Airway Covered Metallic Stent Based on Different Fistula Location and Size in Malignant Tracheoesophageal Fistula

Hongwu Wang, MD, Meimei Tao, MD, Nan Zhang, MD, Dongmei Li, MD, Hang Zou, MD, Jieli Zhang, MD, Lingfei Luo, MD, Hongming Ma, MD and Yunzhi Zhou, MD

Abstract: *Background:* Malignant tracheoesophageal fistula (MTEF) is a devastating complication of esophageal cancer, lung cancer or other carcinoma with a shorter life-span and poor life quality. The aim of this study was to assess the effect of airway stent insertion on MTEF patients. *Methods:* A total of 63 MTEF patients were included, 12 patients with lung cancer and 46 patients with esophageal cancers. Eight zones were proposed to classify various fistula locations. Airway stents were selected based on the various zones and fistula size. *Results:* Airway stents were successfully inserted in all patients, and both airway and esophageal stents in 8 patients. Most fistula were located in locations II (18/63, 28.6%), III (22/63, 34.9%), then VII (9/63, 14.3%). The stents included 10 (15.9%) I shaped, 8 (12.7%) L shaped and 45 (71.4%) Y shaped. Different stents were placed based on different locations and sizes of fistulas. Overall, mean survival time was 163 days (2–270 days). Most symptoms relieved after stent insertion. Mean Karnofsky score jumped from 43.0 ± 10.7 before stent placement to 66.7 ± 10.8 after stent insertion ($P = 0.000$). Complete closure was achieved in 45 patients (71.4%), and incomplete closure and leakage were found in 18 patients. *Conclusions:* Airway stent insertion provides an effective approach to improve symptoms and quality of life. The choice of stent based on different fistula location and size may be a reasonable way in clinical practice.

Key Indexing Terms: Airway stent; Eight zones; Malignant tracheoesophageal fistula. **[Am J Med Sci 2015;350(5):364–368.]**

A malignant tracheoesophageal fistula (MTEF), a pathological communication between the esophagus and the airway, can occur after surgery, radiotherapy, chemotherapy, or airway invasion.[1,2] Approximately, 5% to 15% patients with esophageal malignancy, less than 1% bronchogenic carcinoma patients, and very few from other malignant carcinomas, develop MTEF.[2–4] Autopsy data indicate that MTEF incidence is higher than diagnosed.[3] Tracheoesophageal fistula (TEF) is a negative predictor of long-term survival, and those patients generally have a very poor prognosis and quality of life. Severe cough, pneumonia, frequent aspiration to the airway, malnutrition and life-threatening hemoptysis can lead to rapid deterioration, and most patients die within 3 to 4 months.[2,5]

Several different management strategies have been used for MTEF, including surgical resection/repair of the fistula, feeding gastrostomy/jejunostomy, esophageal stenting, radiotherapy, airway stenting or both in combination.[1,6,7] Undoubtedly, operative resection of the fistula and reconstruction of the airway and alimentary tract will provide the best opportunity of full recovery, however, it carries a high risk of complications, especially for malignant patients, therefore is seldom performed.[7] Feeding gastrostomy/jejunostomy is generally regarded as the ultimate method to treat MTEF before the application of stenting, but some patients refuse the option and insist on eating food again. Palliative therapy with a stent to the tracheobronchial tree and/or esophagus will relieve symptoms immediately, extend the survival period, improve the quality of life and may offer the opportunity for potential multimodal oncologic treatment based on existing data.[3] Since most MTEFs are because of esophageal cancer and there are usually some degree of stenosis associated with fistula, esophageal stenting is preferred than tracheal stenting.[8] However, when an esophageal stent elicit respiratory restriction due to compressed trachea, a tracheal stent is a preferred option.[9]

Unlike the esophageal, the tracheal is divided into different parts. Limited studies have reported the effect of airway covered metallic stent placement in MTEF based on different locations in the tracheal.[10] The aim of this report was to summarize the experience with airway covered metallic stents for palliation of MTEF in 63 patients according to the fistula location and size.

