Original Article

Clinical and pathological staging of primary carcinoma of the larynx

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Summary:

Background: Staging of primary carcinoma of the larynx play an important role in surgical management of the disease .This staging depends on the clinical finding and radiological examination , supported by pathological assessment of the excised tumor

Objectives: To evaluate the accuracy of clinical and radiological staging

Patients' and methods: Forty-two patients with laryngeal carcinoma were admitted to the ENT Department during the period from June 2009 through October 2010. Each patient was staged by clinical examination and computed tomography. Evaluation of the results compared to the final diagnosis of staging , based on the pathological staging of specimens of patients who underwent total laryngectomy and the highest T stage was obtained from clinical and CT staging for patients with early laryngeal carcinoma(T1-T2) .

Results: The clinical staging of laryngeal carcinoma showed: high accuracy in staging was on glottic tumours (83.3%), especially T1 glottic tumours (100%),(small and superficial lesions), and lower accuracy in staging of supraglottic and transglottic tumors (61.9%) , (55.6%) respectively.Underestimation of all tumors was 31.4% .

The CT staging of laryngeal carcinoma showed: very high accuracy in staging transglottic and supraglottic tumours (100%), (85.7%) respectively in comparison to clinical staging and lower accuracy (75%) in staging glottic tumours.

Underestimation of all tumours was 11.5 % of cases (especially small and superficial lesions).

Conclusions: High accuracy rate based on clinical examination was found in glottic carcinoma and high accuracy rate based on radiological examination was found in supraglottic carcinoma.

Clinical examination and CT scan are complementary for sraging of carcinoma of larynx .

Key words: Carcinoma, larynx, staging and CT scan.

Introduction:

The purpose of tumor staging according to the TNM system is to facilitate clinical research and to help assess the prognosis , thus to aid the clinician in planning treatment in a given case .The staging criteria for laryngeal carcinoma is proposed by the UICC and the AJCC guidelines . The degree of invasion of the primary tumor is most accurately reflected in the postsurgical (pT) classification, based on histopathological analysis of the resected specimen (2). The clinical or pretherapeutic (T) classification of the primary tumor is used in patients who did not undergo surgery which is based on all information available prior to treatment, including the finding at physical examination, endoscopy, and sectional imaging. According to the considerations above, it is obvious that involvement of adjacent subsites often occurs as a result of submucosal spread and can therefore be detected only by sectional imaging. Although sectional imaging is recommended in the guidelines of the UICC and the AJCC, no recommendations were made regarding the preference of MR imaging or CT . Several studies published in the literature indicate that the use of sectional imaging by either CT or MR imaging may greatly improve the accuracy of Pretherapeutic T- classification of laryngeal tumors (the stging accuracy of clinical examination with endoscopy alone is increased significantly when combined with either CT or MRI). In addition, the accuracy of clinical staging may vary regarding the primary tumor site decreasing from glottic to supraglottic to transglottic tumors. Conversely, the staging accuracy of sectional imaging is best in transglottic tumors and supraglottic tumors, thus indicating a complementary role for clinical examination/endoscopy and CT/MRI.

Regardless of the tumor subsite , several investigators have reported that small mucosa tumors (pT1) were assessed more easily by laryngoscopy , whereas CT/MRI was superior in the evaluation of large (pT3 and pT4) tumors . In conclusion, data from the literature confirm the relevance of routine use of either CT or MRI as an adjunct to the clinical evaluation and laryngoscopy to improve Pretherapeutic stagin accuracy (1).

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Patient and methods:

