Role of MDCT in Diagnosis and Staging of Carcinoma Oesophagus

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ABSTRACT

Background: Esophageal cancer is the eighth most common malignant tumor and the sixth most common cause of cancer death worldwide. Early detection of carcinoma esophagus and its appropriate staging can be life-saving for many patients. Multi-Detector Computed Tomography (MDCT) plays a crucial role in early detection, local invasion, and metastasis of carcinoma oesophagus, which also helps in appropriate staging and deciding a further plan of management. The present study describes various findings of oesophageal carcinoma on CT to aid in its staging.

Materials and Methods: After ethical clearance, a retrospective and prospective hospital-based study were carried out in the Department of Radiodiagnosis, Mahatma Gandhi medical college and hospital Jaipur, Rajasthan, India over a period of last 5 years. After obtaining consent, 60 patients presenting with clinical symptoms and signs pertaining to carcinoma of oesophagus, were studied with a Multi-Detector CT scanner (128 slices GE Optima CT Machine) using thin sections. Oral and IV contrast was used. Three-dimensional reconstructions were done and various CT findings of oesophageal cancer were studied. The diagnosis and staging were confirmed by postoperative histopathological findings.

Results: Carcinoma oesophagus was commonly seen in the age group between 60 to 70 years (35%) with males (63%) more commonly affected than females (37%). The most common presenting symptom was dysphagia. Alcohol and smoking were associated risk factors. The lower 1/3rd of oesophagus was affected more commonly compared to other parts. The wall thickness in a majority of the cases measured between 10-20mm (71.6%). T3N1M0 was the most common staging found in CT. Out of 60 cases 40% of cases presented with metastasis. Squamous cell carcinoma (80%) was the more common histopathological type. Out of 60patients when CT staging was compared with the postoperative histopathological staging, the sensitivity of CT-scan for 'T 1-T2' stage was 50%, for T3 stage was 73.5 %, in 'N' stage 81%, and in 'M' stage was 100%.

Conclusion: MDCT is a modality of higher sensitivity and specificity for CA esophagus early diagnosis and staging. By early identification of loss of fat planes, detection of lymph nodal involvement, and metastasis to various organs with an overall diagnostic accuracy value of 74 to 84%, MDCT remains an outstanding tool in early diagnosis and staging of carcinoma oesophagus.

Keywords: Carcinoma, Staging, Oesophagus, Multi Detector, Computerized Tomography, (MDCT).

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Introduction

Esophageal cancer is the eighth most common malignant tumor and the sixth most common cause of cancer death worldwide.[1] More than 90% of malignant neoplasms of the oesophagus are squamous cell carcinoma or adenocarcinomas.[2] Detection of esophageal cancer at early stages has a good 5-year survival rate of 57%–78%.[3] In locally advanced disease or with distant metastasis prognosis is generally poor to worse. So for early detection, diagnosis, staging of esophageal cancer imaging plays an important role. Various imaging modalities are Barium swallow, Computed tomography (CT), endoscopic ultrasonography (EUS), positron emission tomography (PET). CT is recommended for initial imaging following confirmation of malignancy by pathological analysis, primarily to rule out unresectable and metastatic disease. With the advent of multidetector computerized tomography (MDCT), the use of thin sections and multiplanar reformation allows more accurate staging of esophageal cancer.

Aims

To evaluate and describe various imaging findings in carcinoma oesophagus on MDCT and it is preoperative staging.

Materials and Methods

A retrospective and prospective hospital-based observational study were carried out in the Department of Radiodiagnosis of our institute over a period of last 5 years after obtaining ethical clearance from the institute and consent from patients. 60 patients presenting with clinical symptoms and signs of carcinoma oesophagus were studied with Multi-Detector CT scanner (128 slice GE optima CT scanner) using thin sections. Oral gastrografin 20-30 ml and IV contrast (60 -80 ml iohexol 350 mg /ml with the rate of 3-4 ml per second) was used. The parameters used were120 kVp and 270 mAs. The CT examination should extend from the lower cervical region to the upper abdomen. Both plain and contrast scans were done. CT acquisition with a collimation of 5mm should be performed with a delay scan in few cases. Initial axial scan with reformatted coronal and sagittal images and three-dimensional reconstruction were also obtained.

