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Clinical cases of late adhesive intestinal obstruction after liver and kidney transplantation in children and surgical methods of their treatment



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ABSTRACT

Abdominal adhesions are one of the most common complications in abdominal surgery. To date, a few cases of late adhesive intestinal obstruction (LAIO) as a complication of organ transplantation in children have been described.

THE PURPOSE of the study was to investigate clinical cases of LAIO in a 9-year-old child after liver transplantation, and in an 8-year-old child after kidney transplantation.

MATERIALS AND METHODS. Clinical case I. A 62-day-old girl was treated with Kasai procedure before a liver transplantation, according to type III atresia of the biliary tract. Orthotopic liver transplantation of the left-lateral segments was performed at the age of 9 months. The surgeries were accompanied by damage to the mesothelium and serous membrane, which led to the formation of intraabdominal adhesions. With the growth of the child there was an enlargement of abdominal organs and adhesions stretching. LAIO was diagnosed 8 years after the first surgery.

Clinical case II. The boy was diagnosed with hypoplastic dysplasia of the right kidney, left-side ureterohydronephrosis at an early age, resulting in chronic end-stage renal disease. Peritoneal dialysis was performed at the age of 6 years. The effect of dialysate on the mesothelium led to the formation of small intestine pseudo-diverticula. At the age of 7 years a bilateral nephrectomy and kidney transplantation were performed. At the age of 8 LAIO was diagnosed.

In both cases, children underwent adhesiolysis. The peritoneum was sutured from the lower and upper edges of the wound to the middle, so that a hole remained in the middle of the wound. A Nelaton catheter was inserted through the hole and 250 mL of sodium hyaluronate solution "Defensa" was injected into the left-lateral part, right-lateral abdominal cavity and small pelvis.

RESULTS. The successful surgical treatment of LAIO in children using local adhesiolysis in combination with sodium hyaluronate was performed. The careful handling of vascular anastomoses and changes in organ topography were required during surgery. The purpose of the surgery on LAIO was not only to restore the chyme transport in the gastrointestinal tract, but also to release the small intestine from the adhesions with the normal anatomy and function preservation. The observation of children for 5 years indicates the effectiveness of intraabdominal administration of sodium hyaluronate solution.

CONCLUSION. Surgical technique concerning the LAIO treatment in children after liver or kidney transplantation should be performed in consideration of the changed topographic anatomy of abdominal cavity. The purpose of surgeries for LAIO after organ transplantation should be to restore the gastrointestinal patency and the functional capacity of the intestine, and prevention of recurrence. To prevent the intraabdominal adhesions, sodium hyaluronate can be used intraoperatively.

KEY WORDS: liver transplantation; kidney transplantation; late adhesive intestinal obstruction; adhesiolysis; sodium hyaluronate

There are more than 28,000 liver and kidney transplantations in Europe each year. One of the complications of the postoperative post-transplant period is late adhesive intestinal obstruction (LAIO), which is according to various authors from 0.1 % to 6.7 %, an average of 0.4 % with a mortality of 13.9 % [15].

The most common cause of cholestatic liver disease in young children is biliary atresia. Because Kasai procedure (hepatopertoenterostomy) is effective in only 25-30 % of cases, 70-75 % of children are candidates for liver transplantation. The urgency of performing orthotopic liver transplantation (OLT) is determined by the rate of increase in liver failure and

the need to prevent irreversible disorders of nutritional status and central nervous system. Progression and irreversibility of liver damage are cause of secondary biliary cirrhosis and indications for liver transplantation. The search for a solution to the donor organs shortage has led to the use of living relative donors, which provides expected good graft's quality [1, 5, 13]. The analysis of the transplantation experience of the world's leading clinics with living donation using served as a strong argument for the development of a liver transplantation program from a living relative donor in Ukraine. Since 2001, this program is implemented at the O. O. Shalimov National Institute of Surgery and Transplantology, National Academy of Medical Science of Ukraine.

