



Comparison of Quality of Life and Nutritional Status in Gastric Cancer Patients Undergoing Gastrectomies

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The aim of this study was to compare the quality of life (QoL) depending on the postoperative survival period or nutritional status in gastric cancer patients. Surviving gastric cancer patients ($n = 222$) after the gastrectomy were included in the study at Soonchunhyang University Bucheon Hospital from April 2010 to August 2012. The Korean versions of the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire Core 30 (QLQ-C30) and a gastric cancer-specific module, the EORTC QLQ-STO22, were used to assess the QoL. The postoperative survival period of the patients fell into two groups; the less-than-1-year group or the more-than-1-year group, and the nutritional status of the patients fell into three groups by a score of patient generated-subjective global assessment (SGA)-A, B, and C. As a result, the rate of malnutrition was 34.5% in the less-than-1-year group and 19.8% in the more-than-1-year group, respectively. Score for the fatigue ($p = 0.006$), loss of appetite ($p = 0.002$), reflux ($p = 0.027$) and body image ($p = 0.004$) in which the QoL was significantly lower in the less-than-1-year group than in the more-than-1-year group. The score of QoL according to the nutritional status of all subjects, overall health status ($p = 0.043$), physical functioning ($p = 0.016$), fatigue ($p = 0.006$), pain ($p = 0.028$), loss of appetite ($p = 0.017$), reflux ($p = 0.003$), eating restriction ($p = 0.002$), anxiety ($p = 0.010$), and body image ($p = 0.001$) was significantly lower in the SGA-C group than in other SGA groups. These results suggest that the nutritional status of the gastrectomy patients with stomach cancer may impact on their QoL. It is necessary to develop nutritional intervention to improve QoL in gastric cancer patients with postoperative malnutrition.

Key Words: Stomach neoplasms, Gastrectomy, Nutritional status, Quality of life

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Introduction

Cancer negatively affects the quality of life (QoL) owing to the disease itself but also adverse effects of cancer therapy and the possibility of relapse. The best treatment for gastric cancer is determined by the survival rate and the QoL in patient after the treatment. Therefore, many studies have continued to evaluate the QoL in cancer patients [1]. Gastric cancer is the second most common cancer in Korea and the first among Korean men [2]. From an early stage of cancer development, gastric cancer patients experience malnutrition and weight loss mainly due to loss of appetite and decrease in bowel function. In addition, there are considerable changes in the physical symptoms and emotional status depending on the timing and the method of the treatment. Since these

conditions greatly affects the QoL, the demands on short- and long- term QoL assessment is getting increased [3]. In fact, studies on the QoL of Korean gastric patients have been conducted according to the type of reconstruction surgery, resection extent, and the status of long-term survival [4–6]. These studies have demonstrated that enhanced level of QoL with increasing survival rate of cancer patients was closely related with the treatment methods or conditions. Cancer recurrence is different for each type of cancer. Usually recurrence of gastric cancer is confirmed one year after surgery. On the other hand, the malnutrition rate in patients after gastrectomy is still high and several problems co-exist, including dumping syndrome, anemia, and nutrient malabsorption.

Therefore, it is very important to develop a method to identify the malnutrition early and to improve nutritional status because it is directly linked to patient symptoms and the QoL [7]. However, studies that simultaneously assess the nutritional status and QoL are limited in Korea. Therefore, we conducted this study to help improve the QoL of gastric cancer patients by investigating the malnutrition rate of gastric cancer patients through the evaluation of nutritional status and the QoL, and to determine whether the QoL is different in gastric cancer patients depending on the postoperative survival period or nutritional status.

Materials and Methods

The subjects were 222 gastric cancer survivors who underwent gastrectomy at the Surgery Department of Soonchunhyang University Hospital, and had no evidence of relapse and no disease in other organs. The goal of the study was thoroughly explained to the patients, who then signed the consent form. The results were obtained through one-on-one interviews. Clinicopathological factors including disease stage, surgical methods, extent of resection, and chemotherapy status were investigated by using the medical records, and the nutritional status was evaluated by the score of patient generated-subjective global assessment (PG-SGA), which the attending dietitian of the gastric cancer surgical team commonly uses for cancer patients. Using the evaluation score, the nutritional status was divided into three stages (SGA-A: well nourished, SGA-B: moderate malnutrition, SGA-C: severe malnutrition). Korean versions of the European Organization for Research and Treatment of Cancer Core Questionnaire (EORTC) QLQ-C30 and the EORTC QLQ-STO22, corresponding to the gastric cancer module, were used to evaluate the QoL. The score was

