



Serial Comparisons of Quality of Life after Distal Subtotal or Total Gastrectomy: What Are the Rational Approaches for Quality of Life Management?

Sujin Park, Ho Young Chung, Seung Soo Lee, Ohkyoung Kwon¹, and Wansik Yu¹

Department of Surgery, Kyungpook National University Hospital,
¹Gastric Cancer Center, Kyungpook National University Medical Center, Daegu, Korea

Purpose: The aims of this study were to make serial comparisons of the quality of life (QoL) between patients who underwent total gastrectomy and those who underwent distal subtotal gastrectomy for gastric cancer and to identify the affected scales with consistency.

Materials and Methods: QoL data of 275 patients who were admitted for surgery between September 2008 and June 2011 and who underwent subtotal gastrectomy or total gastrectomy were obtained preoperatively and postoperatively at 3, 6, 9, 12, 18, and 24 months. The Korean versions of the European Organization for Research and Treatment (EORTC) Quality of Life Questionnaire Core 30 (QLQ-C30) and the gastric cancer specific module, the EORTC QLQ-STO22, were used to assess QoL.

Results: QoL, as assessed by the global health status/QoL and physical functioning, revealed a brief divergence with worse QoL in the total gastrectomy group 3 months postoperatively, followed by rapid convergence. QoL related to restrictive symptoms (nausea/vomiting, dysphagia, reflux, and eating restrictions) and dry mouth was consistently worse in the total gastrectomy group during the first 2 postoperative years.

Conclusions: The general QoL of patients after gastrectomy is highly congruent with subjective physical functioning, and the differences between patients who undergo total gastrectomy and subtotal gastrectomy are no longer valid several months after surgery. In order to further reduce the differences in QoL between patients who underwent total gastrectomy and subtotal gastrectomy, definitive preoperative informing, followed by postoperative symptomatic management, of restrictive symptoms in total gastrectomy patients is the most rational approach.

Key Words: Gastrectomy; Quality of life; Stomach neoplasms

Introduction

The number of long-term survivors after curative surgery for gastric cancer has been increasing, and their quality of life (QoL) has become an important issue. Health care providers have been attempting to improve patient QoL while maintaining patient sur-

vival.¹⁻⁵

The extent of gastrectomy for the curative treatment of gastric cancer is determined by the location of the cancer, regardless of the patient's QoL. Surgeons usually perform total gastrectomy (TG) for gastric cancer in the upper part of the stomach and distal subtotal gastrectomy (STG) for cancer in the lower part. Although there have been some reports of the outcomes of proximal gastrectomy for cancer located in the upper part of the stomach, the results remain controversial,⁶⁻⁹ and the remaining food reservoir is determined by the location of the cancer.

Several attempts have been made to evaluate differences in QoL according to the extent of gastrectomy. In studies conducted on patients with shorter postoperative follow-up periods, patients who

Correspondence to: Ho Young Chung
Department of Surgery, Kyungpook National University Hospital, 130 Dongdeok-ro, Jung-gu, Daegu 700-721, Korea
Tel: +82-53-200-5620, Fax: +82-53-421-0510
E-mail: hychung@knu.ac.kr
Received January 30, 2014
Revised February 28, 2014
Accepted February 28, 2014

underwent STG were found to have a better QoL than those who underwent TG.^{10,11} However, in a study on long-term survivors after surgery, there was no apparent difference in the QoL according to the extent of gastrectomy.^{12,13} Thus, it is reasonable to assume that the QoL of patients who undergo TG or STG are different for some time after surgery, but these differences diminish as patients achieve long-term survival 5 years postoperatively.

If QoL measurements reveal only a temporary difference in patients who underwent TG or STG, additional efforts to achieve an equal QoL for both patient groups may be of low priority. In contrast, if QoL measurements suggest a sustained difference between these groups, this may deserve more attention from health care providers.

The aims of this study were to make serial comparisons of QoL between patients who underwent TG and those who underwent STG for gastric cancer and to identify possible clinical interventions for QoL scales that show sustained differences.

