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CASE REPORT

Combined Y-Shaped Covered Metallic Stents for Gastrobronchial Fistulas Involving the Right Intermediate Bronchus

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Abstract Gastrobronchial fistula that involves the right intermediate bronchus is an extremely rare complication of esophagectomy. In this report, two patients with gastrobronchial fistulas around the secondary right carina were treated by combined Y-shaped covered metallic stents. Four covered stents were inserted successfully at the first attempt with no complications. The gastrobronchial fistula was fully sealed in each patient, and they were able to eat without coughing.

Keywords Respiratory tract fistula · Stents · Fluoroscopy · Postoperative complications

Introduction

Gastrobronchial fistulas are rare but life-threatening complications of esophagectomy. Large Y-shaped covered metallic stents have been used for gastrobronchial fistulas by covering the area of the lower trachea and/or both main bronchi [1, 2]. However, in the case of gastrobronchial fistulas that involve the right intermediate bronchus, a single Y-shaped covered metallic stent might not fully seal the fistula. We present two cases of gastrobronchial fistulas involving the right intermediate bronchus and secondary right carina that were treated by combined Y-shaped covered metallic stents.

Case Reports

Each patient provided written consent for use of their medical records for subsequent publication. The Y-shaped covered metallic stents are covered with silica gel film and are woven with nickel–titanium alloy wires. All stents and delivery systems are manufactured by Micro-Tech Co. Ltd. (Nanjing, China), and an illustration of the stent was provided in a previous publication [3].

Case #1: A 63-year-old woman presented to our department with a 3-day history of productive cough after drinking, yellow sputum, and intermittent fever of 38 °C. The patient had undergone esophagectomy for esophageal cancer 3 weeks before admission, and had not benefited from symptomatic treatment. After admission, a chest computed tomography (CT) showed gastrobronchial fistulas of the right intermediate bronchus (Fig. 1A). Esophagography showed that a small amount of contrast media had overflowed into the right intermediate bronchus. A jejunal nutrition tube and gastrointestinal decompression tube were inserted. An appropriate model of a Y-shaped covered airway stent (Micro-tech Co Ltd, Nanjing, China) was custom made in accordance with the patient's chest CT measurements. Self-expandable airway stents were implanted under fluoroscopic guidance 1 week after admission (Fig. 2B–D). The main portion of the stent

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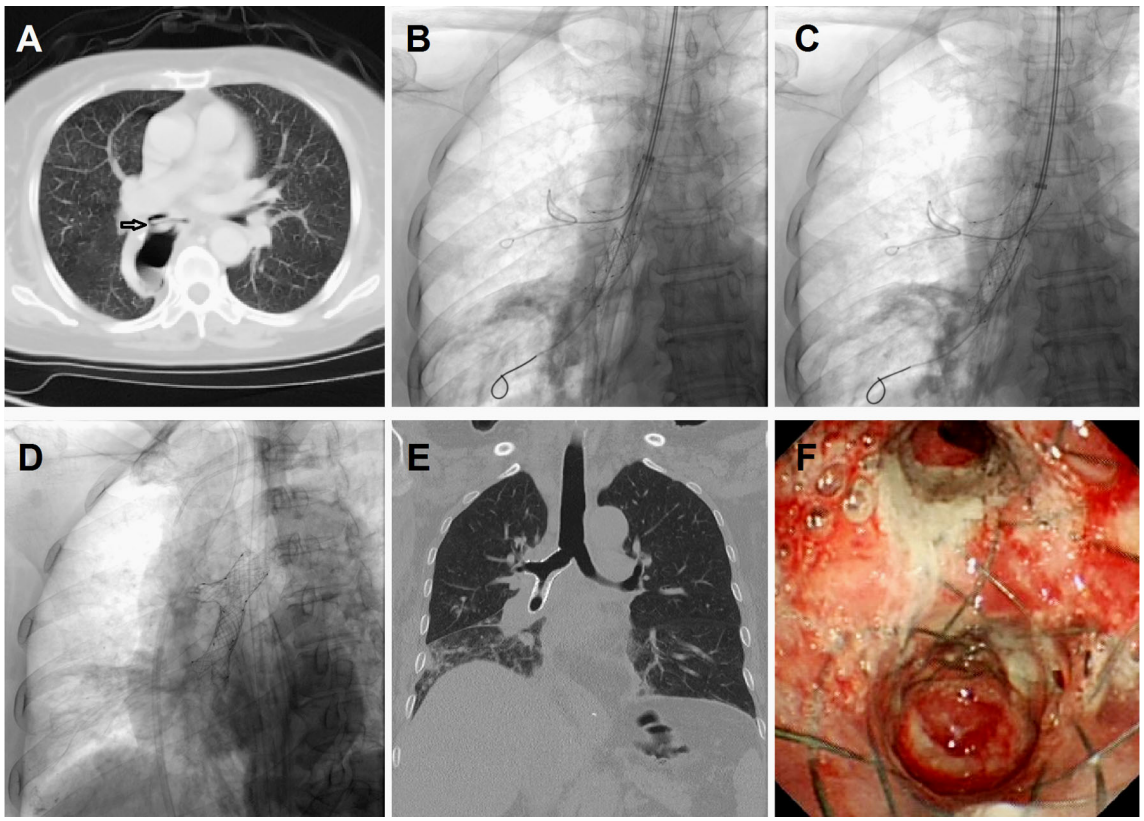

