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Impact of Clinicopathological Features on Gastric Cancer Stage According to TNM Classification

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Abstract

Background/Aim: TNM stage is crucial for patients with gastric cancer because curative resection and treatment are only possible in early TNM stages. Therefore, our objective was to assess the association of clinicopathological features with TNM stage in such patients.

Patients and Methods: The association of age, sex, tumor location and Lauren type with TNM stage was analyzed in 910 patients with gastric cancer.

Results: Age, sex, and tumor location did not have any association with TNM stage in univariate nor multivariate analyses ($p>0.05$). However, compared to the diffuse and mixed types, the intestinal type (as defined by the Lauren classification) presented lower T stage of gastric cancer in the chi-squared test ($p<0.001$) and this association was confirmed in the multinominal log normal model ($p=0.001$).

Conclusion: The histological Lauren type of gastric cancer is associated with lower TNM T stage.

Keywords: Gastric cancer, prognostic factors, Lauren type, TNM classification.

Introduction

Gastric cancer is the fourth most common cancer in men and the seventh most common cancer in women worldwide, with over 968,000 new cases per year. It is also the fifth most common cause of cancer deaths, with a mortality rate of 77/1,000,000 people annually (1). In the United States, according to the American Cancer Society, 5-year survival rates over the period of 1975-2019 for patients with gastric cancer did not exceed 34% (2). In Poland, the epidemiology of gastric cancer has stabilized in the recent years, with 3,010 deaths in males and 1,747 in females per year in 2021; the prognosis of patients with gastric cancer is still very poor, and 5-year survival does not exceed 30% (3).

Nowadays, multimodal treatment of gastric cancer with the application of pre- and postoperative chemotherapy

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and immunotherapy is routinely used. However, an early diagnosis with curative resection still makes up the foundation for a good prognosis of gastric cancer. Early diagnosis is the key prognostic factor, whilst the determination of the stage of the disease makes it possible to select treatment for such patients (4-9).

The most important method of gastric cancer staging is the TNM classification of the American Joint Committee on Cancer/Union for International Cancer Control (AJCC/UICC). The TNM staging system assesses the depth of local tumor infiltration (T), regional lymph node metastasis (N), and the presence of distant metastasis (M); currently, the eighth edition of the classification is used (10, 11). Due to the fact that curative resection and treatment are only possible in stages I and II and occasionally stages III or IV in the TNM classification, the diagnosis of gastric cancer in its early stages is crucial for patients (5, 6, 12-19).

In our previous studies, we confirmed that stage according to the TNM classification has the most important influence on the treatment outcomes of patients with gastric cancer (5, 19). In the present study, the effect of clinicopathological prognostic factors on the gastric cancer stage as expressed in the TNM classification was assessed. Factors such as age, sex, tumor location, and Lauren type in all stages of TNM classification in patients operated on for gastric cancer were included in analysis for association with the stage of gastric cancer by the TNM classification. Furthermore, the outcomes of treatment such as overall complications, systemic complications, surgical complications, relaparotomy, perioperative mortality, and 5-year survival in patients with gastric cancer treated surgically were determined.

Patients and Methods

Patient cohort. Between 2007 and 2017, 910 patients with gastric adenocarcinoma underwent surgical treatment at the First Department of General Surgery of the Jagiellonian University Medical College in Krakow, Poland. Data comprising the clinicopathological features, stage according to the TNM classification, and outcomes of treatment were collected. The influence of clinicopathological prognostic factors such as age, sex, tumor location, and Lauren type on the TNM stage of gastric cancer was evaluated.

Although most articles on the impact of age on the prognosis of patients with gastric cancer define old age as more than 60 years, nowadays, the sixth decade of life is usually a period of relatively good health, therefore, in our study, the threshold age affecting the TNM stage was set at 70 years (6, 13, 17, 18).

