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Human Anatomy Synopsis

Neck and Head

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HUMAN ANATOMY SYNOPSIS: NECK AND HEAD

Human Anatomy Synopsis: Neck and Head
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PREFACE

This is one of a series of Human Anatomy Synopses that are based on over 40 years of Anatomy course notes used in the graduate education of health care professions. This series started as a detailed content outline for a course developed for medical students back in 1983. Since that time, it has undergone many revisions and additions. In 2008 and 2014, text and illustrations were reviewed and revised, and study sections were added throughout the text. In 2017, the 4 Synopses were developed, and the text and illustrations formatted to be used by students as a supplement to anatomy courses.
These 4 Human Anatomy Synopses in this series are: Spine and Neck, Axilla and Upper Limb, Pelvic Girdle and Low Limb, and Thorax, Abdomen, and Pelvis.

This Human Anatomy Synopsis on the Neck and Head is the fifth in this series. It described the contents of the regions of the anterior neck, the skull, the muscles, nerves and blood vessels of the face, regions of the head, and the eye and ear. There are numerous drawings and dissection photographs. In this Synopsis, major structures are CAPTILIZED. This feature allows students to make a study outline by linking together these words under each title or subtitle. After each content area, there are short answer Study Questions to help students relate and apply the anatomy. The answers to these questions are included at the end of the Synopsis.

These Synopses are only possible because of the works of the many anatomists and other basic scientists as well as numerous clinicians who have contributed to our knowledge and understanding of the human body. I am most grateful to them for sharing what they learned. I am also grateful to the many students who over the years, have made comments and suggestions about the content of this work. I am also grateful to Drs. Hilmir Augustsson, Jeff Rot, Ed Kane, Sue Curfman, Jim Viti, and Mrs. Jackie Nelson and to the University of St Augustine for Health Sciences for help with this publication.

This book is dedicated to all those people who have so generously donated their body to science so that we may learn. Thank you for the unselfish gift of yourself to others. May God bless you for your contribution to mankind.

THE NECK

Regions

The NECK extends from the sternal notch, the clavicle, the first rib, and the intervertebral disk between C7 and T1 to the base of the skull and lower border of the mandible. It may be subdivided into the (1) POSTERIOR PARASPINAL REGION, (2) POSTERIOR CERVICAL TRIANGLE, and (3) ANTERIOR NECK REGION.(1-10, 1-02)

The POSTERIOR PARASPINAL REGION consists of muscles lying along the cervical vertebrae. These muscles are described in the Synopsis of the Spine.

The POSTERIOR CERVICAL TRIANGLE lies above the clavicle and between the trapezius and sternocleidomastoid muscles. The boundaries and contents of this triangle are described in the Synopsis of the Axilla and Upper Limb.

1 ANTERIOR NECK REGION

1.1 SUBDIVISIONS

The SUPERFICIAL ANTERIOR NECK (Figs. 1-01; 1-02) contains the (1) HYOID BONE (Fig. 1-03), (2) SUPRAHYOID REGION (Figs. 1-04, 1-05), (3) THYROID GLAND (Fig 1-06), (4) INFRAHYOID REGION (Figs. 1-07, 1-08, 1-09, 1-10), (5) SUBMANDIBULAR REGION (Figs. 1-10, 1-11), (6) CAROTID TRIANGLE (Figs 1-10, 1-12, 1-13, 1-14, 1-15), and (7) LARYNX (Figs. 1-16, 1-17).

The DEEP ANTERIOR NECK (Fig. 1-18, 1-19, 1-20, 1-21) contains the (1) INTERNAL JUGULAR VEIN; (2) BRACHIOCEPHALIC, SUBCLAVIAN and CAROTID ARTERIES; 3) VAGUS, HYPOGLOSSAL, and LINGUAL NERVES; (4) cervical portion of the SYMPATHETIC TRUNK; (5) DEEP ANTERIOR CERVICAL MUSCLES

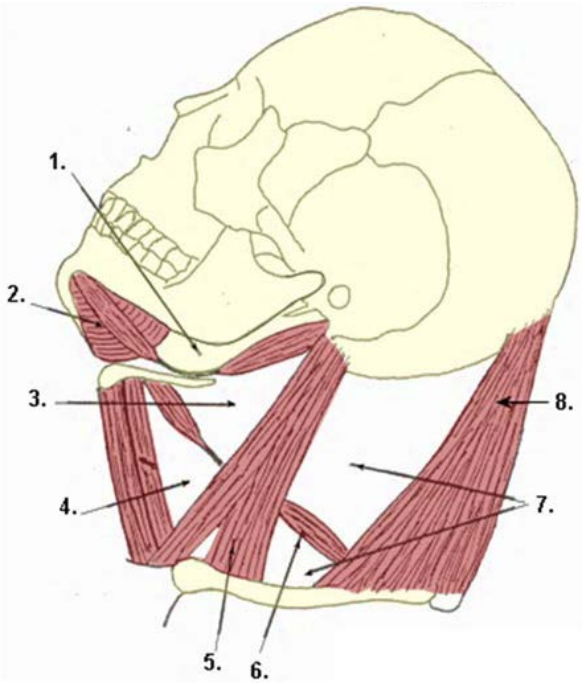


Fig. 1-01. Neck: Diagram showing boundaries of the neck. 1. submandibular region, 2. suprahyoid region, 3. carotid region, 4. infrahyoid region, 5. sternocleidomastoid, 6. inferior belly of omohyoid, 7. posterior cervical triangle, and 8. trapezius.

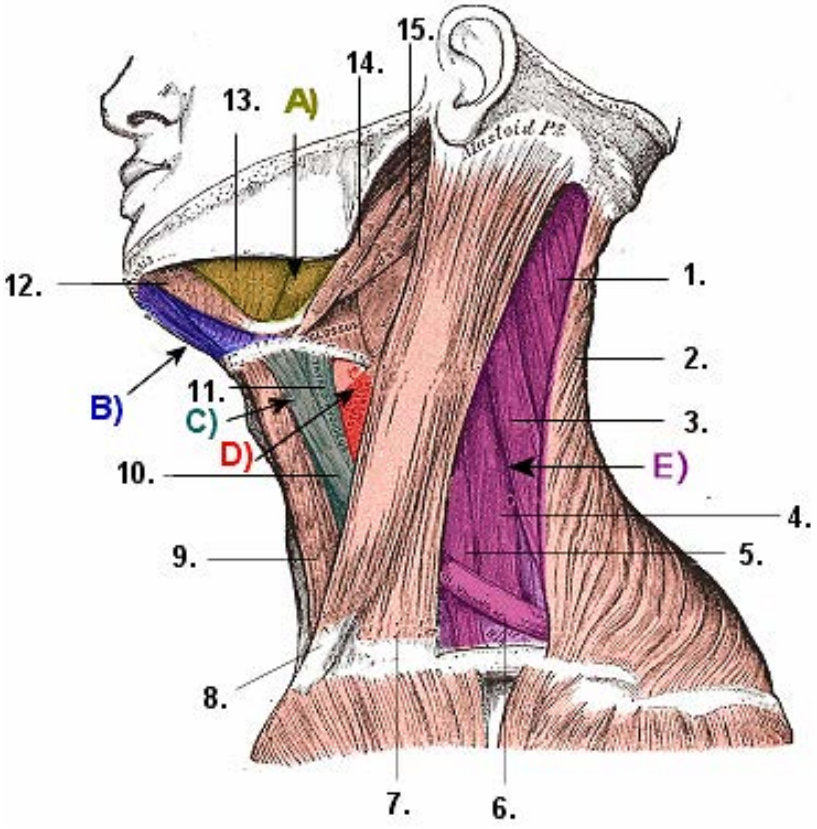


Fig. 1-02. Neck: Drawing of the superficial anterior neck, showing the regions and muscles of this area. A) Submandibular region, B) Suprahyoid region, C) Infrahyoid region, D) Carotid region and E) Posterior cervical triangle. Muscles: 1. Splenius capitis, 2. Trapezius, 3. Levator scapulae, 4. Scalenus medius, 5. Scalenus anterior, 6. Inferior belly of omohyoid, 7. Sternocleidomastoid, clavicular head, and 8. Sternal head, 9. Sternohyoid, 10. Superior belly of omohyoid, 11. Thyrohyoid, 12. Anterior belly of digastric, 13. Mylohyoid, 14. Stylohyoid, and 15. Posterior belly of digastric. (Modified from Gray 1918)

1.2 SUPERFICIAL ANTERIOR NECK

1.2.1 HYOID BONE

The hyoid bone is "U" – shaped (Fig. 1-03). The thick anterior portion is the BODY. The sides curve posteriorly and are called the GREATER HORNS (cornua). The small LESSER HORNS (cornua) arise from the upper lateral margins of the body. The hyoid is suspended in the anterior neck just superior to the THYROID CARTILAGE of the larynx. It is connected to the thyroid cartilage by the THYROHYOID MEMBRANE and the MEDIAN and LATERAL THYROHYOID LIGAMENTS (Figs. 1-06, 1-15) The body and horns of the hyoid also provide attachment sites for the muscles of the suprahyoid and infrahyoid region and for the extrinsic muscles of the tongue.

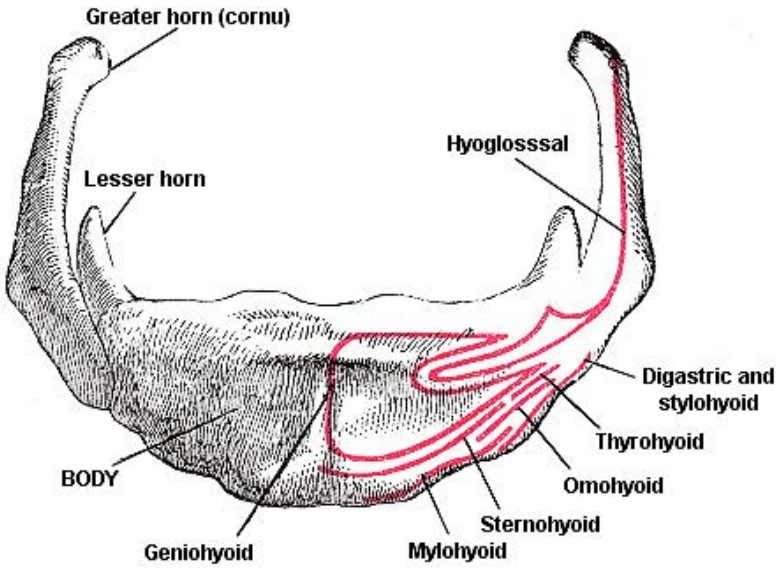


Fig. 1-03. Neck: Drawing of the superior aspect of the hyoid bone showing muscle attachment sites.

1.2.2 SUPRAHYOID REGION

The triangular suprahyoid region lies posterior and inferior to the chin (Figs. 1-01; 1-02). Its base is formed by the hyoid bone and its sides the ANTERIOR BELLIES of the DIGASTRIC. Inferiorly, this region is covered by skin and cervical fascia. Superiorly, it is separated from the oral cavity by the MYLOHYOID MUSCLE. Lying deep to the mylohyoid muscle is the SUBLINGUAL SALIVARY GLAND and the GENIOHYOID muscle.

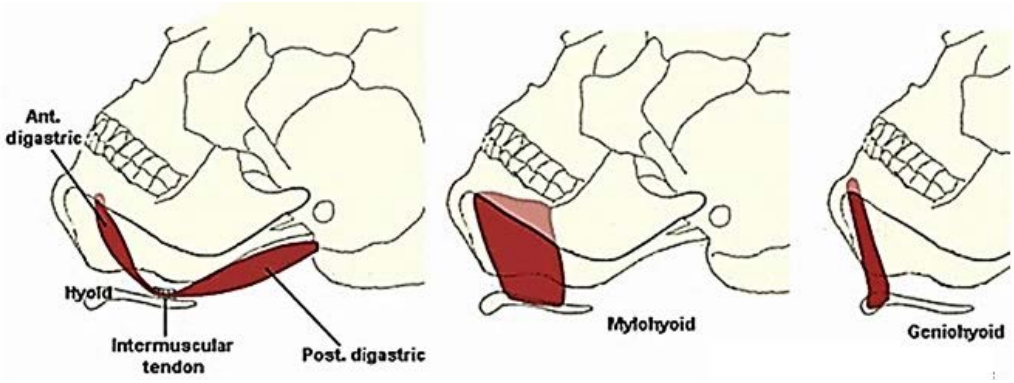


Fig. 1-04. Neck: Diagram of the anterior and posterior bellies of the digastric, mylohyoid, and geniohyoid showing their attachment sites

Muscles in the Suprahyoid Region

1. ANTERIOR BELLY OF THE DIGASTRIC (Figs.1-02, 1-03, 1-04, 1-05)
   - Anterior attachment (origin): Lower anterior internal mandible (digastric fossa).
   - Posterior attachment (insertion): Intermuscular tendon of digastrics posterior belly; body and greater horn of the hyoid by a fascial sling around the intermuscular tendon.
   - Nerve: Mylohyoid nerve from the inferior alveolar nerve off the mandibular division of the trigeminal.
   - Action: Depression and retraction the mandible; elevation and stabilization of the hyoid bone

2. MYLOHYOID (Figs.1-02, 1-03, 1-04, 1-05)
   - Lateral attachment (origin): Lower internal mandible along the mylohyoid line.
   - Medial attachment (insertion): Superior body of the hyoid; median intramuscular raphe with the opposite side mylohyoid.
   - Nerve: Mylohyoid nerve from the inferior alveolar nerve off the mandibular division of the trigeminal.
   - Action: Elevation of the hyoid, floor of the mouth and tongue.

3. GENIOHYOID (Figs. 1-03, 1-04, 1-16)
   - Anterior attachment (origin): Inferior mental spine on the oral anterior tip of the mandible.
   - Posterior attachment (insertion): Body of the hyoid bone.
   - Nerve: C1 through hypoglossal nerve
   - Action: Elevation and protrusion of the hyoid; elevation of the larynx; depression of the mandible.

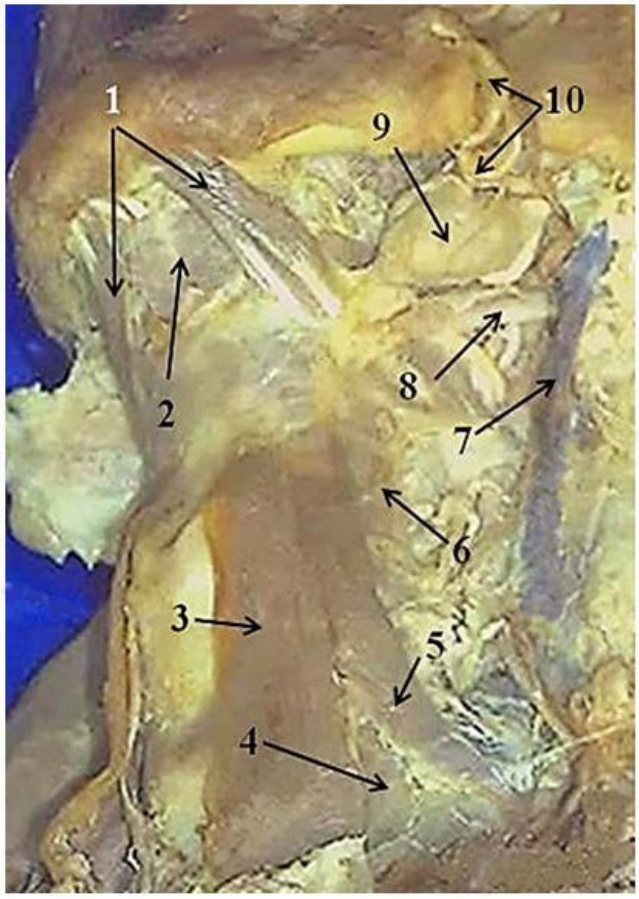


Fig. 1-05. Neck: Dissection of suprahyoid region and anterior neck. 1. Anterior digastric, 2. Mylohyoid, 3.Sternohyoid, 4. Sternothyroid, 5. Omohyoid, 6. Thyrohyoid, 7. Internal jugular vein, 8. Posterior digastric tendon, 9. Submandibular gland, 10. Facial artery.

1.2.3 INFRAHYOID REGION

This region is bordered by the HYOID BONE superiorly and by the STERNUM inferiorly (Figs. 1-01, 1-02, 1-03). Its sides are formed by the superior belly of the OMOHYOID muscle superiorly and the STERNOCLEIDOMASTOID muscle inferiorly. The infrahyoid region contains the THYROID (Fig. 1-06) and PARATHYROID GLANDS. The thyroid

gland lies superficial to the thyroid cartilage and consists of two lobes that are attached centrally by the isthmus. Embedded within the lobes of the thyroid gland are the four small parathyroid glands. A parathyroid gland lies in the superior and the inferior part of each lobe of the thyroid.

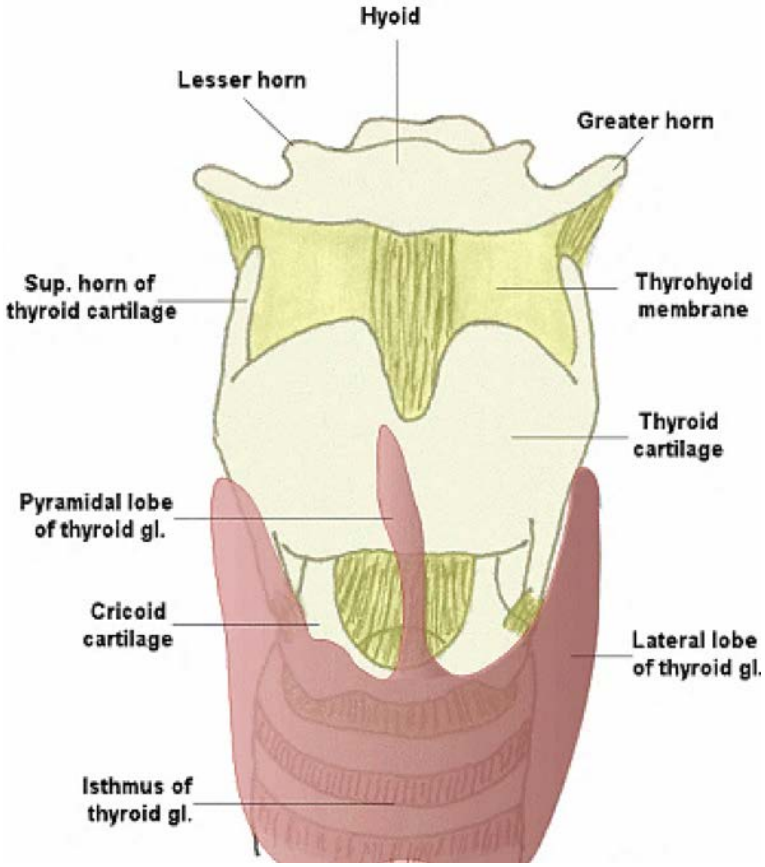


Fig. 1-06. Neck: Thyroid Gland

The infrahyoid region also contains three pairs of muscles interconnecting the hyoid bone, thyroid cartilage, and sternum. These INFRAHYOID MUSCLES (Figs.1-07, 1-08, 1-09, 1-10) are innervated by nerve fibers from the ANSA CERVICALIS (Figs. 1-08, 1-09, 1-11), which lies on the surface of the internal jugular vein. The ansa cervicalis is a nerve loop that is formed by union of the DESCENDING HYPOGLOSSAL NERVE and the DESCENDING CERVICAL NERVE. The descending hypoglossal nerve carries nerve fibers from C1. These fibers run with the HYPOGLOSSAL NERVE but near the division of the common carotid artery they separate from the hypoglossal nerve and travel inferiorly as the descending hypoglossal nerve. The descending cervical nerve contains nerve fibers from C2 and C3.

Muscles in the Infrahyoid Region

1. STERNOHYOID (Figs.1-02, 1-03, 1-07, 1-08, 1-10)
   - Inferior attachment (origin): Medial end of the clavicle and manubrium of the sternum.
   - Superior attachment (insertion): Body of the hyoid.
   - Nerve: ansa cervicalis.
   - Segmental innervation: **C1, C2**, **C3**
   - Actions: Depression of the hyoid; assists in depression of the lower jaw.

2. STERNOTHYROID (Fig. 1-07, 1-08, 1-10)
   - Inferior attachment (origin): Posterior aspect of the manubrium of the sternum.
   - Superior attachment (insertion): External surface of the thyroid cartilage along the oblique line.
   - Nerve: ansa cervicalis.
   - Segmental innervation: (C1), **C2, C3**
   - Action: Depression of the thyroid cartilage and hyoid bone.

3. THYROHYOID (Figs. 1-02, 1-03, 1-07, 1-10)
   - Inferior attachment (origin): External surface of the thyroid cartilage along the oblique line, superior to attachment of the sternothyroid.
   - Superior attachment (insertion): Inferior body and greater horn of the hyoid.
   - Nerve: ansa cervicalis
   - Segmental innervation**: C1**
   - Actions: Depression of the hyoid; elevation of the thyroid cartilage.

4. OMOHYOID (Figs 1-02, 1-03, 1-07, 1-08)
   - Inferior attachment (origin):
     - INFERIOR BELLY: suprascapular notch of the scapula;
     - SUPERIOR BELLY: intermuscular tendon connecting the superior and inferior bellies, superior clavicle via a fascial sling around the intermuscular tendon.
   - Superior attachment (insertion):
     - INFERIOR BELLY: intermuscular tendon connecting the superior and inferior bellies, superior clavicle via a fascial sling around the intermuscular tendon
     - SUPERIOR BELLY: body of the hyoid.
   - Nerve: ansa cervicalis.
   - Segmental innervation**: C1, C2, C3**
   - Actions: Depression and stabilization of the hyoid.

5. STERNOCLEIDOMASTOID (Figs.1-02, 1-07, 1-08, 1-10)
   - Inferior attachment (origin):
     - STERNAL HEAD: anterior manubrium of the sternum;
     - CLAVICULAR HEAD: superior medial clavicle.
   - Superior attachment (insertion): Mastoid process and lateral half of the superior occipital nuchal line.
   - Nerve: Spinal accessory nerve; C2 and C3 spinal nerves.
   - Segmental innervation: **C2, C3**.
   - Actions: Tilts head laterally to the ipsilateral side with concurrent rotation of the head to the contralateral side and extension so that the chin points upward and away (unilateral); extension of the head (bilateral); protrusion of the head (bilateral); flexion of the cervical spine (bilateral); elevation of the sternum (bilateral).

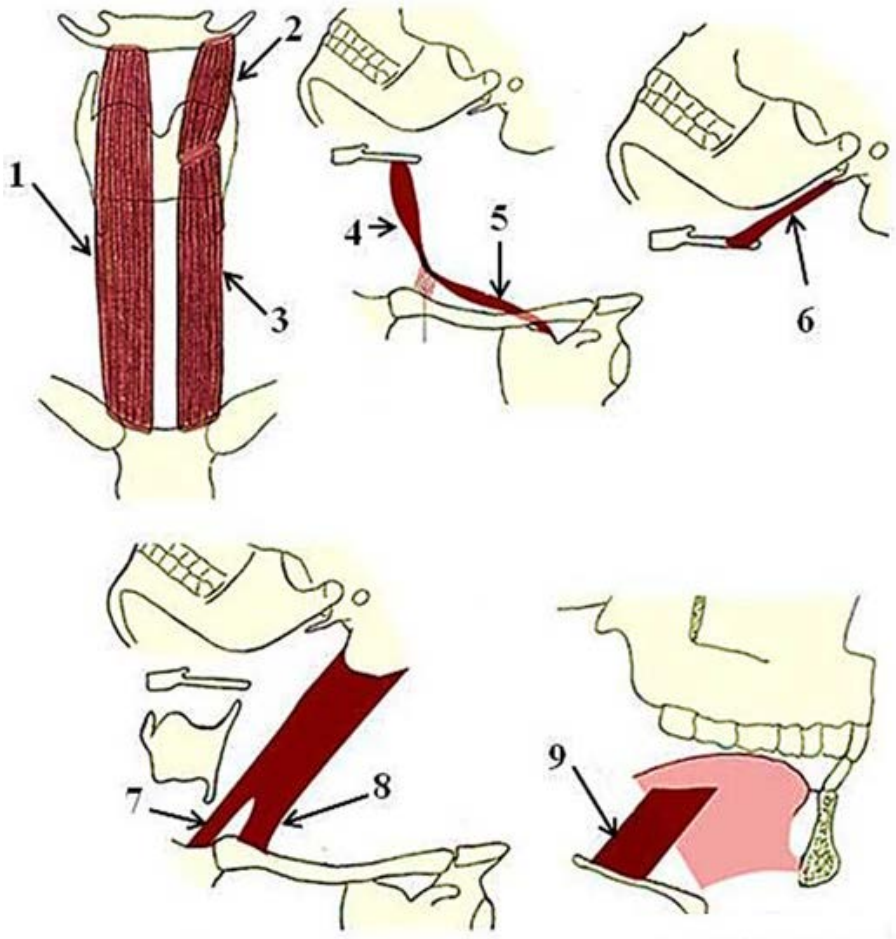


Fig. 1-07. Neck: Diagram of the 1. Sternohyoid, 2. Thyrohyoid, 3. Sternothyroid, 4. Superior belly of omohyoid, 5. Inferior belly of omohyoid, 6. Stylohyoid 7. Sternal head of sternocleidomastoid, 8. Clavicular head of sternocleidomastoid, and 9. Hyoglossus muscles showing the attachment sites.

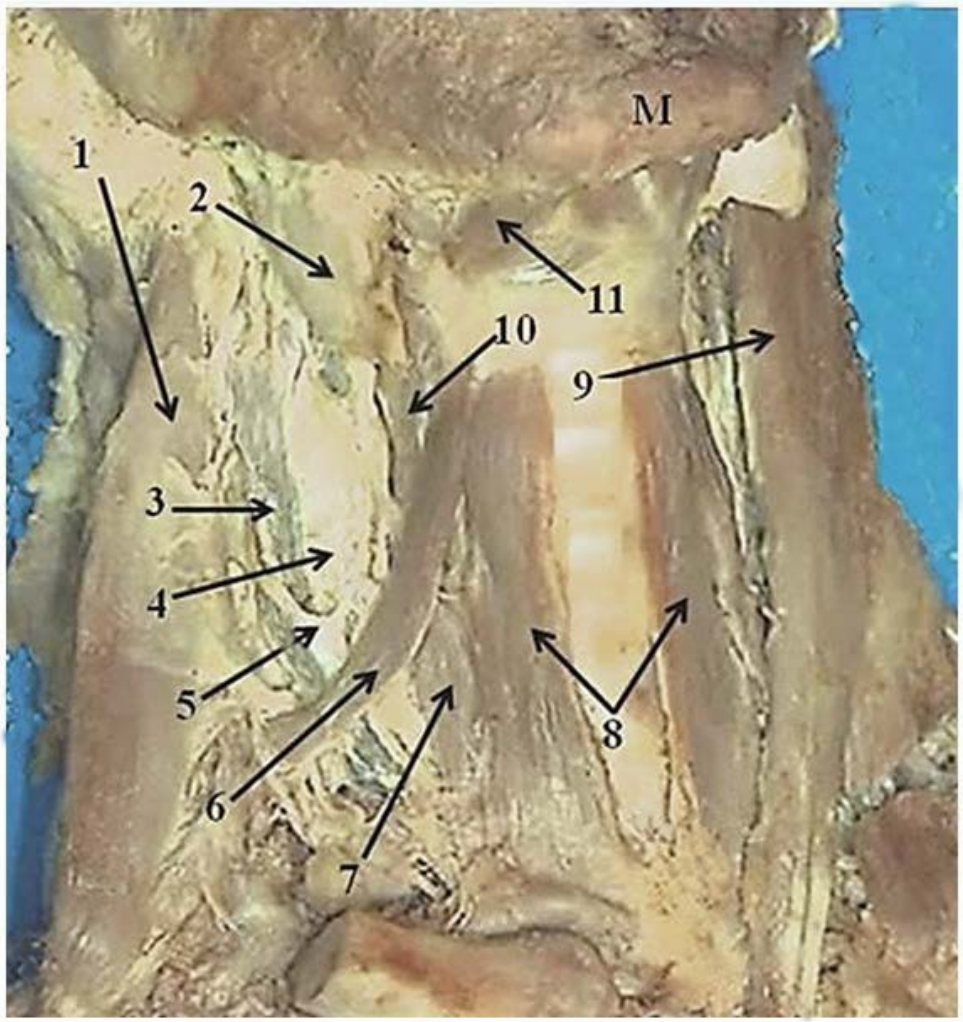


Fig 1-08. Neck: Dissection of infrahyoid and carotid regions. 1. sternocleidomastoid, 2. Submandibular gland, 3. Internal jugular vein, 4. Common carotid artery, 5. Ansa cervicalis, 6. Omohyoid, 7. Sternohyoid, 8. Sternohyoid, 9. Sternocleidomastoid, 10, Thyrohyoid, 11. Mylohyoid. M = Mandible.

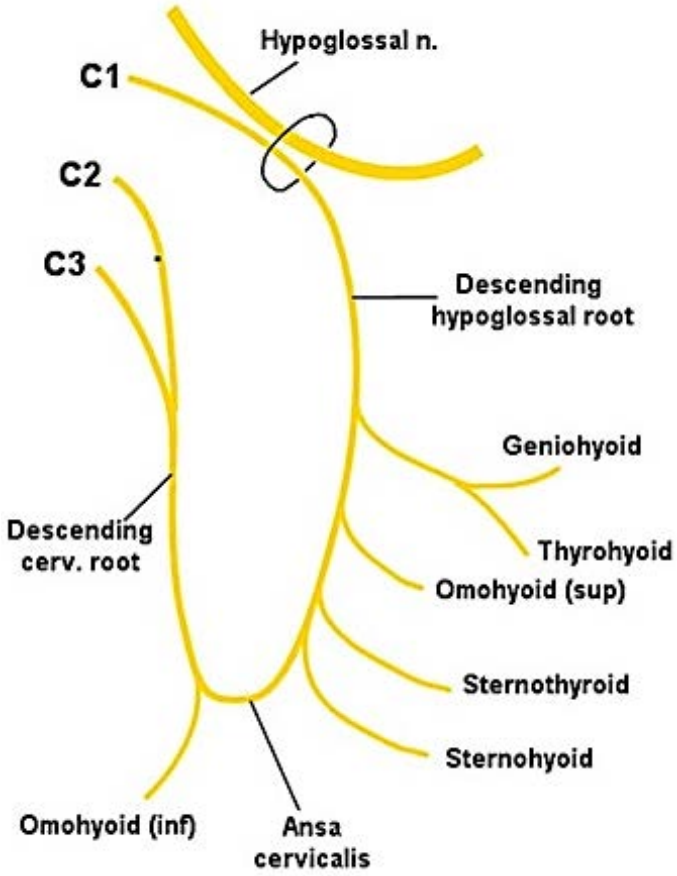


Fig. 1-09. Neck: Diagram showing the ansa cervicalis and its innervations of the infrahyoid muscles.

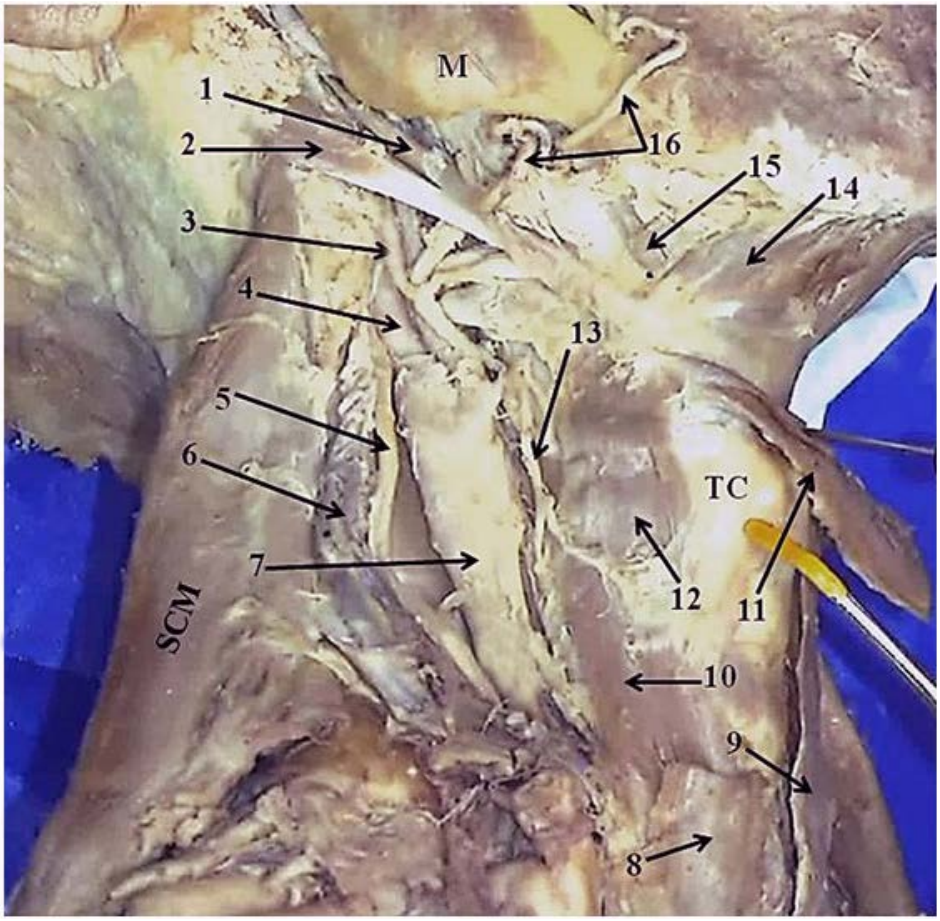


Fig 1-10. Neck: Dissection of anterior neck showing structures in the submandibular, carotid and infrahyoid regions. 1. Stylohyoid, 2. Posterior digastric, 3. Hypoglossal nerve, 4. Internal carotid artery, 5. Vagus (X) nerve, 6. Internal jugular vein, 7. Common carotid artery, 8. Sternohyoid (cut), 9. Sternohyoid, 10. Sternothyroid, 11. Omohyoid (cut and reflected), 12. Thyrohyoid, 13. Superior thyroid artery, 14. Anterior digastrics, 15. Mylohyoid, 16. Facial artery. M= Mandible, SCM = Sternocleidomastoid.

1.2.4 SUBMANDIBULAR TRIANGLE

This triangle is bound by the inferior body of the MANDIBLE superiorly, the ANTERIOR DIGASTRIC anteriorly, and the POSTERIOR DIGASTRIC and STYLOHYOID posteriorly (Figs. 1-01, 1-02, 1-10, 1-11). Its muscular floor (medial boundary) is formed by the MYLOHYOID, HYOGLOSSUS, and MIDDLE PHARNGEAL CONSTRICTOR. The submandibular region contains the (1) SUBMANDIBULAR SALIVARY GLAND, (2) HYPOGLOSSAL NERVE to the muscles of the tongue, (3) MYLOHYOID NERVE to the mylohyoid muscle and anterior belly of the digastric, (4) LINGUAL NERVE for general sensation to the tongue, (5) LINGUAL ARTERY from the external carotid artery to the tongue, (6) FACIAL ARTERY from the external carotid artery to the face, (7) LINGUAL VEIN from the tongue which drains into the internal jugular vein, and (8) FACIAL VEIN from the superficial face which drains into the internal jugular vein.

Muscles in the Submandibular Region

1. ANTERIOR BELLY OF THE DIGASTRIC (Figs. 1-02, 1-03, 1-04, 1-05, 1-12, 1-11)
2. POSTERIOR BELLY OF THE DIGASTRIC (Figs 1-02, 1-04, 1-10, 1-11, 1-14)
   - Posterior attachment (origin): Mastoid notch medial to the temporal mastoid process.
   - Anterior attachment (insertion): Intermuscular tendon to the anterior belly of the digastric; body and greater horn of the hyoid by a fascial sling around the intermuscular tendon.
   - Nerve: Posterior auricular branch of the facial nerve.
   - Actions: Depression and retraction of the mandible with the anterior digastric; retraction, elevation and stabilization of the hyoid.

