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Results of Colostomy Use in Children with Anorectal Malformation

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Abstract

Introduction. *Anorectal malformations in children are still one of the most challenging problems in pediatric coloproctology. The incidence of anorectal malformations in recent years has no tendency to decrease and, according to various authors, ranges from 1 in 4000-5000 live births. Most pediatric surgeons continue to adhere to the opinion about the advisability of preliminary colostomy and delayed proctoplasty at the age of 6-18 months or when the child reaches a certain body weight (8-10 kg.). They are motivating this tactic with the possibility of creating an optimal condition for performing a complex intervention, reducing anesthetic risk, avoiding technical errors.*

Objective *is to improve treatment outcomes for anorectal malformations in children with prior colostomy.*

Materials and methods. *The work is based on the results of treatment of 154 children with anorectal malformation, with preliminary colostomy in the clinic of the Tashkent Pediatric Medical Institute for the period from 2000 to 2020.*

Along with routine and general clinical examination methods, all children underwent: X-ray of the abdominal cavity, colostography, fistuloirrigography, excretory urography, cystography, ultrasound of the perineum (small pelvis), neurosonography (NSG) screening tests.

Results. *154 (10*0%) children had colostomy as a palliative stage of treatment. Of these 117 (76%) children developed colostomy on the first day of life, with the development of intestinal obstruction. In 37 (24%) children, the formation of a colostomy was performed directly by us. 9 (5.8%) children as the first stage before primary radical correction with a high form of the defect and 10 (6.5%) children previously operated on and requiring re-corrective operations, 5 (3.2%) patients underwent colostomy after the development of complications in the early postoperative period. In 13 (8.5%) cases, colostomies were formed with identified concomitant anomalies and defects that clinically "dominated" over anorectal malformation. In 2 (5.4%), a double sigmastoma was*

imposed, in 2 (5.4%) a distal single-barreled sigmastoma, in 5 (13.5%) the Hartmann type terminal sigmastoma.
Conclusion. *The use of colostomy in children with anorectal malformation made it possible to carry out the necessary surgical tactics in a timely and differentiated manner. To reduce the frequency, nature of complications and early disability, to improve the quality of life and social adaptation of patients.*

Key-words: Anorectal Malformations, Colostomy, Surgical Treatment.

1. Introduction

Anorectal malformations in children are a special chapter of pediatric coloproctology. Treatment of this pathology, which is very painful for children and their parents, requires a purely individual approach. Colostomy - removal of a segment (s) of the colon or its loop on the anterior abdominal wall. Although the first stoma was imposed for the treatment of anorectal malformation in 1783, to date, the place and type of stoma in the treatment of anorectal malformation remains an important issue among pediatric surgeons [1, 2, 3].

In the specialized literature, you can find different judgments about the level of colostomy imposition. Some authors recommend choosing the sigmoid colon for this purpose, others prefer the transverse colon, others - the blind and ascending. This issue cannot be resolved unambiguously. First of all, a colostomy should correspond to the main idea of treatment, and also not create any special difficulties during subsequent operations [4, 5, 6].

Recent years have been marked by the possibility of correcting anorectal defect without using a protective colostomy. Moreover, in most publications, preliminary stoma placement is considered correct. At the same time, one cannot agree with the widespread replication of operations without stomas, since this will increase the risk of complications [7, 8].

Clinical studies have shown a high rate of complications associated with neonatal colostomy, in particular, transverse stoma has a higher complication rate than sigmostomy. However, controversy continues over the type of split colostomy. This study compares the clinical outcomes of loop and split colostomy superimposed for anorectal malformation. [9, 10, 11].

There is always a temptation to correct anorectal anomalies without a protective colostomy, but complications associated with both the colostomy itself and its formation and subsequent closure pose a serious threat to the normal functioning of both the intestine itself and the anal sphincter apparatus [12, 13, 14].