Materials and Methods

1. Study population

The QoL of patients with gastric cancer is continually monitored at Kyungpook National University Hospital and Kyungpook National University Medical Center upon admission for surgery and during the follow-up period. With Institutional Review Board (IRB) approval, medical records of patients who were admitted for the surgical treatment of gastric cancer between September 2008 and June 2011 and who had a complete series of QoL assessments during the preoperative period and postoperatively at 3, 6, 9, 12, 18, and 24 months were retrospectively reviewed.

Only patients who underwent curative STG or TG were included. The influence of the surgical route (open or laparoscopic) on QoL had to be controlled for to allow a valid comparison of QoL according to the extent of gastrectomy, and thus, only patients who underwent open gastrectomy were included. To assess the influence of the extent of gastrectomy on QoL, patients who underwent adjuvant chemotherapy, which could diminish QoL, were also excluded; thus, a total of 286 patients were available for analysis.

Eleven patients with co-morbidities or conditions that could influence QoL were excluded, of whom, two had breast cancer, two had colon cancer, two had a psychological disorder, one had remnant gastric cancer, one was pregnant, one had cardiovascular disease, one had renal disease, and one had Parkinson's disease. Of 286 patients, 275 were left for final analyses. Patients were grouped into the STG or TG groups, and their QoL patterns were analyzed.

2. Quality of life assessment

The Korean versions of the European Organization for Research and Treatment (EORTC) Quality of Life Questionnaire Core 30 (QLQ-C30) and the gastric cancer-specific module, the EORTC QLQ-STO22, were used to assess QoL. The EORTC QLQ-C30 is a general module composed of a global health status/QoL scale, five functional scales (physical, role, cognitive, emotional, and social), and nine symptom scales/items (fatigue, nausea and vomiting, pain, dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties). A higher score represents a better QoL for the global health status/QoL and functional scales but a worse QoL for the symptom scales/items. The EORTC QLQ-STO22 is composed of nine symptom scale/items (dysphagia, pain, reflux, eating restrictions, anxiety, dry mouth, taste, body image, and hair loss), and a higher score represents a worse QoL.

Table 1. Characteristics of patients who underwent distal subtotal gastrectomy and total gastrectomy

Variable	Distal subtotal gastrectomy (n=214)	Total gastrectomy (n=61)	P-value
Age (yr)	59.2±11.1	56.9±12.2	0.160
Sex			0.135
Male	121	41	
Female	93	20	
Body mass index (kg/m ²)	23.8±2.8	23.8±2.9	0.996
Previous history of abdominal surgery			0.337
No	200	59	
Yes	14	2	
Stage*			0.128
I	202	55	
II	12	5	
III	0	1	
Postoperative morbidity [†]			0.167
No	208	57	
Yes	6	4	
I	3	0	
IIIa	3	4	

Values are presented as mean±standard deviation or number. *Stages were assigned according to the 7th edition of the Union for International Cancer Control classification. [†]Complications were classified according to the Clavien-Dindo system.

3. Statistical analysis

The prospectively maintained QoL data were retrospectively analyzed. To assess changes in QoL at each time point, preoperative QoL scores were set as baseline values by adjusting them to zero, and the differences in QoL scores from baseline were compared. The chi-square test and Student's t-test were used to compare groups. A P-value of less than 0.05 was considered significant. All statistical analyses were performed using the Statistical Package for Social Science (SPSS) ver. 18.0 (PASW Statistics; IBM Co., Armonk, NY, USA).

Results

1. Characteristics of the study population

Of the 275 patients, 162 were men and 113 were women (male-to-female ratio, 1.43 : 1). The mean age of all patients was 58.7 ± 11.4 years. The STG and TG groups included 214 and 61 patients, respectively (Table 1), and in the STG group, 207 patients underwent Billroth I gastroduodenostomy and 7 patients underwent Billroth II gastrojejunostomy. All patients underwent extended D2 lymphadenectomy. The mean ages of the STG and TG groups were 59.2 ± 11.1 and 56.9 ± 12.2 years, respectively, although this difference was not statistically significant. According to the Clavien-Dindo system, the STG group had three grade I complications

(three cases of surgical wound infection) and three grade IIIa complications (two cases of intra-abdominal fluid collection requiring percutaneous drainage and one case of surgical wound disruption requiring surgical repair). The TG group had four grade IIIa complications (four cases of intra-abdominal fluid collection requiring percutaneous drainage). The complication rate was not significantly different between the groups.

