

Research Article

Analysis of Related Risk Factors for Artificial Airway Management in Postoperative Patients with No Throat in Laryngeal Cancer

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Abstract

Objective: To analyze the relevant factors affecting artificial airway management in postoperative non laryngeal patients with laryngeal cancer. **Method:** A total of 150 patients who underwent total laryngectomy in a tertiary hospital between January 2020 and January 2023 were selected as the study subjects. Their clinical data were retrospectively analyzed, and they were divided into two groups based on whether they had postoperative artificial airway problems: one group had no airway problems (n=52) and the other group had artificial airway problems (n=98). Conduct univariate analysis on factors that may affect artificial airways, and conduct multivariate logistic regression analysis on factors with statistically significant differences. **Results:** Among the 150 patients, a total of 98 experienced postoperative artificial airway problems, with an incidence rate of 65.33%. Gender, age, diabetes, tumor stage, wound healing, sputum viscosity after artificial airway, room temperature and humidity, occurrence of multiple drug resistance, and neck lymph node dissection were included in the univariate analysis of the occurrence of artificial airway problems. The results showed that wound healing, sputum viscosity after artificial airway, room temperature and humidity, occurrence of multiple drug resistance were related to the artificial airway problems of laryngocarcinoma patients without larynx after surgery ($P<0.05$). Four statistically significant single factors, including wound healing, sputum viscosity after artificial airway, room temperature and humidity, and the occurrence of multiple drug resistance, were included in the multivariate logistic regression analysis. The results showed that wound healing, sputum viscosity after artificial airway, and the occurrence of multiple drug resistance were closely related to the occurrence of artificial airway problems in non laryngeal patients after laryngeal cancer surgery, and were independent risk factors ($P<0.05$). **Conclusion:** For patients with laryngeal cancer treated with total laryngectomy, wound healing, sputum viscosity after artificial airway, and the occurrence of multidrug resistance are high-risk influencing factors for postoperative artificial airway problems, which should be taken seriously in clinical work.

Keywords

Laryngeal Cancer, Non Laryngeal Patients, Artificial Airway, Risk Factors

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1. Introduction

Laryngeal cancer and hypopharyngeal cancer are common malignant tumors in the clinical practice of ear, nose, throat, head and neck surgery. Some patients in the middle and late stages need to undergo total laryngectomy surgery [1]. During the operation, the patient was required to have airway ostomy to avoid dyspnea caused by airway compression [2]. After tracheostomy, the original respiratory pathway was changed, forming a new artificial airway. Artificial airway changes the integrity of the airway while ensuring the patient's life, weakening mucosal ciliary movement and glandular function, and losing the natural defense barrier and heating and humidification function of the upper respiratory tract [3]. Insufficient humidification of the airway leads to loss of moisture in the upper respiratory tract, dryness of mucosal secretions, and even respiratory obstruction, ultimately resulting in atelectasis and pulmonary infection [4]. Therefore, further analysis of the influencing factors of artificial airway problems in non laryngeal patients is particularly important. This study retrospectively analyzed the clinical data of 150 non laryngeal cancer patients treated with total laryngectomy in our hospital from January 2020 to January 2023, and analyzed the relevant risk factors for the occurrence of artificial airway problems. The aim is to provide guidance for the care of artificial airway in clinical non laryngeal patients and provide a basis for conducting pipeline research in non laryngeal patients.

2. Materials and Methods

2.1. General Information

The research subjects were 150 laryngeal cancer patients who underwent total laryngectomy in our hospital from January 2020 to January 2022, and their clinical data were retrospectively analyzed. Inclusion criteria: (1) Non laryngeal patients undergoing total laryngeal surgery; (2) Patients with complete clinical data; (3) Patients without distant metastasis. Exclusion criteria: (1) Patients with concomitant other tumors; (2) Patients with cognitive impairment. They were divided into two groups based on the occurrence of artificial airway problems after surgery, one group was the group without airway problems (n=52), and the other group was the group with artificial airway problems (n=98). In the group without airway problems, there were 4 females and 48 males; The patient's age is 42-83 (68.48 ± 8.42) years old; The number of diabetes patients was 7 (13.5%); The proportion of tumor staging is: 47 patients (90.4%) in stages I-II, and 5 patients (9.6%) in stages III-IV. In the group of artificial airway problems, there were 6 females and 92 males; The patient's age is 48-86 (69.43 ± 7.10) years old; The number of patients

with diabetes was 9 (9.2%); The proportion of tumor staging is: 84 people (85.7%) in stages I-II, and 14 people (14.3%) in stages III-IV. There was no statistically significant difference in basic information between the two groups of patients ($P>0.05$), indicating comparability.

