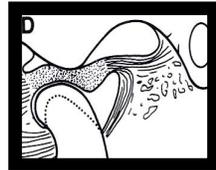
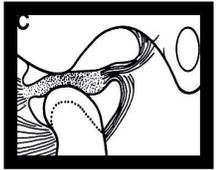
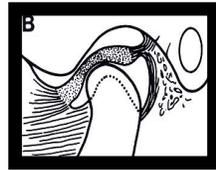
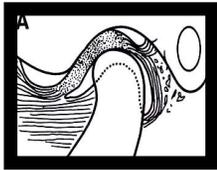
Jaw Joint

- Mouth Opening
 - Rotation (first 20 mm of opening) occurs in the lower compartment
 - Translation occurs in the upper compartment

Figure 7: Rotation and translation of the TMJ. The arrow indicates the direction of condylar translation during opening. The initial stage of mouth opening (position 1) involves rotation and the second stage (position 2) demonstrates translation of the condyle.

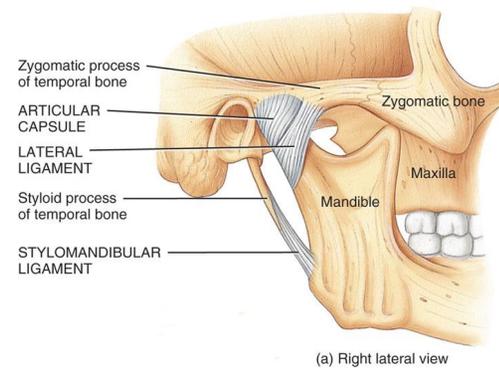
ROTATION AND TRANSLATION





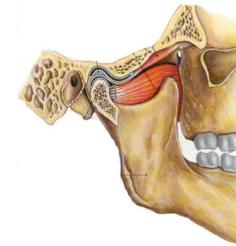
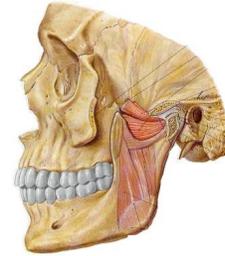
Jaw Joint

- TMJ capsule is a thick fibrous membrane- attaches at eminence, disc, and neck of condyle



Jaw Joint

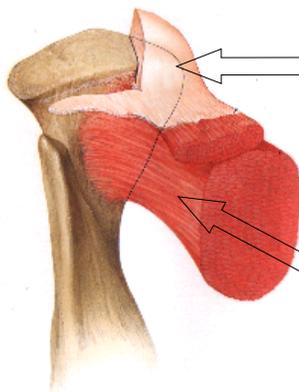
- Articular disc is an extension of fibrous capsule
 - No innervation or blood supply
 - Biconcave shape (like a bowtie)
 - Anterior portion connects to superior head of lateral pterygoid
 - Posterior portion turns into retrodiscal tissue which is highly innervated and vascular
 - Disc held to head of condyle (like a helmet) via medial and lateral collateral ligaments



Fibers of the superior head of the lateral pterygoid muscle attach to the disc.

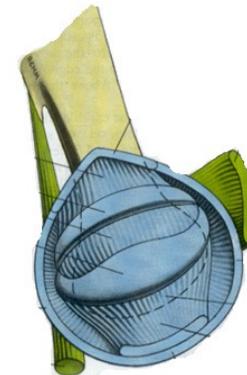
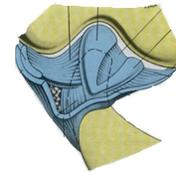
LATERAL PTERYGOID

Attachments:



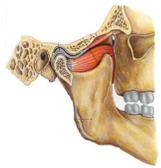
Superior Head:
 "Becomes" the disc.
 Tenses during closure, stabilizing disk

Inferior Head:
 Attaches to neck of condyle.
 Pulls antero-medially, translating condyle for advancement and opening



-the disc is attached to the head of the condyle medially and laterally, but not to the capsule medially and laterally

-the disc is attached to the articular capsule anteriorly and posteriorly

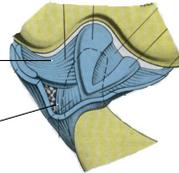


“RETRODISCAL PAD”

