Acquired Benign Tracheoesophageal Fistula: An Alternative Tracheoplastic Technique

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We present a case of surgical management of a tracheoesophageal fistula (TEF) following prolonged intubation. After transverse tracheal division and retraction of the distal stump, direct closure of the esophageal defect and repair of the membranous tracheal defect using a synthetic bioabsorbable patch were performed, followed by interposition of muscle flap between the suture lines and tracheal reconstruction. Large TEFs, without tracheal stenosis or circumferential airway defect, associated with marked peritracheal inflammation, may be treated with this alternative tracheoplastic technique in patients deemed not suitable for tracheal resection and anastomosis.

Keywords: tracheoesophageal fistula, tracheoplastic technique, thoracic surgery

Introduction

Acquired benign tracheoesophageal fistula (TEF) is rare and requires management challenges. In patients on mechanical ventilation, the most important predisposing factors are long-term intubation with endotracheal or tracheostomy tube, overinflated cuff, and posterior counter-pressure by a nasogastric tube. Other risk factors in the etiology of acquired TEF have been reported as poor overall health, airway infections, diabetes mellitus, and steroid therapies. Definitive surgical treatment usually is accomplished by direct closure of tracheal and esophageal defects, for patients with small fistula and normal trachea, or by tracheal resection and anastomosis with primary esophageal repair reserved to those patients with associated tracheal stenosis or wide tracheal defect not amenable to primary repair. Here, we report the surgical management of a large postintubation TEF without tracheal stenosis or circumferential airway defect, associated with marked peritracheal inflammation, in a patient deemed not suitable for tracheal resection and anastomosis.

Case Report

A 59-year-old female patient with acute exacerbation of chronic obstructive pulmonary disease (COPD) due to community-acquired pneumonia and hypercapnic respiratory failure was referred to our hospital. After failure of noninvasive mechanical ventilation, she was intubated by the translaryngeal route. As a long-term ventilator dependence was expected, after 10 days, she received percutaneous tracheostomy and was fed through a nasogastric tube. One month after admission, due to aspiration of gastrointestinal content from the tracheostomy tube, a TEF was suspected and it was subsequently
confirmed by means of endoscopy and computed tomography (CT) scan. Bronchoscopy revealed a fistula caudal to cricoid cartilage and cervical-thoracic CT scan showed a TEF of 3.5 cm in length, localized 2 cm below the vocal cords (Figs. 1A–1C). The patient, maintained on mechanical ventilation due to weaning failure, underwent surgical repair of TEF via an anterior cervical approach. She was positioned supine with the neck slightly extended. The tracheostomy tube was replaced with a sterile endotracheal tube connected to a sterile ventilator circuit and a cross-field ventilation was obtained through the orifice of the tracheostomy. A nasogastric tube was placed to facilitate esophageal dissection. An anterior cervical U-shaped incision, including the tracheostomy stoma, was performed. After mobilization of the subplatysmal flaps and division of the midline raphe between the strap muscles, the pretracheal plane was identified and dissected. In this case, the large airway defect contraindicated the direct closure, owing to the risk of dehiscence or stenosis. Moreover, the patient was at high risk for complications following tracheal resection and anastomosis due to obesity, COPD, recurrent pneumonia, and preoperative tracheostomy, and a marked peritracheal inflammation didn’t allow lateral exposition of the fistulous tract. A transverse tracheal division was therefore performed at the level of the stoma, and the distal tracheal stump, including the fistulous orifice, was retracted allowing, after dissection of the plane between the remaining membranous tracheal wall and the esophagus, a direct approach to the fistula measuring approximately 3 cm in length and 1.5 cm in width (Fig. 2A). The esophageal defect, completely exposed, was then directly repaired in two layers after debridement of the edges of the fistula. The mucosa was closed first with interrupted sutures of polydioxanone 4/0 (PDS; Ethicon, Inc., Somerville, NJ, USA) followed by closure of the overlying muscle with a running suture of PDS 4/0. The closure of membranous tracheal defect on the distal stump was then accomplished with a synthetic bioabsorbable patch (Gore Bio-A tissue reinforcement; W. L. Gore & Associates Inc, Phoenix, AZ, USA) sutured with two semi-continuous non-absorbable 4/0 sutures to the cartilage wall of the trachea (Figs. 2B and 2C). Finally, after interposition of a sternocleidomastoid muscle flap between the esophagus and the airway to avoid close contact of the suture lines, the trachea was reconstructed with a posterior continuous suture of PDS 4/0 between the membranous part of the proximal stump and the free margin of the patch, and a single interrupted suture of polyglactin 3/0 (Vicryl; Ethicon, Inc.) on each side of the continuous suture to approximate the lateral aspects of the two tracheal stumps; then, the anterolateral aspects of the tracheal stumps were sutured to the skin to form a new tracheostomy, and the cervical
incision was closed (Figs. 3A–3D). The endotracheal tube positioned across the field was removed and replaced with a tracheostomy tube. Draining gastrostomy tube, to avoid gastroesophageal reflux, and a feeding jejunostomy tube for enteral nutrition were then placed. The nasogastric tube was removed early in the intensive care unit and an uncuffed tracheostomy tube was used. The postoperative evolution was favorable. On the seventh postoperative day, esophagography confirmed the absence of esophageal leak and the oral feeding was resumed. The bronchoscopy performed 20 days after surgery revealed the full integration of the synthetic bioabsorbable patch with absence of any signs of esophageal-tracheal fistula (Fig. 2D). The patient was discharged 30 days postoperatively with a permanent airway T-tube.

**Discussion and Conclusion**

Large TEFs most often preclude direct closure of tracheal and esophageal defects due to excessive anastomotic tension, requiring tracheal resection and anastomosis with primary esophageal closure. In our case, the patient showed a large TEF but was deemed unsuitable for tracheal resection and reconstruction due to high-risk medical comorbidities and preoperative tracheostomy. The fistula, without tracheal stenosis or circumferential airway defect, was associated with marked peritracheal inflammation, and therefore, an alternative tracheoplastic technique was employed. The transverse tracheal incision and the retraction of the distal stump allowed identification and separation of the fistulous tract and correction of the esophageal defect with a double-layer closure. The patch allowed replacing the missing portion of the membranous part of trachea, thus avoiding the need of a tracheal resection. The Gore Bio-A tissue reinforcement has been already used in the successful treatment of benign and wide TEFs when other more conventional techniques could not be adopted. This report represents a further confirmation of the feasibility and efficacy of the surgical procedure. Large postintubation TEFs, without tracheal stenosis or circumferential airway defect, associated with marked peritracheal inflammation may be treated with this alternative tracheoplastic technique in patients deemed not suitable for tracheal resection and anastomosis.

**Authors’ Contributions**

Dario Amore contributed to research concept, drafting article, and the approval of the submitted and final versions.

Dino Casazza contributed to drafting article, and the approval of the submitted and final versions.

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Cristiano Cesaro contributed to data acquisition and analysis, and the approval of the submitted and final versions.
Emanuele Muto contributed to data acquisition and analysis, and the approval of the submitted and final versions.
Pasquale Imitazione contributed to data acquisition and analysis, and the approval of the submitted and final versions.
Carlo Curcio contributed to completing the approval of the submitted and final versions.

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Disclosure Statement

No conflict of interest.

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