2.2. Method

After the establishment of artificial airway in patients without throat, there may be some complications during the treatment process, including subcutaneous emphysema, pipeline prolapse, local infection, aspiration, bleeding, airway mucosal ulcer, and airway stenosis [5]. To understand the influencing factors of related complications, 150 laryngeal cancer patients who underwent total laryngectomy treatment in our hospital from January 2020 to January 2022 were selected. The correlation between gender, age, diabetes, tumor stage, wound healing, sputum viscosity after artificial airway, room temperature and humidity, the occurrence of multiple drug resistance, neck lymph node dissection and the occurrence of artificial airway problems after surgery was analyzed. The factors with statistical significance were re included for multivariate logistic analysis.

2.3. Statistical Methods

Using statistical software SPSS 25.0 to analyze data, apply χ^2 Perform a multivariate logistic analysis on individuals with statistical significance in univariate analysis.

3. Results

3.1. Pipeline Problem Occurrence Rate

Out of 150 patients, a total of 98 experienced postoperative artificial airway problems, with an incidence rate of 65.33%.

3.2. Single Factor Analysis of Artificial Airway Problems

As shown in Table 1, age, gender, diabetes, tumor stage, wound healing, sputum viscosity after artificial airway, room temperature and humidity, occurrence of multiple drug resistance, and neck lymph node dissection were included in the univariate analysis of the occurrence of artificial airway problems. The results showed that wound healing, sputum viscosity after artificial airway, room temperature and humidity, occurrence of multiple drug resistance, and occurrence of artificial airway problems were related ($P<0.05$).

Table 1. Single factor analysis of artificial airway problems (%).

Variable (n=150)	grouping	artificial airway problem group	no artificial airway problem group	χ^2	P
Age	<60	9 (9.2)	5 (9.6)	0.007	0.931
	≥60	89 (90.8)	47 (90.4)		
Gender	Female	6 (6.1)	4 (7.7)	0.001	0.982
	Male	92 (93.9)	48 (92.3)		
Diabetes	Have	9 (9.2)	7 (13.5)	0.652	0.419
	No	89 (90.8)	45 (86.5)		
Tumor staging	stages I-II	84 (85.7)	47 (90.4)	0.670	0.413
	Stage III-IV	14 (14.3)	5 (9.6)		
Wound healing condition	Grade B and Grade C healing	47 (48.0)	15 (28.8)	5.118	0.024
	Grade A healing	51 (52.0)	37 (71.2)		
Sputum viscosity after artificial airway	I °	61 (62.2)	41 (78.8)	4.303	0.038
	II-III °	37 (37.8)	11 (21.2)		
Room temperature and humidity	abnormal	37 (37.8)	11 (21.2)	4.303	0.038
	normal	61 (62.2)	41 (78.8)		
Multiple drug resistance	occur	28 (28.6)	24 (46.2)	4.637	0.031
	No occurrence	70 (71.4)	28 (53.8)		
Neck lymph node dissection	unilateral	52 (53.1)	31 (59.6)	0.590	0.442
	Bilatera	46 (46.9)	21 (40.4)		

3.3. Multivariate Logistic Regression Analysis of Artificial Airway Problems

Using postoperative artificial airway problems in non laryngeal patients as the dependent variable and statistically significant influencing factors in univariate analysis as independent variables for multivariate analysis, the assigned values are shown in Table 2. Four statistically significant single

factors, including wound healing, sputum viscosity after artificial airway, room temperature and humidity, and the occurrence of multidrug resistance, were included in the multivariate logistic regression analysis. The results are shown in Table 3, indicating that wound healing, sputum viscosity after artificial airway, the occurrence of multidrug resistance, and the occurrence of artificial airway problems are closely related and are independent risk factors ($P < 0.05$).

Table 2. Variable Assignments for Artificial Airway Problems.

dependent variable (Y)	Assigned Method	Argument (X)	Assigned Method
Artificial airway problems	Have=0; No=1	Wound healing condition	Grade B and Grade C healing=0, Grade A healing=1
		Sputum viscosity after artificial airway	II-III °=0, I °=1
		Room temperature and humidity	abnormal=0, normal=1
		Multiple drug resistance	occur=0, No occurrence=1

Table 3. Logistic regression analysis of artificial airway problems.

characteristic	B	S.E.	OR&95%CI	Wald	P
Wound healing condition	1.214	0.418	3.366 (1.485-7.631)	8.447	0.004
Sputum viscosity after artificial airway	0.844	0.423	2.327 (1.014-5.336)	3.976	0.046
Room temperature and humidity	0.794	0.421	2.211 (0.969-5.049)	3.55	0.060
Multiple drug resistance	-1.116	0.409	0.328 (0.147-0.730)	7.455	0.006

4. Discussion

Throat cancer resection for curative effect positive treatment, but can destroy the airway structure and function, establish artificial airway can not completely replace the original physiological function, cause local tissue defense mechanism is severely damaged, to induce complications such as lung infection, so the specification for airway management in laryngeal cancer patients postoperative is very important [6]. To reduce the occurrence of complications, it is particularly important to do a good job in artificial airway management (airway humidification, sputum guidance, pipeline care, etc.). The results of this study showed that among 150 patients, a total of 98 patients experienced postoperative artificial airway problems, with an incidence rate of 65.33%. At the same time, it can be seen from Table 1 that by incorporating age, gender, diabetes, tumor stage, wound healing, sputum viscosity after artificial airway, room temperature and humidity, the occurrence of multiple drug resistance, and neck lymph node cleaning into the single factor analysis of the occurrence of artificial airway problems, the results show that wound healing, sputum viscosity after artificial airway, room temperature and humidity, the occurrence of multiple drug resistance are related to the occurrence of artificial airway problems ($P < 0.05$). The results of multivariate logistic regression analysis showed that wound healing, sputum viscosity after artificial airway, occurrence of multidrug-resistant drugs, and occurrence of artificial airway problems were related risk factors ($P < 0.05$).

