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Successful tubes treatment of esophageal fistula

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Abstract: Aim: To discuss the merits of "tubes treatment" for esophageal fistula (EF). Methods: A 66-year-old female who suffered from a bronchoesophageal and esophagothoratic fistula underwent a successful "three tubes treatment" (close chest drainage, negative pressure suction at the leak, and nasojejunal feeding tube), combination of antibiotics, antacid drugs and nutritional support. Another 55-year-old male patient developed an esophagopleural fistula (EPF) after esophageal carcinoma operation. He too was treated conservatively with the three tubes strategy as mentioned above towards a favorable outcome. Results: The two patients recovered with the tubes treatment, felt well and became able to eat and drink, presenting no complaint. Conclusion: Tubes treatment is an effective basic way for EF. It may be an alternative treatment option.

Key words: Esophageal fistula, Bronchoesophageal fistula, Esophagopleural fistula, Tubes treatment
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INTRODUCTION

Esophageal fistula (EF) is an unusual congenital malformation or acquired complication. It can be basically classified into categories, including tracheo-esophageal fistula (TEF), bronchoesophageal fistula (BEF), esophago-mediastinal fistula, anastomotic fistula, esophageal-aortic fistula (EAF) and esophagopleural fistula (EPF), and so on. Various curative and palliative approaches have been employed for EF patients, but minimal invasive techniques are the means to less morbidity and short hospitalization. The direct beneficiaries are the EF patients. However, conservative tubes treatment had rarely been documented in the past. We here report two successful cases with different types of EF, which were treated by intubation. The final diagnosis was made by imaging and endoscopy.

The evident outcome implies that tubes treatment can both reduce the need for operative intervention and create sufficient preparation for further surgery. Meanwhile, it significantly shortens the course of hospitalization and improves patients' quality of life. According to the complexity of clinic illness, this curative approach is also a good candidate for the treatment of EF. It is safe, cheap, less painful and effective, although more experience is needed.

CASE PRESENTATION

Case 1

A 66-year-old female patient suffered from postprandial thoracoabdominal pain at the right side for 2 weeks. She was admitted to the local clinic. Endoscopy initially disclosed only an esophageal diverticulum with erosion. Chest X radiographs (CXR) showed right lower lung infection and medium right pleural effusion. She showed no improvement after anti-infection therapy and was referred to our hospital due to the onset of chest oppression and marked respiratory distress. Routine physical examination revealed slight elevation of temperature, accelerated respiration (28 breaths per minute), decreased breath sounds in the right lower lung with moist rale, tenderness in epigastrium, and no rebound tenderness. Laboratory test showed total leukocyte count of 15200 μl^{-1}, neutrocyte 80% and

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slight elevation of the liver zymogram, except low serum albumin (24.8 g/L). Computed tomography (CT) scan showed free mediastinal air and collapsed right lung tissue. A triangle shaped diverticulum in mid-esophagus was confirmed by a radiopaque swallow, the contract-medium seen entering the right bronchus and thorax (Figs.1 and 2). Endoscopy detected rupture of the esophageal wall 26~31 cm from the incisors with a 2 cm×3 cm diverticulum (Fig.3). Direct repair and intraluminal stenting was considered as high risk for her severe physical condition and diffuse contamination in the thorax. Tissue adhesive was unsuccessful. For the closure of the fistula, nasogastric aspiration was applied at the wound edge, and thoracic drainage was used to remove the excess effusion rapidly. Aspirate smear check revealed white blood cell (WBC)+++/high power (HP) microscope. A 3rd generation cephalosporin was administered. Enteral nutrition (EN) by nasojejunal feeding was intended to maintain integrity of the intestinal mucosa, preventing its atrophy due to not being used. Twenty days later, esophagography estimated a small diverticulum about 2 cm×0.5 cm that communicated with bronchus. When the disease was controlled fifty-six days later, the patient was discharged from the hospital. Another thirty days later she was asymptomatic. The fistula healed spontaneously later. She was followed up for 7 years without recurrence of symptoms from the diverticulum remnant.