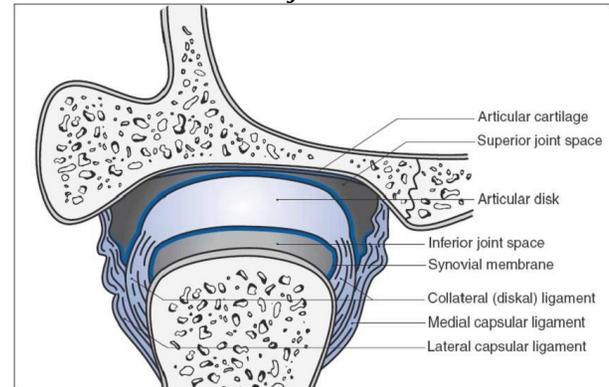


Posterior temporal attachment or “superior lamina”

Posterior mandibular attachment or “inferior lamina”



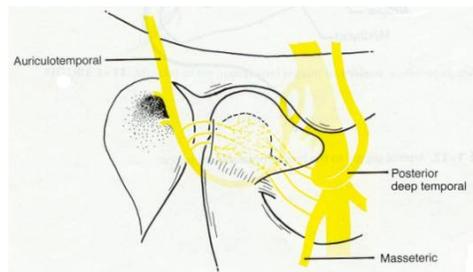
FRONTAL VIEW OF TM JOINT



TMJ Innervation:

Mandibular division of the Trigeminal nerve (V)

- auriculotemporal (75%)
- deep temporal
- masseteric



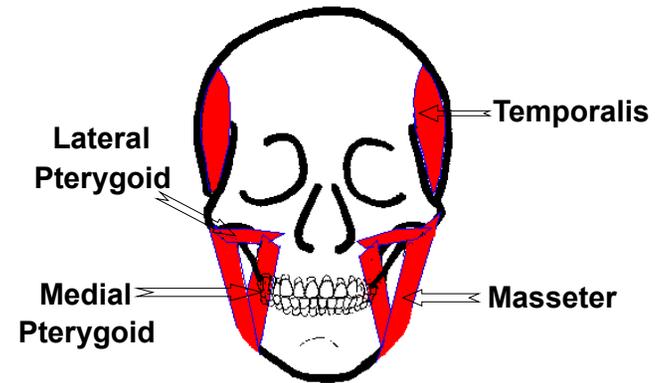
Muscles of Mastication

- Masseter
- Temporalis
- Lateral Pterygoid
- Medial Pterygoid

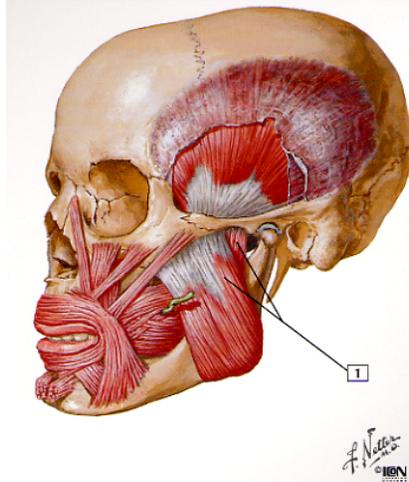
Muscles of Mastication

- Muscles used to chew, open and close mouth
- Other muscles aid in chewing and opening/closing mouth
- All muscles of mastication innervated by Trigeminal nerve
- All of these muscles originate from the skull and insert on the mandible (allows for jaw movement when muscles contract)

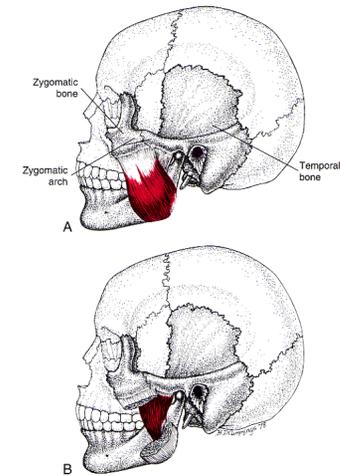
Muscles of Mastication

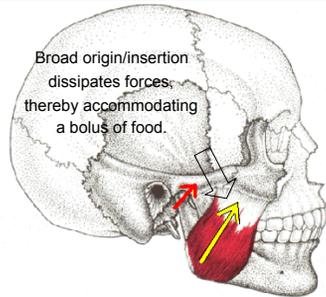


MASSETER



MASSETER

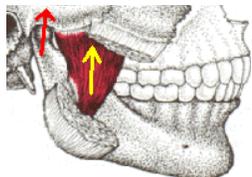




Masseter

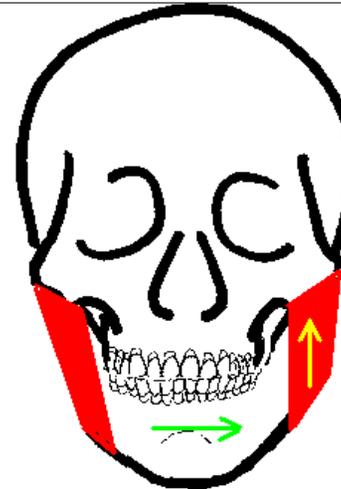
Elevates mandible
*in the direction
of its fibers*

