Efficacy of Swallowing Training Combined with Nutritional Intervention on Quality of Life in Laryngeal Cancer Patients with Dysphagia

Jian-Feng WANG¹,a, Da-Hai LIU²,b*
¹ Department of Radiotherapy, China-Japan Union Hospital of Jilin University, Changchun, China,
² Vascular Surgery Department of Vascular Surgery, China-Japan Union Hospital of Jilin University, Changchun, China

a jfwang@jlu.edu.cn , b radiation1978@163.com
* Corresponding author

Keywords: Laryngeal neoplasm, Dysphagia, Swallowing training, Quality of life.

Abstract. Objective: To investigate the efficacy of swallowing training combined with nutritional intervention on quality of life in laryngeal cancer patients with dysphagia.

Patients and Methods: A total of 66 patients who suffered from laryngeal cancer with dysphagia were selected and divided into control group (CG) and intervention group (IG), each of 33, according to random number tables. Both groups received total laryngectomy and prophylactic radiotherapy and were given routine health counseling and swallowing training, while intervention group was additionally provided with nutritional intervention. To evaluate all patients with Video Fluoroscopic Swallowing Examination (VFSE), Scored Patient-Generated Subjective Global Assessment on Nutritional Status (PG-SGA), and Quality of Life Questionnaire-core 30 (QLQ-c30) after radiotherapy and three months after.

Results: VFSE, PG-SGA, QLQ-c 30 scores after swallowing training in IG were significantly greater than data collected instantly before swallowing training in IG and those collected after swallowing training in CG (P<.05). VFSE score after swallowing training in CG was significantly greater than data collected instantly before swallowing training (P<.05). Difference between before and after swallowing training on VFSE, PG-SGA, and QLQ-c 30 scores in IG were statistically significant greater than those of CG (P<.05).

Conclusion: Swallowing training combined with nutritional intervention can improve swallowing function, nutritional status and quality of life in laryngeal cancer patients with dysphagia.

Introduction

Dysphagia is a common complication in laryngeal cancer patients, approximately 30-50% of these patients are suffering from different degrees of dysphagia due to tumor invasion, surgical injuries, and postoperative radiotherapy. The symptom affects energy, protein and water intake, and further leads to malnutrition, aspiration, aspiration pneumonia, etc. Moreover, conditions and nutritional status of patients reduce treatment effect and quality of life [¹, ²].

At present, researchers are focusing on the harm brought by dysphagia, and functional improvement brought by swallowing training after laryngeal cancer surgery. However, there
is few reports focus on whether swallowing training combined with nutritional intervention triggers more effective clinical efficacy. Therefore, in this study we will evaluate the effect of swallowing training combined with nutritional intervention on quality of life in laryngeal cancer patients with dysphagia.

**Materials and Method**

**General Data**

Subjects who met the following inclusion criteria were eligible for participation: (1) patients with total laryngectomy and whose postoperative pathology indicated squamous cell carcinoma; (2) had greater than 1 on VFSE prior to training; (3) with conscious and was able to participate in swallowing training; (4) with integral gastrointestinal tract; (5) can understand correctly and complete the questionnaire. During January 2016 to September 2017, 66 laryngeal cancer patients were selected, and were randomly divided into intervention group (IG) and control group (CG), each of 33, according to random number tables. There was no significant difference on gender, age, stage, education background, family income, radiation dose, or other general information between the groups ($P>0.05$), as shown in Table 1. This study was approved and reviewed by the Institutional Ethical Board of the China-Japan Union Hospital of Jilin University and obtained informed consent from patients and their family.

| Table 1. Statistical analysis of general data of 2 groups of patients. |
|---|---|---|---|---|---|---|
| Group | n | Gender(n) | Age | Education | Family Income | Dose of RT |
| | | Male | Female | (y, x±s) | (y, ±s) | (Million CNY, ±s) | (Gy, ±s) |
| Intervention group | 33 | 22 | 11 | 58.03±11.54 | 10.01±3.46 | 8.90±3.45 | 55.23±5.32 |
| Control group | 33 | 23 | 10 | 56.89±14.14 | 9.48±4.05 | 7.24±5.23 | 54.76±5.33 |

**Therapeutic Methods**

Research team members included oncology physician, otolaryngologist, diettitan and speech therapist with training protocol. The patients in two groups were assessed weekly according to PG-SGA scale. The nutrition intervention was increased on the basis of those in the intervention group.

