SAS Journal of Medicine
Abbreviated Key Title: SAS J Med
ISSN 2454-5112
Journal homepage: https://saspublishers.com

OPEN ACCESS

Radiology

Contribution of Imagery in Larynx Cancer: About 61 Cases

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DOI: https://doi.org/10.36347/sasjm.2024.v10i10.054 | **Received:** 22.09.2024 | **Accepted:** 26.10.2024 | **Published:** 31.10.2024

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Abstract **Original Research Article**

Extensional imaging of laryngeal tumors relies on multi-bar helical CT scans. This examination requires compliance with a few simple rules in its preparation and performance. The protocol for performing cervico-mediastinal CT scans will be developed. Imaging must take into account not only the initial tumor pathology, but also the entire upper aero-digestive tract and lymph node areas, i.e. acquisition must extend from the base of the skull to the cervico-mediastinal orifice. Thoracic imaging should be performed as a matter of course for overall patient management. Certain deep extensions, only accessible by imaging, are decisive in the choice of treatment: surgery or radio-chemotherapy. In the case of surgery, imaging is a key factor in the choice of total or partial surgery. A complete lymph node survey is also essential in the management of these lymphophilic tumors.

Keywords: Larynx, Cancer, Imaging, CT.

INTRODUCTION

Laryngeal cancers play an important role in all cancers of the aerodigestive tract. The management of laryngeal cancer requires the most accurate assessment of tumor extension possible.

Direct laryngoscopy and computed tomography (CT) are the standard explorations used to assess the extent of these tumors.

MATERIALS AND METHODS

- This is a three-year retrospective study from March 2020 to June 2022 of 61 cases of laryngeal cancer. The cases were collected in the radiology department of the Avicenne military hospital in Marrakech.
- All patients underwent endoscopy under general anaesthesia and cervical CT.
- Cervical MRI was performed in 37 patients.
- All scans were performed using a multi-bar helical scanner.

Injection of contrast medium was systematic:

- Total volume of PDC: 2 ml/kg.
- Two-phase operation:
  - Impregnation phase 2 min before the examination, 1/3 of the dose
  - Vascular opacification phase, 2/3 of the dose
- Acquisition at 50 to 70 seconds

Comparison of the results of direct laryngoscopy and CT scan with those of anatomopathological examination of the surgical specimen.

RESULT

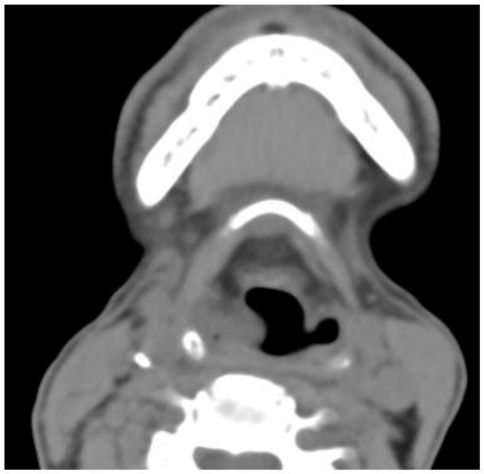
The mean age of our patients was 64 years, with a history of smoking in 37 cases, alcoholism in 23 and no previous treatment for laryngeal pathology.

The dominant symptom was dysphonia.

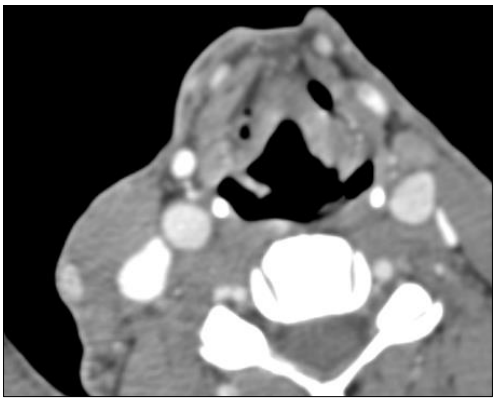
Laryngeal endoscopy revealed a budding and hemorrhagic tumor in 34 cases with a glotto-susglottic tumor topography in 16 cases, glotto-sousglottic in 6 cases, glottic in 9 cases and trans-glottic in 30 cases.

