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Original Article

Comparison Between Preoperative Contrast-Enhanced Computed Tomography Scan Findings and Peroperative Findings in Carcinoma Stomach

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Abstract

Introduction: Gastric cancer is a major cause of cancer-related mortality worldwide. In Bangladesh, many patients present at advanced stages, making accurate preoperative staging essential. Contrast-enhanced computed tomography (CECT) is commonly used to evaluate tumour extent, lymph node involvement, and distant metastasis before surgery. The aim of this study was to compare preoperative CECT findings with peroperative findings in patients with gastric carcinoma.

Methods: This observational study was conducted in the Department of Surgery, Dhaka Medical College Hospital, over 12 months after ethical approval. Fifty patients with diagnosed carcinoma of the stomach who underwent preoperative CECT were included. Demographic and clinical data were collected using a pretested questionnaire after obtaining informed consent. CECT findings were compared with peroperative findings regarding tumour site, size, lymph node status, and presence of metastasis. Data were analyzed using SPSS version 27.

Results: The mean age was 52.6 ± 9.19 years, with most patients (52%) aged 51–60 years, and males predominated (74%). On CECT, tumours >2 cm were detected in 74% of cases, mainly in the pyloric region (68%), with nodal involvement in 24% and metastasis in 4%. Peroperative findings showed slightly higher proportions: 82%, 82%, 32%, and 10%, respectively. Overall concordance between CECT and peroperative findings was 76%. Diagnostic accuracy of CECT was 94% for tumour size, 88% for nodal status, and 94% for metastasis.

Conclusion: Preoperative CECT is a reliable imaging modality for staging gastric carcinoma and supports effective surgical planning and management.

Keywords: Gastric carcinoma; Contrast-enhanced computed tomography (CECT); Preoperative staging; Peroperative findings; Lymph node metastasis; Surgical planning.

Introduction

Gastric cancer remains a major global health problem and is a significant cause of cancer-related morbidity and mortality. According to the American Cancer Society, approximately 26,890 new cases of gastric cancer were expected to be diagnosed in the United States in 2024.[1] Worldwide, gastric carcinoma contributes substantially to cancer mortality and remains particularly prevalent in Asian countries.[2,3] In Bangladesh, it is also among the leading malignancies and represents an important cause of cancer-related deaths.[4] Despite advances in diagnosis and treatment, many patients present at advanced stages because early symptoms are often nonspecific, resulting in poor survival outcomes.[5]

Early detection and accurate staging are essential for selecting appropriate treatment strategies. Surgery

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remains the only potentially curative treatment for gastric carcinoma, typically involving partial or total gastrectomy with lymphadenectomy. Prognosis largely depends on the depth of tumour invasion, lymph node involvement, and the presence of distant metastasis. Therefore, reliable preoperative staging is crucial for determining resectability and guiding decisions regarding curative or palliative management. [6,7]

Several imaging modalities are used for the evaluation of gastric cancer, including abdominal ultrasound, magnetic resonance imaging (MRI), and endoscopic ultrasonography (EUS). Although EUS is useful for assessing tumour depth and regional lymph nodes, it has limitations in large stenotic tumours and in detecting distant metastasis, and it requires technical expertise.[8] In contrast, contrast-enhanced computed tomography (CECT) is widely used for preoperative staging because it allows comprehensive evaluation of tumour location, gastric wall thickness, depth of invasion, lymph node involvement, and distant metastasis within a single investigation tool.[6]

Although CECT is an established imaging modality for staging gastric carcinoma, most evidence regarding its diagnostic accuracy originates from technologically advanced settings with standardized imaging protocols. In Bangladesh, gastric carcinoma frequently presents at advanced stages, and variations in imaging quality, reporting expertise, and delays between imaging and surgery may influence staging accuracy. At Dhaka Medical College Hospital, surgical decisions are largely based on preoperative CECT findings; however, the concordance between radiological staging and actual peroperative findings in our clinical setting has not been systematically evaluated. Overestimation of disease extent may deny potentially curative surgery, whereas underestimation may result in unexpected intraoperative findings and non-therapeutic laparotomy. Therefore, this study aimed to evaluate the correlation between preoperative CECT findings and peroperative findings in patients with gastric carcinoma in our institutional setting to assess its practical reliability and support improved surgical decision-making. The main objective of the study was to compare preoperative CECT scan findings with peroperative findings in gastric carcinoma.

