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7Original Research Article

MDCT imaging features with the histopathological diagnosis of carcinoma esophagus

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Abstract

Early oesophageal cancer has shown a good 5-year survival rate of 57%-78%. Its high mortality rate makes it a major concern. Overall survival rate is 62.5% at 1 year, 42.4% at 2 years and 30% at 5 years. The prognosis is poor in locally advanced diseases and worse in cases with distant metastasis. Squamous cell carcinomas (SCCs) and adenocarcinomas are the most common oesophageal cancers. Patients with the signs and symptoms relating to dysphagia, weight loss, and/or hematemesis were referred from various Departments. Out of all these patients, 78 patients were selected on the basis of histopathological examination (HPE) report showing the confirmed presence of carcinoma of the esophagus. All the patients with upper third growths (14 patients, 24.6%) had squamous carcinoma while 25 out of 28 patients (44%) had middle third growths had squamous carcinoma and 18 out of 36 patients (31%) with lower third growths had SCC. Adenocarcinoma was observed to be seen maximum in lower third location (85.7%). Squamous cell carcinoma was observed to be seen maximum in the middle third location (43.9%) followed by lower third location (31.6%). Adenocarcinoma was observed to be seen maximum in lower third location (85.7%). Squamous cell carcinoma was observed to be seen maximum in middle third location (43.9%) followed by lower third location (31.6%).

Keywords: MDCT, histopathological diagnosis, carcinoma esophagus

Introduction

Oesophageal cancer is among the 10 most frequent cancers in the world and is the seventh leading cause of cancer death. Globally, according to GLOBACAN 2020 estimates oesophageal cancer ranks seventh in terms of incidence (604,000 new cases) and sixth in mortality overall (544,000 deaths), the latter signifying that esophageal cancer was responsible for one in every 18 cancer deaths in 2020. Its late presentation and early extramural disease spread lead to a poor long-term prognosis with a 5-year survival rate of less than 15%. Jammu and Kashmir state of India is one of the states with a high incidence of oesophageal cancer, in the "Central Asian oesophageal cancer belt [1].

ISSN 2515-8260 Volume 09, Issue 02, 2022

Early oesophageal cancer has shown a good 5-year survival rate of 57%-78%. Its high mortality rate makes it a major concern. The prognosis is poor in locally advanced diseases and worse in cases with distant metastasis. Squamous cell carcinomas (SCCs) and adenocarcinomas are the most common oesophageal cancers [2].

The prevalence of oesophageal carcinoma has increased dramatically in the last 30 years with reported increases of 350-800%. Adenocarcinoma is now the most common cell type in the United States, and although the disease may present late it should not be considered an entity with a uniformly poor prognosis. The overall 5-year survival is 25%, increasing to 85% if the nodes are disease-free at presentation. Unfortunately, approximately 75% of patients will have evidence of nodal disease at presentation and 18% will have distant metastases. Appropriate staging is important for the assessment of prognosis and deciding the most appropriate therapy. Treatment options include curative and palliative surgery, chemo-radiotherapy and stent insertion [3, 4].

About 90% of oesophageal tumors consist of carcinomas, with a 40-60% incidence of squamous cell type (SCC) and 30-50% for adenocarcinoma of the gastro-oesophageal junction (GEJ), with the latest representing 80% of tumors arising from Barrett's oesophagus

Histopathological types of oesophagus carcinomas are squamous cell carcinoma, adenocarcinoma, and other rare subtypes are small cell carcinoma, spindle cell, lymphoma, leiomyosarcoma, malignant melanoma and others.

African-Americans are five times more likely to develop squamous cell carcinoma than other socioeconomic groups. While risk factors for squamous cell carcinoma of the oesophagus are well known (e.g., tobacco, alcohol, diet), the risk factors for the oesophageal adenocarcinoma are reflux esophagitis and resultant Barrett’s oesophagus, due to the chronic irritation of the mucosal lining and dietary factors [5].

Heavy smoking and heavy drinking combine to increase the rise 25 to 100-fold, males are 4-6 times more likely than females. Patients with primary squamous cell carcinoma of the head and neck have a significantly increased risk of developing primary squamous cell carcinoma of oesophagus. Prior irradiation is also a probable risk factor. Over the past two decades, the prevalence of adenocarcinoma has risen steadily. Nearly 90% of adenocarcinoma develops in the lower oesophagus and may extend into the gastro-oesophageal junction and stomach; fewer cases develop in the middle third, and the smallest number in the proximal oesophagus [6].

