Human Anatomy

Lec.15 Root of the neck Dr Ban Alwash

The suprasternal notch, also known as the jugular notch is an anatomical feature that located at the midline of the neck, between the **clavicles** and directly above the **sternum**. It is subcutaneous throughout its entire length and can be easily palpated. It articulates at its lateral extremity with the **acromion of the scapula.** At the medial end of the clavicle, **the sternoclavicular joint** can be identified **(Fig. 1).**

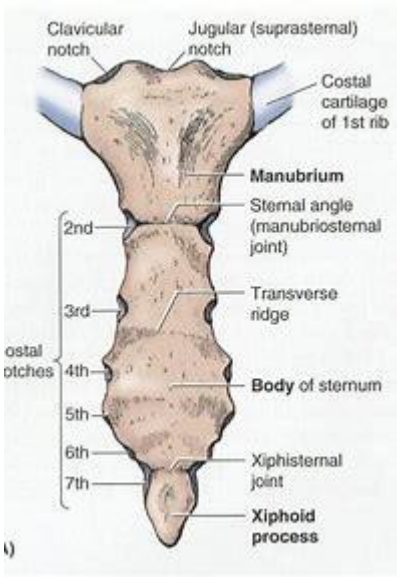

Figure 1: The suprasternal notch

The area of the neck immediately above the **thoracic inlet** is understood to be the root of the neck. Via this space, the structures pass both into and out of the thoracic cavity. The thoracic inlet is a space bounded by **1st thoracic vertebra**, **1st rib** and **manubrium sterni.**

Muscles of the Root of the Neck

- **Scalenus Anterior Muscle.**
- **Scalenus Medius Muscle.**

The scalene muscles are the three muscles found on each side of the neck, spanning between the transverse processes of the **cervical vertebrae** and the **upper two ribs**. They all belong to

the lateral vertebral muscle group. The main functions of these muscles are **flexion, lateral flexion and rotation** of the neck **(Figure 2).**

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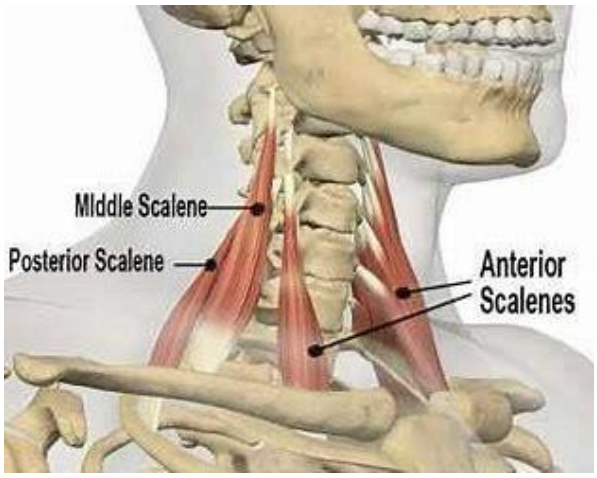