Case 2

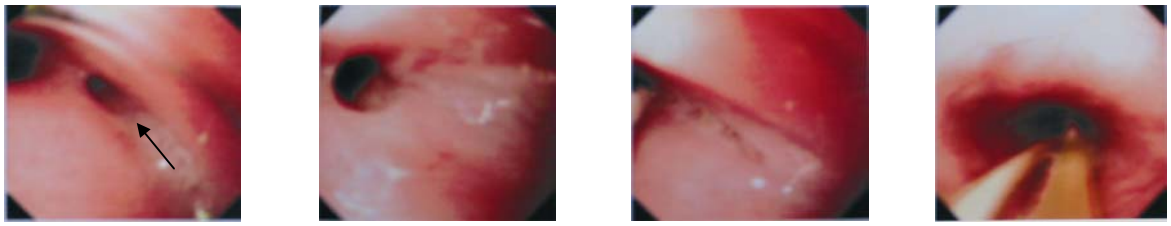
A 55-year-old male patient underwent esophagectomy and esophagogastroanastomosis for medium-high differentiated squamous cell carcinoma at the mid-esophagus, no lymph node metastasis. Ten days later when he was fed with soya milk, white-wadding fluid was readily seen in the drainpipe after methylene blue swallow. The dye leaked from the drainpipe in half a minute after methylene blue swallow. Esophagography with meglumine diatriazoate testified left diversion of the drug in the anastomosis, but it blurred in the pylorus and distal small intestine (Fig.4). Endoscopy showed an anastomotic fistula of 0.8 cm diameter 31~33 cm from the incisors. Clip, sewing thread and thoracic drainpipe could also be seen (Fig.5). To avoid the trauma of re-operation, he was also managed conservatively with the previously described therapy. Nutritional fluids were infused by an 8 FR, 240 cm long TTC (through the channel) nasojejunal feeding tube (Fig.6), combined with adequate antibiotics and antacids. Another gastric tube was placed under endoscope over a guidewire in the area to draw the gastric fluid outside, preventing stimulation of the wound edge. He was dismissed on the postoperative 55th day with normal blood values, no fever, and on a semi-liquid diet. On a follow-up of 6 months, he reported no complaint.

Fig.1 Meglumine diatriazoate taken orally was noted on the esophagogram. A triangular out-pouching from the right lateral wall of the thoracic esophagus was visualized (white arrow)

Fig.2 Esophageal barium imaging showed a right diversion in middle segment. Contrast agent overflew to the right bronchus and thorax

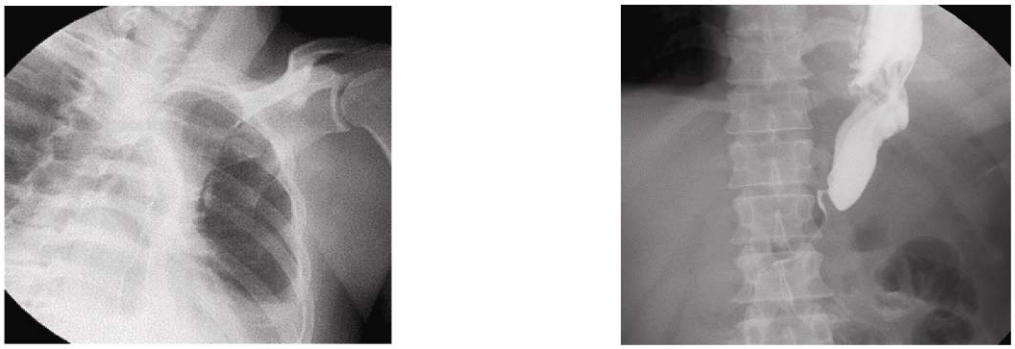
DISCUSSION

A fistula is by definition, an abnormal communication between two epithelial surfaces. Though EFs have low incidence, there are multiple causes. Congenital EFs belong to dysplasia, such as esophageal atresia and TEF. Secondary EFs usually happen after instruments, surgery, trauma, barotraumas (Boer-



