

# Computed Tomography Findings in Cases of Carcinoma Larynx in a Tertiary Care Centre: A Descriptive Study

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## Abstract

**Introduction:** Laryngeal cancer is one of the most common head and neck malignancies, accounting for about 20% of all cases. The association of laryngeal cancer and tobacco smoking is well-established. **Aims and Objectives:** To study the findings of laryngeal cancer on computed tomography. **Materials and Methods:** The study was conducted on 35 patients who came for CT in the Department of Radio Diagnosis at a Tertiary Health Care Centre in a period of 2 years. **Results and Conclusion:** Carcinoma of larynx is less common below the age of 50 years. Maximum numbers of diagnosed patients are in the age group of 60-69 years. Carcinoma of larynx is more common in males. Tobacco smoking has significant risk. Smoking and alcohol act synergistically in predisposing to cancer of larynx. Hoarseness of voice is the most common presenting complaint. Glottic cancers are more common.

**Keywords:** Cancer, Computed Tomography, Larynx

## 1. Introduction

Laryngeal cancer is one of the most common head and neck malignancies, accounting about 20% of all cases<sup>1</sup>. Patients often present with voice changes, sore throat, swallowing difficulty or a lump in neck. Imaging plays an important and complimentary role to clinical examination

as well as endoscopic biopsy in the detailed evaluation of laryngeal cancers. Cross-sectional imaging done with contrast enhanced computed tomography allows excellent depiction of anatomy of larynx and characteristic patterns of submucosal tumour extension<sup>2</sup>. The status of cervical nodal involvement, systemic metastasis etc. is provided by CT imaging.

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## 1.1 CT imaging Findings at Different Levels

### 1.1.1 Supraglottic Carcinoma

Supraglottic squamous cell carcinoma can involve epiglottis, aryepiglottic fold, false vocal fold, as well as deep pre-epiglottic and para-glottic space. Cervical lymph nodes are one of the sites of early metastases.

Asymmetry of the laryngeal sides and cartilage sclerosis is caused by supraglottic soft tissue mass, which displays moderate enhancement. Enlarged lymph nodes more than 1.5 cm in short axis is pathological. Tumour extension can be assessed on CT scan.

### 1.1.2 Glottic Carcinoma

Glottic squamous cell carcinoma involves the true vocal fold. Due to hoarseness of voice it manifests early. As there is lack of lymph drainage of glottis it metastasizes rarely.

Glottic carcinomas can be exophytic or infiltrative enhancing true vocal fold masses. CT is useful for assessment of the extension to anterior commissure (more than 1 mm thickness), posterior commissure, supra- or subglottis.

### 1.1.3 Subglottic Carcinoma

Subglottic squamous cell carcinoma arises from anywhere below the true vocal fold to the inferior edge of the cricoid cartilage. It produces minimal symptoms which are responsible for late detection, early lymph node metastasis and hence poor prognosis.

Enhancing soft tissue is seen at the level of the cricoid cartilage.

## 2. Aims and Objective

To study the spectrum of imaging features of carcinoma of larynx on computed tomography in patients those come to radiology department in tertiary care centre.

## 3. Materials and Methods

- Study design: Descriptive study.
- Study setting: Department of Radio-diagnosis, Tertiary care centre.

- Duration of the study: Period of two years and four months from August 2017 to December 2019.
- Study population: Cases of carcinoma of larynx.
- Sample size: Minimum of 35 cases.
  - Expected frequency: 0.818%
  - Confidence limits: 5%
  - Design effect: 1.0
  - Cluster: 1
  - Confidence level: 99.9%
  - Cluster size: 35
  - Total sample: 35

## 3.1 Eligibility Criteria

### 3.1.1 Inclusion Criteria

- Clinical cases, which are referred to the CT scan Department of Radio Diagnosis of Medical College and Research Centre, irrespective of age and sex.
- Any incidentally found cases of laryngeal cancer.
- All patient with clinical suspicious of laryngeal cancer.