The technique of performing the operative technique is very important - the imposition of an intestinal stoma in order to prevent colostomy complications. It is not controversial that in children

with high variants of malformations and cloaca, as well as before re-corrective operations, it is necessary to perform a colostomy first, and after 2-3 months, a radical correction of the defect [15, 16, 17, 18].

Most pediatric surgeons continue to adhere to the opinion about the advisability of preliminary colostomy and delayed proctoplasty at the age of 6-18 months or when the child reaches a certain body weight (usually about 8-10 kg.), Motivating this tactic with the possibility of creating the optimal conditions for performing a complex intervention, avoiding technical errors and excessive trauma to the muscular structures of the pelvic floor, pelvic organs, vessels and nerves of the rectum [19, 20, 21, 22].

2. Materials and Methods

In our work, we analyzed the use of 154 (100%) colostomies. In the period from 2000 to 2020, 117 (76%) children with and without fistulous, as well as with high fistulous forms of anorectal malformation with an already formed preliminary colostomy in the Perinatal centers or in clinics at the place of residence turned to the department of pediatric surgery of the clinic of the Tashkent Pediatric Medical Institute. The age of the children ranged from 2 months to 14 years. The distribution of patients by the type of colostomy and the form of anorectal malformations is presented in Table 1.

Table 1 - Distribution of Patients Admitted with Colostomy by the Type of Colostomy and the form of Anorectal Malformations

Colostomy types	**Right-handed**			**Left-handed**			**Total**
Anorectal malformation form	According to Girdaladze	Suspended	Cecostomy	Suspended	Double sigmastoma	Distal single-barreled sigmastoma	
Vestibular fistula 7	-	1 (1%)	-	1 (1%)	-	5 (4,3%)	7 (6%)
Rectourethral fistula 15	2 (1,7%)	3 (2,6%)	2 (1,7%)	3 (2,6%)	2 (1,7%)	3 (2,6%)	15 (12,8%)
Rectovesical fistula 10	-	1 (1%)	1 (1%)	3 (2,6%)	1 (1%)	4 (3,4%)	10 (9%)
Atresia without fistula 52	4 (3,4%)	6 (5,1%)	7 (6%)	10 (9%)	2 (1,7%)	23 (19,6%)	52 (44,4%)
Cloaca 5	-	1 (1%)	-	2 (1,7%)	-	2 (1,7%)	5 (4,3%)
Rectal atresia 2	-	-	-	1 (1%)	-	1 (1%)	2 (1,7%)
Rectovaginal fistula 17	3 (2,6%)	-	-	4 (3,4%)	2 (1,7%)	8 (6,8%)	17 (14,5%)
Rectal sac 2	1 (1%)	-	-	-	1 (1%)	-	2 (1,7%)
Vacterl Association 4	1 (1%)	2 (1,7%)	-	1 (1%)	-	-	4 (3,4%)
Colon atresia 3	-	1 (1%)	2 (1,7%)	-	-	-	3 (2,6%)
Total = 117	11 (9,4%)	15 (12,8%)	12 (10,3%)	25 (21,4%)	8 (6,8%)	46 (39%)	117 (100%)

P ≥0.5

As can be seen from Table 1, out of 117 children admitted to us, in 7 (6%) patients, preliminary colostomy was formed with vestibular, in 17 (14.5%) rectovaginal, in 15 (12.8%) rectourethral and in 10 (9%) rectovesical fistulas. In 52 (44.4%) cases with atresia without fistula, 5 (4.3%) cloaca, 2 (1.7%) rectal atresia, 2 (1.7%) rectal sac, 4 (3.4%) Vacterl associations, 3 (2.6%) atresia of the colon. Right-sided colostomy was applied in 38 (32.5%) patients: 11 of them (according to Girdaladze) (9.4%), suspended 15 (12.8%), cecostomy 12 (10.3%). Left-sided colostomas were applied in 24 (67.5%) patients: suspended 25 (21.4%), double sigmastoma 8 (6.8%), distal single-barreled sigmastoma 46 (39.3%).

