Original Article

Surgical treatment of primary tracheobronchial tumors: 16-year experience in a single center

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Background: Primary tracheobronchial tumor (TBT) is a rare disease, and the prognostic factors of surgical treatment have not been well identified.

Methods: Patients with primary TBT and accepted surgical treatment between January 2004 and January 2020 at our institution were retrospectively analyzed. The univariate analysis and multivariate analysis were conducted on the malignant cases. The overall survival (OS) was analyzed using Kaplan-Meier method, and potential prognostic factors were analyzed using Cox regression analysis.

Results: A total of 69 patients (29 males and 40 females) were included. The median follow-up duration was 75.7 months (1.2–177.4 months). The most common histology was adenoid cystic carcinoma (ACC) (37.7%) followed by squamous cell carcinoma (SCC) (23.2%). For patients with malignant tumors, the estimated 5-year OS of the overall population was 77.2% and the estimated 5-year OS of SCC patients was 73.8% especially. The univariate Cox regression analysis identified that age and tumor size had significant effects on OS. The multivariate analysis showed that age (≤50 or >50 years) was independent prognostic factor for OS ($P<0.05$).

Conclusions: Age is independent factor affecting the OS of primary TBT treated by surgery. And patients of TBT with younger age should be much more referred for surgery.

Keywords: Primary tracheobronchial tumor (TBT); surgery; prognostic factors

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Introduction

Primary tracheobronchial tumor (TBT) is a rare disease with an incidence of 0.1–0.4% (1), originating in different parts of the trachea. Due to the low incidence and non-specific clinical manifestations, TBT is often misdiagnosed as bronchial asthma, bronchitis and other diseases in the early stage. Severe respiratory symptoms will appear when the trachea is blocked by more than 75%. Surgical treatment is usually the most important treatment for TBT (2-4). Survival after diagnosis was significantly longer for patients undergoing curative intent resection, with a median overall survival (OS) of 82–198 months, as compared with 3–92 months for patients who did not undergo surgery (2,5-8).

However, due to the low incidence of primary TBT, the

reported prognostic factors affecting the survival of TBT are unclear. Previous studies have reported that age (young), lymph node involvement (N0), small tumor size, margin status (negative), histology [adenoid cystic carcinoma (ACC)] and the use of radiotherapy were associated with an improved survival of tracheobronchial patients (8-12). A report used the National Cancer Database (NCDB) demonstrated that insurance status, cancer grade, residual tumors status, histology and tumor extension were significantly associated with OS for patients with resected primary tracheal carcinoma (13). However, recognized risk factors are still lack. More experience should be accumulated to further clarify the prognostic factors associated with surgical treatment effect of primary TBT.

In this study, the clinical data of 69 patients diagnosed with primary TBT and accepted surgical treatment from January 2004 to January 2020 in our hospital was reviewed and analyzed to identify the potential prognostic factors affecting the surgical outcomes.

We present the following article in accordance with the STROBE reporting checklist (available at https://jtd.amegroups.com/article/view/10.21037/jtd-21-1791/rc).

Methods

Patients

The clinical data of 69 patients diagnosed as primary TBT and accepted surgical treatment at The Second Affiliated Hospital of Air Force Medical University between January 2004 and January 2020 were retrospectively reviewed and analyzed. And the univariate analysis and multivariate analysis were conducted on the malignant cases. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by ethics board of the Second Affiliated Hospital of Air Force Medical University (No. K202111-04) and individual consent for this retrospective analysis was waived.

