 ISSN 2221-2582

UDC 616.34-009.11-008.14-085-073.75-079+615.8+615.246.4/.6+616.352-008.22-053.2-089.83-007.251-036.12
DOI: 10.56871/CmN-W.2023.88.32.010

THE EFFECTIVENESS OF SURGICAL TREATMENT OF CHRONIC CONSTIPATION IN CHILDREN

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For citation: Komissarov MI, Aleshin IYu, Komissarova MYu, Komissarov IA. The effectiveness of surgical treatment of chronic constipation in children. Children's medicine of the North-West (St. Petersburg). 2023;11(1):82–92. DOI: https://doi.org/10.56871/CmN-W.2023.88.32.010

Received: 11.09.2022 **Revised: 17.11.2022** **Accepted: 15.01.2023**

Abstract. Therapy of chronic constipation presents certain difficulties. Based on modern research methods and a large clinical material (3526 patients), it was shown that among patients with so-called functional constipation, anal achalasia is detected in 3.89% of children, and hypertrophy of the internal sphincter in 1.72%. The effectiveness of sphincterotomy of the internal sphincter of the anus has been proven, the immediate and long-term results of this operation have been studied. It was revealed that the restoration of normal defecation in patients with anal achalasia and hypertrophy of the internal sphincter of the anus, with conservative treatment, occurs in no more than 2–3% of cases, after sphincterotomy in 70–90%. However, this process is very slow, over several years.

Key words: *chronic constipation; children; anal achalasia; hypertrophy of the internal anal sphincter; sphincterotomy.*

ЭФФЕКТИВНОСТЬ ОПЕРАТИВНОГО ЛЕЧЕНИЯ ХРОНИЧЕСКИХ ЗАПОРОВ У ДЕТЕЙ

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Для цитирования: Комиссаров М.И., Алешин И.Ю., Комиссарова М.Ю., Комиссаров И.А. Эффективность оперативного лечения хронических запоров у детей // Children's medicine of the North-West. 2023. Т. 11. № 1. С. 82–92. DOI: https://doi.org/10.56871/CmN-W.2023.88.32.010

Поступила: 11.09.2022 **Одобрена: 17.11.2022** **Принята к печати: 15.01.2023**

Резюме. Терапия хронических запоров представляет определенные трудности. На основании современных методов исследования и большом клиническом материале (3526 пациентов) показано, что среди больных с так называемыми функциональными запорами у 3,89% детей выявляется анальная ахалазия, у 1,72% — гипертрофия внутреннего сфинктера. Доказана эффективность сфинктеротомии внутреннего сфинктера заднего прохода, изучены ближайшие и отдаленные результаты этой операции. Выявлено, что восстановление нормальной дефекации у пациентов с анальной ахалазией и гипертрофией внутреннего сфинктера заднего прохода при консервативном лечении происходит не более чем в 2–3% случаев, после сфинктеротомии — в 70–90%. Однако этот процесс происходит очень медленно, в течение нескольких лет.

Ключевые слова: *хронические запоры; дети; анальная ахалазия; гипертрофия внутреннего анального сфинктера; сфинктеротомия.*

Nowadays, chronic constipation is an urgent social problem due to significant prevalence and difficulties in therapy [1–4]. The causes of chronic fecal retention are observed in children with chronic constipations of organic or secondary etiology (surgical — in Hirschsprung's disease and after surgical treatment of anorectal malformations, neurogenic, systemic and metabolic disorders, toxic lesions) [5]. In the vast majority of cases, in more than ten thousand patients, the cause of defecation disorders is not established definitely, because the level of modern knowledge about this problem does not allow to do this, so the diagnosis of «functional constipation» is usually made and

treated conservatively [6–10]. At the same time, the studies of some scientists show, that an integral study with the use of radiodiagnosis and other methods to explain the colon [11–13], made it possible to identify patients with anal sphincter achalasia and hypertrophy of the internal anal sphincter in patients with functional constipation [14, 15]. Such patients were offered various methods of surgical treatment [16–18]. However, there is no data on the frequency of these diseases in the structure of patients with constipation in modern literature. There is contradictory information about the necessity and effectiveness of surgery, and the long-term results have not been studied.

AIM

To optimize the indications for surgical treatment and to make a comparative dynamic analysis of the long-term results of conservative and surgical treatment.

MATERIALS AND METHODS

The study is based on the retrospective analysis of case histories and observations of 3526 patients with chronic constipation in SPbSPMU and children's hospital № 22. All children were examined according to a unified program, including: clinical, radiological, colorectal examination, endorectal sonography, as well as histological and histochemical methods. **Clinical examination** included the study of anamnesis vitae according to a unified way, which included the age of patient when constipation and fecal impaction appeared, types of patient's complaints and examination data with the calculating of the Rome criteria.

