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CLINICAL RESEARCH / KLİNİK ARAŞTIRMA

Factors Affecting the Morbidity and Mortality of Gastric Cancer Surgery

Mide Kanseri Cerrahisinde Morbidite ve Mortaliteyi Etkileyen Faktörler

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Abstract

Objective: 60-65% of all gastric cancers detected in the Western world are locally advanced at the time of diagnosis. Since curative surgery is a factor affecting survival, extended resections applied to these patients may increase the risk of complications. The aim this study was to determine the post-surgical mortality and morbidity rates in locally advanced gastric cancers.

Methods: One hundred-eighteen patients with non-metastatic, locally advanced gastric cancer who underwent surgery at Ankara Oncology Education and Research Hospital between January 2002 and September 2004 were retrospectively analyzed.

Results: Additional organ resection was performed in 65 (55.08%) patients due to adjacent organ invasion. The morbidity and mortality rates of the total series were 21.7% and 4.5%, respectively. In multivariate analyses, the morbidity-increasing parameter was found to be more than two additional organ resections (p=0.001), while the factors-increasing mortality were two or more additional organ resections (p=0.001), cardiovascular and respiratory comorbidities (p=0.002).

Conclusion: Additional organ resection rates are high in patients with locally advanced gastric cancer who do not receive neo-adjuvant therapy, which increases morbidity and mortality rates.

Keywords: Advanced gastric cancer surgery, additional organ resection, morbidity and mortality

Öz

Amaç: Batı ülkelerinde saptanan tüm mide kanserlerinin %60-65'i tanı anında lokal ileri evrededirler. Küratif cerrahi sağkalımı etkileyen en önemli faktör olduğu için bu hastalara uygulanan genişletilmiş rezeksiyonlar komplikasyon riskini arttırabilir. Bu çalışmanın amacı lokal ileri evre mide kanserlerinde cerrahi sonrası mortalite ve morbidite oranlarını saptamaktır.

Yöntem: Ocak 2002 ile Eylül 2004 tarihleri arasında Ankara Onkoloji Eğitim ve Araştırma Hastanesi'nde ameliyat olan non-metastatik, lokal ileri evre mide kanserli 118 hasta geriye dönük olarak incelendi.

Bulgular: Altmış beş (%55,08) hastaya komşu organ invazyonu nedeni ile ek organ rezeksiyonu uygulanmıştı. Toplam serinin morbidite ve mortalite oranları sırasıyla %21,7 ve %4,5 olarak bulundu. Çok yönlü analizlerde morbiditeyi artıran parametre ikiden fazla ek organ rezeksiyonu (p=0,001), mortaliteyi artıran faktörler ise iki veya daha fazla ek organ rezeksiyonu (p=0,001), kardiyovasküler ve solunumsal yandaş hastalıklar (p=0,002) saptandı.

Sonuç: Neoadjuvan tedavi uygulanmayan lokal ileri evre mide kanserli hastalarda ek organ rezeksiyonu oranları yüksektir ve bu durum morbidite ve mortalite oranlarını artırır.

Anahtar Kelimeler: Lokal ileri mide kanseri cerrahisi, ek organ rezeksiyonu, morbidite ve mortalite

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Introduction

Gastric cancer is the fourth most common form of cancer worldwide and the second leading cause of cancer-related deaths[1]. The only curative treatment modality for gastric cancers with a poor prognosis is surgery, which is associated with high morbidity. The aim of surgery should be to improve the patient's quality of life and overall survival. 50% of gastric cancer patients have distant metastases at the time of diagnosis[2], and 70-80% of operated patients have metastases in regional lymph nodes[3]. Lymph node dissection plays an important role in the surgical treatment of advanced gastric cancers because of the high incidence of lymph node metastases. Recent advances in medical and surgical technologies have also manifested themselves in gastric cancer surgery[4]. However, although the safety and feasibility of laparoscopic early-stage gastric cancer surgery have been proven by prospective studies, more research is still needed for advanced gastric cancer[4]. It is particularly important to improve the surgical treatment options for advanced gastric cancer. Our study investigated the factors affecting early postoperative morbidity and mortality in locally advanced gastric cancer patients with poor surgical treatment results.

Materials and Methods

One hundred-eighteen patients who underwent gastrectomy with a diagnosis of gastric cancer at Ankara Oncology Education and Research Hospital between October 2002 and September 2004 were included in the study. Patient files were reviewed retrospectively. Age, gender, blood group, total protein, albumin, hemoglobin, total lymphocyte, comorbid diseases, previous abdominal operations, blood transfusion needs, low-molecular-weight heparin, antibiotic use of the patients were recorded.

Preoperative comorbid diseases were defined as diabetes mellitus, hypertension, chronic obstructive pulmonary disease, and cardiovascular diseases. Cardiac complications, which are among the postoperative complications, are evidenced by echocardiographic and cardiac enzyme changes, pulmonary complications by changes in sputum culture, chest X-ray, and computed tomography. Anastomotic leaks evidenced using radiological methods were recorded.