Squamous cell carcinoma was present in 100% of cases. Tumor recurrence after treatment was revealed on :

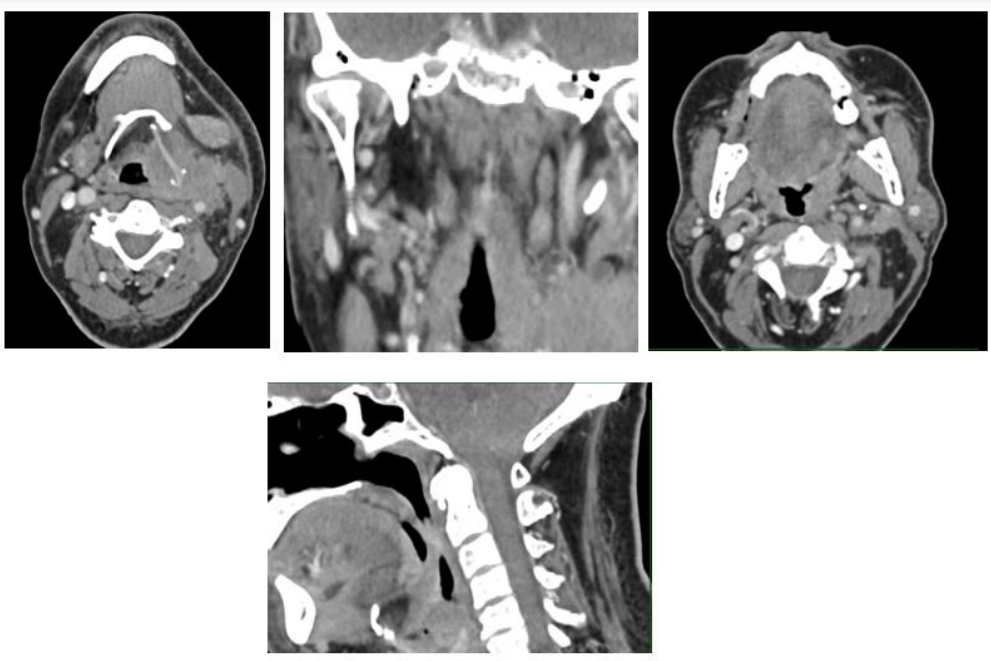
- 16 follow-up CT scans
- 3 cases of follow-up cervical MRI.



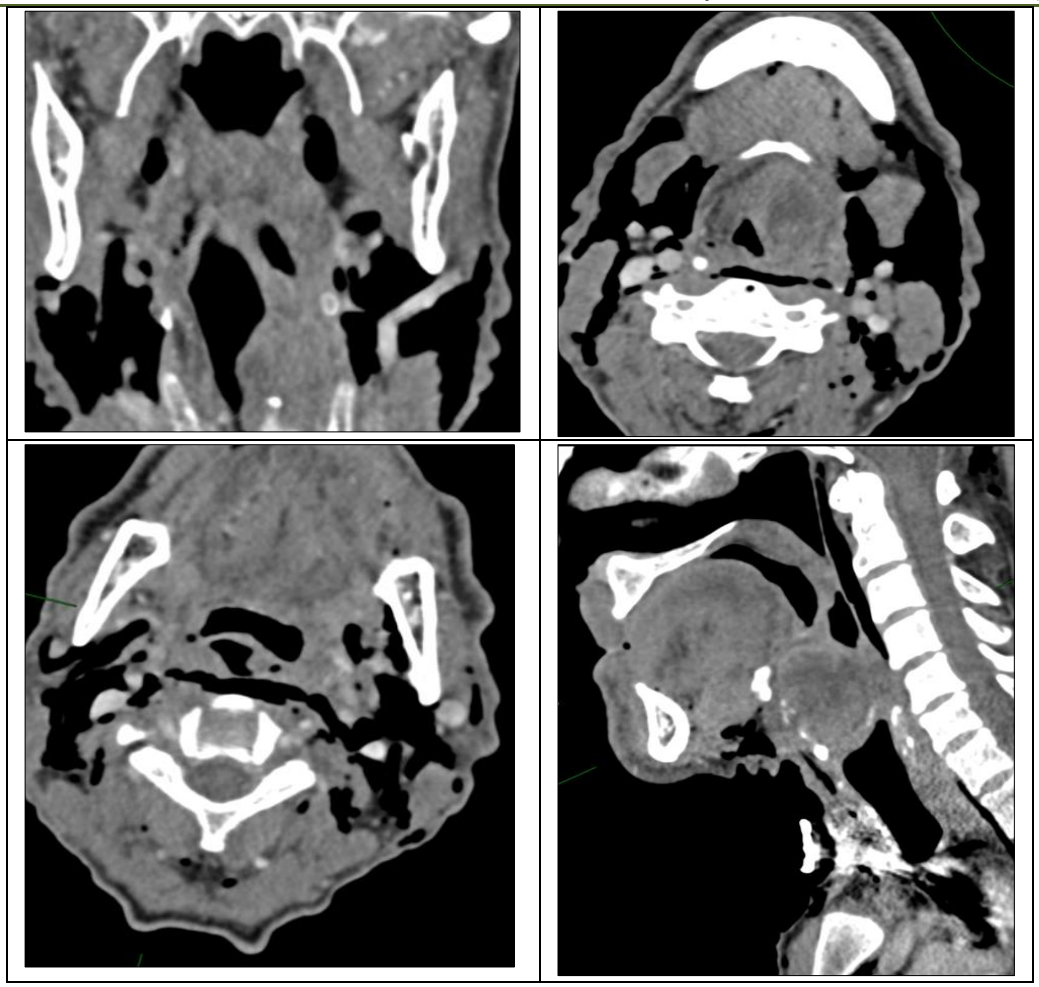
Tumoral Process Above the Glottis: Tumoral process invading the right aryepiglottic fold.



