



Iatrogenic Complete Ventilatory Failure in Two Neonates Undergoing Tracheoesophageal Fistula Repair

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Abstract

Tracheoesophageal fistula (TEF) is one of the most common congenital anomalies presenting for emergency surgical correction in a neonate. The surgical approach is through the right thoracotomy in the lateral decubitus position. The pathology and surgical approach complicate the ventilatory management for this subset of neonates. Several possible causes of ventilatory insufficiency have been reported during the surgical repair in these cases. We report unusual causes of complete ventilatory failure in two patients undergoing TEF repair.

Keywords: Esophageal atresia, infant, respiratory insufficiency, thoracotomy, tracheoesophageal fistula

Introduction

Tracheoesophageal fistula (TEF) results from a congenital fistulous communication between the esophagus and trachea or one of its main branches (1,2). The TEF repair cases can have intraoperative sudden episodes of hypoxemia and desaturation due to a host of surgical, medical, and equipment related causes. The most common cause of difficulty in ventilating such babies is poor lung compliance coupled with the loss of ventilation (3). However, complete ventilatory failure is uncommon during surgical repair of TEF. We describe two such cases of complete loss of ventilation during TEF repair because of the accidental surgical transection of the fistula and an orogastric catheter.

Case Presentations

Informed consent was obtained from the parents of both neonates for publication of the clinical details and photographs.

Case 1

A 2-day old, 36-week premature male infant weighing 1.9 kg, born by spontaneous vaginal delivery presented with copious oral secretions since birth and had an episode of cyanosis following his first feed. Systemic examination revealed mild tachypnea and bilateral coarse breath sounds. A diagnosis of TEF was made, and the baby was scheduled for TEF repair. In the operating room (OR), anaesthesia was induced with thiopental sodium injection and the trachea was intubated with a 2.5-mm ID uncuffed endotracheal tube (ETT) after achieving neuromuscular blockade with rocuronium. The baby was positioned in a lateral decubitus position for surgery. After initial half an hour of surgery, suddenly the ventilator bellows collapsed, capnograph was lost, and auscultation revealed absent breath sounds. A quick equipment check was performed, and manual ventilation was initiated using 100% oxygen. Following this, we observed the sound of airleak from the surgical site. Meanwhile, there was desaturation and bradycardia. Atropine was administered intravenously and ETT was immediately advanced through the endobronchial lumen to reinstated ventilation to the left lung. The surgical site was packed and the patient turned supine. The oxygen saturation improved and the vital parameters normalized. The patient was again turned lateral

and the accidental transection of the fistula at the site of its attachment to the posterior tracheal wall was repaired with ongoing one-lung ventilation. During this period, the arterial saturation could be maintained using assisted ventilation with 80% oxygen and 20% air. Following the tracheal repair, the ETT was again withdrawn back to the trachea and rest of the case was uneventful.

Case 2

A 1-day-old, 2.5kg female baby was diagnosed with TEF with respiratory distress and was posted for TEF repair. Systemic examination and investigations were unremarkable. The trachea was intubated with a 3.0-mm ID uncuffed ETT following induction with thiopentone and neuromuscular blockade with rocuronium. Following lateral decubitus position for the surgery, the surgeons inserted a 20Fr red rubber catheter (Figure 1) into the esophageal pouch. Soon after the catheter insertion, there was a sudden failure to ventilate the child, the peak pressures increased, the end-tidal capnogram was lost and tidal volume decreased to 3–4mL. The ventilation was switched to the manual mode using 100% oxygen, but this was ineffective. Auscultation revealed absent breath sounds. After ruling out ETT dislodgement and equipment-related ventilatory problems, we noticed that the event occurred soon after the insertion of the catheter. So, the catheter was removed immediately and the ventilatory parameters improved. Thereafter, an 8 FG PVC orogastric catheter was inserted and the rest of the case was uneventful.

Discussion

In most cases of TEF repair, the fistula is ligated, orogastric catheter is inserted into the blind upper pouch for its identification and the esophagus is primarily anastomosed. During fistula repair in one child, the inadvertent tracheal injury happened, and left endobronchial intubation was done as a life-saving measure. Left mainstem intubation has also been

recommended for the infra-carinal TEF to help isolate the fistula and right lung simultaneously in a child with well-preserved pulmonary function (4). Iatrogenic airway obstruction following accidental placement of a gastrostomy catheter inside the trachea retrograde through the TEF has been reported earlier(5). The deflation of the gastrostomy tube resolved the condition. In the same child, the gastrostomy balloon caused a linear tracheal laceration, that was sealed by the peritracheal connective tissue.

In our second patient, the thick red rubber catheter possibly exerted pressure over the pharynx and trachea and led to a complete airway occlusion and ventilation failure. Neonates have soft tracheal cartilages and tracheomalacia is a possible anomaly in the TEF patients, which can facilitate its obstruction because of the surrounding pressure (2, 6). Similar ventilatory compromise has been reported previously during the foreign body (battery) removal in a 16-month old baby with (battery) due to air leak from TEF combined with the posterior tracheal wall compression by an adult endoscope (9 mm) (7). In our case also, direct pressure from the 20 Fr (6.6 mm) red rubber catheter could have led to ventilatory failure in the neonate. Since this incidence, the surgeons at our set-up have stopped using red rubber catheter in these cases and are using PVC feeding tubes instead. In another report, a preterm infant undergoing TEF repair developed iatrogenic pneumomediastinum due to false passage of the 8 Fr feeding tube orally for the identification of the blind upper pouch (8).

The goal of ventilation in a TEF patient is to allow adequate gas exchange with the lowest possible inspiratory pressure, avoid gastric distension and atelectasis. However, there are a multitude of reported causes of inadequate ventilation in infants undergoing TEF repair including pre-existing pul-

Main Points:

- The TEF repair cases can have sudden episodes of hypoxemia intraoperatively and desaturation due to a multiple surgical, medical, and equipment related causes.
- Complete loss of ventilation during TEF repair because of the accidental surgical transection of the fistula and an orogastric catheter are a rare cause but should be kept in mind.
- Endobronchial intubation can be lifesaving in patients with accidental transection of fistula/tracheal injury.
- Complications related to insertion of large bore tubes especially red rubber catheters in the upper esophageal pouch should be heeded to when such cases patients deteriorate intraoperatively.
- Eternal vigilance and close communication with the surgeons is the key to successful outcome.



Figure 1. Tracheoesophageal fistula case-2 in lateral decubitus position for surgery with the red rubber catheter *in situ*

monary dysfunction, intubation of the fistula, gastric distention, pneumothorax, ETT obstruction, lung retraction during surgery, kinking of the trachea or the main bronchi, and accidental ligation of the bronchi instead of the fistula. Two additional rarer causes that are mentioned in our report should be added for the differential diagnosis (1, 3, 5, 8-10).

Conclusion

Eternal vigilance is the key to managing TEF repair cases and the anesthesiologists always need to maintain close communication with the surgeon, anticipate critical events, and be prepared to deal with them. Endobronchial intubation can be lifesaving in a scenario of inadvertent tracheal injury and whenever any large bore tubes are inserted in the esophagus, airway obstruction should be anticipated.

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