Transplantation of the left-lateral segments of the liver from a living donor is widely used in pediatric surgery, where the problem of donor liver is particularly relevant. Donating this part of the liver is safe for a donor, which provides extensive use of this method. Early postoperative mortality is 19.2 %, survival up to one year – 70.6 %, survival up to 5 years – 66.7 %. The survival rate of children with liver transplantation up to one year is 54 %, after partial transplantation of the left-lateral segments – 37 % [3, 26].

Kidney transplantation is the optimal treatment for end-stage renal disease (ESRD) with the loss of structure and functions of kidneys in children. Prior to kidney transplantation, children often need hemodialysis (52.2 %) or peritoneal dialysis (47.7 %) [20].

The analysis of scientific papers identified various complications after abdominal organ transplantation. Such as, bile leak into the peritoneal cavity, bile fistulas, failure of cholangiodigestive anastomoses and intestinal anastomoses, hepatic artery stenosis, cancer, graft rejection, etc. [2]. However, there are few data on the occurrence of LAIO after liver or kidney transplantation in children [12]. Abdominal adhesions are the result of trauma at abdominal surgery and are formed in 93 % of cases. LAIO surgeries are complex interventions in pediatric surgery and are accompanied by a high recurrence rate [14, 17-19].

The **PURPOSE** of the study was to investigate clinical cases of late adhesive intestinal obstruction in a 9-year-old child after left lobe liver transplantation, and in an 8-year-old child after right kidney transplantation. Examples of successful surgical treatment of LAIO using local adhesiolysis in combination with sodium hyaluronate are presented.

CLINICAL CASE I

A 9-year-old patient H., (born on July 12, 2006), was hospitalized to the Department of Pediatric Surgery on March 20, 2016, with complaints of repeated vomiting, lack of stool and gas passing, which were observed within 9 hours.

History of disease: congenital malformation, biliary tract atresia, Kasai I procedure and left-lobe liver transplantation (segments II-III of lateral section) from a living relative donor at the age of 9 months.

Due to the importance of previous surgical treatment before LAIO in patients who have undergone liver or kidney transplantation, we consider it appropriate to describe these techniques.

Kasai I procedure technique. At the age of 62 days, the child underwent Kasai procedure for type III biliary atresia (fibrous obliteration of all extrahepatic bile ducts). An incision was made in the right hypochondrium according to Fedorov technique. After the porta hepatis was revised, the gallbladder with hypoplasia and fibrous cord which went to the porta hepatis was mobilized. The fibrous area was excised to the site of the expected spot of the bile ducts. A jejunum was transected at a distance of 15 cm from ligament of Treitz. The distal part of jejunum is sutured and transfer to the porta hepatis through a window in the mesentery of the colon. Portoenteroanastomosis was formed by a single-row polydioxanone monofilament suture. Intestinum was sutured by end-to-side enteroenteroanastomosis using serous-muscular-submucosal sutures. An intussusception valve was formed into the isolated Roux loop and porta hepatis was drained.

At the age of 9 months she was hospitalized at the O. O. Shalimov National Institute of Surgery and Transplantology, National Academy of

Medical Science of Ukraine, with a diagnosis of biliary atresia (congenital malformation), secondary biliary cirrhosis, decompensated portal hypertension, splenomegaly, hypersplenism grade 2, ascites. After preoperative preparation, orthotopic liver transplantation was performed using the left-lateral segments graft from a living relative donor.

Technique of OLT using the left-lateral segments graft from relative donor. The transplantation surgery in childhood had a number of features associated with a small size of the abdominal cavity, as well as the presence of hepatomegaly, splenomegaly, portal hypertension. Previous Kasai I procedure was a complicating factor in transplantation.

Hepatectomy was performed after the excision of liver ligamentous apparatus and supra-, sub-, and retrohepatic parts of vena cava inferior mobilization, and dissection along the entire length of the hepatoduodenal ligament (taking into account the previous Kasai I procedure). Hepatectomy was included: ligation and dissection of lobular hepatic arteries; the portal vein clamping with a vascular clamp over the junction of superior mesenteric and splenic veins, the suprahepatic part of the vena cava inferior; the liver's parenchyma was cut off over the vena cava inferior with preservation a small fragment above it; longitudinal dissection of the rest of the liver over the vena cava inferior; ligation, clipping and short veins excision, mainly draining the first segment and directed to the vena cava inferior from the right-lobe of the liver.

