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Diagnostic value of clinical investigation of children with adhesive intestinal obstruction

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Relevance. Early diagnosis and objective determination of the presence and degree of intestinal obstruction is important for practicing surgeons. The abdominal X-ray examination, the contrast passage examination, and in some cases computer tomography are used for clinical confirmation of this pathological condition.

Purpose – to reveal the diagnostic value of clinical investigation methods in children with adhesive intestinal obstruction.

Materials and methods. We followed up 89 children with adhesive intestinal obstruction. All the children, in addition to a complete clinical physical examination during hospitalization, had the clinical investigation in order to verify the diagnosis: X-ray examination and ultrasound examination of the abdominal organs.

Results. According to our data, the main signs of intestinal obstruction at the X-ray examination of the abdominal cavity were the absence of gas in the large intestine (66; 74.2%), hydroaeric levels or Kloiber's cups (58; 65.2%) and dilation of small intestine loops ≥3 cm (37; 41.6%); at the ultrasound of the abdominal organs – dilation of the small intestine loops ≥3 cm (70; 78.7%) and an ineffective peristalsis (33; 37.1%).

Conclusions. Rapid diagnosis of the surgical disaster in children with suspected adhesive intestinal obstruction and important information is provided by X-ray examination and ultrasound examination of abdominal organs. Ultrasound diagnosis of abdominal organs in patients with peritoneal adhesions is non-invasive and sufficiently informative for multiple monitoring of the disease and the effectiveness of treatment without negative impact on the patient.

The research was carried out in accordance with the principles of the Helsinki Declaration. The study protocol was approved by the Local Ethics Committee of all participating institutions. The informed consent of the patient was obtained for conducting the studies.

No conflict of interests was declared by the authors.

Keywords: children, diagnosis, clinical investigations, adhesive intestinal obstruction.

Діагностична цінність інструментального обстеження дітей із спайковою кишковою непрохідністю

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Важливим для практикуючих хірургів є рання діагностика та об'єктивне визначення наявності й ступеня кишкової непрохідності. Для інструментального підтвердження цього патологічного стану використовується оглядова рентгенографія органів черевної порожнини, дослідження пасажу контрасту, в окремих випадках комп'ютерна томографія.

Мета – виявити діагностичну цінність інструментальних методів обстеження в дітей зі спайковою кишковою непрохідністю.

Матеріали та методи. Під нашим спостереженням перебували 89 дітей зі спайковою кишковою непрохідністю. Усім дітям, окрім повного загальноклінічного фізикального обстеження при госпіталізації, для верифікації діагнозу проведено інструментальне обстеження: оглядова рентгенографія та ультразвукове дослідження органів черевної порожнини.

Результати. За нашими даними, головними ознаками кишкової непрохідності при оглядовій рентгенографії органів черевної порожнини були відсутність газу в товстій кишці (66; 74,2%), гідроаеричні рівні або чаші Клойбера (58; 65,2%) та розширення петель тонкої кишки ≥3 см (37; 41,6%); при УЗД органів черевної порожнини – розширення петель тонкої кишки ≥3 см (70; 78,7%) та неефективна перистальтика (33; 37,1%).

Висновки. Швидку діагностику хірургічної катастрофи в дітей із підозрою на спайкову кишкову непрохідність і важливу інформацію забезпечують оглядова рентгенографія та ультразвукове дослідження органів черевної порожнини. Ультразвукова діагностика органів черевної порожнини в пацієнтів із перитонеальними спайками є неінвазивним і достатньо інформативним для багаторазового моніторингу захворювання та ефективності лікування без негативного впливу на пацієнта.
Дослідження виконано відповідно до принципів Гельсінської декларації. Протокол дослідження ухвалено Локальним етичним комітетом усіх зазначених у роботі установ. На проведення досліджень отримано інформовану згоду батьків, дітей.
Автори заявляють про відсутність конфлікту інтересів.

Ключові слова: діти, діагностика, інструментальне дослідження, спайкова кишкова непрохідність.

