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Pre- and Post-Surgical Health-Related Quality of Life Evaluation of Esophageal Carcinoma Patients

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Abstract

For patients with esophageal carcinoma (ESCA), health-related quality of life (HRQoL) has now become an essential feature. To examine the quality of life of preoperative and postoperative ESCA patients, we used the European Organization for Research and Treatment of Cancer Quality of Life Core Questionnaire (EORTC QLQ C-30) and the Quality of Life Questionnaire Oesophageal 18 (QLQ-OES18). Using the EORTC QLQ-C30 and the QLQ-OES18 questionnaire, the analysis of the quality of life scores of 246 patients with oesophageal cancer who were operated on at the Sun Yat-sen University Cancer Centre during the period 2013 to 2015 was carried out. Differences between pre- and post-surgical EORTC QLQ C-30 and QLQ-OES18 scores were examined using the Student's t-test. Patients' global health status (QoL) decreased significantly one month after the operation but gradually recovered within a year. In terms of the role function, the emotional function, the cognitive function, and the perception and function variants, EORTC QLQ-C30 and QLQ-OES18 scores increased statistically significantly, as did clinical signs variables such as exhaustion, nausea, vomiting, pain, sleeplessness, decreased appetite, stomach pain, and economic hardship. After surgery, there was an improvement in functional and symptom domains in esophageal carcinoma patients. EORTC QLQ-C30 and QLQ-OES18 can be used to assess the HRQoL before and after surgical procedures.

Keywords

Esophageal Carcinoma, EORTC QLQ C-30, QLQ-OES18, Surgery, Quality of Life

1. Introduction

Esophageal cancer is a type of malignancy that has a high incidence and fatality rate worldwide [1]. China is one of the countries with a high incidence of this disease, with new cases of this cancer accounting for 49.7% of the recent global incidence [2]. The most common treatment for this disease is surgery [3] [4], providing a better prognosis for patients with early-stage esophageal cancer. Still, surgery is often related to higher complications and mortality [5]. Not all patients' quality of life improves significantly after esophageal cancer surgery [6] [7]. Many esophageal cancer patients have dysphagia, food restriction, reflux, dysphagia, dry mouth, diarrhea, and cough after surgery, which have serious implications for the patient's quality of life [6].

Treatment findings reported by patients, mainly the health-related quality of life (HRQoL), are increasingly becoming an objective as vital as survival and extent of esophageal carcinoma resection [8]. In recent studies, the European Organization for Research and Treatment of Cancer Quality of Life Core Questionnaire (EORTC QLQ-C30) and the Quality of Life Questionnaire Oesophageal 18 (QLQ-OES18) are widely used for tumor patients, including colorectal cancer, breast cancer, and hepatocellular carcinoma [9] [10] [11] [12]. We aim to determine the EORTC QLQ-C30 and QLQ-OES18 scores in/at patients after esophageal cancer surgery managed in our hospital.

In China, the most effective therapy for people who have early-stage esophageal cancer is surgery. But many ESCA patients choose non-surgical treatment because of concerns about the postoperative quality of life. When selecting different treatment modalities, patients care about the survival time and care about the quality of life. Thus, an assessment of their HRQOL could provide a more helpful message for their choice of preoperative and postoperative treatment [13]. The impact of chest surgery on ESCA and their postoperative complications, such as dyspnea, trouble with coughing, and pain during the perioperative period, contribute to their deterioration of HRQOL after surgery [14] [15]. Regrettably, lack of studies on the impact of surgery on the HRQOL of patients with ESCC. Therefore, the present study aims to describe the HRQOL before and after surgery for ESCC patients in our hospital.

