

Early diagnosis and treatment of tracheoesophageal fistula in a newborn: A case report

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ABSTRACT

Tracheoesophageal fistula (TEF) is an extremely rare congenital anomaly in newborns. In this case, we emphasize the role of contrast tube esophagography in diagnosing TEF and highlight how intraoperative guidewire placement facilitated fistula localization during surgical exploration. A female newborn was admitted to the neonatal intensive care unit due to respiratory distress and wheezing. Her condition deteriorated on day 4, necessitating endotracheal intubation and mechanical ventilation. Despite treatment for congenital pneumonia, intermittent respiratory distress persisted. On day 23, TEF was confirmed via contrast esophagography. At 25 days of age, the patient underwent rigid esophagoscopy, which confirmed the presence of TEF. A guidewire was advanced through the fistula to aid in its localization, allowing for precise surgical repair. This case underscores the challenges associated with diagnosing H-type TEF in neonates and highlights the crucial role of contrast esophagography and intraoperative guidewire placement in optimizing surgical management.

Keywords: Esophageal atresia, esophagogram, neonatal surgery, newborn, tracheoesophageal fistula.



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INTRODUCTION

Congenital tracheoesophageal fistula (TEF) is a rare anomaly, with an estimated incidence of approximately 1 in 2,500 live births.^[1] TEFs are classified into five distinct types based on their anatomical characteristics. Types I and IV are associated with esophageal atresia and are typically diagnosed immediately after birth due to feeding difficulties and respiratory distress. In contrast, Type V, also known as H-type TEF, is the rarest variant and occurs without esophageal atresia, constituting approximately 4% of all TEF cases.^[2] Due to its isolated nature and the absence of esophageal atresia, the diagnosis of H-type TEF is often challenging, particularly in the neonatal period.

H-type TEF frequently presents with nonspecific and subtle clinical manifestations, leading to delayed recognition. Symptoms such as persistent aspiration, recurrent pneumonia, tracheomalacia, and bronchiectasis may develop over time, potentially resulting in significant morbidity and even mortality if left undiagnosed.^[3] Neonates with TEF often exhibit feeding difficulties characterized by coughing, choking, and cyanosis during feeding, which may be misinterpreted as gastroesophageal reflux disease (GERD).^[3] Diagnostic modalities include contrast esophagography, computed tomography (CT), bronchoscopy, and esophagoscopy; however, even with these techniques, diagnosis may be delayed.^[4,5] Critically ill neonates who require prolonged mechanical ventilation pose an additional diagnostic challenge, as persistent respiratory distress may obscure the underlying TEF.

In this report, we present a neonate diagnosed with H-type TEF on day 25 of life. We emphasize the critical role of contrast tube esophagography in early detection and highlight how intraoperative guidewire placement facilitated precise fistula localization, ultimately optimizing surgical exploration and repair.

CASE REPORT

A female infant, born via cesarean section at 39+4 weeks of gestation with a birth weight of 3015 g, was admitted to the neonatal intensive care unit (NICU) due to respiratory distress accompanied by excessive mucus. Antenatal history and the initial physical examination were unremarkable. The patient was initially fed maternal milk via the oral route and received nasal oxygen support. However, on the fourth day of hospitalization, her condition deteriorated with worsening respiratory distress, necessitating intubation and mechanical ventilation. A chest X-ray revealed diffuse infiltrates, leading to a diagnosis of congenital pneumonia. Further evaluation with cardiac ultrasonography identified pulmonary stenosis, a small patent ductus arteriosus, and a secundum atrial septal defect. Cranial ultrasonography findings were within normal limits. Laboratory tests showed a C-reactive protein (CRP) level of 1 mg/L, a white blood cell (WBC) count of 17,000/ μ L with neutrophil predominance, and a hemoglobin (Hb) level of 20.5 g/dL.

