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Comparison of CT and MRI in the Diagnosis of Laryngeal Carcinoma

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ABSTRACT
To compare CT and MRI in the diagnosis of laryngeal carcinoma Eighty-two participants, aged 18-60 years with laryngeal carcinoma of both genders were selected. All MR imaging studies were performed on a 3T MR imaging system with a 16-channel head and neck *coil*. CT scans were performed with a 128-slice CT scanner in the dual-energy CT mode 27. Out of 82 patients, males were 48 and females were 34. Histopathology showed 82 (100%), CT assessed lesions in 80 (97.5%) and MRI in 81 (98.7%) of laryngeal carcinoma cases. The sensitivity of MRI was 98.1, specificity was 95.4 and positive predictive value (PPV) was 96.5. The sensitivity of CT was 92.6, specificity was 88.6 and positive predictive value (PPV) was 93.4. While the MRI is more effective in identifying laryngeal cancer the two methods CT and MRI may be comparable.

INTRODUCTION

A cartilaginous structure supports the series of mucosal folds that make up the larynx. There are two types of laryngeal masses benign and malignant. Three benign laryngeal tumors include neurofibroma, chondroma, and papilloma (85%). More than 90% of laryngeal cancers are squamous cell epithelial tumors[1]. Endoscopy facilitates lesion biopsies as well as precise evaluation of the tumor's mucosal involvement. The evaluation of the larynx's deep and intrinsic soft tissues, as well as the cartilaginous skeleton around it, is possible with computed tomography (CT). CT shows the size and volume of the tumor as well as the degree of the underlying illness[2]. Magnetic resonance imaging (MRI) has been thought to offer an advantage in delineating the tumor-muscle contact and provides a more thorough study of possible cartilage invasion. The accuracy rates of CT and MRI in T staging of laryngeal cancer might approach 80-87%, respectively, when combined with clinical history and laryngoscopy[3]. In contrast to CT, which either overestimates or underestimates the involvement of cartilage, MRI demonstrated a relatively high accuracy but low specificity in the assessment of anterior commissure lesions[4]. Deeper structure investigation can only be done with CT or MRI imaging. The most widely utilized method for general laryngeal imaging is now CT imaging. The majority of hospitals and even some outpatient clinics have it easily available[5]. Because patients are typically forced to hold their breath to reduce movement the incredibly quick acquisition period of a CT picture is quite helpful for the laryngeal evaluation[6].We performed this study to compare CT and MRI in the diagnosis of laryngeal carcinoma.

MATERIALS AND METHODS

After considering the utility of the study and obtaining approval from the ethical review committee, we selected eighty-two participants, aged 18-60 years with diagnosis of laryngeal carcinoma. Patient's consent was obtained before starting the study. Data such as name, age, etc. was recorded. A 3T MR imaging system equipped with a 16-channel head and neck coil was used for all MR imaging tests. The following parameters were used to perform CT scans using a 128-slice CT scanner in dual-energy CT mode 27: 32X 0.6-mm collimation with a z-flying focus spot, 200 and 200 effective mAs, 0.33-second rotation time, 100 and Sn140-kV tube voltages and 0.6 pitch. Transcervical open operations were performed on all patients. Following an integrated resection the surgical specimens were preserved with 10% formalin. The samples were then divided into three to six parts perpendicular to the plane of the voice chords and then paraffin-embedded. Every implanted segment was then divided into axial serial section slices (5 µm) spaced 0.4 mm apart and parallel to the vocal cord plane. Every slice was stained with hematoxylin and eosin. The results were compiled and subjected to statistical analysis using the Mann-Whitney U test. $p>0.05$ was regarded as significant.

RESULTS

Out of 82 patients, males were 48 and females were 34 (Table 1). Table II shows that histopathology showed 82 (100%), CT assessed lesions in 80 (97.5%) and MRI in 81 (98.7%) of laryngeal carcinoma cases (Table 2).

The sensitivity of MRI was 98.1, specificity was 95.4 and positive predictive value (PPV) was 96.5. The sensitivity of CT was 92.6, specificity was 88.6 and positive predictive value (PPV) was 93.4 (Table 3, Fig 1).

