

Postoperative Quality of Life after Total Gastrectomy Compared with Partial Gastrectomy: Longitudinal Evaluation by European Organization for Research and Treatment of Cancer-OG25 and STO22

Jeong-Hwan Lee, Hyuk-Joon Lee, Yun Suk Choi, Tae Han Kim, Yeon-Ju Huh, Yun-Suhk Suh, Seong-Ho Kong, and Han-Kwang Yang

Department of Surgery, Seoul National University Hospital, Seoul National University College of Medicine, Seoul, Korea

Purpose: The European Organization for Research and Treatment of Cancer quality-of-life questionnaire-OG25 was developed to evaluate the quality of life in patients with stomach and esophageal cancer. The following are included in the OG25 but not in the STO22: odynophagia, choked when swallowing, weight loss, trouble eating with others, trouble swallowing saliva, trouble talking, and trouble with coughing. In this study, we evaluated the quality of life of gastrectomized patients using both, the OG25 and the STO22.

Materials and Methods: A total of 138 patients with partial gastrectomy (PG) (distal gastrectomy=91; pylorus-preserving gastrectomy=47) and 44 patients with total gastrectomy (TG) were prospectively evaluated. Body weight and scores from the OG25 and STO22 were evaluated preoperatively and at 3 weeks, 3 months, and 6 months after surgery.

Results: Patients with TG had significant weight loss compared to patients with PG. At 3 months, TG was associated with worse scores for dysphagia, eating, odynophagia, trouble eating with others, trouble with taste, and weight loss on the OG25. TG was also associated with dysphagia, eating restrictions, and anxiety on the STO22. The OG25 helped differentiate between the groups with respect to weight loss, odynophagia, choked when swallowing, and trouble eating with others. The OG25 scores changed over time and were significantly different.

Conclusions: The OG25 is a more sensitive and useful scale than the STO22 for evaluating the quality of life of gastrectomized patients, especially those with total gastrectomy.

Key Words: Stomach neoplasms; Quality of life; Gastrectomy; EORTC; OG-25

Introduction

Gastric cancer is one of the most common malignancies worldwide, being the fourth most common cancer and the second leading cause of cancer-related death.^{1,2} In Korea, gastric

cancer is the most common cancer in men (17.4%) and the fourth most common cancer in women (7.8%). In 1995, the proportion of early gastric cancer (EGC) cases was 28.6% among all cases of gastric cancer; however, that proportion increased to 57.6% in 2009.^{3,4} Early detection of gastric cancer allows for timely treatment and better clinical outcomes. Although alternative treatments have been developed for gastric cancer, radical surgery remains the only treatment that offers the possibility of a cure.⁵ Although the proportion of EGC cases has been increasing, most of them are resectable. Therefore, quality of life (QOL) after gastrectomy has become increasingly important. When evaluating treatments for cancer, health-related QOL has been

Correspondence to: Hyuk-Joon Lee
Department of Surgery, Seoul National University Hospital, 101 Daehak-ro, Jongno-gu, Seoul 03080, Korea
Tel: +82-2-2072-3797, Fax: +82-2-3672-0047
E-mail: appe98@snu.ac.kr
Received October 5, 2016
Revised October 16, 2016
Accepted October 17, 2016

© This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted noncommercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

acknowledged as an important outcome in addition to oncologic outcomes and safety issues.⁶⁻⁹

In recent years, there has been significant progress in defining and measuring QOL in patients with gastric cancer and patients undergoing gastrectomy.¹⁰ The European Organization for Research and Treatment of Cancer (EORTC) developed a cancer-specific questionnaire, the EORTC quality-of-life questionnaire (QLQ)-C30, which has good reliability and validity.¹¹⁻¹³ The EORTC QLQ-C30 evaluates the general condition of cancer patients. This questionnaire has been translated into 81 languages so far and has been used in more than 3,000 studies worldwide.

The EORTC QLQ-STO22 was developed to specifically evaluate the QOL of patients with gastric cancer and esophageal cancer.¹⁴ The OG25 has different evaluation scales from the STO22 in terms of odynophagia, choked when swallowing, trouble talking, weight loss, trouble eating with others, trouble with swallowing saliva, and trouble with coughing. The aim of this study was to evaluate the accuracy of OG25 over the STO22 in assessing the QOL of patients who underwent gastrectomy, especially total gastrectomy.

Materials and Methods

1. Patients

In this prospective study, patients with gastric cancer in the Department of Surgery, Seoul National University Hospital were investigated from July 2014 to October 2015. Patients who were scheduled to undergo gastrectomy were included. A total of 182 patients were enrolled.

The patients were asked to fill out each questionnaire (STO22, OG25) 4 times: preoperatively, and at 3 weeks, 3 months, and 6 months after surgery by a tablet-PC based QOL assessment. The tablet-PC based QOL assessment system allows for changing the pattern display in the electronic medical record and an automatic height, body weight, and a body mass index (BMI) check system. At each visit, the patients checked their body weight.

The study was approved by the Institutional Review Board of the Seoul National University Hospital (1406-108-590), and informed consent was obtained from all participating patients.

2. Treatment details

A prospective analysis of the medical charts was performed considering, in particular, the age, sex, comorbidities, operation method (open vs. laparoscopy or robotic), surgical proce-

dures (total gastrectomy [TG] vs. partial gastrectomy [PG] and pylorus-preserving gastrectomy [PPG]), length of postoperative hospital stay, postoperative complications, and cancer stage.

