A Study of 15 Cases of Tracheoesophageal Fistula Repair.

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Abstract :

The objective of this study was to find out the common type of Tracheoesophageal fistula, associated anomalies, their impact on morbidity and mortality of patients, and difficulties during the operative procedure and in the postoperative period in our set-up. Infants having anomalies associated with Tracheoesophageal fistula had very poor prognosis as compared to those without associated anomalies.

Key words – Congenital anomaly, Tracheoesophageal fistula, Type of TEF.

Introduction : A tracheoesophageal fistula (TEF) is a congenital or acquired communication between the trachea and esophagus. TEFs often lead to severe and fatal pulmonary complications.

Most patients with TEFs are diagnosed immediately following birth or during infancy. TEFs are often associated with life-threatening complications, so they are usually diagnosed in the neonatal period. Patients with a congenital TEF may present in adulthood.

Acquired TEFs occur secondary to malignant disease, infection, ruptured diverticula, and trauma. Postintubation TEFs uncommonly occur following prolonged mechanical ventilation with an endotracheal or tracheostomy tube.

History : The credit for the very first description of TEFs goes to Thomas Gibson, who, in 1697, reported a case of an infant with esophageal atresia and a TEF. In 1839, Thomas Hill recounted the symptoms of another infant with a TEF and an associated imperforate anus. In 1888, Charles Steels, a London surgeon, became the first surgeon to operate on esophageal atresia. In the 19th century, innovative work by many surgeons ultimately led to Cameron Haight's successful primary repair in 1941. Pioneering of surgical techniques in the last several decades has produced survival rates of almost 100% for infants with this once hopeless congenital anomaly[1].

Embryology : Knowledge of embryology is essential to understand the pathogenesis of congenital TEFs.

The esophagus and trachea both develop from the primitive foregut. In a 4- to 6-week-old embryo, the caudal part of the foregut forms a ventral diverticulum that evolves into the trachea. The longitudinal tracheoesophageal fold fuses to form a septum that divides the foregut into a ventral laryngotracheal tube and a dorsal esophagus. The posterior deviation of the tracheoesophageal septum causes incomplete separation of the esophagus from the laryngotracheal tube and results in a TEF.

Incomplete formation of the esophagus is known as esophageal atresia, which may be associated with TEFs. Many anatomic variations of esophageal atresia with or without a TEF may occur. The most common anomaly consists of a blind esophageal pouch and a distal TEF. Pure esophageal atresia without a TEF is the second most common form. The third most common anomaly is the H-type fistula, which consists of a TEF without esophageal atresia[2].

Pathophysiology : Approximately 17-70% of children with TEFs have associated developmental anomalies. These anomalies include Down syndrome, duodenal atresia, and cardiovascular defects. The following congenital anomalies have been reported with variable frequency:

Cardiac anomalies include ventricular septal defect, patent ductus arteriosus, tetralogy of Fallot, atrial septal defect, and right-sided aortic arch.

- Genitourinary anomalies include renal agenesis or dysphagia, horseshoe kidney, polycystic kidney, ureteral and urethral malformations, and hypospadias.
- Gastrointestinal anomalies include imperforate anus, duodenal atresia, malrotation, intestinal malformation, Meckel diverticulum, and annular pancreas.
- Musculoskeletal anomalies include hemivertebrae, radial dysphagia or amelia, polydactyly, syndactyly, rib malformation, scoliosis, and lower limb defect.

Although no definite cause exists for congenital TEFs, an association with trisomies 18, 21, and 13 has been reported. In addition, the use of decongestants that contain imidazoline derivatives by women during the first trimester of pregnancy has been linked to an increased risk for congenital TEFs. [3]

Causes of acquired TEFs include iatrogenic injury, blunt chest or neck trauma, prolonged mechanical ventilation via endotracheal or tracheostomy tube, and

excessive tube cuff pressure in patients ventilated for lung disease.