The primary site of the neoplasm in the upper, middle or lower third of the stomach was defined as the tumor location. For cases of gastric cancer in which the cancer was so advanced at diagnosis that it occupied two or more of the analyzed locations in the stomach (upper/middle/lower), the location was classified as 'other'.

The Lauren classification was used for the histological assessment of the tumor as intestinal, diffuse or mixed (20). The TNM stage of gastric cancer was evaluated in accordance with the eighth edition of the TNM classification (10, 11).

Conventional laparotomy was performed in all cases, including in patients who underwent stomach resection (total/subtotal distal/subtotal proximal gastrectomy), as well as those cases which were unresectable and underwent other procedures (gastrojejunostomy, by-pass surgery, or explorative laparotomy). In stomach resections, additional surgical procedures were carried out, comprising lymphadenectomy D1-D2+, and in some cases, esophagectomy, segmental pancreatectomy, spleen or bowel resections. Some patients with many comorbidities and TNM stage IV disease, including cases presenting symptoms of obstruction, jaundice, and malnutrition, underwent gastrojejunostomy, by-pass surgery, or explorative laparotomy.

In the majority patients with advanced gastric cancer (TNM stage II or higher), multimodal treatment with different chemotherapeutic regimens/specifics was administered (fluorouracil, leucovorin, cisplatin, oxaliplatin, irinotecan, etoposide, doxorubicin and docetaxel).

Follow-up. After discharge, the patients underwent follow-up every 3-6 months or at shorter intervals, whenever justified. In cases of death, the dates were verified using the data obtained from the census registry office. The main outcomes of treatment, collected in the patient database, such as overall complications, systemic complications, surgical complications, repeat laparotomy, perioperative mortality, as well as 5-year survival were collected. However, the study focused on the association of clinicopathological prognostic factors age, sex, tumor location and Lauren type with TNM stage.

Statistical methods. In order to establish the relationships between clinicopathological prognostic factors and T, N and M stages according to the TNM classification, the chi-squared test, multinominal log normal model and logistic regression model were used. The chi-squared test was applied in the univariate analysis. The multinominal log normal model for T stage and N stage, and the logistic regression model for M stage were used in multivariate analysis, which allowed a model of the relationship for a binary dependent variable and for at least one or more predictors (prognostic factors); to be developed $p<0.05$ was considered as statistically significant in two-tailed analysis. The calculations were performed with the statistical package STATISTICA v. 13 (StatSoft Polska, Krakow, Poland) and StatsDirect v. 3.3.4 (Buchan I., StatsDirect statistical software, http://www.statsdirect.com).

Results

Clinicopathological features and TNM staging. The mean age±standard deviation was 64.3±11.8 (range=22-89) years. A total of 597 (65.6%) patients were 70 years or younger, whilst the group older than 70 years consisted of 313 patients (34.4%). The study comprised more males, 599 (65.8%). The most common tumor location was upper third of the stomach (31.6%). The proportion of intestinal and diffuse types, according to the Lauren classification, were comparable at 408 (44.8%) and 393 (43.2%) cases, respectively (Table I).

Table I. *Patient cohort (n=910).*

Clinicopathologic feature		Frequency, n (%)
Age	≤70 Years	597 (65.6%)
	>70 Years	313 (34.4%)
Sex	Male	599 (65.8%)
	Female	311 (34.2%)
Location	Upper	288 (31.6%)
	Middle	245 (26.9%)
	Lower	194 (21.4%
	Other	183 (20.1%)
Lauren type	Diffuse	393 (43.2%)
	Intestinal	408 (44.8%)
	Mixed	109 (12.0%)
T Stage	T1a	38 (4.2%)
	T1b	47 (5.2%)
	T2	142 (15.6%)
	T3	204 (22.4%)
	T4a	155 (17.0%)
	T4b	324 (35.6%)
N Stage	N0	120 (13.2%)
	N1	133 (14.6%)
	N2	146 (16.0%)
	N3a	120 (13.2%_
	N3b	391 (43.0%)
M Stage	M0	483 (53.1%)
	M1	427 (46.9%)
Surgical characteristics		
Resectable cases	Overall	784 (86.2%)
	Total gastrectomy	564 (74.6%)
	Subtotal distal gastrectomy	148 (19.6%)
	Subtotal proximal gastrectomy	44 (5.8%)
Unresectable cases	Overall	126 (13.8%)
	Gastrojejunostomy	16 (1.8%)
	By-pass surgery	52 (5.7%)
	Explorative laparotomy	58 (6.4%)
	Overall complications	181 (19.9%)
Outcomes of treatment	Systemic complications	115 (12.7%)
	Surgical complications	101 (11.1%)
	Repeat laparotomy	44 (4.9%)
	Perioperative mortality	36 (4.0%)
	5-year survival	315 (34.6%)