**Swallowing training protocol.** The swallowing training protocol was designed based on a literature review and the experience of the research team. Two training options were available: indirect (to strengthen swallowing muscles) and direct (postural exercises while swallowing). The protocol was designed to maintain flexibility of oral and pharyngeal structures in order to improve swallow function which included tongue resistance, tongue base retraction, mendelson manoeuvre, supraglottic swallow and jaw exercises. To take the training one time a day, 30 minutes for each time, seven days a week for three months.

**Nutrition intervention protocol.** The individualized nutritional intervention was carried out in IG according to the type and the degree of dysphagia. To recommend a safer bolus volume
and viscosity for each patient according to whose VFSE and the degree of dysphagia. The quantity and the type of daily food intake were recorded, and energy and nutrients intake were calculated. The aims of daily on total energy and protein supply were 6-7kJ·kg⁻¹·D⁻¹ and 1.2-1.5g·kg⁻¹·D⁻¹. If dietary intake did not reach the target or the PG-SGA score was more than 4 points, oral nutritional supplements or nasogastric tube nutrition treatment were carried out to reach the target.

**Evaluation of Efficacy**

Swallowing function, nutritional status and quality of life in 2 groups were evaluated by VFSE, PG-SGA, and QLQ-c30 at the end of the radiotherapy and 3 months after the radiotherapy.

VFSE is considered as the “diagnostic gold standard” to evaluate dysphagia and is of high sensitivity in comprehensive evaluation of oropharyngeal swallowing efficiency (includes silent aspiration and post-swallow pharyngeal residue). VFSE results are used to ascertain the type and degree of dysphagia and track the therapeutic efficacy [3].

PG-SGA was developed based on Subjective Global Assessment (SGA). Clinical studies found that PG-SGA is the most ideal and widely used tool to evaluate nutritional status of patients with tumors. PG-SGA is recommended by ANA as “the first choice to evaluate the nutrition of cancer patients” [4].

European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) is the most validated questionnaire of life tool in oncology and commonly and world widely. It consists of three sections as general health status scale, functional scale, and symptom scale, and with 30 questions in total [5].

**Statistical Analysis**

The statistical data was analyzed with SPSS 18. Comparing mean and standard deviations of demographical data and questionnaire scores between the two groups with the Wilcoxon rank sum test, \( P \) values less than 0.05 were considered statistically significant.

**Results**

**Statistical Analysis of VFSE, PG-SGA and QLQ-c 30 Scores of Patients in the 2 Groups before and after Swallowing Training**

VFSE, PG-SGA, QLQ-c 30 scores after swallowing training in IG were significantly greater than data collected instantly before swallowing training \( (P<.05) \). VFSE scores after swallowing training in CG was significantly greater than data collected instantly before swallowing training \( (P<.05) \) (Table 2).

**Comparison of the Efficacy of Patients between the 2 Groups after Swallowing Training**

VFSE, PG-SGA, QLQ-c 30 scores after swallowing training in IG were significantly greater than those collected in CG \( (P<.05) \) (Table 2).
Table 2. Statistical analysis of VFSE, PG-SGA, QLQ-c 30 before and after swallowing training in 2 groups (x±s).

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>VFSE</th>
<th>PG-SGA</th>
<th>QLQ-c 30</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>intervention group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>end of RT</td>
<td>33</td>
<td>6.98±2.78</td>
<td>4.65±1.54</td>
<td>49.34±7.17</td>
</tr>
<tr>
<td>3 months after RT</td>
<td>33</td>
<td>3.36±2.52&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2.91±1.63&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>57.23±8.33&lt;sup&gt;ab&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>control group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>end of RT</td>
<td>33</td>
<td>6.46±2.43</td>
<td>4.56±1.32</td>
<td>48.62±7.13</td>
</tr>
<tr>
<td>3 months after RT</td>
<td>33</td>
<td>4.24±2.69&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.79±1.52</td>
<td>52.24±8.24</td>
</tr>
</tbody>
</table>

VFSE=Video Fluoroscopic Swallowing Examination, PG-SGA=Scored Patient-Generated Subjective Global Assessment, QLQ-c30=Quality of Life Questionnaire-core 30, RT=radiotherapy.
The standardized score intra-group comparison before and after swallowing training, <sup>a</sup><i>P</i>&lt;0.05; The standardized score inter-group comparison, <sup>b</sup><i>P</i>&lt;0.05.

