

Laryngeal Cancer

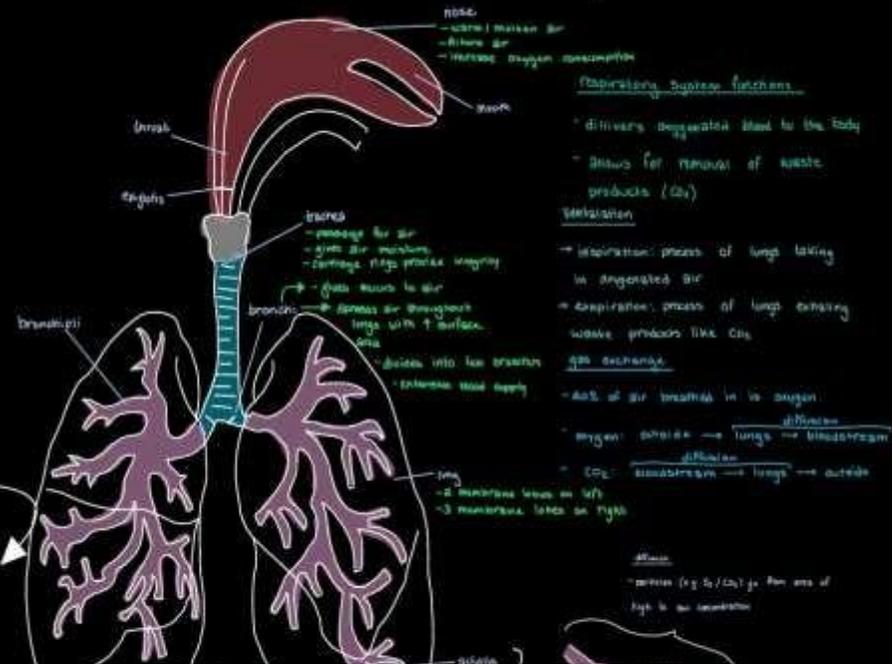
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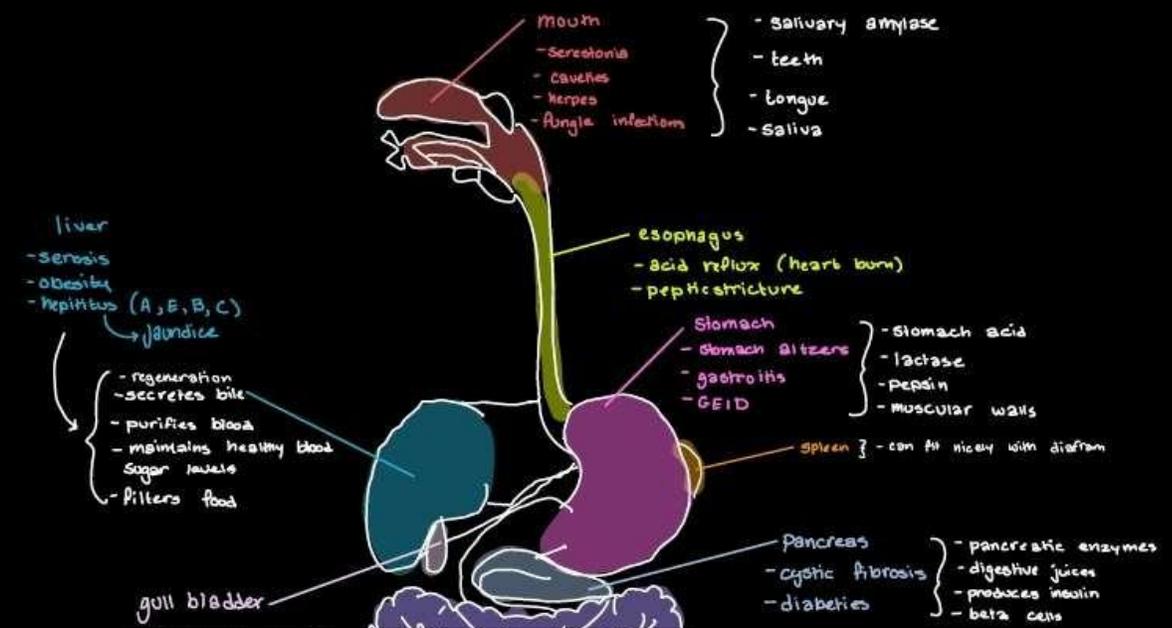
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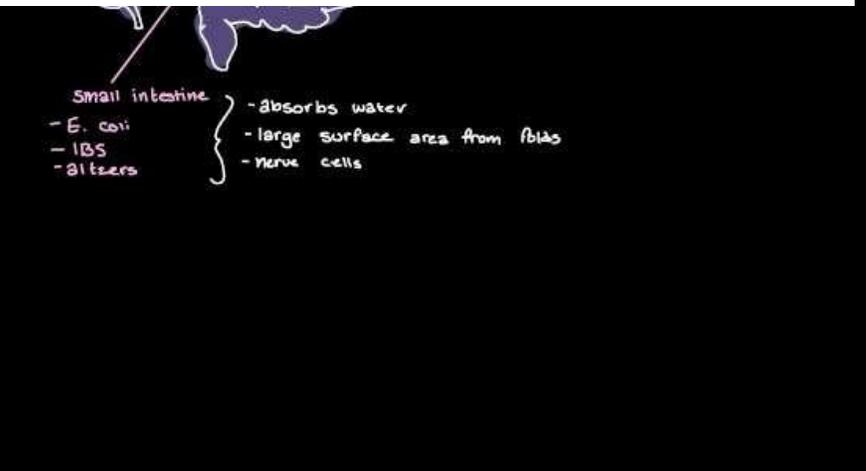
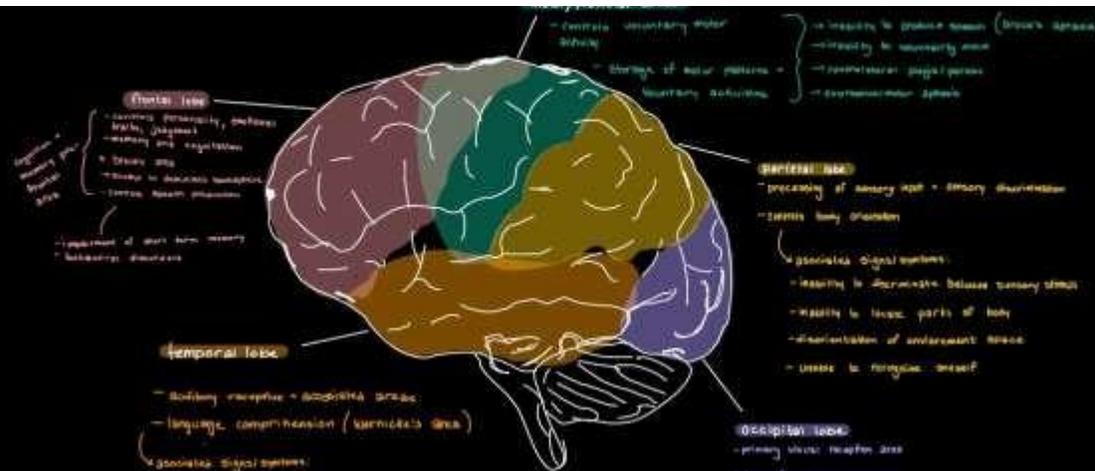
Cardiovascular System