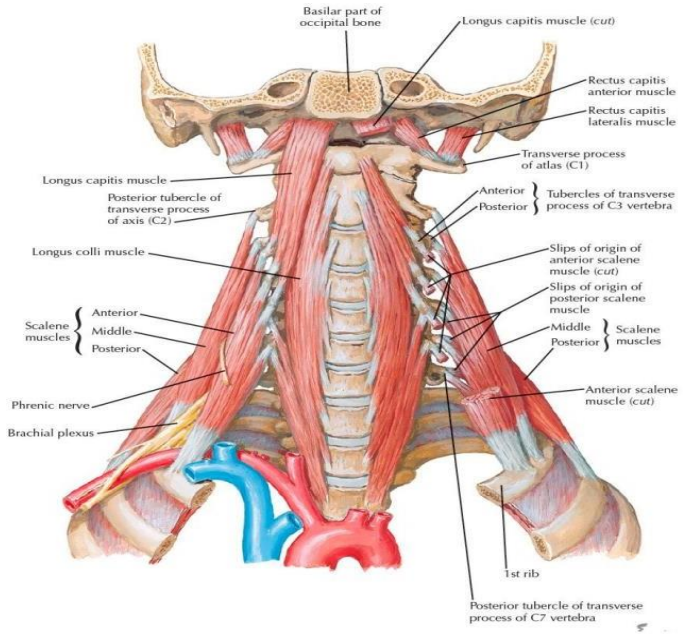


Figure 2: Muscles of the Root of the Neck

The Thoracic Duct

The thoracic duct begins in the abdomen at the upper end of the **cisterna chyli.** It enters the thorax through the aortic opening in the **diaphragm** and ascends upward, inclining gradually to the left. On reaching the superior mediastinum, it is found passing upward along the left marginof the esophagus. At the root of the neck, it continues to ascend along the left margin of the esophagus until it reaches the level of the transverse process of the seventh cervical vertebra. Here, it bends laterally behind the carotid sheath. On reaching the medial border of the scalenus anteriorly, it turns downward and drains into the beginning of the left brachiocephalic vein. It may, however, end in the terminal part of the subclavian or internal jugular veins (Fig. 3).

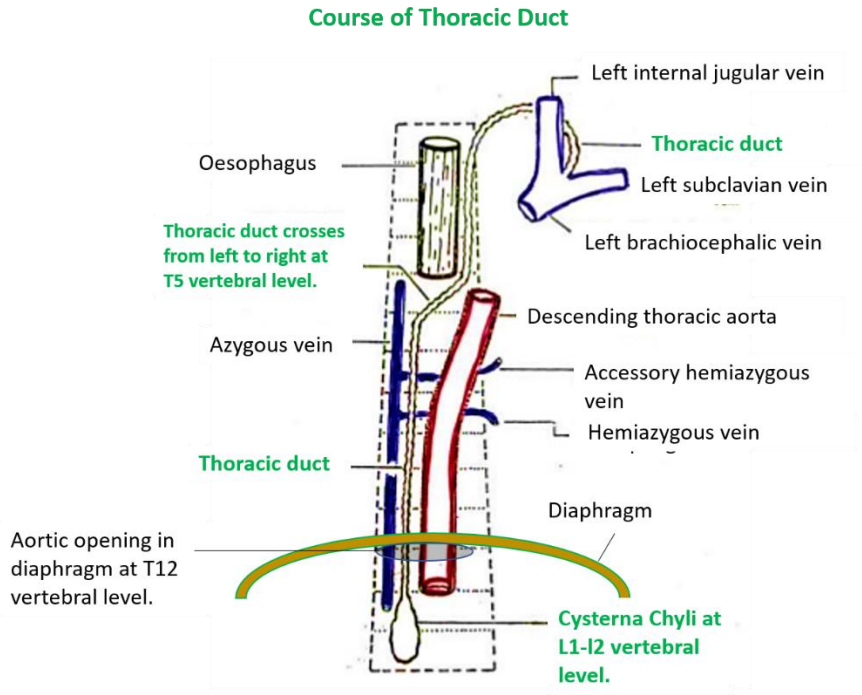


Figure 3: Course of the thoracic duct

Main Nerves of the Neck

Cervical and Brachial Plexus

The brachial plexus is formed in the posterior triangle of the neck by the union of the anterior rami of the 5th, 6th, 7th, and 8th cervical and the first thoracic spinal nerves. This plexus is divided into

roots, trunks, divisions, and cords. The roots of C5 and 6 unite to form the **upper trunk**, the root of C7 continues as the **middle trunk**, and the roots of C8 and T1 unite to form the **lower trunk.** Each trunk then divides into anterior and posterior divisions. The anterior divisions of the upper and middle trunks unite to form the **lateral cord**, the anterior division of the lower trunk continues as the **medial cord**, and the posterior divisions of all three trunks join to form the **posterior cord.** The roots of the brachial plexus enter the base of the neck between the scalenus anterior and the scalenus medius muscles. The trunks and divisions cross the posterior triangle of the neck, and the cords arranged around the axillary artery in the axilla. Here, the brachial plexus and the axillary artery and vein are enclosed in the **axillary sheath (Figure 4,5).**