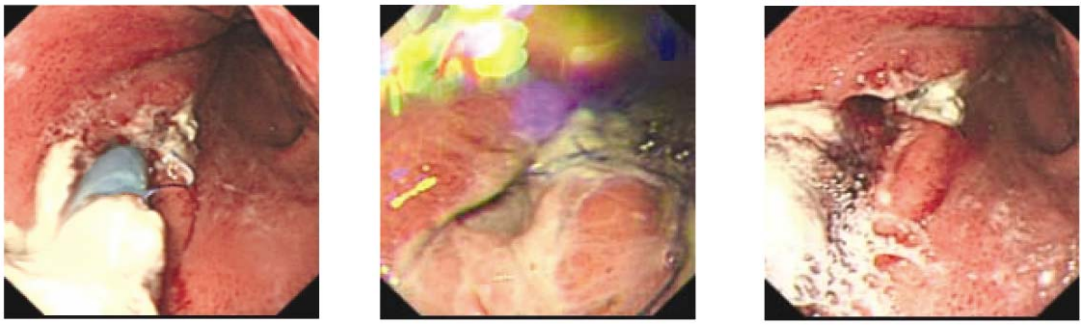
(a) (b) (c) (d)

Fig.3 Endoscopic appearance of a diverticulum 26~31 cm from the incisors (black arrow) (a), normal part (b), nasojejunal intubation (c), and negative pressure suction placement (d)



(a) (b)

Fig.4 Esophagography with meglumine diatriazoate showed a left diversion of the agent. (a) Thoracic gaster is full filling; (b) Few linear contrast agents could be seen in the pylorus, blurred in the distant small bowel



(a) (b) (c)

Fig.5 Endoscopic view of the thoracic drainpipe (a), sewing thread (b) and the clip (c) respectively

Fig.6 Endoscopy displaying the nasojejunal intubation about Treitz's ligament distance

haave's syndrome), tumor, radiation/laser therapy, or infection associated with empyema and communicate with the right pleural cavity due to anatomical reasons. Early fistulization is usually due to iatrogenic injury or esophageal devascularization. Late fistulas correlate with empyema, para-esophageal abscess formation and lymph node metastasis (Evans, 1972; Masard *et al*., 1994). Esophageal diverticulum rupture is a rare life-threatening episode. For case 1 mentioned above, the tiny opening of the diverticulum was not visible under endoscope in the local clinic. There might have been an interval of many hours between

the endoscopy and the appearance of sign and symptoms of overt laceration. When infection at the diverticulum apex resulted in blowout, the diverticulum communicated with bronchus and thorax, and the signs and symptoms were progressive. So it was easy to ignore the complexity in the early stage. Co-existence of esophageal diverticulum with carcinoma has also been reported. Thus, doctors should pay close attention to the diverticulum, if combined with the patient's degenerated clinical status. Awareness of the risk and productive decisions favorably influence the outcome.

After an extensive review of the published literature, we found a variety of techniques available currently. Thoracoplasty, muscle flap repair of the esophagus, surgical stapler, intraluminal stents, tissue adhesive (fibrin glue, etc.), and endoclips have seen successfully used by doctors (Siddiqui *et al*., 2007; Fernando and Benfield, 1996; Asaoka *et al*., 1988; Sethi and Takato, 1978; Adler *et al*., 2001; Agosti *et al*., 1978; Hu *et al*., 2004; Dosios *et al*., 2005; Marjolein and Peter, 2005; Eng *et al*., 1994; Solt *et al*., 1998; Kishi *et al*., 2005; Chryssostalis *et al*., 2005; Teitelbaum *et al*., 2005; Alberti and Alberti-Flor, 2005; Raymer *et al*., 2003; Okita *et al*., 2005; Truong *et al*., 2004; Talbot *et al*., 2007; Chappell and Heck, 2007; Gutiérrez San Román *et al*., 2006; Shichinohe *et al*., 2006; Rieder *et al*., 2006; Nguyen *et al*., 2006; Garand *et al*., 2006; Harries *et al*., 2004). The morbidity and mortality appear dramatically diminishing. The proposed conservative treatment is not innovative as it had been used quite often in the past, but literature is scarce on the topic (Sano *et al*., 1989; Sarli *et al*., 2006; Zueger *et al*., 1997; Nozoe *et al*., 1998). Nowadays newer methods have been developed (stents, endoclips, etc.), which are not necessarily better when compared to the old ones (Castriconi *et al*., 2005; Raymer *et al*., 2003; Freeman *et al*., 2007; Baltayiannis *et al*., 2006; Montesano *et al*., 2006; Rabenstein *et al*., 2006; Metz *et al*., 2006). Consequently, knowledge and experience on the application of the old methods are diminishing especially in young doctors.