Gastrointestinal diseases

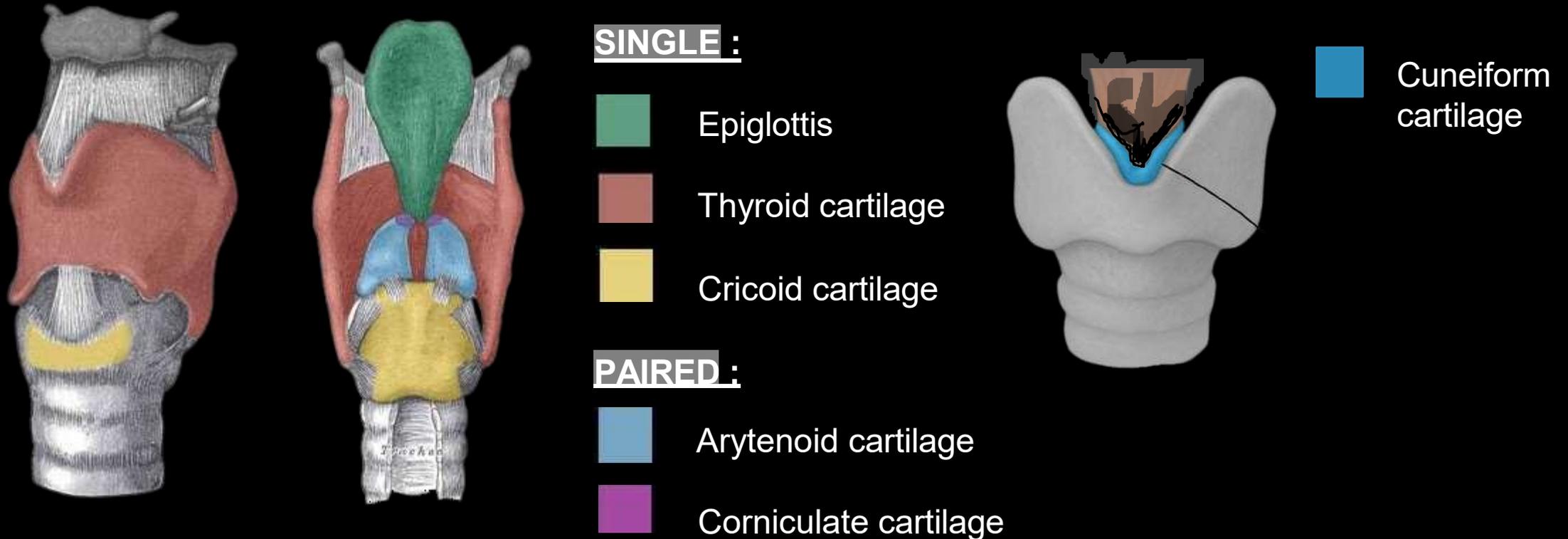


Larynx structures and Anatomy



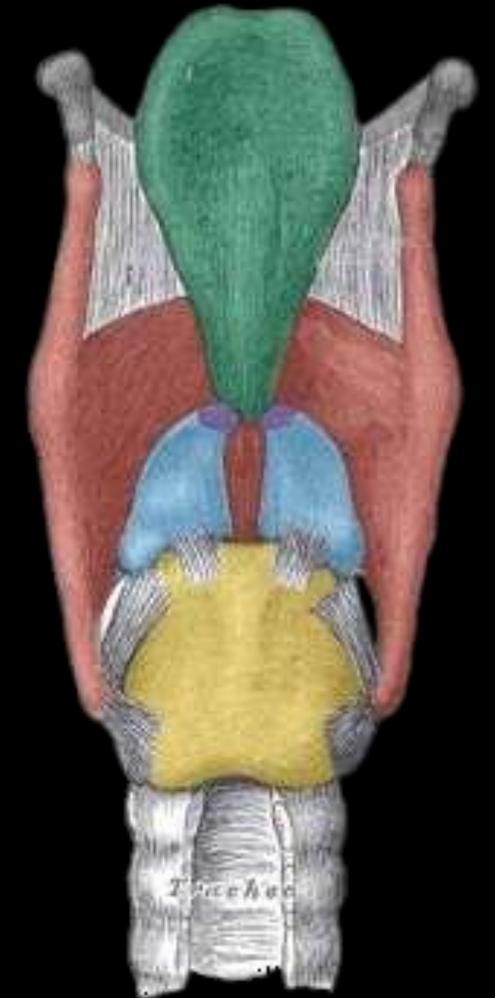
Structures of Larynx

- The larynx is formed a number of cartilage which are articulated by synovial joints and connected together by ligaments and membranes and moved by number of muscles .



Epiglottis :

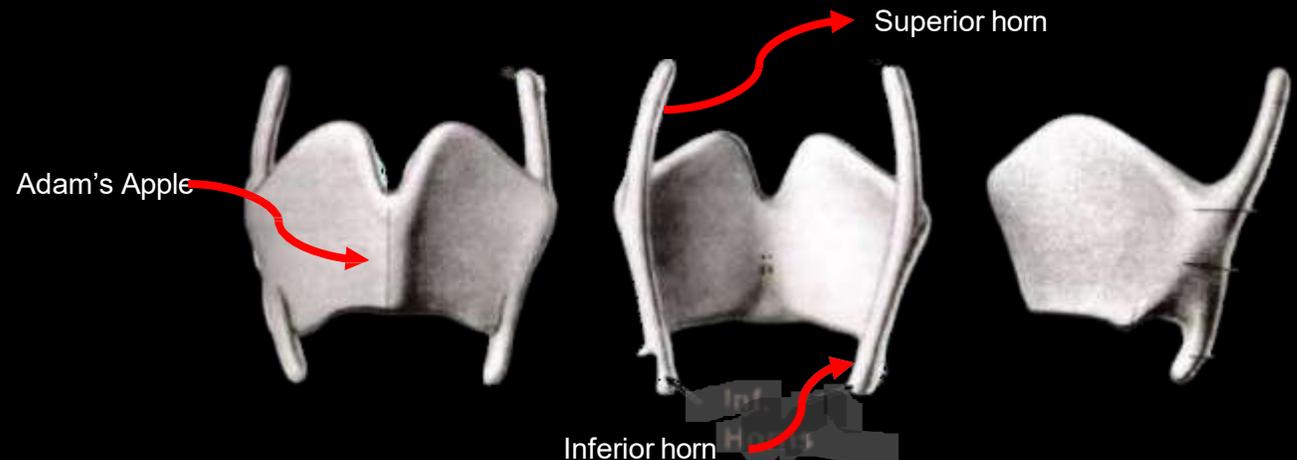
- It is a leaf-like lamella of elastic cartilage.
- It projects upwards behind the tongue and hyoid bones.
- Its upper end is wide and free.
- Its lower end is narrow and fixed to the inner aspect of the thyroid prominence