Introduction

The success of recent years in the study of the pathogenesis and prevention of the adhesion process and the introduction of minimally invasive surgical techniques, unfortunately, did not significantly help in solving the problem of the adhesive intestinal obstruction (AIO). Postoperative adhesions prevail in the structure of both immediate postoperative complications and long-term consequences. According to modern literature data, in pediatric practice, about 5% of patients require inpatient treatment concerning the postoperative AIO, while after intervention on the small intestine this complication takes place the most often – in every 10th child [3,5–8]. Up to 60% of all relaparotomies in children are performed for acute intestinal obstruction (IO) caused by adhesions. Besides, up to 7% of patients have a recurrent course of AIO, which requires repeated hospitalizations and relaparotomy and significantly reduces the quality of life of the child [3,7,12]. Besides, adhesions lead to chronic digestive disorders and pain syndromes, which is especially undesirable in pediatric practice, taking into account high requirements for full rehabilitation and restoration of the quality of life of patients.

So, early diagnosis and objective determination of the presence and degree of IO is important for practicing surgeons. For the clinical confirmation of this pathology, abdominal X-ray, study of the contrast passage (barium suspension or triombrast), and in some cases computer tomography [1,2,4] are used.

With abdominal X-ray typical signs of mechanical IO are hydroaeric levels (Kloiber's cups) of the different diameter, intestinal arches, dilation of small intestine loops. The absence of gas in the large intestine is considered a sign of complete obstruction. Pneumoperitoneum is a sign of a complicated course of the disease with perforation of the gastrointestinal tract (GIT) caused by necrosis [4,9].

If there are no pathognomonic X-ray signs, the contrast passage along the GIT is examined. At the same time, according to modern clinical recommendations [8,12], the oral administration of water-soluble hyperosmolar contrast agents plays not only a diagnostic, but also a therapeutic role, inducing IO arrest. The delivery of contrast to the large intestine within 48 hours is considered to be the obstruction removal criterion.

Ultrasound imaging of the abdominal cavity plays an additional role in the case of apparent clinical and X-ray picture of acute IO, but remains the main verification method of imaging at the examination of children with abdominal syndrome, in particular in acute appendicitis and its complications, taking into account the speed, availability and informativeness of the method without exposure of a child [10,11]. Polypositional abdominal ultrasound helped in imaging the intra-abdominal localization of the level of obstruction, additionally determine the indications to urgent surgery or conduct dynamic monitoring of the AIO conservative treatment effectiveness.

However, in the literature, there is no comparative characteristic of radiological and sonographic signs of intestinal obstruction in children, which was the aim of our study.

The purpose of the study – to determine the diagnostic value of clinical investigation methods in children with AIO.

Materials and methods of the study

89 children with AIO were under supervision at the surgical departments of the Odessa Regional Children's Clinical Hospital. All children, in addition to a complete the clinical physical examination during hospitalization, had the clinical investigation for the purpose of verifying the diagnosis: abdominal X-ray and abdominal ultrasound. The abdominal X-ray as the main method of clinical diagnosis of AIO, as well as clinical manifestations, depended on the age of the pathological process, its prevalence and localization. In most cases (66; 93.0%) of complete obstruction the abdominal X-ray was sufficiently informative to confirm the diagnosis due to the presence of typical X-ray signs: hydroaeric levels of different diameter, intestinal «arches» in combination with the absence of gas in the large intestine.

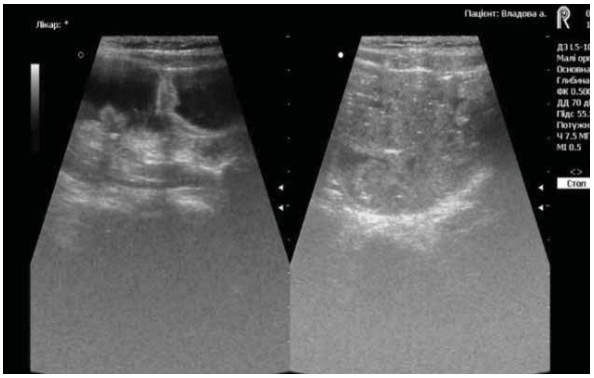
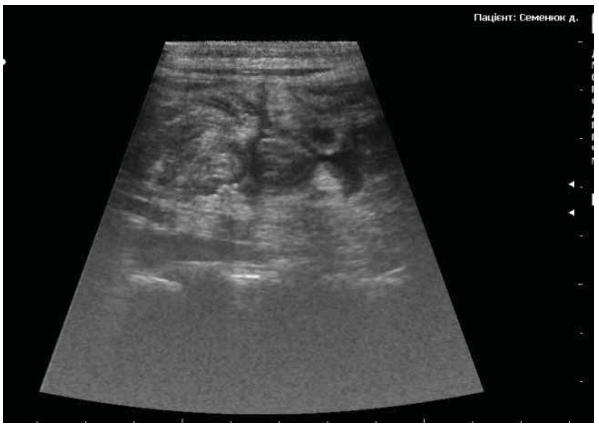
Ultrasound examination revealed thickening of the intestinal walls, overstretching of the lumen of the intestine with its contents, fixed loops or the mass formation from the intestinal loops, and the presence of fluid in the abdominal cavity.

