Rep Pract Oncol Radiother, 2006; 11(5): 235-246

Original Paper

Received: 2006.05.04
Accepted: 2006.11.20
Published: 2006.11.27

Prognostic factors for patients with gastric cancer after surgical resection

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

Witold Kycler[ACDEF], Marek Teresiak[B], Cezary Łoziński[B]

2nd Department of Oncological Surgery, Great Poland Cancer Centre, Poznań, Poland

Summary

Background Stomach cancer is the 8th most common cause of cancer death, with median age of diagnosis 70 years for men and 74 years for women. Surgical resection is still the method of choice and surgical trials are focused on identifying prognostic factors for groups of patients undergoing curative surgery.

Aim The aim of our retrospective study was an analysis of prognostic factors in a group of patients with gastric cancer.

Materials/Methods We retrospectively analyzed a group of 248 patients with gastric cancer. Clinical and histological parameters were collected and then correlated with each another and with survival time using statistical parametric and nonparametric methods. Survival probability was estimated by Kaplan-Meier method. Statistical significance of prognostic factors depending on survival time was assessed by the Cox nonparametric proportional hazard regression model.

Results Univariate analysis showed significance of the following parameters: weight loss of more than 10 kg, tumour size, histological type of tumour, lymph node involvement, stage at the time of diagnosis and type of operation. Multivariate analysis showed that weight loss of more than 10 kg, T2 tumour size, lymph metastases, total gastrectomy and finally curative operation were independent prognostic factors of survival.

Conclusions Taking our data together we conclude that: (i) lymph node metastasis is a significant prognostic factor with poor prognosis, (ii) type of operation is a significant prognostic factor of survival, (iii) we confirmed the influence of T2 depth of invasion for patients' overall survival, (iv) weight loss of more than 10 kg displays a statistical correlation with survival time and worse prognosis, (v) parameters connected with complications after surgical procedures have no influence on survival time in the examined group.

Key words gastric cancer • prognostic factors • statistics • surgical treatment

Full-text PDF: http:/www.rpor.pl/pdf.php?MAN=9703

Word count: 2743
Tables: 7
Figures: 2
References: 44

Author's address: Witold Kycler, 2nd Department of Oncological Surgery, Great Poland Cancer Centre, Garbary 15 Str., 61-866 Poznań, Poland, e-mail: kycler@interia.pl

Background

Rates of stomach cancer are declining rapidly in Poland as in many parts of the world, especially in developed countries due to better living conditions and dietary changes. But we have to remember that it is still the eighth most common cause of cancer death. The incidence in Poland is 18.6 for males and 9.7 for females per 100,000 [1], in Europe 12–15 per 100,000, in the USA 5.2 per 100,000 and 93 per 100,000 in Japan [2,3]. The median age of diagnosis is 70 years for men and 74 years for women, with twice as high incidence in men as in women and increased with age. The geriatric population is expanding, and hence clinical decision making is often confused by effects of aging [2,4]. Complete management of cancer in this population, and its eventual outcome, could be improved by specialists with experience in oncogeriatric management. The anatomic location of gastric cancer is changing. A 4–5% increase in incidents of proximal or cardiac cancers per year in Europe has been noted. This rate parallels the increase in distal oesophageal adenocarcinomas, suggesting a relationship with bile or alkaline reflux [5]. These cancers tend to have a worse prognosis secondary to the later onset of diagnosis and the more extensive lymph node drainage that involves the mediastinal, abdominal, and retroperitoneal lymphatics [6]. Proximal cancers have been subclassified by Siewert and Stein based on location of the majority of tumour mass [7]. Several studies have also noted differences between oesophageal and proximal gastric cancer. Proximal gastric cancers are associated with *H. pylori* infections and often have inflammation, whereas oesophageal cancers are rarely associated with *H. pylori* and have much less inflammation. Distal gastric cancers, on the other hand, have continued to decrease in incidence. This decrease may be due to better living conditions, better dietary habits, and eradication of *H. pylori*. Distal cancers are seen most commonly in Asia [8].

Surgical resection is still the treatment of choice for gastric cancer. The goal of a surgical cure requires complete resection to R0 status, as the stage of disease is the most important predictor of outcome. According to the literature data, 20–30% of patients in Europe present inoperable cancer secondary to metastatic disease. Of the remaining 75% progressing to surgery, 20% of patients have unresectable cancer at the time of surgery, 25% have cancer with positive microscopic margins (R1) and 20–30% have a curative procedure performed [9]. Surgery may be required for curative procedures determined by the incision needed, the extent of gastric/oesophageal resection needed and for palliative secondary to bleeding and obstruction and may even be offered as an option in prolonging life. The great majority of gastric cancers that recur and metastasize do so first in the regional lymph nodes before spreading. A D2 resection includes N1 lymph nodes in the immediate perigastric region and nodes along the celiac access and its named branches and along the middle colic, superior mesentery artery and periaortic nodes. D2 resection has been recommended by the American Joint Committee on Cancer manual [10]. The majority of surgeons in the USA and many in Europe excise the N1 lymph nodes. Several studies in Europe and in the USA, however, have failed to show any significant impact on survival and have even shown an increase in perioperative morbidity and mortality with more extensive lymph node resections [11–18]. Survival data are varied in the literature. According to studies in the USA and Europe the survival rate at 5 years for T1 with no positive node was 93%; for T2, 84%; and for T3, 52%. Overall survival for stage IA is 78%; for stage IB, 58%; for stage II, 34%; for stage IIIA, 20%; for stage IIIB, 18% and for stage IV 7% over 5 years. Survival for R0 is 35% and increases to 79% if the cancer is node negative [19,20].