3. MYLOHYOID (Figs. 1-02, 1-03, 1-04, 1-05, 1-10)
4. HYOGLOSSUS (Fig. 1-07, 1-11, 1-14)
   - Inferior attachment (origin): Superior body and greater horn of the hyoid bone.
   - Superior attachment (insertion): Inferior surface of the side of the tongue.

- Nerve: Hypoglossal nerve.
- Actions: Depression and retraction of the tongue.

5. MIDDLE PHARNGEAL CONSTRICTOR (Fig. 2-36).
6. STYLOHYOID (Figs.1-02, 1-03, 1-04, 1-07, 1-10, 1-11, 1-14)
   - Superior attachment (origin): Styloid process of the temporal bone.
   - Inferior attachment (insertion): Superior body of the hyoid.
   - Nerve: Cervical branch of the facial nerve.
   - Actions: Retraction and elevation of the hyoid.

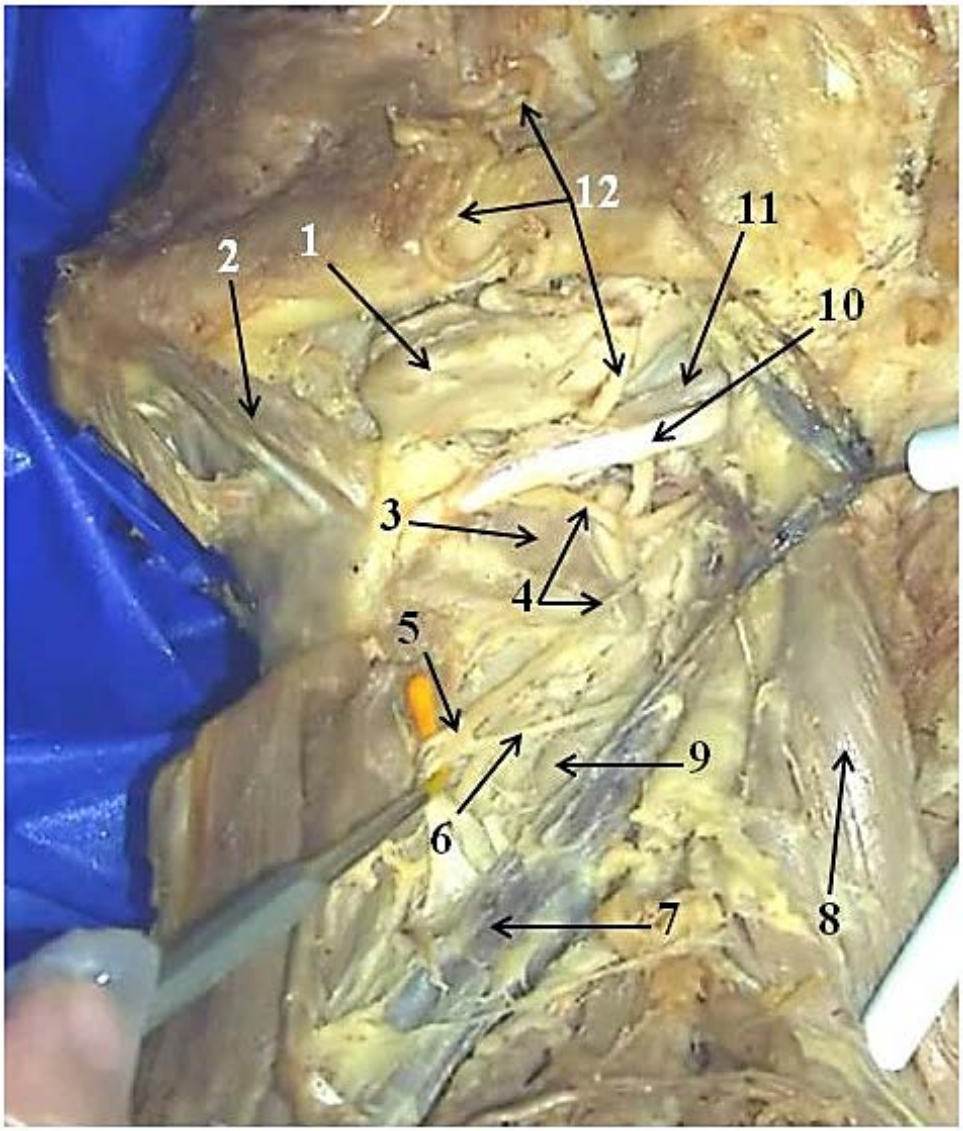


Fig 1-11. Neck: Dissection of the submandibular region and carotid regions. 1. Submandibular gland, 2. Anterior digastric, 3. Hyoglossus, 4. Hypoglossal and descending hypoglossal nerves, 5. Ansa cervicalis, 6. Descending cervical nerve, 7. Internal jugular vein, 8. Sternocleidomastoid, 9. Common carotid artery, 10. Posterior digastric tendon, 11. Stylohyoid, 12. Facial artery.

I. Study questions:

1) Damage to the inferior alveolar nerve would affect which anterior neck muscles and what actions?
2) What forms the ansa cervicalis?
3) What muscles of the infrahyoid region would be affected by damage to the ansa cervicalis? What movement of the hyoid bone would be primarily affected?
4) What muscles form and lie in the submandibular triangle?
5) Trauma to the area of the submandibular triangle would affect which nerves and arteries? What areas would each of the nerves and arteries affect?

1.2.5 CAROTID TRIANGLE

The carotid triangle is bound by the POSTERIOR DIGASTRIC superiorly, the superior belly of the OMOHYOID inferiorly, and the STERNOCLEIDOMASTOID muscle posteriorly (Figs.1-01, 1-02, 1-08, 1-10,1-11, 1-14, 1-15). It contains the (1) COMMON CAROTID ARTERY, (2) EXTERNAL CAROTID ARTERY, (3) INTERNAL CAROTID ARTERY, (4) INTERNAL JUGULAR VEIN, (5) RETROMANDIBULAR VEIN, (6) VAGUS NERVE, and (7) ANSA CERVICALIS. The common carotid artery, internal jugular vein and vagus nerve run together in the neck. This neurovascular bundle is wrapped by a fibrous covering called the CAROTID SHEATH.

The COMMON CAROTID ARTERY (Figs. 1-08, 1-10, 1-12, 1-13, 1-14, 1-15) arises from the BRACHIOCEPHALIC ARTERY on the right and from the arch of the aorta on the left. It divides into the INTERNAL CAROTID ARTERY (Figs. 1-10, 1-12, 1-13, 1-14, 1-15) which is a major source of blood to the brain, and the EXTERNAL CAROTID ARTERY (Figs, 1-12, 1-13, 1-14, 1-15) which branches extensively in the neck, face and oral cavity regions. At the bifurcation of the common carotid are the CAROTID BODY and CAROTID SINUS. The carotid body has chemoreceptors that sense increases in arterial CO_2 and decreases in arterial oxygen. The carotid sinus has pressure receptors that monitor arterial blood pressure.

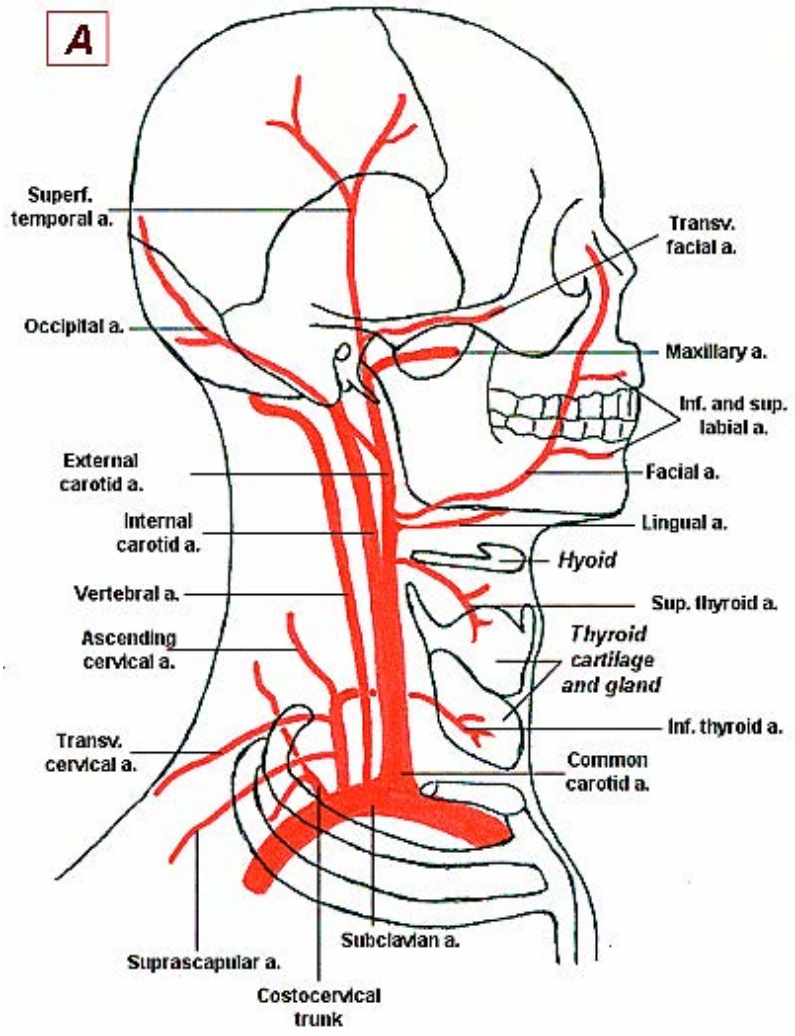


Fig. 1-12. Neck: (A) Drawing of the common carotid and subclavian arteries and branches.

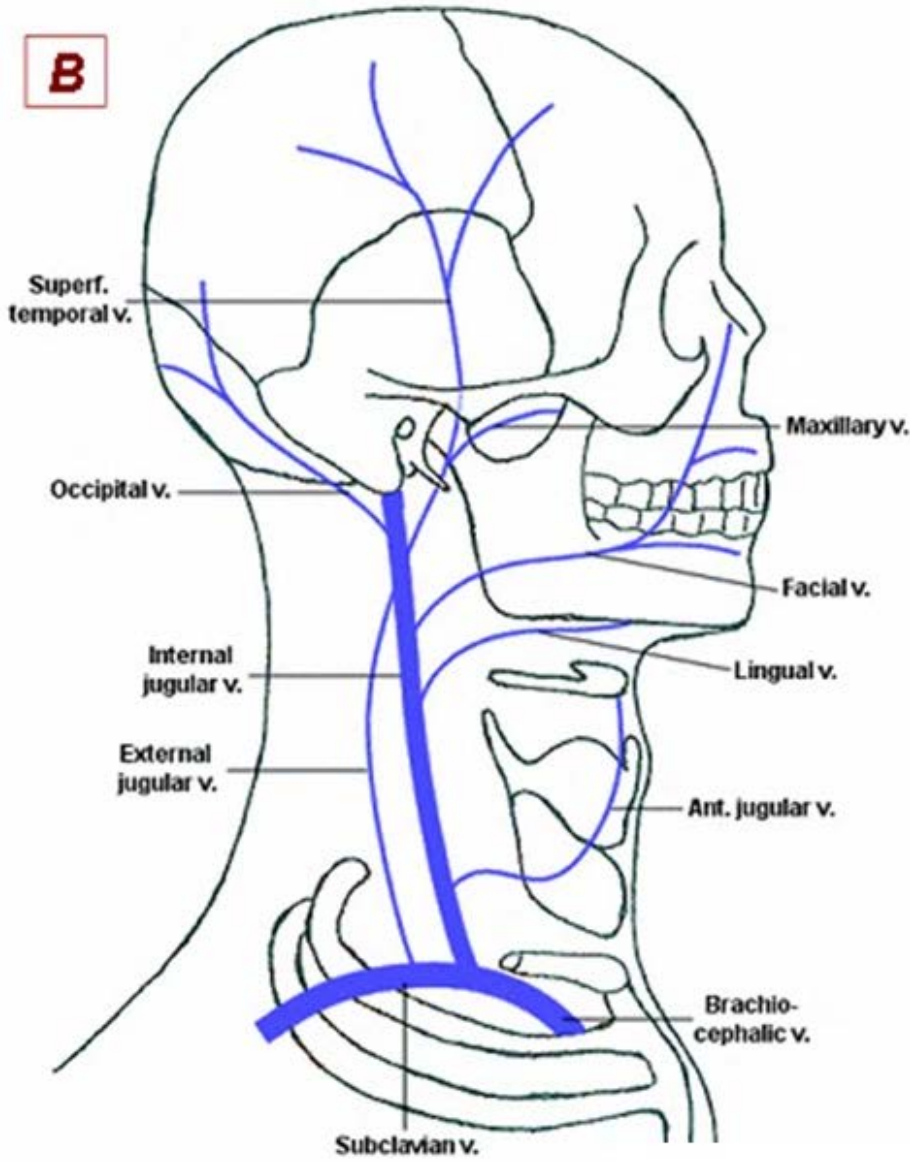


Fig. 1-12. Neck: (B) Drawing of the major veins of the neck and head.

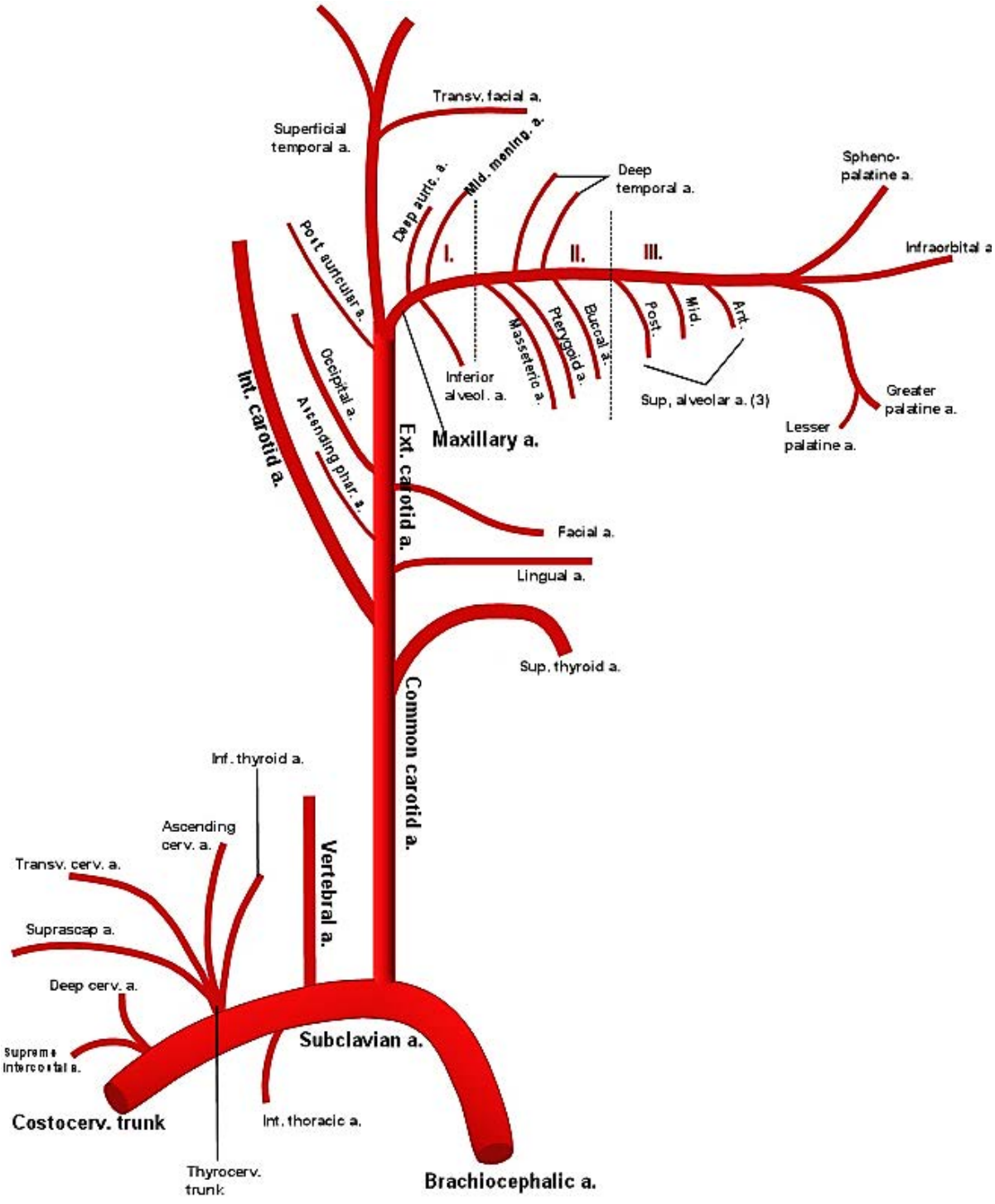


Fig. 1-13. Neck: Diagram of the blood supply to the neck and head

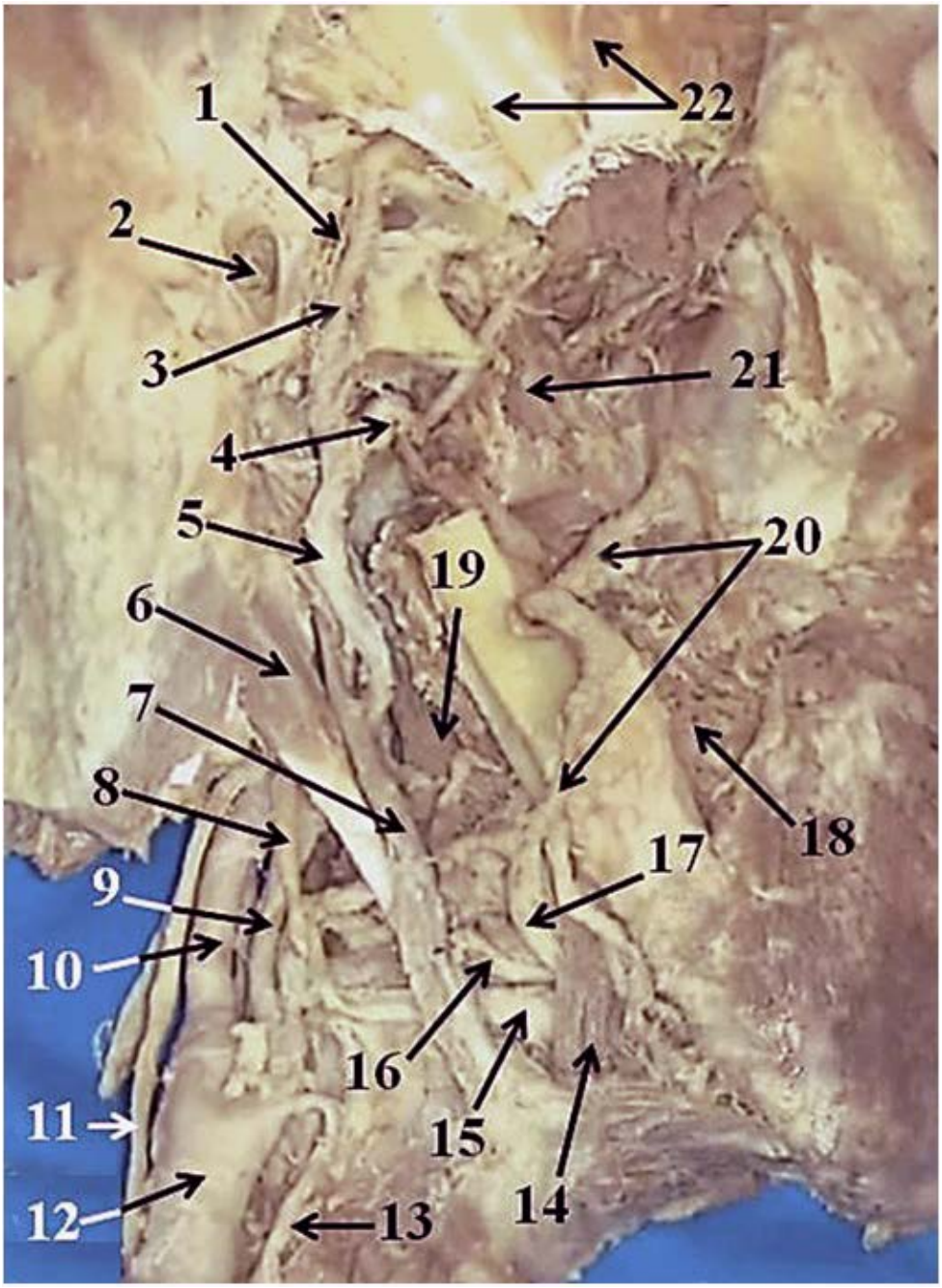


Fig 1-14. Neck: Dissection of the lateral neck, submandibular, jaw and infratemporal fossa regions. 1. Auriculotemporal nerve, 2. External auditory meatus, 3. Superficial temporal artery, 4. Maxillary artery, 5. External carotid artery, 6. Posterior digastric, 7. Stylohyoid, 8. Hypoglossal (XII) nerve, 9. External carotid artery, 10. Internal carotid artery, 11. Vagus (X) nerve, 12. Common carotid artery, 13. Superior thyroid artery, 14.Mylohyoid, 15. Hypoglossal nerve, 16. Duct of submandibular gland, 17. Lingual nerve, 18. Buccinators, 19. Styloglossus inferior to medial pterygoid, 20. Facial artery, 21. Lateral pterygoid, 22. Temporalis tendon and muscle.

The EXTERNAL CAROTID ARTERY (Figs. 1-12, 1-13, 1-14, 1-15) gives off the (1) SUPERIOR THYROID ARTERY to the thyroid gland and larynx; (2) small ACENDING PHARYNGEAL ARTERY to the pharynx and deep anterior cervical muscles, (3) LINGUAL

ARTERY to the tongue; (4) FACIAL ARTERY to the face; (5) OCCIPITAL ARTERY to the posterior scalp; (6) small POSTERIOR AURICULAR ARTERY to the ear and parotid gland; (7) MAXILLARY ARTERY to the masticatory muscles, face, meninges covering the brain, and oral cavity; and (8) SUPERFICIAL TEMPORAL ARTERY to the side of the head and face.

The INTERNAL JUGULAR VEIN lies deep to the sternocleidomastoid and joins the SUBCLAVIAN VEIN from the arm to form the BRACHIOCEPHALIC VEIN (Figs. 1-05, 1-08, 1-11, 1-12,). The right and left brachiocephalic veins unite to form the SUPERIOR VENA CAVA. Blood from the VENOUS SINUSES of the brain, FACIAL VEIN, LINGUAL VEIN, and the SUPERIOR, MIDDLE, and INFERIOR THYROID VEINS drain into the internal jugular vein.

The VAGUS NERVE (X cranial nerve, Figs. 1-10, 1-14, 1-16, 1-19) runs with the internal jugular vein and common carotid artery in the carotid sheath. It contains preganglionic parasympathetic visceral motor fibers to the muscles of the larynx through the RECURRENT LARYNGEAL NERVE and EXTERNAL LARYNGEAL NERVE, general visceral sensory fibers from the larynx by the INTERNAL LARYNGEAL NERVE (Fig. 1-16) as well as visceral sensory from the carotid body and sinus. The vagus nerve then continues to run inferiorly into the thorax and abdomen to provide parasympathetic innervation to the viscera in these regions.

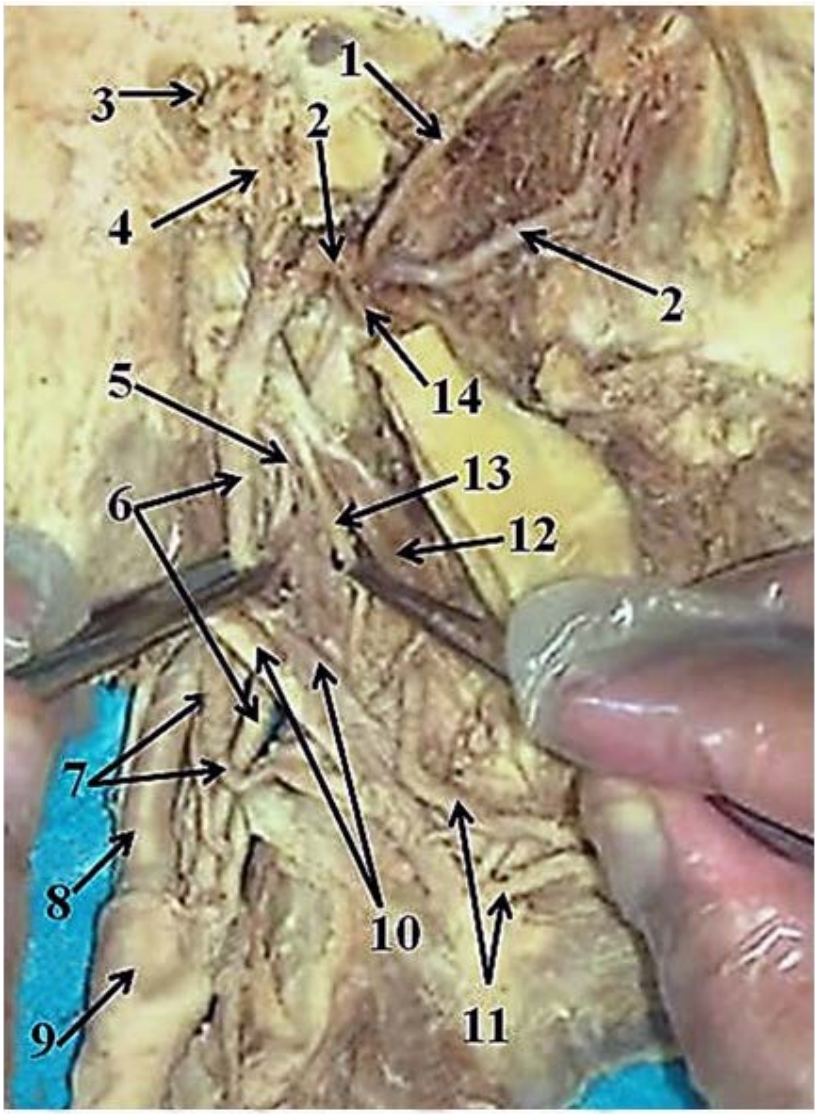


Fig. 1-15. Neck: Dissection of the lateral neck, submandibular, jaw and infratemporal fossa regions showing branches off the carotid and maxillary arteries and the location of the glossopharyngeal (IX) nerve. 1. Deep temporal artery, 2. Maxillary artery, 3. External auditory meatus, 4. Superficial temporal artery, 5. Occipital artery, 6. External carotid artery retracted, 7. Hypoglossal nerve, 8. Internal carotid artery, 9. Common carotid artery, 10. Tendon of posterior digastric and stylohyoid, 11. Facial artery and submental branch, 12. Styloglossus, 13. Glossopharyngeal (IX) nerve, 14. Inferior alveolar artery.

II. Study questions:

1) Name the branches off the internal carotid artery in the neck.
2) Name the branches off the external carotid artery in the neck.
3) What two structures run with the common carotid artery in the neck?
4) What are two motor and sensory nerves arising from the vagus nerve in the carotid triangle?

1.2.6 LARYNGEAL REGION

The LARYNX (Fig. 1-16) is made up of a cartilaginous skeleton. It is attached superiorly to the hyoid bone by the THYROHYOID MEMBRANE and MEDIAN THYROHYOID LIGAMENT and inferiorly to the trachea by the CRICOTRACHEAL LIGAMENT. This cartilaginous skeleton is formed mainly by THYROID CARTILAGE, CRICOID CARTILAGE, and ARYTENOID CARTILAGE (Figs. 1-16, 1-17). There are also small corniculate and cuneiform cartilages that attach to the arytenoid cartilages.

The THYROID CARTILAGE is the largest of the laryngeal cartilages (Figs. 1-16, 1-17). It is C-shaped with the opening facing posteriorly. Lying at the ends of its posterior border, the thyroid cartilage has a slender superior and inferior horn on each side. Each superior horn of the thyroid cartilage is connected to the greater horn of the hyoid by a LATERAL THYROHYOID LIGAMENT. Each inferior horn is attached to the cricoid cartilage by a LATERAL CRICOTHYROID LIGAMENT (Fig. 1-16).

The CRICOID CARTILAGE is a circular ring of cartilage that is narrow anteriorly but wide posteriorly (Figs. 1-16, 1-17). Anteriorly, it attaches to the body of the thyroid cartilage by the MEDIAN CRICOTHYROID LIGAMENT. Posteriorly, it attaches to the inferior horn of the thyroid by the LATERAL CRICOTHYOID LIGAMENT and to the arytenoid cartilages.

The paired triangular ARYTENOID CARTILAGES lie superior to the posterior border of the cricoid cartilage and are attached to cricoid cartilage by the POSTERIOR CRICOARYTENOID LIGAMENT (Fig. 1-16). Each arytenoid cartilage has an anterior VOCAL PROCESS for the attachment of the vocal ligament and vocalis muscle, and a posterior MUSCULAR PROCESS for the attachment of the posterior and lateral cricoarytenoid muscles.

Internally, the passageway through the larynx is crossed by a pair of VOCAL FOLDS (Figs. 1-16, 1-17). Each fold contains the VOCAL LIGAMENT which attaches anteriorly to the thyroid cartilage and posteriorly to the arytenoid cartilages. Each fold also contains the VOCALIS MUSCLE which lies in parallel and adjacent to the vocal ligament (Figs, 1-16, 1-17). The space the between the two vocal folds is called the RIMA GLOTTIS.

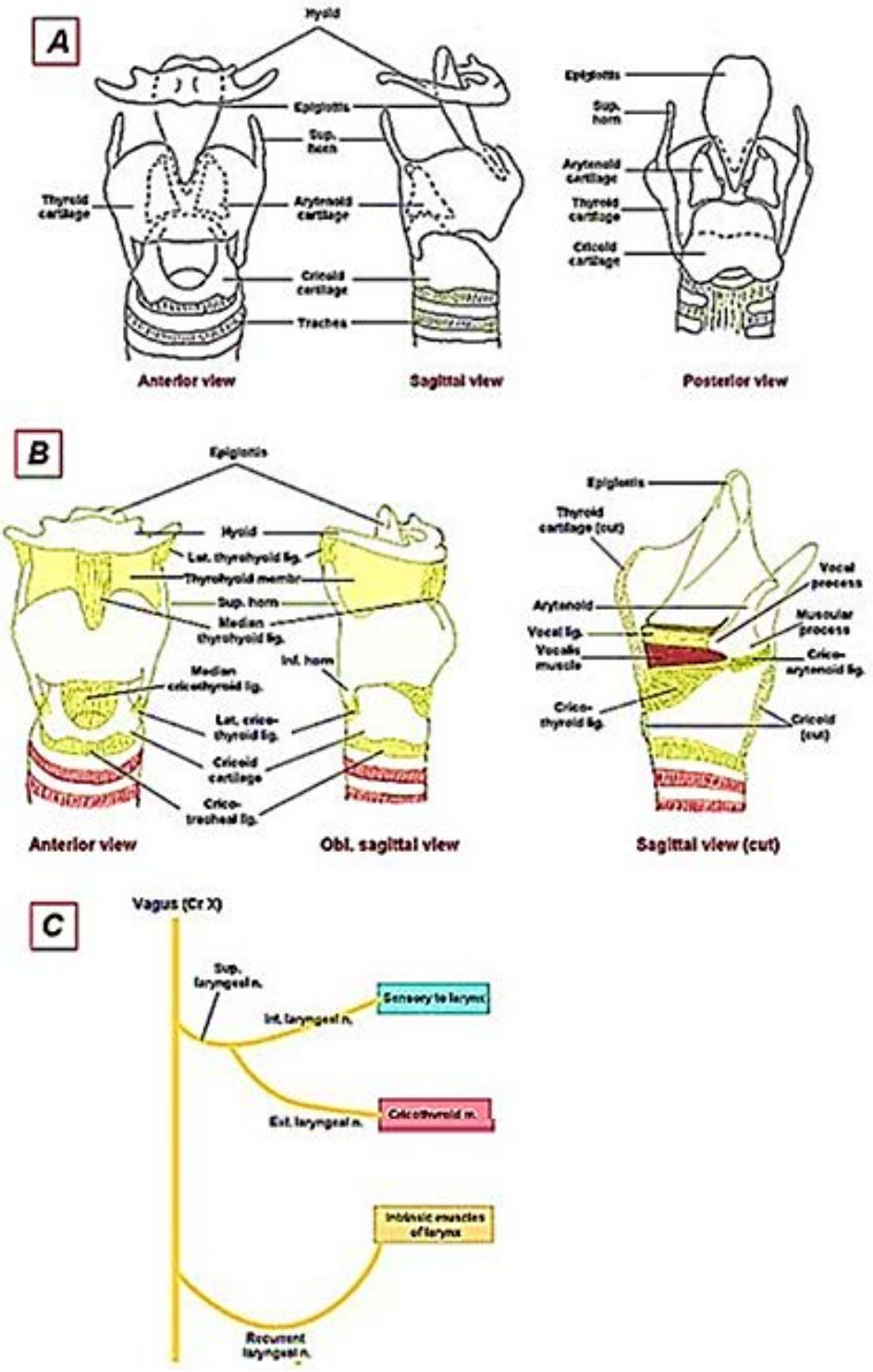
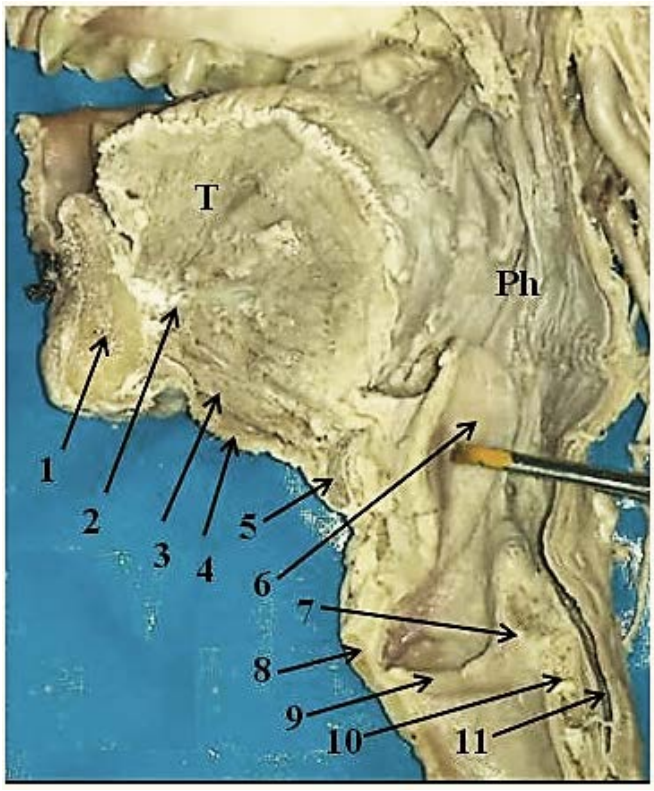


Fig. 1-16: Drawings of larynx (A) in anterior and posterior views, (B) drawing showing the ligaments in anterior and sagittal view and the vocal ligament and vocalis muscle, and (C) drawing showing the motor and sensory innervations of the larynx.



