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Gastric Cancer Staging: EUS And CT

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ABSTRACT

Introduction: Gastric cancer is the fourth most common cancer and the second leading cause of death from cancer. Only complete resection of all gross disease with negative microscopic margins (R0 resection) provides a long-term survival benefit, and the overall 5-year relative survival rate is approximately 20%. To improve survival and quality of life, new therapeutic approaches have been introduced. **Material and methods:** A total of 277 patients (171 men, 106 women) were included in this analysis. The results from the preoperative EUS and MDCT were compared to the postoperative pathological findings. A radial scanning ultrasonic endoscope was used. In patients with early gastric cancer, especially in cases confined to mucosa, endoscopic resection is performed to avoid unnecessary surgical procedures. To achieve R0 resection for locally-advanced gastric cancer , neoadjuvant treatments have been investigated. **Results and discussion:** Laparoscopic surgery has been shown to improve quality of life for both early and locally advanced gastric cancer. Endoscopic ultrasonography (EUS), which is considered to be the most precise method for locoregional staging, was commonly used for differentiating mucosal lesions from submucosal lesions. By contrast, computed tomography (CT) was used to detect the presence of distant metastasis. The difference in accuracy between the ≤20-mm group and other groups was statistically significant for both EUS and MDCT (P = 0.026 and P = 0.044, respectively). **Conclusion:** However, recent technological advances with the helical and multi-detector scanners have provided better CT performance.

Key words: gastric cancer, EUS, CT.

1. INTRODUCTION

Gastric cancer is the fourth most common cancer and the second leading cause of death from cancer (1, 2). Only complete resection of all gross disease with negative microscopic margins (R0 resection) provides a long-term survival benefit, and the overall 5-year relative survival rate is approximately 20% (1, 3). To improve survival and quality of life, new therapeutic approaches have been introduced. In patients with early gastric cancer, especially in cases confined to mucosa, endoscopic resection is performed to avoid unnecessary surgical procedures (4). To achieve R0 resection for locally-advanced gastric cancer, neoadjuvant treatments have been investigated (5). Laparoscopic surgery has been shown to improve quality of life for both early and locally advanced gastric cancer (6, 7).

Endoscopic ultrasonography (EUS), which is considered to be the most precise method for locoregional staging, (8, 9) was commonly used for differentiating mucosal lesions from submucosal lesions. By contrast, computed tomography (CT) was used to detect the presence of distant metastasis (10). However, recent technological advances with the helical and multi-detector scanners have provided better CT performance (11, 12, 13).

With the introduction of new therapeutic options and the recent improvements in CT, further evaluation of the diagnostic accuracy for individual staging by EUS and multidetector-row computed tomography (MDCT) is needed. The present study was conducted to compare the staging accuracy of EUS with that of MDCT in series of patients and to evaluate their usefulness in association with the clinicopathological factors.

2. PATIENTS AND METHODS

In total, 277 patients with gastric lesions who underwent EUS and CT, hospitalized or outpatient treated at Department of gastroenterology and hepatology, Clinical Centre, University of Sarajevo, from January 2008 to December 2012, were analyzed. The results from the preoperative EUS and MDCT were compared to the postoperative pathological findings. A radial scanning ultrasonic endoscope was used. Our experienced endoscopists carried out planned procedures. The tumor infiltration depth was assessed at the time of the procedure using the standard criteria. Lymph nodes equal to or larger than 8 mm were considered positive for metastasis. When lymph node enlargement was found to be >3 cm from the primary lesion, stage N_2 disease was diagnosed. Contrast material-enhanced CT examinations were performed using 16 or 64 detector row scanners. Tumor invasion depth was assessed according to previously reported criteria (15).

When endoscopic resection was indicated from the preoperative imaging, (4, 16) endoscopic mucosal resection or endoscopic submucosal dissection was performed. Patients who were not candidates for endoscopic resection or had residual disease after endoscopic resection underwent either a total or subtotal gastrectomy. The operative specimens were staged by experienced pathol-

ogists according to the Japanese Classification of Gastric Cancer (17).

The results from the preoperative EUS and MDCT were compared with the postoperative pathological staging. In cases with mixed pathology, the pathological type that mainly accounted for the lesion was selected. Papillary and tubular adenocarcinomas were considered differentiated gastric cancers, and poorly-differentiated adenocarcinoma, signet-ring cell carcinoma, and mucinous adenocarcinoma were considered undifferentiated carcinomas (17, 18). In the analysis of T-staging accuracy in relation to the clinicopathological features, χ^2-test was used. A *P*-value of less than 0.05 was considered significant.

3. RESULTS

A total of 277 patients (171 men, 106 women) were included in this analysis.

Histology	
Well-differentiated tubular adenocarcinoma	47
Moderately-differentiated tubular adenocarcinoma	105
Poorly-differentiated adenocarcinoma	85
Signet-ring cell carcinoma	33
Mucinous adenocarcinoma	7

Table 1. Histological types of carcinoma in our sample

Among the 277 patients included in this analysis, the overall accuracy of EUS for T staging was 74.7%, and the rate of overstaging (13.7%) was higher than that of understaging (11.6%). On MDCT, the primary lesions were visualized in 141 of the 277 patients, which meant an overall detection rate of 50.9%. The sensitivity and specificity were 64% and 92.5% for EUS and 96% and 87.3% for MDCT. Table 1. shows the distribution of histology.