Aim

Surgical trials have focused on identifying prognostic factors. Some clinicopathologic features are proposed as a simple tool for prognostic grouping of patients undergoing curative surgery [21,22]. This study analyzed the clinicopathologic

Table 1. Clinical characteristics of patients.

Variables		0		1		p Value
Median age, years (range), Std. Dev.		60.7 (24–83) Std. Dev. 12.5		60.2 (28–87) Std. Dev. 13.2		NS
Gender	Female	42	35.0%	29	34.1%	NS
	Male	78	65.0%	56	65.9%	
Family gastric cancer		9	7.5%	8	9.4%	NS
		111	92.5%	77	90.6%	
A Rh positive		40	33.3%	26	30.6%	NS
		80	66.7%	59	69.4%	
Weight loss of more than 10 kg		65	54.1%	25	29.4%	p=0.0031*
		49	45.9%	56	70.6%	
Previous gastric operation		13	10.8%	10	11.8%	NS
		107	89.2%	75	88.2%	

0 – death; 1 – survived; * Statistically significant; NS – Non-significant.

Table 2. Clinicopathological characteristics of patients.

Clinical staging					
IA	T1N0M0	0	0.0%	11	5.4%
IB	T1N1M0 T2N0M0	1	0.48%	19	9.26%
II	T1N2M0 T2N1M0 T3N0M0	15	7.3%	21	10.2%
IIIA	T2N2M0 T3N1M0 T4N0M0	25	12.2%	16	7.8%
IIIB	T3N2M0	10	4.9%	5	2.4%
IV	M1N3 T4N1 T4N2	81	39.5%	1	0.48%
Depth of invasion.					
T1		13	5.5%	4	1.7%
T2		18	7.5%	34	14.3%
T3		43	18.1%	34	14.3%
T4		46	19.3%	1	0.4%
IV	M1,N3 T4N1 T4N2	44	18.5%	1	0.4%

0 – death; 1 – survived.

features and prognostic factors that affect the survival rate of patients with gastric carcinoma. The aim of this retrospective study was an analysis of prognostic factors in a group of patients with gastric cancer.

Materials and Methods

The series included 248 cancer patients operated on between 1995 and 2001 in the Second Oncological Surgery Ward in the Wielkopolska Oncology Centre in Poznań.

The average age of the examined patient group was 60.7 years old (age 24–87, standard deviation 12.4). The group included 85 women (34.4%) and 162 men (65.6%). The clinicopathologic features of these patients were reviewed retrospectively, including the following information: age, gender, family history, blood group, weight loss of more than 10 kg and previous gastric operation. A histological evaluation was performed according to the AJCC Cancer Staging Manual. According to the grade of anaplasia, 31 tumours were well differentiated, 70 moderately differentiated and 104 poorly differentiated. Radical total gastrectomy was defined as all gross lesions removed as judged by the surgeon (R0, R1) and curative resection was defined as radical total gastrectomy and the resection margins were histologically normal (R0: no residual tumour). Survival rates were obtained from hospital records.

Statistical analysis was performed using univariate logistic regression. We used Shapiro-Wilk and

Table 3. Histological classification of tumours.

Variables	0		1		P Value
Depth of invasion			**Mann-Whitney U Test**		
	U		**Z**		**p-level**
T1	48.0000		–3.2281*		p=0.0012*
T2	36.0000		–4.0931*		p=0.0000*
T3	62.0000		–1.7781		NS
T4	60.0000		2.1654*		p=0.0303*
Histological type	12	10.0%	19	22.4%	p=0.0150*
G1 well	108		66		
G2 moderately	38	31.7%	32	37.6%	NS
	82		53		
G3 poorly differentiated	70	58.3%	34	40.0%	p=0.0097*
	50		51		
Intestinal type	46	48.4%	31	43.1%	NS
	49		41		
Diffused type	21	22.1%	27	37.5%	p=0.0295*
	74		45		
Mixed type	28	29.5%	14	19.4%	p=0.0538*
	67		68		
Sarcoma	0		2	2.4%	NS
	120		83		
Carcinoid	1	0.8%	0	0.0%	NS
	119		85		
Lymphoma	7	5.9%	5	5.9%	NS
	113		85		

0 – death; 1 – survived; * Statistically significant; NS – Non-significant.

