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Acquired benign esophago-airway fistulas

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Abstract *Materials and methods.* Over a period of 25 years, 35 patients with acquired benign esophago-airway fistulas were treated. Only two of them were female. The etiology of the communications was corrosive burns, penetrating wounds, postoperative and endoscopic lesions, esophageal diverticula, prolonged ventilatory assistance, pleural empyema and foreign bodies. Radical operative treatment was performed in 31 cases. In four of these the procedure was palliative, because of poor general condition and lung complications. The operative approach was chosen after precise endoscopic and contrast X-ray examinations. A cervical approach with partial median sternotomy to the third intercostal space was performed in 19 patients. In the rest of the patients a thoracotomy was performed. Simple excision of the fistula, longitudinal suture of the trachea and horizontal suture of the esophagus was the method of choice in nine patients. A flap from the left sternocleidomastoid was additionally interposed in front of the esophagus in 12 patients. In six cases circular resection, reconstruction of the trachea and plastic suture of the esophagus were performed. Esophagectomy with ensuing colon substitution was necessary in four patients. *Results.* Excellent or good results were obtained in 29 of the 31 patients operated on. We had two deaths in the early postoperative period (6.8%) due to lung complications in patients with chemical burns of the esophagus. The operated patients were followed up for period ranging from 3 to 20 years. *Conclusion.* Acquired esophago-respiratory fistulas require emergency surgical treatment. The proper choice of operative approach is largely dependent on the precise diagnosis. Preoperative intensive care and metabolic balance are important factors in this report. Radical operative treatment depends on the basic disease, local inflammation and lung complications. [Eur J Cardio-thorac Surg (1996) 10:713–716]

Key words Trachea · Bronchus · Esophagus · Fistulas

Introduction

The first description of a tracheo-esophageal fistula (TEF), with unknown etiology, is credited to John Taylor in 1737. Bernardus described a broncho-esophageal fistula (BEF) due to tuberculosis. The most common causes of acquired benign TEF and BEF are foreign body extraction, inflammation or trauma [1, 2, 5, 6, 13, 15], lung abscess [6, 15] esophageal diverticula [5, 9, 16] and, cuffed tracheal tube [1]. The operative treatment of esophago-respiratory fistulas (ERF) started at the beginning of the century with esophagostomy, gastrostomy, and possibly local drainage. Thoracotomy and radical operation were first performed

by Sauerbruch in 1923. During the last decades an increasing number of succesfully treated benign esophago-respiratory fistulas have been reported [2, 5, 7–9, 11, 12, 14, 15]. Nevertheless, TEF and BEF still represent difficult curative problems. We would like to share our experience with diagnosis, selection of the surgical approach, and operative treatment results.

Patients and methods

At the Emergency Medicine Institute "N. I. Pirogov" and Clinic for Thoracic Surgery – Bulgarian Medical Academy 35 patients with acquired fistulas between the tracheo-bronchial tree and the esophagus were treated over a period of 25 years. The mean age of the patients was 29 years. The causes of the acquired esophago-airway fistulas from esophageal origin were: caustic injuries of the esophagus in eight patients, in three patients after dilatation of a corrosive stricture, and esophageal diverticula penetration in six patients. The causes of the lesion originating from the tracheo-bronchial tree included: prolonged ventilatory assistance requiring prolonged endotracheal tube (3 weeks – 3 months) in seven patients, lymph node perforation in a bronchus in three patients, following endoscopic procedures or lung resection in five patients and of traumatic origin in three patients (Table 1).

Table 2 shows the symptoms of the esophago-airways communication. An attack of coughing during drinking and swallowing in high risk patients was the first indication of the development of the communication. The severity of the symptoms depended on the fistula size. They were markedly expressed in short wide communications and rather more discrete in narrow fistulas.

The range of diagnostic methods included initial chest radiography. Contrast dye esophagography was performed in patients in whom the diagnosis was suspected. Flexible or rigid endoscopy (tracheobronchoscopy and esophagoscopy) was the most informative diagnostic procedure. A combined method of endoscopy and the swallowing of dye (methylene blue) was employed in cases with discrete symptoms and indirect tracheobronchoscopic evidence of fistula. Computer tomography scanning provided the opportunity for a precise investigation in patients in whom the diagnosis was suspected.

