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Treatment Management of Children with Postoperative Intraabdominal Infiltrates

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Abstract

Purpose. To increase the effectiveness of treatment of children with postoperative intra-abdominal infiltrates.

Materials and methods. The object of clinical studies was appendicular peritonitis in 150 children of 2–18 years old, who were in the department of purulent-septic surgery of the Odessa Regional Children's Clinical Hospital.

Results. The program of complex treatment of postoperative intra-abdominal infiltrate in children with appendicular peritonitis by combined use of drug and preformed physical factors under conditions of in-patient and out-patient treatment is developed. It is proved that the detection of clinical signs (independent and provoked abdominal pain, a palpable "tumor") indicates the formation of postoperative intra-abdominal infiltrate and its localization, which requires obligatory comprehensive sparing treatment at all stages of possible affect.

Conclusions. The use of the developed program of complex treatment improved effectiveness of treatment and provided a "good" result in 95.1% cases and the absence of an "unsatisfactory" result.

Keywords: treatment, management, children, postoperative intra-abdominal infiltrates

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Лечение детей с послеоперационными интраабдоминальными инфильтратами

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Резюме

Цель. Повысить эффективность лечения детей с послеоперационными интраабдоминальными инфильтратами.

Материалы и методы. Объектом клинических исследований был аппендикулярный перитонит у 150 детей в возрасте от 2 до 18 лет, находившихся в отделении гнойно-септической хирургии Одесской областной детской клинической больницы.

Результаты. Разработана программа комплексного лечения послеоперационных интраабдоминальных инфильтратов у детей с аппендикулярным перитонитом путем сочетанного применения медикаментозных и преформированных физических факторов в условиях стационарного и амбулаторного лечения. Доказано, что обнаружение клинических признаков (самостоятельная и спровоцированная боль в животе, пальпируемая «опухоль») свидетельствует о формировании послеоперационного интраабдоминального инфильтрата и его локализации, что требует обязательного комплексного щадящего лечения на всех стадиях возможного аффекта.

Выводы. Применение разработанной программы комплексного лечения повысило эффективность лечения и обеспечило хороший результат в 95,1% случаев и отсутствие неудовлетворительного результата.

Ключевые слова: лечение, дети, послеоперационные интраабдоминальные инфильтраты

■ INTRODUCTION

The role of the greater omentum in the formation of intraperitoneal inflammatory focus is one of the main factors determining the course of the postoperative period at the acute surgical pathology of the abdominal cavity in children [1–3]. Being involved in the inflammatory process, the greater omentum can complicate the course of the underlying disease and provoke 30–35% relaparotomies after abdominal surgery in children [1, 3].

The analysis of modern literature data demonstrated that questions of diagnosis, treatment management, choice of a method and volume of surgical intervention of the intra-abdominal infiltrates are insufficiently studied. Questions of pathomorphological disturbances features at omentitis remain open. The solution of those problems would

significantly reduce the rate of complications at the early and remote postoperative period [4–6].

Despite the great importance, there is a lack of scientific papers devoted to the study of the formation, diagnosis and choice of treatment management of postoperative intra-abdominal infiltrates, and not capture the scope of the task. So, our study is actual.

■ PURPOSE OF THE STUDY

To increase the effectiveness of treatment of children with postoperative intra-abdominal infiltrates (PII) based on the use of comprehensive diagnosis and sparing approaches to treatment.

■ MATERIALS AND METHODS

The object of clinical studies was appendicular peritonitis (AP) in 150 children aged 2–18 years old, who were in the purulent-septic surgery department of the Odessa Regional Children's Clinical Hospital. Prevailing majority were children with local peritonitis (LP) – 129 (86.0%) patients, widespread inflammation of the abdominal cavity was observed in 21 (14.0%) patients. The criterion for selecting children for the experimental group was the presence of postoperative complications of AP as an intra-abdominal infiltrate, the main cause of which was the inflammatory change of the omentum. The mean age of children with complicated AP was (9.8 ± 0.9) years.