Surgical methods, total and distal gastrectomy, D1 and D2 dissection, presence, and number of additional organ resections were recorded. The number of total and metastatic lymph nodes whose tumor stage and differentiation were deducted from the postoperative pathology results was found.

Statistical Analysis

The statistical evaluation was performed using the Statistical Package for the Social Sciences 10.00 software and chi-square test. P values of <0.05 were considered statistically significant. The logistic regression test was used for the multivariate analysis.

Results

The mean age of the patients in the study was 57.7 (28-83). Of the patients, 74 (62.7%) were male and 44 (37.3%) were female. There were 32 (27.1%) patients in the group below 50 years of age and 86 (72.9%) patients in the group above. Subtotal gastrectomy was performed in 45 (38.1%) patients and gastrectomy in 73 (61.9%) patients. D1 dissection was performed in 44 (37.3%) patients, and D2 dissection was performed in 74 (62.7%) patients. One organ was resected in 41 (35.7%) patients who underwent additional organ resection, two organs in 17 (14.4%), and three or more organs were resected in 7 (5.9%). The spleen in 40, the distal pancreas in 13, the gallbladder in 16, the colon in 3, the small intestine in 2, the liver in 1 was resected in patients who underwent additional organ resection. There were 75 (63.6%) patients with R0 resection, 25 (21.2%) with R1 resections, and 18 (15.3%) with R2 resections.

Because of the preoperative evaluation, it was found that 62 (52.6%) of the patients had low total protein levels, 65 (55.1%) had low albumin levels, 82 (69.5%) had low hemoglobin levels, 32 (27.1%) had low lymphocyte levels. Twenty-eight (23.7%) patients had hypertension, 12 (10.2%) patients had diabetes mellitus, and 7 (5.9%) patients had chronic obstructive pulmonary disease.

The tumor was observed proximal to the stomach in 35 (29.7%) patients, distal in 48 (40.7%) patients, and diffused in 20 (16.9%) patients. Of 45 patients who underwent distal gastrectomy, 25 (55.5%) underwent D2 dissection, 14 (31.1%) underwent additional organ resection, 49 (67.1%) of 73 patients who underwent total gastrectomy underwent D2 dissection, 51 (69.8%) underwent additional organ resection. An average of 14.3 (5-29) lymph nodes were removed in patients with D1 dissection, and an average of 30 (18-58) lymph nodes were removed in patients with D2 dissection. Metastases were detected in an average of 7 (0-20) lymph nodes in patients with D1 dissection, and in an average of 8.9 (0-45) lymph nodes in patients with D2 dissection.

While complications were not observed in 93 (78.8%) patients, complications developed in 25 (21.2%) patients. The enterocutaneous fistula was present in 11 (44.0%) of the patients who developed complications. Of all patients, 13 (11.0%) developed respiratory, 12 (10.1%) cardiac, 2 (1.6%) cranial embolism, 3 (2.5%) incision site infection, 2 (1%) 6 developed intra-abdominal abscess, 1 (0.8%) evisceration and 1 (0.8%) intra-abdominal bleeding.

In the multivariate analysis, additional organ resection was found a parameter that increased complications and mortality (Tables 1, 2).

Discussion

Gastric cancer surgery eliminates all tumor foci, both macroscopically and microscopically. For this purpose, total or distal gastrectomy should be performed according to the location of the tumor in the stomach, and if there is an invasion of the surrounding organs, these organs should also be included in the resection procedure. In countries other than Japan, gastric cancers can still be diagnosed at advanced stages. This is particularly evident in our country. As observed in our study, most of the cases (81%) are in the advanced stage. With the developments in surgical techniques, intensive care, and anesthesia, postoperative morbidity and mortality rates have decreased after gastric cancer surgery[5]. The benefit of total gastrectomy for survival in distal tumors has not been demonstrated in prospective randomized studies[6,7].

In our study, the rate of patients who underwent total gastrectomy was 60%. Among patients who underwent total gastrectomy, our morbidity rate was 27.6%, the mortality rate was 12.3%, the morbidity rate was 11.1% and the mortality rate was 2.2% in the distal gastrectomy group. While total gastrectomy seems to increase morbidity in the One-Way analysis, this effect disappears in the multivariate analysis. The main reason for this is that while additional organ resection was performed in 69.8% of the patients in the total gastrectomy group, additional organ resection was performed in 31% of the patients who underwent distal gastrectomy.

The most important discussion topic in gastric cancer surgery is the extent of lymph node dissection. Randomized studies suggest that D2 dissection does not increase survival, but increases mortality and morbidity[8,9]. Non-randomized studies, however, have suggested that D2 dissection increases survival, especially in stages 2 and 3A, and morbidity may increase, but mortality does not[10]. Western studies show that D2 dissection has similar survival rates and higher mortality and morbidity than D1 dissection[8,11].