Nevertheless there are situations where the new methods have failed or cannot be applied e.g. lack of infrastructure, lack of know-how, non-consenting patient, etc. Similarly, there are situations (too old patients, malnutrition, severe inflammation) when operation/re-operation for EF is not possible. In these cases one should know how to deal effectively with the EF, what to expect, and when to expect it. Comprehensive conservative interventions including drainage, antibiotics, gastroprotectants, negative pressure suction and nutritional support play an important role at this time. Tubes should be placed on the right place in accordance with the different types of EFs. To our knowledge, persisting proximal esophageal suction can prevent gastric juice reflux and passage into the thorax, avoiding infection spread in the early stage. Prompt sufficient close chest drainage and lavage is helpful in cleaning the accumulated effusion in the thorax, eradicating the emphysema thoroughly, and promoting expansion of the lung tissue. EN seems to be replacing para-enteral alimentation nowadays to maintain the mucosa integrity in case of failure of the bowel function. Some fistulas especially those of non-malignant origin may seal spontaneously with medical treatment, which is also an expeditious preoperative measure. Other advantages of the "three tubes treatment" are that: easy to carry out and well tolerated by the patient. It presents low risk of complications, and tube care, feeding and removal can be performed easily anywhere; also in some cases the cost is lower because no hospitalization is required. Low viscosity, nutritionally complete liquid diet formulations and patient tolerance of tube placement have made nasojejunal tube placement a popular method for feeding malnourished patients.

Strategies and plans for EF patients should be modified depending on different stages, patterns, and places of the fistula, the patient's general feature and personal desire. In addition, both the available expertise and equipment and the results of prospective, randomized studies should be taken into consideration. A careful drain management allows a good outcome in patients with fistula.

References

Adler, D., McAfee, M., Gostout, C., 2001. Closure of an esophagopleural fistula by using fistula tractcoagulation and an endoscopic suturing device. *Gastrointestinal Endoscopy*, **54**(5):652-653. [doi:10.1067/mge.2001.118650]

Agosti, J., Nojek, C., Figuera, D., 1978. Treatment of acquired chronic esophagopleural fistula by endoscopic cauterization. *Chest*, **73**(1):100-101.

Alberti, L.E., Alberti-Flor, J.J., 2005. Endoclip-assisted closure of infected gastrocutaneous fistulas: report of two

cases. *Endoscopy*, **37**(4):403. [doi:10.1055/s-2005-861123]

Asaoka, M., Imaizumi, M., Kajita, M., Uchida, T., Niimi, T., Abe, T., 1988. One stage repair for an oesphageal fistula after pneumonectomy using an omental flap. *Thorax*, **43**(1):943-944.

Baltayiannis, N., Magoulas, D., Bolanos, N., Anagnostopoulos, D., Kaya, A., Kontogiannopoulos, C.H., Nicolouzos, S., Georgiannakis, E., Kastrinaki, K., Kayiani, E., Chatzimichalis, A., 2006. Expandable wallstents for treatment of tracheoesophageal fistulas of malignant origin. *J. BUON*, **11**(4):457-462.

Castriconi, M., Romagnuolo, G., Giuliano, M.E., Bartone, G., Chianese, F., Maglio, M.N., Molino, C., Festa, P., Zito, E.S., de Sena, G., 2005. Conservative treatment of the digestive fistulas: personal experience. *Ann. Ital. Chir.*, **76**(6):523-527.

Chappell, V.L., Heck, H.A.Jr, 2007. Repair of large, iatrogenic, tracheo-esophageal fistulae. *Ann. Thorac. Surg.*, **83**(2):705-706. [doi:10.1016/j.athoracsur.2006.04.073]

Chryssostalis, A., Rosa, I., Pileire, G., Ozenne, V., Chousterman, M., Hagege, H., 2005. Closure of refractory gastrocutaneous fistula using endoclipping. *Endoscopy*, **37**(9):924. [doi:10.1055/s-2005-870334]

Dosios, T., Karavokyros, I., Felekouras, E., Sigala, F., Pikoulis, E., Spyrakos, S., Papalambros, E., 2005. Presternal gastric bypass for late postpneumonectomy esophagopleural fistula. *Dis. Esophagus*, **18**(3):202-203. [doi:10.1111/j.1442-2050.2005.00472.x]

Eng, J., Sabaratham, S., Mearns, A.J., 1994. Late esophageal fistula after pneumonectomy. *Ann. Thorac. Surg.*, **57**(5):1337-1338.