Tumor Process Partially Filling the Left Piriform Sinus

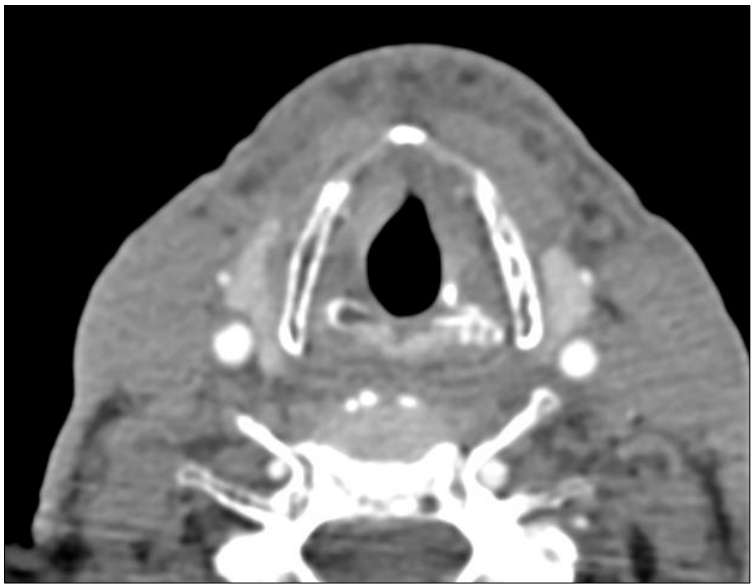


Tumor of Interest in the Supraglottic Region, Predominantly on the Left:
Thickening of the ventricular bands, vallecles, HTE lodge, left ary-epiglottic fold.
Infiltration of the para-laryngeal fatty space bilaterally, more on the left side.
Infiltration of the pre- and peri-vertebral space.

