

## **The triangles of the neck**

- ⊙ Most descriptions of the neck divide the anatomy, into triangles.
- ⊙ These triangles are an organizational device that divides the volume of anatomic detail in the neck into manageable study units.
- ⊙ The triangles of the neck aid in localization of superficial mass lesions and define lymph node drainage patterns. (1)
- ⊙ Classically the neck has been divided into two major triangles, the anterior and the posterior triangles.

### **The anterior triangle**

The anterior triangle is defined laterally by the sternocleidomastoid muscle, superiorly by the mandible, and anteriorly by the midline (1).

The anterior triangle of the neck-is a large triangular space on each side of the neck, in front of sternocleidomastoid with its apex directed downwards and base directed upwards

#### **Boundaries**

- ⊙ *Anterior*: Anterior median line of the neck.
- ⊙ *Posterior*: Anterior border of the sternocleidomastoid muscle.
- ⊙ *Base*: Lower border of the body of mandible and a line extending from the angle of mandible to the mastoid process.
- ⊙ *Apex*: Suprasternal notch at the meeting point between anterior border of sternocleidomastoid and anterior median line.
- ⊙ *Roof*: Investing layer of deep cervical fascia. (2)

**The hyoid bone** divides the anterior triangle into :

-the suprahyoid region, containing the floor of the mouth, sublingual gland, submandibular gland, and lymph nodes

-the infrahyoid region, containing the larynx, hypopharynx, cervical trachea, esophagus, thyroid gland, and parathyroid glands (2)

**The omohyoid muscle** and digastric muscles divides the anterior triangle into:

-The anterior triangle is subdivided by the superior belly of the omohyoid muscle and digastric muscle into four smaller triangles:

- 1.the submental triangle
2. the submandibular triangle
- 3.the carotid triangle
- 4.the muscular triangle (1,2)

The omohyoid and digastric muscles characteristics:

**Digastric muscle** has two bellies – posterior and anterior. The posterior belly arises from the digastric notch on the medial surface of the base of the mastoid process of the temporal bone, and runs downwards and forwards, towards the hyoid bone. The anterior belly arises from digastric fossa on the base of the mandible near symphysis menti and runs downwards and backwards, towards the hyoid bone. Above the hyoid bone the two bellies of the digastric muscle are connected by an intermediate tendon, which is anchored to the hyoid bone by a fascial sling – a component of the investing layer of deep cervical fascia.(2)

**The omohyoid muscle** : consists of superior and inferior bellies joined at an angle by an intermediate tendon. The inferior belly arises from the superior border of scapula, near the suprascapular notch, it then passes behind the sternocleidomastoid and ends there in an intermediate tendon. The superior belly begins at the intermediate tendon and passes almost vertically upwards to be attached to the inferior border of the hyoid bone. The intermediate tendon is anchored to the clavicle by fascial sling derived from investing layer of deep cervical fascia.(2)

**Submental Triangle** – is a median triangle on the front of neck below the chin and above the hyoid bone and occupies the upper portions of both the anterior triangles. This single submental triangle is bounded laterally by the anterior belly of the digastric muscles, superiorly by the mandible, and inferiorly by the hyoid bone (1,2)

#### **Boundaries**

*On each side:* Anterior belly of digastric muscle.

*Base:* Body of hyoid bone.

*Apex:* Chin or symphysis menti.

#### **Floor**

- ⊙ It is formed by the two mylohyoid muscles meeting at the median fibrous raphe extending from symphysis menti to the hyoid bone.

#### **Roof**

- ⊙ Investing layer of deep cervical fascia.(2)

Infections of floor of mouth, tip of tongue, and incisor teeth cause painful enlargement of **submental lymph** nodes because lymph from these structures is drained into these nodes.

### **Muscular Triangle**

#### **Boundaries:**

*Anterior:* Anterior median line of the neck, extending from hyoid bone to the suprasternal notch.

*Anterosuperior:* Superior belly of the omohyoid.

*Posteroinferior:* Anterior border of sternocleidomastoid.

#### **Floor:**

- ⊙ It is formed by sternothyroid, sternohyoid, and thyrohyoid muscles.

#### **Roof:**

- ⊙ It is formed by investing layer of deep cervical fascia. The **superficial fascia over the roof contains anterior jugular vein and associated lymph nodes.**

### **Content:**

- ⊙ Infrahyoid muscles
- ⊙ The important deeper structures in the region of **muscular triangle** are **thyroid gland, trachea, and esophagus**

### **The suprahyoid and infrahyoid groups of muscles**

#### **Suprahyoid Muscles of the Neck**

The suprahyoid muscles comprise following four paired muscles.