Lilliefors test and then Student's t-test, χ^2 square test with Yates' modifications and Fisher's exact test. The Mann-Whitney U-test served as the nonparametric method. The statistical significance of analyzed factors depending on patient survival or death was assessed. Survival probability was estimated using the Kaplan-Meier method. Then, clinical, histopathological and immunohistochemical data showing statistical significance were correlated with survival time. The statistical significance of prognostic factors depending on survival time was assessed by the Cox nonparametric proportional hazard regression model. A p value <0.05 was considered statistically significant for all procedures. The statistical analysis was performed using Statistica for Windows release 6.0.

Results

Among the 275 patients with gastric cancer, 27 failed to be followed up, with follow-up rate of 90.1%. Clinical and histopathological data are presented in Tables 1, 3 and 4. The grade of advance of malignancy according to TNM is presented in Table 2. Out of 248 patients admitted to the Second Division of Oncological Surgery in the Wielkopolska Oncology Centre in Poznań complete data were collected from 205 patients. Age of patients at the time of the initial diagnosis ranged from 24 to 87 with mean age of 60.7 years. The group included 85 women (34.4%) and 162 men (65.6%); the gender ratio was 0.53:1.

Table 4. Clinicopathological features of gastric carcinoma.

Variables	0		1		p Value
N (+)	95	79.2%	39	45.9%	p=0.0000*
	25		46		
Peritoneal dissemination	47	39.2%	1	1.2%	p=0.0000*
	73		84		
Clinical staging	**Mann-Whitney U Test**				
	U		**Z**		**p-level**
T1N0M0	48.0000		–3.2282*		p=0.0012*
T1N1M0	71.0000		–0.6759		NS
T2N0M0	36.0000		–4.0931*		p=0.0000*
T2N1M0	264.0000		–0.5794		NS
T2N2M0	82.0000		0.8660		NS
T3N0M0	62.0000		–1.7781		NS
T3N1M0	311.0000		0.7958		NS
T3N2M0	135.0000		0.8451		NS
T3N1M1	14.0000		0.9847		NS
T4N1M0	60.0000		2.1654*		p=0.0303*
T4N2M0	54.0000		1.4041		NS
T4N2M1	49.5000		2.1330*		p=0.0329*
Synchronous metastases	30	25.0%	2	2.4%	p=0.0000*
	90		83		
Metachronous metastases	19	15.8%	2	2.4%	p=0.0000*
	101		83		

0 – death; 1 – survived; * Statistically significant; NS – Non-significant.

Median survival time according to Kaplan-Meier was 15.9 months; lower quartile (25^{th} percentile) was 4.0 months. The survival curve is presented in Figure 1. Next the following parameters were analyzed: age, gender, family history, blood group, weight loss of more than 10kg, previous gastric operation, depth of invasion using T parameter, histological type according to grade, the Lauren classification scheme with three main subgroups for gastric cancer (intestinal, diffuse and mixed type), pTNM classification, type of surgery and complications.

The statistical significance of analyzed factors depending on patient survival or death was assessed. Results are presented in Tables 1, 3–6. Then, statistical significance of prognostic factors depending on survival time was assessed by the Cox nonparametric proportional hazard regression model. The final results are presented in Table 7.

Univariate analysis showed that weight loss of more than 10kg (p=0.0031); T1 (p=0.0012), T2 (p=0.0000), T4 (p=0.0303) tumour size; histological type according to grade G1 (p=0.0150), G3 (p=0.0097); diffused (p=0.0295) and mixed (p=0.0538) type according to the Lauren classification scheme; extent of lymph nodal involvement (p=0.0000), peritoneal dissemination (p=0.0000), stage at the initial diagnosis T1N0M0 (p=0.0012), T2N0M0 (p=0.0000), T4N1M0 (p=0.0303), T4N2M1 (p=0.0329); synchronous metastases (p=0.0000), metachronous metastases (p=0.0000), radical (p=0.0000), palliative (p=0.0017), curative total gastrectomy (p=0.0000) were significant for examined patients with gastric cancer. Multivariate analysis showed that weight loss of more than 10 kg (p=0.0446), T2 tumour size (p=0.0401), lymph node metastases (p=0.0189), total gastrectomy (p=0.0253), and curative operation (p=0.0005) were independent