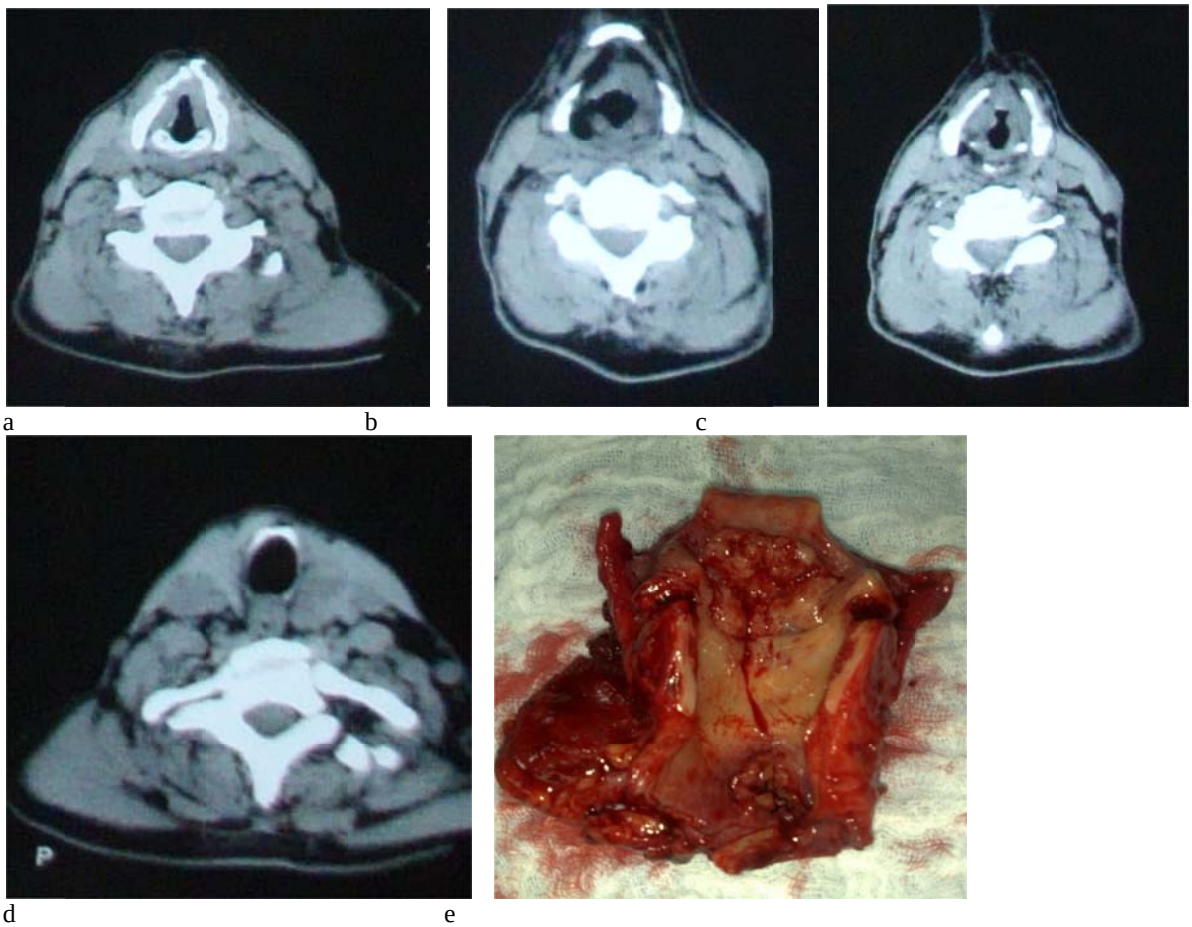
This is a prospective study involved 42 patients with different stages of laryngeal carcinoma who were admitted at the department of otolaryngology/ Hospital of specialized surgeries-Medical City teaching complex during the period from June 2009 through October 2010.

Each patient was examined and staged by clinical examination and computed tomography. Clinical examination include laryngeal mirror, flexible nasolaryngoscopy and rigid laryngoscopy under general anesthesia. CT scan staging was done based on the analysis performed by an experienced radiologist with short clinical information

Tomographic evaluation covered tumor involvement of the following regions : epiglottis, aryepiglottic fold, ventricular folds, vocal folds, subglottis, base of the tongue, preepiglottic space, paraglottic space, thyroid cartilage, cricoid cartilage, and extralaryngeal soft tissues.

Specimens were obtained by total laryngectomy and send for histopathological examination and Pathological(PT) staging of laryngeal cancer was done. Clinical and CT scans tumour staging was evaluated by comparing it to the final diagnosis of staging, which was based on pathologic staging of specimens for patients who underwent total laryngectomy and the highest T stage obtained from clinical and CT staging for patients with early laryngeal carcinoma(T1-T2). Clinical and CT examination analysed were concerned with the study of primary tumors of the larynx(T parameter).according to the TNM classification defined by the Inernational Union Against Cancer(UICC) , reviewed in 2002(3).

