

5. Craniofacial Anatomy

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Part I: General Head and Neck Anatomy

SKELETON

Cranial Skeleton (10 bones)

- Frontal
- Ethmoid (2)
- Sphenoid (2)
- Occipital
- Parietal (2)
- Temporal (2)

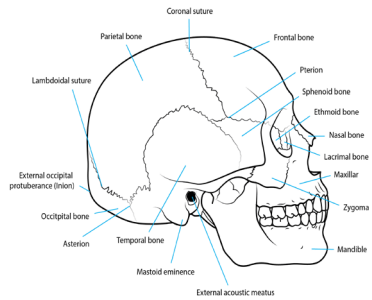


Figure 5-1. Skull Anatomy (lateral view). © 2017 A Campbell, C Restrepo

Facial Skeleton (15 bones)

- Nasal (2)
- Lacrimal (2)
- Inferior Nasal Concha (2)
- Maxilla (2)
- Zygomatic (2)
- Palatine (2)
- Mandible (2)
- Vomer

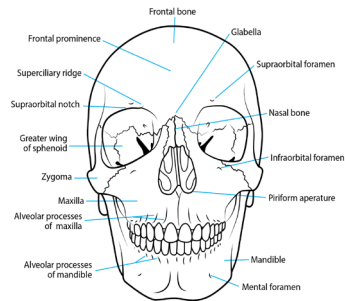


Figure 5-2. Skull Anatomy (frontal view). © 2017 A Campbell, C

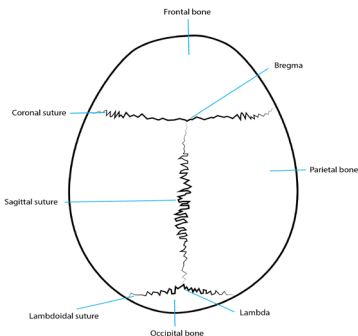


Figure 5-3. Skull Anatomy (superior view). © 2017 A Campbell, C Restrepo

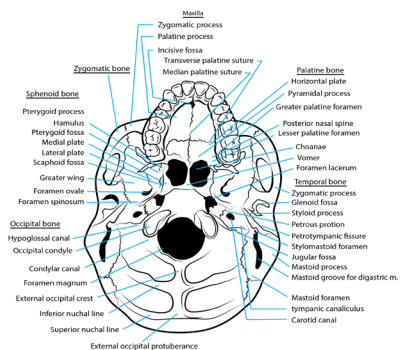


Figure 5-4. Skull Anatomy (inferior view). © 2017 A Campbell, C

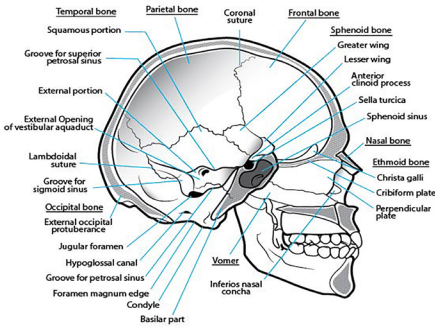


Figure 5-5. Skull Anatomy (internal view).
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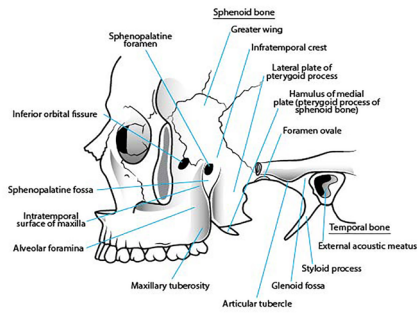


Figure 5-6. Skull Anatomy (lateral external view, zygomatic arch removed). © 2017 A Campbell, C Restrepo

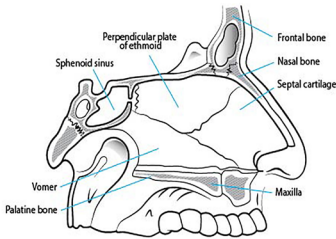


Figure 5-7. Skull Anatomy (lateral nasal wall).
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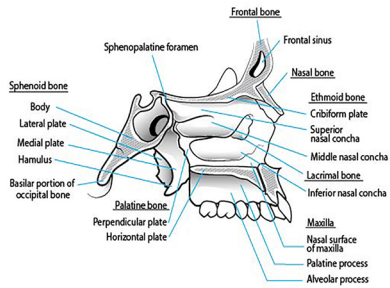


Figure 5-8. Skull Anatomy (nasal septum).
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MUSCLES & FASCIA

Scalp

Soft tissue covering the cranial vault extends from supra orbital margin to external occipital protuberance & superior nuchal line.

Five Layers of the Scalp

S: The skin on the head from which head-hair grows. It contains numerous sebaceous glands and hair follicles.

C: Connective tissue. A dense subcutaneous layer of fat and fibrous tissue that lies beneath the skin, containing the ner-

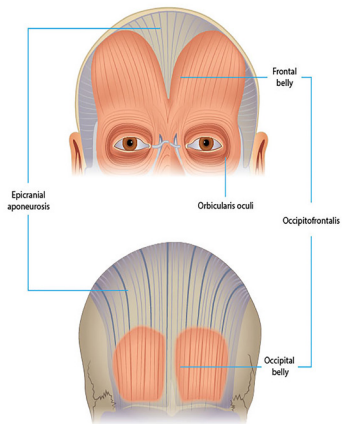


Figure 5-9. Scalp Anatomy (occipitofrontalis).
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ves and vessels of the scalp.

A: Aponeurosis - epicranial aponeurosis or galea aponeurotica) is a tough layer of dense fibrous tissue which runs from the frontalis muscle anteriorly to the occipitalis posteriorly.

L: Loose areolar layer provides an easy plane of separation between the upper three layers and the pericranium. This layer allows the more superficial layers of the scalp to shift about in relation to the pericranium.

P: Pericranium is the periosteum of the skull bones and provides nutrition to the bone and the capacity for repair. It may be lifted from the bone to allow removal of bone windows (craniotomy).

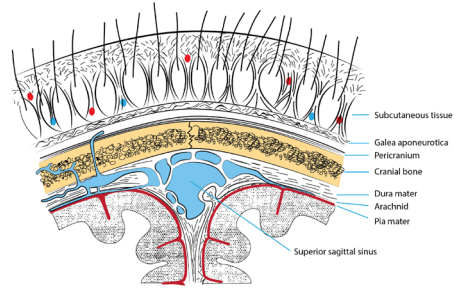


Figure 5-10. Layers of the Scalp. © 2017 A Campbell, C Restrepo

Muscles of Mastication

Mastication is accomplished through the activity of four paired muscles of mastication innervated by the mandibular branch (V3) of the trigeminal nerve.

- **Masseter** - Quadrangular muscle covering lateral aspect of ramus; coronoid process of mandible.

Origin: Inferior border & medial surface of zygomatic arch

Insertion: Lateral surface of ramus of mandible & coronoid process

Action: Elevates, protrudes mandible to close jaws

- **Temporalis** - Extensive fan-shaped muscle covering temporal region. Powerful masticatory muscle.

Origin: Floor of temporal fossa and Deep surface of temporal fascia.

Insertion: Tip & medial surface of coronoid process, Anterior border mandible ramus

Action: Elevates mandible closing jaws.

- **Medial pterygoid** - Thick, quadrilateral muscle that also has two

heads of origin; located deep to ramus of mandible.

Origin: Deep head - medial surface of lateral pterygoid plate;
pyramidal process of palatine bone.

Superficial head - tuberosity of maxilla.

Insertion: Medial surface of ramus of mandible, inferior to mandibular foramen

Action: Elevates mandible-closes jaw; Acting together protrude mandible; Acting alone protrudes side of jaw; Acting alternately produce grinding motion

- **Lateral Pterygoid** - Short, thick muscle having two heads of origin; conical muscle with its apex pointing posteriorly.

Origin: Superior head - infratemporal surface & infratemporal crest of greater wing of sphenoid bone.

Inferior head - Lateral surface of lateral pterygoid plate.

Insertion: Lower head - to neck of mandibular condyle; *Upper head* - to articular disc capsule of TM joint.

Action: Acting together - protrude mandible and depress chin; Acting alone & alternately- produce side-to-side movements of mandible

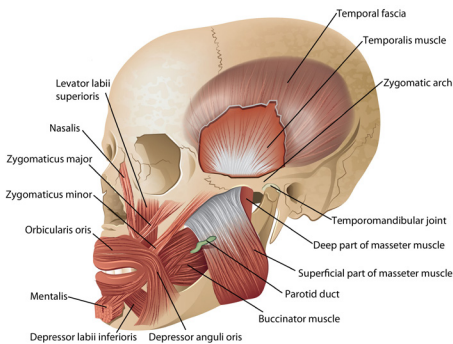


Figure 5-11. Muscles of Mastication (superficial). © 2017 A Campbell, C

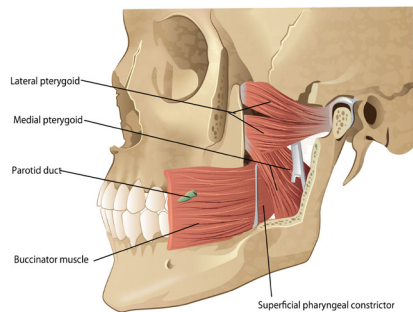


Figure 5-12. Muscles of Mastication (deep). © 2017 A Campbell, C

Muscles of Facial Expression

- Act as either sphincter or dilator of the orifices of the face, and responsible for facial expression
- Bony origin, except orbicularis oris; Insertion into the skin

