LARYNX ANATOMY

ANATOMY OF THE LARYNX

MID-SAGITTAL VIEW

LARYNGOSCOPIC VIEW

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R1 ORL HUSE
INTRODUCTION

- Odd and median organ
- Infrahyoid region
- Phonation, swallowing and breathing

- Triangular pyramid
- Postero- superior base → pharynx and hyoid bone
- Bottom point → upper orifice of the trachea
INTRODUCTION

- C4-C6
- Tongue – trachea
- In women it is somewhat higher than in men.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
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<tbody>
<tr>
<td>Length</td>
<td>44mm</td>
<td>36mm</td>
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<tr>
<td>Transverse diameter</td>
<td>43mm</td>
<td>41mm</td>
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<tr>
<td>Anteroposterior diameter</td>
<td>36mm</td>
<td>26mm</td>
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SKELETAL STRUCTURE

- Framework: 11 cartilages linked by joints and fibroelastic structures
- 3 odd-and median cartilages: the thyroid, cricoid and epiglottis cartilages.
- 4 pair cartilages: corniculate cartilages of Santorini, the cuneiform cartilages of Wrisberg, the posterior sesamoid cartilages and arytenoid cartilages.
- Intrinsic and extrinsic muscles
THYROID CARTILAGE

- Shield shaped cartilage
- Right and left vertical *lamina* → laryngeal prominence (Adam’s apple)
- M: 90° F: 120°
- Children: intrathyroid cartilage
- **Outer surface** ➔ oblique line
- **Inner surface**
- **Superior border** ➔ superior thyroid notch
- **Inferior border** ➔ inferior thyroid notch
- **Superior horns** ➔ lateral thyrohyoid ligaments
- **Inferior horns** ➔ cricothyroid articulation
The oblique line gives attachment to the following muscles:
- Thyrohyoid muscle
- Sternothyroid muscle
- Inferior constrictor muscle

Ligaments attached to the thyroid cartilage:
- Thyroepiglottic lig
- Vestibular lig
- Vocal lig
CRICOID CARTILAGE

- Complete signet ring
- **Anterior arch and posterior lamina**
- Ridge and depressions

- Cricothyroid articulation
- Cricothyroid membrane
- Cricotracheal ligament
- Cricoarytenoid articulation
- Ridge → longitudinal muscle of the esophagus.
EPIGLOTTIC CARTILAGE

- Racket shaped cartilage
- Anterior wall of the laryngeal aditus
- Covered by mucous membrane.
- Hyoepiglottic ligament
- Thyroepiglottic ligament
- Aryepiglottic folds
- Laryngeal surface
- Lingual surface
- Preepligottic space → carcinoma
- Newborns: omega shaped
EPIGLOTTIC CARTILAGE

A. Laryngeal inlet
B. Aryepiglottic fold
C. Cut edge of mucosa
D. Laryngeal ventricle
E. Cuneiform tubercle
F. Corniculate tubercle
G. Interarytenoid depression
H. Epiglottis
I. Laryngeal saccule
J. Middle part of cavity
K. Vestibular fold (mucosa overlying vestibular ligament)
L. Vocal fold (mucosa overlying vocal ligament)
M. Cricoid arch
N. Trachea
O. Rima vestibuli
P. Rima glottidis
ARYTENOID CARTILAGES

- On the upper surface of the cricoid cartilage
- Vocal process → vocal folds
- Vestibular ligaments
- Muscular process → posterior and lateral cricoarytenoid muscles
- Posterior surface → transverse arytenoid muscle
- Apex → corniculate cartilages (Santorini)
- Base → cricoarytenoid joint
OTHER CARTILAGES

- Corniculate cartilages (of Santorini) articulating with the apices of arytenoid cartilages.
- Cuneiform cartilages (of Wrisberg) in each margin of the aryepiglottic fold.
ELASTIC TISSUE

INTRINSIC LIGAMENTS
(connect the laryngeal cartilages)

**Quadrangular membrane** (upper part)
From the sides of the epiglottic cartilage to the corniculate and arytenoid cartilages.

- Aryepiglottic folds
- Vestibular ligaments and vestibular folds

**Ventricular segment of fibroelastic tissue**

**Conus elasticus** (lower part)
- Cricothyroid ligament (anteriorly)
- Vocal ligaments
ELASTIC TISSUE

EXTRINSIC LIGAMENTS
(connect the laryngeal cartilages to the hyoid bone above and trachea below)

- **Thyrohyoid membrane**
  - Median thyrohyoid ligament
  - Lateral thyrohyoid ligaments
  - Pierced by the superior laryngeal artery and nerve (i.b.)
  - Mobility of the hyoid bone and larynx during swallowing and fonation.