2. Materials and Methods

2.1. Participants

The inclusion criteria of this study were as follows: 1) patients performed operations at Sun Yat-sen University Cancer Center from 2013 to 2015; 2) patients were diagnosed as stage I - IV by neck-thorax-abdomen contrast-enhanced computed tomography or positron emission tomography-computed tomography before operation; 3) patients were diagnosed with ESCA in the preoperative pathological examination; 4) patients were investigated EORTC QLQ C30 and QLQ-OES18. The study's elimination criteria were as follows: under 18 years old, and with cognitive and mental disorders, with a history of other tumors. Fi-

nally, the data of 246 ESCA patients were analyzed. General information regarding the patients, including socio-demographic data (gender, age, occupation, marital status, educational level, economic status) and clinical features (tumor location, surgical method, TNM stage and pathological classification), were collected. Each patient in the study signed informed consent. Face-to-face structured or telephone interviews were conducted during the subject's outpatient clinic visit, including pre-operation, one month after the surgery, as well as one year after the surgery. The investigation project was authorized by the Research Ethics Committee of Sun Yat-sen University Cancer Centre.

2.2. Demographics and Clinical Characteristics

We categorize eligible participants by gender (male and female), age (≤60 and >60), occupation (worker, farmer, teacher, civil servant, self-employed, other), marital status (unwed, wed, widowed, divorced), educational attainment (primary, junior, senior or secondary, university and undergraduate and above), economy (poor, fair, good), medical insurance (own expense, urban employee medical insurance, rural cooperative medical care), type of histology (squamous cell carcinoma, microcellular carcinoma, and adenocarcinoma), location of the tumor (upper, central, inferior, gastro-oesophageal junction, and cardiac), as well as the type of surgery (Sweet, Ivor Lewis, McKeown).

2.3. Surgical Types

Sweet is a surgical method to remove esophageal cancer through the left thoracic posterolateral incision and replace the esophagus with the stomach. It is the standard operation for lower esophageal cancer. The left lateral thoracic incision is difficult for the dissection of abdominal lymph nodes, especially in the upper mediastinum. Ivor-Lewis procedure is a radical resection of esophageal cancer through two incisions in the right chest and abdomen. It has obvious advantages in the extent of esophageal cancer resection and lymph node removal. A small incision on the right posterolateral side of the chest is beneficial to the thoracic esophagus, and the lymph nodes around the upper mediastinum, para-esophageal, hilum, and right recurrent laryngeal nerve are thoroughly dissected. By opening the abdominal cavity, the gastric tissue can be better freed, the possibility of injury to the right omentum blood vessel and the right gastric blood vessel is reduced, and the dissection of abdominal lymph nodes becomes very convenient. McKeown, namely neck, thoracic, abdominal three incision surgery, gastro-esophageal neck anastomosis. The advantage of this operation is that it can perform a true three-field lymph node dissection.

2.4. Health-Related Quality of Life Assessment

Participants' quality of life was evaluated by using the Health-Related Quality of Life Questionnaire for Cancer Patients, Quality of Life Questionnaire Core 30, and the Disease-Specific Esophagus Questionnaire, the Quality of Life Ques-

tionnaire Esophagus 18, developed by the European Organisation for the Study and Treatment of Cancer. [12] [16]. The questionnaire has been widely used in researching various cancers in China [11] [17]. The EORTC QLQ-C30 consists of 30 items and 15 dimensions, including a Global Health Quality of Life Scale, five functions scales (physics, roles, emotions, social, cognition), three condition scales (exhaustion, pain, and sickness/vomiting), and six individual scales (breathing difficulties, loss of appetite, sleep disturbances, constipation, diarrhea, finances difficulties). The QLQ-OES18 consists of 17 items, consisting of ten symptom charts (difficulty swallowing, problems eating, retching, achiness, difficulty swallowing saliva, choking while eating, drying of the mouth, difficulty with taste, difficulty coughing, difficulty speaking).