### 3.1.2 Exclusion Criteria

- Pregnancy.
- Patients who are not willing to give consent.
- All restless patient
- Patient in whom CT is contraindicated due to any other reason.
- Patients with trauma to neck.

## 4. Methodology

The study was conducted in CT section of Department of Radio Diagnosis of Medical College and Tertiary Health Care Centre. 35 patients were included in the study. ICE approval was obtained at the start of the study. All patients were called with at least 6 hours fasting before the scan, except for the patients who were scanned on emergency basis. A written consent was obtained from each patient (or patient's parents, in case of minor) after explaining the possibility of a contrast reaction. The bio data, detailed clinical history and CT findings was noted in pre-designed proforma (Annexure I). All patients were subjected to computerized tomography of the Neck with

CT (Siemens 128 slice Somatom Emotion) machine. The scanning parameters included 120–140 kV(p), tube current of 180–200 mA, 0.5-second scanning time, and a 512 x 512 pixel matrix. The Field of Vision (FOV) was 16–18 cm.

Patients were scanned in the axial (supine) axes. Scout films were taken routinely in all patients before starting the scan. Contiguous 5 mm thick slices were obtained at 5 mm interval using an ultra-high algorithm following the injection of an iodinated contrast agent (total dose 3540 g). A longitudinal field of view was taken that extends from the skull base to the sternoclavicular joints with the patient breathing quietly and not swallowing. Coronal and sagittal

reformatted images of the entire neck will also be obtained. Images were reviewed with soft tissue window and bone window settings contacts ossified laryngeal cartilage. It should be ensured that axial images are reformatted in the plane of the larynx. Recent studies have explored the use of post processing such as ‘virtual endoscopy’ which may be useful in evaluating features such as subglottic extension<sup>3</sup>.

## 5. Observations and Results

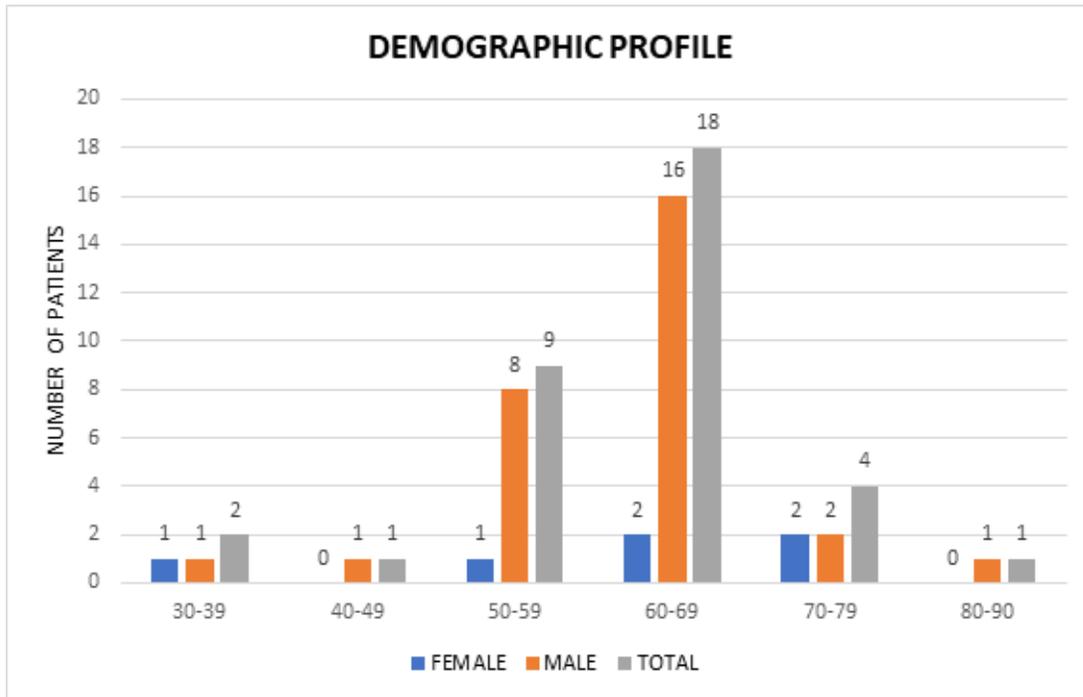
The present study was carried out to study the findings of carcinoma of larynx. Only patients fulfilling the inclusion and the exclusion criteria were included in the