Seats condyle
Anteriorly-Superiorly



←-- Deep segment

One neuron innervates
600 fibrils
Strongest masticatory
muscle of the Herbivores



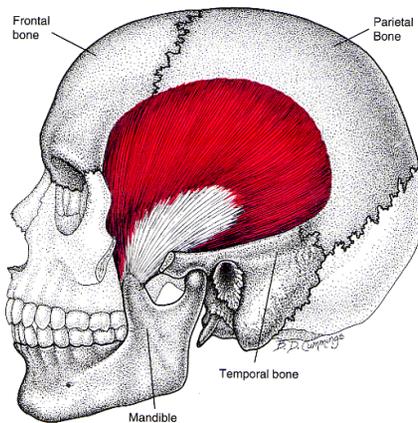
Masseter

Orientation provides
for mastication in
“working” movement

“Working” movement
aligns Masseter for
most efficiency

**Masseters
are for mastication
(when food is
between the teeth)**

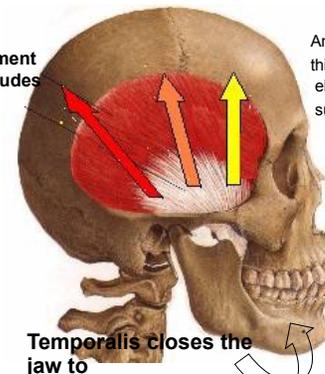
TEMPORALIS



Temporalis

Posterior Segment
is thinnest: retrudes
mandible.

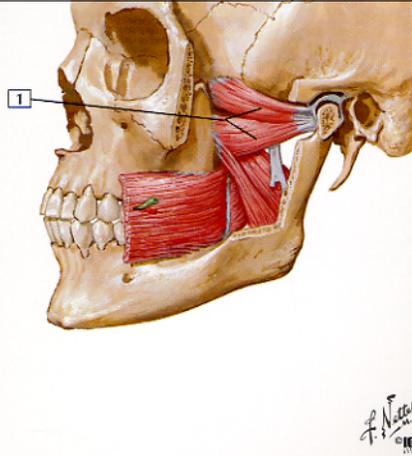
One neuron
recruits
900 fibrils;
50% more
efficient than
masseter



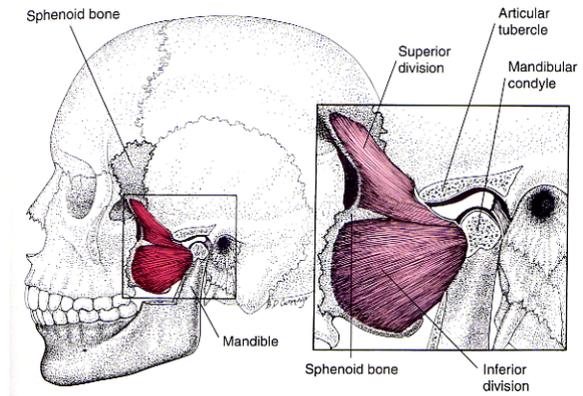
Anterior segment is
thickest & strongest
elevates mandible
superiorly

