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Original Article

Determining Resectability of Carcinoma Stomach on the Basis of Preoperative Imaging with Peroperative Findings and Histopathological Reports

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Abstract

Introduction: Gastric cancer is one of the most common malignant tumors. Early detection of gastric cancer is important for curative treatment and better survival rate. The aim of this present study is to compare between preoperative Endoluminal Ultrasound (EUS), Ultrasonogram (USG), CT Scan findings with peroperative findings and/or postoperative histopathological findings & evaluate the usefulness of EUS, USG & CT scan for determining resectability of carcinoma stomach.

Methods: This cross-sectional descriptive study conducted at Dhaka Medical College & Hospital from March 2016 to August 2017. A total 38 patients were selected based on inclusion and exclusion criteria. Then they were staged by CT scan of abdomen, USG of whole abdomen and EUS. Finally, all those underwent laparotomy & histopathological assessment were done for determining resectibility.

Results: Regarding T staging, 25 (78.10%),22 (68.70%) & 28 (75%) out of 38 patients were staged correctly with EUS, CT & USG respectively. Regarding N staging, 24 (75%),22 (68.8%) & 25 (65.7%) out of 38 patients were staged correctly with EUS, CT scan & USG respectively. The overall accuracy of EUS, CT scan & USG for determination of the T stage was 78.1%, 68.7 % & 75% respectively & N stage was 75 %, 68.8 % & 65.6%. In EUS staging 28 cases were found resectable preoperatively but during operation 26 cases were found resectable and 2 cases were found un-resectable. Among rest of the preoperative un-resectable 10 cases, we found 6 cases were resectable and 4 cases were actually un-resectable. So, the accuracy, sensitivity, specificity of EUS for resectibility was 92.9%, 81.2% and 66.7% respectively. In CT staging 31 cases were found resectable preoperatively but during operation 27 cases were found resectable and 4 cases were found un-resectable. Among rest of the preoperative un-resectable 7 cases, we found 5 cases were resectable and 2 cases were actually un-resectable. So, the accuracy, sensitivity, specificity of CT for resectibility was 87.1%, 84.4% and 33.3% respectively. In USG staging 29 cases were found resectable preoperatively but during operation 24 cases were found resectable and 5 cases were found un-resectable. Among rest of the preoperative un-resectable 9 cases, we found 8 cases were resectable and 1 case was actually un-resectable. So, the accuracy, sensitivity, specificity of USG for resectibility was 82.7%, 75% and 17% respectively

Conclusion: The accurate preoperative staging is extremely essential for proper decision making and stage dependent management, which improve 5 years survival rates or limits unnecessary laparotomy in advanced stage.

Key words: Endoscopic Ultrasonography, CT scan, Gastric cancer, Local staging, TNM.

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Introduction

Stomach cancer is accurately an eminently curable disease provided that it is detected at an appropriate stage and treated adequately. Gastric cancer is one of the most encountered gastrointestinal malignances[1]. More than 70% of cases occur in developing countries and half the world total occurs in Eastern Asia. The highest estimated mortality rates are in Eastern Asia and the lowest in North America[2]. Though Bangladesh is lacking of a definite population-based statistics for cancers, there are few hospitals-based statistics. According to the reports of few specialized hospitals including National institute of Cancer Research and Hospital, Mohakhali, Dhaka, Gastric Cancer is the 5th most common cancer and 3rd most common cancer among the males[3]. Despite advances in diagnosis, the disease is usually detected after invasion of the muscularis propria, because most patients experience vague and nonspecific symptoms in early stages and the classic triad of anemia, weight loss and refusal of meat-based foods is seen only in advanced stage. There is also urgent need to improve the diagnostic modality as well as treatment facilities to overcome the limitations of the overall treatment outcome in the country. Endoscopic ultrasonography (EUS) was first introduced by a Germen doctor in the early 1980s and is now used worldwide[4]. Because of the use of transducers of high frequency, it facilitates the early detection of minute lesions. Simultaneously, the observation of the involvement of lymph nodes and other organs adjacent to the cancer within the range of EUS scanning can provide more detailed additional information[5,6]. Recent advances in Computed Tomographic (CT) technology have sparked renewed interest to evaluate gastric malignancy. And trans abdominal ultrasound has a great role in detecting gastric malignancy. Survival after surgery is highly dependent on the stage of gastric cancer or anatomical extent of disease at the time of operation[7]. The accurate preoperative staging of gastric cancer is the most significant prognostic factor. Such precise stage depending management will limit the occurrence of unnecessary exploratory surgical interventions. The resectibility of stomach cancer mainly depends on lymphnode involvement, liver metastasis, peritoneal metastasis and ascities. This study is designed to determine the accuracy of the preoperative staging in assessing the resectibility of the primary tumor in Ca stomach patients admitted in Dhaka Medical College Hospital with clinical and histological diagnosis of carcinoma stomach.