3. Korean translation of the OG25

We developed a Korean version of the EORTC QLQ-OG25, translating the English version of the QLQ-OG25 into Korean and adapting it for use in Korea. We performed a pilot study of the entire cultural adaptation process using a two-phase process to translate the questionnaire, according to the guidelines of the EORTC QLQ-OG25. Phase 1 represents the iterative forward-backward translation/linguistic process and phase 2 describes the results of qualitative and quantitative evaluation with Korean patients. Ten patients with gastric cancer participated in the pilot study and subsequently, our translated OG25 was approved by the EORTC (Appendix 1).

4. Assessment of quality of life

The EORTC QLQ-STO22 includes 22 questions related to gastric cancer. The questionnaire items included five scales (dysphagia, chest and abdominal pain, reflux, eating restrictions, and anxieties) and four single items (dry mouth, body image, trouble with taste, and hair loss), reflecting disease symptoms, treatment side effects, and psychological issues. Higher scores indicated worse symptomatic problems.¹⁵

The EORTC QLQ-OG25 is a 25-item module designed to increase the sensitivity and specificity of the QLQ-C30. This module comprises six multi-item scales: dysphagia, eating restrictions, reflux, odynophagia, pain, and anxiety, and 10 single-item symptoms, with higher scores indicating worse symptomatic problems for both the multi- and single-item scales.

5. Statistical analysis

Data analysis was performed independently for the QLQ-STO22 and OG25 questionnaires. The mean scores of the global health status and functional scales were compared between the TG and PG patients by Student's t-test. The score changes during the 4 time points (preoperatively, 3 weeks, 3 months, and 6 months after surgery) of each questionnaire were analyzed by analysis of variance. Finally, the differences between the QLQ-STO22 and QLQ-OG25 scores were evaluated. A P-value of <0.05 was considered statistically significant. IBM SPSS Statistics ver. 22 (IBM Co., Armonk, NY, USA) for Windows was used for the statistical analysis.

Results

1. Patients

From July 2014 to October 2015, 182 patients with gastrectomy were included in this study; 72 patients were men (39.6%), and 110 patients were women (60.4%), with a mean age of 56.0 years (standard deviation [SD], 9.3 years; range, 31 to 76 years). Mean preoperative BMI was 24.1 kg/m² (SD, 2.9 kg/m²; range, 16.0 to 35.0 kg/m²). During the study period, 138 patients underwent PG (75.8%), 91 distal gastrectomy (DG), 47 PPG, and 44 underwent TG (24.2%). A total of 155 patients underwent gastrectomy with laparoscopy or a robot-assisted method (85.2%) and 27 patients underwent gastrectomy using an open method (14.8%). Among them, 134 patients had no complications during

their hospital stay (73.6%). The mean hospital stay was 12.5 days (SD, 6.7 days; range, 8 to 51 days). The patients' demographic and clinical information is described in Table 1.

2. Body weight change according to operation type

Patients had their body weight checked preoperatively and at 3 weeks, 3 months, and 6 months after surgery. Mean body weight preoperatively and at 3 weeks, 3 months, and 6 months after surgery was 65.2 kg, 60.6 kg, 59.5 kg, and 59.4 kg, respectively. Mean BMI preoperatively and at 3 weeks, 3 months, and 6 months after surgery was 24.1 kg/m², 22.4 kg/m², 22.0 kg/m², and 21.9 kg/m², respectively. Body weight loss at 3 weeks, 3 months, and 6 months after surgery was 4.27 kg, 4.96 kg, and 4.84 kg in the PG group and 5.70 kg, 7.86 kg, and 9.4 kg in the TG

Table 1. Demographic features and clinical information of patients

Variable	PG (n=138)	TG (n=44)	Total (n=182)
Age (yr)	55.4±9.4 (33~76)	58.0±8.7 (31~71)	56.0±9.3 (31~76)
Sex			
Male	79 (57.2)	31 (70.5)	72 (39.6)
Female	59 (42.8)	13 (29.5)	110 (60.4)
Initial BMI (kg/m ²)	24.0±3.1 (16.0~35.0)	24.4±2.6 (18.8~30.5)	24.1±2.9 (16.0~35.0)
Operation method			
Open	10 (7.2)	17 (38.6)	27 (14.8)
Laparoscopy	128 (92.8)	27 (61.4)	155 (85.2)
Operation type			
Distal gastrectomy	91 (65.9)	-	91 (50.0)
Pylorus preserving gastrectomy	47 (34.1)	-	47 (25.8)
Total gastrectomy	-	44 (100.0)	44 (24.2)
Final stage*			
I	122 (88.4)	28 (63.6)	150 (82.4)
II	7 (5.1)	7 (15.9)	14 (7.7)
III	8 (5.8)	9 (20.5)	17 (9.3)
IV	1 (0.7)	0 (0.0)	1 (0.5)
Complications [†]			
None	106 (76.8)	28 (63.6)	134 (73.6)
I	5 (3.6)	4 (9.1)	9 (4.9)
II	10 (7.2)	7 (15.9)	17 (9.3)
III	15 (10.9)	3 (6.8)	18 (9.9)
IV	2 (1.4)	2 (4.5)	4 (2.2)
Postoperative hospital stay (d)	12.5±7.3 (8~51)	12.5±4.7 (9~30)	12.5±6.7 (8~51)

Values are presented as mean±standard deviation (range) or number (%). The sum of the percentages does not equal 100% because of rounding. PG = partial gastrectomy; TG = total gastrectomy; BMI = body mass index. *Classification according to the American Joint Committee on Cancer 7th edition. [†]Classification according to the Clavien-Dindo classification.

