ORAL STRUCTURES

- Lips
- Commissure of the lips
- Labial mucosa
- Buccal cavity
- Buccal mucosa
- Cheeks
- Glands
- Muscles of the face
- Teeth
- Gingiva
- Retromolar trigone
- Tongue
- Lower jaw (mandible)
- Upper jaw (maxillae)
- Hard palate
- Soft palate
ORAL FUNCTION

• Biological function vs. non-biological
  – Communicates between the digestive and respiratory tracts

• Begin the process of digestion.
• The oral cavity receives food, chews and mixes it with saliva and then begins the swallowing process.
• The taste buds on the tongue provide the different sensations of taste.
• Break down starts with Ptyalin
  – Powerful enzyme in saliva
  – Aids in breakdown of food
  – Converts starch to maltose or disaccharide (double sugar)
LIPS

- Lips
- Commissure of the lips
- Labial mucosa
- Labial glands (inner surface of lip around orifice of mouth… similar to salivary glands)
- Lip reflexes (McClean, 1991)

Function:
- Upper lip
  - More stable (Amerman, 1993)

- Lower lip
  - Depends on mandibular movement
  - More mobile than upper lip
  - Faster
  - Most of the muscles of facial expression insert into the lips
  - Less variable in generating static force than is upper lip (Barlow and Netsell, 1986)
CHEEKS

Consists of….

- Buccal cavity
- Buccal mucosa
- Skin externally
- Mucosa internally
- Between skin and mucosa = facial muscles, muscles of mastication, glandular tissue, fat pad
GLANDS

Introduction

- Salivary Gland is any cell or organ discharging a secretion into the oral cavity.
- Major and minor Salivary Glands
  - Major (Paired)
    - Parotid
    - Submandibular
    - Sublingual
  - Minor
    - Those in the Tongue, Palatine Tonsil, Palate, Lips and Cheeks
MAJOR GLANDS

Parotid

- paired
- In front and beneath the ear
- Stenson's duct drains saliva from gland into mouth
- Opens to the buccal cavity (opposite second molar)
- Produces “serous” saliva (watery and thin)
- Has protein Amylase (helps with starch digestion)
- Contributes to 10% of saliva in mouth when not eating; 25% during meals

MAJOR GLANDS

Submandibular glands

- Paired
- Deep to jaw (toward back of mouth)
- J or U shaped

- Produces 70% of the saliva in our mouth
- serous and mucous
- lubrication of food during mastication to enable effective swallowing and aid digestion
- Warton’s duct = enters the floor of the mouth under the front of the tongue

https://www.parotidsurgerymd.com/education/articles/parotid-salivary-gland-info/#sthash.rw244uwP.dpuf
**MAJOR GLANDS**

**Sublingual**

- Reside beneath the tongue,
- Supply saliva to the floor of the mouth
- There are many (between 600 to 1,000) tiny glands called minor salivary glands
  - 1-2 mm in diameter and coat all the mucosal surfaces or lining of our mouth and throat
- 3-5% of all salivary volume
- Mostly mucous producing but considered mixed

https://www.parotidsurgerymd.com/education/articles/parotid-salivary-gland-info/#sthash.rw244uwP.dpuf
SALIVA CONTROL

• Control of Salivation

• The minor salivary glands secrete saliva continuously (keeps oral cavity moist)

• With food: major glands activate and large amounts of saliva pour out

• Produces 1500ml of saliva per day

• Controlled by the parasympathetic division of the autonomic nervous system

• With ingestion: chemoreceptors and mechanoreceptors in the mouth send signals to the salivatory nuclei in the brain stem to the pons and medulla.
SALIVA CONTROL

• Results of ingestion: parasympathetic nervous system activity increases.
  – Impulses sent by motor fibers in the facial (VII) and glossopharyngeal (IX) nerves dramatically increase the output of watery saliva.