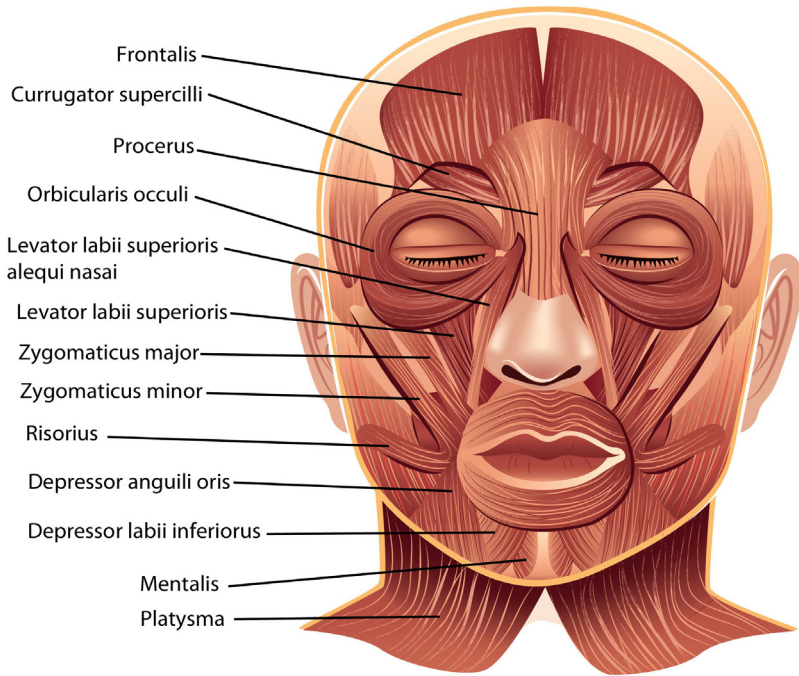


Figure 5-13. Muscles of the face. © 2017 A Campbell, C Restrepo

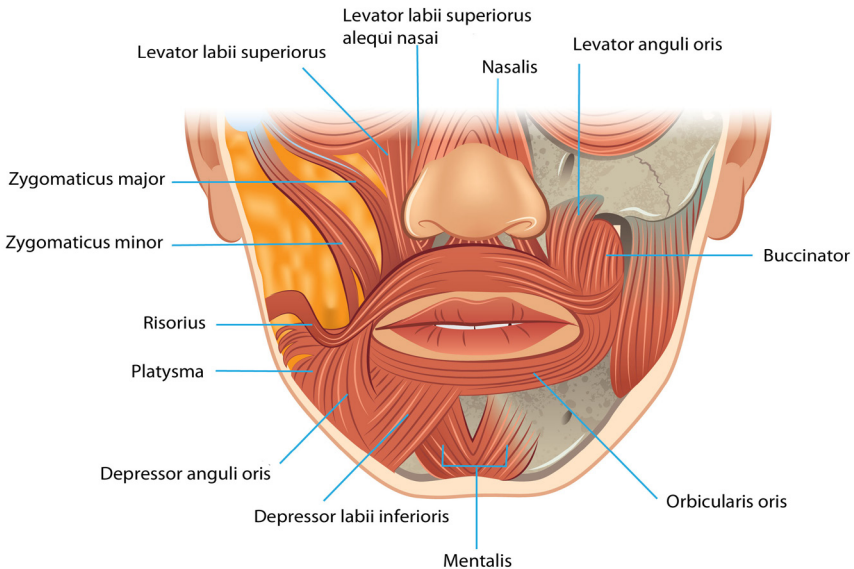


Figure 5-14. Muscles of the face (perioral region). © 2017 A Campbell, C Restrepo

BLOOD SUPPLY

The external and internal carotids arise from the common carotid artery and are side by side in the anterior triangle of the neck (external anterior)

Branches of external carotid:

- Superior thyroid
- Ascending pharyngeal
- Lingual
- Facial
- Occipital
- Posterior auricular
- Maxillary
- Superficial Temporal

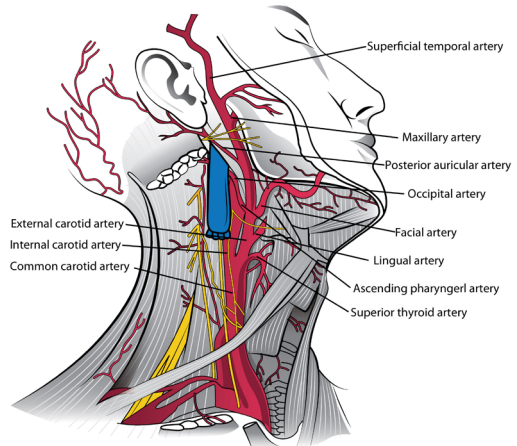


Figure 5-15. Blood Supply to the Face. © 2017 A Campbell, C. Restrepo

Veins corresponding to the above-mentioned arteries drain into the internal jugular vein, located lateral to the common carotid artery.

Nerves in this space:

- Hypoglossal nerve crosses both the internal and external carotids above, curving around the origin of the occipital artery.
- Vagus nerve is within the sheath between and behind artery/vein.
- Sympathetic trunk is behind the sheath.
- Spinal accessory nerve runs for short distance on the lateral side of the vessels before it pierces the sternocleidomastoid
- Internal and external branches of the superior laryngeal nerve; and, still more inferiorly, the external branch of the same nerve; and on the medial side of the external carotid, just below the hyoid bone, may be seen the. The upper portion of the larynx and lower portion of the pharynx are also found in the front part of this space.

SCALP BLOOD SUPPLY

Arteries

1. Supratrochlear
2. Supraorbital

3. Superficial temporal

4. Posterior auricular

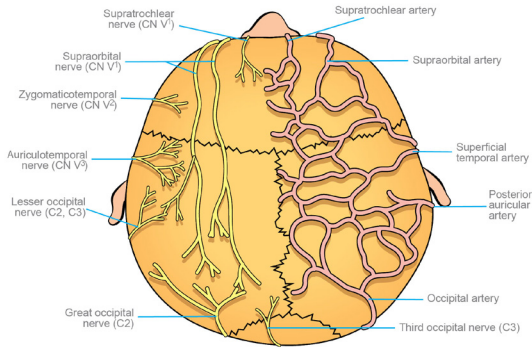


Figure 5-16. Arteries and Nerves of the Scalp. © 2017 A Campbell, C Restrepo

FACIAL BLOOD SUPPLY

Facial artery

- Runs forward over digastric and submandibular gland
- Loops around mandible (palpable) at anterior border of masseter, to enter the face and follows tortuous deep to most facial muscles
- Branches: Inferior labial; Superior labial; Angular

Superficial temporal artery

- Terminal branch of external carotid
- Ascends in front of ear (where it is palpable) to supply temporal and anterior portion of scalp
- Transverse facial artery - runs above parotid duct to supply the cheek region medial to neck of mandible

Maxillary artery

- Entrance to infratemporal fossa medial to neck of mandible
- Branches
 - Inferior alveolar
 - Middle meningeal
 - Posterior superior alveolar
 - Ophthalmic artery
 - Supratrochlear
 - Supraorbital

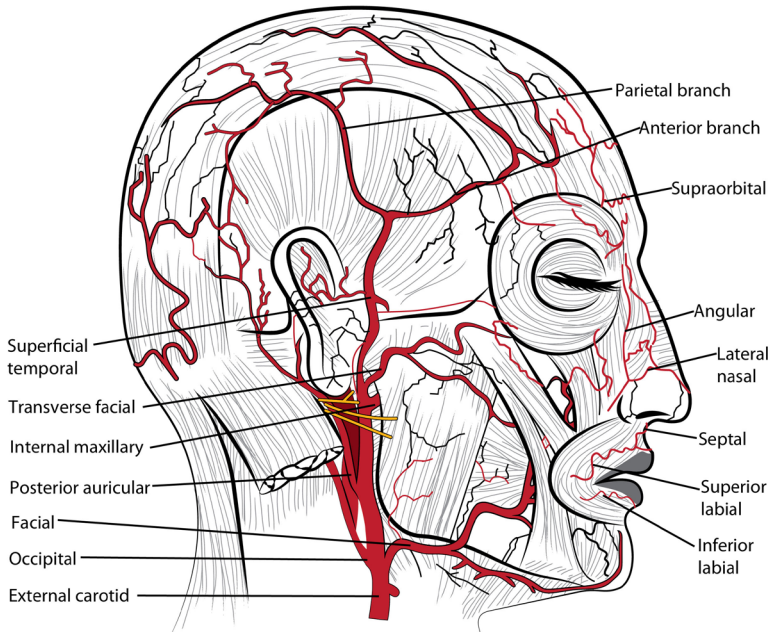


Figure 5-17. Arteries of the Face. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 508.

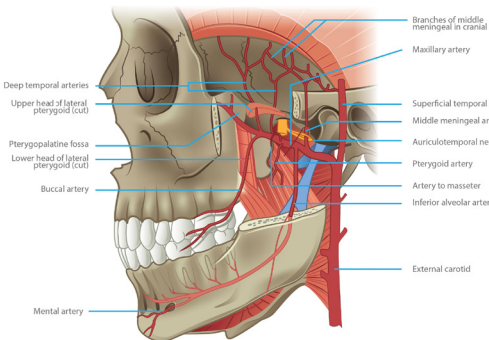


Figure 5-18. Maxillary Artery. © 2017 A Campbell, C Restrepo08.

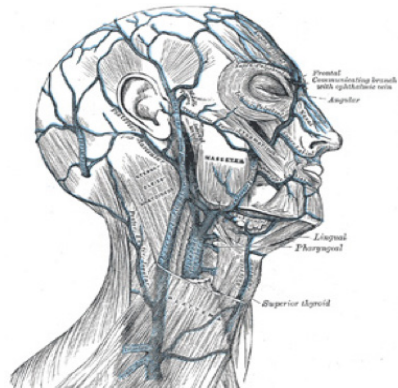


Figure 5-19. Venous Drainage of the Face. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 557. Plate 508.

