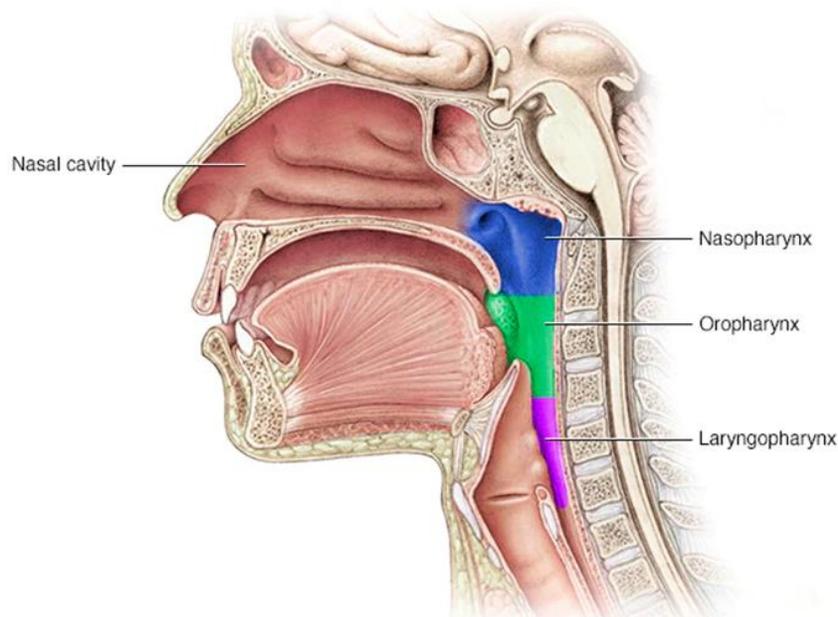


Pharynx, Larynx and Thyroid

The Pharynx

- The pharynx is situated behind the nasal cavities, the mouth, and the larynx.
- Consists of three parts: nasopharynx, oropharynx, and laryngopharynx.
- The pharynx is funnel shaped; its upper, wider end lies under the base of the skull; its lower, narrow end is continuous with the esophagus (C6)
- The pharynx has a musculomembranous wall, which is deficient anteriorly, replaced by the posterior openings into the nose (choanae), the opening into the mouth, and the inlet of the larynx. The pharynx is also continuous with the tympanic cavity via the auditory tube (Eustachian tube) which acts to equalize the pressure of the middle ear.



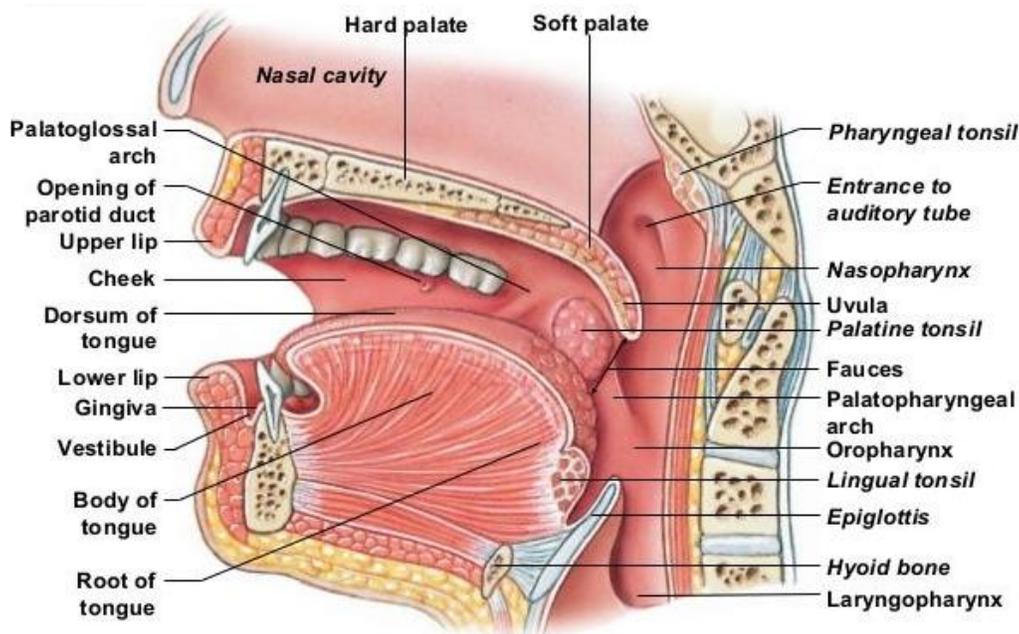
Nasopharynx (Nasal Pharynx)

- This lies above the soft palate and behind the nasal cavities.
- The pharyngeal tonsil; A collection of lymphoid tissue, sits in the submucosa of the roof.