Clinical information and follow-up

Patient clinical and treatment data were collected from Medical Record System of The Second Affiliated Hospital of Air Force Medical University. Clinical data included age, tumor size, gender, length of stay, histological type, smoking history, data of surgery, primary tumor location and symptoms. Based on previous studies, 2 cm of tumor size was used as cut-off for analyzing (1). Treatment data included tumor extension (E1, primary tumor confined to the trachea/bronchus; E2, primary tumor spread outside the trachea/bronchus or spread to adjacent organs) (8,14), lymph node status (N0, no lymph node metastasis; N1, lymph node metastasis; Nx, without dissection of lymph nodes), residual tumors status (R0, no residual tumor after surgery; R1, microscopic residual tumor after surgery) and postoperative treatment [adjuvant therapy was performed for patients with R1 or N1 status. And the decision of conducting adjuvant therapy for patients with E2 status was made based on the multi-disciplinary treatment (MDT)]. Patient follow-up data were collected from Medical Record System and contacting with patients by telephone calls. Computed tomography scan examinations were conducted for evaluation after surgery. And the follow-up was generally performed every 3 months for the first two years, and then every 6 months. OS was defined as the time from the date of surgery to the date of death. Deadline for follow-up was December 16, 2020.

Statistical analysis

Continuous variables were presented as the mean ± standard deviation (SD) while categorical variables were presented as number and percentage. Survival curves were estimated via the Kaplan-Meier method and compared using a log-rank test. Potential factors affecting survival were explored using Cox regression model analysis. A 2-sided $P<0.05$ was considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics version 25 (IBM Corp, Armonk, NY, USA).

Results

Characteristics of patients

A total of 72 patients with primary TBT were treated by surgery from 2004 to 2020. And the operative and 30-day mortality were 0% and 4.17% respectively. Finally, 69 patients were included in analysis. The demographic and clinical data of the overall population were summarized in *Table 1*. Of all 69 patients, there were 62 malignant cases [squamous cell carcinoma (SCC): 16; ACC: 26; mucoepidermoid carcinoma: 10; carcinoids: 4; adenocarcinoma: 4; epithelia-myoepithelial carcinoma: 1; sarcoma: 1] and 7 benign cases (inflammatory pseudotumor: 3; vascular tumor: 1; leiomyoma: 1; schwannoma: 1; plasmacytoma: 1). A total of 29 men and 40

Table 1 Demographic and clinical characteristics of 69 patients with primary tracheobronchial tumors by tumor histology

Variable	Overall	SCC (n=16)	ACC		Others	
			n=26	P value	n=27	P value
Age, years, mean ± SD	45.3±13.9	56.8±8.2	45.7±11.3	0.002	38.2±14.5	<0.001
Tumor size, cm, mean ± SD	2.5±1.2	2.6±1.1	3.0±1.4	0.43	2.0±0.9	0.04
Length of stay, days, mean ± SD	19.4±8.6	18.8±7.3	17.8±6.1	0.63	21.2±10.9	0.45
Gender, n						
Male	29	10	10	0.13	9	0.06
Female	40	6	16		18	
Smoking, n						
Never	47	7	19	0.06	21	0.02
Ever	22	9	7		6	
Location, n						
Cervical	17	4	8	0.36	5	0.79
Intrathoracic trachea	28	5	12		11	
Others	24	7	6		11	
Symptoms						
Cough	65.2%	68.8%	61.5%	0.64	66.7%	0.89
Wheeze	59.4%	62.5%	65.4%	0.85	46.7%	0.31
Bloody sputum/hemoptysis	23.2%	25.0%	15.4%	0.44	26.7%	0.90
Breathless	8.7%	12.5%	7.7%	0.61	6.7%	0.50
Dyspnea	7.2%	6.3%	3.8%	0.72	10.0%	0.67
Fever	1.4%	0.0%	0.0%	–	3.3%	0.46
Hoarseness	1.4%	6.3%	0.0%	0.20	0.0%	0.17
No obvious symptoms	2.9%	0.0%	3.8%	0.43	3.3%	0.46

SCC, squamous cell carcinoma; ACC, adenoid cystic carcinoma; SD, standard deviation.

