

CLINICAL AND MORPHOLOGICAL CHARACTERISTICS OF THE LARYNGEAL CREST

Iroda Ilkhamovna Abdusamatova,

Assistant Teacher, Department of Anatomy, Tashkent State Dental Institute, Uzbekistan

Javokhir Ulugbek-ogli Erkinov, Saidullo Saidaziz-ogli Saidakmalov, Davlat Zakirovich Khodjimamatov

1st year Bachelor's degree students, Faculty of Dentistry, Tashkent State Dental Institute, Uzbekistan

Abstract. The laryngeal crest (prominentia laryngea) is a significant anatomical formation that plays an important role in the physiology of voice production and respiration. This article discusses the clinical and morphological features of the laryngeal crest, its structure and functions. A review of literature data was carried out, as well as an analysis of the results of our own morphological studies, including microscopic and macroscopic examination of tissues. Various pathological conditions associated with changes in the laryngeal ridge region, their clinical manifestations and possible approaches to diagnosis and treatment are described. The presented data may be useful for otolaryngologists, surgeons and other specialists involved in the treatment of diseases of the larynx.

Keywords: laryngeal crest, clinical and morphological features, physiology of voice production, microscopic and macroscopic examination.

Introduction

The pharynx is a hollow organ that connects the upper digestive tract and the respiratory tract. Starting from the base of the skull, at the level of the lower edge of the cricoid cartilage, the pharynx passes into the esophagus, reaching 12-14 cm in length. The width of the pharynx ranges on average from 3.5 cm at the level of its upper parts to 1.5 cm in the area of its transition to the esophagus (this place is the narrowest part of the entire digestive tract, excluding the appendix) [8].

The walls of the pharynx consist of 4 layers:

The mucous membrane in the upper part of the pharynx (nasopharynx), being a continuation of the mucous membrane of the nasal cavity, is covered with multi-row (pseudostratified) ciliated epithelium of the respiratory type and contains many glands. As in the nasal cavity, there is no submucosal layer in the nasopharynx. The mucous membrane of the middle and lower parts of the pharynx is lined with multilayered squamous non-keratinizing epithelium with a poorly differentiated basement membrane [7].

The fibrous membrane (pharyngeal aponeurosis, pharyngobasilar fascia) lies immediately under the mucous membrane, and the pharyngeal muscle is adjacent to it on the outside.