Radical operative treatment of the fistula was performed in 31 patients (Table 3). Contraindications for major operation were advanced lung destruction and severe caustic injuries of the esophagus. A cervical approach with partial sternotomy in the third intercostal space was undertaken in 19 patients with a high fistula. In the rest of the cases high postero-lateral right thoracotomy in the third intercostal space was the method of choice. In nine patients with small-sized communications a simple excision of the fistula, or an excision of the diverticula with longitudinal suture of the trachea or bronchus and horizontal suture of the esophagus, was feasible. In 12 patients with a medium-sized fistulae a flap from the sternocleidomastoid muscle, taken from the mastoid part, was additionally interposed between the gullet and the trachea. Three cases with lung complications required lobectomy.

Because of a tracheal stenosis in six patients, circular resection and reconstruction of the trachea with plastic suture of the esophagus was performed. The anastomoses were divided from the esophagus with polyamide mesh. In four patients, after severe caustic burns of the esophagus, esophagectomy followed by colon substitution was the method of choice. In two of them esophageal substitution was performed at a second stage.

Perioperative and postoperative treatment with broad spectrum antibiotics (cephalosporines – second generation), and including anti-anaerobic bacteria drugs for colon substitution cases, was performed for a week. Gastrostomy as a palliative procedure was used in three patients, and in six other patients as the first stage of treatment.

Table 1 Etiology of the esophago-airway fistulas

Cause	Tracheal	Bronchial	Total
Caustic injuries	8	–	8
Long-standing tracheostomy	7	–	7
Postoperative procedures	3	2	5
Esophageal diverticula	–	6	6
Esophageal dilatation	2	1	3
Lymph node penetration	–	3	3
Traumatic	3	–	3
Total	23	12	35

Table 2 Frequency of the clinical symptoms in the patients with esophago-airway fistulas

Clinical symptoms	Patients
Attack of coughing when taking liquids	35
Dryness of the skin and mouth	29
Pain in the neck and the chest	23
Cough and sputum with particles of meal	12
Hemoptysis	5
Intrathoracic oppression	4
Hoarse voice	2
High temperature (with lung complications)	12

Results

The results were assessed according to the following main factors: time span between the development of the disease and surgical treatment, etiology of the communication, the presence of concomitant disease and the development of lung and mediastinal complications.

Excellent results were recorded for patients treated in the early stage after the development of the fistula. In such patients the hospital treatment was reduced to 2–3 weeks (14 patients). They made a good recovery without complications and remained asymptomatic in the follow-up period. There were no symptoms of dysphagia in any of the operated patients. In a group of five patients some breathing problems remained because of vocal cord paralysis. In the case with long-standing fistulas careful assessment and preoperative preparation were essential. Gastrostomy, performed as a first stage in the treatment of lung complications, increased the number of the radically operated patients. Nevertheless three patients died of lung complications before any major operations could be carried out. Nine patients required prolonged intubation and assisted ventilation during the first 12–14 h postoperatively because of poor respiratory function.

Table 3 Major operations and postoperative results in the treated patients with tracheo-broncho-esophageal fistulas

Cervical approach	Thoracic approach	+ Laparotomy	Type of operation	No.	Recovered	Mortality
6	3		Excision and suture of the fistula	9	8	1
9	3		Tracheo-esophageal reconstruction with muscle interposed*	12	11	1
4	2		With circular resection of the trachea	6	6	–
	4	4	+ Colon substitution	4	4	
19	12		Total number	31	29	2

* With lung resection 3 patients

Parenteral infusions were undertaken during the 1st postoperative week. Early oral feeding with liquids was started on the 2nd day after the tracheo-plastic procedures and on the 6th day after esophageal substitution. The patients with esophageal suture passed through a stage of mixed feeding combining parenteral with enteral nutrition via a nasogastric tube or gastrostomy (for 5–8 days). Postoperative bronchoscopy (one or several) with aspiration was indispensable in about 30% of the patients due to poor expectoration and lung atelectasis.

Early postoperative complications involved 19.3% of the patients undergoing surgery. Two patients had pleural empyema, three bronchopneumonia and a superior cava vein thrombosis occurred in one patient. Two patients died (6.4%) due to severe bronchopneumonia that developed pulmonary gangrene in the early postoperative period. All other patients recovered well after the treatment. The operated patients were followed up for periods ranging from 1 to 20 years with successful outcomes.

