

Comparative Characteristic of the Results of Surgical Treatment of Esophageal Atresia in Newborns

Nazarov Nurali Nurmukhammatovich¹, Ergashev Bakhtiyor Berdialievich²
Terebaev Bilim Aldamuratovich³, Berdalieva Zukhrakhon Bakhtiyor kizi⁴,

^{1,3,4}Tashkent Pediatric Medical Institute,

²Republican Perinatal Center, Uzbekistan

Email: abzalova71@mail.ru

ABSTRACT: We analyzed the results of surgical treatment of 232 neonates with esophageal atresia (AP) in the Republican Perinatal Center (ROC) from 2006 to 2016. The first group (comparison) - 67 neonates for whom the esophageal anastomosis was mainly performed with the traditional method, i.e., single-row interrupted seams. The second (main) group - 165 children, who underwent surgery in a modified clinic way. The results of the study confirmed the effectiveness of the technique to prevent the reflux of gastric contents into the anastomotic zone. A gastric tube (Foley catheter) inserted during surgery was not replaced for at least 10 days, as blind insertion could damage the anastomosis.

KEY WORDS: esophageal atresia, esophagoplasty, gastric intubation, surgical treatment, children.

RELEVANCE

Esophageal atresia (AP) is a severe congenital malformation occurring with a frequency of 1 in 2440-4500 newborns. At the same time, there is a high frequency of combined anomalies, reaching 55.3%, of which 31.6% are multiple combined anomalies, and 23.7% are disease associations and chromosomal abnormalities. " Achievements in neonatology, pediatric surgery, intensive care and anesthesiology of newborns in the last 10-15 years have reduced mortality among children with AP from 50-60% to 11.2% [1, 3, 6, 12].

Despite the success of surgical correction of esophageal atresia, a large number of postoperative complications persist - 40-60%. According to the world literature, "the most frequent complications after esophagoplasty are the failure of the anastomotic sutures, its stenosis and gastroesophageal reflux." The main attention of surgeons is focused on the treatment of these complications [2, 5, 7, 9, 10, 13, 14].

The high percentage of combined anomalies, complications and disability in children, significant economic costs for their rehabilitation, determine the urgency and social significance of this problem.

Purpose. of the present study was a comparative analysis and evaluation of the results of surgical treatment of newborns with esophageal atresia.

Materials and methods. We analyzed the results of surgical treatment of 232 newborns with esophageal atresia (AP) at the Republican Perinatal Center (ROC) from 2006

to 2016. These patients were divided into two groups depending on the method of esophageal anastomosis.

The first group (comparison) - 67 newborns, in whom the esophageal anastomosis was mainly performed using the traditional method, i.e., single-row interrupted sutures.

The second (main) group - 165 children, who underwent surgery in a modified clinic way.

Efficiency criteria were considered the prevention of such "surgical" complications as anastomotic leak, mediastinitis and gastroesophageal reflux in the early postoperative period; reduction in mortality.

The main criterion for the effectiveness of treatment of children in this group was considered the frequency and causes of "surgical" complications, their role in thanatogenesis of newborns with esophageal atresia.

RESULTS AND DISCUSSION.

The first comparison group included 67 newborns: 41 (61.2%) boys and 26 (38.8%) girls. Term - 60 (89.6%), premature - 7 (10.4%). The mean gestational age was 37.4 weeks and ranged from 33 to 41 weeks. The average birth weight is 2862 grams with a range of 1190 to 4000 grams. Primary esophageal anastomosis was performed in 64 (95.5%) newborns, delayed surgical treatment was performed in 3 (4.5%) newborns after gastrostomy for fistless AP. Surgical intervention was performed using the traditional method of esophageal anastomosis.

Postoperative mortality in this group was 67.1% (45/67). The analysis showed that the causes of septic and hemorrhagic nature prevailed in the structure of mortality against the background of the developed "surgical" complications (anastomotic leakage, mediastinitis). Many patients, already on admission, had various manifestations of edematous-hemorrhagic and disseminated intravascular coagulation syndrome, which were aggravated during surgery and the postoperative period.

Early postoperative complications developed in 30 (44.8%) of 67 patients. The nature of complications is shown in Table 1.

