

Chronological Changes in the Clinical Features of Gastric Cancer

Chun-Hwan Lee, MD, Sun-Il Lee, MD, Keun-Won Ryu, MD,¹ and Young-Jae Mbk, MD.

Purpose: Although gastric carcinomas occur throughout the world and the incidence is on the decrease, they remain the most common type of carcinoma in Korea. Significant advancements in the diagnostics and surgical treatment have been achieved during the last three decades. The present retrospective study was undertaken to investigate the chronological changes in the clinical features, including the clinicopathological findings, operative treatment, and the prognosis, of gastric carcinomas.

Methods: A total of 1973 patients with a primary gastric adenocarcinoma who had been treated surgically during the period from 1983 to 1998 at the Department of Surgery, Korea University College of Medicine, were divided into two groups in order to evaluate the chronological changes: 1,007 patients had been treated during the period from 1983 to 1992 (early period) and 966 patients during the period from 1993 to 1998 (late period). The chronological changes in age, sex, ratio of early gastric cancer (EGC), and resectability were analyzed in all 1973 cases. For the 1755 resected cases, we also studied the chronological changes in the clinicopathological and treatment factors between the early-period (n=894) and the late-period (n=867) groups.

Results: There were significant differences between the two periods with regard to age and ratio of EGC: EGC was more frequent in the late period. Univariate analysis of the resected cases showed that the gross type, tumor size, depth of invasion, UICC stage, and histological type were statistically significant. The analysis of the treatment factors revealed that total gastrectomies and extended lymphadenectomies were more frequent during the late period. The number of lymph nodes dissected was 26.0 ± 12.7 in the

early period and 33.4 ± 14.1 in the late period ($P < 0.01$). The 5-year survival rate in all cases was 51.4% in the early period and 55.9% in the late period. The stage-related survival rates (UICC 4th Ed., 1987) in the early vs. the late periods were 92.9% vs. 95.5% in stage IA, 82.1% vs. 91.1% in stage IB, 76.5% vs. 73.1% in stage II, 46.5% vs. 52.1% in stage IIIA, 14.5% vs. 33.6% in stage IIIB, and 2.8% vs. 8.8% in stage IV. There was a statistically significant difference in survival between stage IIIB and IV.

Conclusion: These results suggest that the differences in the clinicopathological findings are related primarily to the increased number of early gastric cancer cases in the late period and that the improved survival noted during the late period for stage IIIB and IV cancers might be related to extended surgery. (*J Korean Surg Soc* 2002;63:298-304)

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Department of Surgery, Korea University College of Medicine and ¹Center for Gastric Cancer, National Cancer Center, Seoul, Korea

: 80
Ⓢ 152-703,
Tel: 02-818-6676, Fax: 02-837-0815
E-mail: yjmok@mail.korea.ac.kr
: 2002 7 22 , : 2002 7 22

20.9% 가
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(1,2)
가
가
가
가
(3)
90

1993
1993
1983 9 1998 12
1,973
1,755
2001 3 1
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741 , 895 337
82.9%
UICC 4 (4)
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(6) SAS
(SAS Institute Inc., Cary, N.C., USA)
Chi-square test student t-test
P < 0.05
Kaplan-Meier
Log-rank test P 0.05

1)
2.0 : 1
1973
19 87
53.9 ± 11.5 , 55.3 ± 12.0
가
(P=0.001)(Table 1).
2)
88.8%, 89.8%
가
19.8%, 27.5% , 80.2%,
72.5% 가
(Table 2).
3)

Table 1. Distribution of sex and age

Factors	Early period (%) (n=1,007)	Late period (%) (n=966)	P value
Sex			NS*
Female	344 (34.2%)	320 (33.1%)	
Male	663 (65.8%)	646 (66.9%)	
Age, years			<0.01
30	30 (3.0%)	22 (2.3%)	
31 40	107 (10.6%)	113 (11.7%)	
41 50	223 (22.1%)	165 (17.1%)	
51 60	325 (32.3%)	312 (32.3%)	
61 70	271 (26.9%)	260 (26.9%)	
71	51 (5.1%)	94 (9.7%)	

*NS = statistically not significant by Chi-Square test.

Table 2. Resectability and ratio of EGC

Factors	Early period (%) (n=1,007)	Late period (%) (n=966)	P value
Resectability			NS*
Resection	894 (88.8%)	867 (89.8%)	
Bypass	73 (7.2%)	60 (6.2%)	
Exploration	40 (4.0%)	39 (4.0%)	
EGC : AGC			<0.01
EGC	199 (19.8%)	266 (27.5%)	
AGC	808 (80.2%)	700 (72.5%)	

*NS = statistically not significant by Chi-Square test.