Abdominal ultrasound was carried out with a Siemens Sonoline SL-1 device and a portable ultrasound device Sonosite Edge II using linear and convex sensors with a power of 5–9 MHz.

Besides, we actively use ultrasound for postoperative monitoring of recovery of intestinal peristaltic activity and dynamics of intra-abdominal changes in the course of peritonitis.

Table 1

Characteristics of X-ray and ultrasound image in children with early adhesive intestinal obstruction (EAIO)

Diagnosis	Abdominal X-ray	Abdominal ultrasound
Early adhesive-paretic intestinal obstruction, acute course (the 4th day of the postoperative period of appendicular peritonitis)	 *a* Multiple hydroaeric levels throughout the abdomen.	 *b* A decrease in the sharpness of the contours and thickening of the intestinal walls, a decrease in the movement of intestinal contents, the presence of fluid in the abdominal cavity.
Early adhesive-obstructive intestinal obstruction, acute course (the 9th day of the post-operative period of appendicular peritonitis)	 *c* Multiple hydroaeric levels of different diameter are not located throughout the abdomen.	 *d* Stretched immobile intestinal loops, the presence of adhesions against the background of fluid in the abdominal cavity.
Early adhesive delayed intestinal obstruction, acute course 3 weeks of the postoperative period of appendicular peritonitis)	 e Solitary hydroaeric levels of different diameter are located in the mesogaster.	 *f* Fixed immobile intestine loops, wall spasms.

According to modern data, abdominal ultrasound is a highly sensitive and specific method for examining patients, provided that there is no flatulence, careful preparation of the patient for examination, and the use of modern ultrasound scanners, which make it possible to obtain a high-quality image [4,10,11].

Research was conducted in accordance with the standard of bioethics and was approved by the institution's ethics committee.

The research was carried out in accordance with the principles of the Helsinki Declaration. The research protocol was approved by the Local Ethics Committee of all institutions mentioned in the work. Informed consent of the children's parents was obtained for the research.

Results and discussion

In early adhesive-paretic intestinal obstruction (EApIO), abdominal X-ray made it possible to detect multiple horizontal levels of fluid in delated intestinal loops throughout the abdomen. Depending on the degree of paresis and severity of the clinical picture, abdominal dilatation was determined caused by air in the loops, which increased the diameter of the intestine (Table 1a).

Abdominal ultrasound in children with EApIO in all cases revealed a decrease in the sharpness of the contours and thickening of the intestinal walls due to the tissues swelling of the organ structures during long-term inflammation, the intestine loops overstretching with contents along the entire length, which led to a decrease in peristalsis; the presence of fluid in the abdominal cavity was the evidence of peritonitis (Table 1b).

In early adhesion-obstructing intestinal obstruction (EAoIO) on the abdominal X-ray the number of hydroaeric levels is slightly less than in adhesive-paretic obstruction, their diameter was different, and their location was not throughout the whole abdomen. The amount of air in the intestinal loops depended on the severity of clinical manifestations (Table 1c).

In cases of EAoIO ultrasound made it possible to visualize not only aperistaltic intestinal loops delated with contents, but also to determine the level of obstruction due to different diameter of the intestine, fixation of the loop with an adhesion against the background of transparent fluid in the abdominal cavity (Table 1d).

