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Popoiu C.M. [1]MD, PhD, Lect; **Boia E.S.**[1] MD, PhD, Prof; **Popoiu Anca**[1]MD, PhD, Assist Prof; **Kundnani Nilima**[1] **MD**, **Chintan T**[2] MD, **Ahmed Z.**[1]**ST**.MBBS, **Bhagwani Shalini** [3]MD, **Kshtriya Lajwanti** [4]MD,Prof, **Brad Giorgiana**[5] MD, **Pakai Roxana**[5]MD

OUR EXPERIENCE WITH TRACHEO-ESOPHAGEAL FISTULA IN CHILDREN

1. University of Medicine and Pharmacy, Timisoara, Romania
2. Civil Hospital Ahemdabad, India
3. Shreeeji Clinic, Vadodara, India
4. Sterling Hospital, Vadodara, India
5. Children's Emergency Hospital, Timisoara, Romania

Abstract

Introduction: Tracheo-esophageal fistula (TEF), is a congenital disorder encountered in neonates or of acquired origin in infants and toddlers, due to foreign body aspiration or accidental injuries. If dwelt in time, surgery proves to be the right treatment with good prognosis.

Aim: to review our experience with tracheo-esophageal fistula.

Materials and methods: Between 2007- 2008, eight children were admitted with the suspicion of tracheo-esophageal fistula. Clinical status, investigations, medical and surgical treatment records, together with post surgical follow-up were reviewed.

Results: Out of these eight children, three had TEF with esophageal atresia, and four were found to have H type TEF. One patient had gastro-esophageal reflux. Surgery was performed in all TEF cases and had a good outcome. No mortality was encountered in our group of patients.

Conclusion: TEF is a surgically treatable condition, if diagnosed and operated in time, with a good prognosis.

Introduction

Tracheo-esophageal Fistula (TEF) in neonates and infants is a rare condition presenting with an abnormal connection between the esophagus and the trachea. TEF in most cases is usually accompanied by esophageal atresia. There are two types of TEF: one being congenital which is found in newborns and other being acquired - commonly seen in infants and toddlers. Congenital tracheo-esophageal fistula, if present at birth is due to failed fusion of the tracheoesophageal ridges during the third week of embryological development [1]. Acquired tracheo-esophageal fistula can be caused by iatrogenic injury, foreign body aspiration (e.g. button batteries), blunt chest, neck trauma, prolonged mechanical ventilation via endotracheal or tracheostomy tube and excessive tube cuff pressure in patients ventilated for lung disease [2]. TEF can be classified in Type A: proximal and distal esophageal bud - a normal esophagus with a missing mid-segment. Type B: proximal esophageal termination on the lower trachea with distal esophageal bud. Type C: proximal esophageal atresia with a distal esophagus arising from the lower trachea or carina. Type D: proximal esophageal termination on the lower trachea or carina with distal esophagus arising from the carina. Type E: A variant of type D: if the two segments of esophagus communicate, this is sometimes termed an ***H-type*** fistula due to its resemblance to the letter H; TEF without EA [3].

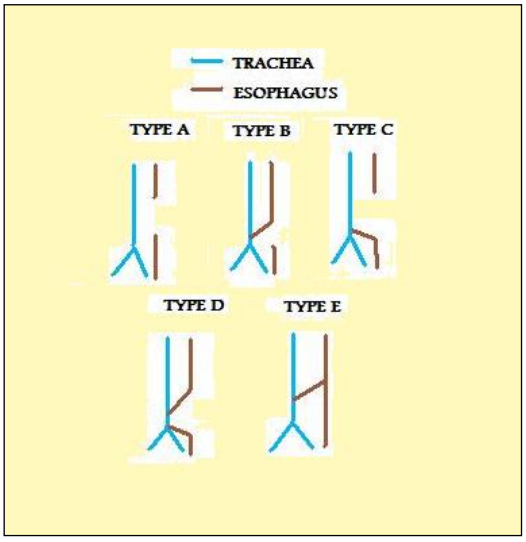

Fig. 1. Types of TEF

Materials and methods: Eight children were referred to our department with the suspicion of tracheoesophageal fistula, between 2007-2008. Clinical status, pregnancy and birth history were noted. Clinical, paraclinical and radiological investigations were made, in order to confirm the diagnosis. Seven cases presented with TEF and surgery was immediately scheduled.