Table 3. Chronological analysis of clinicopathological factors by univariate method

Factors	Early period (%) (n=892)	Late period (%) (n=863)	P value
Location			NS*
Upper 1/3	74 (8.3%)	83 (9.6%)	
Mid 1/3	343 (38.4%)	297 (34.4%)	
Lower 1/3	468 (52.5%)	481 (55.8%)	
Entire	7 (0.8%)	2 (0.2%)	
Gross type			<0.01
EGC	198 (22.2%)	264 (30.6%)	
Borrmann I	19 (2.1%)	19 (2.2%)	
Borrmann II	166 (18.6%)	80 (9.3%)	
Borrmann III	412 (46.2%)	388 (45.0%)	
Borrmann IV	95 (10.7%)	103 (11.9%)	
Unclassified	2 (0.2%)	9 (1.0%)	
Tumor size			<0.01
< 4 cm	332 (37.2%)	387 (44.9%)	
4 - 8 cm	447 (50.1%)	387 (44.9%)	
> 8 cm	113 (12.7%)	89 (10.2%)	
Depth of invasion			<0.01
T1	198 (22.2%)	264 (30.6%)	
T2	230 (25.8%)	168 (19.5%)	
T3	379 (42.5%)	393 (45.5%)	
T4	85 (9.5%)	38 (4.4%)	
Lymph node metastasis			NS
N0	352 (39.5%)	362 (41.9%)	
N1	279 (31.3%)	247 (28.6%)	
N2	184 (20.6%)	211 (24.5%)	
as M1	77 (8.6%)	43 (5.0%)	
Distant metastasis			NS
M0	774 (86.8%)	743 (86.1%)	
M1	118 (13.2%)	120 (13.9%)	
Stage (UICC 4 th ed., 1987)			<0.01
IA	173 (19.4%)	232 (26.9%)	
IB	138 (15.4%)	94 (10.9%)	
II	147 (16.5%)	124 (14.4%)	
IIIA	164 (18.4%)	143 (16.5%)	
IIIB	129 (14.5%)	139 (16.1%)	
IV	141 (15.8%)	131 (15.2%)	
Histologic finding			<0.01
Well differentiated	59 (6.6%)	103 (11.9%)	
Moderately diff.	320 (35.9%)	349 (40.4%)	
Poorly differentiated	403 (45.2%)	276 (32.0%)	
Undifferentiated	1 (0.1%)	0 (0.0%)	
Signet ring	79 (8.8%)	116 (13.5%)	
Mucinous	30 (3.4%)	19 (2.2%)	

*NS = statistically not significant by Chi-Square test.

Table 4. Chronological analysis of op. method, curability, complication, and mortality

Factors	Early period (%) (n=894)	Late period (%) (n=867)	P value
Operative method			<0.01
Total gastrectomy	195 (21.8%)	268 (30.9%)	
Subtotal gastrectomy	684 (76.5%)	595 (68.6%)	
Proximal gastrectomy	13 (1.5%)	0 (0.0%)	
Partial resection	2 (0.2%)	4 (0.5%)	
Curability			NS*
Curative resection	746 (83.5%)	724 (83.5%)	
Noncurative resection	148 (16.5%)	143 (16.5%)	
Complication			NS
No	820 (91.7%)	786 (90.7%)	
Yes	74 (8.3%)	81 (9.3%)	
Operative mortality	6 (0.7%)	10 (1.2%)	NS

*NS = statistically not significant by Chi-Square test.

Table 5. Chronological analysis of degree of lymph node dissection and metastasis

Factors	Early period (%) (n=892)	Late period (%) (n=863)	P value
Degree of LN dissection			<0.01
D0	2 (0.2%)	0 (0.0%)	
D1	168 (18.8%)	116 (13.4%)	
D1.5	17 (1.9%)	168 (19.5%)	
D2.0	703 (78.9%)	486 (56.3%)	
D2.5	0 (0.0%)	89 (10.3%)	
D3.0	2 (0.2%)	2 (0.2%)	
D3.5	0 (0.0%)	2 (0.2%)	
No. of lymph node dissected			<0.01
Mean	26.0 ± 12.7	33.4 ± 14.1	
(Range)	(2 - 90)	(3 - 104)	
No. of LN metastasis			NS*
0	352 (39.5%)	362 (41.9%)	
1 - 6	269 (30.2%)	262 (30.4%)	
7 - 15	160 (17.9%)	154 (17.8%)	
16	111 (12.4%)	85 (9.9%)	

*NS = statistically not significant by Chi-Square test.

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(Table 3).

