Carcinogenesis and treatment of adenocarcinoma of the oesophagus and gastric cardia

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Chapter 10

Benign tracheo-neo-oesophageal fistulas following subtotal oesophagectomy

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Abstract

Background. Benign tracheo-neo-oesophageal fistulas following oesophagectomy are rare and treatment can be challenging. They can result from per-operative tracheal injury or various post-operative complications.

Patients and Methods. Charts of six patients with a benign tracheo-neo-oesophageal fistula after subtotal oesophagectomy treated in this institution between July 1993-August 1999 were analysed.

Results. Three men and three women (median age 61 years) developed a fistula after subtotal oesophagectomy. Symptoms varied from mild swallowing difficulties to aspiration pneumonia and mediastinitis.

Two patients with mild symptoms were treated conservatively. In one patient a long fistula was partly excised via the neck. In three patients the gastric tube was excluded or excised, with surgical closure of the tracheal defect. The alimentary tract was reconstructed by colonic interposition.

There were no major complications. After a median follow-up of 1.6 years all fistulas were closed. All patients were capable of sufficient oral intake.

Conclusion. A benign tracheo-neo-oesophageal fistula following oesophagectomy is a rare, but serious complication. Site and size of the fistula, together with the severity of symptoms, should dictate management.

Introduction

Despite the close anatomical relation between trachea, bronchi and oesophagus, benign tracheo-neo-oesophageal or broncho-neo-oesophageal fistulas following oesophagectomy are rare. The clinical presentation of these fistulas greatly varies, but they are frequently life threatening because of recurrent bronchopneumonia, respiratory failure and sometimes mediastinitis.

Various peri- and postoperative complications may underlie this condition. It can develop postoperatively due to leakage of the anastomosis with inflammatory involvement of the tracheobronchial tree or after endoscopic dilatation of a benign anastomotic stricture.

It can also result from ischaemia of the trachea after extensive dissection in the upper mediastinum, or from traumatic injury to the trachea during surgical dissection. Finally, this complication can be the result of cuff-induced tracheal necrosis during prolonged endotracheal intubation. While various therapeutic strategies have been described, treatment is still a challenge.
In this report, our experience with the management of six patients who developed a benign tracheo-neo-oesophageal fistula after oesophageal resection is presented. Causes, clinical features and various treatment options of this potentially life-threatening complication will be discussed.

**Patients and Methods**

Between July 1993 and August 1999, 383 consecutive patients underwent subtotal oesophagectomy by either transhiatal (N=269) or transthoracic (N=114) approach in the Academic Medical Center at the University of Amsterdam (The Netherlands), a tertiary referral centre for oesophageal surgery. All anastomoses were made in the neck. In 71 patients a two-field lymphadenectomy (chest and upper abdomen) was performed during the transthoracic procedure. Three-field lymph node dissections (including the neck) were not performed.

To assess the incidence and management of benign tracheo-neo-oesophageal fistulas following oesophagectomy, a retrospective analysis was performed by identifying and reviewing the records of all patients with this complication. Patients with malignant tracheo-neo-oesophageal fistulas were excluded.

**Results**

In a consecutive series of 383 patients, one patient (0.3%) developed a benign tracheo-neo-oesophageal fistula following oesophagectomy in our institute. Five other patients with this complication were referred to our hospital during the same period, leaving three men and three women (median age 61 years, range 53 to 69 years) who had developed a fistula after a median period of 30 days (range 18 days and 14 months) after oesophagectomy. One patient had been treated for an adenocarcinoma and five for a squamous cell carcinoma, two of whom had received chemotherapy (cisplatin and etoposide) pre-operatively. No radiotherapy had been administered.

Two patients had relatively mild symptoms (i.e. difficulties with swallowing, weight loss and cough associated with oral intake). Four patients had aspiration pneumonia, two of whom had developed respiratory insufficiency, necessitating artificial ventilation. One patient also had a massive mediastinitis.

In five patients the diagnosis was made by a radiological contrast study, endoscopically verified in four. In one patient the combination of bronchoscopy and GI-endoscopy confirmed the clinical suspicion of a fistula.
Case descriptions

Patients 1 and 2. A 53-year old woman and a 63-year old man developed a tracheo-neo-oesophageal fistula immediately after endoscopic dilatation for a benign anastomotic stricture. One of these patients had been operated on in our hospital after neoadjuvant chemotherapy. In both patients symptoms were only mild, and conservative treatment (i.e. nil per mouth and antibiotics) was successful.

