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Original Research Article

Post Operative Anastomotic Stricture in Case Of Esophageal Atresia – Risk Factors in a Series of 100 Cases

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ABSTRACT

Background
Though there is significant advancement of both the surgical and anaesthetic techniques still post operative stricture is a major issue in case of TEF. There are many studies to assess the significant risk factors for it.
Objectives
To evaluate the risk factors association with anastomotic stricture in case of esophageal atresia.
Methods
We retrospectively reviewed the medical records of 100 newborns operated for EA between 2018 to 2023 in our institute. Eight risk factors associated with post operative stricture were tested.
Results
Out of 100 patients primary anastomosis was performed in 74 patients and delayed anastomosis in 26 patients. Stricture formed in 34 patients(34%) within 1 year from anastomosis. Four risk factors showed strong association with stricture formation: long gap (p= 0.009),delayed anastomosis (p= 0.0006), leak (p=0.003) and reflux(p=0.013).
Conclusion
This study identified a significant association between long gap, delayed anastomosis,leak and reflux with stricture formation.
Key words: Esophageal atresia, Tracheo esophageal fistula, Anastomotic stricture, Intensive care unit, Proton pump inhibitor, Ventricular septal defect, Gastro esophageal reflux disease.

INTRODUCTION
Esophageal atresia(EA) is a congenital anomaly characterised by interruption of the connectivity of the esophagus and sometimes accompanied by tracheo esophageal fistula

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(TEF). The reported incidence of EA with or without TEF is 1:2500 to 3500 livebirths. Between 50-70% of infants with EA have at least one associated congenital malformation. Cardiovascular anomalies occur most freequently in 11-49% of cases. Complex cardiac anomally may account for most of the deaths associated with EA malformation.

Most cases are diagnosed by clinical finding of excessive salivation, regurgitation,coughing,choking following first feeding, and inability to pass a nasogastric tube through mouth or nose into stomach. Diagnosis may be confirmed fluoroscopically with water soluble contrast material.

Surgical repair of atresia and fistula if any, is usually performed in the first day of life. The first successful surgical repair with primary anastomosis was done by Cameron Haight in 1941.[1] Todays improved surgical technique, anaesthetic technique and intensive care treatment has dramaticaly improved the survival rate. Therefore long term morbidity among survivors has become a challange for clinicians.[2]

Anastomotic stricture(AS) has an incidence reported between 32 to 80% cases[3-6] and remains the most common complication of EA repair. Despite prevention strategies with intra operative techniques and/or post operative care have failed to decrease the incidence of AS over time.[7] One of the challenging aspect in stricture management is the identification of patients at high risk for stricture development and detecting predictive signs esspecially in the early post operative period before clinical symptoms develop.

This study is aimed to investigate the potential risk factors for anastomotic stricture formation in operated cases of EA.

MATERIAL AND METHODS

This is a retrospective study. Data collected from medical records and follow up records of 100 infants operated for EA between 2018-2023 in the department of pediatric surgery SVPPGIP, SCB Medical College, Cuttack.

Inclusion and exclusion criteria

To provide a more homogenous population for investigating the factors affecting stricture formation only patients with distal fistula were included in this study. Patients with other types of EA, patients who died in the immediate post operative period in the same hospital stay, those who were lost to follow up are excluded.

Procedure and follow up

All patients underwent an open repair using a right posterolateral thoracotomy incision via 4^{TH} intercostal space. The anastomosis was performed after fistula lgation and mobilisation of proximal esophageal end from trachea. Interrupted suturing with 5-0 polyglactin done with a trans anastomotic feeding tube. Post operatively all patients were kept for elective ventilation in pediatric ICU. NG tube feeding started after 48hours if patient was vitaly stable.Oral feeding started on day 7 if no leak and delayed in case of leak.

Patients were followed up for 1 year post op and had two esophagograms. The first esophagogram was performed on post op day 7 to rule out anastomotic leak prior to initiation of oral feeding and a second late esophagogram was performed at 2months during routine follow up.

