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COMPUTED TOMOGRAPHIC FINDINGS IN PATIENTS WITH ESOPHAGEAL CARCINOMA: AN OBSERVATIONAL STUDY

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Abstract

Background: Esophageal carcinoma is a significant cause of morbidity and mortality worldwide, with early detection and accurate staging being crucial for effective management. Computed tomography (CT) plays a vital role in evaluating esophageal carcinoma, providing detailed information on tumor extent, lymph node involvement, and distant metastases. This study aimed to describe the CT findings in patients diagnosed with esophageal carcinoma at a tertiary care hospital in Dhaka, Bangladesh. ***Methods:*** A cross-sectional observational study was conducted at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2011 to June 2013. A purposive sampling method was used to enroll 53 patients with histopathologically confirmed esophageal carcinoma. CT scans of the chest and abdomen were performed using a standardized protocol, and findings were analyzed using MS Office tools. Data on tumor location, size, local invasion, lymphadenopathy, and distant metastases were recorded and analyzed. ***Results:*** The majority of patients presented with advanced disease, with squamous cell carcinoma being the most common histological type (77.4%). CT findings revealed that the middle third of the esophagus was the most frequently involved site (45.3%). Local invasion into adjacent structures was observed in 62.3% of cases, with tracheobronchial involvement being the most common (37.7%). Regional lymphadenopathy was present in 79.2% of patients, while distant metastases were detected in 35.8%, primarily in the liver (22.6%) and lungs (11.3%). ***Conclusion:*** CT imaging is a valuable tool for assessing the extent of esophageal carcinoma, aiding in accurate staging and treatment planning. The prevalence of advanced disease at presentation underscores the need for early detection and intervention in this population. These findings underscore the significance of CT in managing esophageal carcinoma in resource-constrained settings.

Keywords: Computed tomography, Esophageal carcinoma, Liver, Lungs, Tracheobronchial involvement

INTRODUCTION

Esophageal carcinoma is a serious global health concern, with increasing incidence and mortality rates, particularly in developing nations. It is the eighth most common cancer and ranks sixth in cancer-related mortality worldwide [1]. The disease is histologically classified into two main subtypes: squamous cell carcinoma and adenocarcinoma. While squamous cell carcinoma remains predominant in Asia and parts of Africa, adenocarcinoma has become more prevalent in Western countries, largely due to rising gastroesophageal reflux and obesity rates [2,3]. The burden of esophageal cancer is significant in South Asian countries, including Bangladesh, where late presentation and limited access to advanced diagnostics contribute to a poor prognosis [3]. Clinical symptoms such as progressive dysphagia, weight loss, and chest pain often emerge at advanced stages of the disease. Thus, early and accurate staging is essential to guide treatment decisions and improve outcomes [4]. Imaging plays a central role in the evaluation of esophageal carcinoma. Among available modalities, contrast-enhanced computed tomography (CT) is widely used for staging and follow-up due to its accessibility and ability to assess local invasion, nodal status, and distant metastasis [5]. CT imaging provides valuable information on the extent of esophageal wall thickening, involvement of adjacent mediastinal structures, and presence of enlarged lymph nodes or distant metastatic disease [6]. Although endoscopic ultrasound (EUS) offers superior accuracy in assessing the depth of tumor invasion and local lymphadenopathy, its availability and utility are often limited in low-resource settings [7]. Multidetector computed tomography (MDCT), introduced in the early 2000s, has significantly improved image resolution and speed of acquisition, enabling better delineation of thoracic and abdominal structures [8]. It allows evaluation of the primary tumor, tracheobronchial involvement, aortic invasion, and hepatic, pulmonary, or adrenal metastases [9]. CT also plays a pivotal role in identifying unresectable disease, such as when the tumor encases major vessels or invades adjacent organs, thereby helping to avoid unnecessary surgeries [10]. Despite these advantages, data on CT findings specific to Bangladeshi patients with esophageal carcinoma remain limited. Local research is essential to understand the common patterns of tumor presentation, lymph node spread, and sites of metastasis seen in this population. Given the growing burden of cancer in Bangladesh and the widespread availability of CT imaging, such studies are necessary to guide clinical practice and improve patient outcomes. This study was conducted to analyze the computed tomographic findings in patients with histo-pathologically confirmed esophageal carcinoma at a tertiary care center in Bangladesh. The specific aims were to evaluate tumor location, size, local extension, lymph node involvement, and distant metastases using standardized CT imaging protocols.