The clinical research method included follow-up and physical aspects; examination of patients was performed systematically: examination, palpation, percussion, auscultation, a necessarily rectal examination. The material for paraclinical studies were blood (venous and peripheral), peritoneal content, urine and feces of patients. Ultrasound examinations of the abdominal organs in children with AP and PII studied the violation of the abdominal organs under conditions of occurrence of a primary paraappendicular abscess and PII, its monitoring under the influence of treatment. Assessment of the course and results of treatment of children with PII was performed with the calculation of χ^2 Pearson's statistics, diagnostic coefficients, Student's test, one-way ANOVA test, biometric analysis were performed using MedCalc 9.03 packages; Statistics 8.0 and SPSS 11.01.

■ RESULTS AND DISCUSSION

Based on the results of our own clinical studies, we have developed a program of comprehensive diagnosis and treatment of PII in children with AP by using a diagnostic algorithm (clinical, laboratory, instrumental signs) and comprehensive sparing treatment (drug therapy, preformed physical factors) at the hospital and outpatient stage.

To determine the indications for the use of the proposed treatment methods and to develop a program of sparing comprehensive treatment of children with PII, it was wise to conduct multidimensional clinical studies.

The peculiarity of the AP course in all studied children was the formation of local intra-abdominal changes in the form of paraappendicular abscesses of different severity. Intraoperatively, paraappendicular abscesses were detected in children with both diffuse (DP) and LP. The most common formation of abscess II – 53.8% in DP and 68.1% in LP, while abscess III in DP was only in every third child (38.5%), and in LP – in every sixth child (15.6%).

The average duration of the disease before hospitalization was 2.7 days in our observations. Depending on the age, the average duration of the disease in children of the first age group was 3.2 days, in the second and third groups – 2.5 days.

According to the results of the analysis, a reliable relationship between the duration of the disease and the presence of preoperative complications of AP in the form of I–III abscess formation. In children with abscess III, as the most severe form of intra-abdominal complication of AP, the statistically significant duration of the disease was longer (4.6 days) than in children with abscess I and II ($p=0.000018$).

As the study of the correspondence of specific and nonspecific clinical signs of complicated AP in children showed, the leading complaint was subjective and provoked abdominal pain (142; 94.7%), the location of pain significantly more often indicated the focus of the inflammatory process. Statistical analysis revealed an association of the studied features with the prevalence and degree of intra-abdominal inflammation ($p=0.0000$).

So, "defense musculare" and peritoneal irritation on the right in LP were present in 79.3% of children, and in DP – in 96.0% of patients along the whole abdomen. The symptom of a palpable "tumor" was more often manifested in the abscess I–III formation, generally occurred in 56.0% of patients. Rectal examination for paraappendicular abscess I–III not only helped to establish the diagnosis, but was also important in the dynamic monitoring of the PII treatment quality. Indicators of leukocytosis in all children were approximately the same – (14.70 ± 0.37) G/l. Changes in the leukogram correlated with the prevalence of intra-abdominal inflammation, the severity of the child's condition and the duration of the disease.

Dysfunction of the organism caused by intoxication in all patients with both DP and LP was confirmed by changes in the main biochemical parameters of the blood system: decreased total protein, increased liver transaminases, urea and residual nitrogen, which was caused by the response of the whole organism to intra-abdominal inflammation.

It should be noted that the clinical picture of DP and LP did not differ statistically significant, was quite similar and difficult to differentiate at the preoperative stage, although some signs (the palpable "tumor" symptom, the anterior rectum wall overhanging) allowed to suppose the formation of localized inflammation as II–III abscess.

Bacteriological studies of the peritoneal exudate identified the pathogen in only 104 (69.3%) cases. According to the species composition of microorganisms, among all positive studies, the priority was for *Escherichia coli* – 57 (54.8%) cases.

At ultrasound the attention was paid not only to the presence of structural changes of the para-appendicular inflammatory formation, but also to its size, namely to its area, which was calculated by ultrasonic sizes. The area depended on the amount of soft tissue that participated in the formation of para-appendicular inflammation, most commonly primary para-appendicular inflammatory formations were observed with the area of 20 cm² (115 patients; 76.7%), but in 8.0% cases the area of formation ranged from 60 to 100 cm².