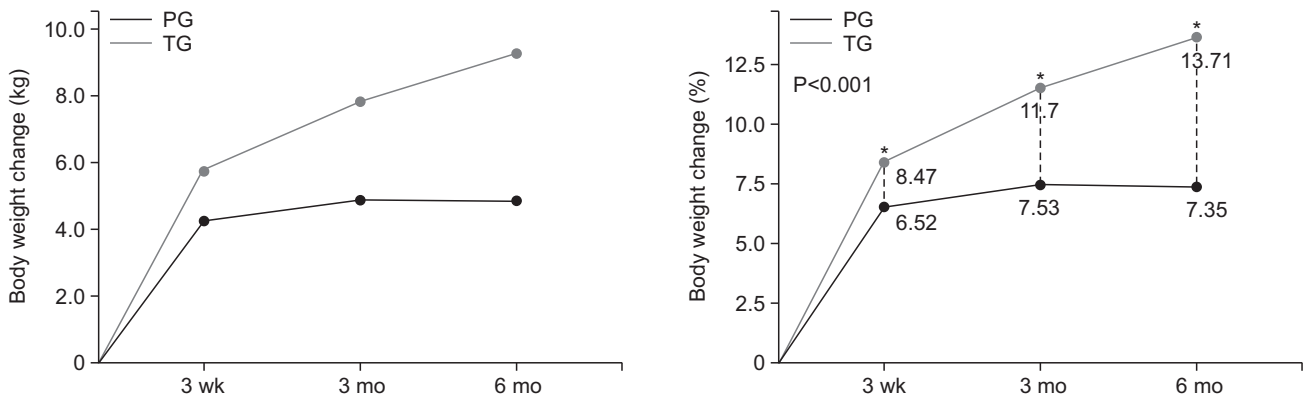


Fig. 1. TG showed significantly more weight loss compared to PG. PG = partial gastrectomy; TG = total gastrectomy. *Significant differences ($P < 0.001$).

group, respectively. Patients who underwent TG showed significantly more body weight loss compared to those who underwent PG at 3 weeks, 3 months, and 6 months after surgery ($P < 0.001$) (Fig. 1). The TG group had a mean weight decrease of 8.47% whereas the PG group had a mean 6.52% decrease ($P < 0.001$) at 3 weeks; 3 months after surgery, the TG group had a mean weight decrease of 11.7%, whereas the PG group had a mean weight decrease of 7.53% ($P < 0.001$).

3. Comparison of preoperative OG25 and STO22 scores

There were no significant differences in preoperative scores between the TG and PG groups on either the OG25 or STO22 (Table 2). There was also no significant difference in each individual score of either the OG25 or STO22 between the PG ($n = 122$) and the TG ($n = 38$) groups.

4. Comparison of postoperative 3 weeks OG25 and STO22 scores

Table 3 shows the significant differences between the PG ($n = 135$) and TG ($n = 43$) in the OG25 and STO22 scores at postoperative 3 weeks. TG was associated with worse scores for dysphagia (OGDYS, TG 22.56; PG 13.54, $P < 0.01$), reflux (OGRFX, TG 8.51; PG 14.68, $P < 0.05$), pain and discomfort (OGPD, TG 17.35; PG 24.76, $P < 0.05$) and weight loss (OGWL, TG 34.67; PG 21.15, $P < 0.05$) in OG25. TG was also associated with worse scores for dysphagia (STODYS, TG 22.56; PG 13.54, $P < 0.01$) and reflux symptoms (STORFX, TG 11.26; PG 17.27, $P < 0.05$) on the STO22. Both the reflux scale and dysphagia scale are included in the OG25 and STO22, but pain and discomfort and weight loss scales are included only in the OG25. In subgroup analysis, the PPG group showed a significantly better score on odynophagia

than the DG group at postoperative 3 weeks on the OG25 (PPG 23.06; DG 15.74, $P < 0.05$).

5. Comparison of postoperative 3 months OG25 and STO22 scores

Table 4 shows the significant differences between the PG ($n = 132$) and TG ($n = 43$) in the OG25 and STO22 scores at postoperative 3 months. The TG was associated with worse scores for dysphagia (OGDYS, TG 16.14; PG 10.70, $P < 0.05$), eating (OGEAT, TG 29.26; PG 19.39, $P < 0.01$), odynophagia (OGODYN, TG 26.74; PG 14.42, $P < 0.01$), eating with others (OGEO, TG 29.33; PG 16.53, $P < 0.05$), trouble with taste (OGTA, TG 18.51; PG 9.51, $P < 0.05$), and weight loss (OGWL, TG 40.26; PG 22.64, $P < 0.01$) on the OG25. TG was also associated with worse scores for dysphagia (STODYS, TG 14.54; PG 10.29, $P < 0.05$), eating restrictions (STOEAT, TG 27.91; PG 18.39, $P < 0.01$) and anxiety (STOANX, TG 40.23; PG 31.22, $P < 0.05$) on the STO22. Odynophagia, trouble with taste, and weight loss scales were included only in the OG25, not in the STO22.

