Larynx (voice box)

Curricular Objectives
By the end of this session students are expected to:

Theory
1. Define the larynx and acknowledge its main functions and clinical importance
2. Classify the structures of the respiratory system into upper and lower tracts
3. Outline the surface landmarks of the larynx
4. List the structures forming the framework of the larynx
5. Describe the cartilages of larynx, their shapes, landmarks, locations, and articulations
6. Discuss shapes, attachment, & specific features of membranes & ligaments of larynx
7. Review the extrinsic & intrinsic muscles of larynx and list their actions in general
8. Underline the attachment & action of cricothyroid & posterior cricoarytenoid muscles
9. Appraise the clinical importance of the above two muscles
10. Outline the divisions of laryngeal cavity and sensory & blood supply of the larynx
11. Summarize the motor nerve supply of the intrinsic muscles of larynx
12. Recall the relation of the laryngeal nerves to the thyroid gland and its blood supply
13. Uncover the consequences of injury to the laryngeal nerves
14. Describe the mucous membrane of laryngeal cavity & how it is different on vocal cords
15. Define cricothyroidotomy and list the layers traversed during the procedure
16. Summarize the changes of the larynx during swallowing
17. Acknowledge the role of the larynx during coughing, sneezing and abdominal straining

Practical
1. Locate the larynx, and review its surface landmarks and the structures covering it
2. Identify the cartilages of larynx, their prominent features and the joints in between
3. Name and identify the membranes and ligaments connecting the cartilages together
4. Identify the laryngeal inlet and the structures forming it
5. Label the glottis and the three regions of the cavity of larynx
6. Locate the cricothyroid & posterior cricoarytenoid muscles
7. List the actions of the above two muscles and name their nerve supply
8. Trace the structures piercing the Thyrohyoid membrane to their origin
9. Recall the course of the left and right recurrent laryngeal nerves
10. Define the extent of the laryngeal cavity and identify its landmarks
11. Recognize major landmarks and regions visible through laryngoscope
12. Discriminate the vocal cords, and other structures visible in a laryngoscopic image
13. Follow the pathway of the food from the oral cavity to the esophagus
14. Palpate the cricothyroid membrane and recall its superficial relations

Selected references and suggested resources
- Clinical Anatomy by Regions, Richard S. Snell, 9th edition
- Grant’s Atlas of Anatomy, 13th Edition
- Anatomy for Babylon medical students (facebook page)
- Anatomy for Babylon medical students (youtube channel)
- Human Anatomy Education (facebook page)
- Human anatomy education (youtube channel)

Feedback and suggestions
- http://goo.gl/forms/SjyjGeUpvH
Session checklist

❖ Clinical highlights:
  ❖ Clinical problems related to Larynx include Laryngitis, Vocal cord paralysis, and Singer nodule
  ❖ Anatomy of larynx is of great value to master Endotracheal Intubation (lifesaving procedure)

❖ Suggested videos
  1. https://youtu.be/2hrcH240SgQ (Events of cough reflex)

❖ Key landmarks:
  ❖ Thyroid cartilage/ Cricoid cartilage/ Epiglottis

❖ Location and extent:
  • It is situated in the anterior midline of the upper part of the neck, opposite to C3-6 vertebrae

❖ NB: The respiratory system is divided into upper tract which includes nose, mouth, & pharynx, and a lower tract extending from the trachea to alveoli. Larynx is included in one or both tracts

❖ Functions:

❖ Framework of the larynx
  • Cartilages/ Ligaments/ Membranes/ Muscles

❖ Cartilages and joints
  • Three large unpaired cartilages and three small paired cartilages
  • They form the foundation to which the membranes, ligaments, and muscles attach
  • The Cricoid cartilage has the shape of a signet ring while Epiglottis is leaf-shaped
  • Laryngeal joints include paired cricothyroid, cricoarytenoid

❖ Membranes and Ligaments
  • The cartilages of the larynx are interconnected by a number of ligaments and membranes
  • The most important membranes are thyrohyoid, quadrangular, and cricothyroid

❖ Cavity of the Larynx
  • It extends from the inlet of the larynx to lower border of cricoid cartilage (onset of trachea)
  • It is divided into upper (the Vestibule), middle (the Sinus), and lower (infraglottic) parts

❖ Muscles of the larynx
  • Extrinsic Muscles:
      ✓ Attach the larynx to the surrounding structures, moving it up & down during swallowing
      ✓ Include muscles from suprahypoid and infrahypoid regions of the neck
  • Intrinsic Muscles
      ✓ Connect laryngeal cartilages to each other & move them to produce one of the followings:
          (a) Open or close the laryngeal inlet
          (b) Adduct and abduct the vocal cords
          (c) Increase or decrease the tension of the vocal cords
      ✓ Two of these muscles are of clinical value, Cricothyroid & Posterior cricoarytenoid

❖ Nerve and blood supply
  • Motor and sensory supply of the larynx is derived from branches of the vagus nerve
  • The superior & inferior thyroid arteries supply the supra & infraglottic regions respectively
Lab activity list
For each task below, identify the listed structures then answer the related questions

❖ Task 1 (location and extent):
✓ Upper border of thyroid cartilage
✓ Lower border of cricoid cartilage
✧ List the layers covering the larynx anteriorly?