Oesophageal carcinoma presents with dysphagia, odynophagia, weight loss and other symptoms related to distant metastasis. Fistulas may develop between the oesophagus and the tracheobronchial tree, increasing the risk of pneumonia and this condition may present as a cough, fever or aspiration.

Diagnosis of the histopathological type of carcinoma is done with esophagoscopy and biopsy. Size and extent of the tumor are very important for surgical management.

Localized tumors are treated with surgery. Larger masses are inoperable and hence are treated with either radiotherapy, chemotherapy or a combination of both. In fewer cases, chemotherapy and radiotherapy can make these tumors operable. So, prognosis depends on the size, extent and associated other conditions, but is generally poor.

Methodology

Patients with the signs and symptoms relating to dysphagia, weight loss, and/or hematemesis were referred from various Departments. Out of all these patients, 78 patients were selected on the basis of histopathological examination (HPE) report showing the confirmed presence of carcinoma of the esophagus.

After taking a properly informed written consent and complete history, a thorough clinical

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examination was done and these patients were subjected to CT scan. Clinical and radiological data from the study was recorded as per the proforma.
Using the 128-Slice Computed Tomography scanner, the staging was done using the TNM staging system proposed by the American Joint Committee. Out of 78 patients, 32 patients underwent surgery for carcinoma esophagus and in them, CT findings were correlated with the post-surgical findings wherever post-surgical biopsy histopathological results were available.

- **Study design:** Hospital based cross sectional study. All the patients with signs and symptoms of UGI disorder were carefully evaluated and a total of 78 patients who fulfilled the inclusion criteria of our study were selected in our study by the following methods.
- **Sample size:** The sample size (n) calculated was 45.

Estimation of sample size: Sample size was calculated by the formula, n= z2pq/d2.

- **P** = Prevalence of carcinoma oesophagus cases for which CECT was done which is equal to 1% according to hospital records.
- **q** = (1-p) = 99%.
- **d** = Allowable absolute error (3%).
- **z** = Standard normal variate for 95% confidence interval (2%).
- Therefore, the sample size (n) comes out to be 45. However due to availability of more cases, the sample size was increased to 78.

Inclusion criteria

- Clinically suspected cases.
- Detected esophageal cancer patients by endoscopy and histopathology.

Exclusion criteria

- Chronic cough.
- Contraindication for contrast injection.
- Impaired renal function (serum creatinine >1.2 mg/dl).

Results

Table 1: Incidence of histological cell types based on endoscopic HPE analysis (n=78)

Histologic cell Types	Frequency	Percentage
Squamous cell Carcinoma	56	71.8
Adenocarcinoma	22	28.2

As noted in the chart, 71.8% of patients had a squamous variety of carcinoma while 28.2% of patients had adenocarcinoma.

Table 2: HPE correlation with MDCT findings based on location (n=78)

Location		Oesophageal Carcinoma	
		Adenocarcinoma	Squamous cell Carcinoma
Lower 1/3rd	Frequency	18	18
	Percentage	85.7%	31.6%
Middle 1/3rd	Frequency	3	25
	Percentage	14.3%	43.9%
Upper 1/3rd	Frequency	0	14
	Percentage	0.0%	24.6%

P value-0.001-Statistically significant relation between distribution of the histological type and location.

All the patients with upper third growths (14 patients, 24.6%) had squamous carcinoma while 25 out of 28 patients (44%) had middle third growths had squamous carcinoma and 18 out of 36 patients (31%) with lower third growths had SCC.
Adenocarcinoma was observed to be seen maximum in lower third location (85.7%).
Squamous cell carcinoma was observed to be seen maximum in the middle third location (43.9%) followed by lower third location (31.6%).
Adenocarcinoma was observed to be seen maximum in lower third location (85.7%). Squamous cell carcinoma was observed to be seen maximum in middle third location (43.9%) followed by lower third location (31.6%)
P value 0.001-Statistically significant relation between distribution of the histological type and location.