**Table 1.** Age distribution

Age Group	Total	Percentage
30-39	2	5.71
40-49	1	2.86
50-59	9	25.71
60-69	18	51.43
70-79	4	11.43
80-90	1	2.86
<b>Grand Total</b>	<b>35</b>	

**Table 2.** Gender distribution

Gender	Number of Patients	Percentage
Female	6	17.14
Male	29	82.86
<b>Grand Total</b>	<b>35</b>	



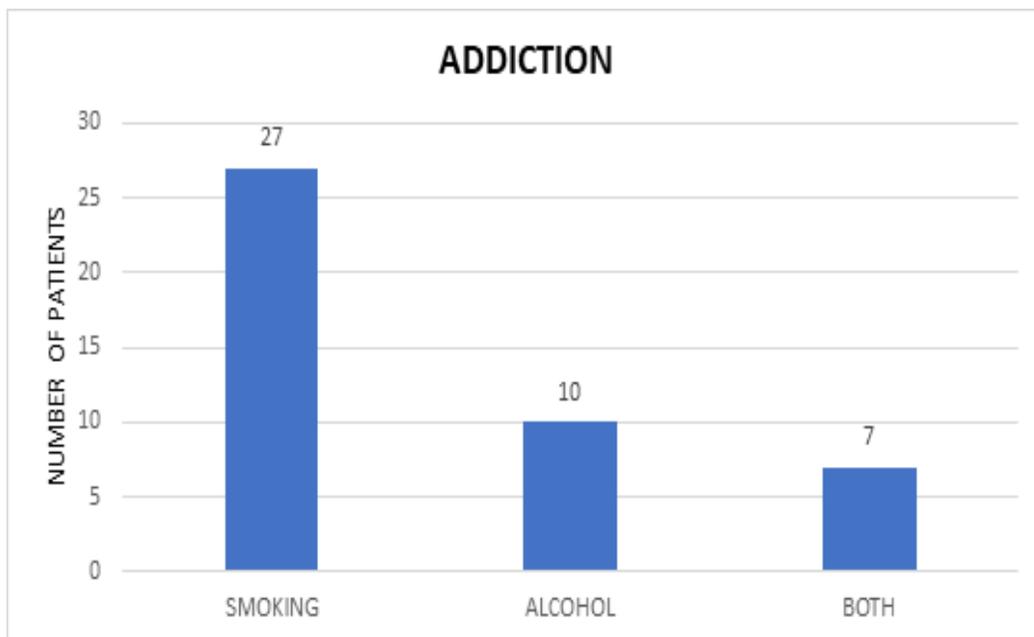
**Chart 1.** Graph showing age and gender distribution.