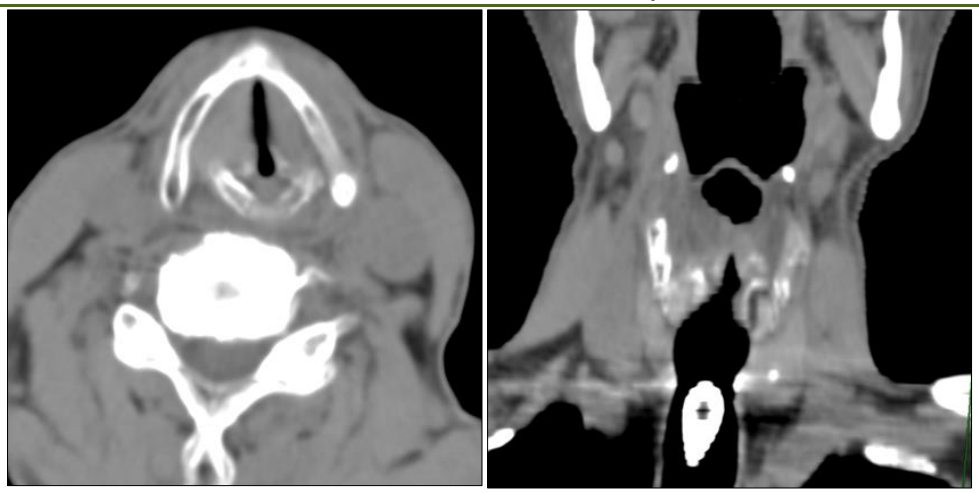


Supraglottic Tumoral Process:
Narrowing with laryngeal stenosis,
Fills the left ventricular band, the vallecules, the HTE loge, the area of the three folds and left piriform sinus.

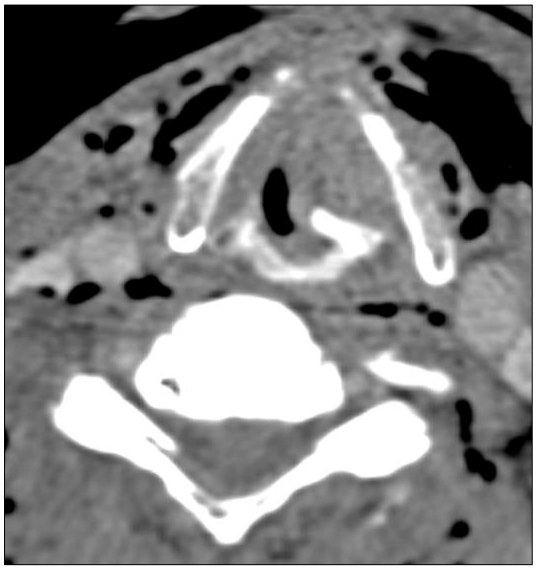
Figures 1: Upper glottic stage



(a) Glottic tumoral process: tumoral thickening of the right vocal cord responsible for a reduction in the laryngeal lumen.

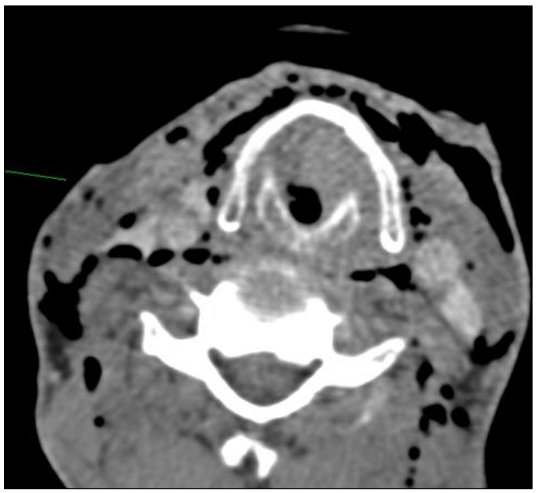


(b) Glottic tumor process: Tumor thickening of the right vocal cord with significant reduction of the laryngeal lumen.



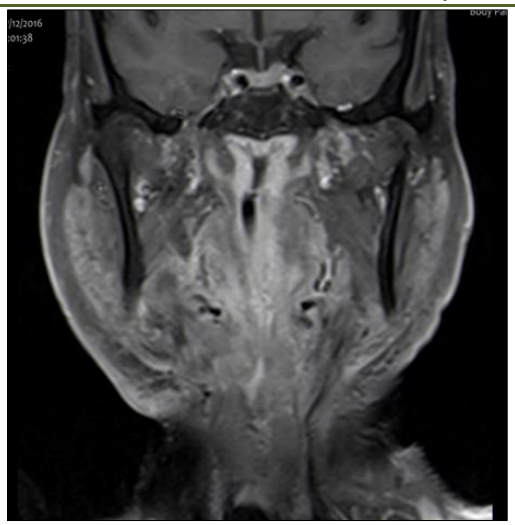
(c) Tumor involving the anterior commissure of the left vocal cord.
Infiltrates para-laryngeal fat. Subluxation and condensation of the left crico-arytenoid cartilage

Figures 2: Glottic stage



Tumoral process budding in the subglottic lumen, respecting the cricoid chaton.