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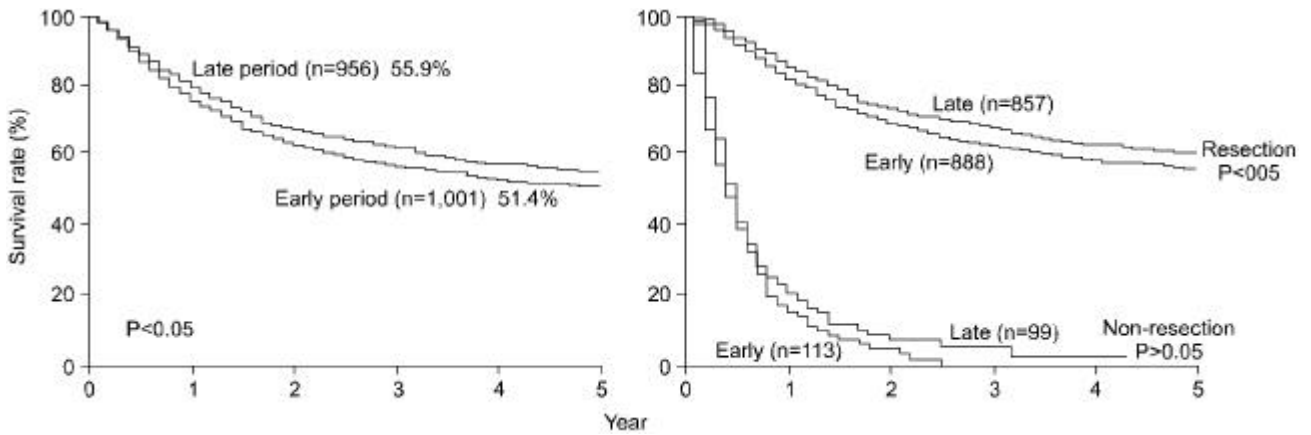


Fig. 1. Survival curves for patients with primary gastric cancer treated surgically.

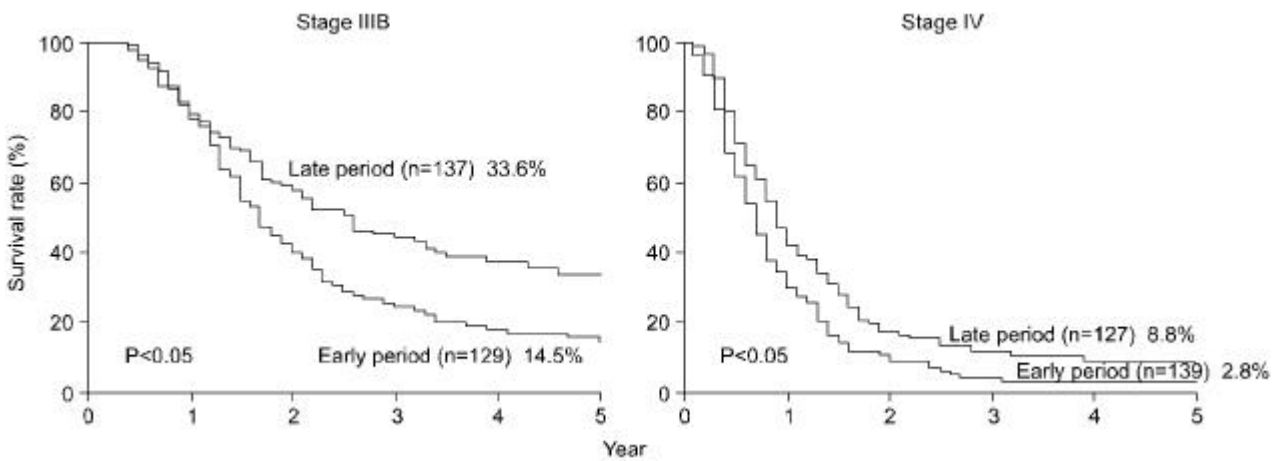


Fig. 2 Comparison of survival curves between early and late period for stage IIIB and IV.

(P < 0.01).
 83.5%, 83.5%
 8.3%, 9.3%
 0.7%, 1.2%
 가
 (Table 4).
 5)
 가
 D1.5 (P < 0.01).
 104 26.0 ± 12.7, 33.4 ± 14.1
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 1 6 , 7 15 16
 가 (Table 5).
 6)
 1,973 16 1,957 5
 51.4%, 55.9%
 가
 57.0%, 61.7% 1,745 5
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Table 6. 5-year survival rate for primary gastric cancer resected by UICC TNM (4th Ed.) stage

UICC stage	Early period (n=886)	Late period (n=853)	P value
IA	92.9%	95.5%	NS*
IB	82.1%	91.1%	NS
II	76.5%	73.1%	NS
IIIA	46.5%	52.1%	NS
IIIB	14.5%	33.6%	<0.01
IV	2.8%	8.8%	<0.01

*NS = statistically not significant by Log-Rank test.