**Table 3.** Clinical symptoms distribution

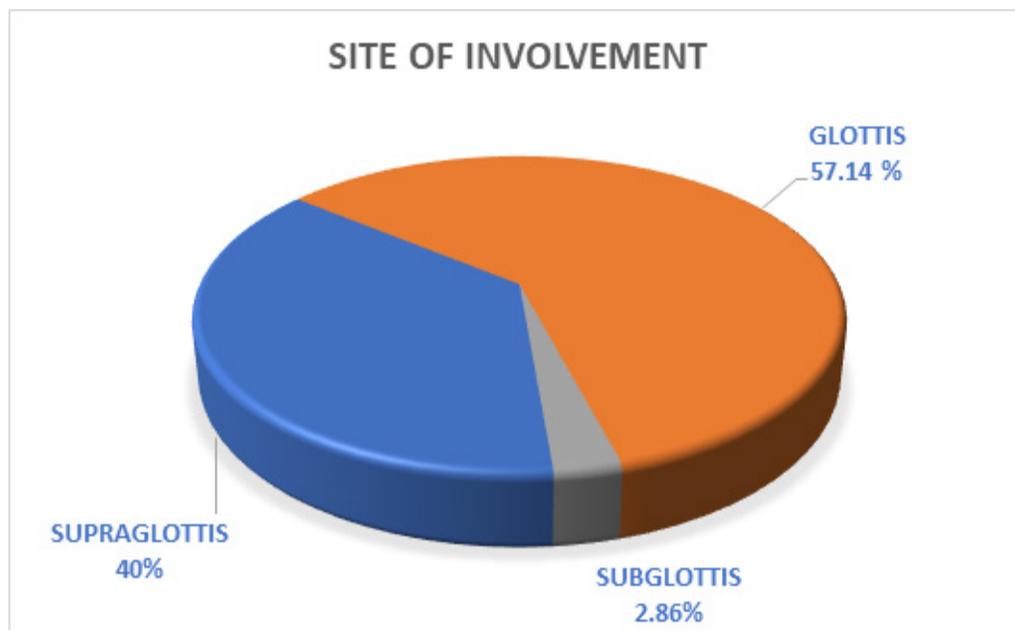
Clinical Symptoms	Number of Patients	Percentage
Dysphagia	24	68.57
Hoarseness of Voice	25	71.43
Dyspnoea	12	34.29
Neck Swelling	13	37.14
Weight Loss	17	48.57

study. Findings in the patients studied were tabulated using Microsoft Excel software. During the period of 24 months of the study, total 35 patients were studied and we obtained following observations and results:

The peak incidence of laryngeal cancer was in males of age group 60-69 years (n = 16, 45.7%) followed by males of age group 50-59 years (n = 8, 22.86%). In females there are 2 cases (5.71%) in 60-69 years and 70-79 years age groups each. (Tables 1 and 2 and Chart 1)



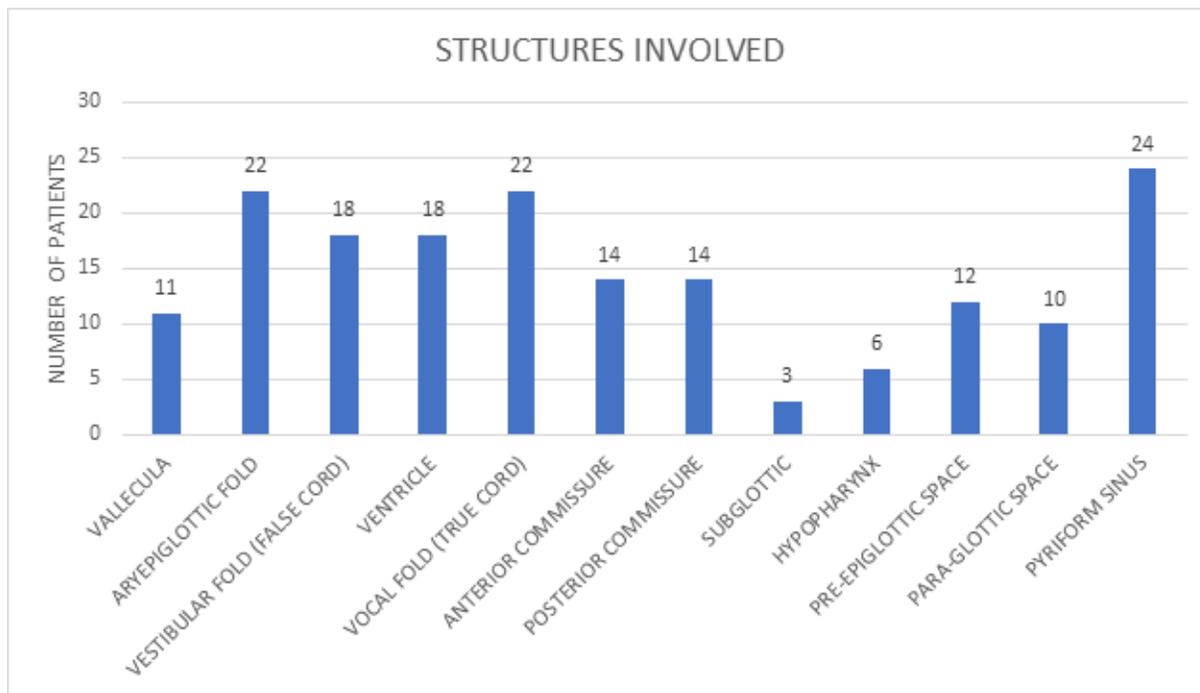
**Chart 2.** Graph showing addiction.