women, with a mean age of 45.3±13.9 years, were included. SCC patients tended to be older than ACC patients (P<0.05) and patients with other histology (P<0.05). The mean tumor size was 2.5±1.2 cm. The mean length of stay was 19.4±8.6 days; 22 patients were smokers, and SCC patients were more smokers than ACC patients (P=0.06) and other patients (P=0.02). Tumors in 17 patients (24.6%) were located in the cervical trachea, 28 (40.6%) were located in the intrathoracic trachea, 5 (7.2%) were located in the carina, 12 (17.4%) were located in the right main bronchus, 7 (10.1%) were located in the left main bronchus. The major symptoms included cough, wheeze, bloody sputum, hemoptysis, breathless, dyspnea, fever and hoarseness. The most initial symptom was cough (65.2%). And there was no statistically significance between different symptoms by histology. The incidence of postoperative complications was 44.9%. Pneumonia was the most common postoperative complications in this study, which accounted for 17.4%. And the incidence of tracheal anastomotic fistula was 10.1%, which was secondly to the pneumonia. Other complications including tracheal stenosis, recurrent laryngeal nerve palsy, chylothorax, fat liquefaction and postoperative bleeding, accounted for 7.2%, 5.8%, 1.4%, 1.4% and 1.4% respectively.

Table 2 Staging and treatment of the 69 patients with primary tracheobronchial tumors by tumor histology

Variable	Overall	SCC (n=16)	ACC		Others	
			n=26	P value	n=27	P value
Tumor size						
≤2 cm	33	6 (37.5%)	8 (30.8%)	0.65	19 (70.4%)	0.04
>2 cm	36	10 (62.5%)	18 (69.2%)		8 (29.6%)	
Tumor extension						
E1	46	8 (50.0%)	14 (53.8%)	0.81	24 (88.9%)	0.005
E2	23	8 (50.0%)	12 (46.2%)		3 (11.1%)	
Lymph node status						
N1	8	5 (31.3%)	2 (7.7%)	0.14	1 (3.7%)	0.04
N0	41	8 (50.0%)	17 (65.4%)		16 (59.3%)	
Nx	20	3 (18.8%)	7 (26.9%)		10 (37.0%)	
Residual tumors status						
R0	59	16 (100%)	18 (69.2%)	0.01	25 (92.6%)	0.27
R1	10	0 (0.0%)	8 (30.8%)		2 (7.4%)	
Treatment						
Surgery only	41	8 (50.0%)	14 (53.8%)	0.75	19 (70.4%)	0.40
Surgery + radiotherapy	6	1 (6.3%)	4 (15.4%)		1 (3.7%)	
Surgery + chemotherapy	20	6 (37.5%)	7 (26.9%)		7 (25.9%)	
Surgery + radiotherapy + chemotherapy	2	1 (6.3%)	1 (3.8%)		0 (0.0%)	

SCC, squamous cell carcinoma; ACC, adenoid cystic carcinoma.

Treatment characteristics

All patients underwent surgical treatment. Tracheal resection with end-to-end anastomosis was main surgical technique in this study, which was performed for 65.2% (45/69) of patients, and remain patients were conducted with bronchus and lung resections (13/69), carinal resections (11/69). And posterolateral thoracotomy was the most surgical approach (50/69), followed by cervical incision (10/69) and median sternotomy (9/69). For patients with carinal tumors, if the tumor was small and involved the orifice of main bronchus, partial carina resection and reconstruction was performed (2/5); otherwise, a total carina resection and reconstruction needed (3/5). And for patients with bronchial tumors, bronchial sleeve resection without lobectomy would be performed (9/19) when the orifice of the upper lobe was not involved, while others received bronchial sleeve resection with lobectomy (10/19). The staging and treatment data of all patients were summarized in *Table 2*. There were 33 patients with tumors smaller than 2 cm and 36 patients with tumors larger than 2 cm. For tumor extension, 46 patients were E1 and 23 patients were E2. There were 49 patients known lymph node status, and 20 patients didn't. And lymph node metastases were found in 16.3% of patients with known lymph node status. A complete resection (R0) was achieved in 85.5%. Most patients underwent surgery only (59.4%), and 40.6% accepted radiotherapy or chemotherapy after surgery. Adjuvant therapy was performed for patients with R1 or N1 status. And the decision of conducting adjuvant therapy for patients with E2 status was made based on the multi-disciplinary treatment (MDT). Furtherly, the treatment strategies for patients between ≥50 group and <50 group were not different. Specifically, for both of patients with ≥50 and <50, tracheal resection was the main surgical technique. And Chi-square test showed that there were no

