

## Preoperative Role of Dynamic Abdominal Computed Tomography in Gastric Tumors

### Gastrik Tümörlerde Dinamik Abdominal Bilgisayarlı Tomografinin Preoperatif Rolü

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#### ÖZET

**GİRİŞ ve AMAÇ:** Mide kanseri tüm dünyada her yıl yaklaşık yarım milyon hastanın ölümüne neden olmaktadır. Dinamik abdominal BT preoperatif tanı ve mide kanserlerinin evrelemede yaygın olarak kullanılmaktadır. Burada en önemli nokta preoperatif evrelemenin doğru yapılarak, hastaların neoadjuvan kemoterapi gibi uygun tedavi seçeneklerine kavuşabilmesidir. Dinamik abdominal BT'nin preoperatif rolünü daha da netleştirmek için; preoperatif BT bulgularını postoperatif ve histopatolojik bulgular eşliğinde karşılaştırdık.

**YÖNTEM ve GEREÇLER:** Mide kanseri nedeniyle 2016 - 2019 yılları arasında operasyon geçiren hastaların kayıtları geriye dönük olarak incelendi. Tüm preoperatif BT bulguları cerrahi bulgularla istatistiksel olarak karşılaştırıldı ve preoperatif BT görüntüleri ameliyat sonrası başka bir radyolog tarafından değerlendirildi.

**BULGULAR:** Üç yıl boyunca kliniğimizde toplam 103 hastaya mide kanseri tanısı konuldu ve opere edildi. İncelenen hastaların 76 'sı (% 73.7) erkek ve 25' i (% 24.2) kadındı ve ortalama yaş 67' idi. Tüm hastalara preoperatif dinamik abdominal BT inceleme yapıldı. Preoperatif BT bulguları evreleme ve tanı için ayrıca hastanın 16' sında (% 15.84) yetersizdi. Bu 16 hastanın ek görüntüleme teknikleri (PET CT, MR, EUS) ve endoskopi nedeniyle tedavi seçenekleriyle, mortalite ve morbidite oranları değişmedi.

**TARTIŞMA ve SONUÇ:** Dinamik abdominal BT' nin mide tümörlerinde preoperatif tanı ve evrelemede önemli bir rolü vardır, ancak bazı vakalar yanlış değerlendirilebildiği veya gözden kaçabildiği görülmektedir. Bu yüzden mide tümörü düşünülen hastalarda preoperatif evreleme yapılırken BT yanında primer olarak endoskopi ve sonrasında MRI, PET, EUS gibi ek görüntüleme yöntemleriyle değerlendirilmesi önemli olarak görülmektedir.

**Anahtar Kelimeler:** Dinamik Abdominal Batın BT, Preoperative Evreleme, Mide Tümörleri

#### ABSTRACT

**INTRODUCTION:** Gastric cancer accounts for nearly half a million deaths each year all over the world. Dynamic abdominal CT is used for preoperative diagnosis and staging of gastric cancers. Preoperative staging must be done correctly, so the patient can get the proper treatment options such as neoadjuvan chemotherapy. To further clarify of preoperative role of dynamic abdominal CT; we compared preoperative CT findings with postoperative, and histopathological findings.

**METHODS:** Patients' records, who underwent gastric operation for gastric cancer, between 2016 to 2019 were analyzed retrospectively. All preoperative CT findings were compared with surgical and histopathological findings statistically, and also preoperative CT images were evaluated by another radiologist postoperatively.

**RESULTS:** For 3 year period total 103 patients were diagnosed and operated for gastric cancer in our clinic. The population was comprised of 76 (73.7%) male and 25(24.2%) female patients who were averagely 67 years old. All of the patients have preoperative dynamic abdominal CT. Preoperative CT findings for staging and also diagnosis were insufficient for 16 (15.84 %) patients of 101. The treatment options, mortality and morbidity rates for 16 patients did not change, because additional imaging technics (PET CT, MRI, EUS) and endoscopy were performed to these patients preoperatively.