Table 3: Histological cell types with gender distribution (n=78)

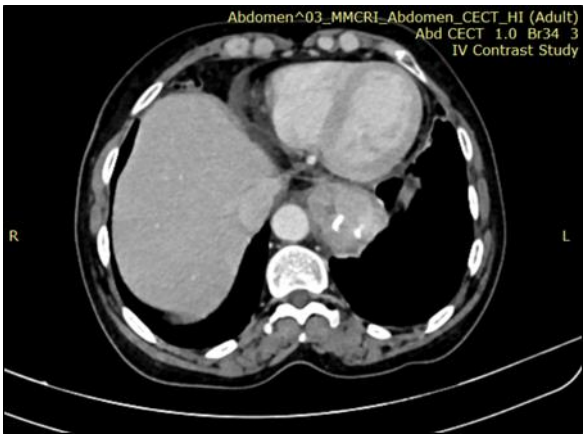
Gender		Oesophageal Carcinoma	
		Adenocarcinoma	**Squamous cell Carcinoma**
Male	Frequency	8	43
	Percentage	72.7%	64.2%
Female	Frequency	3	24
	Percentage	27.3%	35.8%

P value 0.513-statistically insignificant-no significant relation between the gender and oesophageal carcinoma.

Majority of the patients had squamous cell carcinoma which was found in 43 out of 50 male patients (64.2%) and 24 out of 28 female patients (35.8%). 64.2% of the Squamous cell carcinoma cases were seen in males and 35.8% SCC cases were found in females.
Adenocarcinoma was found in 8 out of 50 male patients (16%) and 3 out of 28 female patients (10.7%). 72.7% cases were found in males and 27.3% cases were found in females.
Incidence of both squamous cell variety and adenocarcinoma was observed to be maximum in male patients.
P value-0.513-statistically insignificant-no significant relation between the gender and oesophageal carcinoma.

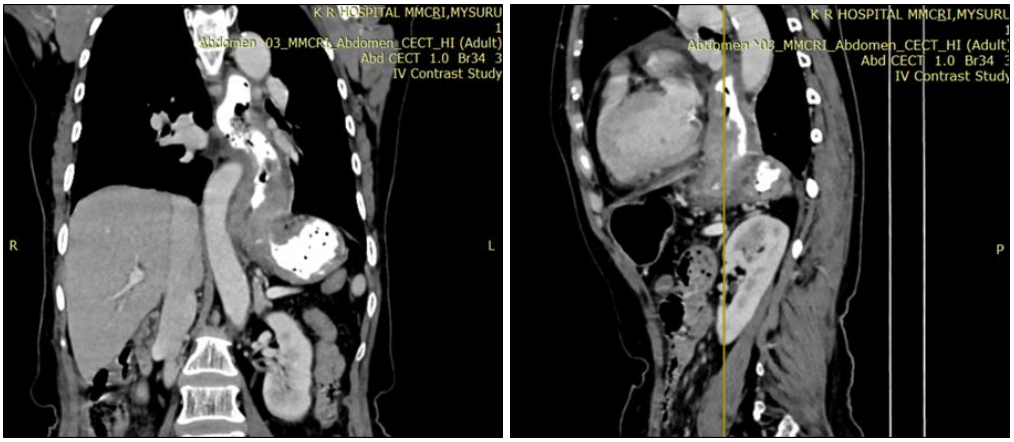
Representative images

Case 1: A 74 year old female patient complaining of dysphagia, pain in throat, weight loss, haematemesis and hoarseness of voice.



(A)

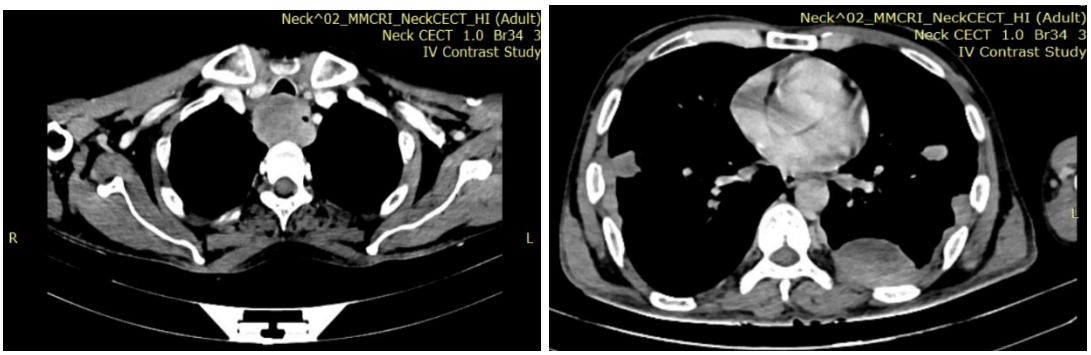
ISSN 2515-8260 Volume 09, Issue 02, 2022