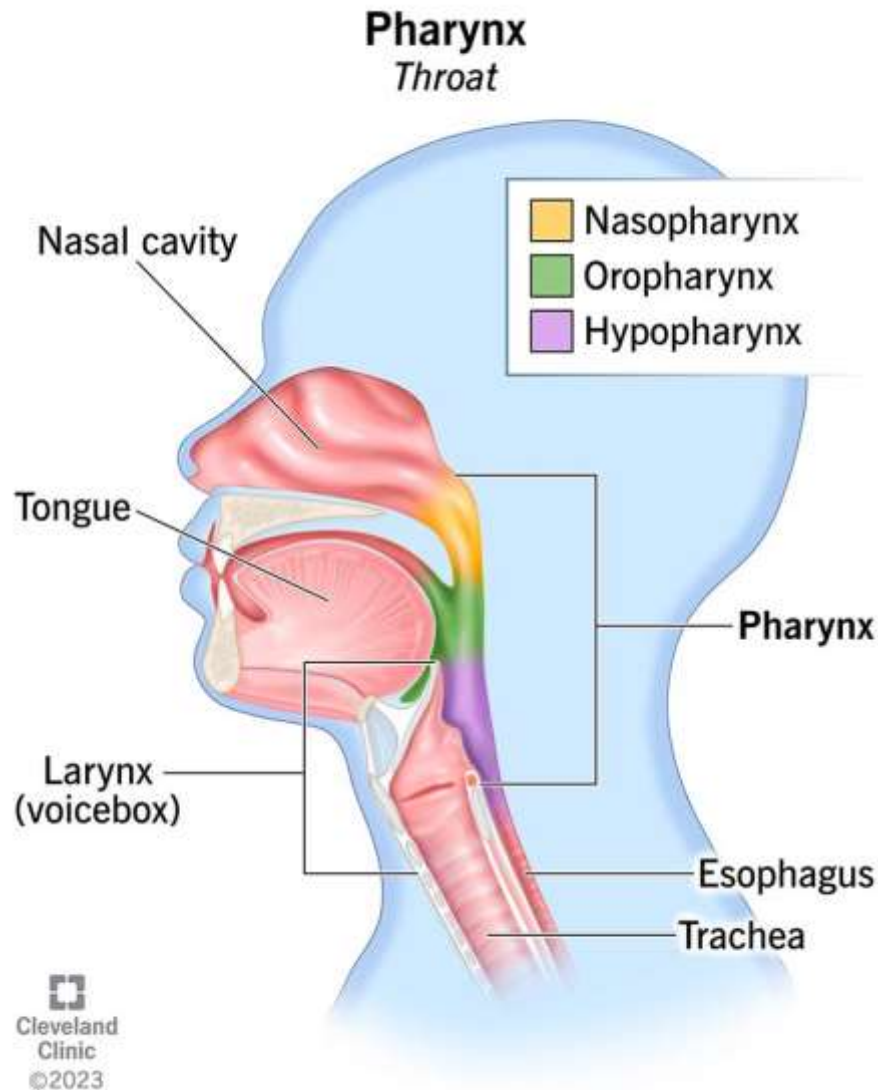


Fig.1. Pharynx: Function & Anatomy [2]

The muscular layer lies under the fibrous layer and, in turn, is divided into 2 layers:

a) the inner layer, represented by vertically directed muscles that lift the pharynx. These include the stylopharyngeus (m. Stylopharyngeus), tubopharyngeal (m. Salpingopharyngeus) and palatopharyngeal (m. Palatopharyngeus) muscles. When these muscles contract, the pharynx rises upward, helping to move the bolus of food downward. Acting together with the muscles that compress the pharynx, they provide peristaltic movements [8].

b) the outer layer is represented by three muscles that compress the pharynx - the upper, middle and lower pharyngeal constrictors. The superior constrictor begins in front of the sphenoid bone and the lower jaw, its bundles go back to the midline of the posterior pharyngeal wall, forming the upper part of the median pharyngeal suture. Some of the bundles of the superior constrictor also begin from the cartilaginous part of the auditory tube, thus participating in its function. This muscle partially covers the middle constrictor of the pharynx, starting from the horns of the hyoid bone and stylohyoid ligament and also ending at the pharyngeal suture, where the fibers on both sides meet. In turn, the middle pharyngeal constrictor partially covers the inferior constrictor (so these three muscles are arranged like a tile). The latter originates from the outer surface of the cricoid cartilage, the lower horn and the posterior edge of the thyroid cartilage and, like the two upper pharyngeal constrictors, forms the pharyngeal suture with its posterior attachment. The inferior pharyngeal

constrictor consists of two parts: the thyropharyngeal, with an oblique arrangement of muscle bundles, and the cricopharyngeal, in which the bundles are located horizontally. Between these two parts there is the so-called “Killian’s dehiscence”, where hernias can occur, including as a complication of esophagoscopy [3].

