

Clinical and Pathological Features of Gastric Carcinoma in the Young

Yuzo UCHIDA¹⁾, Kazuhide TOMONARI¹⁾, Takeshi FURUSAWA²⁾,
Yutaka FUJITOMI²⁾ and Kozo MATSUMOTO²⁾

1) *The Second Department of Surgery, Medical College of Oita, Oita, Japan*

2) *The Furusawa-Hospital for Gastrointestinal Disease, Oita, Japan*

Received for publication, December 14, 1987

KEY WORDS : gastric carcinoma, young adults

ABSTRACT : Twenty-two cases, or 23 lesions, of the so-called "gastric cancer in the young" under the age of 30 years were studied, in comparison with the adult cases in the fifties and the elderly cases over 70 years, and their unique clinico-pathological features were described.

The early symptoms of gastric carcinoma in the young patients are similar to those of peptic ulcer, and often diagnosed as gastric ulcer at first and treated as ulcer patients, but peptic ulcer was found in only 9.1%. All cases in this study had gastrectomy. Twelve of 23 lesions were early gastric carcinoma of superficial depressed type. All other advanced cancer belonged to the infiltrative type, and there was no localized type. Of these 23 lesions, 70% located in the middle third region of the stomach. Histologically, 87.0% were poorly differentiated adenocarcinoma. Involvement of the serosa of gastric wall was found in only 36.4%, and lymph node metastasis was negative in 54.5%. Eighteen of 22 patients are still alive at this moment, and 13 of them (59.1%) survived longer than five years after surgery, and are well without any sign of recurrence.

Prognosis of gastric cancer in young patients was regarded as poor owing to its biological specificity, but actually it could be as good as in other age groups, if the diagnosis was made early enough and lesions were removed properly. For that purpose, needed are repeated endoscopic and biopsy examinations as often as possible in all cases of gastric ulcer of the young.

INTRODUCTION

Gastric carcinoma in young patients was reported at first by DITTRICH¹⁾ in 1848. In Japan, it was reported first time in 1894 by TAKIGUCHI²⁾. Majority of cases reported in early days were advanced inoperable cases, but in recent years there were found many operable cases in the early stage of the disease.

In the past 16 years, 22 young patients with gastric carcinoma visited our clinic, and all had

gastrectomy without exception. In 11 of these 22 cases, their gastric carcinoma was in the early stage.

In this article, clinicopathological features of the 22 operated cases will be presented for discussion.

MATERIALS AND METHOD

In the 16 years from June 1970 to May 1986, 941 cases of gastric cancer were admitted to the Furusawa-Hospital, and 762 cases (80.9%)

derwent gastrectomy.

Twenty-two (2.9%) of 762 gastrectomy cases were young patients under the age of thirty, and 11 (4.7%) of 233 cases of early gastric cancer were young patients. Therefore, 11 of 22 young gastric cancer patients, or 50%, were in the early stage of gastric cancer. The stage of multiple gastric cancer was evaluated by the progress and pathological finding of the lesion of maximal invasion.

The age of 762 gastrectomy cases, 531 males and 231 females, ranged from 21 to 85 years, 57.8 years on the average. Male cases dominated female cases in all age groups, but male and female difference was much less in the age groups under 40 and over 70 than in other age groups (Table 1).

Table 1 Age-distribution of patients with gastric carcinoma

Age group (yr)	No. of cases (%)	Male	Female	Male to female ratio
~29	22 (2.9)	13	9	1.4
30~39	47 (6.2)	27	20	1.4
40~49	136 (17.8)	98	38	2.6
50~59	191 (25.1)	142	49	2.9
60~69	211 (27.7)	152	59	2.9
70~	155 (20.3)	98	59	1.7
Total	762 (100.0)	530	232	2.3

Pathological evaluation in this study followed the "General Rules for the Gastric Cancer Study"³⁾, and the unique features of young cases were compared with the adult cases of age 50 to 59 and the elderly cases of over 70 years of age.