Fig. 1 A 63-year-old woman with gastrobronchial fistula in right intermediate bronchus. **A** A chest CT showed gastrobronchial fistula (arrow) of the right intermediate bronchus. **B** The self-expandable Y-shaped covered stent was implanted under fluoroscopic guidance. **C** A second Y-shaped stent is inserted in the primary right carina. **D** The combined Y-shaped stents showed appropriate location. **E** chest CT scan showed complete sealing of the fistula, with mild tissue hyperplasia within the stent in the right intermediate bronchus after 45 days. **F** The stent recovered its patency after electroresection under fiberoptic bronchoscope

inserted around secondary right carina measured 10 mm in diameter and 20 mm in length, the right lower bronchial part measured 8 mm in diameter and 10 mm in length, and the middle lobe bronchial portion measured 6 mm in diameter and 10 mm in length. The main portion of the stent inserted around primary right carina measured 14 mm in diameter and 15 mm in length, the right upper bronchial part measured 10 mm in diameter and 10 mm in length, and the intermediate bronchial portion measured 10 mm in diameter and 15 mm in length. A repeat transcatheter bronchography showed appropriate location and patency of the stents. During the follow-up, a chest CT scan showed complete sealing of the fistula, with mild tissue hyperplasia within the stent in the right intermediate bronchus after 45 days (Fig. 1E). The stent recovered its patency after electroresection under fiberoptic bronchoscope (Fig. 1F).

Case #2: A 62-year-old man presented to our department with a more than 3-month history of repeated cough after drinking. The patient had undergone esophagectomy for esophageal cancer 7 months earlier. A chest CT showed gastrobronchial fistulas and stenosis of the right intermediate bronchus (Fig. 2A). Esophagography showed that a large amount of contrast media had overflowed into the right intermediate and lower bronchus. A jejunal nutrition tube and gastrointestinal decompression tube were inserted (Fig. 2B). Twelve days later, a self-expandable airway stent was implanted under fluoroscopic guidance. The main portion of the stent inserted around secondary right carina measured 10 mm in diameter and 20 mm in length, the right lower bronchial part measured 6 mm in diameter and 15 mm in length, and the middle lobe bronchial portion measured 6 mm in diameter and 15 mm in length. The main portion of the stent inserted around primary right carina measured 12 mm in diameter and 10 mm in length, the right upper bronchial part measured 8 mm in diameter and 12 mm in length, and the intermediate bronchial portion measured 10 mm in diameter and 20 mm in length. A repeat transcatheter bronchography showed complete sealing of the fistula and patency of the stents (Fig. 2C). The chest CT scan showed complete sealing of the fistula without tissue hyperplasia after 30 days (Fig. 2D).

