

# Patterns in the Larynx

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## Abstract

When we study the anatomy of the larynx, a pattern is seen emerging. The number 3, its multiples and, fractions of 3 like  $1/3$  and  $2/3$  come throughout the description. The larynx is made up of three structures, namely, cartilages, muscles, membranes and ligaments. The cartilages are nine in number. The muscles are divided into nine groups. The membranes and ligaments are also grouped into nine. Inside the larynx there are three levels. There are three folds outside the larynx and three pairs of folds inside it. The nerve supply comprises three nerves. There are three pairs of joints in the larynx.

**Key words:** Larynx, ligaments, muscles, pattern, 3 and its multiples

## INTRODUCTION

Larynx is an important organ for anatomists, head-and-neck surgeons, anesthesiologists, and medical students to study. We should be thorough about the anatomy of this organ to be an expert in giving local anesthetic blocks, diagnosing the type of vocal cord paralysis after neck and cervical spinal surgeries, and to do emergency tracheostomies. I am presenting an easy way to study and remember the anatomy of the larynx.

## DESCRIPTION

In adults, the larynx lies in front of three cervical vertebrae, namely, four to six. It is made of the following three structures: (1) cartilages, (2) muscles, (3) membranes and ligaments. Membranes and ligaments are included as one group because ligaments are formed from the membranes and in fact, the ligaments are thickened membranes.

### Cartilages [Figure 1a]

There are nine cartilages of which three are paired and three unpaired. The unpaired cartilages are epiglottis, thyroid, and cricoid. These are seen in the midline. The paired cartilages are arytenoids, corniculate, and cuneiform.

The thyroid cartilage has two laminae that are fused in the midline. The two laminae are placed at an angle of  $120^\circ$  in females and at  $90^\circ$  in males. ( $120$  and  $90$  are multiple of  $3$ ) In the midline, the fusion is only seen in the lower  $2/3$ , as the upper  $1/3$  is incomplete and forms the superior thyroid notch.

### Muscles [Figure 1b]

There are nine muscle groups as follows:

1. Cricothyroids
2. Posterior cricoarytenoids
3. Oblique arytenoids
4. Transverse arytenoids
5. Aryepiglotticus
6. Lateral cricoarytenoids
7. Vocalis
8. Thyroepiglotticus
9. Thyroarytenoids.

These muscles can be classified into the following six groups according to their functions:<sup>[1]</sup>

- 1) Muscles that open the glottis, e.g., posterior cricoarytenoids; 2) muscles that close the glottis, e.g., lateral cricoarytenoids, transverse arytenoids, and cricothyroid; 3) muscles that tense the vocal cords, e.g., cricothyroid; 4) muscles that relax the vocal cords, e.g., thyroarytenoids and vocalis; 5) muscles that close the inlet of the larynx, e.g., oblique arytenoids and aryepiglotticus; 6) muscles that open the inlet of the larynx, e.g., thyroepiglotticus.

