

LARYNGEAL CANCER

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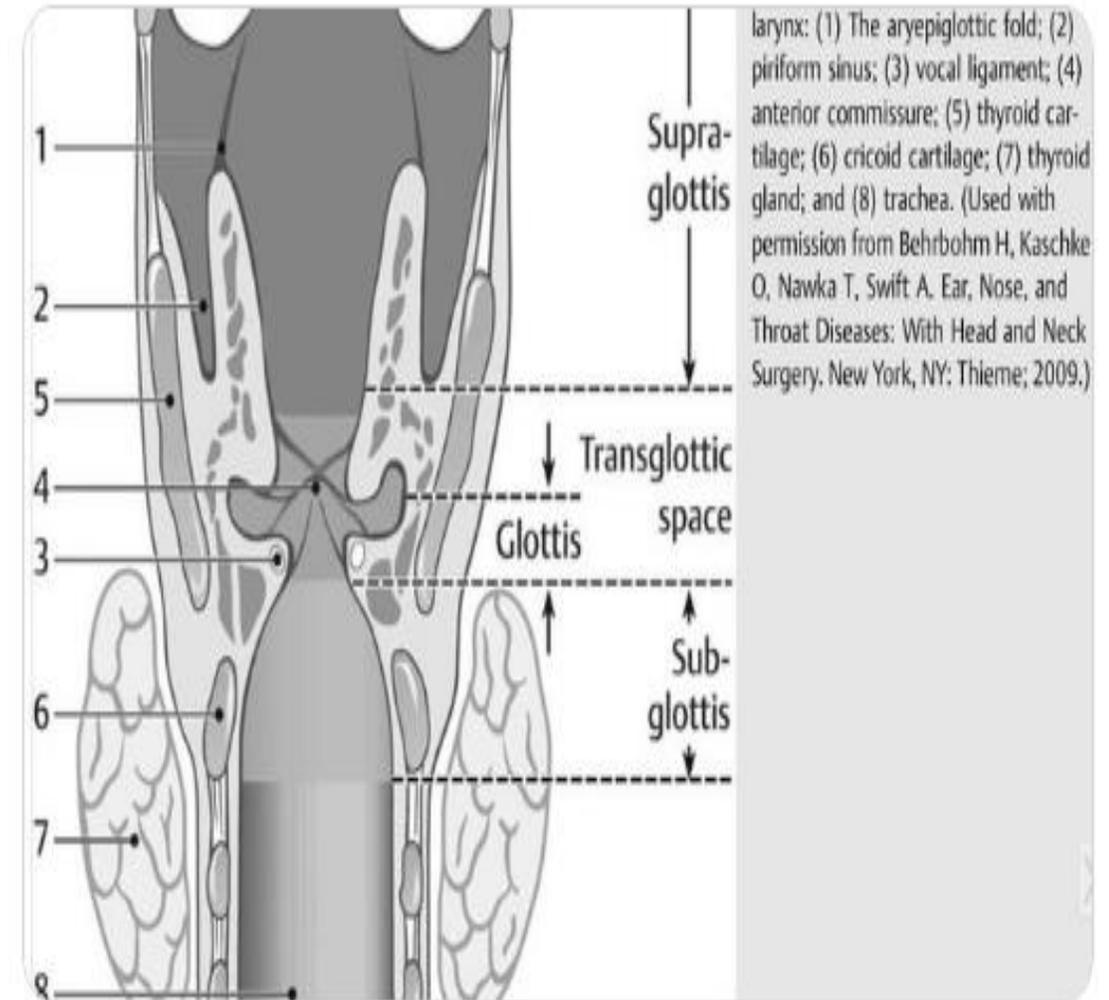
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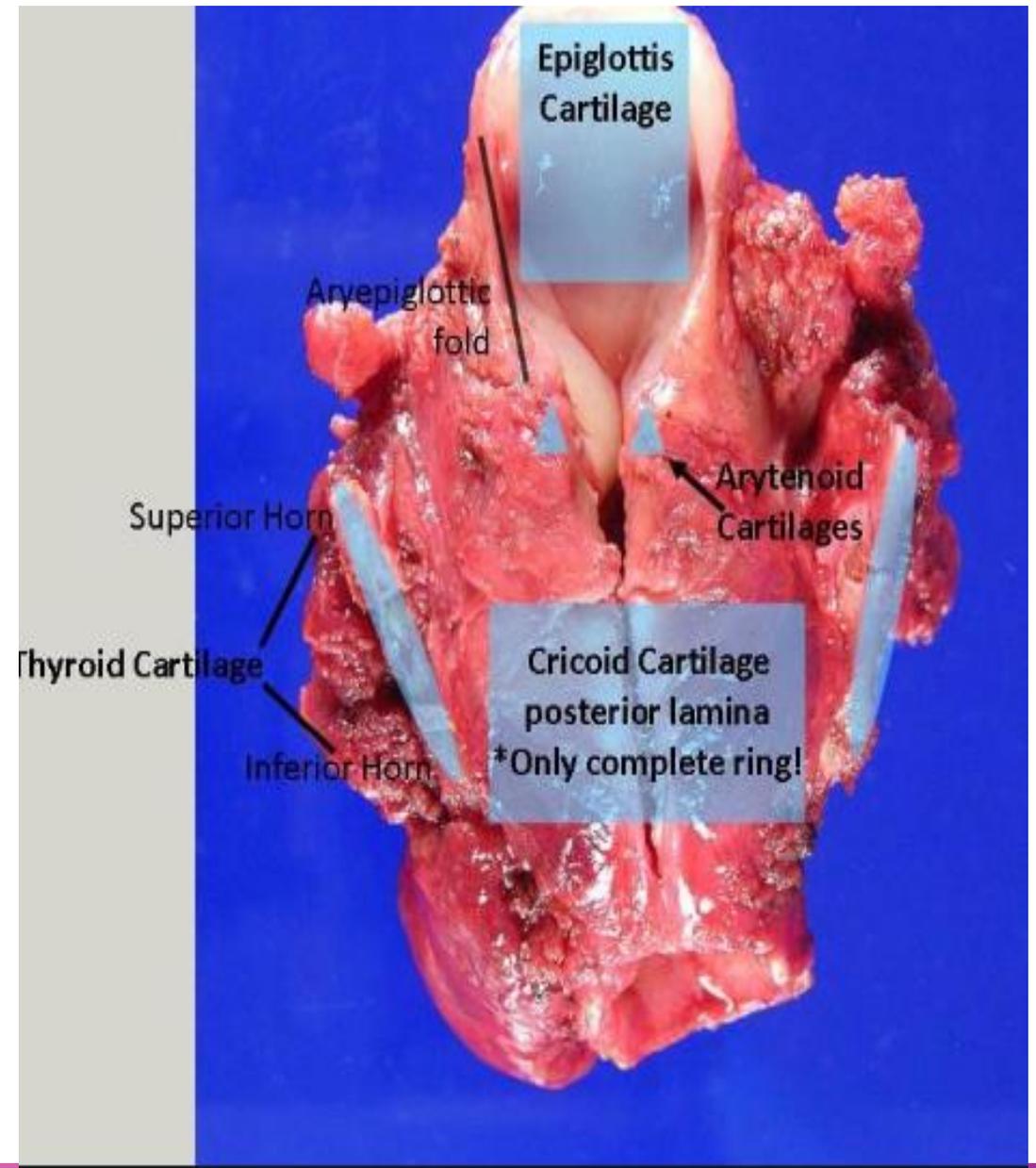
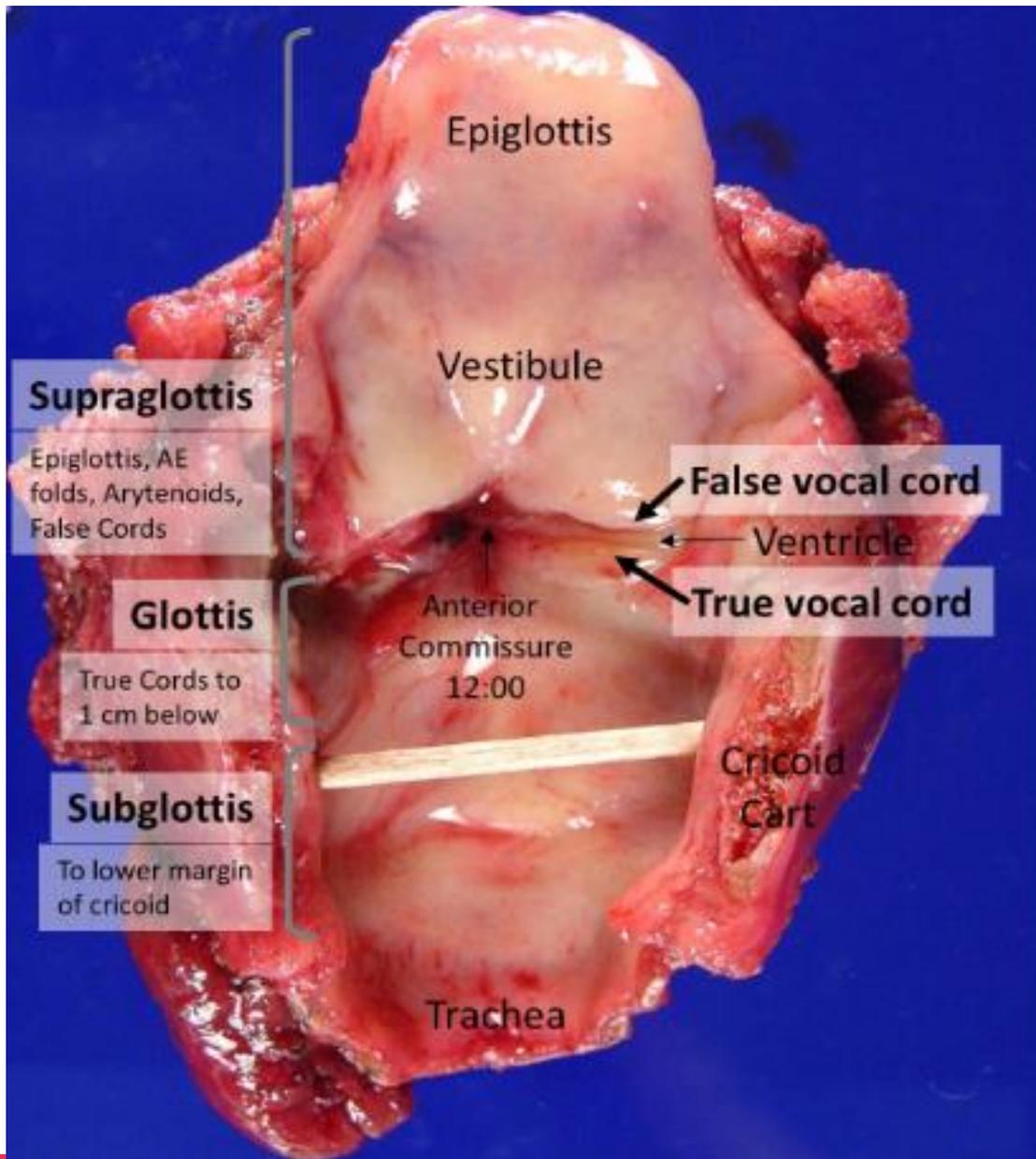
INTRODUCTION