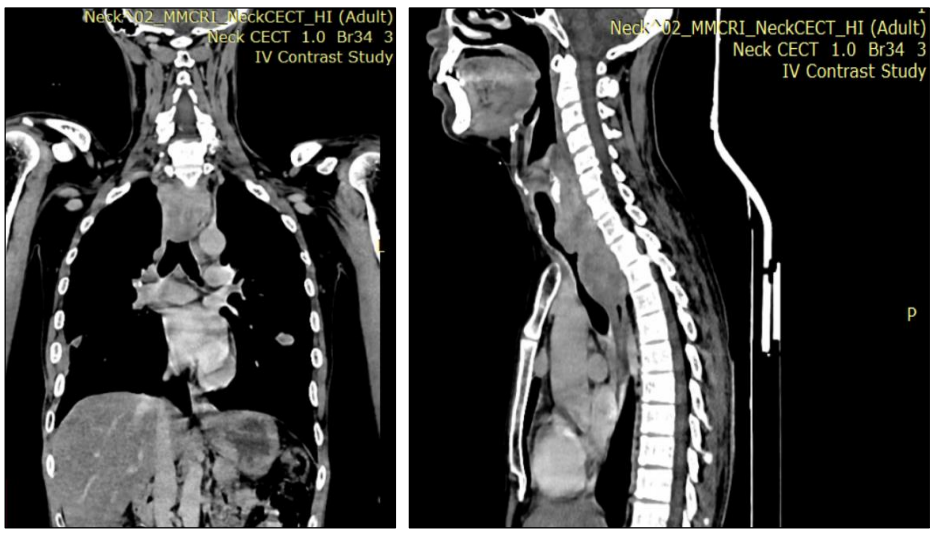
(B) **(C)**

CECT a) Axial b) Coronal and C) Sagittal images of 74 year old female patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and heterogeneous wall attenuation involving lower 1/3rd of oesophagus and gastroesophageal junction for length of approx. 9 cm with maximum wall thickness of 18mm causing significant luminal narrowing. Lesion shows significant pre contrast enhancement of 25-40 HU and post contrast enhancement of 65-70 HU. MDCT stage T3N2M0 -Stage III. HPE- Adenocarcinoma.

Case 2: A 39 year old male patient complaining of dysphagia, pain in throat, weight loss, haematemesis and hoarseness of voice.