**Temporalis closes the
jaw to
approximate the teeth**

LATERAL PTERYGOID

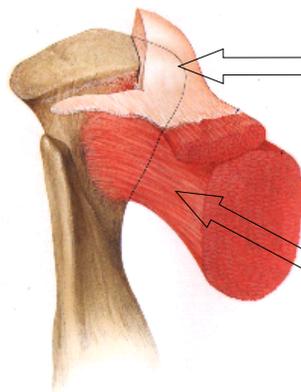


LATERAL PTERYGOID



LATERAL PTERYGOID

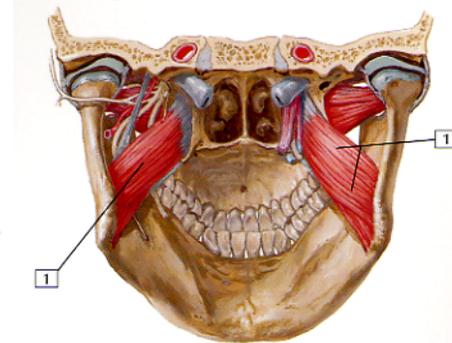
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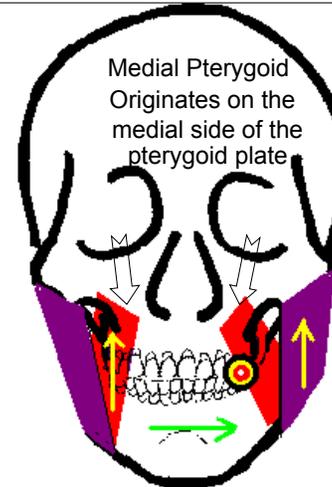
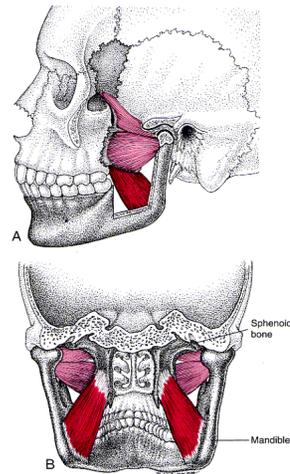
Superior Head:
"Becomes" the disc.
 Tenses during closure, stabilizing disk

Inferior Head:
Attaches to neck of condyle.
 Pulls antero-medially, translating condyle for advancement and opening

MEDIAL PTERYGOID



MEDIAL PTERYGOID



The opposite side
The medial pterygoid
practically
around function...
form a sling
around
the masseter
to provide the
working movement.
Masseters movement
is very slight)

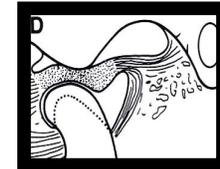
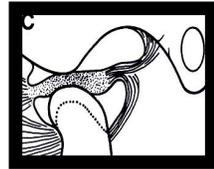
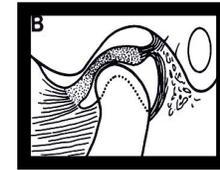
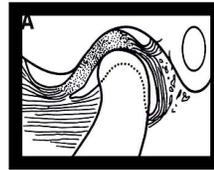
Internal Derangements

What is that
CLICKING?

Internal Derangements

- A (Very) Simplistic Overview
- Reducing Disc Displacement
- Non-Reducing Disc Displacement

The Normal TM Joint



Discal Dislocation with Reduction



A brief discussion of...

Centric Relation

JPT 5th Edition 1987

“...the condyles articulate with the thinnest avascular portion of their respective disks with the complex in the anterosuperior position against the slopes of the articular eminences.”

centric relation \se'n'tri'k ri'-lā'shun\ **1:** the maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective disks with the complex in the anterior-superior position against the slopes of the articular eminences. This position is independent of tooth contact. This position is clinically discernible when the mandible is directed superior and anteriorly. It is restricted to a purely rotary movement about the transverse horizontal axis (GPT-5) **2:** the most retruded physiologic relation of the mandible to the maxillae to and from which the individual can make lateral movements. It is a condition that can exist at various degrees of jaw separation. It occurs around the terminal hinge axis (GPT-3) **3:** the most retruded relation of the mandible to the maxillae when the condyles are in the most posterior unstrained position in the glenoid fossae from which lateral movement can be made at any given degree of jaw separation (GPT-1) **4:** The most posterior relation of the lower to the upper jaw from which lateral movements can be made at a given vertical dimension (Boucher) **5:** a maxilla to mandible relationship in which the condyles and disks are thought to be in the midmost, uppermost position. The position has been difficult to define anatomically but is determined clinically by assessing when the jaw can hinge on a fixed terminal axis (up to 25 mm). It is a clinically determined relationship of the mandible to the maxilla when the condyle disk assemblies are positioned in their most superior position in the mandibular fossae and against the distal slope of the articular eminence (Ash) **6:** the relation of the mandible to the maxillae when the condyles are in the uppermost and rearmost position in the glenoid fossae. This position may not be able to be recorded in the presence of dysfunction of the masticatory system **7:** a clinically determined position of the mandible placing both condyles into their anterior uppermost position. This can be determined in patients without pain or derangement in the TMJ (Ramsford)

