

Original Research

Assessment of the State of the Rectal Sphincter Apparatus in Anal Incontinence in Children after Surgery

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ABSTRACT:

Background: Fecal incontinence is the inability to control your bowel movements, causing stool (feces) to leak unexpectedly from the rectum. **Materials and methods:** The article presents the experience gained in treating 56 patients with anal incontinence after surgery for anorectal malformations, Hirschsprung's disease, for the period 1996-2006. and studying long-term results covering the period from 2007 to 2019. The age of children ranged from 3 months. up to 14 years old. **Results:** In patients of the main group clinically there was a deficiency (fecal incontinence) of the sphincter of 1.2.3 degrees (respectively, in 10.19.7 children). When using the point scale, these numbers changed (respectively in 4.13.19 children). This can be explained by the fact that a clinical assessment of the degree of sphincter insufficiency takes into account only how much the patient is able to retain intestinal contents, and 7 points are taken into account when scoring. **Conclusion:** The analysis of clinical material shows that the anal incontinence in children after operations can be caused by damage to the sphincter apparatus or a violation of the anatomical and topographic ratios of the rectum due to its improper reduction in perineal or abdominal perineal proctoplasty, as well as congenital anomalies with side of the distal spine, which is an independent nosological form, or a concomitant pathology, exacerbating functional disorders in anorectal anomalies, which subsequently negatively affect the results of corrective operations.

KEY WORDS: anal incontinence, rectum, anal sphincter, Hirschsprung's disease, anorectal malformations

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INTRODUCTION

Fecal incontinence is the inability to control your bowel movements, causing stool (feces) to leak unexpectedly from the rectum [1-3]. A significant part of patients suffers from stool control disorders more often in the form of anal incontinence and have a reduced quality of life. The results of treatment of children with anal incontinence are reduced, mainly, to the quality of stool retention. For retention, an important place is occupied by the development of neuromuscular structures parallel to the embryological development of the rectum and anus. Neurogenic control is provided by the nerves of the 2, 3 and 4 sacral segments. Loss of innervation from the 2 to 5 sacral segment leads to incurable incontinence [4].

The second component of the continent is the anus levator muscle with a puborectal loop and the external muscular sphincter. However, Stephens and Smith attached the main role to the levators and downplayed the importance of the external sphincter in retention [5,6]. Other authors believe that the external sphincters play an important role in stool retention. The action of levators is to raise the rectum, at the same time, the puborectal loop and the deep muscles of the external sphincter pull the anal canal anteriorly, pressing the rectum to the triangular ligament. This forms the anorectal angle, and the circular fibers of the external sphincter narrow the anal canal. When the rectum is reduced outside the muscle complex, both the compressive effect and the delay of the anal canal are lost [7, 8].

The third essential component of stool control is sensitivity and proprioceptivity. Sensitivity to the presence of feces is very important, because, according to Stephens, it prevents anal incontinence. Proprioceptivity is present in the muscle and connective tissue of the muscle complex; therefore, the puborectal loop and muscles of the external sphincter quickly respond even to weak distal intestinal distension. The muscular complex provides an anorectal resistance zone 3.5-5 cm long in healthy children. If the reflex contractions of the puborectal loop are weakened and the zone of anorectal resistance is shortened, incontinence sets in [9-12]. Many authors use different criteria to measure retention. So, W.B. Kieswetter (1977) attached importance to retention mechanisms, E.I.Smith et al. (1978) - social adaptation (school attendance), J.H.

Kelly (1972) - to the ball system L.Schnauffer et al. (1967); A.F. Scharli, W. B. Kieswetter (1970); I.Taylor, H. L. Duthie (1973) emphasize the importance of various physiological methods, including manometry, electromyography, and perineal electrical stimulation.

MATERIALS AND METHODS

The article presents the experience gained in treating 56 patients with anal incontinence after surgery for anorectal malformations, Hirschsprung’s disease, for the period 1996-2006. and studying long-term results covering the period from 2007 to 2019. The age of children ranged from 3 months. up to 14 years old. The distribution of children by age and gender is presented in Table 1.

