

Post-Intubation Tracheoesophageal Fistula: A Nine-Year Experience

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ABSTRACT

Introduction: Tracheoesophageal fistula (TEF) is a rare condition, which could be life-threatening if diagnosed late or mismanaged. Post-intubation TEF is the most common form of acquired, non-malignant TEF and is usually associated with tracheal stenosis, which makes the treatment more challenging. Here, we present our experience of managing 21 patients with post-intubation TEF.

Materials & Methods: Twenty one patients including seven women and fourteen men with mean age of 38.05 years, who had post-intubation TEF were managed in our center (Massih Daneshvari Hospital, Tehran, Iran) during 2004-2013. None of the patients were operated before weaning from mechanical ventilation. Single division and closure of the fistula was performed in one patient who did not have accompanying tracheal stenosis. One-stage surgical repair including tracheal resection, anastomosis, primary closure of the esophageal defect, and muscle flap Interposition was the main treatment method in all other cases. Patients were followed up for at least two years.

Results: Excellent and good results achieved in 85.7% of our patients. Major complications including permanent vocal cord paralysis and recurrence of tracheal stenosis necessitating T-tube insertion occurred in two patients (9.5%). Severe cachexia and sepsis secondary to sputum retention resulted in one mortality (4.8%).

Conclusion: Surgery might provide the best treatment results along with low mortality and morbidity rates in post-intubation TEFs if performed within the proper time.

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Introduction

A Tracheoesophageal Fistula (TEF) is an abnormal congenital or acquired connection between the trachea and esophagus, and the acquired-form can be whether malignant or

benign. Tracheal intubation is the most common cause of acquired non-malignant TEF (1-3). Although several approaches have been described for treatment of TEF, the best method with the

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lowest mortality and morbidity rates has not been determined yet. Surgical repair may result in complete healing; however, complications and recurrence will occur whenever performed before weaning from mechanical ventilation (4-10). Here, we present our experience regarding post-intubation TEF cases managed by single-stage operation method during 2004-2013.

Materials and Methods

A retrospective search in Alborz database, (an original private database for medical records of the patients with tracheal diseases in our hospital) retrieved 21 patients with post-intubation TEF during 2004-2013. The patients included fourteen (66.6%) men and seven (33.3%) women with the mean age of 38.05 years (12-72 years; SD=17.23). Trauma was the main cause of intubation (Table 1). All patients were referred to us after weaning from mechanical ventilation except two, who were managed conservatively prior to the operation. Tracheostomy, gastrostomy, and jejunostomy tubes were used in these two patients and the surgical repair was performed after weight gain and weaning from mechanical ventilation.

In order to confirm the diagnosis and determine the exact location of the fistula, rigid bronchoscopy was performed. All the patients had tracheal stenosis at the site of fistula except one, who had been intubated due to vasculitis and secondary respiratory failure (Figure 1). All

TEFs were located in the lower one third of trachea, and fiber-optic laryngoscopy was also used to assess the vocal cords function in all patients.

Surgical repair in all the twenty patients was performed through transverse cervical incision. T-incision with partial sternotomy approach was applied for adequate exposure in one patient who had a long-segment tracheal stenosis.

One stage surgical repair was executed in all patients. Division of the fistula in the twenty patients with tracheal stenosis was followed by tracheal resection and end-to-end anastomosis of trachea by 4-0 Vicryl simple interrupted sutures. In addition, the esophageal wall defect was closed by 4-0 Vicryl simple interrupted sutures on the mucosa and interrupted 4-0 Silk sutures on the muscular layer. In the patient without tracheal stenosis, the tracheal wall defect was closed by 4-0 Vicryl simple interrupted sutures. In all patients, a strap muscle flap (e.g. sternothyroid or sternohyoid) was placed between the trachea and esophagus at the repair site.

All the patients were extubated in the operating room and transferred to the intensive care unit. Nasogastric tube removal and oral feeding started 3-5 days after an x-ray with oral contrast of the esophagus. Anastomosis site was evaluated through flexible bronchoscopy one month post-operation. Patients were also evaluated for the quality of voice, swallowing, and breathing during the follow-up visits for at least two years.

Table 1. Intubation causes

Cause of intubation	No. (%)
Multiple Trauma	15 (71.4)
Suicide	3 (14.2)
Cerebrovascular accident (CVA)	1 (4.8)
Vasculitis	1 (4.8)
Intracranial hemorrhage	1 (4.8)
Total	21 (100)

Results

We defined the operation results as three distinctive groups of excellent, good, or poor (Table 2). The result was considered as excellent when there was no complication. Minor or temporary complications that needed additional therapeutic modalities, such as temporary vocal

Simultaneous tracheal stenosis

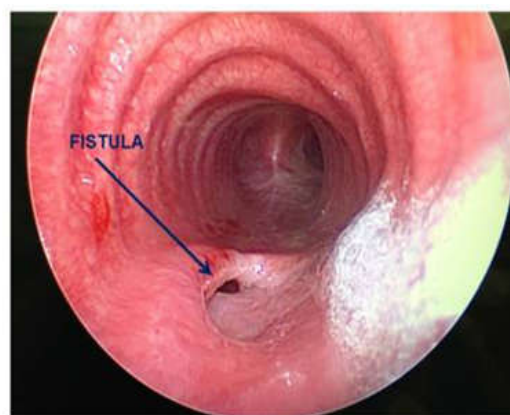
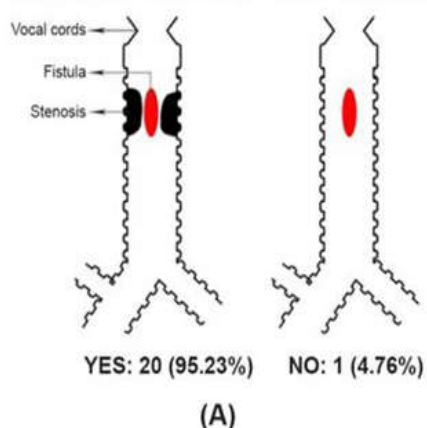


