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Original Research Article

Strategies for optimizing surgical outcome in patients with esophageal atresia with tracheo-esophageal fistula

Rajashekhar T. Patil[1]*, Advait Prakash[2]

[1]Department of Surgery, S. Nijalingappa Medical College, Bagalkot, Karnataka, India
[2]Department of pediatric Surgery, Sri Aurobindo Institute of medical Sciences, Indore, Madhya Pradesh, India

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***Correspondence:**
Dr. Rajashekhar T. Patil,
E-mail: rtpatil79@gmail.com

ABSTRACT

Background: There have been major advances in the surgery for esophageal atresia (EA) and tracheo-esophageal fistula (TEF) with survival now exceeding 90%. The standard open approach to EA and distal TEF has been well described and essentially unchanged in last 60 years. Improved survival in recent decades is most attributable to advances in neonatal surgical techniques, anaesthesia and perioperative care. In a prospective randomized trial, we analysed the effect of pleural flap wrap around the anastomosis and post-operative elective ventilation support for 48 hours as main strategies towards improving the outcome in such patients.
Methods: Twenty five neonates who were diagnosed as a case on tracheo-esophageal fistula (TEF) on clinical and radiological basis were selected for the study. All babies were more than 2kg weight and were operated within first two days of life after optimization. There was no evidence of any congenital heart disease or any other associated anomaly. In all patients primary esophageal anastomosis was possible which was subsequently covered by pleural flap wrap. All the patients were put post-operatively on ventilator electively for 48 hours. Contrast study was done on post-operative day five and feeding was started subsequently.
Results: Postoperative surgical outcome was very good. Out of twenty five cases, 24 patients survived and only one baby died secondary to anastomotic leak and sepsis. Twenty three babies were discharged on post-operative day 8. One baby was on ventilator for 6 days and discharged on postoperative day 15. All patients are on regular follow up.
Conclusions: Surgical outcome in patients with esophageal atresia and tracheo-esophageal fistula in neonates can be improved with use of pleural flap wrap and elective post-operative ventilation.

Keywords: Esophageal atresia, Pleural flap wrap, Tracheo-esophageal fistula, Ventilator support

INTRODUCTION

Esophageal atresia (EA) with tracheo-esophageal fistula (TEF) is a common neonatal surgical emergency. Right thoracotomy with ligation of the fistula and end to end esophageal anastomosis is the management of choice.[1,2] The type of anastomosis has been a subject of debate and various methods have been described.[1-4] A transverse circular anastomosis by extra pleural approach with proper mobilization of both the upper and lower esophageal pouches is the surgical procedure of choice.[4,5] Even following a proper anastomosis, the condition is often complicated by anastomotic leaks and strictures.[6] These complications mandate either re-exploration or a gastrostomy as a life-saving maneuvers.[6-8] Various factors have been implicated in diminishing the complications rate. In order to optimize the outcome we have attempted a pleural flap wrap over anastomosis and postoperative elective ventilation to reduce the complication rate, thereby reducing patient morbidity.

METHODS

Twenty five neonates diagnosed with esophageal atresia and tracheo-esophageal fistula (EA with TEF) on clinical and radiological basis were selected. All patients were more than 2kg in weight and were operated within first two days of life after optimization. The birth weight and mean gestational age of the cohort were matched and all the patients underwent surgical repair under similar conditions by the same team. Magnifying loupes (2.5x) were used for the surgery. The patients underwent right postero-lateral thoracotomy. After proper exposure, by extra pleural approach the azygous vein was ligated. Subsequently, the fistula was identified and ligated using non-absorbable suture. Both the upper and lower pouches were adequately mobilized in order to avoid any tension on the anastomosis. The upper pouch was opened by transverse incision after pushing red rubber tube from outside at mouth. An interrupted single layered anastomosis using absorbable suture material (vicryl 5-0) was performed (Figure 1).

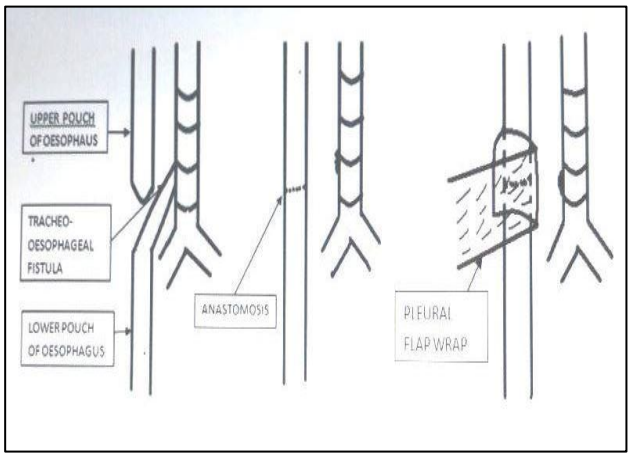

Figure 1: Schematic representation of TEF repair with esophageal anastomosis with pleural flap wrap

A rectangular portion of pleura adjacent to the anastomosis was tailored as a pedicle flap and carefully sutured as a patch over the anastomosed segment of the esophagus (Figure 2). The thoracotomy was closed in layers following insertion of an intercostal water seal chest drain. Postoperatively all patients was kept on ventilator support electively for 48 hours with neck flexed and regular endo-tracheal tube suction. Patients were extubated after 48 hours. Contrast study was performed on post-operative day 5 and feeds were started if no anastomotic leak was detected. Chest drain was removed once feeding was well established. The incidence of complications like anastomotic leaks, anastomotic narrowing with strictures and recurrence of fistula were noted. Hospital stay was also recorded. All patients were kept on regular follow up and the results were analyzed statistically.

