

Original Research Article

CT imaging and staging of carcinoma oesophagus

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ABSTRACT

Background: Over the past decades, computerized tomography (CT) technology has led to an early detection of cancers and thereby decreasing mortality rate. The objective was to demonstrate usefulness of Toshiba Activion 16 slice multi detector computerized tomography (MDCT) scan in staging of oesophageal cancer.

Methods: The study was carried out in the Department of Radio diagnosis, Bapuji Hospital and Chigateri Government Hospital attached to Jagadguru Jayadeva Murugarajendra Medical College, Davangere, Karnataka, India over a period of 24 months. After taking a properly informed written consent, complete history and thorough clinical examination was done and these patients were subjected to CT scan.

Results: The total numbers of patients studied in present study were 25. Out of which 10 were males and 15 were females. There were 6 patients upto the age of 54 years and 8 patients equal to or greater than 65 years of age, there were 11 patients between 55-64 years of age. Dysphagia was the most common symptom in patients and was present in all the 25 patients of present study. Other common symptoms were weight loss followed by pain in throat. Two different types of wall thickenings of the involved portion have been reported. The most common asymmetrical wall thickening was observed in maximum number of patients 18 (72%) and circumferential wall thickening was observed only in 7 number (28%) of patients out of 25 total patients showing heterogeneous/homogeneous enhancement. Lower third (40%) and middle third (40%) of the esophagus was the most common site of involvement with regards to location of oesophageal cancer followed by upper third (20%) of the esophagus. Homogeneous wall attenuation was observed in most of the cases accounting for (64%). The other type of wall attenuation noted were heterogeneous (36%).

Conclusions: By performing endoscopy uncertainty lies in discrimination of muscular layer from serosal layer in most parts of esophagus. However, by employing MDCT technique separation of 2 layers of esophagus can be better judged. Therefore, MDCT has been found to be the most valuable and preferential technique for planning operational strategy.

Keywords: Dysphagia, Haematemesis, Multidetector computerized tomography, Oesophageal carcinoma

INTRODUCTION

Over the past decades, computerized tomography (CT) technology has led to an early detection of cancers and thereby decreasing mortality rate. Introduction of multi detector computerized tomography (MDCT) scanner is a boon to clinical imaging practice. The use of CT has continuously increased due to latest applications and the demand for better technology.¹ For the last few years,

rapid technological advances in cross-sectional imaging modalities have combined with increased number of scanners to enable multiple new modes of imaging the oesophageal carcinoma. Radiologists are skilled in interpreting CT scans in the axial plane, but the development of MDCT coupled with faster reconstruction hardware and software has piqued deep interest in viewing the oesophagus planes other than the axial plane. Therefore, possible viability to conclude the

fair results revealing axial imaging using MDCT equipped with slice thickness of 16mm cannot be ruled out.² The speed and higher resolution of MDCT enable the creation of 3D representations of complex data sets. As automated processing techniques mature, it may become routine to create a 3D representation of the oesophagus with a few mouse clicks. Computed tomography (CT) has become an indispensable tool for evaluating the oesophagus in both the outpatient and emergency room settings.³

Oesophageal cancer is comparatively more in men than in women and it occurs most commonly during the sixth and seventh decade of life. The disease becomes more common with advancing age; it is about 20 times more common in persons after attaining the age of 65 years.

Oesophageal cancer is the eighth most common cancer and the sixth most common cause of worldwide deaths owing to cancer. There are two main types of oesophageal cancers- squamous cell carcinoma: usually involves upper and middle 1/3rd of esophagus; and adenocarcinoma: usually involves lower 1/3rd of esophagus. Squamous cell carcinoma of the oesophagus is associated with tobacco and alcohol consumption; whereas adenocarcinoma is associated with chronic gastro oesophageal reflux disease, Barrett's oesophagus, and increasing body mass index. The aim of this study was to assess the accuracy of multidetector computed tomography (MDCT), including virtual endoscopy (VE) for detection, precise localization, preoperative evaluation and staging of esophageal cancer (EC) by comparison with surgical and histopathological findings. Three-dimensional MDCT, along with VE is a promising method for preoperative evaluation and staging of EC. Although accuracy in N staging remains low in comparison to PET, it provides a larger amount of diagnostic and staging information.⁴

Multi detector computerized tomography (MDCT) meant for diagnosing carcinoma oesophagus is most useful technique of radio imaging modality for staging and management. It also depicts about the severity of the oesophageal cancer and is helpful for the clinicians to plan and devise appropriate treatment. It can also be used to detect distant metastasis.⁵

The area in which multi detector computerized tomography (MDCT) has been applied, displayed heavy impact in gastrointestinal tumours and vascular imaging. Its role is also very important both in diagnosis and prognosis. It is also extremely useful in monitoring patients which are treated surgically or pharmacologically, in order to evaluate response to therapy and possibility of progression towards cancer. MDCT is much useful for staging carcinoma oesophagus because it is the most valuable and vulnerable advanced technique for formulation of actual line of incidence and further treatment to be meted out at the appropriate time and in an appropriate manner.⁶

Esophageal cancers typically spread both by direct invasion and also via network of lymphatics. Hematogenous spread is more common in the patients with advanced stage of diseases. Lungs and liver have been regarded as the usual sites of hematogenous metastases. Oesophageal carcinoma is responsible for <1% of all cancers and 4-10% of all GI malignancies. MDCT provides valuable information regarding the local extent and is quite useful in determining optimal management.