• The chemoreceptors activated
  – Mostly by acidic foods and liquids (vinegar, pickles).
  – Mechanoreceptors are activated by almost any type of mechanical stimulus in the mouth (chewing).
SALIVA CONTROL

• sight and smell of food increases saliva flow
• certain foods can make the mouth water!
• Irritation of the lower gastrointestinal tract can also increase salivation (spicy food, toxins).
• In contrast to parasympathetic controls, the sympathetic division causes the release of a thick, mucin-rich saliva.
• Heavy activation of the sympathetic division constricts blood vessels serving the salivary glands and inhibits the release of saliva, causing dry mouth.
• Dehydration also inhibits salivation.
MUSCLES OF FACIAL EXPRESSION

- Most superficial muscles of the face
- Unlike other skeletal muscles as they are NOT covered by fascia (dense connective tissue)
- Facial and lip muscles are intrinsically related…they exhibit functional unity
**ORBICULARIS ORIS**

- Principle muscle acting on the lips
- Oval ring of muscle fibers
- Located within the lips
- Encircling the mouth slit
- Function = Closes the mouth; Puckers the lips

- Complex muscle…
  - Composed of intrinsic and extrinsic muscle fibers
  - Some muscles are exclusive to the lips (intrinsic)
  - Other fibers from the face insert into the lips (extrinsic)
  - Most of the facial muscles insert into it!
FACIAL MUSCLES

Divided into three sets

• Transverse muscles

• Angular muscles

• Labial and vertical muscles
FACIAL MUSCLES: TRANSVERSE

- Insert into the Orbicularis Oris
- Buccinator
- Risorius

- Function: pull lips against teeth
- Facilitate compression of the lips for consonant production (bilabials and stops)
TRANSVERSE: BUCCHARATOR MUSCLE

- Principle muscle of the cheek
- Deepest of the facial and extrinsic musculature of the lips
- Complex origin

- Function: compresses lips and cheeks against teeth
- Draw corners of mouth laterally
TRANSVERSE: RISORIUS MUSCLE

- Highly variable muscle
- Originates from the fascia covering the Masseter muscle
- Course is horizontal
- Draws the mouth angle lateral-ward
FACIAL MUSCLES: ANGULAR

- Approach the corners of the mouth obliquely from above and below
- Function: producing expressions such as smiling and frowning
FACIAL MUSCLES: ANGULAR

- Levator labii superior
- Levator superior nasi
- Zygomatic minor and major
- Depressor labii inferior
FACIAL: ANGULAR: LEVATOR LABII SUPERIOR

- Proper elevator of the upper lip
FACIAL: ANGULAR: LEVATOR LABII SUPERIOR ALAEQUE NASI MUSCLE

- Elevator of upper lip
- Dilator of nostrils
**FACIAL: ANGULAR: ZYGOMATIC MINOR MUSCLE**

Small muscle of the zygomatic arch

Contracts during a smile
FACIAL: ANGULAR: ZYGOMATIC MAJOR MUSCLE

- Long, slender

- Function: draws the angle of the mouth upward and lateral-ward

- Grinning or smiling broadly
FACIAL: ANGULAR: DEPRESSOR LABII INFERIOR MUSCLE

- Small, flat, quadrangular muscle, lateral to midline
- Function: depressor of the lower lip, draws lower lip lateral-ward
FACIAL MUSCLES: LABIAL OR VERTICAL MUSCLES

- Enter corner of mouth directly from above and below
- Insert into the lips

- Functions: produce facial expressions
- Compressing the corners of the mouth
FACIAL MUSCLES: LABIAL OR VERTICAL

Mentalis Muscle

Depressor Anguli Oris Muscle

 Levator Anguli Oris Muscle
FACIAL: VERTICAL: MENTALIS

- Cone-shaped
- Function: raises the lower lip and mentolabial sulcus
- Wrinkles chin
- Raises base of lower lip
- Helps with protruding
- “pouting muscle”
FACIAL: VERTICAL:
DEPRESSOR ANGULI ORIS MUSCLE

- Function: either depress the angle of the lip or assist in compressing the lips by drawing the upper lip downward against the lower lip
FACIAL: VERTICAL: LEVATOR ANGULI ORIS MUSCLE

- Flat
- Triangular
- Above the angle of the mouth
- Deep to levator labii superior

- Function: draw corner of the mouth upward
- Assists in closing mouth
- Drawing lower lip upward
FACIAL MUSCLES: PARALLEL MUSCLES

- Not lip muscles
- Superficial muscles of the mouth region

- Incisivus Labii Superior Muscle
  - Function: draws corner of the mouth medially and upward...helps pucker and round lips

