THE LARYNX

I - INTRODUCTION

The larynx is an air-conducting organ attached to the respiratory system, located in the middle and anterior part of the neck, at the level of the cervical vertebrae C4, C5 and C6.

The larynx plays an essential role in phonation, respiration and swallowing.

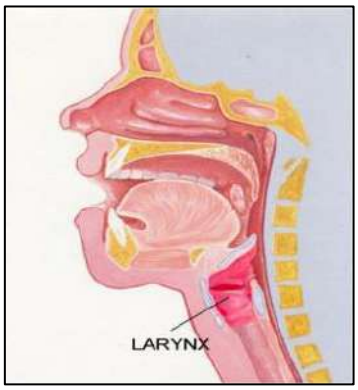
II - DESCRIPTIVE ANATOMY

1-Location: It is an odd, median organ, situated in the middle part of the visceral sheath of the neck, above the trachea, in front of the pharynx, behind the thyroid body, and below the hyoid bone.

2-External configuration:

In its external shape, the larynx is a kind of hollow cylinder. It is a cartilaginous canal, easy to identify thanks to the Adam's apple. Length: 45mm.

Transverse diameter: 40 mm. Sagittal diameter: 35 mm. The dimensions are smaller in women.



3-Structure: It is formed by a cartilaginous skeleton. The different cartilages are joined by joints, membranes, ligaments and muscles. The larynx is lined by a thin mucosa.

A- Cartilaginous skeleton

It includes 3 odd and median cartilages, which are the supporting cartilages of the larynx: the thyroid cartilage, the cricoid cartilage, the epiglottic cartilage, 3 paired and lateral cartilages: the arytenoid cartilages, which are the movable cartilages, the corniculate cartilages and the

cuneiform cartilages.

-The thyroid cartilage: It is located below the hyoid bone and above the cricoid cartilage. It is formed by two vertical oblique lateral laminae, directed backward and outward, forming a concave angle, a dihedral angle open posteriorly, and responsible for the anterior prominence of the laryngeal projection (Adam's apple). It has two superior horns and two inferior horns, and an oblique ridge on the outer surface of the laminae.

-The cricoid cartilage: is located in the lower part of the larynx, above the first tracheal ring. It has the shape of a signet ring, consisting of an anterior ring with a median tubercle (cricoid beak) and a posterior signet bearing the arytenoid and thyroid articular surfaces.

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-The epiglottic cartilage: it is a lamella of elastic cartilage, roughly vertical, located above the thyroid cartilage, behind the tongue. It is an odd, median, racket-shaped structure, with a lower handle that inserts into the concave angle of the thyroid cartilage. Its posterior surface is covered by a mucosa that extends onto the vocal cords. Its anterior surface contacts, from below upward: the posterior surface of the thyroid cartilage, the thyrohyoid membrane, the hyoid bone, and the base of the tongue. Its apex is attached to the posterior surface of the thyroid cartilage by the thyroepiglottic ligament. Its base is superior

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slightly notched. The epiglottic cartilage plays a role as a cover of the airway respiratory tract during swallowing. -The arytenoid cartilages: The arytenoids are two small mobile cartilages placed posteriorly on the lateral parts of the cricoid cartilage's arch, one on the right and one on the left. In the shape of a small triangular pyramid. Each presents: -a base, which articulates with the arch of the cricoid cartilage; from it, the vocal process extends medially and the muscular process extends laterally. -an apex that articulates with the corniculate cartilage.

-a medial surface, lined by the mucosa corresponding to the epiglottis. A posterior surface providing insertion for the inter-arytenoid muscle and an anterolateral surface.

-The corniculate cartilage (Santorini cartilage)

It is a small conical cartilage curved inward. It overlies each arytenoid cartilage. -The cuneiform cartilage (Wrisberg or Morgagni cartilage) It is a small cartilage located above the corniculate cartilage.

-Accessory cartilages of the larynx

Anterior and posterior sesamoid cartilages: are variable

B- Joints:

-Crico-arytenoid joints: they unite the articular facets of the cricoid and of the arytenoids. They are of the trochoid type; the surfaces are convex for the cricoid, concave for the arytenoids.

-Crico-thyroid joints: They are of the arthrodial type, bringing together the horns of the thyroid cartilage with the thyroid articular surface of the cricoid cartilage.

C- Ligaments of the larynx:

They are of two types: intrinsic and extrinsic.