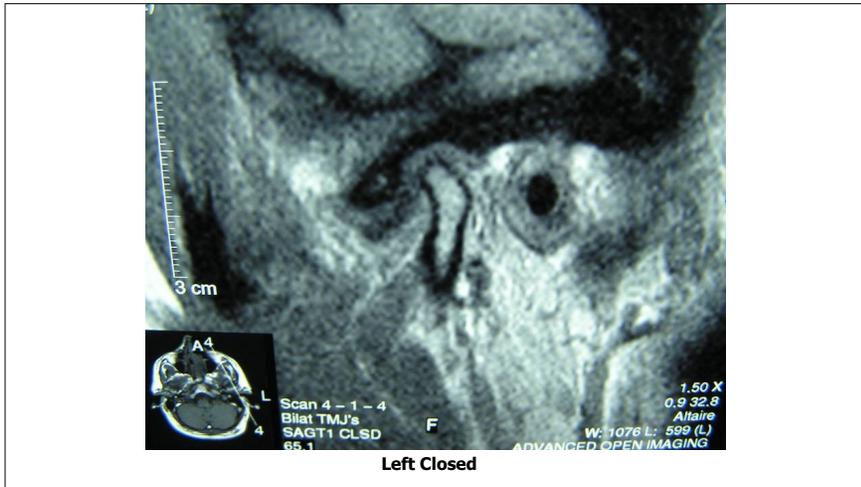
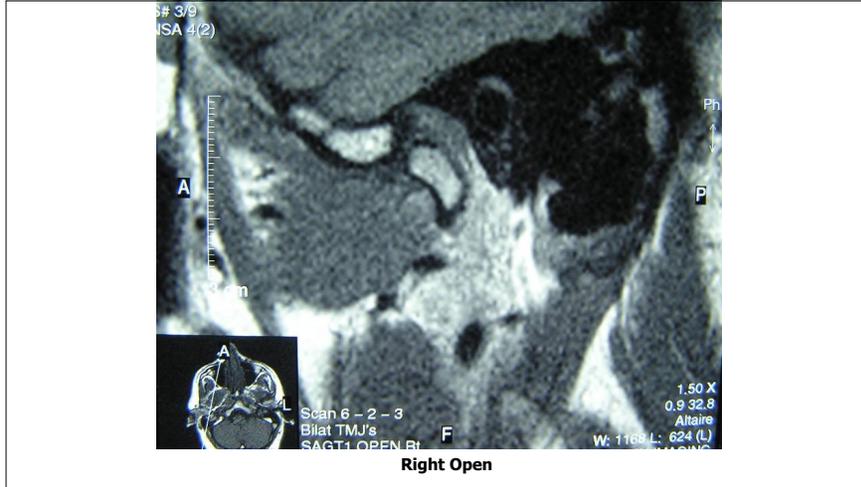
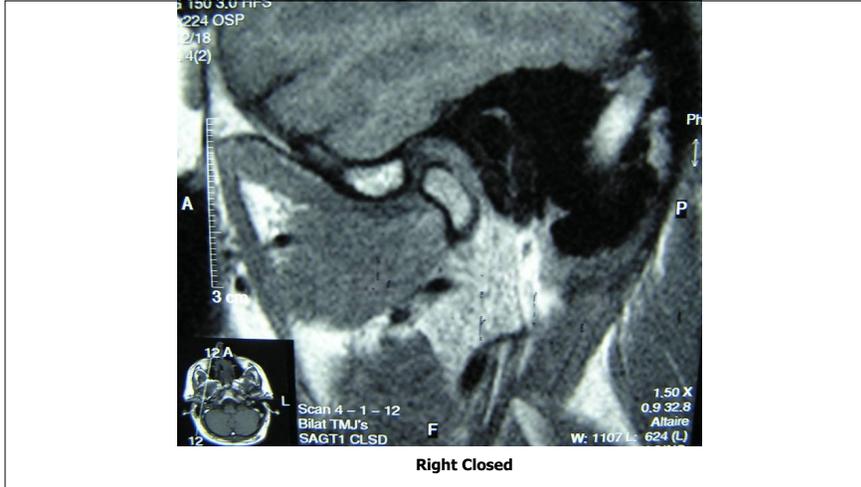
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