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Study of postoperative complications and long-term outcomes of tracheoesophageal fistula repair surgery

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Abstract

Background: Among children, esophageal atresia (EA) with or without tracheoesophageal fistula (TEF) is one of the major and common congenital anomalies. Present study was aimed to study postoperative complications and long-term outcomes of tracheoesophageal fistula repair at a tertiary hospital. **Material and Methods:** Present study was retrospective, case record study, conducted neonates who underwent surgery for tracheoesophageal fistula at our institute. **Results:** In present study, during study period 172 neonates underwent tracheoesophageal fistula repair surgery. Majority were ≥ 37 weeks (73.26 %), male (69.19 %) & had birthweight 2.51 – 3 kgs (42.44 %). Post-operative complications noted were anastomotic leak (10.47 %), stricture (11.63 %) & re-exploration (5.23 %). Mortality was noted among 19 neonates (11.05 %) commonly due to postoperative sepsis & pneumonitis. Common factors associated with postoperative mortality were Pre-operative shock (72.09 %), respiratory distress (66.86 %), surgery after 48 hours of life (66.86 %), preoperative hypothermia (61.05 %), preterm neonates (44.19 %), birth weight < 2500 g (38.95 %), associated anomalies (33.14 %), >3 cm gap between esophageal ends (38.95 %), postoperative sepsis (25 %) & postoperative pneumonitis (30.23 %). **Conclusion:** Although there has been a marked improvement in the antenatal diagnosis of tracheoesophageal fistula, still high mortality is mainly due to diagnosis 24 hours after birth, low birth-weight & associated major anomalies.

Keywords: tracheoesophageal fistula, low birth-weight, surgical repair, congenital anomalies

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Introduction

Among children, esophageal atresia (EA) with or without tracheoesophageal fistula (TEF) is one of the major and common congenital anomalies. It is a life-threatening emergency and at birth may be associated with three C's coughing, choking, and cyanosis. It requires surgical interventions in the early neonatal period.[1] The condition may be an isolated anomaly or associated with other major congenital anomalies such as vertebral, anorectal malformations, cardiac defects, TEF with or without EA, renal malformations, and limb defects (VACTERL/VATER syndrome) and rarely, Di‑George syndrome, polysplenia, and Pierre Robin syndrome.[2]

Prompt recognition, clinical management to prevent aspiration, referral to an appropriate tertiary care center and better intensive care set up have resulted in significant improvement in the rates of morbidity and mortality in these infants over the past 50 years.[3,4] With

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advancements in anesthesiology and neonatal intensive care support, the survival rate of infants with TEF has surpassed 90% .[5,6]

Surgical repair can be performed via thoracotomy or thoracoscopically. Thoracoscopic approach requires additional surgical experience, but its advantages include less surgical trauma and faster postoperative recovery.[7] Other procedures such as endoscopic fibrin occlusion, sclerotherapy, and laser coagulation exist; however they were associated with high recurrence rates.[8] Present study was aimed to study postoperative complications and long-term outcomes of tracheoesophageal fistula repair at a tertiary hospital.

Material And Methods

Present study was retrospective, case record study, conducted in department of surgery, at MIMSR Medical College & Hospital, Latur and Lotus Children Hospital & advanced laparoscopy centre, Latur, India. Neonates who underwent surgery for tracheoesophageal fistula at our institute during January 2011 to December 2021 (10 years) were considered for present study. Study approval was obtained from institutional ethical committee.

Neonates who refused surgery or died without surgery were excluded from the study.

Neonatal details such as weight, sex, day of presentation, birth history, antenatal diagnosis, associated anomalies, immediate postnatal management, history of feeding, respiratory distress, pre-operative pneumonia, pre-operative ventilator dependence, and inotropic support requirement, clinical examination findings were noted. Laboratory investigations, abdomen X‑ ray. Two‑ dimensional‑ echocardiogram, ultrasound abdomen and pelvis findings were noted.