The occurrence of the delayed early obstruction was always accompanied by both changes in the clinical course and the peculiarity of the X-ray and ultrasound picture. Since the inflammatory process in the abdominal cavity has been already arrested, the severity of the manifestations depended on the morphological structure of the adhesion, which compressed the intestinal loop and led to strangulation. The diameter of the levels and the amount of air in the intestines depended on the age of the disease at the time of the examination. Solitary hydroaeric levels of the different diameter above the place of obstruction were found more often (Table 1e).

At this point of the adhesive obstruction occurrence, ultrasound revealed fixed intestinal loops, sometimes the mass of loops with scarcely noticeable movement of the contents due to spasm of the wall, peristalsis was preserved in other areas. The diameter of the intestines differed in different areas (Table 1f). This condition was accompanied by a vivid clinical picture: the child complained of spasm-like pain, repeated vomiting, and delayed defecation. According to the clinical picture, the abdominal X-ray also differed.

Late adhesive intestinal obstruction (LAIO) is characterised by the presence of dense adhesions that stretched the intestinal wall, which led to the local blood supply disorder and intestinal necrosis. So, during the very acute course of LAIO, very clear single hydroaeric levels of different diameter were localized above the level of obstruction, and intestinal air arches pronouncedly indicated to disaster in the abdominal cavity (Table 2a). The picture of the abdominal X-ray did not change during dynamic monitoring.

During the abdominal ultrasound in such a child, besides of the intestinal loop fixation, overstretching of the intestinal loops of various diameter, areas of increased haustration or spasm, and immobile intestinal contents were imaged (Table 2b).

We present the following example of the abdominal X-ray with an acute course of LAIO. In these cases, solitary hydroaeric levels are not as pronounced as with very acute course, their number can be increased, the air «arches» are not tense (Table 2c). However, during the re-examination, when the clinical condition worsens, the abdominal X-ray picture looks like the picture of the very acute course of LAIO.

In these cases, abdominal ultrasound reveals the place of fixation of intestinal loops of various diameter, their overstretching, aperistaltic areas with immobile contents or spasm (Table 2d). With fluid in the abdominal cavity polypositionally, adhesions themselves can be visualized as cords.

At the subacute course of LAIO, signs of partial intestinal obstruction were usually clinically determined, accordingly, at abdominal X-ray the Kloiber's cups were single, of different diameter or multiple small along with moderate pneumatization of intestinal loops (Table 2e).

The subacute course of LAIO was most often treated with conservative treatment, therefore during dynamic monitoring, the picture of abdominal X-ray changed rapidly, there were no hydroaeric levels.

According to this condition, ultrasound of the abdominal cavity also determined moderate intestinal pneumatosis; heterogeneity of intestinal motility, the fixation site could not be visualized even with polypositional examination (Table 2f).

If the clinical manifestations of the postoperative AIO were not clear enough or in cases of unclear X-ray pic-

Table 2
Characteristics of X-ray and ultrasound pictures in children with late adhesive intestinal obstruction