Radiological methods. To assess the anatomical position of the colon, its contractility, and to exclude Hirschprung's disease, standard irrigography with barium suspension was performed without preliminary preparation before the start of conservative therapy. The emptying index [12] was used for objective assessment of emptying. This index was calculated according to the formula: I_0 = M op. / M zap. Where Io is the emptying index; M op. is the arithmetic mean of transverse dimensions of all colon sections after emptying in centimeters; M zap is the arithmetic mean of transverse dimensions of all colon sections during filling in centimeters. Emptying index from 0.1 to 0.4 was considered normal. Index values that exceeded 0.4 were considered as disorders of defecation. Three degrees were identified: I degree — I_0 from 0.4 to 0.65, which corresponded to a moderate delay in defecation and the possibility of independent defecation; II degree — I_0 from 0.65 to 0.8, corresponded to a significant delay in defecation (more than 50%), but it was possible to defecate independently; III degree — I_0 from 0.8 to 1, defecation was not possible without the use of laxatives or enemas.

Anorectal manometry was performed on the devices "Colodynamic 3" (manufacturer "Progress", Rostov-On-Don) and Menfis (Italy). This study allowed to diagnose the violation of reservoir and evacuator functions of the rectum (volume-threshold sensitivity — VTS), to measure the pressure in the anal canal. These indicators characterize the presence of the urge for defecation and its possibility. We separately studied the rectoanal reflex (RAR), which shows the neuroreflectory connection between the rectum and pelvic diaphragm and is a main importance for ensuring the normal act of defecation. Normally, when the pressure in the rectum increases, the pressure in the anal canal should decrease.

Endorectal ultrasonography allowed visualization and determination of the thickness of the internal anal sphincter (IASP); IASP sizes of 1.15±0.12 to 1.41±0.14 mm were considered normal.

Morphological and histochemical study. Biopsy of the rectum was performed according to Swenson's method. Signs of pathologic changes in ganglia were considered to be: agangliosis, hypogangliosis, ganglion dystrophy. A section of rectal mucosa with the dimensions of at least 0.3×0.5 cm was used as a material. Anticholinesterase (AChE) activity in the mucosa within the range of 1–11.0 μmol/mg per minute was considered normal.

To assess the degree of defecation disorder and the results of treatment,an evaluation system was created, which consisted of five sections (Table 1). Sections 1 and 3 assessed the ability to independent defecation, taking into account the frequency of stools and the Rome criteria. In the 2nd section, the presence and frequency of stools, and the 4th section included radiological data. According to the degree of pathology, the patient was given 3 points in each of these sections (0 — no pathology). Section 5 assessed the outcome of treatment.

A good result (0 points) was considered the possibility of independent defecation, when the diet was followed and the rules of defecation were taught, without need of use enemas or laxatives. Satisfactory (1–3 points) result — constipation which followed by the regular courses of conservative therapy (1–2 times a year) allowed

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Таблица 1. Оценка эффективности лечения детей с запором

Tab 1. Assessment of effectiveness of treatment for constipation in children

Part 1. Assessment of regularity of defecation / Раздел 1. Оценка регулярности опорожнения	
Regular defecation / Стул регулярныRegular defecation	0 point / 0 баллов
Defecation once in 2–3 days / Стул один раз в 2–3 дня	1 points / 1 балл
Defecation once in 4–6 days / Стул один раз в 4–6 дня	2 points / 2 балла
Defecation once in 10 days and rare / Стул один раз в 10 дней и реже	3 points / 3 балла
Part 2. Assessment of encopresis / Раздел 2. Оценка каломазания	
No encopresis / Каломазания нет	0 point / 0 баллов
Encopresis rare than 1–2 times a month / Каломазание не чаще 1–2 раз в месяц	1 points / 1 балл
Weekly encopresis / Каломазание еженедельно	2 points / 2 балла
Daily encopresis / Каломазание ежедневно	3 points / 3 балла
Part 3. Roma criteria / Раздел 3. Оценка Римских критериев	
Less than 3 criteria / Определяется менее 3 критериев	0 point / 0 баллов
3 criteria / Определяется 3 критерия	1 points / 1 балл
4 criteria / Определяется 4 критерияv	2 points / 2 балла
5 criteria / Определяется 5 критериев	3 points / 3 балла
Part 4. Assessment of defecation by irrigograms / Раздел 4. Оценка опорожнения по ирригограммам	
Normal defecation, I_o <0,4 / Опорожнение в норме, I_o <0,4	0 point / 0 баллов
1st degree of delay in emptying, I_o from 0.4 to 0.65 / 1-я степень задержки опорожнения, I_o от 0,4 до 0,65	1 points / 1 балл
2nd degree of delay in emptying, I_o from 0.65 to 0.8 / 2-я степень задержки опорожнения, I_o от 0,65 до 0,8	2 points / 2 балла
3rd degree of delay in emptying, I_o> 0.8 / 3-я степень задержки опорожнения, I_o> 0,8	3 points / 3 балла
Part 5. Assessment of treatment / Раздел 5. Оценка результата лечения	
Good result / Хороший результат	0 point / 0 баллов
Satisfactory result / Удовлетворительный результат	1–3 points / 1–3 балла
Unsatisfactory result / Неудовлетворительный результат	4–12 points / 4–12 баллов

to achieve long-term remissions. If there were unsatisfactory results (4–12 points), defecation was impossible without regular laxatives or enemas.