**Chart 3.** Pie diagram showing percentage of site of involvement in Larynx.

The clinical presentations of the patients were studied that revealed hoarseness of voice is the most common symptom seen in majority of cases and was seen in 25

cases (71%). Difficulty in swallowing (dysphagia) was seen in 24 cases (68%), weight loss in 17 cases (48%), neck



**Chart 4.** Graph showing structures involved.

swelling in 13 cases (37%) and difficulty in breathing in 12 cases (34%) (Table 3).

It was seen that out of 35 cases 27 (77%) were chronic smokers. 7 (20%) out of 10 cases drink alcohol along with smoking. (Chart 2).

Of 35 cases it was found that glottic cancer (with and without supra/infra glottic extension) was more common 21 cases (57.14%). Supraglottic cancer was seen in 13 cases (40%) and subglottic cancer accounted for only 2.86% (1 case). However, many of these cases had transglottic spread. (Chart 3).

In 35 cases the different structures involved were studied, it was found that pyriform sinus is involved in maximum no of cases either primarily or extension to pyriform sinus followed by vocal folds (n = 22 cases 62.85%), aryepiglottic folds (n = 22, 62.85%) vestibular folds (n = 18, 51.42%), ventricles (n = 18, 51.42%), anterior commissure (n = 14, 40%), posterior commissure (n = 14, 40%), pre-epiglottic space (n = 12, 34.28%), vallecula (n = 11, 31.42%), para glottic space

(n = 10, 28.57%), hypopharynx (n = 6, 17.14%) and subglottis (n = 3, 8.57%). (Chart 4).

## 6. Discussion

Computed tomography imaging techniques have contributed significantly to the detection, localization, characterization and staging of laryngeal cancer. The initial suspicion of laryngeal masses can be achieved by clinical history and examination and once suspected, they can be localized, further characterized and staged by CT. However, the objective of this study is to determine the location of the lesion, its extent, degree of involvement of adjacent structures and accordingly the further management depends.

In the present study, an attempt has been made to study the characteristics of laryngeal cancer on CT scan. All the imaging was done using a Siemens 128 slice Somatom Perspective machine in the Department of Radio Diagnosis of Medical College and Tertiary Health Care Centre. Our study comprises a total of 35 patients.

**Table 4.** Clinical symptoms distribution

Clinical symptoms	Our study(35 cases)	Jitendra Pratap Singh Chauhan et al (65 cases)
Dysphagia	68.57 %	63.07 %
Hoarseness of voice	71.43 %	50.76 %
Dyspnoea	34.29 %	30.76 %
Neck swelling	37.14 %	49.23 %
Weight loss	48.57 %	49.23 %

**Table 5.** Risk factors of laryngeal cancer

Addiction	Our study (35 cases)	Jitendra Pratap Singh Chauhan et al (65 cases)
Smoking	77.14 %	80 %
Alcohol	28.57 %	26.15 %

In our study, the cases which were referred to Department of Radio Diagnosis suspecting laryngeal cancer were evaluated with Computed Tomography. The cases were analyzed in the following manner as discussed below:

Laryngeal cancer is most commonly seen in male patients of age group 60–69 years (n = 16, 45.71%) and in females of same age group (n = 2, 5.7%). These patients presented with different complains. In a study done by Saurabh Bobdey *et al*<sup>4</sup> it was found that the maximum no of cases were reported in the age group of 60-69 years accounting 31.93% in males and 27.29 % in female.