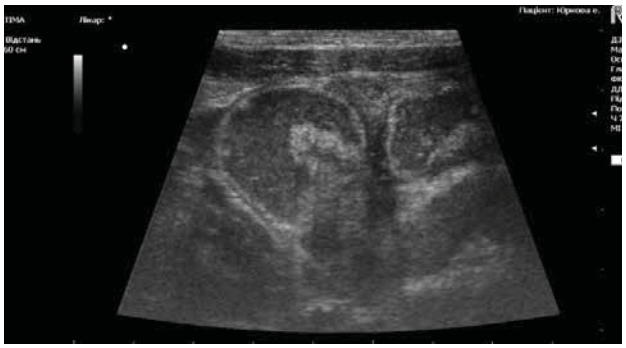
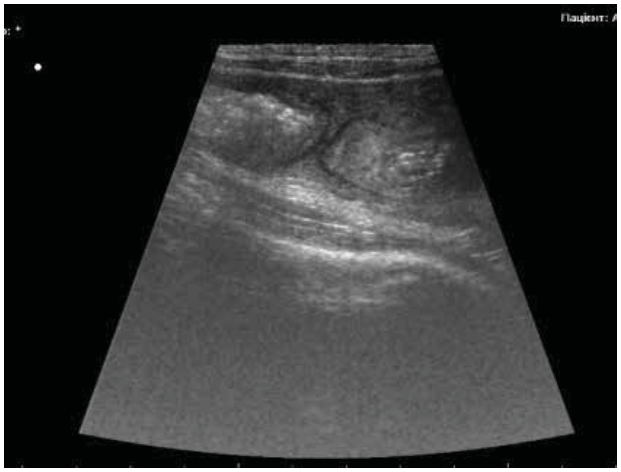
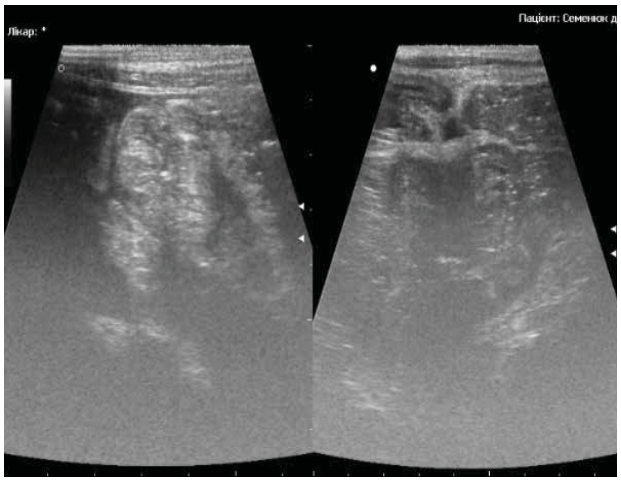
Postoperative period	**Abdominal X-ray**	**Abdominal ultrasound**
Very acute course, 3 months of the postoperative period of appendicular peritonitis	 *a* Single clear hydroaeric levels of different diameter, air arches of the intestines.	 *b* Overstretched immobile intestine loops, pronounced haustration.
Acute course, 6 months of the postoperative period of appendicular peritonitis	 *c* Single dim hydroaeric levels of different diameter, air «arches».	 *d* Overstretched fixed immobile intestinal loops, pronounced haustration.
Subacute course, 12 months of the postoperative period of appendicular peritonitis	 *e* Small hydroaeric levels of different diameter, moderate intestinal pneumatosis.	 *f* Moderate intestinal pneumatosis.

Table 3
Frequency of detection of typical signs of intestinal obstruction during clinical investigation in children

A sign of intestinal obstruction		Frequency of detection	
		Abs	%
X-ray, n=89	Hydroaeric levels (Kloiber cups)	58	65.2
	Intestinal «arches»	17	19.1
	Dilation of small intestine loops ≥3 cm	37	41.6
	Absence of gas in the large intestine	66	74.2
	Pneumoperitoneum	1	1.1
	Absence of characteristic signs	24	26.9
Ultra-sound n=89	Dilation of small intestine loops ≥3 cm	70	78.7
	Inefficient peristalsis	33	37.1
	Swollen mesentery	15	16.9
	Interloop effusion	39	43.8
	Free fluid in the small pelvis	22	24.7
	Free fluid in Morison's pouch	4	4.5
	Thickening of the intestinal wall	17	19.1
	Intramural gas	2	2.3

Fig. X-ray of a *girl A.*, 9 years old (Medical chart No. 5036). The presence of contrast in the sigmoid colon, intestinal pneumatosis. Diagnosis: late adhesive intestinal obstruction, subacute course 6 months after treatment of appendicular peritonitis)

ture, for example, in the subacute form of AIO, the X-ray contrast (the barium sulfate suspension passage) was additionally conducted.

Monitoring of abdominal X-ray was carried out in 6, 12 hours and later. Contrast passage depended on the degree of intestinal paresis. When conducting the contrast X-ray investigation, the following X-ray signs were taken into account:

1) the presence of contrast in the cecum;

2) appearance of contrast in the sigmoid and rectum.

In children, barium sulfate usually appeared in the cecum in 3–3.5 hours, and its complete delivery to the large intestine was observed in 6–7 hours. The presence of contrast in the cecum or more distally within 12 hours was a criterion for excluding obstruction (Fig.).