The EORTC QLQ-C30 and OES-18 questionnaires increased never at all (1 point), somewhat (2 points), considerably (3 points), and very (4 points) in response intensity on the functional and symptom scales. The Global Health Status Scale uses a 7-point scale, which slopes from very bad to very good. (1 to 7 points) [16] [18]. The calculation formula converted the original score was converted into 0 - 100 points by the calculation formula. Global Health Status/QOL selected for this study and the functional scales (including physical, roles, emotions, cognition, and the social function), symptom scales (including fatigue, nauseous, vomiting, and aches and pains), and single-item scales (including breathlessness, sleeplessness, loss of appetite, constipation, diarrhea, and economic difficulties) in QLQC30. Additionally, the OES-18 symptom scale also selected symptoms such as difficulty swallowing, feeding, retching, aches and pains, difficulty swallowing saliva, choking when swallowing, dry mouth, difficulty with taste, difficulty coughing, and difficulty speaking. Finally, statistical assessments of the impact of these scales on the health-related quality of life of ESCA patients were carried out.

2.5. Statistical Analysis

The distribution of the demographic and clinical features of the study participants was done using descriptive statistics. Differences between pre-and post-surgical EORTC QLQ-C30 and OES-18 scores were analyzed using the Student's t-test. All analyses were conducted utilizing the IBM Statistical Product and Service Solutions (SPSS) version 25 (IBM, Armonk, NY, USA). Differences with a two-tailed P-value of <0.05 are considered statistically significant.

3. Results

As shown in Table 1, 246 patients with an average age of 60.22 ± 8.3 years (38 to 82 years) were enrolled in this study. There were 182 male patients, accounting for 74%, and 64 female patients, accounting for 26% of the total. Almost all patients (96.3%) were married. About one-third of patients were workers (9.8%) or farmers (25.6%). Two-thirds of patients only had primary (36.6%) or junior high school (31.7%) education, and all completed treatment, and survey. According

Table 1. Socio-demographic characteristics of study participants.

Demographic	No. of patients	%
Total	246	100
Sex		
Male	182	74
Female	64	26
Age (years)		
Mean (SD)	60.22 (8.31)	
Range of age	38 - 82	
<60	109	44.3
≥60	137	55.7
Occupation		
Worker	24	9.8
Farmer	63	25.6
Teacher	5	2.0
Civil servant	11	4.5
Self-employed	31	12.6
Other	112	45.5
Marriage		
Unmarried	1	0.4
Married	237	96.3
Divorce	0	0
Widowed	8	3.3
Education		
Primary school	90	36.6
Junior high school	78	31.7
High school or secondary school	55	22.4
College	13	5.3
Undergraduate and above	10	4.1
Economy		
Poor	62	25.2
Fair	120	48.8
Good	64	26.0
Medical insurance		
Own expense	48	19.5
Urban Employee Medical Insurance	44	17.9

Continued

Urban Residents Medical Insurance	33	13.4
Rural Cooperative Medical Care	121	49.2
Histological type		
Squamous cell carcinoma	213	86.6
Small cell carcinoma	9	3.7
Adenocarcinoma	24	9.8
Tumor location		
Upper	23	9.3
Middle	147	59.8
Lower	51	20.7
Gastro-esophageal junction	18	7.3
Cardiac	7	2.8
Operation type		
Sweet	120	48.8
Ivor Lewis	66	26.8
McKeown	60	24.4
TNM stage		
I	39	15.9
II	96	39.0
III	106	43.1
IV	4	1.6
Unknown	1	0.4

to the location of the tumor, there were 23 patients (9.3%) in the upper thoracic segment, 147 patients (59.8%) in the middle thoracic segment, 51 patients (20.7%) in the lower thoracic segment, 18 patients (7.3%) in the gastroesophageal junction, and 7 patients (2.8%) in the cardia. According to the pathological classification, squamous cell carcinoma accounted for 86.6%, small cell carcinoma accounted for 3.7%, and adenocarcinoma accounted for 9.8%. Among the different surgical methods, 120 patients received Sweet surgery (48.8%), with patients receiving Ivor Lewis and McKeown accounting for 66 (26.8%) and 60 (24.4%) patients, respectively. In addition, there were 20 patients with recurrence of the disease within one year.

Table 2 presents the scores for the EORTC QLQ-C30 on the Global Health Status, Functional, and Symptom scales/items, with the Functional scale including Physical, Character, Emotional, Social and Cognitive functioning. Symptom scales include exhaustion, sickness and nausea, and pain. Individual item scales include dyspnea, sleeplessness, loss of appetite, constipation, diarrhea, and economic

Table 2. EORTC QLQ C-30 scores of study participants in pre-operation, one month, and one year after operation.