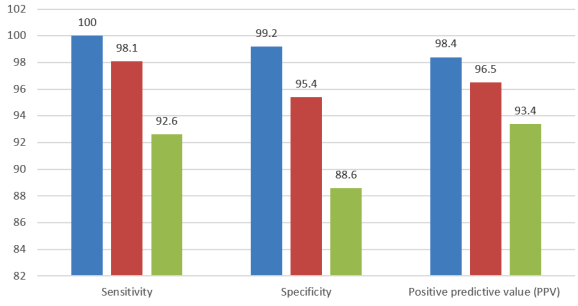

Fig. 1: Accuracy of CT and MRI

Table 1: Patient distribution

	Total- 82	
Gender	Males	Females
Number	48	34

Table 2: Assessment of laryngeal carcinoma

Method	No.	Percentage
Histopathology	82	100
CT	80	97.5
MRI	81	98.7

Table 3: Accuracy of CT and MRI

Parameters	Histopathology	CT	MRI
Sensitivity	100	92.6	98.1
Specificity	99.2	88.6	95.4
Positive predictive value (PPV)	98.4	93.4	96.5

DISCUSSIONS

Making decisions about treatment for individuals with laryngeal and hypopharyngeal squamous cell carcinomas (SCCs) depends critically on the diagnosis of cartilage invasion. Since the degree of thyroid cartilage invasion distinguishes between the T3 and T4a stages the thyroid cartilage is essential to the primary tumor staging process[7,8]. A complete

laryngectomy may be necessary if the tumor penetrates the thyroid cartilage and reaches the superficial soft tissue of the neck, classifying the patient as T4a[9,10]. Treatment that could preserve organs can still be administered if cartilage invasion is confined without extending trans cartilaginously[11,12]. Consequently, poor treatment decisions resulting from an over-or underestimating of thyroid cartilage invasion can seriously harm a patient's quality of life[13,14].We performed this study to compare CT and MRI in the diagnosis of laryngeal carcinoma.

The results of Kuno *et al*.[15] showed that when it came to diagnosing all cartilage collectively (84% for MR imaging against 98% for dual-energy CT, P.004) and thyroid cartilage (64% versus 100%, P.001). They discovered that dual-energy CT had better specificity than MR imaging, with a comparable average area under the curve (0.94 versus 0.95, P.70). There was a trend toward higher sensitivity with MR imaging, although overall sensitivity did not differ substantially (97% against 81%, P.16) for thyroid cartilage (100% versus 89%, P.50).

We observed that histopathology showed 82 (100%), CT assessed lesions in 80 (97.5%) and MRI in 81 (98.7%) of laryngeal carcinoma cases. Sarkar *et al*.[16] included 33 patients (29 men and 4 women) with clinically confirmed laryngeal masses who were assessed by indirect laryngoscopy before being referred for CT and MRI. Direct laryngoscopy was used to do the post-imaging biopsy. MRI and CT revealed accuracy for thyroid cartilage (91.7% vs. 71.4%), cricoid cartilage (85.7% vs. 75%) and arytenoid cartilage (91.7% vs. 71.4%) respectively. Thyroid cartilage had an accuracy rate of 84.2%, arytenoid cartilage of 84%, and cricoid cartilage of 78.9% when it came to MRI identification of cartilage invasion. The study found that the diagnostic accuracy of CT staging was 60.0%, specificity 85.7%, positive predictive value (PPV) 60.0%, negative predictive value (NPV) 85.7%, and accuracy 78.9% (p = 0.084) when compared to histological staging. Comparing histopathological staging and MR staging for diagnostic accuracy revealed sensitivity 80.0%, specificity 92.9%, PPV 80.0%, NPV 92.9%, accuracy 89.5% (p = 0.006).

We found that the sensitivity of MRI was 98.1, specificity was 95.4 and positive predictive value (PPV) was 96.5. The sensitivity of CT was 92.6, specificity was 88.6 and positive predictive value (PPV) was 93.4. Wu *et al*.[17] evaluated the precision of CT and MRI in identifying thyroid cartilage invasion and T staging of laryngeal cancer involving involvement of the anterior vocal commissure (AVC). A selection was made from 26 cases of laryngeal carcinomas. The MRI scan accuracy was 88.46% (23/26) and the CT scan accuracy was 57.69% (15/26), respectively (p<0.01). In addition, they documented one case of preliminary DWI investigation and three cases of incorrect CT or MRI diagnoses about the involvement or lack thereof of the thyroid cartilage. MRI showed a greater accuracy rate on T staging of laryngeal carcinomas with involvement of the anterior vocal commissure (AVC) as compared to CT. The combined use of MRI and CT could increase the precision of T staging and the assessment of thyroid cartilage involvement.

CONCLUSIONS

While the MRI is more effective in identifying laryngeal cancer the two methods CT and MRI may be comparable.

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