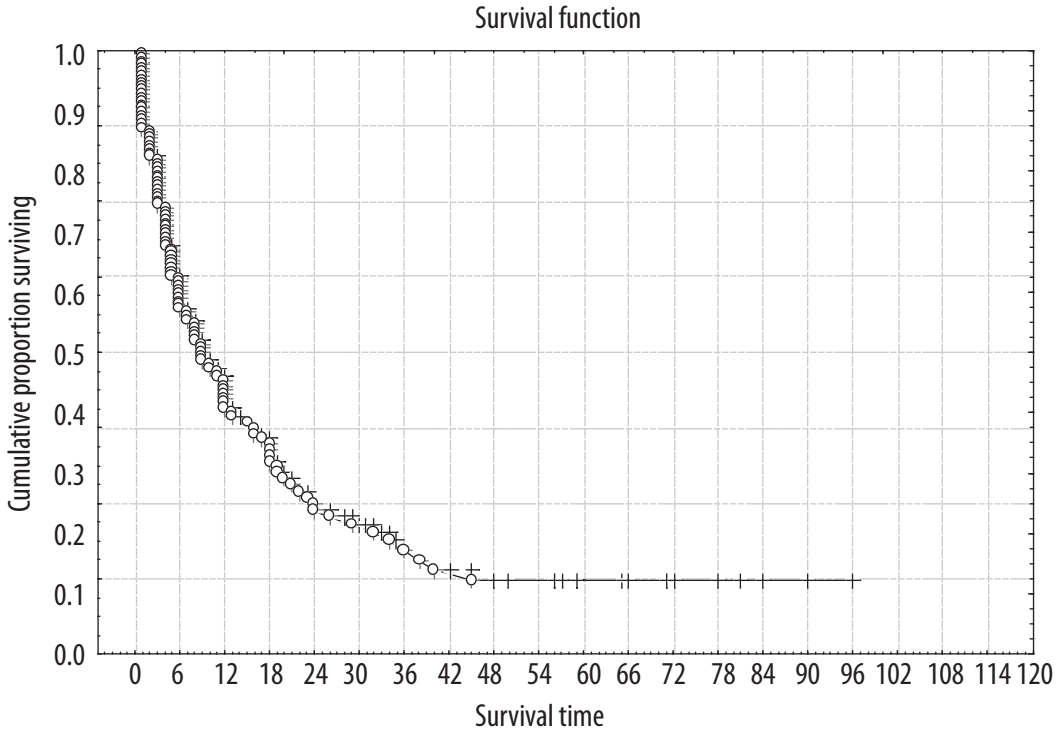

Figure 1. Graph of survival times vs. cumulative proportion surviving according to Kaplan-Meier method.

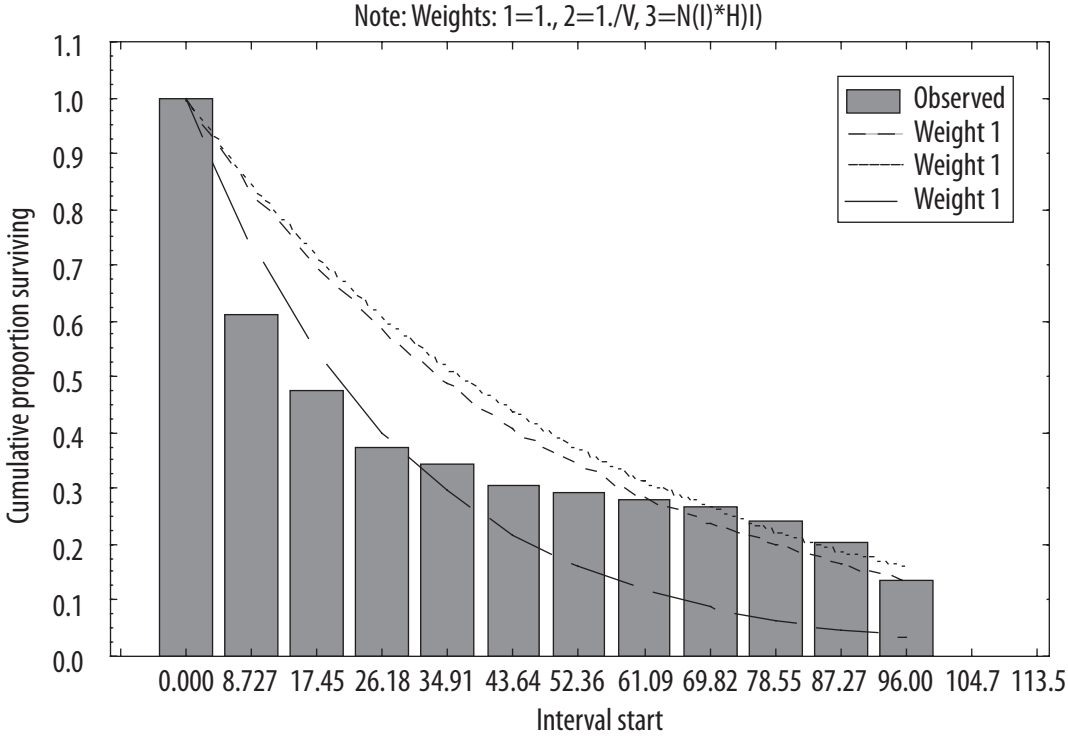

Figure 1. Graph of survival times vs. cumulative proportion surviving according to Kaplan-Meier method.

prognostic factors of survival. The parameters connected with complications showed no statistical significance in the examined group of patients.