- Laryngeal cancer is the **second most common** neoplasm of the upper aero digestive tract after oral cavity carcinoma.
- There are approximately 110,000 to 130,000 new cases diagnosed annually in the world.
- Most of these tumors are **squamous cell carcinomas** (85-95% 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.

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:** It is composed of the **true vocal cords** (upper and lower surface) 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

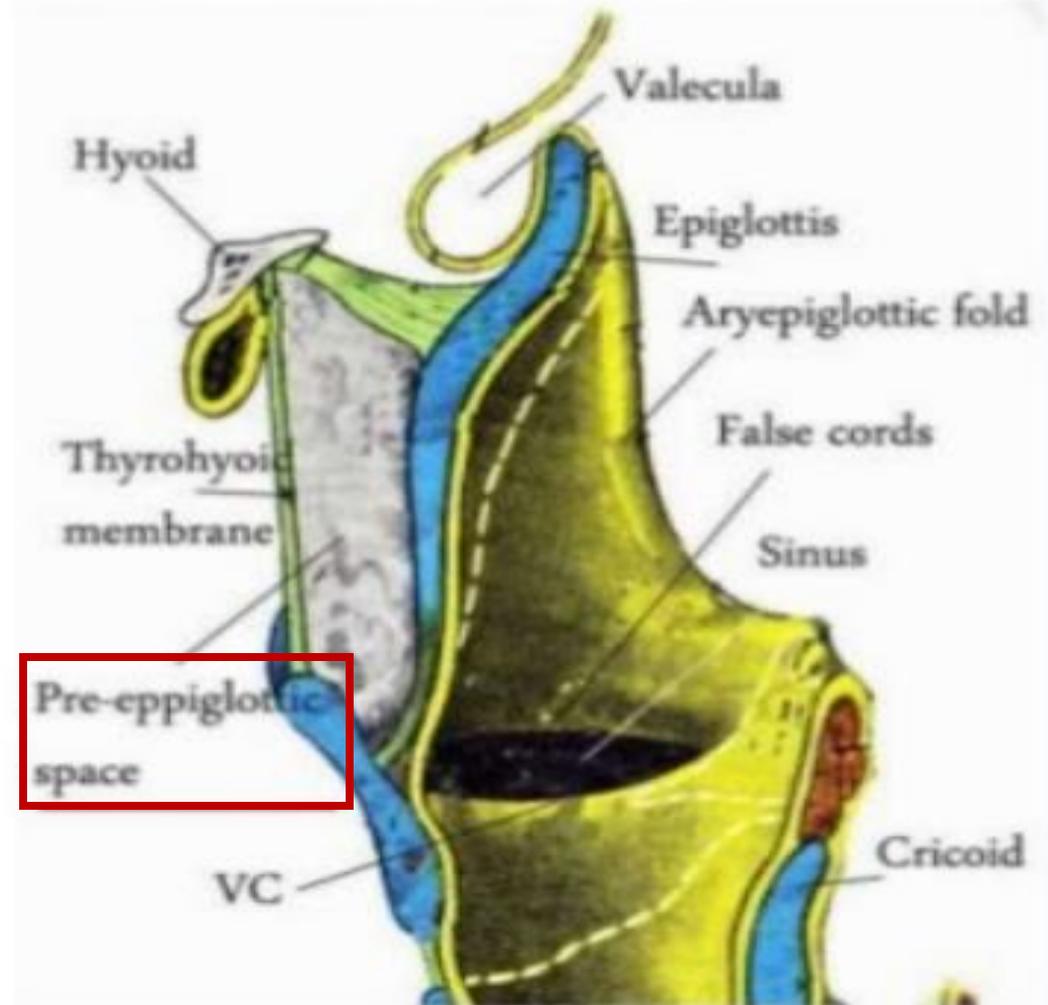




LARYNX SPACES

PRE-EPIGLOTTIC SPACE (BOAYER'S SPACE)

- Bounded superiorly by the hyoepiglottic ligament, anteriorly by the thyrohyoid membrane and ligament, and Posteroinferiorly by the epiglottis and thyroepiglottic ligament.
- The pre-epiglottic space forms an inverted pyramid.
- continuous with the superior portion of the paraglottic space.
- contains abundant fat, blood vessels, lymphatics, and mucosal glands.