Epiglottis

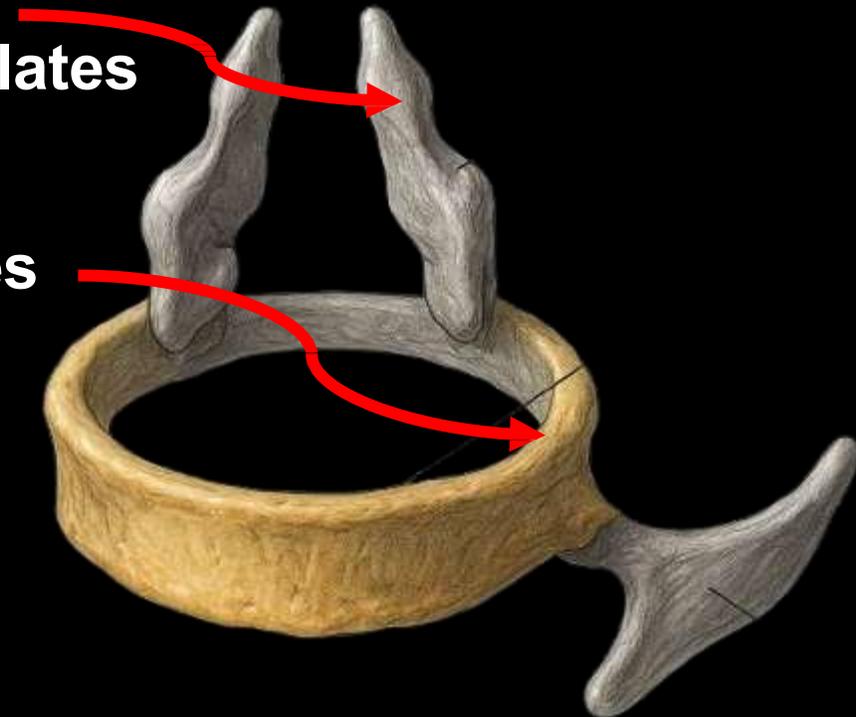
Thyroid cartilage :

- It is formed of 2 quadrilateral laminae which are separated posteriorly but united anteriorly to form the laryngeal prominence (Adam's apple).
- The posterior border of each lamina has 2 horns:
- Superior Horn :attached to the greater horn of hyoid bone by the lateral thyrohyoid ligament.
- Inferior horn :articulates with cricoid cartilage.



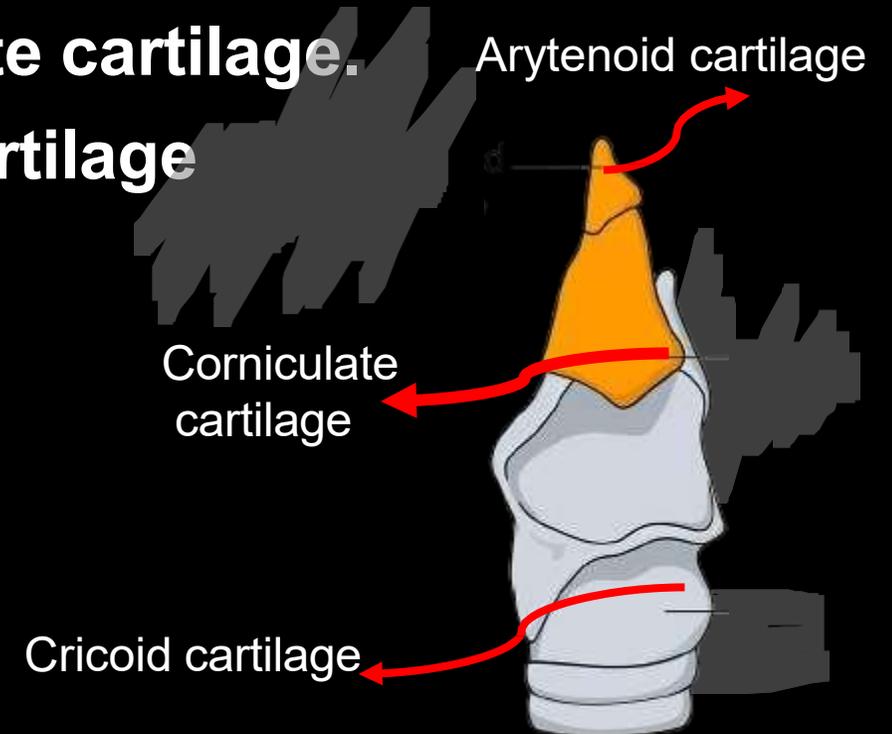
Cricoid cartilage :

- It is ring-shaped having a broad lamina posteriorly and a narrow arch anteriorly.
 - It lies opposite the 6th cervical vertebrae.
 - It articulates with
- a- Posteriorly: upper border of the lamina articulates with 2 arytenoids cartilages.
- b- The anterolateral aspect of the arch articulates with the inferior horn of the thyroid cartilage.



Arytenoid cartilages :

- Each one is pyramidal in shape having:
 - 1) **Apex (above): articulates with corniculate cartilage.**
 - 2) **Base (below): articulates with cricoid cartilage**

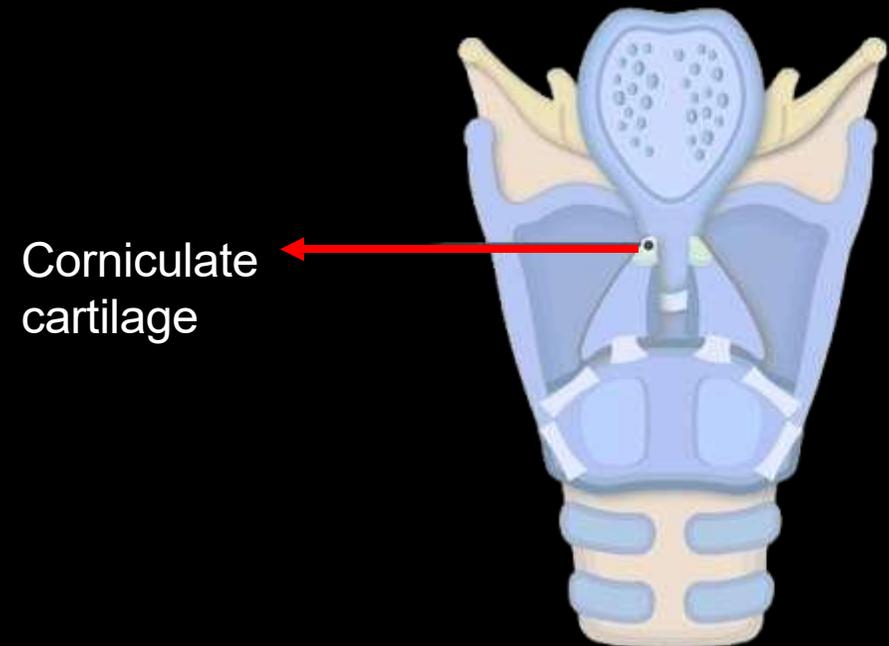


Arytenoid cartilages :