Table 1. The distribution of patients by age and gender

Age	Comparison Group (n-24)		Main group (n-36)		Total
	boys	girls	Boys	girls	
Up to 1	-	1	-	6	7(18,3)
1-3	2	5	2	2	11(18,3)
4-7	3	3	4	5	15(25)
8-11	1	1	8	4	14(23,3)
12-14	1	5	2	1	9(15)
TOTAL	9(15)	15(25)	18(30)	18(30)	56(100)

The examination of children was carried out using general clinical, radiological and special methods. The scope of the examination depended on the age of the patients, the nature of the pathology and the tasks set. Assessment of the general condition of the patient, examination of the rectoanal zone and determination of the anal reflex were carried out according to the rules existing in pediatric proctology.

ECG, ultrasound, abdominal organs were carried out by patients in order to identify pathology or associated abnormalities.

Special research methods. To measure the strength of the active voluntary contraction of the rectum sphincter, before and after surgery, we used a special device for sphincterometry developed at our department (Patent of the Republic of Uzbekistan for invention No. IDP 04428, certificate No. 1485, “Device for sphincterometry”). Using a sphincterometer, 56 healthy children aged 3 to 14 years, as well as sick children (older than 3 years) in the pre- and postoperative periods were examined.

For an objective assessment of the functional state of the sphincter apparatus, we developed a ball scale, which includes 7 main parameters characterizing the state of anal sphincter (Table 2). The total amount on the scale is 14 points, which is the norm. Insufficiency of anal sphincter of 1 degree was estimated at 10-12 points, 2 degrees - 6-9 points, 3 degrees - less than 5 points.

Table 2. The scale for assessing the degree of insufficiency of the rectal sphincter in children

Signs	Clinical manifestation	Scores
Number of bowel movements	1-2 times a day, or 1 time in 2 days	2
	3-5 times a day, or 1 time in 3-4 days	1
	more than 5 times a day, or only after an enema	0
Stool consistency	Dense	2
	Mushy	1
	Liquid	0
The urge to defecate	Exist	2
	Partially	1
	Is absent	0
Anal reflex	Expressed	2
	Weak	1
	Is absent	0
Anatomical topographic	Anus closed, without cicatricial deformity	2

assessment of the anus	Moderate deformation	1
	Atypical location expressed Deformation	0
The degree of development of the distal spine	Proper development	2
	Partial agnesia (hypogenesis) of the coccyx	1
	Agnesia of the coccyx (agnesia of the coccyx and sacrum)	0
Volitional tone of the sphincter	Below the age norm no more than 25%	2
	Below the norm by 25-50%	1
	Below the norm by more than 50%	0

RESULTS AND DISCUSSION:

Nosological forms of diseases and the number of surgical interventions are presented in table 3.

Table 3. Nosological forms of congenital malformations the number of previous operations in children with fecal incontinence

Type of malformation	Total number of patients	The number of corrective operations performed			
		One	Two	Three	Four and more
Anus atresia	10(16,7)	8	-	1	1
Atresia of the anus and rectum	15(25)	10	3	1	1
Atresia with fistulas	21(35)	16	3	2	-
Anus ectopia	4(6,7)	4	-	-	-
Hirschsprung's disease	6(10)	3	2	-	1
Total	56(100)	44(73,3)	9(15)	4(6,6)	3(5)

As can be seen from the table, a large group of patients (26.6%) with impaired rectal function of the rectum performed more than two operations. With each subsequent operation, cicatricial deformity of the anus and sphincter insufficiency became more persistent and often did not respond to rehabilitation treatment. Sphincter insufficiency, cicatricial stenosis of the neoanus, relapse of the fistula and prolapse of the rectal mucosa led to anatomical and functional insufficiency of the sphincter apparatus of the rectum.

The distribution of patients depending on the pathological condition that caused the anatomical and functional insufficiency of the sphincter apparatus is presented in table 4.

Table 4. Types of pathological conditions that cause functional insufficiency of the sphincter apparatus

Pathological condition	Comparison group	Main group	Total
Sphincter insufficiency (SI)	5	8	13(21,6)
SI with cicatricial stenosis	9	19	28(46,6)
SI with recurrent fistula	5	3	8(13,4)
SI with standing of the rectal mucosa	5	6	11(18,4)
Total	24(40)	36(60)	60(100)

Analysis of the material allowed us to highlight the following main options for the manifestation of anal sphincter insufficiency in children (Table 5).