3. Results and Discussion

In 37 (24%) children, the formation of a colostomy (ilest) was performed directly by us. Of these, 9 (5.8%) children as the first stage before primary radical correction with a high form of defect and 10 (6.5%) children previously operated on one or more times with the development of gross anatomical and functional disorders of the lowered intestine and perineum requiring repeated -corrective surgeries, 5 (3.2%) patients underwent colostomy after the development of complications in the early postoperative period, in 13 (8.5%) cases, colostomy was formed with identified concomitant anomalies and defects that clinically "dominated" anorectal malformation. The distribution of patients according to indications and type of colostomy formation is presented in Table 2.

Table 2 - Distribution of Patients According to Indications and Type of Colostomy Formation

Colostomy types	Suspended (ileostomy)	Cecostomy	Double sigmastoma	Distal single-barreled sigmastoma	Hartmann type	Total
Indications						
As the first stage before primary radical correction	**-**	**-**	**2 (5,4%)**	**2 (5,4%)**	**5 (13,5%)**	**9 (24,3%)**
Before re-corrective operations	**2 (5,4%)**	**-**	**1 (2,7%)**	**3 (8,1%)**	**4 (10,8%)**	**10 (27%)**
In case of complications in the early postoperative period	**2 (5,4%)**	**2 (5,4%)**	**1 (2,7%)**	**-**	**-**	**5 (13,5%)**
With concomitant anomalies and malformations	**3 (8,1%)**	**3 (8,1%)**	**-**	**2 (5,4%)**	**5 (13,5%)**	**13 (35,1%)**
Total = 37	**7 (18,9%)**	**5 (13,5%)**	**4 (10,8%)**	**7 (18,9%)**	**14 (37,8%)**	**37 (100%)**

P ≥0.5

Of 9 (24.3%) children, we formed colostomy as the first stage before primary radical correction, 2 (5.4%) had double sigmastoma, 2 (5.4%) had a distal single-barreled sigmastoma, 5 (13.5%) %) terminal sigmastoma of the Hartmann type (corrugation rule).

Of 10 (27%) children whose colostomy was formed before re-corrective operations, previously operated on one or several times with the development of gross anatomical and functional disorders of the reduced intestine and perineum, 2 (5.4%) had suspended (ileostomy), 1 (2.7%) double sigmastoma, y3 (8.1%) distal single-barreled sigmastoma, y4 (10.8%) according to the Hartmann type (corrugation rule).

Out of 5 (13.5%) children in whom colostomy was formed due to complications in the early postoperative period (retraction of the lower bowel, necrosis of the stump, early adhesive obstruction, etc.), 2 (5.4%) had suspended (ileostomy) 2 (5.4%) had cecostomas and 1 (2.7%) had double sigmastomas.

Of 13 (35.1%) children whose colostomy was formed with concomitant anomalies and malformations that did not allow one-stage radical surgery, 3 (8.1%) had suspended (ileostomy), 3 (8.1%) had cecostomy, 2 (5.4%) distal single-barreled sigmastoma, terminal sigmastoma of the Hartmann type (by the corrugation rule) in 5 (13.5%).

Staged corrective surgeries were performed depending on the “clinical dominant” of this or that pathology. In a number of cases, in relation to the revealed lesion of the urinary tract, it was necessary to adhere to expectant tactics. This was done if information about a specific nosological unit made it possible to predict the outcome of the operation in general terms, and there were also burdensome moments.

Expectant tactics are forced with rectourethral and rectovaginal fistulas, neurogenic bladder. For example, only after the elimination of the intestinal anastomosis is it permissible to intervene for a megaureter, vesicoureteral reflux, hydronephrosis, etc.

Only upon further examination with atresia of the anus and rectum, with high fistulous forms with an anastomosis in the bladder and urethra in boys, in 11 patients, the distal end of the atresized intestine opened into the bladder in the projection of the Lieteau triangle, it should be noted that of them 2 patients with rectovesical fistula-girls, which, according to the literature, is a very rare variant of malformations. 4 children had rectourethral fistula.