After skeletalization and verification of the vena cava inferior integrity, hepatocaval and portoportal vascular anastomoses were performed. Clamps were stepwise removed from the supra-hepatic part of the vena cava inferior, portal vein, then from the subhepatic part of the vena cava inferior. The hepatic artery of the recipient was anastomosed with the hepatic artery of the graft. Biliary reconstruction was performed by Roux hepaticojejunostomy (Fig. 1).

Previously, there were no visits to the surgical department about abdominal pain or obstruction in the child. The child was hospitalized with LAIO in serious condition. The skin was pale, with a gray tinge. Heart tones were sonorous, rhythmic, heart rate – 98 bpm, blood pressure – 120/90 mm Hg. Vesicular respiration was auscultated in the lungs. The tongue was dry. The abdomen was not involved in the breathing, increased in size, asymmetric in the epigastric and left-lateral areas; palpation was sharply painful. There were no signs of peritoneal irritation, peristalsis was significantly decreased. "Splash noise" was detected. X-ray examination demonstrated Kloiber's bowls.

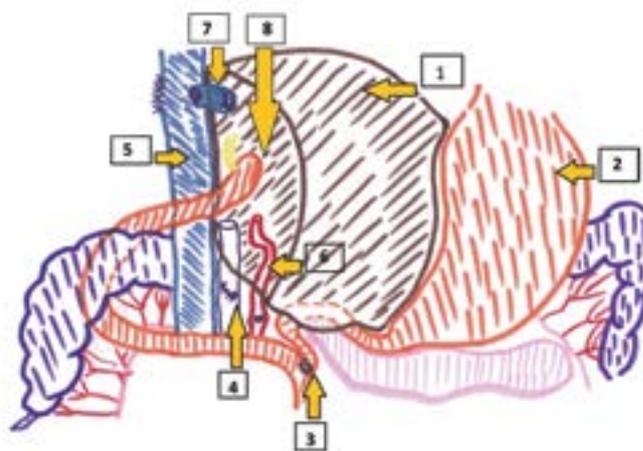


Fig. 1. Scheme of hepatocaval reconstruction after the left-lobe liver transplantation in a patient H. Biliary reconstruction. Roux-en-Y hepaticojejunostomy.

Notes: 1 – liver, 2 – stomach, 3 – excluded loop of the small intestine, 4 – portoportal anastomosis, 5 – vena cava inferior, 6 – hepatic artery anastomosis, 7 – hepatocaval anastomosis, 8 – hepaticojejunal anastomosis.

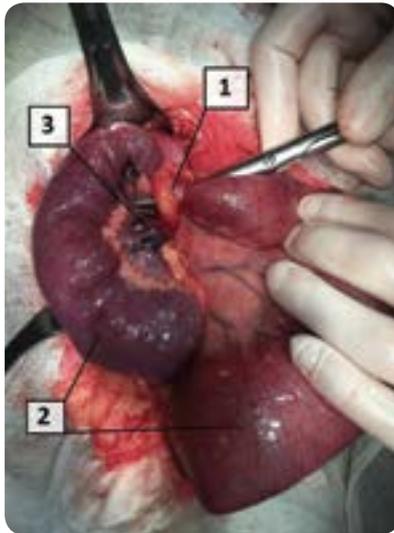


Fig. 2. Late adhesive intestinal obstruction in 9-year-old patient H. Notes: **1** – visceroparietal cord-like adhesion; **2** – swollen afferent intestine loop and empty efferent loop; **3** – ischemic small intestine mesentery.