By the eighth day, the patient demonstrated clinical improvement on mechanical ventilation and was successfully extubated, transitioning to nasal oxygen support. However, during follow-up, she developed recurrent respiratory distress accompanied by increased subcostal and intercostal retractions and nasal flaring, necessitating

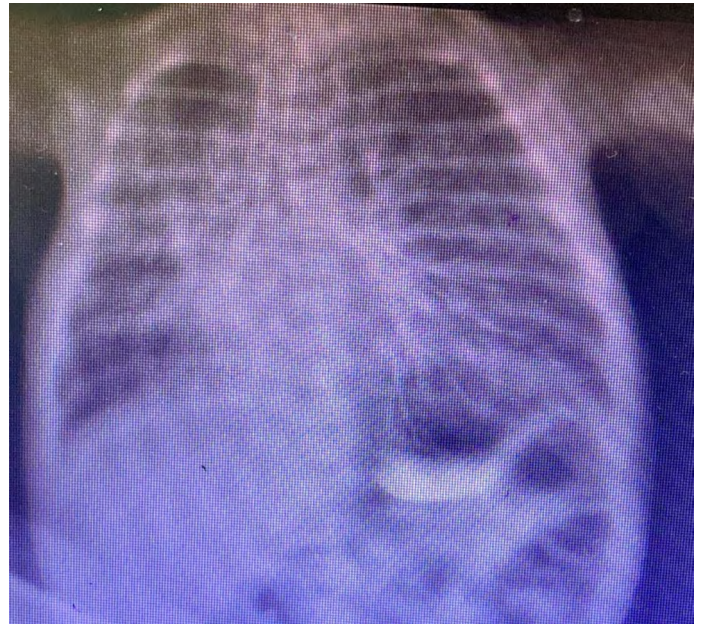


Figure 1: Water soluble radiopaque contrast swallow study on the 23rd day of life showing contrast reflux from the esophagus into the trachea, confirming TEF.

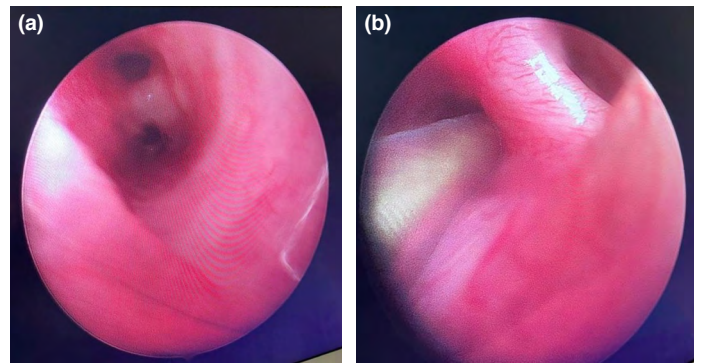


Figure 2: (a) Rigid esophagoscopy confirming the presence of the fistula. (b) Guidewire advanced through the fistulous tract.

reintubation and mechanical ventilation. Given the persistent respiratory instability, two doses of 6cc surfactant were administered. As oxygen requirements escalated, thoracic ultrasonography and computed tomography (CT) were performed, revealing findings consistent with aspiration pneumonia. Blood cultures later identified vancomycin-resistant *Enterococcus* (VRE).

Following extubation, recurrent respiratory distress was noted particularly during oral feeding, raising suspicion of an underlying TEF. On the 23rd day of life, a water-soluble radiopaque contrast swallow study was performed, which confirmed the presence of TEF, as water-soluble radiopaque contrast was observed refluxing upward from a catheter advanced into the stomach (Fig. 1).

The patient was scheduled for surgery on day 25. During the operation, rigid esophagoscopy confirmed the presence of the fistula, and a guidewire was advanced through the fistulous tract. Simultaneous flexible bronchoscopy verified the position of the guidewire (Fig. 2a, b).

Surgical exploration via a left presternal incision identified the fistula, which was meticulously dissected, separated from the trachea, and sutured. The procedure was completed in 55 minutes. Postoperatively, the patient was successfully weaned from mechanical ventilation and extubated on the third postoperative day. A gradual transition to oral feeding was well tolerated, and the patient was discharged on postoperative day eight.