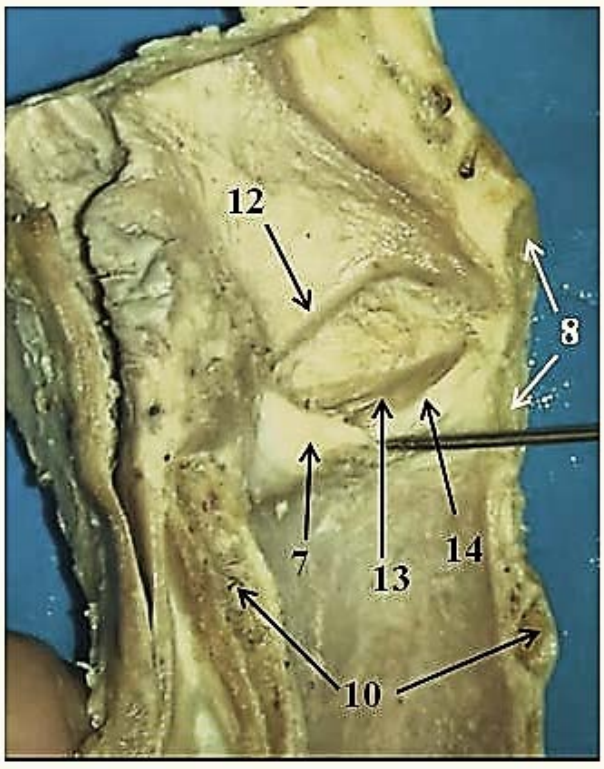


Fig. 1-17. Neck: Sagittal dissections showing the tongue, pharynx and larynx. 1. Mandibular symphysis, 2. Genioglossus, 3. Geniohyoid, 4. Mylohyoid, 5. Body of hyoid bone, 6. Epiglottis, 7. Arytenoids cartilage, 8. Thyroid cartilage, 9. Vocal fold (true), 10. Cricoid cartilage, 11. Esophagus, 12. False vocal folds, 13. Vocalis muscle, 14. Vocal ligament, T = Tongue, Ph = Oral pharynx.

Muscles of the Larynx (Fig. 1-18)

The muscles of the larynx can be divided into EXTRINSIC MUSCLES that move the entire laryngeal complex and INTRINSIC MUSCLES that change the tension on the vocal folds, and change the size and shape of the rima glottis.

The EXTRINSIC MUSCLES that depress the entire larynx are the (1) omohyoid, (2) sternohyoid, and (3) the sternothyroid. Those muscles that elevate the larynx are the (1) stylohyoid, (2) anterior and posterior digastrics, (3) mylohyoid, and (4) geniohyoid.

The INTRINSIC LARYNGEAL MUSCLES are (1) the POSTERIOR CRICOARYTENOID which abducts the vocal folds, (2) the LATERAL CRICOARYTENOID which adducts the vocal folds, (3) the TRANSVERSE and OBLIQUE ARYTENOIDS which close the laryngeal opening, (4) the THYROARYTENOID which relaxes the vocal folds, (5) the VOCALIS which makes fine adjustments in the tension of the vocal ligament, and (6) the CRICOTHYROID which tenses the vocal ligament. All of the intrinsic muscles of the larynx are innervated by the RECURRENT LARYNGEAL NERVE of the vagus with the exception of the CRICOTHYROID (Fig. 1-16). It is innervated by the EXTERNAL LARYNGEAL NERVE which is a branch of the SUPERIOR LARYNGEAL NERVE of the vagus. Sensory innervation of the larynx is by the INTERNAL LARYNGEAL NERVE which is also a branch off the SUPERIOR LARYNGEAL NERVE of the vagus.

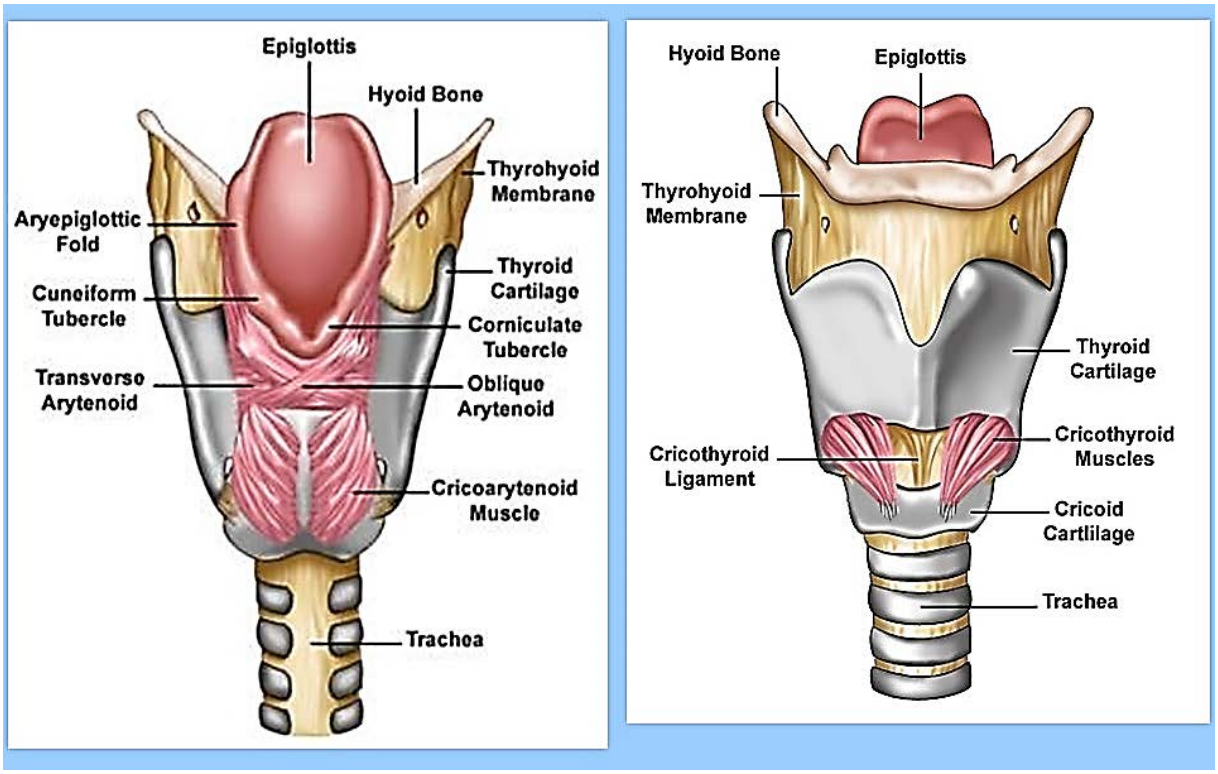


Fig. 1-18. Neck. Intrinsic and extrinsic muscles of the larynx.

Blood supply to the larynx is through the SUPERIOR LARYNGEAL ARTERY that is off the SUPERIOR THYROID ARTERY and the INFERIOR LARYNGEAL ARTERY that is off of the INFERIOR THYROID ARTERY.

III. Study questions:

1) Which ligaments connect the thyroid and the cricoid cartilages?
2) Which muscle runs with the vocal ligament?
3) Damage to the external laryngeal nerve would affect which intrinsic muscle of the larynx?
4) Would damage to the recurrent laryngeal nerve have a greater effect on phonation than damage to the external laryngeal nerve? Why?
5) What would be impaired in the larynx with damage to the internal laryngeal nerve?

1.3 DEEP ANTERIOR NECK

The deep anterior neck (Figs. 1-19, 1-20, 1-21, 1-23) contains the (1) SUBCLAVIAN ARTERY and VEIN, (2) CERVICAL SYMPATHETIC TRUNK and (3) the LONGUS CAPITIS and COLI MUSCLES.

The SUBCLAVIAN ARTERY (Figs. 11-13, 1-19, 1-20, 1-21) in the neck gives off (1) the VERTEBRAL ARTERY which runs cranially through the transverse foramen of the cervical vertebrae to supply the brain, (2) the INTERNAL THORACIC ARTERY to the infrahyoid muscles and rib cage (see Thorax), (3) the COSTOCERVICAL TRUNK which divides into the SUPERIOR INTERCOSTAL ARTERY to the first and second intercostal spaces and the DEEP CERVICAL ARTERY to the deep paraspinal muscles of the neck, and (4) the THYROCERVICAL TRUNK which gives off the INFERIOR THYROID ARTERY, the SUPRASCAPULAR ARTERY, the TRANSVERSE CERVICAL ARTERY, and the ASCENDING CERVICAL ARTERY. The inferior thyroid artery runs cranially to supply blood to the thyroid gland and infrahyoid muscles. The suprascapular and the transverse cervical arteries cross the posterior cervical triangle to vascularize muscles in the scapular region. The ascending cervical artery supplies the longus capitis and coli and the scalenus anterior, medius and posterior.

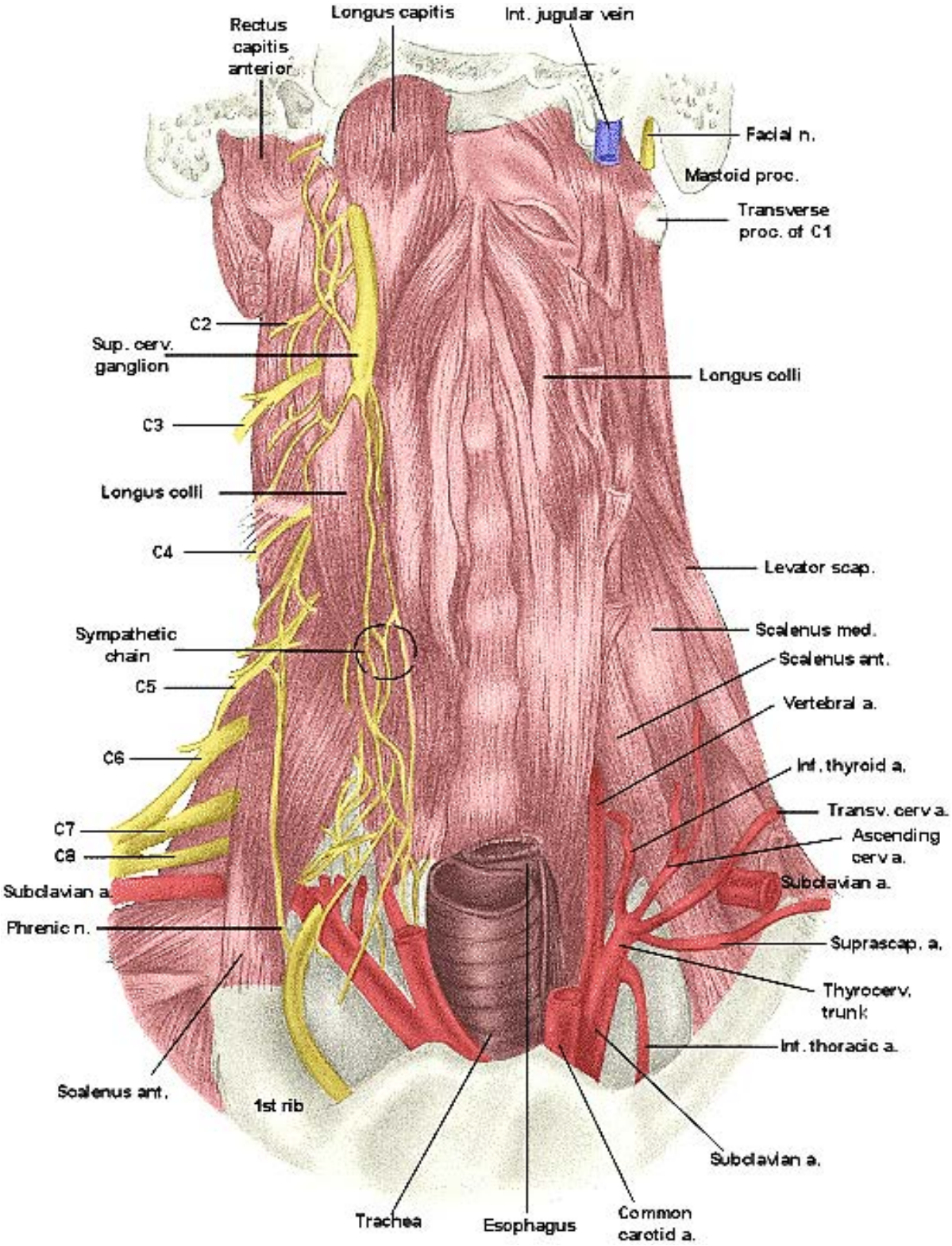


Fig. 1-19. Neck: Drawing of the anterior deep neck showing the muscle, nerves and arteries of this region.

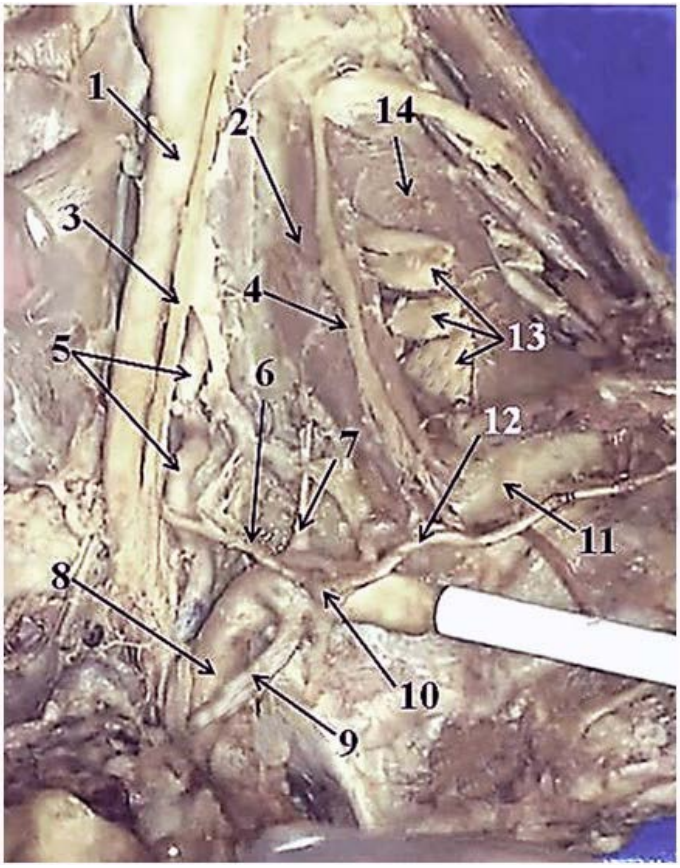


Fig 1-20. Neck: Dissection showing the arteries and nerves in the deep anterior neck. 1. Common carotid artery, 2. Scalenus anterior, 3. Vagus nerve, 4. Phrenic nerve, 5. Vertebral artery, 6. Inferior thyroid artery, 7. Ascending cervical artery, 8. Subclavian artery, 9. Internal thoracic artery, 10. Thyrocervical trunk, 11. Clavicle, 12. Transverse cervical artery, 13. Roots and trunks of brachial plexus, 14. Scalenus medius.

The CERVICAL SYMPATHETIC TRUNK is an extension of the sympathetic trunk found in the thorax (Figs, 1-19, 1-21). It lies deep to the carotid sheath and along the deep anterior muscles of the cervical neck. This part of the sympathetic trunk has an INFERIOR, MIDDLE, and SUPERIOR CERVICAL GANGLIA. The inferior cervical ganglion commonly fuses to the T1 sympathetic ganglion, forming the STELLATE GANGLION. Postganglionic sympathetic fibers from these ganglia pass through grey rami and enter the cervical nerves. These sympathetic ganglia innervate the carotid body and sinus as well as glands and blood vessels within head and neck region.

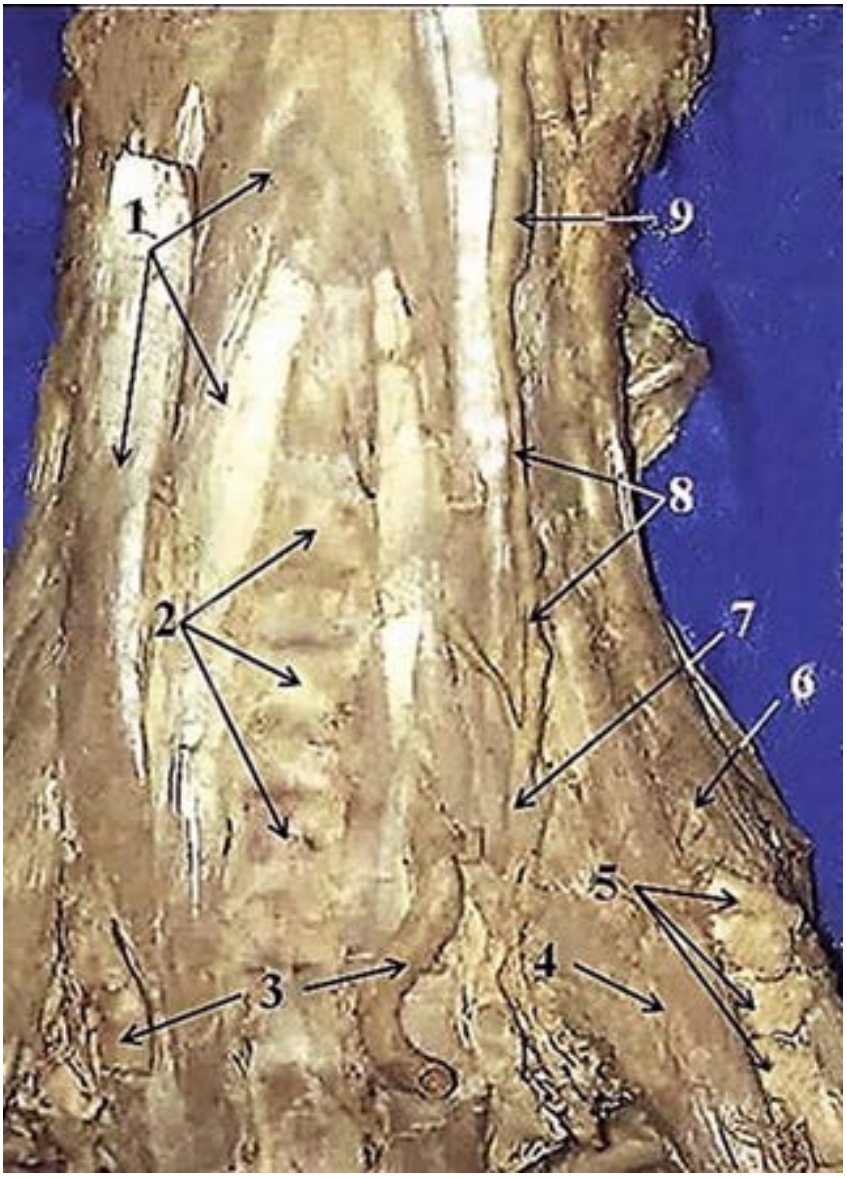


Fig 1-21. Neck: Dissection showing the cervical sympathetic chain and the muscles in the deep anterior neck. 1. Longus coli, 2. Vertebral bodies, 3. Vertebral artery, 4. Scalenus anterior, 5. Roots and trunks of brachial plexus, 6. Scalenus medius, 7. Inferior sympathetic ganglion, 8. Sympathetic trunk, 9. Superior sympathetic ganglion.

Deep Anterior Neck Muscles

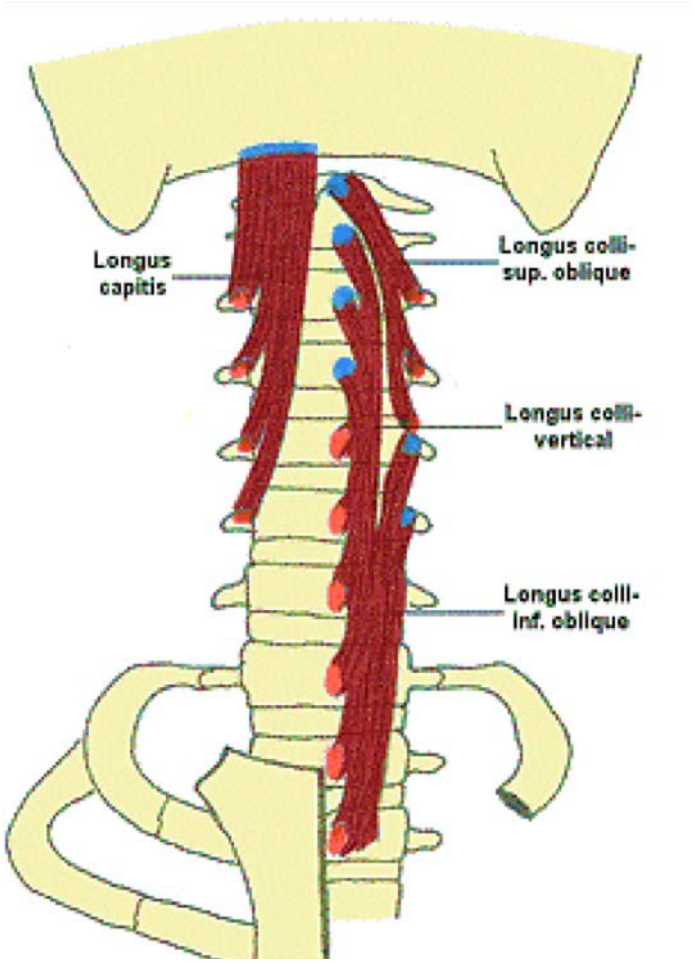


Fig. 1-22. Neck: Diagram of the longus capitis and longus colli muscles in the deep anterior neck showing their attachment sites.

1. LONGUS CAPITIS (Figs. 1-19, 1-21, 1-22)
   - Inferior attachment (origin): Anterior tubercle of the transverse process of vertebrae C3 - C6.
   - Superior attachment (insertion): Basioccipital portion of the occipital bone.
   - Nerve: C1, C2, C3 spinal nerves.
   - Segmental innervation: **C1, C2, C3**.
   - Action: Flexion of the head.

2. LONGUS COLI- SUPERIOR OBLIQUE PORTION (Figs. 1-19, 1-21,1-22)
   - Inferior attachment (origin): Anterior tubercle of the transverse processes of C3 - C5.
   - Superior attachment (insertion): Anterior arch of the atlas.
   - Nerve: C2 - C7, (C8) spinal nerves.
   - Segmental innervation**: C2 - C7**, (C8).
   - Action: Flexion of the neck

3. LONGUS COLI-INFERIOR OBLIQUE PORTION (Fig. 1-22)
   - Inferior attachment (origin): Anterior surface of the bodies of vertebrae T1 - T3.
   - Superior attachment (insertion): Transverse processes of C5- C6.
   - Nerve: C2 - C7, (C8) spinal nerves.
   - Segmental innervation: **C2 - C7**, (C8)
   - Action: Flexion of the neck.

4. LONGUS COLI-VERTICAL PORTION (Fig. 1-22)
   - Inferior attachment (origin): Anterior surface of the vertebral bodies of C5 - T
   - Superior attachment (insertion): Anterior surfaces of the vertebral bodies of C2 - C4.
   - Nerve: C2 - C7, (C8) spinal nerves.
   - Segmental innervation: **C2 - C7**, (C8).
   - Action: Flexion of the neck.

5. RECTUS CAPITIS ANTERIOR (Fig. 1-22)
   - Inferior attachment (origin): Anterior surface of the transverse process of the atlas (C1)
   - Superior attachment (insertion): Occipital bone, anterior to occipital condyle
   - Nerve: C2, C3 spinal nerves.
   - Segmental innervation**: C2, C3.**
   - Actions: Flexion of the head, stabilization of the skull on the cervical spine.

6. RECTUS CAPITIS LATERALIS
   - Inferior attachment (origin): Transverse process of the atlas (C1)
   - Superior attachment (insertion): Jugular process of the occipital bone
   - Nerve: C2, C3 spinal nerves.
   - Segmental innervation: **C2, C3.**
   - Actions: Lateral flexion of the head, stabilization of the head on the cervical spine.

IV. Study questions:

1) What are the main branches directly off the subclavian artery in the deep anterior neck?
2) Occlusion of the thyrocervical trunk would affect which arteries?
3) What two muscles in the deep neck flex the head? What muscle group flexes the neck? What movements might tear these flexors of the head and neck?

2 THE HEAD

Regions of the Head

The head is a very complex area anatomically and functionally. It contains the brain and structures involved in digestion, respiration, vocalization, sight and hearing. Because of this complexity, the head is subdivided commonly into regions and then each region studied. In this chapter, the following regions will be examined: (1) SKULL, (2) FACE, (3) PAROTID REGION, (4) TEMPORAL REGION, (5) INFRATEMPORAL FOSSA, (6) ORAL CAVITY, (7) PHARYNX, (8) ORBIT and EYE, and (9) the EAR.

2.1 THE SKULL

The skull is divided into the VISCERAL CRANIUM that consists of bones involved mainly in oral functions and the NEURAL CRANIUM that surrounds and protects the brain. The VISCERAL CRANIUM consists of the (1) MAXILLA, (2) ZYGOMATIC BONE, (3) SQUAMOUS PART OF THE TEMPORAL BONE, (4) MANDIBLE, (5) STYLOID PROCESS of the temporal bone, (6) MALLEUS, INCUS, and STAPES of the middle ear and (7) NASAL, PALATINE and LACRIMAL BONES. The NEURAL CRANIUM consists of the (1) PARIETAL BONES, (2) FRONTAL BONE, (3) OCCIPITAL BONE, (4) SPHENOID BONE, (5) ETHMOID BONE, and (6) PETROUS PORTION OF THE TEMPORAL BONE.

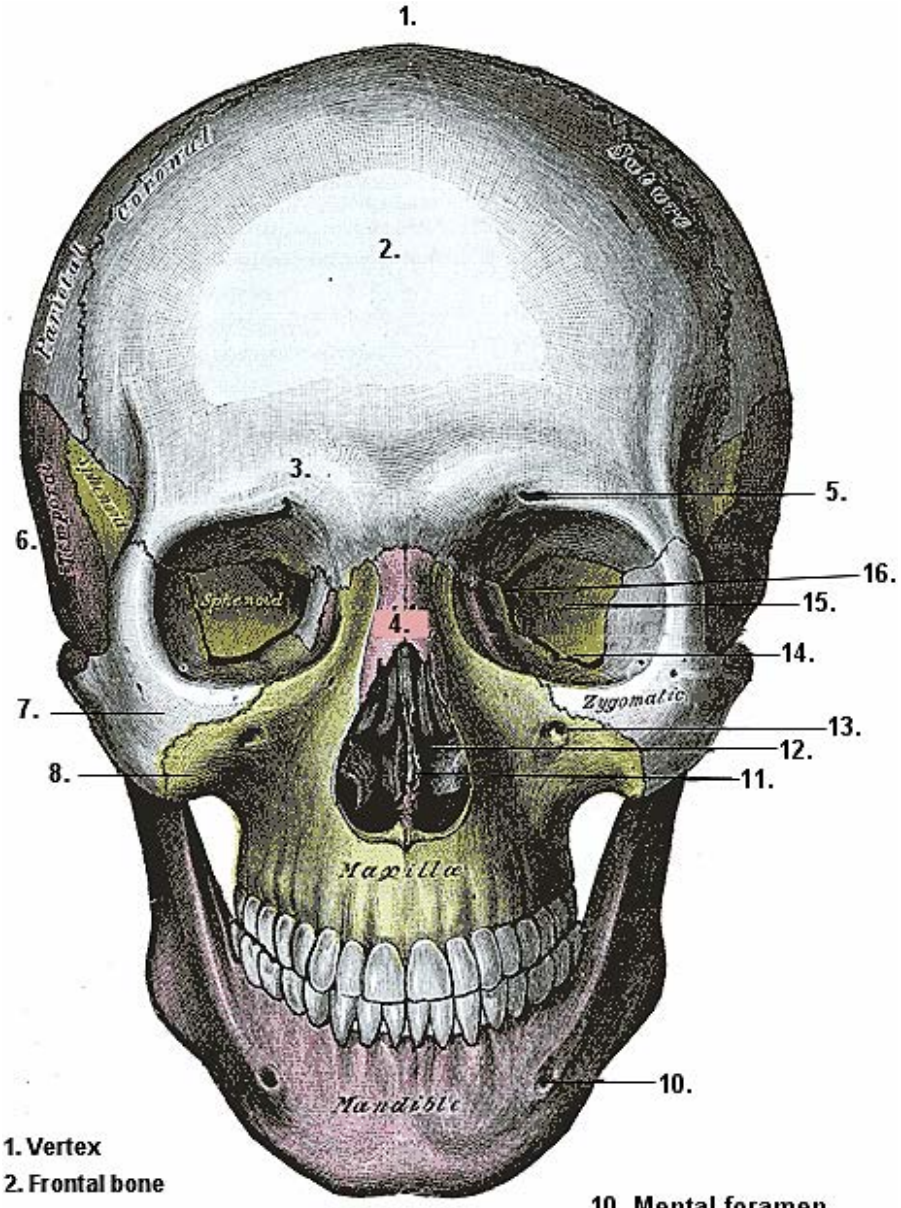


Fig. 2-01. Head: The skull in an anterior view. (Modified from Gray 1918)

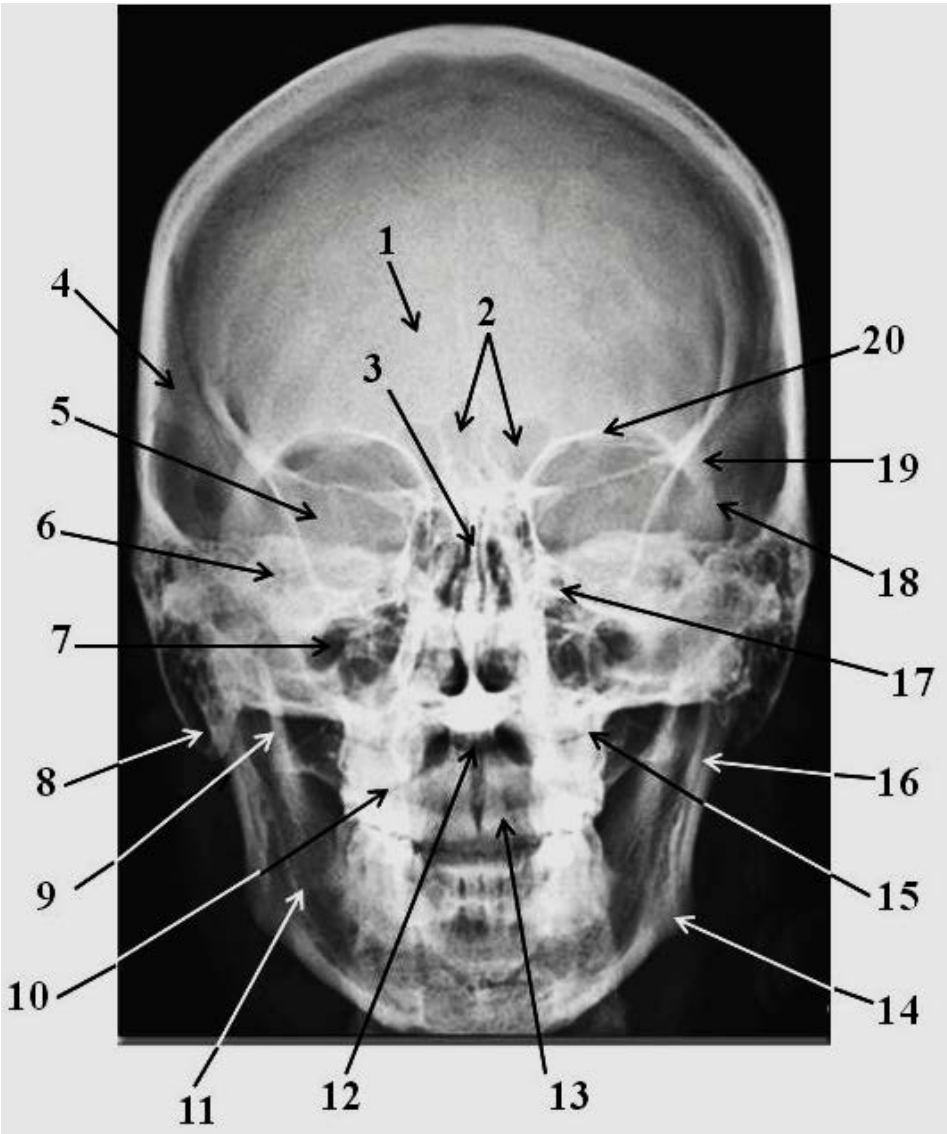
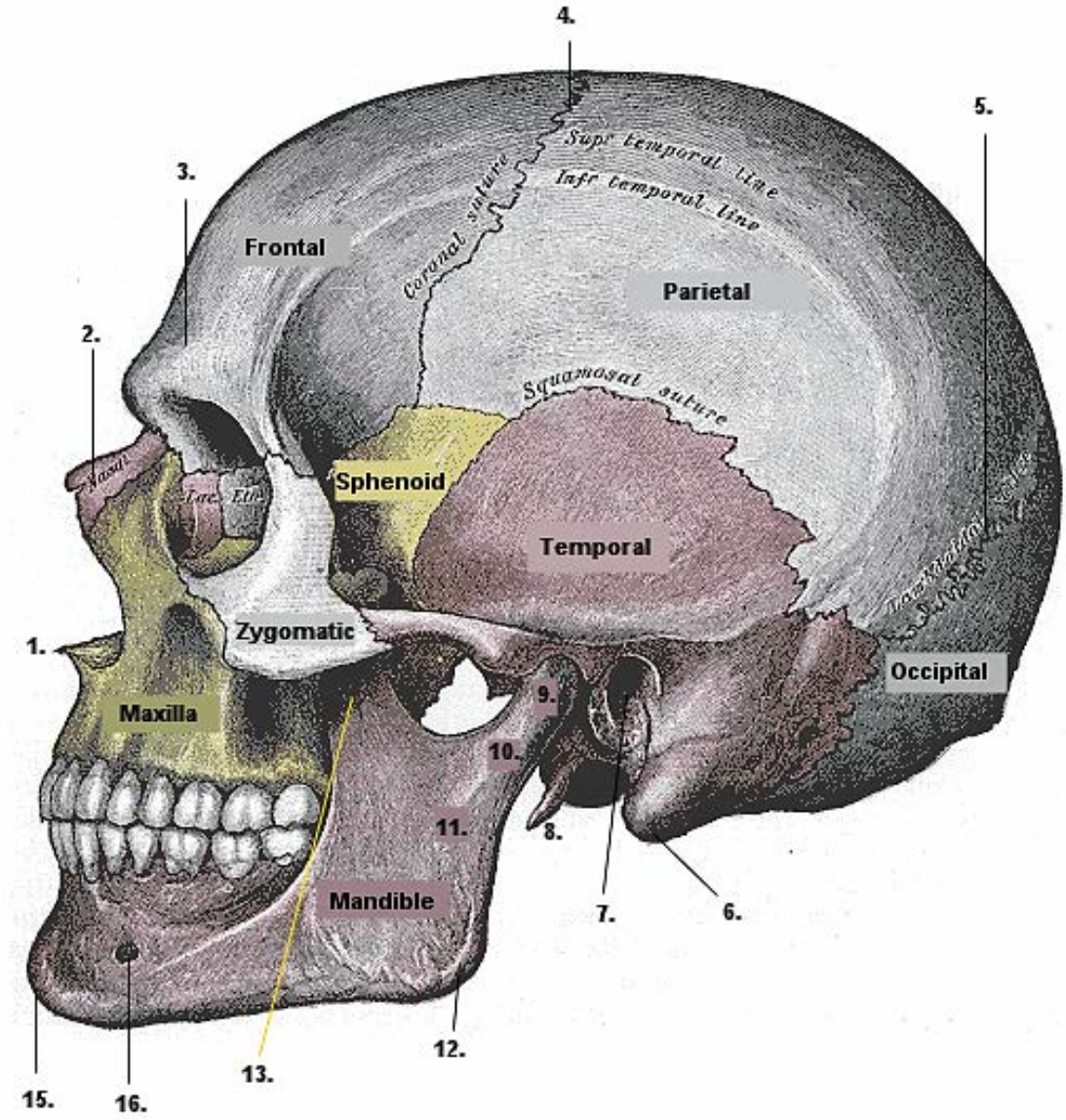


Fig 2-02 Head: AP radiograph of the skull. 1. Frontal bone, 2. Frontal sinus, 3. Perpendicular plate of ethmoid (nasal septum), 4. Parietal bone, 5. Orbit, 6. Petrous part of temporal bone, 7. Maxillary sinus, 8. Mastoid process, 9. Coronoid process of mandible, 10. Atlanto-axial joint, 11. Mandibular canal, 12. Dens, 13. Body of C2, 14. Angle of mandible, 15. Atlanto-occipital joint, 16. Condylar process of mandible, 17. Foramen rotundum, 18. Frontal process of zygomatic bone, 19. Zygomatic process of frontal bone, 20. Supraorbital margin.