Excessive hypertrophy of the lymphoid tissue, usually associated with infection, causes the pharyngeal tonsils to become enlarged; they are commonly referred to as adenoids.

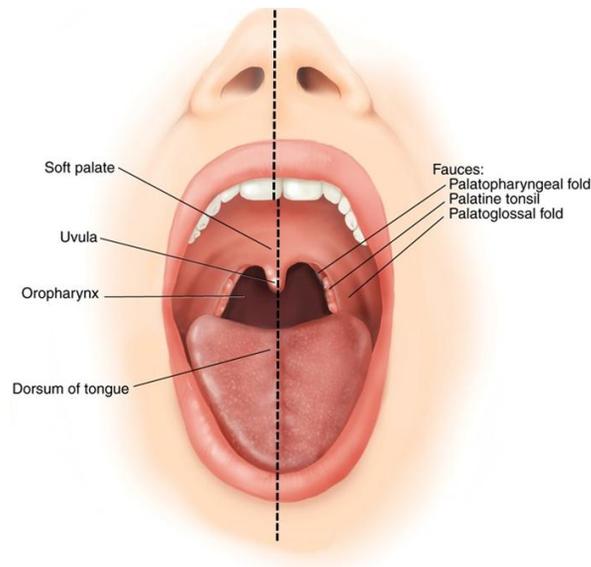
Marked hypertrophy blocks the posterior nasal openings and causes the patient to snore loudly at night and to breathe through the open mouth that made surgical removal is a must.

- The pharyngeal isthmus is the opening between the soft palate and the posterior pharyngeal wall.
- The opening of the auditory tube is on the lateral wall.
- Nerve supply: Maxillary nerve (V2)



Oropharynx (Oral Pharynx)

- This lies behind the oral cavity. The floor is the posterior one third of the tongue and the interval between the tongue and epiglottis (laryngeal cartilage).
- The palatoglossal and palatopharyngeal arches or folds are on the lateral wall. The palatoglossal arch is a fold of mucous membrane covering the palatoglossus muscle.
- The interval between the paired palatoglossal arches is called the oropharyngeal isthmus and marks the boundary between the mouth and pharynx.
- The palatopharyngeal arch is a fold of mucous membrane covering the palatopharyngeus muscle.
- The palatine tonsil occupies the recess between the palatoglossal and palatopharyngeal arches.
- Nerve supply: Glossopharyngeal nerve



Laryngopharynx (Laryngeal Pharynx)

- This lies behind the opening into the larynx.
- The thyroid cartilage forms the lateral wall.
- Nerve supply: Internal laryngeal branch of the vagus nerve

Pharyngeal Blood Supply

- 1) Ascending pharyngeal (branch of external carotid artery)
- 2) Tonsillar branch of facial artery.
- 3) Branches of the maxillary and lingual arteries (both are branches of external carotid artery)

Pharyngeal Muscles

- Superior, middle, and inferior constrictor group muscles, whose fibers run in a somewhat circular direction
- stylopharyngeus, salpingopharyngeus and palatopharyngeus (which is also one of the five paired muscles of the soft palate) group muscles, which run in longitudinal direction

