DOI: 10.21088/ijaa.2349.8471.12125.13

Indian Journal of Anesthesia and Analgesia
Volume 12 Number 1 January - March 2025

Case Report

Anaesthetic Management of Tracheo-oesophageal fistula/oesophageal atresia in Neonate

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How to cite this article:

Matcha Reddysri, Ravi Madhusudhana, Revathi A., et. al, Anaesthetic Management of Tracheo-oesophageal fistula/ oesophageal atresia in Neonate. Ind J Anesth Analg. 2025; 12(1): 65-69.

ABSTRACT

Introduction: Tracheo-oesophageal fistula with or without oesophageal atresia is a congenital anomaly with an incidence of 1 in 3000-4000 births worldwide. Although congenital cardiac disease is the most frequent congenital anomaly, up to 50% of infants have TOF in addition to other congenital abnormalities.

Case Report: At 3 day old the baby was planned for one lung ventilation with right thoracotomy + trachea-oesophageal repair in view of trachea-oesophageal fistula with oesophageal atresia. On examination, the general condition of the child was poor. He was tachypneic with a respiratory rate of 62/min along with chest retraction and nasal flaring. In the operating room, standard monitors were attached. Two intravenous line was secured with 24-gauge cannula on both dorsum of hands. Intravenous anesthesia drugs were loaded using insulin syringe according to baby's weight. Induced with ketamine 4 mg and fentany l4 µg. After confirmation of bag and mask ventilation, succinylcholine 4 mg was given to facilitate end otracheal intubation. Trachea was intubated successfully with uncuffed endotracheal tube of internal diameter 3.0 mm confirmed by auscultation of chest and capnography. The child was ventilated with low tidal volume and high rate. Anesthesia was maintained with oxygen, isoflurane and atracurium. The child was positioned in the right lateral position and thoracotomy was done. At the end of surgery, trial of extubation was done and due to insufficient respiratory effort baby was shifted with ET tube in-situ to NICU.

Conclusion: The anesthetic approach for neonates with TEF with or without EA should primarily concentrate on airway management and ventilation techniques. Maintaining airway patency, ensuring proper ventilation, and adequate

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➢ **Received:** 01-10-2024 ➢ **Revised:** 15-11-2024 ➢ **Accepted:** 13-12-2024

oxygenation rely on effective communication between the pediatric surgeon and the anesthetist during the procedure Neonates are typically recommended to remain intubated endotracheally for a specific duration following surgery, necessitating the arrangement of an NICU bed in advance for these infants before definitive repair.

KEYWORDS

• Airway management • Esophagealatresia (EA) • Tracheoesophageal fistula (TEF) • Neonate anesthesia

KEY MESSAGES

Our patient was 3 day old infant with low birth weight with trachea oesophageal fistula securing intravenous cannula was also difficult and single lumen uncuffed endo tracheal tube was used and we had frequent episodes of migration of tube endo bronchially and changes in saturation and heartrate during collapse of one lung for surgical intervention. This was a challenging case for us which we have managed successfully without any complications.

INTRODUCTION

The anesthetic management of a neonate with tracheoesophageal fistula (TEF) is challenging due to many factors including the connection between the air way and the esophagus leading to difficulty in lung ventilation, the associated anomalies most frequently pertaining to cardiovascular system, and the thoracotomy procedure with its potential adverse hemodynamic consequences and complicated postoperative analgesic management. The kind of anaesthetic administration and the surgical procedure are primarily determined by the anatomical differences related to the abnormality itself. This study will discuss the various approaches to anaesthetic management, with a primary focus on appropriate ventilation strategies. Tracheo-oesophageal fistula (TOF) with or without oesophageal atresia (OA) is a congenital anomaly with an incidence of 1 in 3000-4000 births worldwide. Although congenital cardiac disease is the most frequent congenital anomaly, up to 50% of infants have TOF in addition to other congenital abnormalities. However, TOF can also occur alone. Furthermore, VACTERL (Vertebral anomalies, imperforate Anus, Cardiac malformations, Tracheo-oesophageal fistula, Renal agenesis, and Limb abnormalities, most commonly radial dysplasia) can affect up to 25% of infants born with TOF. (*See Fig. 1*)[1]