RESULTS

1. Interval between the initial symptom and hospitalization

Initial symptoms of 22 young gastric carcinoma patients were epigastralgia in 19 (86.4%), indigestion in six (27.3%), and hemorrhagic vomiting or occult blood in stools in six (27.3%), presenting typical symptoms of peptic ulcer. No pregnancy was involved in these cases. Six cases visited this hospital directly within three months after the first symptom. Three cases tried treatment at home before they came to the hospital

two to five months after the first symptom. Thirteen other cases were treated in other hospitals more than six months and then came to this hospital, and nine of them were diagnosed as gastric ulcer and the rest as gastritis, but carcinoma of the stomach was confirmed within a month by radiographic, endoscopic and biopsy examinations.

2. Association of peptic ulcer

Of 22 young gastric carcinoma cases, two early stage cases (9.1%) were associated with gastric ulcer, but none of the cases had duodenal ulcer. The incidence of peptic ulcer in the young is slightly higher than 4.5% in the elderly group of over 70 years, although the difference is not so significant as 6.3% in the fifties. In spite of the low incidence of gastric ulcer outside the cancerous lesion, ulcer or ulcer-scar was found inside the lesion of carcinoma in 11 of 12 cases (91.7%).

3. Multiple gastric cancer

There were found 791 lesions of carcinoma in the 762 resected stomachs. Thus multiple gastric carcinoma was found in 26 (male 19 and female seven) of 762 cases. Two cases had three or more lesions. The main lesion of multiple gastric carcinoma was advanced carcinoma in 12 cases, and early stage carcinoma in 14 cases. In all 26 cases secondary lesions were in the early stage of cancer. Among 22 young patients, only one female case of age 28 had two early cancer lesions. There was no other multiple case among the young patients.

4. Location of gastric carcinoma

The stomach can be divided into three regions to classify the location of gastric cancer³⁾; the upper third (C), middle third (M) and lower third (A).

One hundred and fourteen of 791 carcinoma lesions (14.4%) were located in C-region, 345 (43.6%) in M-region, and 298 (37.7%) in A-region. Other 34 lesions (4.3%) involved three regions diffusely (Table 2). Table 3 shows distribution of lesions in the different age groups. In the 22 young cases of gastric carcinoma, 16 of 23 lesions (70.0%) were in M-region, and only three (13.0%) located in A-region. No lesion involved three regions diffusely. The older the age of patients, the higher the number of lesions located in A-region.

Table 2 Location of gastric carcinoma (791 lesions)

No. of lesions (%)

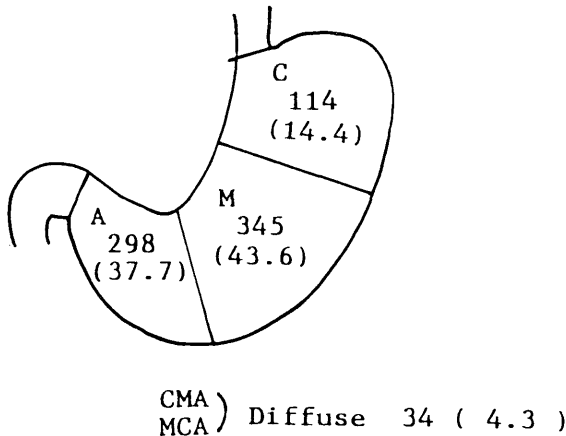


Table 3 Location and age-distribution of gastric carcinoma No. of lesions (%)

Location	Age group (yr)		
	~29	50~59	70~
C	4	30	23
M	16 (70.0)	86 (43.4)	52 (32.7)
A	3	72 (36.4)	75 (47.2)
Diffuse	0	10	9
Total	23 (100.0)	198 (100.0)	159 (100.0)

Table 4 Macroscopic classification of gastric carcinoma

No. of lesions (%)

Age group (yr)	Superficial type	Invading Type			Unclassified type	Total
		Localized	Infiltrative	Diffuse inf.		
~29	12 (52.2)	0	4 (17.4)	3 (13.6)	4 (17.4)	23 (100.0)
50~59	66 (33.3)	31 (15.7)	55 (27.8)	21 (10.6)	25 (12.6)	198 (100.0)
70~	43 (27.0)	46 (28.9)	50 (31.4)	8 (5.0)	12 (7.5)	159 (100.0)