RESULTS

Due to the data of the integral study, three groups of patients were distinguished. The **1st group** consisted of 3330 patients (94.39%). In these children a slightly later appearance of constipation (after 2–3 years) and less severe clinical course of constipation were noted than in patients of the 2nd and 3rd groups. The average point of Rome criteria was 2.24±0.27, which indicated defecation disorder, but was not catastrophic. Markers of radiological methods in most cases indicated impaired motility of the colon and delayed emptying of the I–II degree. The severity of constipation on a 12-point scale was mostly 6–8 points. No specific features were revealed by the anorectal manometry, its results indicated decreased volume-threshold sensitivity, moderate increase in pressure in the anal canal, and normal rectoanal reflex. There were normal sizes of IASP, histologic changes of the rectal wall basically did not allow to draw any conclusions about the nature of constipation, it could be of primary or secondary etiology. However, the AChE value of the rectal mucosa was normal in all cases. It was an indirect sign of the absence of severe intramural conduction disturbance. These patients were diagnosed with **functional constipation**.

In patients of **groups 2** (136 children — 3.89%) and **3** (60 children — 1.72%) constipation appeared at an earlier age (up to two years) and was more severe. Their clinical picture was the same in both groups. In almost 80% of cases constipation was complicated by encopresis. More than 90% of patients suffered from

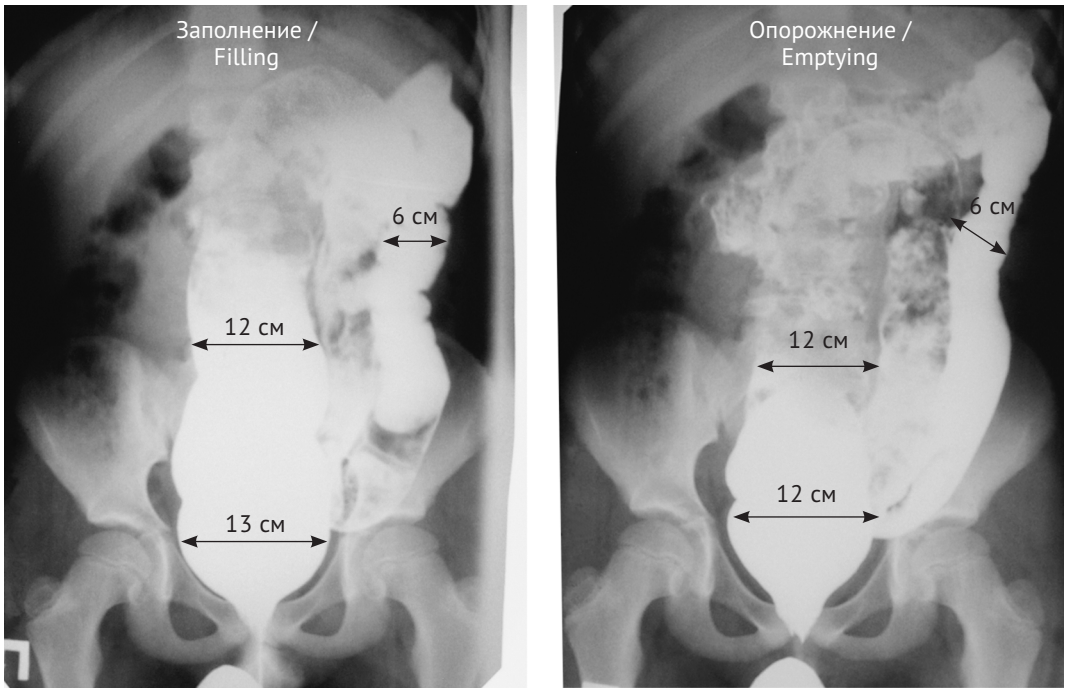

Fig. 1. Irrigograms of patient (group 2) with III degree of voiding disorder. Emptying index 0.96

Рис. 1. Ирригограммы пациента 2-й группы с нарушением опорожнения III степени. Индекс опорожнения 0,96