The incidence of cases by T, N and M stage is presented in Table I; 427 (46.9%) out of 910 patients had distant metastasis (M1 stage).

Surgical characteristics and outcomes of treatment. Resectable cases were dominant at 784 (86.2%), the most common procedure was total gastrectomy, in 582 (63.9%)

Table II. *Association of TNM stage with age in univariate analysis.*

TNM stage	Subgroup	Age, n (%)		*p*-Value*
		≤70 Years (n=597)	>70 Years (n=313)	
T Stage	T1a	24 (4.0%)	14 (4.5%)	0.710
	T1b	35 (5.9%)	12 (3.8%)	
	T2	88 (14.7%)	54 (17.3%)	
	T3	133 (22.3%)	71 (22.7%)	
	T4a	100 (16.8%)	55 (17.6%)	
	T4b	21736.3%)	107 (34.1%)	
N Stage	N0	75 (12.6%)	45 (14.4%)	0.389
	N1	86 (14.4%)	47 (15.0%)	
	N2	100 (16.8%)	46 (14.7%)	
	N3a	71 (11.9%)	49 (15.7%)	
	N3b	265 (44.3%)	126 (40.2%)	
M Stage	M0	304 (50.9%)	179 (57.2%)	0.072
	M1	293 (49.1%)	134 (42.8%)	

*Chi-squared test.

Table III. *Association of TNM stage with sex in univariate analysis.*

TNM stage	Subgroup	Sex, n (%)		*p*-Value*
		Male (n=599)	Female (n=311)	
T Stage	T1a	22 (3.7%)	16 (5.1%)	0.186
	T1b	26 (4.3%)	21 (6.8%)	
	T2	86 (14.4%)	56 (18.0%)	
	T3	144 (24.0%)	60 (19.3%)	
	T4a	103 (17.2%)	52 (16.7%)	
	T4b	218 (36.4%)	106 (34.1%)	
N Stage	N0	60 (10.0%)	60 (19.3%)	0.092
	N1	102 (17.0%)	31 (10.0%)	
	N2	94 (15.7%)	52 (16.7%)	
	N3a	81 (13.5%)	39 (12.5%)	
	N3b	262 (43.8%)	129 (41.5%)	
M Stage	M0	316 (52.8%)	167 (53.7%)	0.787
	M1	283 (47.2%)	144 (46.3%)	

*Chi-squared test.

cases. There were 126 (13.8%) unresectable cases which underwent various other procedures (Table I).

The overall rate of complications was 19.9% with the rates of systemic and surgical complications of 12.7% and 11.1%, respectively. The percentage of repeat laparotomy was 4.9%. The incidence of perioperative mortality was 4.0% and the 5-year survival rate 34.6% (Table I).

Univariate analyses of the association of TNM stage with clinicopathological features. In univariate analyses, age was not significantly associated with the T, N or M stages (Table II). Sex was also not statistically significantly associated with the T, N or M stage in univariate analysis (Table III).

Like age and sex, tumor location also did not comprise a clinicopathological feature affecting the T, N or M stage in the univariate analysis (Table IV).