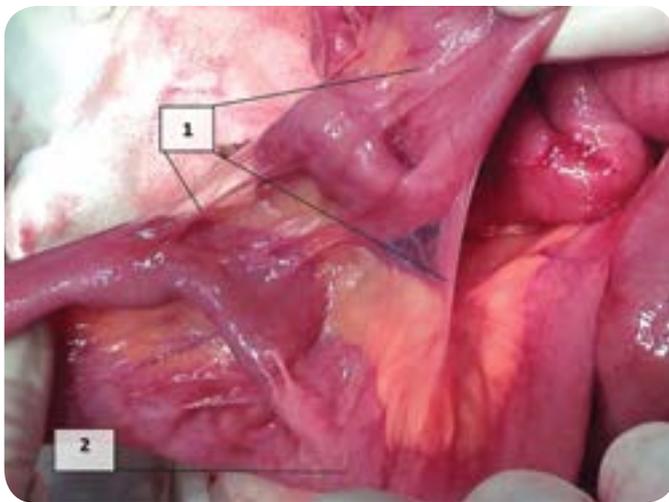


Fig. 3. Adhesions of Roux anastomosis area in 9-year-old patient H. Notes: **1** – interloop adhesions, **2** – Roux jejunojunctional anastomosis.

There was no effect from conservative management of LAIO for 6 hours, the patient's clinical condition deteriorated, which was an absolute indication for surgery. The laparotomy and adhesiolysis for LAIO treatment were performed.

Technique of the surgery. After surgical site preparation, an upper-median laparotomy was performed. Examination revealed that the lower edge of the liver was tightly adherent to the parietal peritoneum in the upper corner of the wound. Adhesive conglomerate was found in the upper-middle-lateral part of the abdomen, mostly on the right, which was represented by loops of the small intestine, the area Roux anastomosis, the area of the transverse colon and the omentum flat. The proximal part of the small intestine is swollen and enlarged, slightly hypertrophied. Luminal narrowing of the proximal intestine was by more than 90 % of the visceroparietal cord-like adhesions, which extended from the root of the small intestine mesentery to the parietal peritoneum on the right side. The torsion of the jejunum and 2/3 of the ileum around the adhesion was identified (Fig. 2).

1/3 of the ileum is adhesions free and contains a small volume of chyme. Viscero-parietal cord-like adhesions are dissected and the area of the jejunum is straightened. As the patency was not restored in this way, the adhesions in proximal parts of the small intestine were eliminated from the free loop in the caudal direction. (Fig. 3)

Some areas of the intestine that were free of serous membrane during surgery were sutured. After restoration of patency, manual passage

of chyme from small intestine to the colon was performed. At the end of the surgery, 250 mL of "Defensal" solution (Yuriya-Pharm, Ukraine) was injected into the abdominal cavity to prevent recurrence of intra-abdominal adhesions. Multifunctional anti-adhesive solution "Defensal" contains 1250 mg sodium hyaluronate, 50 mg decamethoxine in 250 mL of succinate buffer at pH 7.3.

The postoperative period passed without complications, the wound was clean, healed with primary intention, on the 7th day the sutures were removed. On the 12th day the child was discharged from the hospital in satisfactory clinical condition. When the child was observed for 6 years, there was no evidence of adhesions or LAIO.

This case is interesting because this category of surgery must be guided by the anatomical structure that was performed during the liver transplantation. Necessary manipulations in the area of the liver, vascular anastomoses and Roux jejunojunctional anastomosis with inadequate surgical technique could lead to their damage, complicated adhesiolysis and unfavorable outcome of the surgery. Due to etiopathogenesis, adhesions occurred immediately after liver transplantation, but with the age of the child there was growth of abdominal organs and newly-formed anatomical structures during transplantation, which caused late adhesive intestinal obstruction.

CLINICAL CASE II

An 8-year-old patient I. (born on December 19, 2007), was hospitalized to the pediatric surgery department on May 24, 2016, with complaints of an increase of abdomen size, repeated vomiting, lack of stool and gas, which were observed within 10 hours.

History of disease: ESRD, terminal stage due to dysplasia of the right kidney, left-sided uretero-hydronephrosis. Condition after the kidney transplantation from deceased donor (05.12.2015). Secondary mild hypertension. Secondary severe hyperparathyroidism with deformation of the lower extremities, Hypovitaminosis D. Severe growth retardation, malabsorption syndrome, delayed psychomotor development, viral hepatitis C, latent period. Condition after bilateral nephrectomy (December 5, 2015).

Due to the long time required for the selection of the donor kidney, decreased glomerular filtration below 10 mL/min, oliguria and manifestations of ESRD (hyperkalemia, metabolic acidosis, renal edema, skin itch, tremor, seizures) the child was on peritoneal dialysis.