- *** Two processes project from the base;**
- **a- Vocal process direct gives attachment to the vocal ligament and vocalis muscle**
- **b- Muscular process gives attachment for cricoarytenoid muscle.**
- **Sits on the top of the cricoid cartilage and rotates to change the opening of the vocal folds (the rima glottidis).**

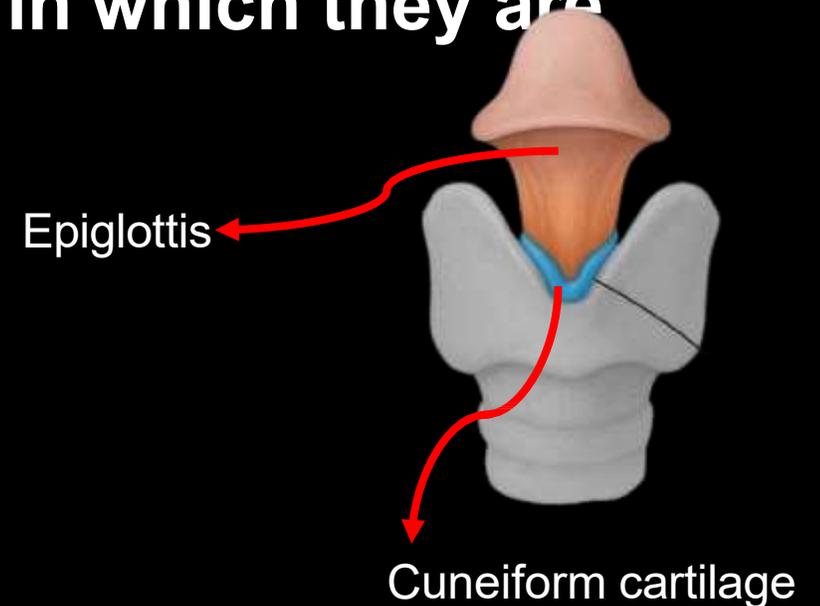
The Corniculate cartilage :

(cartilages of Santorini) are two small conical nodules consisting of elastic cartilage, which articulate with the summits of the arytenoid cartilages and serve to prolong them posteriorly and medially.



The Cuneiform cartilages :

- are two small, elongated pieces of yellow elastic cartilage, placed one on either side, in the aryepiglottic fold.
- Function of the cuneiform cartilages is to support the vocal folds and lateral aspects of the epiglottis. They also provide a degree of solidity to the folds in which they are embedded.

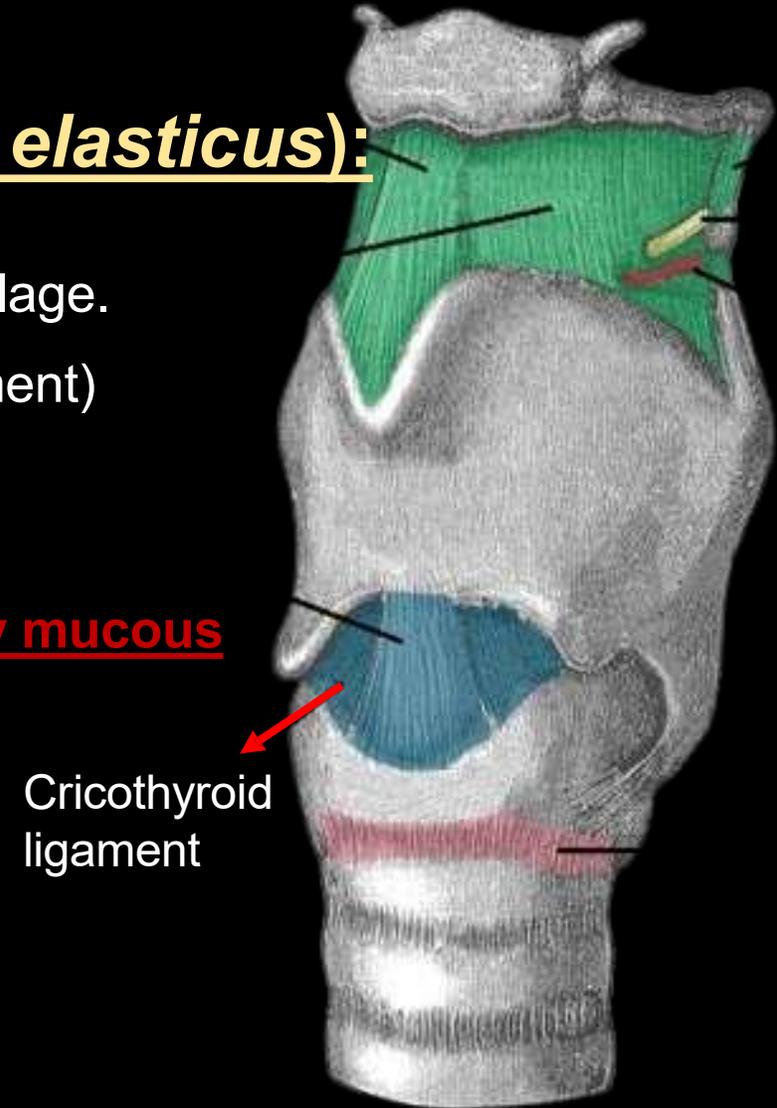


Membranes and ligaments

➤ Cricothyroid membrane and ligaments (*conus elasticus*):

- From upper border of cricoid cartilage to lower border of thyroid cartilage.
 - The upper border of the lateral cricothyroid membrane (Vocal ligament) extends between the inner surface of thyroid cartilage (anterior) and vocal process of arytenoid cartilage (posterior).

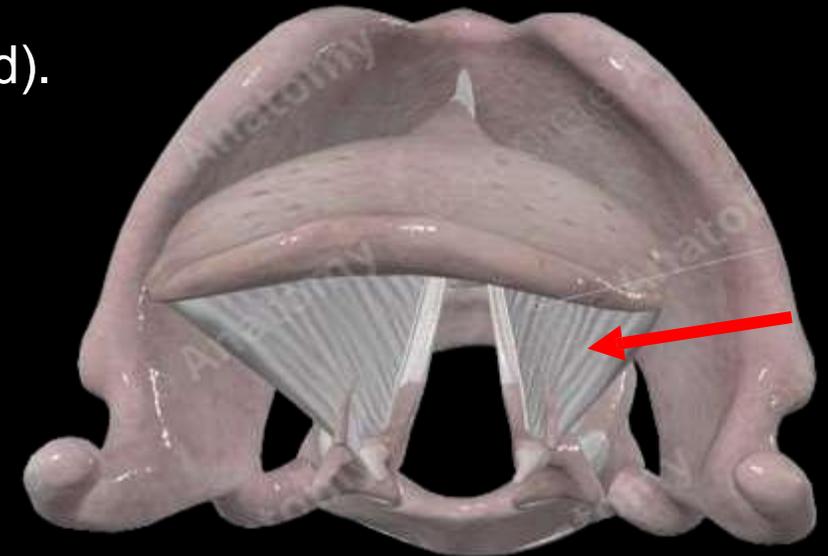
- N.B: the true vocal cord is formed by a vocal ligament covered by mucous membrane



Membranes and ligaments

➤ Quadrangular membrane

- Extends from epiglottis (anterior) & arytenoid cartilages (posterior).
- a- Upper border is free (aryepiglottic fold) and forms the laryngeal inlet.
- b- Lower border forms the vestibular fold (false vocal cord).



