

Application of combined-type Y-shaped covered metallic stents for the treatment of gastrotracheal fistulas and gastrobronchial fistulas



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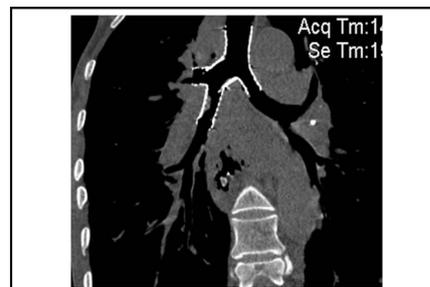
ABSTRACT

Objective: To determine the safety and feasibility of combined-type integrated Y-shaped self-expanding covered metallic stents to treat gastrotracheal fistulas (GTFs) and gastrobronchial fistulas (GBFs).

Methods: We retrospectively reviewed the data of 10 patients with postoperative GTFs or GBFs. Depending on the size and location of the fistula and the airway diameter, we custom-designed 2 or 3 stents for each patient. The combined-type stents consisted of a large and a small Y-shaped stent. Under fluoroscopic guidance, the small stent was inserted into the distal part of the involved airway. Then, the large stent was placed at the trachea and carina. The large stent partly overlapped the main body of the small stent.

Results: All stents were successfully inserted at the first attempt. Esophageal and airway radiography showed no contrast agent leakage, indicating that the fistula was fully sealed. After the procedure, the patients could resume eating without coughing, and their quality of life improved. Each patient was fully followed up. Six patients died at 3.2 to 8 months of tumors (4 patients), hemoptysis (1 patient), or pulmonary infection (1 patient). In 1 patient, the carinal fistula enlarged 4 months after stenting, and another small Y-shaped stent was inserted to seal the fistula. This patient and the remaining 3 patients are still alive.

Conclusions: Deployment of the combined-type Y-shaped integrated self-expanding covered metallic stent proved to be an effective, safe, and minimally invasive procedure for complex GTFs and GBFs. Our patients tolerated the stents well and had good palliation of their symptoms. (*J Thorac Cardiovasc Surg* 2016;152:557-63)



The treatment of a patient with GBF (1 small Y-stent and 1 large Y-stent inserted)

Central Message

The placement of combined-type Y-shaped self-expandable coated metallic stents is a new method for the treatment of GTFs and GBFs.

Perspective

Single and combined tubular stents have been used to treat GTFs and GBFs, but the rates of leakage and stent dislocation were high. The placement of combined-type Y-shaped fully covered self-expandable metallic stents is clinically feasible, and the short-term curative effects were reliable, suggesting that this could be a new method for the treatment of GTFs and GBFs.

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Gastrotracheal fistula (GTF) and gastrobronchial fistula (GBF) are extremely rare and life-threatening complications of esophagectomy.¹⁻⁴ The formation of fistulas

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Abbreviations and Acronyms

GTF = gastrotracheal fistula
 GBF = gastrobronchial fistula
 SCT = spiral computed tomography

between the tracheobronchial tree and the stomach in the late postoperative period after gastric pull-up surgery is most often caused by tumor recurrence, radiation necrosis, and tracheobronchial erosion along the gastric staple line.⁵⁻⁷ A covered metallic esophageal stent would be the first choice for the management of GTFs and GBFs, but most often the clinician faces a situation in which the esophageal stent should have a larger diameter on the gastric side making stenting the alimentary side of the fistula insufficient.⁵ Moreover, the risk of migration is high for stents placed in the gastric pull-up segment.⁵ Some investigators have used single or combined covered tubular airway stents to treat GTFs and GBFs, but the bifurcated structure of the trachea and main bronchi causes a rate of 5.7% to 57% of leakage and stent displacement.^{1,8-11} Y-shaped self-expanding covered metallic stents have been used for sealing fistulas of the airway, with good outcomes.^{4,12} However, in the case of large GTFs and GBFs, and fistulas that involve the carina or the left or right main bronchus, a single Y-shaped stent might not fully seal the fistula. In this study, we used the combined-type Y-shaped covered metallic stent to treat large GTFs and GBFs and fistulas that involved the carina or the left or right main bronchus in 10 patients. The procedure of stent implantation and the recommendations for its use are discussed. The primary aim of our study was to determine the feasibility and safety of this technique for the treatment of complex GTFs and GBFs. A secondary aim was to calculate the long-term stent patency and complication rates during follow-up.