Computed tomography (CT) is a primary imaging modality for enabling the detection and characterization of lesions of the esophagus. It is an effective mode in determining the length, location, nature of characteristics lesions and in monitoring their alteration in size over time. CT of the cervical region, chest, and abdomen is employed to detect the presence of cancer in the esophageal wall, invasion into the tracheobronchial tree, aorta, or pericardium, and the presence of metastatic disease in lymph nodes, lung, liver, bones, or adrenal glands. For an optimal CT, contrast material needs to be administered both orally and intravenously during the investigation. Oral contrast is highly useful for a better delineation of the esophageal wall, whereas intravenous contrast is administered for a better visualization of the vascular structures as well as the margins of the tumor and for the detection of liver metastasis. Particularly, liver metastasis is more readily detected following contrast enhancement. Slice thickness should not exceed 5mm. With a slice thickness of more than 5mm, the chances to miss metastasis are highly increased. Lymph node metastasis can also be detected with CT. Lymph nodes are considered to be malignant if the size exceeds 10mm on CT.⁷

Incidence of gastric cancer is decreasing, whereas the incidence of esophageal cancer is increasing, mainly because of the increase in the frequency of adenocarcinoma of the distal esophagus. Over the past two decades, the incidence of esophageal adenocarcinoma has increased and is currently higher than that of squamous cell carcinoma especially in western countries. The high prevalence of lymph node involvement in esophageal cancer is due to vast network of lymphatics which extends along the entire esophagus. The status of regional lymph node has been found to be an important prognostic factor in patients afflicted with esophageal cancer. Patients with nodal metastasis have a higher spread of the diseases, thereby a worse prognosis.⁸

It has been already in the notice of the clinicians that esophageal cancer metastasizes to distant lymph nodes, liver and lungs before metastasizing to other organs such as bone and adrenal glands. Patients with metastatic esophageal cancer show poor prognosis. Therefore, major surgery is not recommended in the patients. Recently, current preoperative staging techniques such as computed tomography (CT) displays a limited accuracy and therefore, there is an urgent need to depend on invasive

procedures for correct marking and assessing the exact stage of the fatal diseases appropriately.

In the mid-nineties positron emission tomography (PET) superseded other techniques for the staging of esophageal cancer. Now a day's joint venture of PET and CT scanners have been progressively replacing conventional PET for the exact evaluation in oncological patients. In a nut shell PET technique alone is rather a futile attempt and shaken the confidence of radiologists. However, employing both the techniques- PET as well as CT better results have been achieved to mark the requisite spots of this particular disease. Therefore, PET and CT both techniques have been found to be highly dependent for spotting and distinction. Combination of these two modalities have been rendering accurate and authentic findings, thus lead to better diagnosis for treatment of cancer patient.

Rankin S et al, stated that generally, esophageal cancers are epithelial in origin. The esophagus is lined by squamous epithelium and therefore the prevalent histology of esophageal tumors is squamous cell carcinoma in most geographical pockets of the world.⁹

Jemal A et al, in a study the incidence of the subtypes has regional variations. The squamous cell subtypes have the largest worldwide incidence (approximately 90%), but the adenocarcinoma subtype is basically more prevalent in many geographical pockets of North America and Europe. In addition to it, some other areas having high incidence of esophageal cancer are Iran, some parts of Africa, Italy and China. In western countries, it accounts for heavy mortality. The overall number of deaths reported due to esophageal cancer in 2003 was approx. 13000.¹⁰

METHODS

The study was carried out in the Department of Radio diagnosis, Bapuji Hospital and Chigateri Government Hospital attached to Jagadguru Jayadeva Murugarajendra Medical College, Davangere, Karnataka, India over a period of 24 months.

Patients with the signs and symptoms relating to dysphagia, weight loss and/or haematemesis were referred from various Departments of JJMMC Davangere, Karnataka, India. Out of all these patients, 25 patients were selected on the basis of histopathological examination (HPE) report i.e. those patients in which HPE report confirmed presence of carcinoma of esophagus. Rest of the patients were excluded and not considered in this study.