Kidney transplantation technique. The child underwent medial trans-abdominal access, right nephrectomy due to hypoplastic dysplasia of the right kidney and left nephrectomy due to terminal stage uretero-hydronephrosis. The right side of the colon was mobilized and displaced medially to free the retroperitoneal space. Psoas major muscle, distal aorta and proximal iliac vessels were identified. The renal artery was anastomosed to the distal aorta and the renal vein to the distal vena cava; ureter anastomosed with bladder. The graft was placed behind the cecum on the right (Fig. 4).

Upon hospitalization for LAIO, the conservative management for 8 hours was not effective, the child's clinical condition deteriorated; there was asymmetry of the abdomen, more to the right, repeated vomiting, and no stool. Due to the above, the child underwent surgery: the laparotomy and adhesiolysis for LAIO treatment were performed.

Technique of surgery. After surgical site preparation, excision of the previous postoperative scar was performed and made access to the abdominal cavity. Revision of the abdominal cavity revealed a pronounced adhesive conglomerate, which was represented by small intestine with pseudo-diverticula (Fig. 5).

The small intestine with adhesive layer was moved to the right. The dissection of the adhesions with the release of the small intestine to the right lateral part of the abdominal cavity was performed. In the area of kidney transplantation, there were an adhesion process between the cecum, greater omentum and ileum, which is close to the area of vascular anastomoses. Dissection of the adhesion conglomerate with restoration of the anatomical structure was performed (Fig. 6).

Isolation of the ileum from vascular anastomoses wasn't performed because it was hazardous and unreasonable due to the normal patency of

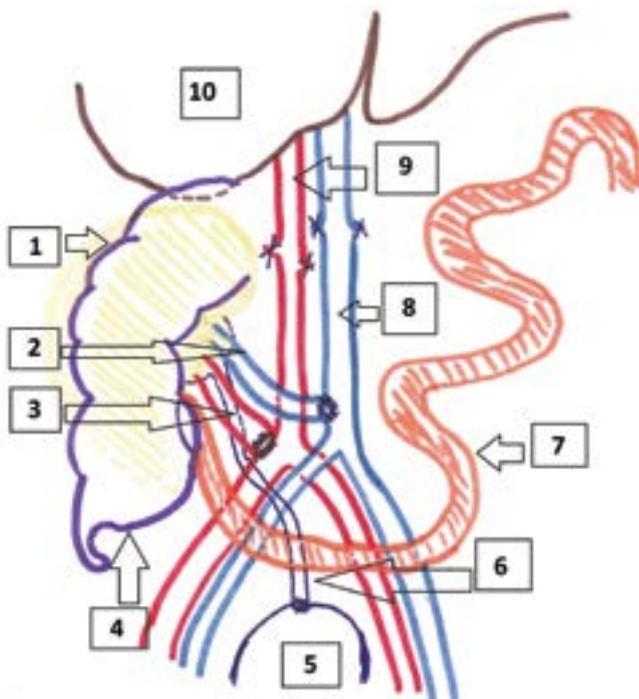


Fig. 4. Right kidney transplantation technique in patient I.
Notes: 1 – renal graft; 2 – renal vein; 3 – renal artery; 4 – caecum; 5 – bladder; 6 – ureter; 7 – small intestine; 8 – vena cava inferior; 9 – aorta; 10 – liver.

