Scientific Research Publishing

Open Journal of Internal Medicine, 2021, 11, 265-274
https://www.scirp.org/journal/ojim
ISSN Online: 2162-5980
ISSN Print: 2162-5972

Impact and Analysis of Prognostic Factors in Patients with Non-Metastatic Esophageal Squamous Cell Carcinoma: A Retrospective Single Institution Study

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How to cite this paper: Keita, M., Bah, M., Koundouno, A.M., Diallo, M., Camara, A., Conde, I.K., Shen, W.B., Traore, B. and Zhu, S.C. (2021) Impact and Analysis of Prognostic Factors in Patients with Non-Metastatic Esophageal Squamous Cell Carcinoma: A Retrospective Single Institution Study. *Open Journal of Internal Medicine*, **11**, 265-274.
https://doi.org/10.4236/ojim.2021.114023

Received: November 5, 2021
Accepted: December 25, 2021
Published: December 28, 2021

Abstract

Objective: To investigate the impact of local tumor factors on the prognosis of non-metastatic esophageal squamous cell carcinoma patients. **Methods:** We performed a retrospective analysis of data from 278 consecutive esophageal squamous cell carcinoma patients between January 2009 and December 2016. The prognosis factors such as the GTV volume, GTV maximum diameter, and GTV length were analyzed. **Results:** The results of ROC curve analysis showed that prognosis critical values of the GTV volume, GTV maximum diameter, and GTV length were 27.98 cm^3, 1.80 and 5.85 cm, respectively. The result of the univariate analysis showed that the GTV volume (P = 0.0184), GTV maximum diameter (P = 0.0246), and GTV length (P = 0.0035) were the prognostic factors for overall survival; the barium meal length (P = 0.0149) was the prognostic factor for local control. The multivariate analysis showed that the barium meal length (P = 0.0013), GTV maximum diameter (P = 0.0047), and GTV length (P = 0.0032) as the independent prognostic factors associated with overall survival; the barium meal length (P = 0.0037) was the only independent prognostic factors for local control. **Conclusion:** The esophageal lesion length was the main prognosis factor for patients with non-metastatic esophageal squamous cell carcinoma. Therefore, we suggest that the physician must give enough attention to these patients in clinical practice, and give active treatment.

Keywords

Esophageal Squamous Cell Carcinoma, Radiotherapy, Non-Metastasis,

Tumor Local Factors, Prognosis

1. Introduction

There are many prognostic factors in patients with esophageal squamous cell carcinoma (SCC) receiving radiotherapy. Among them, the local tumor factors of esophageal lesions, such as primary tumor, maximum diameter, lesion length, and depth of invasion are closely related to the prognosis of patients. According to Boggs, in sixty-seven patients treated for esophageal cancer with chemoradiotherapy followed by esophagectomy, the primary tumor volume was the only multivariate predictor for overall survival (P = 0.0012) and progression-free survival (P = 0.030) at 5-years, rather than traditional TNM staging [1]. Nowadays, related published data are common, but most of the patients in the literature have different stages, especially those with positive lymph node metastasis, which may affect the results of the data analysis. To clarify the predictive value of local tumor factors in esophageal SCC patients receiving radiotherapy, we analyzed 278 cases of consecutive non-metastatic esophageal SCC patients.

2. Material and Method

2.1. Eligibility Criteria

The eligibility criteria included 1) Adults patients with newly diagnosed esophageal SCC, 2) The Karnofsky performance status ≥ 70%, 3) Single and primary esophageal lesion, with a wall thickness of >5 mm on CT; 4) Patients with complete CT scan of the chest, esogastroscopy, and barium meal esophagogram before receiving radiotherapy; 5) No supraclavicular, mediastinal or abdominal lymph node metastases or distant organ metastases detected on CT, MRI or PET/CT; 6) No prior cancer therapy. All patients with distant metastases or with any serious illnesses that would affect the treatment were excluded from this study.