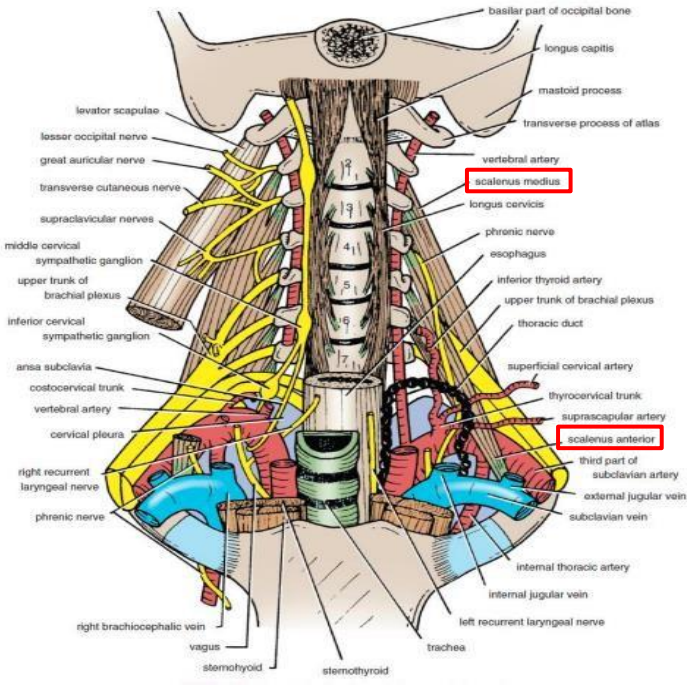


Figure 4: Prevertebral region and the root of the neck.

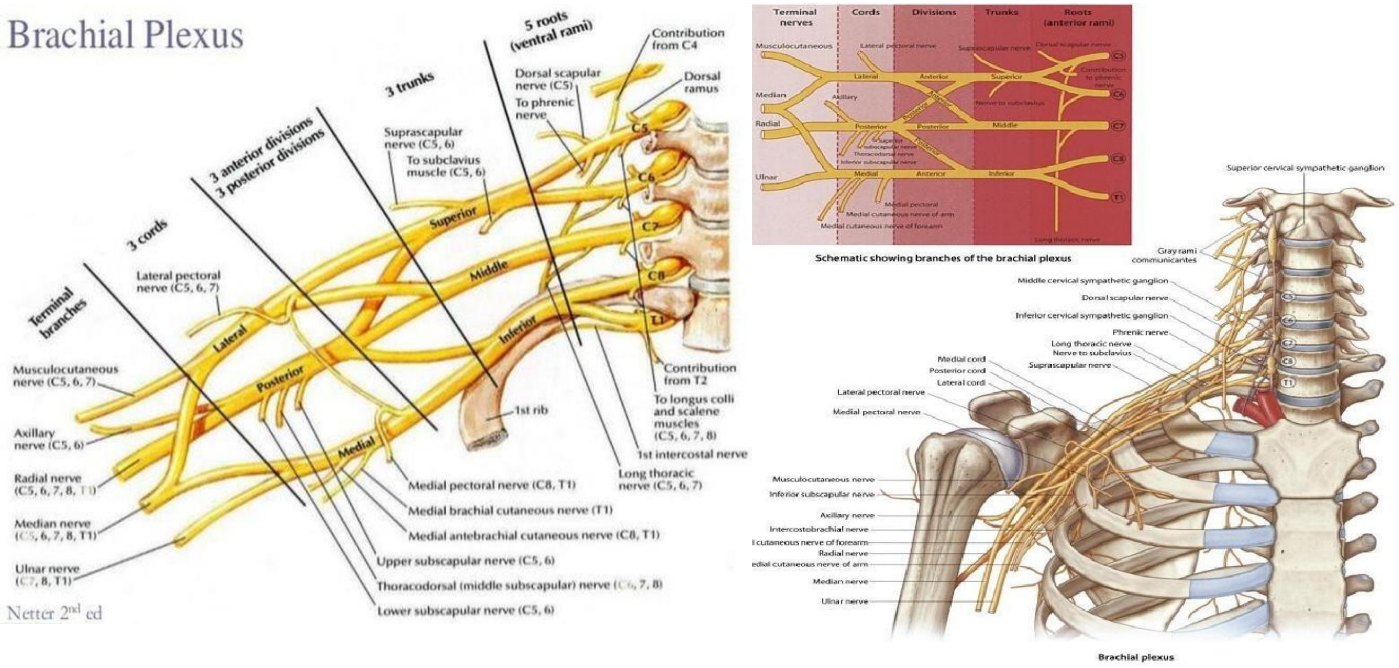


Figure 5: Brachial plexus.