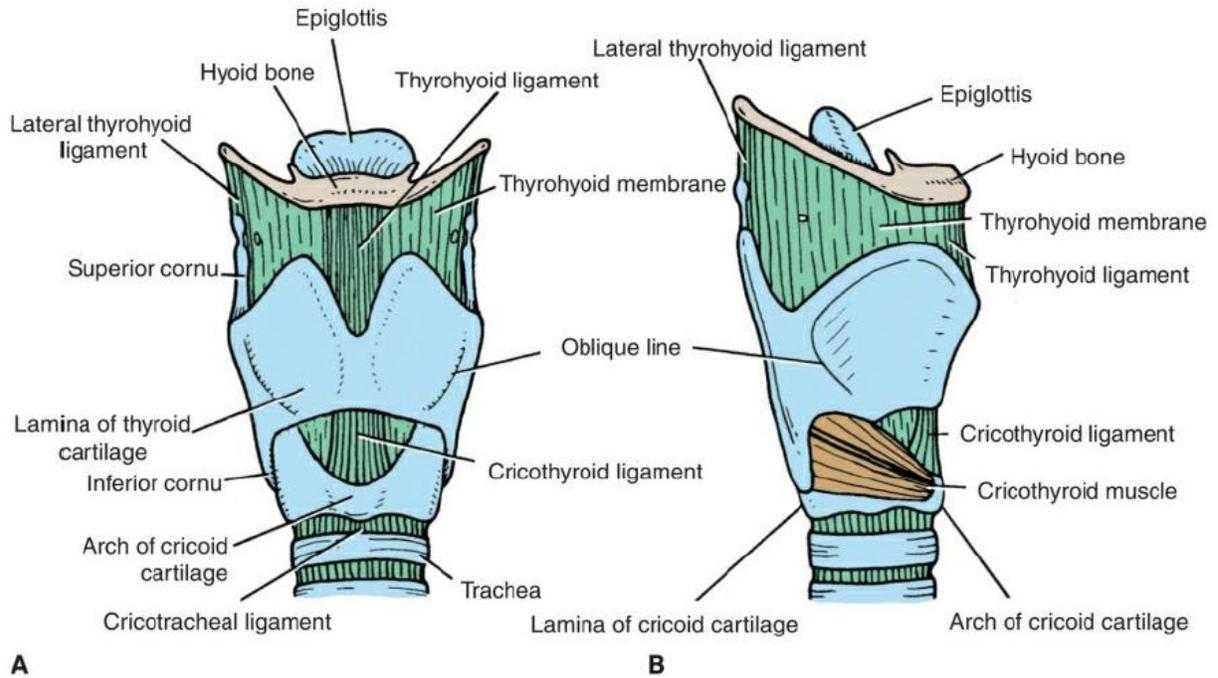
All the muscles are supplied by the pharyngeal plexus of vagus nerve except the stylopharyngeal muscle which is supplied by glossopharyngeal nerve

The Larynx

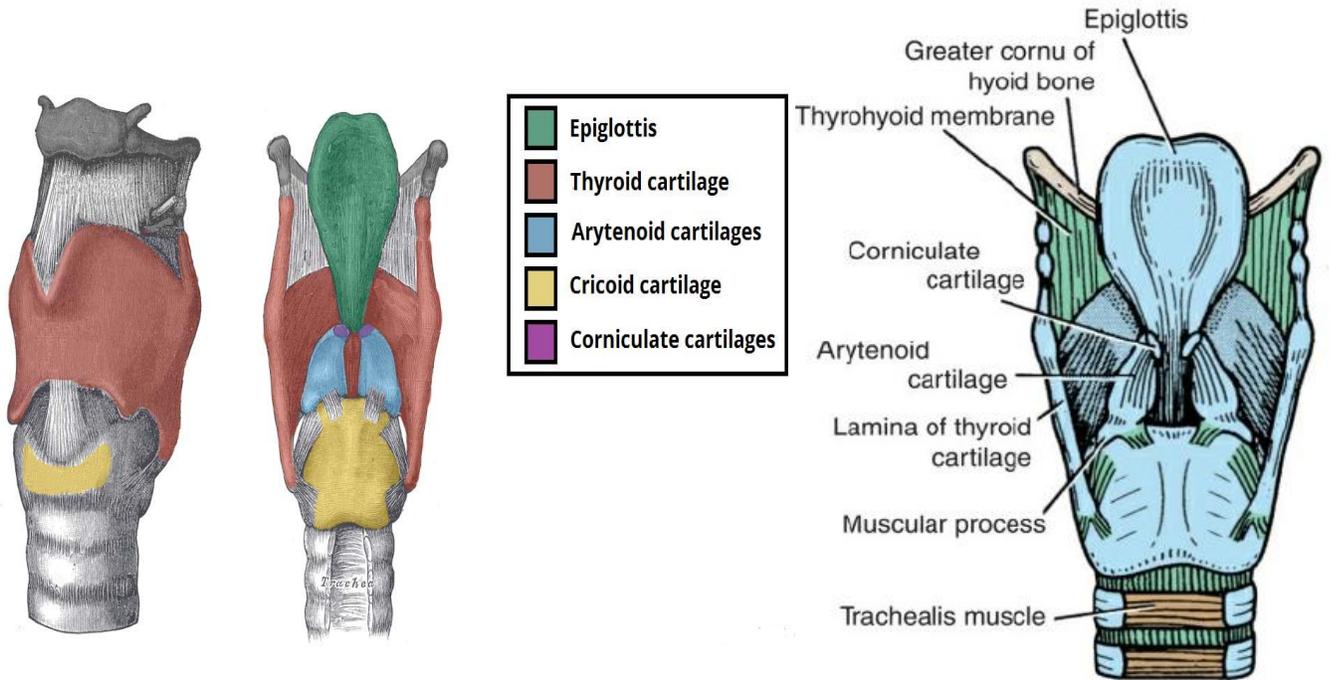
- ✓ The larynx is a respiratory organ, set between the pharynx and trachea. The larynx provides a protective sphincter at the inlet of the air passages (main function) and is responsible for voice production.
- ✓ **Relations:**
 - The larynx lies below the tongue and hyoid bone in the midline of the neck at the level of C4–6 vertebrae.
 - It opens above into the laryngopharynx, and below, it is continuous with the trachea. The larynx is covered in front by the infrahyoid strap muscles and at the sides by the thyroid gland.
- ✓ **Framework:**
 - The framework of the larynx is formed of cartilages that are held together by ligaments and membranes, moved by muscles, and lined by mucous membrane.
 - There are nine cartilages make up the skeleton of larynx, three are single main cartilages (thyroid, cricoid and epiglottic) and three are paired cartilages like arytenoids cartilages.
 - The vocal cords are the upper part of the cricothyroid ligament.
 - One of the laryngeal membranes is the cricothyroid membrane