Results: Three children had tracheoesophageal fistula with oesophageal atresia. Four had congenital H-type TEF, diagnosed by chest X-ray and multiple slice CT scan. The remaining baby had gastroesophageal reflux and was treated accordingly. Virtual bronchoscopy and 3D reconstruction were useful.

H-type TEF is rare type of fistula corrected by surgery. All seven children were followed periodically after the surgery; none had developed surgical complications and all proved to have good prognosis.

Discussions

Congenital TEF without esophageal atresia (EA) H-type is very rare esophageal anomaly, which is also hard to diagnose [4]. Neonates with H-type TEF usually have choking episodes and cyanotic spells [5]. In some cases, infants may present symptoms later in time, with recurrent or multiple pneumonias [6].

Children are usually diagnosed with TEF during the neonatal period, due to other life threatening complications, that accompany the tracheo-esophageal fistula [5].

Acquired TEF can be malignant and nonmalignant. In malignant TEF, the contamination of the respiratory tract, leads to pulmonary infections and major complications. Nonmalignant TEF are traumatic, fistula occur after blunt trauma or open avulsion injury to the neck and thorax. Foreign body lodgment is a common cause seen especially with button battery aspiration.

In most neonatal units, there is a routine practice of passing a 5Fr infant feeding tube through the nose soon after admission/birth in order to diagnose the esophageal malformations. If the catheter stops at 8-10 cm from the alveolar arcade and roentgenogram shows, a coiled catheter in the upper esophageal pouch, one can diagnose esophageal atresia. If esophageal atresia is suspected on clinical grounds, the ideal test would be to pass a stiff rubber catheter through the mouth and note the resistance [5]. Various diagnostic tests can be used to assure TEF such as use of live or virtual bronchoscopy (Figure 2), contrast radiographic studies and multi slice CT scan.