2.2. Patient Characteristics

From January 2009 to December 2016, 278 consecutive patients with esophageal SCC received definitive radiotherapy in our radiotherapy department, of whom 193 were male and 85 were female; their ages ranged from 37 to 89 years, with a median of 67 years; 16 patients had lesions in the cervical esophagus, 81 in the upper thoracic esophagus, 126 in the middle thoracic esophagus and 55 in the lower thoracic esophagus; they were graded according to the degree of dysphagia before treatment, 103 patient had grade 1 and 175 patients had grade 2. Among them, 205 patients received involved-field radiotherapy (IFRT) and 73 patients received elective nodal irradiation (ENI) (**Table 1**). The patients were staged according to the 2010 AJCC staging criteria [2].

Table 1. Patients clinical characteristics.

Patients clinical characteristics	n (%)
Age (median, range)	67 years (37 - 89)
Sex	2.3
- Male	193 (69.4)
- Female	85 (30.6)
Primary site in esophagus	
- Cervical	16 (5.8)
- Upper thoracic	81 (29.1)
- Middle thoracic	126 (45.3)
- Lower thoracic	55 (19.8)
Dysphagia	
- Grade 1	103 (37.1)
- Grade 2	175 (62.9)
Tumor stage	
- Stage I	26 (9.4)
- Stage II	201 (72.3)
- Stage III	51 (18.3)
Radiotherapy	
- IFRT	205 (73.7)
- ENI	73 (26.3)
Chemotherapy	
- cCRT	44 (15.8)
- sCRT	28 (10.1)
- No	206 (74.1)

cCRT: Concurrent chemoradiotherapy; sCRT: Sequential chemoradiotherapy; IFRT: Involved field radiotherapy; ENI: Elective nodal irradiation.

2.3. Chemotherapy

In the whole group, 72 (25.9%) patients underwent chemotherapy, including concurrent chemotherapy 44 cases and sequential chemotherapy 28 cases (Table 1). Typically, patients received 2 - 6 cycles of platinum-based chemotherapy regimen, mainly LFP regimen (calcium folinate 200 mg/time, 5-Fluorouracil 1 g/session on day 1 to 5, Cisplatin 20 mg/time on day 1 to 5, Days 1 to 5) and TP regimen (paclitaxel 240 mg/time, on day 1, cisplatin 20 mg/time, on days 1 to 5).

2.4. Radiotherapy Planning and Target Volume Definition

2.4.1. IFRT Target Volume Definition

All patients were scanned and positioned under a CT simulator from Siemens (Somatom Sensation Open, Germany). Radiation therapy was to be delivered

with three-dimensional conformal radiotherapy (3D-CRT) or Intensity Modulated Irradiation Therapy (IMRT). Treatment plans were generated with a three-dimensional planning system (ADAC Pinnacle3 8.0 m, Philips Medical Systems, USA). For IFRT, the gross tumor volume (GTV) was defined as any visible esophageal lesions shown on CT, barium esophagography, localizable CT or diagnostic CT images, and PET/CT scans if available, plus any involved lymph node (GTV-nd). The clinical tumor volume (CTV) was defined as GTV + 2.0 - 3.0 cm margin superior and inferior to the primary tumor and 0.5 - 0.8 cm margin in the other four directions. The planning tumor volume (PTV) was defined as CTV+ 0.5 to 1.0 cm margin uniformly in all directions. The maximum diameter and length of the GTV and its volume are obtained according to the patient treatment planning system, where the maximum transverse diameter of the GTV refers to the maximum diameter of the esophageal lesion shown on the cross-section of the CT image, the length of the GTV refers to the length of the esophageal lesion from the most upper to the most lower layer shown on the CT image, and the volume of the GTV is automatically calculated by the treatment planning system. The doses prescription required that 95% of PTV should receive a dose of 54 - 68 Gy in 27 - 34 fractions/5 - 7 weeks, with a median dose of 62 Gy.