Clinical Note

Surgical cricothyroidotomy is used in emergency to rapidly gain entry into the subglottic airway by creating an opening in cricothyroid membrane. The key factor in the technique is identification of the cricothyroid membrane; the cricothyroid membrane is usually quite superficial and palpable, then both skin and membrane are perforated



A- anterior view , B- lateral view of the larynx

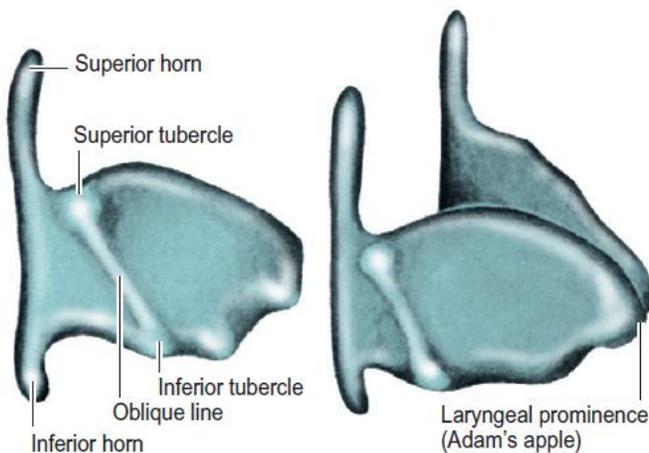


Posterior view (from behind) of the larynx

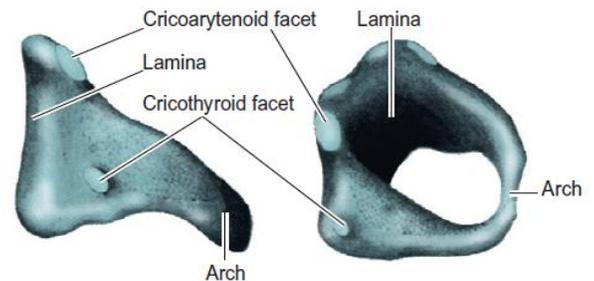
Laryngeal Cartilages

- **Thyroid cartilage:**

- This is the largest cartilage of the larynx and consists of two laminae that meet in the midline in thyroid notch (V angle).
- The laryngeal prominence (Adam's apple) projects forward from the apex of the thyroid notch.
- The posterior border extends upward into a superior cornu and downward into an inferior cornu
- An oblique line for the attachment of muscles is on the outer surface of each lamina.



