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Analysis of prognostic factors and survival of Thoracic solitary fibrous tumors: a SEER population-based study

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Abstract: *Background: Thoracic solitary fibrous tumors (TSFT) are a rare disease. We aim to determine the prognostic factors related to survival of TSFT patients through the use of The Surveillance, Epidemiology, and End Results database to analyze demographic and clinical characteristics. This study is intended to determine the prognostic factors associated with TSFT and has clinical value. Patients and Methods: This is a retrospective study of patients who were diagnosed with TSFT in the SEER database from 2001 to 2015. The kaplan-Meier method and Cox regression analysis were used to identify prognostic factors for patient survival. Results: From the SEER database (2001-2015), 227 patients with TSFT were detected. The 5-year survival rate was 82.7%, and the 10-year survival rate was 62.4%. Surgical resection [HR 0.314, 95% CI 0.201-0.491, P <0.001] was just an independent factor in the improvement of patient prognosis. Conclusion: The results of this study indicate that the prognostic factors for TSFT patients are age, grade, surgery, and chemotherapy. Age <65 years old, well-differentiated, surgery instead of chemotherapy is a favorable prognostic factor for survival of TSFT patients.*

Keywords: *Solitary fibrous tumor, prognostic factors, surgery, SEER*

1. Introduction

Solitary fibrous tumor (SFT) is a type of fibroblastic mesenchymal tumor that rarely metastasizes, including hemangiopericytoma[1, 2]. The incidence of SFT is low, and the disease is generally considered rare. Studies have found that about one-third of cases originate in the thoracic cavity, including the pleura, mediastinum, and lung parenchyma[3]. Complete en bloc surgical resection is the preferred treatment for all localized SFT, but studies have found that even complete resection has a recurrence rate of 63% [4-6]. A multicenter study showed that the 10-year overall survival rate for SFT was 76.8%[7]. At present, there are few studies on TSFT at home and abroad, and the sample size is small, most of which are case reports, and the predictive effect of traditional staging systems on the prognosis of TSFT is still uncertain. Therefore, the study of prognostic factors and survival analysis of TSFT are of great significance. In this study, population-based data from the SEER database was used to analyze the overall survival (OS) of TSFT patients and provide a basis for optimizing the treatment of TSFT patients.

2. Materials and Methods

2.1. Data Source

SEER database was founded in 1973 and is one of the most representative large tumor grade databases in the United States. In this study, SEER* Stat version 8.3.6 software was used to screen TSFT patients

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from 2001 to 2015 from the SEER database.

2.2. Patient Selection

Specific information obtained for each case includes gender, race, tumor grade, chemotherapy, radiation therapy, surgery, marital status, survival time and survival status. Inclusion criteria: If the survival time is unknown or the survival status, surgical conditions, radiotherapy, chemotherapy and other significant factors are missing, the patients will be excluded. This research has obtained permission from SEER to gain access to research data. The primary endpoint of this study is OS.

2.3. Statistical Analysis

SPSS25.0 software was used for analysis. The Kaplan-Meier method was used to draw the survival curve, and the difference between the long-term survival outcomes of the curve was analyzed by Log-rank suggestion. Cox proportional hazard analysis was utilized to analyze the factors affecting the prognosis of TSFT patients. $P<0.05$ considered the difference to be done statistically significant.

3. Results

3.1. Demographics and Clinical Parameters of the Cohort

From the SEER database (2001-2015), 227 TSFT patients were identified. Among all patients, most patients were over 65 years old (n=137, 60.4%), the number of white people was the largest (n=197, 86.8%), and the main treatment received was surgery (n=188, 82.8%), Only 11.5% of patients received radiotherapy and 9.7% of patients received chemotherapy. The main tumor growth sites are lung (n=117,51.5%) and pleura (n=42.3%) (Table 1).

Table 1. Basic information table of included patients

Feature	N	N(%)
Age(years)		
<65	90	39.6%
≥65	137	60.4%
Sex		
Female	105	46.3%
Male	122	53.7%
Race		
White	197	86.8%
Black	14	6.2%
Other	16	7.0%
Marital status		
Married	131	57.7%
Widowed/divorced	48	21.1%
Single	34	15.0%
Unknown	14	6.2%
Grade		
I-II	24	10.6%
III-IV	19	8.4%
Unknown	184	81.0%
Location		
Lung	117	51.5%
Pleura	96	42.3%
Heart	14	6.2%
Surgery		
Yes	188	82.8%
No	39	17.2%
Radiotherapy		
Yes	26	11.5%
No	201	88.5%
Chemotherapy		
Yes	22	9.7%
No	205	90.3%
Total	227	100%