5. Macroscopic classification of gastric carcinoma

Twelve of 23 gastric carcinoma of the young patients (52.7%) belonged to the superficial type in macroscopic classification, and they presented the superficial depressed type³⁾ of the size from 0.9 x 0.8 to 5.4 x 4.7 cm. Four of the other 11 cases showed the infiltrative type (Borrmann's type 3) and three diffuse infiltrative type (Borrmann's type 4), and four other unclassified type (early cancer-like advanced cancer)³⁾. The incidence of the superficial type was lower in the group older than 70 years as compared with the young group, but the incidence of advanced cancer of Borrmann's type 1 and 2 was higher in the elderly group and none in the young group (Table 4).

6. Histologic classification

Gastric carcinoma in this study was classified histologically into the following types; Group A (papillary adenocarcinoma, well differentiated tubular adenocarcinoma), Group B (moderately differentiated tubular adenocarcinoma), Group C (poorly differentiated adenocarcinoma, signet-ring cell carcinoma), Group D (mucinous adenocarcinoma) and Group E (specific type)³⁾.

Twenty of 23 young cases of gastric carcinoma (87.0%) belonged to Group C. No one belonged to Group A. In the group over 70 years, however, many belonged to Group A and few belonged to Group C. In the age group of fifties, there was found no significant difference among the incidence of Group A, B and C (Table 5).

7. Depth of carcinoma invasion in the gastric wall

In 11 of 22 cases (50.0%) of young patients, carcinoma invasion was limited to the mucosal or submucosal layer (m, sm), but only 30.9%

in the fifties and 25.2% in the age group over 70 years. The early gastric cancer is less likely to be found in the older patients. Prognostic serosa-invasion positive cases³⁾ (ps(+)) were found in 36.4% of the young cases, in 45.5% of

Table 5 Histologic classification of gastric carcinoma
No. of lesions (%)

Age group (yr)	Histologic classification					Total
	A	B	C	D	E	
~29	0	2	20 (87.0)	1	0	23 (100.0)
50~59	59 (29.8)	53 (26.8)	78 (39.4)	3	5	198 (100.0)
70~	72 (45.3)	42 (26.4)	38 (23.9)	2	5	159 (100.0)

A : Papillary adenocarcinoma, Well differentiated tubular adenocarcinoma

B : Moderately differentiated tubular adenocarcinoma

C : Poorly differentiated adenocarcinoma, Signet-ring cell carcinoma

D : Mucinous adenocarcinoma

E : Specific type

Table 6 Depth of carcinoma invasion in the stomach wall
No. of cases (%)

Age group (yr)	Depth of ca. invasion			Total
	m ~ sm	pm ~ ss (α , β)	ps (+)	
~29	11 (50.0)	3 (13.6)	8 (36.4)	22 (100.0)
50~59	59 (30.9)	45 (23.6)	87 (45.5)	191 (100.0)
70~	39 (25.2)	41 (26.4)	75 (48.4)	155 (100.0)

m : mucosa, sm : submucosa, pm : propria muscle,

ss : subserosa, ps(+): prognostic serosa-invasion positive (ss γ , se, si, sei)

α : INF- α , β : INF- β ,

the fifties, and 48.4% of the over seventy group, indicating slight increase in the advanced ages (Table 6).

8. Lymph node metastasis

No lymph node metastasis (n_0) was found in 12 cases (54.5%) of the young gastric cancer patients. Metastasis to the perigastric lymph nodes (n_1) was found in four cases, to the lymph nodes at the base of the left gastric artery and around the common hepatic artery (n_2) in three cases, and to the periaortic lymph nodes (n_3) in three other cases.

9. Peritoneal dissemination

Peritoneal dissemination was found in two of 22 cases (9.1%) of the young gastric cancer patients. Both cases had advanced cancer invading into the serosa, macroscopically belonging to the diffuse infiltrative type and histologically to the poorly differentiated adenocarcinoma.

10. Liver metastasis

No metastasis to the liver was found in any of 22 young cases.

11. Operative procedures

The operative procedures applied to 22 young cases of gastric cancer were; distal gastrectomy 18, proximal gastrectomy one, and total gastrectomy three. Curative resection³⁾ was performed in 19 cases (86.4%), and noncurative resection³⁾ in the rest, owing to peritoneal dissemination and lymphatic metastasis.