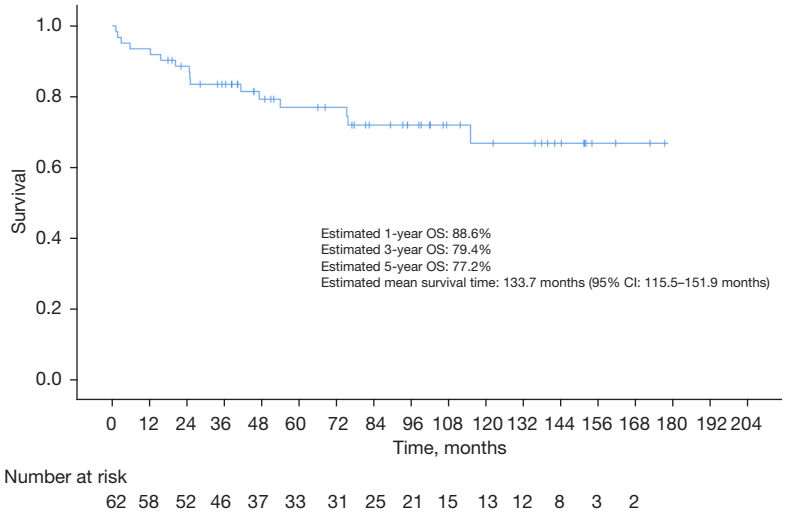

Figure 1 OS of 62 patients with malignant tracheal tumors. OS, overall survival.

differences in types of resection for primary TBTs between ≥50 and <50 patients (P>0.05). Although adjuvant therapy postoperatively was more common in patients ≥50, the difference was not significant between ≥50 and <50 patients (P>0.05). Briefly, patients were treated with adjuvant therapy postoperatively in ≥50 and <50 group was 48.4% (15/31) and 34.2% (13/38) respectively.

The average tumor size of patients in SCC group was larger than that of patients in others group (2.6 *vs.* 2.0 cm) (P<0.05). And the percentage of the tumor spreading adjacent structures in SCC group was higher than that in others group (50.0% *vs.* 11.1%) (P<0.05). All patients with SCC underwent complete resection (R0), which was greater than that of patients with ACC (P<0.05).

Survival and risk factors associated with prognosis

For patients with malignant tumors, the median length of follow-up was 74.7 months for the overall cohort, 48.1 months for patients with ACC, 57.0 months for patients SCC and 89.7 months for patients in the other category. Estimated 1-, 3-, and 5-year OS of the overall population was 88.6%, 79.4%, and 77.2%, respectively, with an estimated mean survival time of 133.7 months (95% CI: 115.5–151.9 months) (*Figure 1*). And all patients with benign tumors were still alive at the deadline for follow-up (range, 42.67–122.90 months).

The Kaplan-Meier analysis showed that patients with young age, small tumor promised a good prognosis while histological type, postoperative treatment, lymph node status and residual tumors status had no significant effects on OS (P>0.05) (*Figure 2A-2F*). The univariate Cox regression analysis showed that the age and tumor were associated with prognostic factors for OS (P<0.05). And the multivariate Cox regression analysis showed that the age (≤50 or >50 years) was independent prognostic factors for OS (P<0.05) (*Table 3*).

Discussion

In this study, the risk factors associated with 69 surgical treated patients with primary TBT were retrospectively analyzed. For patients with malignant tumors, the univariate Cox regression analysis identified that age and tumor size had significant effects on OS. Further multivariate Cox regression analysis confirmed age was the independent prognostic factor.