**DISCUSSION AND CONCLUSION:** Dynamic abdominal CT has a major role for preoperative diagnosis and staging of gastric tumors, but some cases could be misevaluated, so that preoperative evaluation of gastric tumors should be done with dynamic CT and if necessary MRI, PET CT, EUS or endoscopy.

**Keywords:** Abdominal CT, Gastric Tumors, Preoperative Staging

## INTRODUCTION

Gastric cancers are the fourth most seen cancer and the second leading cause of cancer-related mortality worldwide and also the most prevalent cancer in Eastern Asia (1). Incidence rates are 2-3 times higher for male population (2). Age, male sex, smoking, black or Hispanic race, Helicobacter pylori, low socioeconomic status, smoked food, non-steroidal antiinflammatory drugs, statins, obesity, gastroesophageal reflux disease are risk factors of gastric cancer (3). Nowadays, although the incidence of the gastric cancer varies regionally, proximal migration has begun to be seen more frequently, so it leads to the introduction of the FLOT (5FU, Folinic acid, Oxaliplatin, Docetaxel) regimen into the treatment protocols and also the NCCN 2018 guideline changed and the regimen in question has become the main treatment especially in upper gastrointestinal tumors (4).

Upper gastrointestinal endoscopy is the gold standard for the diagnosis of gastric tumors (5). Most of the gastric cancers are adenocarcinomas originating from stomach's superficial layer or mucosa (3). Dynamic Computed Tomography (CT) is used preoperatively for both diagnosis and staging of gastric cancer. Proper treatment whether neoadjuvant chemotherapy or surgical options is performed according to the CT. While evaluation of CT images could be difficult, because of some technical details such as being gastric wall thickness as 7-10 mm and distended stomach recommended during the procedure (6). Preoperative staging with CT could result in understaging or overstaging of the gastric cancer patients. Adjacent organ invasion, normal sized metastatic lymph nodes or enlarged lymph nodes without metastasis may effect in staging status (6). Dynamic CT is essential for T staging for precise localization

of the gastric lesions (7). Preoperative evaluation and staging for gastric cancer is essential for identifying the treatment options. Our goal is to determine the preoperative efficiency of dynamic abdominal CT for gastric cancers.

## METHODS

A total of 103 patients underwent gastric operation for gastric cancer between 2016 to 2019 at the Department of General Surgery in Dışkapi Yıldırım Beyazıt University Training and Research Hospital were included in this retrospective study and all data were obtained from hospital records. Approval for the study was granted by the Ethics Committee of Dışkapi Yıldırım Beyazıt University Training and Research Hospital. Preoperative abdominal CT findings, intraoperative findings, postoperative histopathological findings and postoperative re-examination of CT findings were recorded and analyzed statistically.

## RESULTS

Demographics of the patients were; 76 (73.7%) male and 25 (24.2%) female patients who were averagely 67 (38-88 range) years old. All of the patients had preoperative CT and abdominal USG, and findings analysed for staging and diagnosis. Preoperative 11 (10.6%) abdominal CT didn't report any pathologic findings, whereby the patients had gastric tumors. Preoperative CT could not identify metastatic lymph nodes for 2 (1.9%) patients. For 3 patients CT could not localize the mass precisely. One was gastric cardia mass; reported as prepyloric, one was gastric and colon tumor with liver metastasis; reported as only colon tumor with liver metastasis and one gastric tumor; reported as intrabdominal mass.

The characteristics of 16 patients listed in Table 1.

We performed subtotal or total gastrectomy with Roux-n-Y anastomosis with D2 lymph node dissection for gastric tumors due to localization of the tumor. All patients specimens were reported histopathologically as adenocarcinoma of stomach. These CT findings discussed with a radiologist postoperatively, and confirmed.