Postoperative intra-abdominal inflammatory formation as a rule had the area of 40 cm² (121 patients, 80.7%), but in 7.3% cases the formation area reached 60–100 cm². Further analysis revealed a relationship between preoperative complications in the form of abscesses I–III and the area of postoperative infiltrate, namely: in abscesses I–II, the area of formation was mostly up to 40 cm² (82.1 and 81.3%, respectively), abscesses III led as a rule to sizes larger than 60 cm² – 31.4%. So, the more severe was preoperative para-appendicular inflammation, the greater was the area of the formed PII.

Since 2/3 (59.3%) patients with AP are most often diagnosed PII on the 4–6th day, abdominal ultrasound on the 4–5th day after surgery in children with AP is optimal for the early diagnosis of postoperative intra-abdominal infiltration.

Based on the results of our own clinical studies, a program of comprehensive treatment of PII in children with AP was developed through the combined use of drug and preformed physical factors at the hospital and outpatient treatment.

The choice of PII treatment management depended on the stage of the pathological process, the type and severity of the disease, which was determined comprehensively by clinical, ultrasound and laboratory studies. In the absence of abscessing signs, conservative measures were used; at signs of abscessing and peritonitis – preoperative preparation was made with the subsequent surgical intervention.

Conservative therapy was aimed at rapid relief of inflammation in the abdominal cavity, prevention of abscesses, support of motor-evacuation function of the intestine, prevention of adhesions in the abdominal cavity; its complex took place at the inpatient and outpatient stages.

We have developed and applied a number of ways to correct the described violations.

When dense and loose PII the local conservative treatment was conducted, which included the first stage of the regional antibiotic (kanamycin) using a retroperitoneal located microirrigator by the developed methodology [7] followed by electrophoresis and used simultaneously microclysters with therapeutic antibiotic solution in 0.25% solution dimexide about 30–50 ml twice a day; the second stage included the effect of diadynamotherapy in the projection of infiltrate and nonsteroidal anti-inflammatory drugs in the form of rectal suppositories at the age dosage twice a day.

Further comprehensive rehabilitation treatment of children with PII was based on the general principles of medical rehabilitation and provided the use of therapeutic physical factors (TPF) at the outpatient stage of the outpatient setting. Treatment was carried out according to our program [8] at the outpatient setting by using instrumental physiotherapy and drugs, after relief of intra-abdominal inflammatory phenomena, drug electrophoresis at the postoperative wound projection with the simultaneous use of rectal suppositories Distreptase was performed; after that diadynamotherapy, ultrasound injection of hydrocortisone was performed.

To assess the effectiveness of the proposed program of comprehensive treatment of children with PII, we divided all patients into two groups – control (CG) (traditional treatment) and the main group (MG) (developed treatment). Since after the primary pathology the children were operated with open (laparotomy) and closed (laparoscopy) methods. The each group was divided into subgroups according to the method of initial intervention.

CG included 97 children, of whom 78 (80.4%) patients underwent open laparotomy (CS 1), and 19 (19.6%) patients underwent laparoscopic treatment of the primary process (CS 2). All patients of CG at the postoperative period were diagnosed PII and had a traditional treatment (infusion detoxification, general antibiotic therapy, symptomatic therapy, antiseptic applications), and among TPF only UHF was used.

In the main group, 53 patients were divided into two subgroups as follows: MS 1 – 32 children with PII, who were primarily operated on by the open way – laparotomy; MS 2 – 21 patients who were primarily operated laparoscopically. The postoperative period in patients with MS 1 and MS 2 was the same, there were no differences in clinical

manifestations, so the basic therapy depended on the initial diagnosis rather than on the method of opening the abdominal cavity. Under the conditions of PII, rehabilitation treatment was carried out according to the developed program.