2. Serial comparisons of quality of life between groups

Upon serial comparisons of QoL between STG and TG groups, the STG group revealed a better QoL, as assessed by the global health status/QoL scale, at 3 months postoperatively ($P=0.018$). However, the difference was no longer significant afterward (Fig. 1). A similar pattern was observed in physical functioning in which a brief divergence of QoL was followed by a rapid convergence. No significant differences in QoL were revealed on the remaining functional scales.

The STG group had a significantly better QoL with consistency during the first 2 years after surgery as measured by nausea and vomiting on the EORTC QLQ-C30, and dysphagia, reflux, eating restrictions, and dry mouth as measured on the EORTC QLQ-STO22 (Fig. 2, 3). The convergence of QoL between the STG and TG groups was not observed on these scales 2 years postoperatively. No significant difference in QoL was revealed on the remaining

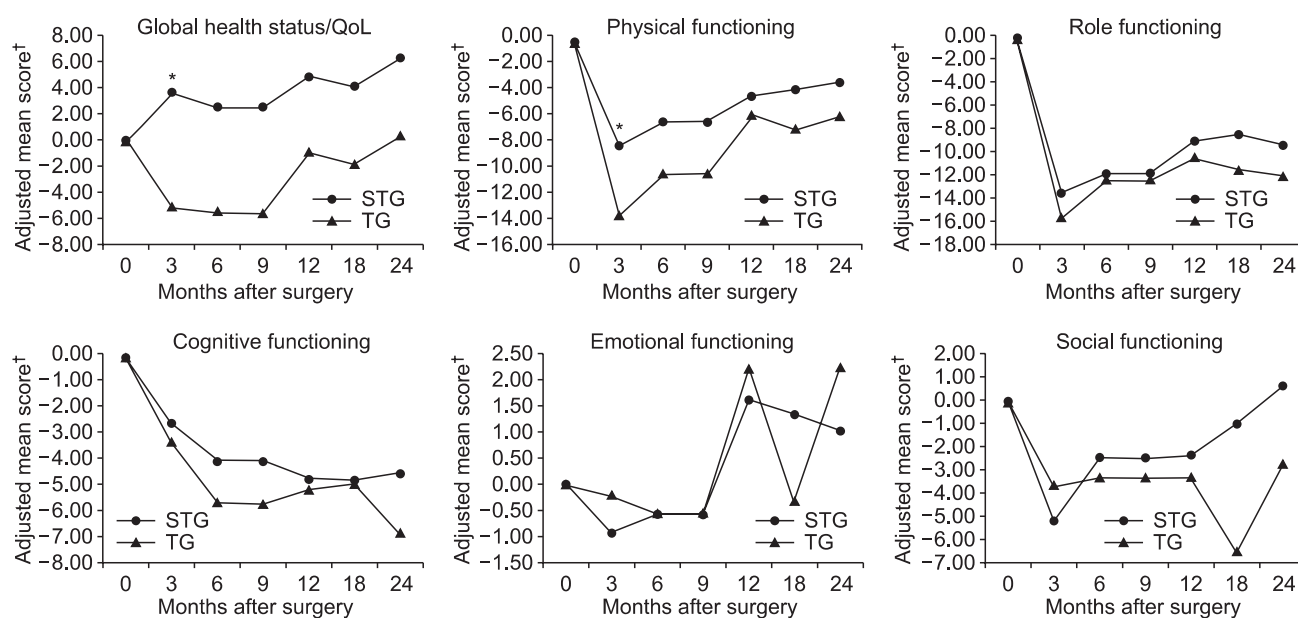


Fig. 1. Serial comparisons of quality of life (QoL) between patients who underwent total gastrectomy (TG) and those who underwent distal subtotal gastrectomy (STG) until the second postoperative year, as assessed by the global health status/QoL and functional scales of the European Organization for Research and Treatment Quality of Life Questionnaire. A higher score represents a better QoL. * $P<0.05$. †Preoperative QoL scores were set as baseline values by adjusting them to zero.