After taking a properly informed written consent and complete history, thorough clinical examination was done and these patients were subjected to CT scan. Clinical and radiological data from the study was recorded as per the proforma.

Study design

An observational and descriptive hospital based study was carried out.

All the patients with signs and symptoms of UGI disorder were carefully evaluated and a total of 25 patients who fulfilled the inclusion criteria of our study were selected in present study by the following methods.

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 >1.2mg/dl).

Study tools

- Toshiba Activion. Multi detector computed tomography- 16 slice (MDCT).
- Automatic pump injector.
- Ionic and non ionic contrast media.
- Case reporting form.

Study protocol

Patient preparation

After taking a thorough history of allergy, chronic obstructive pulmonary disease, diabetes mellitus and hypertension, the patients were kept nil orally overnight prior to the CT scan to avoid complications while administering the contrast medium. Risks of contrast medium administration were narrated to the patient and written consent was obtained prior to the contrast study. The weight of the patient was taken into consideration to assess the dose of intravenous contrast medium.

Technique

All examinations were done on 16 slice Toshiba Activion MDCT. Opacification of digestive tract was achieved by oral administration of diluted 40ml of ionic contrast in 2litres of water. The patient was asked to consume 1.8litres of this diluted contrast at regular intervals for a period of three hours. The patient was asked to lie supine on CT table with arms positioned comfortably above the head in the head-arm rest and lower legs supported. Patient was asked to drink the remaining 200ml. of diluted contrast to opacify the stomach. Patient was asked to hold the breath and a topogram was taken. The patient was subjected to spiral CT scan and non-contrast 8mm

contiguous axial sections were also taken from the level of domes of diaphragm upto the level of third lumbar vertebra. These spiral images were evaluated and further triple phase study was planned.

On non-contrast images, the pre-monitoring slice was decided and a marker for monitoring was placed on the aorta. The dose of intravenous contrast medium to be given was assessed depending on the weight of the patient. For an average adult patient non ionic contrast 100ml, of an iodine concentration of 320mg/ml was injected intravenously. After securing the intravenous cannula in the forearm it was flushed with the intravenous saline to ensure the patency of the vein. The intravenous line was connected through the extension cannula to the automatic pump injector. Adjustments were made and contrast was injected automatically at the rate of 3-5ml/second with 325psi. The injector and measurement buttons were pressed simultaneously. The equipment continued to take a monitoring slice and the moment contrast reached a HU value of 100 in the aorta, the radiation exposure started automatically and the arterial phase spiral images were obtained. After a delay of about 25 seconds, the portal venous phase spiral images were obtained. Further imaging was done, as per requirement of the enhancing pattern of the esophageal lesion.

Vital parameters were checked and general condition of the patient was examined for any post contrast complications.

Data Management and statistical analysis

Interpretation and analysis of the results thus obtained was carried out by the application of descriptive methods e.g. percentage, histograms, bar charts using the IBM SPSS version-20 for windows.

RESULTS

This experimental study was an observational study of 25 patients who presented with the signs and symptoms like dysphagia, weight loss and upper GI bleeding suggestive of disease of upper GIT. Patients from various departments of both Bapuji Hospital and CG Hospital attached to Jagadguru Jayadeva Murugarajendra Medical College, Davangere, Karnataka, India were referred for the CT examination in the department of Radiodiagnosis. Out of all the patients, 25 patients who fulfilled the criteria of the study were only selected.

Table 1: Age wise distribution of cases (n=25).

Age group	No. of patients	Percentage (%)
35-44 years	3	12
45-54 years	3	12
55-64 years	11	44
≥65 years	8	32

- There were 6 patients with less than 55 years of age and 8 patients equal to or greater than 65 years of age.
- There were 11 patients between 55-64 years of age.

Table 2: Sex wise distribution of cases (n=25).

Sex	No. of patients	Percentage (%)
Male	10	40%
Female	15	60%

- In the study group, there were total 25 patients- 10 males and 15 females.
- Female patients were more in number reported as 15 (60%) and male patients were less in number reported as 10 (40%) as compared to females in a total strength of 25 cases.

Table 3: Location of the oesophageal cancer lesion (n=25).

Location	No. of patients	Percentage (%)
Lower 3 rd	10	40
Middle 3 rd	10	40
Upper 3 rd	5	20

Table 4: Wall attenuation of all lesions on MDCT scan done in the study.

Wall attenuation	No. of patients	Percentage (%)
Homogeneous	16	64%
Heterogeneous	9	36%

Most common type of wall attenuation was observed to be homogeneous in 16 (64%) patients followed by heterogeneous in 9 (36%) patients.

Table 5: Esophageal wall thickening of the involved portion.