Venous drainage

- Veins follow the arteries and drain into common facial vein and retromandibular vein
- Communication between supraorbital & superior ophthalmic vein; superior ophthalmic vein & pterygoid plexus of vein communicate with cavernous sinus

Facial vein

- Begins at medial angle of eye (angular vein)
- Runs downward and backward through the face, posterior to the facial artery to join anterior branch of retromandibular vein below angle of mandible, joins to form common facial vein, which drains into internal jugular vein.

NERVES

Cranial nerves provides sensory and motor innervation for the head and neck including:

- General sensory - touch, pain, temperature, pressure, vibration, proprioceptive
- Visceral sensory - sensation from viscera
- Special sensory - smell, vision, taste, hearing, balance
- Somatic motor - muscles that develop from somites
- Branchial motor - muscles developed from branchial arches
- Visceral motor - glands and and smooth muscle

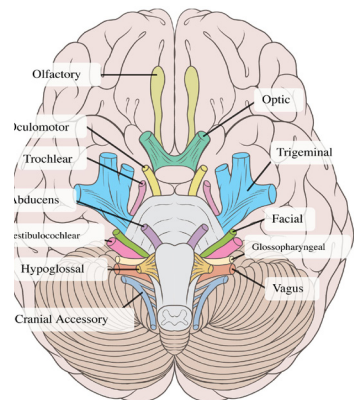


Figure 5-20. Cranial Nerves. Patrick J. Lynch, medical illustrator
derivative work: Brain human inferior view.

CN V: TRIGEMINAL NERVE

Emerges on the midlateral surface of the pons.

- Large sensory root and a smaller motor root.

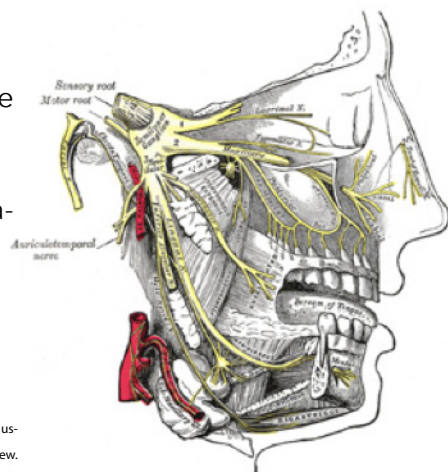


Figure 5-21. Cranial Nerves. Patrick J. Lynch, medical illustrator derivative work: Brain human inferior view.

V1 – Ophthalmic (Sensory) Superior Orbital Fissure

- Lacrimal
- Frontal
- Supratrochlear
- Supraorbital
- Nerve from frontal air sinus
- Nasociliary
- Long and short ciliary
- Infratrochlear
- Ethmoidal
- Anterior
- Internal nasal (medial and lateral)
- External nasal
- Posterior
- Meningeal branch (from the tentorium cerebelli)

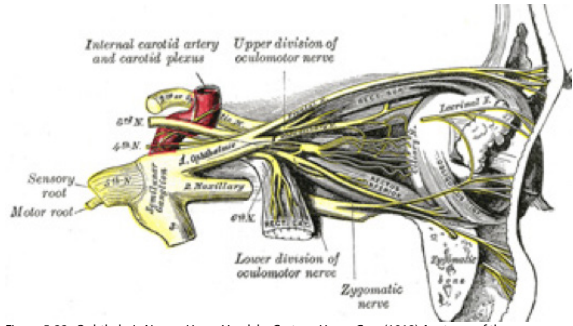


Figure 5-22. Ophthalmic Nerve. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 777.

V2 – Maxillary (Sensory) Foramen Rotundum

- Zygomatic
- Zygomaticotemporal
- Zygomaticofacial
- Infraorbital
- External nasal
- Superior labial
- Superior alveolar
- Posterior
- Middle
- Anterior
- Pterygopalatine
- Orbital
- Greater and lesser palatine
- Posterior superior nasal
- Pharyngeal
- Meningeal

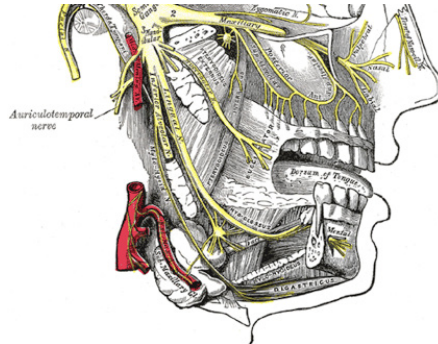


Figure 5-23. Maxillary and Mandibular Nerves. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 778.

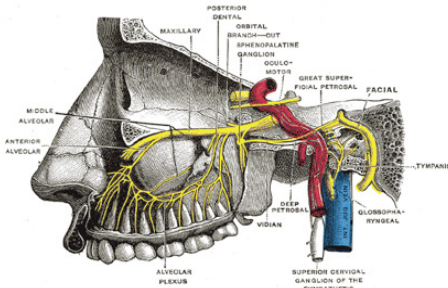


Figure 5-24. Alveolar branches of superior maxillary nerve and sphenopalatine ganglion. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 779.

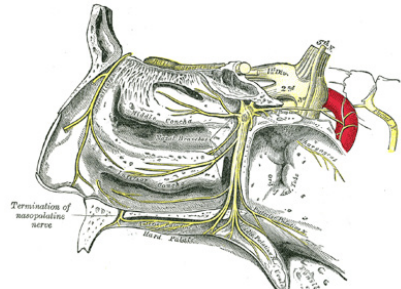


Figure 5-25. The sphenopalatine ganglion and its branches. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 780.

V3 - Mandibular (Sensory and Motor) Foramen Ovale

- Zygomatic
- Zygomaticotemporal
- Zygomaticofacial
- Infraorbital
- External nasal
- Superior labial
- Superior alveolar
 - Posterior
 - Middle
 - Anterior
- Pterygopalatine
 - Orbital
 - Greater and lesser palatine
 - Posterior superior nasal
 - Pharyngeal
- Meningeal

- Medial pterygoid
 - To tensor veli palatini
 - To tensor tympani
- Lateral pterygoid
- Masseteric
- Deep temporal
 - To anterior belly of digastric
 - To mylohyoid

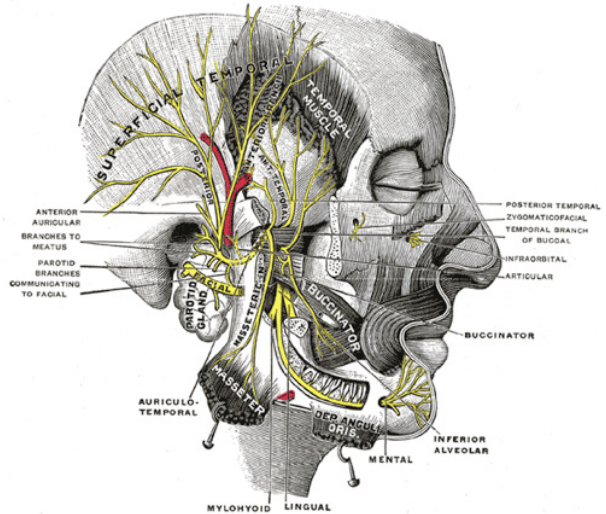


Figure 5-26. Mandibular Nerve. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 781.

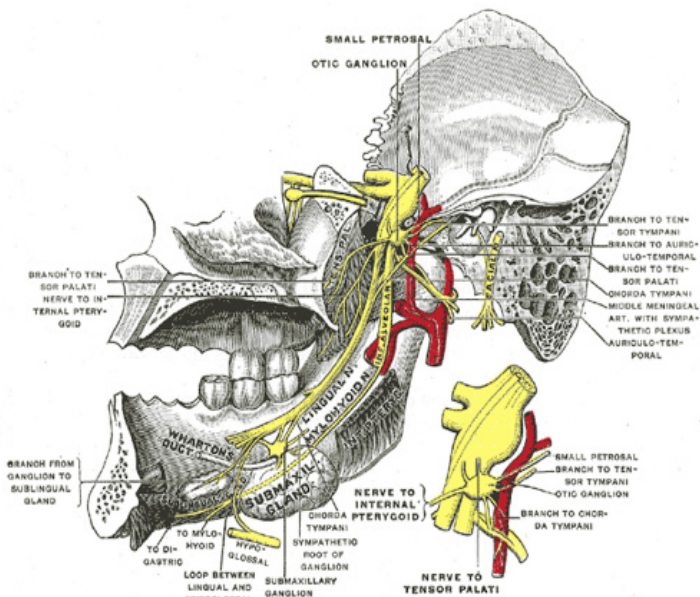


Figure 5-27. Mandibular Nerve seen from medial aspect. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 782.

CN VII: FACIAL NERVE

- Exits skull via internal auditory meatus
- Motor and Sensory

With the facial canal..... Nerve to the Stapedius muscle.
Chorda tympani.

Posterior auricular.

At its exit from the stylomastoid foramen..... Digastric.
Stylohyoid.

Temporal.

Zygomatic.

On the face..... Buccal.
Mandibular.
Cervical.