Thyroid Cartilage



Cricoid Cartilage

- **Cricoid cartilage:**

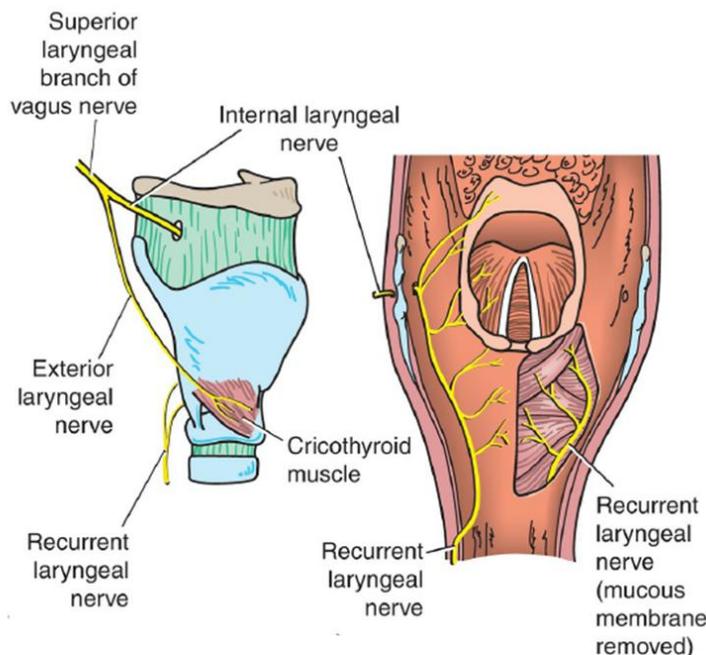
- This cartilage lies below the thyroid cartilage and is shaped like a signet ring, having a broad lamina behind and a shallow arch in front.
- It is the only completely circular element in the respiratory tract.
- The cricoid cartilage has an articular facet on each side of the lateral surface for articulation with the inferior cornu of the thyroid cartilage.
- Posteriorly, the lamina has an articular facet on its upper border on each side for articulation with the arytenoid cartilage.

- **Epiglottic cartilage:**

- This leaf-shaped lamina of elastic cartilage lies behind the root of the tongue.
- Responsible for closure of laryngeal inlet (airway) from the ingested food.

Laryngeal Muscles

- The muscles of the larynx are divided into intrinsic and extrinsic muscles. The intrinsic laryngeal muscles are responsible for controlling sound production.
- All the intrinsic muscles are supplied by recurrent laryngeal nerve – branch of vagus nerve except the cricothyroid muscle, that's why injury to unilateral recurrent laryngeal nerve leads to hoarseness but injury to both nerves leads to paralysis for the intrinsic muscles include the muscle responsible for opening of vocal cords, resulting into vocal cords closure and airway obstruction that necessitate the permanent tracheostomy procedure.
- The cricothyroid muscle:
 - innervated by the superior laryngeal nerve - a branch of the vagus nerve
 - It is responsible for sound pitch (intensity) by tension of the vocal folds in phonation (phonation is the process by which the vocal folds produce certain sounds through vibration), that's why superior laryngeal nerve palsy changes the pitch of the voice and causes an inability to make explosive sounds due to paralysis of the cricothyroid muscle.



The Thyroid Gland

- 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 the deep fascia. The sheath attaches the gland to the larynx and the trachea. This explains why the thyroid gland follows the movements of the larynx in swallowing. Therefore, any pathologic neck swelling that is part of the thyroid gland will move upward when the patient is asked to swallow.

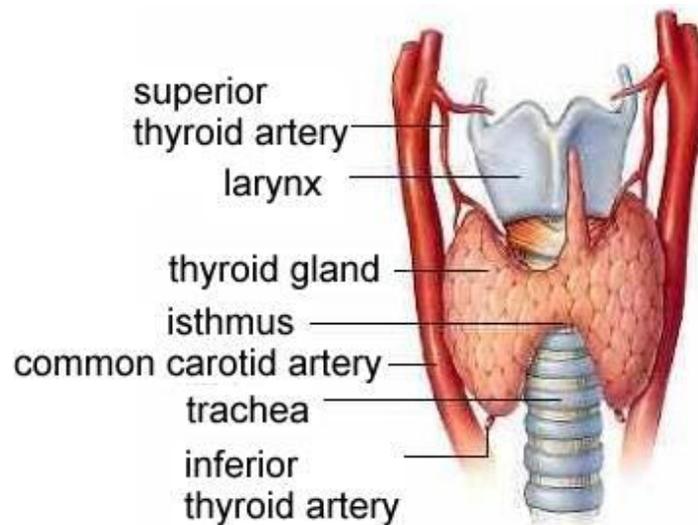
✓ Relations of Lobes

- Anterolateral: Strap muscles (infra hyoid muscles) and the anterior border of the sternocleidomastoid.
- Posterolateral: 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
- Posteriorly: Superior and inferior parathyroid glands.