Wall thickening	No. of patients	Percentage (%)
Circumferential	7	28%
Asymmetrical	18	72%

Two different types of wall thickenings of the involved portion have been reported. The most common asymmetrical wall thickening was observed in maximum number of patients 18 (72%) and circumferential wall thickening was observed only in 7 number (28%) of patients out of 25 total patients.

Table 6: Carcinoma esophagus staging.

Staging	No. of patients (N=25)	Percentage
T1 and T2	9	36
T3	14	56
T4	2	8

No mortality had been reported in carcinoma esophagus staging studies till date. However, staging was maximum in T3 stage patients 14 (56%) followed by 9 (36%) patients with T1 and T2 staging and least number 2 (8%) patients accounted for T4 staging.

Table 7: Length (cm) of the lesion in all the cases by MDCT.

Lesion length (cm)	No. of patients	Percentage
2.5-4.5	6	24%
4.6-6.5	10	40%
6.6-8.5	6	24%
>8.5	3	12%

Length of esophageal lesions observed in 10 patients ranged from 4.6 to 6.5cm and only few (3) patients showed greater than 8.5cm lesions length. However, equal number of patients in two categories each comprising of 6 patients (24%) each were having length of esophageal lesion ranging between 2.5-4.5cm and subsequently 6.6-8.5cm respectively.

Table 8: Distribution of patients on basis of types of esophageal carcinoma and comparing which type is responsible for greater chances of metastasis.

Types	No. of patients	Metastasis
Adenocarcinoma	10 (40%)	0
Squamous cell carcinoma	15 (60%)	2 (13.3%)

No metastasis had been reported in patients with ailment of adenocarcinoma prevailed in 10 (40%) patients. However, only 2 (13.3%) patients reported metastasis in 15 (60%) patients suffering from squamous cell carcinoma.

All the 25 (100%) patients had been reported with complaint of dysphagia to both solids and liquids. There were 21 (84%) patients with complaint of weight loss and pain in throat was reported in 17 (68%) cases. 14 (56%) patients with complaint of vomiting. Out of total 7 (28%) patients with complaint of blood stained vomiting and only 5 (20%) patients with complaint of hoarseness.

- There were 10 males and 15 females in the study group.
- In males, the lesions of the upper third, middle third and lower third of esophagus were 2 (40%), 3 (30%) and 5(50%) respectively.

In females, the lesions of the upper third, middle third and lower third of esophagus were 3 (60%), 7 (70%) and 5 (50%) respectively. There were 10 patients with lesions in the lower third of esophagus, 10 in the middle third and 5 in the upper third of esophagus out of total strength of 25 patients.

Out of the 10 patients with lesions in the middle third of esophagus, 3 were male and 7 females suggesting that the esophageal cancer involving middle third was more common in females than males. However, there was no documented evidence to support this statement. Moreover, our study was based on a small group of patients (n=25) and results can vary only when a large group of people are selected for the study.

Infiltration of the adjacent structures was most commonly detected by the esophageal growth seen in lymph nodes with a maximum population of 23 (92%) of the patients. However, least number only 2 (8%) patients accounted for mediastinal infiltration either in to great vessels or bronchial/tracheobronchus. But infiltration of the adjacent bones was found to be altogether nil.

Great vessel infiltration has been reported both in 2 cases (13.3%) of squamous cell carcinoma but no bronchus infiltration reported in both 2 cases (13.3%) with squamous cell carcinoma and patients with adenocarcinoma had been reported as nil.

Metastasis to distant organs has been reported only in liver, the preferred largest organ to metastasize accounting for only 2 (8%) number of patients. However, no metastasis was observed in lung, bone or lower gastrointestinal tract.

Case 1

A 35 year old female patient complaining of dysphagia, pain in throat, weight loss, haematemesis and hoarseness of voice.

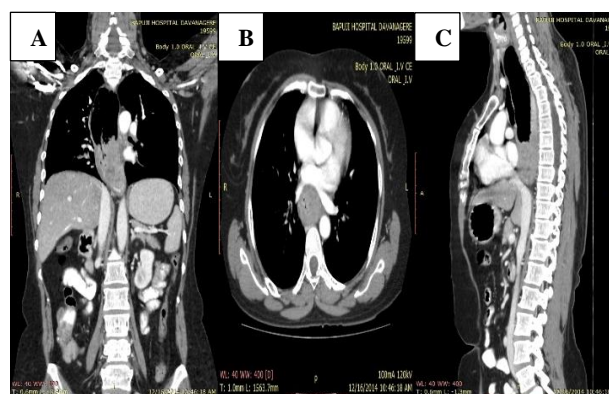


Figure 1: CECT a) coronal; b) axial; c) sagittal images of 35 year old female patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and homogeneous wall attenuation involving middle 1/3rd of oesophagus with distal extension without tracheoesophageal fistula. Oesophagus shows gross dilatation measuring 45mm width. Lesion shows significant pre contrast enhancement of 25-40 HU and post contrast enhancement of 55-70 HU.

