ORIGINAL RESEARCH

CT versus MRI in the diagnosis of laryngeal carcinoma- A Comparative analysis

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ABSTRACT

Background: The larynx is composed of a sequence of mucosal folds supported by a cartilaginous framework. The present study was conducted to compare CT and MRI in the diagnosis of laryngeal carcinoma. **Materials &Methods:** 76patient aged 18 to 60 years of laryngeal carcinoma of both genders were selected. All MR imaging tests were performed using a 3T MR imaging system. A 128-slice CT scanner operating in dual-energy CT mode 27 was used to perform CT scans. **Results:** Out of 76 patients, 40 were males and 36 were females. Histopathology showed 76 (100%), CT assessed lesions in 72 (94.7%) and MRI in 81 (96%) of laryngeal carcinoma cases. The sensitivity of CT was 98.4, specificity was 95.6 and positive predictive value (PPV) was 96.2. The sensitivity of MRI was 93.6, specificity was 89.7, and positive predictive value (PPV) was 94.4. **Conclusion:** Although laryngeal cancer can be detected more accurately using a CT scan, MRI and CT may be similar techniques.

Keywords: Histopathology, laryngeal carcinoma, CT

INTRODUCTION

The larynx is composed of a sequence of mucosal folds supported by a cartilaginous framework. Laryngeal masses can be classified as either benign or malignant. Neurofibroma, chondroma, and papilloma are three benign laryngeal tumors (85%). Squamous cell epithelial tumors account for about 90% of laryngeal malignancies.[1] Endoscopy makes it easier to do lesion biopsies and accurately assess the tumor's involvement of the mucosa. Computed tomography (CT) can be used to assess the deep and intrinsic soft tissues of the larynx as well as the cartilaginous bones around it. CT displays the tumor's size and volume in addition to the severity of the underlying disease.[2]

It has been believed that magnetic resonance imaging (MRI) offers a benefit in defining the tumor-muscle contact and offers a more comprehensive analysis of potential cartilage invasion.[3] When paired with clinical history and laryngoscopy, the accuracy rates of CT and MRI in T staging of laryngeal cancer may be close to 80% and 87%, respectively.[4] When evaluating anterior commissure lesions, MRI showed a comparatively high accuracy but low specificity, in contrast to CT, which either overestimates or underestimates the involvement of cartilage. Only CT or MRI imaging can be used to investigate the structure in greater detail.[5]CT imaging is currently the most popular technique for general laryngeal imaging. Most hospitals have it readily available, as do some outpatient clinics. When it comes to the laryngeal examination, the extremely short acquisition duration of a CT scan is quite useful because patients are usually made to hold their breath in order to minimize movement.[6] The present study was conducted to compare CT and MRI in the diagnosis of laryngeal carcinoma.

MATERIALS &METHODS

The present study comprised of 76patient aged 18 to 60 years of laryngeal carcinoma of both genders. Patients' consent was obtained before starting the study.

Data such as name, age, etc. was recorded. All MR imaging tests were performed using a 3T MR imaging system with a 16-channel head and neck coil. A 128-slice CT scanner operating in dual-energy CT mode 27 was used to perform CT scans with the following settings: 0.6 pitch, 200 and 200 effective mAs, 0.33-second rotation time, 100 and Sn140-kV tube voltages, and 32X 0.6-mm collimation with a z-flying focus spot. All patients underwent open transcervical procedures. The surgical specimens were kept with

10% formalin after an integrated resection. After that, the samples were paraffin-embedded after being split into three to six sections perpendicular to the plane of the voice chords. Following that, each implanted segment was split into axial serial section slices (5 µm) parallel to the implant and separated by 0.4 mm.Theresults were compiled and subjected to statistical analysis. P value less than 0.05 was regardedas significant.

RESULTS

Table I Distribution of patients

Total- 76		
Gender	**Males**	**Females**
Number	40	36

Table I shows that out of 76 patients, 40 were malesand 36 were females.

Table II Assessment of laryngeal carcinoma

Method	Number	Percentage
Histopathology	76	100
CT	72	94.7
MRI	73	96

Table II, graph Ishows that histopathology showed 76 (100%), CT assessed lesions in 72 (94.7%) and MRI in 81 (96%) of laryngeal carcinoma cases.