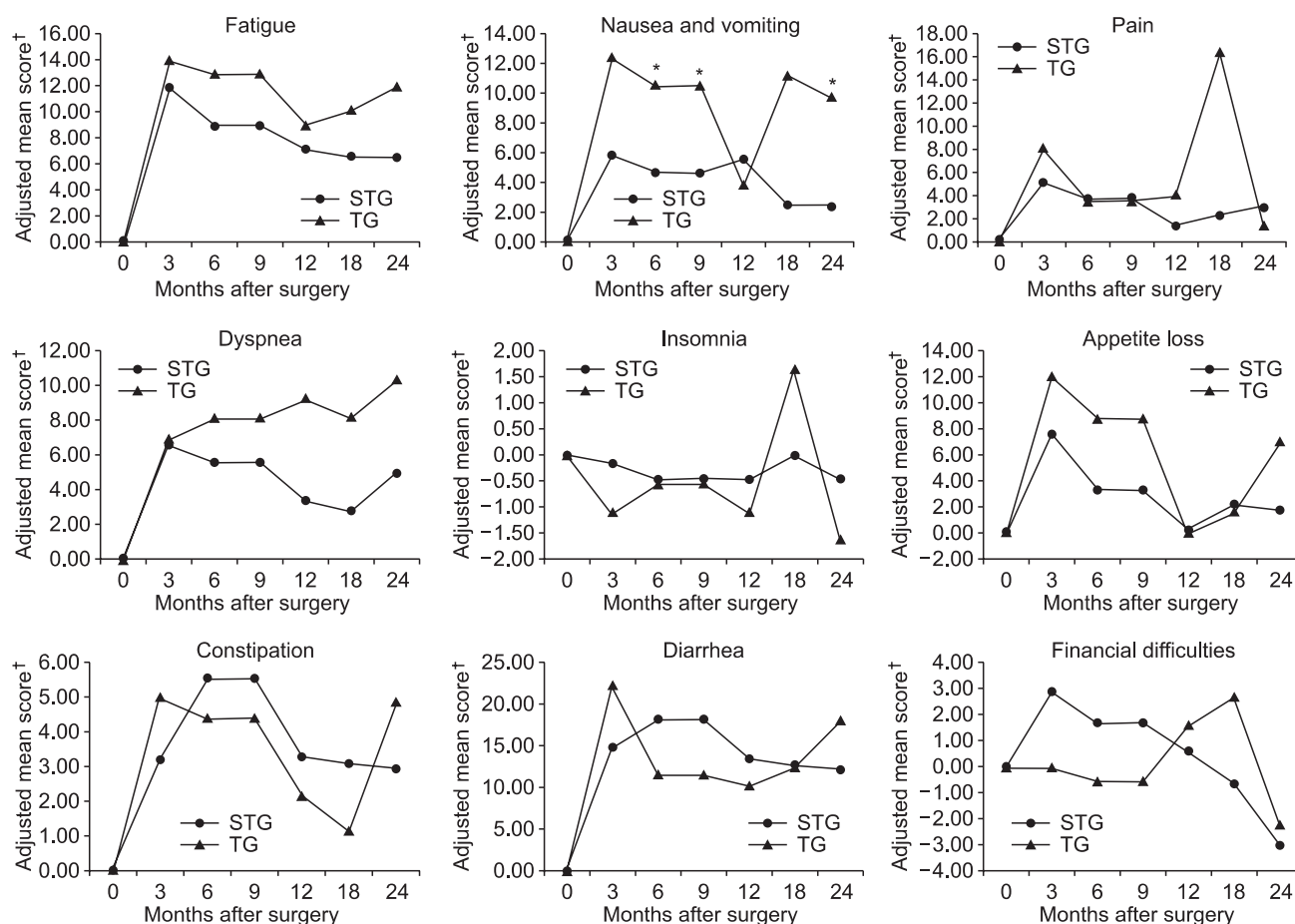


Fig. 2. Serial comparisons of quality of life (QoL) between patients who underwent total gastrectomy (TG) and those who underwent distal subtotal gastrectomy (STG) until the second postoperative year, as assessed by symptom scales/items of the European Organization for Research and Treatment Quality of Life Questionnaire. A higher score represents a worse QoL. * $P < 0.05$. †Preoperative QoL scores were set as baseline values by adjusting them to zero.

symptom scale/items such as fatigue, dyspnea, or body image.

