Evaluation of Two Surgical Methods (Extrapleural and Transpleural) in the Treatment of Neonates with Esophageal Atresia

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Citation

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Abstract

Objective: Esophageal atresia – tracheoesophageal fistula, is a congenital disease with unknown pathogenesis. Surgery is the treatment of choice and the extrapleural approach is the routine technique of surgery while the transpleural approach is easier and faster with better availability. In this study we compared the outcome of these two techniques of surgery.Methods: Thirty neonates with esophageal atresia – tracheoesophagial fistula type C were enrolled in this study, 15 of whom underwent surgery by extrapleural approach and 15 by transpleural approach. Then we compared the two groups for postoperative complications, duration of surgery and mortality rate.Results: There were not significant statistic differences in these two surgical techniques in leakage, wound infection and mortality rate. However, there was a significant rate of pneumothorax in transpleural approach (6 patients), while the average duration of operation was shorter in transpleural approach.Conclusion: As there are no significant statistic differences between these two techniques of surgery in mortality and morbidity, due to shorter duration of operation and facility of surgery it is recommended to utilize the transpleural approach as proper surgical technique.

INTRODUCTION AND AIM

Esophageal atresia – tracheoesophageal fistula[1] is a congenital disease with unknown pathogenesis which takes place due to a defect of separating esophagus and trachea at day 36 of pregnancy. Surgery is the treatment of choice with excellent outcome in the majority of the patients.[2] Most of the cases are sporadic with multifactorial and heterogeneous etiology.[3] Right posterolateral thoracotomy by extrapleural approach through 4th intercostal space is a routine technique of surgery.[1] Although it is difficult and needs much time to detach pleura from chest wall, most of the surgeons prefer to perform this technique rather than transpleural approach, because they believe that empyema will not develop if leak of anastomosis takes place[4] . In addition, reoperation is easier if needed. On the other hand, some surgeons believe that the outcome of both techniques is the same while surgery by transpleural approach may be performed easier and faster. Hence, it seems that shortening of the duration of surgery may result in a better outcome of these neonates, who are having some degree of respiratory problems.[5] In this study, neonates with esophageal atresia type C were divided into two groups; one group underwent surgery by extrapleural approach and the other one by transpleural approach; then we compared both groups for postoperative complications (leak of anastomosis, wound infection, empyema, lung collapse and mortality rate), duration of operation, and duration of hospitalization.

METHODS AND MATERIALS

In a non-double-blinded clinical trial, neonates with esophageal atresia who were admitted in Iman Hospital and Abuzar Hospital from 2007 to 2009 were enrolled. Non-randomized sampling was performed among neonates with esophageal atresia. The patients who had a body weight less than 2kg, cyanotic heart disease, other types of esophageal atresia (A,B,D,E) and long atresia (esophagoesophagostomy was impossible) were excluded from this study. Finally, we enrolled 30 patients in the study, 15 of whom were operated by extrapleural approach and 15 were operated by transpleural approach. Operations were done by two surgeons in two centers; one surgeon performed extrapleural approach while another one did transpleural approach.

Duration of operation, duration of hospital admission, operation complications (leak of anastomosis, wound infection and pneumothorax), duration of being NPO and mortality rate were recorded. Duration of operation was

considered from starting of skin incision up to wound closure.

Chest radiography was obtained at day one and three post operation for possibility of pneumothorax. Bottle of chest tube and wound were evaluated by the surgeon every day for any discharge and wound infection. Routine contrast study of the esophagus for possibility of leakage of the anastomosis was not performed, and we started oral diet at the 6th day after surgery, if GI secretion was not seen in the chest bottle. A contrast study was done in cases suspicious of leakage of anastomosis before beginning oral diet. We also recorded the onset of oral diet. The patients were discharged after removing the chest tube.