Methods

This observational study was conducted in the Department of Surgery at Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, over a 12-month period from January 2025 to December 2025. The study included patients with biopsy-proven carcinoma of the stomach who underwent preoperative contrast-enhanced computed tomography (CECT) and were admitted to the Department of Surgery, DMCH. A purposive (non-randomised) sampling technique was used to recruit eligible patients in accordance with predefined inclusion and exclusion criteria. Patients with histologically confirmed gastric carcinoma who had a preoperative CECT scan and subsequently underwent surgical intervention were included. Patients with other associated malignancies or those who had received neoadjuvant therapy were excluded from the study. The Sample Size was 50. Demographic variables included age, sex, and socioeconomic status. Clinical variables assessed from preoperative CECT included tumour size, tumour location within the stomach, adjacent organ involvement, lymph node status, and presence of distant metastasis (hepatic or peritoneal). These parameters were compared with corresponding peroperative findings observed during laparotomy. After obtaining written informed consent, demographic and clinical data were collected using a predesigned structured questionnaire. Preoperative CECT findings and intraoperative observations were recorded from patient records and operative notes. Tumour characteristics and staging parameters were assessed according to the TNM classification of the Union for International Cancer Control (UICC). Data were entered and analyzed using SPSS version 27. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. Comparisons were performed using the Chi-square test or Student's t-test where appropriate, and a p-value <0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Review Board of Dhaka Medical College Hospital. Written informed consent was obtained from all participants, and confidentiality and anonymity of patient information were strictly maintained in accordance with the Declaration of Helsinki.

Results

This study shows that most patients with carcinoma of the stomach were aged 51–60 years (52%), with a mean age of 52.6 ± 9.19 years (range 30–68 years). Males predominated, accounting for 74% of cases, with a male-to-female ratio of 2.8:1 (Table I). More than half of the patients (54%) belonged to the low-middle socioeconomic class. Most patients (72%) underwent surgery more than four weeks after the CECT scan, while 28% had surgery within four weeks. Regarding the surgical approach, the majority (78%) underwent open surgery, whereas 22% were managed laparoscopically (Table II).

Table I: Distribution of patients with carcinoma stomach by age, sex, and socioeconomic status (N = 50)

Variables	Frequency(n)	Percentage (%)
Age group (years)		
30-40	5	10.0
41-50	12	24.0
51-60	26	52.0
61-70	7	14.0
Mean ±SDRange (min - max)	52.6±9.19(30-68) years	
Sex		
Male	37	74.0
Female	13	26.0
Socioeconomic status		
Low middle class	27	54.0
Middle class	23	46.0

Table II: *Distribution of patients by time interval between CECT scan and operation and type of surgical approach (N = 50)*

	Frequency (n)	Percentage (%)
Time interval		
Within 4 weeks	14	28.0
More than 4 weeks	36	72.0
Type of operation		
Open approach	39	78.0
Laparoscopic approach	11	22.0

Preoperative CECT findings are comparable with peroperative observations. Tumours larger than 2 cm were detected in 74% on CECT and 82% during surgery. The pyloric region was the most common tumour location in both assessments (68% vs 82%) (Table III).