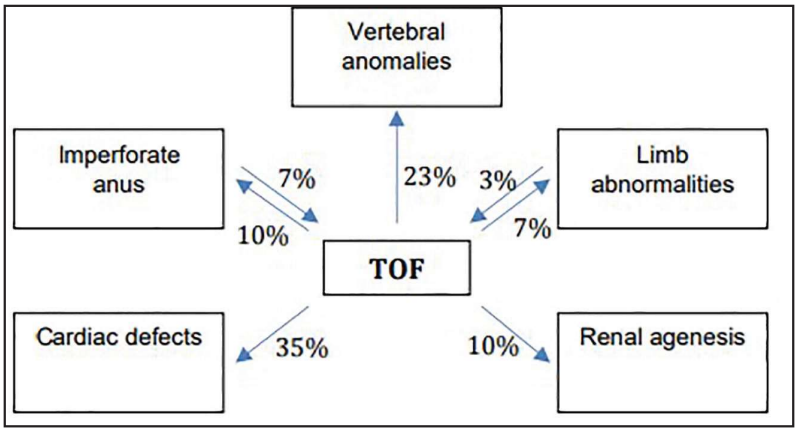

Fig. 1: Frequency of associated VACTERL syndrome defects and TOF[2]

Anatomy of Tracheo-Oesophageal Fistula:

The differentiation of the trachea from the oesophagus occurs during the fourth week of embryonic development. Tracheo-oesophageal abnormalities develop if the trachea and the foregut floor do not completely separate. Six anatomic variations of TOF with and without OA are recognised by the Gross

classification system (*Types A–F, Fig. 2*).[3] A fistula connects the trachea to the lower oesophageal region above the carina in type C lesions, which account for over 90% of cases. The upper oesophageal pouch ends blindly in the mediastinum[1].

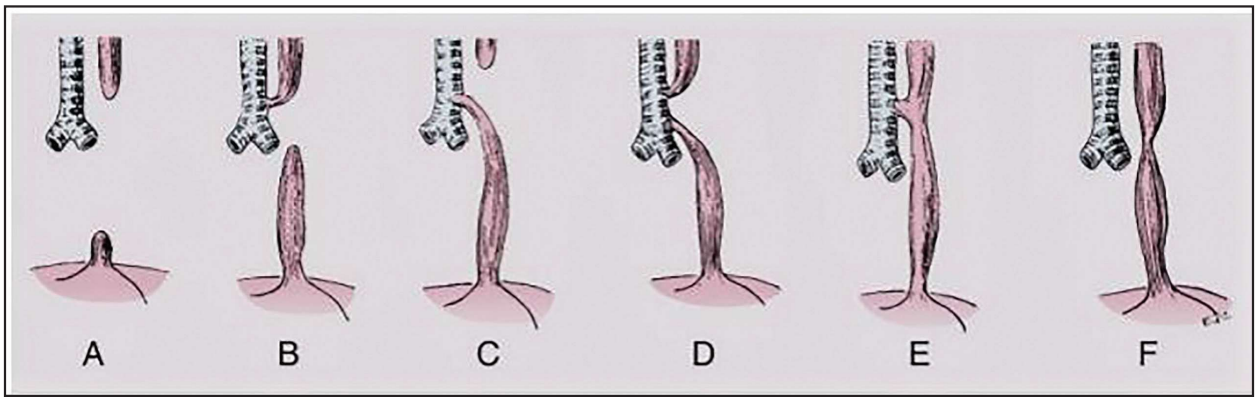

Fig. 2: Variants of tracheo-oesopageal fistula with and withouthoesophageal atresia

