Surgical treatment's possibilities of late adhesive intestinal obstruction in children.

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Abstract

To study the adhesions prevalence in the abdominal cavity and to determine the possibilities of surgical treatment of Late Adhesive Intestinal Obstruction (LAIO) in children. 73 children were operated on for LAIO. 35 children were in a comparison group (comprehensive treatment by traditional methods) and 38 children were in the main group. In the main group was used an anti-adhesive solution which containing sodium hyaluronate and decamethoxin to prevent recurrence of Adhesive Intestinal Obstruction (AIO). The following surgical interventions were performed: adhesiolysis, adhesiolysis and resection of the small intestine, adhesiolysis and making of the ileostomy, elimination of the cause without total adhesiolysis, elimination of the cause without total adhesiolysis and with resection of the small intestine, elimination of the cause without total adhesiolysis and with making of ileostomy. The Adhesion Process (AP) in the abdominal cavity was evaluated by the type of adhesions and their projection on the anterior abdominal wall. The most common causes of LAIO were adhesive conglomerates (32.88%), moorings (23.28%) and visceral-visceral adhesions (21.92%) in lesser extent visceral-parietal and omental-visceral adhesions, accordingly 10.96% and 10.96%.

In main group recurrent AIO was seen in 3 of 38 children (7.89%) and resolved conservatively. In comparison group recurrent AIO occurred in 7 of 35 children (20%). In comparison group, 4 of 7 children required relaparotomy. The method of cause eliminating was used at AIO without total adhesiolysis using sodium hyaluronate for the operated children. When children were observed between 1 and 7 years, recurrence of AIO was in 1 patient who resolved conservatively. Mesothelium damaging leads to the emergence of the primary AP of the abdominal cavity with spreading to the surrounding structures and projection on the areas of the anterior abdominal wall. In operations for LAIO in children, it is advisable to use the operation of the cause eliminating (separation or resection of the conglomerates, cutting of the mooring) without total adhesiolysis in combination with intraoperative use of sodium hyaluronate solution with decamethoxine.

Keywords: Late adhesion intestinal obstruction, Children, Abdominal cavity.

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Introduction

Surgery for AIO in children is up to 4.2% of the total number of abdominal operations. 30% of patients with AIO are re-admitted to surgical hospitals within 4 years.

Open surgery is the best way to treat AIO in the absence of conservative effect of treatment in case of strangulation [1].

The selection of patients with AIO for laparoscopy remains a controversial issue. The operation consists of visualization of the caecum and proximal following with the intersection of the cause of AIO in the area of the transition zone, control of the restoration of the passage of the chyme.

Adhesion conglomerates, dense and intense of AP are an indicator for the transition to laparotomy. In 20% of open laparotomy is advisable due to hyperplastic AP and the possibility of iatrogenic damage to the abdominal cavity organs [2].

Contributing factors to the AP are the number of laparotomies and the duration of peritonitis.

The incidence of requiring re-intervention after lower laparoscopic surgery AP is up to 2%, after colorectal surgery is up to 4% and 0.76% after appendectomy. A variety of surgical techniques and barrier solutions are available to treat children with AIO.

Materials and Methods

A total of 245 patients with LAIO were examined for the period from 2005 to 2020 in age from 3- to 17-year-old. Conservative treatment was successful in 172 children, 73 children were operated on. For recurrent LAIO were hospitalized 21 children, 11 children underwent surgery.

Indications for laparotomy were: ineffectiveness of conservative therapy for 24 hours from its onset; deterioration of the patient's condition during conservative therapy for 12 hours; symptoms of peritonitis and strangulation (after 2 hours of preoperative preparation).

Of the operated: 35 children were a comparison group (comprehensive treatment by traditional methods) and 38 children - the main group (Table 1).

