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Postoperative morbidity in patients with esophageal atresia

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Abstract. A retrospective study was carried out in 110 patients with esophageal atresia seen at the Sophia Children's Hospital, Rotterdam, from 1975 to 1984. Special attention was paid to postoperative morbidity in view of the lack of detailed information concerning this aspect in the literature. Of the 87 surviving patients, 77 had a primary end-to-end anastomosis. The experience with these 77 patients is reviewed and discussed with reference to the literature. Gastroesophageal reflux seems to be the major postoperative complication and a contributing factor to other serious conditions. Early detection and treatment of gastroesophageal reflux may prevent some of these conditions.

Key words: Esophageal atresia – Tracheoesophageal fistula – Gastroesophageal reflux – Tracheal diseases

Introduction

The mortality rate for patients with esophageal atresia has dropped markedly in recent decades thanks to advancements in neonatal intensive care and pediatric anesthesiology. Results of recent studies have placed mortality between 10% and 30% [4, 5, 14, 18, 19, 26]. Details of postoperative morbidity after primary repair of esophageal atresia are seldom supplied in the literature; with the exception of Louhimo [19], Lindahl [18], and Holder [15], most authors have described only a few postoperative complications. Among those reported were gastroesophageal reflux [3, 11, 16, 22, 23, persistent esophageal stenosis [2, 6, 21], recurrent tracheoesophageal fistula [9], cyanotic episodes [10, 25], and the occurrence of scoliosis in later life [8, 13]. We found only three publications mentioning a relationship between respiratory complications and gastroesophageal reflux [1, 12, 27].

We carried out a retrospective study of patients with esophageal atresia seen at the Sophia Children's Hospital, Rotterdam, in the period 1975–84. The postoperative course of patients who underwent primary end-to-end anastomosis was analyzed to determine to what extent some postoperative complications might be prevented.

Materials and methods

From 1975 through 1983, a total of 110 patients presented with esophageal atresia at the Sophia Children's Hospital, Rotterdam. Thirty-five were premature infants with a gestational age under 37 weeks. There were 63 boys and 47 girls. Surgical repair was initiated shortly after birth in 106 patients. The remaining 4 had such serious concomitant congenital defects that all treatment was waived in 2 (one with Potter's disease and one with trisomy 18), while only gastrostomy was performed in the other 2 (1 with Potter's disease and 1 with a hypoplastic left heart). All 4 patients died. Nineteen of the 106 patients that underwent surgical repair died postoperatively, bringing the total number of deaths to 23 (20%).

Congenital heart defects and intracranial hermorrhages secondary to prematurity and anoxia were the main causes of death (Table 1). Death occurred an average of 25 days postnatally, ranging from the 1st day to 1 year of age, with the median on the 12th postnatal day. Only 2 patients died at over 2 months of age: 1 died at 6 months due to gastroesophageal reflux associated with severe tracheomalacia and the other at 8 months of sudden infant death syndrome.

Approximately one-half of the 110 patients had other serious congenital defects. Of the 23 patients who subsequently died, 17 (74%) presented with a total of 46 concomitant congenital anomalies, while 37 of the 87 surviving patients (43%) had a total of 63 concomitant anomalies. Table 2 lists the loca-

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Table 1. Cause of death in 23 patients

	Number
No repair of atresia	4
– trisomy 18	1
– Potter's disease	2
– hypoplastic left heart	1
Congenital cardiac anomalies	7
Intracranial hemorrhages	5
Sepsis / meningitis	3
Aspiration pneumonia	2
Severe tracheomalacia	1
Sudden infant death syndrome	1

tion, type, and number of concomitant anomalies for the two groups of patients.

In 77 of the 87 surviving patients primary repair was feasible. Following division of the tracheoesophageal fistula, if present, an end-to-end anastomosis was performed in all cases. In the remaining 10 patients, the size of the defect between the proximal and distal esophageal segments did not permit end-to-end anastomosis. These patients received a primary gastrostomy and, at a later stage, an esophagoplasty. The esophagus was reconstructed by bridging the defect with an analogous bowel segment. Eight patients received a colon interposition, 1 a jejunal interposition, and the final patient had a gastric graft.