Veins of head and neck

The venous system of the head and neck collect deoxygenated blood and return it to the heart.

The venous drainage can be divided into three parts:

- Venous drainage of the brain and meninges – drained by the **dural venous sinuses.**
- Venous drainage of the scalp and face – drained by veins synonymous with the **arteries of the face and scalp**. These empty into the **internal and external jugular veins.**
- Venous drainage of the neck – drained by the **jugular veins (Fig.6).**

1-External Jugular Vein

The external jugular vein and its tributaries supply the majority of the **external face**. It is formed by the union of two veins:

- **Posterior auricular vein**: drains the area of scalp superior and posterior to the outer ear.
- **Retromandibular vein (posterior branch)**: itself formed by the maxillary and superficial temporal veins, which drain the face.

These two veins combine immediately posterior to the angle **of mandible**, and inferior to the **outer ear,**

forming the external jugular vein.

After formation, the external jugular vein descends down the neck within the **superficial fascia.** It runs anteriorly to the **sternocleidomastoid** muscle, crossing it in an oblique, posterior and inferior direction.

In the root of the neck, the vein passes underneath the **clavicle**, and terminates by draining into the **subclavian vein.** Along its route down the neck, the external jugular vein receives tributaries**; posterior external jugular, transverse cervical and suprascapular veins.**

2-Internal Jugular Vein

The internal jugular vein is a large vein that receives blood from the brain, face, and neck . It formed by petrosal sinus as a continuation of the **sigmoid sinus** and leaves the skull through the jugular **foramen**. It then descends through the neck in the carotid sheath lateral to the **vagus nerve** and the **internal and common carotid arteries**. It ends by joining the subclavian vein behind the medial end of the clavicle to form the **brachiocephalic vein.** Throughout its course, it is closely related to the deep cervical lymph nodes.

Tributaries of the Internal Jugular Vein

1) Inferior petrosal sinus.
2) Facial vein.
3) Pharyngeal veins.
4) Lingual vein.
5) Superior thyroid vein.
6) Middle thyroid vein.

3-Anterior Jugular Vein

The anterior jugular vein descends in the front of the neck close to the midline. Just above the sternum, it is joined to the opposite vein by the **jugular arch**. The anterior jugular vein joins the external jugular vein deep to the **sternocleidomastoid muscle**.