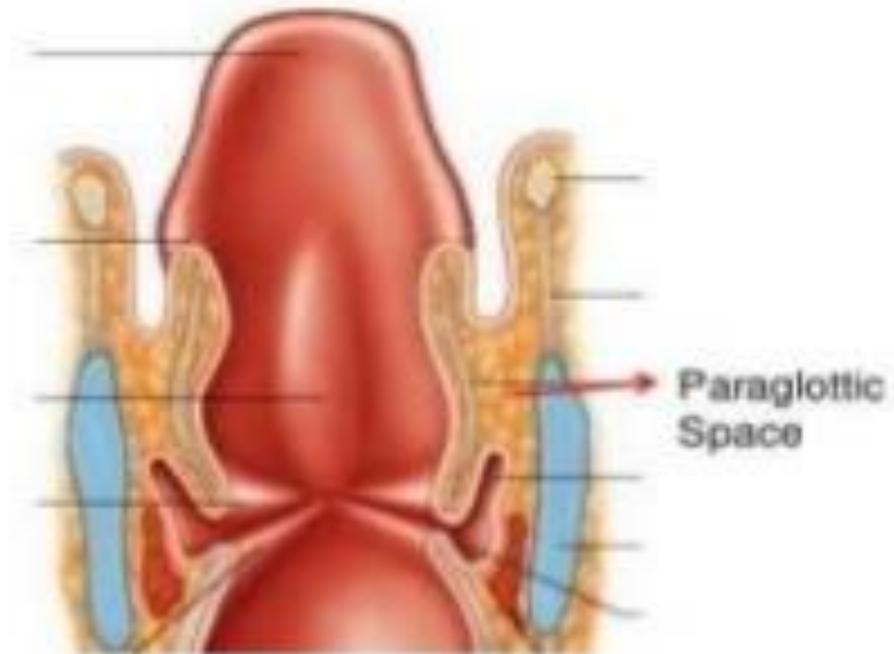
LARYNX SPACES

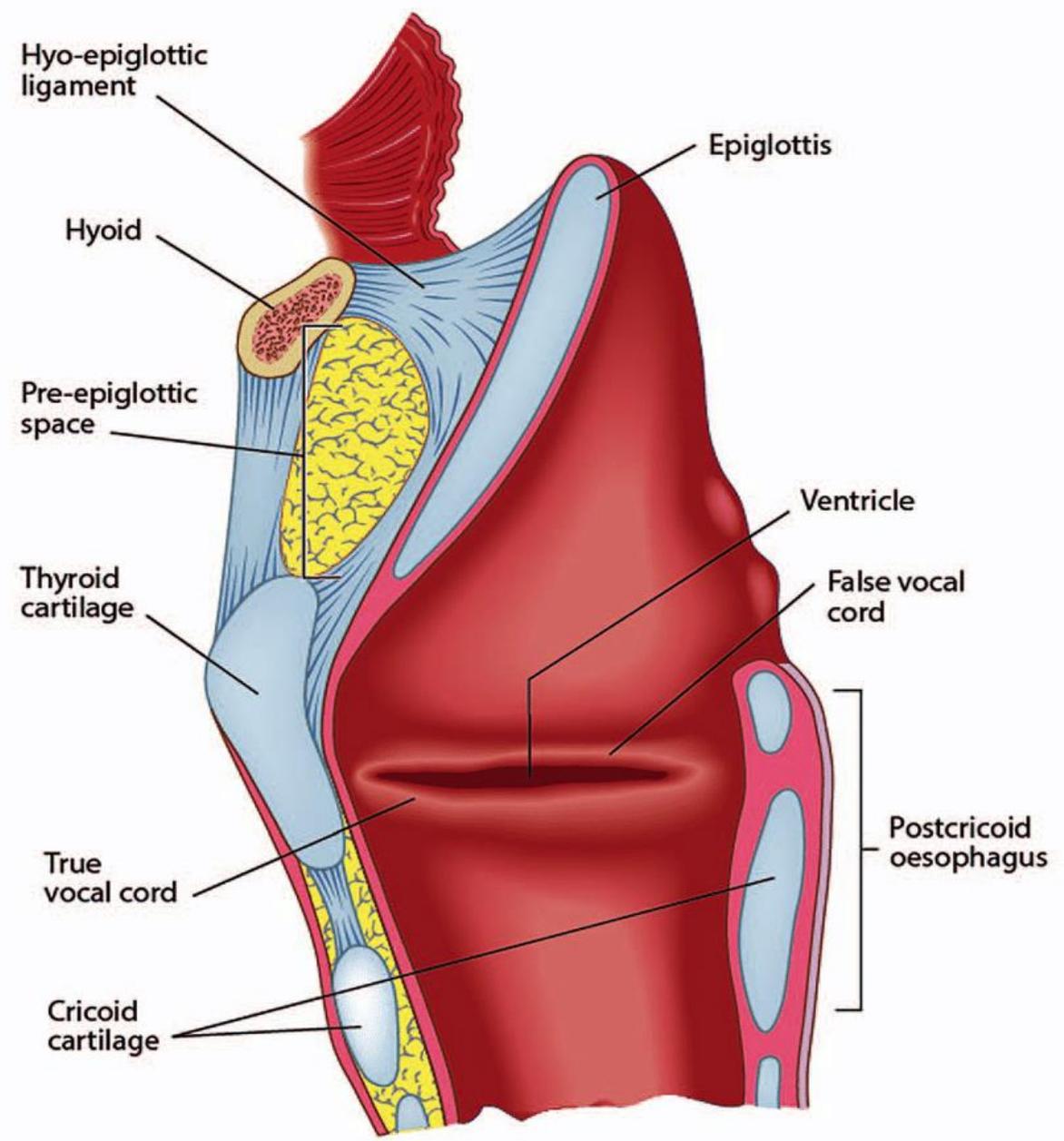
Paraglottic Space

➤ Bounded

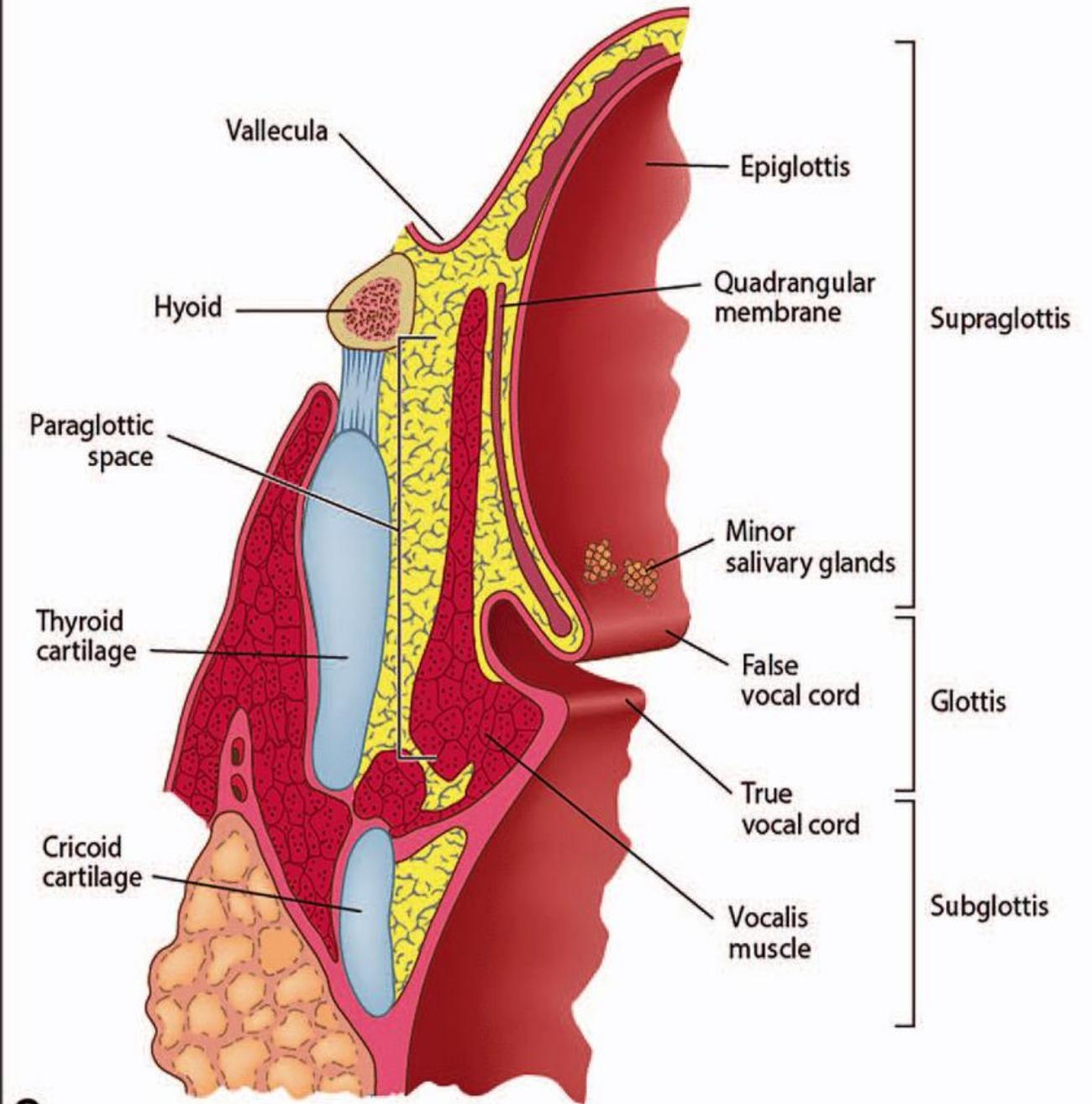
- Laterally – Thyroid Cartilage
- Medially – Cornu Elasticus
- Quadrangular Membrane
- Posteriorly – Mucosa of Pyriform Fossa

It encompasses the laryngeal ventricle & saccule





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LARYNGEAL CANCER SUBTYPES

- Glottic Cancer: 59%
- Supraglottic Cancer: 40%
- Subglottic Cancer: 1%
- Most subglottic masses are extension from glottic carcinomas

RISK FACTORS

- **Alcohol and tobacco** are the two main risk factors for laryngeal cancer. The risk is proportional to the intensity and duration of consumption and the risk decreases after cessation of intake.
- **GERD/LPR**: insufficient evidence to support causal role.
- An increased intake of **fruits and vegetables** is associated with a lower risk of head and neck cancer in all subtypes, which means that this could be a protective factor for 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