Table 5. Surgical procedures..

Variables	0		1		p Value
Total gastrectomy	76	63.3%	80	94.1%	p=0.0000*
	44		5		
Subtotal gastrectomy	1	0.8%	3	3.5%	NS
	119		82		
Radical total gastrectomy	57	47.5%	78	91.8%	p=0.0000*
	63		7		
Palliative total gastrectomy	19	15.8%	2	2.4%	p=0.0017*
	101		83		
Laparotomy	43	35.9%	1	1.2%	p=0.0000*
	77		84		
Resectability		64.1%		98.8%	
		35.9%		1.2%	
Thoracotomy	4	3.3%	0	0.0%	NS
	116		85		
Splenectomy	10	8.3%	13	15.3%	NS
	110		72		
Curative operation	58	48.3%	82	96.5%	p=0.0000*
	62		3		

0 – death; 1 – survived; * Statistically significant; NS – Non-significant.

Discussion

The goal of primary successful treatment is surgical cure complete resection to R0 status. Survival for R0 is 35% and increases to 79% if the cancer is node negative [19, 20]. The studies showed that 25% of patients died during a period of 4.0 months and 50% lived longer than 15.9 months. In the whole group of patients, 1, 3 and 5 year survival was 57%, 34% and 28%, respectively. Survival data vary in the literature according to country of origin, differences in biology, extent of resection, and clinical stage of the disease. The prognosis of gastric cancer remains grim, with a 5-year relative survival of 25% in France and not much more than 21% in Europe [23,24]. In Japan, improvement in survival has been shown with more extensive lymphadenectomy, so it has been attributed to more intense pathologic assessment of lymph nodes. There may be a difference in interpreting pathology as many Western patients may be understaged. A D2 resection is recommended due to identification of 20% incidence of skip metastasis to D2 nodes, but survival was slightly improved only for patients who had T3 disease and were node negative. Several studies have shown that the total number of dissected lymph nodes had no influence on survival, whereas patients with a higher ratio of metastatic/dissected lymph nodes were characterized by significantly poorer prognosis [25]. In the analyzed group of patients 65.4% lymph node metastases were found. It is known that the chance of positive nodes is <4% for a T1a, 23% for a T1b, 44% to 50% for a T2 and 64% for a T3 lesion [26]. In our study univariate analysis showed that lymph node metastases were significant prognostic factors (p=0.0000). Multivariate analysis confirmed that nodal involvement was a significant prognostic factor of survival in the analyzed group (p=0.0189). This is probably one of the most predictive negative factors connected with low overall survival.

The main significant prognostic variable is lymph node involvement [27–29] followed by tumour depth [27,29]. Risk of lymph node spread can be predicted by tumour depth. In Western countries and in the USA early gastric cancer is diagnosed in 15–20%, while in Japan as much as 60% [9].

Table 6. Complications.

Variables	0		1		p Value
Dehistentio vulneris	3	3.9%	2	2.4%	NS
	74		80		
Bleeding (requiring revisions)	2	2.6%	0	0.0%	NS
	75		82		
Wound infection	8	10.4%	6	7.3%	NS
	66		76		
Anastomotic leakage	5	6.5%	0	0.0%	NS
	72		82		
Abscess of the abdomen	0	0.0%	2	2.4%	NS
	77		80		
General complications					
Abscess of the lungs	1	1.3%	1	1.2%	NS
	76		81		
Pneumonia	9	11.7%	6	7.3%	NS
	68		76		
Cardiorespiratory complications	5	6.5%	0	0.0%	NS
	72		82		
Pulmonary embolism	1	1.3%	0	0.0%	NS
	76		82		
7-day perioperative mortality	3	1.5%			
	202				
30-day mortality	14	6.8%			
	191				

0 – death; 1 – survived; NS – Non-significant.

In Poland the number reaches only a few percent. In our material early gastric cancer T1 was found in 17 patients (7.2%), first clinical stage was found in 11 patients (5.4%). The remaining 95.6% of patients had advanced carcinomas. Univariate analysis of our material showed that invasive depth T1 (p=0.0012), T2 (p=0.0000), T4 (p=0.0303) is a significant prognostic factor. Multivariate analysis confirmed the influence of T2 depth of invasion (p=0.0401) for patient overall survival. Komatsu et al. [30] reported that analysis of cases with curative operations showed that lymphatic invasion and lymph node metastasis were significant prognostic factors in patients with T2 gastric cancer. Further examination by multivariate analysis demonstrated that pN2 or higher as classified by both the JCGC (Japanese Classification of Gastric Cancer) and the TNM lymph node staging systems was a predictor of poor prognosis. The authors concluded that lymph node staging was the most reliable prognostic factor for T2 gastric cancer. Close follow-up should be required for patients with stage pN2 or higher gastric cancer. Long-term follow-up should be required for these cancers in particular.