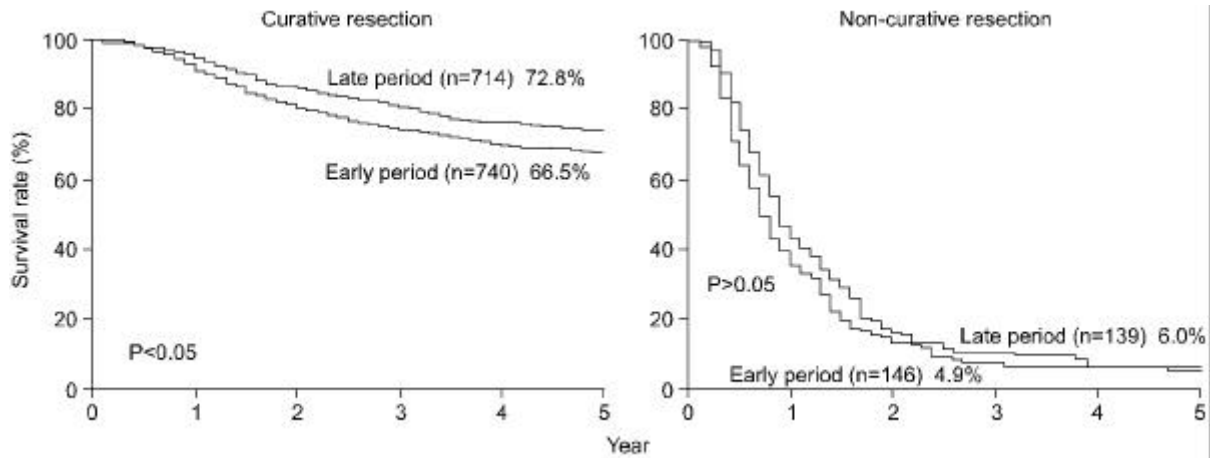


Fig. 3. Comparison of survival curves for curative and non-curative resected cases.

212 2.5 0%, 4.3
 2.9% (Fig. 1).
 Table 6
 III B IV 가 III B
 5 14.5%, 33.6%, IV T4 가
 2.8%, 8.8% (Table 6, Fig. 2).
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 가 66.5%, 72.8% 4.9%, (17,27,28)
 6.0% 가 (Fig. 3). 가 (7,14-18)
 가 (7,13) 가, Borrmann IV 가 (29,30)
 가 (7,14-17)
 2.0 : 1
 53.9 55.3 가 (18)
 50 가 가 UICC TNM IA 가
 32.0% 36.6% 가
 (9, 10, 17-19)
 60 1960 20.6%, 1970 26.0 30.1%
 가 (20-22) III B IV 가
 가 55.2 66.4 , 60 50%
 (8,23-26) 가

(11-13)