- Incisivus Labii Inferior Muscle
  - draws corner of mouth medially and downward
SUPERFICIAL CERVICAL MUSCLE

Platysma

Facial muscle

Thin

Flat

Broad muscle

Covers the lateral and anterior regions of the neck

Function: not understood; supporting muscle
### Supplementary Muscles of Expression

1. Galea aponeurotica
2. Frontalis
3. Orbicularis Oculi
4. Corrugator
SUPPLEMENTARY MUSCLES OF EXPRESSION

- Corrugator
  - Deep to the frontalis and orbicularis oculi
  - Wrinkle the forehead
  - Draw eyebrows downward and medial ward
  - “Frowning muscle”
  - Principle muscle of suffering
MUSCLES OF MASTICATION

- Depressors
- Elevators
MUSCLES OF MASTICATION: DEPRESSORS

1. Digastricus
2. Mylohyoid
3. Geniohyoid
4. Lateral pterygoid
M OF M: DEPRESSOR: DIGASTRICUS MUSCLE

- Anterior and posterior belly
- United by central tendon
- Function: raise hyoid bone
- Hyoid fixed: depress jaw
**M of M: Depressor: Mylohyoid Muscle**

- **Forms floor of the mouth**

- **Function:** minimal; affects balance of the skull on the occipital condyles
M OF M: DEPRESSOR: GENIOHYOID MUSCLE

Superior to the medial border of the mylohyoid muscle

Function: assist in elevating the larynx
Depressing the mandible

Any resistance to depression of the jaw will result in the elevation of the hyoid
M OF M: DEPRESSOR: LATERAL PTERYGOID MUSCLE

- Function: complex...protrudes mandible
- Moves the jaw in a grinding fashion
MUSCLES OF MASTICATION: ELEVATORS

1. Masseter Muscle
2. Temporalis Muscle
3. Medial Pterygoid Muscle
M OF M: ELEVATOR: MASSETER MUSCLE

- Most powerful muscle of mastication
- Thick
- Flat
- Quadrilateral muscle
- Covers the lateral surface of the mandibular ramus

External fibers:

Internal fibers:
**M OF M: ELEVATOR: MASSETER MUSCLE**

- Function: closes jaw
- Pressure on molars
- Elevating the mandible
- Retraction of mandible
- Adapted for power
- Muscle contracts slowly
M OF M: ELEVATOR: TEMPORALIS MUSCLE

- Broad
- Thin
- Fan-shaped muscle

- Function: elevation of the jaw
- Snapping muscle
- Built for speed
M OF M: ELEVATOR: MEDIAL PTERYGOID

- “internal masseter”
- Counterpart to the masseter
- Masseter and medial Pterygoid make up the mandibular sling...angle of the masseter “rests” straps ramus to skull
Dentition

• Biological function: precursor to the digestive tract

• Non-biological function:
  – Appearance of the face
  – Determines facial structure
  – Normal speech production
Dental Morphology

- Four types of teeth:
  - Incisors
  - Canines
  - Pre-molars
  - Molars
• The anterior-posterior relationship of the mesiobuccal cusp of the upper molar to the buccal groove of the lower molar is used to classify occlusion.
CLASS I OCCLUSION

• Normal

• Mesiobuccal cusp of the upper molar occludes in the buccal groove of the lower molar; the remaining teeth are arranged upon a smoothly curving line
CLASS I OCCLUSION
CLASS I MALOCCLUSION

- Normal relationship of the MOLARS but...line of occlusion is incorrect because of malposed teeth, rotations, or other causes
CLASS II MALOCCLUSION

- Lower molar distally positioned relative to upper molar; line of occlusion is not specified
- Mandibular retrusion and/or protrusion
CLASS III MALOCCLUSION

- Lower molar mesially positioned relative to upper molar; line of occlusion not specified
- Mandibular protrusion and/or maxillary retraction
INCISOR RELATIONSHIP

• Overjet: is the horizontal relationship of the upper to the lower incisors
  • Normal = 2mm
  • Unable to close lips
INCISOR RELATIONSHIP

• Under jet: refers to a reversal of normal incisor position
• Upper incisors are lingual to the lower incisors
• Anterior cross bite
INCISOR RELATIONSHIP

- Overbite: refers to the vertical overlap of the upper and lower incisors
- Reported as a percentage of coverage of the lower incisors by the upper incisors
WHY DO WE CARE?