Spigel et al investigated the development of TEFs in patients with small-cell and non-small-cell lung cancer. They reported their findings from 2 small, independent phase II clinical trials in which patients were administered bevacizumab combined with chemotherapy and radiation.[4] Both trials were closed early for safety reasons. However, the data suggested an association between the use of bevacizumab and chemoradiotherapy and a relatively high incidence of TEFs in the settings of small-cell and non-small-cell lung cancer.[4]

The most common complications of surgery are pneumonia and atelectasis leading to respiratory failure in postoperative period. A leak at the anastomotic site and pneumothorax are other complications. Most patients who develop an anastomotic leak also develop strictures, which may be dilated later. [5] Rarely, a recurrent TEF may develop. The management of recurrent TEFs usually requires repeat surgical repair. Some patients develop periodic apneic spells that are likely secondary to gastroesophageal reflux and associated laryngospasm.

Esophageal atresia with tracheo-esophageal fistula is a relatively common congenital anomaly. Research with rodent models is contributing to the scientific understanding of the condition. Advances in surgical care and neonatal management have improved survival to approximately 90%. Long-gap and isolated esophageal atresia present significant management challenges. Post-operative and long-term complications including esophageal stricture, gastro-esophageal reflux, and respiratory compromise remain relatively common and continue to present a challenge for ongoing patient management.[6]

Material and methods : This study was conducted in 15 patients admitted during the period from January 2010 to May 2016 between operated TOF cases with and without associated anomalies

Preoperative investigations done were :

Chest X-ray with simple rubber catheter in upper pouch

Echocardiography

CBC,

Operative Procedure :

The infant is positioned on the left side and stabilized with strapping or sandbags. The right arm is extended above the head and fixed. Care must be taken to ensure that the neck is fixed .A curved incision ia made around the lower border of the scapula, extending from the anterior axillary line to the paravertebral region posteriorly

Division of the subcutaneous tissues and muscles is carried out with diathermy to minimize blood loss. Following division of the muscles the scapula is elevated and the rib spaces are counted by palpation

Having exposed the pleura through the intercostal space stripping of the pleura from the chest wall is carried out by the gentle insertion of a gauze swab into the extrapleural space. Further dissection of the pleura is achived by using moist pledgets.

The azygos vein and posterior mediastinum exposed, and the lower pouch, upper pouch and fistula is seen. Very occasionally the size or position of the fistula may make it impossible for the anesthetist to ventilate the lungs adequately. In that situation the more rapid transpleural approach to the fistula is necessary.

Mobilization of lower esophagus and division of fistula

The azygos vein is ligated and divided. The lower esophagus may be obvious, distending with each inspiration as it lies in the lower posterior mediastinum. The close proximity of the vagus to the lower esophagus helps identification.

Every attempt is made during dissection to preserve the fibers of the vagus supplying the lower. Esophagus. The lower esophagus is dissected circumferentially just distal to the fistula and a tape is placed around it. Traction on this tape controls the fistula and enables the junction of the lower esophagus and trachea to the recognized and dissected.

After carefully defining the junction between the trachea and esophagus, two 5/0 polypropylene (prolene) sutures are placed in the trachea at the extremities of the fistula and the fistula is divided flush with the trachea. The trachea is closed with interrupted sutures. The air tightness of the closure tested by filling the thoracic cavity with saline and watching for bubbles on ventilation an alternative means of closing the fistula is to transfix it close to the trachea with a 5/0 suture.