Case 2

A 60 year old female patient complaining of dysphagia, pain in throat, vomiting.

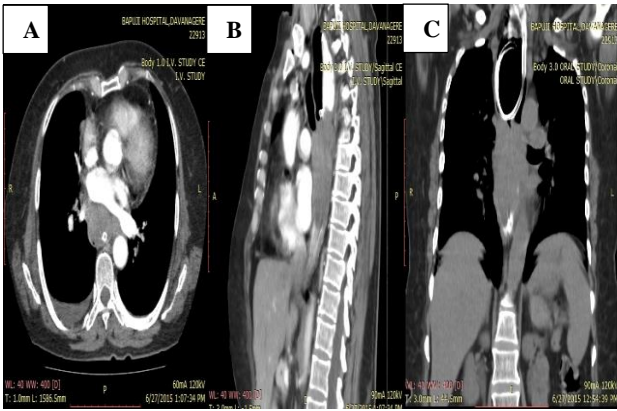


Figure 2: CECT a) axial; b) sagittal; c) coronal images of 60 year old female patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and homogeneous wall attenuation involving middle 1/3rd of oesophagus causing luminal narrowing with proximal oesophageal dilatation. Ryle's tube noted in situ. Lesion shows significant pre contrast enhancement of 30-40 HU and post contrast enhancement of 60-90 HU.

Case 3

A 59 year old male patient complaining of dysphagia, pain in throat, vomiting, hoarseness of voice and haematemesis.

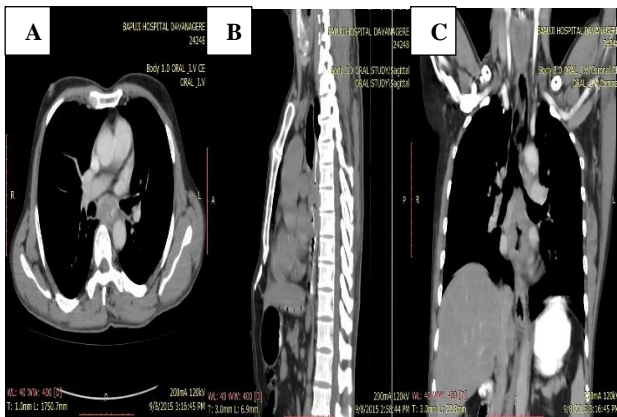


Figure 3: CECT a) axial; b) sagittal; c) coronal images of 59 year old male patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and homogeneous wall attenuation involving middle 1/3rd of oesophagus causing luminal narrowing with proximal oesophageal dilatation. Lesion shows adherence to the aorta with significant pre contrast enhancement of 30-40 HU and post contrast enhancement of 50-70 HU.

Case 4

A 65 year old male patient complaining of dysphagia, weight loss, vomiting and haematemesis.

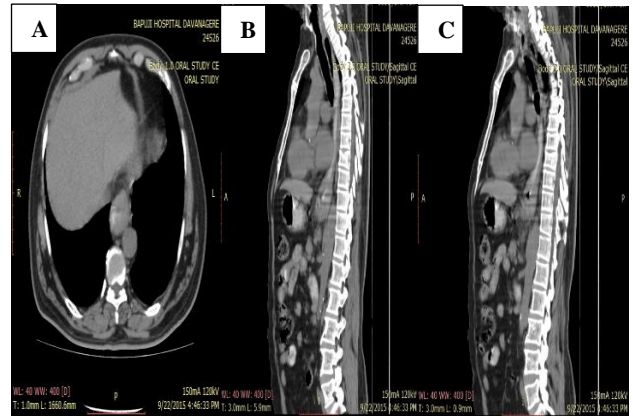


Figure 4: CECT a) axial b & c) sagittal images of 65 year old male patient demonstrates oesophageal carcinoma with asymmetrical wall thickening measuring 2.8cm(L) x 2.5cm(W) and heterogeneous wall attenuation involving lower 1/3rd of oesophagus extending to gastroesophageal junction causing luminal narrowing. Lesion shows significant pre contrast enhancement of 25-35 HU and post contrast enhancement of 40-60 HU.

Case 5

A 70 year old female patient complaining of dysphagia, pain in throat, vomiting and hoarseness of voice.