1. Ant. nasal spine	6. Mastoid process	11. Ramus of mandible
2. Nasal bone	7. External auditory meatus	12. Angle of mandible
3. Glabella	8. Styloid process	13. Coronoid process
4. Coronal suture	9. Condyle	14. Mental foramen
5. Lamboid suture	10. Neck of mandible	15. Mental protuberance

Fig. 2-03. Head: The skull in a lateral view (Modified from Gray 1918)

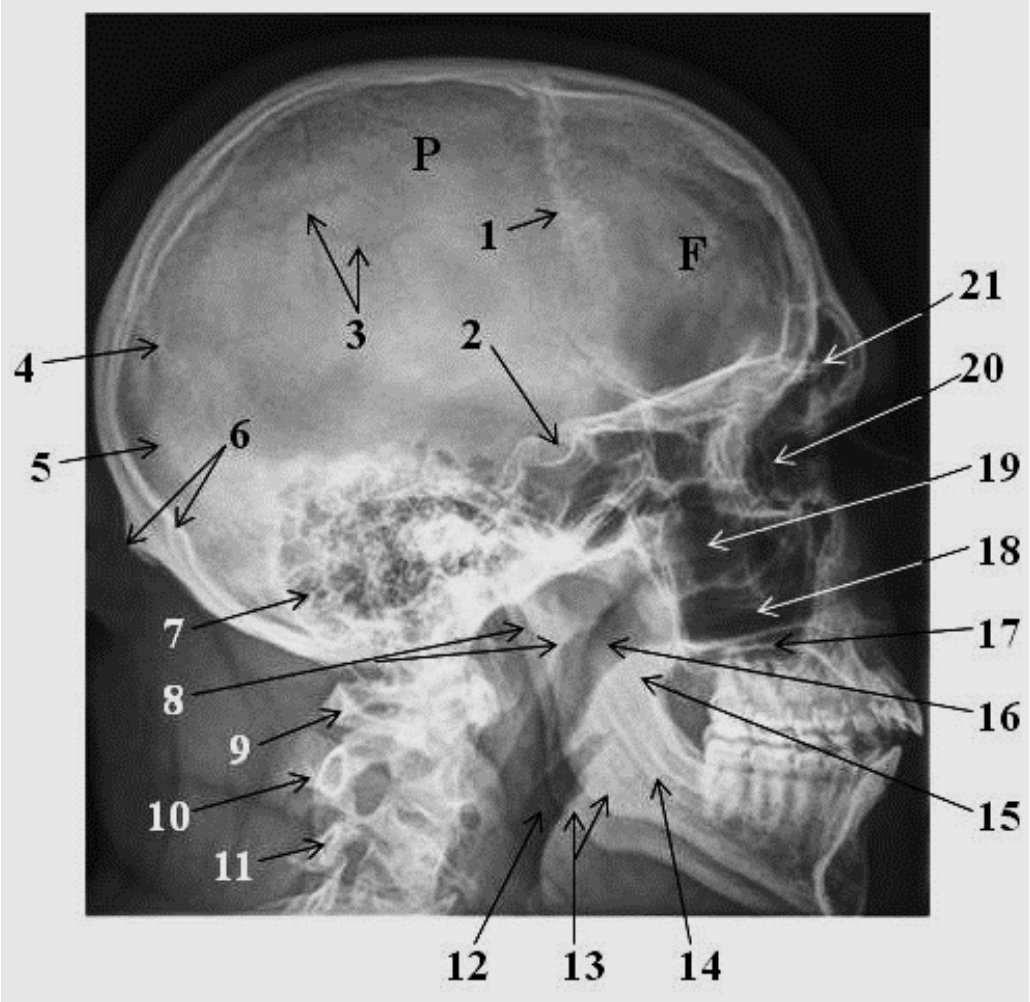


Fig. 2-04. Head: Lateral radiograph of the skull. 1. Coronal suture, 2. Hypophyseal fossa, 3. Groves for middle meningeal artery, 4. Lambdoid suture, 5. Occipital bone, 6. Internal and external occipital protuberance, 7. Mastoid air cells, 8. Condylar processes of mandible (both sides), 9. Posterior tubercle of atlas, 10. Spinous process of axis, 11. Spinous process of C3, 12. Oral pharynx, 13. Mandibular angles (both sides), 14. Mandibular canal, 15. Soft palate, 16. Nasopharynx, 17. Hard palate, 18. Maxillary sinus, 19. Concha in nasal cavity, 20. Orbit, 21. Frontal sinus, F= frontal bone, P = parietal bone.

MAXILLARY BONES

The two maxillary bones form the upper jaws, the anterior part of the hard palate and the inferior margin of the orbit (Figs. 2-01, 2-02, 2-03, 2-04, 2-06, 2-07, 2-07). They are fused to each other anteriorly at the INTERMAXILLARY SUTURE and inferiorly at the INTERPALATINE SUTURE. Each maxillary bone connects with the nasal bone, frontal bone, zygomatic bone, lacrimal bone, and palatine bone. Its outer inferior edge holds the teeth and is called the ALVEOLAR PORTION of the maxillary bone. Medial to the alveolar portion is the HARD PALATE. The orbital part of each maxillary bone forms the inferior part of the bony orbit and contains the INFRAORBITAL FORAMEN through which the INFRAORBITAL NERVE, ARTERY and VEIN exit.

ZYGOMATIC BONE

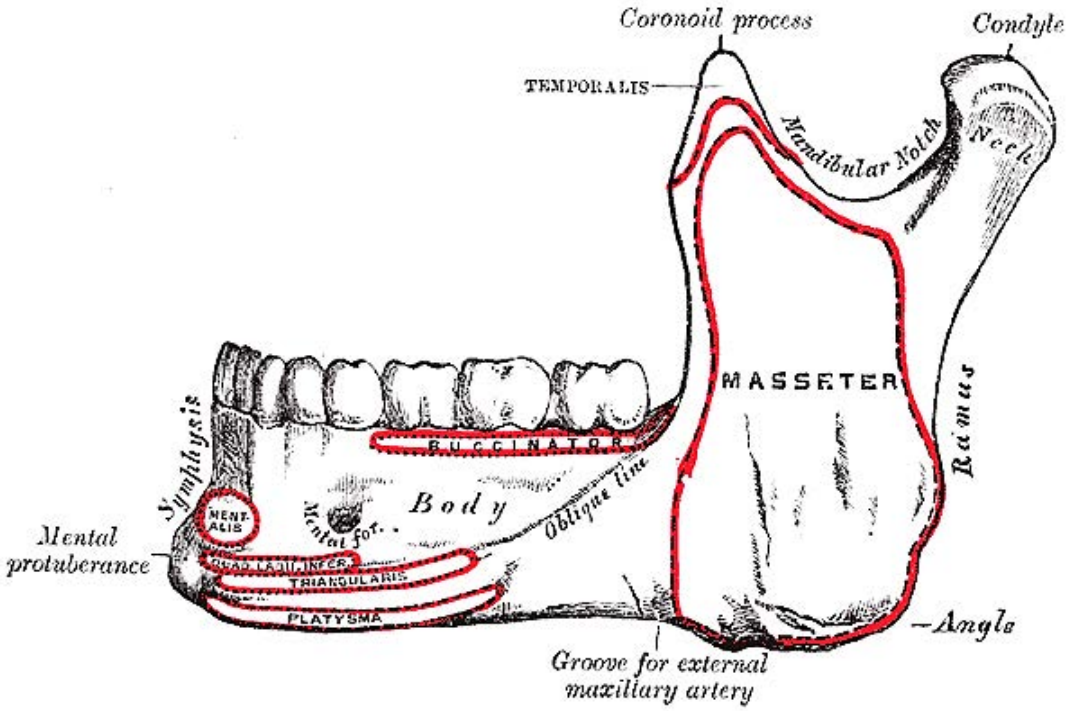
The paired zygomatic bones interconnect with the ZYGOMATIC PROCESS of the MAXILLA and the ZYGOMATIC PROCESS of the TEMPORAL BONE to form the ZYGOMATIC ARCH (Figs. 2-01, 2-02, 2-03, 2-04, 2-06, 2-07). Each zygomatic bone also joins with the frontal bone, sphenoid bone, and maxillary bone to form the lateral and inferiolateral margins of the bony orbit. The zygomatic bone contains a small ZYGOMATICOFACIAL FORAMEN through which passes the ZYGOMATICOFACIAL NERVE and a small ZYGOMATICOTEMPORAL FORAMEN for passage of the ZYGOMATICOTEMPORAL NERVES. Both nerves are sensory to face and are branches of the zygomatic nerve which is off the maxillary division of the trigeminal nerve.

TEMPORAL BONE

The paired temporal bones form part of the lateral aspect of the skull (Figs. 2-01, 2-02, 2-03, 2-04, 2-06, 2-07). Each is subdivided into (1) a SQUAMOUS PORTION which is flat and connects to the parietal and greater wing of the sphenoid; (2) a PETROUS PORTION which contains the middle and inner ear chambers, the MASTOID PROCESS and connects to the occipital bone and the greater wing of the sphenoid; and (3) a TYMPANIC PORTION which contains the STYLOID PROCESS, EXTERNAL AUDITORY MEATUS and MANDIBULAR (GLENOID) FOSSA of the TEMPOROMANDIBULAR JOINT.

MANDIBLE

The J-shaped mandible consists of a BODY, RAMUS, CONDYLAR (MANDIBULAR) PROCESS, and CORONOID PROCESS (Figs. 2-01, 2-02, 2-03, 2-04, 2-05). Anteriorly, the BODY of the right and left mandible fuses at the SYMPHYSIS MENTI. Superiorly, each body has an ALVEOLAR PROCESS that holds the lower teeth, while posteriorly, the body is continuous with the ramus. Medially, the body of the mandible has an opening called the MANDIBULAR FORAMEN. This opening leads to the MANDIBULAR CANAL through which the INFERIOR ALVEOLAR NERVE, ARTERY and VEIN run. As the inferior alveolar nerve enters the mandibular foramen, it gives off the MYLOHYOID NERVE. This nerve runs downward along the inner surface of the mandible in the MYLOHYOID GROOVE to innervate the mylohyoid muscle and the anterior belly of the digastric. The inferior alveolar nerve and vessels supply the lower teeth after which they exit the mandible anteriorly through the MENTAL FORAMEN. The existing nerve and vessels are now called the MENTAL NERVE, ARTERY and VEIN. The RAMUS of the mandible projects cranially from the body and divides into a coronoid process anteriorly and a condylar process posteriorly. Separating the condylar and coronoid processes is the MANDIBULAR NOTCH. The CONDYLAR PROCESS articulates with the MANDIBULAR FOSSA of the temporal bone to form the TEMPOROMANDIBULAR JOINT (TMJ). The CORONOID PROCESS is the attachment site for the TEMPORALIS MUSCLE.



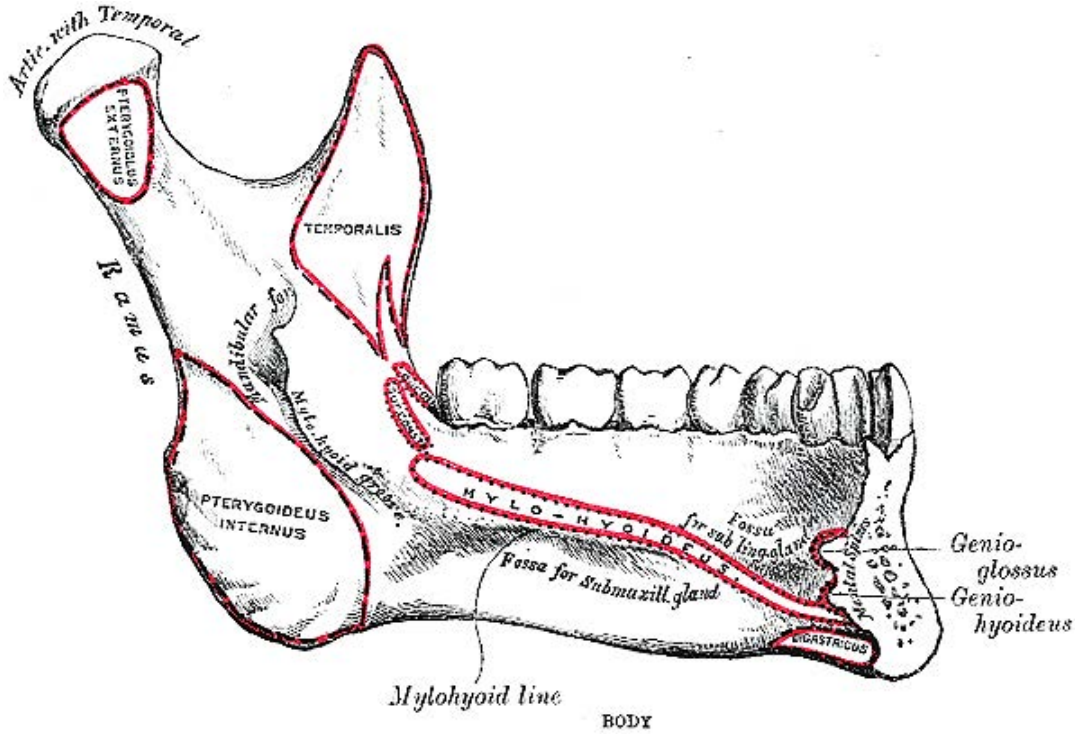


Fig. 2-05. Head: Mandible in external (Top) and internal (Bottom) views (Modified from Gray 1918)

NASAL BONE

The paired nasal bones form the bridge of the nose (Figs. 2-01, 2-02). Each bone attaches superiorly to the frontal bone, laterally to the frontal process of the maxillary bone, and inferiorly to the cartilages of the anterior nose.

VOMER

The unpaired, thin, spear-shaped vomer forms the upper part of the nasal septum along with the perpendicular plate of the ethmoid bone (Figs. 2-01, 2-02, 2-03, 2-04).

PALATINE BONE

The small, paired palatine bones form the posterior part of the hard palate (Fig. 2-06). They articulate anteriorly with the PALATINE PROCESS of the maxilla and posteriorly with the sphenoid and vomer bones.

LACRIMAL BONE

The small, paired lacrimal bones lie on the medial side on the bony orbit between the maxilla, frontal, and ethmoid bones (Fig. 2-02). It supports the LACRIMAL SAC that empties into the NASOLACRIMAL DUCT. Tears wash into the lacrimal sac and then flow through the nasolacrimal duct to the nose where they spill into the nasal cavity.

PARIETAL BONE

The paired flat parietal bones form the top of the neural cranium (Figs. 2-01. 2-02, 2-03, 2-04, 2-07). They attach anteriorly to the frontal bones at the CORONAL SUTURE, posteriorly to the occipital bones at the LAMBDOID SUTURE, and superiorly to each other at the SAGITTAL SUTURE.

FRONTAL BONE

The frontal bone is a single flat bone that forms the anterior part of the skull above the eyes (Figs. 2-01, 2-02, 2-03, 2-04, 2-07). It connects laterally with the zygomatic bone through the ZYGOMATIC PROCESS OF THE FRONTAL BONE and sphenoid bone, inferomedially with the nasal and ethmoid bones, and superiorly with the parietal bones at the CORONAL SUTURE. Its antero-inferior edge forms the superior margin of the bony orbit. This area is called the SUPRAORBITAL MARGIN and it contains the SUPERIOR ORBITAL FISSURE which ends as the SUPRAORBITAL FORAMEN through which the SUPRAORBITAL NERVE, ARTERY and VEIN exit.

OCCIPITAL BONE

The occipital bone forms the posterior and postero-inferior side of the skull (Figs. 2-03, 2-04, 2-06, 2-07). It connects posteriorly to the parietal bones and the temporal bones at the LAMBDOID SUTURE and inferiorly to the petrous portion of the temporal bone and body of the sphenoid. Posteriorly, the external surface of the occipital bone has a distinct central elevation called the EXTERNAL OCCIPITAL PROTUBERANCE and laterally running ridges called the SUPERIOR AND INFERIOR NUCHAL LINES. These external irregularities are sites of muscle attachments. The internal posterior surface of the occipital bone also has several distinct irregularities. They are the INTERNAL OCCIPITAL PROTUBERANCE, the CEREBELLAR FOSSA, and the GROOVE FOR THE TRANSVERSE VENOUS SINUS. Inferiorly. the occipital bone narrows and contains the large, central FORAMEN MAGNUM through which the spinal cord passes, the bilateral HYPOGLOSSAL CANALS for the hypoglossal nerves, and the bilateral OCCIPITAL CONDYLES which articulate with the atlas (C1) to form the ATLANTOOCCIPITAL JOINTS. Anterior to the foramen magnum is the BASILAR PROCESS of the occipital bone which connects to the body of the sphenoid.

SPHENOID BONE

The sphenoid bone forms part of the base of the skull (Figs. 2-01, 2-02, 2-03, 2-04, 2-06, 2-07) It consists of a BODY, and bilateral LESSER and GREATER WINGS. The BODY of the sphenoid lies centrally and contains the SELLA TURCICA (Turkish saddle). The PITUITARY GLAND sits in the HYPOPHYSEAL FOSSA located in the center of the sella turcica. The fossa is bound anteriorly by the TUBERCULUM and posteriorly by the DORSUM SELLAE. Projecting from the top of each side of the tuberculum is an ANTERIOR CLINOID PROCESS which is smaller than the POSTERIOR CLINOID PROCESS that projects from the top of each side of the dorsum sellae. The LESSER WINGS form part of the orbit where each contacts the frontal bone, zygomatic bone, maxillary bone, and ethmoid bone. Each contains the SUPERIOR ORBITAL FISSURE and the OPTIC FORAMEN. The GREATER WINGS form part of the side of the cranium and a large part of the base of the skull. The flat inferior surface of each wing forms the roof of an INFRATEMPORAL FOSSA. Each greater wing contacts the parietal bone, frontal bone, squamous portion of the temporal bone, zygomatic bone, and petrous portion of the temporal bone. Each contains the FORAMEN ROTUNDA for the MAXILLARY DIVISION of the TRIGEMINAL NERVE, the FORAMEN OVALE for the MANDIBULAR DIVISION of the TRIGEMINAL NERVE, and the FORAMEN SPINOSUM for the MIDDLE MENINGEAL ARTERY. Extending inferiorly from the body and each greater wing of the sphenoid are the PTERYGOID PROCESSES. These processes form the posterolateral sides of the nasal cavity and abut the posterior body of the maxilla. Each pterygoid process has a LATERAL and MEDIAL PTERYGOID PLATE (lamina) and between these plates is the PTERYGOID FOSSA. The inferior end of the medial plate has a distinct posterior hook called the HAMULUS. The medial and lateral pterygoid muscles attach to the pterygoid processes.

ETHMOID BONE

The unpaired ethmoid bone forms the upper portion of the nasal cavity where it contacts the frontal and sphenoid bones (Figs. 2-01, 2-02, 2-03, 2-04, 2-07). It contains a PERPENDICULAR PLATE which forms part of the NASAL SEPTUM, and the CRIBRIFORM PLATE through which the OLFACTORY NERVES enter the nasal cavity.

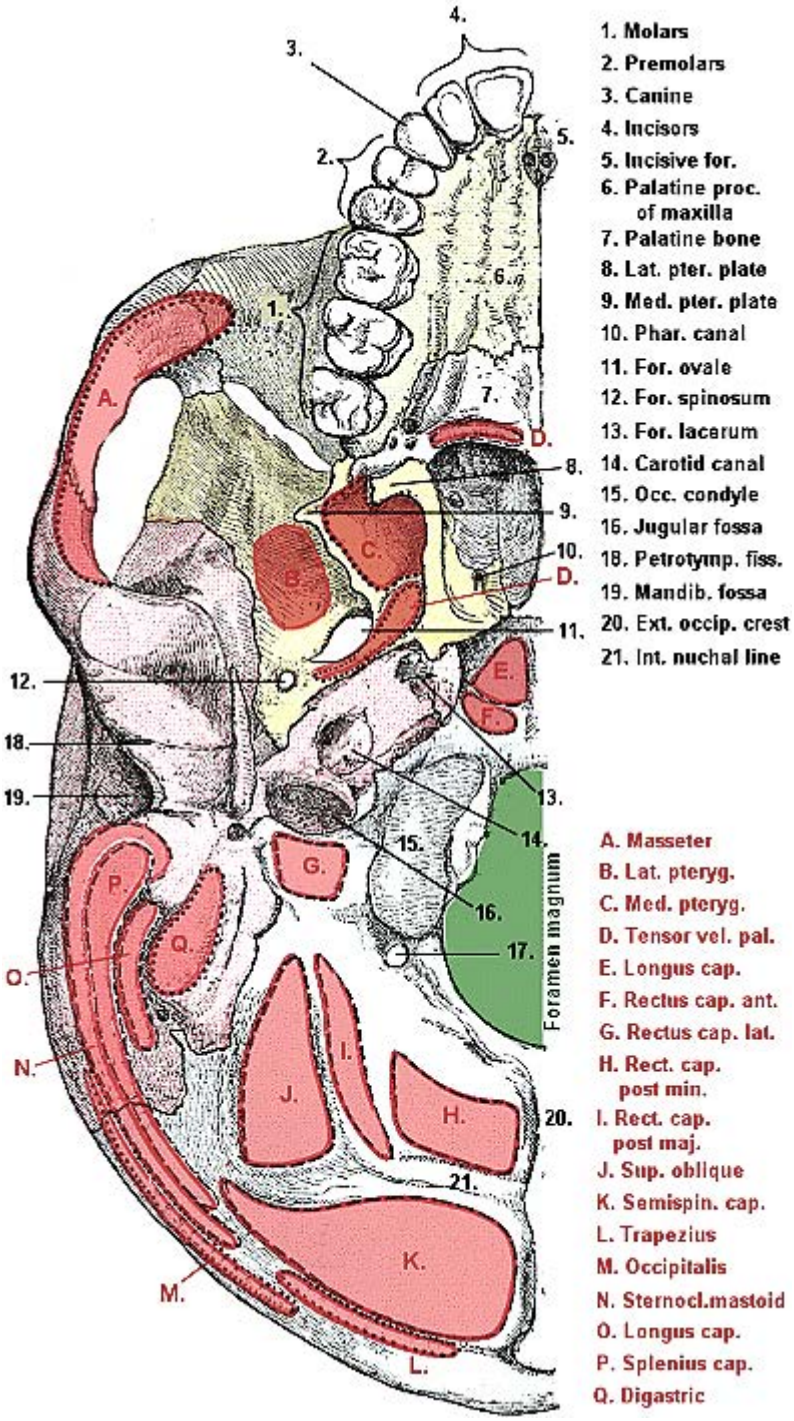


Fig. 2-06. Head: An inferior view of the skull. (Modified from Gray 1918)

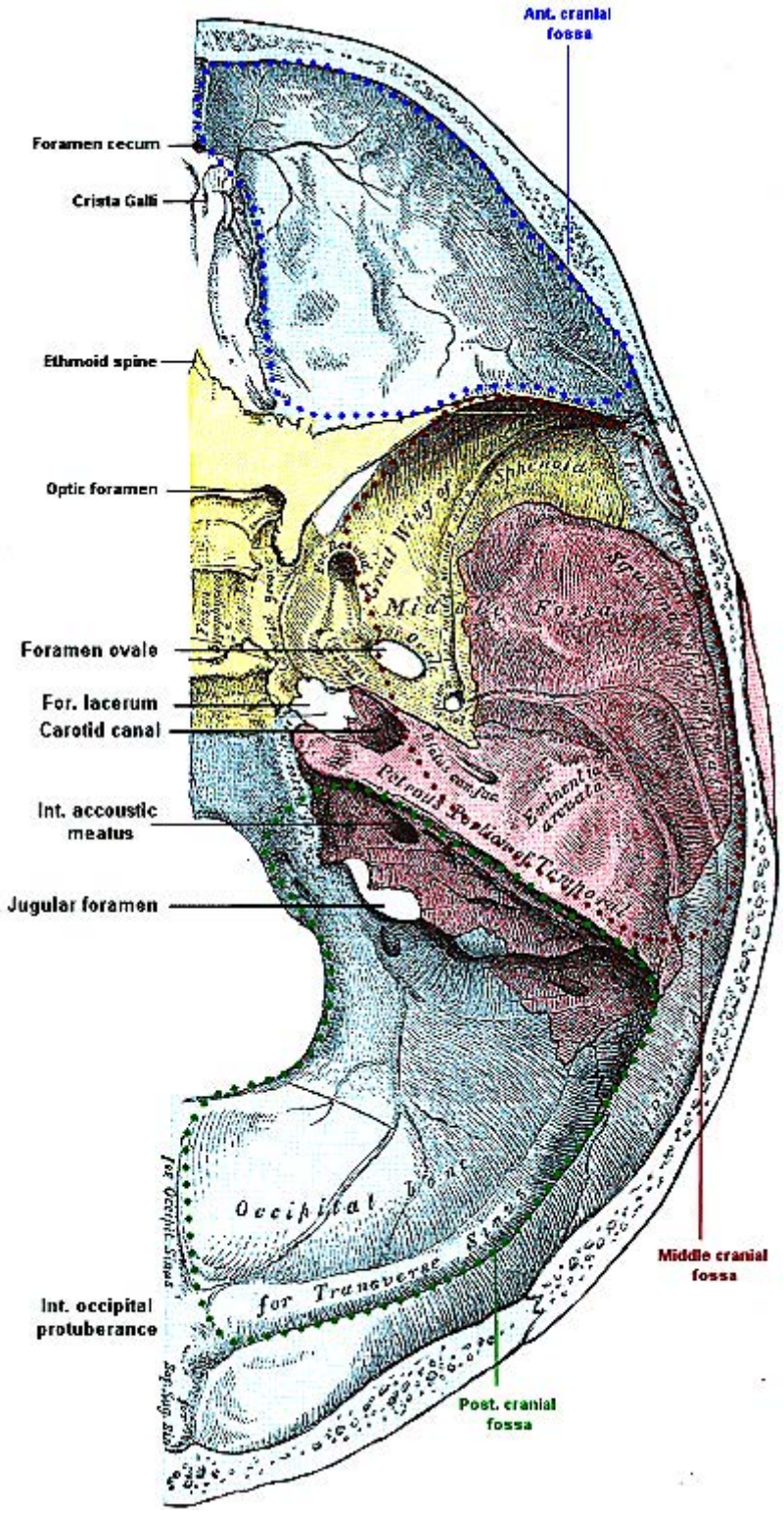


Fig. 2-07. Head: Base of the skull, superior view. (Modified from Gray 1918)

Foramina of the Skull

Foramen	Location	Contents
Supr aorbital	Frontal bone	Supraobtial N., A., V.
Superior orbital fissure	Sphenoid bone	III, IV, VI, Ophthalmic of V
Optic	Sphenoid bone	II, Ophthalmic A.
Rotundum	Sphenoid bone	Maxillary of V
Ovale	Sphenoid bone	Mandibular of V
Spinosum	Sphenoid bone	Middle meningeal A.
Lacerium	Sphenoid bone	Nothing
Inferior orbital fissure	Maxilla	Infraorbital N., A., V.
Infraobital	Maxilla	Infraorbital N., A., V.
Incisive	Maxilla	Nasopalatine N., Sphenopalatine A.
Greater Palatine	Palatine bone	Greater Palatine N., A., V.
Lesser Palatine	Palatine bone	Lesser Palatine N., A., V.
Stylomastoid	Temporal bone	VII
Carotid	Temporal bone	Internal carotid A., Sympathetic plexus
Jugular	Between Temporal bone & Occcipital bones	IX, X, XI
Internal Auditory	Temporal bone	VII, VIII
Magnum	Occcipital bones	Spinal cord, Spinal

2.2 THE FACE

2.2.1 SENSATION TO THE FACE

The TRIGEMINAL NERVE provides general sensation to the face (Figs. 2-08, 2-09, 2-10). The OPHTHALMIC DIVISION OF THE TRIGEMINAL innervates the skin of the forehead and nose. The middle and lateral portions of the forehead are innervated by the

SUPRAORBITAL and SUPRATROCHLEAR NERVES off the FRONTAL NERVE (Figs. 2-08, 2-09, 2-10, 2-13). The root of the nose is innervated by the INFRATROCHEAR NERVE and the tip of the nose by the ANTERIOR ETHMOIDAL NERVE. Both nerves are branches of the NASOCILIARY NERVE.

The MAXILLARY DIVISION OF THE TRIGEMINAL NERVE innervates the region of the face below the eyes and above the mouth. The INFRAORBITAL NERVE innervates the side of the nose, the lower eyelid and area below the eye, and the upper lip (Figs. 2-08, 2-09, 2-10, 2-13, 2-18). The ZYGOMATICOFACIAL NERVE innervates the skin over the zygomatic arch and the ZYGOMATICOTEMPORAL NERVE goes to the skin just lateral to the eye.

The MANDIBULAR DIVISION OF THE TRIGEMINAL NERVE innervates the region of the lower jaw and the area in front of the ear (2-08, 2-09, 2-10, 2-14, 2-18, 2-25, 2-28). The BUCCAL NERVE innervates the skin covering the cheek and lateral jaw regions and the AURICULOTEMPORAL NERVE innervates the area anterior to the ear and the lateral scalp. The MENTAL NERVE, which is a continuation of the INFERIOR ALVEOLAR NERVE to the lower teeth, innervates the skin of the chin and the lower lip.

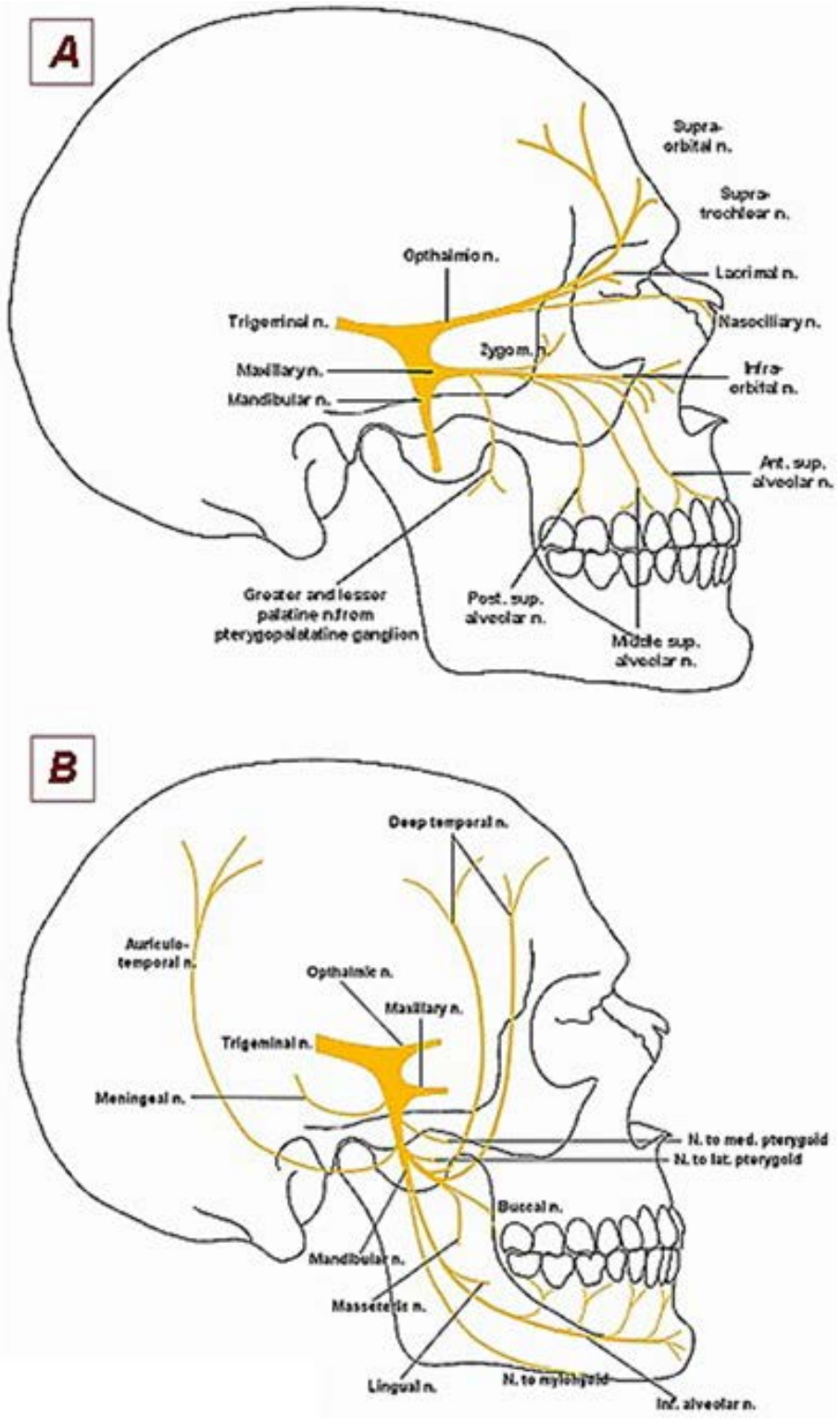


Fig. 2-08. Head: Drawing showing the distribution of the trigeminal nerve relative to the skull.