A peculiar pattern of QoL divergence was revealed by scales related to pain. A sudden divergence in QoL was exhibited on the pain scale of the EORTCE QLQ-STO22 during the second year postoperatively ($P = 0.024$), whereas no such divergence was revealed by the pain scale of the EORTC QLQ-C30.

Discussion

Three types of deviant QoL patterns were identified in this study: 1) scales with consistent QoL gaps throughout, 2) scales without a significant difference, and 3) scales with a brief QoL gap followed by rapid convergence.

A restricted food reservoir in the TG group compared to the STG group was inevitable, and worsening QoL related to this restriction (nausea and vomiting, dysphagia, reflux, and eating restrictions) was observed consistently throughout the first 2 years post-

operatively. The degree of mouth dryness, which seemed unrelated to the remaining food reservoir, also showed this pattern, although the physiological connection between a small food reservoir and mouth dryness is not clear. Scales with high clinical association to the restricted food reservoir revealed consistent QoL gaps, whereas no such gap in QoL was revealed by most of the functional scales (role, cognitive, emotional, and social functioning) and the remaining symptom scales/items.

It was highly predictable that the TG group would develop worse QoL due to the limited food reservoir. However, the third type of deviant pattern provides us with the clinical significance suggesting a key factor that actually determines general QoL. The physical functioning scale revealed a brief QoL gap 3 months postoperatively, followed by a rapid convergence between the TG and STG groups. Other than the physical functioning scale, the global health status/QoL scale was the only scale exhibiting a similar pattern. The deviant QoL pattern between the TG and STG groups