Eight risk factors gender,gestational age, birth weight,associated cardiac anomaly, long gap, type of surgical procedure, leak, reflux are tested for association with stricture formation and its strength. As the focus of study is on detecting predictive factors before the stricture forms the data donot include the cilnical symptoms of anastomotic stricture.

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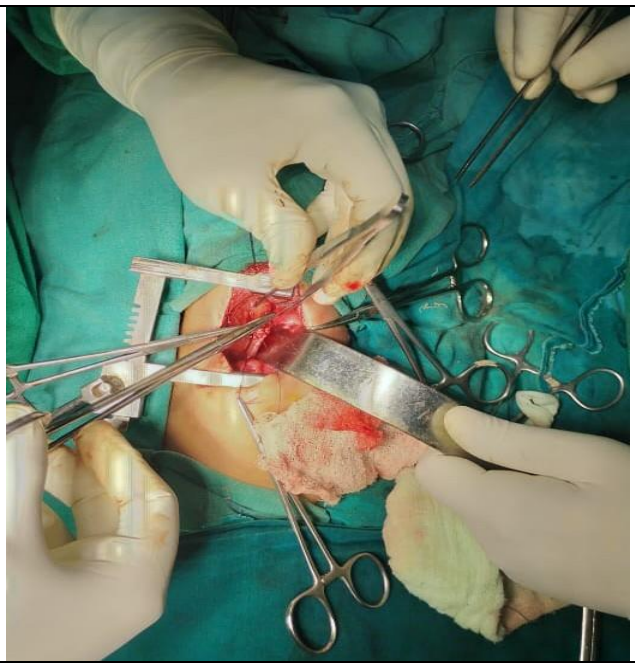

Fig. 1 : Intra operative photograph of TEF repair

Fig. 2 : Barium esophagogram showing stricture

RESULTS AND STATISTICAL ANALYSIS

Our study group includes 100 patients after excluding cases thoes lost to follow up , other types of EA , died before operation and post operation during hospital stay. Out of 100 patients 68 are male and 32 are females. The median birth weight is 2.180 kg (1.8-2.9kg). The median gestational age is 38 weeks (35-39 weeks). Associated cardiac anomaly is seen in 26 patients, mostly VSD. Long gap is seen in 21 patients.

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Parameters		Number(n)	Median or percentage(%)
gender	male	68	68%
	female	32	32%
Gestational age(wk ,median)			38 wks (35-39wks)
Birth weight (kg, median)			2.180 (1.8-2.9 kg)
Cardiac anomaly		26	26%
Long gap EA		21	21%

Table 1 (demographic data)

In this study out of 100 patients primary anastomosis was performed in 74 patients and delayed anastomosis in 26 patients. Leak was seen in 18 patients. Stricture developed in 34 patients. GERD developed in 52 patients.

Parameters	Number(n)	Percentage(%)
Primary anastomosis	74	74%
Delayed anastomosis	26	26%
Leak	18	18%
Stricture	34	34%
GERD	52	52%

Table 2 (Surgical procedure and complications)

In this study out of 100 patients stricture developed in 34 patients (34%) in the first year of life. The median time to stricture formation is 68 days(53-110 days). Patients with and without stricture were comparable in terms of demographic data like gender, birth weight and gestational age.Out of 68 male infants stricture found in 23 (33.82%) patients and out of 32 feemale infants stricture found in 11(34.37%) patients (p=0.956). Patients with stricture formation are younger than thoes without stricture.The gestational age of infants in stricture group is 36 weeks(33-39) and in non stricture group is 38 weeks(35-40). The birth weight of patients with stricture are less compared to non stricture group. The median birth weight of infants in stricture group is 2.32 kg (1.91-3.16) and in non stricture group is 2.58 kg (2.20-3.29). But these data were not significantly associated with stricture development

Cardiac anomalies seen in 26 patients out of them 9 patients develop stricture (34.6%) compared to 25 patients (33.78%) without any cardiac anomaly develop stricture(p= 0.93).
Long gap was seen in 21 cases(21%). Out of 21 patients stricture develop in 13 patients (61.90%) and 8 patients of long gap is in non stricture group. Patients didnot have long gap but developed stricture in 21 cases(26.58%) (p=0.009).