Intrinsic ligaments:

- The crico-thyroid ligament: it connects the upper border of the cricoid to the lower border of the thyroid.

- The thyro-epiglottic ligament: stretched from the lower end of the epiglottis to the cartilage thyroid.

- The jugal ligament: it extends from the corniculate cartilages to the upper border of the arch of the cricoid.

- The aryteno-epiglottic ligaments: stretched from the anterolateral surface of the arytenoid cartilage to the lateral border of the epiglottic cartilage

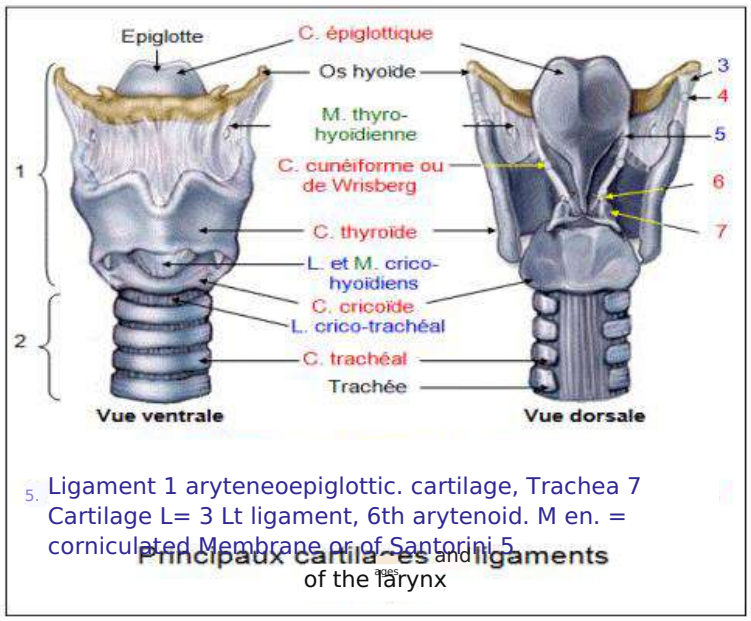
- The superior thyro-arytenoid ligament (Ventricular ligament): it inserts into the inward angle of the thyroid and ends on the arytenoid cartilage.

- The inferior thyro-arytenoid ligament (vocal ligament): It is also called the ligament of the vocal cords, forms the framework of the vocal cords, and runs from the inward angle of the thyroid cartilage to the vocal processes of the arytenoid.

Extrinsic ligaments:

- The crico-tracheal membrane: stretched from the lower border of the cricoid to the first tracheal ring. - The thyro-hyoid membrane: joining the lower border of the hyoid bone to the upper border of the thyroid cartilage. - The hyo-epiglottic membrane: it runs from the upper border of the body of the hyoid bone to the anterior surface of the epiglottis. - The glosso-epiglottic ligaments: they connect the anterior surface of the epiglottic cartilage to the base of the tongue.

- The pharyngo-epiglottic ligaments: extend from the lateral borders of the epiglottis to the lateral wall of the pharynx.



5. Ligament 1 aryteneoepiglottic. cartilage, Trachea 7 Cartilage L= 3 Lt ligament, 6th arytenoid. M en. = corniculated Membrane or of Santorini 5

Principaux cartilages and ligaments of the larynx

D - Muscles of the larynx:

The laryngeal muscles are divided into two groups:

The extrinsic muscles: They extend from the larynx to neighboring organs, they ensure the elevation of the larynx during swallowing, these are essentially:

a/ Pharyngeal muscles

- the inferior constrictor of the pharynx, the stylo-pharyngeal and pharyngostaphyline.

b/ Neck muscles: the sternothyroid and thyrohyoid

Intrinsic muscles:

They all attach to the laryngeal cartilages and all, with the exception of the cricothyroid muscle located behind the thyroid cartilage. All these muscles modify the lumen of the laryngeal cavity and the vocal cords. They are grouped according to their function into muscles:

- the muscles that open the glottic fissure (dilator): the posterior cricoarytenoid.
- The muscles that close the glottic fissure (constrictors): the lateral cricoarytenoid, the superior thyroarytenoid and the inferior thyroarytenoid, the interarytenoid and the cricothyroid.

They are all innervated by the recurrent nerve (or inferior laryngeal nerve), with the exception of the cricothyroid muscle which is innervated by the superior laryngeal nerve.