Laryngeal sub-sites :

Supraglottis :

It consists of the **epiglottis** (lingual and laryngeal surface), **aryepiglottic folds** (laryngeal surface only), **arytenoids**, and **ventricular bands** (false vocal cords).

The lower limit of the supraglottis is a horizontal plane passing through the lateral margin of the ventricle and its union with the upper surface of the true vocal cord.

Glottis :

The glottis is composed of the **true vocal cords** in addition to **anterior** and **posterior commissures**. The upper limit of the glottis is marked by a line drawn through the larynx ventricle to its lower limit which is a horizontal plane 1 cm below the upper limit of the glottis

Subglottis :

It extends from the lower border of the glottis to the lower border of the cricoid cartilage

Laryngeal Spaces :

Pre-epiglottic space (space of Boyer)

boundaries :

- Superior -hyoepiglottic ligament .
- Inferior - thyroepiglottic ligament
- Posterior - epiglottis .
- Anterior - thyrohyoid membrane & thyroid cartilage .

Para- epiglottic space :

• boundaries :

- Superior - separated from Supraglottis by quadrangular membrane
- Inferior - conus elasticus
- Lateral - thyroid cartilage
- Posterior –mucosa of pyriform fossa

Laryngeal Spaces :

Pre-epiglottic space (space of Boyer)

Content:

- fat, areolar tissue , blood vessels , lymphatic and mucosal glands .
- Continues laterally with paraglottic space deep to quadrangular membrane

Para- epiglottic space :

• Content:

- thyroarytenoid muscle

Inferolaterally it is continuous with cartilaginous defect between cricoid & thyroid cartilage Paraglottic involvement in glottic ca – fixity of cord

Laryngeal cancer

- ❖ Laryngeal cancer is the second most common neoplasm of the upper aero digestive tract after oral cavity carcinoma.
 - ❖ Most of these tumors are squamous cell carcinomas, accounting from 85 to 95% of all neoplasms of the larynx .
 - ❖ There are multiple treatment modalities and for this to be successful, it must be appropriately selected by personalizing the patient's approach. It is based primarily on the clinical stage of the patient, their desires, the patient's medical conditions and the prognosis of survival.
- *glottic cancer : 59%
 - *supraglottic cancer :40%
 - *subglottic cancer : 1%
 - *most subglottic masses are extension from glottic carcinoma .

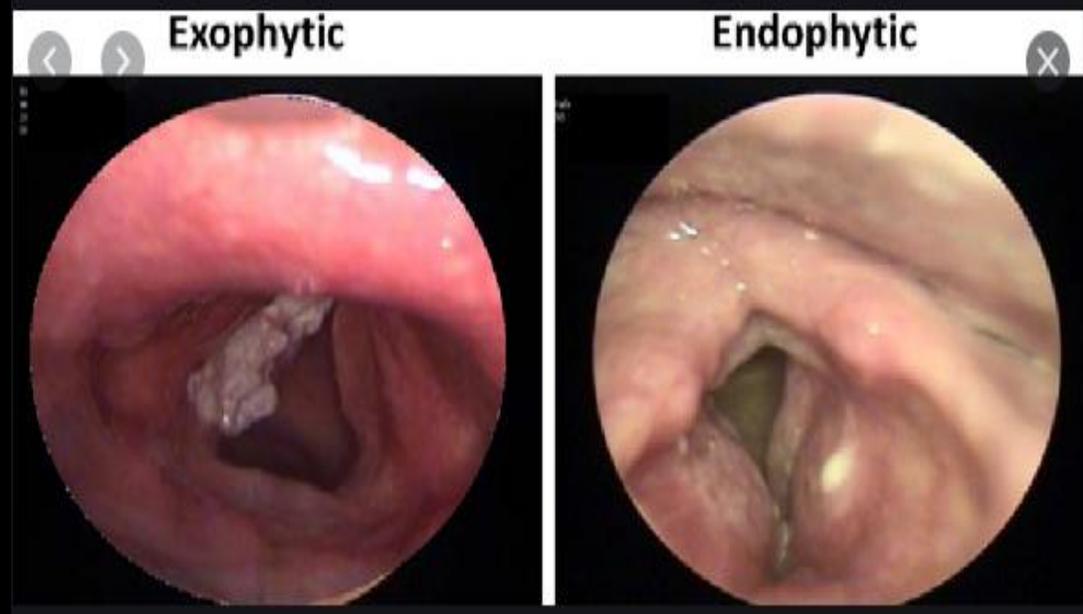
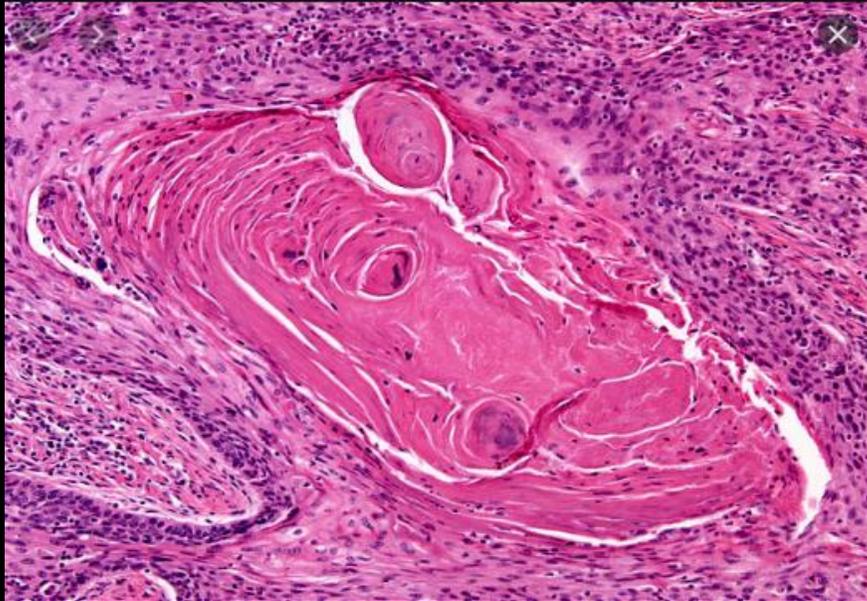
Risk factors