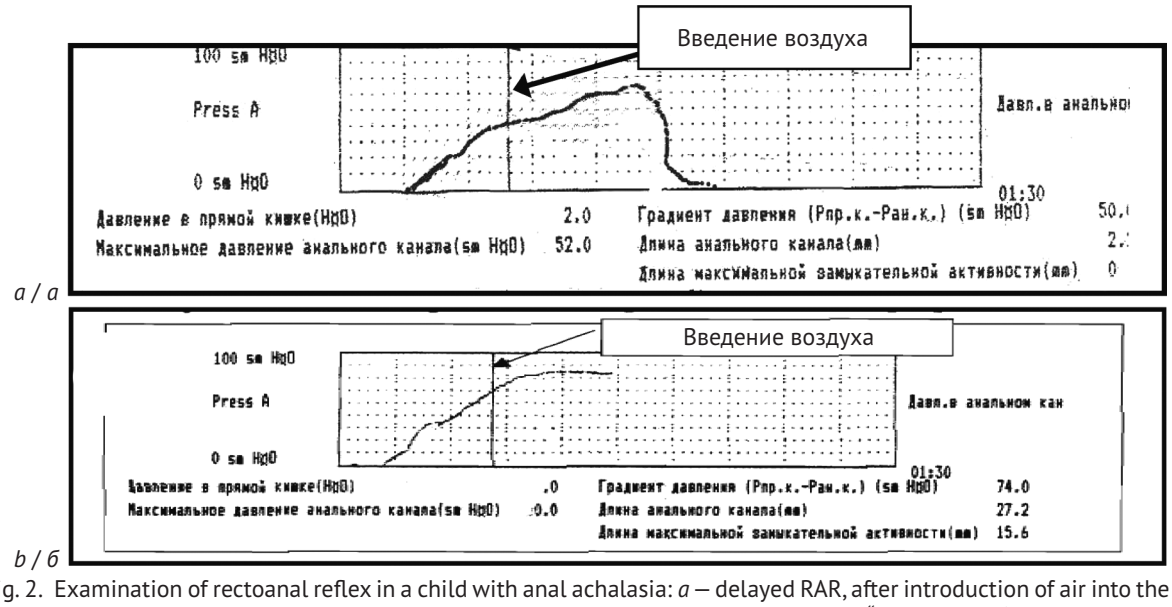

Fig. 2. Examination of rectoanal reflex in a child with anal achalasia: *a* — delayed RAR, after introduction of air into the rectum the decrease of pressure in the anal canal occurs with a significant delay; *b* — reverse "perverted" RAR, after introduction of air into the rectum the increase of pressure in the anal canal is determined

Рис. 2. Исследование ректоанального рефлекса у ребенка с анальной ахалазией: *а* — замедленный РАР, после введения воздуха в прямую кишку снижение давления в анальном канале происходит со значительной задержкой; *б* — обратный «извращенный» РАР, после введения воздуха в прямую кишку определяется повышение давления в анальном канале

delayed defecation longer than four days. The mean Rome criteria in group 2 was 4.47 and in group 3 was 4.19, indicating a very severe voiding disorder.

The radiological indicators (Fig. 1) showed a more pronounced decrease in the motility of colon (II and III degrees). The severity of constipation on a 12-point scale was more than 8 points.

Decreased volume-threshold sensitivity of the rectum, increased pressure in the anal canal, and histological changes were also more pronounced. However, according to these indicators it was impossible to differentiate these patients from children with functional constipation and from each other, since the noted factors were mostly individual for each patient.

 ISSN 2221-2582

At the same time, only patients of **2nd** group in all cases had impaired rectoanal reflex (Fig. 2) and increased AChE activity of the mucosa (more than 18 μmol/L/g protein per hour). The developing of constipation in them can be explained by the violation of the defecation due to partial insufficiency of the intramural nervous system of the rectum and incomplete relaxation of the internal anal sphincter.

The cause of constipation can be considered as **anal achalasia**, because there was not any patient who had the zone of agangliosis at irrigograms, i.e. Hirschprung's disease.

In children of the 3rd group, normal rectoanal reflex and normal AChE values of the mucous membrane (2–10 μmol/mL per minute) were noted in all cases, so these changes were the same to those in patients with functional constipation (group 1). However, endorectal sonography in all cases revealed thickening of the internal anal sphincter (1.5–2 times) relative to normal age values, which constantly maintained high pressure in the anal canal and prevented the normal act of defecation (Table 2, Fig. 3). The degree of thickening was independent of duration of the disease. This allowed us to assume that **hypertrophy of the internal anal sphincter** is a primary pathological process, i.e., an independent disease and not a consequence of constipation.

The differential diagnosis table was created due to data of the research to identify «surgical» causes of functional constipation (Table 3).

All patients with constipation on admission to the hospital were prescribed complex conservative treatment, which included laxatives, enemas, and biofeedback lessons. The majority of children with functional constipation showed stable positive dynamics after the first course of conservative therapy. After 2–5 courses of inpatient treatment and following the doctor's recommendations at home, the number of points did not exceed 6, and the condition of more than 60% of patients was evaluated as 0–4 points. The results of therapy were good or satisfactory.

At the same time, after the similar conservative therapy, more than 60% of children with anal achalasia and hypertrophy of internal anal sphincter had regular defecation only after enema. In 20–30% of children constipation persisted for 2 to 4 days, and almost 10% of patients needed periodic cleansing enema to empty the colon. Only 14 (10.3%) patients had temporary (3–6 months)

Table 2. Thickness of internal anal sphincter in patients with its hypertrophy and in healthy children, mm

Таблица 2. Толщина ВСЗП у пациентов с гипертрофией ВСЗП и в норме, мм

	Age / Возраст		
	4–7 years old / 4–7 лет	8–12 years old / 8–12 лет	12–16 years old / 12–16 лет
Patients (group 3) / Больные 3-й группы	1,8±0,1*	2,00±0,1*	2,20±0,1*
Normal values / Нормальные возрастные показатели	1,15±0,12	1,28 ±0,16	1,41±0,14

*p <0,05.