	Mean Value (95% CI)			Significant Differences		
	Pre-operation	One month after operation	One year after operation	P-value A	P-value B	P-value C
Global Health Status/QoL	140.0 (136.2 - 143.9)	68.7 (67.0 - 70.4)	82.7 (80.4 - 85.0)	0.000	0.000	0.000
Physical Functioning	97.0 (95.8 - 98.3)	85.8 (84.5 - 87.0)	93.5 (92.1 - 95.0)	0.000	0.000	0.000
Role Functioning	57.3 (54.6 - 60.1)	61.6 (59.1 - 64.0)	86.2 (83.2 - 89.3)	0.024	0.000	0.000
Emotional Functioning	60.8 (58.6 - 63.1)	84.7 (82.0 - 87.5)	89.3 (86.8 - 91.7)	0.000	0.000	0.004
Cognitive Functioning	78.2 (75.8 - 80.7)	92.0 (89.9 - 94.0)	94.4 (92.8 - 96.0)	0.000	0.000	0.065
Social Functioning	61.9 (58.4 - 65.5)	60.9 (58.3 - 63.5)	90.5 (87.4 - 93.5)	0.690	0.000	0.000
Fatigue	19.7 (17.3 - 22.0)	31.1 (28.1 - 34.1)	15.3 (12.5 - 18.1)	0.000	0.013	0.000
Nausea and Vomiting	8.15 (5.98 - 10.3)	8.77 (6.02 - 11.53)	3.90 (2.31 - 5.48)	0.727	0.003	0.003
Pain	8.59 (6.87 - 10.3)	22.8 (20.1 - 25.5)	4.78 (3.10 - 6.47)	0.000	0.002	0.000
Dyspnoea	1.41 (0.32 - 2.50)	14.0 (11.3 - 16.6)	10.1 (7.48 - 12.7)	0.000	0.000	0.034
Insomnia	41.48 (38.33 - 44.64)	19.50 (16.18 - 22.82)	10.81 (7.94 - 13.69)	0.000	0.000	0.000
Appetite Loss	38.12 (34.73 - 41.50)	17.19 (13.43 - 20.95)	6.38 (3.92 - 8.84)	0.000	0.000	0.000
Constipation	8.15 (5.97 - 10.33)	5.14 (2.80 - 7.48)	2.12 (0.75 - 3.49)	0.081	0.000	0.024
Diarrhoea	1.42 (0.33 - 2.52)	30.30 (26.58 - 34.02)	24.95 (21.30 - 28.60)	0.000	0.000	0.031
Financial Difficulties	21.80 (17.56 - 26.05)	14.36 (11.18 - 17.53)	4.43 (2.22 - 6.64)	0.004	0.000	0.000

Significant differences between before surgery and one month after surgery (P-value A); Significant differences between before surgery and one year after surgery (P-value B); Significant differences between one month after surgery and one year after surgery (P-value C).

hardship. There was a significant difference between post- and pre-operative EORTC QLQ C-30 scores.

ESCA patients' global health status significantly decreased after surgery. In the functional scales, patients' physical function decreased significantly within one month after surgery but gradually recovered within a year after surgery. Other functioning, including role emotional, social, and cognitive functioning, improved significantly after surgery. Patients felt severe fatigue and pain one month after the operation on the symptom scales, but the symptoms were relieved within a year after the operation. Besides, the symptom of nausea and vomiting did not resolve until one year after surgery. Immediate relief after surgery in terms of insomnia, loss of appetite, constipation, and financial difficulties. However, dyspnea and diarrhea remained severe until one year after surgery.

The EORTC QLQ-OES18 scale can be viewed in Table 3. Symptoms of pain, difficulty swallowing saliva, and choking while swallowing were relieved after surgery. However, the symptom of dysphagia, problems with diets, regurgitation, dry mouth, taste disturbances, coughing, and difficulty speaking all worsened after the operation. When one year after surgery, the symptom of eating,

Table 3. EORTC QLQ-OES18 scores of study participants in pre-operation, one month and one year after operation.