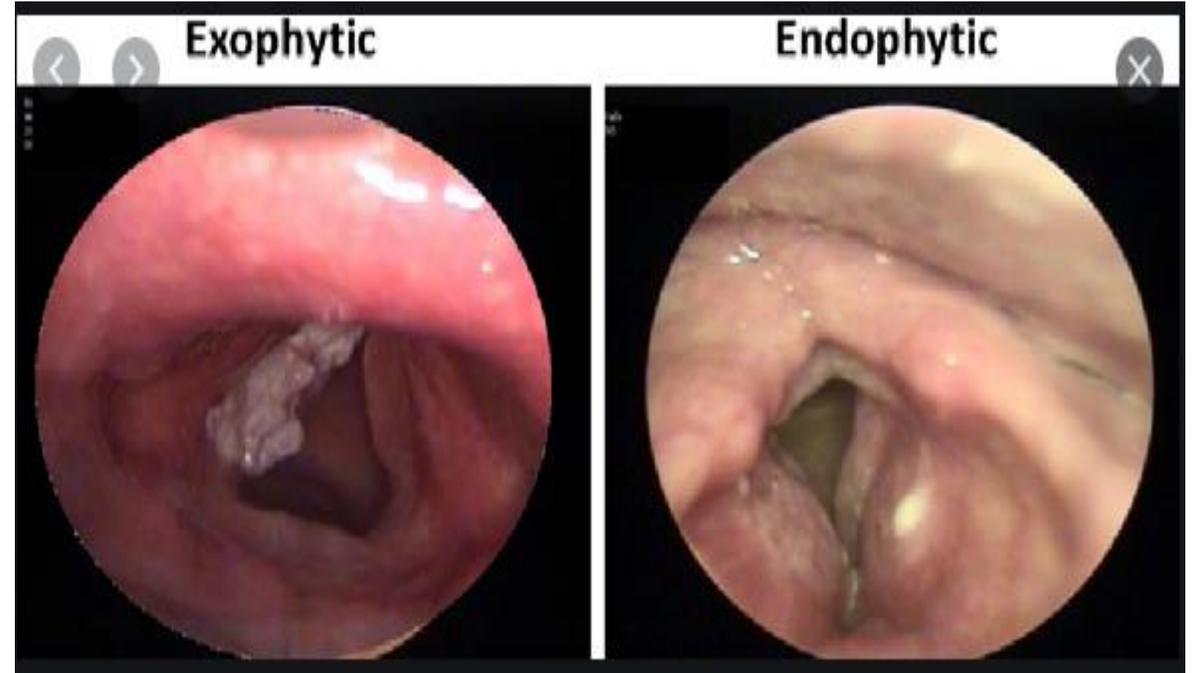
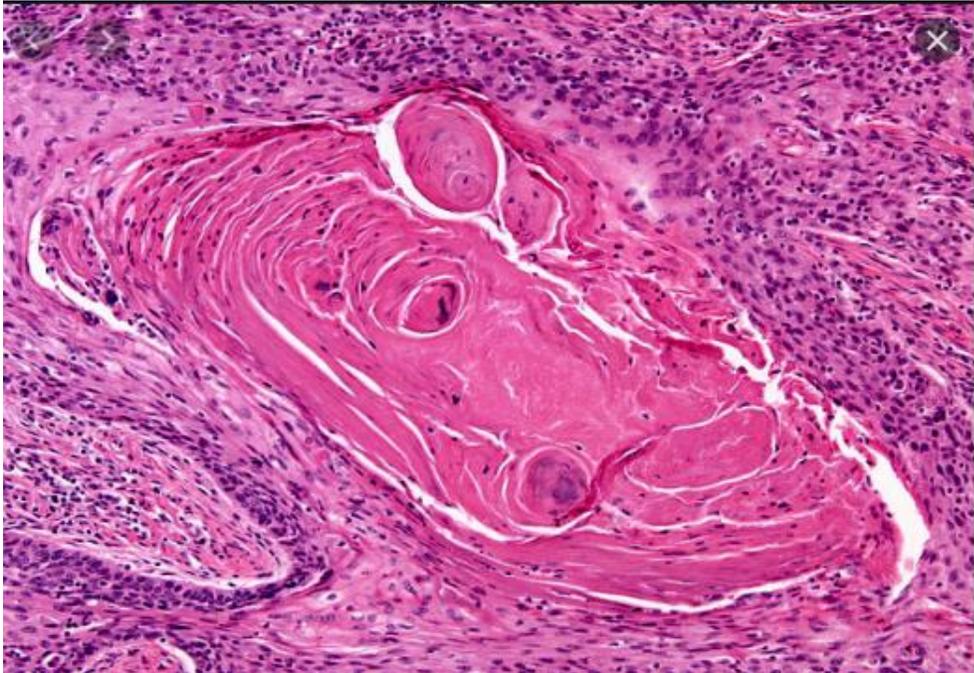
EPIDEMIOLOGY

- In the 1950s, the male-to-female ratio in patients with laryngeal cancer was 15:1.
- This number had changed to 5:1 by the year 2000, and the proportion of women afflicted by the disease is projected to increase in years to come.
- These changes are likely a reflection of shifts in smoking patterns, with women smoking more in recent years.
- Laryngeal cancer most commonly affects men middle-aged or older. The peak incidence is in those aged 50-60 years.

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

- Laryngeal squamous cell cancer has characteristic patterns of spread depending on the site of origin.
- Local spread is along tissue planes, while lymphatic spread is guided initially by the boundaries between embryological anlagen (arches III–VI).
- There is no true anatomical barrier to check spread between the supra- and subglottis.
- Lymphatic spread of glottic cancer is less common than at other subsites due to the lack of submucosal lymphatics in this area.
- Spread to the lymphatics by squamous cell glottic carcinoma when it occurs, is to levels II, III, IV and VI.

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).

LARYNGEAL CANCER SPREAD

PRIMARY SITE	PART OF PRIMARY SITE	LOOK FOR INVOLVEMENT OF
SUPRAGLOTTIC	Epiglottis	Pre-epiglottic space
	Epiglottic petiole	Anterior commissure
	Intra-laryngeal mucosa, false cords	Paraglottic space
	All	Vocal fold
		Laryngeal Cartilage
GLOTTIS	Anterior Cord	Anterior commissure/contralateral cord
	Posterior Cord	Thyroid cartilage and cricothyroid membrane
	All	Arytenoid cartilage/cricoarytenoid joint/posterior commissure
		Paraglottic space
		Supraglottic/subglottic spread
SUBGLOTTIS		Trachea
		Thyroid Gland
		Cervical oesophagus

CLINICAL PRESENTATION

- **GLOTTIC CANCER**

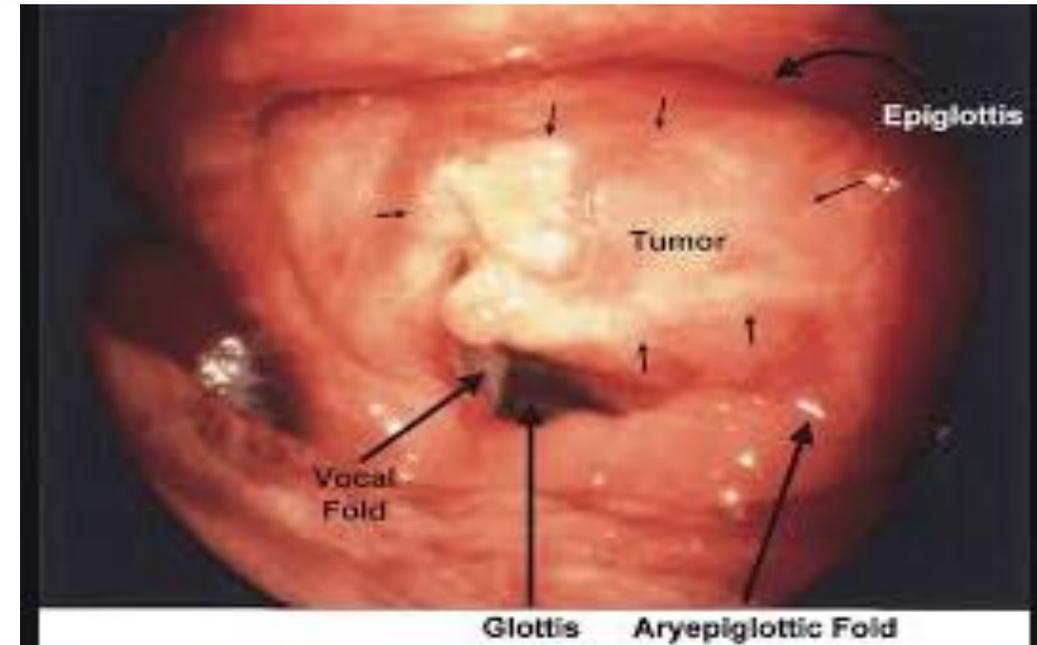
- ✓ Hoarseness is the earliest symptom and hoarseness more than three weeks should be evaluated by otolaryngologist
- ✓ Progressive dyspnea and stridor
- ✓ Hemoptysis indicates large tumor
- ✓ Referred otalgia is a sinister sign indicating deeper invasion