For primary TBT, the surgical treatment has been proved a better outcome compared with other treatments. And end-to-end anastomosis is conducted when the tumor size is less than 2 cm. If resection length is between 2–4 cm, it's necessary to release the tissues around the trachea, and for patients with cervical tumors, a heavy "guardian" suture is placed to prevent excessive extension of the neck in the immediate postoperative period. If the tumor size is more than 4 cm which means length of resection is more than 5 cm usually, the hilum release will be performed for reducing anastomotic tension. The 5-year OS among patients with primary TBT after surgery varies from 47% to 79% based on previous studies (15). A study

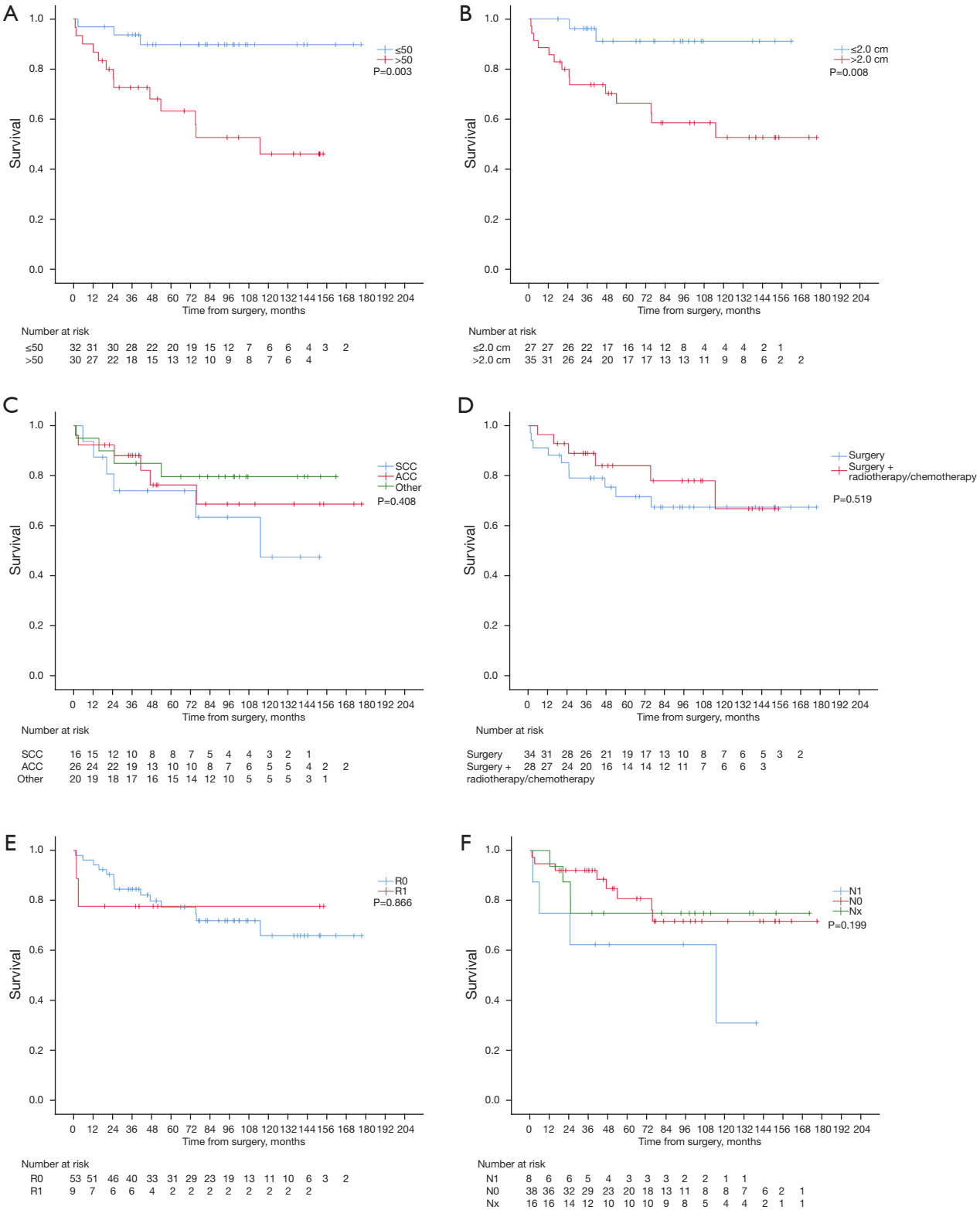

Figure 2 Comparison of OS between different groups in 62 patients with malignant tracheal tumors: (A) age, (B) tumor size, (C) histological type, (D) postoperative treatment, (E) residual tumors status, (F) lymph node status. SCC, squamous cell carcinoma; ACC, adenoid cystic carcinoma; OS, overall survival.

Table 3 Univariate and multivariate Cox regression model analysis of several potential factors for OS in 62 patients with malignant tracheal tumors

Variable	Univariate Cox regression analysis		Multivariate Cox regression analysis	
	HR (95% CI)	P value	HR (95% CI)	P value
Gender		0.485		
Female	Ref	Ref		
Male	1.435 (0.521–3.956)			
Age		0.008		0.037
≤50 years	Ref	Ref	Ref	
>50 years	5.539 (1.573–19.501)		4.340 (1.094–17.214)	
Tumor size		0.019		0.085
≤2 cm	Ref	Ref	Ref	
>2 cm	5.941 (1.347–26.204)		3.962 (0.827–18.976)	
Tumor extension		0.784		
E1	Ref	Ref		
E2	1.152 (0.418–3.178)			
Lymph node status				
N1	Ref	Ref	Ref	Ref
N0	0.358 (0.108–1.192)	0.094	0.489 (0.112–2.128)	0.340
Nx	0.395 (0.098–1.582)	0.189	0.471 (0.075–2.941)	0.420
Histological type				
SCC	Ref	Ref	Ref	Ref
ACC	0.619 (0.199–1.923)	0.407	1.219 (0.241–6.172)	0.811
Others	0.436 (0.123–1.554)	0.201	1.776 (0.359–8.777)	0.481
Smoker		0.942		
Yes	Ref	Ref		
No	0.962 (0.334–2.772)			
Postoperative treatment		0.521		0.704
Surgery	Ref	Ref	Ref	
Surgery + radiotherapy/chemotherapy	0.718 (0.261–1.976)		0.807 (0.266–2.442)	
Residual tumors status		0.866		0.777
R0	Ref	Ref	Ref	
R1	1.137 (0.257–5.031)		1.295 (0.216–7.750)	

OS, overall survival; SCC, squamous cell carcinoma; ACC, adenoid cystic carcinoma.