The effectiveness of comprehensive treatment of children with PII was assessed by the dynamics of the postoperative course of the disease, taking into account the well-being of patients, the severity of pain, general and local temperature response, disappearance of the palpable "tumor", data of rectoabdominal examination, laboratory tests, ultrasound, complications, terms of inpatient treatment. Monitoring of physical, clinical-laboratory and ultrasound picture determined the further management of the patient.

The occurrence of immediate complications in children with PII was studied during inpatient treatment, the nearest – after the completion of outpatient treatment (a month after hospitalization) and long-term results – a year after the inpatient treatment. Among the immediate complications in our children with PII were the following: wound (the postoperative wound suppuration); intra-abdominal (torpid course of peritonitis, abscess of the abdominal cavity infiltration, early adhesive intestinal obstruction); non-abdominal complications (bronchitis, pneumonia, etc.). Immediate, the nearest and long-term results were evaluated by three levels: "good", "satisfactory" and "unsatisfactory".

The "good" result meant that children did not give complaints, no violations of the digestive tract were detected, there was no PII. The "satisfactory" results took place when children complained of discomfort and abdominal pain, sometimes bowel dysfunction occurred. The "unsatisfactory" immediate results included complications that led to the abdominal cavity dysfunction: abscessing infiltrates in the abdominal cavity, adhesive intestinal obstruction.

The comparative analysis showed that the complex inpatient treatment of children with PII using the potentiated regional physiotherapy in combination with endorectal anti-inflammatory treatment had a favorable effect on the disease course, as evidenced by the time of relief of major clinical signs in patients of MG as compared with patients of CG.

It should be noted that the PII course had its differences in children primarily operated on by laparoscopy – in both CS 2 and MS 2 a closed intervention led to a more favorable course of PII.

The use of intrafocal potentiated antibiotic therapy in combination with endorectal anti-inflammatory drugs in the complex treatment of children with PII at the inpatient stage had a positive effect on the disease course, reduced the time of relief of the main clinical signs by 5–8 days when comparing of MG and CG, decreased the stay of patients in the hospital by 6–8 days.

Children who were primarily operated on by laparoscopy (CS 2 and MS 2) were in the hospital for 3–4 days less than the comparison group, ie the closed intervention leads to a favorable course of PII.

Ultrasound data in the dynamics correlated with physical signs and showed a decrease in the infiltrate size in children of MG by 4–5 days earlier than in CG patients, in 24 (24.7%) of which (21 with CS 1, 3 with CS 2) there was an increase in the heterogeneity of the structure, the liquid intra-infiltrate component, effusion in the abdominal cavity, which indicated the abscess of the infiltrate. In 53 patients of the main group (MS 1 – 32, MS 2 – 21), where PII was treated according to the developed method, abscessing was observed in 5.6% cases, of which in MS 1 in 6.3% and in MS 2 in 4.8%. So, the use of the developed

method of PII treatment led to a 4.4-fold reduction in their abscessing compared with the control group. However, the use of primary laparoscopic intervention also led to a 1.7-fold reduction in PII abscess between CS 2 (15.8%) and CS 1 (26.9%), and between MS 2 (4.8%) and MS 1 (6.3%) – 1.3 times, which confirms the overall sparing of PII in minimally invasive interventions.

It should be noted that PII abscess in patients correlated with the area of formation: most often the area of such infiltrate was more than 40 cm², i.e. the larger the area of PII, the more often abscessing was observed. In laparoscopically operated children, the area of the formation did not exceed 60 cm².

Complications in children with PII in MG occurred 4.6 times less often than in patients with CG: in MG complication occurred in only 11.2% cases, while in children with CG complications were in 56.7%. The absence of secondary complications in 83.0% patients with MG (78.1% MS 1; 90.5% MS 2) was statistically significant at a higher level of significance as compared with 43.3% of patients with CG (38.5% CS 1; 63.2% CS 2).

The number of complications also depended on the primary method of intervention: among children with CG 1.7 times more complications were observed at the open method of surgery (61.5% CS 1) compared with the laparoscopic method (36.8% CS 2); in children with MG with minimally invasive intervention complications occurred 2 times less (9.5% MS 2) than in children with open laparotomy (21.9% MS 1).