(A) **(B)**

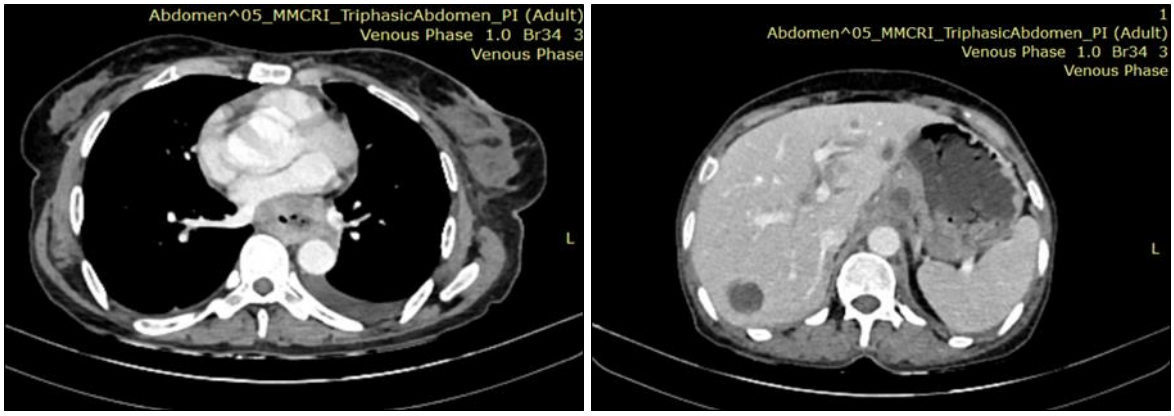


(C) **(D)**

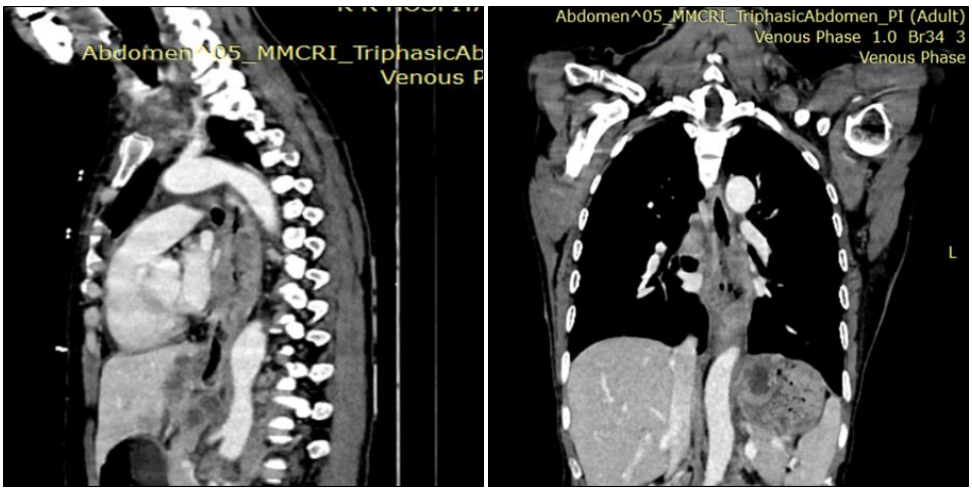
ISSN 2515-8260 Volume 09, Issue 02, 2022

CECT A) & B) Axial C) Sagittal and D) Coronal images of 39-year-old male patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and heterogeneous wall attenuation involving upper thoracic and cervical oesophagus with maximum thickness of 18mm for a length of approx. 9cm with significant luminal narrowing. However distal passage of oral contrast noted. The lesion is noted infiltrating trachea. Lesion shows significant pre contrast enhancement of 25-45 HU and post contrast enhancement of 55-65 HU. Few heterogeneously enhancing lesion in superior segment of right lung lower lobe abutting right major fissure; inferior lingular segment of left lung upper lobe and posterior basal segment of left lung lower lobe. Multiple heterogeneously enhancing pleural based lesion noted along bilateral costal pleural largest measuring 4.5x2.5cm on left side-pulmonary and pleural metastases. MDCT stage T4N2M1-Stage IV. HPE-Squamous cell carcinoma.

Case 3: A 55 year old female patient complaining of dysphagia, pain in throat, weight loss, hematemesis and hoarseness of voice.



(A) **(B)**



(C) **(D)**

CECT A) & B) Axial C) Sagittal and D) Coronal images of 55-year-old female patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and heterogeneous wall attenuation involving middle 1/3rd and lower 1/3rd thoracic oesophagus with maximum thickness of 15mm for a length of approx. 12.5cm with significant luminal narrowing. However distal passage of oral contrast noted. Lesion shows significant pre contrast enhancement of 25-45 HU and post contrast enhancement of 55-65 HU. Liver shows multiple heterogeneously enhancing lesions with central nonenhancing area (s/o