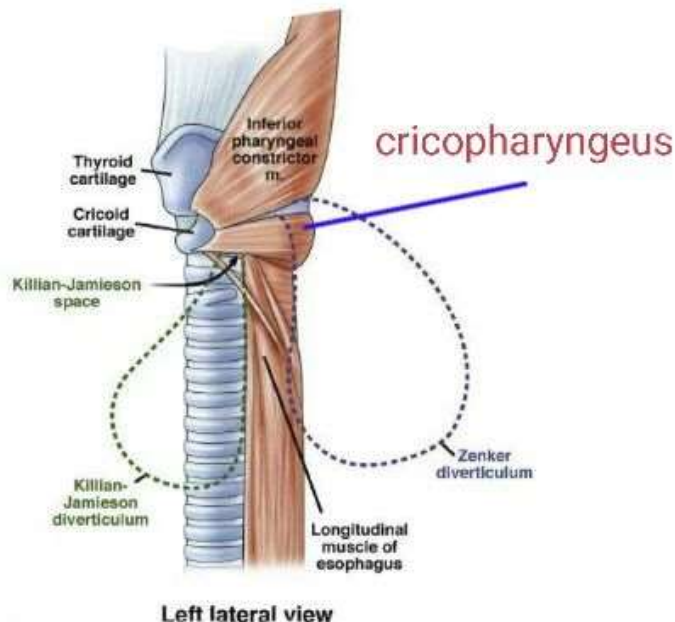
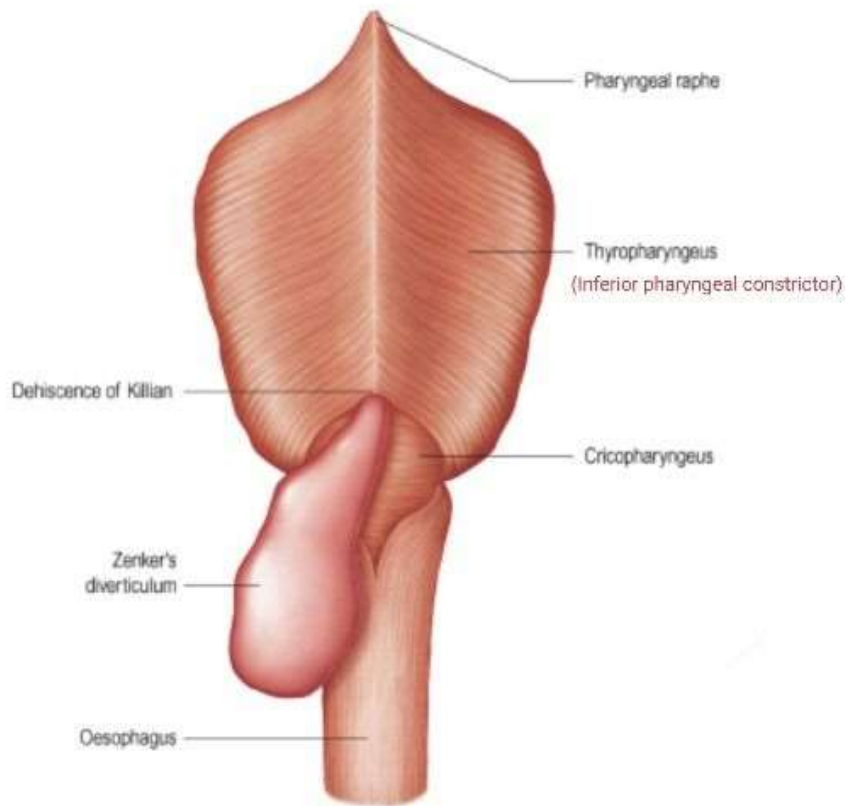


Fig.2. “Killian’s dehiscence”

External fascia (Fascia buccopharyngea) covers the outer surface of the muscularis propria. Above the upper edge of the superior pharyngeal constrictor, it connects with the fibrous membrane of the pharynx (pharyngobasilar fascia).

There are three sections in the pharynx: the upper one is the nasopharynx, the middle one is the oropharynx, and the lower one is the laryngopharynx.

Materials, Review and Discussion

The nasopharynx performs the respiratory function; it communicates with the nasal cavity, middle ear and oropharynx. The walls of the nasopharynx, unlike the underlying sections, are motionless and do not collapse. From above, the nasopharynx is fixed to the base of the skull, from below it passes into the oropharynx (the border is considered to be a plane drawn through the hard palate). In front, the nasopharynx is connected to the nasal cavity through the choanae. On the lateral walls, at a distance of 1.25 cm from the posterior ends of the lower conchae, there are the pharyngeal openings of the auditory tubes. Above and behind they are limited by tubal ridges formed by the protruding cartilaginous walls of the auditory tubes. From the posterior edge of each roller there is a tubopharyngeal fold (plica salpingopharyngeus) downwards, containing the muscle of the same name. Behind the mouth of the auditory tube and the tubal ridge on each side there is a pharyngeal pouch, or Rosenmüller's fossa, which usually contains lymphoid tissue (tubal tonsils). In the area of the dome of the nasopharynx, lymphoid tissue forms the pharyngeal tonsil, which is well developed only in childhood. The pharyngeal tonsil has the appearance of a convex quadrangle and consists of 4-6 lobules located sagittally [4]. During the active growth of lymphoid tissue, the pharyngeal tonsil can significantly increase, partially or completely covering the choanae and the mouths of the auditory tubes. With age, the pharyngeal tonsil undergoes involution, and it usually occurs in adults. absent.