2.4.2. ENI Target Volume Definition

The delineation of the GTV, CTV, and PTV of patients is the same as that of IFRT patients. The lymph node drainage area is delineated according to the American Thoracic Association's classification of chest lymph nodes. The upper thoracic lymph node drainage area includes bilateral supraclavicular, area 2, and areas 4, 5, 6, 7, and 8, the lower boundary is 4 to 5 cm below the tracheal bifurcation or carina; the lymph node drainage area in the middle thoracic area includes area 2, area 4, area 5, area 6, area 7 and area 8. The lower boundary is the cardia lymph node area; the lower thoracic drainage area includes area 4, area 5, area 6, area 7, area 8, paracardia, lesser gastric curvature, and left gastric lymph node area. The delineated lymph node drainage area is defined as CTV-nd. The PTV-nd was defined as CTV-nd + 0.3 - 0.5 cm in the anterior, posterior, left and right directions, and 1.0 - 1.5 cm in the up and down directions. The constraint doses prescription requires that 95% of PTV-nd received (45 - 50.4) Gy/(25 - 28) fractions/5 weeks, with the median dose of 50.4 Gy. After the first course of radiotherapy, the field was reduced to PTV, the prescribed dose was (10 - 20) Gy/(5 - 10) fractions/(1 - 2) week, for the total prescribed dose range of 56 - 70 Gy, and the median dose was 62 Gy.

From all groups, 76 patients received IMRT and 202 patients received 3D-CRT. IFRT and ENI patients are required to delineate the target area while delineating the adjacent important tissues and organs. The doses constraints to organs at risk were: V20 for both lungs < 25%, and the average dose < 14 Gy; the average heart dose < 24 Gy; the maximum spinal cord dose < 45 Gy. All treatments were performed with Siemens linear accelerator 6 MVX.

2.5. Follow up

Patients were followed up as of December 31, 2019. Radiotherapy patients were followed up for 3 to 123 months, with a median of 39 months. The follow-up rate was 98.1%. There were 136, 83, and 38 patients who survived 1, 3, and 5 years, respectively.

2.6. Statistical Methods

All statistical analysis was performed using SPSS 21.0 statistical software, the Kaplan-Meier method was used for univariate analysis, and significance test was performed by two-tailed Log-rank method; ROC curve analysis in diagnostic tests was used to obtain the best tumor local factors predicting the prognosis of esophageal SCC patients. The optimal cut-off value, sensitivity, specificity, and area under the curve of the diagnostic test are calculated using the ROC curve, and the critical value of each tumor local factor to predict the prognosis of the patient was determined at the same time; the Cox proportional hazard.

3. Results

3.1. Tumor Local Factors Analysis

The length of the patient's esophageal barium meal contrast ranges from 1.8 to 15.0 cm, with a median of 5.0 cm. According to the TPS system of the conformal radiotherapy plan, the target area of the esophageal lesion is delineated to obtain the GTV maximum transverse diameter, GTV length, and GTV volume. The GTV maximum transverse diameter was 0.75 - 7.14 cm, with a median of 2.52 cm; GTV length was 1.8 - 17.10 cm, a median of 7.20 cm; GTV volume was 5.43 - 265.21 cm^3, a median of 39.11 cm^3.

3.2. ROC Curve Analysis of the Effectiveness of Tumor Local Factors in Predicting the Prognosis of Esophageal SCC Patients

Take the local tumor factors as the detection variables, the patient's survival status as the state variable, and set the value of the state variable as 0 to establish the ROC curve. The results showed that the lesion length, GTV maximum transverse diameter, GTV length, and GTV volume area under the curve of esophageal barium meal were 0.638, 0.662, 0.665, and 0.631, respectively. The above indicators can effectively predict the prognosis of patients with esophageal SCC, and the difference is statistically significant ($P < 0.05$); their cut-off values were 4.25 cm, 1.80 cm, 5.85 cm, and 27.98 cm^3, respectively. The sensitivity of predicting the prognosis of the patient was 82.8%, 76.7%, 77.8%, and 72.2%, and the specificity was 60.0%, 75.6%, 73.6% and 76.7% respectively (**Table 2**).