Figure 1. A- Simultaneous tracheal stenosis. B- Endoscopic view of a fistula without concomitant tracheal stenosis

Table 2. Results of the operations on the patients with post-intubation TEF in Massih Daneshvari Hospital during 2004-2013

Result of operation	No. (%)
Excellent (no complication)	11 (52.4)
Good (minor complications)	7 (33.3)
Poor	2 (9.5)
Death	1 (4.8)
Total	21 (100)

cord paralysis, sputum retention requiring bronchoscopy for airway toilet, and granulation formation at the site of anastomosis which needs to be excised via rigid bronchoscopy, were defined as good results. Furthermore, the results were classified as poor, when there were complications that needed long-term treatments and follow-ups, such as permanent vocal cord paralysis or recurrent tracheal stenosis.

All patients were followed up for at least two years and the quality of breath, their voice and swallowing were assessed in follow-up visits.

One patient with cervical spinal injury and bilateral diaphragmatic paralysis expired three weeks after operation due to pneumonia and severe sepsis secondary to sputum retention.

Two patients (9.5%) demonstrated poor results including permanent unilateral vocal cord paralysis in one, and tracheal stenosis recurrence in another, for whom T-tube was inserted. The latter case had long-segment tracheal stenosis and the tracheal anastomosis was performed under significant tension.

Good results were obtained in seven patients (33.3%). Temporary vocal cord paralysis was resolved by corticosteroid and antireflux therapy in one patient. Three underwent frequent flexible bronchoscopies for airway toilet due to inability to cough. Three other patients, who re-referred to the hospital because of dyspnea, needed rigid bronchoscopy for granulation tissue excision.

The rest of the patients (52.4%) presented no complication and were regarded as the excellent result. Overall, 85.7% of the patients had excellent and good results.

Discussion

Acquired TEF may be due to malignant or benign origins; the causes of acquired nonmalignant form are listed in table 3 (1, 11, 12). Post-intubation TEF which was described in 1967 for the first time by Flege (13) is the most common type (1). This complication occurs in 0.3-3% of mechanically ventilated patients (1) and may lead in recurrent pulmonary infections, severe sepsis, loss of tidal volume, and inadequate gas exchange in addition to gastric distention with subsequent difficulties in the weaning process.

In the past, in order to prevent the mentioned problems, fistula closure was tried while the patient was under mechanical ventilation, but the

Table 3. Causes of benign acquired tracheoesophageal fistula

Trauma
Penetrating trauma
Blunt trauma
Iatrogenic
Endoscopy (tracheal or esophageal)
Stenting (tracheal or esophageal)
Tracheal intubation
Tracheostomy
Laryngectomy and application of electrolarynx
Cervical spine surgery
Esophagectomy
Transesophageal echocardiography
Foreign body ingestion
Small foreign bodies with sharp edges (e.g. bone)
Small batteries
Esophagitis
Caustic injuries
Secondary to esophageal diverticulum
Secondary to immune deficiency
Granulomatous infections with mediastinal involvement
Tuberculosis
Fungal infections
Syphilis

relevant mortality, morbidity, and recurrence rates were very high.

Although successful closure of fistula in ventilated patients has been reported in the literature (14), it is advisable to avoid any attempts for closing when the patient is under mechanical ventilation (14). Instead, such patients should be managed conservatively by placing tracheostomy, drainage gastrostomy, and feeding jejunostomy tubes. In order to prevent further tracheal damage, tracheostomy should be performed through the stenotic part of the trachea and its cuff should be placed under the site of fistula. Similarly, in our study two of our patients were managed by the latter method, and went under fistula repair after weaning and weight gain, which was associated with good results.

Several therapeutic methods including endoluminal stenting, fibrin glue application, and surgery have been described for post-intubation TEF. Although temporary stenting, typically in the esophagus, could be successful for fistula occlusion, it might not definitely eliminate the fistula (15). As Eleftheriadis and Kotzampassi demonstrated in their study (16), endoluminal stenting can be a candidate for bridge therapy in critically high-risk patients.

There are some reports about successful closure of TEF by endoscopic fibrin glue (17,18,19). As the evidence presents, this method can only be suggested as an alternative for surgery or as bridge-therapy before surgery in patients with small TEFs.

Grillo in 1976 reported the single-stage definitive operation for management of benign TEFs (20). Before that, the common method was patching the defect of tracheal wall with muscular flaps in a multiple-stage procedure. We also operated all our patients via the single-stage

method aimed to correct both the tracheal stenosis and esophageal wall defect. Despite the recommendation of Grillo regarding suturing a pedicle muscle flap over the esophageal closure, only in cases that vertical repair line of the trachea and the esophagus are contiguous or have massive inflammation, we applied strap muscle flaps in all our patients.

Our study on a significant number of patients with post-intubation TEF indicated that single-stage operation is the preferred method of treatment with acceptable results. Also, we showed that intubated patients can be managed conservatively and be weaned from the mechanical ventilation pre-operation in order to reduce the rate of complications and recurrence.

Conclusion

According to our results and also the literature, single-stage operation approach directed toward correction of both the tracheal stenosis and the esophageal wall defect will be associated with the most favorable results. By which, the lower rates of mortality and morbidity in these patients can be achieved.

Acknowledgement

None.

Conflict of Interest

The authors declare no conflict of interest.

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