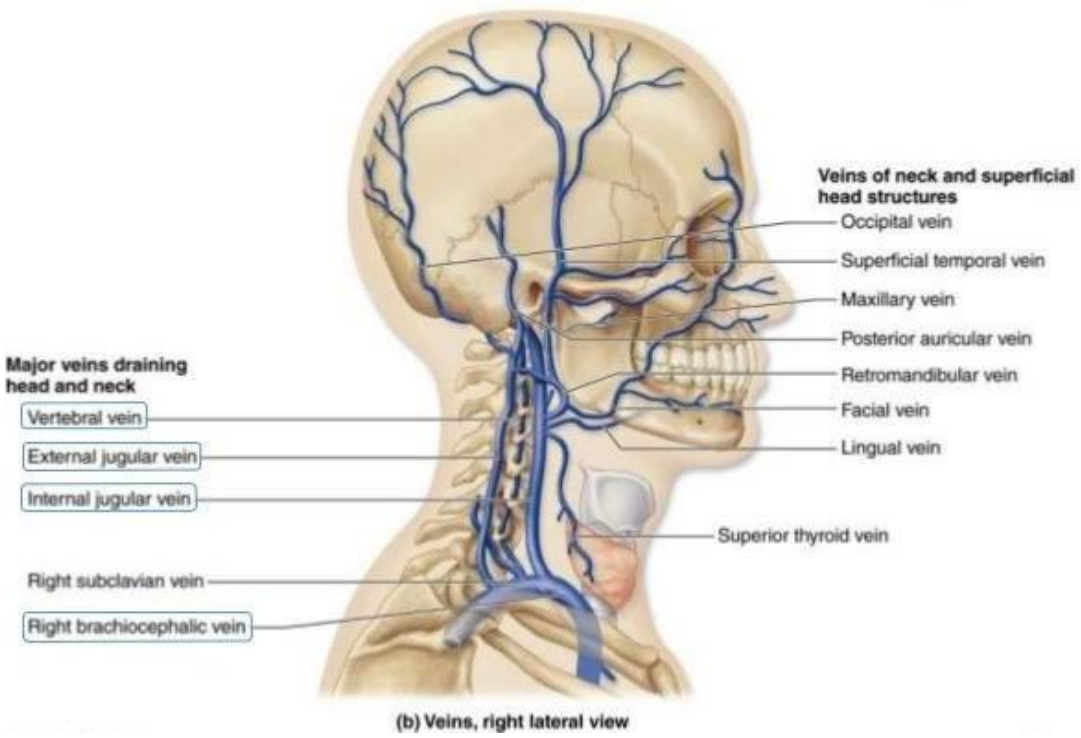


Figure 6: Lateral view of the head and neck veinous drainage

Subclavian Vein

The subclavian vein is a continuation of the axillary vein at the outer border of the **1st rib**. It joins the **internal jugular vein** to form **the brachiocephalic vein**, and it receives the external jugular vein. In addition, it often receives **the thoracic duct** on the left side and the **right lymphatic duct on the right.**

Lymph Drainage of the Head and Neck

The lymph nodes of the head and neck are arranged as a regional collar that extends from below the chin to the back of the head and as a deep vertical terminal group that is embedded in the carotid sheath in the neck. The regional nodes are arranged as follows:

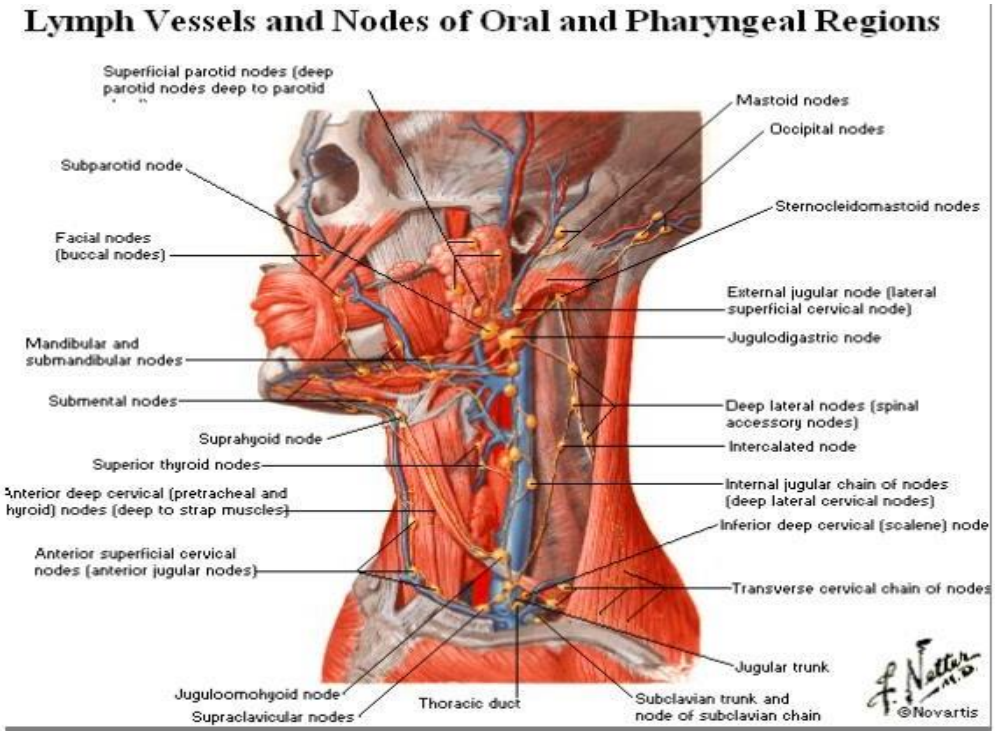
- **Occipital nodes:** These are situated over the occipital bone on the back of the skull. They receive lymph from the back of the scalp.
- **Retroauricular (mastoid) nodes**: These lie behind the ear over the mastoid process. They receive lymph from the scalp above the ear, the auricle, and the external auditory meatus.
- **Parotid nodes**: These are situated on or within the parotid salivary gland. They receive lymph from the scalp above the parotid gland, the eyelids, the parotid gland, the auricle, and the external auditory meatus.
- **Buccal (facial) nodes**: One or two nodes lie in the cheek over the buccinator muscle. They drain lymph that ultimately passes into the submandibular nodes.
- **Submandibular nodes**: These lie superficial to the submandibular salivary gland just below the lower margin of the jaw. They receive lymph from the front of the scalp; the nose; the cheek; the upper lip and the lower lip (except the central part); the frontal, maxillary, and ethmoid sinuses; the upper and lower teeth (except the lower incisors); the anterior two thirds of the tongue (except the tip); the floor of the mouth and vestibule; and the gums.
- **Submental nodes**: These lie in the submental triangle just below the chin. They drain lymph from the tip of the tongue, the floor of the anterior part of the mouth, the incisor teeth, the center part of the lower lip, and the skin over the chin.
- **Anterior cervical nodes**: These lie along the course of the anterior jugular veins in the front of the neck. They receive lymph from the skin and superficial tissues of the front of the neck.
- **Superficial cervical nodes**: These lie along the course of the external