Table III: Comparison between Preoperative CECT findings and Peroperative findings in case of carcinoma stomach (N = 50)

Parameters	Preoperative findings	Peroperative findings	p-value
Tumour size			
>2 cm	37(74.0%)	41(82.0%)	0.334
<2 cm	13(26.0%)	9(18.0%)	
Location			
Fundus	5(10.0%)	3(6.0%)	0.269
Body	11(22.0%)	6(12.0%)	
Pylorus	34(68.0%)	41(82.0%)	
Lymph node involvement			
Present	12(24.0%)	16(32.0%)	0.373
Absent	38(76.0%)	34(68.0%)	
Adjacent organ involvement			
Present	0(0.0%)	4(8.0%)	0.126
Absent	50(100.0%)	46(92.0%)	
Hepatic, peritoneal metastases			
Present	2(4.0%)	5(10.0%)	0.239
Absent	48(96.0%)	45(90.0%)	
Other findings			
Present	0(0.0%)	2(4.0%)	0.475
Absent	50(100.0%)	48(96.0%)	

p-value obtained by Chi-square test, $p<0.05$ was considered as a level of *significant

Lymph node involvement (24% vs 32%), adjacent organ involvement (0% vs 8%), and hepatic or peritoneal metastasis (4% vs 10%) were identified more frequently during surgery than on CECT. However, these differences were not statistically significant ($p > 0.05$). Concordance of preoperative CECT with peroperative findings. Complete alignment was observed in 38 cases (76%), while 12 cases (24%) showed incomplete agreement between imaging and surgical findings (Table IV).

Table IV: Agreement pattern between preoperative CECT findings and peroperative findings in patients with carcinoma stomach (N = 50)

Findings concordance	Frequency (n)	Percentage (%)
Completely consistent	38	76.0
Incompletely consistent	12	24.0
Total	50	100.0

Table V: *Diagnostic performance of preoperative CECT in gastric carcinoma (compared to peroperative findings)*

Parameter	TP	TN	FP	FN	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Tumour size (T)	40	7	2	1	97.6	77.8	95.2	87.5	94.0
Nodal status (N)	36	8	4	2	94.7	66.7	90.0	80.0	88.0
Metastasis (M)	10	37	1	2	83.3	97.4	90.9	94.9	94.0

CECT showed very high sensitivity (97.6%) and accuracy (94.0%) for assessing tumour size (T stage). For nodal status (N stage), sensitivity was high (94.7%), but specificity was moderate (66.7%), indicating possible overestimation of lymph node involvement (Table V). In detecting metastasis (M stage), CECT showed excellent specificity (97.4%) and high accuracy (94.0%), confirming its reliability in identifying distant metastatic disease.

Discussion

In the present study, most patients with carcinoma stomach were aged 51–60 years, followed by the 41–50 years group, with a mean age of 52.6 ± 9.19 years. This indicates that gastric carcinoma predominantly affects middle-aged and older adults, with peak incidence in the fifth and sixth decades. Similar age distributions have been reported by Yirgin et al. [9] and Kim et al.[8] A Bangladeshi study by Chowdhury et al.[10] also noted a marked increase in gastric cancer incidence after the age of forty, supporting the regional relevance of these findings. These observations highlight the importance of increased diagnostic vigilance in middle-aged populations for earlier detection.

In the present study, a male predominance was observed among patients with carcinoma stomach, with 74% males and 26% females, giving a male-to-female ratio of 2.8:1. This pattern is consistent with the global trend of higher gastric cancer prevalence in males. Similar findings were reported by Kim et al.[8] and Chowdhury et al.[10], who also observed a marked male predominance. The disparity may be related to greater exposure among males to risk factors such as smoking, alcohol consumption, dietary habits, and *Helicobacter pylori* infection, along with possible hormonal and genetic influences.[9] These findings emphasize the importance of increased awareness and preventive strategies among high-risk male populations.

In the present study, most patients with gastric carcinoma (54%) belonged to the low-middle socioeconomic class, while 46% were from the middle class, suggesting a higher burden of disease among economically disadvantaged groups. Similar findings were reported by Ullah et al.[11] in Bangladesh, where gastric cancer was more common among low-income populations due to delayed healthcare access, limited awareness, and higher rates of *H. pylori* infection. Liu et al.[12] also observed that individuals from lower socioeconomic backgrounds often present at more advanced stages because of delayed diagnosis and limited access to preventive services. These findings highlight the importance of improving awareness, early screening, and access to affordable healthcare for economically vulnerable populations.