The diagnostic criteria included age and gender of the patients and various CT findings like part of the involved esophagus, wall thickness, length of the involved segment, type of enhancement, and associated findings of local mediastinal invasion, lymph nodal, and distant metastasis.

Then staging was done based on an internationally approved staging system (TNM classification system) maintained by the American Joint Committee on Cancer (AJCC). The depth of local invasion by the primary tumor included in T stage, the extent of regional lymph node involvement included in N stage, and the presence or absence of distant metastasis included in M stage in our study. Then patients were further classified into N0 (no cancer-positive nodes), N1 (one or two cancer-positive nodes), N2 (three to six cancer-positive nodes), and N3 (seven or more cancer-positive nodes) stage.[4,5]

Observation: Patients of the age group between 31 to 90 years were included in our study. The highest prevalence was between 60-70 years age group accounting for 35% of total patients. Out of 60 patients, 63% affected were male and 37% affected were female patients. The most common presenting symptom was dysphagia seen in all 60 patients. Other symptoms were weight loss seen in 70% of patients followed by abdominal and chest pain (44%), dyspepsia (36%), and odynophagia (24%). Alcohol and smoking were associated risk factors. The

lower oesophagus (60%) was more commonly involved compared to mid (35%), upper (3%), and cervical (2%) parts of oesophagus. The wall thickness in the majority of the cases measured between 10-20mm (71.6%) as shown in **Table 1**. T3N1M0 was the most common staging found in CT. Out of 60 patients who underwent CT-scan for carcinoma oesophagus in our study, 24 patients showed distant metastasis. Squamous cell carcinoma was the more common histopathological variant (80%) as shown in **Table 2.**

Table: 1

MDCT Findings	Number of Cases	Percent of Cases
Wall thickening<10 mm	5	8.4%
10-20 mm	43	71.6%
>20 mm	12	20%
Wall attenuation		
Homogeneous	37	64%
Heterogeneous	23	38%
Lymph nodal involvement		
Neck nodes	2	3.3%
Thoracic nodes	36	60%
Abdominal nodes	14	23.33%
Metastasis	24	40%