CASE REPORT

The patient was 3-day-old, 1090 g, male, born to a 27 years old nulliparous woman within normal BMI with term gestation was referred to our institute for emergency lower segment cesarean section (LSCS). She is known hypothyroid on regular medication (Tab Thyroxine sodium 200 mcg/day since 4th month of pregnancy) with pre-eclampsia start on medication (Tab Labet al.ol 100 mg TID since 3 days prior to LSCS). She had a pre-natal ultrasound which revealed polyhydramnios with amniotic fluid index (AFI) of 20-22 cm. Mild to moderate polyhydramnios was noted. Preanaesthetic evaluation done and she underwent emergency LSCS under spinal anesthesia without any intraoperative difficulty or complications. The baby was shifted to NICU in view of low birth weight (1.9 kg) and respiratory distress secondary to transient tachypnoea of newborn. APGAR at 1 minute was 7/10 while APGAR at 7 minutes was 9/10. Chest retractions wee noted immediately upon delivery.

Pre operative assessment: At 3 day old the baby was planned for one lung ventilation with right thoracotomy+ trachea-oesophageal repair in view of trachea-oesophageal fistula (type c) with oesophagealatresia. Blood investigation were within normal range. Upon birth, he had labored breathing for which he was given symptomatic treatment at NICU. His general condition did not improve. On examination, the general condition of the child was poor. He was tachypneic with a respiratory rate of 62/min along with chest retraction and nasal flaring. Heart rate was 144/min. Auscultation of chest revealed bilateral air entry present. It is not uncommon for neonates with TOF to present with respiratory complications as they are prone to aspiration. An x-ray of the chest could reveal infiltrates. In order to lower morbidity and mortality,pulmonary problems must be prevented or treated. The newborn is kept upright and all oral feedings are discontinued in order to reduce the danger of aspiration pneumonitis. Additionally, intermittent suctioning of the upper oesophageal pouch is carried out to reduce the buildup of saliva. Determining the existence and potential anaesthetic implications of any concurrent congenital anomalies, particularly heart problems, should be the primary goal of a comprehensive preoperative examination. Because congenital cardiac disease is so common, a preoperative echocardiography is required. Heart problems including tetralogy of Fallot, ventricular septal defect, and atrial septal defect are frequently linked to TOF and will affect how the anaesthetic is managed. Aortic arch abnormalities can also be found on an echocardiography, which may change the surgical approach. According to reports, up to 5% of individuals have a right-sided aortic arch that necessitates a left thoracotomy. Preoperative evaluations for the heart and lungs are crucial, but if a newborn has any VACTERL defects, diagnostic testing has to be done to see whether any coexisting anomalies occur. It is helpful to get a lumbar ultrasound if there is a sacral dimple in order to assess the neuraxial anatomy, particularly if you intend

to implant a caudal catheter for postoperative analgesia. To rule out hydronephros is or other renal irregularities, which may also impact anaesthetic treatment, a renal ultrasound should also be performed. Intra operative management: In the operating room, standard monitors were attached. Two intravenous line was secured with 24-gauge cannula on both dorsum of hands. Intravenous anesthesia drugs were loaded using insulin syringe according to baby's weight. He was induced with ketamine 4 mg and fentanyl 4 µg. After confirmation of bag and mask ventilation, succinylcholine 4 mg was given to facilitate-en do tracheal intubation. Trachea was in tubated successfully with uncuffed endotracheal tube of internal diameter 3.0 mm confirmed by auscultation of chest and capnography. The child was ventilated with low tidal volume and high rate. The goal during induction is to intubate the infant while minimizing distention of the stomach. If measures are not taken to avoid stomach distention. Anesthesia was maintained with oxygen, is of lurane and atracurium. The child was positioned in the right lateral position and thoracotomy was done. During dissection, there were frequent episodes of bradycardia for which surgeons were requested to stop every time, and heart rate improved immediately spontaneously. Surgery lasted for 3 hours. At the end of surgery, trial of extubation was done and due to insufficient respiratory effort baby was shifted with ET tube in-situ to NICU. Postoperative management: It is best to schedule the neonatal intensive care unit (NICU) in advance of the procedure because these patients need to be intubated for a while after the procedure To shield the an astomosis from extended exposure to thepressure applied by the ETT, it is advisable to keep this duration as brief as feasible. However, tracheo bronchomalacia or secretions may frequently necessitate reintubation for these infants. The neonate is exposed to hyperextension of the neck during there intubation procedure, which causes a stretch in the anastomosis line, which needs to be safeguarded during this time. Since reintubation is not a preferred course of treatment, a team comprising the anaesthetist, surgeon, and neonatologist/intensivec are specialist should determine when to remove the trachea. The fluid and electrolyte requirements are maintained according to hemodynamic parameters and laboratory tests including serum sodium, creatinine and urea.