Figure 3: Subglottic stage

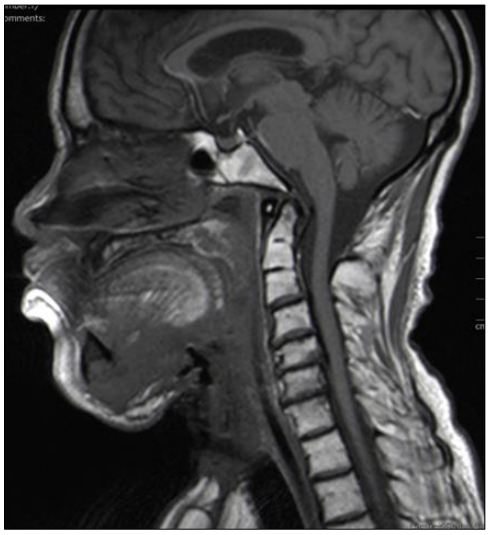


a. 68 years old, neo larynx operated and irradiated:

-Absence of tumor residue or recurrence.

Thickening of the laryngectomy site.

Edematous infiltration and remodeling of peri-laryngeal soft tissues.



b. 64 years old, laryngeal carcinoma treated with radio-chemotherapy

Figure 4

DISCUSSION

Laryngeal cancers predominate in men between the ages of 45 and 70. Incidence rises in young adults and women, especially in urban areas. Tobacco is the main carcinogen.

Squamous cell carcinoma is the most common histological type, and clinical signs vary according to the tumor's origin and evolution (dysphonia, dysphagia, dyspnea).

Endoscopy under general anaesthetic is essential for the assessment of laryngeal cancers, as it is for any other site in the upper aerodigestive tract.

Its objectives are to determine the local extension of the tumour, to perform the biopsy and to examine the entire mucosa of the VADS for any other synchronous location. This alone is insufficient to assess locoregional extension, hence the importance of CT scanning.

CT is currently the most commonly used examination for assessing the initial extension of these cancers. The introduction of multi-slice scanners has enabled us to explore the entire larynx in less than 20 seconds, reduce motion artifacts, perform dynamic maneuvers and produce two-dimensional reconstructions. Optimized PDC injection ensures good tumor impregnation.

CT scans can also be used to explore all lymph nodes, and to determine the extent of the disease. Supraglottic tumors account for around 46% of laryngeal tumors and have 4 main localizations: tumors of the laryngeal face of the epiglottis, tumors of the laryngeal margella, tumors of the ventricular band and tumors of Morgagni's ventricle, which are often discovered late.

Key Points in the Extension Work-Up :

- Downwards to the glottic plane: frontal reconstructions in phonation.
- Upwards to the vallecula and tongue base: sagittal reconstructions of the tongue base.
- Hyo-thyro-epiglottic loge (HTE): replacement of pre-epiglottic fat by tumor (axial sections and sagittal reconstructions).

Cartilage damage is manifested by three types of change on CT: condensation, which is frequent; erosions, which indicate the onset of cartilage extension; and frank lysis.

Glottic tumors account for 45% of laryngeal tumors, and can involve the anterior commissure: anterior tissue thickening in direct contact with the cartilage, the contralateral vocal cord, the cartilage at the foot of the epiglottis and the preepiglottic lodge, and the posterior commissure.

In-depth extension is towards the vocal muscle, the paraglottic fatty space and the cartilage.

Subglottic tumours are rare. They are deep infiltrating, infiltrating the cricoid cartilage with extra-laryngeal extension to the adjacent soft tissues and thyroid, high and low extension to the trachea.

International Union Against Cancer (UICC) TNM classification updated in 2010.

Classification by stage groups

Upper glottic stage

T1	Tumeur limitée à une seule localisation de l'étage sus-glottique avec mobilité normale des cordes vocales
T2	Tumeur à point de départ sus-glottique étendue à une région adjacente (vallécule, muqueuse de la base de langue, paroi interne du sinus piriforme) avec mobilité cordale conservée.
T3	Tumeur à point de départ sus-glottique avec fixation d'une corde vocale et/ou envahissement de la zone rétrocricoïdienne et/ou envahissement de l'espace graisseux pré-épiglottique (loge hyo-thyro-épiglottique) et/ou envahissement de la paroi interne du sinus piriforme, et/ou envahissement de la base profonde de la langue et/ou lyse *minima* du cartilage thyroïde (corticale interne).
T4	**T4a:** tumeur étendue à travers le cartilage thyroïde et/ou s'étendant à d'autres structures extralaryngées (trachée, parties molles du cou dont les muscles profonds extrinsèques de la langue, muscles infra-hyoïdiens, thyroïde, œsophage). **T4b**: tumeur envahissant l'espace prévertébral, les structures médiastinales, ou englobant l'artère carotide.