3.3. The Impact of Treatment-Related Conditions on the Prognosis of Esophageal SCC Patients

The patients were grouped according to whether they received chemotherapy,

Table 2. ROC curveanalysis.

Variables	Area	Std. Error(a)	*P*	95% Confidence Interval	
				Lower Bound	Upper Bound
Barium meal length	0.638	0.048	0.008	0.545	0.732
GTV maximum diameter	0.662	0.048	0.002	0.568	0.757
GTV length GTV	0.665	0.048	0.002	0.571	0.760
GTV volume GTV	0.631	0.049	0.013	0.535	0.727

GTV: Gross Tumor Volume.

ENI treatment, the prescribed dose, and whether they were intensity-modulated. The results showed that chemotherapy, prescribed dose, and treatment methods had no significant effect on the prognosis of patients, but the survival rate of ENI patients was significantly better than that of IFRT patients (P = 0.0394, Table 3).

3.4. The Influence of Tumor Local Factors on the Prognosis of Esophageal SCC Patients

The univariate analysis of 278 patients with esophageal cancer showed that the length of esophageal barium meal contrast (P = 0.0004), the maximum transverse diameter of GTV (P = 0.0246), the length of GTV (P = 0.0035), and the volume of GTV (P = 0.0184) were all prognostic factor affecting the survival rate of esophageal SCC patients; the length of the esophageal barium meal contrast lesion (P = 0.0149) is a factor affecting the local control rate of the patient (Table 4). Incorporating the above factors into the Cox model for multivariate analysis, the results showed that the length of esophageal barium meal contrast lesions (P = 0.0013), GTV maximum transverse diameter (P = 0.0047) and GTV length (P = 0.0032) are independent prognosis of patient survival rate Influencing factors; the length of esophageal barium meal contrast lesions (P = 0.0037) is an independent prognostic factor of the patient's local control rate (Table 5).

4. Discussion

Radiation therapy is the main treatment for non-surgical treatment of patients with esophageal SCC, and radiotherapy mainly targets the local tumor and lymph node metastasis. Therefore, compared with distant metastasis, for non-surgical esophageal SCC patients receiving radiotherapy, it is more targeted to discuss the impact of tumor local factors on the survival rate of patients with esophageal SCC undergoing non-surgical treatment of radiotherapy.

In this study, we analyzed the more routine local tumor factors that are clinically concerned and easily available. To exclude the influence of lymph node metastasis on the survival rate of esophageal SCC patients, we only enrolled patients with clinically non-metastatic esophageal SCC. The analysis showed that the length of the esophageal barium meal contrast lesions, the maximum

Table 3. Treatment modality.

Treatment status		*n*	Survival rate (%)			χ^2	*P*
			1-year	3-years	5-years		
Chemotherapy	Yes	72	77.97	42.37	20.34	0.01	0.9431
	No	206	78.92	38.24	20.59		
ENI	Yes	73	81.13	52.83	28.03	4.24	0.0394
	No	205	78.10	35.71	18.57		
Dose	≤60 Gy	105	77.36	33.02	16.98	2.03	0.1542
	>60 Gy	173	79.62	43.31	22.73		
RT-technic	IMRT	76	81.82	51.52	24.24	3.17	0.0748
	3D-CRT	202	77.66	35.02	19.29		

ENI: Elective nodal irradiation; IMRT: Intensity-modulated radiation therapy; 3D-CRT: 3-Dimensional conformal radiotherapy.

Table 4. Univariate analysis of prognosis factors associate with survival and local control rate.