Table 1

Early postoperative complications in esophageal atresia in patients of the comparison group, n = 30

Complications	Number of cases	Frequency, %
Anastomotic leak	24	35,8%
Fistula stump failure	1	1,5%
Recanalization of tracheoesophageal fistula	1	1,5%
Stomach perforation, peritonitis	2	3,0%
Хилоторакс	2	3,0%
Total	30	44,8%

In half of the cases, there was a complicated course of the postoperative period. The most frequent complication was the failure of the esophageal anastomosis - 35.8% (24/67). This complication developed early (2-3-4 days) of the postoperative period.

X-ray examination was performed when frothy saliva appeared along the drainage from the posterior mediastinum to confirm the probable leakage of the anastomosis. For this purpose, the child was allowed to swallow a small amount of a water-soluble contrast agent. Repeated X-ray examinations were performed during treatment as needed as a control test (Fig. 1).

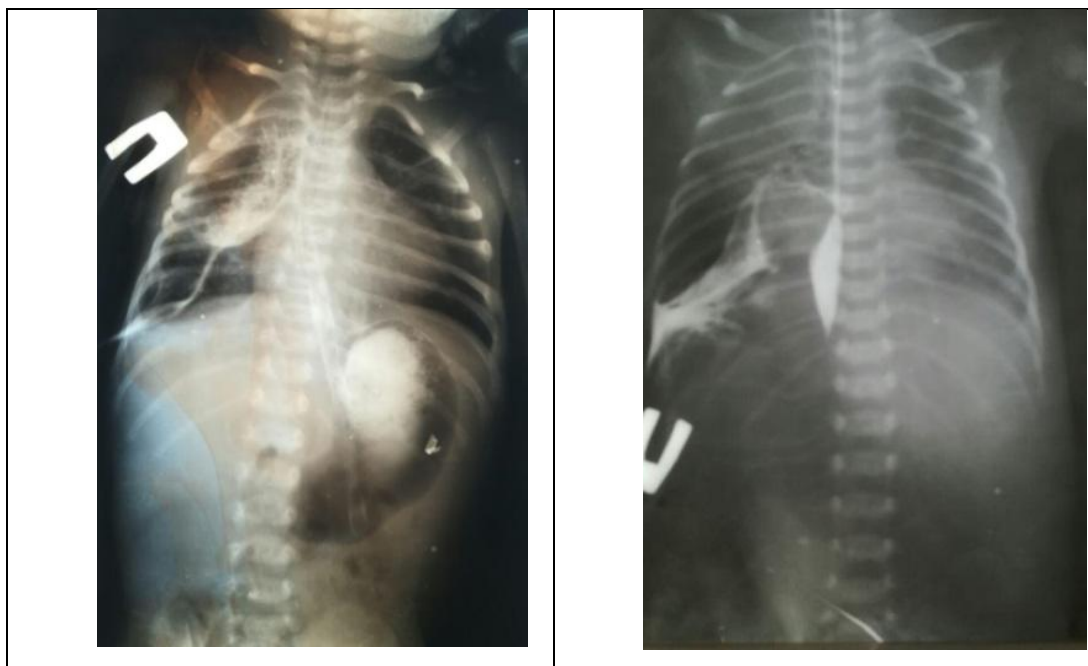


Figure: 1. Radiograph of anastomotic leak in esophageal atresia

A number of authors propose to allocate "large" and "small" anastomotic leakage. "Large" inconsistency is characterized by a significant divergence of sutures in the zone of esophago-esophagoanastomosis, a significant amount of drainage, pneumomediastinum, respiratory failure [4, 8, 11].

"Small" leakage of the anastomosis ("leakage") is clinically manifested by an insignificant discharge of saliva through the drainage from the posterior mediastinum. With this type of failure, healing is possible with conservative treatment (adequate drainage, nutritional withdrawal, antibiotic therapy).