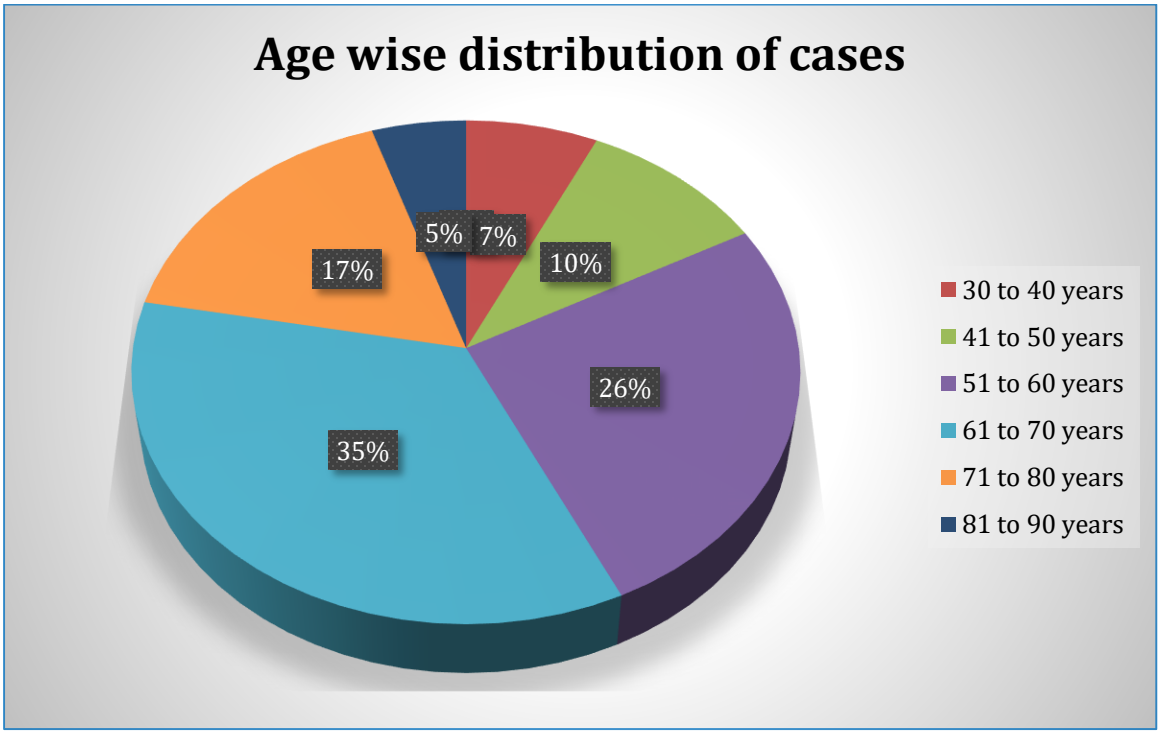
Table: 2

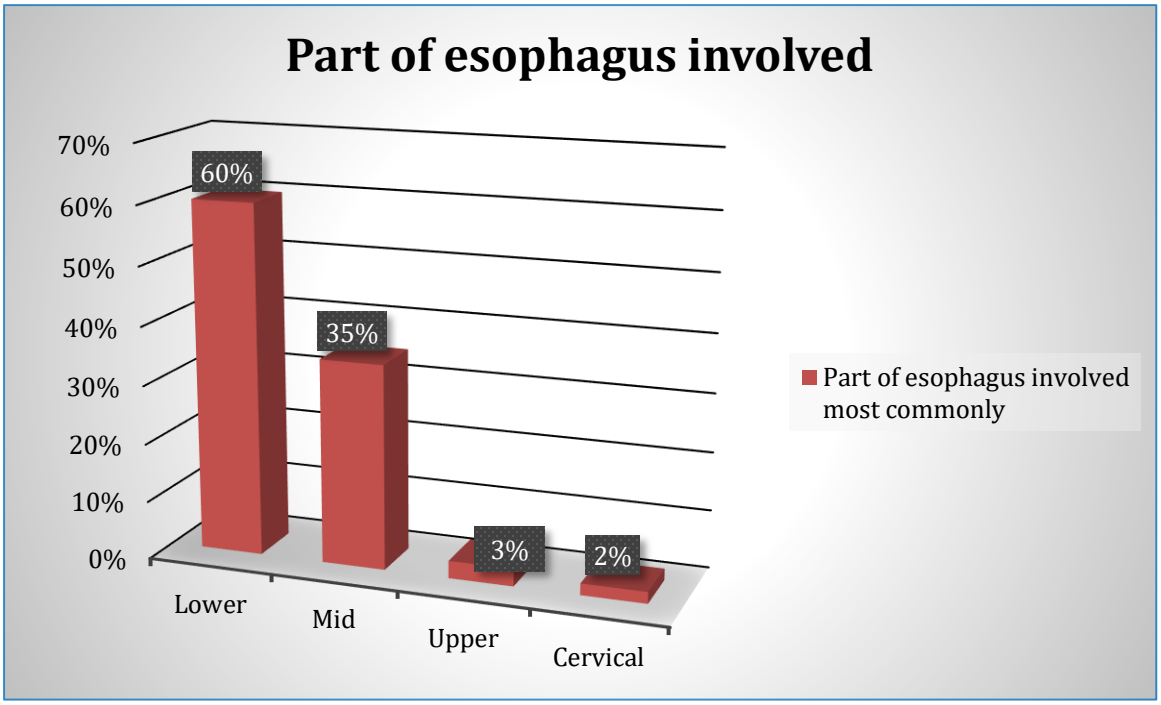
Histological cell type of carcinoma Oesophagus		
Type	No. of cases	Percent of cases
Squamous cell carcinoma	48	80%
Adenocarcinoma	12	20%