In comparison with the diffuse and mixed Lauren type, patients with intestinal Lauren type had lower T stage according to the chi-squared test ($p<0.001$, Table V) However, the univariate analysis did not show a statistically significant influence of Lauren type on the N or M (Table V) stages.

Multivariate analyses of the association of TNM stage with clinicopathological features. Multivariate analyses revealed that neither age nor sex were independent factors determining T, N and M stages (Table VI, Table VII, and Table VIII, respectively). Moreover, nor did tumor location statistically influence T (Table VI) or N (Table VII) stages in the multinominal log normal model, nor M stage in the logistic regression model (Table VIII) in multivariate analysis.

The finding that in comparison with the diffuse and mixed Lauren type, patients with intestinal Lauren type had lower T stage was confirmed in the multinominal log normal model ($p=0.001$, Table VI). But Lauren type was not an independent prognostic factor for N stage in the logistic regression model (Table VII) nor for M stage in the multinominal log normal model (Table VIII).

Discussion

In patients with gastric cancer, we examined the distribution and impact of various clinicopathological prognostic factors on stage according to the TNM classification. Below we review worldwide reports about the association of age, sex, tumor location and Lauren type with TNM stage of gastric cancer and we compare our findings with these.

Table IV. *Association of TNM stage with tumor location in univariate analysis.*

		Tumor location, n (%)			
TNM stage	Subgroup	Upper (n=288)	Middle (n=245)	Lower (n=194)	*p*-Value*
T Stage	T1a	13 (4.5%)	11 (4.5%)	11 (5.7%)	0.309
	T1b	16 (5.6%)	11 (4.5%)	14 (7.2%)	
	T2	36 (12.5%)	44 (8.0%)	41 (21.1%)	
	T3	71 (24.7%)	59 (24.1%)	44 (22.7%)	
	T4a	44 (15.3%)	44 (18.0%)	28 (14.4%)	
	T4b	108 (37.4%)	76 (30.9%)	56 (28.9%)	
N Stage	N0	31 (10.8%)	40 (16.3%)	35 (18.0%)	0.746
	N1	44 (15.3%)	31 (127%)	36 (18.6%)	
	N2	59 (20.5%)	38 (15.5%)	33 (17.0%)	
	N3a	39 (13.5%)	36 (14.7%)	15 (7.7%)	
	N3b	115 (39.9%)	100 (40.8%)	75 (38.7%)	
M Stage	M0	157 (54.5%)	140 (57.1%)	117 (60.3%)	0.451
	M1	131 (45.5%)	105 (42.9%)	77 (39.7%)	

*Chi-squared test.

Table V. *Association of TNM stage with Lauren type in univariate analysis.*

		Lauren type, n (%)			
TNM stage	Subgroup	Intestinal (n=408)	Diffuse (n=393)	Mixed (n=109)	*p*-Value*
T Stage	T1a	33 (8.4%)	3 (0.7%)	2 (1.8%)	<0.001
	T1b	32 (8.1%)	12 (2.9%)	3 (2.8%)	
	T2	80 (20.4%)	47 (11.5%)	15 (13.8%)	
	T3	110 (28.0%)	77 (18.9%)	17 (15.6%)	
	T4a	52 (13.2%)	81 (19.9%)	22 (20.2%)	
	T4b	86 (21.9%)	188 (46.1%)	50 (45.9%)	
N Stage	N0	56 (13.7%)	49 (12.5%)	15 (13.8%)	0.667
	N1	67 (16.4%)	53 (13.5%)	13 (11.9%)	
	N2	62 (5.2%)	69 (17.6%)	15 (13.8%)	
	N3a	50 (12.3%)	58 (14.8%)	12 (11.0%)	
	N3b	173 (42.4%)	164 (41.6%)	54 (49.5%)	
M Stage	M0	221 (54.2%)	213 (54.2%)	49 (45.0%)	0.194
	M1	187 (45.8%)	180 (45.8%)	60 (55.0%)	

*Chi-squared test.