Discussion

The development of esophago-respiratory fistula (ERF) is a rare complication in routine surgical practice, but in the last years the number of patients with prolonged endotracheal tube in place and endoscopies has increased [2, 3, 4, 10, 12]. We have treated a large group of 89 patients with severe caustic burns of the esophagus. In eight (9%) of them, ERF was observed. In our experience 14 patients with prolonged ventilatory assistance developed tracheal stricture, requiring tracheal resection. In seven (50%) of them tracheo-esophageal fistula (TEF) developed. These were high risk patients, demanding close observation. Nevertheless a large number of cases come to us too late for surgical treatment, with advanced lung complications, and this is consistent with the data in the literature [1, 3, 4, 5, 15].

The manifestation of the symptoms depends on the size of the fistula. A sudden attack of coughing lasting several seconds after swallowing is very indicative of the condition and sufficient to suspect the diagnosis. But in cases of small communications the symptoms can be very discrete. The plain radiographic findings and tomography provide information on the condition of the lungs and mediastinum, thereby confirming a fistula with indirect symptoms. Esophagography almost invariably contributes to the definitive diagnosis of the ERF [8, 13]. The importance of endoscopic methods is to demonstrate the level of the pathologic communication and, in turn, to determine a cervical or thoracic surgical approach [3, 7, 12]. Preoperative preparation of the patients by parenteral or enteral (through nasogastric tube or gastrostomy) feeding, tracheobronchial aspiration and antibiotic treatment are of the utmost importance.

The operative technique includes complete separation with the interposition of a muscle flap when necessary. Longitudinal suture of the trachea and horizontal suture of the esophagus preserve the patency of the tubes. Circular resection of the tracheal segments and colon substitution of the esophagus are resorted to if necessary for the radical treatment of the main disease. Lung abscess could be treated with segmentectomy or lobectomy in one stage with the fistula in adequately prepared patients. The postoperative mortality and morbidity are largely dependent of pulmonary complications and the general condition of the patient. Cases with advanced pulmonary gangrene are not suitable for radical surgical management.

Good results in patients with ERF treated in time confirm that early diagnosis and operative treatment improve the prognosis.

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Discussion

Dr. P. Levasseur (*Le Plessis Robinson, France*): My first comment is that you mixed tracheo-esophageal fistulas and broncho-esophageal fistulas in your series. As you know, the therapeutic problems of broncho-esophageal fistulas are much easier than those of tracheo-esophageal fistulas. In the same way, you mixed the different etiologies of tracheo-esophageal fistulas, and it is very difficult to comment on the therapeutic approach of such different cases.

About the diagnosis, I agree with you in emphasizing the importance of flexible endoscopy, especially in the tracheobronchial tree, to make the diagnosis. You pointed out the importance of the CT scan not for the diagnosis but to look at the state of the lung and to decide on the removal of destroyed lung, and I think it is absolutely necessary for bronchopleural fistula.

About the treatment, in non-cancer tracheo-esophageal fistula you insist on the necessity of a good and long preparation with gastrostomy and pulmonary treatment. It is very important, but sometimes you do not have so much time to do a good operation.

About the technique, I would like to ask you two questions. First, in your series, you don't always perform intermuscular flap interposition. I think that it's absolutely necessary to do flap interposition in all cases to prevent recurrence of the esophageal fistula. My second question is: you used a cervical approach with partial sternotomy in 19 patients. Don't you think that, in many cases, the cervical approach alone is sufficient?

Dr. Cherveniakov: Thank you for your consideration and for your criticism. I want to mention that in practice the clinical development and treatment of both types of fistulas, broncho-esophageal and tracheo-esophageal, are quite similar. This consideration made us put both groups of patients together.

We prefer the cervical approach with partial sternotomy because it gives a better opportunity to operate on the entire trachea. We have two ways of dividing the esophagus from the trachea. One of them is with the sternocleidomastoid muscle and the other one is using this artificial tissue which we put between the pipes, wrapping it around the trachea and partially around the esophagus.

Dr. T. Molnar (*Pecs, Hungary*): I am fond of Professor Sauerbruch, and you mentioned the muscle interposition or covering the fistula with muscle as a very important part of the operation. However, the first to use this method and report on it was Abrashanoff in his article in the *Zentralblatt für Chirurgie* in 1911, – 10 years before your Sauerbruch quotation or citation was published, I think.