Patient 3. A 61-year old woman had developed a salivary fistula due to postoperative anastomotic leakage after a transhiatal procedure, which closed spontaneously after six months of conservative management. One year later a secondary fistula developed between the cervical anastomosis and the right main-stem bronchus (Figure 1). After several unsuccessful attempts to obliterate this long fistula endoscopically (fibrin glue and clips), it was partly excised surgically through a right-sided cervical incision. A T-drain was inserted in the oesophagus, creating a new fistula to the skin, leaving the long, mediastinal track to the right bronchus to obliterate. After removal of the T-drain, the enterocutaneous fistula closed spontaneously.

Patient 4. After transthoracic oesophagectomy and cervical gastric tube reconstruction, leakage of the longitudinal staple line developed in this 61-year old woman, halfway the gastric tube, leading to a mild mediastinitis and imminent respiratory insufficiency due to fistulisation to the trachea. A cervical esophagostomy was created, while leaving the vital gastric tube in situ. Two drains were placed via the neck into the gastric tube; one for flushing the mediastinal cavity and one for administering enteral feeding in the proximal jejunum. The patient quickly recovered and could leave the hospital after 40 days. Five months later the general condition of the patient had greatly improved, and continuity of the alimentary tract was reconstructed by subcutaneous colonic interposition.

Patient 5. In this 58-year old male, a transhiatal oesophageal resection was complicated by a high lesion of the posterior wall of the trachea, which was immediately closed after conversion to a thoracotomy and covered by a pleural patch. Two weeks later aspiration pneumonia developed and reintubation was necessary. A tracheo-neo-oesophageal fistula was diagnosed. During surgical re-exploration with partial sternal split, the gastric tube was partly excised and closed, and the necrotic remnant of the pleural patch was removed. Temporary oesophagostomy and tracheostomy were performed and a pedicled intercostal muscle flap was applied to the tracheal defect. After two months continuity of the alimentary tract was restored by subcutaneous colonic interposition.

Patient 6. Two weeks after transhiatal oesophageal resection this 69-year old male patient developed a persisting cough during eating and signs of aspiration pneumonia. At endoscopy this appeared to be
due to partial necrosis of the proximal gastric tube over a distance of a few centimetres, with a secondary fistula to the trachea. Through cervical exploration with partial sternal split, and anterior thoracotomy, the gastric tube was partly excised and closed. The cervical defect of the trachea was primarily closed. During the same procedure a colonic segment was interposed, distally in the retrosternal position and proximally in the prevertebral position, to reinforce the closed tracheal defect with vital tissue. (Figure 2)

In all patients the fistula was preceded by leakage of the proximal or longitudinal suture line, albeit in two patients after a relatively long interval of benign stricture formation. In the four patients who needed operative reintervention, various surgical strategies were used successfully. These four patients had to stay at the Intensive Care Unit for a median period of five days (range two to 15 days). One patient developed a cervical abscess postoperatively, which needed surgical drainage. There were no serious other postoperative complications and no associated deaths. After a median follow-up of 1.6 years (range six months to three years) all fistulas were closed, as confirmed by radiological contrast studies. All patients were alive, without recurrent disease, and capable of sufficient oral intake without swallowing difficulties.

Discussion

A benign tracheo-neo-oesophageal fistula following subtotal oesophagectomy is a rare but potentially life-threatening complication.