At the subacute course of LAIO there were signs of partial intestinal obstruction (either Kloiber cups of different diameter along with moderate pneumatization of the intestinal loops, or multiple small horizontal levels of fluid). The acute and very acute course was characterized by classic symptoms of complete obstruction (solitary Kloiber's cups of different diameter, unevenly distributed throughout the abdominal cavity, «arches» in stretched intestinal loops, homogeneous darkening in the lower parts of the abdominal cavity). As a rule, contrast X-ray investigations were conducted in EAIO and subacute LAIO – the contrast passage (barium sulfate suspension) disorder degree made it possible to specify the diagnosis in ambiguous situations and determine treatment management.

However, taking into account the need for repeated radiation exposure during contrast X-ray examination on the one hand, and careful approach to diagnosis in pediatric surgery on the other one – we compared the clinical, X-ray and ultrasound signs of AIO and developed a complex diagnostic algorithm.

The frequency of determination of typical signs in the clinical investigations in children with AIO is given in the table 3. So, with abdominal X-ray, the main sign of any intestinal obstruction – the hydroaeric levels – was detected in 58 (65.2%) patients, at the same time 66 (74.2%) children had no gas in the large intestine; the dilatated small intestine loops were recorded in 37 (41.6%) patients, and intestinal «arches» – in every 5th patient (17; 19.1%).

All 89 (100%) children with AIO who were under our supervision were conducted abdominal ultrasound. Ultrasound revealed the following leading signs of AIO: an increase in the diameter of intestinal loops ≥3 cm (70; 78.7%), inhibition of peristalsis and pendular movement of intestinal contents (33; 37.1%), swollen mesentery (15; 16.9%). With a longer history of the pathological process, the presence of free fluid as an interloop effusion (39; 43.8%) or in the small pelvis (22; 24.7%), thickening of the intestinal wall (17; 19.1%) are observed, which is a sign of ischemic changes.

We can observe from the table 3 that in children with AIO ultrasound most often revealed overstretching of the small intestine loops. But this sign is considered to be low-specific and as a single one has no diagnostic value, because it is often determined with flatulence in children with functional intestinal pathology and, accordingly, should be used in a comprehensive assessment.

However, in our opinion, if the child has a history of abdominal surgery, the value of this sign increases and in

case of its presence, first of all, it is necessary to exclude the dilation of intestinal loops with gas caused by intestinal obstruction to determine treatment management.

So, the clinical investigation in children with suspected AIO, that is abdominal X-ray and ultrasound, is a necessary diagnostic step on the way to the rapid detection of a surgical disaster in the abdominal cavity and important information for monitoring the disease and treatment efficacy. Signs of IO at the abdominal X-ray and ultrasound supplement each other, and sometimes they are interchangeable, if it is not possible to conduct both examinations. X-ray examination has been long occupied its place in the diagnosis of IO, but repeated radiation exposure has a certain negative value, the abdominal ultrasound in patients with postoperative peritoneal adhesions and AIO is non-invasive and sufficiently informative, which makes it possible to monitor in dynamic the course of the pathological process in different periods of treatment and multiple investigations without negative impact on the patient.

Conclusions

Based on the above said, we give the following conclusions:

1. A necessary diagnostic step in children with suspected AIO is abdominal X-ray and ultrasound, which provides a quick diagnosis of a surgical disaster in the abdominal cavity and important information for monitoring the disease and treatment efficacy. Signs of IO in abdominal X-ray and ultrasound supplement each other, and sometimes they are interchangeable.

2. According to our data, the main signs of IO in abdominal X-ray and ultrasound were the absence of gas in the large intestine (66; 74.2%), the presence of hydroaeric levels or Kloiber cups (58; 65.2%) and the dilation of small intestine loops ≥3 cm (37; 41.6%); abdominal ultrasound examination revealed the dilation of the small intestine loops ≥3 cm (70; 78.7%) and ineffective peristalsis (33; 37.1%).

3. X-ray examination has been long occupied a prominent place in IO diagnosis, but a repeated radiation exposure has the negative impact, but abdominal ultrasound in patients with peritoneal adhesions is non-invasive and sufficiently informative, which makes it possible to dynamically monitor the course of the pathological process at different periods of treatment and multiple observations without the patient exposure.