Material and Methods

This cross-sectional descriptive study was carried out in the department of surgery at Dhaka Medical College and Hospital, Dhaka during March 2016 and August 2017 to assess resectability of stomach malignancy depending on preoperative imaging with peroperative findings and/or histopathological reports. Total 38 patients were enrolled in this study by purposive sampling and endoscopically and histologically diagnosed patients of Ca stomach upto T3N2M0 were taken and those stomach growth patients with acute abdomen like perforation, fistula, huge ascities, pelvic deposit were excluded. All cases were evaluated by detailed history, clinical examination, routine investigations and USG, EUS & CT scan of W/A. All underwent laparotomy(curative total gastrectomy or subtotal gastrectomy or palliative lower partial gastrectomy or only palliative gastrojejunostomy), peroperative findings were recorded and USG,EUS,CT scan findings were compared to peroperative findings and/or histopathological findings. The results were analyzed by table, chart/figures and accuracy, sensitivity as well as specificity of USG,EUS,CT scan findings were done in comparison to peroperative findings and histopathological reports. All tests were considered to be significant at $p<0.05$ (Chi Square Test).

Result

A total number of 38 patients with diagnosis of adenocarcinoma of stomach by upper GI endoscopy and biopsy were included in this study who were fit for surgery and underwent surgical intervention.

Among the patients most of the patients (26.3%) were in the age group of more than 60 years and only least number of patients (7.8%) were below 35 years. Most of the patients (71%) were male.

According to location of the tumor, Antrum was most commonly involved (65.7%), followed by Body (28.94%) and Fundus (5.2%).

Table I : *Histopathological T and N staging*

T staging		n	%
T stage	T1	0	0
	T2	4	12.5
	T3	21	65.6
	T4	7	21.8
N stage	N0	7	21.8
	N1	17	53.1
	N2	8	25

Table II: *Accuracy of EUS, CT and USG preoperative T staging in 38 patients with histopathological staging.*

		n	Pathologic stage			Accuracy	Sensitivity	Specificity	P
			T2	T3	T4	(%)	(%)	(%)	Value
EUS Stage	T2	4	3	1	0	75	75	96.4	.00
	T3	22(1)	1	18(1)	3	81.8	85.7	63.6	
	T4	6(5)	0	2	4(5)	66.7	57.1	92	
	Total	32(6)	4	21(1)	7(5)	78.1			
CT Stage	T2	5	3	2	0	60	75	92.8	.004
	T3	21	1	16	4	76.2	76.2	54.5	
	T4	6(6)	0	3	3(6)	50	42.9	88	
	Total	32(6)	4	21	7(6)	68.7			
USG Stage	T2	3	2	1	0	66.7	50	96.4	.004
	T3	21	2	17	2	80.9	80.9	63.8	
	T4	8(6)	0	3	5(6)	62.5	71.4	41.4	
	Total	32(6)	4	21	7(6)	75			

T2- Lamina propria, mucosa and submucosa, T3- Subserosal connective tissue T4- Serosa and adjacent structure

Table III : *Accuracy of EUS, CT and USG preoperative N staging in 38 patients with histopathological staging:*

		n	Pathologic stage			Accuracy	Sensitivity	Specificity	P
			N0	N1	N2	(%)	(%)	(%)	value
EUS Stage	N0	7	5	2	0	71.4	71.4	92	.00
	N1	19	2	14	3	73.7	82.4	66.7	
	N2	6(6)	0	1	5(6)	83.3	62.5	95.8	
	Total	32(6)	7	17	8(6)	75			
CT Stage	N0	6	4	2	0	66.7	57.1	92	.001
	N1	19	3	13	3	68.4	76.5	60	
	N2	7(6)	0	2	5(6)	71.4	62.5	91.7	
	Total	32(6)	7	17	8(6)	68.8			
USG Stage	N0	5	3	2	0	60	42.8	92	.001
	N1	20	4	13	3	65	76.4	53	
	N2	7(6)	0	2	5(6)	71.4	62.5	81.4	
	Total	32(6)	7	17	8(6)	65.6			

N0- No lymph nodes, N1- Metastasis in 1–6 regional nodes, N2- Metastasis in 7–15 regional nodes