from Massachusetts General Hospital demonstrated that resection was associated with improved survival, and the rate of survival at 5 years was 87% in patients undergoing resection while 30% in patients without resection (16). A nationwide study in The Netherlands reported that patients treated with surgery had a 5-year survival of 41% (2). In a national analysis in England, the 10-year actuarial palliation-free survival of patients who underwent curative

surgery was 60.8%, compared with 19.5% for the condition overall (3). A SEER study on tracheal cancer showed that patients who underwent surgery, with or without adjuvant therapy, had superior OS than those who did not (17). In our study, estimated 5-year OS of the patients with malignant tumor was 77.2%, exhibiting excellent result and consistent with previous studies. Together with previous studies, our study suggested that patients with primary TBT should undergo surgical treatment when possible.

However, the factors affecting the prognosis of surgery were worthy of attention. Previous studies using multivariate Cox regression analysis showed that age, histology, tumor size, lymph node stage, surgical margins, tumor extension, treatment methods are potential prognosis factors for surgical treatment (8,9,13,14,18). A summary of articles related to prognostic factors of patients with tracheal tumor surgery in the past 20 years is shown in *Table 4*. We incorporated these factors into our analysis, and univariate Cox regression analysis showed age and tumor size had significant effects on the OS. Moreover, in the multivariate analysis, we found age was the only independent risk factor for prognosis of surgery, which was consistent with Bhattacharyya, Mallick, Webb *et al.* reported (1,5,21). The results suggested that for young patients with tracheal tumors, surgical treatment should be performed as much as possible. The functional status of young people is good in most condition, and it helps to recover the trauma caused by surgery, which is able to maximize the benefits of surgery. Surgery can significantly improve the prognosis of patients. And for older patients, comprehensive factors such as surgery related trauma, surgical complications and patient tolerance should be fully considered. Surgery may reduce the physical and mental state of elderly patients, which can aggravate the aging symptoms and decline the life quality.