calculated by investigating 15 scales from the EORTC QLQ-C30 and 9 scales from the EORTC QLQ-STO22. In the EORTC QLQ-C30, the QoL is higher when the general health and functional scale score is higher, and the QoL is lower when the symptom scale score is higher. In the EORTC QLQ-STO22, the QoL is lower when the score of each category is higher. In this study, the postoperative survival period was divided into two groups (the less-than-1-year group and the more-than-1-year group) and the nutritional status into three groups (SGA-A, B, and C), and each indicator was analyzed comparatively. Statistical analysis for all data collected from the investigation were performed by using the SPSS program (ver. 18.0, SPSS Inc., Chicago, IL, USA). The Soonchunhyang University Medical School IRB approved the study protocol. The general information of the patients was presented as means and standard deviation, and the postoperative malnutrition rate was analyzed by using the chi-square test. Analysis of covariance (ANCOVA), adjusted for gender and follow up duration, was conducted for comparison of QoL between groups according to postoperative elapsed time period. Among the groups divided by the nutritional status, the differences of QoL were also tested by ANCOVA adjusted for extent of gastric resection which showed the significant differences. Then, post hoc comparison was performed among groups of different nutritional status. For all analyses, $p < 0.05$ was considered statistically significant.

Results

Clinical characteristics

A total of 222 patients participated in the study; the mean age was 54.9, with 68.9% men and 31.1% women. A group of the less-than-1-year of post-operation, with a mean survival duration of 8.6 month, had 116 (52.3%) patients, and a group of the more-than-1-year of post-operation, with a mean survival duration of 18.4 months, had 106 (47.7%) patients. When the final disease stage was classified according to the 6th Union for International Cancer Control (UICC), 120 (54.1%) patients had stage I and II while 102 (45.9%) patients had stage III and IV, showing no significant difference between the two groups. In terms of the surgical methods, 153 (68.9%) underwent laparoscopic surgery and 69 (31.1%) underwent laparotomy. Considering the resection extent, 168 (75.7%) received subtotal gastrectomy and 54 (24.3%) received total gastrectomy; adjuvant chemotherapy was administered to 78 patients (35.1%), and there was no significant difference in the distribution between the two groups (Table 1).

Table 1. Clinicopathologic data according to the period of postoperative survival

	Total (n = 222)	Less-than-1-year group (n = 116)	More-than-1-year group (n = 106)	p value
Age, years	54.9 ± 13.8*	55.5 ± 12.8	55.3 ± 11.6	0.461
Gender				
Male	153 (68.9) [†]	72 (62.1)	81 (76.4)	0.029
Female	69 (31.1)	44 (37.9)	25 (23.6)	
Stage				
I	69 (31.1)	32 (27.6)	37 (34.9)	0.452
II	51 (23.0)	29 (25.0)	22 (20.8)	
III	92 (41.4)	49 (42.2)	43 (40.6)	
IV	10 (4.5)	6 (5.2)	4 (3.8)	
Operation method				
Open	69 (31.1)	37 (31.9)	32 (30.2)	0.885
Laparo	153 (69.8)	79 (68.1)	74 (69.8)	
Extent of gastric resection				
Total	54 (24.3)	27 (23.3)	27 (25.5)	0.755
Subtotal	168 (75.7)	89 (76.7)	79 (74.5)	
Chemotherapy				
Yes	78 (35.1)	40 (34.5)	38 (35.8)	0.888
No	144 (64.9)	76 (65.5)	68 (64.2)	
Follow up duration (month)	13.5 ± 5.8	8.6 ± 3.8	18.4 ± 6.1	< 0.001

*Mean ± standard deviation; [†]Number (%).

Malnutrition rate

When indicators of nutritional status were compared between two groups of postoperative survival period, there was no difference in the serum albumin and hemoglobin levels, since these indicators were within the normal range in patient of both groups. The serum albumin level was significantly different after the surgery between two groups. The mean weight loss was 5.1% in the less-than-1-year group and 3.3% in the more-than-1-year group, and the difference was significant ($p < 0.001$). The pre-operative malnutrition rate for all subjects was 4.5%. After surgery, the rate of moderate malnutrition and the rate of severe malnutrition was 25.9% and 8.6% in the less-than-1-year group and 17.0% and 2.8% in the more-than-1-year group, respectively; thus, the malnutrition rate was significantly higher in the less-than-1-year group ($p < 0.05$) (Table 2).

