Print ISSN: 2321-6379
Online ISSN: 2321-595X
DOI: 10.17354/ijss/2017/400

Original Article

Usefulness of Laryngoscopy and Computerized Tomography as Combined Diagnostic Modality for Accurate Diagnosis and Appropriate Treatment Selection in Laryngeal Malignancies

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Abstract

Introduction: Cancer can develop in any part of the larynx, but the cure rate is affected by the location of the tumor. For the purposes of tumor staging, the larynx is divided into three anatomical regions: The glottis (true vocal cords, anterior, and posterior commissures); the supraglottis (epiglottis, arytenoids and aryepiglottic folds, and false cords); and the subglottis.

Aim: The aim of the study is to study about the involvement of the pre-epiglottic and paraglottic spaces in tumors of larynx and to trace the extent of spread of tumour from one region to other regions.

Materials and Methods: 30 cases were selected in which there was good clinicopathological correlation and growth patterns could be compared with computerized tomography (CT) findings.

Results: 60% patients have pre-epiglottic space involvement seen in CT, which could not be found in laryngoscopic. True vocal cord involvements are picked up as same in both CT and laryngoscopic examination. Anterior commissure involvement is detected more in CT and is about 50%. Whereas in laryngoscopic examinations 23% were detectable.

Conclusion: All cases of laryngeal malignancies combined CT and laryngoscopic examination should be taken for accurate diagnosis and appropriate treatment selection.

Key words: Computerized tomography scan, Laryngeal cancer, Laryngoscopy

INTRODUCTION

Almost all malignancies of the larynx arise from the mucosal surface and thus are accessible to direct visualization and biopsy. The anatomy of larynx is relatively complex and landmarks are located close to one another. However, the computerized tomography (CT) evaluates areas that the clinician cannot see: Areas deep to the mucosa or blocked from direct visualization by the bulk of the tumour.[1-3]

Access this article online

www.ijss-sn.com

Month of Submission : 06-2017
Month of Peer Review : 07-2017
Month of Acceptance : 08-2017
Month of Publishing : 08-2017

The goal of the CT study is to help determine the most appropriate therapy. A total laryngectomy leaves the patients without voice. Various partial laryngectomies leave enough of the larynx so voice can be produced by the normal mechanism. The feasibility of these voice conserving partial laryngectomies depends on the position of the tumor relative to the potential lines of resection. Therefore, accurate demonstration of the extent of the tumor is very important.[4,5]

Modem laryngeal imaging uses either CT or magnetic resonance imaging (MRI) to show the relationship of disease to very small laryngeal structures. Even in patients who cannot cooperate completely, CT offers a consistently good examination, with short imaging times, and thin sections.

Before the advent of CT and MRI techniques, accurate assessment of the deep tissues, and cartilages of the

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larynx could be achieved only by surgical exploration. Direct laryngoscopy is useful to demonstrate the mucosal surface of the larynx and CT is more useful for diagnosing the tissue plane invasion and luminal extension of the growth. This study explains how combination of endoscopy and CT scan is a better diagnostic tool in therapeutic planning of malignant tumors of larynx.[6-8]

Aim

To study about the involvement of the pre-epiglottic and paraglottic spaces in tumors of larynx and to trace the extent of spread of tumor from one region to other regions.

MATERIALS AND METHODS

This is a prospective study and all the cases selected for this study were chosen from the patients who attended our upgraded Institute of Otorhinolaryngology Government General Hospital, Chennai. This study was done after institutional approval and written informed consent was obtained from all the patients included in the study. 30 cases were selected in which there was good clinicopathological correlation and growth patterns could be compared with CT findings.

Inclusion Criteria

Malignant turnouts involving the larynx alone taken for study.

Exclusion Criteria

Benign lesions of larynx, tuberculosis, True vocal cord lesions without anterior commissure involvement, recurrent growth. The clinical evaluation was done by indirect laryngoscopy, direct laryngoscopy, neck exanimation, biopsy from the tumor, radiologic methods to assess the extent of tumor spread, and staging.

RESULTS

In this study, 19 out of 30 patients came between - years of age (63.3%) only six patients came under <40 years of age (20%) and two patients came above 70 years of age (6.66%). Among the 19 cases, in four 1-60 years of age, 11 were supraglottic, and eight were glottic regions. 19 out of 30 patients came between 41 and 60 years of age (63.3%). Only six patients came under <40 years of age (20%) and two patients came above 70 years of age (6.66%). Among the 19 cases in 41-60 years of age, 11 were supraglottic and eight were glottic tumors. Among the six cases <40 years of age, four were supraglottic growth and two were glottic tumors. No subglottic tumor was found. Among the 30 patients studied 28 were male and two were female with a male:female ratio of 14:1. This implies a higher incidence in male in this country. Glottic tumors in female patients were not found in our study. The absence of glottic tumor in female group may be due to absence of predisposing factors such as alcohol, smoking, and pan chewing. Among the patients selected for study tuberculosis was ruled out by clinical methods such as indirect laryngoscopy, direct laryngoscopy, Mantoux, erythrocyte sedimentation rate, X-ray chest, for all the patients biopsy had been taken before CT to confirm the diagnosis (Table 1).