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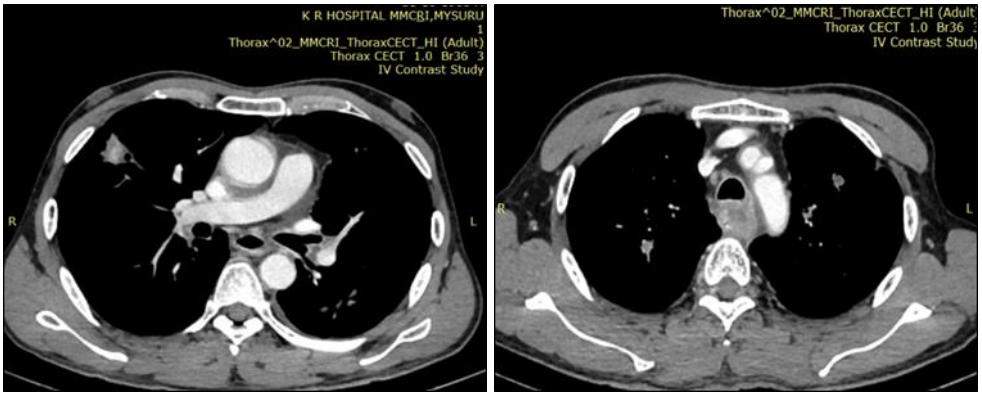
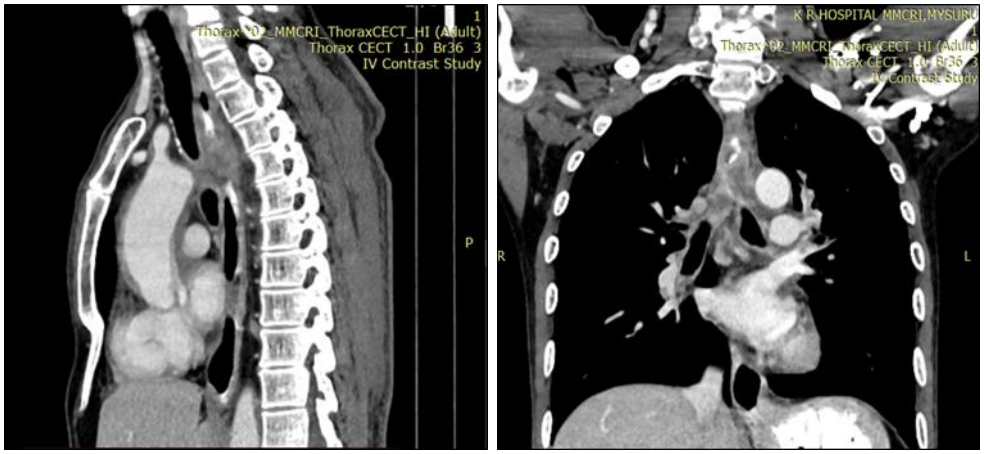
necrosis) randomly distributed in both lobes of liver. Largest measuring 19x22mm in segment VII of liver. -Liver metastases. Few heterogeneously enhancing metastatic deposits along lesser curvature of stomach. Multiple mediastinal, supraclavicular and abdominal lymphadenopathy were noted. MDCT stage T3N3M1-Stage IV. HPE-Squamous cell carcinoma.

Case 4: A 53 year old male patient complaining of dysphagia, pain in throat, weight loss, hematemesis and hoarseness of voice.