Evans, J.P., 1972. Postpneumonectomy oesophageal fistula. *Thorax*, **27**(6):674-677.

Fernando, H.C., Benfield, J.R., 1996. Surgical management and treatment of esophageal fistula. *Surg. Clin. North Am.*, **76**(5):1123-1134. [doi:10.1016/S0039-6109(05)70501-6]

Freeman, R.K., Ascioti, A.J., Wozniak, T.C., 2007. Postoperative esophageal leak management with the polyflex esophageal stent. *J. Thorac. Cardiovasc. Surg.*, **133**(2):333-338. [doi:10.1016/j.jtcvs.2006.10.008]

Garand, S.A., Kareti, L.R., Dumont, T.M., Seip, C., 2006. Thoracoscopic repair of tracheoesophageal fistula in a septuagenarian. *Ann. Thorac. Surg.*, **81**(5):1899-1901. [doi:10.1016/j.athoracsur.2005.05.073]

Gutiérrez San Román, C., Barrios, J.E., Lluna, J., Ibañez, V., Hernández, E., Ayuso, L., Valdes, E., Roca, A., Marco, A., García-Sala, C., 2006. Long-term assessment of the treatment of recurrent tracheoesophageal fistula with fibrin glue associated with diathermy. *J. Pediatr. Surg.*, **41**(11):1870-1873. [doi:10.1016/j.jpedsurg.2006.06.014]

Harries, K., Masoud, A., Brown, T.H., Richards, D.G., 2004. Endoscopic placement of fibrin sealant as a treatment for a long-standing Boerhaave's fistula. *Dis. Esophagus*, **17**(4):348-350. [doi:10.1111/j.1442-2050.2004.00421.x]

Hu, J.L., Li, P., Yang, H.P., Liu, G., Xiong, W., Zhou, X.D., Li, X.J., Huang, Y., Shen, Y.J., Zhou, H.M., 2004. Endoscopic airway stenting for tracheobronchial stenosis and tracheoesophageal fistula. *Disan Junyi Daxue Xuebao*, **26**(6):543-545 (in Chinese).

Kishi, K., Nakao, T., Goto, H., Kimura, M., Sonomura, T., Yamanaka, N., Nanjo, K., Sato, M., 2005. A fast placement technique for covered tracheobronchial stents in patients with complicated esophagorespiratory fistulas. *Cardiovasc. Intervent. Radiol.*, **28**(4):485-489. [doi:10.1007/s00270-003-0203-x]

Marjolein, H., Peter, D.S., 2005. Endoscopic Palliation of Malignant Dysphagia and Esophageal Fistulas. *In*: Gregory, G.G., Michael, L.K., Norton, I., Christopher, J.G. (Eds.), Clinical Gastrointestinal Endoscopy. Elsevier Inc., Elsevier Saunders, p.436.

Masard, G., Ducrocq, X., Hentz, J.G., Kessler, R., Dumont, P., Wihlm, J.M., Morand, G., 1994. Esophapleural fistula: an early and long term complication after pneumonectomy. *Ann. Thorac. Surg.*, **58**(5):1437-1440.

Metz, R., Kimmings, A.N., Verhagen, H.J., Rinkes, I.H., van Hillegersberg, R., 2006. Aortoesophageal fistula successfully treated by endovascular stent-graft. *Ann. Thorac. Surg.*, **82**(3):1117-1119. [doi:10.1016/j.athoracsur.2006.01.091]

Montesano, M., Crucitti, P., Pandolfi, M., Zanca, A., Gabbrielli, A., Coppola, R., 2006. Sems (self expanding metal stents) in a patient with esophagogastric cancer and esophagorespiratory fistula (ERF). *Rays*, **31**(1):21-24.

Nguyen, T., Zainabadi, K., Bui, T., Emil, S., Gelfand, D., Nguyen, N., 2006. Thoracoscopic repair of esophageal atresia and tracheoesophageal fistula: lessons learned. *J. Laparoendosc. Adv. Surg. Tech. A*, **16**(2):174-178. [doi:10.1089/lap.2006.16.174]

Nozoe, T., Kitamura, M., Adachi, Y., Funahashi, S., Yoh, R., Iso, Y., Matsumata, T., Sugimachi, K., 1998. Successful conservative treatment for esophageal perforation by a fish bone associated with mediastinitis. *Hepatogastroenterology*, **45**(24):2190-2192.