Table: 3

Stage	Accurately staged by CT (corroborated with surgery findings)	Not accurately staged (corroborated with surgery Findings)	Total
T1-T2	11(50%)	11(50%)	22
T3	25(73.5%)	9(26.5%)	34
T4	4(100%)	0	4

Table 3: Accuracy of T staging in our study with the CT findings corroborated with surgery findings in 60 cases


Age wise distribution of cases
5%
7%
10%
17%
26%
35%
30 to 40 years
41 to 50 years
51 to 60 years
61 to 70 years
71 to 80 years
81 to 90 years


Part of esophagus involved
70%
60%
50%
40%
30%
20%
10%
0%
60%
35%
3%
2%
Lower
Mid
Upper
Cervical
Part of esophagus involved most commonly

Illustrations

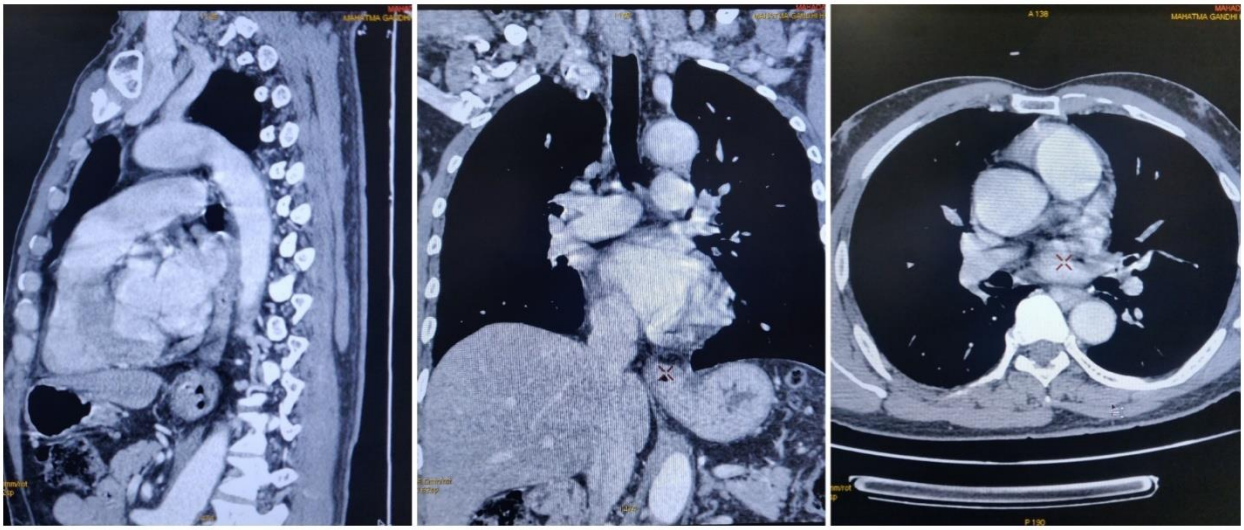


Figure 1: Contrast enhanced CT (CECT) scan image shows that there is irregular homogenous circumferential mass lesion with lumen narrowing in lower one third of oesophagus with involvement of GE junction and part of fundus of stomach.