(A) **(B)**

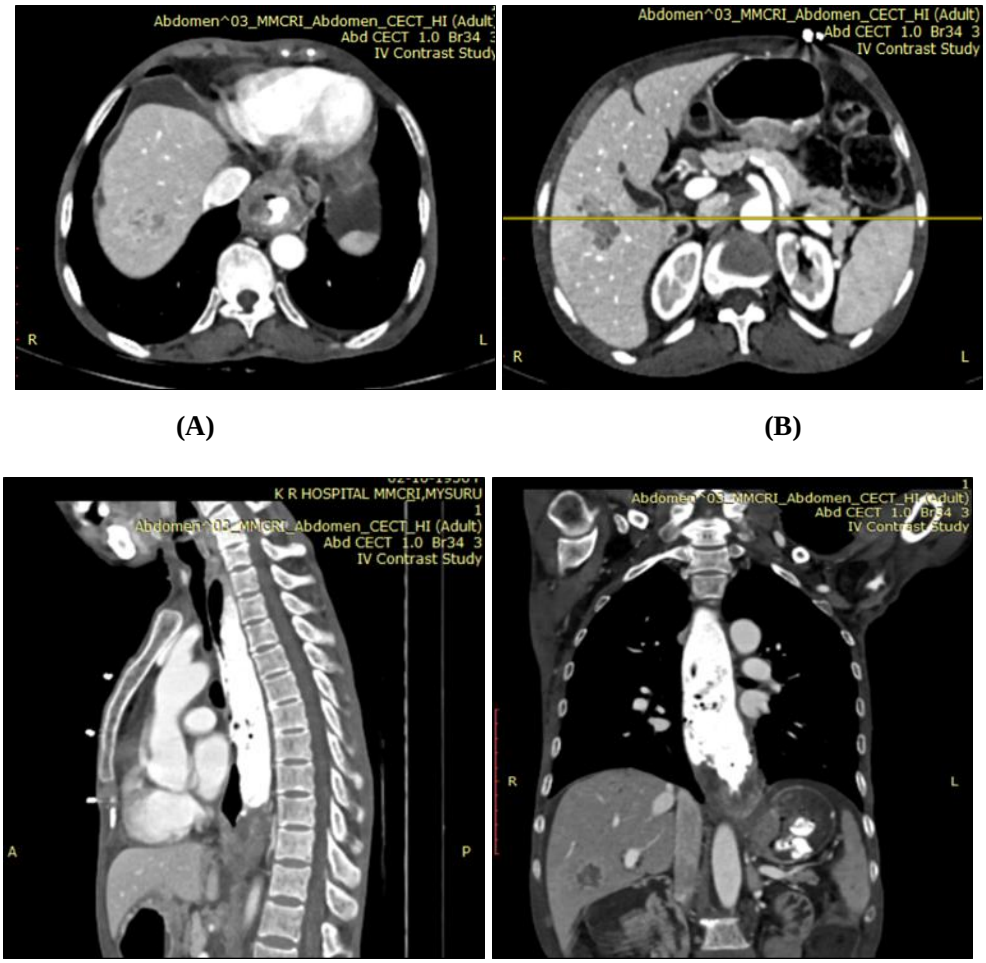


(C) **(D)**

CECT A) & B) Axial C) Sagittal and D) Coronal images of 53-year-old male patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and heterogeneous wall attenuation involving middle 1/3rd of thoracic oesophagus with maximum thickness of 13mm for a length of approx. 7cm causing luminal narrowing. However distal passage of oral contrast noted. Lesion shows significant pre contrast enhancement of 30-45 HU and post contrast enhancement of 50-55 HU. A well-defined heterogeneously enhancing nodule noted involving lateral segment of right lung middle lobe-lung metastasis. MDCT stage T2N2M1-Stage IV. HPE-Squamous cell carcinoma.

Case 5: A 65 year old female patient complaining of dysphagia, pain in throat, weight loss, hematemesis and hoarseness of voice.

ISSN 2515-8260 Volume 09, Issue 02, 2022



(A) **(B)**

(C) **(D)**

CECT A) & B) Axial C) Sagittal and D) Coronal images of 65-year-old female patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and heterogeneous wall attenuation involving lower 1/3rd thoracic oesophagus extending upto GE junction with maximum thickness of 24mm for a length of approx. 8.6cm with significant luminal narrowing with upstream dilatation, however distal passage of positive oral contrast noted. Lesion shows significant pre contrast enhancement of 30-40 HU and post contrast enhancement of 50-60 HU. Liver shows few heterogeneously enhancing lesions with nonenhancing areas within(s/o necrosis) in segments II, V, IVB, VII and VIII of liver, largest measuring 3x2.7cm in segment V-liver metastases. Few enlarged paraoesophageal and paracardiac lymph nodes noted. MDCT stage T3N2M1-Stage IV. HPE-Squamous cell carcinoma.

Discussion

In a study conducted by Sopa Pongpornsup MD *et al*. [7] of 21 patients with oesophageal cancer the overall sensitivity, specificity, PPV, NPV and accuracy of CT T3 staging were 75%, 78%, 66.7%, 84.6%, and 77.3% respectively. The CT T4 staging had sensitivity 75%, specificity 85.7%, PPV 75%, NPV 85.7%, and accuracy 81.8%. In N staging, N0 staging from CT study had a sensitivity 50%, specificity 33%, and accuracy 38%. N1 staging from CT study had a sensitivity 33%, specificity 50%, and accuracy 38%.

Out of 78 patients included in our study, 14 patients (18%) showed evidence of distant metastases were given M1 Stage and remaining 64 (82%) patients were given M0 stage. In our study out of 78 patients, 98.71% accuracy for M stage was seen. CT scan is a superb