**Comparison of the Difference before and after Swallowing Training between the 2 Groups**

Difference between before and after swallowing training of VFSE, PG-SGA, and QLQ-c 30 scores in IG were statistically significant greater than those of CG(<i>P</i>&lt;0.05) (Table 3).

Table 3. Difference between before and after swallowing training on VFSE, PG-SGA, QLQ-c 30 scores in 2 groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>VFSE</th>
<th>PG-SGA</th>
<th>QLQ-c30</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>intervention group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>3.64±2.12&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.92±1.45&lt;sup&gt;a&lt;/sup&gt;</td>
<td>8.28±7.79&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td><strong>control group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>5.23±1.97</td>
<td>0.69±1.25</td>
<td>4.45±6.90</td>
<td></td>
</tr>
</tbody>
</table>

VFSE=Video Fluoroscopic Swallowing Examination, PG-SGA=Scored Patient-Generated Subjective Global Assessment, QLQ-c30=Quality of Life Questionnaire-Core 30. The standardized score in intervention group compared to that control group, <sup>a</sup><i>P</i>&lt;0.05.

**Discussion**

Swallowing is a complex process involving many muscles, cranial nerves and multiple reflex, which requires a synergistic action of oral, pharynx, larynx and esophagus. There is high incidence of dysphagia in laryngeal cancer patients because of the effects of tumor invasion and treatment. The syndrome leads to malnutrition, dehydration, weight loss, eating-drinking-phobia, and affects the treatment effect and reduces the quality of life[6].

In this study, patients with dysphagia after laryngectomy and radiotherapy were diagnosed by VFSE, and swallowing training was considered as the basis of rehabilitation therapy. Radiotherapy can lead to dysphagia by means of causing swelling and ulceration of oral mucosa, reducing saliva secretion, damaging cranial nerves which result in tongue movement.
disorder and pharyngeal cavity sensation weaken\textsuperscript{7}. Kraaijenga \textsuperscript{8} found that activities of tongue and oropharynx muscles, swallowing function are improved through the training intervention of lips, mandible, tongue and swallowing muscles. Our results suggest that the training of swallowing function begins immediately after radiotherapy instantly, and plays a positive role to improve the swallowing function in two groups during three months of swallowing training significantly.

Malnutrition is a common problem among patients with laryngeal cancer, which leads to fatigue, low immunity, increased complications, prolonged hospitalization, and reduces the clinical effectiveness \textsuperscript{9}. \textbf{37.5\%} of laryngeal cancer patients lose more than 5\% of their body weight within two weeks after operation. The study had shown that nutrition intervention can increase energy protein intake, maintain weight and improve quality of life for patients with head and neck cancer receiving radiotherapy, and has a positive effect on therapeutic effect \textsuperscript{10}. Our study found that swallowing training combined with nutrition intervention including individualized diet suggestion and timely nutritional supplement for patients at nutritional risk can significantly improve nutritional status of laryngeal cancer patients with dysphagia.

Quality of life is a multi-factorial concept which is related to physical, functional, psychological and social well-being. It has become a new standard for evaluating the curative effect of malignant tumor. Hypofunction, chewing pain and swallowing dysfunction in patients with head and neck cancer decreases appetite, leads to malnutrition, decrease physical and social activities, and reduces the quality of life of patients \textsuperscript{11}. The results are in accordance with the study of Prevost \textsuperscript{12} which confirmed that dietary status of patients is closely related to their quality of life. Patients with adequate energy and protein intake have better quality of life. Our study found that swallowing training combined with nutrition intervention improves dietary intake and the quality of life, especially for patients with nutritional risk.

To sum up, swallowing training combined with nutrition intervention can improve swallowing function, nutritional status, and quality of life of patients with dysphagia, and it is worthy of clinical application.

\textbf{References}