Age. Some studies carried out in Asia analyzed the influence of age on the N stage in patients with early gastric cancer. Zheng *et al.* reported that younger patients had a higher possibility of lymph node metastasis than older patients [relative risk=0.444, 95% confidence interval (CI)=0.215-0.916, *p*=0.028] (21). Contrary to this observation, a meta-analysis including 23 studies by Zhao *et al.* of early gastric cancer showed that older patients were more likely to have lymph node metastasis (22). In the studies of Kim *et al.* (23), Ashakawa *et al.* (24) and Lee *et al.* (25), age was not a clinicopathological factor related to lymph node metastasis in such patients. Thus, when the reports from Asia about the influence of age on lymph node metastasis in early gastric cancer are summarized, the conclusions vary (21-25).

In another study of 1,550 patients with TNM stage I gastric cancer, younger patients were found to be more

Table VI. *Multinominal log normal model for association of factors with T stage.*

Parameter	Subgroup	Parameter estimate	Standard error	Wald	CI	*p*-Value
Intercept		−1.95	0.24	65.8	−2.42-−1.48	0.001
Age	>70 Years	−0.1	0.18	0.32	−0.45-0.25	0.569
Sex	Male	0.22	0.17	1.57	−0.12-0.57	0.209
Location	Upper	−0.34	0.268	1.63	−0.87-0.18	0.201
	Middle	−0.02	0.173	0.02	−0.36-0.31	0.884
	Lower	−0.18	0.168	1.165	−0.513-0.148	0.280
Lauren type	Diffuse	0.858	0.337	6.46	0.19-1.52	0.011
	Intestinal	0.39	0.146	3.21	0.106-0.68	0.001
	Mixed	0.72	0.33	4.59	0.061-1.37	0.032

CI: Confidence interval.

Table VII. *Multinominal log normal model for N stage.*

Parameter	Subgroup	Parameter estimate	Standard error	Wald	CI	*p*-Value
Intercept		−2.12	0.258	67.4	−2.632-−1.618	0.001
Age	>70 Years	0.184	0.18	1.04	−0.169-0.537	0.307
Sex	Male	0.26	0.161	2.668	−0.052-0.578	0.102
Location	Upper	0.26	0.203	1.64	−0.137-0.66	0.199
	Middle	−0.343	0.267	1.63	−0.868-0.182	0.201
	Lower	−0.038	0.15	0.063	−0.334-0.258	0.802
Lauren type	Diffuse	0.056	0.153	0.135	−0.242-0.35	0.712
	Intestinal	0.075	0.152	0.24	−0.22-0.37	0.619
	Mixed	0.008	0.10	0.006	−0.196-0.212	0.938

CI: Confidence interval.

likely to have lymph node metastasis [odds ratio (OR)=0.663, 95% CI=0.48-0.91, p=0.011], while older patients were more likely to have deeper tumor invasion ((T2 *vs.* T1: OR=1.74, 95% CI=1.34-2.26; p<0.001) (26). Alshehri *et al.* examined the influence of age on lymph node metastases of 2,005 patients with advanced gastric cancer. In their study, age was not relevant in univariate analysis and was not an independent prognostic factor for N stage in the logistic regression model (OR=1.035, 95% CI=0.854-1.255; p<0.726) (18). Similar to Alshieri *et al.* (18), we conclude age was not an influencing factor in regional lymph node metastasis. In our study, age was also not a prognostic factor influencing the depth of local tumor infiltration, regional lymph node metastasis, nor the presence of distant metastases according to the TNM classification in univariate and multivariate analyses.

