CASE REPORT

Intraoperative ventilatory management of adult tracheoesophageal fistula

Samie Asghar Dogar, Mohammad Hamid

Abstract

Iatrogenic Tracheo Esophageal Fistula (TEF) in adults is a rare complication occurring secondary to trauma and prolonged intubation. There is very scarce data regarding its airway management and that too is from the paediatric age group. We describe the case of a young male undergoing TEF repair. We started with routine tracheal intubation but during surgery our tracheal tube was hindering surgical repair. So we used intermittent ventilation by passing the tracheal tube distal to the fistula and then pulling it back and providing clear surgical field during apnoea. It was done several times until the repair was completed successfully. Different airway management techniques are described in literature with the most common being oral intubation and placement of cuff distal to the fistula. However it may need to be modified according to the situation. We used a different technique for ventilation and will discuss it's pros and cons.

Keywords: Intraoperative, Ventilation, Trachea, Fistula.

Introduction

Iatrogenic Tracheo Esophageal Fistula (TEF) in adults is a rare complication occurring secondary to malignancy, trauma and prolonged intubation. Airway management during surgery is a challenge as the endo tracheal tube that is routinely placed for ventilation can hinder or block surgical access and also that leak from fistula can make positive pressure ventilation difficult and even dangerous. There is very scarce data regarding airway management of TEF in adults, most of the data is from the paediatric age group. Different techniques are described in literature with the most common being oral intubation and placement of cuff distal to the fistula. However the ventilation technique may need to be modified according to the situation.

Case Report

We describe the case of a 28 year old male who came to our hospital for cervical TEF repair on 25th of December, 2014. He had a history of a head injury in a road traffic accident and mechanical ventilation in ICU for 3 weeks. He underwent tracheostomy and gastrostomy during that ICU stay.

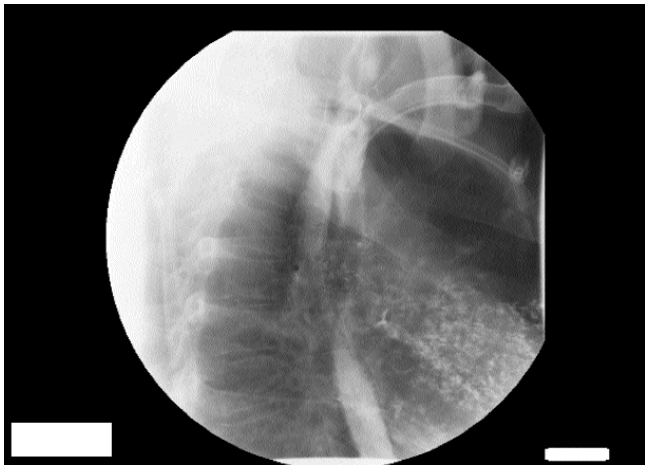

Figure-1: Preoperative XRAY Oesophagogram showing contrast extravasations into the tracheobronchial tree.

On pre-operative evaluation he had a tracheoesophageal fistula at the level of his tracheostomy. He had an oesophagogram which showed contrast extravasation into the tracheo bronchial tree (Figure-1). His x ray chest showed patchy shadows of contrast medium in his left lung which was dependent during the study (Figure-2). Rest of the preoperative evaluation was unremarkable. He was pre-medicated with oral midazolam 7.5mg one hour before surgery. Routine monitors of ECG, Pulse oximeter and NIBP were applied. Anaesthesia was induced with intravenous (IV) fentanyl 2 micrograms/kg, midazolam 3 mg and sevoflorane. Muscle relaxation was achieved using Rocuronium 0.9 mg/kg. After one minute tracheostomy tube was removed. Direct laryngoscopy was done which showed a grade 1 view however 8 mm tracheal tube (TT) tube encountered resistance in the subglottic area, smaller tubes were used until a 6.5 mm TT passed easily. A paediatric flexible fibreoptic was used to confirm the cuff position distal to the fistula and proximal to the carina. An arterial cannula was placed in his left radial artery to record arterial blood pressures. Paracetamol 1 gram IV(co analgesic) and dexamethasone 8 mg IV (to reduce post-operative oedema) were administered. Anaesthesia was maintained with a 1 to 1.2% end tidal concentration of isoflorane in oxygen and