jugular vein on the side of the neck. They drain lymph from the skin over the angle of the jaw, the skin over the lower part of the parotid gland, and the lobe of the ear.

- **Retropharyngeal nodes**: These lie behind the pharynx and in front of the vertebral column. They receive lymph from the nasal pharynx, the auditory tube, and the vertebral column.
- **Laryngeal nodes: These lie in front of the larynx. They receive lymph from the larynx.**
- **Tracheal (paratracheal) nodes:** These lie alongside the trachea. They receive lymph from neighboring structures, including the thyroid gland.

Deep Cervical Nodes

The deep cervical nodes form a vertical chain along the course of the internal jugular vein within the carotid sheath. They receive lymph from all the groups of regional nodes. **The jugulodigastric nod**e, which is located below and behind the angle of the jaw, is mainly concerned with drainage of the tonsil and the tongue. **The juguloomohyoid node**, which is situated close to the omohyoid muscle, is mainly associated with drainage of the tongue. The efferent lymph vessels from the deep cervical lymph nodes join to form **the jugular trunk**, which drains into the thoracic duct or the right lymphatic duct **(Figure 7).**



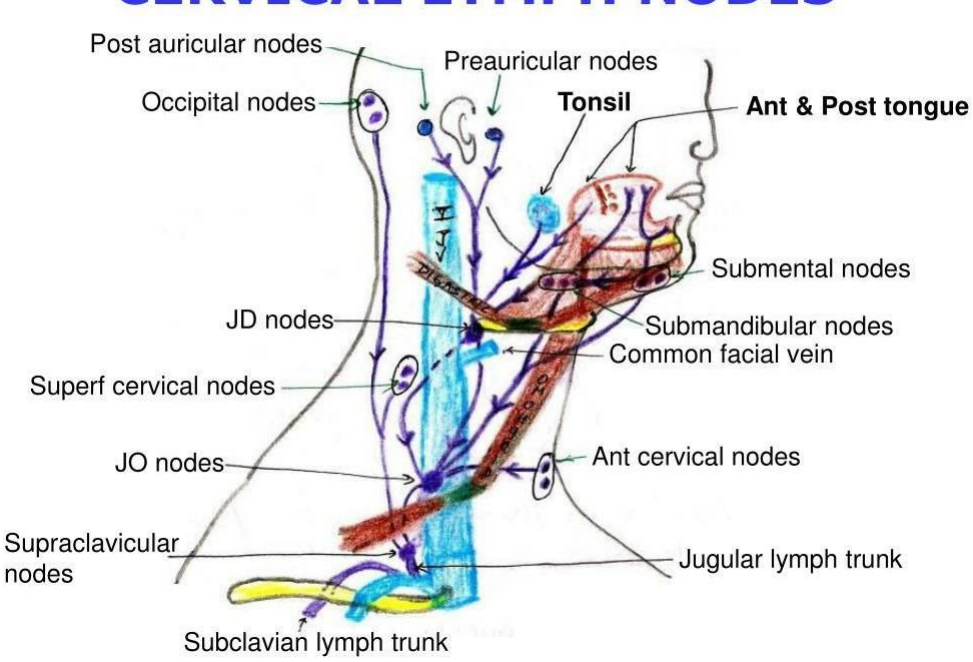


Figure 7: Head and neck lymph nodes.