• Sounds most commonly affected by malocclusion:
  
  – /s, z, sh, zh, ch, j/

  – /f, v/; /t, d, n, l/, /b, p, m/

• Dental anomalies have the greatest effect if they are present before or during speech development

• Mastication issues

• Malnutrition
THE TONGUE

Primary articulator
Most important
Most active
Modifies shape and size of oral cavity
Changes resonance characteristics
Functions as a valve
Noise generator

Biological Function:
- Taste
- Mastication (chewing)
- Deglutition (swallowing)
THE HYDROSTAT

• Used to manipulate items (food, sucker, pen…) consists mainly of muscles

• composed mainly of muscle tissue. Since muscle tissue itself is mainly made of water and is also effectively incompressible

• The muscle fibers in a muscular hydrostat are oriented in three different directions: parallel to the long axis, perpendicular to the long axis, and wrapped obliquely around the long axis
THE TONGUE: SUPERFICIAL ANATOMY

• Mucous Membrane = outer covering of the tongue

• Corium or dermis = dense felt like network of fibrous connective tissue
  – Forms the “skeleton” of the tongue

  – Just below epidermis
DESCRIPTION OF THE TONGUE

• 2 anatomical divisions

  – Body = portion of the tongue beneath the hard palate

  – Root or Base = behind the hard palate
DIVISIONS OF TONGUE

In relation to the roof of the mouth

**Tip** = nearest to the front teeth

**Blade** = just below the upper alveolar ridge

**Front** = beneath the hard palate

**Back** = beneath the soft palate
TONGUE SURFACE ANATOMY

• Divided into a longitudinal medial sulcus from front to back

• Foramen cecum = pit at the posterior end of the longitudinal sulcus
TONGUE SURFACE ANATOMY

- Sulcus Terminalis = “V” shaped groove courses anteriorly and laterally to the margins of the tongue
- Divides tongue into oral and pharyngeal portion
TONGUE SURFACE ANATOMY

• Lingual Tonsils = made up by lymph glands

• Make up pharyngeal surface

• Posterior 1/3

• Palatine surface = portion under the soft palate; characterized by projections called papillae

• Papillae = thickly distributed over entire 2/3 of dorsum…surface characteristic = roughness
DEEP STRUCTURES OF THE TONGUE

8 (or 9) muscles of the tongue

Intrinsic
Extrinsic

Median septum = divides tongue into longitudinal halves therefore the muscles of the tongue are considered paired

Individually supplied by motor and sensory nerves and blood vessels

https://youtu.be/s40qNQ-I7hc
THE TONGUE: INTRINSIC MUSCLES

- Superior longitudinal
- Inferior longitudinal
- Transverse
- Vertical
TONGUE: INTRINSIC: SUPERIOR LONGITUDINAL MUSCLE

- Turn the tip upward

- Oblique fibers assist in turning the lateral margins upward

- Giving dorsum concave or trough-like appearance
TONGUE: INTRINSIC: INFERIOR LONGITUDINAL MUSCLE

- Contraction = shortens the tongue or pulls tip downward
**TONGUE: INTRINSIC: TRANSVERSE MUSCLE**

Fibers = radiate somewhat on the lateral aspect of tongue…fanlike distribution

Contraction = tongue to narrow and to become elongated
TONGUE: INTRINSIC: VERTICAL MUSCLE

- Confined to lateral portion of the tongue
- Highly developed anteriorly
- Contraction = flattens the tongue
THE EXTRINSIC TONGUE MUSCLES (4)

- Genioglossus
- Styloglossus
- Palatoglossus
- Hyoglossus
TONGUE: EXTRINSIC: GENIOGLOSSUS

- Forms bulk of tongue tissue
- Strongest
- Largest
- Of the extrinsic muscles
- Flat, triangular
- Posterior fibers = draw whole tongue anteriorly to protrude the tip from the mouth
- Press the tip against the teeth and alveolar ridges

- Contraction of anterior fibers = retraction of tongue
- Contraction of entire muscle = draws tongue downward (makes a trough)
TONGUE: EXTRINSIC: STYLOGLOSSUS