60% patients have pre-epiglottic space involvement seen in CT, which could not be found in laryngoscopic. True vocal cord involvements are picked up as same in both CT and laryngoscopic examination. Anterior commissure involvement is detected more in CT and is about 50%, whereas in laryngoscopic examinations 23% were detectable. In supraglottic region, there is no difference in tumor spread in both laryngoscopic examination (97%) and CT (97%). Subglottic involvement is detected more in CT scan (7%). Tracheal air column is better shown by CT than laryngoscopic examination that is identified and compromised in 7% CT whereas 3.3% in laryngoscopic examinations. Laryngeal frame work involvement is accurately estimated in CT scan which is about 44% in thyroid cartilage involvement. While in laryngoscopic examinations both were detected less in percentage is about 7%. No extralaryngeal spread is diagnosed by laryngoscopic examination. Whereas 50% of extra laryngeal spread diagnosed using CT scan (Table 2).

In clinical staging, 21 out of 30 (70%) patients presented in Stages III, 4 out of 30 (13.3%) in Stage IV. Whereas 5 out of 30 (16.6%) in Stage II and no patient presented in Stage I (Table 3).

Table 1: Correlation of CT and laryngoscopy findings of carcinoma larynx

Site	*n*=30 (%)	
	CT	CE
Within laryngeal frame work		
Pre-epiglottic space	60	0
True vocal cords	83	76
Anterior commissure	50	-
Supraglottic/subglottic region	97/7	97/3.3
Tracheal air column	7	3.3
Laryngeal frame work		
Thyroid cartilage	44	7
Beyond the laryngeal frame work		
Extralaryngeal space	50	0
Lymph nodes	33	23

CT: Computerized tomography, CE: Contrast enhanced

In staging of supraglottic tumors underestimation occurred in laryngoscopic examination particularly in T_2 and T_4 whereas overestimation occurred in T_3 stage when compared to CT staging (Table 4).

In glottic tumors underestimation in T_2 and T_3 stages in laryngoscopic staging compared to CT staging (Table 5).

Thyroid cartilage involvement was better assessed by CT than clinical examination. Hence, underestimation of T_4 and overestimation of T_3 occurred in clinical examination of supraglottic tumors. In glottic growths, underestimation of tumors occurred in T_2 and T_3 lesions.

Histopathological Examination

Among 30 patients, 29 had biopsy report as squamous cell carcinoma (96.66%) and one patient has verrucous carcinoma (3.33%) suggesting that all tumors are epithelial in origin (Table 6).

DISCUSSION

The laryngoscopic examination showed involvement of vocal cords, vestibular folds, ary epiglottic folds, arytenoids, pyriform fossae, and epiglottis very precisely whereas the involvement of pre-epiglottic space, paraglottic space, cricothyroid space, cricoarytenoid joint, thyroid cartilage, subglottic extension, and tracheal air column were not well shown. So that clinical staging of tumors was not complete and adequate and required additional investigation like CT. The mobility of vocal cords was best and most accurately estimated with laryngoscopic examination than CT scan. The CT was very useful in identification of involvement of pre-epiglottic space, paraglottic space, thyroid cartilage erosion, subglottic extension, involvement of anterior commissure, tracheal air column, thyroid gland, and lymph nodal metastasis. Pre-epiglottic space involvement is not at all detected by indirect laryngoscopy, direct laryngoscopy. It is only diagnosed by CT scan. Pre-epiglottic space is filled with fat and less vascular. Hence, it is resistant to radiotherapy. For this pre-epiglottic space involvement is contraindication for partial laryngectomy and radiotherapy. For this total or near total laryngectomy is indicated.[8-12] In this study about 60% of cases were diagnosed CT scan. Invasion of pre-epiglottic space in supraglottic tumors 77.77% in our study which was very much higher. Indirect laryngoscopic examination almost correlates well with direct laryngoscopic examination. In our study, we found out additional findings in direct laryngoscopy over indirect laryngoscopy in three cases only out of 30 cases showing 10% variation.[13] In one case, the cord mobility restricted was found to be a fixed cord. In another case, the left vocal cord not seen in indirect laryngoscopy was seen in direct laryngoscopy and found to be mobile. Flex extension of right cord was also seen in the same case. The CT scan is needed to the cartilage involvement, so overstate occurs if computerized tonograph scan is done. In our study about 50% of anterior commissure involvement, diagnosed in CT scan, whereas 23% only diagnosed in laryngoscopic examination. There is no difference in supraglottic tumors with CT and laryngoscopic examination. Laryngoscopic examination was almost same in finding out supraglottic tumor extension and adequacy of tracheal airway. Mobility of vocal cords was accurately estimated with laryngoscopic examination than CT. In supraglottic extension, the mass itself obstructed the view of vocal cords and fixity