The result was deemed as accurate if it was comparable to the final diagnosis , an overestimate if the resulting T stage was greater than that of the final diagnosis.



a b c

d e

Figure 1 : radiological and gross pathological specimen

(a,b,c,d); Axial CT images showing soft tissue mass involving the left aryepiglottic fold, false cord and left paraglottic space. Both glottic and subglottic regions were tumor free. CT scan staging was T3 supraglottic tumor while clinical staging was T2 supraglottic tumor. (e); Total laryngectomy specimen shows fungative mass involving the left supraglottic region (aryepiglottic fold, false vocal cord, lower half of epiglottis) with extension to the right side. Glottic and subglottic regions were tumour free. pathological staging was T3 supraglottic tumour.

Results:

Table (1): Evaluation of the clinical tumour staging accuracy stratified by tumour location.

Clinical tumor staging evaluation	Tumor location					
	supraglottic		Glottis		transglottic	
	No.	%	No.	%	No.	%
Underestimate	7	33.3	2	16.7	4	44.4
Accurate	13	61.9	10	83.3	5	55.6
Overestimate	1	4.8	0	0	0	0
Total	21	100	12	100	9	100
P (Chi-square) = 0.54 [NS]						

Table (2) : Evaluation of the CT scan staging accuracy stratified by tumour location.

CT scan tumor staging evaluation	Tumor location					
	supraglottic		Glottis		transglottic	
	No.	%	No.	%	No.	%
Underestimate	2	9.5	3	25	0	0
Accurate	18	85.7	9	75	9	100
Overestimate	1	4.8	0	0	0	0
Total	21	100	12	100	9	100
P (Chi-square) = 0.37[NS] : Conf. Level not less than 63%						

Table (3) : Accuracy of the Clinical evaluation in tumor staging distributed according to the final diagnosis (early and advanced tumor (T3-T4) stage).

Tumor stage (Final diagnosis)				
Clinical tumour staging evaluation	Early(T1-T2)		Advanced tumor (T3-T4)	
	NO.	%	NO.	%
Underestimate	1	8.3	12	40
Accurate	11	91.7	17	56.7
Overestimate	0	0	1	3.3
Total	12	100	30	100
P (Chi-square) = 0.09 [NS] : Conf. Level not less than 91%				

Table (4): Accuracy of the CT scan in tumor staging distributed according to the final diagnosis (early and advanced tumor (T3-T4) stage).

	Tumor stage (Final diagnosis)			
CT scan tumor staging evaluation	Early(T1-T2)		Advanced tumor (T3-T4)	
	NO.	%	NO.	%
Underestimate	4	33.3	1	3.3
Accurate	8	66.7	28	93.3
Overestimate	0	0	1	3.3
Total	12	100	30	100
P (Chi-square) = 0.022 [S] : Conf. Level not less than 97.8%				

Table (5): Validity parameters of clinical tumour staging when used to predict advanced tumor stage (T3-T4) by final diagnosis

Tumor stage (Final diagnosis)			
Clinical tumor staging-advanced stage	Early(T1-T2)	Advanced tumor (T3-T4)	Total
T1-T2	12	5	17
Advanced tumor (T3-T4)	0	25	25
Total	12	30	42

Clinical tumor staging-advanced stage
Sensitivity = 83.3%
Specificity = 100%
Accuracy = 88.1%
PPV at 50% pretest probability = 100%
PPV at 90% pretest probability = 100%
NPV at 10% pretest probability = 98.2%

Table (6): Validity parameters of CT scan tumour staging when used to predict advanced tumor stage (T3-T4) by final diagnosis

tumor stage (Final diagnosis)			
CT scan tumor staging-advanced stage	Early(T1-T2)	Advanced tumor (T3-T4)	Total
T1-T2	12	1	13
Advanced tumor (T3-T4)	0	29	29
Total	12	30	42