Table 5. Variants of manifestation of insufficiency of the external sphincter

Reason of failure	Comparison group	Main group	Total
External sphincter damage up to 1/3	4	2	6
Damage of the external sphincter 1/2	-	4	4
Multiple damage of the external sphincter more than 1/2	3	3	6
Multiple damage of the external sphincter and levators	4	3	7
Complete damage of the external sphincter	2	-	2
Extraction of the rectum outside the external sphincter	-	2	2
Perineal muscle hypoplasia (AC, ASC)	7	12	19
Total	20	26	46

Note: AC- agenesia of the coccyx, ASC - agenesia of the sacrum and coccyx.

The clinical picture of fecal incontinence in children depended on the degree of damage to the sphincter apparatus, the severity of cicatricial processes in the anorectal zone, the presence of recurrent fistulas in the genitourinary system, prolapse or extinction of the rectal mucosa and concomitant malformations (hypoplasia of the perineal muscles, agenesis of the coccyx, lower sacral vertebrae, etc.) To a large extent, the clinical picture was determined by the nature of damage to the rectal apparatus of the rectum.

In children with anal incontinence under the age of 1 year, a "sagging crotch" was determined. With coccyx agenesis in children under 1-year-old, the distal part of the spine was palpated at a distance of more than 25 mm from the posterior pole of the neoanus (neoanus-coccyx distance), and in older children, more than 30 mm. In these children, fecal incontinence was observed, often prolapse or standing of the rectal mucosa. The gaping of the anus was not infrequently observed. The anal reflex was weakened or absent.

Sphincterometry indices depended mainly on the degree of damage to the anal sphincter. Of the 25 patients, in 6 strong-willed tone was reduced compared with the norm by 25-50%, sphincter insufficiency was of the second degree. From the anamnesis it is known that these children were operated on once (for Hirschsprung-3 disease, low form of atresia-3) and were repeatedly treated conservatively. Clinically, failure was expressed as loose stool incontinence.

In 19 children, the volitional tone was below the norm by more than 50%, there was a sphincter insufficiency of 2-3 degrees. According to the anamnesis, these children were operated on 2 or more times, more often because of the high form of atresia, of which 14 had incontinence combined with a defect in the distal spine. Such a decrease in the tone of the anal sphincter, in our opinion, was due to the lack of an internal sphincter and malformation of the distal spine (high forms of atresia), which is aggravated with frequent repeated operations. The retaining function in such cases is performed by the muscles of the external sphincter and the pelvic floor.

The condition of anal sphincter in 36 children of the main group was evaluated using a point scale. According to the evaluation results, the patients were divided into three groups: 1- group, external sphincter insufficiency of the 1st degree- 4 children (10-12 points); Group 2, degree 2 insufficiency - 13 children (6-9 points); 3-group 3-degree insufficiency -19 (5 or less points). In children under 3 years of age, the sphincter volitional tone was assessed by 1 point (average parameter), since normative indicators were not obtained in this age group.

In patients of the main group clinically there was a deficiency (fecal incontinence) of the sphincter of 1.2.3 degrees (respectively, in 10.19.7 children). When using the point scale, these numbers changed

(respectively in 4.13.19 children). This can be explained by the fact that a clinical assessment of the degree of sphincter insufficiency takes into account only how much the patient is able to retain intestinal contents, and 7 points are taken into account when scoring. Therefore, we believe that the use of a point scale to assess the degree of the functional state of anal sphincter is more objective and helps the practitioner in choosing the right treatment tactics.

CONCLUSION

Thus, the analysis of clinical material shows that the anal incontinence in children after operations can be caused by damage to the sphincter apparatus or a violation of the anatomical and topographic ratios of the rectum due to its improper reduction in perineal or abdominal perineal proctoplasty, as well as congenital anomalies with side of the distal spine, which is an independent nosological form, or a concomitant pathology, exacerbating functional disorders in anorectal anomalies, which subsequently negatively affect the results of corrective operations.

Establishing the nature of damage to the anorectal zone and concomitant changes in the coccyx and pelvic floor muscles during primary as well as repeated operations is the key to successful treatment of anal sphincter insufficiency in children.

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ETHICAL APPROVAL

The ethical approval for the study was granted by the Committee of Ethical Approval for Researches under the Ministry of Health of the Republic of Uzbekistan.

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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