- **Cricotracheal membrane**
  - Cricoid cartilage and the first tracheal ring

- **Cricothyroid membrane**
  - Middle cricothyroid ligament
  - External branch of the superior laryngeal nerve and the middle laryngeal artery perforate it.
LIGAMENTS OF THE EPIGLOTTIS

- Middle and lateral glosso epiglottic ligaments
- Pharyngoepiglottic ligaments
- Thyroepiglottic ligament
- Hyoepiglottic membrane, muscle and ligament
- Aryepiglottic ligaments
JOINTS OF THE LARYNX

**Cricothyroid joint**
Allows to tilt forward or behind the thyroid cartilage changing the tension of the vocal chords.

**Cricoarytenoid joint**
Allows fronto-translational movements to get away or close the arytenoid cartilages. Separate or approximate the vocal chords.
INTERNAL ANATOMY

LARYNGEAL ADITUS
- Epiglottis (ant)
- Aryepiglottic folds (laterally)
- Corniculate cartilages and arytenoideus muscle (post)

- Glossoepiglottic folds and valleculae
- Piriform recesses

LARYNX
- Vestibule
- Ventricle
- Subglottic cavity
- Vestibular folds
- Vocal folds
**INTERNAL ANATOMY**

- **Vestibule**
  - Aditus → vestibular folds

- **Vestibular folds**
  - Mucous membrane + connective tissue (vestibular ligament)
  - Thyroid cartilage → arytenoid cartilage

- **Ventricle of the larynx**
  - Recess between the vestibular and the vocal folds.
  - Laryngeal saccule (ant): contains mucous glands to lubricate the vocal folds.
  - Thyroarytenoid muscle
- **Glottis:** vocal folds + space between them
  - The narrowest portion of the larynx
  - Anterior 3/5 → vocal chords → intermembranous portion
  - Posterior 2/5 → vocal process → intercartilaginous portion
STRUCTURE OF ADULT VOCAL FOLD

- **The Cover**
  - Epithelium (mucosa)
  - Basal lamina
  - Superficial layer of lamina propria

- **The transition**
  - Intermediate layer of lamina propria
  - Deep layer of lamina propria

- **The body**
  - Vocalis muscle (thyroarytenoid muscle)
STRUCTURE OF ADULT VOCAL FOLD

**COVER**

- **Epithelium**
  - Anterior glottis → stratified squamous
  - Posterior glottis → pseudostratified ciliated

- **Basal lamina → physical support**
  - Lamina lucida
  - Lamina densa

- **Superficial layer of lamina propria**
  - Reinke’s space (potential space) → Reinke’s edema
  - Fibrous components + extracellular matrix
STRUCTURE OF ADULT VOCAL FOLD

TRANSITION

- Intermediate layer of the lamina propria
  - Elastic fibers
- Deep layer of the lamina propria
  - Collagenous fibers

BODY

- The vocalis muscle
MUSCULATURE

EXTRINSIC MUSCLES

GROUP 1:
- **INFRAHYOID**: omohyoid, sternohyoid, sternothyroid and thyrohyoid muscles
- Depressors (exception thyrohyoid)

GROUP 2: (suprahyoid)
- Stylohyoid, digastric and mylohyoid muscles
- Elevate the larynx

GROUP 3:
- Stilofaryngeal and palatofaryngeal muscles
- Elevate the larynx and the pharynx

GROUP 4:
- Middle and inferior constrictor muscles of the pharynx
MUSCULATURE

INTRINSIC MUSCLES

- Shape and size of the aditus and glottis
- Cricothyroid → lateral and outer aspect of the larynx
- Posterior and lateral cricoarytenoid
- Transverse and oblique arytenoid
- Lateral and medial thyroarytenoid (vocalis muscle)
Cricothyroid muscle

External surface of the arch of the cricoid cartilage

- Straight part
- Oblique part
- To lengthen, tense and adduction of the vocal chords
- Superior laringeal nerve
Posterior cricoarytenoid muscle

- Origin: posterior surface of the cricoid lamina
- Insertion: muscular process of the arytenoid cartilage
- Midline crest - Cricoesophageal tendon
- Function: the only ABDUCTOR of the vocal chords
Lateral cricoarytenoid muscle

✓ Origin: upper border and outer surface of the cricoid arch
✓ Insertion: anterior surface of the muscular process of the arytenoid cartilage
✓ Antagonist of the posterior cricoarytenoid → adduction vocal chords
Transverse arytenoid muscle

- Between the posterior surfaces of the two arytenoid cartilages
- It approximates the two arytenoid cartilages.