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3.2. Survival Outcomes

Among 227 cases of TSFT, the 5-year survival rate was 82.7%, and the 10-year survival rate was 62.4% (Figure 1). This article uses Kaplan-Meier to analyze the possible prognostic factors of TSFT patients, such as age, gender, grade, surgery, radiotherapy, and chemotherapy. The results showed that there was no significant statistical difference between radiotherapy and the prognosis of patients (P=0.056) (Figure 2), while age (P=0.004) (Figure 3), grade (P=0.029) (Figure 4) , surgery (P<0.001) (Figure 5), chemotherapy (P=0.014) (Figure 6), etc. had significant differences The statistical difference. When stratified by age, we found that the 5-year overall survival of patients younger than 65 years was higher than that of patients ≥65 years of age (62.1% vs 43.7%). When stratified by surgery, we found that the median of surgical patients the survival time is 83 months, and the median survival time of patients without surgery is 12 months.

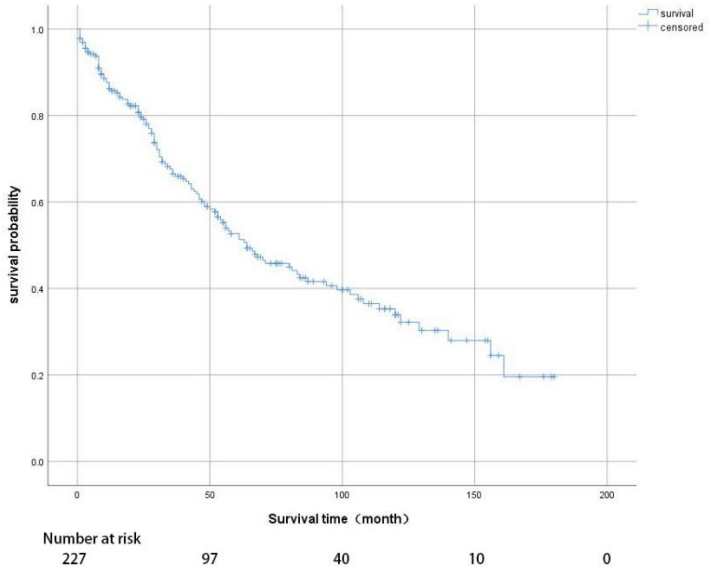

Figure 1. Overall survival rate of TSFT patients.

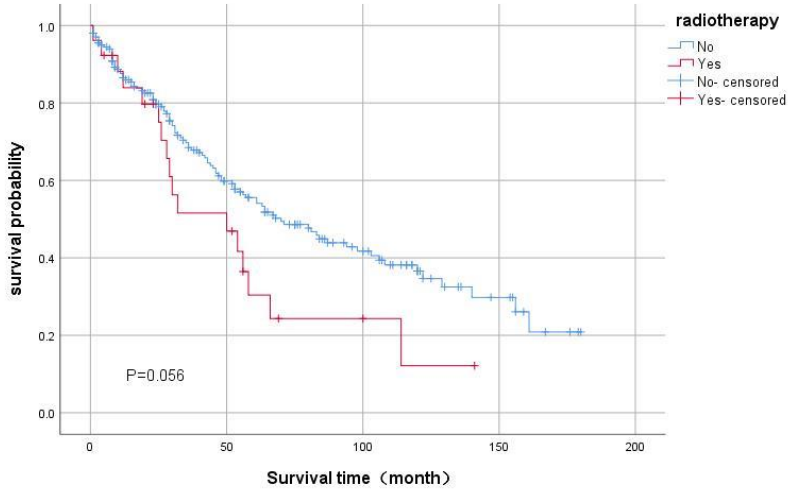

Figure 2.Comparison of overall survival of TSFT patients with or without radiotherapy.

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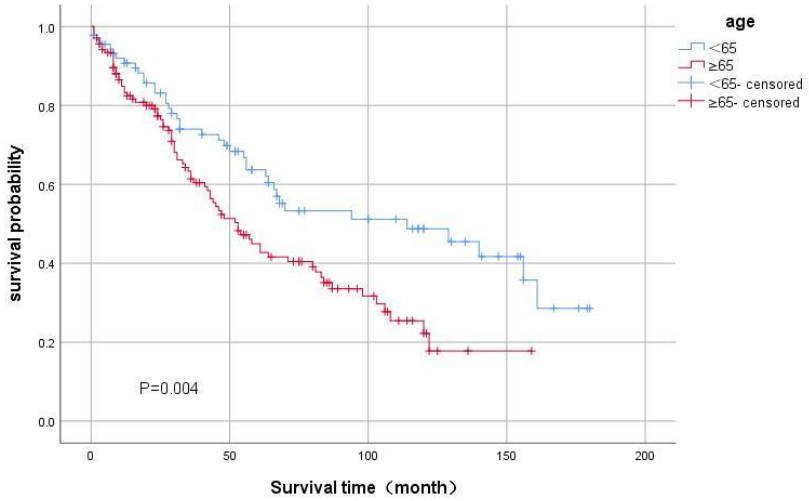

Figure 3. Comparison of overall survival of TSFT patients of different ages.