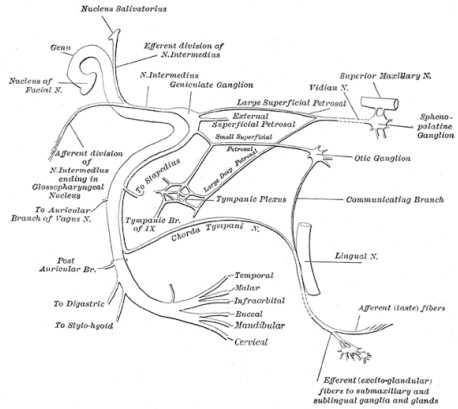


Figure 5-28. Facial Nerve. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 788.

Temporal	Frontalis, occipitalis, orbicularis oculi, corrugator supercillii, procerus
Zygomatic	Orbicularis oculi
Buccal	Buccinator, orbicularis oris, nasalis, levator labii superioris, levator labii superioris alaeque nasi, zygomaticus major and minor, levator anguli oris
Mandibular	Orbicularis oris, mentalis, depressor anguli oris, depressor labii inferioris, risorius
Cervical	Platysma

Clinical Testing CN VII

Motor facial Muscles

- T - Raise eyebrows
- Z - Raise Upper Lip
- B - Smile
- M - Depress lower lip
- C - Contract platysma

Corneal Reflex

- V1 and VII

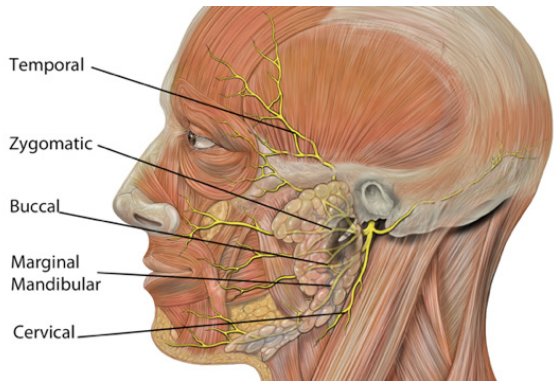


Figure 5-29. Branches of Facial Nerve. Patrick J. Lynch, medical illustrator derivative work: Head facial nerve superficial branches.

LYMPHATICS

The lymph glands of the head are arranged in the following groups:

- Occipital

- Posterior Auricular
- Facial
- Deep Facial
- Anterior Auricular
- Lingual
- Parotid
- Retropharyngeal

Vessels carrying lymph from the face pass through nodes arranged like a "collar" around the base of the head.

- Occipital
- Retro-auricular (Mastoid)
- Parotid
- Submandibular
- Submental

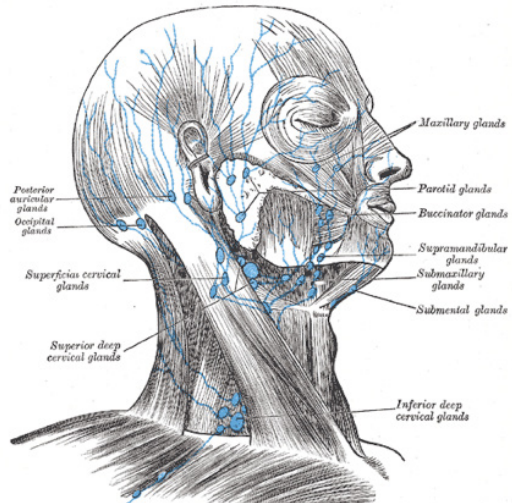


Figure 5-30. Lymphatic Drainage of the Head and Neck. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 602.

Lymphatic drainage in 3 territories-

- Upper territories- greater part of forehead, lateral ½ of eye lid, conjunctiva, lateral part of cheek and parotid area- preauricular lymph node (parotid)
- Middle territories- median part of forehead, external nose, upper lip, lateral part of lower lip, medial ½ of eye lid, medial part of cheek, greater part of lower jaw- submandibular lymph node
- Lower territories- central part of lower lip, chin- sub mental lymph node

SALIVARY GLANDS

Parotid gland

- Largest salivary secretes saliva through Stensen's duct opposite second molar into the oral cavity to facilitate chewing and swallowing.
- Overlies mandibular ramus and anterior and inferior to the external ear and extends irregularly from the zygomatic arch to the an-

gle of the mandible.

- Covered by deep parotid fascia.

Structures that pass through parotid gland:

- Facial nerve and its branches
- External carotid artery which gives off its two terminal branches, the maxillary artery and the superficial temporal artery, inside the gland
- Retromandibular vein

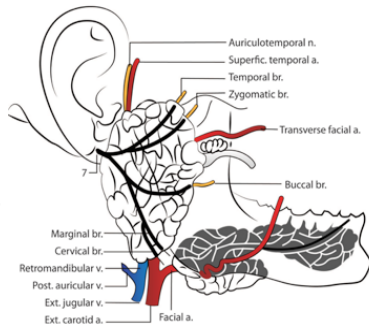


Figure 5-31. Parotid Gland. © 2017 A Campbell, C Restrepo

Submandibular Gland

- Mostly situated in the submandibular triangle, reaching forward to the anterior belly of the digastric and backward to the stylomandibular ligament, which intervenes between it and the parotid gland.
- Submandibular duct (Wharton's duct) begins by numerous branches from the deep surface of the gland, and runs forward and to a small papilla at the side of the lingual frenulum.

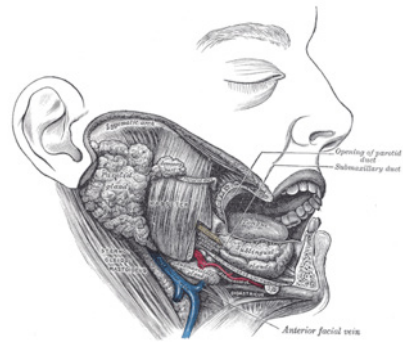


Figure 5-32. Salivary Glands. Henry Vandyke Carter – Henry Gray (1918) *Anatomy of the Human Body*. Bartleby.com: Gray's Anatomy, Plate 1024.

Sublingual Gland

- Beneath the mucous membrane of the floor of the mouth, at the side
- Sublingual duct (Bartholin's duct), opens into the submaxillary duct of the lingual frenulum.

Part II: Lips, Nose, and Nasal Cavity

LIPS

- Soft, movable, fleshy folds
- Opening for food intake

- Close for suction or seal
- Fine movements for articulation
- Tactile sensory organs
- Erogenous in kissing
- Symbols of sexuality and sensuality

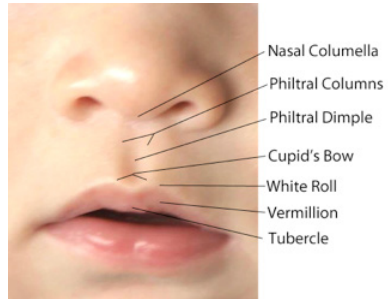


Figure 5-33 Lip Surface Anatomy. © 2017 A Campbell, C Restrepo

Philtral columns: Bilateral vertical lip bulge created by dermal insertion of orbicularis oris fibers

Philtral dimple: Concavity between columns created by relative paucity of muscle fibers

White roll: Prominent ridge just above cutaneous-vermillion border

Vermillion: Red mucosal portion of lip divided into dry (keratinized) and wet (nonkeratinized)

Red line: Junction between wet and dry vermilion where lips meet

Cupid's bow: Curvature of central white roll, two lateral peaks are the inferior extension of the philtral columns

Tubercle: Vermillion fullness at central lip inferior apex of cupid bow

Layers of the Lip:

1. External skin
2. Orbicularis oris muscle (contain labial arteries)
3. Labial Glands (between mucous membrane and orbicularis oris)
4. Internal mucous membrane (frenulum midline)



Figure 5-34. Lips Contracted. © 2017 A Campbell, C Restrepo

Orbicularis Oris Muscle

- Concentric band forming oral sphincter
- Upper and lower fibers arise from each modiolus and desussate in midline
- Superficial fibers upper lip criss-cross at midline to attach to dermis of overlying skin to at philtrum
- Deeper fibers attach anterior nasal spine
- Pars marginalis - Beneath lip margin; Fine movement (speech)

- Pars peripheralis - Around lip periphery; Gross movement

Vascular Supply

Upper Lip - Superior labial artery:

- Branches from facial artery lateral to commissure
- Courses within 1 cm of free lip border b/t muscle and mucosa
- Anastomoses with artery of opposite side
- Columellar branches anastomose with dorsal nasal vessels

Lower Lip - Inferior labial artery:

- Branches from facial
- Anastomoses with artery of opposite side

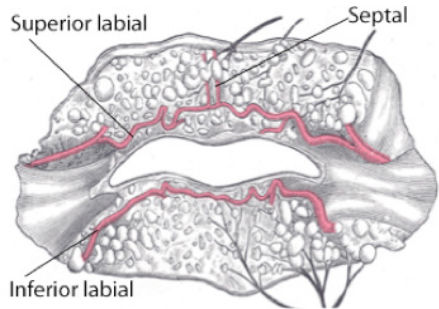


Figure 5-35. Blood Supply to Lips. Henry Vandyke Carter – Henry Gray (1918) Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 509.