Low forms of anorectal malformations can be treated without a split colostomy. Also, many data have shown the reliability of a one-stage operation for medium and high atresia; the need for a separate colostomy remains the first link in surgical correction. By itself, the imposition of a

colostomy is a minor surgical operation, but it is fraught with serious complications. Complications include, but are not limited to: retraction, prolapse, parastomal hernia, and bowel obstruction.

X-ray research methods carried out at different times after the imposition of a colostomy showed that the decrease in the diameter of the disconnected part of the colon was directly proportional to the life of the disconnected intestine. In 7 children with a high form of atresia, in whom a colostomy was placed on the right sections of the large intestine in the form of double barrels in the first days after birth, there was a decrease in the intestinal diameter to 1.0-1.5 cm within 6-8 months after the intervention.

I would like to note that in 3 patients at the place of residence, the high form of the defect was regarded as low and an attempt was made to perineal lowering of the intestine, which subsequently led to the discovery in two patients of an anastomosis with the bladder and urethra, respectively, with the development of retraction of the reduced bowel and metabolic phenomena. Acidosis, pyelonephritis and cystitis.

During repeated visits of initially operated children with retraction of the reduced bowel, with gross cicatricial changes in the obturator of the rectum, recurrence of the disease, as well as with the formation of complete perrectal fistulas, the first stage of re-corrective surgical treatment was always colostomy imposition.

In three patients with rectovaginal fistula, an attempt at perineal correction of the defect led to the development of retraction of the reduced bowel, anastomotic failure, and cicatricial deformity of the anus. In the future, a preliminary formation of a single-barreled terminal sigmostoma was performed, followed by repeated radical surgery.

Stoma level has been associated with complications. A sigmostomy is more appropriate, while a transversal tube has a higher risk of complications. Prolapse in this case is the most numerous complication. It has been found that loop colostomy has a higher complication rate and prolapse. Neither height nor type of stoma was associated with complications.

This managed not only to avoid evagination of the stoma intestine, but also constant contamination and maceration of the pericolostomy zone, since the created intestinal "accordion" passed the intestinal contents after some accumulation and pressure at the colostomy mouth. The pressure, in turn, prevented the development of "disconnected gut syndrome". So, in our studies, we identified early and late complications due to the wrong choice of the type, level and technique of colostomy placement. Table 3.

Table 3 - The Nature and Frequency of Colostomy Complications

Stoma type	Complications					
	Suppuration and dehiscence of the wound edges	Stoma stenosis	Parastomal eventration	Intestinal evagination	«Disconnected» gut syndrome	Distal fecal stones
Right-handed						
by Girdaladze	3	1	1	1	2	7
Suspended	2	1		1	1	5
Cecostomy	3	2	2	-	1	2
Left-handed						
Suspended	3	4	1	-	-	5
Double sigmastoma	2	3	2	3	1	1
Distal single-barreled sigmastoma	3	2	2	1	-	-
Hartmann type	1	1	-	-	-	-
Total	**17**	**14**	**8**	**6**	**5**	**20**

Right-sided colostomas among the patients examined by us, according to the Girdaladze method, accounted for 11 (9.4%) children. The Girdaladze method is based on the creation of an unnatural anus, in which the spur is formed by two narrow muscular-aponeurotic flaps of the external oblique muscle of the abdomen, held under the intestinal loop in a direction perpendicular to it and sutured to the opposite parts of the aponeurosis.

From this group, 3 patients developed complications in the form of suppuration and dehiscence of the wound edges. In our opinion, the reason for the development of this complication was infection of the edges of the postoperative wound with intestinal discharge and technical errors in the colostomy operation.