Table IV : *Accuracy of EUS,CT and USG for resectability with histopathological staging*

		n	Pathologic stage		Accuracy	Sensitivity	Specificity	P
			Resectable	Un-resectable	(%)	(%)	(%)	value
EUS	Resectable	28	26	2	92.9	81.2	66.7	.00
	Un-resectable	10	6	4	40			
	Total	38	32	6	80			
CT	Resectable	31	27	4	87.1	84.4	33.3	.00
	Un-resectable	7	5	2	28.6			
	Total	38	32	6	76.3			
USG	Resectable	29	24	5	82.7	75	17	.00
	Non-Resectable	9	8	1	12			
	Total	38	32	6	65.7			

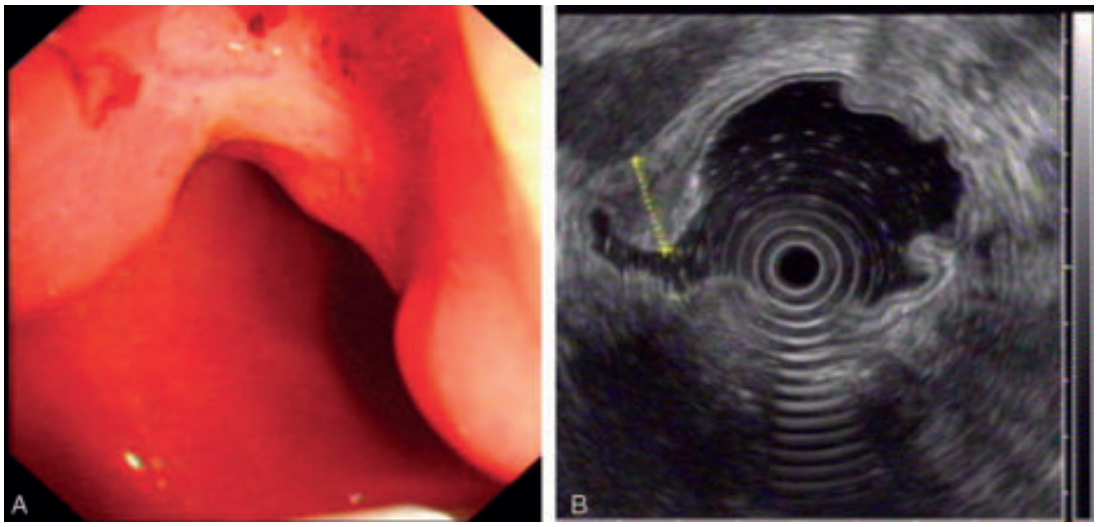

Fig. 1: *(A) Endoscopic image of the gastric cancer showing an ulcer located in the anterior wall of the antrum; (B) EUS image showing hypoechoic lesion spreading from the mucosa to muscularis propria layers*