Graph I Assessment of laryngeal carcinoma

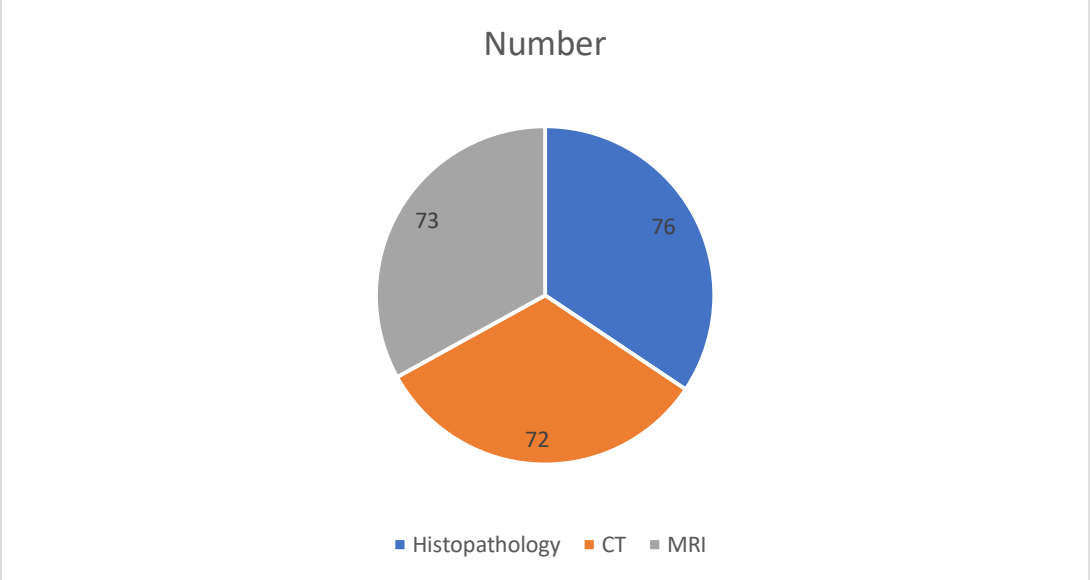

Table III Accuracy of CT & MRI

Parameters	Histopathology	CT	MRI
Sensitivity	100	98.4	93.6
Specificity	99.1	95.6	89.7
Positive predictive value (PPV)	98.5	96.2	94.4

Table III shows that the sensitivity of CT was 98.4, specificity was 95.6 and positive predictive value (PPV) was 96.2. The sensitivity of MRI was 93.6, specificity was 89.7, and positive predictive value (PPV) was 94.4.

DISCUSSION

The detection of cartilage invasion is crucial for treatment decisions for patients with laryngeal and hypopharyngeal squamous cell carcinomas (SCCs).[7] The thyroid cartilage is crucial to the main tumor staging process because the level of invasion determines the difference between the T3 and T4a phases.[8] If the tumor spreads to the superficial soft tissue of the neck through the thyroid cartilage, the patient is classified as T4a and may require a total laryngectomy. If cartilage invasion is contained without spreading transcartilaginously, treatment that could save organs can still be given.[9,10] Therefore, a patient's quality of life may be severely harmed by incorrect treatment choices brought on by an overestimation or underestimation of thyroid cartilage invasion.[11,12]The present study was conducted to compare CT and MRI in the diagnosis of laryngeal carcinoma.

We found that out of 76 patients, 40 were males and 36 were females. Becker M et al[13]compared the usefulness of computed tomography (CT) and gadolinium-enhanced magnetic resonance (MR) imaging in the detection of neoplastic invasion of laryngeal cartilage.In a prospective study, 53 patients with carcinoma of the larynx or piriform sinus underwent CT and MR imaging before total or partial laryngectomy. The findings at imaging and pathologic examination were compared.At histologic examination, neoplastic invasion of cartilage was present in 34 patients and absent in 19. MR imaging was more sensitive than CT (89% vs 66%; P = .001). Inflammatory changes and fibrosis, however, were indistinguishable from tumor on MR images, resulting in overestimation of neoplastic invasion in a large number of patients. Therefore, MR imaging was less specific than CT (84% vs 94%; P = .004).

We found that histopathology showed 76 (100%), CT assessed lesions in 72 (94.7%) and MRI in 81 (96%) of laryngeal carcinoma cases.Zbaren et al[14]determined which imaging should be used as an adjunct to other clinical examinations in the pretherapeutic staging of laryngeal carcinoma.In this study, 40 consecutive patients with neoplasms of the larynx, who were treated surgically, were included in a prospective pretherapeutic staging protocol that included indirect laryngoscopy, direct microlaryngoscopy, contrast-enhanced CT, and gadolinium-diethylenetriamine pentaacetic acid-enhanced MR imaging at 1.5 Tesla. The surgical specimens were cut in whole-organ slices parallel to the plane of the axial CT and MR images. The histologic findings were compared with the clinical findings including the CT and MR images. Clinical/endoscopic evaluation failed to correctly stage 17 tumors due to invasion of the paraglottic space (1 tumor), preepiglottic space (2 tumors), and extralaryngeal soft tissues (14 tumors), resulting in a pretherapeutic staging accuracy of 57.5%. Neoplastic invasion of cartilage was present in 28 patients and absent in 12 patients. Although MR imaging was more sensitive in detecting neoplastic invasion of cartilage than CT (94% vs. 67%; P = 0.001), MR imaging was less specific than CT (74% vs. 87%; P = 0.007). There was no difference between the overall accuracy of CT and MR imaging in detecting neoplastic invasion of cartilage (80% vs. 82%). The accuracy of combined clinical/endoscopic examination and CT staging was 80% and the accuracy of combined clinical/endoscopic examination and MR imaging staging was 87.5%; the difference was not statistically significant.

We found that the sensitivity of CT was 98.4, specificity was 95.6 and positive predictive value (PPV) was 96.2. The sensitivity of MRI was 93.6, specificity was 89.7, and positive predictive value (PPV) was 94.4. Herman et al[15]evaluated the intra- and interobserver reproducibility of the interpretation of CT examinations of laryngeal carcinoma. The CT examinations of 100 laryngeal cancers were retrospectively reviewed twice by two independent reviewers. Involvement of different structures was assessed, using a standard scoring form. A borderline significant difference between the observers ($p < 0.04$) was present. Fair to substantial intraobserver reproducibility (kappa = 0.29-0.86), and fair to substantial interobserver reproducibility (average kappa = 0. 26-0.74) were found for most laryngeal structures when a dichotomous categorical scale was used. On the average somewhat lower, but still fair to substantial, intraobserver (kappa = 0.36-0.72), and fair to moderate interobserver (average kappa = 0.29-0.47) reproducibility, were found when a nominal or ordinal categorical scale was used. In conclusion, the interpretation of CT images of laryngeal tumors is reproducible.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that although laryngeal cancer can be detected more accurately using a CT scan, MRI and CT may be similar techniques.

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