Out of a total of 205 analyzed surgical interventions, curative operation was performed in 140 patients. Gastrectomy in combination with lymphadenectomy was performed as a curative modality for localized gastric cancer in our group of gastric cancer patients. In the group of patients with gastric adenocarcinoma in the upper third of the stomach the extent of lymphadenectomy should be tailored to tumour location. Lymphadenectomy might include the lateroaortic lymph nodes for advanced gastric cancer in

Table 7. Statistical significance factors depending on survival time assessed by Cox nonparametric proportional hazard regression model.

Statistical survival analysis	Dependent variable: survival – (months) $\chi 2 = 141.129$; df = 18 ; p = 0.0000 (p<0.05)				
Prognostic factor	**Beta**	**Statistical error**	**Exponent beta (relative risk)**	**Wald statistic**	**p**
Weight loss of more than 10 kg	0.4254	0.2118	1.5303	4.0315	0.0446*
T1	–3.4727	1.8939	0.0310	3.3622	NS
T2	–0.6422	0.3129	0.5260	4.2124	0.0401*
T4	0.4038	0.2621	1.4975	2.3729	NS
Histological type G1 well	–0.1543	0.3650	0.8570	0.1786	NS
G3 poorly differentiated	–0.2114	0.2160	0.8094	0.9574	NS
Diffused type	–0.0530	0.6040	0.9482	0.0077	NS
Mixed type	0.4491	0.4726	1.5669	0.9030	NS
N (+) N (–)	1.06910	0.4555	2.9127	5.5073	0.0189*
Peritoneal dissemination	0.4198	0.2903	1.5216	2.0898	NS
T1N0M0	2.0575	2.1179	7.8265	0.9437	NS
T2N0M0	–1.8715	1.2929	0.1538	2.0953	NS
T4N1M0	0.2955	0.5292	1.3438	0.3118	NS
T4N2M1	0.7044	1.0521	2.0226	0.4482	NS
Synchronous metastases	0.1218	0.2472	1.1295	0.2428	NS
Metachronous metastases	0.2071	0.3242	1.2301	0.4078	NS
Total gastrectomy	–0.7667	0.3428	0.4645	5.0013	0.0253*
Curative operation	0.5322	0.1533	1.7027	12.0117	0.0005*

0 – death; 1 – survived; * Statistically significant; NS – Non-significant.

the upper third of the stomach and the supradiaphragmatic and lower paraesophageal nodes for tumours extending to the oesophagus [31]. Several studies have demonstrated no survival difference in type of resection as long as margins are negative [32,33]. Randomized controlled trials are needed to verify these indices. A sentinel node biopsy has been proposed for early gastric cancer when a local excision may be performed. The sentinel node technique should be performed to identify unsuspected patterns of drainage and to allow for a more thorough pathologic assessment of the first sentinel node. No clinical trials have been performed to give definitive recommendations, and critics of this technique note the extensive drainage to the celiac axis, liver, mediastinum and retroperitoneal basins [34]. In our series univariate analysis showed that type of operation was significant but only curative or total gastrectomy were significant prognostic factors of survival in multivariate analysis. The p value was 0.0005 and the relative risk was 1.7027 when the observed value was curative resection. Multivariate analysis showed that total gastrectomy was a negative independent prognostic factor of survival in our group with p value 0.0253 and relative risk 5.0013. Total gastrectomy was the procedure most frequently performed in our patients (76%) as a curative (89.7%) or palliative (11.3%) operation. Poor outcomes for patients with palliative treatment and worst survival rate were the most negative predictive factors for this group.

Weight loss of more than 10kg (p=0.0446) showed a statistical correlation with survival time in our study. This is characteristic for advanced cancers but we did not find any papers analyzing that as an independent prognostic factor. Many authors confirmed that pain is the first symptom [35] and

that anaemia as an inaugural event is increasing significantly [36]. Symptomatic findings in the early stage of disease are relatively vague and nonspecific. The increased use of proton pump inhibitors may contribute to later time of diagnosis due to resolution of common vague symptoms [37].

Several authors have reported on other prognostic factors by multivariate analysis, such as histological type with well, moderate or poor differentiation [38]. By histological type, we found significance in univariate analysis between patient survival or death for histologically good (G1: p=0.0150) and poor (G3: p= 0.0097) differentiation. Nakamura et al. [39] analyzed the histological types of early gastric cancer in elderly patients, and found that 45.5% of early gastric carcinomas were well differentiated. Other studies have reported similar results but there were any significance with survival rate/none with a significant effect on survival [40]. We did not find any similar correlations in our study.