Prospects for further research. Rapid diagnosis of the surgical disaster in children with suspected AIO and important information are provided by abdominal X-ray and ultrasound examination. Ultrasound diagnostics of abdominal organs in patients with peritoneal adhesions is non-invasive and sufficiently informative, that is why it is advisable to use abdominal ultrasound for multiple monitoring of the disease and treatment efficacy without a negative impact on the patient.

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References/Література

1. Almafreji I, Chinaka U, Hussain A, Lynch, M, Cottrell R. (2020). Role of Gastrografin in Patients With Small Bowel Obstruction. Cureus. 12 (8): e9695. doi: 10.7759/cureus.9695.
2. Bonnard A, Kohaut J, Sieurin A, Belarbi N, El Ghoneimi A. (2011). Gastrografin for uncomplicated adhesive small bowel obstruction in children. Pediatr Surg Int. 27 (12): 127–181. doi: 10.1007/s00383-011-2963-8.
3. Deng Y, Wang Y, Guo C. (2019, Mar). Prediction of surgical management for operated adhesive postoperative small bowel obstruction in a pediatric population. Medicine (Baltimore). 98 (11): e14919. doi: 10.1097/MD.0000000000014919. PMID: 30882714; PMCID: PMC6426593.
4. Gerner–Rasmussen J, Donatsky AM, Bjerrum F. (2019). The role of non-invasive imaging techniques in detecting intra-abdominal adhesions: a systematic review. Langenbecks Arch Surg. 404 (6): 653–661. doi: 10.1007/s00423-018-1732-8.
5. Khan RA, Ara R, Wahab Sh, Ahmad I. (2019). Ultrasound in pediatric intestinal obstruction: Assessing its full potential. Paediatric Surgery.Ukraine. 4 (65): 19–24. doi: 10.15574/PS.2019.65.19.
6. Kvashnina AA, Melnychenko MG, Rybalchenko VF. (2022). Clinical effectiveness of sodium hyaluronate gel usage for prevention of postoperative adhesion in children. Modern Pediatrics. Ukraine. 2 (122): 21–26. doi: 10.15574/SP.2022.122.21.
7. Melnichenko M, Kvashnina A. (2020). Pathogenetic aspects of post-surgical adhesions prevention (review of literature). J Educ Health Sport. 10 (5): 380–393. doi: 10.12775/JEHS.2020.10.05.040.
8. MOZ Ukrainy. (2012). Pro zatverdzhennia protokoliv likuvannia ditei zi spetsialnosti «Dytiacha khirurhiia» iz zminamy vnesenymy nakazom Ministerstva okhorony zdorov'ia Ukrainy. Nakaz MOZ Ukrainy No 150. [МОЗ України. (2012). Про затвердження протоколів лікування дітей зі спеціальності «Дитяча хірургія» із змінами внесеними наказом Міністерства охорони здоров'я України. Наказ МОЗ України №150].
9. Paily A, Kotecha J, Sreedharan L, Kumar B. (2019). Resolution of adhesive small bowel obstruction with a protocol based on Gastrografin administration. Med Life. 12 (1): 10–14. doi: 10.25122/jml-2018-0082.
10. Smereczyński A, Starzyńska T, Kołaczyk K, Bojko S et al. (2012). Intra-abdominal adhesions in ultrasound. Part I: The visceroperitoneal bordeline, anatomy and the method of examination. J Ultrason. 12 (51): 472–478. doi: 10.15557/JoU.2012.0034.
11. Smereczyński A, Starzyńska T, Kołaczyk K, Bojko S et al. (2013). Intra-abdominal adhesions in ultrasound. Part II: The morphology of changes. J Ultrason. 13 (52): 93–103. doi: 10.15557/JoU.2013.0008.
12. Ten Broek R, Krielen P, Di Saverio S, Coccolini F et al. (2018, Jun 19). Bologna guidelines for diagnosis and management of adhesive small bowel obstruction (ASBO): 2017 update of the evidence-based guidelines from the world society of emergency surgery ASBO working group. World J Emerg Surg. 13: 24. doi: 10.1186/s13017-018-0185-2.

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