There were still some controversial issues about the treatment of tracheal surgery. Firstly, the adjuvant treatment (radiotherapy and/or chemotherapy) of tracheal tumors after surgery was controversial. There is no consensus on adjuvant therapy for patients with primary tracheal neoplasm after surgery. Although some studies showed that adjuvant therapy postoperatively did not improve the OS for patients with primary tracheal neoplasm (22), most studies demonstrated patients with adjuvant therapy have better OS than those patients without adjuvant therapy (23). However, the characters of patients received adjuvant therapy were not consistent in different centers. Not only patients had either R1 or N1 status received adjuvant therapy, but also patients with the neoplasm spreading to the adjacent tissues or organs received adjuvant therapy (23,24). In our center, other than patients with R1 or N1 status, patients with primary neoplasm that spread to adjacent organs and other structures (E2) will be taken into consideration for adjuvant therapy. And the decision of conducting adjuvant therapy for patients with E2 status was made based on the MDT. Many studies in recent years have also proposed many effective adjuvant therapies. For example, some studies have shown that radiotherapy with additional carbon ion radiotherapy boost has a good effect on local tumor control of ACC (25). And neoadjuvant therapy was effective in tracheal tumors according to some reports (26). Meanwhile, the immunotherapy proposed in recent years may also be one of the tracheal tumor treatments. Therefore, it is necessary to standardize the postoperative adjuvant treatment of tracheal tumors, and it is hoped that effective postoperative treatment can improve the prognosis of patients. Secondly, for tracheal tumor lymph node dissection, there were different opinions. Some reports found that lymph node status had no impact on the prognosis of patients with TBTs (8) while some studies have found that the status of lymph nodes affects the prognosis (9). The possible reason is that the extent and number of lymph node dissection were not standardized, and the tracheal tumor lymph node dissection was only judged by the surgeon. A report from Massachusetts General Hospital found lymph node-positive SCC related to lower survival while no correlation between lymph node status and ACC survival (9), which may indicate that for SCC patients, a more standardized lymph node dissection is very important. Therefore, a standard lymph node dissection method similar to lung cancer or other tumors is necessary for surgery of tracheal tumors. Thirdly, the effect of complete resection on survival remains controversial in primary tracheobronchial neoplasm. Usually, R0 resected is required, and many studies have also proved that R0 resection has a better prognosis than R1 (6). However, several studies indicated that the OS between patients with having complete resection and incomplete resection was not significant (19,27). Zhao *et al.* (19) pointed that patients with ACC which was a kind of low-grade malignant tumor can receive R1 during surgery, because tension-free anastomosis is more important for patients than R0 resection for ACC. And our result also demonstrated that there was no survival difference between R0 and R1 disease. The reason maybe that patients with R1 disease were mainly ACC (8/10). In our ACC group, positive margin was encountered in 30.8%

Table 4 A summary of articles related to prognostic factors of patients with tracheal tumor surgery in the past 20 years