❖ Task 2 (cartilages of the larynx):
✓ Thyroid: Laminae/ Oblique line/ Superior and inferior cornu
✧ The upper border of thyroid cartilage lies at the level of __________ vertebra
✓ Cricoid: Plate (lamina)/ Arch/ 2 paired facets for articulations
✧ Which part of thyroid cartilage articulates with the cricoid cartilage?
✓ Epiglottis: Stalk / Lamina/ Free border
✧ Describe the movements of the epiglottis
✓ Arytenoid: Vocal & Muscular processes
✧ Arytenoid cartilages are sitting on the shoulders of __________

❖ Task 3 (membranes of the larynx):
✓ Thyrohyoid membrane
✧ It extends between __________ and __________
✧ List the structures piercing it
✓ Quadrangular membrane/ Aryepiglottic folds/ Vestibular ligament
✧ Name the cartilages that provide attachment to this membrane?
✧ Describe the attachment of the Aryepiglottic folds
✧ The vestibular ligament extends between _________________and _________________
✓ Cricothyroid membrane (ligament)/ Vocal ligament
✧ It is attached inferiorly to ______________
✧ Its free upper margin extends between ____________ anteriorly and __________ Posteriorly

Note: The vocal cords represent the free margin of the cricothyroid ligament

❖ Task 4 (Inlet of the larynx)
✓ Upper border of epiglottis/ aryepiglottic folds/ inter-arytenoid membrane
✧ Name the pharyngeal part and spaces related to the inlet of the larynx

❖ Task 5 (Cavity of the Larynx)
✓ Vestibule (supraglottic) / Sinus (glottic)/ infraglottic
✧ The glottis is the gap between ______________

❖ Task 6 (Muscles of the larynx)
✓ Cricothyroid/ Posterior cricoarytenoid
✧ Outline the attachment and main action of these two muscles

❖ Task 7 (Nerves of the larynx)
✓ Superior laryngeal: external laryngeal/ internal laryngeal
✓ Recurrent laryngeal
✧ Which nerve supplies the cricothyroid muscle? Which nerve supplies other intrinsic muscles?
✧ List the nerves carrying sensation from the supraglottic and infraglottic regions
**Review questions:**
1. The lower border of cricoid cartilage lies at the level of _______ vertebra
2. List the muscles attached to the posterior border of each lamina of thyroid cartilage
3. Explain why the larynx moves with hyoid bone?
4. Differentiate between vocal cords & vestibular folds by color, location & movability
5. Why do you think the vocal cords have a different color from the rest of laryngeal mucosa?
6. Looking at the figure below respond to the followings
   a) Identify the numbered structures
   b) The structure numbered __________ is incised during emergency cricothyroidotomy
   c) Paralysis of the structure numbered __________ causes weakness of voice.
   d) Hoarseness of voice may result when the structure numbered __________ is injured

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Homework

1. What is cricothyroidotomy? List the layers traversed by the knife during procedure

2. A 35 years old woman patient presented with Stridor following total thyroidectomy. Which of the following is likely expected during trans-nasal endoscopy
   - A. Inability to elevate the soft palate
   - B. Swelling in the piriform fossa
   - C. Inability to abduct the vocal folds
   - D. Incompetent cricopharyngeus sphincter
   - E. Inability to adduct the vestibular folds

   Confirm your answer by watching this video: [https://youtu.be/G4EoiVg4oE4](https://youtu.be/G4EoiVg4oE4)

3. A 20-year-old female came to the hospital complaining that a fish bone got stuck in her throat. Physical examination revealed that discomfort increases on moving the thyroid cartilage from side to side. The physician concluded that the fish bone was stuck in the laryngeal part of pharynx
   - A. At which location of the laryngopharynx, the fish bone may be lodged?
   - B. What nerve is likely to be injured during the removal of the fish bone?
   - C. What is the consequence of injuring this nerve?

4. Watch the suggested video number 2 then respond accordingly
   - A. Which of the functions of the larynx is being tested in this video?
   - B. Which muscle is responsible for the high pitched tone of this singer
   - C. From the list below, encircle the structure that you identify in the video
     1. Aryepiglottic folds 2. Epiglottis 3. Vestibular folds
   - D. Describe movements of vocal cords, shape of glottis & muscles involved in this action