Variables	*n*	Survival rate (%)			χ^2	*P*	Local control rate (%)			χ^2	*P*
		1-year	3-years	5-years			1-year	3-years	5-years		
Barium meal length					12.54	0.0004				5.92	0.0149
≤4.5 cm	71	88.54	53.22	29.17			85.09	67.69	63.27		
>4.5 cm	207	73.05	31.14	15.57			77.44	54.82	42.79		
GTV maximum diameter					5.05	0.0246				1.44	0.2295
≤1.8 cm	60	90.57	47.17	28.30			84.59	65.73	57.26		
>1.8 cm	218	75.71	37.14	18.57			79.19	58.37	49.82		
GTV length					8.54	0.0035				2.80	0.0943
≤6.0 cm	91	88.89	51.85	29.63			83.99	64.65	61.04		
>6.0 cm	187	74.18	33.52	16.48			78.96	57.69	46.21		
GTV volume					5.56	0.0184				0.22	0.6411
≤30.0 cm^3	93	90.11	46.15	25.27			78.92	60.32	53.98		
>30.0 cm^3	185	72.67	35.47	18.02			81.19	59.59	49.47		

GTV: Gross Tumor Volume.

Table 5. Multivariate analysis of prognosis factors associate with survival and local control rate.

Item	Variable	B	SE	Wald	*P*	OR	95% CI	
							Lower	Upper
Survival rate	Barium meal length	0.387	0.157	6.111	0.013	1.473	1.084	2.002
	GTV maximum diameter	0.378	0.190	3.963	0.047	1.460	1.006	2.118
	GTV length GTV	0.363	0.170	4.580	0.032	1.438	1.031	2.005
	GTV volume GTV	0.110	0.181	0.369	0.544	0.896	0.619	1.277
Local control rate	Barium meal length	0.494	0.236	4.370	0.037	1.639	1.031	2.603
	GTV maximum diameter	0.388	0.276	1.980	0.159	1.474	0.859	2.530
	GTV length GTV	0.356	0.255	1.956	0.162	1.428	0.867	2.353
	GTV volume GTV	0.404	0.258	2.462	0.117	0.667	0.403	1.106

GTV: Gross Tumor Volume.

transverse diameter of GTV, and the GTV length, which are significantly related to the tumor, are independent factors affecting the survival rate of esophageal SCC patients, and the length of the esophageal barium meal contrast lesion is also the independence of affecting the patient's local control rate. This is similar to previous reports. Li H. *et al*. [3] analyzed 72 patients with clinical stage N0 esophageal cancer, and the results showed that the length, maximum diameter, and volume of esophageal cancer tumors have varying degrees of influence on the short-term efficacy and survival rate of radiotherapy. Among them, tumor length is the main factor affecting short-term efficacy and long-term survival.

The length of the esophageal barium meal contrast is an important indicator of the prognosis of esophageal SCC patients. Previous reports [4] [5] believed that the length of esophageal lesions is closely related to the depth of esophageal invasion and lymph node metastasis. The longer the esophageal lesion, the deeper the tumor invasion, the lymph node, the risk of lymph node metastasis is also greater.

The length of the esophageal lesions is positively correlated with the probability of lymph node metastasis, which may be related to the dislocation and distribution of esophageal lymphatic vessels. Therefore, the longer the lesion, the more corresponding lymph nodes will be affected, which increases the possibility of metastasis and affects the prognosis of esophageal SCC patients. Tumor length plays an important role in the clinical staging of patients with non-surgical esophageal SCC. In our previous studies on the clinical staging of esophageal cancer [6] [7], the length of esophageal lesions played an important role as an indicator of the clinical stage of patients. Although the current AJCC staging of esophageal cancer uses the depth of tumor invasion instead of the length of the esophagus for the T stage, the length of esophageal lesions in clinical studies also plays an important role in predicting the prognosis of patients [8] [9]. In this study, to clarify the impact of the length of the esophageal lesions on the survival rate of patients, we applied the ROC curve analysis method to define the specific cut-off values of the patients in this group. The results show that when the patient's lesion length is ≤4.5 cm, the patient survival rate, and local control rate are better than those patients with esophageal lesion length > 4.5 cm, which is similar to the results reported in the past [8] [9] [10] [11] [12].