Department of Anaesthesiology, Aga Khan University Hospital, Karachi.
Correspondence: Samie Asghar Dogar. Email: samiedogar@gmail.com

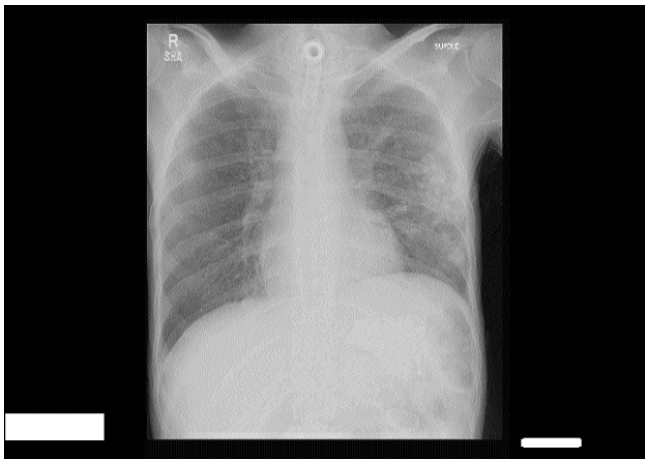

Figure-2: Preoperative Chest XRAY showing patchy shadowing in patient's left lung which was dependent during the oesophagogram (Figure 1).

air. Atracurium 10 mg bolus followed by an infusion at 0.4mg/kg/hour. Ventilation was volume controlled keeping patient's end tidal CO2 between 35 to 40 mm Hg. Surgical incision was through the neck. The surgery was technically difficult due to adhesions and the surgeon encountered difficulty as our tracheal tube was coming in his way. In order to facilitate exposure we pulled the TT tube up proximal to the fistula and the surgeon passed a 6 mm tracheal tube directly from the tracheostomy opening to get better exposure. We resumed ventilation through that second tracheal tube. This however did not help and the progress of surgery was not satisfactory. Therefore an intermittent apnoea technique, was tried by removing the TT tube through the tracheostomy. The oral TT was pushed distal to the defect and the lung was ventilated with 100% oxygen. It was then pulled back proximal to the defect clearing the surgical field. Surgery was resumed during apnoea. As soon as the saturation came down to 92% the surgeon stopped and the tube was pushed distal to the defect under direct visualization through surgical field and ventilation resumed with 100% oxygen. This was done back and forth for about 40 minutes during which the repair was completed successfully. Intravenous midazolam 5 mg and fentanyl 250 micrograms were administered to prevent awareness during this time. Finally oral TT tube was removed and tracheostomy tube was placed back. The patient recovered and was shifted to the recovery room. The post operative course was uneventful. On follow up in the clinic an oesophagogram was done which showed no extravasation of the contrast.

Discussion

Tracheo Esophageal Fistula (TEF) is usually a congenital abnormality but it can rarely develop in adults due to malignancy, trauma or prolonged tracheal intubation.[1] Factors implicated in the development of post intubation TEF are high cuff pressure, high airway pressure, excessive motion of tracheal tube (TT), prolonged duration of intubation, respiratory infections, esophageal infection, hypotension, nasogastric tube, and advanced age. Cuff pressure is probably the most important factor.[2] Complete obstruction of tracheal blood flow occurs at cuff pressure of greater than 50 cm H2O in normotensive patients but in hypotensive patients it occurs at 34cm H2O.[3] Post intubation it can develop from 12-200 days with a mean of 40 days.[4] High volume low pressure cuffs and growing awareness has decreased its incidence.

Perioperatively ventilation is challenging, some of the methods described in textbooks are1) Oral intubation and cuff distal to the fistula 2) Insertion of a sterile single lumen tube into the opened trachea distal to the area of resection, 3) One lung ventilation in cases of low lying fistulas 4) High Frequency Jet Ventilation through the stenotic area, or even 5) Use of Cardiopulmonary bypass.[5] For oral intubation it is very important to correctly place the TT tube cuff distal to the fistula and proximal to the carina.[6] Correct position is confirmed by a fibre optic bronchoscope.