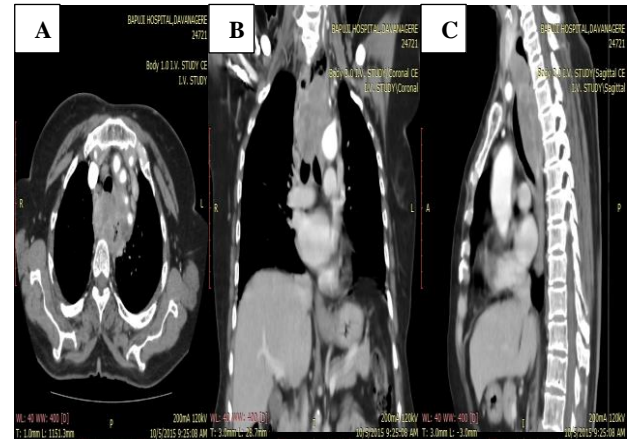


Figure 5: CECT a) axial b) coronal c) sagittal images of 70 year old female patient demonstrates oesophageal carcinoma with long segment asymmetrical wall thickening and heterogeneous wall attenuation involving upper 1/3rd of oesophagus with distal extension causing luminal narrowing with proximal oesophageal dilatation. Lesion shows significant pre contrast enhancement of 30-45 HU and post contrast enhancement of 55-75 HU.

Case 6

A 60 year old male patient complaining of dysphagia, pain in throat, weight loss.

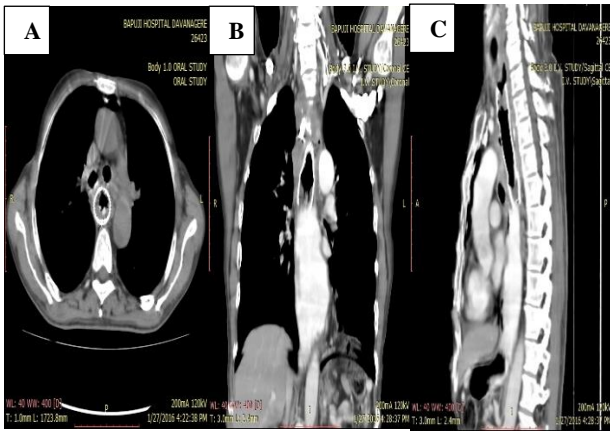


Figure 6: CECT a) axial; b) coronal; c) sagittal images of 60 year old male patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and heterogeneous wall attenuation involving middle 1/3rd of oesophagus with distal extension, causing luminal narrowing with proximal oesophageal dilatation. Lesion shows adherence to the aorta with significant pre contrast enhancement of 30-45 HU and post contrast enhancement of 55-75 HU.

Case 7

A 64 year old female patient complaining of dysphagia, weight loss, vomiting.

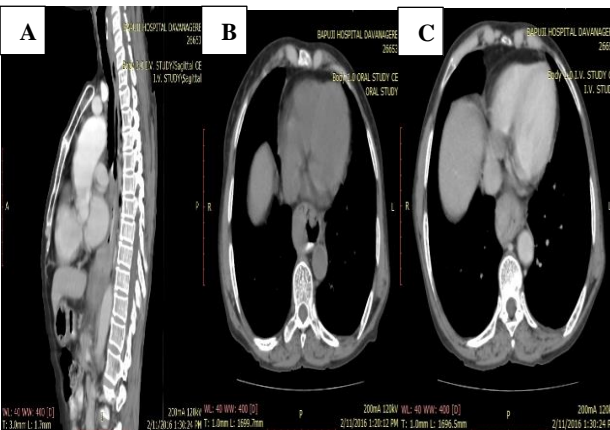


Figure 7: CECT a) sagittal; b) and c) axial images of 64 year old female patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and homogeneous wall attenuation involving lower 1/3rd of oesophagus with extending to gastroesophageal junction, causing luminal narrowing with proximal oesophageal dilatation. Lesion shows significant pre contrast enhancement of 20-40 HU and post contrast enhancement of 60-80 HU.

Case 8

A 68 year old male patient complaining of dysphagia, pain in throat, weight loss.

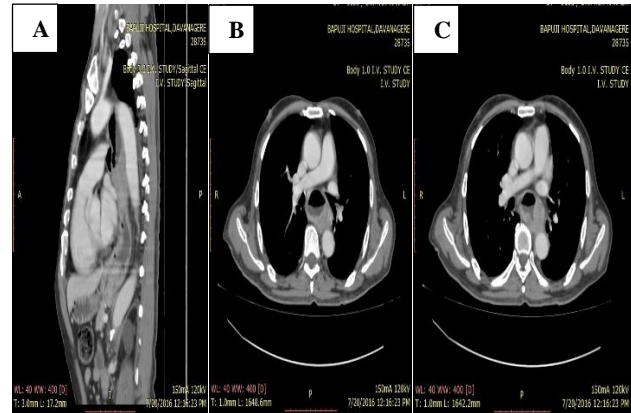


Figure 8: CECT a) sagittal; b) and c) axial images of 68 year old male patient demonstrates mid oesophageal carcinoma with upper thoracic esophagus is dilated with air fluid levels secondary to irregular posterior wall thickening of length 4.5cm involving the middle 1/3rd of thoracic esophagus about 2cm below the carina with maximum thickness of 2.2 cm. Gastroesophageal junction noted 5cm above the diaphragm suggestive of hiatus hernia with midoesophageal carcinoma.