Although it is difficult to evaluate the effect of D2 dissection on survival due to stage migration (Will-Rogers phenomenon), D2 dissection should be performed for true staging. According to the AJCC staging system, at least 15 lymph nodes must be removed for staging, which indicates

Table 1. Demographic characteristics of patients

Characteristics		n (%)
Age	<50	32 (27.1)
	>50	86 (72.9)
Gender	Male	74 (62.7)
	Female	44 (37.3)
Total protein	Normal	56 (47.5)
Hemoglobin	Low (<5 gr/dL)	62 (52.5)
Lymphocyte	Low (<10 gr/dL)	82 (69.5)
Cardiac diseases	Low (<900/mL)	32 (27.1)
Lung diseases		28 (25.2)
Diabetus mellitus		7 (5.9)
		12 (10.1)

Table 2. Surgical characteristics and pathological findings

Characteristics		n (%)
Tumor localization	Proximal	35 (29.7)
	Distal	48 (40.7)
	Corpus	20 (16.9)
	Diffused	15 (12.7)
Dissection	D1	44 (37.3)
	D2	74 (62.7)
Gastrectomy	Total	73 (61.9)
	Subtotal	45 (38.1)
Number of additional organs resected	None	53 (44.9)
	1	41 (34.7)
	2	17 (14.4)
	3 and more	7 (5.9)
Degree of differentiation	Good	13 (11.0)
	Moderate	31 (26.3)
	Poor	63 (53.4)
	Unknown	11 (9.3)
Total number of lymph nodes	<20	45 (38.1)
	>20	73 (61.9)
Number of metastatic lymph nodes	1-6	38 (32.2)
	7-15	40 (33.9)
	>15	20 (16.9)

the removal of more advanced lymph nodes than the D1 dissection level. In our series, the number of patients who underwent D2 dissection included 2/3 of all patients, and the mean number of lymph nodes removed was 30. Morbidity was 22.7% in the D1 dissection group, 20.2% in the D2 dissection group, and mortality was 6.8% in the D1 dissection group and 9.4% in the D2 dissection group. Although total gastrectomy and additional organ resection, which may further increase mortality and morbidity in the D2 group, were performed at a higher rate, the fact that the mortality and morbidity rates were the same as in the D1 dissection group indicates that D2 dissection can be performed safely.

The most important factor for the long-term survival of patients with locally advanced gastric cancer is R0 resection[12-14]. Many studies have shown its effectiveness on the number of additional organs resected and mortality and morbidity in gastric cancers[12]. In our study, additional organ resection was performed in addition to gastrectomy in 65 patients. While mortality was 1.8% and morbidity was 10.2% in patients without additional organ resection, mortality increased to 13.8% and morbidity increased to 27.5% in patients who underwent organ resection. The morbidity rate increases from 17% to 71% as the number of additional organs resected increases. Mortality was 42.8% after three or more additional organ resections. In multivariate analysis, additional organ resection was found to be the only parameter that increased both mortality and morbidity.

Although the rate of advanced gastric cancer was high in our study, our morbidity rates were similar to the Japanese and Western series, and our mortality rates were similar to the Western series but higher than the Japanese series. D2 dissection and total gastrectomy can be safely performed in the surgical treatment of gastric cancer, as additional organ resection is the only effective factor in both mortality and morbidity according to the multivariate analysis. Patient age was shown to be no contraindication for radical surgery by the multivariate analysis.

Recently, the results of neoadjuvant chemotherapy regimens applied in radiologically proven locally advanced and proximal tumors have been published[15,16]. Neoadjuvant chemotherapy and postoperative adjuvant radiotherapy and chemotherapy combined with complete tumor resection and lymph node dissection significantly improve the postoperative survival time of gastric cancer patients[15], but studies on the application of neoadjuvant chemotherapy in locally advanced and proximal gastric tumors have shown that morbidity and perioperative death rates are not affected[17].

Laparoscopic surgery is also gaining popularity for treating gastric cancer. However, although the safety and feasibility of laparoscopic early-stage gastric cancer surgery have been proven by prospective studies, further research is still needed for advanced gastric cancer[4].

Study Limitations

The small number of patients and the heterogeneity of resected additional organs are limitations of our study.

Conclusion

Additional organ resection is associated with increased morbidity and mortality in patients with locally advanced gastric cancer. The comorbid disease of the patient contributed to this. Preoperative evaluation of these patients should be performed meticulously, and neoadjuvant treatments should be given priority before surgery.

Ethics

Ethics Committee Approval: The study was approved by the Bezmialem Vakıf University of Local Ethics Committee (protocol number: 11/246, date: 07.07.2020).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

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