12. Postoperative course

None of 22 young patients died within 30 days after gastrectomy. Later died four patients, but the rest, 18 patients, are still alive, and 13 of them survived longer than years revealing no sign of recurrence (5-year survival rate : 59.1%).

Four cases of death included two male and two female cases. All had poorly differentiated adenocarcinoma in histological examination with invasion into the serosa of the gastric wall (Table 7). One case, 22-year-old female, had curative resection, but died of peritoneal metastasis two years and nine months after the surgery. The other three cases had non-curative resection and died within one and a half year after the surgery.

Table 7 Young patients with gastric carcinoma died after surgery

Age (yr) /Sex	Cases	Histologic classification	Operative findings				Resection	Curability	Survival time	Causes of death
			H	P	S	n				
1) 22 /F.		por	o	o	se	n ₂	Distal	curative	2y. 9mo.	P. dissemi.
2) 25 /M.		por	o	o	se	n ₄	Total	non-cur.	1y. 5mo.	P. dissemi.
3) 27 /F.		por	o	+	se	n ₃	Total	non-cur.	9mo.	P. dissemi.
4) 26 /M.		por	o	+	se	n ₄	Total	non-cur.	2mo.	Suicide

por : poorly differentiated adenocarcinoma, P. dissemi. : Peritoneal dissemination

DISCUSSION

Gastric carcinoma is found often in the fifties and sixties of age, and it is rare among young people. Definition of "the young" varies in reporters, meaning under 45⁴⁾, 40^{5,6)}, 35⁷⁻¹⁰⁾, or 30 years.¹¹⁻¹³⁾ In most of the reports by Japanese authors, "the young gastric cancer patients" belong to the age group under 30 years,¹⁴⁻¹⁹⁾ excluding the patients younger than 15 years of age as "gastric cancer in the child"²⁰⁾. In our study, also, "gastric carcinoma in the young" dealt with the cases under age 30, and their clinicopathological features were evaluated in comparison with "gastric carcinoma in the adult" of the fifties and "gastric carcinoma in the elderly" of the group over 70 years of age.

Incidence of gastric carcinoma in the young people varies from 1 to 2% in the Western literature,^{11,21-23)} 1.3 % in the latest statistics.^{11,13)} In Japan it was reported as 1.5% or 2.4%.^{14,17,18,24,25)} According to the Registration of Gastric Cancer in Japan, Report No. 16, it is 1.9%. The result of our study, 2.9% is not far from the reports in the past.

Sex ratio : The sex ratio of gastric carcinoma patients in different countries shows a similar pattern. The ratio of male patients is twice of female patients except in the young group in which the sex ratio is equal in most reports.^{21,22,24)} In some papers, more male than female cases were reported, but it often reflects inclusion of patients older than 30 years.¹³⁾ Over-all registration in Japan²⁵⁾ shows a lower ratio of young male to female, 1 : 1.25, but in our study the ratio is reversed to 1.4 : 1, although male ratio is much lower than 2.9 : 1 in the

fifties and sixties.

Symptoms and diagnosis : Initial symptoms of gastric carcinoma in the young are similar to the signs of peptic ulcer so that gastric ulcer is suspected at first and treated for some time before final diagnosis.^{12,13,17,22,26)} Thirteen of our 22 cases (59.1%) were treated for gastric ulcer in other hospitals. Therefore, endoscopic examination and biopsy must be repeated for the young patients of gastric ulcer.