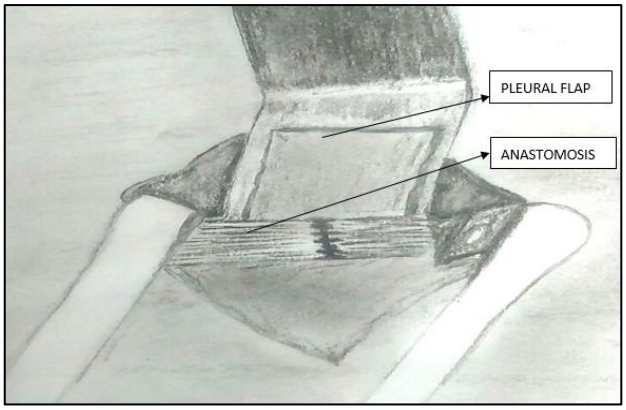

Figure 2: Diagrammatic representation of thoracotomy with repair of pleural flap.

RESULTS

The mean gestational age was 37 weeks mean birth weight was 2.6 kilograms (Table 1).

Table 1: Distribution of patients according to weight.

Weight range (in Kg) of patients	No. of patients (%)
2-2.5 Kg	13 (52%)
2.5-3.0 Kg	5 (20%)
>3.0 Kg	2 (8%)

A total of twenty five patients were operated out of which fifteen were females and ten were males. Five patients were operated on the first day of life and 20 patients were operated on second post-natal day (Figure 3). There were no other associated congenital anomalies and congenital cardiac disease. The mean operating time was 85 minutes. All patients were kept on elective ventilation for 48 hours with neck flexed and were extubated once suitable arterial blood gas readings were achieved (Table 2).

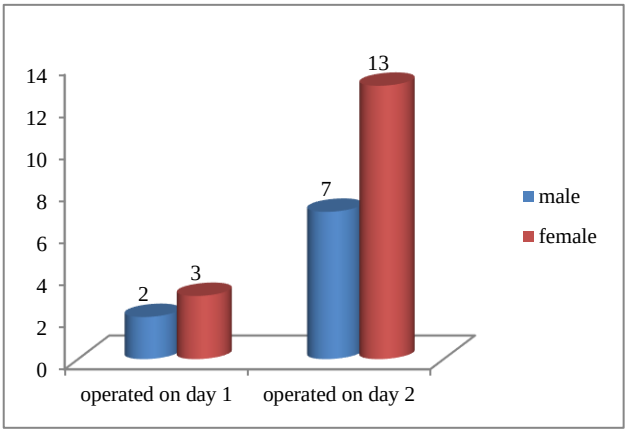

Figure 3: Distribution of patients according to day of surgery and gender.

Table 2: Division of patients according to elective ventilation.

Duration of ventilator support	No of patients (%)
48 hours	22 (88%)
48-72 hours	2 (8%)
>72 hours	1 (4%)

All the patients were kept nil per mouth post-operatively for a period of at least five days during which total parenteral nutrition was administered. A contrast esophagogram was performed on the fifth postoperative day. Various complications were recorded (Table 3). No leak or stricture was detected in the contrast study in twenty four cases. Anastomotic leak was observed in one patient who later developed septicaemia and succumbed. The mean hospital stay was 8.13 days (Table 4). All patients are on regular follow up and no recurrence of the fistula or reflux was observed on follow up.

Table 3: Various complications encountered in the study group.

Complication	No. of patients
Wound infection	3
Pneumonia	2
Minor leak (managed conservatively)	1
Major Leak with septicaemia	1

Table 4: Distribution of patients according to hospital stay.

Hospital stay	No. of patients (%)
8 days	21 (84%)
10 days	2 (8%)
15 days	1 (4%)

DISCUSSION

EA with TEF repair has been a relatively commonly performed neonatal surgery. However the morbidities following the surgery have 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] The chief complications include a narrow anastomosis, anastomotic strictures, leaks and recurrent fistula formation. Different factors were responsible for these poor outcomes.[9-12] The general condition of the patient, the amount of gap between the segments, the kind of fistula, the nature of suture materials used and the type of anastomosis performed all have been implicated.[10,13] The use of a rectangular part of pleura as a patch over the site of anastomosis adds to the strength and supposedly prevents ischemia. Use of pleural wrap was associated with less anastomotic dehiscence in patients with moderate gap EA and TEF (2-3cm) as well as it decreased the magnitude of the leakage.[14] The beneficial effect of pleural flap is believed to occur in the same way as an omental patch following bowel anastomosis. This novel alteration in the technique serves as a strong buttress preventing anastomotic leaks. The procedure is also simple and involves incision of a small rectangular part of pleura and suturing it to the anastomosis site.

Elective postoperative ventilation in the management of EA with TEF emphasizes the importance and influence of non-reversal of anaesthesia, paralysis, and elective ventilation for protection of the esophageal anastomosis following repair of oesophageal atresia with trachea-esophageal fistula.[15] We consider that using ventilatory support in early post-operative period avoids the need for initial vigorous physiotherapy. As a result, the anastomosis can be rested and protected from injury, and in addition, the prevention of postoperative respiratory distress will maintain adequate tissue PaO_2. Furthermore, the use of adequate muscle relaxant will paralyze the esophageal intramural muscle and result in alleviation of anastomotic tension. As seen in our study, the survival rate of the patients was 96%. The complication rate was nearly which included minor wound infection and pneumonia. All the complications were managed successfully conservatively, however, 1 patient succumbed to anastomotic leak and subsequent septicaemia.

CONCLUSION

We have used the conventional technique of oesophageal anastomosis but with the modification of pleural flap wrap on it. This technique along with postoperative elective ventilation is safe, and effective for reducing complications and thereby morbidity in patients with EA-TEF. Both these strategies when used together have also helped in achieving significantly low mortality rates.

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Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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