Out of 100 patients, primary anastomosis was performed in 74 patients (74%) and delayed anastomosis in 26 patients (26%). Stricture developed in 18 patients in primary anastomosis group (24.32%) versus 16 patients (61.53%) in delayed anastomosis (p= 0.0006).

The median length of post operative ventilation was 4 days(3-7days) and had no significant effect on stricture formation.

Anastomotic leak was seen in 18 patients. Leak was managed conservatively in 15 patients where as 3 patients required reanastomosis. Stricture formed in 12 patients with leak (66.66%) where as 22 patients (26.82%) in no leak group developed stricture . This finding is statistically significant (p=0.003).
52 patients (52%) in our study group had GERD symptoms and were therefore prescribed PPIs. Out of 52 patients 24 patients(46.15%) developed stricture, where as in non reflux

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group 10 patients (20.83%) developed stricture. The patients having reflux developed stricture at a significantly higher rate(p= 0.031).

variables	N	Stricture(n=34)	No stricture(n=66)	P value
male	68	23(33.82%)	45(66.18%)	0.956
female	32	11(34.37%)	21(65.63%)	
Gestational age,wk median		36(33-39)	38(35-40)	
Birth weight,kg median		2.32(1.91-3.16)	2.58(2.20-3.29)	
Cardiac anomaly	26	9(34.6%)	17(65.4%)	0.93
No cardiac anomaly	74	25(33.78%)	49(66.2%)	
Long gap EA	21	13(61.90%)	8(38.10%)	0.009
No long gap EA	79	21(26.58%)	58(73.42%)	
Primary anastomosis	74	18(24.32%)	56(75.7%)	0.0006
Delayed anastomosis	26	16(61.53%)	10(38.5%)	
leak	18	12(66.66%)	6(33.33%)	0.003
No leak	82	22(26.82%)	60(73.17%)	
Reflux	52	24(46.15%)	28(53.84%)	0.031
No reflux	48	10(20.83%)	38(79.16%)	

Table 3 (factors tested for associattion with stricture formation)

DISCUSSION

This study provides a thorough examination of multiple risk factors associated with stricture formation. Four major factors that found strongly associated with stricture formation are long gap EA, delayed anastomosis, anastomotic leak and reflux.

Long gap EA and delayed anastomosis partly overlap each other. All our patients with long gap underwent a staged procedure. Patients with low birth weight, unstable condition or with sever associated anomalies would also undegone ligation of fistula first in first stage and anastomosis in second stage. The significance of both factors in stricture formation is supported in numerous other publications.[5,8,9,10]

Anastomotic leak in our study is also a major risk factor for stricture formation with a significant statistical association, which is also seen in previously published studies.[11,12]

GERD is a major contributor for stricture formation with a published prevalence of 20-63%.[6] Current recomendation by ESPGHAN-NASPGHAN suggests treating all EA with acid supression within first year of life.[13] Our data suggest that PPI didnot stop the incidence of stricture as has been previously pulished by several other authors.[4,14,15,16,17,18]

CONCLUSION

Our study identifies the significant association of risk factors like long gap,delayed anastomosis, anastomotic leak, reflux with stricture formation.

Demographic data including gestational age, birth weight, gender, associated cardiac anomaly didnot show any significant association in our study.

The strong features of our study is homogenecity of the patient group resulting from a standardised treatment provided in a single institution, where all surgeries and post operative care were led by one team of specialists dedicated to patients with EA.

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LIMITATION

The limitation of our study is small sample size, retrospective nature of study and small data loss.

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