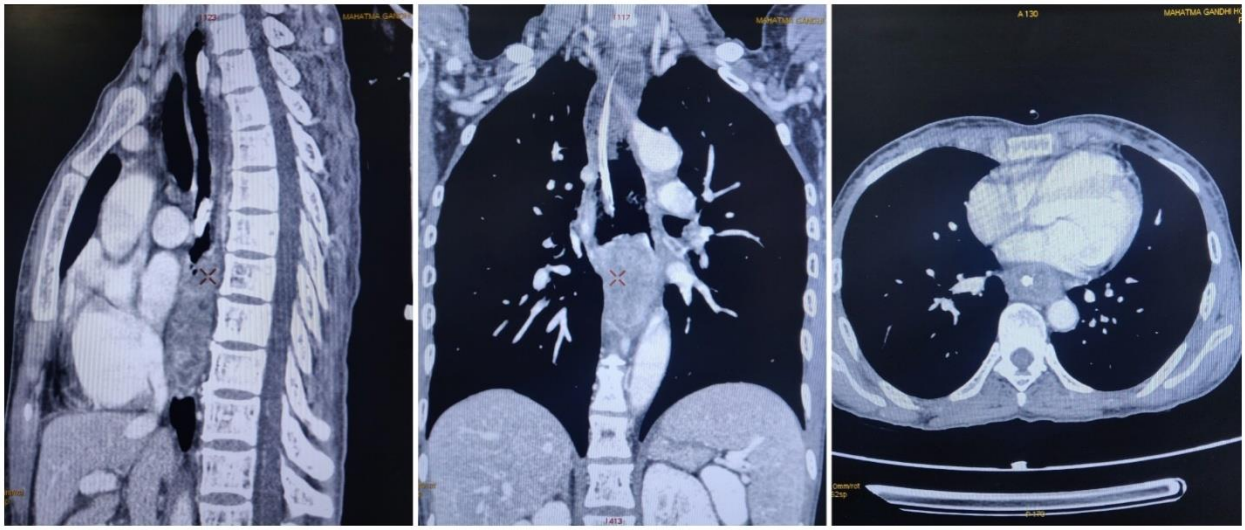


Figure 2: 48 years Female CECT shows that there is circumferential mural wall thickening of mid-lower oesophagus with heterogeneous enhancement.

Discussion

In our study highest prevalence of carcinoma oesophagus is seen in the 60-70 years age group accounting for 35 % of the total no of patients. Out of 60 patients, 63 % affected were male and 37 % affected were female patients.

Among four parts of oesophagus the lower oesophagus (60%) was more commonly involved compared to the mid (35%), upper (3%), and cervical (2%) oesophagus in our study.

The wall thickness in the majority of the cases measured between 10-20mm (71.6%). Irregular circumferential mass like mural thickening with heterogeneous enhancement is seen in these patients. Sometimes few small areas of necrosis are also noted. In few cases

air-fluid levels are also noted in tight strictures. In 27 patients (54%) mediastinal involvement was noted. In one patient (2%) tracheoesophageal fistula was noted. In 36 patients (60%) regional lymph nodes in the thorax were seen. Metastasis was noted in 24 cases (40%) out of 60 patients.

In our study out of 22 patients classified in T1-T2 stages, 50% were accurately staged and 50% were not accurately staged. Of the 34 patients classified in the T3 stage, 73.5% of cases were accurately staged after being corroborated with surgical findings. Of the 4 patients classified in the T4 stage, all were seen to be accurately staged after being corroborated with CT findings. The sensitivity of the CT-scan to identify the M stage was 100%.

So the result found that sensitivity of CT scan in T staging is 66.6% which is less compared to the result obtained in a study done by Kavita U Vaishnav et al., which shows 77.94% sensitivity of CT-scan for 'T'-staging. Whereas, results of CT sensitivity for 'N' and 'M' staging are 81% and 100% respectively, compared to 79.4% and 99% for 'N' stage and 'M' stage respectively in their study. So CT is less accurate in differentiating between T1 and T2 disease. In later stages, CT also appears to accurately stage the disease along with regional and distant metastasis.

Conclusion

So besides being a rapid and non-invasive test, MDCT is also a modality of higher sensitivity and specificity for early diagnosis and staging of carcinoma oesophagus. By early identification of loss of fat planes, detection of lymph nodal involvement, and metastasis to various organs with an overall diagnostic accuracy value of 74 to 84%, MDCT remains an outstanding tool in early diagnosis and staging of carcinoma oesophagus.

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