1. Digastric.
2. Stylohyoid.
3. Mylohyoid.
4. Geniohyoid

#### **Infrahyoid Muscles of the Neck**

##### **(Strap Muscles of the Neck)**

The infrahyoid muscles are ribbon-like and comprise following four paired muscles

1. Sternothyroid.
2. Sternohyoid.
3. Thyrohyoid.
4. Omohyoid.

The infrahyoid muscles are arranged into two layers with two muscles in each layer, viz.

- ⊙ 1. **Superficial layer**
  - (a) Sternohyoid
  - (b) Omohyoid.

- ⊙ 2. **Deep layer**
  - (a) Sternothyroid
  - (b) Thyrohyoid.

#### **Nerve Supply**

All are supplied by ventral rami of C1, C2, and C3 spinal nerves.

The sternohyoid, omohyoid, and thyrohyoid are supplied by the ansa cervicalis and its superior root.

The **thyrohyoid** is innervated directly by a branch from the **hypoglossal nerve carrying fibres of ventral ramus of C1**.(2)

### **The carotid triangle**

- ⊙ Generally-The carotid triangle is bounded by the superior belly the omohyoid muscle, the posterior belly of the digastric muscle, and the sternocleidomastoid muscle and inferiorly by the inferior pharyngeal constrictor and thyrohyoid muscles.(1)

#### **Boundaries**

- ⊙ *Superiorly*: Posterior belly of digastric supplemented by stylohyoid.
- ⊙ *Anteroinferiorly*: Superior belly of omohyoid.
- ⊙ *Posteriorly*: Anterior border of sternocleidomastoid.

- ## Contents

- Common carotid artery**-It ascends from just behind the inferior angle of the carotid triangle in the carotid sheath under cover of anterior border of sternocleidomastoid and in front of lower 4 cervical transverse processes and at the level of the upper border of the thyroid cartilage divides into external and internal carotid arteries. The common carotid artery gives no other branches in the neck (2)

It ascends anteromedial to the internal carotid artery and gives the following five branches in the triangle:

1. Ascending pharyngeal artery (first branch).
2. Superior thyroid artery.
3. Lingual artery.
4. Facial artery.
5. Occipital artery.

- ⊙ **Internal carotid artery**

- ⊙ It runs straight upwards as the continuation of the common carotid artery.(1)

- ⊙ **Hypoglossal nerve**

- ⊙ It descends between the internal jugular vein and internal carotid artery. Then just above the level of greater cornu of hyoid bone, it hooks around the origin of the occipital artery, runs forwards, crossing in front of internal carotid artery, external carotid artery, and loop of lingual artery to run on the hyoglossus muscle above the hyoid bone. As it crosses the internal carotid artery, it gives off the superior root of ansa cervicalis (also called *descendens hypoglossi*), which descends on the anterior wall of the internal and common carotid arteries and becomes embedded in the anterior wall of the carotid sheath. (2)

- ⊙ **Internal jugular vein:** It is partly hidden by the posterior edge of the sternocleidomastoid. It descends posterolateral to common and internal carotid arteries and receives the following three veins in the region of carotid triangle:

1. Lingual vein.
2. Common facial vein.
3. Superior thyroid vein.(2)

- ⊙ **Carotid sheath**

- ⊙ It is a fascial sheath which encloses internal jugular vein, and internal and common carotid arteries. The vagus nerve lies in between the vein and the artery on a deeper plane. The ansa cervicalis is embedded in its anterior wall whereas the cervical sympathetic chain lies just deep to its posterior wall on the prevertebral fascia. (2)

- ⊙ **Vagus nerve**

- ⊙ It descends vertically downwards, first between the internal carotid artery and internal jugular vein and then between common carotid artery and internal jugular vein. It gives the following two branches in the carotid triangle.
- ⊙ 1. **Pharyngeal branch:** It runs inferomedially between the external and internal carotid arteries to join the pharyngeal plexus on the superior constrictor of the pharynx.
- ⊙ 2. **Superior laryngeal nerve:** It runs on a deep plane, deep to both internal and external carotid arteries, where it divides into internal and external laryngeal nerves.
- ⊙ The internal laryngeal nerve (sensory) passes forwards to disappear deep to thyrohyoid muscle; there it pierces the thyrohyoid membrane to supply the laryngeal mucosa.
- ⊙ The external laryngeal nerve (motor) descends to supply the inferior constrictor and cricothyroid muscles after passing deep to the superior belly of the omohyoid.(2)