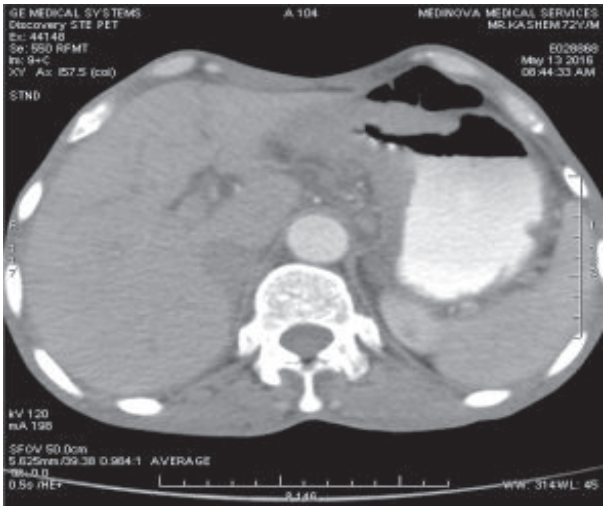

Fig. 2: *CT Scan of abdomen showing growth in stomach (With contrast).*

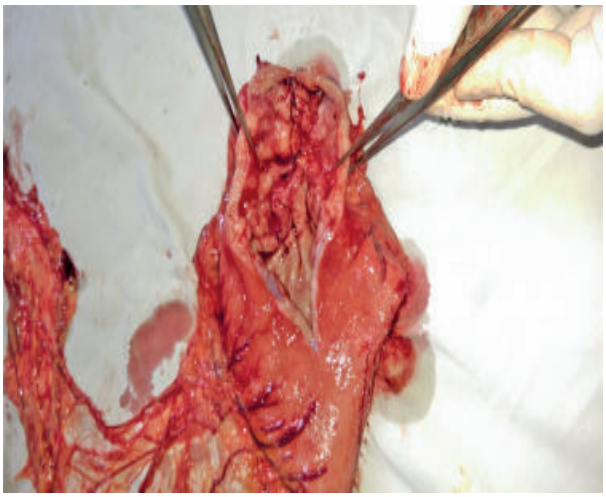

Fig. 3: *Resected specimen of stomach showing growth at pylorus .*

Discussion

Gastric cancer is one of the most encountered gastrointestinal malignances. The overall 5-year survival rates are still not encouraging, although many advances in diagnostic modalities and therapeutic regimens have been achieved during last few decades. The disease is usually detected after invasion of the muscularis propria, because most patients experience vague and nonspecific symptoms in early stages and the classic triad of anemia, weight loss and refusal of meat-based foods is seen only in advanced stage. The improvement of survival rates depends primarily on early detection and treatment of gastric cancer. It has been well accepted that accurate preoperative staging is not only important for prediction of the prognosis, but also essential to establishment of individualized cancer therapy. In this study total 38 patients were selected by maintaining inclusion and exclusion criteria, the percentage of male and female were 71.05% and 28.94% respectively. The mean age of patients was 55 years (Table I), 27 patients were male and 11 were female. The American Cancer Society's estimates for stomach cancer in the United States for 2016 are gastric cancer mostly affects older people. The average age of people when they are diagnosed were 69. Here the sample population were selected consecutively who diagnosed as a case of adenocarcinoma of stomach, before or after hospital admission by upper GIT endoscopy and biopsy. After clinical evaluation USG of whole abdomen, CT scan of abdomen and EUS done to assess depth of invasion of tumor and lymph node status preoperatively and the accuracy of both modalities were compared with per operative findings and post-operative histopathology in resectable cases. In a routine clinical setting, patients with gastric cancer most commonly undergo staging with CT Scan and conventional transabdominal ultrasonogram. EUS is a recent modality of investigation in our country though widely used in western countries. In this study,USG, EUS and CT scan were carried out in all patients. Regarding T staging, 25 (78.10%) out of 38 patients were staged correctly with EUS (Table II) with 4(12.5%) under staged, and 3(9.4%) over staged. Regarding T staging, 22 (68.70%) out of 38 patients were staged correctly with CT (Table II) with 6(18.8%) under staged, and 4(12.5%) over staged. Regarding T staging, 28 (75%) out of 38 patients were staged correctly with USG (Table III) with 5(12.5%) under staged and 5(12.5%) over staged. Regarding N staging, 24 (75%) out of 38 patients were staged correctly with EUS (Table III) with 5(15.6%) under staged, and 3(9.4%) over staged. Regarding N staging, 22 (68.8%) out of 38 patients were staged correctly with CT (Table III) with 5(15.6%) under staged, and 5(15.6%) over staged. Regarding N staging, 25 (65.7%) out of 38 patients were staged correctly with USG (Table III) with 5(15.6%) under staged and 8(18.7%) over staged. The overall accuracy of EUS for determination of the T stage was 78.1 %, and for T2, T3, and T4 were 75 %, 81.8 %, 66.7 % respectively and sensitivity were 75%, 85.7%, 57.1% respectively and specificity were 96.4%, 63.6%, 92% respectively (p<0.05). The overall accuracy of CT scan for determination of the T stage was 68.7 %, and for T2, T3, and T4 were 60 %, 76.2 %, 50 % respectively and sensitivity were 75%, 76.2%, 42.9% respectively and specificity were 92.8%, 54.5%, 88% respectively(p<0.05). The overall accuracy of USG for determination of the T stage was 75 %, and for T2, T3, and T4 were 66.7 %, 80.9 %, 62.5 % respectively and sensitivity were 50%, 80.9%, 71.4% respectively and specificity were 96.4%, 63.8%, 41.4% respectively (p<0.05). The overall accuracy of EUS for determination of the N stage was 75 %, and for N0, N1 and N2 were 71.4 %, 73.7 %, 83.3 % respectively and sensitivity were 71.4%, 82.4%, 62.5% respectively and specificity were 92%, 66.7%, 95.8% respectively (p<0.05). The overall accuracy of CT for determination of the N stage was 68.8 %, and for N0, N1 and N2 were 66.7%, 68.4 %, 71.4 % respectively and sensitivity were 57.1%, 76.5 %, 62.5 % respectively and specificity were 92%, 60%, 91.7% respectively (p<0.05). The overall accuracy of USG for determination of the N stage was 65.6 %, and for N0, N1 and N2 were 60%, 65 %, 71.4 % respectively and sensitivity were 42.8%, 76.4 %, 62.5 % respectively and specificity were 92%, 53%, 81.4% respectively(p<0.05). Xi WD et al. reported in a study that the overall accuracy of EUS for determination of the T stage was 80.0 %, and for T1, T2, T3, and T4 were 100 %, 71.4 %, 87.5 % and 72.7 %, respectively. For N stage, EUS had the accuracy of 68.6 %, with sensitivity and specificity of 66.7 % and 73.7 %, respectively. Resectability was predicted with sensitivity and specificity of 87.5 % and 100 %, respectively[8]. Willis *et al*. reported that overall accuracy of EUS for T, T1, T2, T3, and T4 staging were 78%, 80%, 63%, 95%, and 83%, respectively. Regional lymph node staging was correctly conducted in 77 % of all 116 patients[9]. Habermann CR et al.