modality for detecting metastatic diseases to the liver, adrenal glands and lungs.
In a study conducted by Mehul S Pateliya *et al*. [8] on 100 cases of carcinoma oesophagus, The overall accuracy of MDCT in detecting distant metastases was 99%. In a study by Sumithra *et al*. [9], out of 37 patients who underwent CT-scan for carcinoma oesophagus 6 patients showed distant metastasis. Two patients showed metastasis to lung, 2 patients to liver and 2 patients to adrenal glands and the sensitivity of CT scan to identify M stage was 100%. For M staging MDCT is considered as a standard modality in most situations and is superior to MR in depicting mediastinal, hilar, pulmonary, pericardial, pleural, omental, mesenteric and peritoneal disease.
In a study conducted by Dr. Kavita U Vaishnav *et al*. [10], of 100 adult patients CT findings were correlated and confirmed by endoscopy, biopsy, histopathology, and postoperative findings. Analysis showed that out of 100 patients 68 were operated, so CT staging was compared with operative and histopathological staging. The sensitivity of CT scan in T stage was 77.94%, in N stage 79.41%, and for M stage 99%. In our study the overall accuracy of MDCT scan in T stage was 81.25%, in N stage 75%, and for M stage 98.71% respectively.
Contrast-enhanced CT remains as the imaging investigation of choice in preoperative esophageal cancer staging since it is rapid and non-invasive modality to evaluate local extension of tumours, to detect lymphadenopathy and metastatic disease which is vital in determining resect ability and in radiation therapy planning.
The individual layers of oesophageal wall cannot be delineated accurately with CT-scan and further CT cannot identify microscopic infiltration. Thus, CT is less accurate in differentiating between T1 and T2 disease.
Endoscopic ultrasonography (EUS) and EUS-guided fine-needle aspiration (FNA) are-now considered to be invaluable tools for accurate pretreatment staging of esophageal cancer. Numerous studies have demonstrated that EUS is superior to CT in both T and N staging of esophageal cancer. Since this facility was not available in our hospital, it was not performed in our patients.
MDCT cannot precisely distinguish between reactive hyperplasia and metastatic mediastinal lymphadenopathy, which has an implication on staging of the cancer.

Conclusion

- Adenocarcinoma was observed to be seen maximum in lower third location (85.7%).
- Squamous cell carcinoma was observed to be seen maximum in the middle third location (43.9%) followed by lower third location (31.6%).
- Adenocarcinoma was observed to be seen maximum in lower third location (85.7%). Squamous cell carcinoma was observed to be seen maximum in middle third location (43.9%) followed by lower third location (31.6%).

References

1. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. CA Cancer J Clin. 2011;61(2):69-90.
2. Talsma K, Van Hagen P, Grotenhuis BA, *et al*. Comparison of the 6th and 7th editions of the UICCAJCC TNM classification for esophageal cancer. Ann Surg Oncol 2012;19(7):2142-2148.
3. Edge SB, Compton CC. The American Joint Committee on Cancer: the 7th edition of the AJCC cancer staging manual and the future of TNM. Ann Surg Oncol. 2010;17(6):1471-1474.
4. Rice TW, Blackstone EH, Rusch VW. 7th edition of the AJCC cancer staging manual: esophagus and esophagogastric junction. Ann Surg Oncol. 2010;17(7):1721-1724.

ISSN 2515-8260 Volume 09, Issue 02, 2022

5. Kim TJ, Kim HY, Lee KW, Kim MS. Multimodality assessment of esophageal cancer: preoperative staging and monitoring of response to therapy. Radio Graphics. 2009;29(2):403-421.
6. 8th edition AJCC/UICC staging of cancers of the esophagus and esophagogastric junction: application to clinical practice Thomas W. Rice1, Deepa T. Patil2, Eugene H. Blackstone.
7. Sopa Pongpornsup MD, Suthinee Posri MD, Kanyarat Totanarungroj MD. Diagnostic Accuracy of Multidetector Computed Tomography (MDCT) in Evaluation for Mediastinal Invasion of Esophageal Cancer. Journal of the Medical Association of Thailand Chotmaihet Thangphaet, 2012 May, 1-8.
8. Role of CT scan in staging of carcinoma of esophagus-a study of 100 cases-Mehul S and Himanshu C *et al*.
9. Sumithra L, Vijay Kumar KR, Nagaraj BR. The Role of MDCT in Oesophageal Cancer. International Journal of Anatomy, Radiology and Surgery. 2016 Jul;5(3):RO37-RO40.
10. Vaishnav KU, Vaishnav UG, Patel SB, Bhatt CJ, Shah, *et al*. Role of CT-Scan in staging of carcinoma of oesophagus-a study of 100 cases. Gujarat Medical Journal. 2014;69(1):87-92.

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