- **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

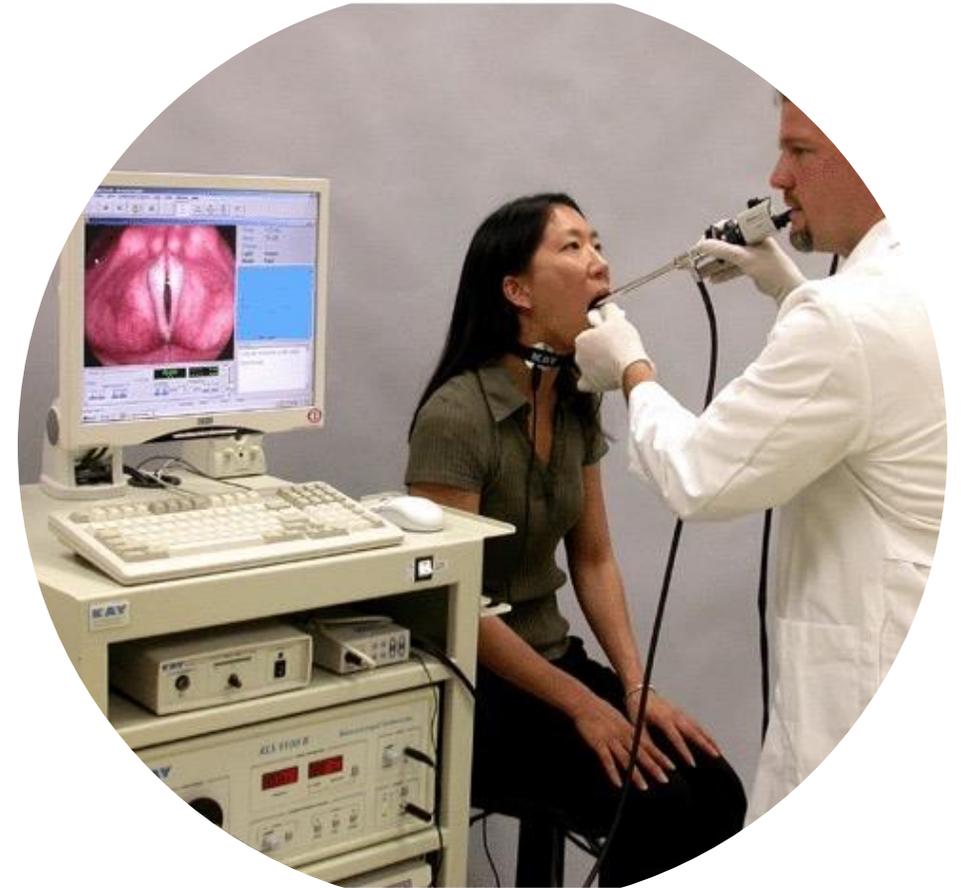


DIAGNOSIS- CLINICAL EXAM AND LARYNGOSCOPY

- 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)

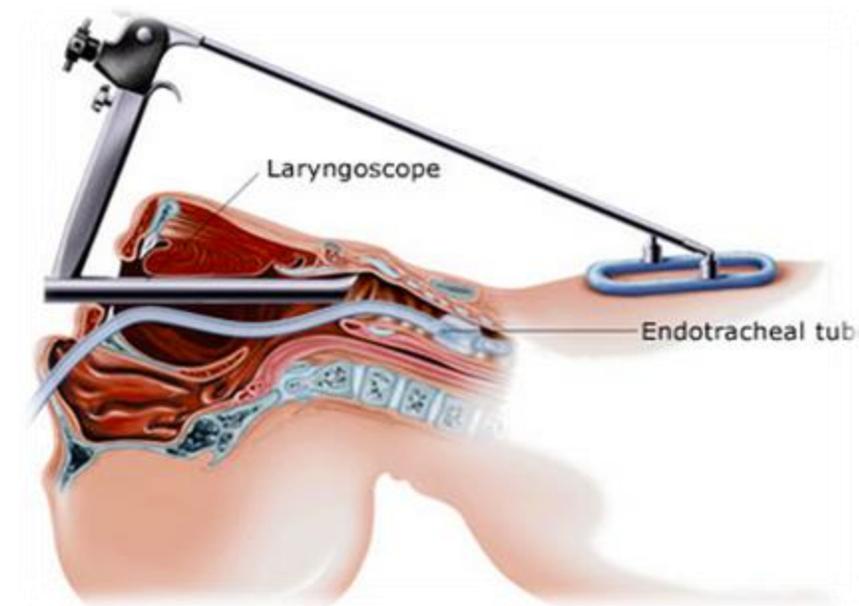
DIAGNOSIS- CLINICAL EXAM AND LARYNGOSCOPY

- The sensitivity and specificity of **videostroboscopy** in predicting the invasive nature of lesions based on absence or mucosal reduction was 96.8% and 92.8%, respectively.
- It is extremely important to perform biopsy of the primary site or by fine needle aspiration of the affected lymph node if possible.



OPERATIVE ENDOSCOPIC EXAMINATION AND BIOPSY

- Direct laryngoscopy allows the clinician to examine the larynx in greater detail, palpate the larynx, and obtain a biopsy for histologic analysis.
- Maintenance of a secure airway at all times is the paramount concern, and for severely compromised airways, a **tracheostomy** under local anesthetic may be necessary.



DIAGNOSIS- IMAGING

- It is recommended to perform imaging studies that support staging, such as **computed axial tomography (CT Scan)**, which is a very useful resource for assessing affection of **bone structures**.
- **Positron emission tomography (PET Scan)** combined with CT are useful in evaluating **recurrences** and can identify areas of **local and nodular recurrence and distant metastases**.
- **MRI** surpasses the CT in the detection when **cartilaginous and soft tissues** are affected.
- **CT** sensitivity was 60% and specificity was 85.7% and **MRI** showed 80% sensitivity and 92.9% specificity.

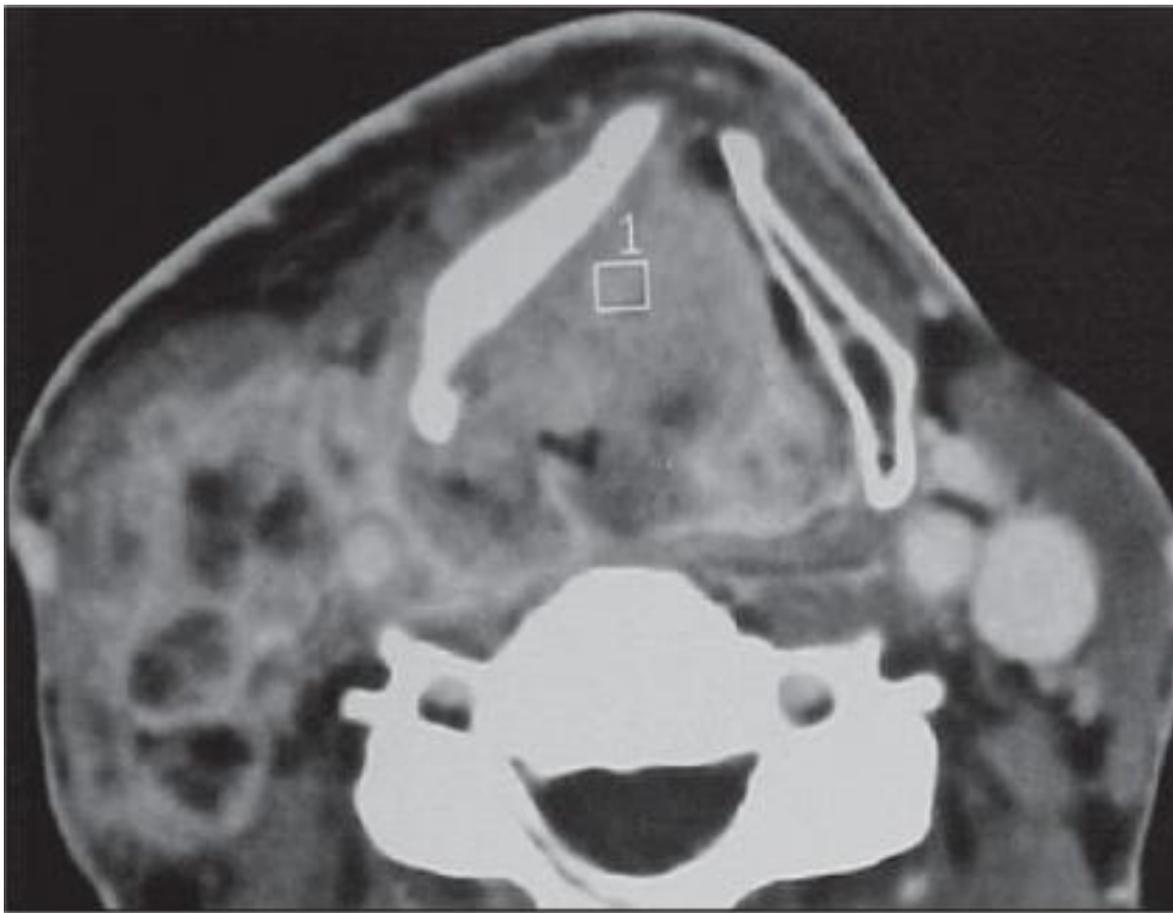


Figure 2. Axial tomographic view at the level of ventricular folds, where a voluminous tumor-like lesion is observed, causing constriction of the larynx lumen. There is a tumor-like component invading the right paraglottic space. Sclerosis is observed on the right wing of the thyroid cartilage, as well as lymphadenomegalies with hypodense nucleus at right.

