



Postoperative quality of life and dysfunction in patients after combined total gastrectomy and esophagectomy



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HIGHLIGHTS

- Postoperative QOL and dysfunction after combined esophagectomy and total gastrectomy were evaluated using two questionnaires.
- QOL and dysfunction may be influenced more by current status than by surgical history.
- Reconstruction with a pedicled jejunal flap is reasonable.

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ABSTRACT

Background: Patients with esophageal cancer and a history of gastrectomy or concurrent gastric cancer undergo not only esophagectomy but also total gastrectomy. The goal of this study is to evaluate the postoperative quality of life (QOL) and dysfunction of these patients using two postoperative questionnaires.

Materials and methods: From 1999 to 2015, 41 patients underwent concurrent esophagectomy and total gastrectomy. A jejunal pedicle with the subcutaneous supercharge technique was used for reconstruction. Patients were divided into two groups, including those undergoing concurrent esophagectomy and gastrectomy (Group 1), and those undergoing esophagectomy alone (Group 2, history of previous gastrectomy). Patients were analyzed by time interval, including patients within three years of surgery (Group A) and those more than three years after surgery (Group B).

Results: Eighteen patients completed the questionnaires. The mean DAUGS20 score was 26.4 ± 13.2 . The DAUGS20 scores of groups 1 (N = 7) and 2 (N = 11) were 25.4 ± 12.5 and 27 ± 15.4 ($p = 0.58$), respectively. Global health status scored by the EORTC QLQ-C30 were 71.4 ± 18.5 in group 1 and 67.4 ± 22.8 in group 2 ($p = 0.85$). DAUGS20 scores of group A (N = 10) and B (N = 8) were 28.1 ± 12.4 and 23.3 ± 14.4 ($p = 0.35$). No significant differences were found between groups A and B regarding the QLQ-C30 scores.

Conclusion: DAUGS20 and QLQ-C30 scores showed no significant differences between groups 1 and 2 or groups A and B. These results suggest that postoperative QOL and dysfunction may be influenced more by current status than by surgical history and postoperative interval. Previous reports describe a DAUGS 20 score after gastrectomy of 27.8 and after esophagectomy of 36.1. The DAUGS20 score of these 18 patients is lower than DAUGS20 scores for patients undergoing either operation alone. Reconstruction using a subcutaneously placed jejunal segment seems to be reasonable.

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1. Introduction

A gastric tube is the first choice as an esophageal substitute for reconstruction after esophagectomy in patients with esophageal cancer [1]. However, reconstruction using an organ other than the stomach is required in patients with esophageal cancer and a

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history of gastrectomy or concurrent gastric cancer. Mortality rates seem to be higher in patients who undergo colon graft reconstruction than in those who undergo reconstruction with a jejunal graft, although the incidence of graft loss and anastomotic leakage were comparable in both techniques [2]. At present, reconstruction using a jejunal pedicle is a safe operation that provides advantages as more active transport of food and a lower rate of regurgitation by peristalsis compared with reconstruction using a colon pedicle [3]. Previous reports showed that the supercharge technique is useful for improving the intestinal blood flow because the venous partial pressure of oxygen increased markedly after the arterial and venous anastomosis [4]. This technique may reduce the risk of anastomotic leakage and stenosis. Based on previous studies, we usually use a jejunal graft reconstruction with the supercharge technique for patients whose stomach cannot be used as a conduit.

Patients with cancer of the esophagus who have a history of gastrectomy or concurrent gastric cancer undergo not only esophagectomy but also total gastrectomy. These patients are becoming more common, as esophageal cancer is diagnosed in 482,000 people worldwide every year [5] and gastric cancer is the fifth most common malignancy (951,000 per year) worldwide [6]. There are few objective evaluations of postoperative quality of life (QOL) in these patients. Health-related QOL includes physical, social, and psychological states [7]. Questionnaires such as the European Organization for Research and Treatment of Cancer Quality of Life Core-30 (EORTC QLQ-C30) [8] and the Dysfunction After Upper Gastrointestinal Surgery (DAUGS) 20 scoring system [9] assess patients undergoing surgery, chemotherapy, radiotherapy, and supportive care. In this study, we evaluate the post-operative QOL of patients who underwent esophagectomy (with a previous history of gastrectomy) or concurrent esophagectomy and gastrectomy.