Thyroid Gland

Location and Description

The thyroid gland consists of right and left lobes connected by a narrow isthmus. It is a vascular organ surrounded by a sheath derived from the pretracheal layer of deep fascia. The sheath attaches the gland to **the larynx and the trachea.** Each lobe is pear shaped, with its apex being directed upward as far as the oblique line on the lamina of the thyroid cartilage; its base lies below at the level of the **fourth or fifth tracheal ring.**

The isthmus extends across the midline in front of the **second, third, and fourth tracheal rings.**

A pyramidal lobe is often present, and it projects upward from the isthmus, usually to the left of the midline. A fibrous or muscular band frequently connects **the pyramidal lobe** to the hyoid bone; if it is muscular, it is referred to as **the levator glandulae thyroideae (Figure 8)**.

❖ Relations of the Lobes

Anterolaterally: The sternothyroid, the superior belly of the omohyoid, the sternohyoid, and the anterior border of the sternocleidomastoid.

Posterolaterally: The carotid sheath with the common carotid artery, the internal jugular vein, and the vagus nerve.

Medially: The larynx, the trachea, the pharynx, and the esophagus. Associated with these structures, are the **cricothyroid muscle and its nerve supply, the external laryngeal nerve**. In the groove between the esophagus and the trachea is the **recurrent laryngeal nerve.**

The rounded posterior border of each lobe is related posteriorly to the superior and inferior parathyroid glands and the anastomosis between the superior and inferior thyroid arteries.

❖ Relations of the Isthmus:

Anteriorly: The sternothyroids, sternohyoids, anterior jugular veins, fascia, and skin

Posteriorly: The second, third, and fourth rings of the trachea.

The terminal branches of the superior thyroid arteries anastomose along its upper border.

❖ Blood Supply

The **arteries** to the thyroid gland are the **superior thyroid artery, the inferior thyroid artery, and sometimes the thyroidea ima**. The arteries anastomose profusely with one another over the surface of the gland.

1. The superior thyroid artery: a branch of the external carotid artery, descends to the upper pole of each lobe, accompanied by the **external laryngeal nerve.**

2. The inferior thyroid artery: a branch of the thyrocervical trunk, ascends behind the gland to the level of the cricoid cartilage. It then turns medially and downward to reach the posterior border

of the gland. The **recurrent laryngeal** nerve crosses either in front of or behind the artery, or it may pass between its branches.

3. The thyroidea ima: if present, may arise from the **brachiocephalic artery** or the arch of the aorta. It ascends **in front of the trachea to the isthmus**.

❖ The veins from the thyroid gland are the following:

1.The superior thyroid, which drains into the **internal jugular vein.**

2.The middle thyroid, which drains into the **internal jugular vein**.

3. The inferior thyroid veins of the two sides anastomose with one another as they descend in front of the trachea. They drain into the **left brachiocephalic vein in the thorax**.

❖ Lymph Drainage

The lymph from the thyroid gland drains mainly laterally into the deep cervical lymph nodes. A few lymph vessels descend to the paratracheal nodes.

❖ Nerve Supply

Superior, middle, and inferior cervical sympathetic ganglia.

Functions of the Thyroid Gland

The thyroid hormones, thyroxine and triiodothyronine, increase the metabolic activity of most cells in the body. The parafollicular cells produce the hormone thyrocalcitonin, which lowers the level of blood calcium.