All 77 patients with primary end-to-end anastomosis underwent a roentgenologic examination around the 10th postoperative day. A gastrografin esophagram was made in order to study the esophageal-gastric passage and to detect any gastroesophageal reflux, suture stenosis, fistula recurrence or anastomotic leak. If the esophagram showed neither anastomotic leak nor recurrent fistula, oral feedings were initiated. Patients with spontaneous gastroesophageal reflux were treated with an antacid (Gaviscon) to prevent esophagitis. The median duration of hospital stay amounted to 49 days, ranging from 2 weeks to 15 months.

Our retrospective analysis concerned the pattern of morbidity in these 77 surviving patients. The postooerative follow-up lasted an average of 3½ years (6 weeks to 8 years).

Table 2. Concomitant congenital anomalies

	Group that died $n = 23$		Group of survivors $n = 87$	
Number of patients	17 (74%)		37 (43%)	
Circulatory tract		17		18
ASD	5			
VSD			6	
Digestive tract		9		15
Imperforate anus	3		10	
Urogenital tract		9		16
Kidney aplasia	2			
Hypospadias			3	
Respiratory tract		1		
Skeletal anomalies				10
Radius agenesis			1	
Spinal deformity			4	
Other anomalies		10		4
Down's syndrome			2	
Potter's disease	2			
Total number of anomalies		46		63

Results

The postoperative course was completely uneventful in only 17 of the 77 patients with primary end-to-end anastomosis (22%). These patients stayed in hospital for 15–110 days, while the remaining 60 patients, all suffering from one or more postoperative complications, required a hospital stay of from 20 to 420 days. The postoperative course of all 77 patients with primary end-to-end anastomosis is shown in Table 3. Gastroesophageal reflux, esophageal stenosis, and respiratory complications secondary to tracheomalacia were the most frequent complications.

Gastroesophageal complications

Gastroesophageal reflux was noted in 42 patients (54%), occurring spontaneously in 30 and on provocation in 12. There appeared to be a direct relationship between gastroesophageal reflux, particularly the spontaneous type, and esophagitis or esophageal stenosis. Table 4 lists the number of patients who had esophagitis or esophageal stenosis related to gastroesophageal reflux. Nine of the patients with spontaneous reflux suffered from esophagitis; 8 of these underwent Nissen fundoplication due to the severity of their condition, which was confirmed by endoscopy and did not respond to treatment. In 1 patient esophagitis persisted to such an extent that the distal esophagus was eventually resected and replaced with an autologous gastric graft. Subsequently, the com-

Table 3. Postoperative course in 77 patients with end-to-end anastomosis

	No.	%	Mean duration of hospital stay
Patients without postoperative complications	17	22	21 days (15–110)
Patients with postoperative complications	60	78	39 days (20–420)
Gastroesophageal reflux	42	54	
Esophageal stenosis	38	49	
Respiratory complications	24	30	
Esophagitis	12	15	
Anastomotic leakage	11	14	
Recurrent fistula	8	10	
Obstruction (foreign body)	6	8	
Esophageal perforation	3	4	
Esophageal diverticulum	4	4	

Table 4. Esophagitis and esophageal stenosis in relation to gastroesophageal reflux

	Number of patients	Esophagitis	Fundoplication	Stenosis	Mean number of dilatations per patient
Spontaneous reflux	30	9	8	21	6 (2–40)
Provoked reflux	12	3	–	5	3 (2–4)
No reflux	35	–	–	12	2 (1–14)
Total number of patients	77				

plaints disappeared. The provoked gastroesophageal reflux was only rarely associated with esophagitis and no patient required fundoplication.