Of 24 newborns with anastomotic leakage, surgical tactics were used in 2 (8.3%). It consisted of a rethoracotomy. 1 child underwent uncoupling of the anastomosis, a cervical esophago- and gastrostomy was placed, another 1 child underwent reanastomosis. 22 (91.7%) patients were treated conservatively. As a result of conservative treatment, healing of the anastomosis occurred in 8 (33.7%) newborns on 26-49 postoperative days. 16 (66.7%) children with anastomotic leakage died despite surgical and conservative treatment (Table 2).

Table 2
Anastomotic leakage in children of the first group, n = 24

	Number of cases	%	Died	%
"Big" insolvency	2	8,3	2	100
"Minor" insolvency	22	91,7	14	63,3

According to the results of the surgical treatment of children of the first group, we came to the conclusion that the high frequency of anastomotic leakage with the traditional method is associated with: insufficient tightness of the anastomosis due to poor adaptation of the edges of the sutured ends of the esophagus when using single-row interrupted sutures; the use of a two-row suture in newborns with AP, which is an aggravating factor leading to additional compression of tissues, blood stasis, pronounced circulatory hypoxia; constant throwing of gastric contents into the anastomosis area, aggravating the anastomosis phenomenon and increasing the risk of anastomotic leakage.

Analysis of the results of surgical treatment of patients with esophageal atresia in the main group. The main group included 165 newborns: 97 (59%) boys and 68 (41%) girls. There were 128 full-term babies (77.6%), premature babies - 37 (22.4%). The nature of the operations performed is shown in Table 3.

Table 3
The nature of the operations performed for the children of the main group, n = 165

Nature of operations		amount	%
Primary esophageal anastomosis		150	91
Simultaneous	Esophageal anastomosis + PDA ligation	1	0,6
	Esophageal anastomosis + duodenoduodenoanastomosis + perineal proctoplasty	1	0,6
	Esophageal anastomosis + sigmoidostomy	1	0,6
	Esophageal anastomosis + perineal proctoplasty	1	0,6
	Laparocentesis and abdominal drainage	1	0,6
Staged AP correction	Gastrostomy	1	0,6
	Duodenoduodenoanastomosis + sigmoidostomy	1	0,6

	Sigmastomy	3	1 ,8
	Perineal proctoplasty	4	2 ,4
	Laparocentesis and abdominal drainage	1	0 ,6
Total		1 65	1 00

For all newborns of this group, anastomosis of the esophagus was performed according to the modified method of the clinic (patent for invention of the Republic of Uzbekistan, No. IAP 05092 dated 09.29.2015, "Method for surgical treatment of esophageal atresia" Authors: ErgashevBB ..EshkabilovSh.D.). The use of this method improves the efficiency of surgical treatment of children with esophageal atresia. The operation provides reliable tightness of the anastomosis, preventing the reflux of gastric contents into the anastomotic area, reduces the incidence of its failure, mediastitis and postoperative mortality (Fig. 2-5).

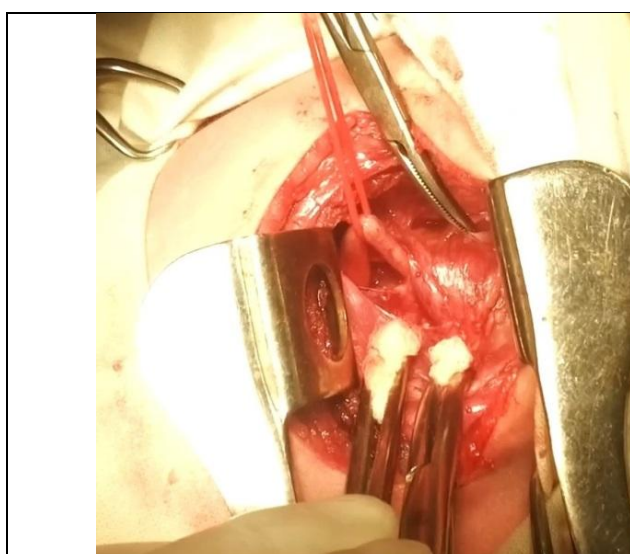


Fig. 2. The stage of mobilization of the upper segment of the esophagus and the lower TPJ