METHODOLOGY

This cross-sectional observational study was conducted at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2011 to June 2013. A purposive sampling method was employed to enroll 53 patients with histo-pathologically confirmed esophageal carcinoma. Patients of all ages and both genders were included, while those with incomplete medical records or contraindications to CT imaging were excluded. All participants underwent contrast-enhanced CT scans of the chest and abdomen using a standardized protocol. Imaging was performed with a 64-slice multidetector CT scanner, and findings were interpreted by experienced radiologists. Data on tumor location, size, local invasion, lymph node involvement, and distant metastases were recorded. Data were collected using a structured proforma and analyzed using MS Office tools, including Excel for data entry and statistical calculations. Descriptive statistics, such as frequencies and percentages, were used to summarize the findings. The study adhered to ethical guidelines, and informed consent was obtained from all participants. This methodology ensured a systematic approach to evaluating CT findings in esophageal carcinoma, providing valuable insights into disease patterns in this population.

RESULT

The study included 53 patients with histo-pathologically confirmed esophageal carcinoma, with a mean age of 55.4 ± 10.2 years. The majority of participants were male (68.7%), and squamous cell

carcinoma (SCC) was the predominant histological type, accounting for 77.4% of cases. Adenocarcinoma was less common, representing 22.6% of the cohort. CT imaging revealed that the middle third of the esophagus was the most frequently involved site, observed in 45.3% of patients. The lower third was affected in 35.8% of cases, while the upper third was the least common site, accounting for 18.9%. Tumor size varied significantly, with a mean diameter of 4.2 ± 1.5 cm. Local invasion into adjacent structures was detected in 62.3% of patients, with tracheobronchial involvement being the most common (37.7%), followed by aortic invasion (15.1%) and pericardial involvement (9.4%). Regional lymphadenopathy was present in 79.2% of cases, with the most frequently involved nodes being the periesophageal (56.6%), celiac (35.8%), and supraclavicular (22.6%) groups. Distant metastases were identified in 35.8% of patients, with the liver being the most common site (22.6%), followed by the lungs (11.3%) and bones (9.4%).

Table 1: Demographic and Clinical Characteristics of the Study Population

Characteristic	**n (%)**
Mean age (years)	55.4 ± 10.2
Gender (Male: Female)	2.1:1
Histological type	
Squamous cell carcinoma	41 (77.4%)
Adenocarcinoma	12 (22.6%)

Table 2: Tumor characteristics on CT imaging

Characteristic	**n (%)**
Tumor location	
Upper third	10 (18.9%)
Middle third	24 (45.3%)
Lower third	19 (35.8%)
Mean tumor size (cm)	4.2 ± 1.5
Local invasion: 33 (62.3%)	
Tracheobronchial	20 (37.7%)
Aortic	8 (15.1%)
Pericardial	5 (9.4%)

Table 3: Lymph node and metastatic involvement on CT imaging

Characteristic	**n (%)**
Regional lymphadenopathy: 42 (79.2%)	
Periesophageal nodes	30 (56.6%)
Celiac nodes	19 (35.8%)
Supraclavicular nodes	12 (22.6%)
Distant metastases: 19 (35.8%)	
Liver	12 (22.6%)
Lungs	6 (11.3%)
Bones	5 (9.4%)

