



Tactical Approaches at the Perforative Peritonitis in the Neonates

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Abstract

The outcomes of treatment of the newborn with perforative peritonitis for 20 years from 1992 to 2011 in the Pediatric Center RHN^o1-NCM MH RS (Y) are studied. The use of peritoneal drainage in the complex of measures of preoperative preparation of a patient allowed lengthening the time of preparation from 1.5 - 2 hours to 8 - 12 hours. In this case, there was the possibility of a more appropriate correction of fluid and electrolyte metabolic disorder, urine output restoration, reducing signs of infection and toxic shock, which helps to prevent serious complications of general peritonitis as multiple-organ-failure syndrome and disseminated intravascular coagulation syndrome. Over the study period neonatal mortality with perforative peritonitis decreased from 75% to 21%.

Keywords: the newborn, peritonitis, peritoneal drainage.

Advances in neonatology related to better quality of care for the newborn with low birth weight, premature newborn children, those suffered chronic intrauterine hypoxia and other adverse ante-and intranatal factors improve survival of such children and help to increase the number of the newborn at risk for severe disease of the gastrointestinal tract [2,5,6]. The most severe and life-threatening disease of the gastrointestinal tract of the newborn is perforation of the stomach and intestines. The fatality of the newborn with such disease reaches 40-80% [1,4]. The clinical progression of perforation of the gastrointestinal tract in the newborn is extremely serious, combined with a high intra-abdominal pressure syndrome and multiple organ failure [3,7].

The objective of the research: to study the outcomes of perforative peritonitis in the newborn depending on the use of preoperative abdominal decompression and tactical approaches changes in preoperative preparation.



Materials and Methods

Over 20 years from 1992 to 2011 31 newborn children with peritonitis were hospitalized in children's surgery department. By nosology 42% (13 patients) were neonates with necrotizing enterocolitis (stage III), 42% (13 patients) with automatic gastric perforations, 6.4% (2 patients) with destructive appendicitis, by 3.2% - liver abscess with peritonitis, matured mesentery cyst, arteritis of umbilical vessels (Table 1). During the first week of life neonates mainly with automatic gastric perforations, which often occur on the 2nd -3rd days of life in 54% of premature infants with respiratory distress syndrome, were hospitalized. Among neonates with necrotizing enterocolitis in 7 infants (54%) the phenomena of peritonitis occurred at the first week of life. In their case history this group of patients had chronic fetal hypoxia. The rate of prematurity in the group of patients with enterocolitis was 54% (7 neonates). Necrotizing enterocolitis of stage IIIa, which is characterized by the phenomena of intestinal obstruction, the presence of infiltration in the peritoneal cavity was observed in 3 cases (23%). The remaining 10 neonates (77%) were hospitalized with stage IIIb of necrotizing enterocolitis – the stage of perforative peritonitis. Perforations often localized in the ileum - 70%, in the descending colon - 30%.

All neonates underwent laboratory tests, including acid-base balance, electrolyte level, ultrasound investigation and abdominal plan radiography. Preoperative preparation included the selection of adequate ventilation parameters providing normal gas exchange, correction of hemodynamic disturbances, stabilized blood pressure, correction of electrolyte abnormalities, acid-base balance, hypovolemia, restored urine output of at least 1.5 - 2.0 ml/kg/h, blood transfusion and plasma transfusion if necessary, intravenous broad-spectrum antibiotics. The preoperative preparation includes warming the baby and maintaining body temperature at a normal level.

Since 2002 in the complex of measures of the preoperative preparation we have been applying peritoneal drainage for abdominal decompression under local anesthesia in the iliac roll. Reduced intra-abdominal pressure improves intestinal hemodynamics, renal blood flow, which allow extending the preparation of a patient from 8 to 12 hours from the time a child is admitted to the Department of anesthesiology and resuscitation of intensive care against the conservative treatment of infectious-toxic shock. The readiness criteria for surgery are restored urine output, pulse appearance in the peripheral arteries, improved blood pressure, oxygen saturation (at least 90 - 94%).



Results and Discussion

Necrotizing enterocolitis (NEC) is a disease of 'survived premature neonates', 2-9% of premature neonates become ill. In etiology and pathogenesis of NEC a major role is played by ischemia, suffered in the perinatal period, inadequate nutrition in the early postnatal period and associated abnormal intestinal colonization. Risk factors are chronic hypoxia in respiratory distress syndrome, birth asphyxia, prematurity, congenital heart disease, NEC is also often observed in intestinal malformation - gastroschisis, intestinal obstruction, Hirschsprung's disease. Measures of NEC prevention in premature neonates are the optimal choice of antibacterial therapy, the enteral nutrition with half-cell milk formula in the optimum time with the definition of tolerance to it, early use of probiotics. Walsh and Kliegman classification distinguishes three stages of NEC according to the progression of clinical symptoms: suspected necrotizing enterocolitis (I stage), clear (II stage) and progressive (surgical stage), which is divided into IIIa - obstruction and infiltration in the abdomen and IIIb - perforation of a hollow body, the appearance of pneumoperitoneum in the X-ray.

In stage I the newborn (suspected NEC) have functional disorders of the gastrointestinal tract in the form of slight abdominal distention, may have extended loop of intestine, bloody additive in defecation against signs of growing intoxication as a propensity to bradyarrhythmias, leukopenia and thrombocytopenia. At this stage the newborn are consulted by a surgeon; through preventive conservative measures in most cases we could prevent the progression of symptoms of peritonitis. In such cases we cancel enteral feeding, give probiotics, start antibacterial therapy with cephalosporin (cefotaxime is chosen) and metronidazole, conduct immunotherapy if necessary, prokinetics, infusion therapy if necessary. In most cases according to our data against the therapy 89% of patients have a better sense of well-being which allows gradually introducing enteral feeding with half-cell milk formula *Alfare* or *Frisopre*.