가
가

가

1983 9 1998 12
1,973 (1992

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가

IIIB

IV

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REFERENCES

- 1) Boring CC, Squires TS, Tong T, Montgomery S. Cancer statistics, 1994. CA. Cancer J Clin 1994;44:7-26.
- 2) Annual report of the central cancer registry in Korea (1999. 1. 1 1999. 12. 31). Central cancer registry center in Korea, Ministry of Health and Welfare, Republic of Korea. 2000.
- 3) Ryu KW, Mok YJ, Kim SJ, Kim JS. Prognosis for patients with early gastric cancer-Comparison of D1 vs D2 lymphadenectomy. J Korean Surg Soc 2000;59:596-601.
- 4) Hermanek P, Sobin LH. UICC TNM classification of malignant tumors. 4th ed. 2nd revision. Berlin: Springer, 1992.
- 5) Watanabe H, Jass JR, Sobin LH. Histological typing of oesophageal and gastric tumors. 2nd ed. Heidelberg: Springer-Verlag, 1990.
- 6) Japanese Research Society for Gastric Cancer. Japanese classification of gastric carcinoma. 1st English ed. Tokyo: Kanehara, 1995.
- 7) Mok YJ. Treatment strategy for early gastric cancer. Korean J Gastroenterology 1998;32:45-54.
- 8) Otsuji E, Yamaguchi T, Sawai K, Hagiwara A, Taniguchi H, Takahashi T. Recent advances in surgical treatment have improved the survival of patients with gastric carcinoma. Cancer 1998;82:1233-7.
- 9) Chung CH, Mok YJ, Son GS, Kim SJ, Kim SJ. Results of surgical treatment and analysis of prognostic factors in primary gastric adenocarcinoma. J Korean Cancer Association 1999; 31:458-65.
- 10) Park JH, Kim DG, Jung SS, Yoo SJ, Lee MD, Kim SK, et al. Clinical analysis of gastric adenocarcinoma experienced during recent 10 years and follow up results. J Korean Surg Soc 1992;42:787-98.
- 11) Yi SH, Kim HC, Lee SH, Park HC, Yoon C, Joo HJ, et al. Multivariate analysis of prognostic factors in gastric cancer. J Korean Surg Soc 1999;56:75-83.
- 12) Miwa K, Miyazaki H, Sahara H, Fujimura T, Yonemura Y, Noguchi M, Falla R. Rationale for extensive lymphadenectomy in early gastric carcinoma. Br J Cancer 1995;72:15 18-24.
- 13) Seto Y, Nagawa H, Muto T. Impact of lymph node metastasis on survival with early gastric cancer. World J Surg 1997;21: 186-9.
- 14) Hur YS, Yang HK, Kim JP. Factors analysis associated with lymph node metastasis in 1301 early gastric cancers. J Korean Surg Soc 1995;49:68-76.
- 15) Itoh H, Oohata Y, Nakamura L, Magata T, Mibu R, Nakayama F. Complete ten-year postgastroectomy follow-up of early gastric cancer. Am J Surg 1989;158:14-6.
- 16) Oleagoitia JM, Echevarria A, Santidrian JI, Ulaia MA, Hernandez-Calvo J. Early gastric cancer. Br J Surg 1986;73: 804-6.
- 17) Choi MG, Lee JH, Park KJ, Yang HK, Park JG, Lee KU, et al. Chronological changes clinicopathologic features in gastric cancer. J Korean Surg Soc 1999;57:5 14-22.
- 18) Lee JS, Cho WI, Yoo SJ, Kim EK, Chang SK, Kim SN, et al. Serial clinical analysis and survival rate of 900 patients treated for malignant gastric tumor. J Korean Surg Soc 1993; 45:792-802.
- 19) Noh SH, Yoo CH, Kim YI, Kim CB, Min JS, Lee KS. Results after a gastrectomy of 2,603 patients with gastric cancer: analysis of survival rate and prognostic factor. J Korean Surg Soc 1998;55:206-13.
- 20) Lee KU, Kim JP. Clinical analysis of the gastric cancer. J Korean Surg Soc 1973;15:13-21.
- 21) Lee TS, Park HC, Joo HZ. A clinical study of gastric cancer. J Korean Surg Soc 1987;32:528-36.
- 22) Kim WG, Choi YM. Clinical review of gastric cancer. J Korean Surg Soc 1986;31:694-703.
- 23) Kitamura K, Yamaguchi T, Sawai K, Nishida S, Yamamoto K, Okamoto K, et al. Chronologic changes in the clinicopathologic findings and survival of gastric cancer patients. J Clin Oncol 1997;15:3471-80.
- 24) Yamazaki H, Oshima A, Murakami R, Endoh S, Ubukata T. A long term follow-up study of patients with gastric cancer detected by mass screening. Cancer 1989;63:613-7.
- 25) Ikeda Y, Mori M, Kamakura T, Haraguchi Y, Saku M, Sugimachi K. Improvements in diagnosis have changed the incidence of histological types in advanced gastric cancer. Br J Cancer 1995;72:424-6.
- 26) Nakamura K, Ueyama T, Yao T, Xuan ZX, Ambe K, Adachi Y, et al. Pathology and prognosis of gastric carcinoma. Findings in 10,000 patients who underwent primary gastrectomy. Cancer 1992;70:1030-7.
- 27) Cheun CS, Kang YJ, Park JS. Clinical study of early gastric

- cancer. *J Korean Surg Soc* 1994;46:353-9.
- 28) Jang AS, Oh SK. A clinical characteristics of the gastric carcinoma according to histologic type. *J Korean Surg Soc* 1993; 45:645-53.
- 29) Msika S, Tazi MA, Benhamiche AM, Couillault C, Harb M, Faivre J. Population-based study of diagnosis, treatment and prognosis of gastric cancer. *Br J Surg* 1997;84:1474-8.
- 30) Koong HN, Chan HS, Nambiar R, Soo KC, Ho J, Ng HS, et al. Gastric cancers in Singapore: poor prognosis arising from late presentation. *Aust N Z J Surg* 1996;66:813-5.
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