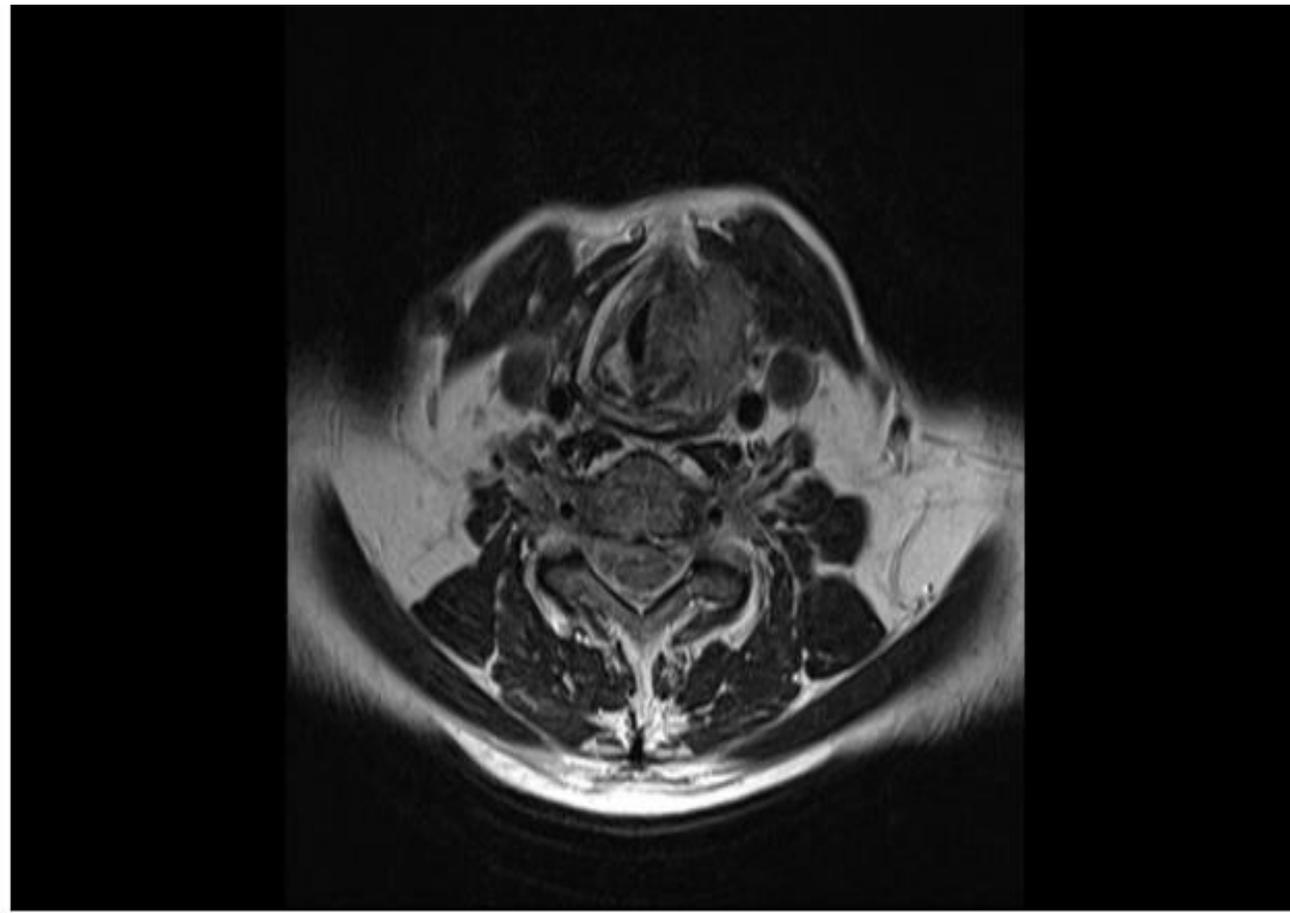
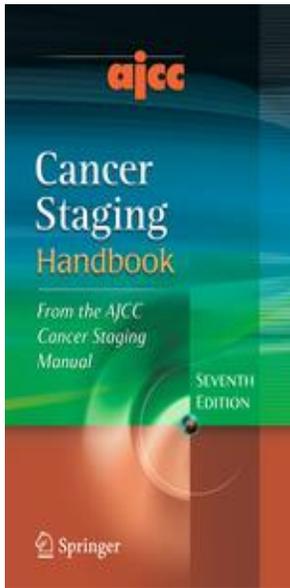


Fig. 3: T2w axial - T4 glottic tumor with infiltration of thyroid cartilage on the left side

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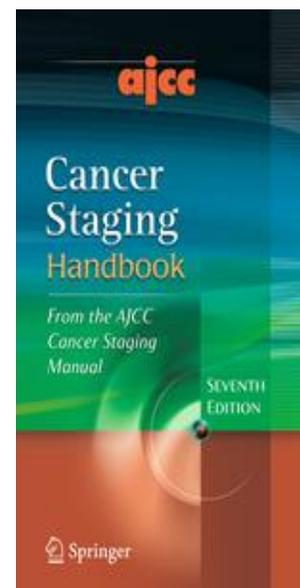
STAGING & MANAGEMENT

HUSSAM SHAKUR



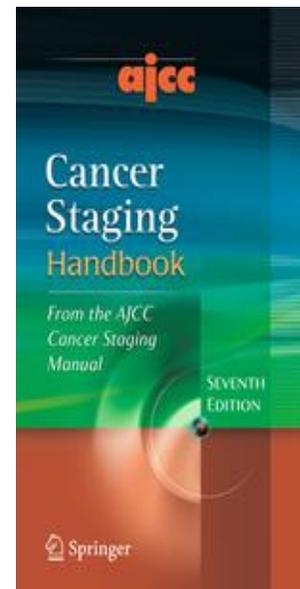
Supraglottis

T1	Tumor limited to one subsite of supraglottis with normal vocal cord mobility
T2	Tumor invades mucosa of more than one adjacent subsite of supraglottis or glottis or region outside the supraglottis without fixation of the larynx.
T3	Tumor limited to the larynx with vocal cord fixation and/or invades any of the following: postcricoid area, pre-epiglottic space, paraglottic space, and/or inner cortex of thyroid cartilage.
T4a	Moderately advanced local disease. Tumor invades through the thyroid cartilage and/or invades tissues beyond the larynx
T4b	Very advanced local disease. Tumor invades pre-vertebral space, encases carotid artery, or invades mediastinal structures



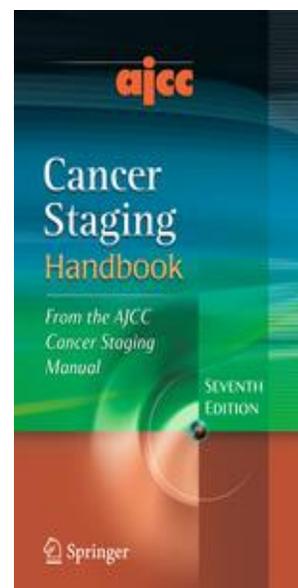
Glottis

T1	Tumor limited to the vocal cord(s) with normal mobility
T1a	Tumor limited to one vocal cord
T1b	Tumor involves both vocal cords
T2	Tumor extends to supraglottis and/or glottis, and/or with impaired vocal cord mobility
T3	Tumor limited to the larynx with vocal cord fixation and/or invasion of the paraglottic space, and/or inner cortex of the thyroid cartilage
T4a	Moderately advanced local disease. Tumor invades through the outer cortex of the thyroid cartilage and/or invades tissues beyond the larynx
T4b	Very advanced local disease. Tumor invades pre-vertebral space, encases carotid artery, or invades mediastinal structures.



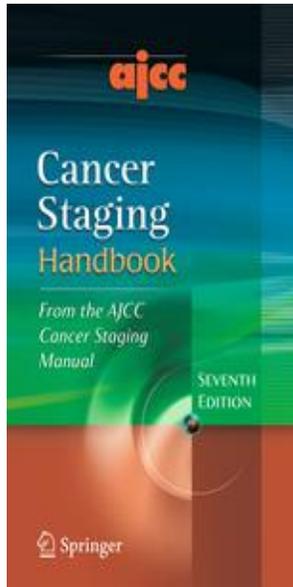
Subglottis

T1	Tumor limited to the subglottis
T2	Tumor extends to vocal cord(s) with normal or impaired mobility
T3	Tumor limited to the larynx with vocal cord fixation
T4a	Moderately advanced local disease. Tumor invades cricoid or thyroid cartilage and/or invades tissues beyond the larynx
T4b	Very advanced local disease. Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures.