	Mean Value (95% CI)			Significant Differences		
	Pre-operation	One month after operation	One year after operation	P-value A	P-value B	P-value C
Dysphagia	15.54 (13.72 - 17.36)	18.20 (16.00 - 20.40)	18.67 (15.74 - 21.60)	0.062	0.074	0.776
Problems with eating	25.70 (24.20 - 27.20)	32.04 (30.23 - 33.85)	24.60 (22.89 - 26.31)	0.000	0.315	0.000
Reflux	0.97 (0.22 - 1.72)	29.87 (26.79 - 32.95)	25.26 (22.45 - 28.07)	0.000	0.000	0.022
Pain	10.04 (8.65 - 11.44)	9.75 (8.25 - 11.24)	2.42 (1.56 - 3.28)	0.750	0.000	0.000
Trouble swallowing saliva	30.12 (24.26 - 35.98)	4.81 (2.97 - 6.64)	2.67 (0.81 - 4.53)	0.000	0.000	0.103
Choked when swallowing	29.25 (25.34 - 33.16)	24.64 (20.46 - 28.82)	11.87 (8.68 - 15.07)	0.075	0.000	0.000
Dry mouth	1.06 (0.21 - 1.90)	9.57 (6.89 - 12.25)	3.90 (2.27 - 5.52)	0.000	0.003	0.000
Trouble with taste	0.70 (−0.14 - 1.56)	5.49 (3.33 - 7.65)	2.30 (0.65 - 3.95)	0.000	0.095	0.018
Trouble with coughing	0.53 (−0.24 - 1.31)	15.07 (11.88 - 18.25)	1.59 (0.35 - 2.83)	0.000	0.158	0.000
Trouble talking	0.53 (−0.24 - 1.31)	11.2 (7.60 - 14.85)	2.13 (0.76 - 3.51)	0.000	0.049	0.000

Significant differences between before surgery and one month after surgery (P-value A); Significant differences between before surgery and one year after surgery (P-value B); Significant differences between one month after surgery and one year after surgery (P-value C).

dry mouth, tasting, coughing, and talking were better than one month after surgery. It is worth noting that dysphagia symptoms are still very severe up to one year after surgery. As a result of the surgery, the patient developed severe reflux symptoms postoperatively. In addition, surgical methods had effects on the quality of life. Patients with McKeown procedure had more difficulties in swallowing saliva than those with Ivor-Lewis procedure one year after operation ($P < 0.05$). Sweet operation was more prone to cause an emotion question than McKeown one year after surgery ($P < 0.05$). Compared with cases of Sweet, cases of McKeown procedure were more likely to have appetite loss and trouble swallowing saliva one year after surgery ($P < 0.05$).

4. Discussion

In the current comprehensive treatment concept of esophageal carcinoma, HRQoL has been included as a management outcome [19]. Our study shows evidence of significant improvement in patients' HRQoL after surgery. Changes in overall quality of life and common cancer symptoms can be accurately reflected, but not particular esophageal cancer symptoms, for instance, dysphagia and reflux. Based on QLQ-C30, the supplementary scale of esophageal cancer-specific symptoms improved, including QLQ-OES24 and QIQ-OES18. The QLQ-OES24 focuses on symptoms and feelings specific to esophageal cancer, consisting of six domains (dysphagia, feeding problems, eating, dyspepsia, pain) and five single items (dry mouth, cough, speak, hair loss, and mood items). A total of 24 specific symptom items were included. The QLQ-OES24 questionnaire is

complex and time-consuming and cannot be completed accurately. QLQ-OESl8 is a simplified version of QLQ-0ES24, widely used in clinical applications. QLQ-0ES18 includes four domains of symptoms in patients with esophageal cancer (swallowing difficulties, eating problems, regurgitation, and aches and pains) and six individual cases (difficulty swallowing saliva, choking while swallowing, thirst, tenderness, cough, and speech). EORTCQLQ-0ESl8 can be used to evaluate patients' quality of life after treatment, including radical esophagectomy, radiochemotherapy, endoscopic therapy, palliative radiotherapy, and chemotherapy.