QoL according to the period of postoperative survival

The overall health status considering the EORTC QLQ-C30 was lower in the less-than-1-year group, but the difference

between two groups was not significant. When the 15 functional scales were compared, although the QoL considering the physical, emotional, cognitive and social function categories was lower in the less-than-1-year group than in the more-than-10-year group, the difference between two groups was not significant. In the 9 categories pertaining to symptom scales, the QoL considering fatigue, pain, sleep disorder, loss of appetite, diarrhea and financial difficulties was lower in the less-than-1-year group but the mean scores for nausea and vomiting were the same. On the other hand, the QoL considering the dyspnea was higher in the less-than-1-year group than in the more-than-10-year group. Among those symptoms, the symptoms that reached statistical significance were fatigue ($p < 0.01$) and loss of appetite ($p < 0.01$), in which the QoL was significantly lower in the less-than-1-year group. The QoL considering all the 9 categories of the QLQ-STO22 was lower in the less-than-1-year group, but the result was significant for only two categories of reflux ($p < 0.05$) and body image ($p < 0.01$) (Table 3).

Table 2. Comparison of nutritional status according to the period of postoperative survival

		Total (n = 222)	Less-than-1-year group (n = 116)	More-than-1-year group (n = 106)	p value
Albumin, g/dL	Preoperative	4.3 ± 0.4*	4.3 ± 0.4	4.3 ± 0.4	0.932
	Current	4.2 ± 0.5	4.1 ± 0.5	4.3 ± 0.5	0.009
Hemoglobin, g/dL	Preoperative	13.1 ± 2.1	13.2 ± 2.1	13.0 ± 2.2	0.818
	Current	13.3 ± 2.3	13.1 ± 2.7	13.5 ± 1.8	0.118
Weight loss change, %		4.4 ± 2.9	5.1 ± 3.4	3.3 ± 2.4	< 0.001
BMI gap, kg/m ²		1.0 ± 0.9	1.2 ± 0.9	0.8 ± 0.6	< 0.001
Preoperative SGA grade	A	212 (95.5) [†]	112 (96.6)	100 (94.3)	0.438
	B	10 (4.5)	4 (3.4)	6 (5.7)	
	C	0 (0.0)	0 (0.0)	0 (0.0)	
Current SGA grade	A	161 (72.5)	76 (65.5)	85 (80.2)	0.033
	B	48 (21.6)	30 (25.9)	18 (17.0)	
	C	13 (5.9)	10 (8.6)	3 (2.8)	

BMI: body mass index, SGA: subjective global assessment.

 *Mean ± standard deviation; [†]Number (%).

QoL according to the postoperative nutritional status

When we compared the QoL according to the nutritional status of all subjects, the overall health status was the highest for the well-nourished group (SGA-A) ($p < 0.05$). In terms of the functional scales, the QoL of the SGA-A and SGA-B groups was higher than that of the SGA-C group in the physical functioning ($p < 0.05$). Regarding the symptom scales, the QoL was significantly lower in the SGA-C group than in the SGA-A group for considering the categories of fatigue ($p < 0.01$) and pain ($p < 0.05$), and the QoL was significantly lower in the SGA-C group than in the other two groups for considering the category of loss of appetite ($p < 0.05$). Considering most categories of the QLQ-STO22, SGA-C group has significantly lower QoL for reflux ($p < 0.01$), eating restriction ($p < 0.01$), anxiety ($p < 0.05$), and body image ($p < 0.01$) (Table 4).

Discussion

The results from QoL studies in gastric cancer patients are diverse [4,8,9]. In studies of the QoL according to resection extent, patients who underwent partial resection showed a significant difference in the overall health status at 3 months after the surgery compared to the patients who underwent total resection [4]. In addition, the QoL was reported to be lower in patients whose diagnosed disease stage was higher and who underwent total resection [8], and the QoL was

higher in patients who underwent laparoscopic surgery than in patients who underwent laparotomy [9]. In this study, when the QoL categories were evaluated according to the postoperative survival period, a significant difference was observed only in symptoms of fatigue, loss of appetite, reflux, and body image. This is somewhat different from the results reported by Park et al. [10], that the QoL score of both groups was lower than the mean score for overall health status and that significant differences were shown regarding the physical function, dyspnea, constipation, diarrhea, financial difficulties, loss of appetite, and body image between two groups.