In our study the Lauren scheme was analyzed as histological parameters. The intestinal type typically involves the distal stomach and the gland-like structures that mimic intestinal glands. The diffuse or signet ring type is more frequently found in the proximal stomach, and the tumours are more poorly differentiated and lack glandular structures. The intestinal type is more commonly seen in Asian patients and the elderly, the second one more commonly in Western cultures, younger patients and individuals with blood type A [26,41].

Many patients present distant metastases or direct invasion of organs, obviating the possibility of complete resection. Metastatic or unresectable upper gastrointestinal malignancies are incurable but do benefit from palliative surgery and chemotherapy [42]. The combination of chemoradiotherapy and palliative surgery has been reported to have positive results on overall survival [43]. In our study significantly worse prognosis was found in univariate analysis for patients with synchronous or metachronous metastases (p=0.0000 and p=0.0000 respectively). There is no correlation with survival rates.

The remaining parameters such as complications showed no statistically significant influence on patient survival and did not display any statistical significance on patient survival. Two trials in Europe (Dutch trial [18] and MRC trial [16]) proved that postoperative mortality will not affect the results in the long term. Following great improvements in surgical techniques, postoperative care and measures of digestive tract reconstruction may increase the risk of general complications [44].

Conclusions

We conclude that: (i) lymph node metastasis is a significant prognostic factor with poor prognosis for gastric cancer patients, (ii) in our series multivariate analysis showed that curative and total gastrectomy are respectively positive and negative significant prognostic factors of survival, (iii) our analysis confirms the influence of T2 depth of invasion for patients' overall survival, (iv) one clinical symptom, weight loss of more than 10kg, displays a statistical correlation with survival time and worse prognosis in a group of patients with gastric cancer, (v) the parameters connected with complications after the surgical procedures do not display any significant influence on survival time in the examined group.

References:

1. Didkowska J, Wojciechowska U, Tarkowski W, Zatoński W: Nowotwory złośliwe w Polsce w 1999 roku. Centrum Onkologii – Instytut Marii Skłodowskiej Curie 2002
2. Wayman J, Forman D, Griffin SM: Monitoring the changing pattern of esophago-gastric cancer: data from a UK regional cancer registry. Cancer Causes Control, 2001; 12: 943–9
3. Terry MB, Gaudet MM, Gammon MD: The epidemiology of gastric cancer. Semin Radiat Oncol, 2002; 12: 111–27
4. Kranenbarg EK, van de Velde CJ: Gastric cancer in the eldery. Eur J Surg Oncol, 1998; 24: 384–90
5. Blot WJ, Devesa SS, Kneller RW, Fraumeni JF Jr: Rising incidence of adenocarcinoma of the esophagus and gastric cardia. JAMA, 1991; 265: 1287–9
6. de Manzoni G, Pedrazzani C, Di Leo A et al: Metastases to the para-aortic lymph nodes in adenocarcinoma of the cardia. Eur J Surg, 2001; 167: 413–8
7. Siewert JR, Stein HJ: Classification of adenocarcinoma of the oesophagogastric junction. Br J Surg, 1998; 85: 1457–9
8. Driessen A, Van Raemdonck D, De Leyn P et al: Are carcinomas of the cardia oesophageal or gastric adenocarcinomas? Eur J Cancer, 2003; 39: 2487–94
9. Rubin P: Clinical Oncology: A Multidisciplinary Approach for Physicians and students, 8th ed. New York: WB Saunders, 2001