After resuscitation & stabilization, all neonates underwent standard surgical repair. During surgery, right thoracotomy through the 4th intercostal space was performed with an extrapleural approach. The azygos vein was ligated and divided. The TEF was transfixed and divided, the upper esophageal pouch was identified and dissected, an attempt was done to do a primary esophago esophageal anastomosis with interrupted single layer 6/0 Vicryl sutures over 6 French feeding tubes. A chest drain was kept in the extrapleural space. Those neonates with long gap, or only fistula, were transfixed without dividing it and cervical esophagostomy and feeding gastrostomy were performed. Those neonates with pure esophageal atresia, cervical esophagostomy and feeding gastrostomy were performed.

Postoperatively, all the neonates were kept in the neonatal intensive care unit. Outcome variables, other surgical interventions, postoperative complications, and final outcome were recorded. Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

Results

In present study, during study period 172 neonates underwent tracheoesophageal fistula repair surgery. Majority were ≥ 37 weeks (73.26 %), male (69.19 %) & had birthweight 2.51 – 3 kgs (42.44 %).

Table 1: General characteristics

Characteristics	No. of patients (n=42)	Percentage
Gestational age		
< 37 weeks	46	26.74
≥ 37 weeks	126	73.26
Birth weight (Kg)		
< 2	34	19.77
2- 2.5	45	26.16
2.51 - 3	73	42.44
>3	20	11.63
Gender		

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Male	119	69.19
Female	53	30.81

Post-operative complications noted were anastomotic leak (10.47 %), stricture (11.63 %) & re-exploration (5.23 %). Mortality was noted among 19 neonates (11.05 %) commonly due to postoperative sepsis & pneumonitis.

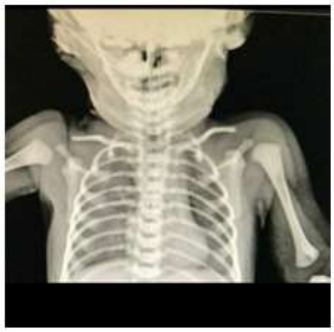
Table 2: Complication

Complication	No. of patients (n=42)	Percentage
Anastomotic leak	18	10.47
Stricture	20	11.63
Re-exploration	9	5.23
Mortality	19	11.05

In present study common factors associated with postoperative mortality were Pre-operative shock (72.09 %), respiratory distress (66.86 %), surgery after 48 hours of life (66.86 %), preoperative hypothermia (61.05 %), preterm neonates (44.19 %), birth weight <2500 g (38.95 %), associated anomalies (33.14 %), > 3 cm gap between esophageal ends (38.95 %), postoperative sepsis (25 %) & postoperative pneumonitis (30.23 %).

Table 3: Factors associated with postoperative mortality

Factors associated n (%)	No. of patients (n=18)	Percentage
Pre-operative		
Preoperative shock	124	72.09
Preoperative respiratory distress	115	66.86
Operation beyond 48 h of life	115	66.86
Preoperative hypothermia	105	61.05
Preterm neonates	76	44.19
Birth weight <2500 g	67	38.95
Associated anomalies	57	33.14
Intra-operative		
Gap between esophageal ends (cm)		
<2	29	16.86
2.1 - 3	76	44.19
≥3	67	38.95
Postoperative		
Sepsis	43	25
Postoperative pneumonitis	52	30.23



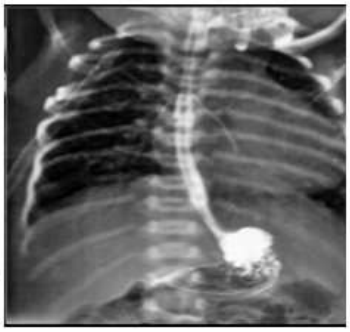


Figure 1 **Figure 2**

Figure 1: Pre-operative chest X ray suggestive of coiling of tube in neck suggestive of tracheo-oesophageal fistula

