The role of ultrasound sonography in diagnosis of appendicular peritonitis in children

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Abstract: In order to study the possibilities of ultrasound sonography with diffuse purulent appendicular peritonitis (DPAP) complicated by paralysis of the intestine (PI) in children, 93 patients were examined for an objective assessment of the motor activity of the intestine, the degree of prevalence of the pathological process in the abdominal cavity and with the dynamic control of the effectiveness of treatment. At the age of 2 to 15 years with appendicular peritonitis. Patients are divided into 2 groups: I group of comparison - 45 patients with appendicular peritonitis complicated by intestinal paresis I-II stage. In the II group there were 48 children with DPAP complicated by PI (main group). The following echographic indicators: the presence of fluid in the abdominal cavity and its localization; presence of intestinal peristalsis; diameter and thickness of the intestine; the accumulation of fluid and air in the lumen of the intestine; character of the progression of chyme in the gut. When comparing the preoperative parameters of USZ with the results of intraoperative revision of the abdominal cavity, it was revealed that in 91.2% of cases the echographic data coincided with the intraoperative ones. USS in the postoperative period can detect not only a positive clinical picture, but also contribute to early detection of postoperative intra-abdominal complications (abscesses of the abdominal cavity, adhesive complications).

Keywords: appendicular peritonitis in children, ultrasound sonography, diagnostics

Purulent appendicular peritonitis (DPAP), complicated by intestinal paralysis (PC), is one of the topical problem of pediatric surgery. Diagnosis of PGAP, complicated by PC, and correct evaluation of its severity before surgery in children is the basis for choosing further therapeutic tactics and disease prognosis [5, 10, 11]. To study the prevalence of purulent process and motor function of the intestine with appendicular peritonitis, various methods are used [1, 2, 4, 8]. Studies that require the introduction of foreign bodies (tools, contrast and radioactive substances) are acceptable only in the pre-operative period according to the indications, but they can not be used in the next few hours and days after the operation, as they themselves can

cause serious complications [6]. Applied for an objective assessment of the activity of the intestinephonoenterography and electroenterography, along with the recording of peristaltic intestinal sounds, also record cardiac tones and pulmonary rales [7], which leads to difficulty in diagnosis. All this proves that the problem of diagnosing the form of appendicular peritonitis, as well as the degree of intestinal paresis in the preoperative period, remains topical. In this connection, it is of great scientific and practical interest to use ultrasound sonography (USS) of the abdominal cavity for assessing the prevalence of the abdominal pathological process and the degree of paresis of the intestine in peritonitis in children in the pre and postoperative periods [3, 9, 12,13]. The purpose of our study was to study the possibilities of USS in DPAP complicated by PI in children for an objective assessment of the motor activity of the intestine, the degree of prevalence of the pathological process in the abdominal cavity and with the dynamic control of the effectiveness of treatment.

Materials and methods. In the clinic of the Samarkand branch of pediatric surgery of the Republican Specialized Scientific and Practical Medical Center of Pediatric surgery, 93 patients aged 2 to 15 years (40 girls, 53 boys) entered the surgical department with a diagnosis of peritonitis under our supervision. To clarify the severity of intestinal paresis, the prevalence of the inflammatory process in the abdominal cavity, determination of further surgical tactics and evaluation of the effectiveness of the ongoing treatment for patients with PGAP complicated by PI, the dynamic ultrasound of the abdominal organs was performed in the complex of the examination. The motor-evacuator activity of the intestine was studied, the degree of prevalence of the inflammatory process in patients with appendicular peritonitis in the dynamics, the localization and prevalence of free fluid in the abdominal cavity, the presence of intestinal peristalsis and its nature, the diameter of the intestine, the accumulation of fluid and gas in its lumen, dynamics of the progress of chyme along the intestinal tube. The studies were performed without preliminary preparation of the patient, in the horizontal position on the back, with the ALOKA-500-SSD, SIEMENSE SOWOLINE SI-450 using linear sensors 3.5; 5.5; and 7.5 MHz, in real time using a dosed compression sensor on the abdominal wall.