Data regarding perioperative management of TEF is mostly from paediatric population as it is very rare in adults. Andropoulos et al in their review of 61 newborns with TEF noted that there was variation in practice but standard management was muscle relaxation, oral tracheal intubation and broncoscopy for positioning below the fistula.[8] In our case we encountered an un-anticipated problem which was inability to pass standard size TT tubes. It was because of tracheal stenosis which we missed in our preoperative evaluation. On literature review we found that tracheal stenosis was frequently present along with post intubation TEF.[9] However, we did not find any anaesthesia case describing the same problem similar to our case in airway management. In patients with iatrogenic TEF secondary to prolonged intubation tracheal stenosis should also be suspected.

Various modifications to standard ventilation techniques is described in literature for this procedure. Ford and colleagues in a complex distal fistula passed two separate MLT tubes into each bronchus, however they experienced difficulty in positioning larger cuff of MLT tube in left main bronchus. They eventually intubated the left bronchus through the surgical field.[10]

In our technique there were several potential risks. Of note, desaturation due to tube dislodgement as it happened in a case with Alabbad et al.[11] where on lateral

positioning the TT tube dislodged into the fistula which eventually resulted in mortality. In our case we could continuously monitor our TT tube through the surgical field and we manoeuvred it under direct vision. Other potential problems could be aspiration of blood during apnoea on an unprotected airway and injury to trachea with repeated pulling and pushing. To minimize aspiration we kept the patient in slight head down position and the surgeon's assistant did meticulous suctioning of the surgical field. To prevent trauma we manoeuvred the TT tube very gently under direct visualization through surgical field. We also tried to keep apnoea periods as short as possible by close communication with the surgery team.

Conclusion

Although airway management in adult iatrogenic TEF is challenging and many different methods are described, this unique technique was invention of necessity and worked for our patient.

Disclosure: No

Conflict of Interest: No

Funding Sources: No

References

1. Baisi A, Bonavina L, Narne S, Peracchia A. Benign tracheoesophageal fistula: results of surgical therapy. Dis Esophagus 1999; 12: 209-11.
2. Kastanos N, Estopa Miro R, Marin Perez A, Xaublet Mir A, Agusti-Vidal A. Laryngotracheal injury due to endotracheal intubation: Incidence, evolution, and predisposing factors.A long term study. Crit Care Med 1983; 11: 362-7.
3. Kaur D, Anand S, Sharma P, Kumar S. Early presentation of postintubation tracheoesophageal fistula: Perioperative anesthetic management. J Anaesthesiol Clin Pharmacol 2012; 28: 114-6.
4. Marzelle J, Dartevelle P, Khalife J, Rojas-Miranda A, Chapelier A, Levasseur P. Surgical management of acquired postintubation TOF. Eur J Cardiothorac Surg 1989; 3: 499-503.
5. Miller RD, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Young WL, editors. Miller's Anesthesia. 7th ed. London: Churchill Livingstone 2009.
6. Yao FF, Fontes ML, Malhotra V. Anesthesiology Problem Oriented Patient Management. 7th ed. Philedelphia: Lippincott Williams and Wilkins; 2012, pp- 885.
7. Knottenbelt G, Costi D, Stephens P, Beringer R, Davidson A. An audit of anesthetic management and complications of tracheo-esophageal fistula and esophageal atresia repair. Paediatr Anaesth 2012; 22: 268-74.
8. Andropoulos DB, Rowe RW, Betts JM. Anaesthetic and surgical airway management during tracheo-oesophageal fistula repair. Paediatr Anaesth 1998; 8: 313-9.
9. Fiala P, Cernohorsky S, Cermak J, Patek J, Krepela E, Mouckova M. Tracheal stenosis complicated with tracheoesophageal fistula. Eur J Cardiothorac Surg 2004; 25: 127-30.
10. Ford JM, Shields JA. Selective bilateral bronchial intubation for large, acquired tracheoesophageal fistula. AANA J 2012; 80: 49-53.
11. Alabbad SI, Shaw K, Puligandla PS, Carranza R, Bernard C, Laberge JM. The pitfalls of endotracheal intubation beyond the fistula in babies with type C esophageal atresia. Semin Pediatr Surg 2009; 18: 116-8.