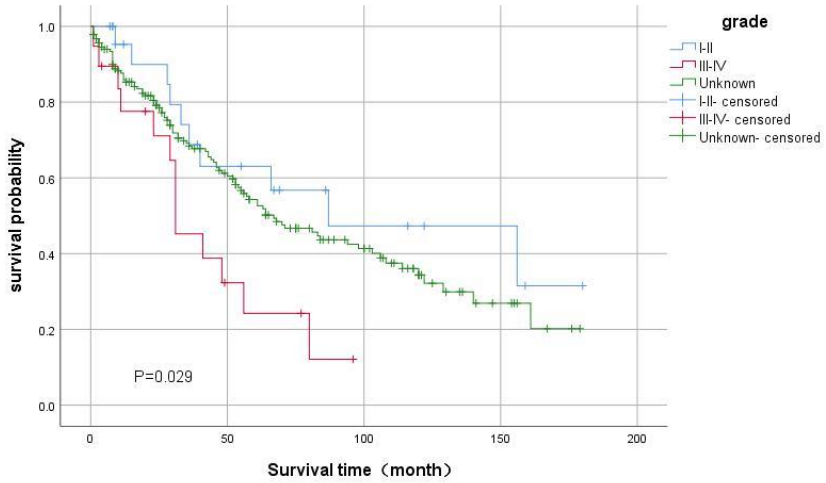

Figure 4.Comparison of overall survival of patients with different grades of TSFT.

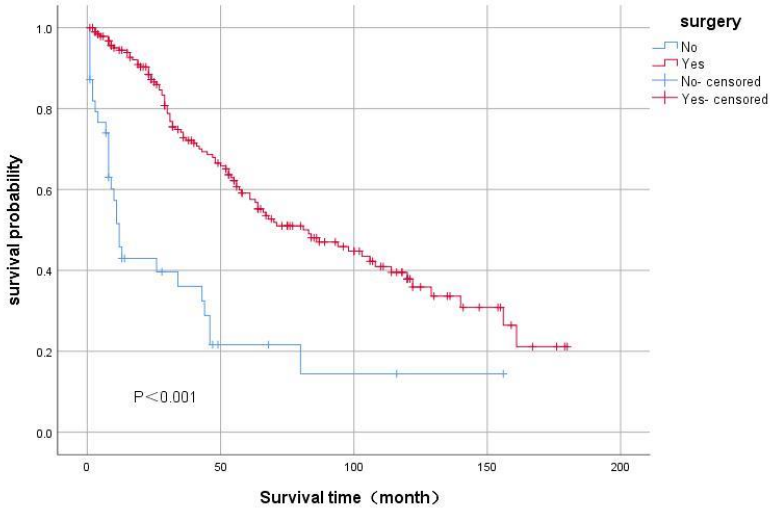

Figure 5.Comparison of overall survival of TSFT patients with or without surgery.

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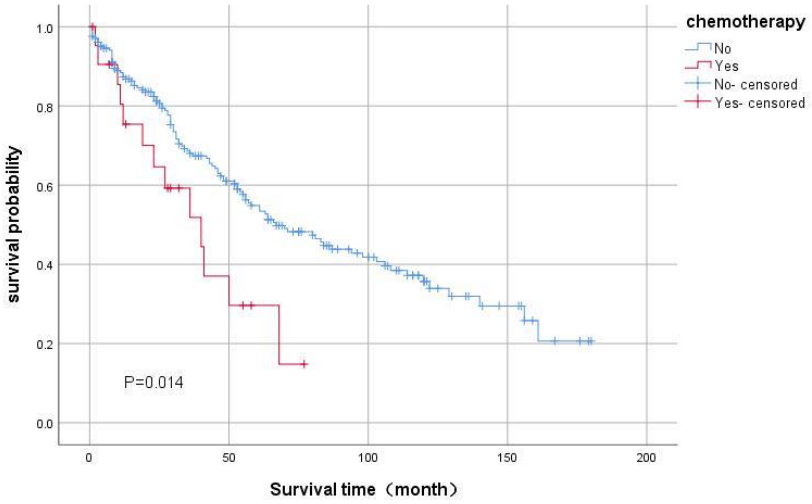

Figure 6.Comparison of overall survival of TSFT patients with or without chemotherapy.

3.3. Evaluation of Prognostic Factors

The results of this study show that age, surgery, and chemotherapy are all independent factors affecting the prognosis of TSFT patients. This study found that surgical resection [HR 0.314, 95%CI 0.201-0.491, P<0.001] is an independent factor influencing the improvement of patient prognosis (Table 2).