Results and discussion. Depending on the results of the initial surgical examination and the severity of the clinical manifestations of the intestinal paresis and the type of treatment performed, all the patients examined were divided into two groups. The first group included 45 patients with appendicular peritonitis complicated by intestinal paresis of stage III (comparison group). The second group included 48 children from 98 patients with PGAP complicated by PI (main group). By age composition, both groups were equivalent, which facilitates comparative analysis. 96% of the patients of the first group with appendicular peritonitis received on 1-4 days from the onset of the disease, in the second group all patients (100%)

were admitted at a later date - on 3-10 days. In the first group, local patients were defined in 4 patients, diffuse in 36 patients and appendicular peritonitis distributed in 5 patients. In the second group, all patients were diagnosed with DPAP. Patients of the first group (45 children, the comparison group), depending on the method of elimination of the intestinal paresis, are divided into three subgroups. Patients of the first subgroup (24 patients) in the pre- and postoperative periods by means of nasogastric tube sucked out stagnant gastric contents and periodically washed with 2% sodium hydrogen carbonate solution, used cleansing hypertonic enema, infusion detoxification therapy, correction of potassium deficiency. As a result, intestinal paresis was permitted. Children of the second subgroup (11 patients) with the aim of stopping the intestinal paresis with the above-mentioned treatment of intestinal paresis were additionally treated with proserin. Patients of the third subgroup (10 patients), to eliminate paresis of the intestine by the above methods failed, and the treatment complex was supplemented by a long epidural anesthesia with lidocaine. 48 children with PGAP complicated by PI (the second group), when the above set of measures for stimulation of motor-evacuation functions of the intestine did not produce any effect, retrograde decompression of the small intestine with a special probe via cystostomy or appendicostomy was additionally applied. The primary USS patients were conducted within 1 to 12 hours from the time of admission to the hospital. Then, in the postoperative period, the dynamics of each patient was studied 3-4 times. Results of USS were compared with clinical signs, and they were confirmed by intraoperative data. With ultrasonic abdominal cavity for diagnosing the degree of prevalence of the inflammatory process and the severity of the intestinal paresis, the following echographic indicators: the presence of fluid in the abdominal cavity and its localization; presence of intestinal peristalsis; diameter and thickness of the intestine; the accumulation of fluid and air in the lumen of the intestine; character of the progression of chyme in the gut. In children with appendicular peritonitis of the first subgroup, the following echographic features were characteristic. In the right iliac region, there was always local paresis of the intestine: the areas with "mute" intestinal loops, whose diameter was not changed, were visualized, pneumatosis intestinal loops, small local fluid accumulation in the lumen of the small intestine in one or two areas, or liquid was not detected. The progression of chyme is slowed down in the zone of greatest soreness. In other parts of the abdominal cavity the progression of chyme is uniform, without slowing down. Local appendicular peritonitis was echographically characterized by the accumulation of free fluid in the area of the dome of the cecum. In patients of the second and third subgroups, the intestinal loops are moderately stretched with a predominance of liquid contents over pneumatization, the movement of the chyme is weak, progressive, and peristaltic movements are rare. With diffuse appendicular peritonitis, the accumulation of free

fluid in the inter-loop spaces, right lateral canal, right iliac region and in the projection of the small pelvis. In patients of the second group (48 children) throughout the abdominal cavity, intestinal loops were visualized, sharply extended with liquid contents with or without single gas bubbles. Peristalsis of the intestine is absent, the motion of the chyme is weak pendulum, or completely absent. A significant amount of fluid in all parts of the abdominal cavity. With PGAP, complicated with PI, the accumulation of free fluid was visualized in all parts of the abdominal cavity (5 or more abdominal cavities). The obtained clinical signs and data of USS in patients with PGAP complicated by intestinal paresis were compared with intraoperative indices. In patients with first-second subgroups intraoperatively revealed the spread of the inflammatory process beyond the cecum, purulent exudate was located between the loops of the intestines, without going beyond the boundary of the lower floor of the abdominal cavity. The parietal peritoneum looked dull, edematous. The intestinal loops in diameter were not changed, the pulsation of the vessels and the intestinal peristalsis were preserved. The surveyed children of the third subgroup in the operation found that the inflammatory process spread to the lower and middle floors of the abdominal cavity, leaving free sub - diaphragmatic spaces. The effusion in all cases was purulent, often with a characteristic colibacillary smell. The parietal and visceral peritoneum looked edematous, dim, with fibrinous overlap in the area of ileocecal angle. Bowel loops were moderately inflated, hyperemic, at a distance of 40-70 cm from the ileocecal angle there were fibrinous overlays. Peristalsis of the intestine and ripple of the mesentery vessels were visually weakened, the lumen contained a lot of liquid and gases. The most severe among our patients were children of the second group with DPAP, complicated by PC. During the operation, a total lesion of the visceral and parietal peritoneum was detected. In the abdominal cavity a large amount of purulent-fibrinous effusion with a colibacillary odor was detected. Macroscopically the peritoneum looked thickened, infiltrated with massive fibrinous overlays all over. In 38.3% of patients, petechial hemorrhages on the serous cover of the small intestine, often with multiple inter-loop ulcers. The loops of the intestine are sharply swollen in diameter, filled with intestinal contents - "the bowel". Peristalsis of the intestine is absent, pulsation of the vessels of the mesentery of the intestine is sharply weakened, the color of the intestine is changed, is hyperemic, with a purple hue, the walls are thickened, covered with fibrinous coating. Consequently, clinical preoperative symptoms in virtually all patients are verified on the basis of intraoperative revision of the abdominal cavity. When comparing the preoperative indicators of USS with the results of intraoperative revision of the abdominal cavity, it was revealed that in 91.2% of cases the echographic data coincided with the intraoperative data. In the remaining 8.8% of cases, a hyperdiagnosis, associated with mastering the method. The use of dynamic