Glottic stage

T1	Tumeur limitée au plan glottique mobile (mais pouvant atteindre la commissure antérieure ou postérieure. - T1a : tumeur limitée à une corde vocal . - T_{1b} : tumeur touchant les deux cordes vocales.
T2	Tumeur étendue à la supraglotte et/ou la sous-glotte et/ou avec mobilité altérée
T3	Tumeur limitée au larynx avec corde vocale **fixée**
T4	-T4a: tumeur étendue au cartilage thyroïde et/ou au-delà du larynx (trachée, glande thyroïde, etc.) - T4b: idem supraglotte.

Subglottic stage

T1	Tumeur limitée à la sous-glotte
T2	Tumeur étendue au plan glottique avec une mobilité cordale altérée ou normale
T3	Tumeur à point de départ sous-glottique limitée au larynx avec fixation glottique.
T4	T4a : tumeur étendue à travers le cartilage thyroïde ou cricoïde et/ou s'étendant à d'autres structures extralaryngées (trachée, parties molles du cou dont les muscles profonds extrinsèques de la langue, muscles infra-hyoïdiens, thyroïde, pharynx, œsophage). T4b : idem supraglotte.

N: Adenopathy

N0	Pas de signe d'atteinte des ganglions lymphatiques régionaux
N1	Métastase dans un seul ganglion lymphatique homolatéral ≦ 3 cm dans sa plus grande dimension
N2	Métastase unique dans un seul ganglion lymphatique régional homolatéral > 3 cm et ≦ 6 cm dans sa plus grande dimension, ou métastases ganglionnaires multiples toutes ≦ 6 cm N2a :Métastase dans un seul ganglion lymphatique>3 cm mais ≦6 cm N2b : Métastases homolatérales multiples toutes ≦ 6 cm N2c : Métastases bilatérales ou controlatérales ≦ 6 cm
N3	Métastase dans un ganglion lymphatique > 6 cm dans sa plus grande dimension

T: Primary tumor

Stade 0	Tis	N0	M0
Stade I	T1	N0	M0
Stade II	T2	N0	M0
Stade III	T1, T2	N1	M0
	T3	N0N1	M0
Stade IV $_A$	T1, T2, T3	N2	M0
	T4a	N0, N1, N2	M0
Stade IV $_B$	T4b	Tout N	M0
	Tout T	N3	M0
Stade IV $_C$	Tout T	Tout N	M1

M: distant metastases

M0	Pas de métastase à distance
M1	Présence de métastase(s) à distance

Laryngeal MRI has a very limited role and is indicated in 2ème cases of moderate cartilage extension or deep extension into the vocal cord.

Cartilage damage is reflected by an increase in signal compared with normal cartilage on the T2 sequence, and contrast enhancement on the injected T1 sequence. Diffusion MRI with calculation of the apparent diffusion coefficient in case of doubtful post-therapeutic imaging. Inflammation does not cause diffusion restriction. Tumor evolution is manifested by diffusion restriction with a low ADC.

Laryngeal ultrasound is of no real interest, but is indicated to characterize cervical adenopathies, and can be useful in children. In adults, it is hampered by calcifications and ossifications of the cartilaginous framework, which reduce acoustic windows. It studies infiltration of pericarotid soft tissues, the anterior soft tissues, the thyroid, the HTE lodge, which appears hypoechoic, the base of the tongue and the piriform sinuses (swallowing).

Laryngeal PET-scan is indicated for post-treatment monitoring and differentiation between recurrence and necrosis, detection of uni- or bilateral metastatic cervical adenopathies, as well as second tumor localizations, distant metastases or synchronous tumors of other organs.

CONCLUSION

Laryngeal cancer is common (25% of VADS k), and its main risk factors are alcohol and tobacco abuse. Diagnosis is based on laryngoscopy + biopsy, and CT remains the gold standard for precise extension assessment and post-treatment monitoring, thanks to new imaging sequences.

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