Case 9

A 36 year old male patient complaining of dysphagia, pain in throat, weight loss, vomiting.

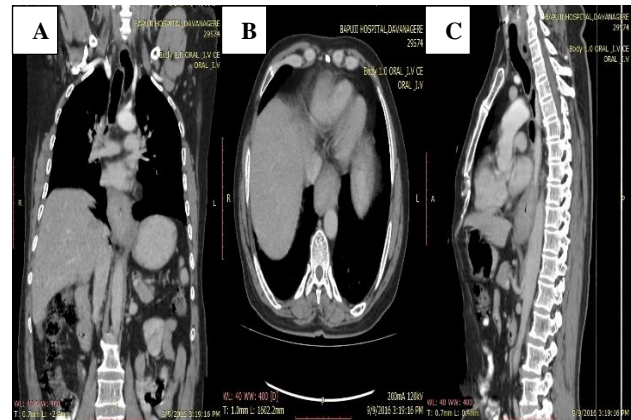


Figure 9: CECT a) coronal b) axial c) sagittal images of 36 year old male patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and homogeneous wall attenuation involving lower 1/3rd of oesophagus with extending to gastroesophageal junction, causing luminal narrowing with proximal oesophageal dilatation. Lesion shows significant pre contrast enhancement of 20-40 HU and post contrast enhancement of 60-80 HU.

Case 10

A 78 year old female patient complaining of dysphagia, pain in throat, weight loss and hoarseness of voice.

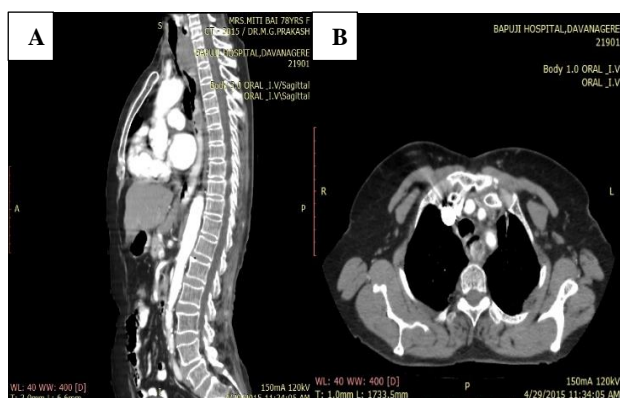


Figure 10: CECT a) sagittal b) axial images of 78 year old female patient demonstrates oesophageal carcinoma with asymmetrical wall thickening and homogeneous wall attenuation involving upper 1/3rd of oesophagus. Lesion shows significant pre contrast enhancement of 25-35 HU and post contrast enhancement of 50-70 HU.

DISCUSSION

Oesophagus is a part of gastrointestinal tract and its main function is to transport food boluses from the pharynx to the stomach through peristaltic movement. Oesophagus is well suited organ for evaluation by many imaging techniques. Esophageal cancer is the fifth most common cause of deaths owing to concerned disorder and the eighth leading cause of cancer mortality in women worldwide. In addition, relative survival rate has also been showing declining trends as eruption of appropriate tumors have not been detected at the initial stage. Therefore, early accurate pre-treatment staging of esophageal cancer has become an integral part for assessing operability and determining a suitable treatment plan. Although anatomic classifications have been devised as under, yet it is a matter of great concern to check the carcinoma accordingly.¹¹

In the study carcinoma esophageal staging had been carried out revealing that most of the patients (56%) were categorized under T₃ stage followed by (36%) under T₁ and T₂ stages and only (8%) under T₄ stage. Esophageal cancer is one of the common malignant tumors in India. Position, morphology and size of the esophageal lumen can be visualized on CT scan for qualitative diagnosis.

In present studies it has been duly reported that the effectiveness of multi-detector computed tomography (MDCT), a great modality for performing multiplanar reformation imaging to confirm a true lesion from three or more plane images in the case of mediastinal invasion. Esophageal wall thickness is a basic finding when

assessing the esophagus by CT and a lack of symmetry with respect to wall thickness is another classic but not specific CT finding in ESCC. The most useful aspect of CT in detecting tumor depth is in evaluating advanced stages, when adjacent structures are invaded. Riedel et al established that bronchoscopy could be used to detect local infiltration of the trachea or bronchi by advanced cancers in the proximal esophagus. The overall accuracy of bronchoscopy plus multiple brush cytology and biopsy sampling had been to the extent of 95.8%.¹²