US in the postoperative period in all patients with appendicular peritonitis allows to detect not only a positive clinical picture, but also contribute to the early recognition of postoperative intra-abdominal complications. Thus, 17 (18.3%) sick children from 93 had various intra-abdominal complications. With the help of USS, postoperative complications were diagnosed in 8 patients on days 4-7, and in the remaining 9 patients - 7-14 days. Two patients in the postoperative period were diagnosed with continuing peritonitis. This complication was manifested on day 3-4 after the operation. A severe clinical course was observed, the temperature stably exceeded 39 C, the manifestations of intoxication progressed in the form of delirium, sometimes euphoric state, psychomotor agitation. Observed tachypnea, severe tachycardia more than 120 beats per minute, sharp-featured face, dry mouth, skin, reduced turgor. Through the probe, there was abundant stagnant gastric contents with an admixture of bile and the smell of E. coli. The indices of endotoxicosis were kept at high values, the intestinal peristalsis was not listened to. When palpation, there was either severe or moderate soreness throughout the abdomen. The tension of the muscles of the anterior abdominal wall was moderate or insignificant, but there was a pronounced positive symptom of Schetkin-Blumberg. With USS revealed the predominance of liquid contents over pneumatization in the expanded loops of the small intestine, rare peristaltic movements or the absence of peristalsis, the presence of edema of the walls, not a large amount of free fluid between the loops. If such changes are suspected after the operation, a dynamic ultrasound of the abdominal cavity organs should be performed daily, in the absence of positive dynamics, a change in therapeutic tactics is recommended. Abscesses of the abdominal cavity (AAC) were found in 12 children. Of these, intercellular abscesses were found in 3 patients, subclavian abscesses in 3, right ileal region in 4, lateral canal in 1 and inside pelvic in 1 patient. 3-5 days of the postoperative period, the temperature was set to rise, and soon exceeded 39 oC, indices of toxemia also increased, local soreness appeared in the anterior abdominal wall, but these symptoms were less pronounced than with continuing peritonitis. Echographic signs of intra-abdominal abscesses were the presence of irregularly shaped formations with fuzzy contours with reduced echogenicity, often with heterogeneous contents. When observed in dynamics, the ultrasound pattern did not change after eating and stimulating the intestine. 4 patients with unformed, intertisciplinary, multiple and complicated AAC had relaparotomy, and 8 patients with intra-abdominal abscesses formed - local minilaparotomy or percutaneous drainage at their wall-mounted arrangement. Three children showed signs of early adhesive intestinal obstruction (AIO). On USS to distinguish paralytic and mechanical intestinal obstruction difficult. In this case, the diagnosis is facilitated by a thorough examination of all parts of the abdominal cavity, if you can detect areas of intact bowel loops, along with stretched. In the early stages of AIO with USS

it is possible to see the gut region with a peristaltic wave. The pendulum movement of the chyme, as if striking against an obstacle, rolls back. An uneven accumulation of fluid and gases in the lumen of the gut is determined. Patients with SKN underwent repeated surgical intervention. Thus, the use of USS in PGAP, complicated by PI, in children in the pre-operative period allows not only to establish the prevalence of peritonitis, but also to determine the severity of the violation of motor-evacuation function of the intestine. Dynamic USS allows to predict the course of the postoperative period, to reveal in a timely manner postoperative intra-abdominal complications and choose the most optimal variant of surgical treatment tactics.

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