- **Tobacco use.** Smoking any form of tobacco (cigarettes, cigars, or pipes) or marijuana greatly increases your risk. As does using chewing tobacco or snuff..
- **Alcohol use.** Drinking more than 1 drink a day increases your risk. If you drink and smoke, your risk is many times higher.
- **Gender.** Men are 4 to 5 times more likely to develop laryngeal cancer than women.
- **Age.** More than half of people with laryngeal cancer are age 65 or older when the disease is found.
- **Race.** Laryngeal cancer is more common in African Americans and whites than it is in Latinos and Asians.
- **Certain inherited syndromes.** People with certain inherited genetic conditions, such as Fanconi anemia and dyskeratosis congenita, are at increased risk for laryngeal cancer.
- **Certain exposures at work.** People who have been exposed to things like sulfuric acid mist, nickel, wood dust, paint fumes, or asbestos on the job have an increased risk of developing laryngeal cancer.
- **HPV.** most frequently with subtypes 16 and 18. It has been detected in 21% of advanced laryngeal cancers, most commonly detected in women compared to men

Histological subtypes

- Squamous Cell Carcinoma (85-90 % common)
- Verrucous Carcinoma (< 1%)
- Chondrosarcoma
- Fibrosarcoma
- Minor salivary carcinoma
- Adenocarcinoma
- Oat cell carcinoma
- Giant cell and Spindle cell carcinoma etc

Pathology of SCC



- Macroscopically, squamous cell cancer (SCC) of the larynx may be exophytic or endophytic.
- Microscopically, it is characterized by the presence of 'prickle' cells and keratin whorls.

Laryngeal cancer spread

The most common site for distant hematogenous metastasis is the lung.

The mediastinum is the most common site for distant lymphatic metastases.

The incidence of distant metastasis varies according to the site of the primary tumor (the rate is 3.1% to 8.8% in glottic SCC and 3.7% to 15% in supraglottic SCC. 14.3% of subglottic SCCs developed distant metastases).



Clinical presentation

- **GLOTTIC CANCER**
 - ✓ Hoarseness is the earliest symptom and hoarseness more than three weeks should be evaluated by otolaryngologist
 - ✓ Progressive dyspnea and stridor
 - ✓ Hemoptysis indicates large tumor
 - ✓ Referred otalgia is a sinister sign indicating deeper invasion
- **SUPRAGLOTTIC CANCER**
 - ✓ Globus or foreign body sensation, parasthesia
 - ✓ If exophytic, hemoptysis may occur
 - ✓ Asymptomatic
 - ✓ Cervical lymphadenopathy as first presentation
 - ✓ Odynophagia, referred otalgia
- **SUBGLOTTIC CANCER**
 - ✓ Globus or foreign body sensation
 - ✓ Progressive dyspnea and stridor

Diagnosis

- HISTORY
- CLINICAL EXAMINATION
 - Good neck exam looking for cervical lymphadenopathy and broadening of the laryngeal prominence is required
 - The base of the tongue should be palpated for masses as well
 - Restricted laryngeal crepitus may be a sign of post cricoid or retropharyngeal invasion
 - Indirect laryngoscopy (not used regularly these days)
 - Fibre-optic nasolaryngoscopy (standard for laryngeal assessment)

Indirect laryngoscopy

can be done in the doctor's office. The doctor uses a light source and a small hand mirror held at the back of the throat to look at the throat, larynx and vocal cords.

A flexible or fiberoptic laryngoscopy

is usually done by an ear, nose and throat (ENT) surgeon in the doctor's office. The surgeon sprays an anesthetic on the back of the nose and throat just before the test. This helps open up the sinuses and prevents gagging. A flexible laryngoscope is inserted through the nose and down to the throat so the surgeon can look at the larynx.

A direct laryngoscopy

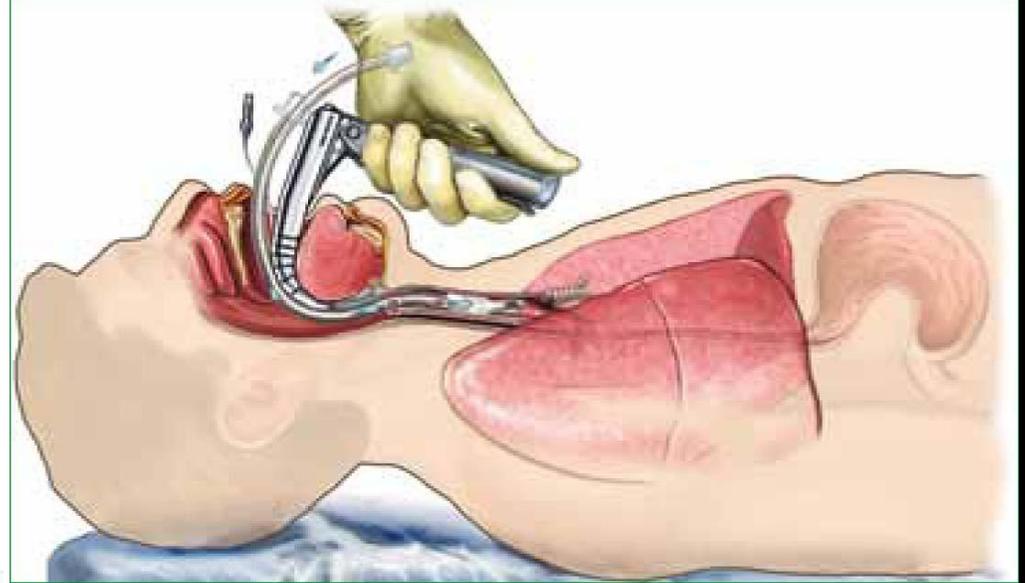
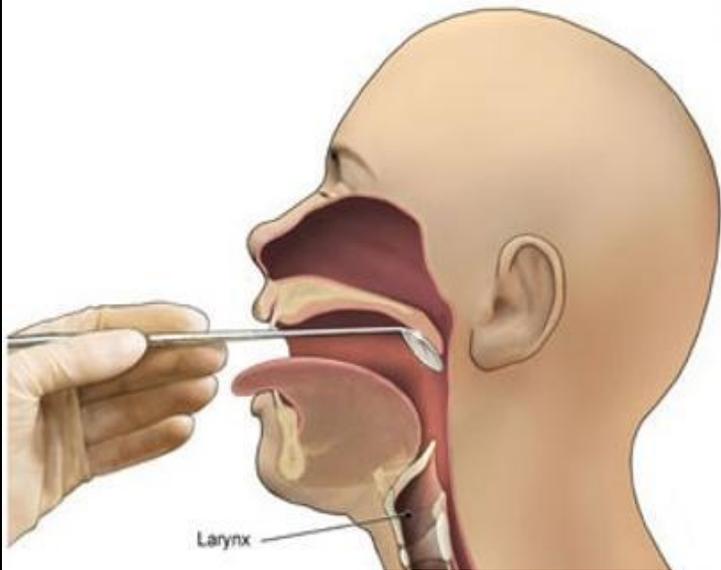
is done by an ENT surgeon in the operating room using a general anesthetic. A direct laryngoscopy is usually done to collect a biopsy sample if a laryngeal tumor is seen during an indirect or flexible laryngoscopy. The surgeon inserts a rigid laryngoscope into the mouth to look at the larynx and remove a sample of tissue for biopsy.