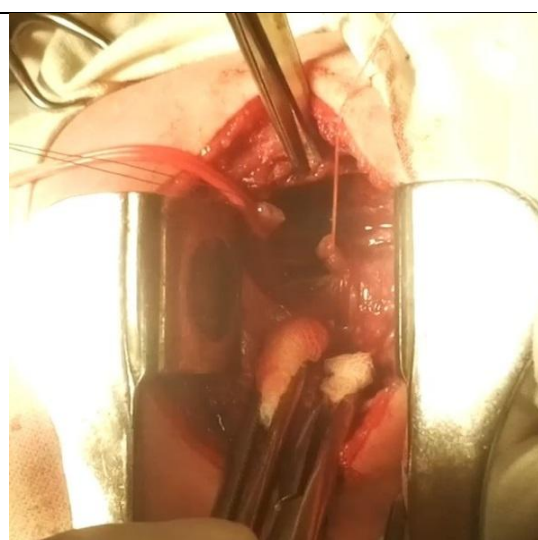


Figure: 3. Stage of liquidation of the lower TPN

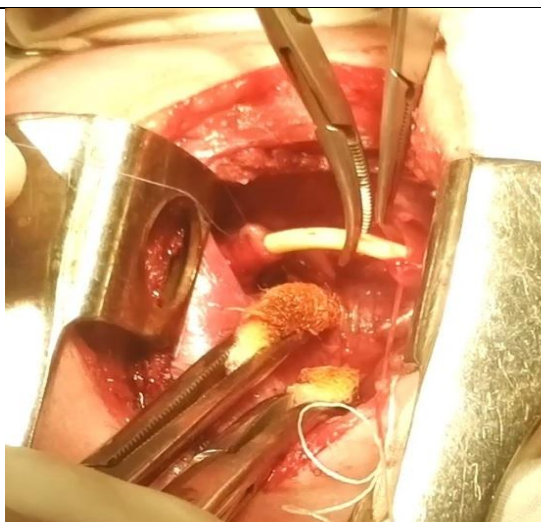


Figure: 4. Passing the Foley catheter into the stomach

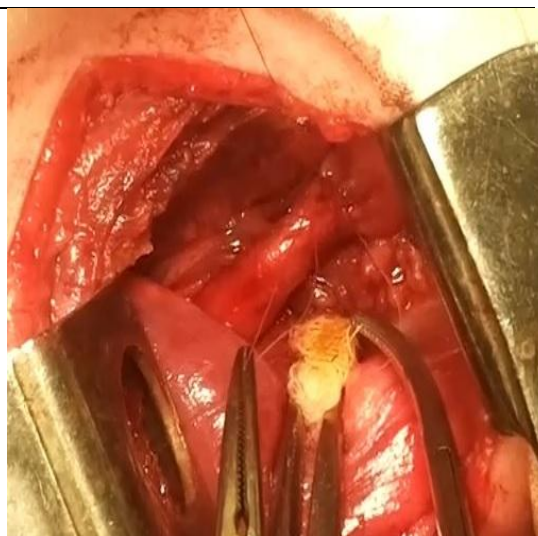


Figure: 5. Applying a single-row continuous seam to the front wall

The technique of gastric intubation with a Foley catheter differs from gastric intubation with a conventional gastric tube in the distal end of the Foley catheter is inflated, pulled up, and thereby closing the cardiac section, prevents gastric contents from being thrown into the anastomotic zone (Fig. 6). The effectiveness of the proposed method of gastric intubation was checked by contrast x-ray examination in the postoperative period. The results of the study confirmed the effectiveness of the technique to prevent the reflux of gastric contents into the anastomotic zone. A gastric tube (Foley catheter) inserted during surgery was not replaced for at least 10 days, as blind insertion could damage the anastomosis. (fig. 7.).