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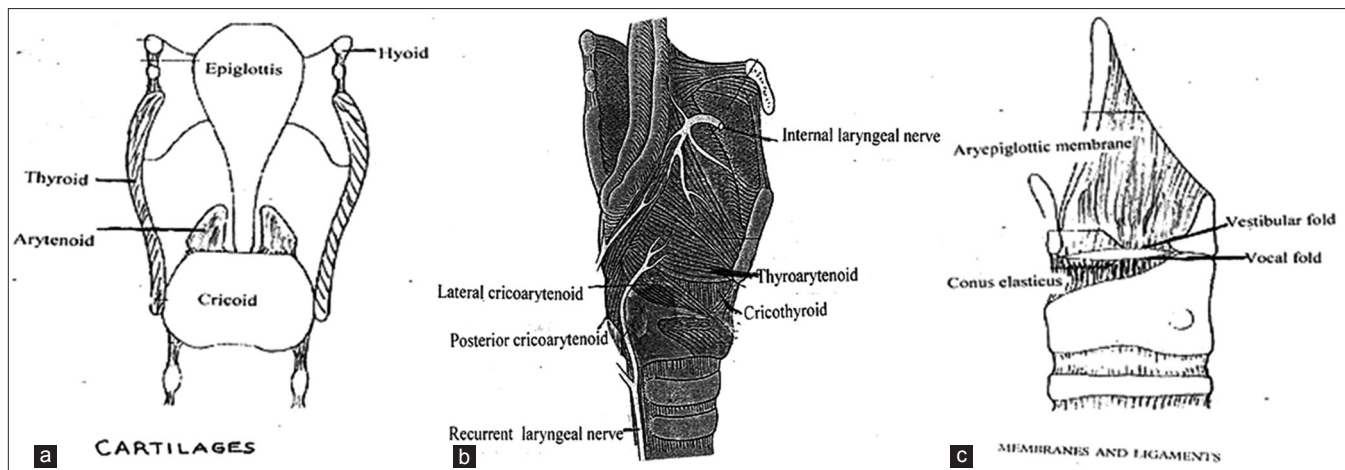
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**Figure 1:** (a) Cartilages, (b) muscles, (c) nerves and ligaments of larynx

### Ligaments and membranes [Figure 1c]

Ligaments are nine in number, three external and six internal. The external ligaments connect the larynx to outside structures. There are thyrohyoid membranes and ligaments that connect the thyroid cartilage to the hyoid bone. The median and lateral parts of the membrane are thickened to form one median and two lateral thyrohyoid ligaments. This membrane is pierced by the internal laryngeal nerves.

The hyoepiglottic ligament connects the anterior surface of the epiglottis to the upper surface of the hyoid bone. The cricotracheal ligament connects the cricoid cartilage to the upper end of the trachea.

### Intrinsic ligaments

Intrinsic ligaments are parts of broad sheet of fibroelastic tissue known as fibroelastic membrane of the larynx. It is intercepted on each side by the sinus of the larynx. The part above the sinus is called quadrat membrane. The upper free margin forms the aryepiglottic fold. The lower margin forms the vestibular fold.

The part below the sinus is called conus elasticus. The anterior part is thick and it forms the cricothyroid ligament. The upper free border forms the vocal ligaments.

### Nerve supply [Figure 1b]

The nerve supply comprises the following three nerves: internal branch of superior laryngeal nerve, external branch of superior laryngeal nerve, and recurrent laryngeal nerve; all these are branches of the vagus.

The internal branch of the superior laryngeal nerve consists of mainly sensory fibers and supplies from above till the vocal cords. The external branch supplies the cricothyroid muscle. The recurrent laryngeal nerve supplies, all the intrinsic muscles except the cricothyroid, and the sensory supply are below the vocal cords.

### Levels of the larynx

There are three levels of the larynx, namely, the supraglottic

space that extends from the laryngeal inlet to the vestibular folds, transglottic space that extends from the vestibular folds to the vocal folds, and subglottic space that extends from the vocal folds to the inferior border of the cricoid cartilage.

### External folds

There are three folds outside the larynx of which one is a median glosso epiglottic fold and the rest of the two are lateral glosso epiglottic folds, which connects the epiglottis to the tongue.

### Internal folds

There are three pairs of internal folds, namely, vocal folds, vestibular folds, and aryepiglottic folds.

### Vocal cords

Anterior 2/3 is membranous and posterior 1/3 is cartilaginous. Vocal cord in the coronal section is three-sided, i.e., wedge shaped.<sup>[2]</sup> Each vocal fold consists of three structures, namely, conus elasticus, vocal ligament, and muscle fibers. The three muscles are thyroarytenoids, vocalis, and thyroepiglotticus.

### Joints

There are three pairs of joints in the larynx, namely, cricothyroid joints, cricoarytenoid joints, and arytenocorniculate joints.<sup>[3]</sup>

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