According to the structure the complications in the observed children with AP in the main and control groups at the inpatient stage are presented in Fig. 1.

The analysis of the effectiveness of PII treatment showed that the proposed comprehensive treatment of children with PII in the hospital reduced the abscess of intra-abdominal infiltrates 7.3 times: among patients with MG abscess occurred in 3.8% of children, and in patients with CG – in 24.7% cases.

The application of the developed method of PII treatment led to a reduction in their abscess 4.4 times as compared with the control group. However, the use of primary laparoscopic intervention also led to a 1.7-fold reduction in PII abscess between CS 2 (15.8%) and CS 1 (26.9%), and between MS 2 (4.8%) and MS 1 (6.3%) – 1.3 times, which confirms the sparing of PII course at minimally invasive interventions.

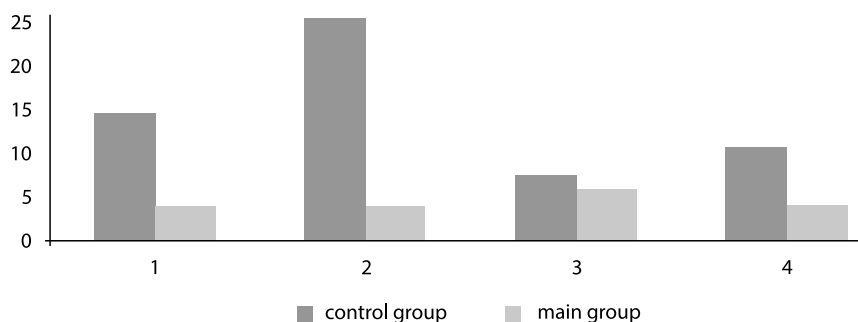


Fig. 1. The structure of the main complications in children of the studied groups: 1 – suppuration of the postoperative wound; 2 – abscess of intra-abdominal infiltrate; 3 – early adhesive intestinal obstruction; 4 – non-abdominal complications

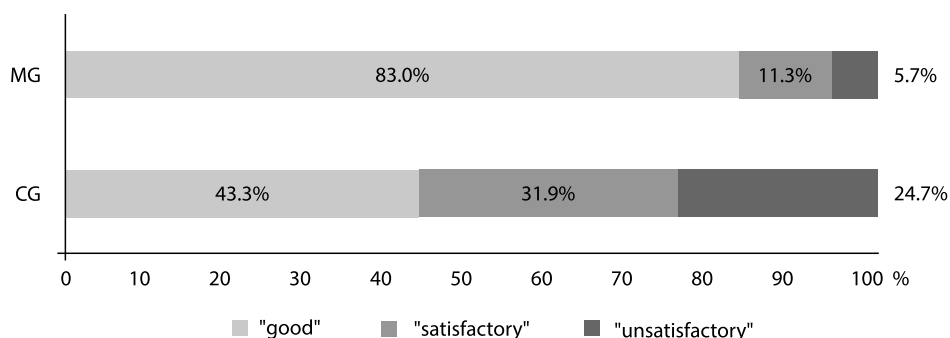


Fig. 2. Immediate results of treatment of children of the studied groups

The final analysis of the results of inpatient treatment by the three-points scale was conducted among all observed children and showed the following: immediate "good" treatment result was achieved in 87.6% of patients of MG and 2 times less in CG patients – 43.3% (Fig. 2).

The direct result was assessed as "satisfactory" in 11.3% of MG children and in 31.9% of CG patients. In MG children the "unsatisfactory" direct result was observed only in 5.7%, while in CG children "unsatisfactory" direct result of complex treatment was observed in almost a quarter of patients – 24.7%.

Summarizing all the above-said, we consider it necessary to note that the use of the potentiated regional antibiotic therapy and local anti-inflammatory therapy (therapeutic microclysters, endorectal suppositories) in the complex treatment of PII in children has improved treatment outcomes, allowed to avoid of abscessing and reduce the term of inpatient treatment and recommend the developed methods for practical use.

