Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 27s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

The Choice of Optimal Treatment Methods for Invaginal Intestinal Obstruction in Children

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Cite this paper as: Yulchiev K.S, Kadirov.K. Z, (2025) The Choice of Optimal Treatment Methods for Invaginal Intestinal Obstruction in Children, *Journal of Neonatal Surgery*, 14 (27s), 1149-1152

ABSTRACT

Annotation: The experience of treatment of 75 patients with various variants of invagination intestinal obstruction (IIO) in children was analyzed. The structure and methods of treatment (IIO) at different stages of the disease are presented.There were 31(41.3%) patients admitted to the hospital up to 12 hours after the onset of the disease. In these patients, the invaginate was tried to be disinvaginated conservatively. At the same time, 12 patients managed to disinvaginate conservatively, while the remaining 19 patients failed. Out of the total number of 63 (100%) operated patients, 17 (27%) patients underwent minimally invasive laparoscopic disinvagination. In 8 (13%) patients, it was possible to disinvaginate, and in 9 (14%) patients, due to technical impossibility, they switched to conversion.

In 55 (73.3%) patients, the operation was performed by laparotomic (right pararectal) access. In 52 patients, intestinal intussusception was disinvaginated. In 3 cases, a right-sided hemicolectomy was performed with partial resection of the small intestine and subsequent (second stage)- ileotransverzoanastomosis.

All patients were discharged with recovery. One patient died, it was a child, 6 months old with acute intestinal intussusception, many days ago, complicated by peritonitis on the background of multiple organ failure syndrome.

In our opinion, there should be an individual approach to each patient with this disease, both in the treatment tactics and in the administration before and after the operating period. Each of the selected treatment methods has its own indications and a reasonable approach to a particular type of treatment.

Based on our own material, we analyzed the results of treatment and proposed the most rational approach to the diagnosis and treatment of intestinal intussusception.

Therapeutic tactics for complicated forms of intestinal intussusception were based on the effectiveness of lymphotropic and antibacterial therapy for severe inflammatory processes in the intestine..

Keywords: *intestinal invagination, diagnosis, treatment, laparoscopy, Meckel's diverticulum, children*

1. INTRODUCTION

Intussusception-related intestinal obstruction is a relatively common condition in pediatric abdominal surgery. It frequently occurs in infants and accounts for 70–80% of all acquired forms of intestinal obstruction, and in infants, it represents over 90% of cases and 50% of all types of intestinal obstruction (7).

Delayed diagnosis and inappropriate therapeutic decision-making can lead to serious complications.

Thanks to the research conducted by domestic and international surgeons (1–12), significant improvements have been made in the diagnosis and treatment of this pathology. However, the literature still contains contradictory information regarding the management strategies for this condition.

Objective and Purpose

The aim of this study is to analyze the results of clinical observation and treatment in 75 pediatric patients diagnosed with intussusception-related intestinal obstruction. Optimal treatment approaches are proposed for various forms of this condition.

The purpose of the research was to improve treatment outcomes based on the analysis and selection of the most rational methods of diagnosis and therapy for intestinal intussusception

2. MATERIALS AND METHODS

The study material consisted of 75 children (43 boys and 32 girls) diagnosed with intestinal intussusception who received treatment at the Department of Pediatric Surgery of the Republican Scientific Center for Emergency Medical Care

(RSCEMC) during the period from 2019 to 2022.

The patients were divided by age as follows:

- Under 1 year – 54 children (72%)
- From 1 to 3 years – 13 children (17.3%)
- Over 3 years – 8 children (10.7%)

Table 1. Distribution of Patients by Sex and Age

Sex	Under 1 year	1–3 years	Over 3 years	Total
Boys	30	8	5	43
Girls	24	5	3	32
Total	**54**	**13**	**8**	**75**

A total of 31 patients were admitted within 12 hours from the onset of symptoms; 22 within 24 hours; 16 within 48 hours; 3 within 72 hours; and 3 patients after more than 72 hours.