With the progression of enterocolitis the clinical picture corresponds to stage II of 'clear' NEC, when reversible stage - IIa and irreversible stage IIb are distinguished. With the reversible stage of NEC the abdominal plan radiography has fluid levels in the bowel loops and the characteristic pneumatosis of intestinal wall - air bubbles interstitially in the bulk of intestinal wall due to necrotic changes in the intestinal mucosa. This stage can still be reversed, but the patient has starting necrotic changes in the intestinal tube, so it requires to change the antibacterial therapy with drugs of reserve (*Meropenem*) and surely to introduce immunotherapy. If the state of the patient permits at this stage it is necessary to use hyperbaric oxygenation. But, as a rule, at this stage the



newborn require ventilation therapy and are in the neonatal intensive care unit with artificial lung ventilation. When stage IIb of irreversible NEC is observed the abdominal plan radiography has an extensive intestinal pneumatosis, the air may appear in the portal vein (air bubbles against hepatic shadow along portal vessels are observed) – the sign indicates the presence of distinct necrotic changes in the intestinal wall, the air gets into the lumen of vessels, the signs of ascites may appear, the symptom of ‘static bowel loop’ - a toxic expansion of the colon. This stage requires surgery - laparotomy and cutting off the affected part of the intestine in the form of removing intestinal stoma with or without resection. In some cases it is enough to apply laparocentesis and decompression of the abdomen against the intensive therapy according to the program of treatment of sepsis. But the outcome of NEC in survived neonates may be intestinal obstruction due to scarring of the affected area of the intestinal tube.

The stage of progressive NEC requires obligatory surgery because there are signs of peritonitis. Stage IIIa is characterized by signs of fibrinous peritonitis, covert intestinal perforation: not yet pneumoperitoneum, but patients have infiltrates or conglomerates of intestinal loops with the progression of the clinical picture of intestinal obstruction, radiologically there are multiple levels in the loops of the intestine, inflammatory changes in the anterior abdominal wall can be observed (a sign of interintestinal abscesses in the abdominal cavity). In stage IIIa we operated on three neonates, 1 patient died.

In stage IIIb clinically and radiologically there appear signs of perforative peritonitis: the phenomena of infectious-toxic shock with marble skin, microcirculation disorder, rapid bloating with expanded veins of the anterior abdominal wall, respiratory failure, oligourium; a large amount of free air in the abdominal cavity is radiologically determined (Figures 1, 2). According to laboratory data decompensated metabolic acidosis, leukopenia, thrombocytopenia, the shift of leukocyte formulae to the left with the emergence of toxic grain of neutrophils are recorded. At this stage of NEC the neonatal status is extremely serious, due to the severity of the state the preoperative preparation was short, in 2-3 hours neonates underwent surgery. The volume of surgery was restricted to surgical resection of affected areas of the intestine and excretion of intestinal stoma. This tactic was used with three neonates with stage IIIb of NEC, the mortality in this group was 66%.

Since 2002 in order to decompress the abdominal cavity during pneumoperitoneum in neonates we have been using peritoneal drainage, against which it is possible to more adequately conduct preoperative correction of hemodynamic disorder and perform surgery when the volume of circulating blood is filled. Over the past 10 years 7 neonates with stage IIIb of NEC were operated



with prolonged preoperative preparation against peritoneal drainage. The mortality was 28% (2 neonates).

In the group of neonates with automatic perforations of the stomach the state of a patient became worse sharply, always accompanied by increased intra-abdominal pressure, severe pneumoperitoneum. In most cases automatic perforations of the stomach were observed in preterm immature children, in our observation 85% of patients (11 neonates) had a respiratory distress syndrome in their history. In this pathology it is necessary to apply peritoneal drainage. In 2/3 of cases of automatic perforations of the stomach the pathology was located in the anterior wall of the stomach, in 1/3 of cases - on the back, which caused some difficulties in mobilizing the stomach and suturing the defect of the wall. As a rule, defects in the stomach were extended, were located in the center of the diseased stomach wall, represented by almost thinned mucosa. Therefore, suturing diseased wall led to the tubuliform deformation of the stomach of a patient, overcasting the second row of seam was not always possible due to a small area of the stomach. Until 2002 80% of neonates with automatic perforations of the stomach was fatal (4 of 5). Changed tactics of preoperative preparation as laparocentesis reduced the mortality rate in this group of preterm neonates to 25% (2 of 8).

Conclusion

The peculiarity of peritonitis in neonates is the presence of high intra-abdominal pressure syndrome, which is a starting point for the developed multiple organ failure syndrome. The elimination of high intra-abdominal pressure among measures of preoperative preparation for the newborn allows preventing serious complications of peritonitis. Changed tactics in preoperative preparation for neonates with general peritonitis reduced mortality of those with in stage IIIb of NEC by 2.4 times (from 66% to 28%), of those with automatic perforation of the stomach by 3.2 times (from 80% to 25%).

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Table 1. Reasons for peritonitis in the newborn

<i>Nosology</i>	<i>Number of patients</i>	<i>%</i>
Necrotizing enterocolitis	13	42%
Automatic perforations of the stomach	13	42%
Destructive appendicitis	2	6,4%
Liver abscess	1	3,2%
Maturated mesenterium cyst	1	3,2%
Arteritis of umbilical vessels	1	3,2%
Total:	31	100%