Sensation

Upper Lip:

- Infraorbital Nerve (V2) - Infraorbital foramen 5-7mm below infraorbital rim at medial limbus

Lower Lip:

- Mental Nerve (V3) - Mental foramen at level second premolar

NOSE

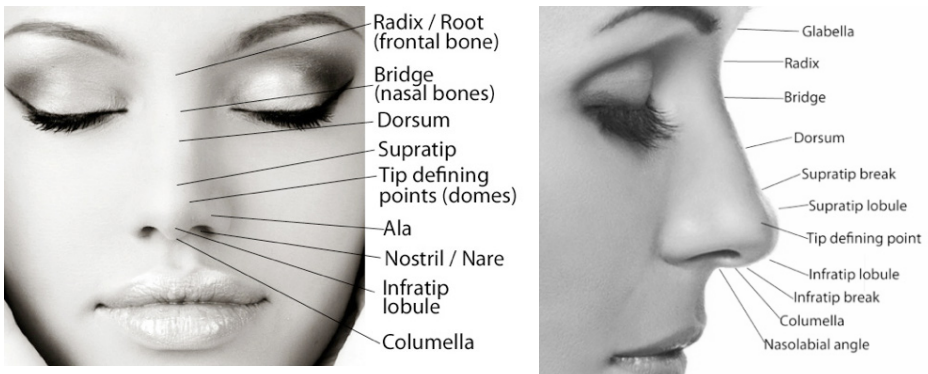


Figure 5-36 Surface Anatomy of the Nose. © 2017 A Campbell, C Restrepo

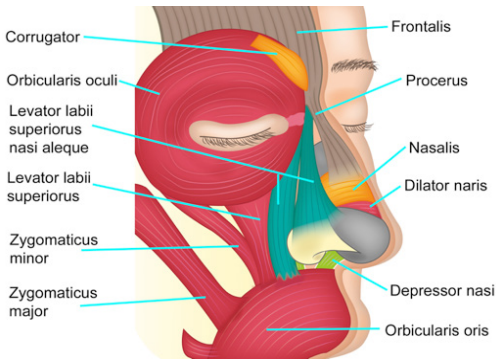


Figure 5-37. Nasal Musculature. © 2017 A Campbell, C Restrepo

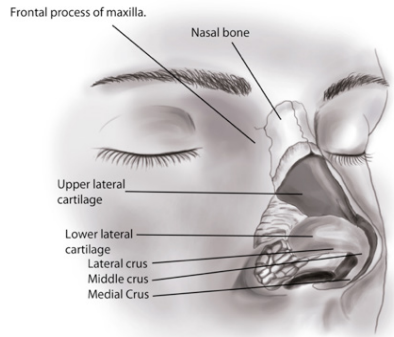


Figure 5-38. Bone and Cartilage of the Nose. © 2017 A Campbell, C Restrepo

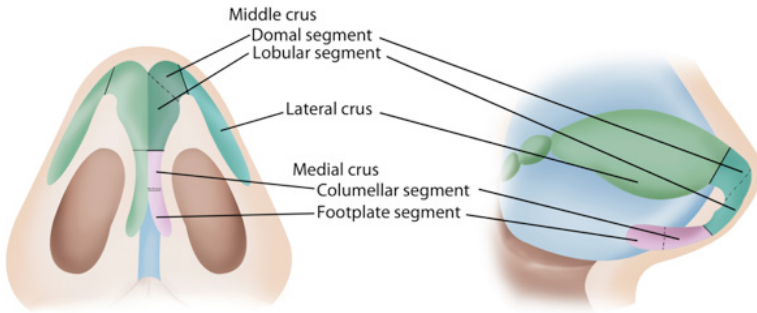


Figure 5-39. Lower Lateral Cartilage of the Nose. © 2017 A Campbell, C Restrepo

Blood Supply

- Dense subdermal plexus
- Dorsal Nasal Artery
- Lateral Nasal Artery
- Angular Artery
- Nasal Septal Artery

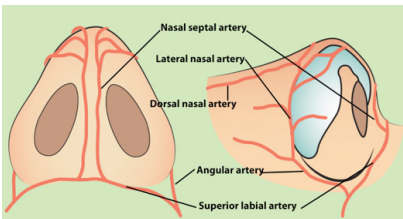


Figure 5-40. Blood Supply to the Nose. © 2017 A Campbell, C Restrepo

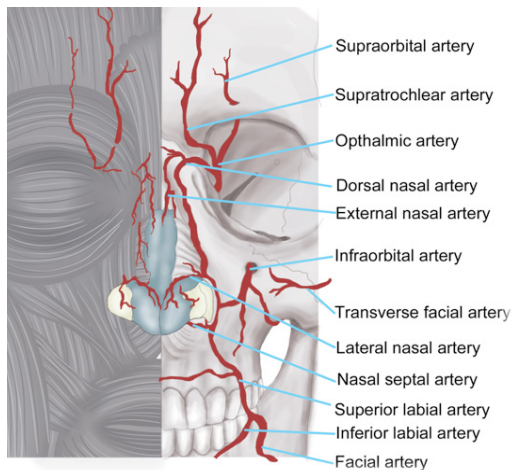


Figure 5-41. Blood Supply to the Face and Nose. © 2017 A Campbell, C Restrepo

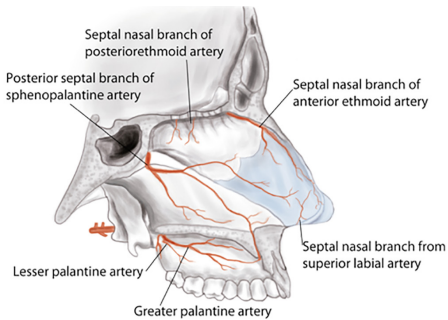


Figure 5-42. Blood Supply to the Nasal Septum. © 2017 A Campbell, C Restrepo

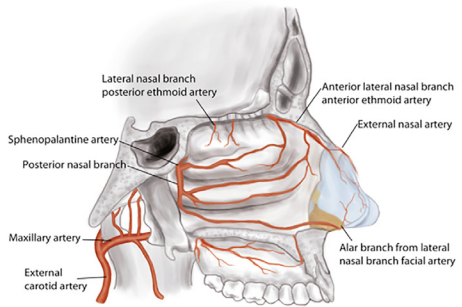


Figure 5-43. Blood Supply to the Lateral Nasal Wall. © 2017 A Campbell, C Restrepo

Nerve Supply

External nose supplied by V1 and V2.

- Superior aspect of the nose, including the tip, is supplied by the infratrochlear nerve (V1), the supratrochlear nerve (V1), and the external nasal branch of the anterior ethmoid nerve (V1).
- The infraorbital nerve (V2) supplies the inferior and lateral aspects of the nose, extending to the lower eyelids.

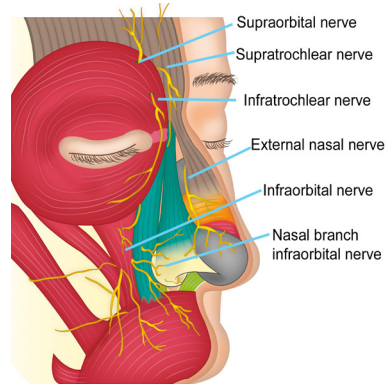


Figure 5-44. Nerves of the external nose © 2017 A Campbell, C Restrepo

Internal nasal cavity may be subdivided into the nasal septum, the lateral walls, and the cribriform plate.

- The superior inner aspect of the lateral nasal wall is supplied by the anterior and posterior ethmoid nerves (V1).
- The sphenopalatine ganglion (V2) is located at the posterior end of the middle turbinate and innervates the posterior nasal cavity.

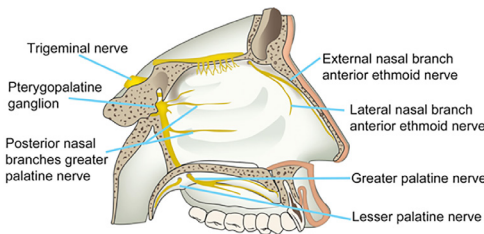


Figure 5-45. Nerves of the Lateral Nasal Wall. © 2017 A Campbell, C Restrepo

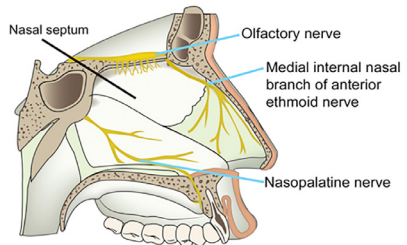


Figure 5-46. Nerves of the Nasal Septum. © 2017 A Campbell, C Restrepo

- The anterior and posterior ethmoid nerves (V1) and the sphenopalatine ganglion (through the nasopalatine nerve) provide sensation to most of the septum.

- The cribriform plate holds the special sensory branches of the olfactory nerve (CN I).

Nasal Septum

Bone:

- Perpendicular plate of ethmoid
- Vomer - Grooved by nasopalatine artery and nerve and articulates nasal crest (maxilla, palatine bone)

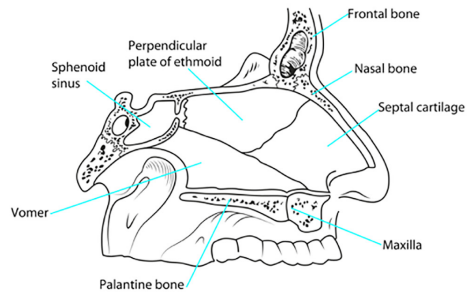


Figure 5-47. Nasal Septum. © 2017 A Campbell, C Restrepo

Cartilage:

- Quadrilateral in form, thicker at its margins than at its center, and completes the separation between the nasal cavities in front.
- Anterior margin, thickest above, is connected with the nasal bones, and is continuous with the medial margins of the upper lateral cartilages; below, it is connected to the medial crura of the lower lateral alar cartilages by fibrous tissue
- Its posterior margin is connected with the perpendicular plate of the ethmoid; its inferior margin with the vomer and the palatine process of the maxilla

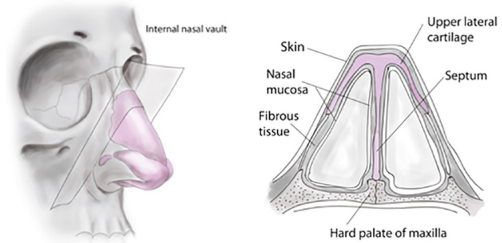


Figure 5-48. Nasal Septum (cross section). © 2017 A Campbell, C Restrepo

Internal nasal valve

- Bordered by septum, nasal floor, inferior turbinate, and caudal border of the upper lateral cartilage

External nasal valve

- Level of the inner nostril
- Formed by caudal edge of LLC, soft-tissue alae, membranous septum, and nostril sill.