Previous studies have examined the effect of treatment on HRQOL in ESCA patients. Different treatment modalities affect patients' HRQOL outcomes [20]. The researchers in Sweden observed that up to 50% of patients with poorer quality of life after surgery, which includes poorer body, role, emotion, and social functioning after esophagectomy compared with a level before treatment [21]. Besides, Scarpa M *et al.* assessed the QOL scores between ESCA surgery patients and those who received surgery and adjuvant chemoradiotherapy assessed the QOL scores in ESCA surgery patients versus those undergoing surgery and adjuvant chemoradiation [14]. Similarly, Scarpa M found that patients who only received surgery suffered severe pain and had poorer physical and emotional functions than the surgery and adjuvant chemoradiotherapy group. However, patients with surgery and adjuvant chemoradiotherapy exhibited poorer physical functions, including higher degrees of exhaustion, breathlessness, and diarrhea after treatment. HRQOL of patients with esophageal cancer is affected by many factors [22]. CY Chen *et al.* found that for patients with early-stage ESCC, surgery-only patients generally outperformed surgery and concurrent chemoradiotherapy and chemoradiotherapy groups [23]. Moreover, better role and emotional functioning in patients with surgery and concurrent chemoradiation than in patients with chemoradiation. For patients with advanced ESCC, there was no remarkable variation in HRQOL scores between the chemoradiotherapy and surgery groups as well as the concurrent chemoradiotherapy group. Besides different treatment modalities, both surgical and postoperative medical complications were associated with worse postoperative HRQOL outcomes [24]. There are differences in patient's postoperative quality of life with different surgical methods [25]. In terms of reflux esophagitis, the incidence of endothoracic anastomosis is higher than that of cervical anastomosis [26].

The study measured the HRQoL of esophageal carcinoma patients operated in our hospital using the EORTC QLQ-C30 and QLQ-OES18 questionnaires. This research data confirmed that HRQoL measurement in esophageal carcinoma patients provided many benefits, whether assessed from clinical symptoms and functional status. However, deteriorations were seen in the general health status. The patients' symptoms, include a noticeable improvement in sickness and nausea, pain, sleeplessness, loss of appetite, and constipation. For patients with esophageal carcinoma, the purpose of esophagectomy was not only to remove the

esophageal tumor and provide long-term survival but also to improve quality of life. However, the patient's digestive tract was reconstructed due to the effects of the esophagectomy Patients always complain of severe dyspnoea and diarrhea after surgery [27]. Although patients' symptoms in the study one year after the operation have eased compared to one month after the operation, to prevent dyspnea and diarrhea, greater attention should be paid to respiratory and dietary care, Because most patients only eat liquid food, the risk of anastomotic stenosis or gastrointestinal reflux increases after surgery [28]. Liquid diets always could not provide adequate nutrition but cause reflux for postoperative patients. Postoperative patients always have low immunity and a high risk of postoperative complications. Upper gastrointestinal reflux can cause complications such as anastomotic leakage or lung infection [29]. Due to the increased nutritional needs of postoperative patients, we recommend a diet high in protein-calorie distribution, high in calorie density, and high in branched-chain amino acids. Amino acids (arginine, glutamine), omega-3 fatty acids, vitamin C, and D are beneficial to malnutrition patients [30] [31].

5. Conclusion

Surgery plays a big part in the well-being of patients with esophageal cancer, mainly manifested as improvement in functional and symptom domains after surgery. However, esophagectomy aggravated the patient's symptoms of dyspnea, diarrhea, dysphagia, and reflux. EORTC QLQ-C30 and QLQ-OES18 can be used to assess the quality of life of esophageal cancer patients both preoperatively and postoperatively.

Data Availability

The data collections which were in use and under analysis in the present study are open to a reasonable request from the respective authors.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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