- Smallest of the muscles that arise from the styloid process
- Contraction = draws tongue upward
- Backward

- True antagonist of the Genioglossus muscle
- Draw sides upward
- Assists intrinsic muscles in making dorsum concave or trough-like
TONGUE: EXTRINSIC: PALATOGLOSSUSUS MUSCLE

- Muscle of the tongue OR of the palate
- AKA glossopalatine muscle
- Contraction = lower soft palate or raise back of the tongue to groove dorsum
- Forms Palatoglossal arch (anterior faucial pillar)
TONGUE: EXTRINSIC: HYOGLOSSUS MUSCLE

- Contraction = retract and depress the tongue
- Elevate the hyoid bone
TONGUE: MOTOR CONTROL

• Posterior Genioglossus = contracts to move tongue anteriorly (produce high vowels)

• Ballistic movement = sudden contractions of single muscles that cease abruptly before the movement ceases

• Movement of the tongue = complex pattern of finely graded changes in activity…one or two muscles produce most of the movement
• Others cooperate…stabilize adjacent structures…oppose movement
TASTE
THE MANDIBLE

• Jaw = primary movements = elevation and depression
• Protrusion and retraction, lateral (grinding)...combined movements
• Only truly movable bone in the face
• Articulates with temporal bone at the glenoid fossa...forms TMJ

• Normal mobility depends on integrity of Temporomandibular Joint (TMJ)....Diarthrodial joint
MANDIBULAR MOVEMENTS

- Influence....
- Lip posture
- Tongue position
- Oral cavity configuration
- Changes in pharyngeal cavity dimensions
- Laryngeal height

- Translational and rotational movements or combined
MASTICATION
THE PALATE

- The palate = modifies the degree of coupling between the nasopharynx and the remainder of the VT
  - Fixed bony plate in front
  - Muscular valve behind

- Consists of three parts
  - Alveolar arch (tooth bearing process of maxillae)
  - Hard palate (bony)
  - Soft palate (muscular)
SOFT PALATE

• 4 primary muscles for movement

• During swallowing, elevates to partition the nasopharynx from oropharynx

• Tensor-veli palatini = tenses and flattens, pulls laterally and downward (CN V: mandibular: motor)

• Levator veli palatini = elevates and retracts CN X: pharyngeal: motor

• Palatoglossus = depresses, sphincter, forms anterior faucial arch

• Palatopharyngeus = forms posterior faucial arch, squeezes space in oral isthmus (oral stage)

• Muscularis uvulae = shortens and elevates

• CN V and IX sensory, taste
Intrinsic muscle of the velum (soft palate) → Contraction of muscularis uvulae = shortens and lifts the soft palate → innervated by the pharyngeal branches of the vagus nerve (CN X) after motor fibers have been relayed via the cranial accessory nerve (CN XI) → Uvula = small pendulous structure of the soft palate (not muscularis uvulae)
SOFT PALATE: FUNCTION

• Tense muscles = soft palate rises, closes off nasal cavity…sound goes through oral cavity (oral sounds)

• Relaxed muscles = soft palate drops, coupes the oral and nasal cavities…sound goes through both cavities (nasal sounds)
PHARYNX (6)

- Musculotendinous tube
- Extends from base of skull to approximately C-6
- 12 cm in length

- Most inferior = continuous with esophagus
- Permits passage of food and liquids

- Composed of circular (circumferential [3]) and longitudinal muscles [3]
- Circumferential muscles possess sphincter like action
- Aids in moving food and liquids through it
PHARYNX: (3) DIVISIONS

- Superior and middle constrictors-contract upon the bolus to squeeze it down
- Inferior constrictor-includes thyropharyngeus (superior), and cricopharyngeus (inferior)
- CP default position is tonic but relaxes during swallowing for bolus passage
- Palatopharyngeus- elevates, contracts upon the bolus, some laryngeal elevation
- Salpingopharyngeus – elevates and laterally draws walls up
- Stylopharyngeus – elevates the pharynx, some laryngeal elevation

- Motor innervation: CN IX: stylopharyngeus, CN X: all constrictors, palatopharyngeus, salingo
- Sensory: CN IX and CN X (pharyngeal plexus
HYOID BONE