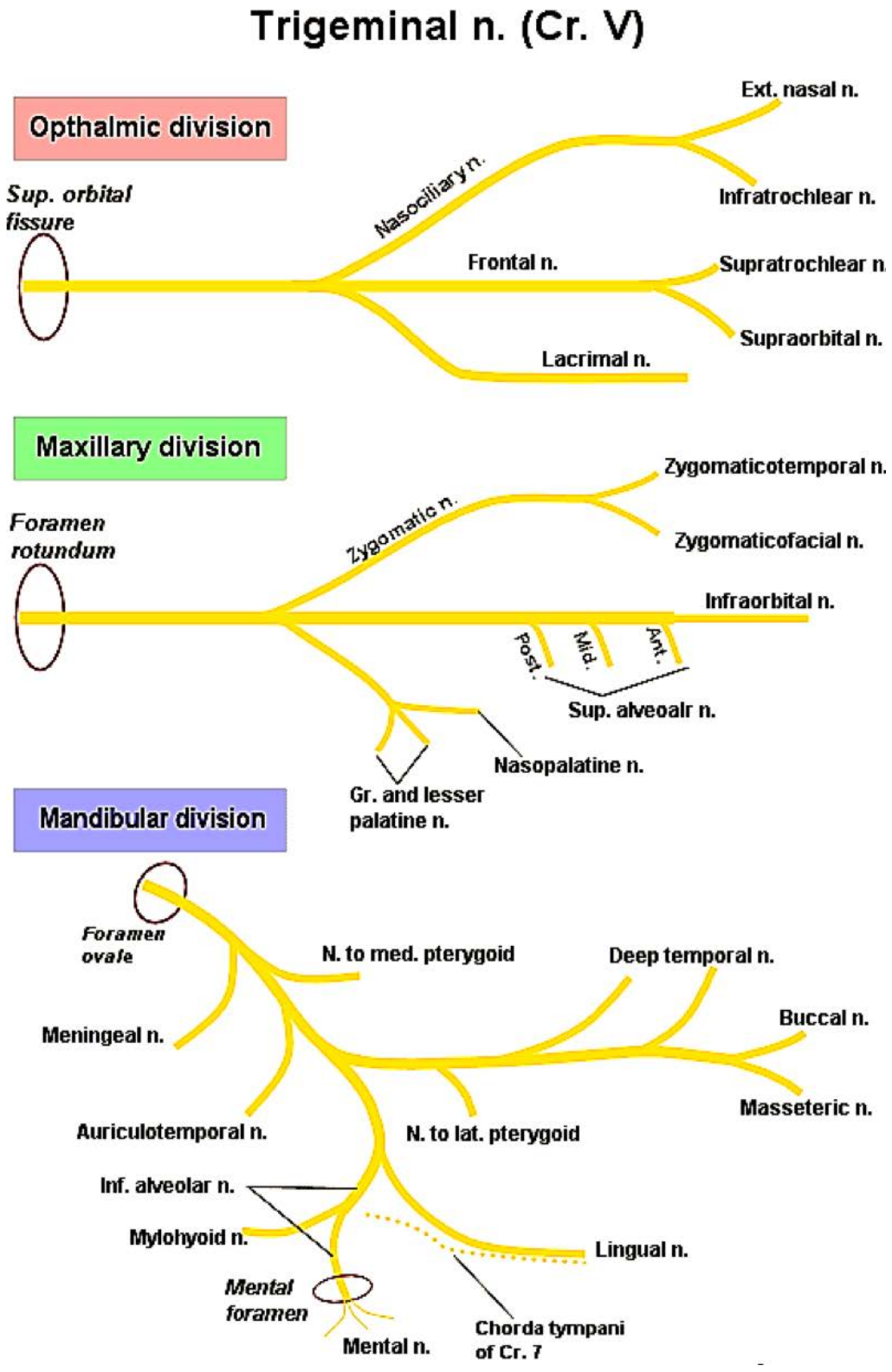


Fig. 2-09. Head: Diagram of the Trigeminal Nerve

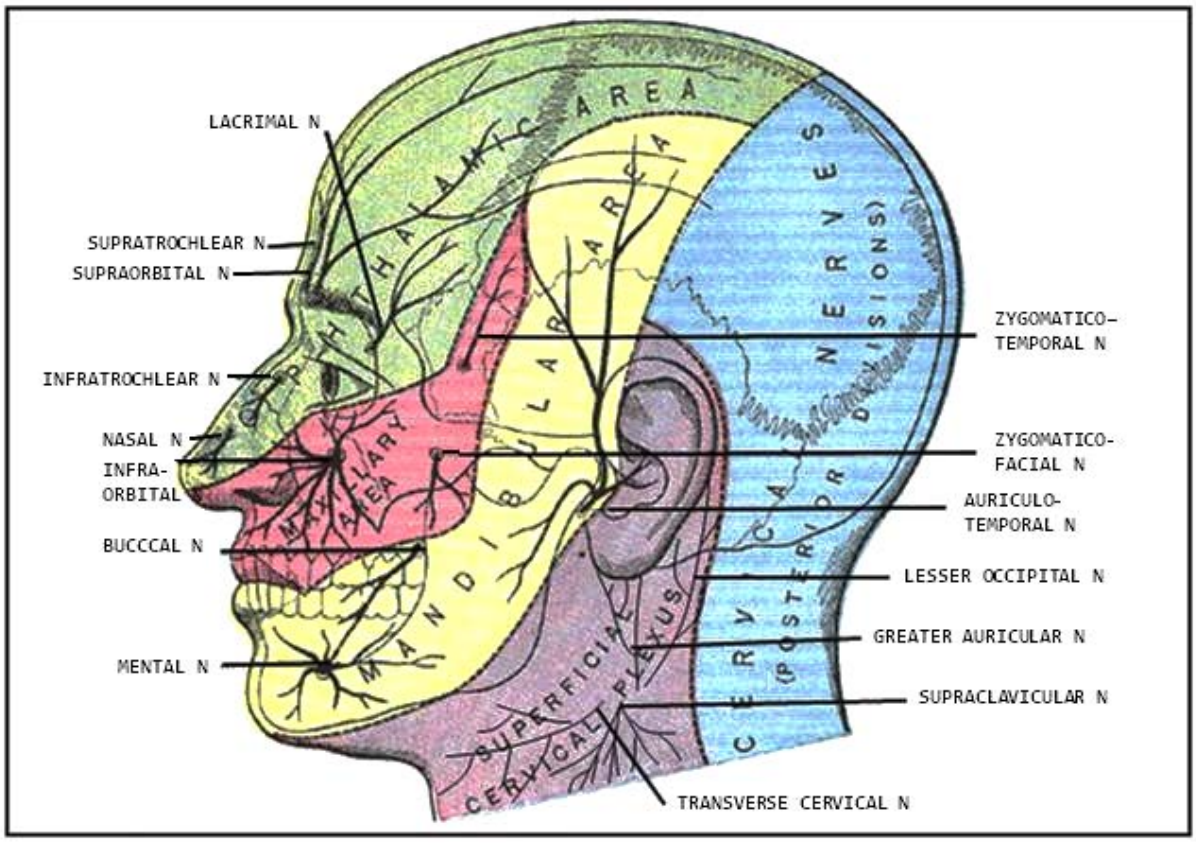


Fig. 2-10. Head: Sensory distribution of the face by the trigeminal nerve and neck by the cervical plexus (Modified from Gray's 1918)

2.2.2 BLOOD VESSELS OF THE FACE

The FACIAL ARTERY from the external carotid and the TRANSVERSE FACIAL ARTERY from the SUPERFICIAL TEMPORAL ARTERIES are the main blood supplies to the face (Figs. 2-11, 2-25, 2-26). The facial artery runs initially along the inferior margin of the mandibular body where it gives off the SUBMENTAL ARTERY. It then turns cranially towards the corner of the mouth giving off SUPERIOR and INFERIOR LABIAL ARTERIES. The facial artery ends as the ANGULAR ARTERY which runs along the lateral margin of the nose. The TRANSVERSE FACIAL ARTERY runs across the face near the zygomatic arch. It anastomosis with the facial artery and supplies blood to the parotid gland and the area of the upper cheek. In addition, the SUPRAORBITAL and SUPRATROCHEAR ARTERIES supply blood to the forehead, the INFRAORBITAL ARTERY supplies the area of the face just below the eye and the MENTAL ARTERY supplies blood to the chin.

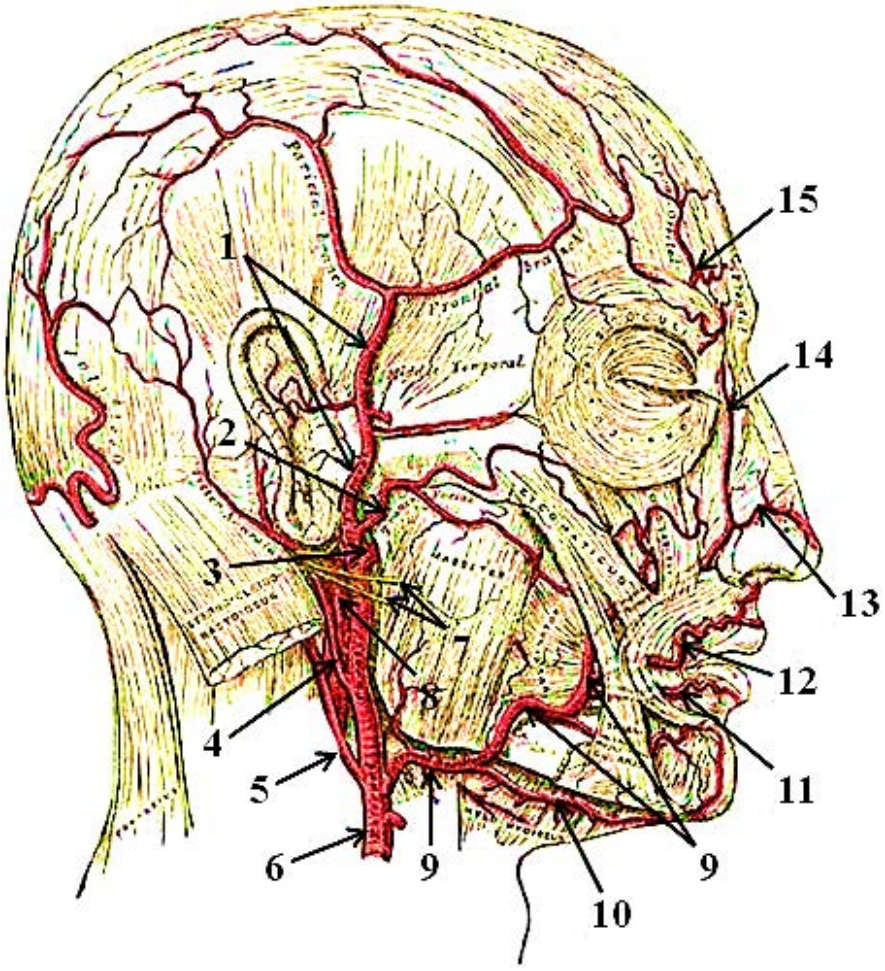


Fig. 2-11. Head: Arteries to the face from external carotid artery. (modified from Gray's 1918) . 1. Superficial temporal a., 2. Transverse facial a. , 3. Maxillary a., 4. Posterior auricular a., 5. Occipital a., 6. Common carotid a., 7. Facial nerve, 8. Internal carotid a., 9. Facial a., 10. Submental a., 11. Inferior labial a., 12. Superior labial a., 13. Lateral nasal a., 14. Angular a., 15. Supraorbital a.

The FACIAL VEIN is the main vein of the face. (Fig. 2-12). It receives blood from the SUPRATROCHLEAR and SUPRAORBITAL VEINS, the SUPERIOR and INFERIOR LABIAL VEINS, and the SUBMENTAL VEIN. The superior part of the facial vein that runs with the angular artery is called the ANGULAR VEIN. The angular vein communicates with the SUPERIOR and INFERIOR OPHTHALMIC VEINS of the eye which are continuous with the CAVERNOUS SINUS of the brain. The facial vein empties into the INTERNAL JUGULAR VEIN.

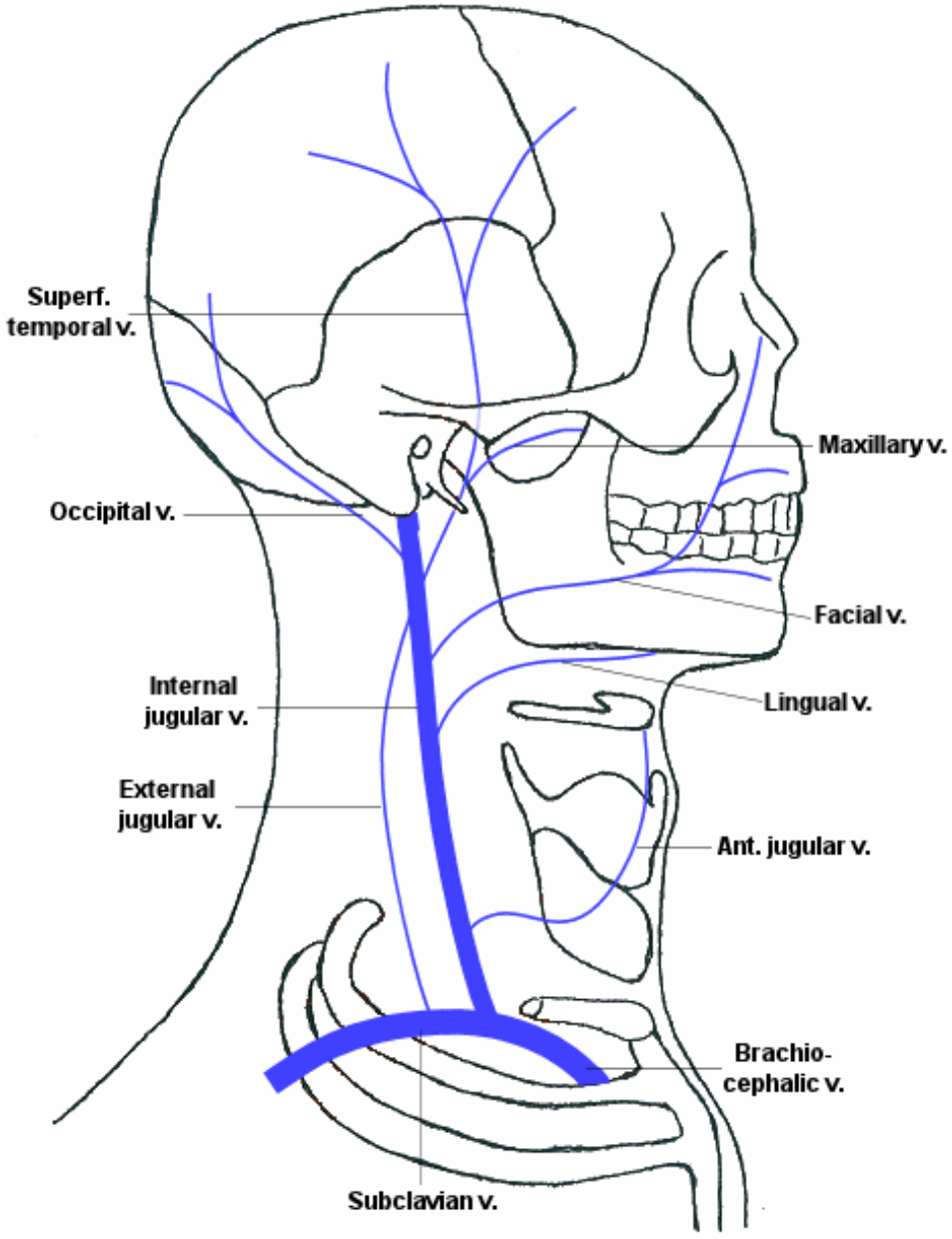


Fig. 2-12. Head: Veins of the face

2.2.3 MUSCLES OF FACIAL EXPRESSION

These cutaneous muscles attach in part to the skin of the face and contract to produce our facial expressions (Figs. 2-13, 2-14, 2-15). With the exception of the LEVATOR PALPEBRAE SUPERIORIS which is innervated by the OCULOMOTOR NERVE (III), all of these muscles of facial expression are innervated by the FACIAL NERVE (VII).

The muscles of facial expression can be grouped regionally as follows:

1. FOREHEAD
   The large FRONTALIS MUSCLE spans the forehead and elevates the eyebrows and wrinkles the skin of this region. It is part of the OCCIPITOFRONTALIS MUSCLE that runs across the top of the head and moves the scalp forward and backward.

2. EYE
   - ORBICULARIS OCULI muscle encircles the eye and produces full closure the eye.
   - LEVATOR PALPEBRAE SUPERIORIS attaches to the upper eyelid and elevates it to open the eye.
   - CORRUGATOR attaches to the medial eyebrow and pulls it upward and laterally.

3. NOSE
   - NASALIS MUSCLE covers the external nose and compresses the nostrils (transverse part) or dilates them (alar part).

- PROCERUS MUSCLE extends from the middle of the forehead to the bridge of the nose. It moves the medial part of the eyebrows downward and wrinkles the skin over the bridge of the nose.

4. CHEEK

The BUCCINATOR runs from the lateral surface of the mandible and maxilla to the muscles along the side of the mouth. It presses the cheek inward toward the oral cavity. During eating, this muscle helps move the food toward the teeth. It also moves air in and out of the oral cavity during sucking and blowing.

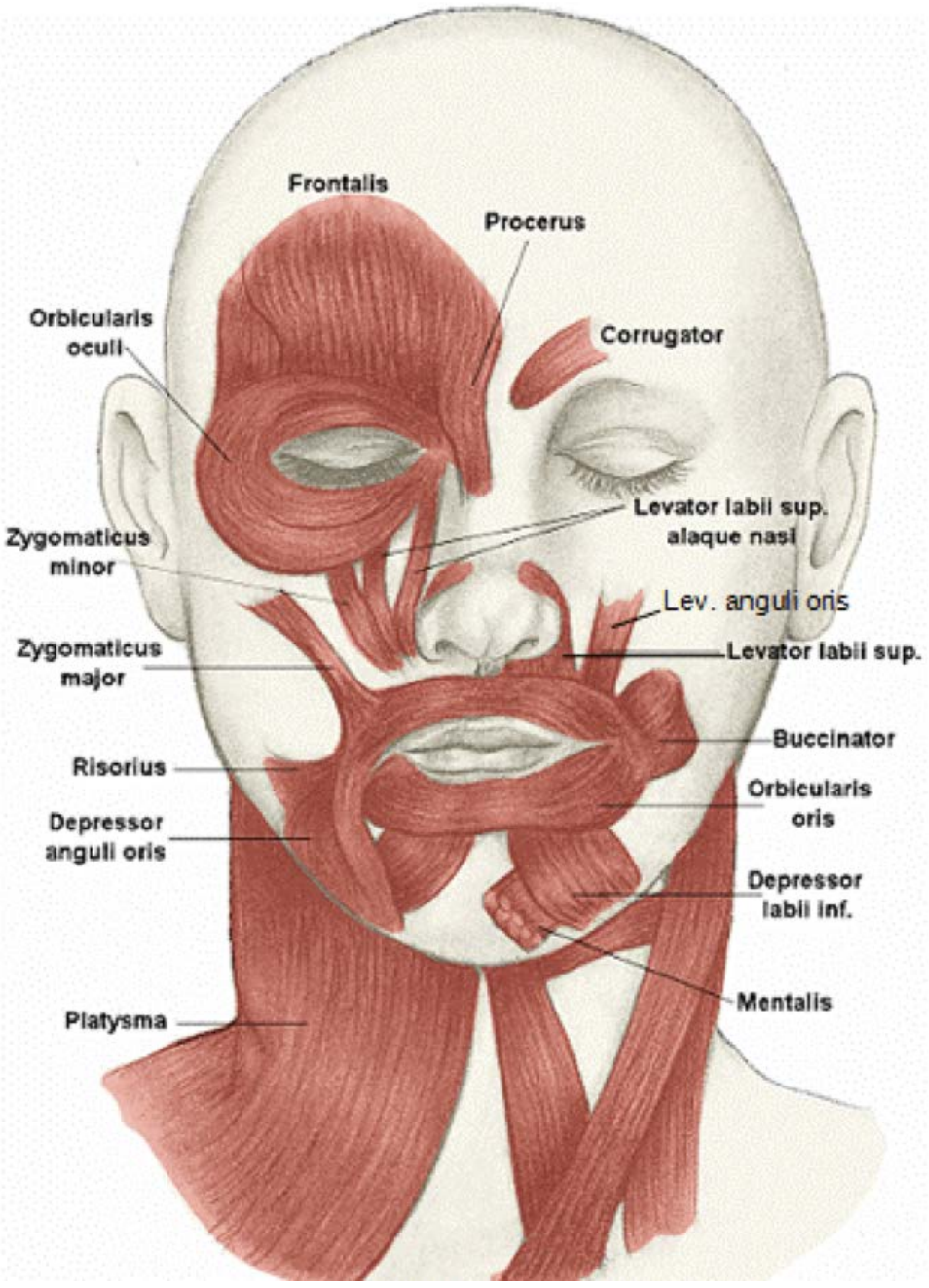


Fig. 2-13. Head: Drawing of the muscles of facial expression.

5. MOUTH
   - ORBICULARIS ORIS muscle encircles the mouth and acts to close and protrude the lips.
   - ZYGOMATICUS MAJOR and MINOR muscles arise from the zygomatic arch and attach near the corner of the mouth. They elevate the angle of the mouth.
   - LEVATOR LABII SUPERIORIS muscle runs from below the orbit (maxilla) to the upper lip and elevates the upper lip.
   - LEVATOR LABII SUPERIORIS ALAEQUE NASI arises from the frontal process of the maxilla to the side of the nose and to the upper lip. It assists in elevating the upper lip and dilating the nostrils.
   - LEVATOR ANGULI ORIS runs from the lower border of the orbit (maxilla) to the corner of the mouth under the zygomaticus major and minor. It raises the angle of the mouth.
   - RISORIUS MUSCLES extends laterally from the corner of the mouth and retracts corners of the mouth laterally.
   - DEPRESSOR ANGULI ORIS muscle arises from the mandible and attaches to the lower corners of the mouth. It depresses the corner of the mouth.
   - DEPRESSOR LABII INFERIORIS muscle arises from the mandible under the depressor anguli oris. It attaches to the lower lip and depresses the lower lip.
   - MENTALIS muscle runs from the symphyseal region of the mandible to the middle of the lower lip. It depresses the medial lower lip.

6. NECK

   The PLATYSMA lies in the subcutaneous tissue of the anterior neck extending from the upper pectoral region to the mandible. It depresses the lower lip and angles of the mouth and assists in mouth opening.

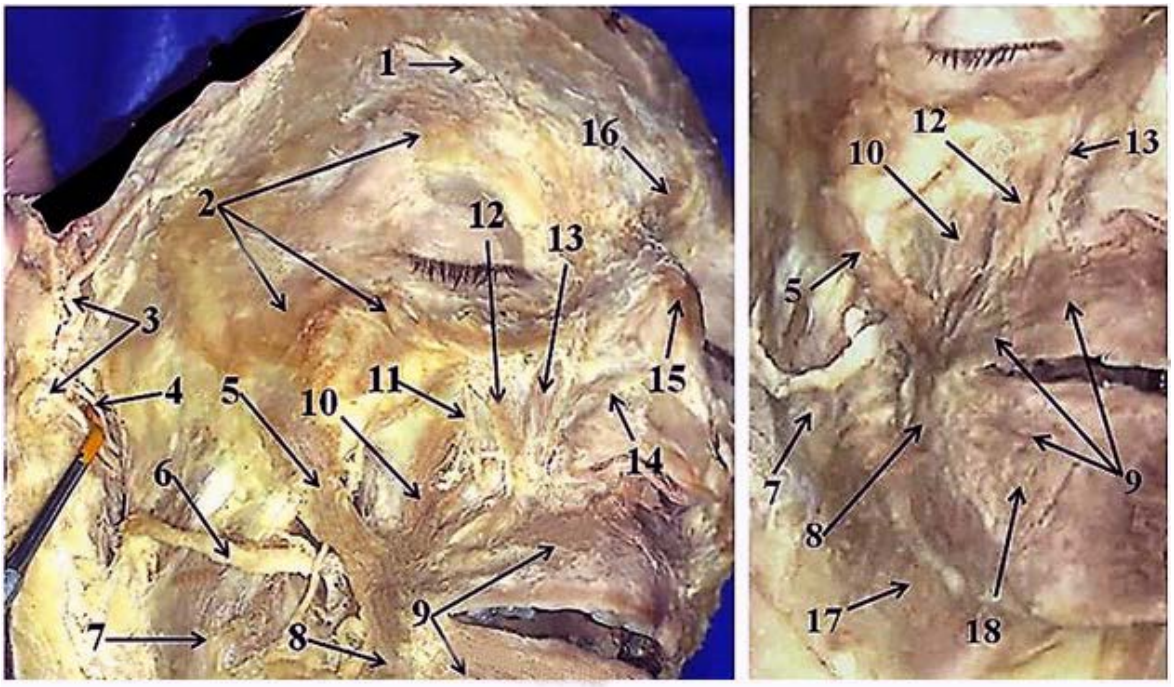


Fig 2-14. Head: Dissection of face. 1. Supraorbital nerve, 2. Orbicularis occuli, 3. Superficial temporal a. 4. Auriculotemporal n., 5. Zygomaticus major, 6. Parotid duct, 7.Masseter, 8. Depressor labii inferioris 9. Orbicularis oris 10. Levator anguli oris, 11. Infraorbital n., 12. Levator labii superioris, 13. Levator labii superioris alaeque nasi, 14. Nasalis, 15. Procerus, 16. Corrugator, 17. Platysma, 18. Depressor anguli oris

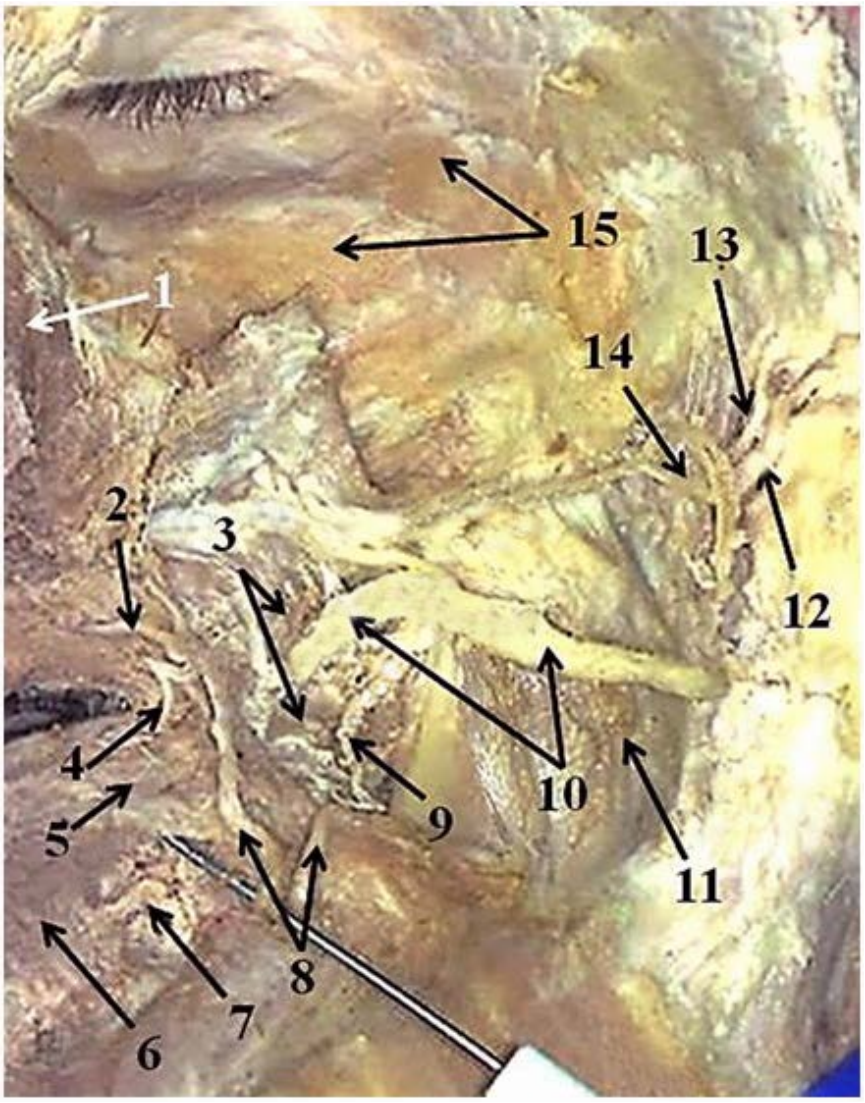


Fig 2-15. Head: Dissection of lateral face. 1. Levator labii superioris alaeque nasi, 2. Superior labial a., 3. Buccinator, 4. Inferior labial a., 5. Orbicularis oris, 6. Depressor labii inferioris 7. Mental a. & n., 8. Facial a., 9. Buccal n., 10. Parotid duct, 11. Masseter, 12. Superficial temporal a., 13. Auriculotemporal n., 14. Zygomatic branch of VII, 15. Orbicularis occuli

V. Study questions:

1) What is the main difference between the innervation of the facial nerve and the trigeminal nerve?
2) Where would sensory impairment on the face occur with a lesion to each of the following nerves:
   a. Supraorbital n.
   b. Inferior alveolar n.
   c. Buccal n.
   d. Maxillary n.
   e. Frontal n.
3) What arteries provide the main blood supply to the face?
4) With a paralysis of the facial muscles around the mouth, what actions would be impaired?

2.3 PAROTID REGION

2.3.1 BOUNDARIES

This region is bound ANTERIORLY by the ramus of the mandible, masseter, and the medial pterygoid muscles; POSTERIORLY by the mastoid process of the temporal bone and the anterior border of the sternocleidomastoid muscle; SUPERIORLY by the external auditory meatus and temporomandibular joint and INFERIORLY by the posterior belly of the digastric and the stylohyoid muscle.

2.3.2 CONTENTS

This region contains 1) PAROTID GLAND, which is a salivary gland, 2) FACIAL NERVE; 3) EXTERNAL CAROTID ARTERY and 3 branches, 4) RETROMANDIBULAR VEIN; 5) AURICULOTEMPORAL NERVE from the trigeminal nerve, and 6) GREATER AURICULAR NERVE from C2 - C3.

The FACIAL NERVE (Figs. 2-16, 2-17) arises from the STYLOMASTOID FORAMEN and passes through the parotid gland. It first gives off the POSTERIOR AURICULAR NERVE to the posterior belly of the digastric and then divides into five terminal branches to the muscles of facial expression. 1) The TEMPORAL BRANCH innervates the muscles above and around the eye. 2) The ZYGOMATIC BRANCH innervates the muscles below the eye and in the upper cheek region. 3) The BUCCAL BRANCH innervates the buccinator and muscles in the lower cheek and the upper mouth region. 4) The MANDIBULAR BRANCH innervates the muscles around and below the mouth. 5) The CERVICAL BRANCH innervates the platysma.

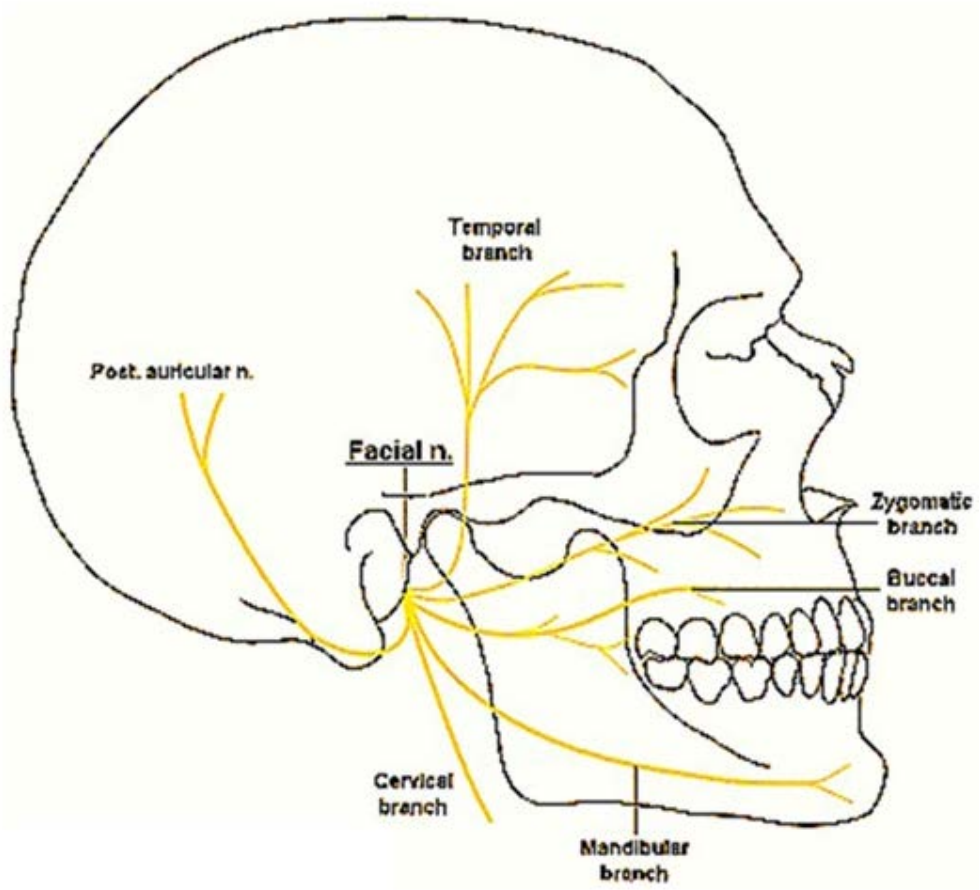


Fig. 2-16. Head: Diagram showing the distribution of the facial nerve.

The EXTERNAL CAROTID ARTERY enters the parotid gland and there gives off the 1) POSTERIOR AURICULAR ARTERY, 2) SUPERFICIAL TEMPORAL ARTERY, and 3) MAXILLARY ARTERY.

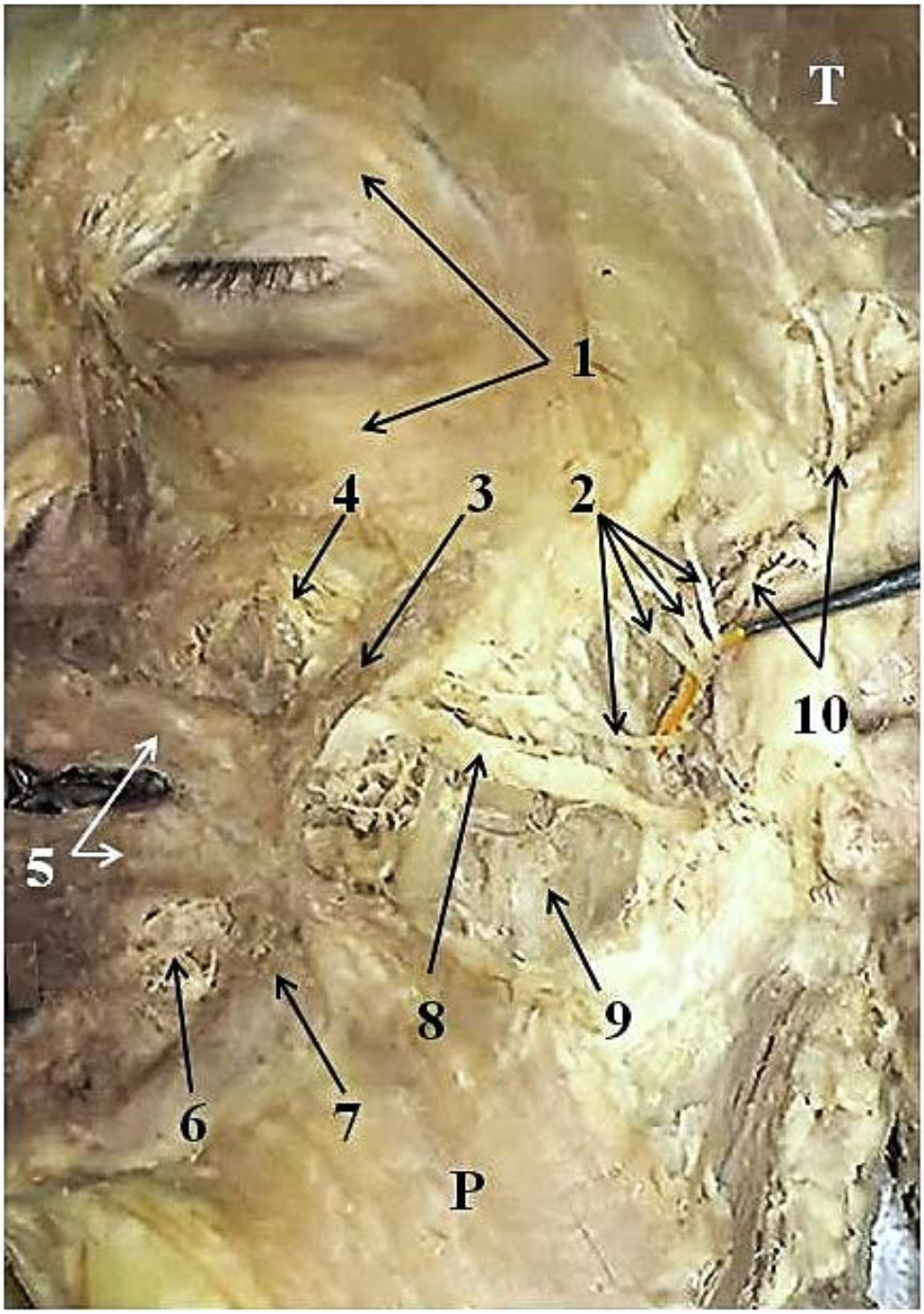


Fig 2-17. Head: Dissection of the lateral face. 1. Orbicularis occuli, 2. Facial n (VII), 3. Zygomaticus major, 4. Infraorbital n., 5. Orbicularis oris, 6. Mental n. & a., 7. Depressor anguli oris, 8. Parotid duct, 9. Masseter, 10. Superficial temporal a., P = platysma, T = temporalis.