There are many reports on the impact of esophageal tumor volume on the prognosis of patients. Most authors [13] [14] [15] [16] [17] believe that the tumor volume of esophageal cancer is an important prognostic indicator of the patient's prognosis. However, due to the large differences in the staging standards and stages of patients in related reports, the conditions for patient enrollment are uneven, and the standards are not the same when GTV is delineated, there is currently no unified opinion and standard for the classification of patients' GTV volume.

In this study, we also used the ROC curve analysis method to judge the GTV volume of this group of patients. The results showed that the best cut-off value

for the patient was 27.98 cm^3, which was used as the standard to classify the patients. The results of the univariate analysis showed that tumor volume was one of the prognostic indicators of patient survival rate, while the results of the multivariate analysis did not show its significance in judging the prognosis of patients. The possible reasons for the analysis are: 1) The patients in this group are all clinically non-metastatic, compared with previous related reports, GTV includes enlarged lymph nodes, and its influence on the prognosis of patients may be weakened to a certain extent; 2) This study only performed single-factor and multi-factor analysis on the local tumor indicators of patients. When performing statistical analysis, collinearity may occur, which will affect the statistical results. The results from Li H. *et al*. [3] study, which is similar to our results, the univariate analysis showed that tumor volume, length, and diameter significantly affected the survival rate and short-term efficacy of patients. In multivariate analysis, tumor volume was also not the patient's factor affecting prognosis.

5. Conclusion

The main local tumor factor affecting the prognosis of clinically non-metastatic esophageal SCC is the length of the esophageal lesion. Therefore, in clinical practice physicians must pay sufficient attention to patients with long esophageal lesions and provide active treatment.

Disclosure

No authors report any conflict of interest.

Authors' Contributions

KEITA M. and SHEN W.B. drafted the manuscript and participated in data collection, and helped to analyze the data. ZHU Shuchai participated in the coordination of the study. All authors read and approved the final manuscript.

Conflicts of Interest

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

References

[1] Boggs, D.H., Hanna, A., Burrows, W., Horiba, N. and Suntharalingam, M. (2015) Primary Gross Tumor Volume Is an Important Prognostic Factor in Locally Advanced Esophageal Cancer Patients Treated with Trimodality Therapy. *Journal of Gastrointestinal Cancer*, **46**, 131-137. https://doi.org/10.1007/s12029-015-9699-y

[2] Edge, S.B. and Compton, C.C. (2010) The American Joint Committee on Cancer: the 7th Edition of the AJCC Cancer Staging Manual and the Future of TNM. *Annals of Surgical Oncology*, **17**, 1471-1474. https://doi.org/10.1245/s10434-010-0985-4

[3] Li, H., Li, Y., Liu, X., Sun, H., Wang, Z. and Zheng, Y. (2015) Patterns of Lymphatic Spread in Thoracic Esophageal Squamous Cell Carcinoma: A Study of 313 Cases. *Chinese Journal of Oncology*, **37**, 841-844.

[4] Ma, Z., Tang, P., Zhang, H., Chen, C. and Yu, Z. (2014) Analysis of Early Lymph Node Metastasis Pattern and Prognosis in Thoracic Esophageal Squamous Cell Carcinoma. *Chinese Journal of Gastrointestinal Surgery*, **17**, 884-887.

[5] Li, C., Tan, L.J., Liu, X., Han, W.M., *et al*. (2021) Analysis of the Efficacy and Prognostic Factors of 1 637 Esophageal Cancer Patients Treated with Intensity-Modulated Radiotherapy. *Chinese Journal of Oncology*, **43**, 678-684.