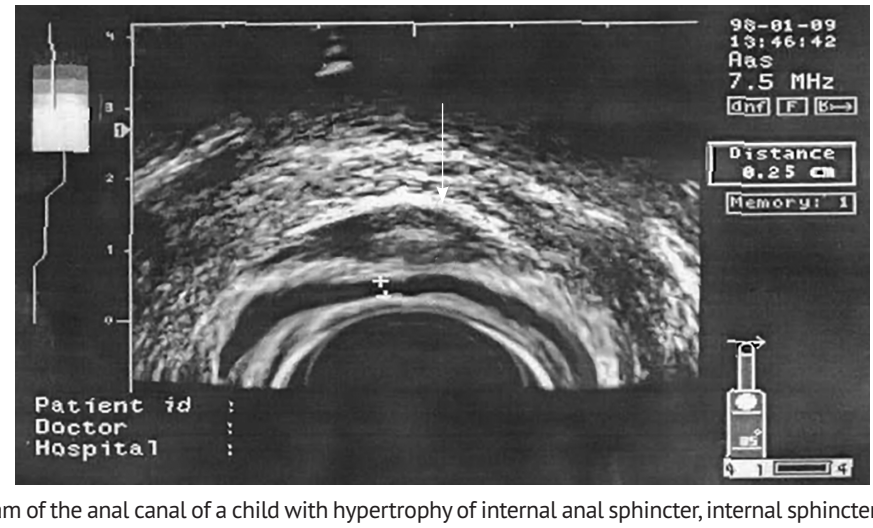

Fig. 3. Endosonogram of the anal canal of a child with hypertrophy of internal anal sphincter, internal sphincter thickness — 2.5 mm

Рис. 3. Эндосонограмма анального канала ребенка с гипертрофией ВСЗП, толщина внутреннего сфинктера — 2,5 мм

Table 3. Differential diagnosis to identify "surgical" causes of functional constipation

Таблица 3. Дифференциально-диагностическая таблица для выявления «хирургических» причин функциональных запоров

Group of patient's / Группы пациентов	Main diagnostics markers / Главные диагностические признаки	Diagnosis / Диагноз
1st group — 3330 patients (94,39%) / 1-я группа — 3330 пациентов (94,39%)	I_o >0,4, normal rectoanal reflex, AChE activity <11 μmol/L/g protein per hour, thickness of internal anal spincter <1.5 mm I_o >0,4, нормальный РАР, активность АХЭ <11 мкмоль/л/г белка в час, толщина ВСЗП <1,5 мм	Functional constipation / Функциональный запор
2nd group — 136 patients (3,89%) / 2-я группа — 136 пациентов (3,89%)	I_o >0,65, delayed or reversed rectoanal reflex, AChE activity >12 μmol/L/g protein per hour, thickness of internal anal spincter <1,5 mm / I_o >0,65, замедленный или обратный РАР, активность АХЭ >12 мкмоль/л/г белка в час, толщина ВСЗП <1,5 мм	Anal sphincter achalasia / Анальная ахалазия
3rd group — 60 patients (1,72%) / 3-я группа — 60 пациентов (1,72%)	I_o >0,65, normal rectoanal reflex, AChE activity <11 μmol/L/g protein per hour, thickness of internal anal spincter >1,6 мм / I_o >0,65, нормальный РАР, активность АХЭ <11 мкмоль/л/г белка в час, толщина ВСЗП >1,6 мм	Hypertrophy of internal anal sphincter / Гипертрофия ВСЗП

recovery of independent defecation. The number of points on a 12-point scale in all cases exceeded 7, so the results of treatment were unsatisfactory.

Thus, patients with anal sphincter achalasia and hypertrophy of the internal anal sphincter were very limited to conservative treatment, and its results were not reliable. This was the cause for the use of surgical treatment — sphincterotomy of the internal anal sphincter.

On the basis of these results we developed indications for surgical treatment of chronic constipation in children. In our opinion, there must be three factors out of five (the first two are mandatory):

1. Ineffectiveness of long-term (at least 1.5–2 years) complex and regular conservative therapy.
2. Presence on irrigograms of dilated, in the form of a poorly contracting balloon, distal colon with an emptying index of more than 0.65.
3. Increase in the tone of the anal canal above 50 cm of aqueous pressure (in anal sphincter achalasia and hypertrophy of internal anal sphincter). Reverse ("perverted") or delayed rectoanal reflex (in anal sphincter achalasia).
4. Increased activity of acetylcholinesterase of rectal mucosa more than 12 μmol/L/g protein per hour (in anal sphincter achalasia).
5. he thickness of the internal anal sphincter exceeding 1.6 mm (in hypertrophy of the internal anal sphincter).