Pathological findings : Some reported^{12,23)} that gastric carcinoma is located in the distal stomach in 80% of cases regardless the age of the patient. However, BEDKIAN *et al*¹¹⁾ reported that gastric carcinoma often involves the proximal stomach diffusely in the young patients, as did MATSUSAKA *et al*²⁴⁾ similar findings. They presumed mucosal metaplasia as a reason. In the recent reports in Japan, many found gastric carcinoma of the young in the middle or body portion of the stomach. In our cases also, 78.3% of lesions were located in the middle third of the stomach.

a) Macroscopic classification : Predominant type of early gastric carcinoma of the young was the superficial depressed type in the literature.^{16,19)} In our cases, 12 of 23 (53.2%) young gastric carcinoma belonged to the superficial type, and all of them belonged to the superficial depressed type. In the literature,^{6,8,11,17,18,24)} most of advanced gastric cancer belonged to the infiltrative type, and we found no case of the localized type.

b) Histological classification : Gastric carcinoma of the young belonged to the poorly differentiated adenocarcinoma in most cases according to many authors, and we found also poorly differentiated adenocarcinoma in 87.1% of our

young cases. In the literature,^{14,15,23)} many reported gastric carcinoma of the young involved the serosa in most cases and were often associated with lymph node metastasis, suspecting their histologic type as the cause. In our cases, however, 50% of carcinoma invasion was found in the mucosal or submucosal layers, and only 36.4% involved the serosa, although 87.0% of our cases had poorly differentiated adenocarcinoma. No lymph node metastasis was found in 54.5% of our cases. Therefore, the high incidence of carcinoma invasion into the serosa or lymphatic metastasis is not due to the biological specificity of gastric cancer of the young, but to the delayed timing of discovery and resection of the lesions.

Prognosis: Prognosis of gastric cancer in the young patients was pessimistic in most reports^{10,17)} in the past, but 13 of our 22 young cases (59.1%) survived more than five years, and other five patients are well and active up to date. In conclusion, it is obvious that early diagnosis and resection in the early stage will guarantee good prognosis even in the young patients of gastric cancer. Furthermore, prognosis of gastric cancer in the young would be better than in the older patients, because there are less complication of heart or liver diseases, diabetes mellitus and others than in the older patients so that they can tolerate extensive surgical maneuvers and aggressive adjuvant chemotherapy much better than the old.

ACKNOWLEDGEMENT

We wish to thank Professor J. SHIRABE, Vice-President of Medical College of Oita for his kind advice in this study.

REFERENCES

- 1) DITTRICH, F.: Die krebsige Erkrankung des Magens, vom pathol. anatomischen Standpunkte aus geschildert, *Prag. Vjschr. prakt. Heilk.*, 1: 1-29, 1848. (by MIZUGAMI, T.)
- 2) TAKIGUCHI, K.: Gastric carcinoma in a 25-yr-old man. *Tokyo-Ijishinshi*, 871: 13-17, 1894. (in Japanese)
- 3) JAPANESE RESEARCH SOCIETY FOR GASTRIC CANCER: The general rules for the gastric cancer study(11th Edition). Kanehara, Tokyo, 1985.
- 4) LEVINE, M. S., LAUFER, I. and THOMPSON, J. J.: Carcinoma of the gastric cardia in young people. *Am. J. Roentgenol.*, 140: 69-72, 1983.
- 5) GRABIEC, J. and OWEN, D. A.: Carcinoma of the stomach in young persons. *Cancer*, 56: 388-396, 1985.
- 6) RADI, M. J., FENOGLIO-PREISER, C. M., BARTOW, S. A. and KEY, C. R.: Gastric carcinoma in the young: A clinicopathological and immunohistochemical study. *Am. J. Gastroenterology*, 81: 747-756, 1986.
- 7) BLOSS, R. S., MILLER, T. A. and COPELAND III, E. M.: Carcinoma of the stomach in the young adult. *Surgery, Gynecology and Obstetrics*, 150: 883-886, 1980.
- 8) IKOSI-O'CONNOR, M. G. and DOUGLASS, H. O.: Gastric cancer in young patients. *Journal of Surgical Oncology*, 26: 219-224, 1984.
- 9) DOBKIN, J. A. and SCHUBERT, T. T.: Gastric cancer in a young adult. *Am. J. Gastroenterol.*, 81: 607-610, 1986.
- 10) TSO, P. L., BRINGAZZ, W. L., DAUTERIVE, A. L., CORREA, P. and COHN, I.: Gastric carcinoma in the young. *Cancer*, 59: 1362-1365, 1987.
- 11) BEDKIAN, A., KHANKHANLAN, N., HELBRUN, L., BODEY, G. P., STROEHLEIN, J. R. and VALDIVIESO, M.: Gastric carcinoma in young adults. *Southern Medical Journal*, 72: 654-656, 1979.
- 12) HANSEN, R. M. and HANSON, G. A.: Gastric carcinoma in young people. A case report and review of the literature. *Am. J. Gastroenterol.*, 74: 497-503, 1980.
- 13) SCHWARTZ, M. G. and SGAGLIONE, N. A.: Gastric carcinoma in the young: Overview of the literature. *The Mount Sinai Journal of Medicine*, 51: 720-723, 1984.
- 14) FURUSAWA, M., SOEJIMA, K., HIYAMA, T., TOMODA, H., WAKITA, M., KAIBARA, N. and WAKASUGI, K.: Cancer of the upper gastrointestinal tract in the young adult; Gastric cancer. *Stomach and Intestine*, 7: 866-879, 1972. (Abstract in English)
- 15) HISHIOKA, B., FUJITA, Y., TOKUDA, H., ITSUJI, I., YASUKAWA, M., MATSUMOTO, S., HARADA, M., NAKAJIMA, T. and NANRI, K.: Study on gastric cancer in young adults. *Japanese Journal of Cancer Clinics*, 24: 1045-1049, 1978. (Abstract in English)
- 16) KOTANAGI, H., YAMAGUCHI, T., KOHNO, K. and TAKAHASHI, T.: Comparative study of early gastric cancer in the young and in the aged. *Japanese Journal of Cancer Clinics*, 26: 1239-