### ● **Accessory nerve**

- It runs downwards and backwards across the upper part of the triangle, superficial to the internal jugular vein to enter the sternocleidomastoid muscle, which it supplies. (2)

### **Ansa cervicalis / ansa hypoglossi**

-is a U-shaped nerve loop

-is present in the region of the carotid triangle embedded in the anterior wall of the carotid sheath

-it is derived from ventral rami of C1, C2, and C3 spinal nerves

-it supplies all the infrahyoid muscles except thyrohyoid, which is supplied by nerve to thyrohyoid (C1) from hypoglossal nerve.(2)

- Ansa cervicalis has the following two roots: 1. **Superior/upper root (descendens hypoglossi)** is formed by the descending branch of the hypoglossal nerve carrying C1 spinal nerve fibres. It descends downwards over internal and common carotid arteries. 2. **Inferior/lower root (descendens cervicalis)** is derived from C2 and C3 spinal nerves. As this root descends, it first winds round the internal jugular vein and then continues anteroinferiorly to join the superior root in front of the common carotid artery at the level of cricoid cartilage.(2)
- Distribution-1. Superior root gives branch to superior belly of omohyoid.
- 2. Dependent loop gives branches to sternohyoid, sternothyroid, and inferior belly of the omohyoid (2)

## **The submandibular triangle:**

**The submandibular triangle, also known as the digastric triangle**, is bounded anteriorly by the anterior belly of the digastric muscle, posteriorly by the posterior belly of the digastric muscle, superiorly by the mandible, and inferiorly by the mylohyoid and hypoglossus muscles.(1)

### **Boundaries**

**Anteroinferiorly:** Anterior belly of digastric muscle.

**Posteroinferiorly:** Posterior belly of digastric muscle, supplemented by stylohyoid muscle.

**Base:** It is formed by the base of the mandible and imaginary line joining the angle of the mandible to the mastoid process.

**Apex:** It is formed by the intermediate tendon of the digastric muscle, being bound down to hyoid bone by a fascial sling derived from investing layer of deep cervical fascia.

### **Floor**

It is formed by mylohyoid (anteriorly), hyoglossus, and small part of the middle constrictor (posteriorly).(2)

### **Roof**

It is formed by investing layer of deep cervical fascia, which splits to enclose the submandibular salivary gland. In the superficial fascia over the roof lies platysma, cervical branch of facial nerve, and ascending branch of transverse cervical nerve.

### **Contents**

The digastric triangle is subdivided into anterior and posterior parts by the stylomandibular ligament, which extends from the tip of the styloid process to the

angle of the mandible. The posterior part of the triangle is continuous above with the parotid region.

*Contents in the anterior part of the triangle:*

1. Submandibular salivary gland.
2. Submandibular lymph nodes.
3. Hypoglossal nerve.
4. Facial vein (lies superficial to the gland).
5. Facial artery (lies deep to the gland).
6. Submental artery.
7. Mylohyoid nerve and vessels.(2)

*Contents in the posterior part of the triangle:*

1. External carotid artery.
2. Carotid sheath and its contents.
3. Structures passing between the external and internal carotid arteries (2).

The side of the neck

- ⦿ The side of the neck is roughly **quadrangular** in shape.
- ⦿ It is bounded **anteriorly** by anterior midline of the neck, **posteriorly** by anterior border of the trapezius, **superiorly** by the lower border of the body of the mandible and a line extending from the angle of the mandible to the mastoid process, and **inferiorly** by the clavicle.(2)

Surface Landmarks on the Side of the Neck

1. Sternocleidomastoid ms
2. Mastoid process
3. Anterior border of trapezius
4. Lesser supraclavicular fossa.It overlies the internal jugular vein.
5. Greater supraclavicular fossa.It overlies the cervical part of brachial plexus and the third part of the subclavian artery.
6. Transverse process of first cervical vertebra .it is crossed by spinal accessory nerve.
7. Lower border of the mandible
8. Clavicle (2)

The side of the neck is divided into large anterior and posterior triangles by the sternocleidomastoid muscle which runs across this area diagonally from mastoid process to the upper end of the sternum

### **Sternocleidomastoid Muscle**

#### **a.Origin**

The muscle arises by two heads: sternal and clavicular.

**-The sternal head**, is tendinous and arises by a rounded tendon from the superolateral part of the front of the manubrium sterni.

**-The clavicular head**, is flat and musculoaponeurotic and it arises from the medial third of the superior surface of the clavicle.

### **b.Insertion**

The muscle is inserted by a thick tendon on the lateral surface of the mastoid process (other authors-also by a thin aponeurosis into the lateral half of the superior nuchal line of the occipital Bone).