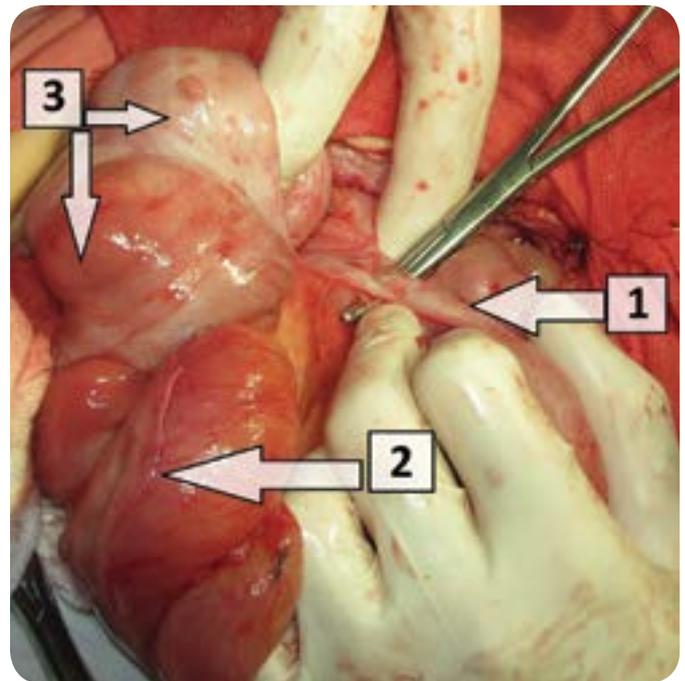


Fig. 6. Dissection of adhesions and pseudo-diverticula in 8-year-old patient I.
Notes: 1 – interloop adhesions; 2 – adhesive layer; 3 – pseudo-diverticula.

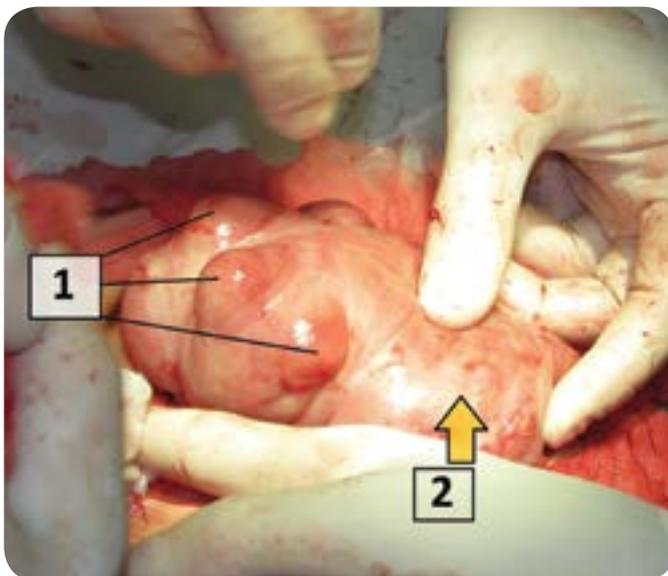


Fig. 5. Pseudo-diverticula (1) and adhesive layer (2) in 8-year-old patient I.

the ileum in this area. The small intestine chyme was passed into large intestine. Control of hemostasis was performed. At the end of the surgery, 250 mL of anti-adhesive solution “Defensal” was injected into abdominal cavity to prevent recurrence of intra-abdominal adhesions.

The postoperative period passed without complications, the wound was clean, healed by primary intention. Kidney function was satisfactory. On the 12th day the boy was discharged home. When observing the child

for 5 years – the clinical condition is satisfactory, there were no complaints.

The complexity of this case was that the reason for the adhesion process was not only the kidney transplantation, but also peritoneal dialysis, which led to the formation of adhesive layers, pseudo-diverticula of the small intestine and LAIO. Dissection of the adhesions in the areas of vascular anastomoses was not performed to prevent complicated adhesiolysis.

DISCUSSION

In the case of a child who underwent LAIO surgery after liver transplantation, several relaparotomies during Kasai I procedure and the liver transplantation surgery were a cause for the hyperplastic adhesions formation. They were accompanied by damaging of mesothelium and the serous membrane, which led to the formation of intra-abdominal adhesions. With the growth of the child there was an enlargement of abdominal organs with adhesions stretching, which resulted in the development of LAIO 8 years after the first surgery.

When performing surgical intervention on LAIO, it was necessary to be as careful as possible to the area of vascular anastomoses in consideration of the altered topography of the organs while restoring the passage of the chyme.

In the case of a child with a kidney transplant, a peritoneal dialysis and transplantation caused adhesions. But the effect of dialysate on the mesothelium led to the formation of pseudo-diverticula of the small intestine. The purpose of the surgery on LAIO was not only to restore the passage of the chyme, but also to release the small intestine from the adhesive layers with the restoration of anatomic position and preservation of function.