During a one-year follow-up period, the patient exhibited no signs of respiratory distress or feeding difficulties, demonstrating a favorable clinical outcome. Consent for publication was obtained from the patient's family.

DISCUSSION

Due to the anatomical characteristics of congenital H-type TEF, its diagnosis remains a significant challenge.^[6] In cases in which the fistula has a narrow diameter, diagnosis is often delayed, as these patients are frequently misdiagnosed with gastroesophageal reflux disease or recurrent aspiration pneumonia.^[4,5] The true incidence of H-type TEF is difficult to determine because of its low morbidity and the high rate of misdiagnosis during the neonatal period. Most cases presenting in the neonatal period are rarely identified within the first month of life. In infants with recurrent pulmonary infections, as in our case, chest computed tomography may be performed under suspicion of an underlying pulmonary pathology, further complicating the clinical picture, particularly after oral feeding.^[7]

H-type TEFs are typically located more cephalad on the tracheal side and lower on the esophageal side, forming an anatomical configuration that resembles an "N" rather than an "H." This structure makes complete visualization of the fistula challenging on computed tomography imaging. In our case, thoracic computed tomography did not directly reveal the fistula but contributed to the diagnosis of an H-type TEF anomaly. A water-soluble radiopaque contrast swallow study (tube esophagogram), when performed using a specialized technique, can successfully visualize the fistula, as demonstrated in our case. In neonates suspected of having H-type TEF, bronchoscopy and esophagoscopy under anesthesia are valuable diagnostic tools for identifying the fistula.^[8] Li et al.^[9] reported the use of methylene blue dye during esophagoscopy to aid in the diagnosis of TEF anomalies in neonates. Similarly, Wong et al.^[10] demonstrated that flexible bronchoscopy with guidewire cannulation facilitated anatomical localization of the fistula in H-type TEF cases and contributed to increased rates of early diagnosis.

As is well known, TEF represents a subtype of esophageal atresia, and their pathophysiologies share common embryological origins. However, both the diagnostic process and therapeutic approach to TEF exhibit distinct characteristics, making it a separate clinical entity from esophageal atresia. The clinical differences and diagnostic considerations have been discussed above. In the management of esophageal atresia, traditional thoracotomy has gradually been replaced by thoracoscopic repair.^[11] With the development of smaller thoracoscopic instruments, many centers are now able to perform minimally invasive repair of esophageal atresia. However, due to the cervical location of many TEFs, the adoption of minimally invasive techniques for their repair has been slower and less widespread.^[12]

CONCLUSION

Early diagnosis and prompt surgical intervention are crucial in the management of TEF. Delays in diagnosis often arise because of the nonspecific nature of its symptoms. Reported early clinical manifestations include coughing, choking, vomiting, cyanosis, stridor during feeding, hemoptysis, regurgitation, dyspnea, tachypnea, and recurrent pneumonia. In our case, the predominant findings were respiratory distress following oral feeding, paroxysmal cyanosis without coughing, and aspiration pneumonia. Although coughing is a common symptom in older children with TEF, the cough reflex is not fully developed in neonates, leading to prolonged requirements for mechanical ventilation and further diagnostic challenges. In our patient, TEF was identified using a tube esophagogram performed without anesthesia. The diagnosis was subsequently confirmed through esophagoscopy-assisted guidewire placement, which effectively delineated the anatomical localization of the fistula and facilitated surgical planning.

A water-soluble radiopaque contrast esophagogram performed by an experienced radiologist is a rapid and effective early diagnostic method. The use of a guidewire passed through the fistula during confirmation with esophagoscopy and bronchoscopy facilitates surgical intervention and shortens the procedure time.

Statement

Ethics Committee Approval: This is a single case report, and therefore ethics committee approval was not required in accordance with institutional policies.

Informed Consent: Consent for publication has been obtained from the patient's family.

Conflict of Interest: The authors declare that there is no conflict of interest.

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