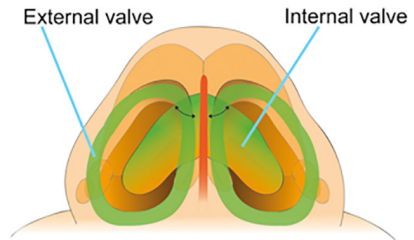


Figure 5-49. Nasal Valves. © 2017 A Campbell, C Restrepo

Nasal Cavity

- To the front of the nasal cavity is the nose, while the back blends into the nasopharynx via the choanae.
- Paranasal sinuses connected to the nasal cavity through small orifices (ostia).

Roof

- Frontal bone
- Cribriform plate ethmoid (CN I) with olfactory epithelium
- Sphenoid body

Medial Wall

- Nasal septum

Lateral wall

- Maxilla
- Ethmoid
- Superior concha
- Middle concha
- Inferior concha

Floor (Roof of mouth)

- Bones of the hard palate.

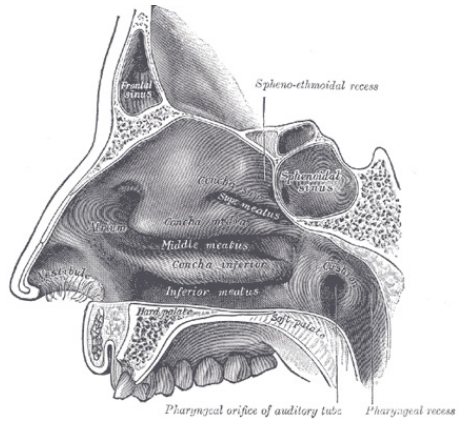


Figure 5-50. Lateral Nasal Wall. Henry Vandyke Carter – Henry Gray (1918)
Anatomy of the Human Body. Bartleby.com: Gray's Anatomy, Plate 855.

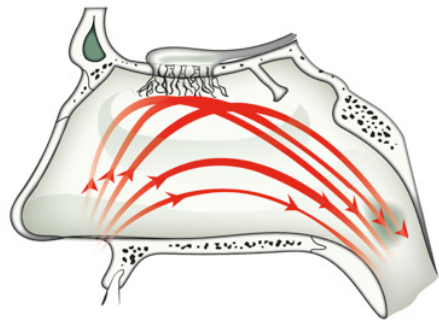


Figure 5-51. Airflow in the Nasopharynx. © 2017 A Campbell, C Restrepo

Turbinates disrupt the airflow, directing air toward the olfactory epithelium on the surface of the turbinates and the septum. The vomeronasal organ is located at the back of the septum and has a role in pheromone detection.

Cilia and **mucus** along the inside wall of the nasal cavity trap and remove dust and pathogens from the air as it flows through the nasal cavity. The cilia move the mucus down the nasal cavity to the pharynx, where it can be swallowed.

Part III: Tongue, Pharynx, Palate, Teeth

TONGUE

- Floor of mouth attached at root; Nerves and vessels enter at root.

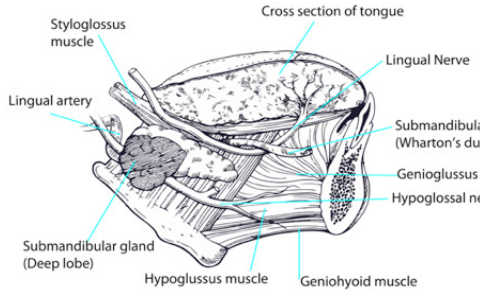


Figure 5-52. Anatomy of the Tongue. © 2017 A Campbell, C Restrepo

- Upper surface: mucosa and papillae
 - Fungiform (taste buds), Conical, Filiform papillae - Anterior 2/3
 - Circumvallate papillae (large, taste buds) - "V" configuration at junction anterior 2/3, posterior 1/3
 - Foliate papillae - taste buds

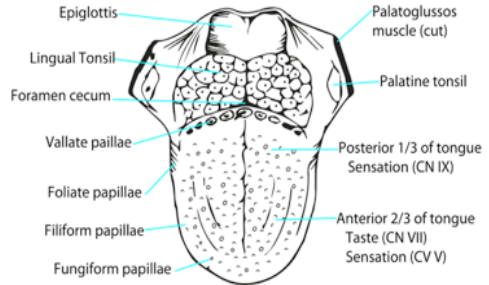


Figure 5-53. Tongue Surface. © 2017 A Campbell, C Restrepo

- Foramen Cecum (embryonic origin thyroid) - Apex of "V"
- Lingual Tonsil - Lymphoid tissue posterior to "V" on pharyngeal surface
- Epiglottis - Immediately posterior to lingual tonsil at midline; Attached to tongue by glossoepiglottic folds

Sensation

- Trigeminal Nerve (V) - Lingual nerve branches; General sensation to anterior 2/3
- Facial Nerve (VII) - Chorda tympani branches travel with lingual

- nerve; Taste to anterior 2/3
- Glossopharyngeal Nerve (IX) - Taste and general sensation to posterior 1/3
- Vagus Nerve (X) - Taste to small area posterior lingual tonsil

Extrinsic muscles:

Gross movement

- Genioglossus (XII)
- Styloglossus (XII)
- Hypoglossus (XII)
- Palatoglossus (X)

Intrinsic muscles:

Shape tongue; Swallowing and Speech

- Hypoglossal nerve (XII)

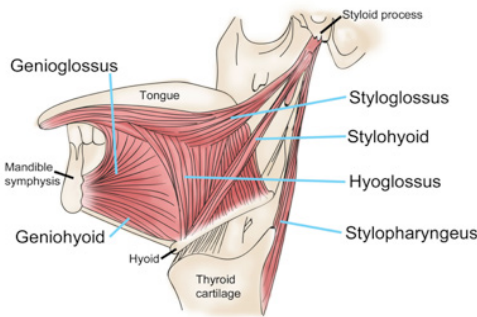


Figure 5-54. Tongue Muscles. © 2017 A Campbell, C Restrepo

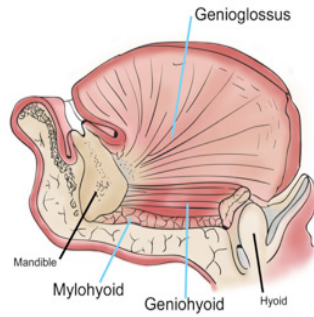


Figure 5-55. Tongue Muscles (cross section). © 2017 A Campbell, C

Blood Supply

Lingual arteries (external carotid) - Penetrate the tongue near its deep base and course toward the tip within the ventral portion.

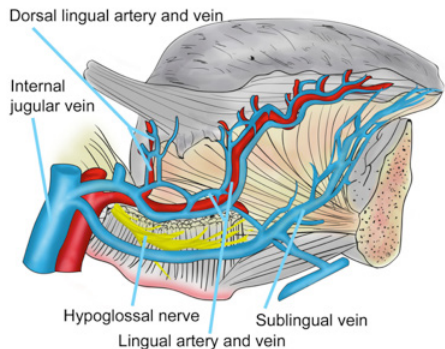


Figure 5-56. Blood Supply to the Tongue. © 2017 A Campbell, C Restrepo

PHARYNX

Nasopharynx:

Base of occiput to soft palate

- Choana
- Pharyngeal tonsil
- Eustachian tubes

Oropharynx:

Between soft palate and epiglottis

- Root of Tongue
- Lingual tonsil, Palantine Tonsils

Hypopharynx:

Between epiglottis and cricoid cartilage

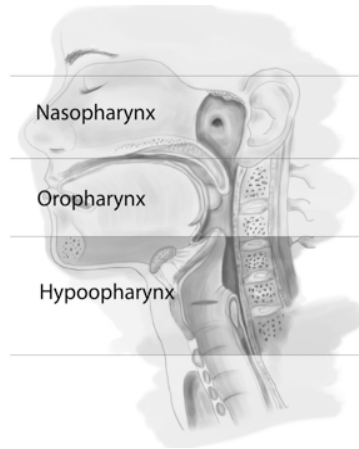


Figure 5-57. Division of the Pharynx.

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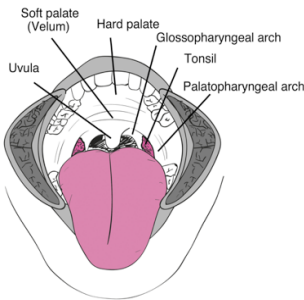


Figure 5-58. Oropharynx.

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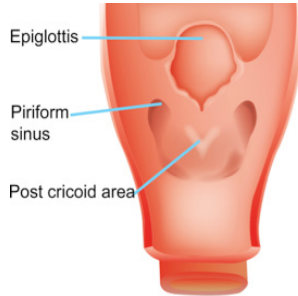


Figure 5-59. Hypopharynx.

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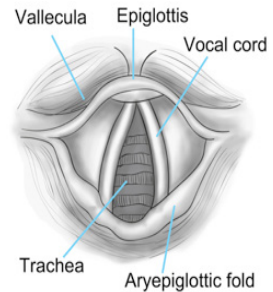


Figure 5-60. Epiglottis and Vocal Cords.