Figure 2: Post op oral contrast study shows good passage across anastomosis

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Discussion

Tracheo esophageal fistula repair has been a relatively common performed neonatal surgery. However the morbidities following the surgery has acted as a deterrent in the long-term follow up of these patients. The complication rates vary from 18 to 50% in various studies.[9,10] Children with TEF have high risk of gastrointestinal and respiratory complications despite the surgical repair of TEF.[11] These complications are more severe in the first few years of life but may last in varying degrees throughout life.[11,12] Respiratory outcomes, as a result of functional and anatomical abnormalities, include tracheomalacia/tracheobronchomalacia, bronchiectasis, and recurrent cough.[13,14] Whereas, gastrointestinal complications include esophageal strictures, motility dysfunction, growth retardation, and gastroesophageal reflux (GERD).[11,12,15]

In study by Ashish K et al.,[16] among 130 cases, male and female babies were each 65 (50%). Primary TEF Repair was done in 104 cases and Esophagostomy/ Gastrostomy (EG) was done in 26 cases. Among the primary TEF repair case 53 were males and 51 Females. In EG group 11 were Males and 15 Females. Total number of cases survived postoperatively and discharged were 34 (26.15%) and the remaining 96 (73.84%) cases were died postoperatively or discharged against medical advice.

Shinde ND et al.,[17] studied 44 neonates underwent surgery for esophageal atresia with or without TEF. Male‑to‑female ratio was 2.4:1. The mean birth weight of neonates was 2500 ± 900 g. The mean gestation age was 35 ± 5 weeks. Sepsis was the leading cause of postoperative morbidity seen in 45.5%, followed by anastomotic leak in 22.7%. Postoperative mortality was 59% with the survival rate of 41%. Sepsis, hypothermia, delayed diagnosis, delayed referral, aspiration pneumonitis, anastomotic leaks were the preventable factors affecting the outcome.

In study by Akshaty K et al.,[18] preoperative factor which had significant negative impact on survival were antenatally diagnosed polyhydramnios, maternal anemia, gestational age and associated severe cardiac anomalies. Need for blood transfusion and need for platelets transfusion did not show significant difference among two groups but the need for plasma transfusion had poor survival. SIRS/sepsis played important determining factor in survival of EA-TEF. Patients who could be fed early, had better survival. Pneumothorax, pneumonia and leak didn't show significant difference in survival.

Postoperative complications such as anastomotic leakage remain a major challenge for surgeons due to their occurrence despite the advents in modern surgical care. The most commonly occurring complications are anastomosis leakage, tension pneumothorax, and sepsis.[19,20] Moreover, the long term complications of the surgery include esophageal strictures, reoccurrence of TEF, tracheomalacia, gastroesophageal reflux, dysphagia, recurrent pneumonia, and cough.

The incidence of anastomotic stricture following repair of EA/TEF appears to vary but recent reports suggest that a stricture requiring dilatation may be present in as many as 80% patients.[21,22] Anastomotic leaks occur in up to 17% of patients and can have potentially significant long-term consequences.[22] While 95% resolve spontaneously or with pleural drainage, oesophageal stricture follows in 50% cases. [22,23]

Prognosis of a patient with EA and TEF depends on the weight of the patient, day of presentation, associated anomalies, and ventilatory dependence. Esophageal gap length, anatomy of the defect and physiological status are the other factors guiding the therapy.[24] Poor prenatal supervision, aspiration pneumonia, prematurity, low birth weight, delayed referral and inadequate transport facilities, associated congenital anomalies, and lack of advanced Neonatal Intensive Care Units (NICUs) facilities were the important contributing factors for high mortality.[25]

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Conclusion

Although there has been a marked improvement in the antenatal diagnosis of tracheoesophageal fistula, still high mortality is mainly due to diagnosis 24 hours after birth, low birth-weight & associated major anomalies. Early diagnosis with the help of red rubber catheter shortly after birth, measures to prevent pneumonia, strict infection control measures for prevention of septicemia are recommended to improve the outcomes of tracheoesophageal fistula repair cases.

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