SUBJECT AND METHODS

Design

This investigation was a retrospective study. Informed consents were obtained from all patients or their representatives before stent implantation. This study was approved by Meitan general Hospital Institutional Review Board (IRB no. 2006.08).

Patients

A total of 63 patients with malignant inoperable MTEF were treated using covered metallic stents from September 2006 to February 2014, including 51 men and 12 women, ageing from 27 to 76 years old with the mean age of 57. All patients (or their families) were informed about the procedures, possible results and complications.

All patients were not suitable to accept surgery due to illness severity, higher surgical risk or their refusal. These patients conformed to at least one of following criteria: (1) esophageal unsuitable for stenting; (2) respiratory complications due to esophageal stent only and (3) airway stenosis. The decision regarding airway stent placement was based on the location of the stenosis and esophageal peristalsis. From experiences one can find that if esophageal peristalsis is strong, the esophageal metallic stent is prone to move. Therefore, placement of the airway stent in these patients is preferable. Firstly, airway stent was inserted. If the fistula was not satisfactorily closed, another esophageal stent was implanted depending on the situation of esophagus.

Stent Implantation

All patients in this study received covered metallic airway stents (Micro-Tech, Nanjing, China). The choice of

From the Department of Medical Oncology (HW, NZ, DL, HZ, JZ, LL, HM); and the Department of Respiratory Medicine (MT, YZ) Meitan General Hospital, Beijing, China.

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Correspondence: Hongwu Wang, MD, Department of Medical Oncology, Meitan General Hospital, No.29 Xibahe Nanli, Chaoyang District, Beijing 100028, China (E-mail: wanghongwu2008@aliyun.com).

stent length and diameter was determined by the endoscopic examination and chest computed tomography scan. Airway Y stents were implanted using a rigid bronchoscopy (KARL STORZ GmbH and Co, Tuttlingen, Germany) under general anesthesia. Other stents were placed with flexible video bronchoscopy (Olympus Medical, Tokyo, Japan) under general anesthesia. The flexible bronchoscope was inserted at the proximal end of the lesion through the mouth or rigid bronchoscopy. A guide wire was inserted through the bronchoscope and passed through the lesion and then the bronchoscope was withdrawn. The location of the guide wire was confirmed by the bronchoscope, which was reinserted. The delivery catheter (Micro-Tech) was advanced over the guide wire to deploy the stent under bronchoscopic visualization. The delivery catheter, guide wire and bronchoscope were withdrawn, leaving the stent in the lesion site. The bronchoscope was used to check the position and the extension of the stent.

Fistula Location and Size

Five locations of the central airway were proposed to classify airway stenosis in a previous study: (1) location I, upper 3rd of the trachea; (2) location II, middle 3rd of the trachea; (3) location III, lower 3rd of the trachea; (4) location IV, right main bronchus; (5) location V, left main bronchus.[11] Based on the above classification method, 8 zones were proposed to classify various fistula locations in this study. As illustrated in Figure 1, locations I, II and III were defined the same as 5 locations. Location IV, trachea carina; location V, right main bronchus; location VI, right middle bronchus; location VII, proximal of left main bronchus; location VIII, distal of left main bronchus. Fistula was classified into small (<1 cm) and big (>1 cm) according to a previous study.[12]

As illustrated in Table 1, the I-shaped stent was adopted for patients with small fistula in the location I, location II and location VIII. The Y-shaped stent was used for patients with big fistula in the location II, location III, location V, location VII, and for patients with small fistula in the location III and location IV. The L-shaped stent was chosen for patients with small fistula in the location V, location VI and location VII.