Case source[†] [year of publication]	Era	Tumor	Prognostic factors (univariate analysis)	Prognostic factors (multivariate analysis)
NCDB [2020] (6)[‡]	2004–2015	SCC: 81 ACC: 137 Others: 67		Age, histology, surgery type, residual tumors status
Chinese Academy of Medical Sciences and Peking Union Medical College [2020] (18)	1965–2017	MEC: 101	Smoking history, tumor size, tumor extension, lymph node status	Lymph node status
NCDB [2019] (13)	2004–2014	SCC: 234 ACC: 180 Others: 135	Age, insurance status, Charlson/Deyo comorbidity score, chemotherapy, cancer grade, residual tumors status, histology, lymph node status, tumor extension	Insurance status, cancer grade, residual tumors status, histology, tumor extension
Chinese Academy of Medical Sciences and Peking Union Medical College [2019] (8)	1967–2017	ACC: 142	Complaint duration, time of surgery, tumor size, tumor extension, treatment methods	Complaint duration, treatment methods
Shanghai Chest Hospital [2016] (7)	1995–2014	ACC: 83	Residual tumors status	
Shanghai Chest Hospital [2013] (19)	2001–2012	Trachea ACC: 43	Symptom of dyspnea, resection length	
Shanghai Chest Hospital [2013] (19)	2001–2012	Bronchial ACC: 26	Tumor size, relapse	
Massachusetts General Hospital [2010] (20)	1962–2008	ACC: 108	Airway margin, extension, lymph node status, perineural growth	
Massachusetts General Hospital [2004] (9)	1962–2002	ACC: 101 SCC: 90	Histology, age, residual tumors status, lymph node status	Histology, age, residual tumors status, airway margin
This study	2004–2020	SCC: 16 ACC: 26 Others: 27	Age, tumor size	Age

[†], the sources are available from dataset [PubMed]; [‡], this cohort selection criteria are different from the article published in 2019; NCDB, the National Cancer Database; MEC, mucoepidermoid carcinoma; SCC, squamous cell carcinoma; ACC, adenoid cystic carcinoma.

of patients, which was similar to previous studies (19,28).

An interesting result was noticed in our study. With regards to oncologic outcomes we showed that OS was no statistically significant among ACC, SCC and other pathological types while many previous studies showed strong difference, especially for SCC (5,6,9,13,14). Comparative survival rates after resection varied between previous studies, with 5-year survival rates of 52% to 100% for ACC and 39% to 53% for SCC (2,6,9,29,30). A retrospective analysis from Massachusetts General Hospital reported that 5-year survival of ACC patients with surgery were 78% which was similar to our study (77.6%) (20). But for SCC, a long-term follow-up of 270 patients showed that 39.1% of patients with resected survived at 5 years (9), while 5-year survival for SCC in our study (73.8%) was higher than most studies. A report from Massachusetts General Hospital found that complete resection and age in SCC was associated with improved survival (9). As for mean age of SCC, a national study reported mean age was 65 years and what Massachusetts General Hospital showed was 61 years (6,9), while the mean age of SCC in our study was 56.8 years which was smaller than those of the other studies. On the other hand, R0 resection rate of SCC in our study (100%) was the highest rate of primary TBTs' studies. The differences in age and R0 resection rate may offer explanation for SCC 5-year survival's disparity. These findings indicated that other than from the other histological types, for patient with SCC, the R0 resection should be tried the best to achieved, especially for younger patients.

Our study has several limitations. It was a retrospective study in a single center with limited number of patients, which had its intrinsic limitations. However, the present investigation was a pretty large single-center retrospective study of primary TBT compared with other centers. Moreover, the patients in this study included a variety of histological type, providing adequate information which was representative. This study can contribute to the understanding of the clinical characteristics and prognostic factors of primary TBT.

In summary, this study shared the analysis of the prognostic factors and compared with other studies, finding age as independent prognostic factors of primary TBT, and for patient with SCC, the R0 resection should be tried the best to achieved, especially for younger patients, which had important clinical significance for clinical monitoring of primary TBT treated by surgery.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://jtd.amegroups.com/article/view/10.21037/jtd-21-1791/rc

Data Sharing Statement: Available at https://jtd.amegroups.com/article/view/10.21037/jtd-21-1791/dss

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jtd.amegroups.com/article/view/10.21037/jtd-21-1791/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by ethics board of the Second Affiliated Hospital of Air Force Medical University (No. K202111-04) and individual consent for this retrospective analysis was waived.

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