SURGICAL TECHNIQUE

In the position, while the patient was lying on his back, as in lithotomy, the anal canal mucosa was fixed with «holders» along the posterior semicircle. 2–3 ml of 0.25% novocaine solution for "hydropreparation" was injected under it. The mucosa was dissected at 1/3 of the posterior semicircle of the anal canal in the transverse direction, on the border with the perianal skin. The anal canal and the distal part of the rectum were separated from the mucous membrane for 3–4 cm. A smooth muscle plate 2.5–3.5 cm long, 0.3–0.4 cm wide, and 1–2 mm thick was dissected along the posterior surface of the anal canal. The proximal end of the dissected section was the distal part of the smooth muscle layer of the rectum. Then the mucous membrane was sutured to the wound bottom. A swab with oil was left in the rectum for one day.

Table 4. Number of patients both with anal achalasia and without it examined in different times after surgical treatment

Таблица 4. Количество детей с анальной ахалазией, обследованных в разные сроки после операции, и пациентов контрольной группы

Time after surgery / Срок после операции	Number of patients / Количество детей	
	after internal sphincterotomy / после внутренней сфинктеротомии	control group / контрольная группа
1–2 years / 1–2 года	93	43
3–5 years / 3–5 лет	60	31
7–10 years 7–10 лет	43	18

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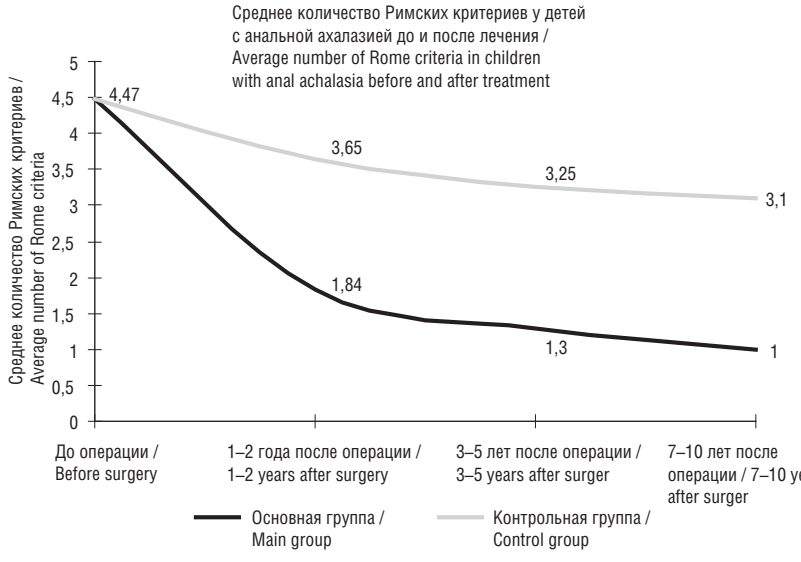

Fig. 4. Dynamics of changes in the number of Roma criteria in patients after surgery and control group

Рис. 4. Динамика изменения количества Римских критериев у больных после операции и контрольной группы

A total of 134 sphincterotomies were performed in children with anal sphincter achalasia and hypertrophy of the internal anal sphincter. 62 patients with the same diagnoses who were not operated on for various reasons have formed a control group and received conservative therapy.

Table 4 shows the number of children with anal sphincter achalasia examined at different times after surgery and patients of the control group who received only conservative therapy.

Before surgery, the majority of patients (93.81%) had stool retention for more than 4 days. In 1–2 years after internal sphincterotomy the number of patients with such a pronounced voiding delay decreased to 13.98% ($p < 0.05$). However, it should be noted that the recovery process was very slow. Thus, in 1–2 years after the operation independent defecation was noted only in 38.7% of cases, in 3–5 years — in 50% ($p < 0.05$), and in 7–10 years — in 60.47% of patients ($p < 0.05$).

The similar dynamics was observed in the study of fecal impaction. The disappearance of this unpleasant symptom occurred slowly and in the same time with the restoration of independent defecation. In the control group as a result of long-term conservative treatment there were no cases of complete restoration of independent defecation, although some patients showed some improvement. Figure 4 shows the comparative dynamics of changes in the number of Roma criteria in patients after surgery and in the control group.

The figure shows that before treatment, the average number of Roma criteria in both groups was similar and exceeded 4, indicating a serious degree of voiding impairment. After surgical treatment, we observed their constant decrease (on average to 1 after 7–10 years). At the same time in patients of the control group the decrease was less significant and amounted to 3.1 after 7–10 years. The differences were statistically significant ($p < 0.05$).

Similar dynamics was noted when comparing radiological parameters. Figure 5 shows that the contractile function of the colon in patients after sphincterotomy improved more than 2-fold, and in 3–5 years after surgery the emptying index approached normal values. In children of the control group every time this index indicated a serious delay in emptying of the colon (0.69 with a norm of 0.4).

Figures 6 and 7 show the dynamics of the main parameters of the gastrointestinal manometry — volume-threshold sensitivity and pressure in the anal canal. In both groups there was a tendency toward improvement of volume-threshold sensitivity. However, in patients who received surgery its values were close to normal, whereas in patients after conservative treatment a much larger volume of liquid was needed for the urge to defecate. The tone of anal canal after sphincterotomy, in contrast to the patients in the control group, also decreased and reached normal values.