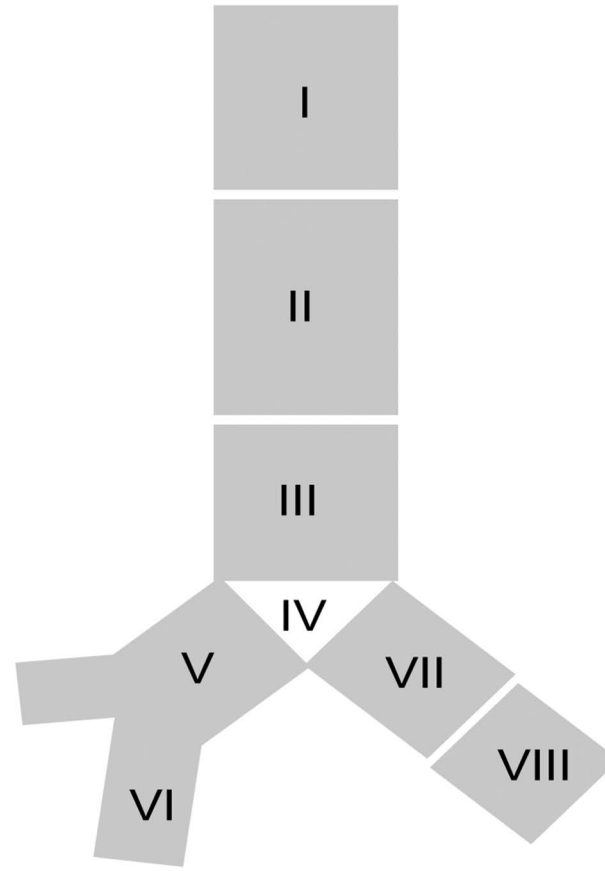

FIGURE 1. Eight locations of the central airway: (1) location I, upper 3rd of the trachea; (2) location II, middle 3rd of the trachea; (3) location III, lower 3rd of the trachea; (4) location IV, trachea carina; (5) location V, right main bronchus; (6) location VI, right middle bronchus; (7) location VII, proximal of left main bronchus; (8) location VIII, distal of left main bronchus.

Data Acquisition

The baseline study characteristics were recorded, including the site of fistula and previous treatment with chemotherapy, radiation and surgery. Successful stent implantation, symptomatic relief and complications were also recorded.

Patient Follow-up

Patients were followed up both in clinical and in endoscopy. All patients received first follow-up at 1 month, then every 2 months or based on patient's symptoms. Clinical and endoscopic follow-up were more frequent in those patients for the growth of granulation tissue due to stent. A long-term follow-up has also been made through telephone by the referring doctors when patients could not visit doctors routinely.

Karnofsky Score Analysis

Karnofsky Score (KPS) has been developed to assess the quality of life of cancer patients. The first KPS score was administered to all patients before stenting. The 2nd KPS score was given to the same patients at 1 month during follow-up.

Statistical Analysis

An exploratory analysis was performed by using SPSS16.0. The χ^2 test was used for categorical data. The paired *t* test was used for manifestations before and after treatment. Survival data were assessed by the Kaplan–Meier method.

RESULTS

As shown in Table 2, patients included 46 cases of esophageal cancer, 12 cases of squamous cell lung carcinoma, 1 case of esophageal lymphoma, 3 cases of tracheal adenoid cystic carcinoma and 1 case of thyroid cancer. Seventeen patients received conventional radiotherapy. The demography and clinical data are listed in Table 1. All patients underwent airway stent insertion and 8 patients (12.7%) with both airway and esophageal stent insertion. Clinical manifestations of these patients before and after stent placement are listed in Table 3, including dyspnea (25 [39.7%] versus 2 [3.2%]; $P = 0.000$), cough (63 [100%] versus 15 [23.8%]; $P = 0.000$) and pulmonary infection (63 [100%] versus 10 [15.9%]; $P = 0.000$). Mean KPS was 43.0 ± 10.7 before stent placement and mean KPS was 66.7 ± 10.8 after stent placement ($P = 0.000$) (Figure 2). Complete closure was achieved in 45 patients (71.4%), and incomplete closure and leakage were found in 18 patients. But stents were not removed in 18 patients due to the improvement of clinical manifestations.

Most fistulas were located in location II (18/63, 28.6%), location III (22/63, 34.9%), then location VII (9/63, 14.3%).