Triantafillidis et al expressed their views that computed tomography (CT) was one of the most useful and widely used modern method for pre-operative staging of patients with esophageal carcinoma. Moreover, CT can also accurately detect the circumferential or eccentric thickness of the esophageal wall at the site of the tumor. Despite the high degree of CT specificity concerning the thickness of the esophageal wall, the overall specificity for detecting spread to contiguous structures is low.¹³ Chen presented his findings in the year 1999 mentioning that patients with squamous intraepithelial lesions and half of patients with superficial ESCC showed no symptoms at all when diagnosed symptoms made their appearance only when tumors were large enough to interfere with esophageal function or showed their existence due to spread through the esophageal wall.¹⁴

Rice et al have clearly established that carcinoma of the esophagus had a poor prognosis because the diagnosis was rarely made before the development of local invasion or distant metastasis. However, despite these numerous and often invasive pre-operative examinations, surgical exploration has proven to be the only accurate method to determine actual tumour extent.¹⁵

CONCLUSION

The present studies further established that most frequent type of prevalent esophageal carcinoma has been “squamous cell carcinoma” followed by adenocarcinoma. It has been further established that esophageal carcinoma is more prevalent in the females (60%) as compared to males (40%).

MDCT has been found to be the most valuable and preferential technique for planning operational strategy revealed as CT images are very clear and distinct with high density resolution in human tissue. CT scan displays significant role in preoperative staging of esophageal cancer. CT scan is the only modality which has established operation resection rate in treatment and improvement of esophageal cancer. Spiral CT-3D reconstruction technique can display well human body structure and relationship with the surrounding structures.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Yamabe Y, Kuroki Y, Ishikawa T, Miyakawa K, Kuroki S, Sekiguchi R. Tumor staging of advanced esophageal cancer: combination of double contrast oesophagography and contrast enhanced CT. *AJR.* 2008;191:753-7.
2. Schreurs LM, Pultrum BB, Koopmans KP, Verhoef CC, Jager PL, van Dam GM, et al. Better assessment of nodal metastases by PET/CT fusion compared to side-by-side PET/CT in oesophageal cancer. *Anticancer Research.* 2008;28(3B):1867-73.
3. Din R, Mahsud I, Khan N, Iqbal K, Khan H. Study of carcinoma esophagus in Dera Ismail Khan. *Gomal J Med Sci.* 2010;8(2):229-31.
4. Onbaş O, Eroglu A, Kantarci M, Polat P, Alper F, Karaoglanoglu N, et al. Preoperative staging of esophageal carcinoma with multidetector CT and virtual endoscopy. *Eur J Radiol.* 2006;57(1):90-5.
5. Lee SS, Kim SB, Park S, Kim YH, Ryu JS, Song HY, et al. Capecitabine and cisplatin chemotherapy (XP) alone or sequentially combined chemoradiotherapy containing XP regimen in patients with three different settings of stage IV esophageal cancer. *Jpn J Clin Oncol.* 2007;37(11):829-35.
6. Moss AA, Schnyder P, Thoeni RF, Margulis AR. Esophageal carcinoma: pretherapy staging by computed tomography. *AJR.* 1981;136(6):1051-56.
7. Balthazar EJ. CT of the gastrointestinal Tract: Principles and interpretation. *AJR Am J Roentgenol.* 1991;156(1):23-32.
8. Peters JH, Hoefft SF, Heimbucher J. Selection of patients for curative or palliative resection of esophageal cancer based on preoperative endoscopic ultrasonography. *Arch Surg.* 1994;129:534-9.
9. Rankin S. esophageal cancer. In: Husband JES, Reznick RH. eds. *Imaging in oncology.* Oxford: Isis Medical Media; 1998:93-110.
10. Jemal A, Murray T, Samuels A. Cancer statics, 2003 *CA cancer J Clin.* 2003;53:5-26.
11. Adam A, Dixon AK, Grainger RG, Allison DJ. TNM staging of common cancers. In: Grainger and Allison's diagnostic radiology essentials. Philadelphia: Churchill Livingstone; 2013:920.
12. Riedel M, Huak RW, Stein HJ, Mounyam L, Schulz C, Schomig A. Preoperative bronchoscopic assessment of airway invasion by esophageal cancer: a prospective study. *Chest.* 1998;113:687-95.
13. Triantfillidis JK, Cheracakis, P, Argyros, N. *Ann Gastroenterol.* 2000;13(4):253-60.
14. Chen LQ, Hu CY, Ghadirian P, Duranceau A. Early detection of esophageal squamous cell carcinoma and its effects on therapy an overview. *Dis Esophagus.* 1999;12:161-7.
15. Rice TW, Rusch VW, Ishwaran H, Apperson-Hansen C. Worldwide esophageal cancer collaboration. *Duis Esophagus.* 2009;22(1):1-8.

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