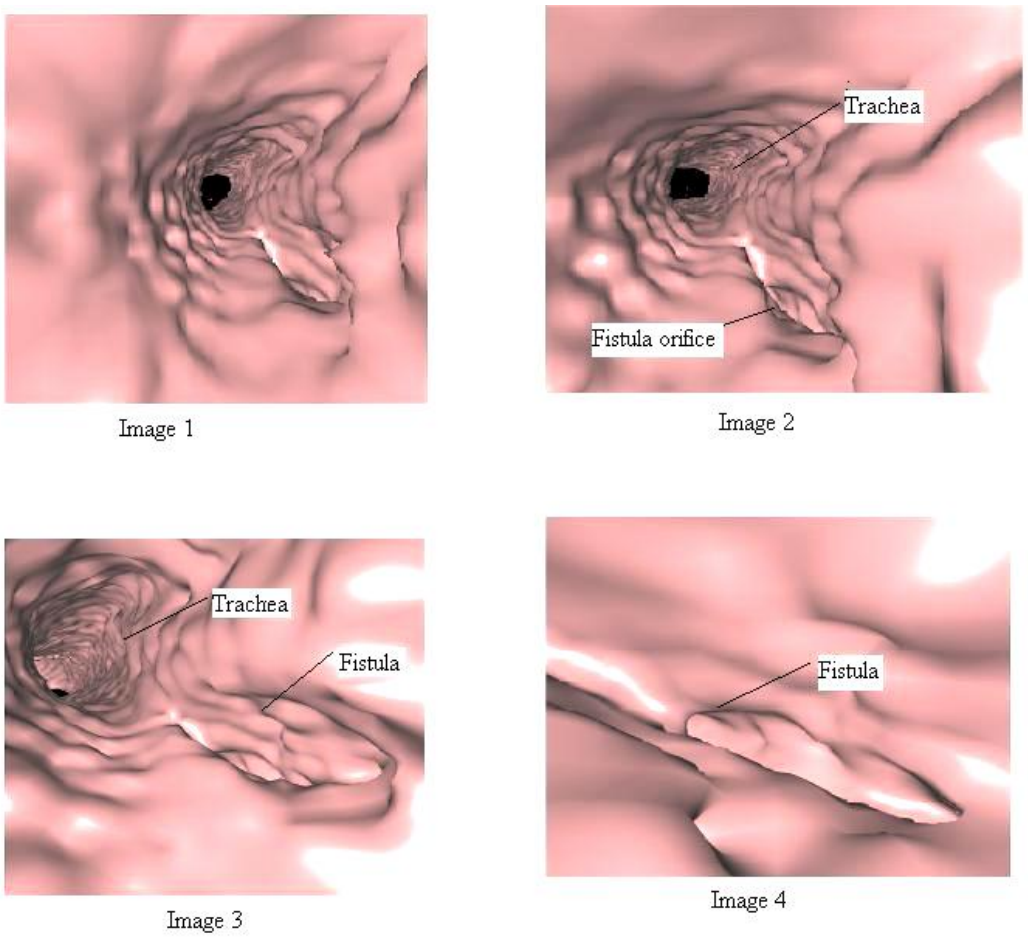

Image 1 Image 2 Image 3 Image 4

Fig. 2. Bronchoscopy of TEF

Nowadays, the best thing to do is to pass a stiff red catheter into the esophagus in all cases of neonatal pneumonia and then confirm TEF using multi slice CT scan.

Contrast studies may not be easy for neonates, due to technical positioning difficulties and the risk of pulmonary aspiration.

Due to difficult detection, congenital TEF should be taken into consideration in infants and young adults with respiratory distress or recurrent pneumonia.

For patients with suspicion of TEF, we should check plain X-ray film for aspiration and gastric dilatation. Barium contrast study - esophagogram shows the fistula in 80% of cases [7]. Tc-99m sulfur colloid scintigraphic technique has been used to confirm the diagnosis non-invasively [8]. Bronchoscopy and esophagoscopy can confirm the diagnosis by demonstrating the opening of the fistula [9]. Computed tomography may be helpful in identifying the TEF [10].

Diagnostic difficulties in H-type TEF are due to the following features: age of presentation, symptoms, time to diagnosis, and the beginning of medically/surgically treatment [11].

TEF should be differentiated from GER, esophageal stenosis, and functional dysfunction of the esophagus, cystic fibrosis and agamaglobulinemia.

Prompt surgery of TEF is the optimum treatment. Some complications after TEF repair have been reported like post-surgery RDS, post-surgery GER stricture and stenosis, tracheomalacia, recurrent TEF, pulmonary hemorrhage[12,13].

Any attempt at feeding a newborn with esophageal atresia, could cause aspiration pneumonia as the milk collects in the blind pouch and overflows into the trachea and lungs. Furthermore, a fistula between the lower esophagus and trachea may allow stomach acid to flow into the lungs and cause severe damage. Due to this danger, the condition should be considered a medical and surgical emergency, and treated as soon as possible.

Treatment: is exclusively surgical and points towards esophageal reconstruction through an end-to-end anastomosis, gastric transposition or esophageal replacement with colonic segment and of course, fistula ligature.

For H-type fistula, most of the superior isolated fistulas can be ligated with cervical approach. For this, a right supraclavicular incision is performed, platysma muscle dissected, and then further protecting sternocleidomastoid muscle and vessels of the neck, and esophagus is isolated superior and inferior to the fistula. Small fistulas can be double ligated [6].

For the inferiorly located fistulas below the level of T3 vertebrae, it is better to perform through right extra pleural thoracotomy. A laceration to the recurrent laryngeal nerve is seen as commonly as in 30% of cases and is very dangerous. So a great care is required to avoid such injury.