© 2017 A Campbell, C Restrepo

The pharynx is a muscular tube covered by mucosa

- Paired superior, middle and inferior constrictor muscles
- Sweep from anterior origins to meet in posterior midline

Superior pharyngeal constrictor

- Broad origin from posterior pharyngeal raphe
- Insertion to medial pterygoid plate superiorly and pterygomandibular raphe and mandible inferiorly

Middle pharyngeal constrictor

- Origin from hyoid
- Overlaps superior constrictor

Inferior pharyngeal constrictor

- Origin from thyroid cartilage
- Overlaps middle constrictor

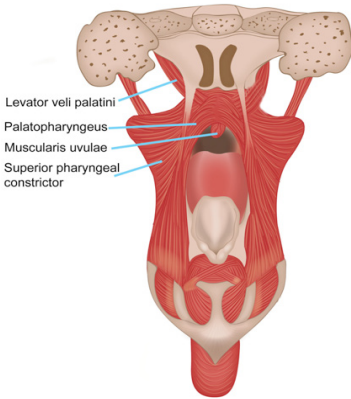


Figure 5-61. Muscles of the Pharynx. © 2017 A Campbell, C Restrepo

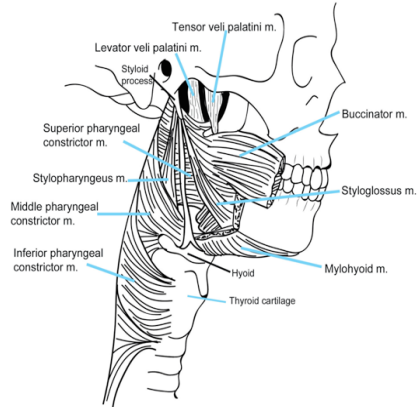


Figure 5-62. Muscles of the palate (posterior view, constrictor muscles removed). ©2017 A Campbell, C Restrepo

PALATE

Hard Palate

- Primary Palate
 - Anterior of incisive foramen
 - Derived from premaxilla
- Secondary Palate
 - Posterior of incisive foramen
 - Palatine process of maxilla
 - Horizontal plate palatine bone

Mucosa firmly attached to bone of hard palate

- Oral Mucoperiosteum
 - Thick, fibrous
 - Minor salivary glands
- Nasal mucosa
 - Thin, delicate

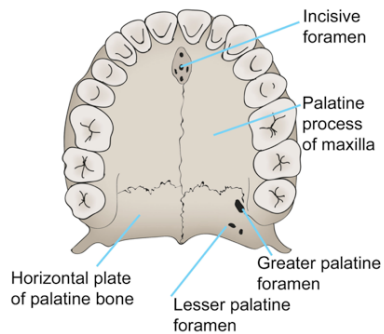


Figure 5-63. Hard Palate. © 2017 A Campbell, C Restrepo

Blood Supply

- Greater palatine arteries: Greater palatine foramen->Medial to

3rd maxillary molar

- Lesser palatine arteries: Lesser palatine foramen
- Nasopalatine artery: Incisive foramen

Soft Palate (Vellum)

Muscular complex

- Levator veli palatine
- Tensor veli palatine
- Palatoglossus
- Palatopharyngeus
- Muscularis uvulae

Oral mucosa

Nasal mucosa

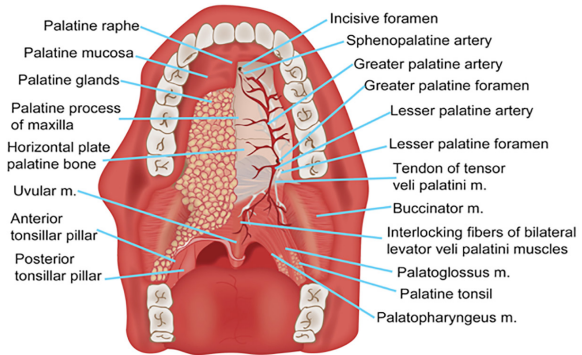


Figure 5-64. Anatomy of the Palate. © 2017 A Campbell, C Restrepo

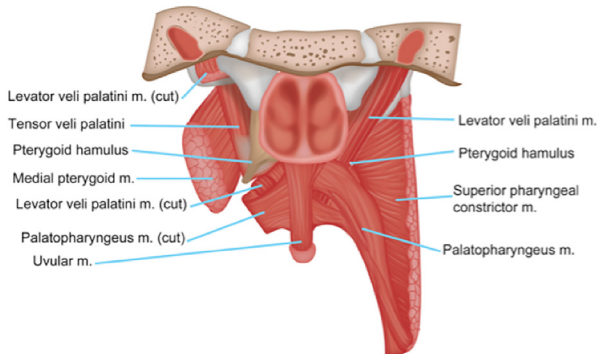


Figure 5-65. Posterior View Soft Palate. © 2017 A Campbell, C Restrepo

Levator veli palatine

- Largest muscle soft palate
- Originate petrous bone base of skull, medial cartilage of eustacian tube
- Sweep forward, downward, and medially into soft palate to join in midline
- Contraction elevates palate and opens eustacian tube

Tensor veli palatine

- Originate from medial pterygoid plate and lateral cartilage of eustacian tube
- Sweep forward, downward, and medially around hamulus

- Insert onto posterior hard palate and contralateral muscle
- Contraction tenses palate and is primary opener of eustachian tube

Palatoglossus muscles

- Fibers sweep from midline lateral and inferior to lateral margin of tongue
- Anterior tonsillar pillar

Palatopharyngeus muscles

- Sweeps from lateral pharynx upward into soft palate
- Posterior tonsillar pillar (Posterior pharyngeal arch)
- Clinically used for spinchcter pharyngoplasty (Hines)

Muscularis uvulae

- Longitudinal fibers midline soft palate to uvula

Velum

- Extends from posterior hard palate to uvula.

Velopharyngeal Mechanism

- Muscular valve extending from posterior hard palate to posterior pharyngeal wall.
- Provides separation between oral and nasal cavities during speech and swallowing.

Levator veli palatini

- Sling
- Elevates and posteriorly displaces palate to provide velopharyngeal closure and competence

Assisting musculature

- Superior constrictor

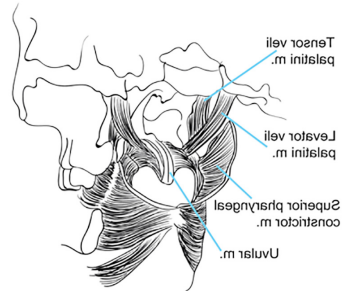


Figure 5-66. Muscles of the Soft Palate (posterior view)
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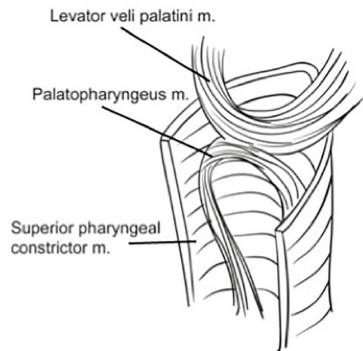


Figure 5-67. Levator sling. © 2017 A Campbell, C Restrepo

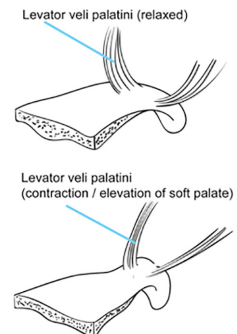


Figure 5-68. Contraction of levator sling.
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- Palatoglossus
- Palatopharyngeus
- Tensor veli palatini
- Uvula

Velopharyngeal Closure

- At rest, velum suspended with tip of uvula resting on dorsum of tongue.
- Velopharyngeal port open during rest breathing to allow unencumbered air flow
- During closure, velum elevates to make complete contact with posterior pharyngeal wall to prevent escape of air through nose
- Lateral pharyngeal wall movement toward midline and anterior movement of posterior wall movement

Normal VP Closure (Nasoendoscopy)

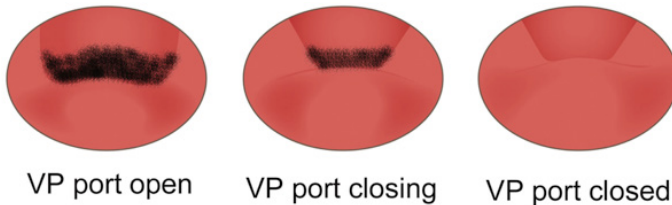


Figure 5-69. Velopharyngeal closure. © 2017 A Campbell, C Restrepo

Swallowing:

1. Bolus of food pushed back by elevating tongue (styloglossus) into fauces
2. Palatoglossus & palatopharyngeus m contract to squeeze the bolus backward into oropharynx. Tensor veli palatini & levator veli palatini elevate soft palate & uvula to close entrance into nasopharynx
3. Wall of pharynx raised by palatopharyngeus & stylopharyngeus to receive food, Suprahyoid muscle elevates hyoid bone & larynx to close opening into larynx, passing over the epiglottis, prevent food from entering respiratory pathway
4. Action of superior, middle, and inferior constrictor move food through oropharynx and laryngopharynx to the esophagus, where

it propelled by peristalsis to the stomach.