Okita, R., Mukaida, H., Takiyama, W., Oheda, M., Uchida, N., Ishihara, H., 2005. Successful surgical treatment of aortoesophageal fistula after esophagectomy. *Ann. Thorac. Surg.*, **79**(3):1059-1061. [doi:10.1016/j.athoracsur.2003.09.116]

Rabenstein, T., Boosfeld, C., Henrich, R., Ell, C., 2006. First use of ventricular septal defect occlusion device for endoscopic closure of an esophagorespiratory fistula using bronchoscopy and esophagoscopy. *Chest*, **130**(3):906-909. [doi:10.1378/chest.130.3.906]

Raymer, G.S., Sadana, A., Campbell, D.B., Rowe, W.A., 2003. Endoscopic clip application as an adjunct to closure of mature esophageal perforation with fistulae. *Clin. Gastroenterol. Hepatol.*, **1**(1):44-50. [doi:10.1053/jcgh.2003.50007]

Rieder, F., Hamer, O., Gelbmann, C., Scholmerich, J., Gross, V., Feuerbach, S., Herfarth, H., Rogler, G., 2006. Crohn's disease of the esophagus: treatment of an esophagobronchial fistula with the novel liquid embolic polymer "onyx". *Z. Gastroenterol.*, **44**(7):599-602. [doi:10.1055/

s-2006-926644]

Sano, T., Naruke, T., Watanabe, H., Kondo, H., Goya, T., Tsuchiya, R., Suemasu, K., 1989. An esophagobronchopleural fistula successfully treated by a surgical procedure combined with conservative therapy after resection for lung cancer. *Jpn. J. Clin. Oncol.*, **19**(4):402-408.

Sarli, D., Bona, D., Abraham, M., Bonavina, L., 2006. Conservative and surgical treatment of esophago-gastric anastomotic leaks. *Ann. Ital. Chir.*, **77**(5):391-396.

Sethi, G.K., Takato, T., 1978. Esophageal fistula following pulmonary resection. *Ann. Thorac. Surg.*, **25**(1):74-81.

Shichinohe, T., Okushiba, S., Morikawa, T., Kitashiro, S., Manase, H., Kawarada, Y., Sekido, M., Yamamoto, Y., Kondo, S., 2006. Salvage of a massive esophago-tracheal fistula resulting from a stenting treatment. *Dis. Esophagus*, **19**(4):299-304. [doi:10.1111/j.1442-2050.2006.00582.x]

Siddiqui, A.A., Kowalski, T., Cohen, S., 2007. Closure of a nonhealing gastrocutaneous fistula using an endoscopic clip. *South Med. J.*, **100**(1):75-76.

Solt, J., Boros, S., Zoltan, I., Horvath, O.P., Andics, L., Bajor, J., 1998. Malignant esophageal-respiratory fistula and esophageal stenosis treated with a Gianturco-Z-stent. *Orv. Hetil.*, **139**(41):2447-2453.

Talbot, M.L., Hugh, T.B., Spratt, P., 2007. Gastric antral patch oesophagoplasty for iatrogenic tracheo-oesophageal fistula. *ANZ J. Surg.*, **77**(4):295-297. [doi:10.1111/j.1445-2197.2007.04036.x]

Teitelbaum, J.E., Gorcey, S.A., Fox, V.L., 2005. Combined endoscopic cautery and clip closure of chronic gastrocutaneous fistulas. *Gastrointest. Endosc.*, **62**(3):432-435. [doi:10.1016/j.gie.2005.04.047]

Truong, S., Bohm, G., Klinge, U., Stumpf, M., Schumpelick, V., 2004. Results after endoscopic treatment of postoperative upper gastrointestinal fistulas and leaks using combined Vicryl plug and fibrin glue. *Surg. Endosc.*, **18**(7):1105-1108. [doi:10.1007/s00464-003-8286-7]

Zueger, O., Bolliger, C.T., Quadri, F., Lohri, A., Soler, M., Izbicki, G., Perruchoud, A.P., 1997. Conservative management of a broncho-oesophageal fistula in a patient with non-Hodgkin's lymphoma. *Respiration*, **64**(5):388-391.