The postoperative wound healing of laryngeal cancer is divided into three levels: A, B, and C. A level indicates good wound healing, while B and C levels indicate poor wound healing effect. Different surgical site infections and/or concurrent pharyngeal fistula are common postoperative complications in patients with laryngeal and hypopharyngeal cancer [7]. If a pharyngeal fistula occurs and the neck wound persists, it can easily lead to infection and bleeding around the artificial airway, increase treatment time, and affect treatment effectiveness. The results of this study showed that the staging of wound healing had a statistically significant impact on the management of artificial airway in non laryngeal patients (OR=3.366, 95% CI (1.485-7.631), $p=0.004$). The risk of

artificial airway problems in grade B and grade C healing was 2.266 times higher than that in grade A healing.

Most patients undergoing laryngeal cancer surgery require tracheostomy, which causes significant tissue damage and alters the patient's normal breathing pattern [8]. After tracheostomy, the upper respiratory tract lacks the function of heating, humidifying, and filtering gases. External air directly enters the lower respiratory tract through the tracheal cannula, which can easily form phlegm scabs inside the tracheal cannula, leading to respiratory obstruction [9]. On this basis, if the viscosity of sputum is higher, it is more likely to cause the formation of phlegm scabs, which increases the risk of artificial airway blockage. The results of this study showed that the viscosity of sputum had a statistically significant impact on the occurrence of artificial airway problems in non laryngeal patients (OR=2.327, 95% CI (1.014-5.336), $p=0.006$), indicating that the risk of artificial airway problems in II ° and III ° sputum was 1.327 times higher than that in I ° sputum.

With the continuous development and clinical application of new drugs and technologies, the clinical detection rate of multidrug-resistant bacteria (MDRO) is also showing an increasing trend year by year. This "super bacterium" poses new challenges to the infection prevention and control work of medical institutions worldwide [10]. Laryngeal cancer patients are mostly elderly people, who are at high risk of hospital infection due to multiple underlying diseases and low immune function [11]. According to the investigation results of Fu Jiangtao [12], MAO Xiaofeng [13], Qiu Liping [14], patients after laryngeal cancer hospital infection pathogens include *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. Infection with multidrug-resistant bacteria can prolong treatment time and increase the risk of developing artificial airway problems. From Table 2, it can be concluded that the occurrence of multidrug resistance has a statistically significant impact on the occurrence of artificial airway problems in non laryngeal patients (OR=0.328 (0.147 0.730), 95% CI (0.147 0.730), $p=0.046$), indicating that patients with multidrug resistance have a 0.672 fold increased risk of developing artificial airway problems compared to those without multidrug resistance.

In summary, for laryngeal cancer patients treated with total laryngectomy, wound healing, sputum viscosity after artificial airway, and the occurrence of multidrug resistance are

high-risk influencing factors for postoperative artificial airway problems. Clinical attention should be paid to providing targeted measures and interventions to improve clinical treatment effectiveness and patient prognosis.

5. Conclusion

In this study, wound healing, sputum viscosity after artificial airway, and occurrence of multiple drug resistance were important factors affecting the occurrence of artificial airway problems in total laryngeal patients. In clinical work, we should observe and change the dressing frequently to prevent wound infection and promote wound healing. Careful consideration in medication, to prevent the occurrence of multiple drug resistance. For multi-drug resistant patients, according to the results of drug sensitivity culture, targeted drugs to promote the recovery of patients. Establish a good airway humidification environment, promote sputum dilution, timely discharge from the body, maintain the normal physiological function of airway epidermal cells cilia, so as to achieve the purpose of sputum dilution, elimination of local tissue edema and infection. Therefore, in the future work, the focus is still to improve the effect of humidification, promote wound healing, prevent the occurrence of multiple drug resistance, reduce the complications of patients with total laryngeal pneumotomy, and ensure the safety and comfort of patients. Limited by the sample size and the inclusion of the evaluation indicators, the research results are not perfect enough, so we look forward to further large-scale and multi-center cooperation and research in the future.

Abbreviations

MDRO: Multidrug-Resistant Organism

Author Contributions

Qing Shasha: Study design, research implementation, data analysis, paper writing

Xiao Hongying: Study design, data collection and analysis

Chen Xiaofang: Data collection and data collection analysis

Conflicts of Interest

The authors declare no conflicts of interest.

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