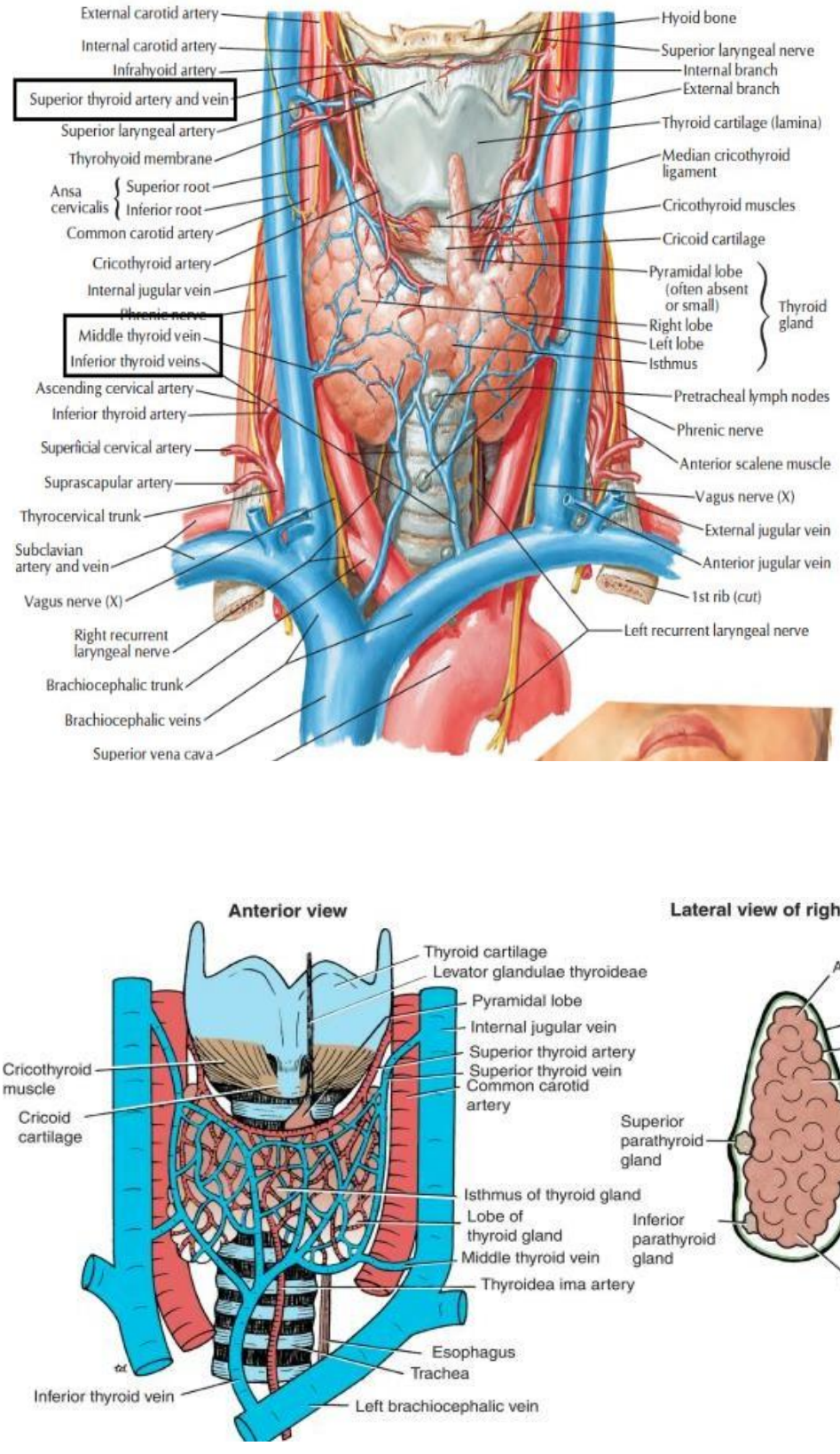


Figure 8: The structure and vascular supply of the thyroid gland.

Parathyroid Glands

Location and Description

The parathyroid glands are ovoid bodies measuring about 6 mm long in their greatest diameter. They are four in number and are closely related to the posterior border of the thyroid gland, lying within its fascial capsule.

- **The two superior parathyroid glands** are the more constant in position and lie at the level of the middle of the posterior border of the thyroid gland.
- **The two inferior parathyroid glands** usually lie close to the inferior poles of the thyroid gland. They may lie within the fascial sheath, embedded in the thyroid substance, or outside the fascial sheath. Sometimes, they are found some distance caudal to the thyroid gland, in association with the inferior thyroid veins, or they may even reside in the superior mediastinum in the thorax.

❖ Blood Supply

The arterial supply to the parathyroid glands is from the superior and inferior thyroid arteries. The venous drainage is into the superior, middle, and inferior thyroid veins.

References

- **Snell RS. Clinical Anatomy by Regions. 9th edition. Philadelphia, PA: Lippincott Williams & Wilkins, 2012.**
- **https://teachmeanatomy.inf**