VI. Study questions:

1) What muscles of the face could be affected with by damage to the zygomatic branch of the facial nerve?
2) What is the difference between the buccal nerve and the buccal branch of the facial nerve?
3. What sensory impairment occurs in the face with damage to the facial nerve?

2.4 TEMPORAL REGION

2.4.1 BOUNDARIES

The temporal region is bound INFERIORLY by the parotid region; ANTERIORLY by the frontal process of the zygomatic bone and POSTERIORLY by the root of the zygomatic process of the temporal bone.

2.4.2 CONTENTS

It contains 1) TEMPORALIS MUSCLE, 2) AURICULOTEMPORAL NERVE, 3) TEMPOROMANDIBULAR JOINT, 4) TEMPORAL BRANCHES of the FACIAL NERVE, 5) ZYGOMATICOTEMPORAL NERVE, 6) DEEP TEMPORAL NERVES of the trigeminal, 7) SUPERFICIAL and DEEP TEMPORAL BLOOD VESSELS, and 8) EXTERNAL AUDITORY MEATUS.

2.4.3 TEMPOROMANDIBULAR JOINT (TMJ)

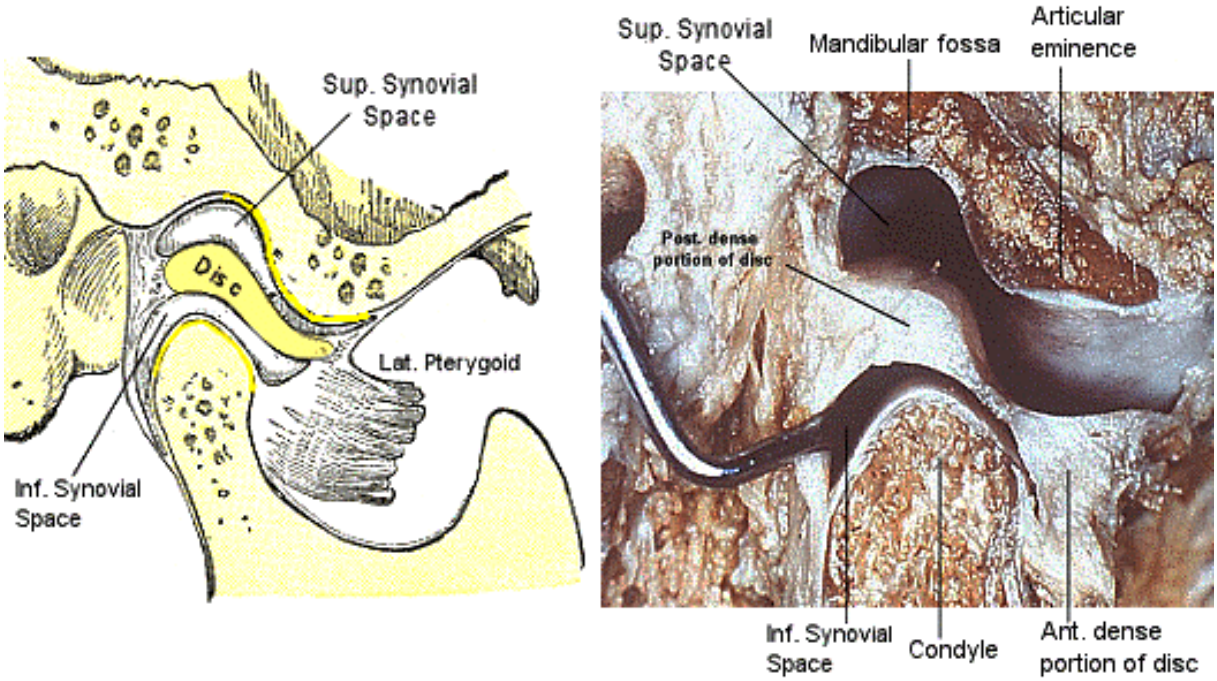


Fig. 2-18. Head: Drawing and dissection of the right TMJ. (image on the left modified from Gray 1918)

The TMJ is formed by the MANDIBULAR (glenoid) FOSSA of the temporal bone and the MANDIBULAR CONDYLE (Fig. 2-18). Anterior to the mandibular fossa is the ARTICULAR TUBERCLE and posterior to it is the POSTGLENOID TUBERCLE. The temporomandibular joint contains an INTERARTICULAR DISC that is attached anteriorly to lateral pterygoid muscle, through the joint capsule, and posteriorly to a SUPERIOR and INFERIOR LAMINA of the posterior ligament (Figs. 2-19, 2-20).

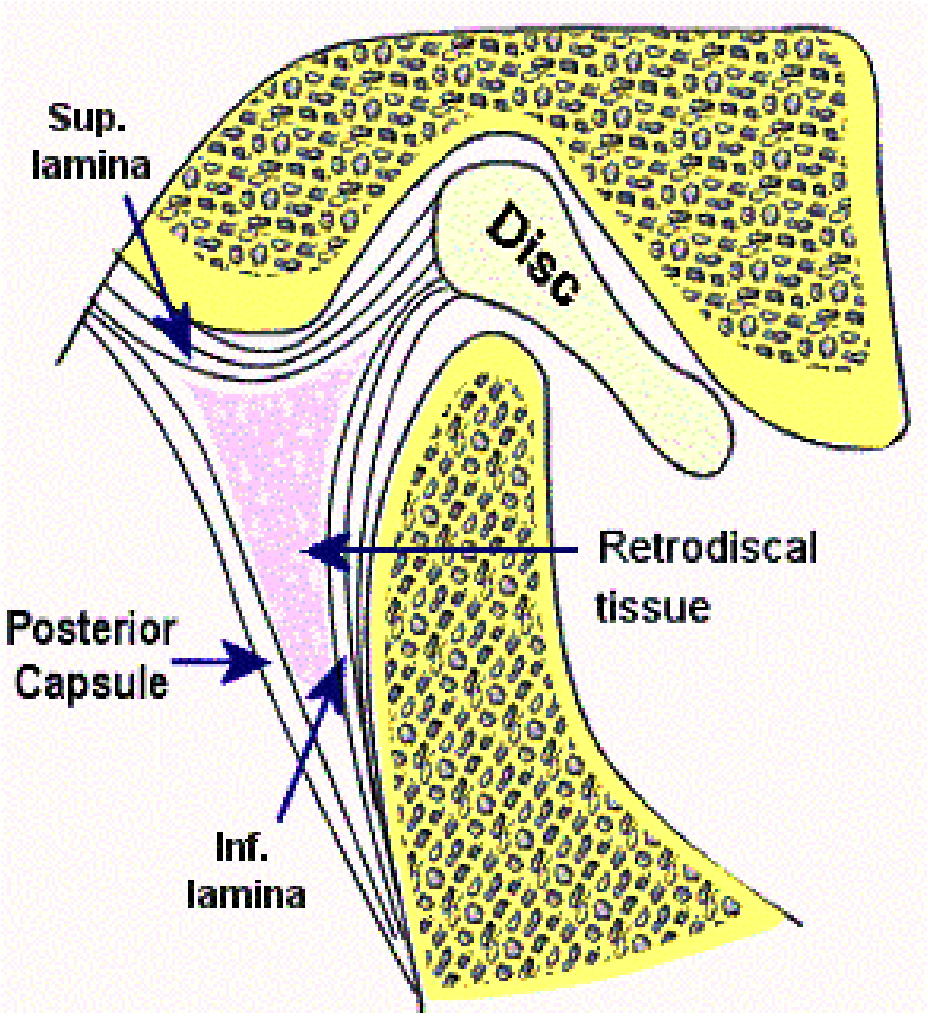


Fig. 2-19. Head: Capsule, Superior lamina and inferior lamina of the TMJ (Modified from Gray 1918)

The SUPERIOR LAMINA contains collagen but also many elastic fibers. The elasticity of this lamina allows the disc to move forward over the articular tubercle during mouth opening which stretches the superior lamina. The lamina then recoils during mouth closing pulling the disc posteriorly. The INFERIOR LAMINA is non-elastic. It attaches the disc to the neck of the condyle and limits the extent of anterior disc movement. The JOINT CAPSULE has HORIZONTAL and OBLIQUE LIGAMENTS laterally that seem to limit transverse rotation and translation of the mandibular condylar.

Lateral to the temporomandibular joint is the temporal branch of the facial nerve while anterior to the joint is the insertion of the lateral pterygoid muscle. Posterior to the TMJ are the parotid gland, external auditory meatus, trunk of the facial nerve, auriculotemporal nerve and superficial temporal vessels. Medial to the joint are the chorda tympani nerve off the facial nerve and middle meningeal artery.

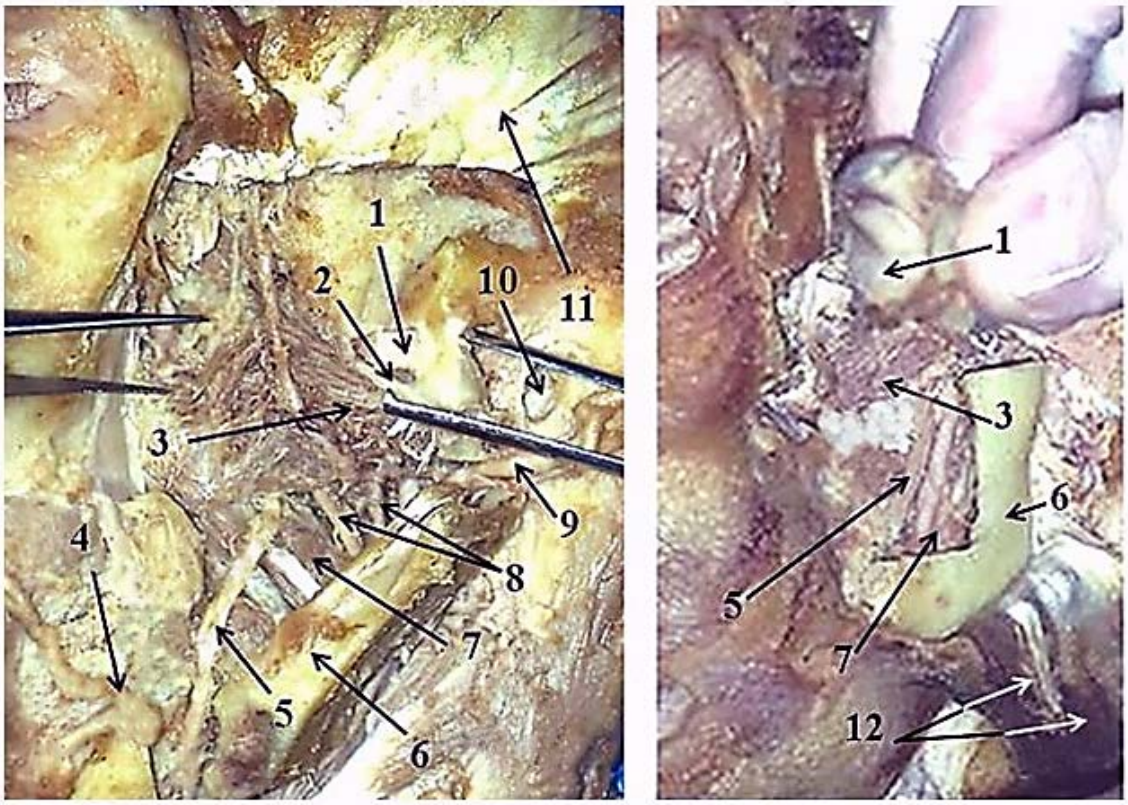


Fig 2-20. Head: Dissections of temporomandibular joint (TMJ) region. 1. TMJ disc, 2. TMJ capsule, 3. Lateral pterygoid m., 4. Facial a., 5. Lingual n., 6. Ramus of mandible, 7. Medial pterygoid m., 8. Inferior alveolar n. & a., 9. Superficial temporal a., 10. External auditory meatus, 11. Temporalis m. 12. Masseter m.

2.4.4 MUSCLES OF MASTICATION

These muscles act at the temporomandibular joint to CLOSE THE MOUTH during eating and are all innervated by branches from the MANDIBULAR DIVISION of the TRIGEMINAL NERVE.

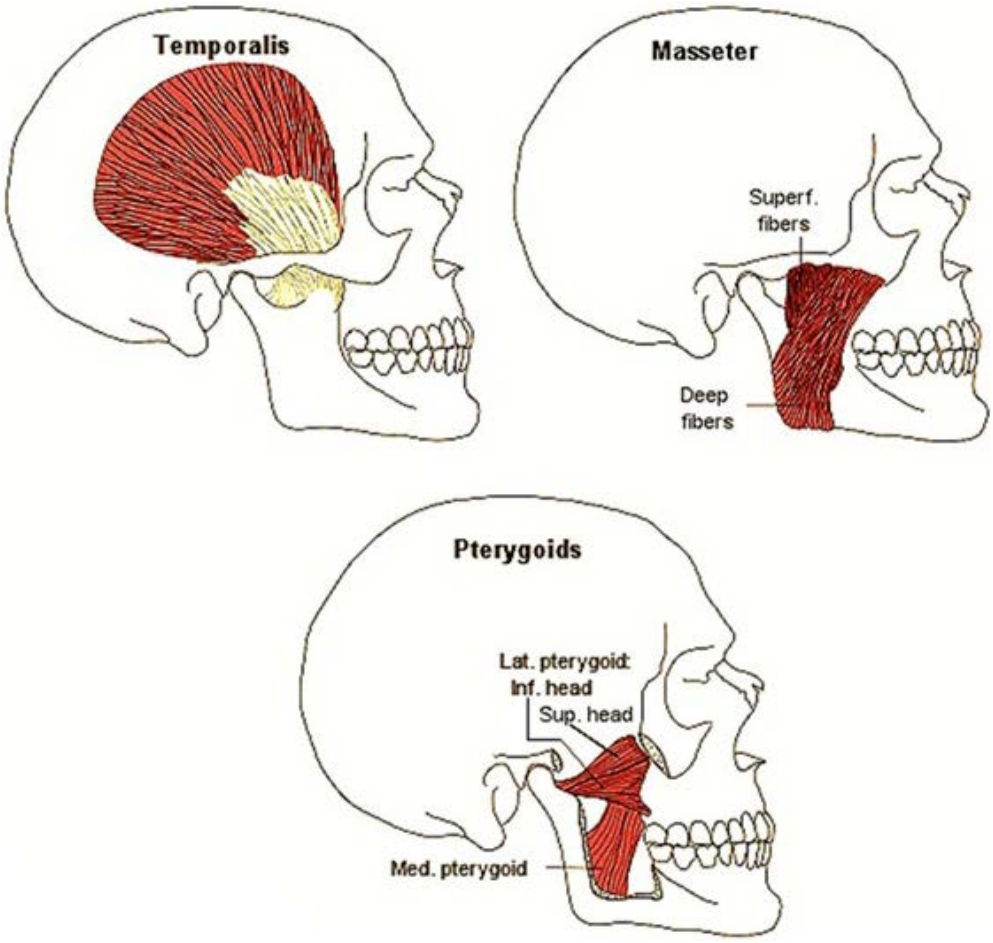


Fig. 2-21. Head: Muscles of mastication

1. TEMPORALIS MUSCLE (Figs. 2-05, 2-20, 2-21, 2-22)
   - Superior attachment (origin): The temporal fossa and temporal lines on lateral skull.
   - Inferior attachment (insertion): Coronoid process and the anterior ramus of mandible.
   - Actions: Elevation and retrusion of the mandible, lateral deviation of the mandible to the same side.

2. MASSETER (Figs. 2-05,2-20, 2-21, 2-22)
   - Superior attachment (origin): Inferior and medial zygomatic arch.
   - Inferior attachment (insertion): Lateral mandibular ramus and mandibular coronoid process and angle.
   - Actions: Elevation and protrusion of the mandible, lateral deviation of the mandible to the opposite side.

3. MEDIAL PTERYGOID (Figs. 2-05, 2-20, 2-21, 2-22)
   - Superior attachment (origin): Medial lateral pterygoid plate of the sphenoid, palatine bone, and maxilla tuberosity.
   - Inferior attachment (insertion): Medial angle of the mandible.
   - Actions: Elevation and protrusion of the mandible, lateral deviation of the mandible to the opposite side.

4. LATERAL PTERYGOID (Figs. 2-05, 2-20, 2-21, 2-22)
   - Superior attachment (origin):
     - SUPERIOR HEAD: Infratemporal surface of greater wing of sphenoid bone;
     - INFERIOR HEAD: lateral surface of the lateral pterygoid plate.
   - Inferior attachment (insertion): Articular disk and capsule of temporomandibular joint, neck of mandibular condyle.
   - Actions: protrusion and depression of the mandible, guides retraction of the articular disc during jaw closing, lateral deviation of the mandible to the opposite side.

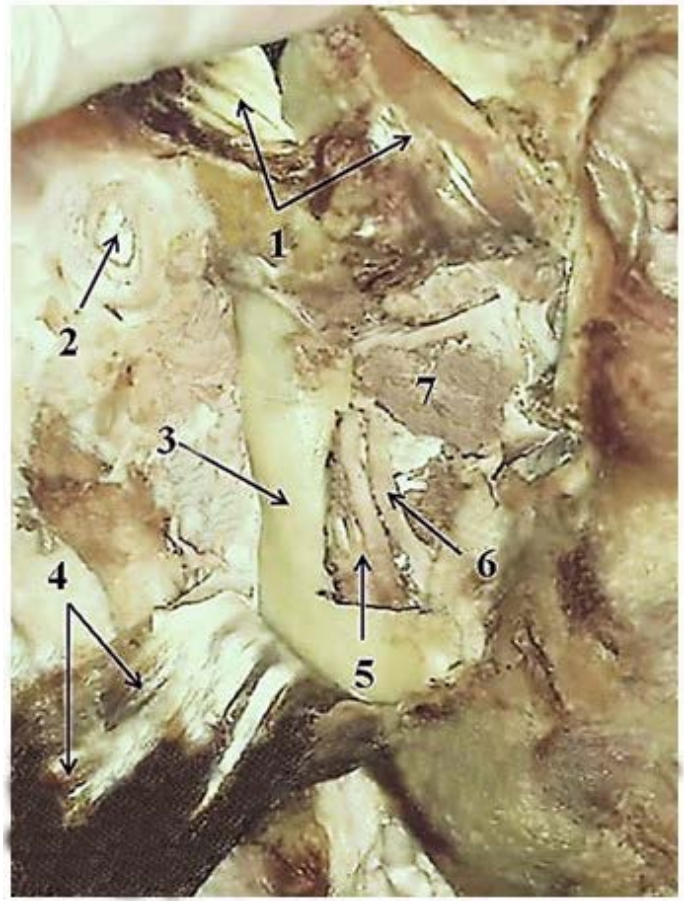


Fig 2-22. Head: Dissection of jaw muscles. 1. Temporalis, 2. External auditory meatus, 3. Ramus of mandible, 4. Masseter, 5. Medial pterygoid, 6. Lingual n., 7. Lateral pterygoid.

2.4.5 JAW MOVEMENTS

MOUTH OPENING

Mouth opening can be divided into two stages. During the first stage, the mandibular condyles rotate anteriorly relative to their articular disc and the mouth open 11 - 25 mm. During the second stage, the condyles and disc translate anteriorly over the articular tubercle and the mouth opens to 40 - 50 mm. Anterior translation of the condyle during the second stage of mouth opening moves the articular disc anteriorly. This anterior movement of the disc is controlled by stretching of the elastic superior lamina and limited by the non-elastic inferior lamina. If the proximal interphalangeal joints of the index and middle fingers can be placed between the upper and lower incisors than the amount of mouth opening is considered to be functional. If the proximal interphalangeal joints of the index, middle and ring fingers can be placed between the incisors, than mouth opening is considered normal (LeVangie and Norkin, 2011).

MOUTH CLOSING

Mouth closing also has two stages which are the reverse of opening. During the initial closing stage, the mandibular condyles and the articular disc move posteriorly over the articular tubercle and into the mandibular fossa. Posterior movement of the disc during closing occurs by recoil of the superior lamina and is controlled by eccentric contraction of the superior head of the lateral pterygoid that attaches to the anterior aspect of the articular disc (LeVangie and Norkin, 2011). During the second stage, the disc is in the mandibular (glenoid) fossa and does not move as the mandibular condyle rotates posteriorly to fully close the mouth.

PROTRUSION AND RETRUSION

Protrusion of the mandible involves bilateral anterior translation of the mandibular condyles and the disk. Retrusion involves posterior translation of the condyles and disk. Normal protrusion of the mandible is 6 - 9 mm. whereas normal retrusion is only 3 mm. (LeVangie and Norkin, 2011).

LATERAL JAW MOVEMENT

Lateral movements of the mandible are produced by two different mechanisms. When the mouth is closed, lateral movement results from anterior translation of one condyle and a horizontal rotation of the other condyle. When the mouth is open, lateral movement results from posterior translation (retrusion) of the condyle on the side to which the jaw is moving and anterior translation (protrusion) of the opposite side condyle. Thus, lateral movement of the jaw to the left is produced by the temporalis and digastrics muscles retruding the left condyle posteriorly, while the masseter, medial pterygoid, and lateral pterygoid muscles protrude the right condyle anteriorly.

VII. Study questions:

1) What structures attach to the intraarticular disc of the TMJ?
2) What structures would be damaged if the mandibular condyle were dislocated in a posterior direction? What if the dislocation is in a medial direction?
3) What do all of the muscles of mastication have in common?
4) What muscles can close and protrude the lower jaw?
5) What muscles will generate lateral jaw movement to the right?

2.5 INFRATEMPORAL FOSSA

2.5.1 BOUNDARIES

This fossa (Fig. 2-06) is bound LATERALLY by the ramus of the mandible, MEDIALLY by the lateral plate of the pterygoid, ANTERIORLY by the posterior surface of the maxilla and the inferior orbital fissure, POSTERIORLY by the condylar process of the mandible and styloid process, INFERIORLY by the inferior attachment of the medial pterygoid muscle, and SUPERIORLY by the greater wing of the sphenoid containing the FORAMEN OVALE through which the mandibular division of the trigeminal nerve passes.

2.5.2 CONTENTS

The infratemporal fossa contains 1) LATERAL PTERYGOID MUSCLE, 2) MEDIAL PTERYGOID MUSCLE, 3) inferior attachment of the TEMPORALIS MUSCLE, 4) MANDIBULAR DIVISION of the TRIGEMINAL NERVE, 5) CHORDA TYMPANI of VII, and 6) branches of the MAXILLARY ARTERY.

The TRIGEMINAL NERVE is subdivided into an OPHTHALMIC DIVISION, MAXILLARY DIVISION, and MANDIBULAR DIVISION (Figs. 2-08, 2-09, 2-23). Branches from the ophthalmic division are sensory to the face, and those from the maxillary division are sensory to the face, upper teeth, and palate. Only the mandibular division contains both motor and sensory branches.

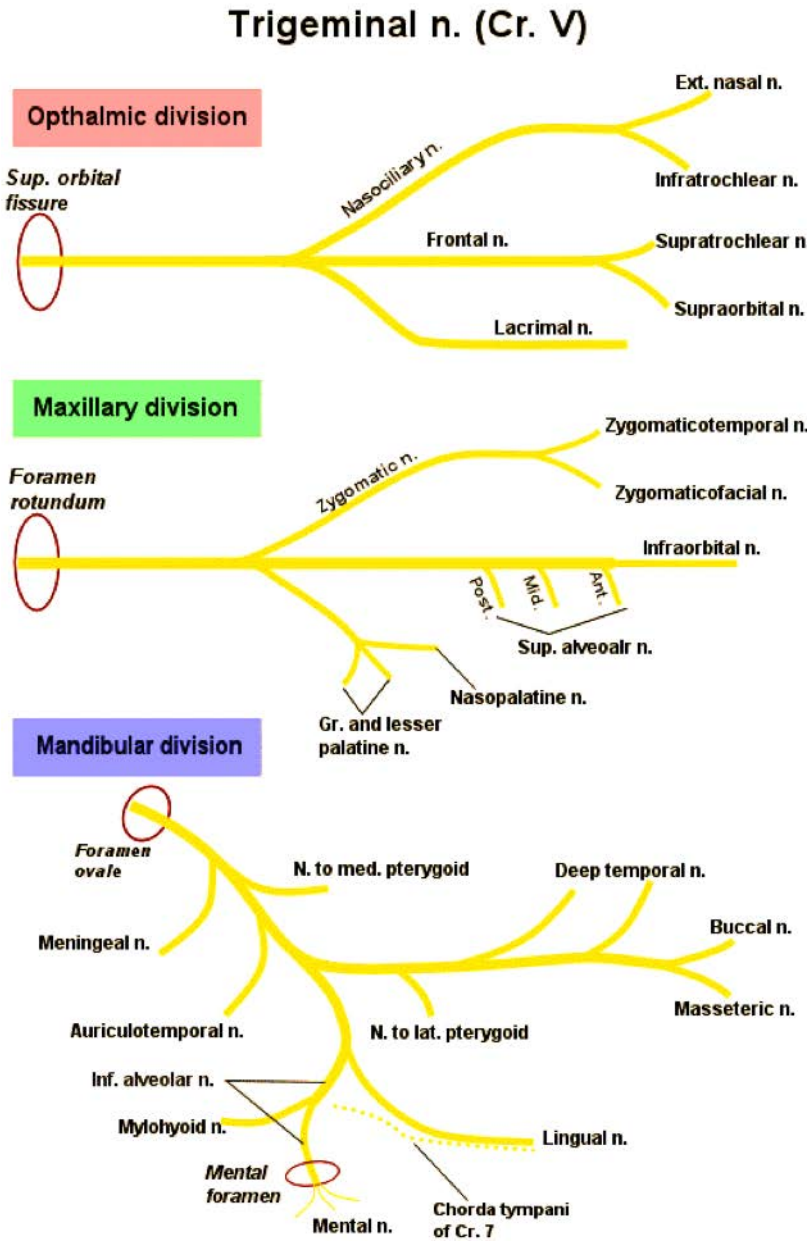


Fig. 2-23. Head: Diagram of the Trigeminal (V) Nerve

The MANDIBULAR DIVISION of the trigeminal nerve enters the infratemporal fossa through the FORAMEN OVALE (2-06, 2-08, 2-09, 2-23, 2-24). From the main trunk of the nerve arise the MENINGEAL NERVE to the meninges of the middle and posterior cranial fossa, and the NERVE TO THE MEDIAL PTERYGOID MUSCLE. The main trunk of the mandibular division then divides into ANTERIOR and POSTERIOR DIVISIONS.

The ANTERIOR DIVISION of the mandibular division of V gives rises to the MASSETERIC NERVE to the masseter, 2 - 3 DEEP TEMPORAL NERVES to the temporalis muscle, the NERVE TO THE LATERAL PTERYGOID MUSCLE, and the BUCCAL NERVE to the skin of the cheek region.

The POSTERIOR DIVISION of the mandibular division of V gives off the AURICULOTEMPORAL NERVE to the skin anterior to the ear and the parotid gland, the LINGUAL NERVE which provides general sensation to the anterior tongue, and the INFERIOR ALVEOLAR NERVE which is sensory to the mandibular teeth and ends as the MENTAL NERVE to skin of the chin. Near the mandibular foramen, the inferior alveolar nerve gives off the MYLOHYOID NERVE to the mylohyoid muscle and the anterior belly of the digastric.

The CHORDA TYMPANI (Figs. 2-24, 2-33) is a branch off the facial nerve. It runs medial to the tympanic membrane of the ear and enters the infratemporal fossa to join the lingual nerve. The chorda tympani then travels with the lingual nerve to the tongue where it innervates the taste buds in the anterior two-thirds of the tongue.

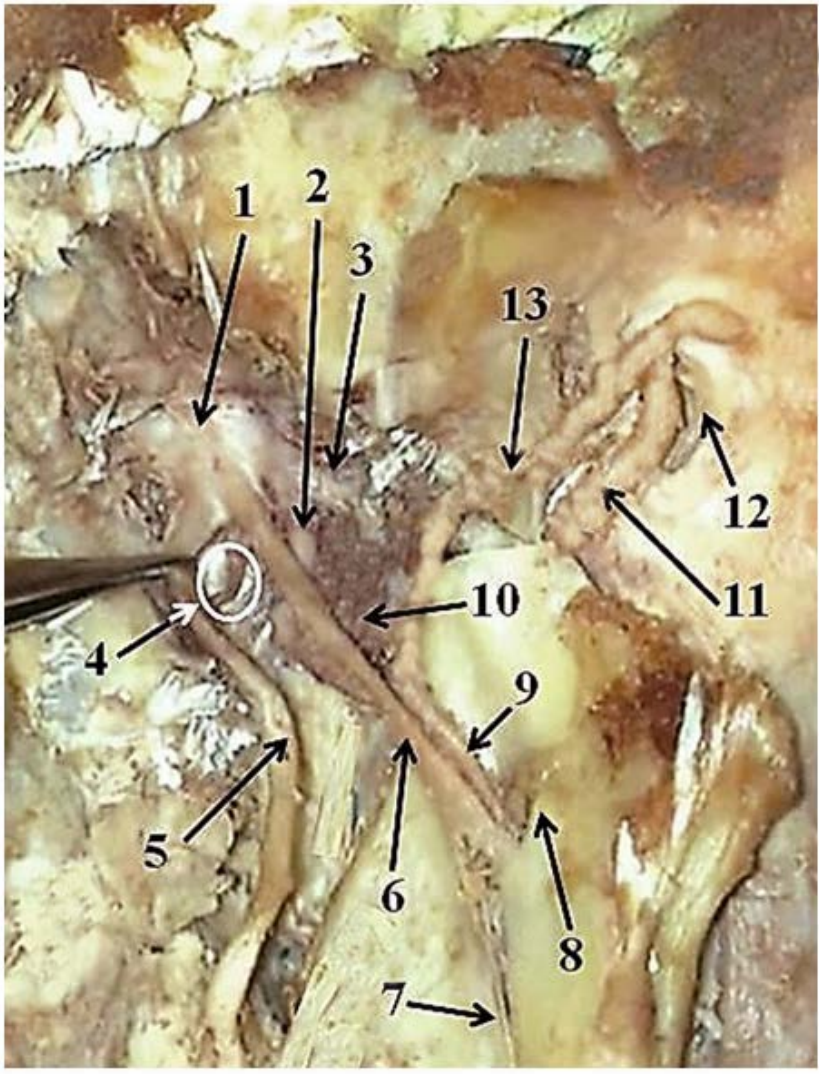


Fig 2-24. Head: Dissection of infratemporal fossa and mandibular nerve. 1. Mandibular nerve exiting foramen ovale, 2. Middle meningeal artery from maxillary, 3. Auriculotemporal crossing the middle meningeal a., 4. Chorda tympani (circled) from facial nerve joining the lingual n., 5. Lingual n., 6. Inferior alveolar n., 7. Mylohyoid n., 8. Lingula at the opening of the mandibular canal, 9. Inferior alveolar a., 10. Maxillary a., 11. Superficial temporal a., 12. External auditory meatus, 13.Temporal artery off maxillary artery cut and reflected.

The MAXILLARY ARTERY begins in the parotid region and runs horizontally and anteriorly through the infratemporal fossa (Figs. 2-11, 2-25, 2-26, 2-27). It is divided into THREE PARTS by the lateral pterygoid muscle.

The FIRST PART lies inferior to the lateral pterygoid muscle. It gives off the 1) DEEP AURICULAR ARTERY to the ear, 2) MIDDLE MENINGEAL ARTERY to the meninges covering the cerebral cortex, and 3) INFERIOR ALVEOLAR ARTERY providing blood supply to the mandibular teeth and chin (mental A..) .

The SECOND PART of the maxillary artery crosses the belly of the lateral pterygoid. It gives off 1) a MASSETERIC ARTERY to the masseter muscle, 2) usually two DEEP TEMPORAL ARTERIES to the temporalis muscle, 3) a PTERYGOID ARTERY to the medial and lateral pterygoid muscles, and 4) a BUCCAL ARTERY to the buccinator muscle.

The THIRD PART of the maxillary artery lies anterior to the lateral pterygoid. It gives off 1) POSTERIOR SUPERIOR, MIDDLE SUPERIOR, and ANTERIOR SUPERIOR ALVEOLAR ARTERIES to the teeth, 2) a DESCENDING PALATINE ARTERY that divides into GREATER PALATINE and LESSER PALATINE ARTERIES to the palate, 3) a SPHENOPALATINE ARTERY to the anterior hard palate, and 3) an INFRAORBITAL ARTERY which enters the inferior orbital fissure and exits the infraorbital foramen to the area of the face below the eye.

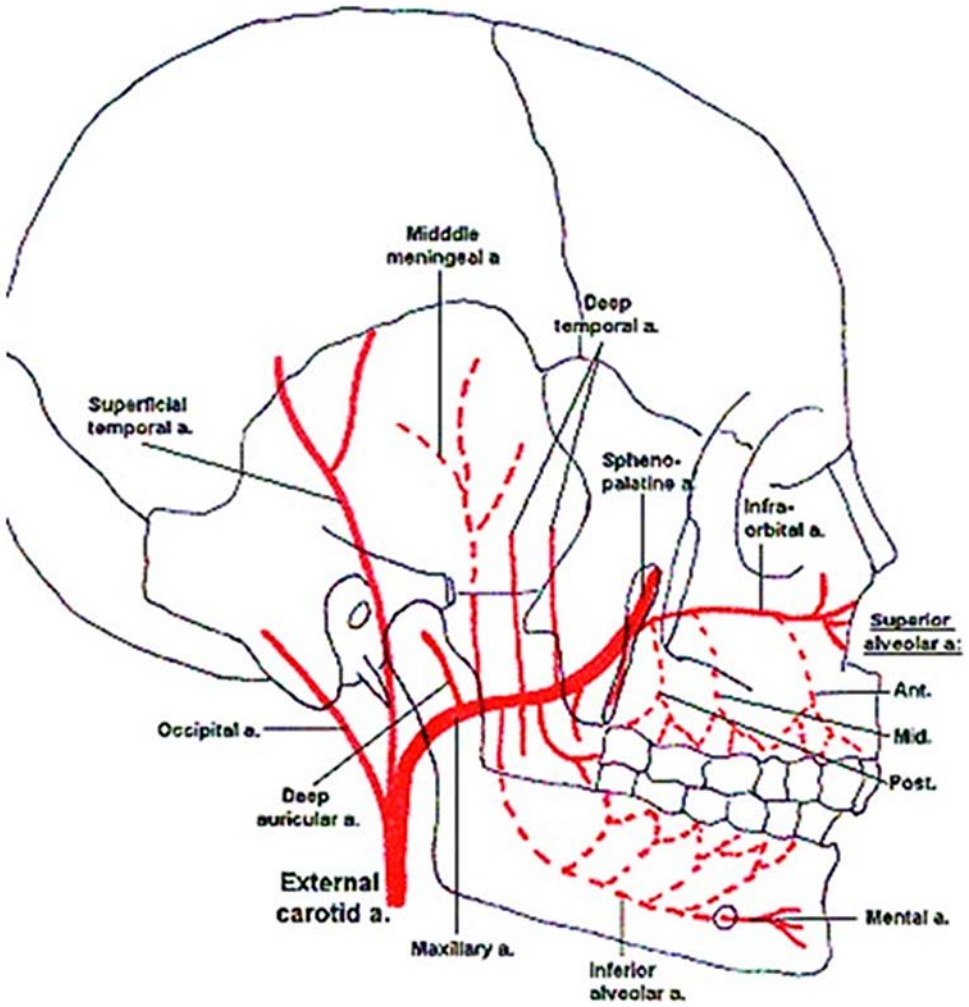


Fig. 2-25. Head: Diagram of the maxillary artery showing its orientation to the skull and some of its branches.