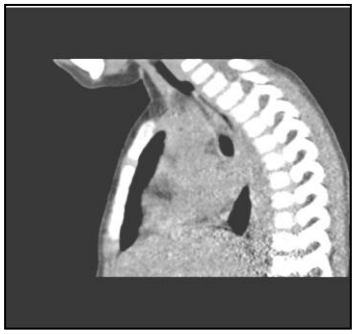

Fig. 3. H-type fistula

Long-term results: recurrent tracheo-esophageal fistula (RTOF) occurs in 5%-15% of patients following esophageal atresia repair. Redo-thoracotomy is technically challenging and associated with significant morbidity. Endoscopic occlusion of the RTOF with tissue adhesives (fibrin glue) is reported to be safe and highly effective [14]. However, long-term results of such therapy are absent from the literature. Eleven institutions responded to the request for data, providing 22 patients (age range 1 month to 12 years) for review. All had undergone initially successful RTOF closure by endoscopic methods and had been followed up for a median of 107 months. There was no morbidity or mortality directly related to the procedure. Overall, only 55% of these endoscopically treated fistulas, remained closed long-term. Fistula recurrence invariably occurred within 12 months of successful therapy. Most patients required multiple endoscopic procedures to achieve successful RTOF closure, although significantly fewer attempts were required with fibrin glue therapy. Surgical re-exploration remains the treatment of choice in the fit child. Endoscopic therapy offers a safe and elegant alternative to high-risk surgery in the sick child, although repeated treatments may be required for successful RTOF closure. Hence, taking into account such past surveys, nowadays is best to perform surgery, then to opt for endoscopic procedures in many critical cases.

Long-term assessment of the treatment of recurrent tracheoesophageal fistula with fibrin glue associated with diathermy was dissatisfactory [15]. A relatively large series and a long-term follow-up were lacking according to this study.

We consider that the success of the procedure depends on several technical factors such as an early diagnosis, before epithelium is formed in the fistula, and the use of initial diathermia. The results obtained in such study were with 85% success with a follow-up over 1 year show that the fibrin adhesive is the reference substance for the treatment of RTF; hence it was recommended as endoscopic application associated with diathermia as initial measure. Each case and TEF presentation varies, and the option for surgical treatment strategy depends on the surgeon skills and experience.

Conclusion: TEF is a surgically treatable condition, if the diagnosis is established in time. Treatment provided, in experienced surgical hands, results in a very good prognosis.

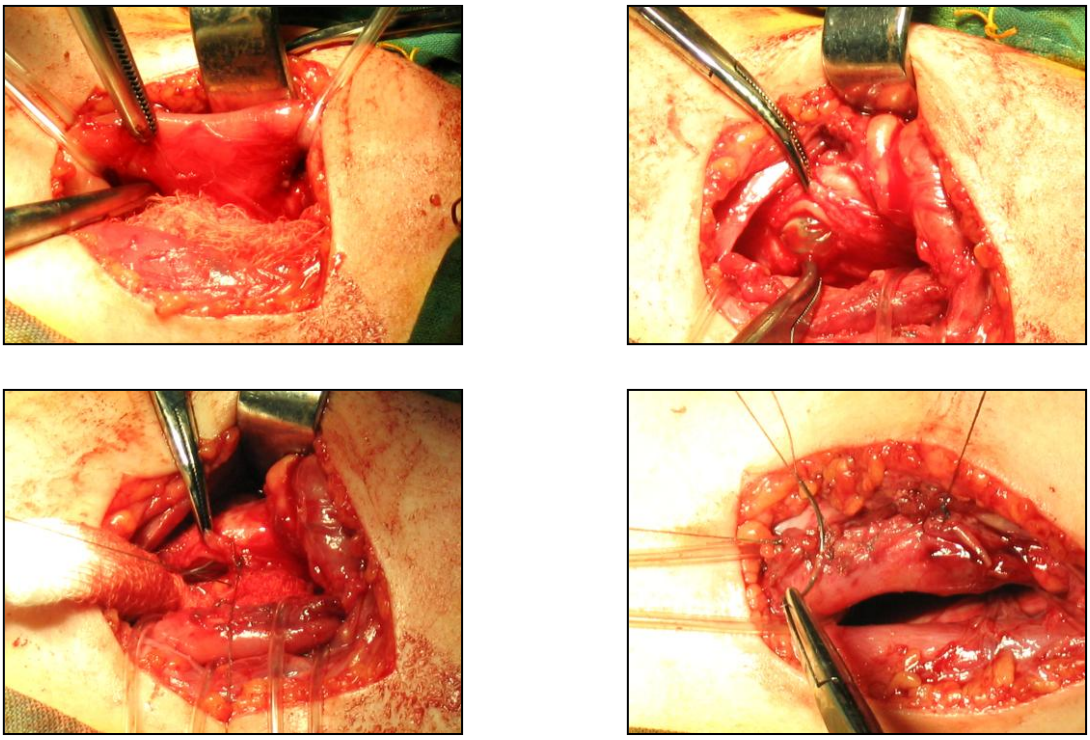

Fig. 4. Surgical aspects - fistula ligature.

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