Analysis of Risk Factors for Pneumonia in 482 Patients Undergoing Oral Cancer Surgery With Tracheotomy

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Purpose: Elective tracheostomy is a common procedure used in patients with oral cancer. However, secondary tracheotomy-associated pneumonia (TAP) is an important complication after surgery. This study investigated the risk factors related to postoperative TAP complications in patients with oral cancer.

Materials and Methods: A retrospective study was performed from January 2012 to October 2013. Data on patients who had oral cancer and underwent neck dissection or reconstructive surgery with tracheotomy were collected from the Hospital Information System. The predictive variables were age, gender, alcohol history, smoking history, basic disease (including diabetes, hypertension, and cardiovascular disease), tumor location, and duration of tracheotomy, which were extracted from electronic medical records. The outcome variable was TAP. Descriptive single factors and bivariable statistics were computed and the *P* value was set at .05.

Results: Four hundred eighty-two patients who received tracheotomy after oral cancer surgery were included in this study and 95 (19.7%) developed TAP. Univariate analysis showed that male gender (odds ratio [OR] = 1.853; 95% confidence interval [CI], 1.083-3.17; *P* = .024 to <.05), long duration of tracheotomy (OR = 1.673; 95% CI, 1.343-2.083; *P* < .0001), and smoking (OR = 1.656; 95% CI, 1.053-2.604; *P* = .029 to <.05) were risk factors for TAP. Then, 2 variables independently related to an increased risk of postoperative TAP were found by multivariate regression analysis, which were male gender (OR = 1.945; *P* = .018) and long duration of tracheotomy (OR = 1.694; *P* = .0001).

Conclusions: The present findings indicate that male gender and tracheotomy duration are important risk factors for TAP in patients undergoing major oral cancer surgery.

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The risk of complications is increased during the postoperative period; in surgical procedures, the respiratory system is frequently affected. In a large meta-analysis, the incidence of postoperative pulmonary complications (PPCs) reported in patients undergoing non-thoracic surgery varied widely from 2 to 19%.[1] Major head and neck surgery most often results in upper airway obstruction, which in turn causes edema of the larynx, pharynx, and posterior tongue and requires the use of bulky reconstructive

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flaps. Bilateral neck dissection surgery or removal of the mandible, tongue, and floor of the mouth is even more risky.[2] The incidence of PPC has been shown to vary among patients after head and neck surgery, which was considered intermediate in a large meta-analysis.[3] Although elective tracheostomy is performed as part of this surgical procedure, patients easily develop PPCs.[4] Therefore, the incidence of PPC in patients after head and neck surgery is 15 to 46%.[5] For instance, pneumonia has been reported at an overall postoperative rate of at least 20%.[6] Ong et al[6] suggested that 73 patients treated with major head and neck surgery were sufficient for analysis: 37 patients (47%) had pulmonary complications that progressed to pneumonia in 29 (40%). Petrar et al[4] found that major head and neck surgery results in increased risk for PPCs, with advanced age and hypertension strongly related to PPCs. Decreased lung function and postsurgical atelectasis have emerged as important risk factors for pneumonia.[6] Previous meta-analyses have reported that cigarette smoking is an independent predictor of PPCs.[3,7] Tracheostomy and anesthesia lasting longer than 4 hours are other known risk factors for pneumonia in head and neck surgery.[8] An increased incidence of pulmonary complications delays recovery, demands greater intensive care, increases hospital stay, and obviously leads to higher health care costs. In this study, all patients underwent oral oncology resection, free flap transplantation, and tracheostomy after surgery. The authors assessed other risk factors for their roles in the occurrence of pneumonia.

Materials and Methods

This retrospective study was approved by the institutional research ethics board to review data of patients after oral cancer surgery at a tertiary care center in Shanghai, China. Data recorded from admission and anesthesia records included age, gender, basic diseases (including diabetes, hypertension, and cardiovascular disease), preoperative smoking, and alcohol use. Patients were considered smokers when currently smoking or had a smoking history of 10 pack-years during their lifetime. Patients with unrecorded current smoking status or history of cigarette use were counted as nonsmokers. Preoperative comorbidities were obtained from hospitalization documents. Duration of tracheostomy and tumor site were determined from hospital charts. Inclusion criteria were an age older than 18 years, anesthesia time longer than 3 hours, procedure requiring tracheotomy, and free tissue transfer repair without postoperative mechanical ventilation. Patients with pre-existing pulmonary disease were excluded.

The practices of the authors' clinic are similar to those found in other major head and neck cancer centers, as described in contemporary reports in the field (elective tracheostomy is a common procedure in patients after head and neck surgery). A gastric feeding tube was implanted before transfer to the intensive care unit (ICU) in a fully awake state, where oxygen was provided through a tracheotomy. After the operation, all patients were routinely treated with antibiotics.

PRIMARY OUTCOME VARIABLE

The primary outcome was tracheotomy-associated pneumonia (TAP). Diagnosis of pneumonia was contingent on at least 2 of the following criteria: persistent (ie, ≥24 hours) fever (>37.5°C), purulent sputum volume increase (20%), new shadowing on chest radiograph, or persistent (ie, ≥2 days) localized signs at chest examination (crackles, bronchial breathing, wheeze, or pleural rub).[6] Chest radiographs were assessed by a respiratory physician (J.K.) who was blinded to patients' postoperative therapy.

DATA COLLECTION

Data were obtained retrospectively on patients undergoing oral oncology surgery with tracheostomy from January 2012 to December 2013 in the authors' hospital unit. Data regarding overall outcomes were collected for 523 cases, although comprehensive operation details were available for 482 patients. All procedures included neck dissection with or without reconstructive surgery. Tracheotomies were carried out by the surgical team.

STATISTICAL ANALYSIS

Data analysis was performed using SPSS 16 (SPSS, Inc, Chicago, IL). Univariate analyses were carried out by χ^2 test; logistic regression analysis was conducted using statistically relevant factors to identify independent risk factors for TAP; data are presented as unadjusted odds ratios (ORs) and 95% confidence intervals (CIs). A P value less than .05 was considered statistically significant.

Results

PATIENT DATA

The present study included 482 patients (334 men and 148 women; 20 to 88 yr old; 58.28 ± 13 yr). There were 197 (40.87%) cases of tongue carcinoma, 61 (12.66%) cases of cancer of the floor of the mouth, 54 (11.2%) cases of buccal mucosa carcinoma, 64 (13.28%) cases of jaw malignant neoplasm, 15 (3.11%) cases of palate carcinoma, 70 (14.52%) cases of gingiva carcinoma, and 21 (4.4%) cases of