Oblique arytenoid muscle

- Origin: posterior surface of the transverse arytenoid muscle
- Insertion: the tip of the opposite arytenoid cartilage
- Adduction of the vocal chords.
(Lateral) Thyroarytenoid muscle

- Origin: inner surface of thyroid cartilage
- Insertion: lateral surface of arytenoid cartilage
- Thyroepiglottic muscle
- Function: to shorten the vocal ligaments.
- Adduction of vestibular folds

Vocalis muscle

- Origin: the same
- Insertion: vocal process of arytenoid cartilage
- Thicker, deeper and better developed.
- Function: adducts the vocal fold
Extrinsic muscles
Pull up (high tones) and pull down (low tones) the larynx

Intrinsic muscles

1. **Adduction of the chords**
   - Lateral cricoarytenoid / transverse arytenoyd / vocalis muscles (medial thyroarytenoid)

2. **Variation of the length and tenseness of the chords**
   - Cricothyroid and thyroarytenoid muscles → tone of the voice.

3. **Abduction of the chords**
   - Posterior cricoarytenoid
LARYNGEAL SPACES

- **Subglottic:**
  - Glottis
  - Lower border of the cricoid cartilage

- **Preepiglottic**
  - Ant.: thyroid cartilage and thyrohyoid m.
  - Above: hyoepiglottic lig. and vallecula
  - Posteriorly: epiglottis

The epiglottic tumors can extend in this region.

- **Paraglottic**
  - Anterolat: thyroid cartilage
  - Medially: laryngeal ventricle, quadrangular m. and conus elasticus
BLOOD SUPPLY

- **Superior laryngeal artery**
  - Arises from the sup. thyroid aa
  - Internal branch of the superior laryngeal nerve
  - Runs horizontally across the thyrohyoid membrane.

- **Inferior laryngeal artery**
  - Inf. thyroid artery
  - Killian-Jamieson area (cricothyroid art)
  - Inf border of inf. Constrictor m.

- **Cricothyroid artery**
  - Sup. thyroid artery
  - Cricothyroid membrane
Veins

- Superior laryngeal vein
  - Sup. thyroid vein
  - Internal jugular vein

- Inferior laryngeal vein
  - Inferior thyroid vein
  - Brachiocefalic vein
Lymphatics

Superior group
- Prelaryngeal nodes
- Upper portion of deep cervical chain

Vocal folds

Inferior group
- Pre and paratracheal nodes
- Laryngeal nodes
- Lower deep cervical nodes
- Supraclavicular nodes
SUPERIOR LARYNGEAL NERVE

- Inferior ganglion of X nerve
- **External branch** - Ends in the cricothyroid muscle
Internal branch

- Thyrohyoid membrane/ superior laryngeal artery

Sensitive

- Root of tongue
- Epiglottis and valleculae
- Piriform recess
- Vestible, vestibular folds, ventricl
- Posterior wall of larynx
- Anterior wall of pharynx
- Mucosa of hipopharynx

Sympathetic/parasympathetic fibres
**NERVES**

**INFERIOR LARYNGEAL (RECURRENT) NERVE**

- The most important MOTOR nerve
- Longer on the left side
- Related to the inferior thyroid aa and the thyroid gland

- The left nerve originates in the chest and surrounds the aortic arc. It penetrates into the larynx behind the cricothyroid articulation.
- The right nerve originates in the base of the neck, anteriorly to the subclavian aa. It penetrates into the larynx behind the cricoarytenoid articulation.
- Anterior branch (adductor)
  - Lateral cricoarytenoid m.
  - Thyroaritenoid m.
  - Vocalis and aryepiglottic m.

- Posterior branch (abductor)
  - Posterior cricoarytenoid m. (abductor)
  - Arytenoid m. (adductors)

- Anastomotic branch
  - With a branch from the superior laryng
  - Interarytenoid m.
  - Posterior cricoarytenoid m.
  - Pressure of subglottic airflow
  - Reflex of the cough
BIBLIOGRAPHY