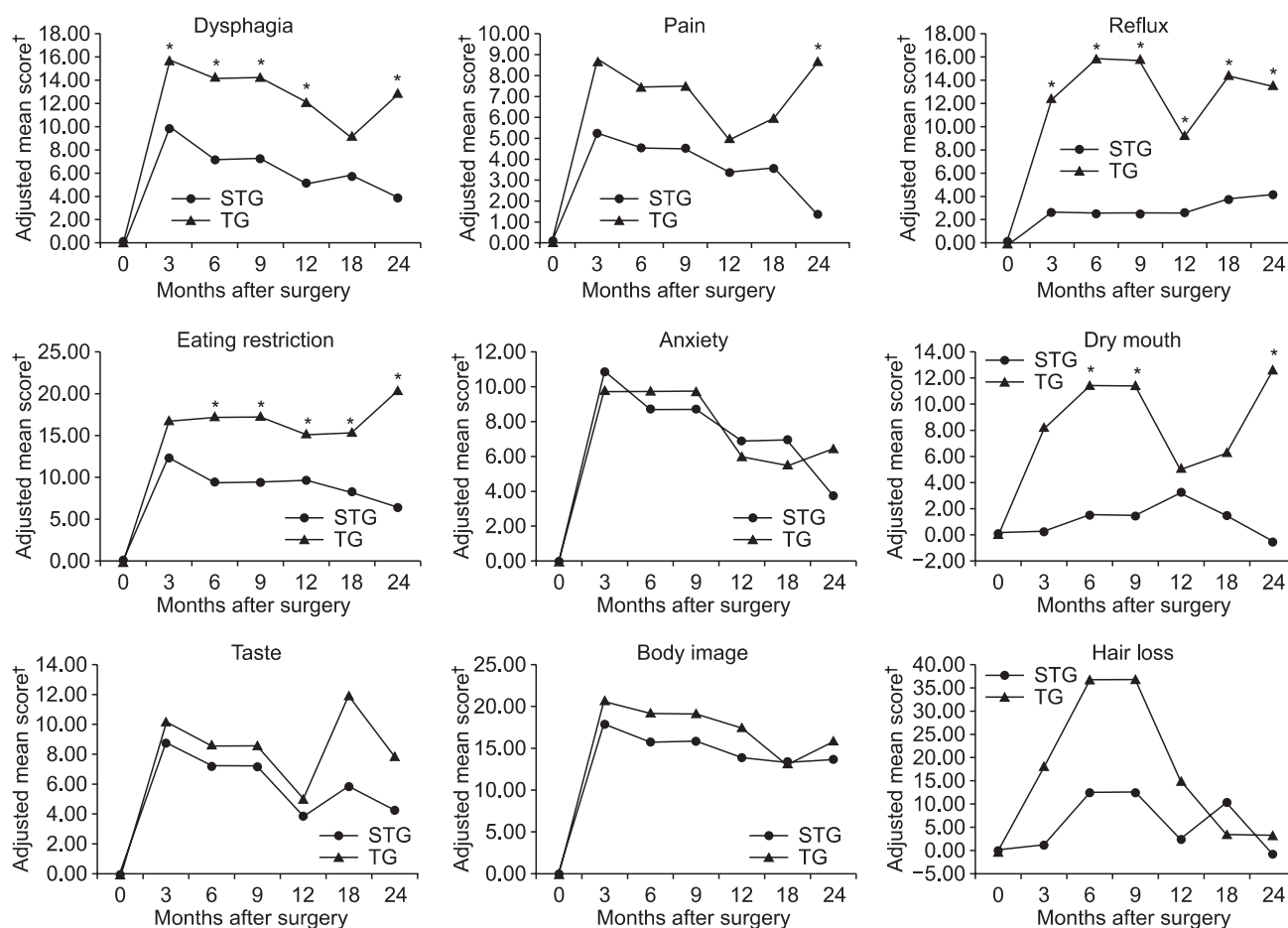


Fig. 3. Serial comparisons of quality of life (QoL) between patients who underwent total gastrectomy (TG) and those who underwent distal subtotal gastrectomy (STG) until the second postoperative year, as assessed by the European Organization for Research and Treatment Quality of Life Questionnaire. A higher score represents a worse QoL. * $P < 0.05$. †Preoperative QoL scores were set as baseline values by adjusting them to zero.

as assessed by the physical functioning is important based on the following: 1) the basis of the early divergence followed by the rapid convergence, and 2) its resemblance to the global health status/QoL.

The physical functional scale is composed of questions that assess limitations in strenuous or daily activities, difficulties in walking, and the need for daytime rest. TG is reported to be inferior to STG with respect to postoperative food tolerance, body weight, and nutritional status.¹⁴⁻¹⁶ Patients who undergo TG take fewer calories and may therefore require more meals per day to maintain an adequate nutritional status. Although only the stomach and upper gastrointestinal tract are surgically altered, the consequences of TG may result in deterioration of bodily functions, resulting in worse QoL in the TG group. However, worse QoL in physical functioning by TG group was no longer exhibited beyond the third postoperative month. By the definition of QoL, physical functioning scale does not reflect the magnitude of bodily functions, but the gap be-

tween actual and expected bodily functions. Patients who undergo TG seemed to adjust by controlling the discrepancy between actual and expected bodily functions even with the on-going presence of aggravating factors.

The similarity in the deviant patterns between physical functioning and the global health status/QoL suggests that the physical functioning scale, but not scales related to symptoms of the restricted food reservoir, is the dominant factor, which determines the patient's general QoL. In fact, although patients who undergo TG suffer worse QoL from restrictive symptoms through 2 years postoperatively, the global health status/QoL seemed to be less affected by those symptoms. There have been on-going efforts for enhanced recovery after surgery¹⁷⁻²¹ and any efforts for faster restoration of postoperative physical function, instead of those for relieving individualized symptoms, would be more practical and effective approaches to enhance recovery of general QoL for any patient with cancer after surgery.

In patients who undergo TG, early efforts, such as additive nutritional supplementation, to achieve a quick restoration of postoperative physical function, may yield positive outcomes. However, extension of such efforts beyond early postoperative periods to reduce persistent QoL gaps between patients who undergo TG and those who undergo STG is not supported with a lack of differences in the corresponding QoL scales.