The diagnosis of intestinal intussusception was based on patient history, clinical presentation, and objective findings from ultrasonography and radiological imaging. In two ambiguous cases, the diagnosis was confirmed through laparoscopic examination.

Ultrasound examination plays a crucial role in the diagnosis of intussusception. Below is an example from our clinical observations using abdominal ultrasound. On the abdominal ultrasound, a characteristic “target sign” (also known as the “donut sign”) is visualized: a hypoechoic outer rim of uniform density (representing the segment of the intestine into which another segment is telescoped) and a central hyperechoic core on the transverse plane (Figure 1).

Figure 1. Intestinal intussusception in an 8-month-old boy.

3. RESULTS AND DISCUSSION

Our treatment strategy for patients with intestinal intussusception was as follows: for those admitted within the first 12 hours from the onset of symptoms, we initially attempted conservative management to reduce the intussusception. For both diagnostic and therapeutic purposes, air was insufflated into the rectum under fluoroscopic guidance using a Richardson balloon. The volume of air was calculated at 150 cm^3 per kilogram of body weight.

Upon clear visualization of the intussuscepted segment, an additional volume of air was introduced to achieve reduction, raising the total air volume within the intestinal lumen to 300 cm^3.

As a result, out of 31 patients admitted within 12 hours, non-surgical reduction of the intussusception was successfully achieved in 12 cases (38.7%). In the remaining 19 patients (61.3%), surgical intervention was required.

Table 2. Types of Performed Manipulations and Surgeries for Intussusception-related Intestinal Obstruction (IIO)

Conservative Method	Minimally Invasive (Laparoscopic) Method	Laparotomic (Traditional) Method
Out of 31 patients, reduction was successful in 12 cases; in 19 cases, it failed and surgical treatment was performed.	Out of 17 patients, reduction was successful in 8 cases. In 9 cases, due to failure of laparoscopic reduction, conversion to open surgery was required.	Out of 55 patients, reduction was successful in 52 cases. In 3 cases, right-sided hemicolectomy with partial resection of the small intestine was performed.

Out of the total 63 (100%) operated patients with this pathology, a minimally invasive laparoscopic method was applied in 17 patients (27%). Among them, successful reduction of the intussusception was achieved in 8 cases (13%). However, due to technical limitations, conversion to open surgery was required in 9 patients (14%).

In 55 patients (73.3%), surgery was performed using a laparotomic approach (right-sided pararectal incision). Intussusception reduction was successful in 52 of these cases. In 3 cases, a right-sided hemicolectomy with partial resection of the small intestine was performed, followed by a second-stage ileotransverse anastomosis.

Among all operated patients, in 3 cases (4.7%) a small bowel–small bowel intussusception was observed; in 2 of them, it was associated with Meckel's diverticulum.

In 7 cases (11.1%), complex intussusception was found (ileocecal, ceco-colic, and colo-colic intussusceptions). One of these cases occurred in the background of total small bowel polyposis (Peutz–Jeghers syndrome), and the patient underwent a second elective surgery two months later.

In 3 patients admitted more than 4 days after the onset of symptoms with signs of peritonitis and necrosis of the intussuscepted segment, a right-sided hemicolectomy with partial resection of the ileum and terminal enterostomy with bowel intubation was performed (in order to prevent enteral insufficiency).

We present an example from our clinical observations: a case of acute intussusception complicated by gangrene of the terminal ileum, cecum, and one-third of the ascending colon, in which a right hemicolectomy with partial resection of the ileum was performed (Figure 2).