## DISCUSSION

Gastric cancer is one of the leading causes of cancer deaths worldwide. Expected 5-year survival is approximately 25% and most cases are advanced stage when diagnosed and whose surgical treatment options are limited (8). Adenocarcinomas forms 95% of all gastric carcinomas. Curative treatment of gastric adenocarcinoma is the resection of partial or total stomach (R0) with lymph node dissection (D2) (9). Histological type and lymph node metastasis are the most important prognostic factors for gastric cancer. Gold standard diagnosis of gastric cancer is preoperative upper GIS endoscopy with biopsy (10). Currently, new treatment modalities like perieoperative chemotherapy have gained importance for gastric cancer treatment, but 5-year survival rates have remained 35-45% (11).

To decide on proper treatment modality for gastric cancer depends on preoperative true staging of gastric tumor. CT, positron emission tomography (PET) and endoscopic ultrasonography (EUS) are the most used preoperative staging imaging procedures for gastric cancer (12). Our preoperative and postoperative CT findings about gastric cancer diagnosis and preoperative staging and for some cases EUS, PET or endoscopy were correlated with the literature. CT is frequently preferred for preoperative staging of gastric cancer, and also postoperative patient follow-up of recurrence and response to treatment therapy (13). CT could define; the mass, tumor

depth, size of the mass (T), metastasis (M), lymph nodes (N) and ascites which have been used for TNM staging. CT has controversies such as; detecting local tumor invasion, normal sized metastatic lymph nodes and peritoneal dissemination. Also it exposes patients to ionizing radiation and has poor soft-tissue contrast (14).

The other technical detail was thickness of gastric wall at CT was reported 7-10 mm. If stomach was not distended with oral contrast or any liquid, wrinkled stomach wall could be interpreted as wall thickening, causing false positive finding (6). All patients in our study underwent dynamic CT with intravenous and oral contrast. Enlarged non-metastatic intraabdominal lymph nodes could also cause overstaging (6). Minami et al reported the accuracy of abdominal CT in diagnosis of 71 early and advanced gastric cancer patients as 53% and 92% respectively (15). We had preoperative CT findings insufficient for 16 (15,5%) patients. We concluded that our misevaluated CT findings were mostly emergency cases and were reported urgently and also these results correlated with the literature.

On the other hand CT had similar results for preoperative gastric cancer T-staging with EUS. The accuracy of CT for T-staging was reported as 77.1-88.9% and tumor serosal involvement specificity and sensitivity rates were reported 82.8-100% and 80-96.8% respectively (16).

Kwee et al. reported that CT sensitivity for detecting lymph node metastasis was 62.5-91.9% and specificity as 50.0-87.9% in a systematic review (17). The authors concluded that, normal sized metastatic lymph nodes could be misevaluated as normal lymph nodes and reactive enlarged nodes could be commented as metastatic lymph nodes. We detected metastatic lymph nodes histopathologically for 2 patients (1, 94%) whom preoperative CT findings were reported as non-metastatic lymph nodes. Liu Y et al. reported that PET/MRI performs better in TN

staging compared with PET/CT and it should be the optimal imaging technique for an accurate N staging for gastric cancer(18).

Another challenging issue is the detecting involvement of adjacent organ for gastric cancer with CT. Some authors recommended that absence of fatty plane between mass and organ could be considered as adjacent organ involvement, but for cachectic patients this CT finding could be misleading (19). CT was reported as the modality of choice imaging technique for metastasis during preoperative staging of gastric cancers. Pelvis, abdomen and thorax could be identified for distant metastasis at the same time. Sensivity and specificity of CT detecting gastric cancer distant metastasis reported as 14.3-59.1% and 93.3-99.8% respectively (20). Peritoneal metastasis could be difficult to detect with CT and reported sensitivity was 28.3% and specificity was 93.3-99.8% (21).

Despite the improvements in imaging technics, preoperative staging and treatment modalities of gastric cancer, there has not been a consensus of preoperative imaging of gastric cancer patients worldwide. In the other hand, as perioperative methodology in order to provide downstage in the tumor stage, increase the chance of R0 resection, treat micrometastatic disease and improve overall survival have become so crucial. So the role of

CT for preoperative staging in gastric malignancies have been increasing more than ever.