The strong agreement between the physical functioning scale and global health status/QoL and their rapid convergence during the early postoperative period does not warrant neglecting QoL related to restrictive symptoms, in which patients who underwent TG are affected by worse QoL for at least 2 years postoperatively. The minimum of 2 long years of deterred QoL related to restrictive symptoms necessitates the need for management of QoL. To begin with, creation of food reservoir for TG patients may eliminate the source of restrictive symptoms. There have been several efforts to create a food reservoir for patients who undergo TG, which would probably would eliminate the restrictive symptoms.²²⁻²⁴ However, such techniques never gain much popularity, and most patients with gastric cancer at the upper part of the stomach undergo TG, in which a restricted food reservoir is inevitable. As QoL is the gap between reality and expectation,^{25,26} providing patients with definitive informing regarding the restrictive symptoms they need to follow after surgery for a considerable amount of time, rather than providing obscure information about symptom resolution in the indefinite future, may reduce the gap in QoL. Furthermore, QoL is the patient perception of their position in life,²⁷ and any efforts to alter their perception would be helpful for improving QoL. Altering symptom perception using symptomatic therapy would be a simple and rational approach for patients who undergo TG and who experience restrictive symptoms. In contrast, our results suggest that clinical approaches, other than symptomatic management, such as additive nutritional support for patients who undergo TG, would not reduce the on-going QoL gap between patients who undergo TG and STG beyond 3 months postoperatively.

The pain scale of the EORTC QLQ-STO22 revealed a controversial divergence of QoL at 2 years postoperatively. We were unable to verify whether this was a temporary difference or a noteworthy trigger point for a new deviant pattern. Continued analyses of QoL beyond 2 years may offer valuable information on serial QoL patterns toward long-term survival, and suggest the duration of additive symptomatic alterations required for patients who undergo TG.

In conclusion, the general QoL of gastrectomized patients is

highly interrelated to the level of satisfaction regarding their bodily functions. This level of satisfaction in patients who undergo TG becomes as good as that of patients who undergo STG, despite early deterioration, within a few months after surgery. Definitive preoperative counseling followed by postoperative symptomatic management of restrictive symptoms in patients who undergo TG are the most rational and evidence-based approach to reduce persistent QoL differences between patients who undergo TG and those who undergo STG.

Acknowledgments

This manuscript was presented at the 34th Meeting of the Korean Gastric Cancer Association as a poster, entitled "Differences in the Postoperative Two Year Quality of Life after Subtotal Gastrectomy and Total Gastrectomy." It was awarded the best poster presentation.

This research was supported by the Kyungpook National University Research Fund, 2012.

References

1. Takeuchi H, Kitagawa Y. Sentinel node navigation surgery in patients with early gastric cancer. *Dig Surg* 2013;30:104-111.
2. Hiki N, Nunobe S, Kubota T, Jiang X. Function-preserving gastrectomy for early gastric cancer. *Ann Surg Oncol* 2013;20:2683-2692.
3. Tomikawa M, Korenaga D, Akahoshi T, Kohshi K, Sugimachi K, Nagao Y, et al. Quality of life after laparoscopy-assisted pylorus-preserving gastrectomy: an evaluation using a questionnaire mailed to the patients. *Surg Today* 2012;42:625-632.
4. Liu J, Yang K, Chen XZ, Dai B, Zhang B, Chen ZX, et al. Quality of life following laparoscopic-assisted distal gastrectomy for gastric cancer. *Hepatogastroenterology* 2012;59:2207-2212.
5. Abe N, Takeuchi H, Ohki A, Yanagida O, Masaki T, Mori T, et al. Long-term outcomes of combination of endoscopic submucosal dissection and laparoscopic lymph node dissection without gastrectomy for early gastric cancer patients who have a potential risk of lymph node metastasis. *Gastrointest Endosc* 2011;74:792-797.
6. Wen L, Chen XZ, Wu B, Chen XL, Wang L, Yang K, et al. Total vs. proximal gastrectomy for proximal gastric cancer: a systematic review and meta-analysis. *Hepatogastroenterology* 2012;59:633-640.