Sex. Li *et al.* assessed the impact of sex on the TNM stage separately for White, Black, and Asian populations of patients with gastric cancer. In comparison with the White male population, they found White female patients more often had T1 (24.37 *vs.* 23.08%, p<0.01) and N0 (43.70 *vs.* 39.29%, p<0.01) stages, but less frequently had M1 stage (31.32 *vs.* 34.91%, p<0.01). A similar pattern was found for Black female patients compared with Black men (T1 stage: 26.86 *vs.* 24.37%, p<0.01; N0 stage: 43.70 *vs.* 41.64%, p<0.01; M1 stage: 31.32 *vs.* 34.64%, p<0.01), whereas in the Asian population, there were no significant differences in T1 (14.12 *vs.* 11.06%; p=0,137), N (22.67 *vs.*

Table VIII. *The logistic regression model for M stage.*

Parameter	Subgroup	OR	95% CI	β Regression coefficient	*p*-Value
Intercept				−2.8	0.001
Age	>70 Years	1.027	1.005-1.049	0.026	0.152
Sex	Male	0.954	0.465-1.958	−0.046	0.899
Location	Upper	0.25	0.091-0.682	−1.38	0.682
	Middle	0.337	0.179-0.637	−1.08	0.824
	Lower	0.573	0.330-0.974	−0.55	0.397
Lauren type	Diffuse	0.236	0.107-0.521	−1.44	0.275
	Intestinal	0.855	0.323-2.260	−0.155	0.753
	Mixed	0.298	0.150-0.560	−1.208	0.297

CI: Confidence interval; OR: odds ratio.

22.44%; p=0.532) and M stages (22.35 *vs*. 22.71%; p=0.492) by sex. For both White and Black patients, tumor staging according to the TNM classification was less advanced in female patients than in male. In Asian female patients, the TNM stage was similar to their male counterparts (27).

In our review of worldwide reports, we also found Asian studies about the association of sex with TNM stage in patients with gastric cancer. However, in the studies by Zhao *et al.* (22), and Zheng *et al.* (26), Asian female patients more commonly had regional lymph node metastasis compared with Asian men. In the meta-analysis carried out by Zhao *et al.*, 16 studies were pooled, and the authors came to the conclusion that female sex was strongly connected with lymph node metastasis in early gastric cancer (22). According to a study conducted by Zheng *et al.* of 1,550 Chinese patients with gastric cancer stage I, *muscularis propria* infiltration (T2 *vs.* T1) was not related to sex. However, lymph node metastasis was closely related to being female in univariate and multivariate (OR=1.59, 95% CI=1.14-2.23, p=0.007) analyses. They developed a hypothesis that sex hormones might play an important role in lymph node metastasis (26), but the pathogenic connection between sex and lymph node metastasis remains unknown.

Contrary to this, there are a few reports which show no relevant effect of sex on lymph node metastasis in patients with early gastric cancer (20, 21, 23, 28). In a cohort of patients with advanced gastric cancer, the study carried out by Alshehri *et al.* showed that sex was not an independent prognostic factor for N stage in the logistic regression model (OR=0.840, 95% CI=0.682-1.034; p<0.099) (18). The analysis carried out in our study showed that sex did not affect T, N, and M stages, as seen in the chi-squared test in univariate analysis, as well in the multinominal log normal model and in the logistic regression model in multivariate analyses.

Tumor location. In patients with gastric cancer in our study, similarly to age and sex, tumor location did not have an effect on T, N, and M stages in the TNM classification – neither in univariate or multivariate analyses. In over 5,000 patients with early gastric cancer, according to Zou *et al.*, tumor in the lower third of the stomach was an independent prognostic factor which correlated with lymph node metastasis (hazard ratio=2.659, 95% CI=1.196-5.911; p=0.016) (28); and in the meta-analysis conducted by Zhao *et al.*, tumor outside the middle part of the stomach was significantly associated with lymph node metastasis in such patients (22). However, the studies by Zheng e*t al.* (21), Kim *et al.* (23), Ashakawa *et al.* (24), and Lee *et al.* (25), performed in patients with early gastric cancer did not show any influence of tumor location in the stomach on the TNM N stage. Furthermore, as we also found, a study by Jun *et al.* in 338 patients with advanced gastric cancer showed the tumor location did not affect TNM staging of lymph node metastasis (p=0.124) (29).