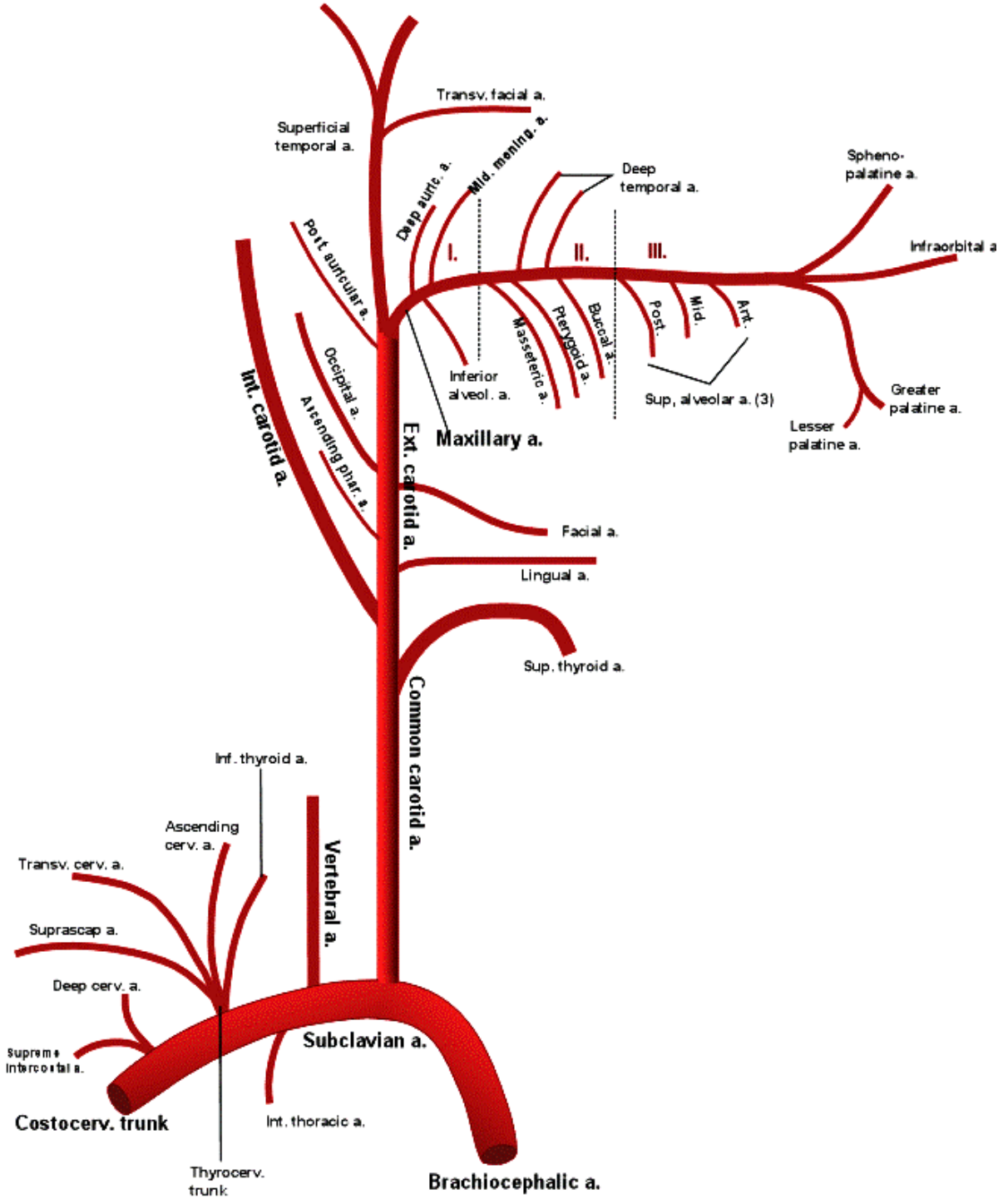


Fig. 2-26. Head: Summary diagram for the subclavian and carotid arteries. I = part one of the maxillary artery, II = part two of the maxillary artery, III = part three of the maxillary artery

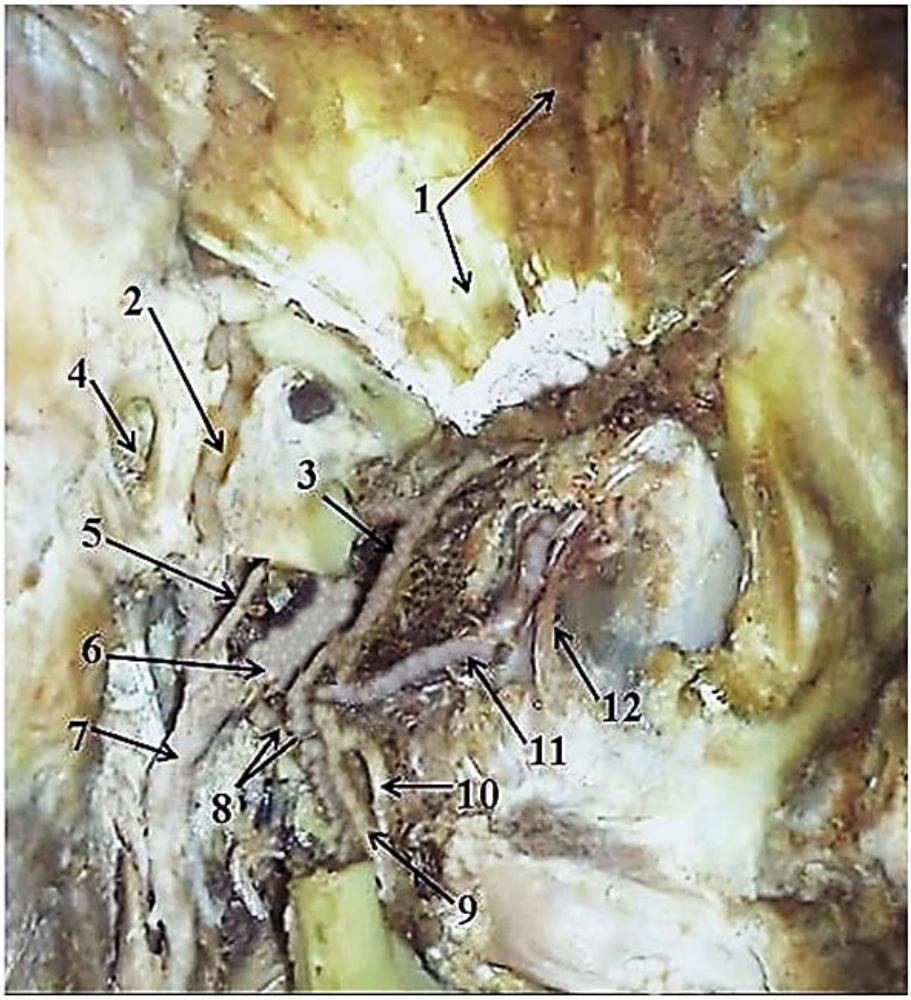


Fig 2-27. Head: Dissection of maxillary artery. 1. Temporalis , 2. Superficial temporal a., 3. Deep temporal a., 4. External auditory meatus, 5. Middle meningeal a., 6. Maxillary a., 7. External carotid a., 8. Inferior alveolar a. & v., 9. Inferior alveolar n., 10. Lingual n., 11. Continuation of maxillary artery (part II), 12. Posterior superior alveolar a.

VIII. Study questions:

1) What could be the sensory and motor effect of damage to the maxillary division of V?
2) What nerves of the mandibular division of V contain motor fibers? Does the anterior or posterior division of the mandibular division of V give off more motor nerves?
3) Which nerve of the mandibular division contains both motor and sensory nerves?
4) Blood supply to which structures would be reduced with blockage of the 2nd part of the maxillary artery? What about blockage to the 3rd part

2.6 ORAL CAVITY

2.6.1 BOUNDARIES

The oral cavity is the region inside the mouth. It is bound SUPERIORLY by the hard and soft palates, INFERIORLY by the tongue, LATERALLY and ANTERIORLY by the teeth, gum and cheeks, and POSTERIORLY by the pharynx (Fig. 2-28).

2.6.2 CONTENTS

The oral cavity contains the 1) HARD PALATE, 2) SOFT PALATE, 3) UPPER and 4) LOWER TEETH, and 5) the TONGUE. As the nerve and blood supply to the upper and lower teeth have been described, only the palate and tongue will be described here.

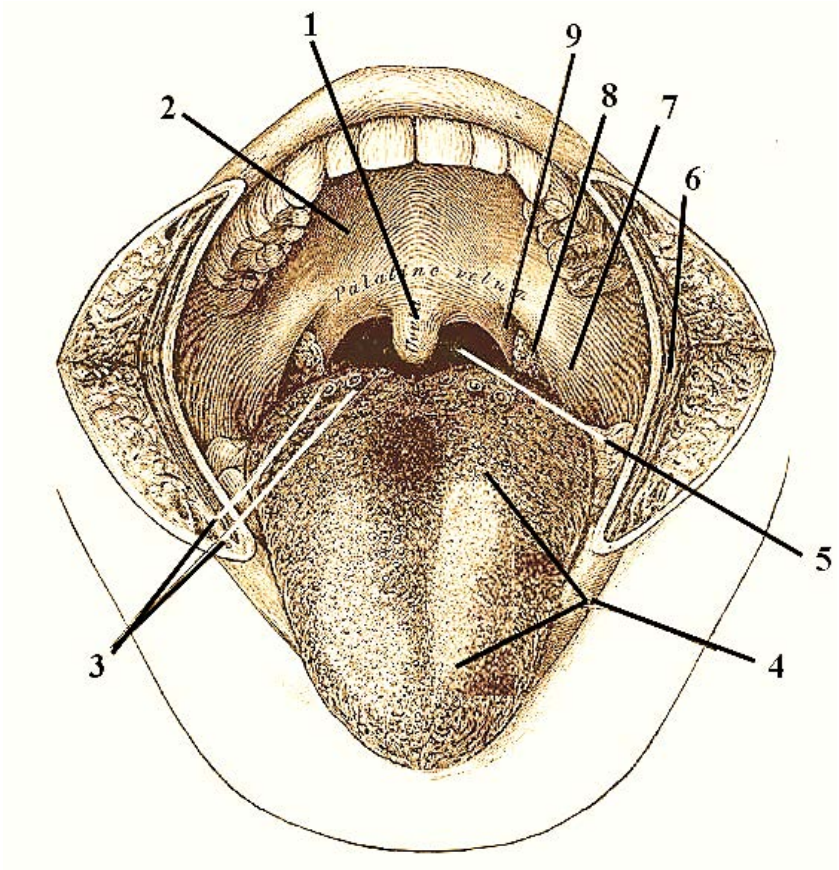


Fig. 2-28. Head: The oral cavity showing its boarders and contents. 1. Uvula of soft palate, 2. Hard palate, 3. Circumvallate papillae at border of anterior 2/3 and posterior 1/3 of tongue, 4. Anterior 2/3 of tongue 5. Oral pharynx, 6. Buccinator muscle, 7. Glossopalatine arch, 8. Palatine tonsil, 9. Pharyngopalatine arch. (modified from Gray 1918)

2.6.3 PALATE

The palate is subdivided into an anterior HARD PALATE and a posterior SOFT PALATE (Figs. 2-04, 2-10, 2-29, 2-30, 2-31).

The HARD PALATE is formed by the palatine plate of the maxillary bone and the palatine bone (Fig. 23-04). It is innervated anteriorly by the NASOPALATINE NERVE and posteriorly by the GREATER PALATINE NERVE (Figs. 2-09, 2-23, 2-29, 2-31). Blood to the hard palate is from the SPHENOPALATINE ARTERY anteriorly and the GREATER PALATINE ARTERY posteriorly (Figs. 2-25, 2-26, 2-29, 2-31).

The SOFT PALATE consists of glandular tissue and five pairs of muscles. It is innervated by the LESSER PALATINE NERVE (Figs. 2-09, 2-23, 2-29) and receives blood from the LESSER PALATINE ARTERY (Figs. 2-25, 2-26, 2-29). Venous blood from the palate is drained through matching veins that accompany the arteries.

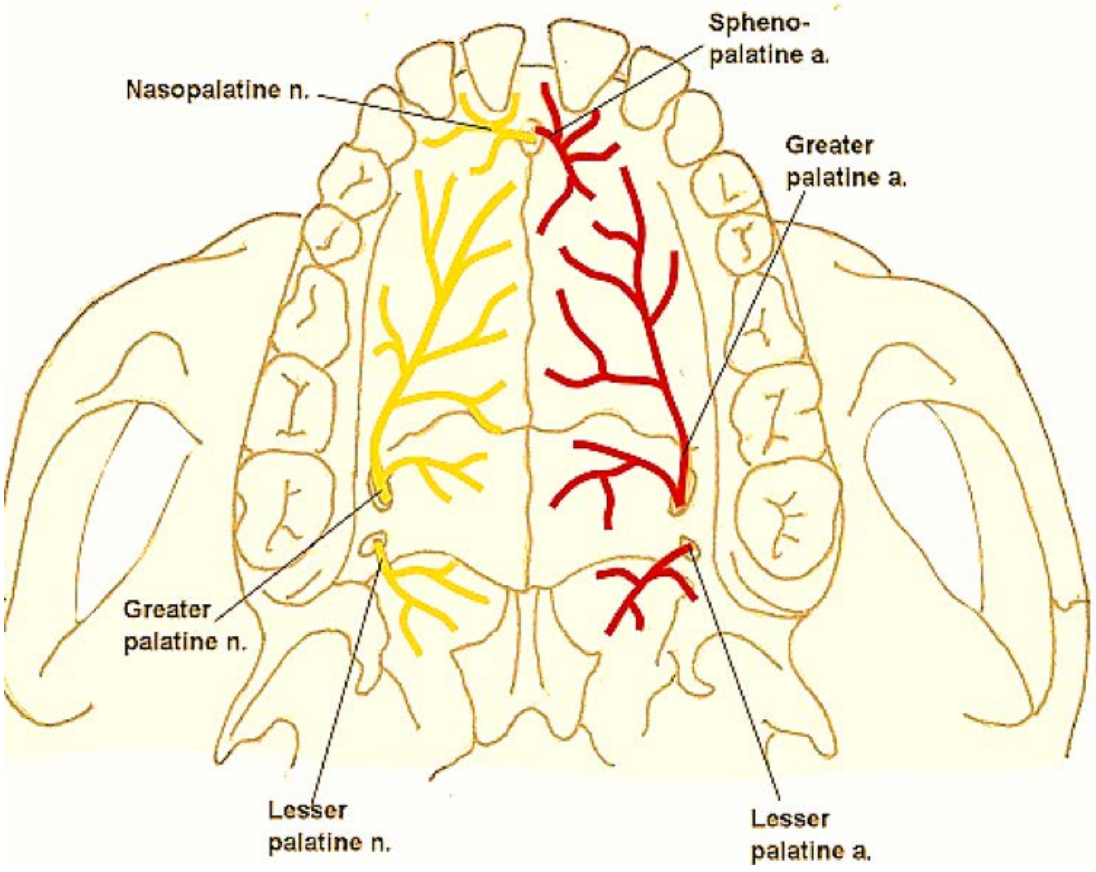


Fig. 2-29. Head: Diagram of the palate showing its innervation and arterial blood supply.

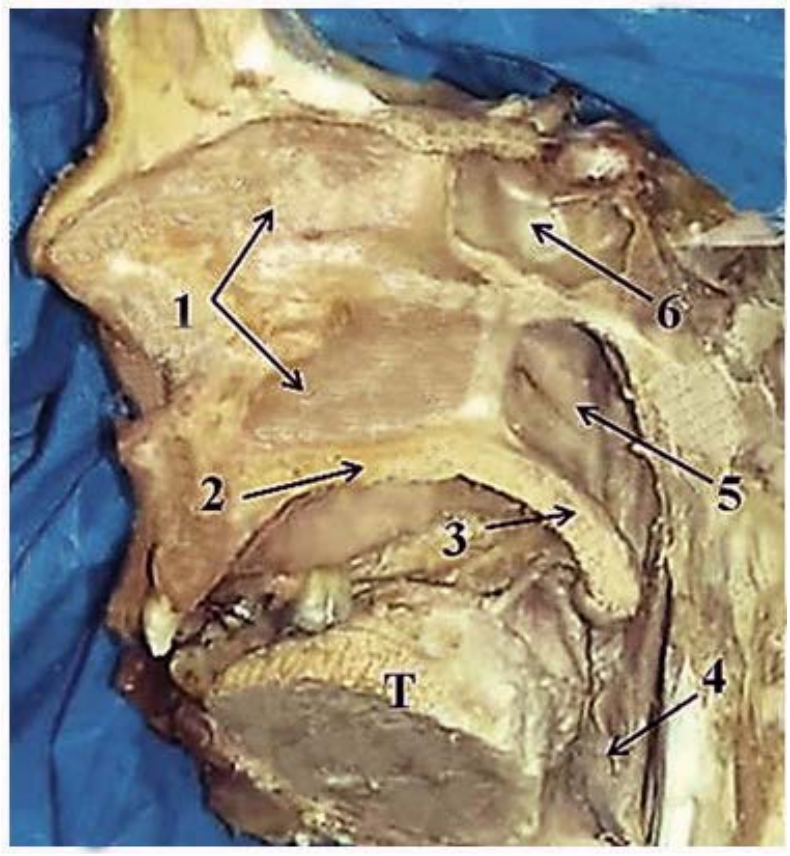


Fig 2-30. Head: Sagittal dissection of the palate and nasal cavity. 1. Nasal septum, 2. Hard palate, 3. Soft palate, 4. Oral pharynx, 5. Nasopharynx, 6. Sphenoid sinus, T = tongue.

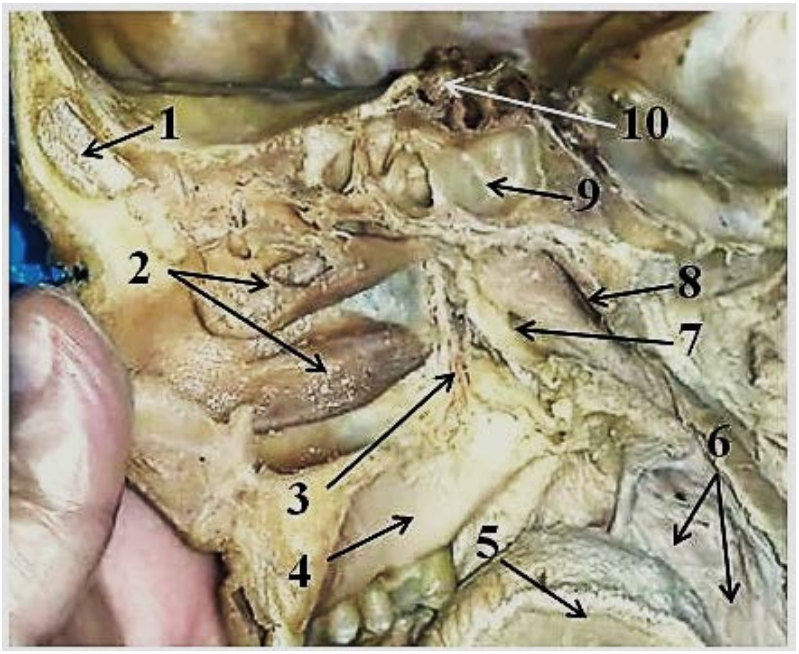


Fig 2-31. Head: Sagittal dissection of the palate and nasal cavity. 1. Frontal sinus, 2. Middle & Inferior conchae, 3. Greater palatine N. & A., 4. Palate, 5. Tongue, 6. Oral pharynx, 7. Eustachian tube, 8. Naso pharynx, 9. Sphenoid sinus, 10. Sella turcica

2.6.4 TONGUE

The superior surface of the tongue is divided into an ANTERIOR TWO-THIRDS and POSTERIOR ONE-THIRD by the TERMINAL SULCUS and circumvallate papillae (Fig. 2-32). The anterior two-thirds is innervated by the LINGUAL NERVE for general sensation and the CHORDA TYMPANI of the facial nerve for taste (Figs. 2-09, 2-10, 2-20, 2-22, 2-23, 2-30, 2-32, 2- 33). The posterior one-third is innervated mainly by the GLOSSOPHARYNGEAL NERVE for general sensation and taste (Fig. 2-15, 2-32, 2- 33), but the root of the tongue which is near the epiglottis is innervated for general sensation and taste by the VAGUS NERVE (Figs. 2-32,). Blood supply to the tongue is from the LINGUAL ARTERY off the external carotid artery and venous return through the LINGUAL VEIN (Fig. 2-22, 2-26).

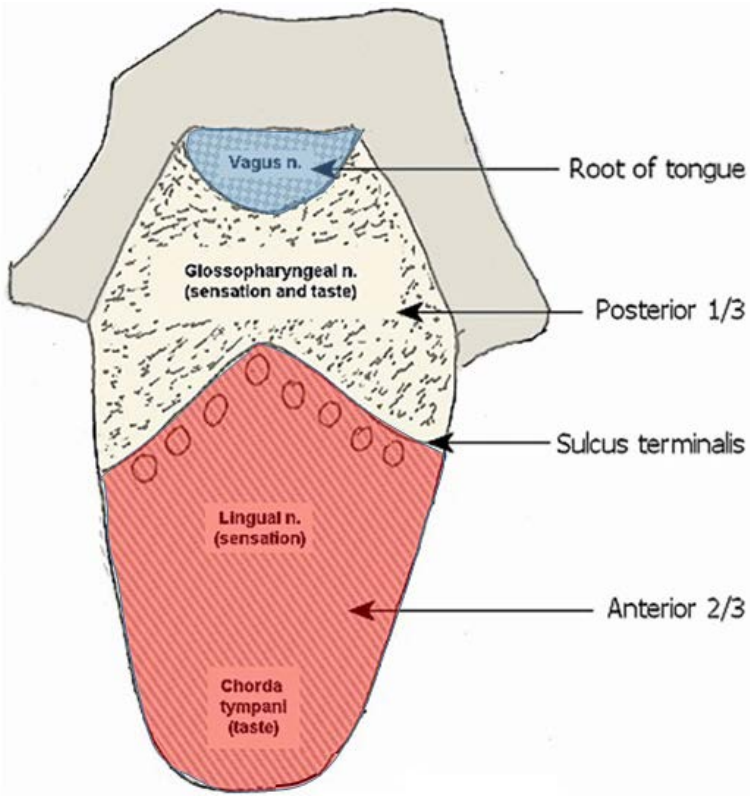


Fig. 2-32. Head: Diagram showing the superior surface innervations of the tongue

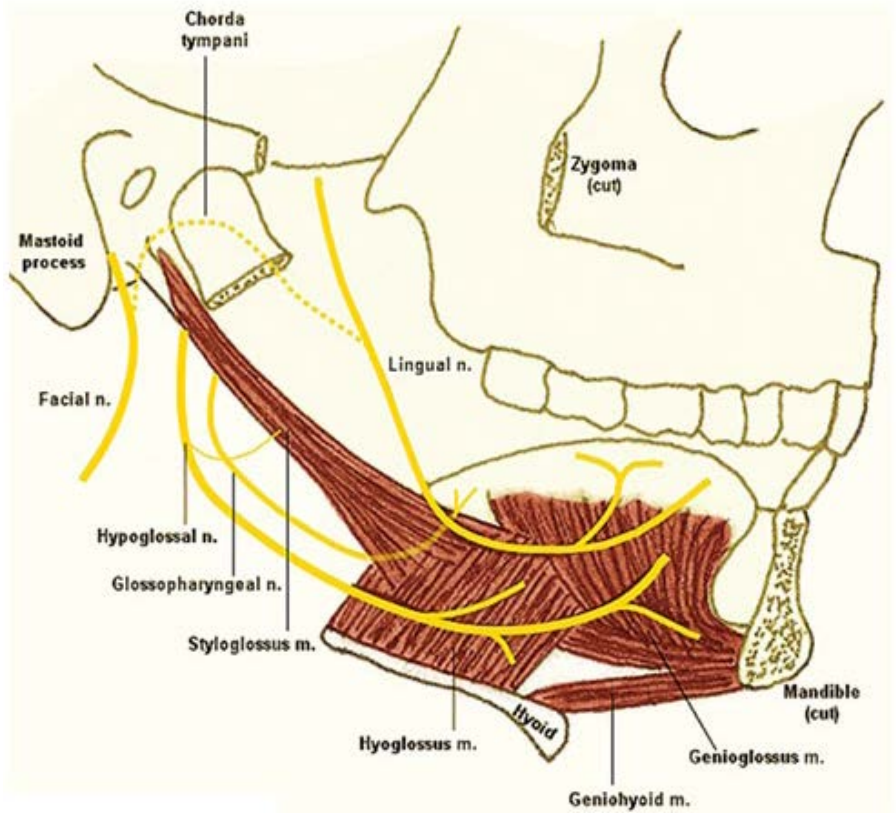
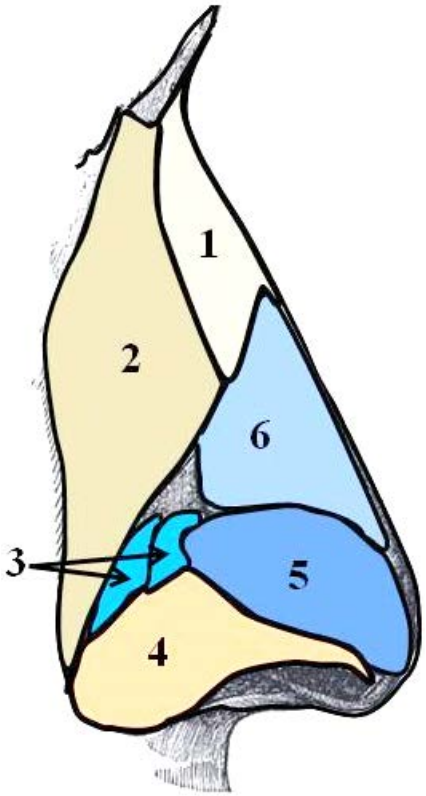


Fig. 2-33. Head: Innervations to the tongue.

The tongue consists of intrinsic skeletal muscles that lie entirely within the body of the tongue and extrinsic skeletal muscles that enter the tongue from outside attachment sites. The INTRINSIC MUSCLES form transverse, longitudinal and vertical muscle bundles within the body of the tongue. The EXTRINSIC MUSCLES are the GENIOGLOSSUS, HYOGLOSSUS, PALATOGLOSSUS, and STYLOGLOSSUS (Fig. 2-14, 2-15, 2-33, 2-35). The genioglossus protrudes the tongue, the hyoglossus depresses it, the palatoglossus elevates the posterior tongue, and the styloglossus retracts it. Both the intrinsic and extrinsic tongue muscles are innervated by the HYPOGLOSSAL NERVE (Figs. 2-10, 2-11, 2-14, 2-15, 2-33), with the exception of the palatoglossus which is innervated by the vagus nerve.

2.7 NASAL CAVITY

The external nose is constructed of the **NASAL BONE** and the **FRONTAL PROCESS OF THE MAXILLA** and 3 sets of cartilage (Fig 2-34), The **LATERAL CARTILAGE** attaches to the nasal bone and the anterior –inferior aspect of the frontal process. Below the lateral cartilage is the **GREAT ALAR CARTILAGE** which connects to the frontal process through a fibrous membrane. This fibrous membrane contains several small **LESSER ALAR CARTILAGES**. The grater and the lesser alar cartilages attach inferiorly to the fibrous lateral wall that forms the lateral part of the nasal opening.



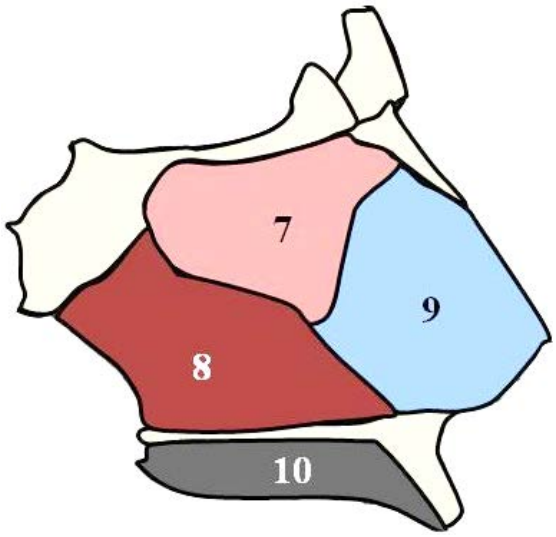


Fig 2-34. Head: (Left) Drawing of the external nose and (Right) of the nasal septum. 1. Nasal bone, 2. Frontal process of maxilla, 3. Lesser alar cartilages, 4. Fibrous lateral wall, 5. Greater alar cartilage, 6. Lateral nasal cartilage, 7. Perpendicular plate of ethmoid bone, 8. Vomer, 9. Septal cartilage, 10. Hard palate (maxilla and palatine bones).

Separating the nasal cavity is the nasal septum (Figs. 2-01, 2-02, 2-30, 2-34). This septum has boney and cartilaginous part. The upper posterior part of the septum is formed by the **PERPENDICULAR PLATE OF THE ETHMOID BONE** and the posterior inferior part by the **VOMER.** The anterior part of the septum is formed by the **SEPTAL CARTILAGE.**

On the both lateral walls of the nasal cavity are superior, middle and inferior protruding ridges called **CONCHAE OR TURBINATES** (Fig. 2-31). Beneath the superior concha is the opening for the sphenoid sinus while the maxillary and frontal sinuses open beneath the middle concha. Under the inferior concha, the nasolacrimal duct opens into the nasal cavity.

2.8 PHARYNX

2.8.1 REGIONS

The pharynx is basically the region of the throat. It extends from the nasal cavity to the esophagus and is subdivided into the 1) NASAL PHARYNX which communicates with the nasal cavity, 2) ORAL PHARYNX which communicates with the oral cavity, and 3) LARYNGEAL PHARYNX which lies behind the larynx and is continuous with the esophagus (Figs. 2-30, 2-31, 2-35). The pharynx is closed off posteriorly and laterally by three pairs of pharyngeal muscles (Fig. 2-36): 1) SUPERIOR CONSTRICTOR lying at the level of the oral cavity, 2) MIDDLE CONSTRICTOR lying at the level of the hyoid, and 3) INFERIOR CONSTRICTOR lying at the level of the thyroid cartilage.

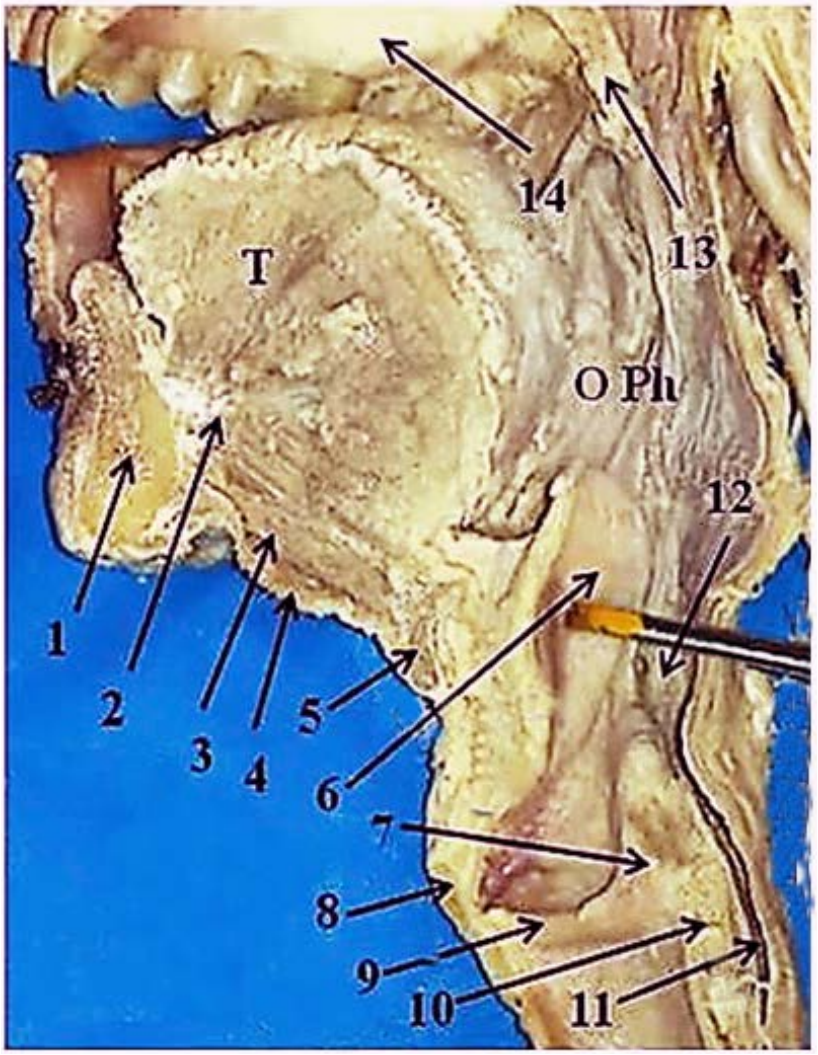


Fig. 2-35. Head: Sagittal section through the head showing the oral and laryngeal of the pharynx. 1. Mandibular symphysis, 2. Genioglossus, 3. Geniohyoid, 4. Mylohyoid, 5. Hyoid body, 6. Epiglotis,7. Arytenoid cartilage, 8. Thyroid cartilage, 9. Vocal fold, 10. Cricoid cartilage, 11. Esophagus, 12. Laryngeal pharynx, 13. Soft palate, 14. Hard palate, OPh = Oral pharynx.

2.8.2 MUSCLES OF THE PHARYNX

1. SUPERIOR PHARNYGEAL CONSTRICTOR (Fig. 2-36)
   - Anterior attachment: Hamulus of the medial pterygoid plate, pterygomandibular raphe, and mylohyoid line of the mandible.
   - Posterior attachment: Occipital bone and median pharyngeal raphe with the opposite superior constrictor.
   - Nerve: Vagus nerve.
   - Action: Constricts the upper pharynx for swallowing.

2. MIDDLE PHARYNGEAL CONSTRICTOR (Fig. 2-36)
   - Anterior attachment: Greater and lesser horns of the hyoid bone.
   - Posterior attachment: Median pharyngeal raphe with opposite middle constrictor.
   - Nerve: Vagus nerve.
   - Action: Constricts middle pharynx for swallowing.

3. INFERIOR PHARYNGEAL CONSTRICTOR (Fig. 2-36)
   - Anterior attachment: Oblique line of the thyroid cartilage, lateral surface of the posterior cricoid cartilage.
   - Posterior attachment: Median pharyngeal raphe with opposite inferior constrictor.
   - Nerve: Vagus nerve.
   - Action: Constricts lower pharynx during swallowing.

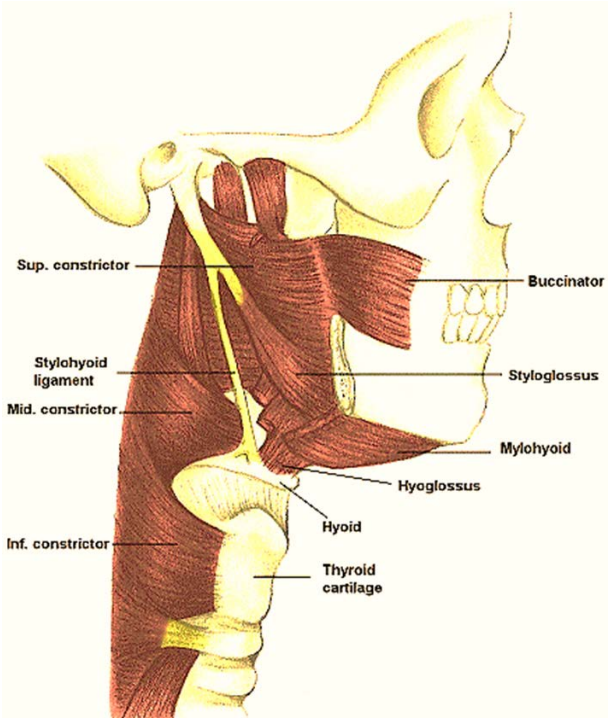


Fig. 2-36: Picture of the superior constrictor, middle constrictor, and inferior constrictor.