Among the 141 patients with visualized primary lesions on MDCT, T-staging accuracy in relation to the clinicopathological features was analyzed (Table 2). The lesions at the angle revealed the lowest accuracy by EUS (41.7%), followed by lesions at the cardia (53.3%). When compared to other groups, the lesions at the angle showed a statistically significant difference ($P = 0.037$). For MDCT, the accuracy of the lesions at the cardia was the lowest (33.3%, $P = 0.012$), followed by lesions at the angle (58.3%). The performance of EUS and MDCT for the combination group of lesions at the cardia and angle had also significantly lower accuracy than the other groups ($P = 0.019$ and $P = 0.031$, respectively). With regard to size, the accuracy of both modalities tended to decline as the tumor increased. The difference in accuracy between the ≤20-mm group and other groups was statistically significant for both EUS and MDCT ($P = 0.026$ and $P = 0.044$, respectively).

For early gastric lesions with ulcerative changes, EUS demonstrated a significantly lower accuracy rate when compared to lesions without ulcerative changes (P=0.00001). In contrast, the accuracy of MDCT for lesions with and without ulcerative changes was not significantly different.

	Total	EUS		MDCT	
		Accuracy (n)	%	Accuracy (n)	%
Location					
Cardia	15	8	53.3	5	33.3***
Body	48	29	60.4	34	70.8
Angle	24	10	41.7*	14	58.3
Antrum	46	33	71.7	31	67.4
Prepyloric	8	7	87.5	6	75.0
Histology					
Differentiated	70	46	65.7	43	61.4
Undifferentiated	71	41	57.7	47	66.2
Gross (EGC)					
0-I	3	1	33.3	1	33.3
0-IIa	7	6	85.7	7	100.0
0-IIb	5	4	80.0	3	60.0
0-IIc	43	35	81.4	36	83.7
Ulcerative change (EGC)					
Yes	13	4	30.8**	8	61.5
No	45	42	93.3	39	86.7
Gross (AGC)					
1	3	2	66.7	3	100.0
2	10	5	50.0	2	20.0***
3	59	31	52.5	30	50.8
4	10	3	30.0	8	80.0
Size					
≤20 mm	27	22	81.5*	22	81.5***
20–40 mm	45	27	60.0	27	60.0
≥40 mm	67	36	53.7	39	58.2

* P < 0.05, compared with other endoscopic ultrasonography (EUS) groups; ** P < 0.01, compared with other EUS groups; *** P < 0.05, compared with other multidetector row computed tomography (MDCT) groups. AGC, advanced gastric cancer; EGC, early gastric cancer.

Table 2. Accuracy of EUS and MDCT for T staging and clinicopathological features.

4. DISCUSSION

Since 1990, EUS has been accepted as the most reliable imaging method for T staging (10, 11, 12). It was reported to have very high T-staging accuracy. There have been reported few studies directly comparing the accuracy of EUS and conventional CT, EUS has been considered more accurate than CT (19, 20). Two reports comparing single-/two-detector helical CT and EUS demonstrated the increased accuracy of CT, but the accuracy of EUS was still higher than CT (12, 14). Recently, studies using MDCT for T staging of gastric cancer have shown improved accuracy, approaching that of EUS. In the studies performed with the 16 or 64 MDCT alone, the T-staging accuracy has been reported to be up to 89%. Some authors have suggested that the accuracy of MDCT for T staging had almost caught up with that of EUS, and that MDCT might replace EUS for preoperative staging (21, 22).

Considering prior studies, it was suggested in a previous report that the presence of non-visualized primary lesions on MDCT might reflect the presence of early gastric cancer lesions without regional lymph node metastasis, (23) of which the results are consistent with the present study. Therefore, to correct the underestimation for the appropriate comparison of EUS with MDCT, we analyzed the

performance for T staging. The results are consistent with recent studies on the accuracy of MDCT, which show it to be very close to that of EUS (11, 13, 15). The rate of early gastric lesions (41%) in the visualized lesion group was also adequate when compared to those reported in previous studies, from 46% to 53% (24, 25).

For the analysis of N staging, the criterion of 8 mm, used in previous studies, (12, 14) was chosen for both EUS and MDCT. For evaluating the depth of gastric invasion, the presence of ulcerative change, size, location, and histology have been established as important factors that influence the staging accuracy of EUS (26, 27, 28, 29, 30, 31).

In the present study, the performance of both modalities was analyzed in relation to the clinicopathological factors (Table 2). With regard to location and size, both scanning modalities showed a similar tendency. For early gastric lesions with ulcerative changes, the accuracy of EUS was significantly low; this finding is consistent with previous studies (30, 31). In cases with a diffuse infiltrative morphology (Bormann type 4), the performance of EUS was also low, although the result was not statistically significant. Seven of 10 diffused infiltrative lesions were very large, over 100 mm, and the low accuracy can be explained by the difficulty of a thorough examination of very large lesions with EUS. When a lesion with ulceration or a large, diffused infiltrative lesion is suspected upon preoperative evaluation, MDCT might be more accurate than EUS. However, this requires further study in a larger sample for confirmation. Among the 10 lesions classified as Bormann type 2, only two lesions were correctly staged by MDCT. For differentiating mucosal lesions from submucosal lesions, EUS is the first-line imaging modality; this is because it shows more detail of the five-layer structure of the gastric wall than CT. However, in determining the individual T and N stage, the present study showed that the accuracy of MDCT was very close to that of EUS. When a large lesion or a lesion at the angle or cardia is examined by both modalities, cautious interpretation is necessary for T staging. Early gastric lesions with ulceration should be also meticulously interpreted by EUS.

5. CONCLUSION

Both EUS and MDCT are useful, complementary modalities for the preoperative evaluation of gastric cancer.

CONFLICT OF INTEREST: NONE DECLARED

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