6. Comparison of postoperative 6 months OG25 and STO22 scores

Table 5 shows the significant differences between PG ($n = 133$) and TG ($n = 42$) in OG25 and STO22 scores at postoperative 6 months. TG was associated with worse scores including body image (OGBI, TG 65.17; PG 76.56, $P < 0.05$), dysphagia (OGDYS, TG 16.26; PG 9.35, $P < 0.05$), odynophagia (OGODYN, TG 17.14; PG 13.09, $P < 0.05$), pain and discomfort (OGPD, TG 7.55; PG 15.88, $P < 0.05$), anxiety (OGANX, TG 34.10; PG 34.50, $P < 0.01$) and weight loss (OGWL, TG 40.43; PG 23.48, $P < 0.01$) in OG25. TG was associated with worse scores for body image (STOBI,

Table 2. Preoperative mean scores of functional scales and symptom scales of OG25 and STO22

Scale name	Operation group		P-value
	PG (n=122)	TG (n=38)	
OG25			
Functional scales			
Body image (OGBI)	85.74	83.47	0.57
Symptom scales			
Dysphagia (OGDYS)	6.59	9.00	0.36
Eating (OGEAT)	7.94	9.95	0.42
Reflux (OGRFX)	11.50	9.71	0.46
Odynophagia (OGODYN)	4.40	8.32	0.26
Pain and discomfort (OGPD)	19.65	20.08	0.91
Anxiety (OGANX)	34.16	34.24	0.99
Eating with others (OGEO)	2.43	5.24	0.27
Dry mouth (OGDM)	17.90	20.92	0.52
Trouble with taste (OGTA)	1.89	4.39	0.35
Trouble swallowing saliva (OGSV)	1.36	0.87	0.66
Choked when swallowing (OGCH)	0.27	1.74	0.66
Trouble with coughing (OGCO)	12.20	12.21	1.00
Trouble talking (OGSP)	0.54	3.50	0.17
Weight loss (OGWL)	5.43	7.92	0.40
Hair loss (OGHL)	8.16	14.89	0.15
STO22			
Functional scales			
Body image (STOBI)	86.42	83.47	0.46
Symptom scales			
Dysphagia (STODYS)	6.54	9.00	0.35
Pain (STOPAIN)	16.14	19.32	0.37
Reflux symptoms (STORFX)	12.39	9.84	0.28
Eating restrictions (STOEAT)	7.46	8.89	0.52
Anxiety (STOANX)	24.69	25.55	0.80
Dry mouth (STODM)	17.76	20.92	0.50
Taste (STOTA)	3.79	7.87	0.19
Hair loss (STOHL)	9.75	14.47	0.23

Values are presented as mean scores. PG = partial gastrectomy; TG = total gastrectomy.

TG 65.71; PG 76.56, $P<0.05$), dysphagia (STODYS, TG 16.26; PG 9.35, $P<0.05$), reflux symptoms (STORFX, TG 6.57; PG 12.04, $P<0.05$) and eating restrictions (STOEAT, TG 21.05; PG 15.05, $P<0.05$) on the STO22. The odynophagia and weight loss scales were included only on the OG25, not the STO22. In

Table 3. Postoperative 3 weeks mean scores on functional scales and symptom scales in OG25 and STO22

Scale name	Operation group		P-value
	PG (n=135)	TG (n=43)	
OG25			
Functional scales			
Body image (OGBI)	73.95	69.93	0.36
Symptom scales			
Dysphagia* (OGDYS)	13.54	22.56	<0.01
Eating (OGEAT)	24.08	28.23	0.15
Reflux* (OGRFX)	14.68	8.51	0.02
Odynophagia (OGODYN)	18.29	23.19	0.08
Pain and discomfort* (OGPD)	24.76	17.35	0.02
Anxiety (OGANX)	35.01	37.98	0.47
Eating with others (OGEO)	17.67	23.88	0.12
Dry mouth (OGDM)	25.06	16.95	0.05
Trouble with taste (OGTA)	13.76	20.02	0.10
Trouble swallowing saliva (OGSV)	2.70	6.93	0.30
Choked when swallowing (OGCH)	0.49	2.33	0.10
Trouble with coughing (OGCO)	16.41	17.65	0.68
Trouble talking (OGSP)	3.67	3.84	0.93
Weight loss* (OGWL)	21.15	34.67	0.01
Hair loss (OGHL)	4.67	10.09	0.18
STO22			
Functional scales			
Body image (STOBI)	24.58	25.02	0.36
Symptom scales			
Dysphagia* (STODYS)	13.54	22.56	<0.01
Pain (STOPAIN)	23.63	21.47	0.42
Reflux symptoms* (STORFX)	17.27	11.26	0.02
Eating restrictions (STOEAT)	22.73	26.67	0.15
Anxiety (STOANX)	30.16	36.81	0.07
Dry mouth (STODM)	25.06	16.95	0.05
Taste (STOTA)	18.93	20.00	0.79
Hair loss (STOHL)	13.46	21.62	0.32

Values are presented as mean scores. PG = partial gastrectomy; TG = total gastrectomy. *Significant differences ($P<0.05$).

subgroup analysis, the PPG group showed a significantly better score for reflux than the DG group on the STO22 (PPG 16.80; DG 9.52, $P<0.05$).