IX. Study questions:

1) What are the nerve innervations and blood supply to the upper teeth? What about the lower teeth?
2) How does the nerve innervations and blood supply to the hard palate differ from that of the soft palate?
3) Is it possible to lose motor control of the tongue but maintain taste and sensation? How?
4) Will damage to the facial nerve affect the tongue? How?
5) How does the anterior 2/3 of the tongue differ from the posterior 1/3 of the tongue?
6) Is it possible to lose general sensation to the tongue but not taste or motor function? How?
7) What is common to the very back of the tongue and the pharyngeal constrictor muscles?

2.9 THE EYE

2.9.1 BONY ORBIT

The EYE BALL lies within the BONY ORBIT of the skull. This protective chamber is made up of the FRONTAL BONE, ZYGOMATIC BONE, MAXILLARY BONE, ETHMOID BONE, SPHENOID BONE, LACRIMAL BONE, and PALATINE BONE (Figs. 2-01, 2-03). Nerves and blood vessels to the region of the eye enter the orbit through 3 openings (Figs. 2-01, 2-07, Table 22.1): 1) OPTIC FORAMEN with the OPTIC NERVE and RETINAL VESSELS, 2) SUPERIOR ORBITAL FISSURE with the FRONTAL, LACRIMAL and NASOLACRIMAL NERVES off the ophthalmic division of the trigeminal and the OCULOMOTOR, ABDUCENS, and TROCHLEAR NERVES to the muscles which move the eye, and 3) INFERIOR ORBITAL FISSURE with the INFRAORBITAL NERVE and ARTERY.

2.9.2 THE EYEBALL

The eyeball is subdivided into an ANTERIOR REGION containing the CORNEA, IRIS, PUPIL, LENS, and CILIARY BODY, and a POSTERIOR REGION consisting of the RETINA, the underlying CHOROID, and the OPTIC DISC (Fig. 2-37). Outside the choroid is the fibrous SCLERA that extends anteriorly to the cornea and forms the white part of the eye surrounding the iris. The sclera helps maintain the size and shape of the eyeball and provides attachment sites for the muscles that move the eyeball.

The CORNEA is the most anterior part of the eyeball. It is a translucent disk that is avascular. Posterior to the cornea is the IRIS. It is the colored donut-shaped structure that surrounds the central black opening called the PUPIL. The iris contains smooth muscle that enlarges or constricts the size of the pupil to control the amount of light that passes to the retina. Posterior to the iris is the oval-shaped LENS. The lens is suspended by a series of SUSPENSORY LIGAMENTS from the CILIARY BODY. Smooth muscles within the ciliary body change the tension on the suspensory ligaments which in turn changes the shape of the lens for focusing images on the retina. Between the lens anteriorly and the retina posteriorly is a gel-like transparent substance called the VITREOUS HUMOR. It helps maintain the shape and curvature of the eyeball so that the distance from the lens to the retina is constant and the retinal surface is smooth.

The RETINA contains the sensory ROD and CONE RECEPTORS for detecting visual images. Rods are responsible for black and white vision and cones for color vision. Cones are concentrated in a central posterior area of the retina called the FOVEA where vision is most

acute. Rods are most plentiful along the sides of the retina. Both receptors are innervated by the OPTIC NERVE. Posterior to the retina is the CHOROID which contains branches of the RETINAL ARTERY and VEIN. These vessels run with the optic nerve to enter the choroid at the OPTIC DISC.

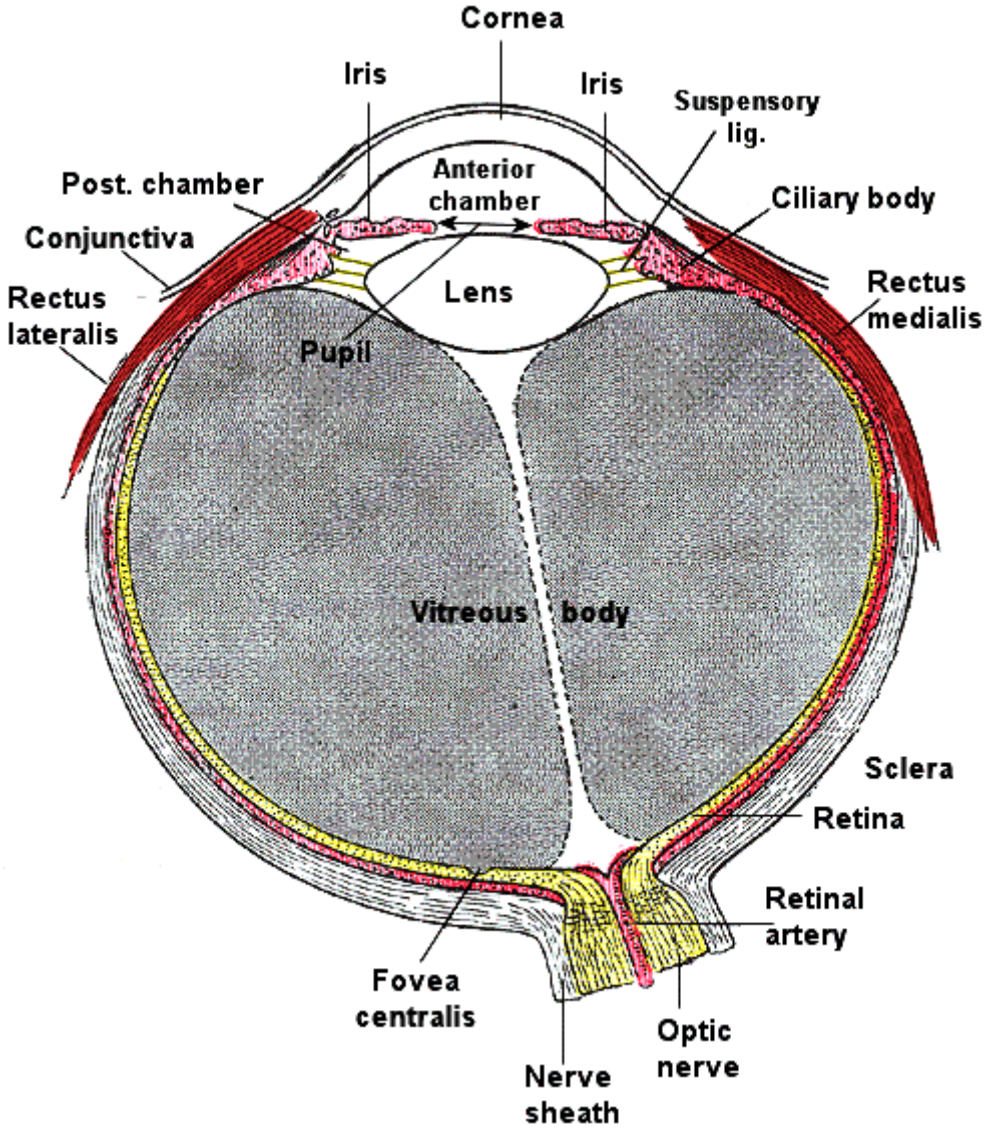


Fig. 2-37: Drawing of the eyeball showing its components and muscles. (Modified from Gray 1918)

2.9.3 MUSCLES OF THE EYE

There are six muscles that move the eyeball (Fig. 2-38).

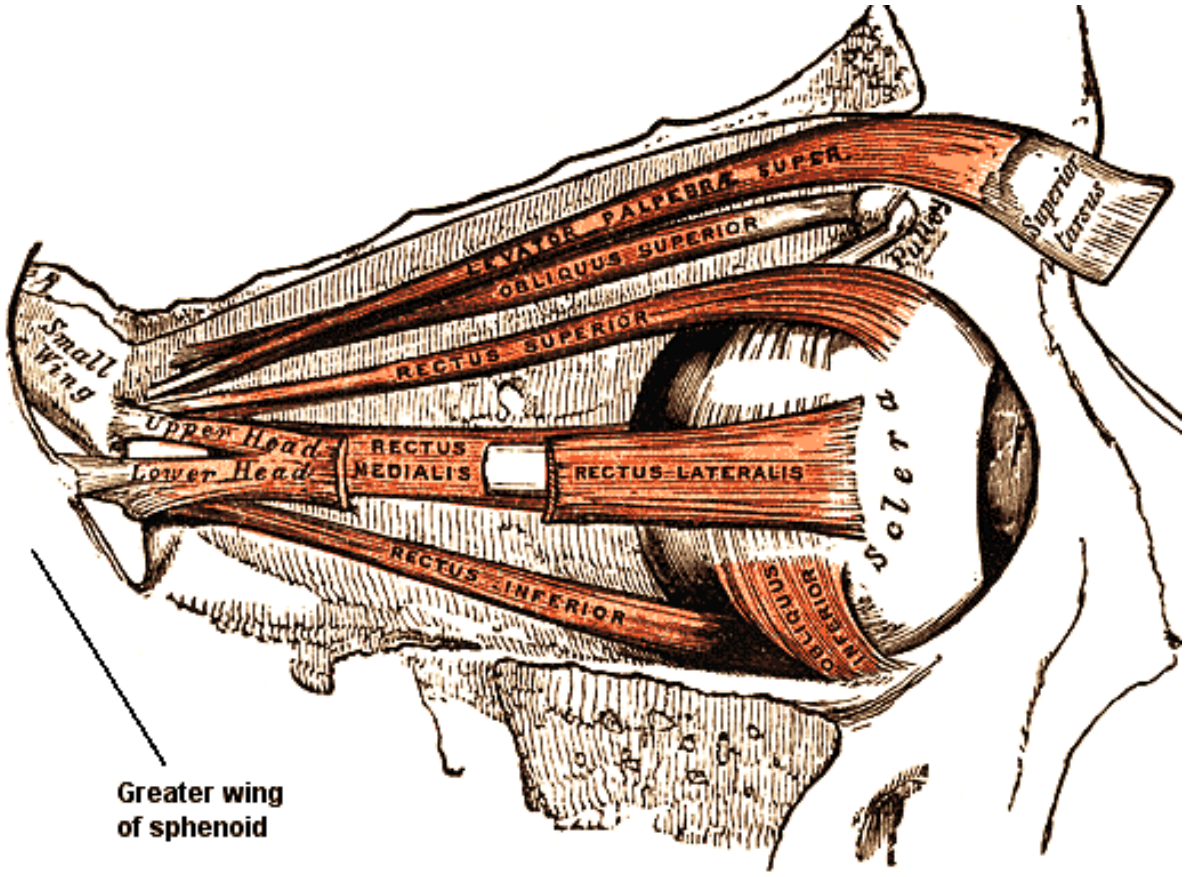


Fig 2-38. Head: Muscles of the Eye. (Modified from Gray 1918)

MEDIAL RECTUS

- Nerve: oculomotor (III)
- Action: adducts the pupil

LATERAL RECTUS

- Nerve: abducens (VI)
- Action: abducts the pupil

SUPERIOR RECTUS

- Nerve: oculomotor (III)
- Action: elevates the pupil

INFERIOR RECTUS

- Nerve: oculomotor (III)
- Action: depresses the pupil

INFERIOR OBLIQUE

- Nerve: oculomotor (III)
- Action: elevates and lateral rotates the pupil

SUPERIOR OBLIQUE

- Nerve: trochlear (IV)
- Action: depresses and laterally rotates the pupil.

2.10 THE EAR

2.10.1 EXTERNAL EAR

The ear is subdivided into an external, middle and inner ear (Fig. 2-39). The external ear consists of the AURICLE and the EXTERNAL AUDITORY (ACOUSTIC) MEATUS. It is innervated by the auriculotemporal nerve, the greater auricular nerve, and the lesser occipital nerve.

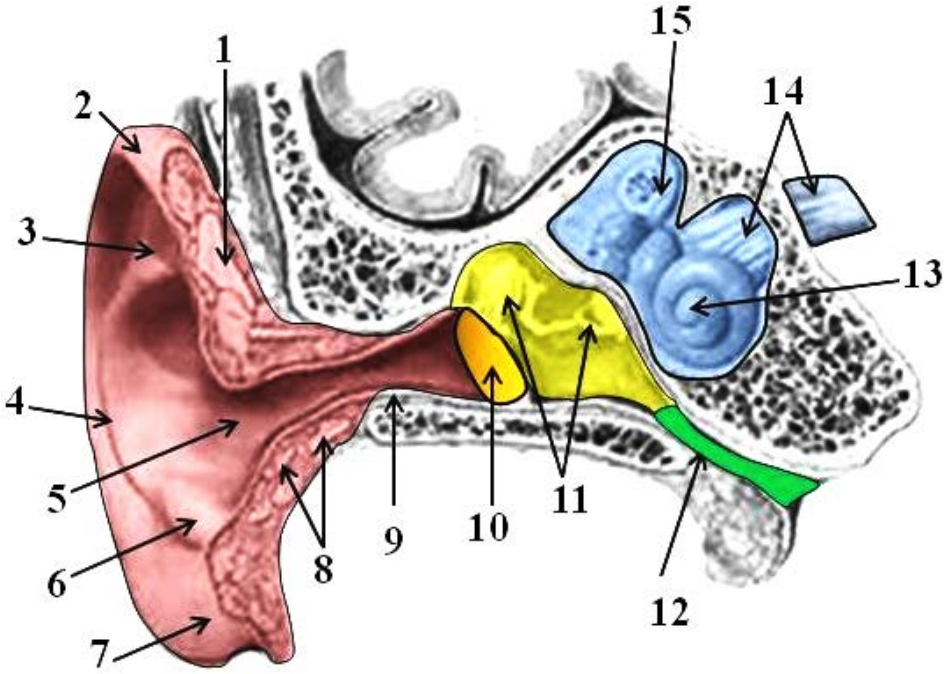


Fig. 2-39. Head: Drawing of the external, middle and inner ear regions. 1. Cartilage of external ear, 2. Helix, 3. Triangular fossa, 4. Anti helix, 5. External auditory meatus, 6. Anti tragus, 7. Ear lobe, 8. Cartilaginous auditory canal, 9. Boney auditory canal, 10. Tympanic membrane, 11. Ossicles on middle ear, 12. Eustachian (auditory) tube, 13. Cochlea, 14. Vestibulocochlear nerve (VIII) 15. Semicircular canal.

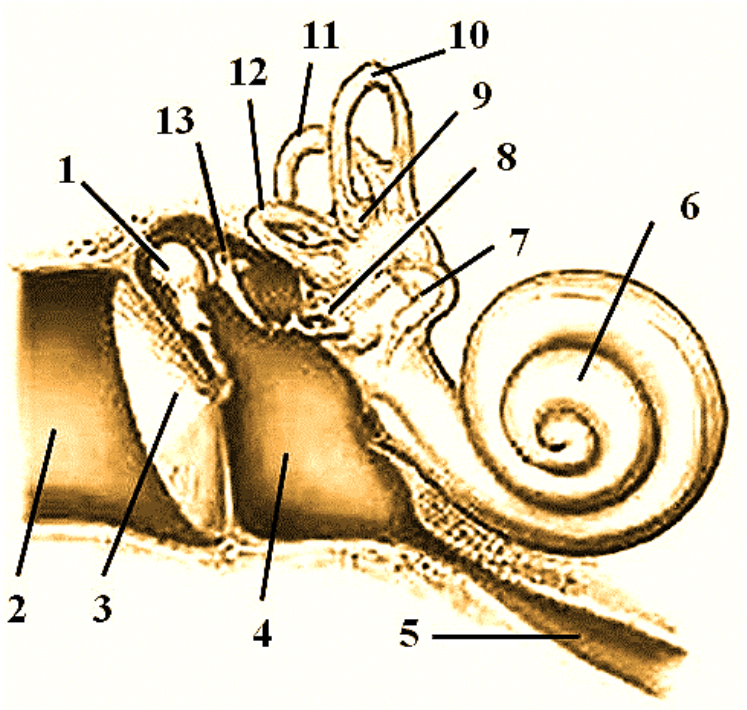


Fig 2-40. Head. Drawing of the middle and inner ear showing the ear ossicles, cochlea and semicircular canals. 1. Malleus, 2. External auditory canal, 3. Tympanic membrane, 4. Middle ear chamber, 5. Eustachian (auditory) tube, 6. Cochlea, 7. Vestibule, 8. Stapes, 9. Ampulla, 10. Superior semicircular canal, 11. Posterior semicircular canal, 12. Lateral semicircular canal, 13, Incus.

2.10.2 MIDDLE EAR

The middle ear (Figs. 2-39, 2-40) contains the 1) TYMPANIC MEMBRANE, 2) three auditory ossicles: MALLEUS, INCUS, and STAPES, 3) opening to the EUSTACHIAN (AUDITORY) TUBE, 4) TENSOR TYMPANI MUSCLE that tenses the tympanic membrane and is innervated by the mandibular division of the trigeminal, 5) STAPEDIUS MUSCLE that moves the stapes backward and is innervated by the facial nerve, 6) FACIAL NERVE which passes through the facial canal lying superior to the stapes, and 7) CHORDA TYMPANI which arises from the facial nerve and crosses the upper border of the tympanic membrane.

2.10.3 INNER EAR

The inner ear contains the 1) COCHLEA, 2) VESTIBULE, and 3) SEMICIRCULAR CANALS (Figs. 2-39, 2-40). The cochlea, vestibule and semicircular canals are innervated by the VESTIBULOCOCHLEAR NERVE (VIII) with the cochlear division going to the cochlea and the vestibular division going to the vestibule and the three semicircular canals.

The COCHLEA is the sensory organ for hearing. This spiral tube contains the sensory receptor for hearing called the ORGAN OF CORTI (Figs.2-41, 22-42). Each spiral tube is lined with the membranous labyrinth containing a fluid called ENDOLYMPH. The membranous labyrinth of the cochlea ahs three ducts: a middle COCHLEAR DUCT (Scala Media) with the Organ of Corti, an upper SCALA VESTIBULE and a lower SCALA TYPMPANI (Figs. 2-41, 2-42).

The vestibule and the semicircular canals are sense organs for equilibrium. The VESTIBULE contains the SACCULE and UTRICLE that contain a receptor called the MACULA The three SEMICIRCULAR CANALS (anterior, posterior and lateral canals) open into the vestibule. Each canal has a dilation called an AMPULLA that contains a sensory receptor called the CRISTA AMPULLARIS .

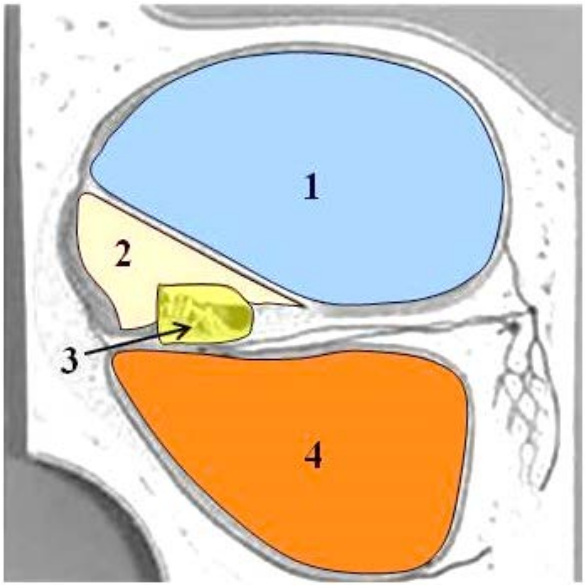


Fig. 2-41. Head: Drawing of the osseous labyrinth of the inner ear showing the vestibule, semicircular canals and cochlea. 1. Scala vestibule, 2. Cochlear duct (scala media), 3. Organ of Corti, 4. Scala tympani.

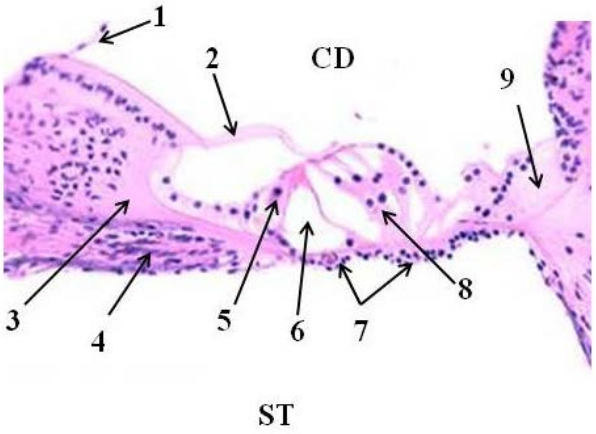


Fig. 2-42. Head: Micrograph of the Organ of Corti. 1. Reissner,s (vestibular) membrane, 2. Tectoral membrane, 3. Limbus, 4. Cochlear branch of VIII, 5. Inner hair cells, 6. Corti's tunnel, 7. Basilar membrane, 8. Outer hair cells, 9. Spiral Ligament, CD = cochlear duct (scala media), ST = scala tympani.

X. Study questions:

1) Inability to move the eye laterally indicates damage to which nerve?
2) Inability to move the eye straight up and down, as well as medially, indicates damage to which nerve?
3) If a person has a hearing problem, which part of the ear might be involved? What if it is a balance problem?

2.11 CRANIAL NERVES

In this section of the on the head and neck, most of the cranial nerves and their functions were described. Below is a diagram (Fig. 2-43) and summary table 23-2 of all the cranial nerves. You should know each by name and number, because these nerves are often referred to by number only.

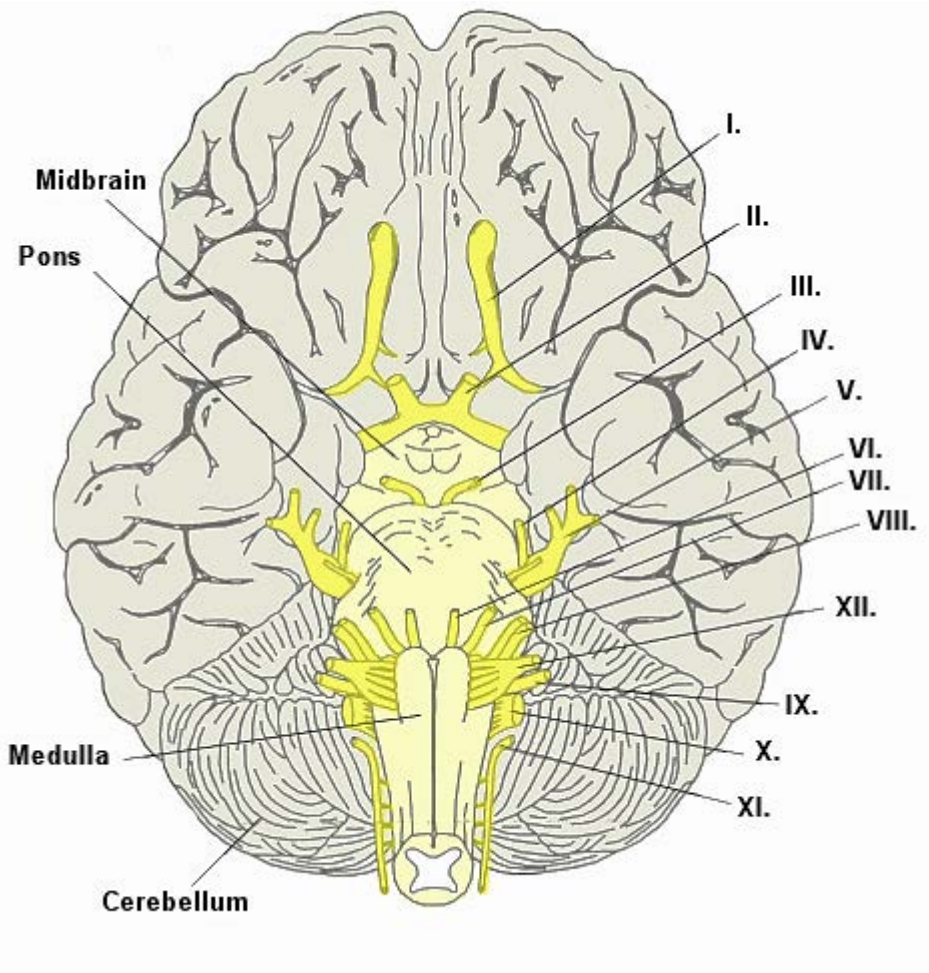


Fig. 2-43. Head: Diagram showing the cranial nerves

Cranial Nerves

NUMBER	NAME	FUNCTION
I	Olfactory	• Sense of Smell
II	Optic	• Vision
III	Oculomotor	• Movements of the eyes; superior rectus, inferior rectus, medial rectus, inferior obligue muscles) and upper eyes lid (levator palpebre) • Accommodation and pupillary constriction (parasympathetic)
IV	Trochlear	• Movement of the eye (superior oblique muscle)
V	Trigminal	• General sensation of face and anterior 2/3 of tongue, external auditory meatus, outer tympanic membrane, nasal cavity, soft palate • Movement of the mandible, tension of tym,panic membrane (eardrum)
VI	Abducent	• Movement of the eyes (lateral rectus)
VII	Facial	• Taste from anterior 2/3 of tongue • Viscera of soft palate • Tearing (parasympathetic to lacrimal gland) and salivation (parasympathetic to sublingual and submandibular glands) • Muscle of facial expression, stylohyoid, posterior digastric, stepedis muscle of the middle ear
VIII	Vestibulocochlear	• Hearing and vestibular function (balance and equillbrium)
IX	Glossophyarynegeal	• Taste from posterior 1/3 of tongue • General sensation from posterior 1/3 of tongue, pharynx, and input frm carotid sinus and carotid body • sensation from behind the ear, eustachian tube, inner tympanic membrane, tympanic cavity • Salivation (parasympathetic to parotid gland) • Stylopharyngenus muscle

NUMBER	NAME	FUNCTION
X		• Taste from epiglottis • Sensation from pharynx, larynx, lungs , heart and abdominal viscera • Sensation from external auditory meatus, tympanic cavity • Motor to thoracic and abdominal visceral (parasympathetic) • Motor to muscle of pharynx , larynx and soft palate
XI	Spinal Accessory	• Innervation of trapezius and sternocledomastoid muscles
XII	Hypoglossal	• Movement of the tongue (intrinsic muscles of tongue; hyoglossus; genioglossus , stylossus

STUDY QUESTIONS

I. Infrahyoid Region: page 12

Damage to the inferior alveolar nerve would affect which anterior neck muscles and what actions?
A= The Mylohyoid N which is a branch of the inferior alveolar n. innervates the anterior digastric which depresses and retracts the mandible and the mylohyoid which elevates the hyoid and the floor of the mouth

What forms the ansa cervicalis?
A= Descending hypoglossal which carries fibers from C1 and the descending cervical which has fibers from C2 – C3.

What muscles of the infrahyoid region would be affected by damage to the ansa cervicalis? What movement of the hyoid bone would be primarily affected?
A= Sternohyoid, sternothyroid, thyrohyoid, omohyoid muscles and depression of hyoid,

What muscles form and lie in the submandibular triangle?
A= Anterior digastric which depresses and retracts the mandible, posterior digastric which depresses and retracts the mandible and elevates and retracts the hyoid; stylohyoid which elevates and retracts the hyoid; mylohyoid which elevates the hyoid and the floor of the mouth; hyoglossus which depresses and retracts the tongue; and the middle pharyngeal constrictor which squeezes food downward from the mouth to the esophagus

Trauma to the area of the submandibular triangle would affect which nerves and arteries? What areas would each of the nerves and arteries affect?
A= The hypoglossal N to the tongue, lingual N to the tongue and mylohyoid N to the anterior digastric and mylohiod muscles would be involved as well as the lingual A. to the tongue and facial A. to the face.

II. Carotid Region: page 22

Name the branches off the internal carotid artery in the neck.
A= There are no branches off the internal carotid in the neck.

Name the branches off the external carotid artery in the neck.
A= superior thyroid A., lingual A., facial A., ascending pharyngeal A., occipital A., posterior auricular A., maxillary A., transverse facial A., superficial temporal A.

What two structures run with the common carotid artery in the neck?
A= Internal jugular V. and the vagus N.

What are two motor and sensory nerves from the vagus nerve in the carotid triangle?
A= The recurrent laryngeal and external laryngeal nerves to the muscles of the larynx are in this region as are the internal laryngeal nerve which is sensory to the larynx and sensory nerves to the carotid sinus and body.

III. Larynx: page 29

Which ligaments connect the thyroid and the cricoid cartilages?
A= Median and lateral cricothyroid ligaments

Which muscle runs with the vocal ligament?
A= Vocalis muscle

Damage to the external laryngeal nerve would affect which intrinsic muscle of the larynx?
A= Cricothyroid muscle

Would damage to the recurrent laryngeal nerve have a greater effect on phonation than damage to the external laryngeal nerve?
A= Yes because the recurrent laryngeal innervates all the intrinsic muscles of the larynx which are used for phonation except the cricothyroid muscle

What would be impaired in the larynx with damage to the internal laryngeal nerve?
A= Sensation of the larynx

IV. Deep Anterior Neck: page 34

What are the main branches directly off the subclavian artery in the deep anterior neck?
A= Costocervical trunk, internal thoracic A., thyrocervical trunk, vertebral A.

Occlusion of the thyrocervical trunk would affect which arteries ?
A= Inferior thyroid a., ascending cervical A., transverse cervical A. and suprascapular A. (if it arise from the trunk and this varies)

What two muscles in the deep neck flex the head? What muscle group flexes the neck? What movement might tear these flexors of the head and neck?
A= Flexion of head = longus capitis and rectus capitis anterior; flexion of the neck = longus colli group; excessive backward extension of the head and neck might tear these flexors.

V. Innervation and Blood Supply: page 53

What is the main difference between the innervation of the facial nerve and the trigeminal nerve?
A= The facial nerve is motor to the muscles of facial expression while the trigeminal is the sensory nerve of the face.

Where would the sensory impairment to the face occur with a lesion to each of the following nerves:

a. Supraorbital n. A= Area above the eyes; forehead
b. Inferior alveolar n. A= Front of the mandible
c. Buccal n. A= cheek area
d. Maxillary n. A= area below the eyes
e. Frontal n. A= forehead and nose

What arteries provide the main blood supply to the face?
A= Facial and transverse facial arteries are the main blood supply to the face but the supraorbital, infraorbital, and mental arteries contribute

With a paralysis of the facial muscles around the mouth, what actions would be impaired?
A= Elevation and depression of the lips and angles of the mouth, puckering of the lips, which would affect smiling, frowning, pouting, sucking, eating, speaking

VI. Facial Nerve: page 65

What muscles of the face could be affected with a damage to the zygomatic branch of the facial nerve?
A= Zygomaticus major and minor, the part of the orbicularis occuli below the eye, levator anguli oris, levator labii superioris, and the levator labii superioris alaque nasi

What is the difference between the buccal nerve and the buccal branch of the facial nerve?
A= The buccal nerve is off the mandibular division of the trigeminal N. and is sensory to the cheek region of the face whereas the buccal branch of the facial N. is off the facial N. and is motor to the buccinator muscle.

What sensory impairment occurs in the face with damage to the facial nerve?
A= There is no sensory impairment to the face because the facial N. is motor to the muscles of facial expression. It is the trigeminal N. that is sensory to the face.

VII. Temporomandibular Joint (TMJ): page 68

What structures attach to the intra-articular disc of the TMJ?
A= The lateral pterygoid muscle, joint capsule, superior and inferior laminae

What structures would be damaged if the mandibular condyle were dislocated in a posterior direction? What if the dislocation is in a medial direction?
A= A posterior dislocation could damage the parotid gland, external auditory meatus, facial nerve trunk, auriculotemporal nerve, and superficial temporal blood vessels. A medial dislocation could damage the chorda tympani of VII and middle meningeal A.

What do all of the muscles of mastication have in common?
A= All muscles of mastication close the jaw and are all innervated by the mandibular division of the trigeminal N.

What muscles close and protrude the lower jaw?
A= masseter and medial and lateral pterygoid muscles

What muscles will generate lateral jaw movement to the right?
A= Right temporalis, left masseter, left medial pterygoid, left lateral pterygoid - the right anterior and posterior digastric muscle would also be involved.

VIII. Facial Nerves and Arteries: page 76

What could be the sensory and motor effect of damage to the maxillary division of V?
A= There would be sensory involvement to the palate, lateral face, face below the eye, and upper teeth but no motor affect.

What nerves of the mandibular division of V contain motor fibers? Does the anterior or posterior division of the mandibular division of V give off more motor nerves?
A= Motor fibers are in the inferior alveolar N (mylohyoid N.); nerves to the medial and lateral pterygoids; masseteric nerve; and deep temporal nerves. The anterior division gives off more motor nerves.

Which nerve of the mandibular division contains both motor and sensory nerves?
A= The inferior alveolar nerve contains has both motor fibers to the mylohyoid and anterior digastric muscles and sensory from the lower teeth and anterior mandible. However, the nerves to the muscles also contain sensory fibers from those muscles and the auriculotemporal N. which is sensory to the face contains visceral motor nerves to the parotid gland.

Blood supply to which structures would be reduced with blockage of the 2nd part of the maxillary artery? What about blockage to the 3rd part
A= If the second part is blocked, blood to the masseter, medial and lateral pterygoids, temporalis muscles and cheek region would be reduced as would blood to the upper teeth, palate, and the area of the face directly below the eye. If the third part is blocked, blood to the upper teeth, palate and the area below the eye would be reduced.

IX. Oral Cavity: Page 83

What are the nerve innervation and blood supply to the upper teeth? What about the lower teeth?
A= The posterior alveolar, middle alveolar and anterior alveolar nerves (off the superior alveolar N.) and arteries supply the upper teeth. The lower teeth are innervated by and receive blood from the inferior alveolar N. and A.

How does the nerve innervation and blood supply to the hard palate differ from that of the soft palate?
A= The soft palate receives its innervation and blood supply by the lesser palatine N. and A. The hard palate receives its innervation from the greater palatine and nasopalatine nerves and blood supply from the greater palatine and sphenopalatine arteries.

Is it possible to lose motor control of the tongue but maintain taste and sensation? How?
A= Yes because motor to the tongue is by the hypoglossal N. and general sensory by the lingual and glossopharyngeal nerves and taste by the chorda tympani of the facial N. and glossopharyngeal N.

Will damage to the facial nerve affect the tongue? How?
A= Yes by affecting the chorda tympani of the VII which is taste to the anterior 2/3 of the tongue

How does the anterior 2/3 of the tongue differ from the posterior 1/3 of the tongue?
A= In the anterior 2/3 of the tongue, taste is by the chorda tympani and general sensation by the lingual N. but in the posterior 1/3 of the tongue taste and general sensation are by the glossopharyngeal N.

Is it possible to lose general sensation to the tongue but not taste or motor function? How?
A= Damage to the lingual nerve or to the mandibular division of V will affect general sensation but not taste as this by the chorda tympani of VII. Motor will not be lost as this is by XII.

What is common to the very back of the tongue and the pharyngeal constrictor muscles?
A= The very back or root of the tongue is innervated by the vagus (X) nerve and this is the same nerve that innervates the pharyngeal constrictor muscles of the pharynx. (Think of the gag reflex)

X. Eye and Ear: page 93

Inability to move the eye laterally indicates damage to which nerve?
A= Abducens N. (VI)

Inability to move the eye straight up and down, as well as medially, indicates damage to which nerve?
A= Oculomotor N. (III)

If a person has a hearing problem, which part of the ear might be involved? What if it is a balance problem?
A= With a hearing problem the external, middle or inner could be involved as these are all involved in the transmission or reception of sound waves for hearing. If balance is a problem, the inner ear is mostly involved as it is the only part of the ear that has this function.

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