Table 1. *Distribution of children with LAIO, according to the performed surgical interventions (n=73).*

Distribution of children with LAIO, according to the performed surgical interventions (n=73)		
Surgical interventions	**Main group**	**Comparison group**
Adhesiolysis	12	13
Adhesiolysis and resection of the small intestine	6	4
Adhesiolysis with ileostomy	1	1
Elimination of the cause without total adhesiolysis	12	13
Elimination of the cause without total adhesiolysis and resection of the small intestine	6	3
Elimination of the cause without total adhesiolysis and ileostomy	1	1
Total	38	35

Relaparotomy site

At AIO in the case of appendicitis, performed a median laparotomy, in the case of primary surgery for AIO performed a laparotomy incision with excision of the old postoperative scar, in the case of repeated operations for AIO, performed a laparotomy elsewhere (not on the old scar). This was done due to the hyperplasticity of the AP in secondary relaparotomy for AIO, the possibility of iatrogenic damage of the abdominal cavity structures and the involvement of abdominal organs in the adhesion with the parietal peritoneum of the scar.

Adhesiolysis

Adhesiolysis based on the principle of "from simple to complex". The loop of the small intestine was released from adhesions by dissecting the adhesions with a diatermocoagulator in the proximal and distal directions until complete release of intestinal loops [3]. The condition of the intestinal loops was assessed, if necessary, resection was performed with the imposition of an ileo-ileoanastomosis “end to end”. Chyme was moved from the small intestine, starting from the ligament of Treitz to the large intestine through the ileocecal valve.

Ileostomy

The removal of the ileostomy was due to the signs of peritonitis, infiltrative-inflammatory changes of the distal ileum and the serious condition of children. The imposition of a primary anastomosis was unwarranted due to the high risk of postoperative complications. Resection of the terminal section was performed for 10 to 40 cm. The distal part of the ileum was 3 to 10 cm long. It was necessary to preserve the largest part of the distal part of the ileum and suture it to the parietal peritoneum of the lateral wall of the abdominal cavity.

An overlay of a single-stemmed (terminal) ileostomy was performed in the left iliac region. The ileostomy was performed by forming a peritoneal-muscular-aponeurotic layer with subsequent fixation of the intestinal wall to it. From the abdominal cavity, the mesentery of the stoma area was fixed in the avascular zone to the anterior-lateral wall of the abdomen to prevent evagination. Operations for intestinal continuity restoring began with the "stoma" stage of the surgery. Two enveloping stoma sections, using an electrocoagulator, dissected the skin, subcutaneous tissue. The ileum was released from the aponeurotic muscle and peritoneum, freeing the mesenteric margin. A part of a sterile glove according to the diameter was placed on the stoma. This corresponded to the conditions of maintaining sterility during the surgery.

The next step was performing a right-side transrectal laparotomy. Isolation of the distal part of the blind part of the ileum, even with a significant development of the AP, was not difficult due to its fixation during the previous operation. The blind part of the ileum was taken on the suture holder, and the steel area was moved into the abdominal cavity. When the distance of the distal part of the ileum from the ileocecal valve is more than 5 centimeters and the diameter of the blind end of the Iileum 1⁄2 and more proximal, ileo-ileoanastomosis was applied “end to end” using L-type serous-muscular and inverted through sutures.

Results

When assessing the AP, according to the primary localization, in all cases it was detected at the site of surgery or at the site of mesothelial damage. Thus, in the case of kidney transplantation, which was preceded by peritoneal dialysis, the place of primary localization was considered the entire abdominal cavity, because the damage to the mesothelium was throughout the visceral and parietal peritoneum. In the case of catarrhal appendicitis, the place of primary localization of the AP was the right iliac region. It was important to assess the AP by type of adhesions depending on the previous operation, which allowed to determine the extent of surgery.

Thus, the most common causes of LAIO were adhesive conglomerates (32.88%), moorings (23.28%) and visceral-visceral adhesions (21.92%) in lesser extent visceral-parietal and omental-visceral adhesions, accordingly 10.96 % and 10.96%.