CT scan tumor staging-advanced stage
Sensitivity = 96.7%
Specificity = 100%
Accuracy = 97.6%
PPV at 50% pretest probability = 100%
PPV at 90% pretest probability = 100%
NPV at 10% pretest probability = 99.6%
N.B; as shown in the above tables; (12), (13).Both CT scan and clinical staging are perfectly specific (100%) in detecting advanced tumours i.e. being positive in any of the two will establish the Diagnosis of advanced stage and thus the need for total laryngectomy with (100%) confidence.
Clinical staging is of low sensitivity in predicting advanced stage (the rate of false–ve is 16.7%), while CT is of high sensitivity (the false –ve is 3.3

Discussion:

Overall accuracy of CT scan and clinical evaluation in tumour staging is shown in tables: (1),(2), (3) , (4) In our series we found the Overall accuracy of CT scan in tumour staging was (85.7%) and for clinical staging was (66.7%).
This is nearly the same results with that obtained by Katsantonis et al (1986) (4), who reported preoperative CT and clinical staging accuracy of 82%, 72%, respectively.
Vogl et al (1991) (5) reported preoperative clinical staging accuracy of 64% for laryngeal carcinomas. This is little different from that obtained by: Sulfaro et al (1989) (13), who found the accuracy of the clinical vs CT staging for laryngeal carcinomas was 59% , 71%, respectively**.**
Thabet et al (1996)(2), reported overall accuracy in tumour staging by clinical evaluation 52% and CT scan 68%. Becker (1997) (7), and Zbaren (1996) (8) reported preoperative clinical staging accuracy for laryngeal carcinomas of 58% , 57.5% respectively.

Ferri T(1999**)** (9) found the staging accuracy of laryngoscopy vs CT scan was 51.3% , 70.1%, respectively.

Differences in our results from those of previous studies might be explained by the presence of a large number of superficial and small mucosal tumors in their series,which lowered CT accuracy, and a large number of T3 and T4 tumors which lowered CE accuracy.

Evaluation of clinical tumour staging accuracy stratified by tumour location. As shown in table: (5)

In our series, we found high accuracy in staging glottic tumours 83.3%, especiallyT1 glottic tumours 100% , (small and superficial lesions). This agrees with that observed by: Thabet et al (1996) (2) ,who reported similar results and found high accuracy in staging glottic tumours (85%) by clinical evaluation, especially superficial lesions. Katsantonis et al (1986) (4) who reported a very reliable clinical staging for glottic tumours, offering 93% accuracy.

In our series we found lower accuracy in staging supraglottic tumours was (61.9%). Thabet et al (1996)(2), and Katsantonis et al (1986)[(4)] reported preoperative clinical staging accuracy of 45%, 74% for supraglottic tumours respectively. In our series, the accuracy of clinical evaluation in staging transglottic tumours was (55.6%). This is compatible with that observed by:

Katsantonis et al (4), who found clinical evaluation accuracy of 50% for transglottic tumours , but disagrees with that obtained by: Thabet et al (2) ,who reported very low accuracy in staging transglottic tumours (31%). Evaluation of CT scan tumour staging accuracy stratified by tumour location. As shown in table: (6)

In our series, we found very high accuracy in staging supraglottic and transglottic tumours (85.7 %), (100 %) respectively in comparison with. clinical staging : Katsantonis et al (1986) showed also high CT scan staging accuracy of 83% for supraglottic, and 88% for transglottic tumors. Thabet et al (1996) reported preoperative CT staging accuracy of 68% for supraglottic, and 88% for transglottic tumors. In our series, CT scan showed lower accuracy (75%) in staging glottic tumors, which is the same results of: Katsantonis et al (74%), and higher than: Thabet et al (1996) who reported lower accuracy (46%) in staging glottic tumors.