In our study of 35 cases, hoarseness of voice was the most common clinical symptom constituting 71.43% followed by dysphagia 68.57%, weight loss 48.57%, neck swelling 37.14% and dyspnea 34.29%. According to the Jitendra Pratap Singh Chauhan *et al*<sup>5</sup> study in 65 consecutive patients with laryngeal cancer, dysphagia constituted the most common symptom i.e. 63.07%, followed by hoarseness of voice 50.76%, neck swelling

and weight loss 49.23% each and dyspnoea 30.76%. Table 4 is showing symptoms in patients with laryngeal cancers.

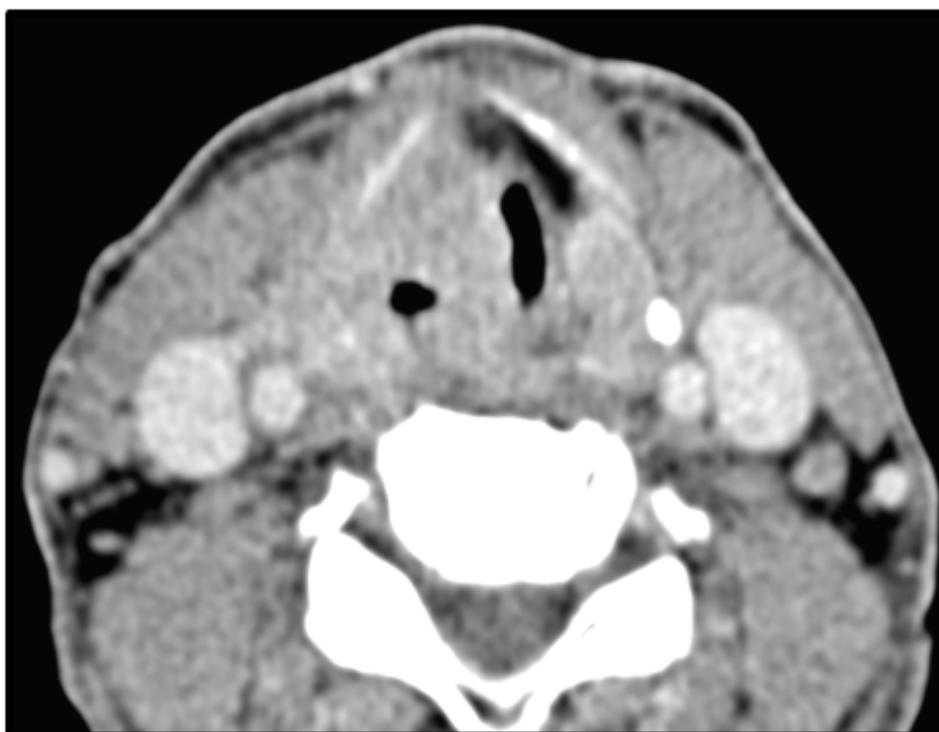
Our study of 35 cases showed 27 patients 77.14% had history of smoking and 28.57% patients had history of alcohol and 20% of them showed history both smoking and alcohol. According to was the Jitendra Pratap Singh Chauhan *et al* study<sup>5</sup> in 65 consecutive patients with laryngeal cancer, smoking constituted of 80% while alcohol 26.15%. Our study shows that people with addiction to smoking are more prone for laryngeal cancer. People addicted to alcohol only are less prone for laryngeal cancer compared to those addicted to both smoking and alcohol. In a study by Rao *et al*<sup>6</sup> found bidi and cigarette smoking is associated with cancer of larynx. (Table 5).

## 7. CT Characteristics

In our study majority of the masses are ill defined, hyperdense and show moderate and heterogenous