10. AJCC Cancer Staging Manual, 6th ed. New York: Springer-Verlag, 2002
11. Dhar DK, Kubota H, Kinukawa N, Maruyama R et al: Prognostic significance of metastatic lymph node size in patients with gastric cancer. Br J Surg, 2003; 90: 1522–30
12. Bonenkamp JJ, Songun I, Hermans J et al: Randomised comparison of morbidity after D1 and D2 dissection for gastric cancer in 996 Dutch patients. Lancet, 1995; 345: 745–8
13. McCulloch P, Niita ME, Kazi H et al: Gastrectomy with extended lymphadenectomy for primary treatment of gastric cancer. Br J Surg, 2005; 92: 5–13
14. Hartgrink HH, van de Velde CJH, Putter H et al: Extended lymph node dissection for gastric cancer: who may benefit? Final results of the randomized Dutch Gastric Cancer Study Group Trial. J Clin Oncol, 2004; 22: 2069–77
15. Degiuli M, Sasako M, Ponti A et al: Morbidity and mortality after D2 gastrectomy for gastric cancer: results of the Italian Gastric Cancer Study Group prospective multicenter surgical study. J Clin Oncol, 1998; 16: 1490–3
16. Cuschieri A, Fayers P, Fielding J et al: Postoperative morbidity and mortality after D1 and D2 resections for gastric cancer: preliminary results of the MRC randomised controlled surgical trial. Lancet, 1996; 347: 995–9
17. Robertson CS, Chung SCS, Woods SDS et al: A prospective randomized trial comparing R1 subtotal gastrectomy with R3 total gastrectomy for antral cancer. Ann Surg, 1994; 220: 175–82
18. Bonenkamp JJ, Songun I, Hermans J et al: Randomized comparison of morbidity after D1 and D2 dissection for gastric cancer in 996 Dutch patients. Lancet, 1995; 345: 745–8
19. Kooby DA, Surawinata A, Klimstra DS et al: Biologic predictors of survival in node-negative gastric cancer. Ann Surg, 2003; 237: 828–37
20. National Cancer Institute. Surveillance, epidemiology, and results: incidence, stomach cancer. Available at: *http://www.seer.cancer.gov/faststats/html/inc_stomach.html* 2004
21. Borie F, Rigau V, Fingerhut A, Millat B: Prognostic Factors for Early Gastric Cancer in France: Cox Regression Analysis of 322 Cases. World J Surg, 2004; 28: 686–91
22. Guadagni S, Reed PI, Johnston BJ et al: Early gastric cancer: follow-up after gastrectomy in 159 patients. Br J Surg, 1993; 80: 325–8
23. Coleman MP, Esteve J, Damiecki P et al: Trends in cancer incidence and mortality. IARC Sci Publ, 1993; 1–806
24. Faivre J, Forman D, Esteve J, Gatta G: Survival of patients with oesophageal and gastric cancers in Europe. Eur J Cancer, 1998; 34: 2167–75
25. Bonenkamp JJ, Hermans J, Sasako M et al: Extended lymphnode dissection for gastric cancer. Dutch Gastric Cancer group. N Engl J Med, 1999; 340: 908–14
26. Hohenberger P, Gretschel S: Gastric cancer. Lancet, 2003; 362: 305–15
27. Ranaldi R, Santinelli A, Verdolini R et al: Long term follow-up in early gastric cancer: evaluation of prognostic factors. J Pathol, 1995; 177: 343–51
28. Kim JP, Hur YS, Yang HK: Lymph node metastasis as a significant prognostic factor in early gastric cancer: analysis of 1136 early gastric cancers. Ann Surg Oncol, 1995; 2: 308–13
29. Behrns KE, Dalton RR, Van Heerden JA et al: Extended lymph node dissection for gastric cancer: is it value? Surg Clin North Am, 1992; 72: 433–43
30. Komatsu S, Ichikawa D, Kurioka H et al: Prognostic and clinical evaluation of patients with T2 gastric cancer. Hepatogastroenterology, 2005; 52: 965–8
31. Kunisaki C, Shimada H, Nomura M et al: Surgical outcome in patients with gastric adenocarcinoma in the upper third of the stomach. Surgery, 2005; 137: 165–71
32. de Manzoni G, Pedrazzani C, Pasini F et al: Results of surgical treatment of adenocarcinoma of the gastric cardia. Ann Thorac Surg, 2002; 73: 1035–40
33. Katai H, Sano T, Fukagawa T et al: Prospective study of proximal gastrectomy for early gastric cancer in the upper third od the stomach. Br J Surg, 2003; 90: 850–3
34. Hohenberger P, Gretschel S: Gastric cancer. Lancet, 2003; 362: 5–15
35. Meyer C, Lozac'h P, Rohr S et al: Gastric cancer: the French survey. Acta Gastroenterol Belg, 2002; 65: 161–5
36. Faycal J, Bessaguet C, Nousbaum JB et al: Epidemiology and long term survival of gastric carcinoma in the French district of Finistere between 1984 and 1995. Gastroenterol Clin Biol, 2005; 29: 23–32
37. Wayman J, Hayes N, Raimes SA, Griffin MS: Prescription of proton pump inhibitors before endoscopy. A potential cause of missed diagnosis of early gastric cancer. Arch Fam Med, 2000; 9: 385–88
38. Maehara Y, Okuyama T, Oshiro T et al: Early carcinoma of the stomach. Surg Gynecol Obstet, 1993; 177: 593–7
39. Nakamura T, Yao T, Niho Y, Tsuneyoshi M: A clinicopathological study in young patients. J Am Coll Surg, 1999; 188: 22–6
40. Kim DY, Kyoon J, Ryu SY et al: Clinicopathologic characteristic of gastric carcinoma in eldery patients: A comparison with young patients. World J Gastroenterol, 2005; 11: 22–6

41. Lauren P: The two histological main types of gastric carcinoma: diffuse and so-called intestinal-type carcinoma. An attempt at histo-clinical classification. Acta Pathol Microbiol Scand, 1965; 64: 31–49

42. Shah MA, Schwartz GK: Treatment of metastatic esophagus and gastric cancer. Semin Oncol, 2004; 31: 574–87

43. Schwartz RE: Postoperative adjuwant chemoradiation therapy for patients with resected gastric cancer: intergroup 116. J Clin Oncol, 2001; 19: 1879–80

44. Sasako M: Clinical trials of surgical treatment of malignant diseases. Int J Clin Oncol, 2005; 10: 165–70