Besides, the children who underwent primary laparoscopic surgery, in general, had fewer complications, i.e. the primary sparing intervention generally led to a sparing course of the disease.

The effectiveness of outpatient treatment in children with PII was evaluated taking into account the well-being of patients, impaired bowel mobility and adhesions, the presence of infiltration in the abdominal cavity. To study the results of outpatient treatment, a multifactor questionnaire was developed, which allowed to assess the condition of patients and detect organ dysfunction by quasi-monitoring by the main clinical features.

With the help of quasi-monitoring, information on the condition of 109 children with PII was obtained after 1 month after inpatient treatment. Information about 41 sick children was obtained from MG. Among them, 25 patients developed MS 1 (primary laparotomy) and 16 children were included in MS 2 (primary laparoscopy), i.e. in the hospital they received a course of comprehensive treatment, and outpatient treatment of these children was also carried out according to the developed program [3]. The CG included 68 children (53 with CS 1 – operated primarily by the open method, 15 of CS 2 – operated primarily laparoscopically), who received traditional treatment at the inpatient stage, and at the outpatient stage these children did not receive the recommended treatment, and only the potassium iodide electrophoresis.

Significantly more often clinical signs (abdominal discomfort, independent and provoked abdominal pain, palpable "tumor", vomiting, intestinal dysfunction, predisposition to constipation, adhesive intestinal obstruction, ultrasound signs of intra-abdominal infiltrate) occurred in patients with CG in comparison with MG that testified to abdominal organs dysfunctions after the transferred PII (Fig. 3).

The analysis of differences in all clinical signs in the control and main groups after the completion of the outpatient treatment in the nearest term (one month after hospitalization) reflected the advantage of using a developed program of the complex treatment using enhanced local drug therapy and therapeutic physical factors at hospital and outpatient treatment in children with PII: the chance of determining ultrasound signs of intra-abdominal infiltration in children with MG decreased 17 times (17.87; CI (2.30 ÷ 138.82)). At the same time, the risk of adhesive obstruction in MG children reduced threefold compared with CG patients. We consider these data to be the main indicators of the effectiveness of the proposed outpatient treatment of children with PII.

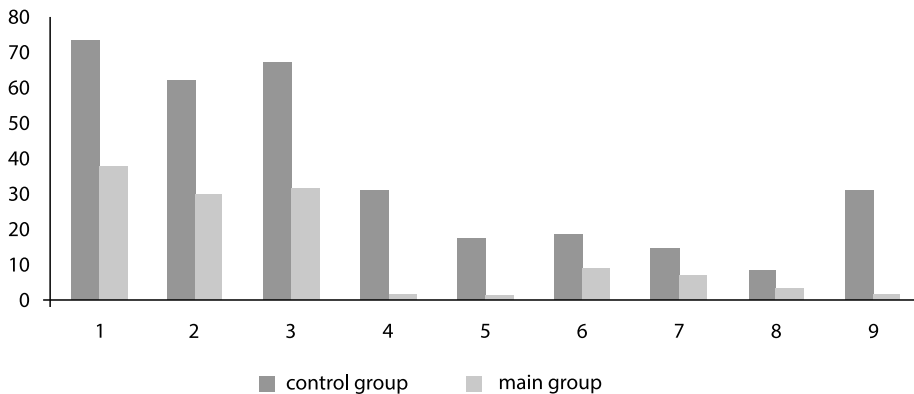


Fig. 3. Clinical signs in the studied children in the nearest period ($p=0.001$): 1 – abdominal discomfort; 2 – abdominal pain; 3 – provoked abdominal pain; 4 – palpable "tumor"; 5 – vomiting; 6 – intestinal dysfunction; 7 – tendency to constipation; 8 – adhesive intestinal obstruction; 9 – ultrasound signs of infiltration