Table 4. Postoperative 3 months mean scores on functional scales and symptom scales in OG25 and STO22

Scale name	Operation group		P-value
	PG (n=132)	TG (n=43)	
OG25			
Functional scales			
Body image (OGBI)	73.61	63.28	0.54
Symptom scales			
Dysphagia* (OGDYS)	10.70	16.14	0.03
Eating* (OGEAT)	19.39	29.26	<0.01
Reflux (OGRFX)	10.26	6.98	0.17
Odynophagia* (OGODYN)	14.42	26.74	<0.01
Pain and discomfort (OGPD)	17.85	12.37	0.06
Anxiety (OGANX)	35.40	39.88	0.30
Eating with others* (OGEO)	16.53	29.33	0.01
Dry mouth (OGDM)	16.04	17.12	0.76
Trouble with taste* (OGTA)	9.51	18.51	0.04
Trouble swallowing saliva (OGSV)	2.00	3.07	0.51
Choked when swallowing (OGCH)	2.75	6.93	0.16
Trouble with coughing (OGCO)	10.27	12.33	0.53
Trouble talking (OGSP)	4.25	6.16	0.44
Weight loss* (OGWL)	22.64	40.26	<0.01
Hair loss (OGHL)	8.29	11.23	0.42
STO22			
Functional scales			
Body image (STOBI)	73.61	64.44	0.80
Symptom scales			
Dysphagia* (STODYS)	10.29	14.54	0.03
Pain (STOPAIN)	15.11	14.48	0.18
Reflux symptoms (STORFX)	12.70	10.26	0.36
Eating restrictions* (STO EAT)	18.39	27.91	<0.01
Anxiety* (STOANX)	31.22	40.23	0.02
Dry mouth (STODM)	16.04	17.70	0.64
Taste (STOTA)	13.53	18.53	0.24
Hair loss (STOHL)	8.05	12.40	0.17

Values are presented as mean scores. PG = partial gastrectomy; TG = total gastrectomy. *Significant differences ($P < 0.05$).

Table 5. Postoperative 6 months mean scores of functional scales and symptom scales in OG25 and STO22

Scale name	Operation group		P-value
	PG (n=133)	TG (n=42)	
OG25			
Functional scales			
Body image* (OGBI)	76.56	65.17	0.01
Symptom scales			
Dysphagia* (OGDYS)	9.35	16.26	0.01
Eating (OGEAT)	15.75	21.81	0.05
Reflux (OGRFX)	9.80	6.02	0.07
Odynophagia* (OGODYN)	13.09	17.14	0.01
Pain and discomfort* (OGPD)	15.88	7.55	0.01
Anxiety* (OGANX)	34.50	34.10	<0.01
Eating with others (OGEO)	11.42	21.33	0.92
Dry mouth (OGDM)	16.20	15.81	0.91
Trouble with taste (OGTA)	9.46	15.81	0.11
Trouble swallowing saliva (OGSV)	1.24	2.36	0.47
Choking when swallowing (OGCH)	2.74	6.29	0.44
Trouble with coughing (OGCO)	8.44	11.79	0.23
Trouble talking (OGSP)	3.72	3.93	0.91
Weight loss* (OGWL)	23.48	40.43	<0.01
Hair loss (OGHL)	15.94	15.02	0.82
STO22			
Functional scales			
Body image* (STOBI)	76.56	65.17	0.01
Symptom scales			
Dysphagia* (STODYS)	9.35	16.26	0.01
Pain (STOPAIN)	16.83	16.07	0.75
Reflux symptoms* (STORFX)	12.04	6.57	0.02
Eating restrictions* (STO EAT)	15.05	21.05	0.04
Anxiety (STOANX)	30.75	36.14	0.18
Dry mouth (STODM)	16.45	15.81	0.87
Taste (STOTA)	10.94	15.76	0.16
Hair loss (STOHL)	17.10	16.64	0.91

Values are presented as mean scores. PG = partial gastrectomy; TG = total gastrectomy. *Significant differences ($P < 0.05$).

7. Scales discriminating total gastrectomy from partial gastrectomy on the OG25

The change in each of the scales according to time was analyzed. TG patients showed worse symptom scores including pain and discomfort, reflux, weight loss, dysphagia, anxiety, body im-

age, eating, odynophagia, and trouble with taste symptoms than PG patients, as expected.

Only the OG25 can recognized the difference between the two groups for weight loss, odynophagia, choked when swallowing, and difficulty eating with others. The scores on these