Esophageal stenosis occurred twice as often in patients with reflux as in those without, with most cases in the group with spontaneous gastroesophageal reflux. In 28 patients the stenosis occurred at the site of the anastomosis; in the remaining 10 a stricture developed in the distal esophagus. All 38 patients underwent dilatation, generally more than once. One patient with spontaneous reflux required dilatation 40 times.

Esophageal perforation occurred three times secondary to dilatation. In two cases this was treated conservatively with antibiotics and continuous aspiration. The remaining patient underwent thoracotomy, at which time the perforation was sutured and closed.

Anastomotic leaks presented almost twice as often in patients with gastroesophageal reflux as in those without. In 10 of the 11 cases this was treated with broad-spectrum antibiotics and thoracic drainage. One patient with persistent anastomotic leakage required thoracotomy and reanastomosis.

Respiratory complications

Respiratory complications occurred postoperatively in 24 patients (30%); recurrent pneumonia and recurrent aspiration were the most common problems. Here too there seemed to be a direct relationship to gastroesophageal reflux: reflux was shown roentgenologically in the majority of these patients. Table 5 lists the respiratory complications related to gastroesophageal reflux.

Twenty of the 24 patients underwent bronchoscopy, which confirmed the presumed diagnosis of tracheomalacia in all 20 cases. Six of these patients also presented with bronchomalacia of the right upper lobe; in 2 cases the right upper lobe was found to be hypoplastic. In 7 patients the tracheomalacia was so severe as to cause cyanotic episodes. Three of these patients had gastroesophageal reflux.

Twelve of the 24 patients with respiratory complications required treatment (Table 6). According to the underlying cause, this consisted of Nissen fundoplication in 4 patients, aortopexy in 3, and ligation of a recurrent fistula in 3. The remaining 2 patients suffered from severe tracheomalacia and respiratory insufficiency. They were intubated for 1 year, upon which the complaints gradually disappeared as the condition of the tracheal tissues improved. The other 12 patients with tracheomalacia did not require specific treatment.

Our review of the follow-up of these 77 patients with primary end-to-end anastomosis revealed that 90% were without complaints 3 years postoperatively. Mild passage complications persisted in 35, however, without signs of either esophageal stenosis or tracheomalacia. In these cases there was roentgenologic evidence of severely disturbed esophageal motility resulting in a functional passage disturbance, as described in the literature [7, 20, 24].

Table 5. Respiratory complications secondary to tracheomalacia and gastroesophageal reflux

	Number of patients	Gastroesophageal reflux
Recurrent pneumonia	10	9
Recurrent aspiration with apnea and/or tachypnea	7	7
Cyanotic episodes	7	3
Number of patients	24	

Table 6. Treatment of respiratory tract infections

	Number of patients
Nissen fundoplication (antireflux procedure)	4
Aortopexy	3
Division of recurrent fistula	3
Prolonged intubation	2
Total number of patients	12

Discussion

Our study has revealed that although the mortality of patients with esophageal atresia has dropped to approximately 20%, serious complications which frequently occur in the postoperative phase increase the duration of hospital stay, with a median of 18 days. The morbidity of these patients is often caused by gastroesophageal reflux. According to Kibel [17], spontaneous gastroesophageal reflux occurs in 50% of all newborns and as such should not be regarded as pathologic. However, in association with an esophageal anastomosis, reflux can apparantly lead to serious complications. We found that gastroesophageal reflux played an important part in the occurrence of esophageal stenosis (anastomotic stricture), anastomotic leaks, and esophagitis. Gastroesophageal reflux was also a contributory factor in a number of patients with respiratory problems.

Consequently, we feel that more attention should be paid to the early detection of gastroesophageal reflux in the postoperative phase of patients with esophageal atresia. Some postoperative complications, such as esophageal stricture and stenosis, may then be prevented. Likewise, patients with recurrent pneumonia and/or cyanotic episodes should be examined for gastroesophageal reflux. If reflux is confirmed, an antireflux procedure may bring relief. In patients with severe tracheomalacia without evidence of reflux, aortopexy or prolonged intubation is indicated.

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