RESULTS

Thirty neonates were enrolled in this study, 15 of whom underwent surgery by extrapleural approach and 15 by transpleural approach. Five patients (16.6%) developed leakage of anastomosis, 3 of whom were in the transpleural group and 2 were in the extrapleural group. There were no significant statistic differences in the rate of anastomosis leakage (p-value = 0.63) between the surgical techniques. One of two patients in the extrapleural group who developed leakage of anastomosis died in account of aspiration pneumonia and sepsis. Three patients in transpleural group with leakage of anastomosis responded well to TPN and antibiotic therapy.

Three patients died after surgery (10%), two of whom were in the transpleural group and one was in the extrapleural group. In the transpleural group, cause of death in one patient was massive pneumothorax and in another one hypoxic ischemic brain damage. However, undiagnosed cardiac anomaly could not be excluded in the latter one. Statistic analysis showed that there were no significant differences in mortality rates between the surgical techniques.

Six patients developed pneumothorax after surgery; all were in the transpleural group. Five patients presented pneumothorax in the side of the operation (right side), 4 patients responded to tube thoracostomy while one patient died due to prolonged hypoxia. One patient who was under mechanical ventilation developed left-sided pneumothorax that responded to chest tube insertion. The rate of pneumothorax was statistically significantly higher in the transpleural group as compared to the extrapleural group (p-value = 0.007). (Table1)

Figure 1

Table 1: Comparison of frequency of pneumothrax between the two methods (P

Methods	Pneumothorax (+)	Pneumothorax (-)	Total
Extrapleural	0	15	15
Intrapleural	6	9	15

Three patients developed wound infection, all of whom were in the extrapleural group. Wound infection rates did not show significant statistic differences.

Duration of operation was significantly shorter in the transpleural group (p-value = 0.0004). The mean duration of operation in the extrapleural group was 135.33 minutes whereas in the transpleural group it was 102.33 minutes.

There were no significant statistic differences between the two groups in duration of hospitalization and duration of being NPO.

DISCUSSION

Five of 30 patients developed leakage of anastomosis (16.6%), and there was no significant statistic difference in leakage of anastomosis between the surgical techniques. In other studies, rate of leakage of anastomosis was 10%-20% and in a textbook of pediatric surgery, it was 14%-16%.[6,7]

Etiology of anastomosis leakage includes expertise of surgeon, distance between proximal and distal part of the anastomosis and surgical technique. The more distant the two ends of the anastomosis are, the more tension will happen and the risk of leakage will increase.[8,9]

The popularity of the extrapleural approach instead of the transpleural approach is due to more possibility of empyema followed by leakage in the transpleural approach. In a case of leakage of anastomosis, mortality and morbidity would be less common in extrapleural compared to transpleural approach.[2,4]

Mortality rate depends on prematurity, aspiration pneumonia and severe cardiac anomaly[10,11] .We excluded premature neonates, neonates weighing less than 2kg and patients with cyanotic heart anomaly. However, for detecting other congenital heart anomaly, echocardiography should be performed and we could not do that. It is better to do abdominal sonography and spinal x-ray that all may contribute to the survival of patients. Anesthesia technique and postoperative care may also have a role in survival of the patients.

As mortality and morbidity rates in transpleural approach do not show significant differences to extrapleural approach and transpleural approach permits increased facility of surgery with shorter duration, it is recommended as a proper technique of surgery for neonates with esophageal atresia tracheoesophageal fistula. In addition, leakage of anastomosis may be managed well with the new generation of antibiotics and intensive care after operation. A significant problem in transpleural approach was the high rate of pneumothorax. Therefore, it is essential to obtain CXR after operation in all patients and to insert a chest tube if needed. By tube thoracostomy and respiratory physiotherapy, this problem can be handled well. Although our operations were done by two different surgeons and this could be a bias in mean duration of operations, pleural detachment from chest wall needs much time and elimination of this procedure can shorten duration of surgery significantly.

It is recommended to do other studies by selecting the patients randomly and performing echo-cardiography, abdominal sonography and spinal x-ray for all patients to detect cardiac and renal disease thoroughly. Hence, it will be possible to describe the effect of surgical technique on patient survival.

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