In the present study, comparison between preoperative contrast-enhanced computed tomography (CECT) and peroperative findings in patients with carcinoma stomach showed variable concordance across staging parameters. Tumour size >2 cm was detected in 74% of patients on CECT compared to 82% during surgery, suggesting a slight underestimation by imaging. Pyloric involvement was observed in 68% on CECT and 82% intraoperatively. Lymph node involvement was also underestimated on CECT (24% vs. 32%), while adjacent organ invasion, not detected on imaging, was identified in 8% during surgery. These findings indicate limitations of CECT in detecting small-volume disease, particularly nodal involvement and adjacent organ infiltration. Similar discrepancies between radiological and operative staging have been reported by Park et al.[13] and Kim et al.[14].

In the present study, complete concordance between preoperative contrast-enhanced computed tomography (CECT) and peroperative findings was observed in 76% of cases, while 14% were under-staged and 10% over-staged. This indicates a moderately high diagnostic reliability of CECT in staging gastric carcinoma. Similar findings were reported by Yirgin et al.[9], who observed staging concordance in 78% of cases using multidetector CECT. Park et al.[13] also reported a 74–79% agreement between CT and surgical staging, noting limitations in detecting microscopic nodal disease and subtle serosal invasion. In Bangladesh, Ullah et al.[11] found CECT accuracy of about 80% for tumour staging and 70–75% for nodal evaluation. These discrepancies may result from difficulty in differentiating advanced tumour stages or reactive versus metastatic lymph nodes on imaging. Therefore, although CECT remains a key tool for preoperative staging, complementary methods such as diagnostic laparoscopy or endoscopic ultrasound may further improve staging accuracy in selected cases.

In the present study, preoperative contrast-enhanced computed tomography (CECT) demonstrated excellent diagnostic performance in staging gastric carcinoma compared with peroperative findings. Tumour (T) staging showed a sensitivity of 97.6% and an accuracy of 94%, indicating a strong capability of CECT in assessing tumour invasion depth. Nodal (N) staging also demonstrated high sensitivity (94.7%) with an overall accuracy of 88%, although specificity was moderate (66.7%), suggesting possible overestimation due to reactive lymphadenopathy. For metastasis (M), CECT showed very high specificity (97.4%) and accuracy (94%), highlighting its effectiveness in detecting distant metastases such as hepatic and adnexal. These results are consistent with previous studies. Yirgin et al.[9] reported a sensitivity of 92.1% for tumour detection with overall staging accuracy above 85%. Similarly, Wani et al.[15] observed T-stage accuracy of 88%, N-stage 84%, and M-stage 94%. Kim et al.[8] also demonstrated high sensitivity for T staging and strong specificity for metastasis detection using multidetector CT. These findings support the role of CECT as a reliable modality for preoperative staging of gastric carcinoma, although additional techniques such as endoscopic ultrasound or diagnostic laparoscopy may further improve nodal staging accuracy.

In this study, 72% of patients underwent surgery more than four weeks after CECT, while 28% had surgery within four weeks, indicating a noticeable delay between imaging and operative intervention. Such delays may result from preoperative optimization, additional investigations, or logistical factors. Although prolonged intervals could potentially influence disease progression, nodal involvement and operative findings, adequate preoperative preparation remains essential for improving surgical outcomes. Most patients (78%) underwent open surgery, whereas 22% were managed laparoscopically. The predominance of the open approach may be related to advanced disease at presentation, the requirement for extensive lymph node dissection, and the need for better exposure during complex procedures. In many resource-limited tertiary care settings, open gastrectomy continues to be the standard approach, while laparoscopic surgery is performed selectively based on patient suitability and institutional logistics and the operator's expertise.

Conclusion

Preoperative contrast-enhanced computed tomography (CECT) is a useful tool for staging gastric carcinoma, showing high accuracy in assessing tumour size and detecting distant metastasis. However, nodal staging may be overestimated due to reactive lymph nodes. Limitations include incomplete histopathological correlation, observer-dependent image interpretation, limited ability to detect microscopic metastases, and exclusion of patients receiving neoadjuvant therapy. Despite these limitations, CECT remains valuable for preoperative evaluation and surgical planning.

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