### **c.Arterial Supply**

The sternocleidomastoid is supplied by branches of following arteries:

1. **Upper part**, by occipital and posterior auricular arteries.
2. **Middle part**, by superior thyroid artery.
3. **Lower part**, by suprascapular artery.

### **d.Nerve Supply**

The sternocleidomastoid muscle is supplied by the spinal accessory nerve. It is also supplied by the ventral rami of C2 and C3, which are mostly sensory and carry proprioceptive sensations from the muscle. (2)

### **e.Superficial Relations**

- ⊙ Skin
- ⊙ Platysma
- ⊙ Three cutaneous nerves
- (a) Great auricular
- (b) Transverse cervical
- (c) Medial supraclavicular
- (d) Lesser occipital
  - ⊙ External jugular vein
  - ⊙ Superficial cervical lymph nodes
  - ⊙ Parotid gland (2)

### **f.Deep Relations**

#### **-In the upper part**

- (a) *Muscle*: Posterior belly of digastric, longissimus capitis, and splenius capitis
- (b) *Artery*: Occipital artery

#### **-In the middle part**

- (a) *Muscles*: Levator scapulae, scalenus anterior, scalenus medius, scalenus posterior, splenius capitis, inferior belly of omohyoid
- (b) *Arteries*: Common carotid, internal carotid
- (c) *Veins*: Internal jugular, anterior jugular
- (d) *Nerves*: Vagus, spinal accessory, cervical plexus, brachial plexus (upper part), ansa cervicalis (inferior root)
- (e) *Glands*: Thyroid gland, lymph nodes

#### **-In the lower part**

- (a) *Muscles*: Sternohyoid, sternothyroid, scalenus anterior
- (b) *Arteries*: Suprascapular, transverse cervical
- (c) *Veins*: Anterior jugular
- (d) *Nerves*: Brachial plexus (lower part), phrenic nerve (2)

## **Posterior triangle**

-It is the triangular space on the side of neck behind the sternocleidomastoid muscle. Its apex is directed upwards and backwards towards the mastoid process and base downwards towards the clavicle. (2)

### **-Boundaries**

*Anterior*: Posterior border of sternocleidomastoid muscle.

*Posterior*: Anterior border of trapezius muscle.

*Inferior (base)*: Superior aspect of middle third of the clavicle.

*Superior (apex)*: Meeting point of sternocleidomastoid and trapezius muscles at the superior nuchal line of the occipital bone. (2)

### **-Floor**



The floor of posterior triangle is muscular and is formed from above downwards by the following muscles:

1. Semispinalis capitis.
2. Splenius capitis.
3. Levator scapulae.
4. Scalenus medius.
5. First digitation of serratus anterior (sometimes).

#### **-Fascial floor of the posterior triangle**

The muscular floor of posterior triangle is covered by prevertebral layer of deep cervical fascia, which forms the **fascial carpet of the floor of the posterior triangle**. It forms axillary sheath around subclavian artery and brachial plexus travelling from the root of the neck to the upper limb).(2)

#### **-Roof**

It is formed by the investing layer of the deep cervical fascia, stretching between the sternocleidomastoid and trapezius muscles.

The **superficial fascia overlying the roof** contains platysma, external jugular and posterior jugular veins, and cutaneous nerves and vessels.

**Structures piercing the roof** of the posterior triangle are:

1. **Four cutaneous branches of cervical plexus**, viz.

- (a) Lesser occipital nerve (C2)
- (b) Great auricular nerve (C2, C3)
- (c) Transverse cervical nerve (C2, C3)
- (d) Supraclavicular nerves (C3, C4).

- ⊙ They pierce the roof near the middle of the posterior border of the sternocleidomastoid muscle

2. **External jugular vein**: It begins just below the angle of mandible, runs downwards and backwards crossing the sternocleidomastoid obliquely and under the cover of platysma).(2)

-The posterior triangle of the neck is divided by the inferior belly of the omohyoid muscle into the supraclavicular triangle inferiorly and the occipital triangle superiorly.

- ⊙ The **occipital triangle** is bounded by the sternocleidomastoid muscle, the inferior belly of the omohyoid muscle, and the trapezius muscle.
- ⊙ The **supraclavicular triangle** is bounded by the inferior belly of the omohyoid muscle, the sternocleidomastoid muscle, and the clavicle; the floor of the triangle is formed by the scalene muscles (1)

## **SUBOCCIPITAL TRIANGLE**

This is a triangular muscular space situated deep in the suboccipital region of the neck, one on each side of the midline and bounded by four suboccipital muscles.