Stoma stenosis developed in 1 patient, which was the result of an insufficiently wide outlet on the skin of the anterior abdominal wall. Parastomal eventration developed in 1 patient due to the formation of a wide canal on the anterior abdominal wall. Intestinal evagination developed in 1 patient. The reason for the development of this complication was the leaving of a large segment of the free loop of the large intestine in the abdominal cavity. Disconnected gut syndrome developed in 2 patients due to the lack of passage of intestinal contents through the intestinal lumen and further "shutdown" from normal functioning.

Fecal stones in the distal colon developed in 7 (12.5%) patients with suspended colostomy and 2 (3.6%) children with cecostomy. In our opinion, the reason for the development of this complication is insufficient evacuation of fecal contents from the suspended colostomy.

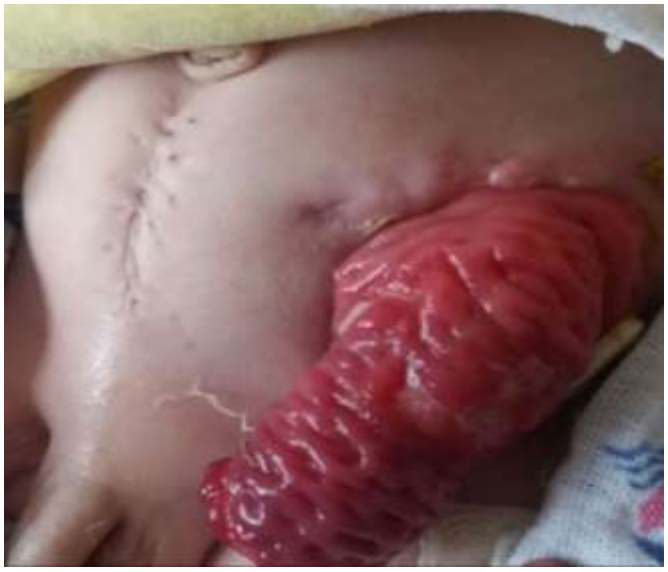
In children with an early cecostomy, 1 patient had a complication in the form of “disconnected” bowel syndrome. A high colostomy imposition can be considered as the cause of this complication, which led to the "shutdown" of the functioning of the distal colon and further narrowing of the intestinal lumen. In 2 patients, we observed the presence of fecal stones in the distal intestine.

During the formation of a suspended colostomy on the left in 2 patients, we noted suppuration and dehiscence of the wound edges and evagination of the intestines in 1 child. During the formation of a suspended colostomy and a cecostomy, one complication was noted in the form of stoma stenosis.

Left-sided colostomas in children were characterized by suppuration and dehiscence of the wound edges developed in 3 patients with a suspended colostomy, in 2 with a double sigmastoma, in 3 with a distal single-barreled sigmastoma, and in 1 with a Hartmann-type stoma, which is due to infection of the edges of the postoperative wound with intestinal discharge due to improper ostomy care and hygiene violations. This complication was stopped by the method of local antiseptic therapy and the imposition of guiding sutures.

Stoma evagination was observed in 3 patients with double sigmastoma, and in 1 with distal single-barreled sigmastoma. Fig. 1

Figure 1 - Evagination of the Large Intestine through a Colostomy



Prolapse can occur with all types of stomas. The prolapse of the intestine through the stoma was associated with the leaving in the abdominal cavity of a large free pstomal section of the intestine, which is very mobile and can "turn inside out" through the colostomy opening. If a colostomy is placed in a fixed part of the colon, prolapse will not occur. The following reasons were predisposed to this: increased intra-abdominal pressure, the use of foods that increase peristalsis. In 2 patients, 4 cm of bowel prolapse was observed. These children underwent conservative therapy by correcting nutrition and using a cotton gauze pad (pelot), pressing the surface of the colostomy. In 3 patients there was a prolapse of 12 cm of the intestine, with its infringement in the stoma opening. In this group of children, we used surgical treatment - stoma reconstruction.