The middle section of the pharynx - the oropharynx - is involved in the passage of both air and food. From above it communicates with the nasopharynx, and during swallowing it is separated from it by the velum palatine. In front, the oropharynx communicates with the oral cavity through the pharynx. The pharynx is limited: from above - by the edge of the soft palate, from the sides - by the anterior and posterior palatine arches, from below - by the root of the tongue. At the back, the oropharynx borders with the third cervical vertebra, and below it passes into the laryngopharynx. At the border of the laryngopharynx and oropharynx, the respiratory and digestive tracts intersect. The functioning of this intersection is ensured by a valve mechanism in which the soft palate and epiglottis participate, opening the way for either a food bolus or a stream of air. When swallowing, the soft palate rises and the epiglottis descends, the respiratory tract is isolated from the digestive tract, preventing food from entering the upper and lower respiratory tract [5].

In the middle part of the soft palate there is an extension called the uvula. From the sides, the soft palate splits and passes into the anterior and posterior palatine arches, which contain muscles. In the posterior arches there are the velopharyngeal muscles (m. Palatopharyngeus), in the anterior ones - the palatoglossus (m. Palatoglossus). When these muscles contract, the opposite arches move closer together, acting as a sphincter at the moment of swallowing. From above, two muscles are also woven into the soft palate - the muscle that lifts the soft palate (m.levator veli palatini) and the muscle that tenses the soft palate (m.tensor veli palatini) [6]. When the muscle that lifts the soft palate contracts, the latter rises and is pressed against the posterior wall, and thus the oropharynx is isolated from the nasopharynx. The muscle that strains the soft palate tightens it and stretches it to the sides. In addition, both muscles participate in the peristalsis of the auditory tube: the muscle that lifts the soft palate expands its lumen, and the muscle that tenses the soft palate narrows it, but at the same time the mouth of the tube expands.

Between the palatine arches there are the palatine tonsils (the first and second tonsils of the

Pirogov-Waldeyer's lymphoid ring).

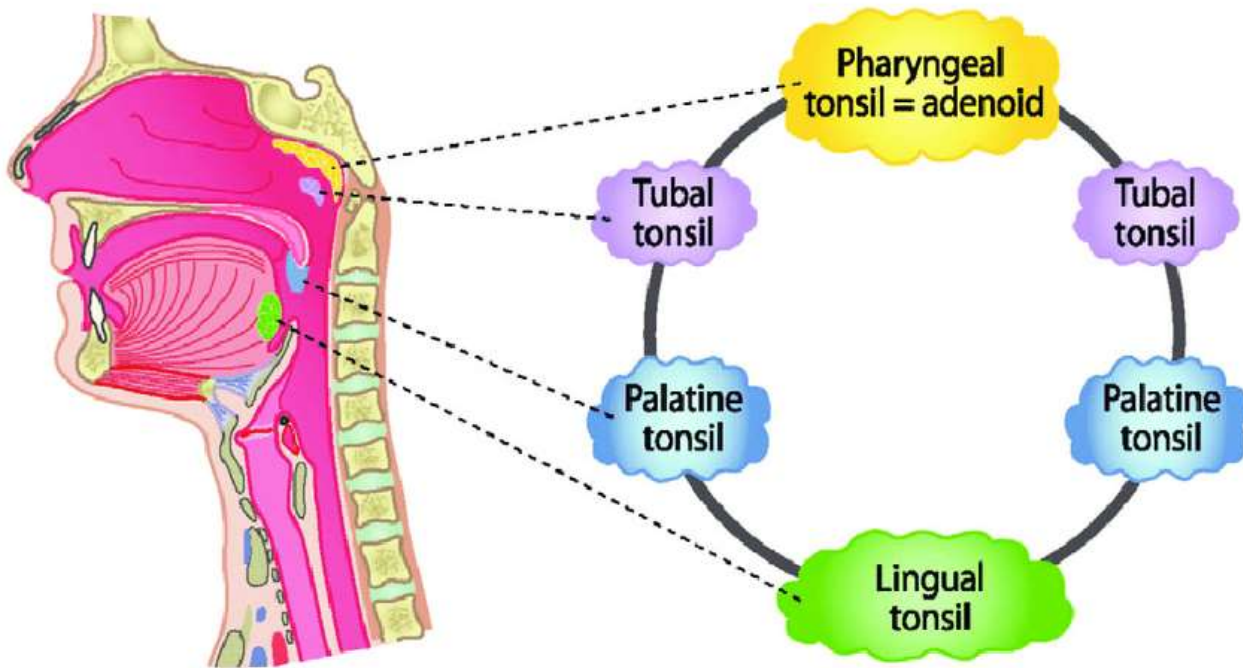


Fig.3. Waldeyer's ring [1]

