Case Report

Use of improved tracheal catheters in patient of tracheostomy tube-induced tracheoesophageal fistula: a case report

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Abstract: Tracheostomy tube might cause tracheoesophageal fistula (TEF) due to high cuff pressure or direct mechanical trauma. Surgical repair provides the ideal way to deal with TEF but it necessitates the weaning the patient from mechanical ventilation. Here we report a spontaneous closure of TEF by managing it with improved tracheal catheters in a patient who is dependent on mechanical ventilation.

Keywords: Tracheal catheters, tracheostomy tube-induced tracheoesophageal fistula

Introduction

Acquired, nonmalignant tracheoesophageal fistula (TEF) is a very rare disease and difficult to manage [1, 2]. High cuff pressure or direct mechanical traumas during mechanical ventilation are considered as the main causes of TEF [3, 4]. Most TEFs are diagnosed when patients are very wake and need mechanical ventilation which made the immediate surgical repair of the fistula impossible [5]. Mathisen et al. reported the successful use of a new tracheostomy tube with the cuff positioned below the fistula to allow for delayed surgical closure in patients with tracheostomy [6]. However, tracheostomy tubes with only one length are provided in our hospital. Moreover, the insertion of a new tracheostomy tube with fixed-length might theoretically cause a new fistula. We initially used cuffed endotracheal tubes with different inserting lengths to tackle with this problem. As the outsider part of the orotracheal catheter is long, tube distorting and catheter slippage are occasionally seen. The nurses also complained of an additional difficulty in performing trans-tracheostomy suction. Improved tracheal catheters with shortened and varied lengths were later inserted instead and routinely changed once every 7 days in a 78-year-old patient. After six months’ care, bronchoscopy confirmed a spontaneous closure of the TEF in this patient.

Case report

A 75-year-old male with a history of chronic obstructive pulmonary disease, coronary atherosclerotic heart disease, hypertension (Grade III, severe), type II diabetes mellitus and benign prostate hyperplasia was admitted to our hospital and received emergent tracheostomy and ventilator-controlled respiration due to severe type II respiratory failure with bronchopneumonia in Jan. 2007. After symptomatic therapy, his condition gradually improved. However, he failed to wean off from the ventilator and required long-term respiratory support through the tracheostomy tube.

The patient broke out in cyanosis, abdominal distention and unconsciousness on Mar. 12th, 2010 and was urgently sent to our hospital. The respirator machine alarmed due to ultra-low airway pressure. Blood pressure and blood oxygen saturation showed a progressive decrease accompanied by tachycardia. A large amount of gastric contents and brown liquids (about 50
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mL) were suctioned through the tracheostomy tube. Mass air and brown liquids were also drained out from the gastric tube. These symptoms and signs made us believe that he got TEF due to long-term tracheostomy tube intubation and malnutrition.

As the patient was too weak to tolerate surgery and endoscopic repair, a conservative therapy that was similar to what Mathisen et al. [6] had done was provided. Tracheostomy tube was rapidly removed and a traditional orotracheal catheter (34 cm long) was inserted with the cuff placed below the fistula (Figure 1). Mechanical ventilation was re-provided with the monitor showing normal airway pressure. After treatment with aspiration pneumonia, blood oxygen saturation and blood pressure returned to normal 2 hours later. His vital signs remained stable thereafter.

Surgical repair of the fistula later was abandoned later because his family members showed great concerns about the surgical risk and rejected further invasive operations. We continued to use the orotracheal catheter for ventilation and changed it to a new one with different insertion lengths (the cuff was positioned about 1.5 cm below the fistula) once every week. However, as only a minor part of the orotracheal catheter was placed in the trachea, the center of gravity was located on the outsider part which made the catheter difficult to fasten and easy to slip out (Figure 1A). Moreover, the catheter was prone to swing and distort when the patient moved. The nurses also stated that it was difficult to do trans-tracheostomy suction effectively due to the long crooked tubes (Figure 1B).

To solve these problems, we shortened the lengths of the orotracheal catheters with the

Figure 1. Normal orotracheal intubation for the patient during mechanical ventilation (A) and trans-tracheostomy suction preparation with aerocyst deflation (B).

Figure 2. Photos show the normal orotracheal tube (A) and our modified shortened orotracheal tube (B).
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help of technicians (Figure 2). Different lengths of catheters were prepared and inserted once every one week to avoid new injuries of the trachea due to constant pressure of the cuffs on the same area. The patients tolerate well with the modified catheters (Figure 3). Much less distorting was found when using the improved catheters (Figure 3A). A more efficient trans-tracheostomy suction could be achieved (Figure 3B). The patient showed minimal discomfort and less infections.

After six months of expectant recovery, tracheoesophageal fistula showed a spontaneous closure confirmed by bronchoscopy and bronchography using meglumine diatrizoate. The modified orotracheal catheter was then replaced by normal tracheostomy tube and oral feeding was started. The patient recovered well and no new TEF occurred.

Discussion

Acquired, nonmalignant TEF is thought to be mostly derived from long-term intubation [3]. In patients with undergoing tracheostomy, the incidence of TEF is about 0.5% [7]. Diagnosis can be easily made by aspiration pneumonia and abdominal distension-related signs. Bronchoscopy is a useful tool to identify the place and size of the fistula. Although no bronchoscopy was performed, the typical signs and history made us believe that the patient described above got tracheostomy induced TEF.

Most patients were diagnosed with TEF when they were still mechanically ventilated. In these cases, surgical repair could not be performed instantly and the rapid control of the fistula using conservative methods is essential for both efficient oxygen delivery and gastric decompression [8, 9]. Mathisen et al successfully controlled the fistula by inserting a new longer tracheostomy tube with the cuff positioned below the fistula in 38 patients [6]. Endoscopic management of TEF using fibrin glue associated with diathermy, stents and other techniques were also tried [1, 10-13]. However, both longer tracheostomy tubes and endoscopic therapy were not available in our hospital. Moreover, as the patient was in critical condition and could not wean off from mechanical ventilation, we did not think endoscopic therapy could be immediately performed for him.

Inspired by the methods used by Mathisen et al [6], we used the orotracheal tube to avoid further contact with the fistula and ensure safe ventilation. But the tendency to swing and distort; the difficulty in fastening and the inefficiency in trans-tracheostomy suction drove us to modify the normal endotracheal tube. By just shortening the lengths of the tube, we saw more fixed stability, more conducive suctioning, more tolerant by the patient and less distortions. Furthermore, by using modified orotracheal tubes with different lengths once every week, we could avoid a constant compression on the trachea mucosa and theoretically reduced the chance to introduce new tracheal injuries. We thought this might be a factor that promotes the spontaneous recovery of the TEF.

To conclude, the simple modifications of the orotracheal tubes might be useful in the rapid
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control of TEF in patients with mechanical ventilation and avoiding new trachea injuries.

Disclosure of conflict of interest

None.

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