Table 2. Univariate and Multivariate analysis

Feature	Univariate analysis			Multivariate analysis		
	HR	95% Cl	P	HR	95% Cl	P
Age(years)						
<65	1.00			1.00		
≥65	1.766	1.191-2.620	0.005	1.888	1.251-2.850	0.002
Sex				NI		
Female	1.00					
Male	1.080	0.750-1.556	0.678			
Race				NI		
White	1.00					
Black	1.481	0.722-2.842	0.238			
Other	0.722	0.280-1.457	0.286			
Marital status				NI		
Married	1.00					
Widowed/divorced	1.629	1.048-2.532	0.030			
Single	1.374	0.805-2.348	0.244			
Unknown	1.065	0.461-2.463	0.882			
Grade						
I-II	1.00			1.00		
III-IV	2.734	1.188-6.293	0.018	2.061	0.881-4.821	0.095
Unknown	1.372	0.713-2.639	0.344	1.220	0.631-2.361	0.554
Location				NI		
Lung	1.00					
Pleura	1.127	0.775-1.639	0.530			
Heart	1.039	0.473-2.282	0.924			
Surgery						
Yes	1.00			1.00		
No	0.285	0.185-0.440	＜0.001	0.314	0.201-0.491	＜0.001
Radiotherapy						
Yes	1.00			1.00		
No	1.643	0.980-2.755	0.060	2.161	1.266-3.687	0.005
Chemotherapy						
Yes	1.00			1.00		
No	2.049	1.139-3.687	0.017	2.030	1.105-3.731	0.023

4. Discussion

Five cases of pleural SFT were reported for the first time in 1931[8]. Since then, individual cases of

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relating SFT have been reported worldwide. SFT occurs mostly in the serous membrane, dura mater, and deep soft tissues[9]. SFT can occur at any age, but it is most common in patients 40 to 70 years old. Compared with intra-abdominal or soft tissue SFT, meningeal SFT is more common in younger patients, while pleural SFT is more common in older patients [10]. Due to the low incidence of TSFT and the limited sample size of previous studies, it is necessary to conduct a larger research scale to deepen the understanding of TSFT behavior and help diagnosis and prognosis. There are no large-scale studies that can verify these prognostic factors. Currently, the most extensive study includes 45 patients with pleural SFT [11]. In order to evaluate the impact of various prognostic factors on survival, we collected a sufficient number of patients for research by using the SEER database. This population-based study aims to analyze the population associated with TSFT Statistics and factors determine the prognostic factors related to TSFT survival. The SEER database has been widely used to study rare cancers[12-15].

Previous studies have shown that the prognosis of TSFT is mainly related to tumor nature, size, and local recurrence[10, 16, 17]. However, this study found that the results of this study show that age, surgery, and chemotherapy are all independent factors affecting the prognosis of patients with thoracic SFT. The older the age, the worse the tissue differentiation, the worse the prognosis of patients who did not undergo surgery and received chemotherapy. Recently, several studies on a small number of patients reported a 5-year survival rate between 75% and 96% [17-20]. The results of this study showed that among 227 cases of TSFT, the 5-year survival rate was 82.7%, which was similar to the results of previous studies.

Surgery is the preferred treatment for TSFT[18, 21, 22]. In this study, the five-year survival period of patients who underwent surgical resection was significantly higher than those who did not undergo surgery, and the prognosis was better. Studies have found that the 10-year survival rate of patients undergoing surgery can be as high as 97.5%, and that chemotherapy and radiotherapy are both beneficial to the prognosis of patients. The results are similar to this article, Chemotherapy is an independent factor of poor prognosis [20].

According to observations, this is the first time that the SEER database has been used to analyze the clinical characteristics and survival prognosis of TSFT. However, this article also has inevitable limitations. First, it is a retrospective study with observational nature and the possibility of selection bias. Second, SEER the number of cycles of chemotherapy and the plan of radiotherapy are not included in the database. Third, the database lacks key information such as tumor size and the location of recurrence and metastasis. Therefore, considering the importance of these factors, it should be carefully interpreted in the current results.

5. Conclusion

Our study found that surgery is the first choice for the treatment of TSFT. The older the age, the worse the tissue differentiation, and the worse the prognosis of patients who did not undergo surgery and received chemotherapy. A prospective randomized study is needed to more accurately give the best treatment strategy for such patients.

Data Availability

Publicly available datasets were analyzed in this study. This data can be found here: www.seer.cancer.gov.

Ethics Statement

This study was exempt from the approval processes of the Institutional Review Boards because the SEER database patient information is de-identified.

Acknowledgement

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Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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