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Endoscopic closure of acquired oesophagorespiratory fistulas with cardiac septal defect occluders or vascular plugs

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Acquired oesophagorespiratory fistulas;
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Flexible bronchoscope;
Stent;
Aspirated pneumonia

Summary
Objectives: To report an endoscopic treatment for inoperable oesophagorespiratory fistulas (ORFs).
Patients and methods: Six patients with inoperable acquired tracheobronchial-oesophageal fistulas (four males and two females; mean age, 70.2 ± 10.28 years) were included. Cardiac septal defect occluders or vascular plugs were implanted through a flexible bronchoscope to close the ORFs. Monthly follow-ups were done for 16 months.
Results: All fistulas were successfully closed immediately after the procedure. The severe aspirated pneumonia was controlled in 7–10 days. The two mechanically ventilated patients were weaned successfully from the ventilator, and the general condition of patients improved rapidly. However, the fistulas recanalised in four patients because of the cutting effect of the edge of the occluders 1–12 months after the procedure. Other reasons, such as compression of the tracheal intubation balloon and repeated inflammation of the oesophageal diverticulum, may also have contributed to the recanalisation.

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Conclusions: Endoscopic closure of acquired ORFs with cardiac septal defect occluders or vascular plugs improve patients' general condition immediately after the procedure, but may result in recanalisation longterm. The occlusion might be considered an abridgement to surgery.

Introduction

Acquired oesophagorespiratory fistula (ORF) is an acquired, abnormal communication between the oesophagus and the airway. Mangaveira-Albernaz reported the origins of 456 cases of tracheo-oesophageal fistulas: 80% were from tumours, 8% from inflammation, 9% from trauma, and 3% were agnogenic [1]. About 0.3%—5% of patients suffered from tracheo-oesophageal fistulas after tracheostomy and intubation [2,3]. Large tracheo-oesophageal fistulas are difficult to treat. Surgery is an important option but some patients are unable to tolerate it because of poor condition caused by severe, recurrent, aspirated pneumonia and malnutrition [4]. Other approaches include conservative supportive therapy, stenting, biogel sealing, and plugs. These methods may result in poor efficacy or lethal complications [5]. Here we report a series of patients with acquired ORF treated with cardiac septal defect occluders or vascular plugs.

Patients and methods

Between September 2012 and July 2014, six patients (four males and two females) at Guangdong General Hospital, Guangdong, China, ranging in age from 55 to 80 years (mean, 70.2 $\pm$ 10.28 years) were confirmed by endoscopic examination and Computer Tomography(CT) scan to have eight ORFs. Two were already mechanically ventilated because of respiratory failure. During the study period, all patients were informed that use of the device was being performed off-label; written, informed consent was obtained from all patients before the procedure. The study protocol was approved by the Ethics Committee of Guangdong General Hospital.

Procedure

The procedure was carried out under conscious sedation using propofol at an initial intravenous bolus of 0.5—1.0 mg/kg and continuously 1.5—4.5 mg/kg. Repeated intravenous 10 mg boluses of propofol were administered every minute until the patients had achieved adequate sedation. In contrast to the previously reported patients in whom rigid bronchoscopic, oesophagoscopic, and fluoroscopic guidance was used, the current procedure was carried out only under direct bronchoscopic visualisation at the bronchoscopy suite or intensive care unit. Upon insertion of the bronchoscope into the oesophagus, we substituted negative pressure for positive pressure in order to obtain clear vision. Bronchoscopy, oesophageal gastroscope, and chest CT scan were performed to outline the anatomy and size of the fistula. If the fistula could not be found, we injected methylene blue into the oesophagus and checked the dyed bronchus. In addition, we inserted a guide wire from the oesophagus and transferred it to the opposite side of the fistula, then, keeping it in place, took a CT scan to determine its destination and to focus on the location of the fistulas. The implantation was completed from either a tracheal or oesophageal approach, depending on the patient's status and anatomical features.

Devices

The occlusion devices used in this study were cardiac septal defect occluders (Lifetech Scientific, Shenzhen, China) and vascular plugs (Lifetech). Lifetech devices are similar to the corresponding Amplatzer devices (ADs) that were used in other reports, all of which were made from knitted nitinol mesh. The main difference between Lifetech devices and ADs is the baffle materials: those of the Lifetech devices are polyethylene terephthalate (PET) in the cardiac septal defect occluder and expanded polytetrafluoroethylene (PTFE) in the vascular plug, whereas the Amplatzer atrial occluder and muscular ventricular septal occluder are made from Dacron polyester; no fabric baffles were sewn into the Amplatzer vascular plug (AVP).

The size and type of device chosen were dependent on the length and shape of the fistula, with the intent that the retention disc of the occluder would completely cover the fistulous connection and that the diameter of the occluding waist and that of the plug fit inside the fistula. If the fistula was located between the central airway and oesophagus, a cardiac septal defect occluder would be selected to provide enough space for both discs to expand on both sides and to anchor the occluder against displacement in situ. If the fistula was located in the peripheral airway and shaped narrowly like a duct, vascular plugs were chosen to close the tubular fistula.

Closure techniques

After deciding to implant the device from the tracheal approach, we chose an intubation tube with an inside diameter larger than 8 mm in order to contain the bronchoscope and delivery sheath at the same time. A 0.035-inch guide wire was introduced through the bronchoscopic working channel and advanced into the fistula. Over the wire, a 5F—7F delivery sheath with core was introduced into the fistula and forwarded into the oesophagus. After pulling out the sheath core and the guide wire, we inserted the steel cable into the loader and connected the occluder

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