The differences between the groups were statistically significant ($p < 0.05$). At the same time, it should be taken into account that these indicators are conditional and cannot always be associated with each specific patient, but they clearly demonstrate the general trend of the clinical course of the disease and changes in the data of various methods of investigation.

Table 5 summarizes the general data on the efficacy of internal sphincterotomy for anal achalasia.

The table shows that the effectiveness of surgical treatment increased depending on the time

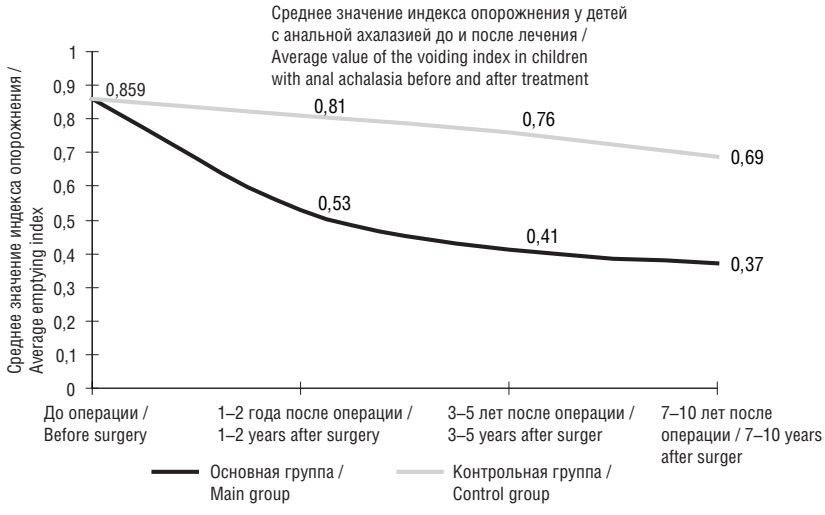

Fig. 5. Dynamics of changes in the mean values of the emptying index in patients after surgical treatment and in children of control group

Рис. 5. Динамика изменения средних значений индекса опорожнения у больных после операции и контрольной группы

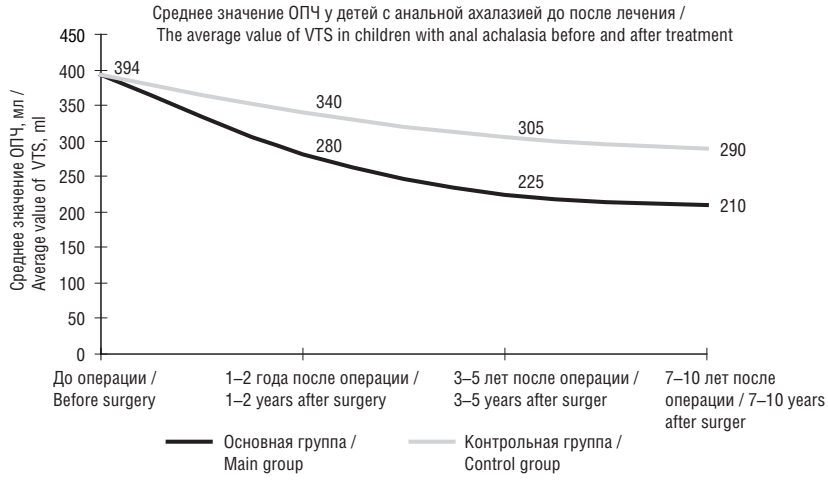

Fig. 6. Dynamics of changes in the average indices of volume-threshold sensitivity (VTS) in patients after surgical treatment and in children of control group

Рис. 6. Динамика изменения средних показателей объемно-пороговой чувствительности (ОПЧ) у больных после операции и контрольной группы

after its performance, but this process was very slow. In patients of the control group, the effectiveness of conservative treatment was unsatisfactory in all cases.

It should also be noted that in more than 23% of patients there was no improvement at all after surgical intervention. This is probably due to the fact that the current state of the problem does not always allow to determine the cause of constipation, and patients may need other methods of conservative or surgical treatment (transrectal resection of the rectum, Soave's or Duhamel operation).

Table 6 demonstrates the number of children with hypertrophy of internal anal sphincter examined in different times after surgery and patients of control group with the same diagnosis who received only conservative therapy.

The dynamics of clinical picture, radiologic data and results of gastrointestinal manometry at different terms after surgery in children with hypertrophy of internal anal sphincter was the same as in patients with anal achalasia. Only a slight difference in quantitative parameters was noted.

Table 7 presents general data on the efficacy of sphincterotomy of the internal anal sphincter if it was hypertrophied.

The table shows that the effectiveness of surgical treatment, as well as in children with anal achalasia, increased very slowly. In both groups of children, the maximum clinical improvement after sphincterotomy occurred within 3–5 years after surgery, and then the recovery of voiding function was sharply delayed.

