Surgical management of aortoesophageal fistula caused by foreign bodies

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Abstract

Objective: Aortoesophageal fistula (AEF) is a rare complication of foreign-body ingestion but is often life threatening. Methods: Between July 2006 and July 2009, four patients (two male and two female, age between 54 and 62 years old) with AEF were treated in our center. Cardiopulmonary bypass was established in all cases. The infected aorta was resected and replaced with aortic Dacron graft. The esophagus was mobilized and removed, and the digestive tract was reconstructed 1–2 months later after the first operation, by performing anastomosis of the esophagus and stomach at the neck. Results: All four cases were treated successfully and survived up to the days when this article was written. Conclusions: It might be a safer way to perform this surgery under cardiopulmonary bypass. Thorough surgical debridement should be done, including resection of thoracic esophagus, adequate irrigation and flushing, and full draining of the chest cavity. Reconstruction of the digestive tract in the second stage of this two-stage operation should be the safest choice.

Keywords: Aortoesophageal fistula; Foreign induced; Surgical management

1. Introduction

Aortoesophageal fistula (AEF) is a rare complication of foreign-body ingestion. However, it is highly dangerous and is often life threatening. Nandi and Ong [1] reviewed 2394 cases of impacted esophageal foreign body but only found two (0.08%) complicated with AEF. However, the patients were both refractory to treatment and associated with rather poor outcome. Kelly et al. [2] reviewed over 100 documented cases of AEF secondary to foreign-body ingestion and found that only seven cases survived after 12 months. In the present study, we reported four continuous cases of AEF caused by either fish or poultry bones, all of which survived after successful surgical management in our center.

2. Materials and methods

Between July 2006 and July 2009, four patients (two men and two women) with AEF received surgical treatment in the Department of Cardiothoracic Surgery, Shanghai Zhongshan Hospital. Among these patients, two were caused by fish bones, while the rest by poultry bones. Their ages ranged from 54 to 62 years. All of them reported chest pain 5–7 days after the injuries, followed by fever, general malaise, elevated white blood cells, and other symptoms of infection. All suffered from hematemesis and/or melena. Gastroscopy revealed esophageal ulcers in all cases, but no remaining foreign body was found. Preoperative computerized tomography angiogram (CTA) indicated AEF and mediastinitis in all the four patients. Three of them underwent emergency surgeries after diagnosis, and one received elective surgery. The operation was divided into two stages. In the first stage, the injured thoracic aorta was removed and replaced by an aortic Dacron graft, the thoracic esophagus was totally resected, and the cervical esophagostomy was performed. Furthermore, we performed jejunostomy for nutrition support. After a 1–2 months’ recovery period, we began the second stage of esophagus reconstruction.

The first case was a female patient, aged 54 years. Intermittent chest pain occurred after accidental oral intake of fish bone. CT scan was normal. The chest pain increased after 7 days, followed by fever, malaise, elevated white blood cells count, and other symptoms of infection. Gastroscopy showed an ulcer in the upper esophagus, 1.0 cm in diameter, located 25 cm from the incisors. She vomited 300-ml blood 2 days later. Enhanced CT showed a descending aortic arch pseudo-aneurysm, at the convex side of the esophagus, a large amount of bilateral pleural effusion, and mediastinitis. Upon arriving at our hospital, the patient’s blood pressure was 90/60 mmHg and temperature 39 °C. An emergency operation was done on 7 July 2006; and stage 2 surgery to reconstruct the digestive tract was done on 17 September 2006.

The second patient was a 62-year-old male. Chest pain occurred 5 days after accidental oral intake of chicken bone,
followed by high fever, and leukocytosis. The patient vomited 200-ml blood 2 days later. Emergency gastroscopy saw an esophageal ulcer 0.5 cm in diameter located 28 cm from the incisors. Enhanced CT showed a descending thoracic aortic pseudo-aneurysm, AEF, and mediastinal abscess. On 16 August 2006, the patient was transferred to our hospital for emergency surgery. Moreover, stage 2 surgery was done on 10 October 2006.

The third patient was a 57-year-old female. Chest pain occurred 7 days after duck bone injury associated with high fever and leukocytosis. One day later, she had 200-ml hematemesis and about 300-ml melena. Emergency gastroscopy showed an ulcer 0.6 cm in diameter, located 28 cm from the incisors in the esophagus. Enhanced CT indicated descending thoracic aorta esophageal fistula and mediastinal abscess. On 14 October 2008, the patient was transferred to our hospital for emergency surgery. Second-stage surgery was done on 29 November.

The fourth patient was a 54-year-old male. His course is more complicated than the other three. Recurrent chest pain occurred after oral intake of fish bone. He did not visit the hospital right away. Six days later, he had fever, followed by hematemesis and melena of about 500 ml. At the local hospital, he was diagnosed to have AEF. On 31 March 2009, the descending aorta endovascular stent was placed to close the aortic fistula. One month later, the patient began to intake semiliquid. However, 2 days later, he had 300-ml hematemesis again. CTA still indicated AEF. Thus, on 16 June, the second stent was placed. While 2 weeks later, repeat gastroscopy detected the ulcer located 29—33 cm away from the incisors in the esophagus, it did not heal. The diameter was 3 cm. The aortic stent could be seen through the ulcer. Hence, broad-spectrum antibiotics were applied, and the patient was transferred to our hospital on 9 July 2009 for selective surgery. One stent was removed and artificial blood vessels were implanted. The proximal part of the Dacron prosthesis was anastomosed to the part of the remaining stent graft with 3/0 prolene. Reconstruction of the digestive tract was performed on 26 August 2009 (Figs. 1 and 2).