2. Methods

From January 1st 1999 to December 31st 2015, 41 patients underwent esophagectomy and total gastrectomy at Jichi Medical University Hospital. The proximal jejunum was brought up subcutaneously in a Roux-en-Y fashion together with its vascular pedicle and the divided second or third jejunal vessels were microscopically anastomosed to the internal thoracic vessels as a “supercharger” (Fig. 1). Overall, 25 patients were contacted for



Fig. 1. The proximal jejunal flap is pulled up in a Roux-en-Y fashion subcutaneously together with its vascular pedicle. The cut edges of the second jejunal vessel are microscopically anastomosed to the internal thoracic vessels, referred to as “supercharging” (arrow head).

inclusion in this study because they survived without recurrence and have not received chemotherapy within three months. Surveys were returned by 18 patients. There are two groups, including patients who had undergone concurrent resection of esophageal cancer and gastric cancer (Group 1, $N = 7$), and patients with esophageal cancer who previously underwent gastrectomy (Group 2, $N = 11$). We also evaluated these patients according to the postoperative interval. Group A ($N = 10$) includes patients evaluated within three years of surgery and Group B ($N = 8$) includes those evaluated more than three years after surgery. Postsurgical QOL was evaluated using the EORTC QLQ-C30 and DAUGS20 questionnaires.

The EORTC QLQ-C30 includes a global health status/QOL scale, five functional scales evaluating physical functioning, role functioning, emotional functioning, cognitive functioning, and social functioning, and seven symptom scales/items evaluating fatigue, nausea and vomiting, pain, dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties [10]. Scoring algorithms were created by the EORTC Quality of Life Study Group, a high score for functional scale represents a high/healthy level of functioning. A high score for the global health status/quality of life represents a high quality of life. In contrast, a high score for the symptom scale represents a higher level of symptoms/problems [11].

The DAUGS scoring system uses 20 items related to post-operative gastrointestinal dysfunction, each scored 0 to 5. High scores indicate more severe dysfunction. The 20 items are divided into seven categories: diarrhea or soft feces, pain, dumping-like symptoms, food passage dysfunction, nausea and vomiting, decreased physical activity, and reflux symptoms [9].

The ethics committee of Jichi Medical University Hospital approved this study and written informed consent was obtained from all enrolled patients.

2.1. Statistical analysis

Study variables include: gender, age, weight loss after surgery (%), operative time (min), estimated blood loss (ml) and post-operative interval (months).

The JMP9 statistical package (SAS, Cary, NC, USA) was used for data analysis. Scores for the DAUGS20 and EORTC QLQ-C30 were compared between two groups using a non-parametric test (Wilcoxon rank-sum). P-values of less than 0.05 are considered significant.

3. Results

Eighteen (72%) of 25 eligible patients completed the questionnaire and returned it by mail, and constitute the study group. The average operating time was 655 min and average estimated blood

Table 1

Characteristics and operative outcomes for patients who underwent both total gastrectomy and esophagectomy (survey respondents).

	Group 1 (n = 7)	Group 2 (n = 11)	p Value
Gender (male/female)	7/0	11/0	
Age (years)	68.1 ± 5.4	67.5 ± 10.3	1.00
Weight loss after surgery (%)	12.5 ± 7.9	10.0 ± 5.5	0.59
Operative time (min)	645.5 ± 78.3	660 ± 111.7	0.72
Estimated Blood loss (ml)	642.9 ± 260.0	1089.5 ± 620.9	0.12
Months postoperative	63.3 ± 53.1	51.8 ± 49.0	0.86

Data is shown as mean ± Standard Deviation.

Group1, patients who underwent both total gastrectomy and esophagectomy.

Group 2, patients with previous history of gastrectomy who underwent both remnant gastrectomy and esophagectomy.

Table 2
Clinicopathological outcomes in 18 patients.

	Group 1 (n = 7)	Group 2 (n = 11)
Tumor Stage		
T1a	2	2
T1b	3	7
T2		1
T3	2	1
Lymph node Stage		
N0	6	7
N1		2
N2		2
N3	1	
Reason for gastrectomy		
History of benign ulcer		6
History of gastric cancer		4
Other		1
Concurrent gastric cancer	7	

Group1, patients who underwent both total gastrectomy and esophagectomy.