Because of the high incidence of prolapse, loop colostomy is associated with a higher complication rate than split stoma. Other complications, including megarectum and UTIs, are independent of the type of stoma. In general terms, the best kind of split sigmoidostomy has not yet been determined.

Bowel eventration was noted in 1 patient with suspended colostomy, 2 with double sigmastoma, and 2 with distal unilateral sigmastoma. The colon loops fell out through the incision wound next to the withdrawn intestinal stoma. This complication developed when a too wide canal was formed in the abdominal wall. In this situation, an emergency operation was carried out with the elimination of the intestinal eventration and the reconstruction of the stoma by imposing a single-barreled colostomy like Hartmann with corrugation of the intestine. The predisposing factors for eventration were: an increase in intra-abdominal pressure, a change in the regenerative abilities of tissues in the exhausted state of the patient (with hypotrophy, hypoproteinemia).

Stoma stenosis developed in 4 patients with suspended colostomy, 3 with double sigmastoma, 2 with distal single-barreled sigmastoma, and 1 with Hartmann-type stoma patients. The narrowing was in the final section of the intestine, at the level of the skin and at a depth - at the level of the dissected aponeurosis. The reasons for the development of stoma stenosis were: the imposition of frequent interrupted sutures, which led to hypergranulation of the tissue around the sutures, followed by impaired circulation of the stoma outlet; a too narrow opening was created in the musculo-aponeurotic layer and there was a compression of the intestine, followed by its stenosis;

A long-standing stricture can lead to a suprastenotic expansion of the overlying sections with the development of irreversible processes in the intestinal wall, in the future this can complicate reconstructive operations on the intestine.

Disconnected bowel syndrome developed in 1 patient with double sigmastoma. The cause of this complication was the wrong choice of the colostomy height, which led to the "disconnection" of

the distal colon from normal functioning. This complication made it difficult to carry out further surgical manipulation.

In 5 children with suspended and in 1 child with double sigmastoma, we observed the presence of fecal stones in the distal part of the intestine, which is associated with the throwing of fecal masses into the stoma discharge loop, in the distal part of the colon, fecal stones are formed, which contributes to the preservation of suprasthenotic expansion and symptoms intoxication

When analyzing the advantages of any of the types of colostomy, I would like to note that often a colostomy is the only way to create conditions for emptying the intestine against the background of intestinal obstruction. It is possible to work without infection of surgical wounds, which prevents the development of postoperative complications in the form of retraction, prolapse of the rectal mucosa, stenosis of the anus and incontinence phenomena.

Overall, our results support the fact that sigmostomy is more favorable than transverse colon stomas. Also, our studies show the presence of greater complications from loop stomas than from separate ones; in particular, this applies to prolapse. It should be noted that the lack of information from pediatric surgeons about other colostomy techniques also plays a huge role, and more often the ostomy surgeon mainly uses the technique that he knows best. When forming a colostomy, it is necessary not only to create an adequate emptying of the intestine, but also to plan the further stage of the operation anatomically and physiologically in order to avoid complications associated with incorrect determination of the type and level of colostomy.

4. Conclusion

1. All high forms of anorectal defects, as well as cloacal forms, require preliminary formation of a "protective" colostomy;
2. Re-corrective operations in all cases of complications should be performed only under the guise of a "protective" colostomy.
3. Preferably the formation of a single-barreled terminal colostomy (sigmostomy);
4. Colostomy must be taken out through a separate "window" outside the surgical incision;
5. Colostomy is necessary in case of identified concomitant anomalies and defects that clinically "dominate" over anorectal malformation;

At the same time, it was possible to completely and adequately empty the intestine, morphologically verify the defective segment of the intestine, avoid the "disconnected" bowel

syndrome, infection of the urinary system and perform reconstructive surgery in the shortest possible time and under aseptic conditions.

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Consent

Written informed consent was obtained from all participants of the research for publication of this paper and any accompanying information related to this study.

Conflict of Interest

The authors declare that they have no competing interests.

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