[6] Jiang, N., Ge, X.L., Zhang, Z.Y., *et al*. (2021) Prognostic Factors for Patients with Esophageal Cancer Receiving Definitive Radiotherapy Alone: A Retrospective Analysis. *Cancer Management and Research*, **13**, 3229-3234. https://doi.org/10.2147/CMAR.S300672

[7] Shen, W.B., Zhu, S.C., Li, J., *et al*. (2008) Prognostic Effect of Clinical Staging for Esophageal Carcinoma Patients with Three-Dimensional Conformal Radiotherapy. *Chinese Journal of Radiological Medicine and Protection*, **28**, 371-374.

[8] Vadhwana, B., Zosimas, D., Lykoudis, P.M., Phen, H.M., Martinou, M. and Khoo, D. (2020) Tumour Length as an Independent Prognostic Factor in Resectable Oesophageal Carcinoma. *Annals of the Royal College of Surgeons of England*, **102**, 185-190. https://doi.org/10.1308/rcsann.2019.0147

[9] Xu, Q., Liu, Z.K., Cao, Y.K., *et al*. (2012) Relationship of Gross Tumor Volume with Lymph Node Metastasis and Prognosis of Esophageal Carcinoma. *Chinese Journal of Oncology*, **34**, 684-687.

[10] Lee, P.C., Port, J.L., Paul, S., Stiles, B.M. and Altorki, N.K. (2009) Predictors of Long-Term Survival after Resection of Esophageal Carcinoma with Nonregional Nodal Metastases. *The Annals of Thoracic Surgery*, **88**, 186-193. https://doi.org/10.1016/j.athoracsur.2009.03.079

[11] Zhang, H., Shang, X., Zhu, X., Tang, P., Chen, C., Jiang, H., *et al*. (2018) Impact of the Number of Lymph Node Examined on the Prognosis of Esophageal Squamous Cell Carcinoma. *Chinese Journal of Digestive Surgery*, **17**, 817-824.

[12] Wang, L., Kong, J., Han, C., *et al*. (2013) Analysis the Long-Term Effect of 781 Patients with Different Parts of Esophageal Carcinoma Treated by Three-Dimensional Conformal Radiotherapy. *Chinese Journal of Radiation Oncology*, **22**, 18-21.

[13] Shen, W.B., Zhu, S.C., Gao, H.M., *et al*. (2013) Analysis of Failure Patterns of Three-Dimensional Conformal Radiotherapy Alone in Resectable Esophageal Cancer. *Chinese Journal of Radiation Oncology*, **22**, 205-208.

[14] Li, J., Zhu, S.C., Wang, Y.X., *et al*. (2012) Analysis the Long-Term Effect of 375 Patients with Esophageal Carcinoma Treated by Three-Dimensional Conformal Radiotherapy. *Chinese Journal of Radiation Oncology*, **21**, 334-338.

[15] Li, X.N., Wang, L., Han, C., *et al*. (2014) Analysis of Relationship between CT-GTV and Prognosis in Patients with Esophageal Cancer after Three-Dimensional Radiotherapy. *Chinese Journal of Radiation Oncology*, **24**, 23-26.

[16] Wang, Y., Wang, L., Yang, Q., Li, J., Qi, Z., He, M., Yao, J. and Qiao, X. (2015) Factors on Prognosis in Patients of Stage pT3N0M0 Thoracic Esophageal Squamous Cell Carcinoma after Two-Field Esophagectomy. *Journal of Cancer Research and Therapeutics*, **11**, 16-23. https://doi.org/10.4103/0973-1482.163833

[17] Chen, X., Chen, J., Zheng, X., Chen, Y., Lin, Y., Zheng, Q., *et al*. (2015) Prognostic Factors in Patients with Thoracic Esophageal Carcinoma Staged pT1-4aN0M0 Undergone Esophagectomy with Three-Field Lymphadenectomy. *Annals of Translational Medicine*, **3**, 282.