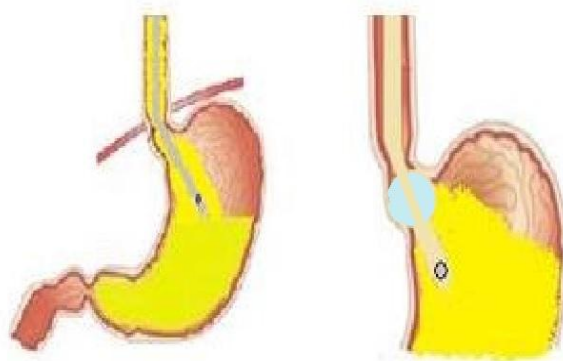


Figure: 6. Technique of gastric intubation with Foley catheter



Figure: 7. X-ray assessment of the effectiveness of gastric intubation

Drainage from the posterior mediastinum is placed two centimeters under water; active aspiration is not performed. Enteral feeding of children in the postoperative period began

from 4-5 days. In the absence of signs of anastomotic leakage, drainage from the posterior mediastinum was removed 6-7 days after surgery. The state of the anastomosis was monitored at the slightest suspicion of its failure. If the anastomosis failed, the mediastinal drainage and the gastric tube were not removed until the fistula was completely healed. The fistula closed on average after 23 ± 7.5 days.

In the main group, early postoperative complications were observed in 20 (12.1%) cases. Comparative characteristics of early postoperative complications in the studied groups (Table 4.).

Table 4
Comparative characteristics of early postoperative complications in patients of the main and control groups

Complications		Main group (n=165)		Control group (n=67)		p	χ^2
		A mount	%	A mount	%		
Specific	Anastomotic leak	1 4	8 ,4	2 4	3 5,8	< 0,001	2 5,996
	Fistula stump failure	-	-	1 5	1, 5	> 0,05	2 ,473
	Recanalization of tracheoesophageal fistula	-	-	1 5	1, 5	> 0,05	2 ,473
General surgical	Bronchopleural fistula	1 ,6	0 ,6	-	-	> 0,05	0 ,407
	Pneumothorax, pyopneumothorax	2 ,2	1 ,2	-	-	> 0,05	0 ,819
	Stomach perforation, peritonitis	1 ,6	0 ,6	2 0	3, 0	> 0,05	8 ,629
	Thrombosis of mesenteric vessels	1 ,6	0 ,6	-	-	> 0,05	0 ,407
	Chylothorax	1 ,6	0 ,6	-	-	> 0,05	0 ,407
	Hydrothorax	-	-	2 0	3, 0	< 0,05	4 ,968
Total		2 0	1 2,1	3 0	4 4,8	< 0,05	1 5.507

In the main group, in the postoperative period, surgical complications developed in 12.1% of cases; and in the control - in 44.8% of cases. There were 14 (8.4%) specific complications in the main group, and 27 (40.3%) in the comparison group; general surgical complications in the main group were 6 (3.6%), in the comparison group - 3 (4.5%).

Comparative analysis of the nature of the anastomotic leak showed that in the comparison group, "large" inconsistency occurred in 2 (8.3%) newborns; did not occur in the main group.

Rethoracotomy was performed for newborns of the control group with "large" anastomotic insufficiency. One child underwent uncoupling of the anastomosis, a gastrostomy was placed; another underwent reanastomosis. However, these patients died, despite the performed surgical interventions. 22 (91.7%) patients with "minor" anastomotic insufficiency were treated conservatively. In 8 (33.7%) newborns, as a result of conservative treatment, the anastomosis healed on postoperative days 26–49. 14 (63.6%) children with "minor" anastomotic insufficiency died in the postoperative period. In the control group, 16 (66.7%) children with anastomotic insufficiency died despite surgical and conservative treatment. In the main group, "large" anastomotic insufficiency was not observed. All (14) children with "small" AN were treated conservatively, 5 of them died (35.7%).

CONCLUSION.

Thus, mortality in case of anastomotic insufficiency decreased from 66.7% (in the control group) to 35.7% (in the main group). In our opinion, the decrease in mortality after anastomotic insufficiency is due to a decrease in the severity of the course of mediastitis, the developed endogenous intoxication and the syndrome of multiple organ failure. One of the main reasons for the development of acute mediastinitis, endogenous intoxication is the reflux of gastric contents into the anastomotic zone and mediastinum with anastomotic insufficiency in the early postoperative period. The use of the technique of gastric sounding with a Foley catheter in children of the main group made it possible to prevent the reflux of gastric contents into the mediastinum, which limited its aggressive effect on the functions of organs involved in the pathological process. It should be emphasized that other specific complications did not develop in the children of the main group.

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