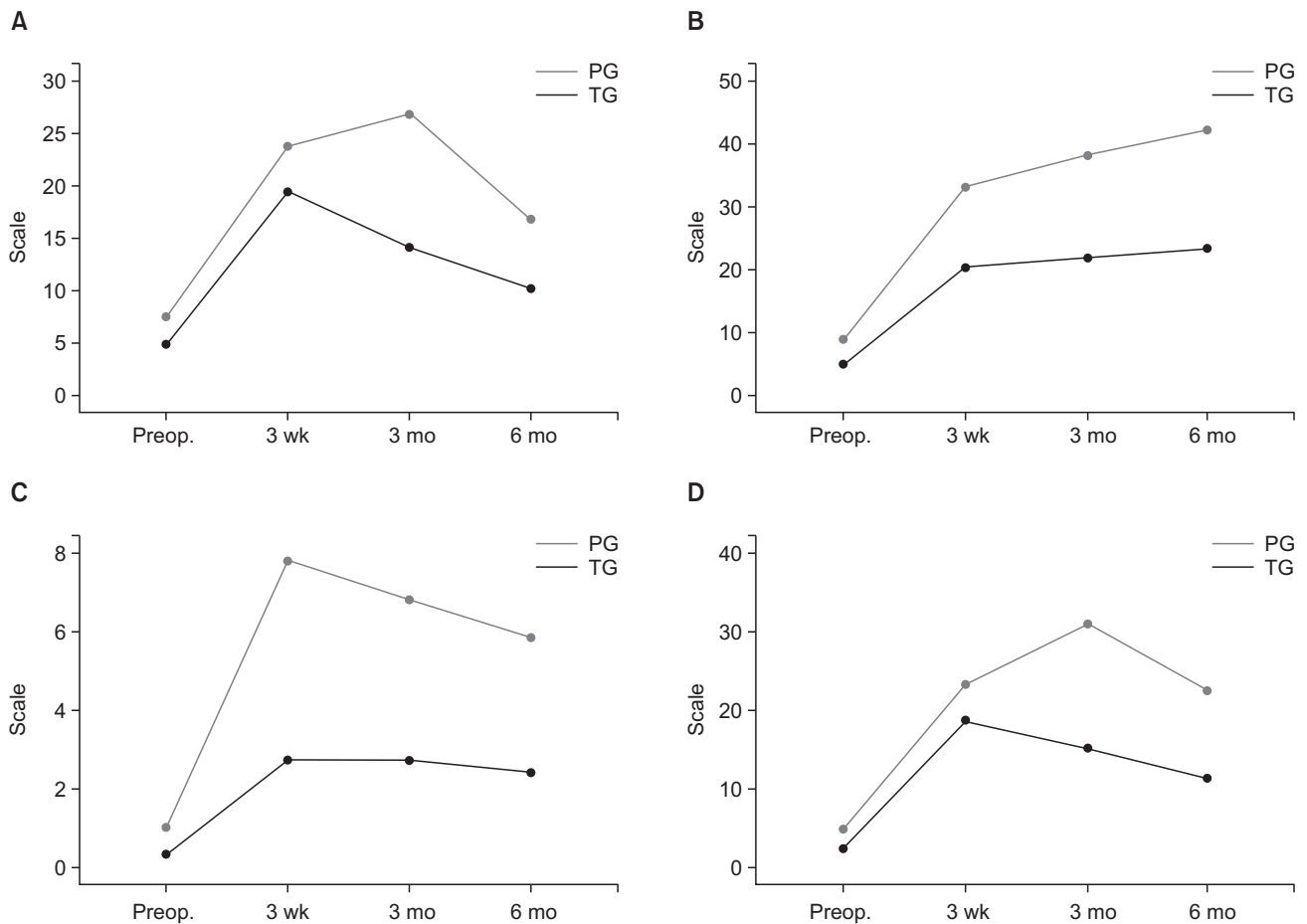


Fig. 2. Scales discriminating total from partial gastrectomy with the OG25. (A) Odynophagia. (B) Weight loss. (C) Checked when swallowing. (D) Eating with others. PG = partial gastrectomy; TG = total gastrectomy; Preop. = preoperative.

scales changed over time and the changes were significantly different (Fig. 2).

Discussion

In this study, the EORTC QLQ-STO22 and QLQ-OG25 were used to evaluate differences in the preoperatively and postoperatively reported outcomes between the TG and PG groups.

Worldwide, the incidence of esophageal cancer (EC) and gastric cardia cancer is increasing, whereas the incidence of non-cardiac adenocarcinomas of the stomach is decreasing.^{16,17} The growing incidence of EC and gastric cardia cancer demonstrates the need for valid methods to measure health-related QOL in patients with esophagogastric junction cancer and proximal gastric cancer.¹⁸

This study aimed to identify differences between the TG and PG groups during the pre- and postoperative periods using the EORTC QLQ-STO22 and QLQ-OG25, and to evaluate

the QOL of gastrectomized patients. The study also examined changes in weight between the two groups over time to determine which group showed a significant weight change.

Although significant differences were not observed in reported symptoms between the two groups in the pre-operative period, significant differences did occur postoperatively. In particular, 3 weeks after surgery, symptoms of pain and discomfort, reflux, weight loss, and dysphagia were worse in the TG group than in the PG group, as confirmed by the OG25. The two items of pain/discomfort and weight loss could only be confirmed by the OG25, not the STO22. Likewise, body image, eating, odynophagia, odynophagia, trouble with taste, weight loss, and dysphagia were worse 3 months after surgery in the TG group than in the PG group. Among these symptoms, body image, odynophagia, trouble with taste, and weight loss could only be confirmed by the OG25. Similarly, 6 months after surgery, the symptoms of body image, eating, odynophagia, weight loss, and dysphagia were confirmed by the OG25 to be worse in

the TG group than in the PG group. Among these symptoms, odynophagia and weight loss cannot be identified by the STO22. Furthermore, differences in symptoms observed between groups over time were confirmed only by the OG25, which includes scales for odynophagia, weight loss, choked when swallowing, and trouble eating with others.

Six months after surgery, the TG group had a weight decrease of 12.71% whereas the PG group had a 7.35 % decrease ($P < 0.001$). Similar to our results, Kim et al.¹⁹ showed that QOL of patients in the TG group was lower than that of patients in the PG group, reporting that QOL of patients in the TG group remained worse than that of the patients in the PG group, even after adjusting for cancer stage and other potential confounders. Their study found that QOL varies depending on the presence of the gastroesophageal junction (i.e., the upper third of the stomach) after surgery, which the OG25 accounts for better than the STO22. Similarly, Oñate-Ocaña et al.²⁰ evaluated QOL in 163 esophagogastric cancer patients and reported that the OG25 accurately reflects the health related postoperative QOL of esophagogastric cancer patients.