Regional Lymph Nodes (N)

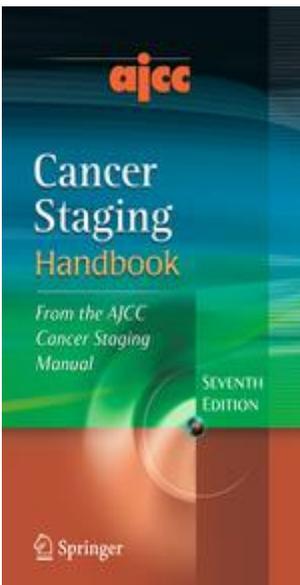
NX	Regional lymph nodes cannot be assessed
N1	Metastasis in a single ipsilateral lymph node, 3cm or less in greatest dimension
N2	Metastasis in a single ipsilateral lymph node, more than 3 cm but not more than 6 cm in greatest dimension; or in multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension; or in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension
N2a	Metastasis in a 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)

M0	No distant metastasis
M1	Distant metastasis

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

Management

PRINCIPLES OF MANAGEMENT OF LARYNGEAL CANCER

- For the purpose of management, laryngeal cancer has been broadly divided into two groups :
 - Early Laryngeal Cancer (Stage I & Stage II)
 - Advanced Laryngeal Cancer (Stage III & Stage IV)

The goals in the treatment of laryngeal cancer are:

1. Healing the patient
2. Preserving the function of the larynx
3. Minimize treatment morbidity

Management

MANAGEMENT OF EARLY LARYNGEAL CANCER

- Modalities of treatment for early laryngeal cancer.
 - ✓ Radiotherapy
 - ✓ Transoral endolaryngeal surgery

Note: in early Sub glottis tumors: Lesions can be successfully treated by radiotherapy alone with preservation of the normal voice. Surgery is reserved for cases of radiotherapy failure or for patients who cannot be easily assessed for radiation therapy

Management

In a study by Chung et al., it was found that **radiotherapy** has a 3-year local control of 91.9% and a 5-year local control of 89.9% compared to 82.8% and 73.2% control in the **cordectomy** group. [13] The healing opportunities are extremely good with any of the following options: radiotherapy, trans oral laser microsurgery and open partial laryngeal surgery. A systematic review has found insufficient evidence to determine which of these options is most effective in early carcinoma [6]

Modality of Treatment	ADVANTAGE	DISADVANTAGE
Radiotherapy	Better voice outcomes, Laryngeal structures preserved	Radical treatment Complications like Mucositis, Odynophagia, Laryngeal edema, Xerostomia, Stricture and fibrosis, Radionecrosis, Hypothyroidism.
Transoral Endolaryngeal surgery	Single sitting, Minimal absence from employment, Certainty of removal of specimen, Ability to assess margin & Allows further laryngeal surgery or radiotherapy	Affect voice quality, Access difficulty, May need repeated operations.

Management

MANAGEMENT OF ADVANCED LARYNGEAL CANCER

Combination therapy (Multimodality)

- The main options for the treatment of advanced laryngeal cancer currently are –
 - ✓ Total Laryngectomy or **And /or**
 - ✓ Chemoradiotherapy

Management of T4 disease

- **Supraglottis and glottis:** Chemotherapy given together with radiotherapy may be considered for patients who require total laryngectomy to control the disease. It is possible to select induction chemotherapy followed by concurrent chemotherapy and radiation. Laryngectomy is reserved for patients with less than 50% response to chemotherapy or for those who have persistent disease after radiation. Definitive radiotherapy alone is preferred in patients who are not eligible for simultaneous chemotherapy and surgery (total laryngectomy) to rescue radiation failures [20].
- **Subglottis:** Total laryngectomy together with thyroidectomy and dissection of bilateral tracheoesophageal ganglia usually followed by postoperative radiotherapy are indicated. Radiation therapy alone is indicated for patients who are not eligible for surgery [15,18].

Management

Modality of Treatment	ADVANTAGE	DISADVANTAGE
Total Laryngectomy	Excellent local and regional control	Poor voice production and communication, Bad psychological effects
Chemoradiotherapy	Organ preservation?, Less distant metastases	Double local recurrence rate,
Transoral Endolaryngeal surgery	Good local and regional control Laryngeal preservation surgery,	Need radiotherapy or chemoradiotherapy post surgery in maximum cases. Expertise required to get better results and more studies required
Open Partial/Sub-total Laryngectomy	Good local and regional control Laryngeal preservation surgery,	Done on small T3 tumors only Expertise required to get better results and more studies required

MANAGEMENT OF NODAL METASTASES

- For early laryngeal cancer, the risk of metastasis, especially for glottic cancer, is negligible. Therefore, the nodal basins are not treated electively.
- In advanced laryngeal cancer, there is high risk of occult nodal metastases, of up to 60 %, esp. when supraglottis is involved. Therefore, in the N0 neck, the primary echelon nodes are treated electively either by radiotherapy or surgery.
- 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.
- 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.

MANAGEMENT OF NODAL METASTASES

- In advanced nodal disease (N2 or N3), if the primary treatment is being treated by surgery then a Modified radical neck dissection (**MRND**) is defined as the excision of all lymph nodes routinely removed in a radical neck dissection with preservation of one or more nonlymphatic structures , should be performed with consideration of postoperative radiotherapy or chemo radiotherapy.
- If the primary treatment is being treated by chemotherapy, further treatment is controversial. The options are neck dissection or treatment followed by PET scan.

According to the pathological findings after primary surgery, postoperative radiotherapy or postoperative chemoradiotherapy is used as an adjuvant treatment when the following histological features are present:

1. T4 disease.
2. Perineural invasion.
3. Lymphovascular invasion.
4. Margins compromised or less than 5 mm.
5. Extracapsular extension in a lymph node.
6. Commitment of two or more lymph nodes.

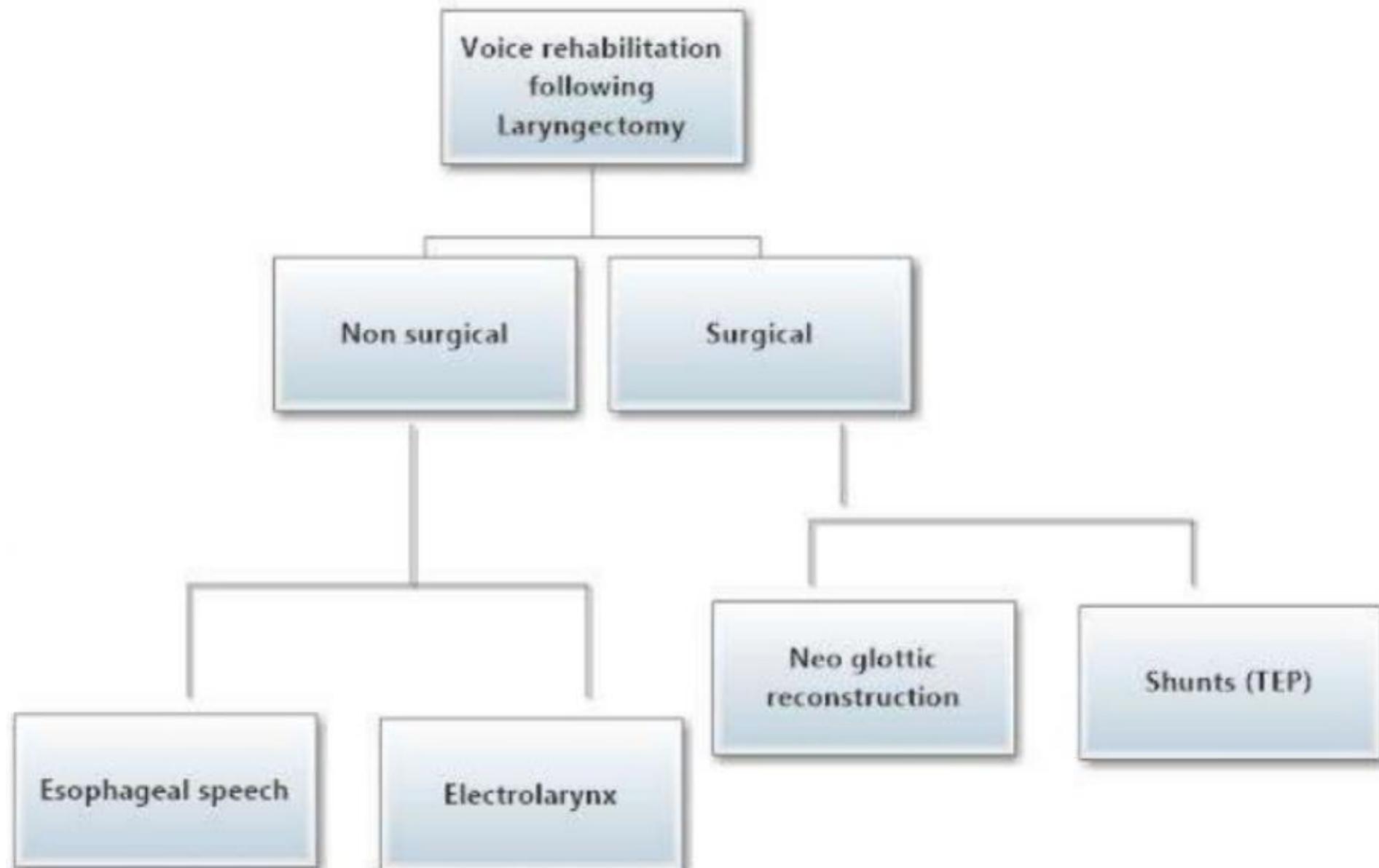
PROGNOSIS

	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

Laryngeal cancer morbidity

- Functional alterations following total Laryngectomy:
 1. Loss of smell.
 2. Changes in normal swallowing mechanism.
 3. Changes in the pattern of respiration.
 4. Most importantly Loss of speech.