The most common hyperplastic AP was observed in the case of kidney transplantation, which was due to previous peritoneal dialysis in a child. The change in the normal anatomy of the ACO was in AIO in the case of liver transplantation. When separating the adhesions, it was necessary to know the course of the previous surgery. Diffuse peritonitis when using drainage techniques were subsequently accompanied by significant adhesions with deserosion and damage to the mesothelium during their separation.

It should be noted that when using drainage methods of local (42 children), diffuse (19 children) and generalized peritonitis laparotomy access (17 children) and abdominal lavage with ozonated NaCl 0.9% at concentration of 3-5 mg/l, the

development of AIO was observed only in 1 child in the case of local peritonitis and 2 children after diffuse peritonitis, during 7 years of the postoperative period. The signs of LAIO at these children were bought up by conservative therapy (Table 2).

The projection of AP on the anterior abdominal wall by areas should be used to select the method of surgical treatment of LAIO and select the location of trocars for laparoscopic adhesiolysis. Common to all pathologies is the involvement of 3rd site in the AP-regio umbilicalis, because it is projection of the small intestine loops, which are most vulnerable to the AP. During the operation, in this category of patients, it was impossible to establish the primary location of the AP, because there were all types of adhesions with spread to the entire abdominal cavity and projection on all parts of the abdominal wall. Thus, relaparotomies contribute to the further development of the AP.

Table 2. *Distribution of children with LAIO, according to the performed surgical interventions and recurrence of the disease (n = 73).*

Surgical interventions	Main group		Comparison group	
	Number of operated	Number of relapses	Number of operated	Number of relapses
Adhesiolysis	12	2	13	4
Adhesiolysis and resection of the small intestine	6	1	4	1
Adhesiolysis with ileostomy	1	-	1	-
Elimination of the cause without total adhesiolysis	12	-	13	1
Elimination of the cause without total adhesiolysis and resection of the small intestine	6	-	3	1
Elimination of the cause without total adhesiolysis and ileostomy	1	-	1	-
Total	38	3 (7.89 %)	35	7 (20 %)

Discussion

Comparison group 4 of 7 children required relaparotomy. The operated children used the method of eliminating the cause of AIO without total adhesiolysis using sodium hyaluronate. When children were observed for 1 to 7 years, recurrence of AIO was in 1 patient who resolved conservatively.

Thus, the development of adhesions of the abdominal cavity trigger is damage to the mesothelium, which occurs: mechanically (during surgery), due to irritating action, which triggers the mechanisms of the immune response (peritoneal dialysis, installation of drainage) and inflammation [4]. AP occurs primarily at the site of mesothelial damage and is able to spread to surrounding areas and structures of the abdominal cavity, while projecting to different parts of the abdominal wall.

Total adhesiolysis leads to recurrence of AIO to a greater extent than surgery to eliminate the cause without adhesiolysis. The usage of sodium hyaluronate in combination with decamethoxine acts on the pathogenetic links of the formation of adhesions, reducing the number of relapses. Sodium hyaluronate is an active substance that is present in the extracellular matrix, and decamethoxime is an effective antimicrobial agent [5]. Thus, sodium hyaluronate has a barrier function up to 3 days while mesothelial wounds heal and decamethoxine inhibits microbial activity, helps to reduce the density and number of adhesions.

Conclusion

Damage to the mesothelium leads to the primary AP of the abdominal cavity with the spreading to the surrounding structures and projection on the areas of the anterior abdominal wall. The use of abdominal cavity drainages in children provokes the development of AP, so it should be limited and performed only under strict indications. Adhesion conglomerates (32.88%) and moorings (23.28%) are the most common causes of relaparotomies in LAIO in children. In operations on LAIO in children, it is advisable to use the operation of eliminating of the cause (separation or resection of the conglomerate, cutting of the mooring) without providing of total adhesiolysis in combination with intraoperative use of sodium hyaluronate solution with decamethoxine. The projection of the AP on the anterior abdominal wall, depending on the previous operation in children can be used at laparoscopic surgeries performing.

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