However, a new QOL method to evaluate post-gastrectomy symptoms is required. Recently, new QOL assessment tools were developed. The Japan Postgastrectomy Syndrome Working Party developed and validated an assessment scale, the Post-gastrectomy Syndrome Assessment Scale-45 (PGSAS-45). This tool can be used to comprehensively evaluate the outcomes of gastrectomized patients. The PGSAS-45 has 45 items in total, 6 items from the short form-8, 15 items from the Gastrointestinal Symptom Rating Scale, and an additional 22 items.²¹

This study had the following limitations: first, it was a prospective cohort study at a single hospital, examining a small number of patients. Also, the patients' follow-up period was 6 months, which allowed the confirmation of short-term QOL only, not long-term QOL. In conclusion, the OG25 is a more sensitive and useful scale than the STO22 for the evaluation of QOL in gastrectomized patients, especially those with total gastrectomy.

Conflicts of Interest


No potential conflict of interest relevant to this article was reported.

References

- Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. *CA Cancer J Clin* 2011;61:69-90.
- Van Cutsem E, Sagaert X, Topal B, Haustermans K, Prenen H. Gastric cancer. *Lancet* 2016. doi: 10.1016/S0140-6736(16)30354-3 [In print].
- Jeong O, Park YK. Clinicopathological features and surgical treatment of gastric cancer in South Korea: the results of 2009 nationwide survey on surgically treated gastric cancer patients. *J Gastric Cancer* 2011;11:69-77.
- Jung KW, Won YJ, Oh CM, Kong HJ, Cho H, Lee DH, et al. Prediction of cancer incidence and mortality in Korea, 2015. *Cancer Res Treat* 2015;47:142-148.
- Kobayashi D, Kodera Y, Fujiwara M, Koike M, Nakayama G, Nakao A. Assessment of quality of life after gastrectomy using EORTC QLQ-C30 and STO22. *World J Surg* 2011;35:357-364.
- Macintyre IM, Akoh JA. Improving survival in gastric cancer: review of operative mortality in English language publications from 1970. *Br J Surg* 1991;78:771-776.
- Maruyama K, Okabayashi K, Kinoshita T. Progress in gastric cancer surgery in Japan and its limits of radicality. *World J Surg* 1987;11:418-425.
- Korenaga D, Tsujitani S, Haraguchi M, Okamura T, Tamada R, Sugimachi K, et al. Long-term survival in Japanese patients with far advanced carcinoma of the stomach. *World J Surg* 1988;12:236-240.
- Köckerling F, Reck T, Gall FP. Extended gastrectomy: who benefits? *World J Surg* 1995;19:541-545.
- McCall MD, Graham PJ, Bathe OF. Quality of life: a critical outcome for all surgical treatments of gastric cancer. *World J Gastroenterol* 2016;22:1101-1113.
- Aaronson NK, Ahmedzai S, Bergman B, Bullinger M, Cull A, Duez NJ, et al. The European organization for research and treatment of cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst* 1993;85:365-376.
- Sprangers MA, Cull A, Groenvold M, Bjordal K, Blazeby J, Aaronson NK. The European organization for research and treatment of cancer approach to developing questionnaire modules: an update and overview. *EORTC quality of life study group. Qual Life Res* 1998;7:291-300.
- Kaasa S, Bjordal K, Aaronson N, Moum T, Wist E, Hagen S, et al. The EORTC core quality of life questionnaire (QLQ-C30): validity and reliability when analysed with patients treated with palliative radiotherapy. *Eur J Cancer* 1995;31A:2260-2263.
- van der Schaaf M, Derogar M, Lagergren P. Reference values

- of oesophago-gastric symptoms (EORTC QLQ-OG25) in a population-based setting. *Eur J Cancer* 2012;48:1602-1607.
15. Fayers P, Bottomley A; EORTC Quality of Life Group; Quality of Life Unit. Quality of life research within the EORTC-the EORTC QLQ-C30. European organisation for research and treatment of cancer. *Eur J Cancer* 2002;38 Suppl 4:S125-S133.
 16. Botterweck AA, Schouten LJ, Volovics A, Dorant E, van Den Brandt PA. Trends in incidence of adenocarcinoma of the oesophagus and gastric cardia in ten European countries. *Int J Epidemiol* 2000;29:645-654.
 17. Ferro A, Peleteiro B, Malvezzi M, Bosetti C, Bertuccio P, Levi F, et al. Worldwide trends in gastric cancer mortality (1980-2011), with predictions to 2015, and incidence by subtype. *Eur J Cancer* 2014;50:1330-1344.
 18. Tomaszewski KA, Püsküllüoğlu M, Biesiada K, Bochenek J, Nieckula J, Krzemieniecki K. Validation of the polish version of the eortc QLQ-C30 and the QLQ-OG25 for the assessment of health-related quality of life in patients with esophagi-gastric cancer. *J Psychosoc Oncol* 2013;31:191-203.
 19. Kim AR, Cho J, Hsu YJ, Choi MG, Noh JH, Sohn TS, et al. Changes of quality of life in gastric cancer patients after curative resection: a longitudinal cohort study in Korea. *Ann Surg* 2012;256:1008-1013.
 20. Oñate-Ocaña LF, Velázquez-Monroy N, Vázquez L, Espinosa-Mireles-de-Villafranca P, Núñez-Rosas E, Ovando-Lezama M, et al. Clinical validation of the EORTC QLQ-OG25 questionnaire for the evaluation of health-related quality of life in Mexican patients with esophagogastric cancers. *Psychooncology* 2012;21:745-753.
 21. Nakada K, Ikeda M, Takahashi M, Kinami S, Yoshida M, Uenosono Y, et al. Characteristics and clinical relevance of post-gastrectomy syndrome assessment scale (PGSAS)-45: newly developed integrated questionnaires for assessment of living status and quality of life in postgastrectomy patients. *Gastric Cancer* 2015;18:147-158.