- U-shaped
- Attached to thyroid cartilage below and tongue above
- In a muscular sling = can be pulled in many directions
- During swallow, moves up and forward as larynx elevates beneath to protect airway and stretch open the UES
MUSCLES OF SWALLOW

- Mylohyoid = upward hyoid movement
- Geniohyoid – upward, forward hyoid movement
- Anterior belly of the digastricus = jaw opener, hyoid upward
- Post. Belly of the digastricus = posterior, hyoid upward
- Stylohyoid = posterior, hyoid upward
- Hyoglossus = hyoid upward
- Thyrohyoid = hyoid and larynx move together
- Sternothyroid = pulls larynx down
- Sternohyoid = pulls hyoid down
- Omohyoid = pulls hyoid down
INNERVATION OF SWALLOW MUSCLES

- CN V (mylohyoid branch): mylohyoid, anterior belly of digastricus
- CN VII: posterior belly of digastricus
- CN XII: hyoglossus
- Cervical plexus C1 (courses with XII)- thyrohyoid, geniohyoid,
- Ansa cervicalis – sternohyoid, omohyoid, sternothyroid
- Sensory: ventral rami of the C spine and cutaneous branch of the cervical plexus
THE LARYNX

- Made of cartilage, membranes, and muscle
- Anterior neck; atop of trachea
- Biologically: protects airway
- Swallow: moves up and forward to protect airway
- Epiglottis: flips posteriorly and diverts bolus laterally
- Arytenoids tilt anteriorly to close airway
- True and false vocal folds adduct closing glottis during swallowing
INTRINSIC MUSCLES OF LARYNX

- **Cricothyroid**
  - **Attachments**: Anterior lateral surface of the cricoid cartilage to the inferior margin of the thyroid cartilage
  - **Innervation**: Superior laryngeal nerve, external branch
  - **Action**: Tenses vocal cord. Lengthens and tenses TVF, alters distance between thyroid and arytenoids

- **Posterior Cricoarytenoid**
  - **Attachments**: Posterior lamina of cricoid cartilage to the muscular process of arytenoid
  - **Innervation**: Inferior (recurrent) nerve
  - **Action**: Abducts vocal cord. Externally rotates arytenoids

- **Lateral Cricoarytenoid**
  - **Attachments**: Lateral surface of cricoid cartilage to the muscular process of the arytenoid cartilage
  - **Innervation**: Inferior (recurrent) nerve
  - **Action**: Adducts vocal cord. Internally rotates arytenoids

- **Thyroarytenoid (Vocalis)**
  - **Attachments**: Posterior surface of the thyroid cartilage to the muscular process of the arytenoid cartilage
  - **Innervation**: Inferior (recurrent) nerve
  - **Action**: Adducts vocal cord and relaxes the vocal cord. Tenses too

- **Arytenoid transverse**
  - **Attachments**: Arytenoid cartilage to arytenoid cartilage
  - **Innervation**: Inferior (recurrent) nerve
  - **Action**: Adducts vocal cord

- **Oblique**
  - **Attachments**: Arytenoid cartilage to arytenoid cartilage
  - **Innervation**: Arytenoid nerve
  - **Action**: Adducts arytenoids
INNERVATION OF THE LARYNX

- MOTOR: CN X (left recurrent laryngeal n.) - mucous membrane at valleculae, epiglottis, aryepiglottic folds, and most of larynx
- CN X (external branch of SLN) - cricothyroid

- SENSORY: CN X (internal branch of SLN) – mucous membrane at valleculae, epiglottis, aryepiglottic folds, and most of larynx
- CN X (recurrent laryngeal n) – mucous membrane below level of TVF
- CN X – taste at level of epiglottis
UPPER ESOPHAGEAL SPHINCTER

- Junction between pharynx and esophagus

- Made up of striated muscle contiguous with pharynx and esophagus; attaches to larynx

- During swallow, UES relaxes, stretched by upward and forward movement of larynx
UES MUSCLES AND INNERVATION

Cricopharyngeus (lower inferior constrictor) – primary muscle of UES

Cervical (superior esophageal muscle)

MOTOR: CN X: cricopharyngeus
CN X: (L RLN) – superior esophageal muscle
SENSORY: CN X: general