METHODS

Our institutional review board approved this retrospective study, and written informed consent was obtained from each participant or their next of kin for the use of their clinical records in this study.

Patients

From January 2010 to January 2014, we treated 10 patients who had developed complex GTFs or GBFs after undergoing esophagectomy for the treatment of esophageal cancer. Their clinical and imaging data were retrospectively analyzed, and are summarized in Table 1, and nutritional parameters were assessed using Nutritional Risk Screening 2002.¹³⁻¹⁵ In all patients, the diagnosis was made using spiral computed tomography (SCT) of the chest and bronchoscopy. All patients had undergone esophageal cancer resection and supra-aortic arch gastroesophageal anastomosis 6 to 17 months before the intervention. Of the 10 study patients, 9 had undergone radiotherapy (6000-7000 cGy) for the original esophageal cancer, and in these patients, the fistula appeared 5 to 16 months after radiotherapy. The remaining patient had undergone radiotherapy (6500 cGy) 2 months before surgery and received chemotherapy (with 5-fluorouracil, cisplatin, etc.) for 3 months after surgery. In this patient, the fistula appeared 9 months after radiotherapy (4 months after chemotherapy). All patients coughed when drinking or eating, and these symptoms were aggravated when the patients were lying down. Two patients had fever and hemoptysis. The patients had undergone antiinflammatory drug treatment, gastrointestinal decompression, and enteral nutrition for 7 days to 5 months before the stenting, with poor results.

Preintervention Preparation

Before the intervention, all patients had varying levels of malnutrition. Once the fistula was diagnosed, an intestinal feeding tube was inserted using digital subtraction angiography or endoscopy. Enteral nutrient solution (produced by the general nutrition center of our hospital), together with intravenous hyperalimentation, was injected through the tube to maintain caloric intake 3 to 5 days before the stent was manufactured. The enteral nutrient solution was used for 1 to 2 weeks (or longer in some weak patients) after stenting while oral intake was gradually recovered. Routine blood tests, including liver and renal function, blood coagulation function tests, and pulmonary function tests were also performed before the procedure. Chest SCT and bronchoscopy were used to determine the location and size of the fistula. The inner diameter of the trachea and bronchi were measured using chest SCT, and large (placed across the carina) and small (placed across the bifurcation of the lobar bronchus) Y-shaped stents were customized for each patient according to the imaging data.

TABLE 1. Clinical data of the 10 patients with complex gastrotracheal fistulas and gastrobronchial fistulas

Patient Number/ Age (y)/Sex	Disease	Previous treatment	Location of fistula	Symptom duration	Follow-up time (mo)	Follow-up result
1/64/M	Esophageal cancer	RT	LMB	4 mo	9	Live
2/58/M	Esophageal cancer	RT	RMB	3 mo	4.8	Dead
3/45/M	Esophageal cancer	RT	Trachea	7 d	7	Dead
4/51/M	Esophageal cancer	RT	RMB	15 d	3	Dead
5/69/M	Esophageal cancer	RT	RMB	1.5 mo	4	Live
6/52/M	Esophageal cancer	RT	LMB	40 d	3.2	Dead
7/49/M	Esophageal cancer	RT and CTx	LMB	17 d	6	Dead
8/57/M	Esophageal cancer	RT	RMB	5 mo	15	Live
9/73/M	Esophageal cancer	RT	LMB	8 d	8	Dead
10/75/M	Esophageal cancer	RT	Trachea	14 d	6.7	Live

M, Male; RT, radiation treatment; LMB, left main bronchus; RMB, right main bronchus; CTx, chemotherapy.

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