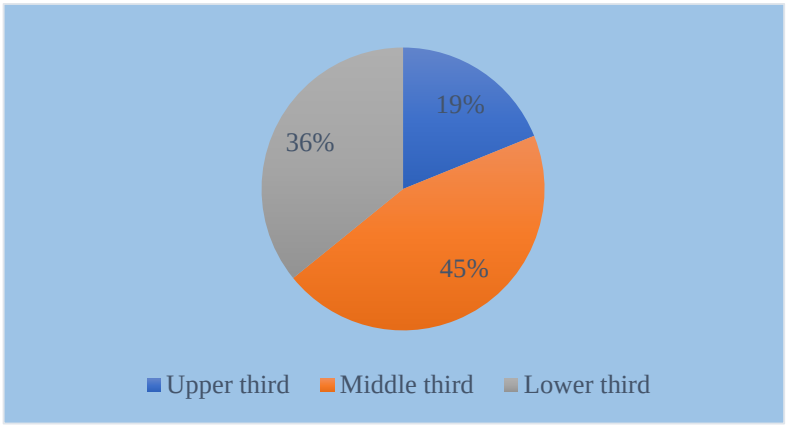

Figure 1: Frequency of tumor location

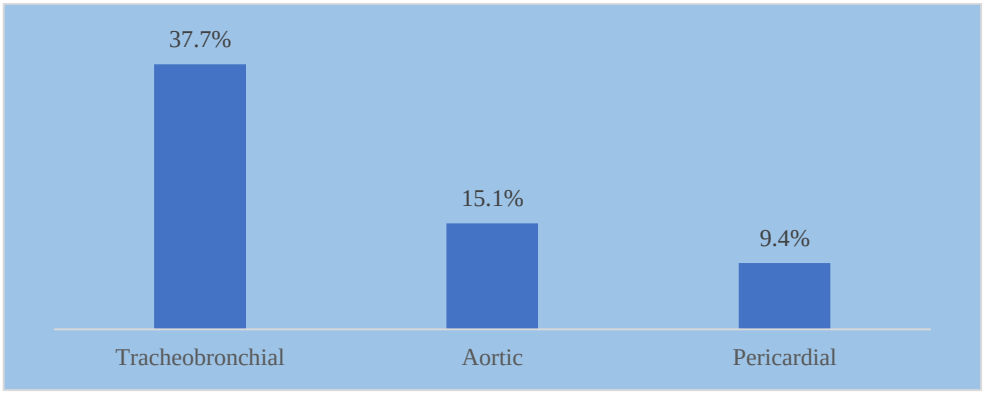

Figure 2: Frequency of local invasion sites

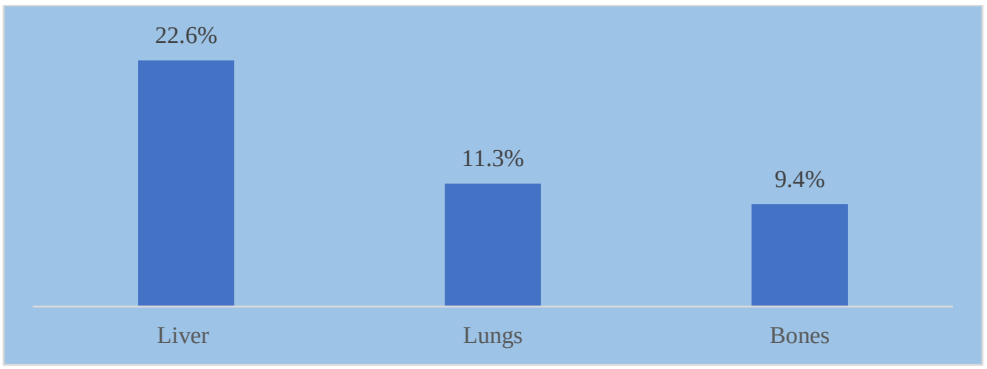

Figure 3: Prevalence of distant metastases

Figure 4: Features are suggestive of infiltrative growth involving the lower end of the oesophagus, gastro-oesophageal junction, and cardiac end of the stomach with infiltration into adjacent fat planes and regional lymphadenopathy. Bilateral minimal pleural effusion with pleural thickening. Scattered inflammatory lesions with scattered linear fibrosis in both lungs.

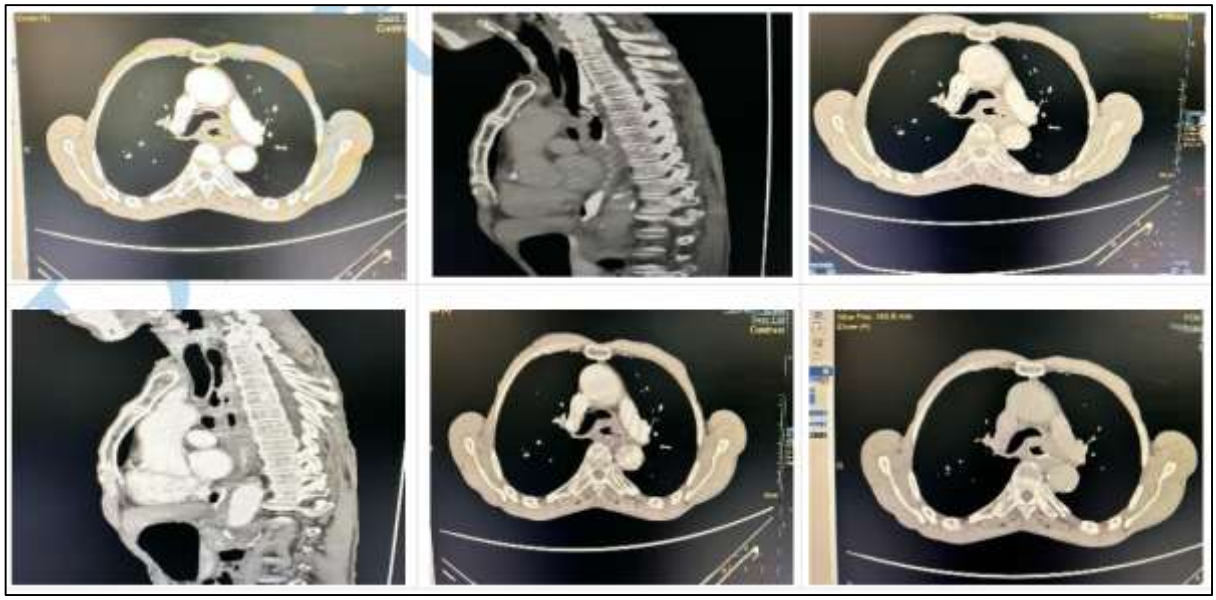

Figure 5: Infiltrative growth involving mid-thoracic oesophagus and adjacent upper & lower thoracic oesophagus with para-oesophageal, right hilar & mediastinal lymphadenopathy. Multiple nodular consolidations at the right upper & middle lobes. D/D - Metastasis (remote possibility). Follow up recommended.