Group 2, patients with previous history of gastrectomy who underwent both remnant gastrectomy and esophagectomy.

loss was 916 ml. Patient characteristics are shown in Table 1. All enrolled patients were men and weight loss after surgery was 11.0 ± 6.5 (%). The 18 study participants included seven patients in Group 1 and 11 patients in Group 2. There are no significant differences in age, weight loss after surgery, operative time, estimated blood loss or postoperative interval between the two groups. Table 2 shows the clinicopathological findings of the 18 patients. Fourteen of the 18 had early disease and 13 had no lymph node involvement. Six underwent previous gastrectomy for benign lesions and four had gastrectomy for malignant lesion in Group 2. The overall DAUGS20 score is the sum of the scores for the 20 items. The mean DAUGS20 score after esophagectomy and total gastrectomy (n = 18) was 26.4 ± 13.2 . There were no significant differences between groups 1 and 2 regarding total DAUGS20 score or the scores on individual items (Table 3).

The results of global health status, functional scales and symptom scales of EORTC QLQ-C30 are shown in Table 4. There are no significant differences in all scales and status of the two groups

Table 3
DAUGS20 scores.

	Group 1 (n = 7)	Group 2 (n = 11)	p Value
Total score	25.4 ± 12.5	27 ± 15.4	0.58
Question			
1. Do you feel more full halfway through a meal compared with how you felt before surgery?	2.0 ± 1.30	2.5 ± 1.50	0.45
2. Do you have a heavy sensation in your stomach after eating?	1.29 ± 1.11	1.27 ± 1.56	0.78
3. Do you suddenly feel bloated during a meal?	1.43 ± 1.13	2.27 ± 1.27	0.17
4. Do you feel a sensation of abdominal fullness after eating?	1.57 ± 1.51	1.72 ± 1.84	0.96
5. Have you lost your appetite?	1.14 ± 1.35	0.82 ± 1.40	0.30
6. Do you have difficulty in swallowing soft food?	2.14 ± 1.57	1.18 ± 1.40	0.17
7. Do you have a choking sensation when swallowing food?	1.29 ± 1.38	1.09 ± 1.22	0.78
8. Do you have difficulty in sleeping because of bitter tasting fluid regurgitating into your mouth?	1.00 ± 1.00	0.36 ± 0.67	0.10
9. Is any acidic fluid regurgitated into your mouth?	0.43 ± 0.53	0.18 ± 0.40	0.29
10. Do you vomit after meals?	0.71 ± 0.76	0.55 ± 0.820	0.58
11. Do you feel food retained in your chest?	0.57 ± 0.53	0.45 ± 0.69	0.57
12. Do you feel nauseated?	0.57 ± 0.53	0.64 ± 1.29	0.46
13. Do you have pain in the pit of your stomach after eating?	0.86 ± 0.69	1.09 ± 1.64	0.89
14. Do you have abdominal pain within 30 min of eating?	0.86 ± 0.69	1.09 ± 1.64	0.73
15. Do you feel fatigue or weakness within 2-3 hours after eating?	0.43 ± 0.53	0.64 ± 1.03	1.00
16. Do you feel sleepy within 2-3 hours after eating?	0.86 ± 1.07	1.36 ± 1.57	0.57
17. Do you have diarrhea?	2.0 ± 1.15	2.63 ± 1.21	0.28
18. Do you have soft stools?	1.43 ± 0.98	1.91 ± 1.51	0.58
19. Do you have less strength or a lower activity level?	2.43 ± 0.98	2.91 ± 1.70	0.43
20. Do you feel dizzy or unsteady when walking up stairs or slopes?	1.71 ± 1.11	2.0 ± 1.67	0.75

Data is shown as mean ± Standard Deviation.

Group1, patients who underwent both total gastrectomy and esophagectomy.

Group 2, patients with previous history of gastrectomy who underwent both remnant gastrectomy and esophagectomy.

(Table 4). Table 5 shows the postoperative DAUGS20 scores. Only the score for question 3 (Do you suddenly feel bloated during a meal?) was significantly improved three years after surgery (Table 5). There are no significant differences between groups A and B regarding EORTC QLQ-C30 scores (data not shown).

4. Discussion

Health-related QOL is generally accepted to include physical, social, and psychological aspects [7]. Most frequently, surgical outcomes are conveyed in terms of oncological outcomes such as recurrence and survival [12], however surgeons should consider QOL and dysfunction after surgery. Questionnaires are accepted by patients as a sign of concern by the physician for their QOL and usually completed without reluctance [13]. The European Organization for Research and Treatment of Cancer developed and validated the EORTC QLQ-C30 questionnaire designed to assess the QOL in patients with cancer [10]. This questionnaire is used for a wide range of patients with cancer. The DAUGS 20 scoring system was designed to assess postoperative dysfunction, specifically in patients with upper gastrointestinal malignancies, and was originally developed for simultaneous use with the EORTC QLQ-C30 [14].