Cleft Palate and Velopharyngeal Insufficiency (VPI)

Cleft Anatomy

- Usually U-shaped or broadly V-shaped cleft
- Absence of levator veli palatine (LVP) sling
- Abnormal levator insertion to posterior hard palate

Anatomic Causes of VPI and Hypernasality in Cleft Palate

- LVP not oriented transversely to form normal sling
- Instead LVP inserts anteriorly on HP
- Abnormal LVP cannot elevate velum

Passavant's ridge:

Prominent bulging of posterior pharyngeal wall in patients with inadequate velar elevation due to compensatory hypertrophy of superior pharyngeal constrictor

DENTAL ANATOMY

32 Permanent Teeth

4 quadrants of 8 teeth

Numbering

- Right Maxillary 3rd Molar (#1) → Left Maxillary 3rd Molar (#16)
- Left Mandibular 3rd Molar (#17) → Right Mandibular 3rd Molar (#32)
- Incisors, Canines, Premolars
 - Single conical root
- Molars
 - Mandibular Molars: Two roots
 - Maxillary Molars: Three roots

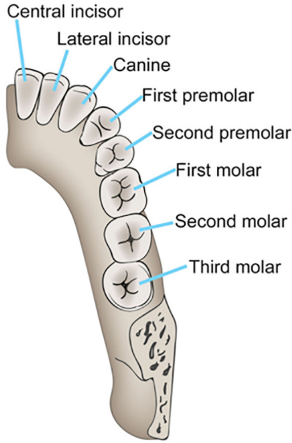


Figure 5-70. Permanent teeth (mandibular right quadrant). © 2017 A Campbell, C Restrepo

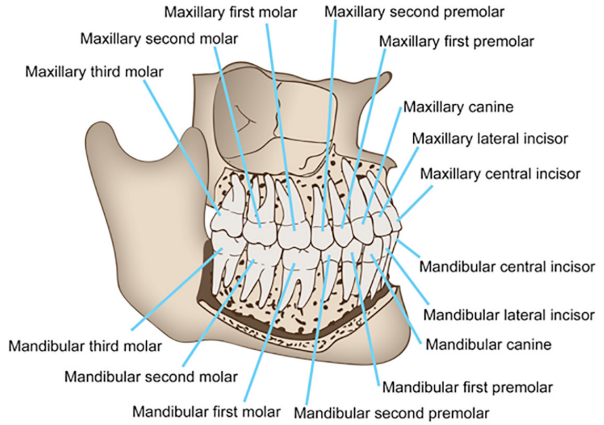


Figure 5-71. Permanent dentition. © 2017 A Campbell, C Restrepo

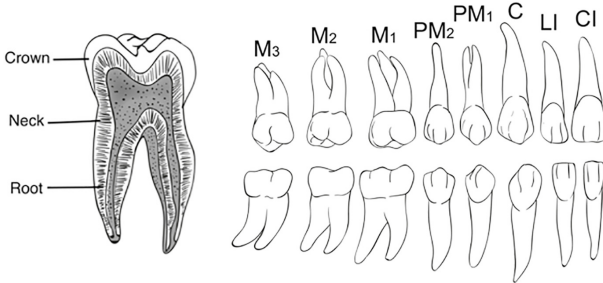


Figure 5-72. Tooth anatomy. © 2017 A Campbell, C Restrepo

Figure 5-73. Permanent Dentition. © 2017 A Campbell, C Restrepo

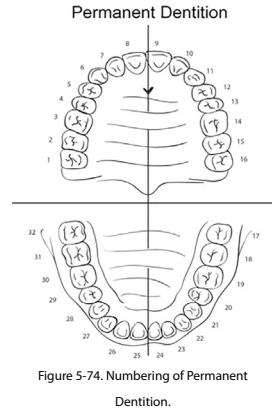


Figure 5-74. Numbering of Permanent Dentition. © 2017 A Campbell, C Restrepo

Primary / Deciduous teeth
(age at normal eruption)

- Maxillary Central Incisor (CI) - 8-10 months
- Maxillary Lateral Incisor (LI) - 8-10 months
- Maxillary Canine (C) - 16-20 months
- Maxillary First Molar (M1) - 15-21 months
- Maxillary Second Molar (M2) - 16-24 months

- Mandibular Central Incisor (CI) - 6-9 months
- Mandibular Lateral Incisor (LI) - 15-21 months
- Mandibular Canine (C) - 15-21 months
- Mandibular First Molar (M1) - 15-21 months
- Mandibular Second Molar (M2) - 15-21 months

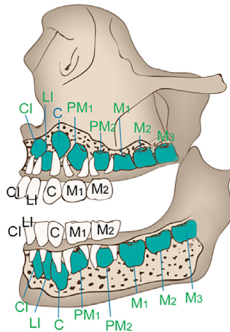


Figure 5-75. Anatomy and Eruption of Primary (Deciduous) and Permanent Teeth. © 2017 A Campbell, C Restrepo

Permanent teeth
(age at normal eruption)

- Maxillary Central Incisor (CI) - 7 years
- Maxillary Lateral Incisor (LI) - 8 years
- Maxillary Canine (C) - 11-12 years
- Maxillary First Preolar (PM1) - 9 years
- Maxillary Second Preolar (PM2) - 10 years
- Maxillary First Molar (M1) - 6 years
- Maxillary Second Molar (M2) - 12-13 years
- Maxillary Third Molar (M3) - 17-25 years

- Mandibular Central Incisor (CI) - 7 years
- Mandibular Lateral Incisor (LI) - 8 years
- Mandibular Canine (C) - 11-12 years
- Mandibular First Preolar (PM1) - 9 years
- Mandibular Second Preolar (PM2) - 10 years
- Mandibular First Molar (M1) - 6 years
- Mandibular Second Molar (M2) - 12-13 years
- Mandibular Third Molar (M3) - 17-25 years

Children

20 Deciduous Teeth
 4 quadrants of 5 teeth

- Central Incisor
- Lateral Incisor
- Canine
- First Molar
- Second Molar
- Third Molar

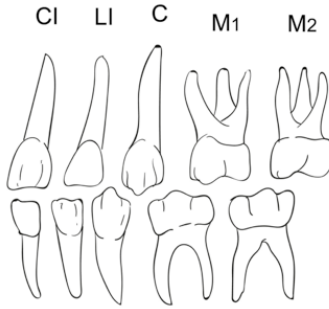


Figure 5-76. Primary (Deciduous) Dentition.
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Deciduous Dentition

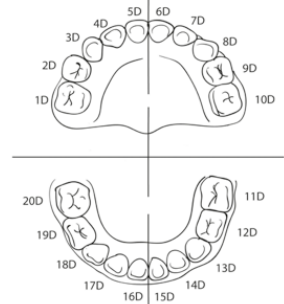


Figure 5-77. Primary (Deciduous) Dentition.
 © 2017 A Campbell, C Restrepo

Terminology

Mesial - Medial toward dental midline

Distal - Posterior toward molars

Lingual - Toward the tongue (mandible)

Palatal - Toward the palate (maxilla)

Buccal - Lateral to bicuspid/molars

Labial - Anterior to incisors/canines

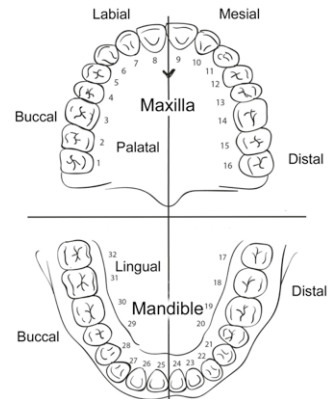


Figure 5-78. Terminology of Dental Relationships.
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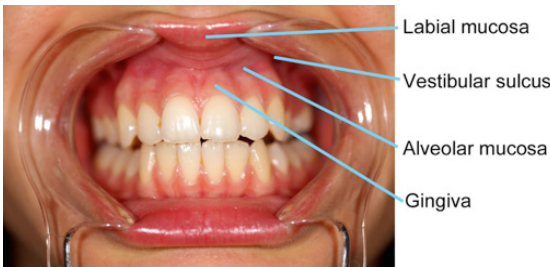


Figure 5-79. Oral Anatomy. © 2017 A Campbell, C Restrepo

Occlusal surfaces

Cusps- High points

- Molars - 4 Cusps
- Premolars (Bicuspid) - 2 cusps

Grooves- Low points

Gingiva

- Marginal
- Attached
- Interdental

Occlusion:

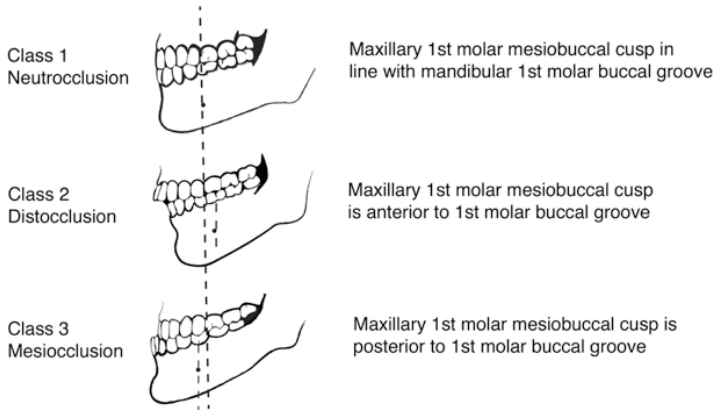


Figure 5-80. Angle's Classification of Dental Occlusion. © 2017 A Campbell, C Restrepo

Overbite

- Extent of vertical (superior-inferior) overlap of the maxillary central incisors over the mandibular central incisors.

Overjet

- Extent of horizontal (anterior-posterior) overlap of the maxillary central incisors over the mandibular central incisors

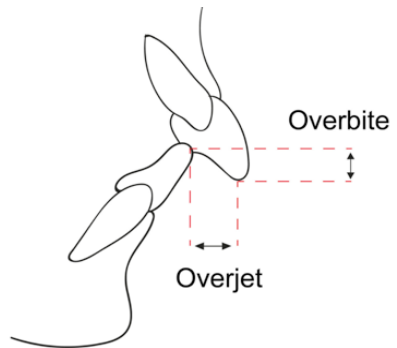


Figure 5-81. Overbite and Overjet. © 2017 A Campbell, C Restrepo

KEY READING

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