DISCUSSION

This observational study presents critical findings on the computed tomographic characteristics of esophageal carcinoma in a Bangladeshi population. Our results reinforce well-documented epidemiological trends regarding age, sex distribution, histopathological subtypes, and radiological features of the disease. The predominance of squamous cell carcinoma (77.4%) observed in our study aligns with patterns reported in other Asian populations, where squamous histology is more prevalent due to lifestyle and environmental factors, such as betel nut chewing, smoking, alcohol intake, and consumption of hot beverages [11,12]. In contrast, adenocarcinoma is more commonly seen in Western nations, where it is associated with gastroesophageal reflux disease, Barrett's esophagus, and obesity [13]. The male preponderance in our cohort is consistent with global and regional epidemiological data, suggesting that males are 2 to 4 times more likely to develop esophageal cancer, largely due to higher exposure to risk factors such as tobacco and alcohol use [14]. The mean age of presentation (55.4 ± 10.2 years) also corresponds with findings from previous studies in South Asia, where esophageal cancer frequently manifests in the fifth and sixth decades of life [15]. CT imaging revealed that the middle third of the esophagus was most commonly involved (45.3 percent), which mirrors the known predilection of squamous cell carcinoma for this anatomical region [16]. The lower third of the esophagus was affected in 35.8 percent of patients, reflecting the proportion of adenocarcinoma cases in our population. Similar segmental distribution has been noted in prior CT-based studies, particularly from the Indian subcontinent [17]. Tumor size ranged widely, with a mean diameter of 4.2 cm. Tumor length and thickness have been reported as important prognostic indicators, influencing resectability and overall survival [18]. Our study observed local invasion into adjacent structures in 62.3 percent of patients, with tracheobronchial involvement (37.7 percent) being the most common. These findings emphasize the aggressive nature of the disease at presentation. Previous multidetector CT studies have shown similar invasion patterns, highlighting the modality's usefulness in determining operability [19,20]. Regional lymphadenopathy was present in 79.2 percent of patients. The periesophageal (56.6 percent), celiac (35.8 percent), and supraclavicular (22.6 percent) lymph nodes were most commonly involved. These findings are consistent with the known lymphatic spread of esophageal cancer and support earlier observations regarding the central role of CT in nodal staging [21]. Although endoscopic ultrasound remains superior for local nodal assessment, CT is more practical for broader regional and distant evaluation, especially in resource-constrained settings [22]. Among the patients, 35.8% developed distant

metastases, with the liver as the predominant site (22.6%). The lungs (11.3%) and bones (9.4%) were also commonly affected. These results are comparable to those from international cohorts and confirm the liver as the most frequent site of distant spread due to hematogenous dissemination via the portal system [23]. CT remains a cornerstone imaging tool for identifying such metastases and guiding treatment decisions, particularly when curative surgery is not feasible [24]. In summary, this study underscores the importance of CT imaging in the initial evaluation and staging of esophageal carcinoma. The findings contribute to the limited pool of region-specific radiological data and reinforce the need for early diagnosis and integrated imaging in managing this aggressive malignancy.

Limitations:
This study has limitations, including its single-center design, small sample size, and purposive sampling method, which may limit generalizability. Additionally, the lack of advanced imaging modalities like PET-CT and endoscopic ultrasound restricts comprehensive staging. Future multicenter studies with larger cohorts are needed to validate these findings.

CONCLUSION

CT imaging plays a crucial role in the staging and management of esophageal carcinoma, particularly in settings where advanced diagnostic tools are unavailable. The high prevalence of advanced disease at presentation highlights the need for public health strategies aimed at early detection and intervention. Future research should focus on improving diagnostic accuracy and exploring targeted therapies to enhance patient outcomes.

Recommendation:
Future studies should incorporate advanced imaging modalities like PET-CT and endoscopic ultrasound for more accurate staging. Public health initiatives should focus on early detection and awareness programs to reduce late-stage diagnoses. Multidisciplinary approaches and targeted therapies should be explored to improve outcomes for esophageal carcinoma patients in resource-limited settings.

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