Table 2: Clinical staging

Site/stage	I	II	III	IV	Total
Supraglottis	0	2	14	2	18
Glottis	0	3	7	2	12
Subglottis	0	0	0	0	0

Table 3: Correlation of laryngoscopic examination - CT staging in supraglottic tumors

T stage	*n*=18 (%)	
	CE	CT
T_1	-	-
T_2	2 (11.00)	3 (16.50)
T_3	14 (78.00)	6 (33.50)
T_4	2 (11.00)	9 (60.00)

CT: Computerized tomography, CE: Contrast-enhanced

Table 4: Correlation of laryngoscopic examination - CT staging of glottic tumors

T stage	*n*=12 (%)	
	CE	CT
T_1	-	-
T_2	3 (24.99)	-
T_3	7 (58.30)	7 (58.30)
T_4	2 (16.66)	5 (41.60)

CT: Computerized tomography, CE: Contrast enhanced

Table 5: Laryngoscopic staging compared with CT staging

Site	Overestimation	Underestimation
Supraglottic	T_3	T_2 and T_4
Glottis	-	T_2 and T_3

CT: Computerized tomography

Table 6: Histopathological examination

Number of patients	Type of carcinoma (%)
29	Squamous cell carcinoma (96.66)
1	Verrucous carcinoma (3.33)

of vocal cords could not be assessed clinically. Hence, overestimation of T occurred. It is a hidden site. It may not be detected by laryngoscopic examination. CT scan is needed for evaluation of the subglottic region and tracheal air column. Subglottic involvement rules out any partial surgeries and it also needed to decide the extent of dissection of tumour while during radical surgeries.[14]

Thyroid cartilage and cricoid cartilage involvement is better detected by CT scan, whereas MRI is the ideal mode of investigation to detect the cartilage involvement. Thyroid cartilage invasion is a contraindication for any partial laryngectomies or radiotherapy here also CT scan plays a major role for planning the treatment.[15]

According to Will Roger's phenomenon the development of better imaging means that systematic upstaging of tumors will occur when imaging data are added, so that tumors are upstaged and apparent improved correlation. Lymph nodes were better identified and staged in CT. The involvement of lymph nodes were identified in 10 patients (33%) by CT was compared to seven patients (23%) by laryngoscopic examination, i.e., three clinically nodal negative patients were found to nodal positive by CT. The discrete non-enhancing mass in the lymph node bearing region of neck >1.5 cm in one diameter is significant and considered as secondaries neck from primary tumor and this should not be missed.[16]

In all the 10 cases of lymph nodes involvement I.V. contrast material omnipaque (iohexol) was used. No complication due to I.V. contrast material was met. In non-enhancing CT, lymph nodes appeared as heterogenous mass lesion of more than 1.5 cm with ill-defined margins. Surrounding fat density appeared high - "dirty fat appearance." There was evidence of cystic degeneration, necrosis, and no evidence of calcification.

CONCLUSION

Endoscopy and CT scan individually delineate the tumor extent incompletely. The combination of both increases better diagnosis of the three dimensional extent of the disease for selecting appropriate treatment modality and thereby reducing the residual disease as well as recurrence of disease and increasing the prognosis. In laryngeal malignancies when anterior commissure is involved CT is more useful in detecting thyroid cartilage and thyroid gland involvement. In case of glottic malignancies, CT is more useful and diagnosing the paraglottic and subglottic extension. In all these cases, CT is useful for diagnosing the occult cervical nodes. Considering the cost factor MRI can be restricted for high suspicious of cartilage involvement. Therefore, it is firmly suggested that all cases of laryngeal malignancies combined CT and laryngoscopic examination should be taken for accurate diagnosis and appropriate treatment selection.

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How to cite this article: Sivasubramanian T, Radhakrishnan KR, Anandan H. Usefulness of Laryngoscopy and Computerized Tomography as Combined Diagnostic Modality for Accurate Diagnosis and Appropriate Treatment Selection in Laryngeal Malignancies. Int J Sci Stud 2017;5(5):90-93.

Source of Support: Nil, **Conflict of Interest:** None declared.