This study found no significant differences between groups 1 and 2 regarding characteristics and operative results for patients who answered the survey (Table 1). The mean DAUGS20 score was 26.4 ± 13.2 . The DAUGS20 scores of groups 1 (N = 7) and 2 (N = 11) were 25.4 ± 12.5 and 27 ± 15.4 (p = 0.58), respectively (Table 3). Global health status scores using the EORTC QLQ-C30 were 71.4 ± 18.5 in group 1 and 67.4 ± 22.8 in group 2 (p = 0.85) (Table 4). The results of functional scales and symptom scales of EORTC QLQ-C30 showed no significant differences in all scales between the two groups (Table 4). DAUGS20 scores for groups A (N = 10) and B (N = 8) were 28.1 ± 12.4 and 23.3 ± 14.4 (p = 0.35) (Table 5).

Patients with esophageal cancer and a history of gastrectomy or concurrent gastric cancer undergo not only esophagectomy, but also total gastrectomy. Previous studies have described that gastric resection has a great impact on health related QOL in patients with

Table 4
EORTC QLQC-30 scores.

	Group 1 (n = 7)	Group 2 (n = 11)	p Value
Global health status	71.4 ± 18.5	67.4 ± 22.8	0.85
Functional scales			
Physical functioning	83.8 ± 9.3	82.4 ± 16.7	1.00
Role functioning	85.7 ± 20.2	86.4 ± 23.4	0.88
Emotional functioning	88.1 ± 21.0	81.8 ± 13.9	0.26
Cognitive functioning	78.6 ± 23.0	78.8 ± 13.1	0.67
Social functioning	88.1 ± 21.0	93.9 ± 8.4	0.96
Symptom scales			
Fatigue	17.5 ± 21.1	37.4 ± 21.8	0.07
Nausea and vomiting	0 ± 0	6.1 ± 11.2	0.16
Pain	14.3 ± 26.2	18.2 ± 32.4	0.79
Dyspnea	14.3 ± 26.2	24.4 ± 21.6	0.30
Insomnia	19.0 ± 26.2	12.1 ± 16.8	0.67
Appetite loss	9.52 ± 16.2	9.1 ± 15.6	1.00
Constipation	9.5 ± 16.3	9.1 ± 15.6	1.00
Diarrhea	9.5 ± 16.3	9.1 ± 15.6	1.00
Financial difficulties	19.0 ± 37.8	15.2 ± 22.9	0.91

Data is shown as mean ± Standard Deviation.

Group 1, patients who underwent both total gastrectomy and esophagectomy.

Group 2, patients with previous history of gastrectomy who underwent both remnant gastrectomy and esophagectomy.

gastric cancer and QOL is influenced by the extent of resection [15]. We hypothesized that the postoperative QOL of patients who underwent total gastrectomy and esophagectomy should be greatly impaired. In addition, these 18 patients underwent surgery which took more than 10 h and 900 ml blood loss on average. We sought to evaluate their postoperative QOL and dysfunction using two survey instruments in this study.

We hypothesized that patients in Group 2 would have fewer symptoms than those in Group 1, because patients in Group 2 previously underwent gastrectomy and are already impaired when they underwent esophageal resection. However, the data in the present study show no significant differences between two groups in terms of postoperative QOL and dysfunction, as evaluated by both the EORTC QLQ-C30 and DAUGS 20 scoring systems. These

results show that postoperative QOL and dysfunction might be influenced more by their current patient status than their surgical history. We found a significant difference in only question 3 of the DAUGS20 survey between Groups A and B ($P = 0.04$). A tendency for improvement was shown in question 14. These results indicate that patients after upper gastrointestinal (GI) tract surgery can improve their eating style over time.

In this study, the DAUGS20 score after esophagectomy and total gastrectomy ($n = 18$) was 26.4 ± 13.2 . Weight loss after surgery was 11.0 ± 6.5 (%). Previous reports show a DAUGS 20 score after gastrectomy alone of 27.8 and after esophagectomy alone of 36.1 [9]. Weight loss after gastrectomy and esophagectomy was 11.2 and 12.9%, respectively [9]. Surprisingly, these results indicate less dysfunction than reported for patients undergoing either operation alone, even though the patients in this study underwent more extensive resections. The reconstruction technique used here may reduce regurgitation of intestinal fluid. In addition, patients in this study can augment peristaltic movement of food distally by manual compression of the subcutaneous jejunal segment. These patients may be satisfied in terms of postoperative QOL and dysfunction after simply surviving their disease.