#### **Boundaries**

- ⊙ **Superomedial**: Rectus capitis posterior major, supplemented by rectus capitis posterior minor.
- ⊙ **Superolateral**: Obliquus capitis superior.
- ⊙ **Inferior**: Obliquus capitis inferior.

**Roof**: This is formed by dense fibrous tissue, and covered by semispinalis capitis laterally and longissimus capitis and splenius capitis (occasionally) laterally.

**Floor**: The floor is formed by (a) posterior arch of atlas and (b) posterior atlanto-occipital membrane).(2)

#### **Contents**

- ⊙ The contents of suboccipital triangle are as follows:
- ⊙ 1. Suboccipital plexus of veins.
- ⊙ 2. Greater occipital nerve.

- ⊙ 3. Dorsal ramus of 1st cervical nerve (suboccipital nerve).
- ⊙ 4. Third part of vertebral artery.(2)

### **Lymphatic Regions of the Neck**

- ⊙ According to the anatomic studies the cervical lymphatic system is organized into three functional units:
- ⊙ (1) Waldeyer's tonsillar ring
- ⊙ (2) the transitional lymph nodes located between the head and neck
- ⊙ (3) the cervical lymph nodes, in their proper sense.
- ⊙ Waldeyer's tonsillar ring consists of the palatine tonsils, lingual tonsil, adenoids, and adjacent submucosal lymphatics.(1)

The transitional nodes are arranged in a circular manner at the transition of the head and neck regions and include:

- ⊙ (1) submental lymph nodes
- ⊙ (2) submandibular lymph nodes
- ⊙ (3) parotid lymph nodes
- ⊙ (4) retroauricular lymph nodes
- ⊙ (5) occipital lymph nodes
- ⊙ (6) retropharyngeal nodes
- ⊙ (7) sublingual lymph nodes. (1)

The cervical lymph nodes comprise superficial and deep nodes, and each of these groups includes lateral and medial nodes. The deep lateral cervical lymph nodes are arranged in three chains: (a) the internal jugular vein chain, (b) the spinal accessory nerve chain, and (c) the supraclavicular lymph node chain. The internal jugular nodes and the spinal accessory lymph nodes are divided into upper, middle, and lower groups. The deep medial cervical group consists of the prelaryngeal, prethyroidal, pretracheal, and paratracheal lymph nodes.(1)

References : Text are exclusive for educational and demonstrative purposes to best illustrate the syllabus in the current conditions, the written text is cited from the books listed below:

- (1) Gnepp D. Diagnostic Surgical Pathology of the Head and Neck, 2nd Edition
- (2) Singh V. Textbook of Anatomy. Head, Neck and Brain-second edition, 2014

### **For practicals mandatory texts from**

**Richard L. Drake, A. Wayne Vogl, Adam W.M. Mitchell, *Gray's for students*, Churchill Livingstone Elsevier, 2010**

**And additional completing the essential reading of the lecture texts from:**

1. **Gray H, *Gray's Anatomy – Anatomy descriptive and surgery*, Produced by Magpie Books, London, 1995.**
2. **Frank Netter - *Atlas of Human Anatomy* - Published by Icon Learning Systems, 2003**

**English section-additional references that can be useful for practicals**

## **Second year**

Carmine D. Clemente - *Anatomy: A Regional Atlas of the Human Body* - Published by Lippincott Williams & Wilkins, 2007.

Frank Netter - *Atlas of Human Anatomy* - Published by Icon Learning Systems, 2003.

Gray's Anatomy – *The anatomical basis of medicine and surgery*, Ed. XXXVIII.

Johannes Sobotta - *Sobotta Atlas of Human Anatomy* - Published by Lippincott Williams & Wilkins, 1996.

Keith L. Moore, A. M. R. Agur - *Essential Clinical Anatomy*, Published by Lippincott Williams & Wilkins, 2007.

Keith L. Moore, Arthur F. Dalley, A. M. R. Agur - *Clinically Oriented Anatomy* - Published by Lippincott Williams & Wilkins, 2006.

Mike T. Timmons, Michael J. Timmons, Ralph T. Hutchings, William C. Ober, Claire W. Garrison, Frederic Martini - *Human Anatomy: Laboratory Guide and Dissection Manual* - Published by Prentice Hall, 2002.

[www.bartleby.com/sv/pr060700.html](http://www.bartleby.com/sv/pr060700.html) -pentru Gray anatomy

<https://anatomiaartistica.files.wordpress.com/.../color-atlas-of-anatomy-a-photog-study-o>. -key words on google are: color anatomy atlas