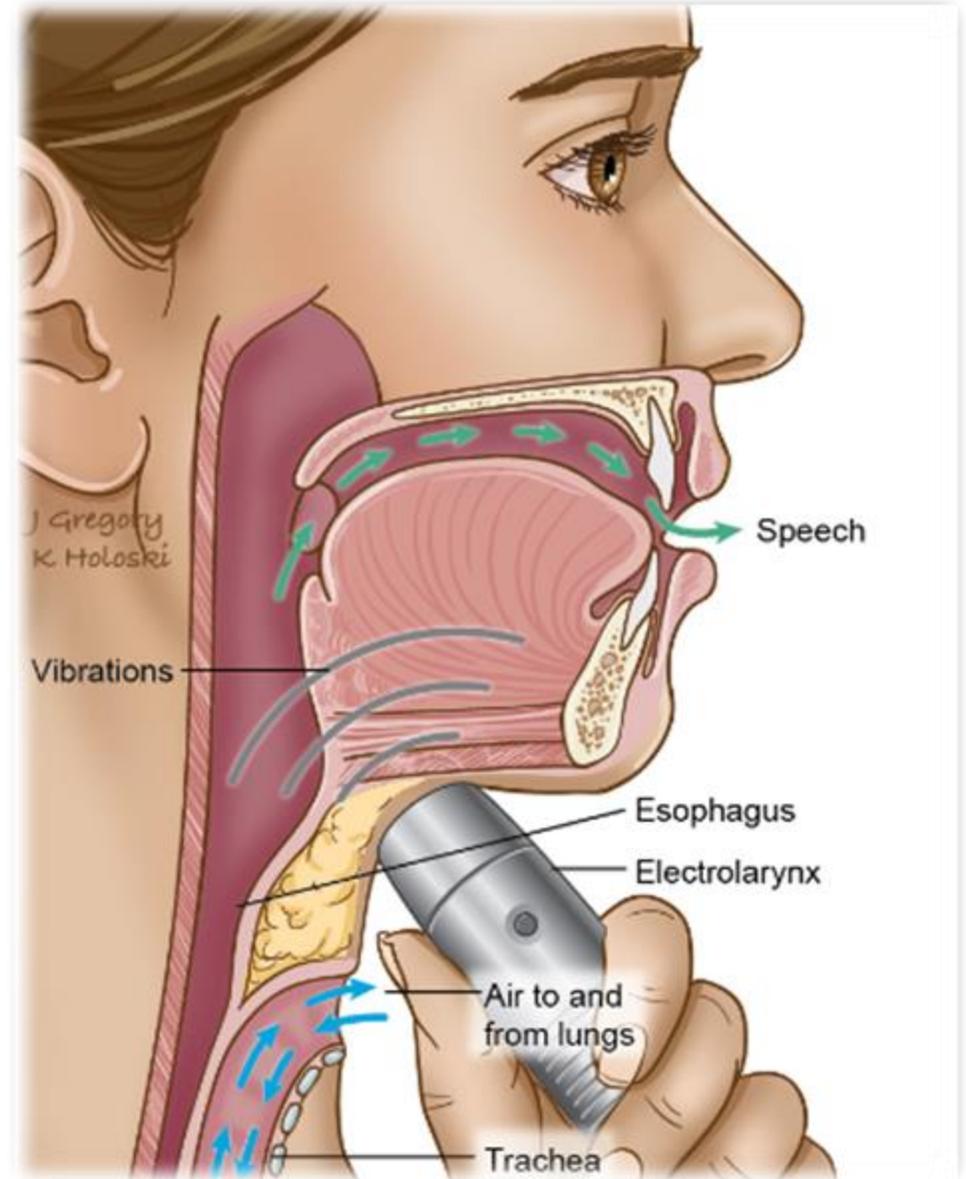


Esophageal speech:

- Physiology: Air is swallowed into cervical esophagus, swallowed air is then expelled out causing vibrations of pharyngeal mucosa. These vibrations along with articulations of tongue cause speech to occur, The exact vibrating portion of pharynx is the pharyngo-esophageal segment, The vibrating muscles and mucosa of cervical esophagus and hypopharynx cause speech.
- Advantages: Patient's hands are free, No additional surgery / prosthesis needed. Get easily adapted to esophageal voice.
- Disadvantages: Nearly 40% of pts fail to develop esophageal speech, Quality of voice generated is rather poor, Pt. may not be able to continuously speak using esophageal voice without interruption. They will be able to speak only in short bursts, Significant training is necessary, Loudness / pitch control is difficult, Fundamental frequency of esophageal speech is 65 Hz which is lower than that of male and female frequencies.

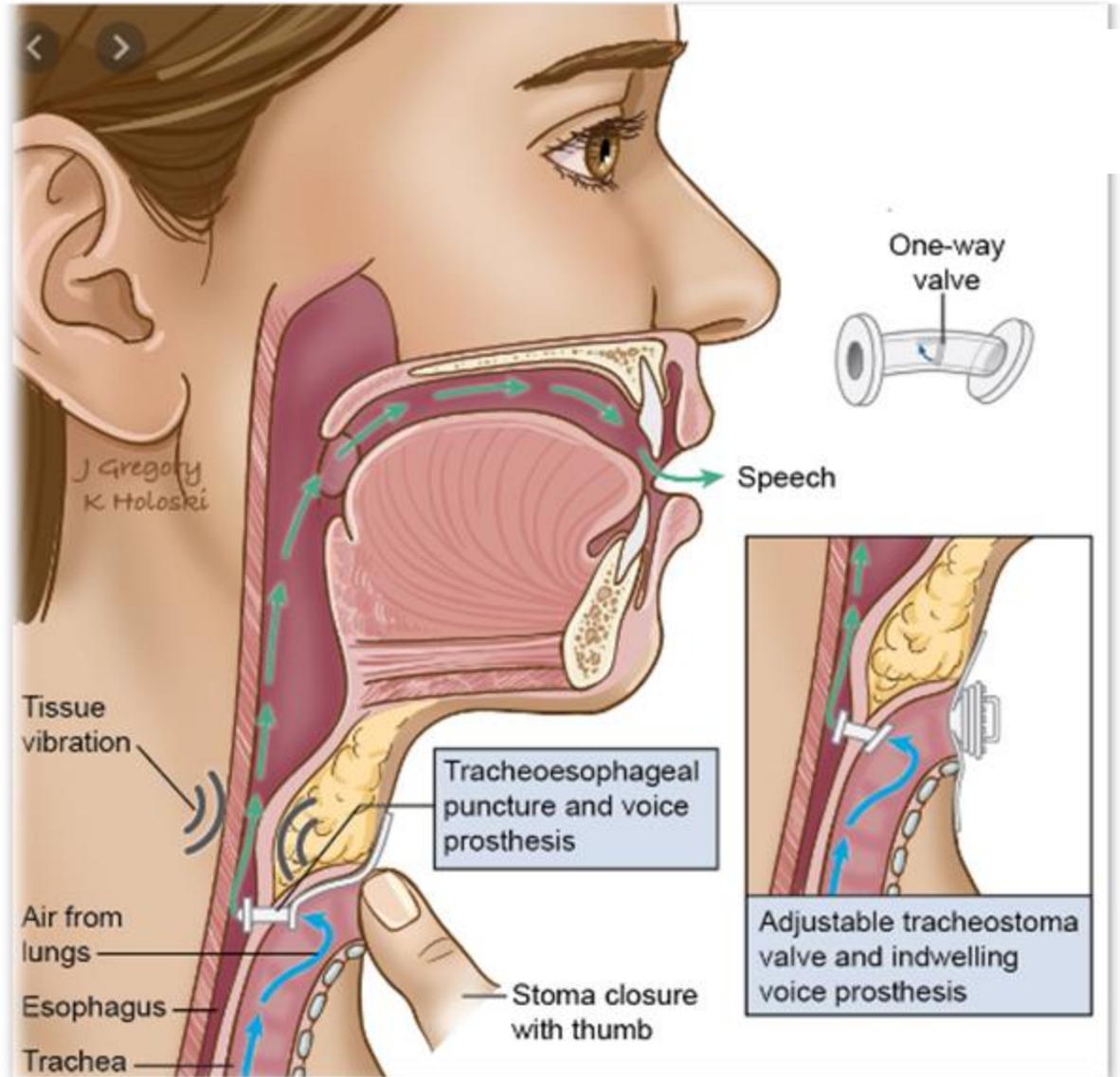
Electro larynx

- These are battery operated vibrating devices
- 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.



Shunt surgeries- Tracheoesophageal Shunt (TEP)

- Was first introduced by Blom and Singer in 1979.
- 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 in the trachea. It fits snugly into the trachea-esophageal wound.



Conclusion

- Laryngeal cancer is the second most frequent tumor of the upper aerodigestive tract.
- The most common type is squamous cell carcinoma, accounting for 85-95% of neoplasms.
- The most important risk factors are alcohol and tobacco consumption.
- The diagnosis is made by histopathology; however a complete medical history and physical examination should be performed. The direct visualization by direct or indirect laryngoscopy, or videostroboscopy are fundamental in the diagnosis process. The mass should be evaluated completely by extension imaging studies such as a computed tomography or nuclear magnetic resonance.
- Staging of the patient is vital for the correct treatment approach

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THANK YOU!