The malnutrition rate of the subjects in our study was 34.5% in the less-than-1-year group but this number was decreased to 19.8% in the more-than-1-year group. This was slightly higher than the rate reported by Ryu & Kim [11] and similar to the result of Wu et al. [12]. As the postoperative nutritional status of patients are getting worse and manifested with weight loss and hypoalbuminemia even at 6 months after the surgery, continuous nutritional management is recommended [13]. From up to date studies which explored the relationship between the nutritional status and QoL are very rare. In a study by Seo et al. [14], there was no association between the QoL and nutritional indicators such as the total serum protein and albumin levels, prognostic nutrition index (PNI), and a body weight. Regarding nutrient intake, the group with a lower QoL had significantly less intake of nutrients such as proteins,

Table 3. Comparison of quality of life according to the period of postoperative survival

	Less-than-1-year group (n = 116)	More-than-1-year group (n = 106)	p value
QLQ-C30 function			
Overall health status	68.8 ± 25.4*	73.0 ± 19.6	0.484
Physical functioning	82.7 ± 13.6	85.6 ± 10.1	0.501
Role functioning	80.4 ± 26.5	87.9 ± 20.6	0.095
Emotional functioning	83.4 ± 22.2	84.0 ± 16.7	0.410
Cognitive functioning	80.6 ± 12.7	83.6 ± 13.5	0.377
Social functioning	85.1 ± 11.9	86.6 ± 17.6	0.590
QLQ-C30 symptom			
Fatigue	22.3 ± 12.5	28.4 ± 18.2	0.006
Nausea and vomiting	13.4 ± 11.6	13.4 ± 13.8	0.385
Pain	10.4 ± 18.1	10.8 ± 9.0	0.271
Dyspnea	12.9 ± 9.1	11.5 ± 10.4	0.358
Insomnia	12.1 ± 10.9	15.0 ± 11.8	0.405
Appetite loss	11.5 ± 13.2	16.3 ± 17.5	0.002
Constipation	15.8 ± 11.6	17.1 ± 10.4	0.203
Diarrhea	18.4 ± 12.9	19.0 ± 13.3	0.355
Financial difficulties	19.8 ± 10.0	22.3 ± 11.5	0.184
QLQ-STO22 symptom			
Dysphagia	12.8 ± 17.8	10.7 ± 16.9	0.359
Pain	18.4 ± 15.5	18.6 ± 21.9	0.616
Reflux	18.0 ± 16.8	12.5 ± 17.6	0.027
Eating restriction	16.7 ± 17.5	12.6 ± 13.2	0.272
Anxiety	24.9 ± 16.1	19.2 ± 13.6	0.090
Dry mouth	19.7 ± 20.2	18.5 ± 16.0	0.535
Taste problem	11.2 ± 12.9	9.5 ± 13.3	0.251
Body image	18.0 ± 18.1	10.9 ± 14.6	0.004
Hair loss	28.6 ± 32.5	26.6 ± 23.7	0.355

p values were calculated by ANCOVA adjusted for gender and follow up duration.

QLQ: quality of life questionnaire.

*Mean ± standard deviation.

iron, and zinc, and such a problem was more severe in women than in men; thus, a balanced nutrient intake is emphasized to improve the post-operative QoL [15]. In our study, the QoL was significantly lower in the SGA-C group than in the SGA-A group considering the overall health status including functional scales (physical functioning), and symptom scales (fatigue, pain, and loss of appetite) of the EORTC QLQ-C30, and the QoL in the SGA-C group was lower for considering reflux, eating restriction, anxiety, and body image scales of the QLQ-STO22.

This is consistent with the results from other study for the nutritional evaluation by using the nutritional risk screening (NRS) 2002, in which the QoL of the high-risk group with NRS ≥ 3 was significantly lower than that of other groups [16]. The association between the nutritional status and the QoL of cancer patients was well described in a study by Marin Caro et al. [17]. Therefore, as QoL markedly decreases when the nutritional status deteriorates, great efforts to prevent malnutrition to enhance early recovery from post-surgery need to be made.