Appendix 1. Korean version of the European Organization for Research and Treatment of Cancer (EORTC) quality of life questionnaire (QLQ)-OG25 compared with English version of the EORTC QLQ-OG25




EORTC QLQ – OG25

Patients sometimes report that they have the following symptoms or problems. Please indicate the extent to which you have experienced these symptoms or problems during the past week. Please answer by circling the number that best applies to you.

During the past week:	Not at	A	Quite a	Very
	all	little	bit	much
1. Have you had problems eating solid foods?	1	2	3	4
2. Have you had problems eating liquidised or soft foods?	1	2	3	4
3. Have you had problems drinking liquids?	1	2	3	4
4. Have you had trouble enjoying your meals?	1	2	3	4
5. Have you felt full up too quickly after beginning to eat?	1	2	3	4
6. Has it taken you a long time to complete your meals?	1	2	3	4
7. Have you had difficulty eating?	1	2	3	4
8. Have you had acid indigestion or heartburn?	1	2	3	4
9. Has acid or bile coming into your mouth been a problem?	1	2	3	4
10. Have you had discomfort when eating?	1	2	3	4
11. Have you had pain when you eat?	1	2	3	4
12. Have you had pain in your stomach area?	1	2	3	4
13. Have you had discomfort in your stomach area?	1	2	3	4
14. Have you been thinking about your illness?	1	2	3	4
15. Have you worried about your health in the future?	1	2	3	4
16. Have you had trouble with eating in front of other people?	1	2	3	4
17. Have you had a dry mouth?	1	2	3	4
18. Have you had problems with your sense of taste?	1	2	3	4
19. Have you felt physically less attractive as a result of your disease or treatment?	1	2	3	4
20. Have you had difficulty swallowing your saliva?	1	2	3	4
21. Have you choked when swallowing?	1	2	3	4
22. Have you coughed?	1	2	3	4
23. Have you had difficulty talking?	1	2	3	4
24. Have you worried about your weight being too low?	1	2	3	4
25. Answer this question only if you lost any hair: If so, were you upset by the loss of your hair?	1	2	3	4

© EORTC QLQ-OG25 Copyright 2007 EORTC Quality of life group. All rights reserved (phase IV module)

KOREAN



EORTC QLQ – OG25

환자들은 때때로 다음과 같은 증상이나 문제들을 호소합니다. 지난 일주일 동안 이 증상들이나 문제들을 어느 정도 경험했는지를 가장 잘 나타내는 번호에 동그라미 해 주십시오.

지난 일주일 동안에,	전혀 아니다	약간 그렇다	꽤 그렇다	매우 그렇다
1. 고행 음식을 먹는데 어려움이 있었습니까?	1	2	3	4
2. 즙으로 된 음식이나 부드러운 음식을 먹는데 어려움이 있었습니까?	1	2	3	4
3. 액체를 마시는데 어려움이 있었습니까?	1	2	3	4
4. 식사를 즐기는데 곤란한 적이 있었습니까?	1	2	3	4
5. 먹기 시작한 후 너무 빨리 배가 부르다고 느낀 적이 있었습니까?	1	2	3	4
6. 식사를 마치는데 시간이 많이 걸린 적이 있었습니까?	1	2	3	4
7. 먹는데 어려움이 있었습니까?	1	2	3	4
8. 위산으로 인한 소화불량이나 속쓰림이 있었습니까?	1	2	3	4
9. 위산이나 담즙이 입으로 올라와 곤란한 적이 있었습니까?	1	2	3	4
10. 먹을 때 불편을 느낀 적이 있었습니까?	1	2	3	4
11. 먹을 때 통증을 느낀 적이 있었습니까?	1	2	3	4
12. 위 부위에 통증을 느낀 적이 있었습니까?	1	2	3	4
13. 위 부위에 불편함을 느낀 적이 있었습니까?	1	2	3	4
14. 당신의 질병에 대해 생각하고 있었습니까?	1	2	3	4
15. 앞으로의 건강에 대해 걱정했습니까?	1	2	3	4
16. 다른 사람 앞에서 식사하는 것이 곤란한 적이 있었습니까?	1	2	3	4
17. 입이 마른 적이 있었습니까?	1	2	3	4
18. 맛을 느끼기가 어려운 적이 있었습니까?	1	2	3	4
19. 질병이나 치료로 인해 자신의 신체적 매력이 진보다 못하다고 느낀 적이 있었습니까?	1	2	3	4
20. 침을 삼키기가 어려운 적이 있었습니까?	1	2	3	4
21. 삼킬 때 숨이 막힌 적이 있었습니까?	1	2	3	4
22. 기침을 한 적이 있었습니까?	1	2	3	4
23. 말하기가 어려운 적이 있었습니까?	1	2	3	4
24. 체중이 너무 적다고 걱정한 적이 있었습니까?	1	2	3	4
25. 탈모로 인해 속상했습니까? (탈모를 경험하신 분만 대답해주시기 바랍니다.)	1	2	3	4

© EORTC QLQ-OG25 Copyright 2007 EORTC Quality of life group. 저작권 소유