- 1243, 1980. (Abstract in English)
- 17) UMEYAMA, K., SOWA, M., KAMINO, K., KATO, Y. and SATAKE, K. : Gastric carcinoma in young adults in Japan. *Anticancer Research*, **2** : 283-286, 1982.
- 18) NAKATSU, M., LIU, S., SHIOZAKI, T., DAIBO, M., HABA, T., TAKIZAWA, N., KUMAGAI, K., MAEKAWA, K., GONDA, H., URABE, M., HAYASHIDA, Y., SAWADA, Y., TAKEZOE, K. and KIDOKORO, T. : Gastric cancer in the young; A study of 28 resected cases. *Progress of Digestive Endoscopy*, **24** : 101-104, 1984. (Abstract in English)
- 19) NAOMOTO, Y., OKANOBU, K., KOBAYASHI, G., GOHCHI, A., OHNISHI, T., OHNISHI, N., YAMAGIWA, H., YOSHIMURA, T. and TOMIYAMA, H. : Clinical and pathological study on 9 cases of juvenile gastric cancer. *Journal of Japanese Society for Clinical Surgery*, **46** : 1618-1623, 1985. (Abstract in English)
- 20) GOTO, S., IKEDA, K., NAKAGAWA, A., MIYAZAKI, S., ISHII, E., FUJIOKA, K., IWASHITA, A., SHIMIZU, S., and WATANABE, K. : Carcinoma of the stomach in childhood. — A case report of a 7-year and 5-month-old boy and a literal review—. *Journal of the Japanese Society of Pediatric Surgeons*, **18** : 1159-1169, 1982. (Abstract in English)
- 21) MC NEER, G. : Cancer of the stomach in the young. *Am. J. Roentgenol.*, **45** : 537-550, 1941.
- 22) BELLEGIE, N. and DAHLIN, D. : Malignant disease of the stomach in young adults. *Ann. Surg.*, **138** : 7-12, 1953.
- 23) TAMURA, P. Y., CUTIS, C. : Carcinoma of the stomach in the young adult. *Cancer*, **13** : 379-385, 1960.
- 24) MATSUSAKA, T., SOEJIMA, K., KODAMA, Y., SAITO, T. and INOKUCHI, K. : Carcinomas of the stomach in the young adults. *Jpn. J. Surg.*, **6** : 170-177, 1976.
- 25) JAPANESE RESEARCH SOCIETY FOR GASTRIC CANCER : Registration of gastric cancer in Japan, No. 16. National Cancer Institute, Tokyo, 1984.
- 26) KLEIN, E. and WILLIAM, S. : Carcinoma of the stomach in young adults. *Am. J. Gastroenterol.* **38** : 69-74, 1962.