A small tube is passed through the distal esophagus into the stomach to ensure that an adequate lumen exists and to enables air distending the stomach to be aspirated Dissection of the lower esophagus needs care to preserve the vagal attachments and prevent damage to the adjacent thoracic duct and left pleura A 5/0 stay suture allows traction on the lower esophagus without excessive handling with forceps. Dissection should be the minimum required to achieve an

anastomosis, if the upper pouch is not immediately visible pressure on the Replogic tube by the anesthetist will usually advance into the mediastinum. Dissection of the upper pouch should be sufficient to allow an opening to be made in the distal end for an anastomosis to be performed. As with the lower esophagus, branches of the vagus supplying the upper esophagus should not be disturbed. Dissection on the plane between the esophagus and trachea should be carried out with extreme care to avoid inadervently opening the trachea. A stay suture can be placed in the muscular wall of the esophagus to facilitate its exposure and minimize the need for forceps traction. When opening the upper esophagus care should be taken to ensure that the opening is at the lowermost point; this is most reliably recoznized by pushing the replogle tube. The size of the opening in the upper esophagus should correspond to the diameter of lower esophagus.

Anastomosis

This is achived using interrupted 5/0 or 6/0 sutures positioned along the posterior aspect of the anastomosis, particular care being taken to ensure that both mucosa and muscle are included in each suture. It is seldom necessary to insert more than four or five sutures. Unless the two ends of the esophagus are very close together the sitting of these sutures before tying is essential.

Following completion of the posterior layer of the anastomosis, a feeding tube should replace the Replogle tube and be advanced across the anastomosis into the stomach. The anterior layer of the anastomosis is then completed over the tube. The tube is to be left in situ for feeding its mobility should be checked to ensure that a suture has not inadvertently passed through it.

Wound closure

The lung is expanded following the Placement of two Pericostal 3/0 Polyglactin sutures. The muscles are closed with 3/0 coated Polyglycolic acid (Dexon); the subcutaneous layer with plain 4/0 Polyglycolic acid, and the skin with subcuticular 5/0 Polyglycolic acid.

A chest drain is used in all cases

In 1 patients oesophagostomy and feeding gastrostomy was done,who presented with pure oesophageal atresia

Post operative care :

Neonatal intensive care sos ventilation

Nebulisation and chest physiotherapy

Ryles tube aspiration first 48 hrs, and ryles tube feeding after 48 hrs

Syp Domstal through ryles tube for Gastroesophageal reflux.

Oral feeds on 10th post operative day and intercostals drain removal on 11th day

Observation and Discussion :

This study of 15 cases of oesophageal atresia with and without TOF repair done from January 2010 to May 2016 .

The most common type was type C around 90 percent cases followed by A around 20 percent, no other type was found in this study

The most frequent associated anomalies found were cardiac ones, and then followed by anorctal malformation,and renal.

The associated anomalies caused intraoperative difficulty as well as required special postoperative care.

The most common postoperative complications that occurred in our setup were recurrent pneumonia and, in a small percentage of cases, gastro esophageal reflux and anastomotic stricture,anawstomotic leaks.

Discussion :

With recent advances in neonatal intensive care and anesthesia the moatality and morbidity has been reduced drastically

The management of TOF is mainly affected by

- Late diagnosis
- Prematurity
- Established pneumonia
- Low birth weight
- Associated anomalies

All the associated anomalies were found in type C TOF

- 2 patients were associated with cardiac anomalies
- 1 pts were associated with anorectal anomalies
- 1 patient was associated triple atresia, TOF, ARM, and duodenal atresia

Table 1

	cases	survival	percentage
Associated anomalies	04	03	90
No associated anomalies	11	10	95

Conclusion :

From our study of 15 cases of Tracheoesophageal fistula repair, carried out, we conclude

- Common type: Oesophageal atresia with distal TOF.
- Commonly associated anomaly: Cardiac (patent ductus arteriosus)
- Morbidity and mortality both increased if Esophageal Artesia with TOF was associated with another abnormality.

The survival rate of operated patients can be improved by :

- Early diagnosis and timely reference for surgery by a pediatrician
- Good Preoperative anesthetic care
- Perfect knowledge of anatomy and meticulous, skilled dissection within the adequate minimum time by the surgeon
- Better postoperative neonatal intensive care

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