✓ Arterial Supply

The arteries to the thyroid gland are

- I. The superior thyroid artery: a branch of the external carotid artery.
- II. The inferior thyroid artery: a branch of the thyrocervical trunk which is branch of subclavian artery (branch from aorta, the main arterial supply of the upper limbs).
- III. thyroidea ima (It is an anatomical variant when present; supplies blood to thyroid gland primarily and mostly arises from the brachiocephalic trunk or aortic arch directly).



✓ Lymphatic Drainage

- The majority of the gland drains laterally into the deep cervical lymph nodes.
- The paratracheal nodes.

✓ Nerve Supply

Superior, middle, and inferior cervical sympathetic ganglia

✓ Thyroid Gland Functions

The thyroid hormones:

- thyroxine and triiodothyronine, increase the metabolic activity of most cells in the body.
- thyrocalcitonin, which lowers the level of blood calcium.

- Retrosternal Goiter

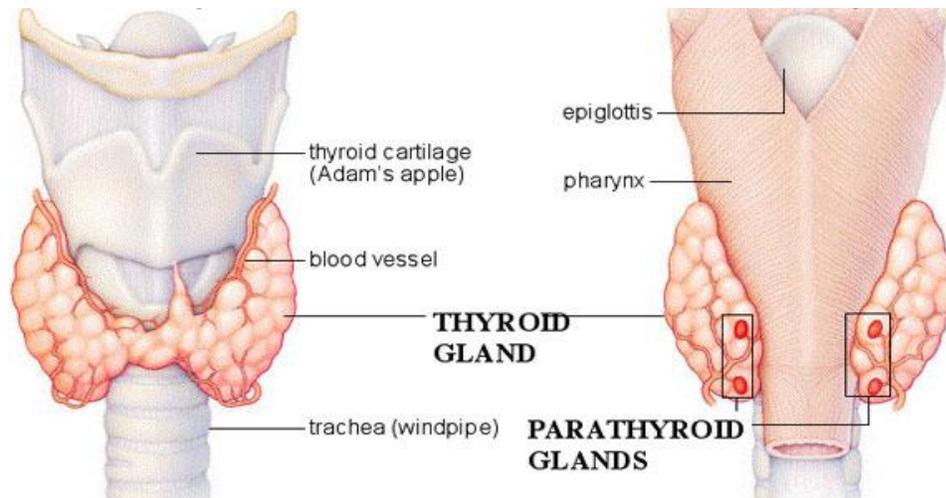
The attachment of the sternothyroid muscles to the thyroid cartilage effectively limits upward expansion of the gland. There being no limitation to downward expansion, it is not uncommon for a pathologically enlarged thyroid gland to extend downward behind the sternum. A retrosternal goiter (any abnormal enlargement of the thyroid gland) can compress the trachea and cause dangerous dyspnea.

✓ Thyroid Gland Development

- The thyroid gland begins to develop during the 3rd week as a thickening in the midline of the base of the tongue. Later this thickening becomes the thyroglossal duct which grows inferiorly. As development continues, the duct elongates and its distal end becomes bilobed which expand to form the thyroid gland.
- The thyroid gland now migrates inferiorly along this duct. By the 7th week, it reaches its final position in relation to the larynx and trachea in the neck. Meanwhile, the solid cord connecting the thyroid gland to the tongue disintegrate and disappears. The site of origin of the thyroglossal duct on the tongue remains as a pit called the **foramen cecum**.
- Failure of development of the thyroid gland may occur and is the commonest cause of **cretinism**.
- The descent of the thyroid may be arrested at any point between the base of the tongue and its final position in neck. **Lingual thyroid** is the most common form of incomplete descent.

Parathyroid Glands

- The parathyroid glands are ovoid bodies measuring about 6 mm long in their greatest diameter. They are four in number (two superior and two inferior) 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 superior and inferior thyroid arteries supply blood to the parathyroid glands. The venous drainage is into the superior, middle, and inferior thyroid veins.

Lymph Drainage

Lymph drains to the deep cervical and paratracheal lymph nodes.

Nerve Supply

Superior or middle cervical sympathetic ganglia

Parathyroid Gland Functions

The chief cells produce the parathyroid hormone, which stimulates osteoclastic activity in bones, thus mobilizing the bone calcium and increasing the calcium levels in the blood.

The parathyroid hormone also stimulates the absorption of dietary calcium from the small intestine.

The calcium levels in the blood control the secretion of the parathyroid hormone.

Hyperparathyroidism is a common disorder associated with multiple manifestations, include brown tumors in the jaws