The Pirogov-Waldeyer's lymphoid ring includes the following tonsils:

- Palatine tonsils (No. 1, 2) For more detailed anatomical and clinical features, see below.
- Pharyngeal tonsil (unpaired, No. 3), located in the area of the dome of the nasopharynx and was discussed in the corresponding section.
- The lingual tonsil (unpaired, No. 4) is located at the root of the tongue and can communicate with the lower poles of the palatine tonsils. In the lingual tonsil, compared to the palatine tonsil, the network of blood vessels is more developed; significantly more ducts of the mucous glands open into the bottom of small and underdeveloped crypts.
- Tubal tonsils (No. 5, 6) are located in the nasopharynx, behind the mouths of the auditory tubes (in the so-called "Rosenmüller fossae"). They contain mainly lymphoid tissue; follicles are rare. Hypertrophy of the tubal tonsils can lead to disruption of the ventilation function of the auditory tube [8].

Accumulations of lymphoid tissue that do not form tonsils, but also have functional and clinical significance:

- Granules of lymphoid tissue on the posterior wall of the pharynx;
- Accumulations of lymphoid tissue behind the posterior palatine arches - lateral ridges of the pharynx. With hypertrophy and inflammation of the granules or lateral ridges, hypertrophic pharyngitis (granular or lateral) occurs;
- Lymphoid tissue at the entrance to the larynx and in the pyriform sinuses of the pharynx.

The laryngopharynx is the lower part of the pharynx, narrows funnel-shaped downwards and passes into the esophagus. The border between the oropharynx and laryngopharynx is the upper edge of the epiglottis and the root of the tongue. Behind the laryngopharynx are the cervical vertebrae C4-C5, in front is the larynx, so that its posterior wall is the anterior wall of the laryngopharynx. The hypopharynx opens the entrance to the larynx. On the sides of the entrance to the larynx, between it and the side walls of the pharynx, there are depressions that taper cone-shaped downwards - pear-shaped pockets (sinuses), along which the food bolus moves to the

entrance to the esophagus [8].

Blood supply to the pharynx.

The blood supply to the upper and middle pharynx is carried out mainly by the ascending pharyngeal artery (a.pharyngea ascendens), which is a branch of the external carotid artery. In addition, branches from the maxillary, facial and lingual arteries take part in the blood supply. The blood supply to the lower part of the pharynx is carried out by branches directly from the external carotid artery and the superior thyroid artery.

Venous blood collects in venous plexuses, one of which is located in the soft palate, the other on the outer surface of the posterior and lateral walls of the pharynx. From the venous plexuses, blood collects in the pharyngeal veins, which descend along the ascending pharyngeal artery and flow through several trunks into the internal jugular vein.

Innervation of the pharynx.

The pharynx is innervated by the branches of the trigeminal, glossopharyngeal, vagus and accessory nerves, as well as the laryngopharyngeal branches of the superior cervical ganglion of the sympathetic trunk.

Conclusion

The laryngeal crest, or prominentia laryngea, is a critical anatomical structure with significant implications for phonation and respiration. Through a comprehensive review of the literature and detailed morphological studies, both microscopic and macroscopic, this paper has highlighted the intricate structure and essential functions of the laryngeal crest. Various pathological conditions associated with changes in the laryngeal crest have been identified, along with their clinical manifestations and potential diagnostic and therapeutic approaches. The insights gained from this study are valuable for otolaryngologists, surgeons, and other healthcare professionals involved in the management of laryngeal disorders, offering a deeper understanding of the clinical and morphological characteristics of the laryngeal crest. This knowledge enhances the ability to diagnose, treat, and manage conditions affecting this vital region of the larynx.

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