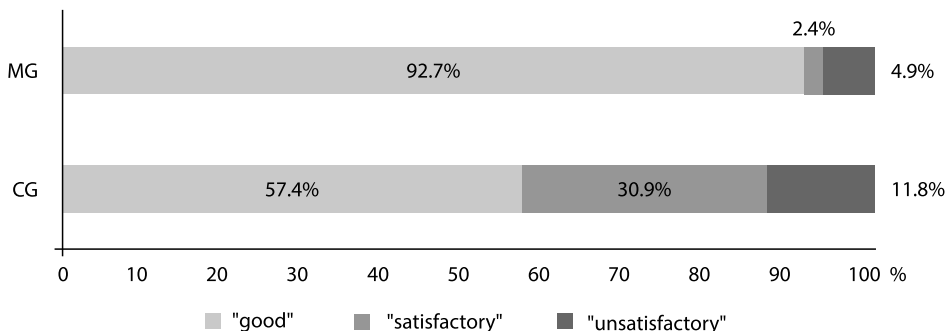


Fig. 4. The nearest results of treatment of children of the studied groups

The final analysis of the immediate results of rehabilitation treatment according to the three-point system was conducted among the observed groups of children and showed the following: the nearest "good" result was achieved in 92.7% of MG patients and only 57.4% of CG patients (Fig. 4).

As for the "unsatisfactory" result, in CG it was determined 2.4 times more often than in MG (11.8% vs 4.9% cases). In children of CS 2 and MS 2 (primary laparoscopic intervention) there was no "unsatisfactory" result, which confirms the sparing of laparoscopic intervention and the favorable course of the postoperative period.

Our own research has shown that the use of the treatment complex at the outpatient stage contributed to the complete disappearance of PII, prevented the development of late adhesive intestinal obstruction.

Summarizing the above-said, we consider that the use of therapeutic physical factors in the complex outpatient treatment of children with PII under the developed program had a positive effect on the restoration of impaired functions of the child's organism with PII in general and abdominal organs, as evidenced by the main indicator – the decrease of a palpable "tumor" presence and ultrasound signs of abdominal infiltration in children of MG to 97.6% cases and a threefold reduction of adhesive intestinal obstruction in MG children as compared with CG patients.

■ CONCLUSIONS

1. The leading sign in the occurrence of postoperative intra-abdominal infiltrate in all patients of the control and main groups were subjective and provoked abdominal pain (81.3%), a symptom of a palpable "tumor" (81.3%), the location of which reliably indicated the location of the intra-abdominal infiltrate, and pain was 4 times more common on the right (67.3%) than in the lower abdomen (15.3%) with pelvic infiltration. Peritoneal irritation and "defense musculature" were present only in the abscess of the postoperative intra-abdominal infiltrate (above the site of its localization), in general, were found 2.5 times more often on the right than in the lower abdomen.
2. Ultrasound monitoring on the 4–5th day after the primary operation in all cases helped to visualize the stage of postoperative intra-abdominal infiltrate (loose, dense, abscess) and to choose treatment management depending on the stage of the process and to control infiltrate changes. The determination of the area of the infiltrate allowed predicting its consequence: abscessing of the postoperative intra-abdominal infiltrate in patients was most often observed when the area of infiltrate is more than 40 cm².
3. The use of the developed intrafocal potentiated antibiotic therapy in combination with endorectal anti-inflammatory treatment in the complex inpatient treatment of children with postoperative intra-abdominal infiltrate had a favorable effect on the course of the disease, reduced the time of relief of the main clinical signs by 5–8 days when comparing the main and control groups, reduced the length of stay of patients in the hospital by 6–8 days, reduced the number of complications (from 56.7 to 17.0%), increased the number of "good" immediate results to 87.6% cases and reduced the "unsatisfactory" results to 5.7% ($p \leq 0.0001$).
4. The use of therapeutic physical factors and rectal suppositories of fibrinolytic and proteolytic enzymes according to the developed program at the outpatient stage provided the "good" immediate results in 92.7% cases, reduction of "unsatisfactory" results to 4.9% cases, while in children of the control group "unsatisfactory" the nearest result was 11.8% ($p \leq 0.0001$).



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