A laryngostroboscopy (or videostroboscopy)

Is used to examine the vocal cords during speech. A camera is attached to a laryngoscope, and flashing lights are used to slow down the image of the cords moving. A laryngostroboscopy may be done to diagnosis laryngeal cancer. It may also be done to assess speech before, during and after treatment.

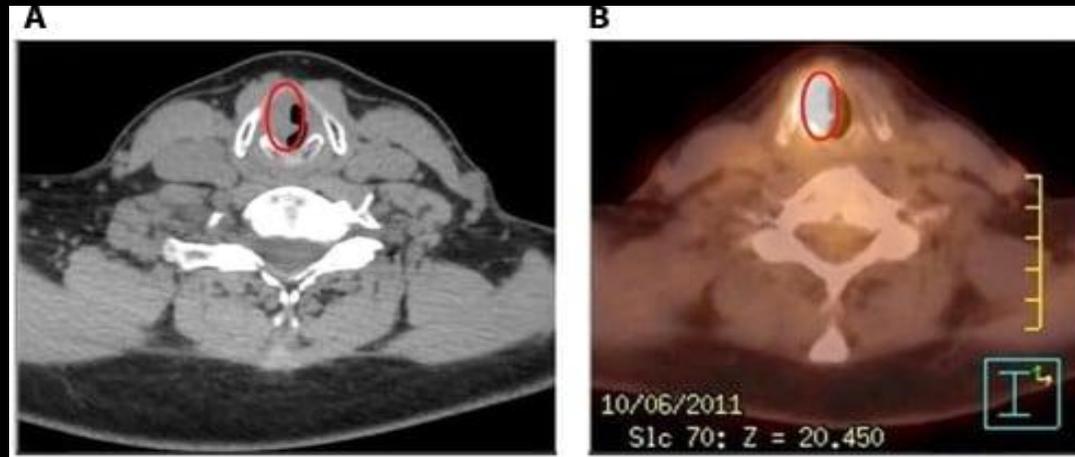
Biopsy

- endoscopic biopsy – tissue samples are removed from the larynx during a direct laryngoscopy
- fine needle aspiration (FNA)



Imaging

- Is recommended to perform imaging studies that support staging, such as computed axial tomography, which is a very useful resource for assessing affection of bone structures.
- Positron emission tomography combined with computed tomography are useful in evaluating recurrences and can identify areas of local and nodular recurrence and distant metastases.
- Nuclear magnetic resonance surpasses the computerized axial tomography in the detection when cartilaginous and soft tissues are affected.



Staging

STAGING- PRIMARY TUMOR

T-STAGE	DEFINITION
TX	Minimum requirements to assess primary tumor cannot be met
T0	No Primary tumor
Tis	Carcinoma in situ

TNM Staging

Supraglottis

T1	Tumor limited to one subsite of supraglottis with normal vocal cord ability
T2	Tumor invades mucosa of more than one adjacent subsite of supraglottis or glottis or region outside the supraglottis (e.g., mucosa of base of tongue, vallecula, medial wall or pyriform sinus) without fixation of the larynx
T3	Tumor limited to larynx with vocal cord fixation or invades any of the following: postcricoid area, pre-epiglottic tissues, paraglottic space, or minor thyroid cartilage erosion (e.g., inner cortex)
T4a	Tumor invades through the thyroid cartilage or invades tissues beyond the larynx (e.g. trachea, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus)
T4b	Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures

TNM Staging

Glottis

T1	Tumor limited to the vocal cord(s) (may involve anterior or posterior commissure) with normal mobility
T1a	Tumor limited to one vocal cord
T1b	Tumor involves both vocal cords
T2	Tumor extends to supraglottis or subglottis, or with impaired vocal cord mobility
T3	Tumor limited to the larynx with vocal cord fixation or invades paraglottic space, or minor thyroid cartilage erosion (e.g., inner cortex)
T4a	Tumor invades through the thyroid cartilage or invades tissues beyond the larynx (e.g., trachea, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus)
T4b	Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures

TNM Staging

Subglottis

T1	Tumor limited to the subglottis
T2	Tumor extends to the vocal cord(s) with normal or impaired mobility
T3	Tumor limited to larynx with vocal cord fixation
T4a	Tumor invades cricoid or thyroid cartilage or invades tissues beyond the larynx (e.g., trachea, soft tissues of neck including deep extrinsic muscles of the tongue, strap muscles, thyroid, or esophagus)
T4b	Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures

TNM Staging

Regional Lymph Nodes (N)

NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in single ipsilateral lymph node, 3 cm or less in greatest dimension
N2	Metastasis in a single ipsilateral lymph node, more than 3 cm but not more than 6 cm in greatest dimension, or in multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension, or in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension
N2a	Metastasis in single ipsilateral lymph node, more than 3 cm but not more than 6 cm in greatest dimension
N2b	Metastasis in multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension
N2c	Metastasis in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension
N3	Metastasis in a lymph node, more than 6 cm in greatest dimension

Distant Metastasis (M)

MX	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

Cancer Staging

Anatomic Stage/Prognostic Groups

Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T3	N0	M0
	T1	N1	M0
	T2	N1	M0
	T3	N1	M0
Stage IVA	T4a	N0	M0
	T4a	N1	M0
	T1	N2	M0
	T2	N2	M0
	T3	N2	M0
	T4a	N2	M0
Stage IVB	T4b	Any N	M0
	Any T	N3	M0
Stage IVC	Any T	Any N	M1

Most common site for laryngeal carcinoma distant metastasis is ?

Lung

There's a correlation between each stage and the T

Stage 1 > T1

Stage 2 > T2

stage 3 > T3

stage 4 > T4

And the patient in this would be M0 and N0

Once you see N1 then you move directly to stage 3

N2 > IVA

N3 > IVB

Once you see M1 the directly move to IVC

Management :

Carcinoma in situ : vocal cord stripping, radiation therapy (RT), and laser excision

For the purpose of the management , laryngeal cancer has been broadly divided into :

1. Early laryngeal cancer (stage I (T1) and stage II (T2)) :

(Radiation or Surgery (both have 85-95% cure rate).

2.advanced laryngeal cancer (stage III and IV) :

(Total laryngectomy +/- RadioChemoradiotherapy)

Total laryngectomy

Indications:

- 1. Advanced laryngeal cancer with extensive cartilage destruction and extra laryngeal spread. (T3, T4)**
- 2. Involvement of posterior commissure with both arytenoids.**
- 3. Completion procedure after failed partial laryngectomy/irradiation.**
- 4. Severe aspiration following partial/near total laryngectomy.**
- 5. Massive nodal metastasis.**

Nodal management :

Nodal involvement affect the survival and the prognosis, so we have to treat the neck .