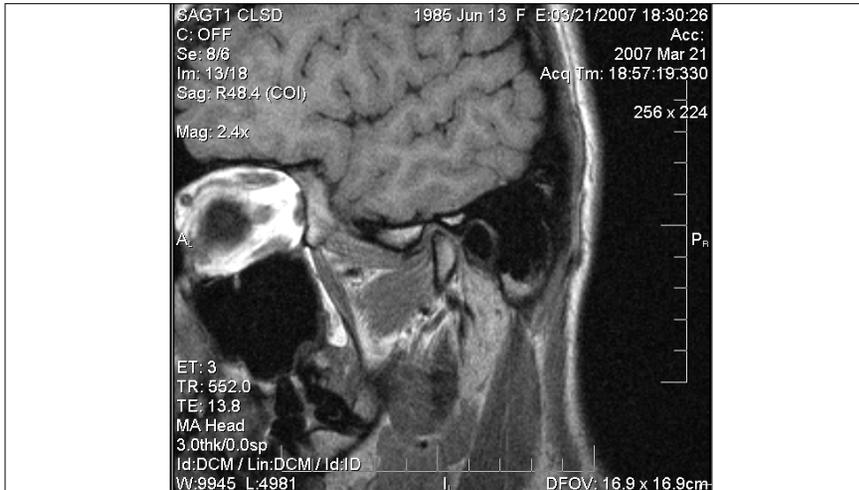
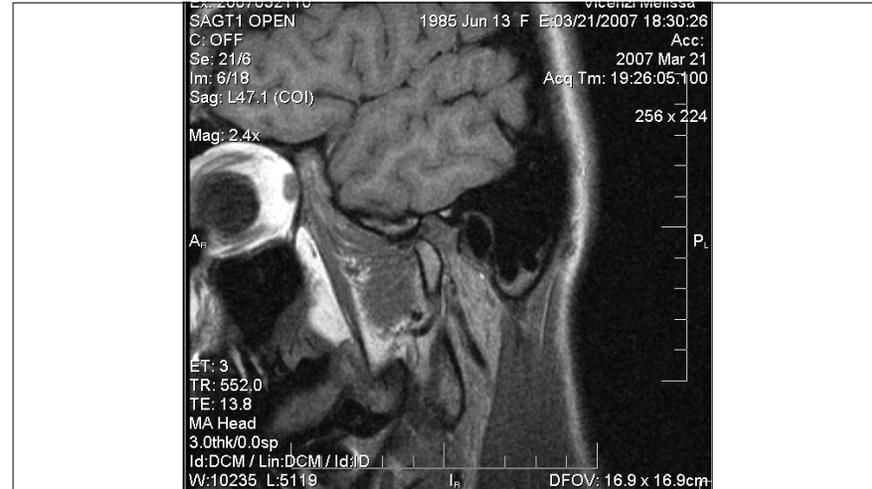
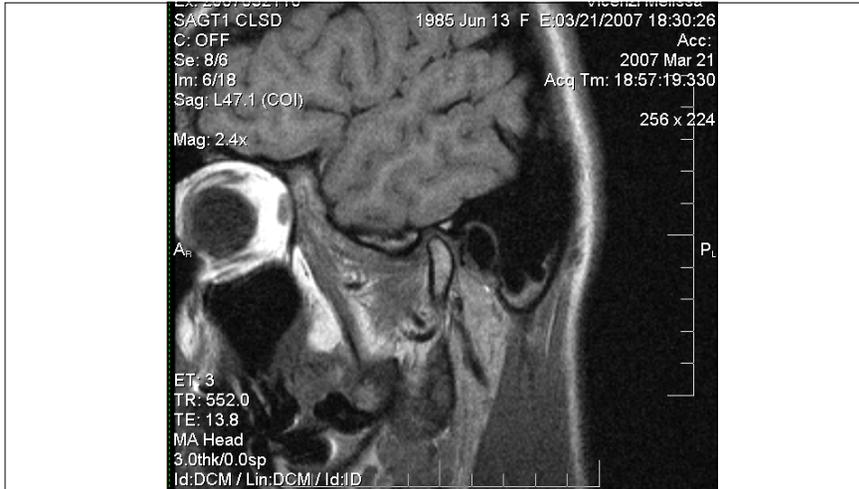
Discal Dislocation without Reduction