In the present series, the six patients form a heterogeneous group concerning aetiology. Five out of six fistulas developed after transhiatal resection. In four cases this complication was not related to the transhiatal procedure per se, but to leakage of the cervical anastomosis and secondary fistulisation to the trachea, which is probably the most important cause of fistulisation. According to the literature, a benign tracheo-neo-oesophageal fistula is particularly related to a supra radical transthoracic procedure with devascularisation of the trachea and main-stem bronchi due to extensive dissection in the upper mediastinum. This extended (three field) dissection is not performed in our institute and no fistulas were related to vascular injury to the trachea. A direct traumatic injury to the trachea may also underlie the development of a tracheo-neo-oesophageal fistula. After unsuccessful repair, a mediastinal abscess may develop that drains into the neo-oesophagus, resulting in a fistula (patient 5). Although this is a feared complication after blunt resection of the oesophagus, the incidence of tracheal tears during transhiatal resection is only around one percent.
Fistulas induced by the cuff of an endotracheal tube in patients requiring prolonged mechanical ventilation are currently rare due to the availability of low pressure cuffs. In the literature a correlation has been suggested between neo-adjuvant chemotherapy and neo-oesophageal fistula development. In the present series two patients had received neo-adjuvant chemotherapy prior to surgery, but numbers are too small to confirm a supposed correlation.

Tracheo-neo-oesophageal fistulas may present with various symptoms. They can be relatively mild (e.g. cough associated with oral intake; patient 1 and 2), or more severe (e.g. recurrent bronchopneumonia; patient 3 and 6) and even life-threatening (e.g. mediastinitis; patient 4 and 5). When a fistula is suspected on clinical grounds, radiological contrast studies (in upright and supine positions) are preferably used to confirm the diagnosis. Endoscopy can be helpful to localise the fistula. Because it can be difficult to identify a small defect in the folded neo-oesophageal mucosa, bronchoscopy can be more informative.

There is still considerable diversity of opinion regarding the optimal management of this lesion. In our opinion, it is not the aetiology but the site and size of the fistula, in combination with the severity of symptoms that should determine the treatment of a benign tracheo-neo-oesophageal fistula following oesophagectomy. In the absence of severe mediastinal or pulmonary infection, a conservative treatment regimen (i.e. nil per mouth, with or without anti-microbial agents) may be considered (patient 1 and 2). If the fistula fails to heal within a four to six week period, conservative management should be abandoned.

In the literature good results have been described by endoscopic obliteration. Our experience is limited but disappointing. Even in the patient with a long mediastinal fistula track (patient 3), several endoscopic attempts with fibrin glue and haemoclips failed.

If surgical intervention is necessary, a direct approach with closure of the tracheal and oesophageal defects is preferred. An omental or pleural patch, or a muscle flap can be applied to fill the dead space and add vital tissue to the defect to prevent recurrent fistulisation (patient 5).

If the neo-oesophagus can not be preserved, continuity of the gastrointestinal tract is reconstructed with e.g. colonic interposition. The colon segment is preferably placed in the pre-vertebral position to reinforce the posterior wall of the trachea. If a distal remnant of the gastric tube precludes pre-vertebral colonic reconstruction in that area, a distal retro-sternal and a proximal pre-vertebral course of the colon segment can be combined (patient 6, figure 2).

In three patients the gastric tube was (partly) left in situ and secondarily bypassed by an extra-anatomic colonic interposition. Theoretically, this strategy could lead to long-term bacterial overgrowth or even fistulisation between the gastric stump and the overlying pulmonary parenchyma. Neither problem was encountered in the present cases (patient 4, 5, and 6). Apparently, drainage from the defunctionalised stomach into the duodenum has been sufficient so far.

In patients with a severe mediastinitis, elimination of the septic focus (especially resection of the necrotic proximal part of the gastric tube) is of crucial importance. A temporary oesophagostomy is
created, followed by extra-anatomical reconstruction at a later stage. A subcutaneous colonic interposition can be created to avoid redo-surgery in an inflamed area. (patient 4 and 5).

**Conclusion**

A benign tracheo-neo-oesophageal fistula following oesophagectomy, is a rare but serious complication. As indicated by the six presented cases in this study, the site, size and underlying cause in combination with the severity of symptoms should determine the treatment strategy. Conservative treatment can be justified, but in the presence of severe symptoms, surgical intervention, with a tailored approach, is inevitable.

With an individualised treatment, this potentially life-threatening condition can be managed successfully.

**References**


Figure 1. Fistula (arrow) between the oesophago-gastric anastomosis and the right main bronchus in a radiological contrast study.

Figure 2. Schematic diagram of a proximal pre-vertebral and distal retro-sternal colonic interposition (a) and radiological contrast study (b). (1 = oesophagocolostomy; 2 = colojejunostomy; 3 = jejunoojejunostomy; 4 = distal remnant of gastric tube.)