The use of antiadhesive “Defensal” solution in both cases and the observation of children for 5 years indicate the effectiveness of its application for LAIO treatment.

CONCLUSION

1. **Surgical technique concerning the LAIO treatment in children after liver or kidney transplantation should be performed in consideration of the altered topographic anatomy of abdominal cavity.**
2. **The purpose of LAIO surgery should be to restore gastrointestinal patency and the functional capacity of the intestine, without violating the previous anatomy as well as prevention of recurrence. This may be realised by local adhesiolysis in combination with intraoperative application of sodium hyaluronate solution «Defensal».**

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Клінічні випадки пізньої спайкової кишкової непрохідності після трансплантації печінки та нирки у дітей та способи їх хірургічного лікування



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РЕЗЮМЕ

Спайковий процес в черевній порожнині є одним із найбільш частих ускладнень в абдомінальній хірургії. У 56-70 % він є причиною непрохідності тонкої кишки, що досить часто потребує повторних оперативних втручань. В літературі описано небагато випадків пізньої спайкової кишкової непрохідності (ПСКН), як ускладнення трансплантації органів у дітей.

МЕТА РОБОТИ. Описати клінічні випадки ПСКН у дитини 9 років після трансплантації печінки та у дитини 8 років після трансплантації нирки.

МАТЕРІАЛИ ТА МЕТОДИ ДОСЛІДЖЕННЯ. Клінічний випадок 1. Дівчинці у віці 62 доби після констатації атрезії жовчовивідних шляхів III типу була проведена операція Касаї I, як паліативний спосіб продовження життя до трансплантації печінки. У віці 9 місяців було виконана ортотопічна трансплантація лівої латеральної секції печінки від живого родинного донора. Операції супроводжувались ушкодженням мезотелію та травматизацією серозної оболонки, що призвело до утворення інтраабдомінальних зрощень. З ростом дитини відбувався ріст органів черевної порожнини та розтягування спайок, наслідком чого стало формування ПСКН через 8 років після першої операції.

Клінічний випадок 2. Хлопчику у ранньому віці було діагностовано гіпопластичну дисплазію правої нирки, уретерогідронефроз зліва, наслідком чого була термінальна стадія хронічної ниркової недостатності. У віці 6 років проведений перитонеальний діаліз. Вплив діалізу на мезотелій призвів до утворення псевдо-дивертикулів тонкої кишки. У віці 7 років виконано двобічну нефректомію та трансплантацію нирки від померлого донора. У 8 років діагностовано ПСКН.

В обох випадках дітям виконали операції адгезіолілізу. Наприкінці оперативного втручання зашивали очеревину від країв рани до середини, залишаючи отвір, через який вводили катетер Нелатона. В лівий та правий латеральний відділи черевної порожнини і в малий таз через катетер вводили 250 мл розчину гіалуронату натрію «Дефенсаль». Пошарово зашивали передню черевну стінку.

РЕЗУЛЬТАТИ. Проведено успішне хірургічне лікування ПСКН у дітей за допомогою місцевого адгезіолілізу в поєднанні з розчином гіалуронату натрію. Виконання операції потребувало обережного поводження з судинними анастомозами та урахування зміненої топографії органів. Метою лікування ПСКН було не тільки відновлення пасажу хімусу в шлунково-кишковому тракті, а й звільнення тонкої кишки від спайок із збереженням її нормальної анатомії та функції. Спостереження за дітьми протягом 5 років свідчать про ефективність внутрішньочеревного введення розчину гіалуронату натрію.

ВИСНОВКИ. Метою операцій при ПСКН після трансплантації органів має бути відновлення прохідності шлунково-кишкового тракту та функціональної здатності кишки без порушення «післятрансплантаційної» анатомії, а також попередження рецидиву захворювання. Для профілактики виникнення інтраабдомінальних зрощень можна використовувати інтраопераційно розчин гіалуронату натрію.

КЛЮЧОВІ СЛОВА: трансплантація печінки; трансплантація нирки; пізня спайкова кишкова непрохідність; адгезіолізіс; гіалуронат натрію



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