Diagnostic Imaging

- MRI
 - Needed to absolutely confirm DDw/oR.
 - Critical to have the MRI taken correctly.
 - Contraindications include pace maker, metal fragments in the eye, ferro-magnetic aneurism clips, significant metal in the area of interest, etc.
 - Write the prescription for closed and wide open views (see Dr. Clifton Simmons MRI protocol for full details).
 - Provide a bite block for the open view.
 - Read the film yourself and discuss with the radiologist if you disagree with the interpretation.







Why do you need to know about disc displacements?

Anatomy of the upper airway

Airway

- ❑ What is the #1 causative factor of OSA?
- ❑ Weight?
- ❑ Age?
- ❑ AIRWAY SIZE!

Upper Airway

- ❑ Anatomy
- ❑ Nose
- ❑ Oral Cavity
- ❑ Pharynx (throat)

Upper Airway

- ❑ Function of the Upper Airway
- ❑ Conduct Air
- ❑ To prevent foreign materials from entering the lower airway
- ❑ Smell/Speech

Nose

- ❑ Function
- ❑ Heat, humidify and filter the incoming air
- ❑ Smell
- ❑ Speech

Anatomy of the Nose

- ❑ Most common obstruction in the nose are due to shape and size of the nasal septum and turbinates, and to a lesser degree the adenoids



nasal breathing vs. mouth breathing during development

Nose

- ❑ Does a blockage of the nose directly cause OSA?
- ❑ What about:
 - ❑ Sprays?
 - ❑ Surgeries?
 - ❑ Nasal strips?

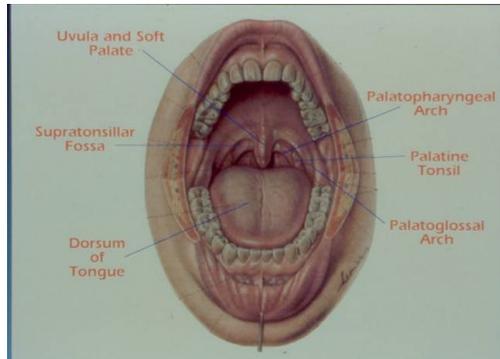
Nose and Snoring



Anatomy of the Oral Cavity

- ❑ Roof of the mouth is formed by the hard and soft palate
- ❑ Uvula is the fleshy structure that hangs off the soft palate (a.k.a. the part that dangles)
- ❑ Palatine tonsils are located bilaterally

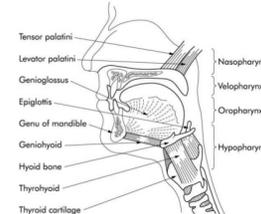
Anatomy of the Oral Cavity



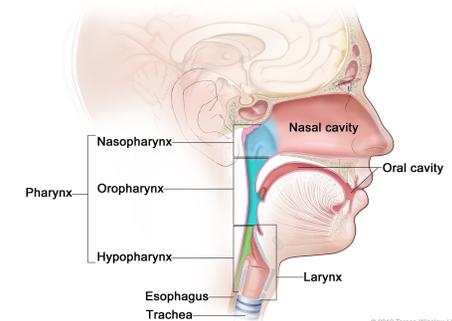
Pharynx - Throat

- ❑ Nasopharynx
- ❑ Oropharynx
- ❑ Laryngopharynx

Anatomical representation of the upper airway and the important muscles controlling airway patency.

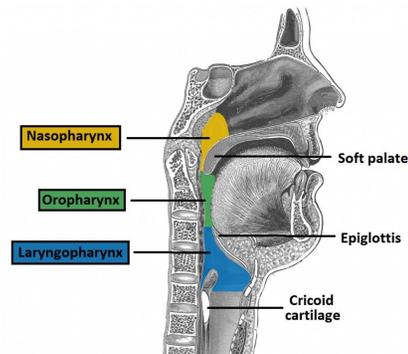


Anatomy of the Pharynx



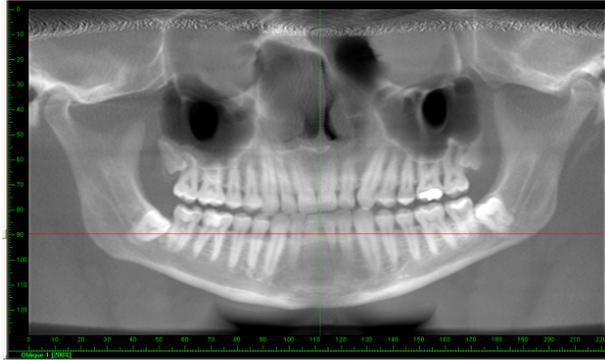
Velopharynx

- ❑ Directly posterior to soft palate area of pharynx
- ❑ Overlap of oropharynx and nasopharynx
- ❑ Most highly collapsible area of airway

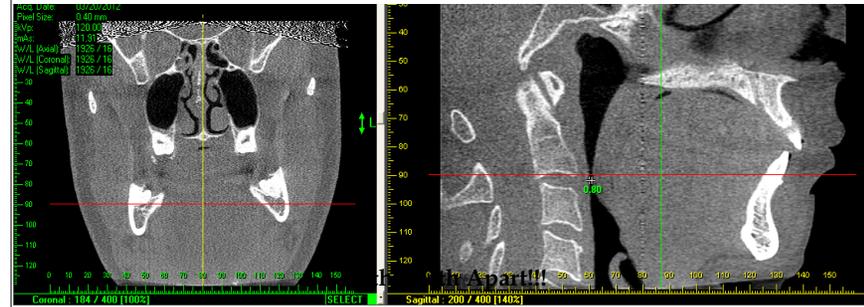


What areas of pharynx are most susceptible to collapse?