For all four cases, a left posterolateral thoracotomy incision was made to gain access to the aorta and esophagus. Cardiopulmonary bypass (CPB) was also established in three cases via the left femoral artery and vein, and, in the fourth case, via the left femoral artery and pulmonary vein (left heart bypass). The proximal and distal ends of the descending aorta were cross-clamped, respectively. The infected aorta was resected and replaced by an aortic Dacron graft. The resected aorta received microbiological assessment. In the first case, the necrotic defect of the aorta was immediately next to the origin of the left subclavian artery; therefore, the cannulation of the femoral artery and vein plus the cannulation of the pulmonary artery and ascending aorta were undertaken; after the temperature was lowered to 18°C, the proximal occlusion clamp was released and the circulation of the upper body of this patient was discontinued to complete the proximal anastomosis. After CPB, the thoracic esophagus was mobilized and removed. The proximal end of the esophagus was fistulized through the neck, and the remote end was closed. Thrombosis, pus, and necrotic tissue were thoroughly cleared, and the chest cavity was repeatedly irrigated and flushed with warm saline.

Fig. 1. CTA of the fourth case. (a) AEF onset: the leakage of contrast from the aorta and mediastinitis. (b) After the first endovascular stent graft was inserted: still see the leakage. (c): 13 months after operation: the reconstructed esophagus behind the sternum.
Chest-tube drainage was used. Jejunostomy was also performed. Intravenous nutritional support was started on the second postoperative day. Enteral nutrition was then administered step by step. Chest drainage was placed for approximately 2 weeks until the drainage volume was less than 50 ml per day, and results of microbe culture became negative. Broad-spectrum antibiotics were routinely used until the drainage tubes were removed. Only the stent removed from the fourth patient was found to contain *Escherichia coli*. All other cases had negative results in the bacteriological tests.

Reconstruction of digestive tract was performed 1–2 months after the first operation. The patient was positioned supine and a limited upper midline incision was applied. The stomach was mobilized, preserving the right gastroepiploic arcade. Then the stomach was trimmed to a gastric tube, which was suitable for reconstruction. We selected the substernal route to perform the esophagogastric anastomosis in the cervix.

3. Results

All four patients survived until this article was written (range: 13 months—4 years). The patients’ last follow-up CTA time was March 2009, August 2009, June 2010, and September 2010, separately. The first case had the cervical anastomotic leakage and was cured after dressing management. Cervical anastomotic stenosis appeared in the second case, and was cured after the expansion treatment.

4. Discussion

AEF caused by a foreign body is rare, and its long-term survival rate is very low. Kelly et al. [2] found that only seven cases had survived more than 1 year. We reviewed the literature published in Chinese and also found poor outcomes; less than 10 cases were cured. And all these successful cases should be attributed to surgical treatment. The mortality rate of conservative treatment was as high as 100%. The first successfully cured case was by Cterteko and Mok [3] in 1980 using the direct occlusion of the descending aorta and the direct suture of the aortic and esophageal fistula. However, direct repair of the fistula was highly risky, was usually associated with unfavorable outcomes, and in most cases, was used to deal with those without mediastinal abscess. With the application of new techniques, we used newer and more secure methods and obtained successful results. This article discussed the treatment strategies and surgical techniques used in our center, which may contribute to favorable outcome in the future.

The diagnosis of AEF caused by foreign bodies is not complicated. Based on the history of foreign-body ingestion, the Chiari triad of symptoms (chest pain, sentinel arterial upper gastrointestinal tract hemorrhage, and exsanguination after an asymptomatic interval), combined with CTA and/or endoscopy, one can always make a clear diagnosis. Therefore, early detection and treatment are fairly important and should be emphasized. Generally, the interval between sentinel hemorrhage and exsanguination is more than 24 h. Patients with esophageal injury caused by foreign bodies should be transferred to qualified hospitals that can deal with AEF as early as possible. The Sengstaken-Blakemore tube (SBT) should be used to control the initial bleeding temporarily so as to allow emergent surgery. Endovascular angioplasty has now become a useful option, as demonstrated through use on our patient and in a previously reported case in other centers [4]. It still remains controversial as to whether endovascular stenting could be
used as a definitive procedure or as a short-term measure before definitive open surgical treatment. According to our experience, endovascular thoracic aorta stenting should be used as a temporary or transitional measure before definitive open surgery because these wounds always associated with contamination and infection.

Simple repair of the fistula is rarely performed nowadays due to infection and rather poor prognosis. In our opinion, surgical operation should be performed in centers where CPB is available. It should be safer and more reliable to perform aortic surgery under CPB [5], which makes it easy to cut the infected aortic wall and implant Dacron vascular prosthesis. Both ends of the vascular prosthesis should be anastomosed with healthy aorta. A homograft might be a better choice as data [6] indicated that a homograft has stronger anti-infection ability. According to our experience, however, a Dacron vascular prosthesis is also acceptable. Surgical debridement should be done thoroughly, including resection of the thoracic esophagus, repeated irrigation and flushing, and full draining of the chest cavity. Relative long-term use of antibiotics should be implemented to control the infection. One-stage reconstruction of the digestive tract inside the chest cavity could avoid the second surgery, but infection would be hard to manage in case an esophageal fistula appeared. Therefore, it is risky to some extent. In our opinion, reconstruction of the digestive tract in the second stage of this two-stage operation should be a safer choice, though it is a longer process.

References