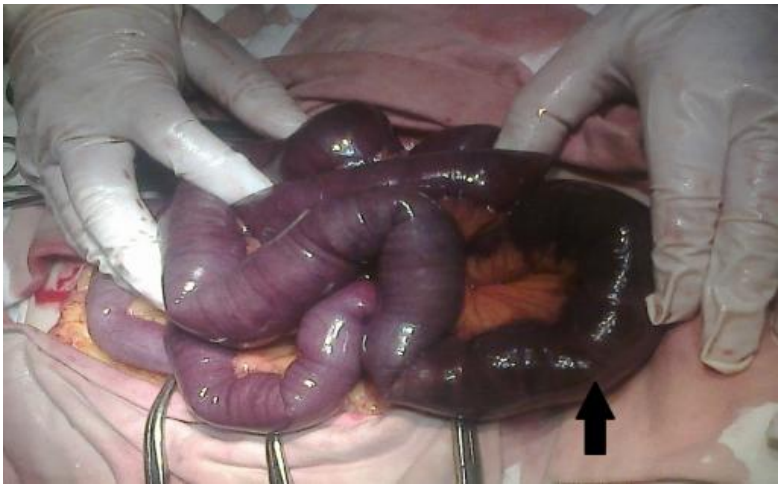

Figure 2. Intestinal gangrene subject to resection.

Bowel resections were performed within visibly healthy tissue margins — no less than 7–8 cm from the necrotic border proximally, and 4–5 cm distally.

In 6 (9.5%) patients who underwent surgery at a later stage of the disease with signs of peritonitis, a cecostomy with intestinal intubation was performed following desinvagination. Mechanical evacuation of intestinal contents in these patients led to a reduction in endogenous intoxication, intra-luminal and intra-abdominal pressure, which in turn improved microcirculation in the bowel wall. This also had a positive impact on respiratory function by reducing intrathoracic tension.

In the second stage of surgery, an ileotransverse end-to-side anastomosis was performed in a planned manner after 2–3 months depending on the patient's condition. All intestinal anastomoses healed satisfactorily; no signs of anastomotic leakage or anastomositis were observed.

Among the 63 operated patients, 47 (74.6%) underwent appendectomy due to secondary changes in the appendix observed after desinvagination.

In 16 patients (25.4%), with pronounced inflammatory and infiltrative changes in the intestinal wall accompanied by peritonitis, a micro-irrigator was intraoperatively installed at the mesenteric root near the ileocecal angle. This device allowed for targeted lymphotropic antibiotic therapy, administered once daily in age-appropriate dosages, increasing the antibiotic concentration at the site of inflammation. In our opinion, this method is highly effective and promotes the resolution of inflammation and restoration of intestinal function.

Given that persistent vomiting causes significant electrolyte loss — especially potassium, which may lead to intestinal paresis — appropriate preoperative resuscitation therapy was conducted to restore homeostasis.

Among the 63 operated patients, there was 1 death (1.6%) — a 6-month-old infant with longstanding acute intestinal obstruction complicated by intussusception, peritonitis, and intestinal bleeding. The patient had an unfavorable premorbid background and died from multiple organ failure.

Based on our analysis, we concluded that the treatment of this pathology requires a differentiated approach tailored to the specific form and stage of the disease.

4. CONCLUSIONS

1. a) Therapeutic tactics should follow a stepwise approach — from simple to complex. In early admissions (within 12 hours), conservative treatment should be attempted first. If ineffective, laparoscopic desinvagination should be employed. In case of technical failure, laparotomy with manual desinvagination should be performed. b) Emergency laparotomy is indicated for patients admitted late with signs of peritonitis or comorbidities that contraindicate laparoscopy (e.g., pneumonia, cardiovascular diseases).
2. Laparoscopic desinvagination is considered appropriate within the early stages of the disease (up to 48 hours), as in later stages bowel wall edema and infiltration often make the procedure technically impossible.
3. Emergency laparotomy is indicated in patients admitted at later stages of disease progression with signs of peritonitis and comorbidities contraindicating laparoscopic surgery (such as pneumonia or cardiovascular conditions).
4. To prevent recurrence of intussusception in cases of excessive mobility of the ileocecal region, **cecopexy** is recommended.
5. In cases with pronounced inflammatory changes in the intestinal wall and signs of peritonitis, it is advisable to place a micro-irrigator in the mesentery near the ileocecal region to allow for **lymphotropic antibiotic therapy**.

In cases of diffuse peritonitis secondary to intestinal intussusception, especially in severe inflammation, the creation of an **enterostomy with intestinal intubation** is considered both pathogenetically justified and effective in preventing **small bowel insufficiency**

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