DISCUSSION

Persistent gastroesophageal reflux is probably the most common long term problem and occurs more frequently after a delayed primary repair. A rarer complication, but one that can define long term outcomes after TOF/OA repair is tracheomalacia. Tracheomalacia can cause collapse of the airway resulting in stridor, apnea or recurrent pneumonia. Tracheomalacia tends to improve after the first 3 to 5 years of life, but if severe may require treatment with tracheopexy. Overall, mortality rates are less than 10% in developed countries. The Spitz system predicts the prognosis of patients with TOF/OA based on their birth weights and the presence or absence of major congenital heart disease (Table 1). Low birth weight infants who have cardiac anomalies have the highest morbidity and mortality rates.[1]

Table 1: Spitz survival rates, 2006

Group	Features	Survival
I	Birth weight >1500g no major cardiac anomaly	98%
II	Birth weight < 1500g or major cardiac anomaly	82%
III	Birth weight < 1500g and major cardiac anomaly	50%

In low-resource settings, mortality rates remain high and vary from 40% to 80%.[6] The high mortality rates have been attributed to late presentation which is often associated with aspiration and pneumonia. Other factors which contribute to mortality include minimal supportive care such as lack of neonatal intensive care and parenteral nutrition for early feeding. Early postoperative complications include sepsis and respiratory failure. Most children are not paralysed and so are not intubated or ventilated until surgery. A gastrostomy may be necessary as the initial procedure if gastric distension in a neonate with severe lung disease is caused by high inflation pressures, but this is extremely rare. An early thoracotomy to divide and ligate a big distal fistula that is causing issues is the best course of action[5]. As with other congenital anomalies, children with TOF/OA require long term supportive multidisciplinary care with follow up to minimize further

complications. A common symptom of tracheomalacia in children is the "TOF cough," which is characterised by noisy barking. About two thirds of TOF survivors experience recurrent chest infections in their early years of childhood, including pneumonia and bronchitis. Aspiration or recurrent infections can cause bronchiectas is and prolonged lobar collapse, which are irreparable lung damage. Forty percent of survivors experience wheeze, which does not get better with age[2]. Before starting enteral feeding after surgery, it is advised to perform a water-soluble contrast-enhanced examination of the oesophagus on the fifth or seventh day to check for any anastomotic leakage. Due to the presence of an NG-tube and the lack of a water-soluble contrast-enhanced evaluation, enteral feeding began earlier for our patients on the third day following surgery. Small feeds were then tolerated even after the removal of the NG-tube and radiological evaluation of the oesophagus was completed at a different facility using a water-soluble contrast[3]. To check for evidence of aspiration and air in the lower oesophagus, a chest X-ray may be helpful. It is advised to use a computed tomography scan to evaluate the lung parenchyma, which can occasionally be used to show the fistula.[4]

CONCLUSION

The anesthetic management of neonates with TEF with or without EA, should mainly focus on the airway management and ventilation strategies. The maintenance of the patency of the airway and adequate ventilation and oxygenation depends on the communication between the pediatric surgeon and the anesthetist throughout the surgery. Aside from the airway and respiratory problems, the anesthetic considerations should also include the optimization of the status pertaining to co-morbidities due to associated congenital anomalies, which increase the incidence of adverse events, complications and morbidity in the perioperative period.[5] The neonates are preferred to remain endotracheally intubated for a period of time postoperatively, hence, an NICU bed should be organized for these neonates prior to definitive repair.

Conflict of Interest: None

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