- 1. Therefore, in the N0 neck, the primary nodes are treated electively either by radiotherapy or surgery**
- 2. For the N1 neck, if treatment of primary is by surgery, then treatment is by selective II-IV neck dissection, followed by chemo radiotherapy where appropriate.**
- 3. If the primary is treated by chemo radiotherapy, then the treatment of the nodal metastases can also be performed by chemo radiotherapy followed by assessment of neck.**

Nodal Management :

4. In advanced nodal disease (N2 or N3), if the primary treatment is being treated by surgery then a MRND should be performed with consideration of postoperative radiotherapy or chemo radiotherapy.

RND (Radical neck dissection): Removal of

1. The 6 levels of LNs.
2. Spinal accessory nerve .
3. Internal jugular vein .
4. Sternocleidomastoid.
5. RND is not done anymore and replaced by MRND or SND

MRND (Modified radical neck dissection) :

Removal of the 6 levels of LNS while preserving at least one of the non-lymphatic tissue (Spinal accessory nerve or Internal jugular vein or SCM).

SND (selective neck dissection):

Removal of one level or sublevel of LNs , with the aid of sentinel lymph node biopsy.

- If the primary treatment is being treated by chemotherapy, further treatment is controversial. The options are neck dissection or Chemoradiotherapy followed by PET scan.

PROGNOSIS

	5 YEAR SURVIVAL
STAGE I	> 95%
STAGE II	85-90%
STAGE III	70-80%
STAGE IV	50-60%

- After initial treatment patients are followed at 4-6 week intervals. After first year decreases to every 2 months. Third and fourth year every three months, with annual visits after that.
- Patients considered cured after being disease free for five years
- Most laryngeal cancers reoccur in the first two years

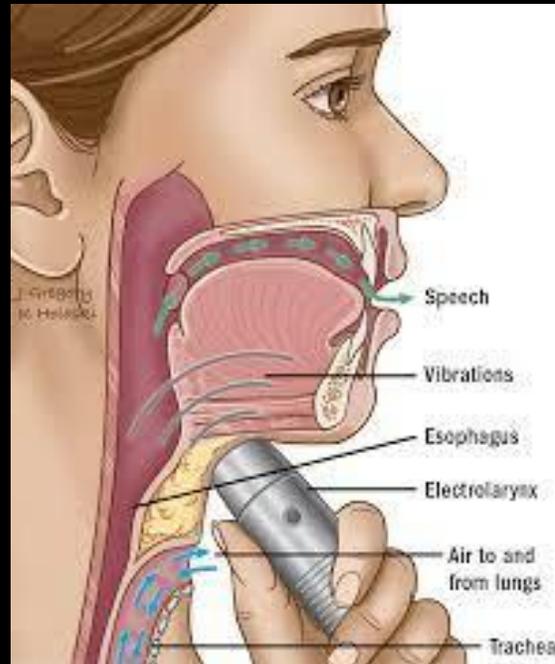
The 3 basic options for voice restoration after total laryngectomy (TL) are:

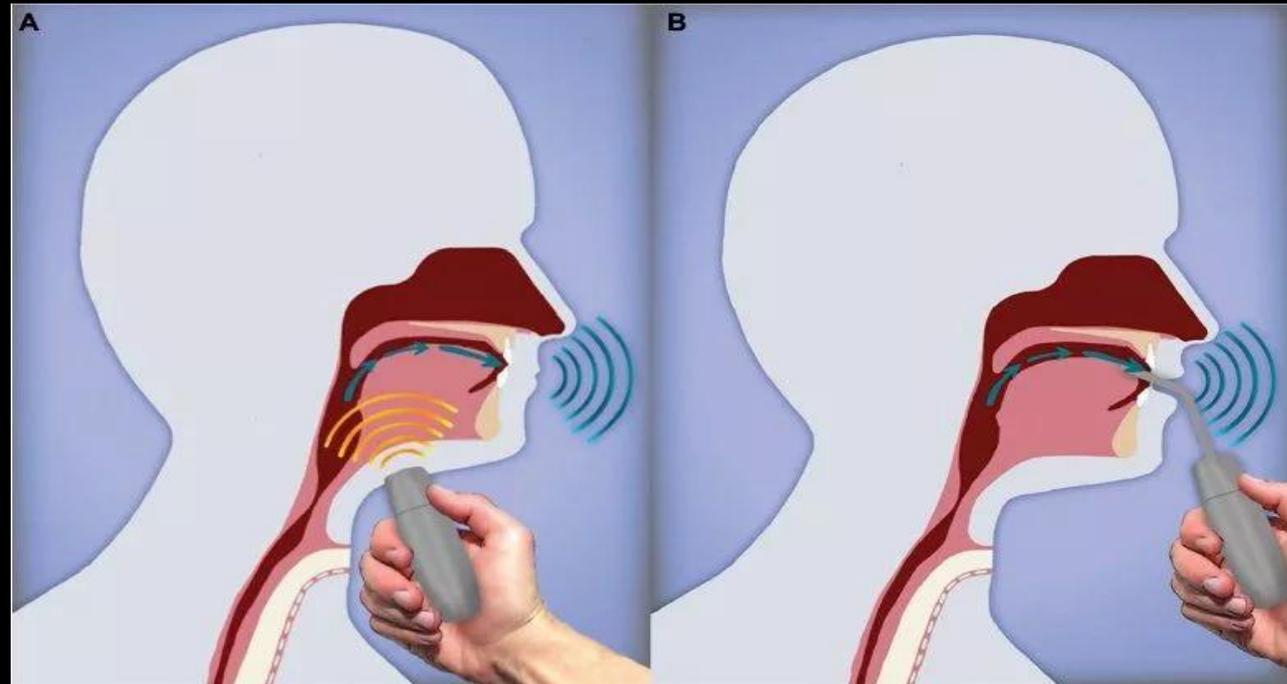
- (1) artificial larynx speech**
- (2) esophageal speech**
- (3) tracheoesophageal speech.**

Selection of a method should be based on input from the surgeon, speech pathologist, and patient.

Electrolarynx :

An electrolarynx is a battery-operated machine that produces sound for you to create a voice. After surgery to remove the whole of your voice box (total laryngectomy), you are no longer able to speak in the normal way. But there are different ways you can communicate and learn to speak again.





- It is held in the submandibular region.
- Muscle contraction and changes in facial muscle tension causes rudiments of speech.
- Initial training to use this equipment should begin even before surgery.
- Two types:
- External /neck , which is commonly used.
- Intraoral type.

Shunt

involves creation of shunt (Fistula) between trachea and esophagus.
Basic aim : to divert air from the trachea into the esophagus.

Causes of failure :

1. Aspiration through the fistula.
2. Closure of the fistula.

To avoid these problems , prosthesis was introduced .

One way silicone valve is introduced via the fistula.

This valve served as one way conduit for air into esophagus while preventing aspiration.

This prosthesis has two flanges , one enters the esophagus while the other rests on the trachea.

shunt

Tracheoesophageal Voice Prosthesis