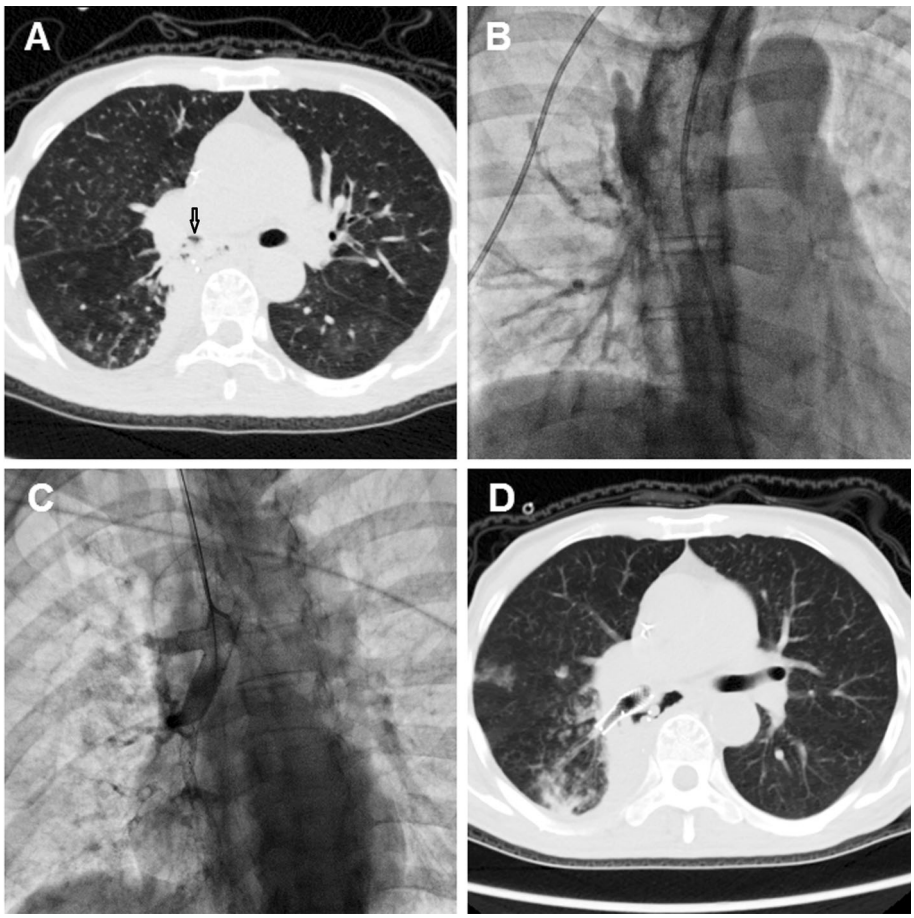

Fig. 2 A 62-year-old man with gastrobronchial fistula. **A** A chest CT showed gastrobronchial fistulas and stenosis (arrow) of the right intermediate bronchus. **B** Bronchography showed a large amount of contrast media had overflowed into the right intermediate and lower bronchus. **C** A repeat transcatheter bronchography showed complete sealing of the fistula. **D** The chest CT scan showed complete sealing of the fistula without tissue hyperplasia during the follow-up

Discussion

Airway fistula is a severe and potentially life-threatening complication often encountered after surgery for esophageal carcinoma [4]. Unfortunately, neither medical nor surgical treatment shows an excellent curative effect, and mortality and disability rates are high. Most of these patients may be too sick to undergo definitive open surgery [5]. Currently, airway stents have been widely used clinically for the treatment of tracheobronchial stenosis or tracheal fistula [6]. For example, both silicone Y stents and metallic Y stents have been widely used to treat carinal stenosis or fistulas. However, few studies have described the treatment of complex airway fistula or stenosis, such as gastrobronchial fistula that involves the right intermediate bronchus.

Here, we report two patients with gastrobronchial fistulas involving the right intermediate bronchus and secondary right carina and were treated by combined Y-shaped covered metallic stents. Four covered stents were inserted successfully at the first attempt with no complications. In each patient, the gastrobronchial fistula was fully sealed and they were able to resume eating without coughing. During the follow-up, only the first case showed mild tissue hyperplasia in the end of the stent in the right intermediate bronchus after 45 days. Stent restenosis is one of the most common complications after stenting, because stents are not effective against neoplasms and proliferating granulation tissue. Thus, bronchoscopic surveillance with or without debridement of granulation tissue is necessary to avoid this complication during the follow-up.

Various types and materials of airway stents have been studied. The silicone stent is one of the most common stents due to its easy removability, durability, and low cost [7, 8]. However, Y-shaped metallic stents show good support and flexibility, and can be inserted with the help of guidewires. Metallic stent placement may be less traumatizing and minimizes the procedures in cases with a fistula [9]. Individualized Y-shaped metallic stents can be produced upon request, and are designed to fit on the main carina. The implanted Y-shaped metallic stents showed excellent stability, with a low migration rate. In this study, customized Y-shaped metallic stents were used for fistula around the secondary right carina.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval Statement All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the Ethics Committee and Medical Records Management Section of the he First Affiliated Hospital of Zhengzhou University.

Informed Consent Statement Informed consent was obtained from all individual participants included in the study.

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