Table 4. Comparison of quality of life according to nutritional status

	SGA-A (n = 161)	SGA-B (n = 48)	SGA-C (n = 13)	Tukey	p value
QLQ-C30 function					
Overall health status	72.1 ± 28.5*	67.0 ± 19.3	61.5 ± 23.4	1 > 3	0.032
Physical functioning	89.6 ± 18.9	87.5 ± 15.1	74.4 ± 18.3	1,2 > 3	0.025
Role functioning	86.9 ± 22.0	80.2 ± 20.6	79.9 ± 21.5		0.584
Emotional functioning	85.7 ± 19.2	82.6 ± 16.8	73.9 ± 16.4		0.067
Cognitive functioning	85.0 ± 13.7	83.6 ± 16.5	82.2 ± 19.4		0.579
Social functioning	84.4 ± 18.4	80.6 ± 15.6	78.1 ± 20.5		0.446
QLQ-C30 symptom					
Fatigue	18.6 ± 14.3	23.2 ± 12.5	27.9 ± 19.0	1 < 3	0.002
Nausea and vomiting	10.7 ± 16.5	13.4 ± 13.8	14.0 ± 15.2		0.044
Pain	8.6 ± 14.9	10.4 ± 11.2	13.0 ± 16.3	1 < 3	0.030
Dyspnea	12.0 ± 18.0	11.9 ± 13.1	12.4 ± 16.5		0.520
Insomnia	11.3 ± 16.2	13.1 ± 19.4	14.8 ± 17.8		0.418
Appetite loss	9.9 ± 12.8	14.5 ± 19.2	18.5 ± 20.1	1,2 < 3	0.011
Constipation	12.5 ± 10.6	14.8 ± 5.6	16.8 ± 11.5		0.302
Diarrhea	18.7 ± 19.5	17.4 ± 12.9	20.4 ± 16.2		0.485
Financial difficulties	18.3 ± 15.9	21.8 ± 15.0	23.0 ± 21.5		0.349
QLQ-STO22 symptom					
Dysphagia	11.7 ± 22.0	10.4 ± 15.4	12.7 ± 15.6		0.416
Pain	17.1 ± 21.4	16.6 ± 22.5	18.1 ± 18.9		0.523
Reflux	8.6 ± 16.3	11.5 ± 17.7	16.0 ± 15.0	1 < 3	0.002
Eating restriction	10.3 ± 16.6	15.6 ± 23.2	17.3 ± 18.4	1 < 2, 1 < 3	0.004
Anxiety	14.2 ± 18.2	20.9 ± 13.6	23.0 ± 15.1	1 < 3	0.014
Dry mouth	18.4 ± 26.6	21.5 ± 26.0	19.3 ± 24.6		0.203
Taste problem	10.7 ± 18.3	12.5 ± 20.8	13.1 ± 23.0		0.331
Body image	12.1 ± 21.2	14.9 ± 19.3	21.6 ± 15.3	1,2 < 3	0.001
Hair loss	23.5 ± 19.6	28.7 ± 22.9	26.8 ± 17.5		0.089

p values were calculated by ANCOVA adjusted for extent of gastric resection.

QLQ: quality of life questionnaire.

*Mean ± standard deviation.

This study has some limitations. Different recovery patterns among patients owing to variations in the elapsed time from the surgery could result in differences in QoL, but our classification might have been somewhat broad owing to a criterion value of 1 year. Unfortunately, QoL comparison or adjusting the results with the surgical method or range could not be performed. Though many studies have been performed to associate the surgical method and QoL, this study is still

meaningful because the study involved nutritional evaluation methods commonly used by dietitians. The results of this study implicate the relationship between nutritional status and QoL. Therefore, these two indicators could be included in the management protocol of postoperative gastric cancer and also be utilized in the care system of long-term survivals from gastric cancer.

Conclusion

Our results indicate that the QoL of gastric cancer patients is getting lower with lesser elapsed time of post-gastrectomy and with a worsening of nutritional status. To improve the QoL when treating cancer, active nutritional management must be performed and continuous studies that integrate the effect of the long-term outcome and diet quality on the QoL are required.

Conflict of Interest

We declare that we have no conflict of interest.

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