Diagnosis and treatment of gastric cancer should be multidisciplinary team approach to prevent misvaluations and to choose the proper treatment modality for the patient. General surgeons or assistants often interpret the CT imagings as radiologists do mostly in emergency patients and less in elective cases. Therefore, it is important to note that imaging examinations to be interpreted by experienced gastrointestinal system radiologists may protect patients from unnecessary surgery morbidity or risk of skipping diagnosis because the region in question is quite confusing for interpreting and that false negative cases may be countered due to some technical details.

## CONCLUSION

Gastric cancer management requires a multidisciplinary team approach and still abdominal CT is the first choice of imaging modality due to its relatively high accuracy rates and wide availability. If needed other imaging modalities (EUS, MRI, PET) should be added preoperative period to prevent misvaluation of gastric cancer patients.

**Conflict of interest:** All of the authors declare that they have no conflict of interest.

**Table 1:** Comparison of Preoperative CT Findings with Postoperative Operation and Histopathological Findings

NO	AGE	GENDER	PREOPERATIVE ABDOMINAL CT	PREOPERATIVE ENDOSCOPY	PREOPERATIVE HISTOPATHOLOGY	TYPE OF OPERATION PERFORMED	POSTOPERATIVE HISTOPATHOLOGY
1	64	M	Gastric antrum wall thickening without any metastatic lymph nodes.	Gastric antral ulcer and mass.	Adenocarcinoma	Distal Subtotal Gastrectomy+ Roux-N-Y Gastrojejunostomy	Mucinous adenocarcinoma, 7/27 lymph node metastasis
2	40	F	Normal abdominal CT findings	Gastric mass at antrum-corporus junction	Malign epithelial tumor	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy	Poorly cohesive carcinoma 1/13 lymph node metastasis
3	60	M	Gastric wall thickening and right renal mass.	Urgent Surgery	Signet-ring cell adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy +Renal mass excision	Gastric adenocarcinoma + Renal papillary carcinoma, 32/32 gastric lymph node metastasis
4	79	M	Pyloric circular wall thickening	Gastric mass at cardia	Adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy	Adenocarcinoma, no lymphnode metastasis
5	59	M	Normal abdominal CT findings	Gastric mass at corpus	Adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy	Adenocarcinoma 1/51 lymphnode metastasis
6	45	M	Normal abdominal CT findings	Gastric mass in antrum	Malign epithelial tumor	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy	Adenocarcinoma "poorly cohesive", 0/20 lymph node metastasis
7	70	M	Sigmoid colon wall thickening with liver masses	Urgent Surgery	Adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy + Total colectomy	Adenocarcinoma of stomach and colon
8	47	M	Normal abdominal CT findings	Gastric mass in prepyloric area	Adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy	Adenocarcinoma, 0/35 lymph node metastasis
9	83	M	Normal abdominal CT findings	Gastric mass at corpus	Signet-ring cell adenocarcinoma	Laparotomy, Peritonitis Carcinomatosa	Adenocarcinoma in frozen section
10	88	F	3 cm sized, right abdominal located mass near small intestine	Urgent Surgery	Adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy	Adenocarcinoma, 2/26 lymph node metastasis
12	46	F	Normal abdominal CT findings	Gastric mass in angular area	Adenocarcinoma	Distal Subtotal Gastrectomy+ Billroth 2	Early gastric adenocarcinoma without lymph node metastasis
13	69	M	Normal abdominal CT findings	Gastric mass at cardia	Adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy	Adenocarcinoma, 0/28 lymph node metastasis
14	82	M	Normal abdominal CT findings	Gastric mass at cardia	Adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy	Adenocarcinoma, 11/20 lymph node metastasis
15	74	M	Normal abdominal CT findings	Gastric mass in prepyloric area	Adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy + Splenectomy	Adenocarcinoma, 0/18 lymph node metastasis
16	72	M	Normal abdominal CT findings	Gastric mass in prepyloric area	Adenocarcinoma	Total Gastrectomy+ Roux-N-Y Gastrojejunostomy + Splenectomy	Adenocarcinoma, 6/24 lymph node metastasis

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