7. Ooki A, Yamashita K, Kikuchi S, Sakuramoto S, Katada N, Hutawatari N, et al. Clinical significance of total gastrectomy for proximal gastric cancer. *Anticancer Res* 2008;28:2875-2883.
8. An JY, Youn HG, Choi MG, Noh JH, Sohn TS, Kim S. The difficult choice between total and proximal gastrectomy in proximal early gastric cancer. *Am J Surg* 2008;196:587-591.
9. Kim JH, Park SS, Kim J, Boo YJ, Kim SJ, Mok YJ, et al. Surgical outcomes for gastric cancer in the upper third of the stomach. *World J Surg* 2006;30:1870-1876.
10. Huang CC, Lien HH, Wang PC, Yang JC, Cheng CY, Huang CS. Quality of life in disease-free gastric adenocarcinoma survivors: impacts of clinical stages and reconstructive surgical procedures. *Dig Surg* 2007;24:59-65.
11. Svedlund J, Sullivan M, Liedman B, Lundell L, Sjödin I. Quality of life after gastrectomy for gastric carcinoma: controlled study of reconstructive procedures. *World J Surg* 1997;21:422-433.
12. Lee SS, Han SW, Jeong H, Song J, Chung HY, Yu W. Quality of life of long-term survivors after a subtotal or a total gastrectomy for gastric cancer. *J Korean Gastric Cancer Assoc* 2010;10:34-39.
13. Díaz De Liaño A, Oteiza Martínez F, Ciga MA, Aizcorbe M, Cobo F, Trujillo R. Impact of surgical procedure for gastric cancer on quality of life. *Br J Surg* 2003;90:91-94.
14. Bae JM, Park JW, Yang HK, Kim JP. Nutritional status of gastric cancer patients after total gastrectomy. *World J Surg* 1998;22:254-260.
15. Korenaga D, Orita H, Okuyama T, Moriguchi S, Maehara Y, Sugimachi K. Quality of life after gastrectomy in patients with carcinoma of the stomach. *Br J Surg* 1992;79:248-250.
16. Bozzetti F, Ravera E, Cozzaglio L, Dossena G, Agradi E, Bonfanti G, et al. Comparison of nutritional status after total or subtotal gastrectomy. *Nutrition* 1990;6:371-375.
17. Blom RL, van Heijl M, Bemelman WA, Hollmann MW, Klinkenbijn JH, Busch OR, et al. Initial experiences of an enhanced recovery protocol in esophageal surgery. *World J Surg* 2013;37:2372-2378.
18. Zhuang CL, Ye XZ, Zhang XD, Chen BC, Yu Z. Enhanced recovery after surgery programs versus traditional care for colorectal surgery: a meta-analysis of randomized controlled trials. *Dis Colon Rectum* 2013;56:667-678.
19. Khan SA, Ullah S, Ahmed J, Wilson TR, McNaught C, Hartley J, et al. Influence of enhanced recovery after surgery pathways and laparoscopic surgery on health-related quality of life. *Colorectal Dis* 2013;15:900-907.
20. Yamada T, Hayashi T, Cho H, Yoshikawa T, Taniguchi H, Fukushima R, et al. Usefulness of enhanced recovery after surgery protocol as compared with conventional perioperative care in gastric surgery. *Gastric Cancer* 2012;15:34-41.
21. Barlow R, Price P, Reid TD, Hunt S, Clark GW, Havard TJ, et al. Prospective multicentre randomised controlled trial of early enteral nutrition for patients undergoing major upper gastrointestinal surgical resection. *Clin Nutr* 2011;30:560-566.
22. Namikawa T, Oki T, Kitagawa H, Okabayashi T, Kobayashi M, Hanazaki K. Impact of jejunal pouch interposition reconstruction after proximal gastrectomy for early gastric cancer on quality of life: short- and long-term consequences. *Am J Surg* 2012;204:203-209.
23. Shibata C, Ueno T, Kakyou M, Kinouchi M, Sasaki I. Results of reconstruction with jejunal pouch after gastrectomy: correlation with gastrointestinal motor activity. *Dig Surg* 2009;26:177-186.
24. Kono K, Iizuka H, Sekikawa T, Sugai H, Takahashi A, Fujii H, et al. Improved quality of life with jejunal pouch reconstruction after total gastrectomy. *Am J Surg* 2003;185:150-154.
25. Calman KC. Quality of life in cancer patients--an hypothesis. *J Med Ethics* 1984;10:124-127.
26. Lee SS, Ryu SW, Kim IH, Sohn SS. Quality of life beyond the early postoperative period after laparoscopy-assisted distal gastrectomy: the level of patient expectation as the essence of quality of life. *Gastric Cancer* 2012;15:299-304.
27. Bottomley A. The cancer patient and quality of life. *Oncologist* 2002;7:120-125.