CONCLUSION

In conclusion, it should be noted that, although anal achalasia and hypertrophy of the internal anal sphincter are different diseases, but the clinical manifestations and course of the disease, as well as the recovery process after sphincterotomy, were the same, because the pathogenetic mechanism in these conditions is identical — pathologically high pressure in the anal canal, which prevents the full

 ISSN 2221-2582

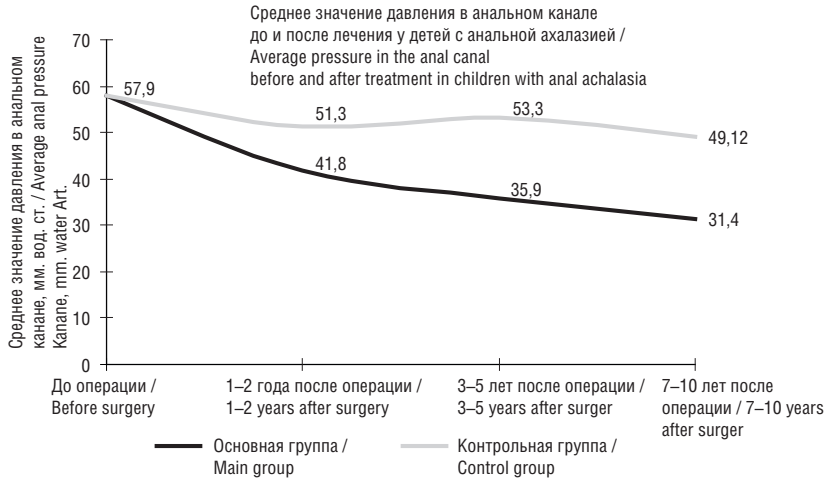

Fig. 7. Dynamics of changes in the mean data of pressure of anal canal in patients after surgical treatment and in children of control group

Рис. 7. Динамика изменения средних показателей давления в анальном канале у больных после операции и контрольной группы

Table 5. Results of internal sphincterotomy in patients with anal achalasia at different terms after surgery (with use of a 12-point scale)

Таблица 5. Результаты внутренней сфинктеротомии у больных с анальной ахалазией в разные сроки после операции (по 12-балльной шкале)

Result / Результат	Years after surgical treatment / Сроки после операции		
	1–2 years / 1–2 года	3–5 years / 3–5 лет	7–10 years / 7–10 лет
Good (0 point) / Хороший (0 баллов)	2,15%	41,67%*	60,47%*
Satisfying (1–3 point) / Удовлетворительный (1–3 балла)	56,99%	28,33%*	16,28%*
Unsatisfying (4–12 point) / Плохой (4–12 баллов)	40,86%	30,00%	23,26%

* $p<0,05$.

Table 6: Children with hypertrophy of internal anal sphincter examined in different times after surgery

Таблица 6. Количество детей с гипертрофией ВСЗП, обследованных в разные сроки после операции

Time after surgical treatment / Срок после операции	Children, n / Количество детей, n	
	after internal sphincterotomy / после внутренней сфинктеротомии	control group / контрольная группа
1–2 years / 1–2 года	41	19
3–5 years / 3–5 лет	24	14
7–10 years / 7–10 лет	14	8

act of defecation. Sphincterotomy of the internal anal sphincter allows to reduce anal pressure and achieve more than 70–90% of cases of restoration of independent emptying. At the same time, it should be taken into account that it is not etiological treatment. After this treatment, only prerequisites for the restoration of defecation are created, and an indispensable condition for the success of the operation is a full and long-term conservative therapy in the postoperative period.

Thus, it has been proved that in functional constipation the only objective diagnostic criterion is an increased emptying index. In anal achalasia, with a high emptying index, there is an increase in pressure in the anal canal, pathological rectoanal reflex and an increase in the concentration of acetylcholinesterase of the rectal mucosa. Hypertrophy of the internal anal sphincter is characterized by a high emptying index, high pressure in the anal canal combined with an increase in the thickness of the smooth muscle layer of the anal canal. Children with anal achalasia account for 3.9%, with hypertrophy of an internal anal sphincter — 1.7% in all patients with chronic constipa-

Table 7. Results of internal sphincterotomy in patients with hypertrophy of internal anal sphincter at different terms after surgery (with use of a 12-point scale)

Таблица 7. Результаты внутренней сфинктеротомии у больных с гипертрофией ВСЗП в разные сроки после операции (по 12-балльной шкале)

Result / Результат	Time after surgical treatment / Сроки после операции		
	1–2 years / 1–2 года	3–5 years / 3–5 лет	7–10 years / 7–10 лет
Good (0 point) / Хороший (0 баллов)	4,87%	58,33%*	64,29,%*
Satisfying (1–3 points) / Удовлетворительный (1–3 балла)	58,54%	25,0%*	28,57%*
Unsatisfying (4–12 points) / Плохой (4–12 баллов)	36,59%	16,67%*	7,14%*

* $p<0,05$.

tion. Sphincterotomy of the internal anal sphincter is indicated only for patients with anal achalasia and its hypertrophy. It was found that the recovery of defecation, radiological and colodynamical parameters after sphincterotomy is very slow, within 3–5 years. Conservative therapy for chronic constipation in children with anal achalasia and hypertrophy of the internal anal sphincter is ineffective. Sphincterotomy, in turn, is an effective procedure and allows to restore independent defecation in more than 70–90% of cases.

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