This study has acknowledged limitations. Of 41 patients eligible for the study, 18 completed the questionnaires, resulting in a relatively small sample size. This study is based on voluntary completion of the two questionnaires. It takes about 20 min to complete these two questionnaires and some patients might consider this a burden. Second, the results are subjective, due to the nature of the survey instruments used. However, both instruments have been extensively tested and validated for evaluation of patients following esophagectomy and/or gastrectomy.

While reconstruction using a subcutaneously placed jejunal segment may be unusual for the patient, the postoperative QOL and dysfunctions after total gastrectomy and esophagectomy with this reconstruction seems to be reasonable.

5. Conclusion

Our results show that postoperative QOL and dysfunction might

Table 5
DAUGS 20 scores according to postoperative interval.

	Group A (n = 10)	Group B (n = 8)	p Value
total score	28.1 ± 12.4	23.3 ± 14.4	0.35
Question			
1. Do you feel more full halfway through a meal compared with how you felt before surgery?	2.7 ± 1.4	1.9 ± 1.4	0.25
2. Do you have a heavy sensation in your stomach after eating?	1.6 ± 1.3	0.9 ± 1.4	0.21
3. Do you suddenly feel bloated during a meal?	2.5 ± 1.2	1.25 ± 1.0	0.04
4. Do you feel a sensation of abdominal fullness after eating?	2.2 ± 1.8	1.0 ± 1.4	0.13
5. Have you lost your appetite?	0.7 ± 1.3	1.3 ± 1.5	0.36
6. Do you have difficulty in swallowing soft food?	1.9 ± 1.9	1.1 ± 1.0	0.58
7. Do you have a choking sensation when swallowing food?	1.4 ± 1.5	0.9 ± 0.8	0.61
8. Do you have difficulty in sleeping because of bitter tasting fluid regurgitating into your mouth?	0.7 ± 1.1	0.5 ± 0.5	1.00
9. Is any acidic fluid regurgitated into your mouth?	0.2 ± 0.4	0.4 ± 0.5	0.46
10. Do you vomit after meals?	0.6 ± 0.8	0.6 ± 0.7	0.88
11. Do you feel food retained in your chest?	0.5 ± 0.7	0.5 ± 0.5	0.88
12. Do you feel nauseated?	0.4 ± 0.7	0.9 ± 1.4	0.44
13. Do you have pain in the pit of your stomach after eating?	1.4 ± 1.5	0.5 ± 0.8	0.14
14. Do you have abdominal pain within 30 min of eating?	1.5 ± 1.6	0.4 ± 0.5	0.08
15. Do you feel fatigue or weakness within 2-3 hours after eating?	0.6 ± 0.7	0.5 ± 1.1	0.44
16. Do you feel sleepy within 2-3 hours after eating?	0.8 ± 0.8	1.6 ± 1.8	0.48
17. Do you have diarrhea?	2.3 ± 1.3	2.5 ± 1.1	0.68
18. Do you have soft stools?	1.8 ± 1.5	1.6 ± 1.2	1.00
19. Do you have less strength or a lower activity level?	2.5 ± 1.6	3.0 ± 1.3	0.53
20. Do you feel dizzy or unsteady when walking up stairs or slopes?	1.8 ± 1.4	2.0 ± 1.6	0.82

Data is shown as mean ± Standard Deviation.

Group A, within three years postoperatively.

Group B, more than three years postoperatively.

be influenced more by current status than by surgical history. Previous reports describe that the DAUGS 20 score after gastrectomy alone was 27.8 and after esophagectomy was 36.1 [9]. The DAUGS20 score of these 18 patients is lower than patients undergoing either operation alone. The reconstruction technique used may contribute to improved postoperative QOL and reduced dysfunction in patients undergoing total gastrectomy and esophagectomy.

Ethical approval

The ethics committee of Jichi Medical University Hospital approved this study.

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Conflicts of interest

No conflict of interest.

Author contribution

All authors in this manuscript contributed to the design of the study, analysis/interpretation of data, and drafting of this manuscript. AL helped in drafting the manuscript and interpretation of data. S.S and M.N collected questionnaires. S.S and Y.H obtained the written informed consent from the patients. S.S and Y.S performed statistical analysis. N.S, J.K and AL edited the manuscript. All authors have read and approved this manuscript for publication.

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Our study is not an RCT.

Guarantor

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Consent for publication

Written informed consent to participate and publish was obtained from all enrolled patients.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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