**Table 6.** Location of lesion

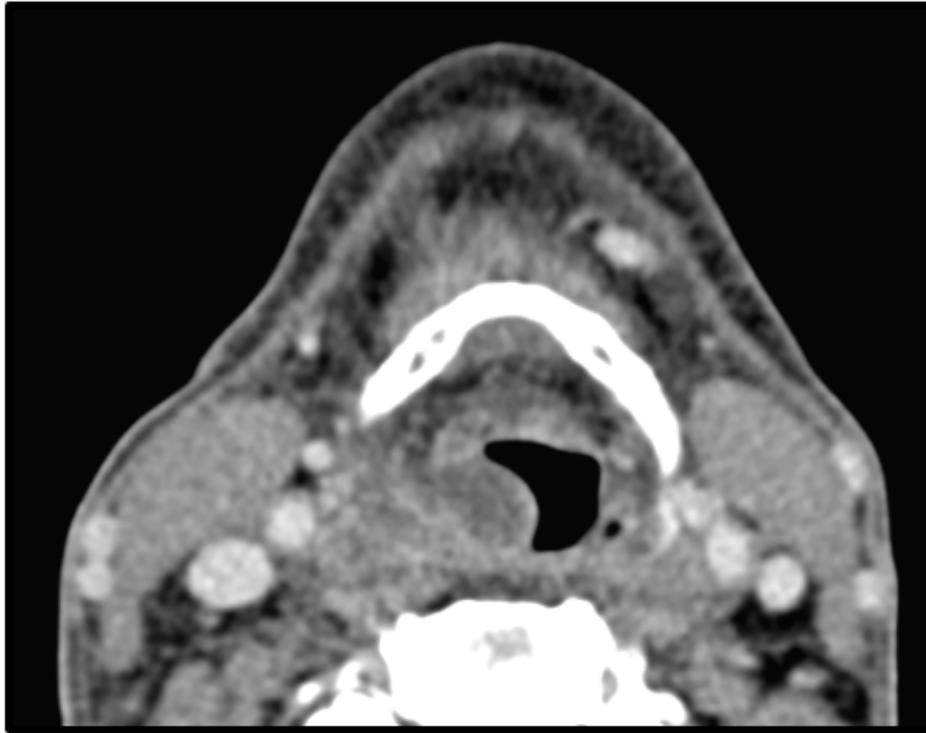
Location	Our study	Joshi, et al	Nachalon et al
Supraglottis	40.00%	30%	21%
Glottis	57.14%	65%	69%
Subglottis	2.86%	5%	10%

**Figure 1.** Glottic carcinoma: Axial CT image showing lesion in right true vocal cord infiltrating adjacent para glottic space and thyroid cartilage.

contrast enhancement. All the lesions were soft tissue attenuating. Mass effect on airway is seen in cases. Lymph nodal metastasis is seen in 22.8% cases.

In our study it was found that glottis was the most common location of laryngeal cancer (57.14%) followed by supraglottis 40% and subglottis 2.86%. In a study by Joshi, *et al*<sup>2</sup> it was found that glottis was the most common location of laryngeal cancer (65%) followed by supraglottis

(30%) and subglottis (5%). The study by Nachalon *et al*<sup>7</sup> also showed the most common location as glottis (69%) followed by supraglottis (21%) and subglottis (10%). Alexander D Karatzanis *et al* in his study on 384 cases found supraglottic carcinomas were 208 cases (54.1%), glottic were 142 cases (36.9%) and subglottic were 15 cases (4%); 19 additional cases (5%) that could not be further classified<sup>8</sup> (Table 6).



**Figure 2.** Supraglottic carcinoma: Axial CT image showing lesion with its epicentre in right aryepiglottic fold.

## 8. Conclusion

Computed Tomography has a significant role in the assessment of laryngeal cancer which was initially not easy to detect. Maximum numbers of cases were seen in 6<sup>th</sup> decade and in males. Most common symptom observed was hoarseness of voice. Smoking is a risk factor for laryngeal cancer.

In our study, all the cases showed intermediate to hyperdense on plain non enhanced CT scan. They appear ill-defined and show heterogenous post contrast enhancement.

In our study, glottis is the most common site of involvement of laryngeal cancer (n = 21, 57.1%) followed by supraglottis (n = 13, 40%) and subglottis (n = 1, 2.9%) and right side being the most common side of involvement.

Pyriform sinus is involved in maximum number of cases (n = 24, 68.57%) either primarily or as extension

of the disease, followed by vocal folds and aryepiglottic folds (n = 22 cases, 62.85% each).

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