The constrictor muscles of the glottis:

1- The lateral cricoarytenoid muscle:

Origin: the superior edge of the cricoid cartilage.

Insertion: the muscular process of the arytenoid cartilage.

2- The inferior thyroarytenoid muscle:

Origin: the inward-angled border of the thyroid cartilage.

Insertion: the vocal process of the arytenoid cartilage.

3- The superior thyroarytenoid muscle:

Origin: the inward-angled border of the thyroid cartilage.

Insertion: the muscular process of the arytenoid.

4- The interarytenoid or aryarytenoid muscle:

it is located posteriorly between the two arytenoids.

It has two fascicles: oblique and transverse.

The transverse fascicle stretched between the arytenoids.

The oblique bundle stretched from the muscular process of the arytenoid on one side to the summit of the contralateral arytenoid.

5- the crico-thyroid muscles :

Origin: the anterolateral face of the cricoid arch on each side.

Insertion: it ends on the inferior border of the thyroid cartilage.

The dilator muscle of the larynx:

1- The posterior crico-arytenoid muscle:

Origin: it inserts on the lateral fossa of the cricoid notch.

Insertion: it ends on the muscular process of the arytenoid cartilage.

4- Inner configuration

The wall of the larynx is lined with a thin mucosa. Internally the larynx has three levels, identified relative to the glottis: the cavity where the vocal cords are inserted.

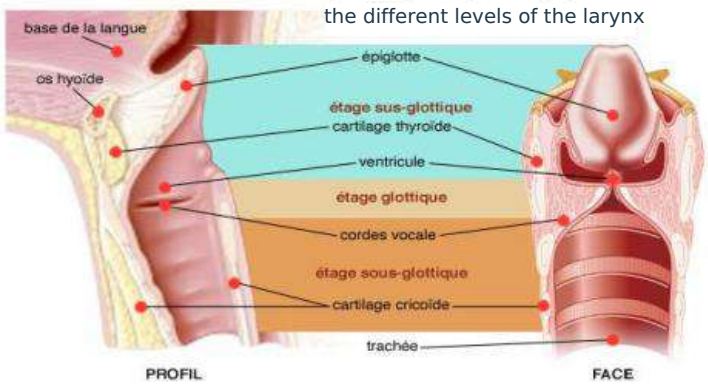
- The upper or supraglottic level is at the level of the epiglottis and its cavity is called the vestibule of the larynx.

-The middle or ventricular or glottic level, on each side on its middle part, two superimposed folds directed from front to back: these are the ventricular bands and the vocal cords.

-The ventricular bands: They are formed by the superior thyro-arytenoid ligament stretched from the inward angle of the thyroid cartilage to the arytenoid cartilage.

-The vocal cord goes from the same inward angle to the vocal process of the arytenoid cartilage; its thickness contains the inferior thyro-arytenoid ligament and the inferior thyro-arytenoid muscle. The space between the two vocal cords is the glottic cleft. Between the ventricular bands and the vocal cords, a lateral diverticulum is formed: the laryngeal ventricle.

-The lower level is the subglottic part, bounded above by the glottic cleft and continuing downward into the trachea.



III- Vascularization of the larynx and innervation of the larynx:

1- Arterial vascularization:

The blood supply to the larynx is provided by three arteries on each side:

-the superior laryngeal artery, a branch of the superior thyroid artery for the muscles of the larynx and the mucosa of the upper level of the larynx.

- the inferior laryngeal artery, a branch of the superior thyroid artery, gives branches to the lower level of the larynx.

-the posterior laryngeal artery, a branch of the inferior thyroid artery, for the mucosa of the posterior surface of the larynx.

2- Venous vascularization:

The superior laryngeal vein and the inferior laryngeal vein drain into the internal jugular vein, via the superior thyroid vein and the thyro-lingo-facial trunk. The posterior laryngeal veins drain into the inferior thyroid vein.

3-Lymphatics of the larynx: It originates from 2 networks: supraglottic and infraglottic. They drain into the nodes of the internal jugular chain. 4-Innervation of the larynx: Supplied by branches of the vagus nerve. The superior laryngeal nerve: innervates the epiglottis, the mucous membranes of the ventricle and the infraglottic cavity, and the cricothyroid muscle.

The recurrent laryngeal nerve innervates all the muscles of the larynx, except the cricothyroid.