Lauren type. In our study, in 910 patients with gastric cancer, histological type according to the Lauren classification had a crucial impact on the T stage. The patients with Lauren intestinal type disease (44.8% of cases), in comparison with those with the diffuse (43.2%) and mixed Lauren type (12%), presented lower T stage in the chi-squared test (p<0.001) and in the multinominal log normal model (p=0.001).

In a study by Lee *et al.*, the histological type according to the Lauren classification was not a prognostic factor affecting the N stage in patients with early gastric cancer (p=0.402) (25). However, most articles concerning gastric cancer reported lower TNM stages according in patients with the intestinal type than in those with Lauren diffuse and mixed types, which we confirmed with our findings for stage T (22, 26, 29-31). Yamashita *et al.* examined the influence of Lauren histology on the TNM classification in 232 patients with advanced gastric cancer. It is interesting that in their study, there was a relatively high rate of the diffuse type (68% *vs.* our rate of 43%). In univariate analysis, they found the diffuse type was significantly related to more advanced T (p=0.0002) and N (p=0.016) stages than the intestinal type. However, a multivariate logistic regression analysis demonstrated that only T stage was eventually an independent predictor for patients with Lauren diffuse type advanced gastric cancer (p=0.013) (30). Qiu *et al.* observed that the diffuse type was associated with a more advanced T stage (p<0.001), N stage (p<0.001) and more advanced total TNM stage (p=0.027). In 41.3% of patients with the intestinal type, there was no evidence of lymph node metastasis, while in patients with the diffuse type, the N0 rate was only 28.6% (31). In a study of a European cohort of 1,153 patients with gastric cancer by Schirren *et al., c*ompared to patients with the Lauren intestinal type, those with diffuse or mixed types had more advanced T (p<0.001) and N (p<0.001) stages and also a more advanced total TNM stage (p<0.001) (32).

Study limitations. This was a single-center retrospective study, however, the patient database contained 910 cases, making a large group of patients for statistical analysis.

In this study, only four clinicopathological features were included: age, sex, tumor location and Lauren type, which did influence T staging of gastric cancer, so the number of prognostic factors included for analysis could have been higher. However, such parameters were chosen for the analysis for which the data in the patient database was the most complete.

In the case of tumor location, when at diagnosis the gastric cancer was so advanced that it occupied two or more analyzed locations within the stomach upper/middle/lower, the location was classified as "other" since it was not possible to determine which location was primary. In order to properly assess the influence of the tumor location in the stomach on the TNM stage of gastric cancer in univariate and multivariate analyses, the location classified as "other" was excluded and this was the case for 183 patients.

The patient database is from the years 2007-2017, so it could be more up to date. However, for these years, analysis of the patients was carried out, and the study outcomes do include the 5-year survival rate.

Conclusion

In previous studies, we confirmed the key association of TNM stage with prognosis in patients with gastric cancer (5, 19). Therefore, here we examined the influence of the clinicopathological prognostic factors age, sex, tumor location and Lauren type on TNM stage in such patients. We found Lauren intestinal gastric cancer was an independent prognostic factor for lower T stage. Prognosis should be better for such patients because the depth of local tumor infiltration is less advanced in these cases. For clinicians, including surgeons, the diffuse and mixed types compared to the intestinal type defined by the Lauren classification require more radical methods of treatment.

Conflicts of Interest

The Authors declare that they have no conflicts of interest in relation to this study.

Authors' Contributions

Oliwia Majewska – study concept, statistical analysis, analysis of database results, review of articles for the Discussion, writing the article. Radosław Pach – analysis of database results, critical review. Paweł Brzewski – statistical analysis, analysis of database results. Jan Kulig – study concept, critical review. Piotr Kulig – study concept, collection and analysis of patient database, statistical analysis, analysis of database results, review of articles for the Discussion.

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