In our series the clinical staging accuracy decreased from glottic to supraglottic to transglottic tumors, whereas CT scan staging became significantly more accurate in the same direction. The same results observed by: Katsantonis et al (1986), Ferri T (1999), Thabet et al (1996). Inaccurate clinical evaluation staging for all tumours. As shown in table: (3) Harrison (1970) (10) ,reported clinical evaluation underestimation of the lesion extent in 40% of his patients. Pillsbury and Kirchner (1979) (11) reported inaccurate clinical evaluation staging versus pathological staging for 40% of all tumors in their series, including 37% for glottic, 38% for supraglottic, 50% for transglottic and 13% for subglottic. Sulfaro et al (1989) reported inaccurate clinical evaluation staging for 41% of laryngeal tumours. In Thabet et al (1996) there was inaccurate clinical evaluation staging for all tumors 48% including 55% for supraglottic, 15% glottic, 68% transglottic, in the inaccurately staged cases, underestimation occurred in majority of patients. In our series, an inaccurate clinical evaluation staging for all tumors was (33.3%), and for each tumor location was :supraglottic (38%), glottic (16.7 %) and transglottic (44%)), in the majority of the cases that were staged inaccurately, the error was one of underestimation. This rate was similar to that reported by: Pillsburyand Kirchner (1979) and Thabet et al (1996).

This underestimation resulted from difficulty in clinical evaluation of cartilage invasion, laryngeal space invasion, and extralaryngeal spread when fixed vocal cords were not present. Therefore, high rates of T3 and T4 laryngeal tumours were underestimated by clinical evaluation.

Inaccurate CT scan staging for all tumors. As shown in table: (4)

In our series, an inaccurate CT scan staging for all tumours was (14%).

In the majority of the cases that were staged inaccurately, the error was one of underestimation: in particular, tumours confined to the mucosa and early infiltration of laryngeal fat spaces was not detected by CT. This is comparable to the results obtained by: Katsantonis et al (1986) , and less than that reported by: Thabet et al, understaging in 20% of cases and overstaging in 12% of cases

In our series, CT scan was taken about two weeks after biopsy which make overestimation of small percentage and lower than Thabet et al, who send their patients for CT scan one week after biopsy taking.

Conclusions:

The accuracy of clinical staging decreased from glottic to supraglottic to transglottic tumours. Conversely, the staging accuracy of sectional imaging is best in transglottic tumours and supraglottic tumours and lower in glottic tumours.

References:

1.Mahmood F. Mafee, Galdino E. Valbasson, Minerva Becker, JS Lewin, SG Nour, AL Weber, M. Becker : Imaging of the Head and Neck: larynx and hypopharynx: 733-7 .

2.Thabet HM, Sessions DG. Gado MH, et al. Comparison of clinical evaluation and computed tomographic diagnostic accuracy for tumors of the

larynx and hypopharynx. Laryngoscope 1996; 106: 589-94

3. Scott-Brawn's Otorhinolaryngology, Head and Neck Surgery7th edition; by Nigel Beasley; Anatomy of the larynx; 2131-2

4. Katsantonis et al., Kataantonis GP, Archer GA, Rosenblum BN, et al. The degree to which accuracy of preoperative staging of laryngeal carcinoma has been enhanced by computed tomography. Otolaryngol Head Neck Surg. 1986; 95:52-61.

5. Vogl TJ, Steger W, Grevers G, Schreiner M, Dressel S, Lissner]. MRI with Gd-DTPA in tumors of larynx and hypopharynx. Eur Radiol 1991; 1: 58-64

6. Becker M, Zbdren P, Laeng H, Stoupis C, Porcellini B. Vock P. Neoplastic invasion of the laryngeal cartilage: Comparison of MR imaging and CT with histopathologic correlation. Radiology 1995: 194: 661-9.

7. Becker M, ZbSren P, Delavelle J, et al. Neoplastic invasion of the laryngeal cartilage: reassessment of criteria for diagnosis at Cl. Radiology 1997; 203: 521-32.

8. Zbaren P, Becker M, Laeng , H. Pretherapeutic staging of laryngeal cancer: clinical findings, computed tomography and magnetic resonance imaging versus histopathology. Cancer 1996; 77: 1263-73.

9. Ferri T, De Thomasis G, Quaranta N, Bacchi G, Bottazzi D. The value of CT scans in improving laryngoscopy in patients with laryngeal cancer. Eur Arch Otorhinolaryngol. 1999; 256(8):395-9. PubMed PMID: 10525943.

10. Harrison DFN. Pathology of hypopharyngeal cancer in relation to surgical management. Laryngol Otol. 1970; 84:349-67.

11. Pillsbury MR, Kirchner JA. Clinical vs. histopathologic staging in laryngeal cancer. Arch Otol. 1979; 105:157-9