reported that in comparison with histologic results, CT achieved correct T staging in 39 patients (76%) and correct N staging in 35 patients (70%). The corresponding results for EUS achieved correct T staging in 44 patients (86%) and correct N staging in 45 patients (90%). There were no significant difference between T staging (***p*** = .55) and N staging (**p**= .99)[10]. Pan Z et al. reported that when resectibility was considered to be the outcome, the total accuracy of MDCT was 87.4%, sensitivity was 89.7% and specificity was 76.7%[11]. In our study, among 38 patients, criteria for resectibility were up to stage T3N2M0. In EUS staging 28 cases were found resectable preoperatively but during operation 26 cases were found resectable and 2 cases were found un-resectable. Among rest of the preoperative un-resectable 10 cases, we found 6 cases were resectable and 4 cases were actually un-resectable. So, the accuracy, sensitivity, specificity of EUS for resectibility were 92.9%, 81.2% and 66.7% respectively (***p***<0.05). In CT staging 31 cases were found resectable preoperatively but during operation 27 cases were found resectable and 4 cases were found un-resectable. Among rest of the preoperative un-resectable 7 cases, we found 5 cases were resectable and 2 cases were actually un-resectable. So, the accuracy, sensitivity, specificity of CT for resectibility were 87.1%, 84.4% and 33.3% respectively(***p***<0.05). In USG staging 29 cases were found resectable preoperatively but during operation 24 cases were found resectable and 5 cases were found un-resectable. Among rest of the preoperative un-resectable 9 cases, we found 8 cases were resectable and 1 cases was actually un-resectable. So, the accuracy, sensitivity, specificity of USG for resectibility were 82.7%, 75% and 17% respectively (*p*<0.05). All of these *p* values were obtained by chi square test. Our results suggest that for determining resectibility both modalities have close accuracy for T & N staging but EUS can accurately assess more detail of the five-layer structure of the gastric wall also lymph node status than CT scan & USG. EUS can be done in the same setting along with upper GI endoscopy and radiation hazards of CT scan can be avoided. However, in determining resectibility regarding T & N stage, the present study showed that the accuracy, sensitivity and specificity of EUS are better than that of CT scan & USG.

Limitations of the study were sample size was relatively small, it was a single center-based study and none of the patients had a T1 tumor, so comparison between CT scan and EUS in regard to this early stage could not be performed.

Recommendations:

Further study is needed combining large sample size and multiple center based data to determine accuracy of the procedure. Improvement in EUS, USG & CT scan equipment of higher configuration will be essential to overcome the weak points of this method.

Conclusion

Abdominal ultrasound, CT scan & EUS are important imaging modalities for stomach carcinoma. EUS, a newer modality is superior to USG, CT, and conventional endoscopy in the assessment of primary tumor invasion depth and regional lymph node status. It can be done in same setting along with Endoscopy of upper GIT. So diagnosis and extent of local invasion can be assessed. In case of advanced stage, it can detect local extension, perigastric lymph nodes invasion to surrounding structures. EUS, a new modality in our country is a useful option for accurate staging of gastric cancer. In summary, determining resectibility EUS ,CT scan & USG are helpful but EUS is more sensitive and specific determining resectibility of gastric carcinoma.

Conflict of Interest: All the authors of this study do not have any financial interest or conflict with any industries or parties.

Ethical Approval: Ethical committee of Dhaka Medical College.

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