- ❑ Retroglossal
- ❑ Retropalatal (most frequent) although less than 20% of the time the only area of collapse
- ❑ Surgery?

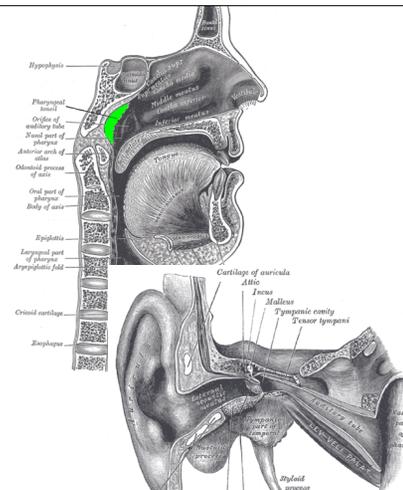


0.8 mm Airway!!!



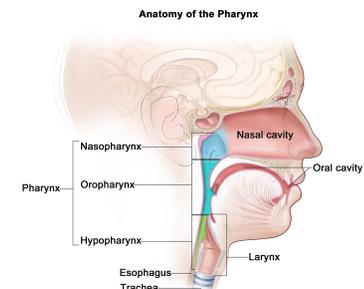
Nasopharynx

- ❑ Located posterior to nasal cavity
- ❑ Includes adenoids
- ❑ Eustachian Tubes
 - ❑ Connects the middle ear and nasopharynx
 - ❑ Middle ear infection (inflammation of middle ear- usually occurs in younger kids due to a shorter or more horizontal tube allowing for bacterial growth to occur in middle ear, or due to swollen adenoids blocking eustachian tube opening)



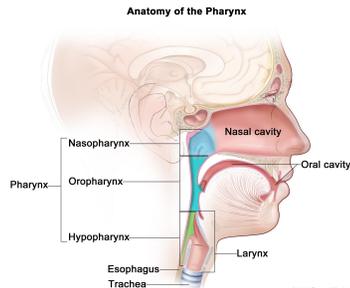
Oropharynx

- ❑ Lies behind the oral cavity
- ❑ Contains palatine and lingual tonsils, soft palate, base of tongue, and pharyngeal walls
- ❑ Superior surface of epiglottis is inferior boundary (epiglottis is usually considered part of the larynx)



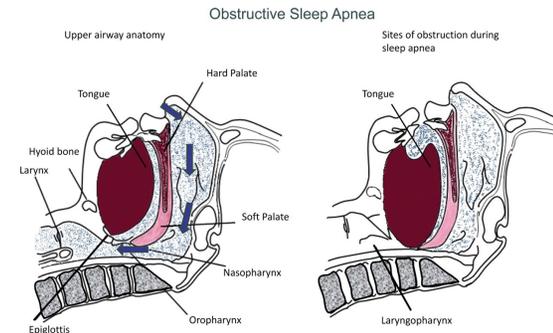
Laryngopharynx (also called hypopharynx)

- Lies between the base of the tongue and the entrance to the esophagus
- Lies posterior to the epiglottis



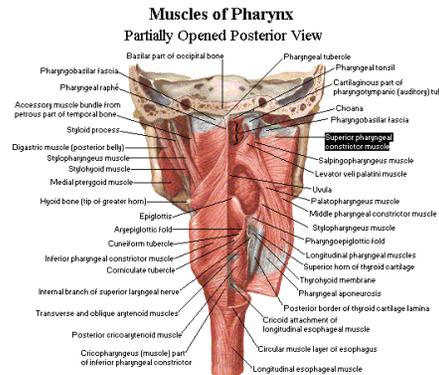
Hyoid Bone

- Important in breathing, swallowing and speech
- Thought to play a key role in keeping airway open during sleep
- More inferiorly placed hyoid bone is associated with higher severity of OSA



Why don't we have OSA during the day?

- Pharyngeal muscle tone!
- NREM sleep intercostal muscle responsible for 60% of tidal value
- REM=atonia. Only diaphragm working for tidal volume



Where can I learn more?

- Contact me via email...cameron@sleepidaho.com

Thank You!

Questions?

Cameron@sleepidaho.com