Modern Approach To The Diagnosis And Treatment Of Necrotising Enterocolitis In Neonates

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ABSTRACT

one of the most severe diseases in newborns - necrotizing enterocolitis - is analysed from the modern point of view. Causes and risk factors of the disease development are considered. The peculiarities of pathogenesis and microbiological status of newborns are shown. The clinical picture of necrotising enterocolitis is covered in detail, clinical stages of the disease, on which its classification is based, are analysed. It is shown that the choice of therapeutic tactics depends on the severity of the child's condition and the stage of the process. At I and II stages of the disease conservative therapy is carried out, at III stage both conservative and operative treatment is possible, at IV stage emergency surgery is indicated. The operation of choice is the technique of decompressive intestinal stomas, which helps to preserve the length of the intestine as much as possible and reduces the risk of postoperative complications.

Keywords: necrotizing enterocolitis, intestinal necroses, neonatal intestinal diseases

Introduction. Necrotising enterocolitis (NEC) is one of the most severe diseases in newborns, in which the target organ is the intestine. The first report about this disease was published in 1964, and the first work reflecting the experience of surgical treatment of enterocolitis appeared in the press in 1967. According to foreign authors, NEC occurs with a frequency of 2.4 per 1000 newborns, which is 2.1% of all children admitted to neonatological intensive care units, according to domestic authors - with a frequency of 4%.

From the clinical point of view, NEC is characterised by a wide range of variants of the course of the disease: from mild cases to severe forms complicated by intestinal necrosis, perforation, peritonitis and sepsis. As a rule, the disease develops in the first two weeks of life, but in 16% of patients it occurs immediately after birth. In practice, paediatric surgeons more often meet with enterocolitis already at the stage of peritonitis, when the prognosis for the life of patients worsens and mortality reaches 70%, and in case of extensive intestinal necrosis - 100%.

Until recently, it was believed that NEC was the domain of "surviving premature infants", but today this process is often diagnosed in premature infants. Risk factors that may predispose to the development of this disease include hypoxia, asphyxia, apnoea, lung pathology, hypovolemic shock, complicated labour, duration of anhydrous period more than 6 hours, congenital heart defects, intrauterine infection, prematurity, perinatal CNS damage, "aggressive" enteral nutrition, peculiarities of intestinal blood supply in newborns. Despite the polyetiological nature of NEC development, the main cause of the disease is intrauterine chronic fetal hypoxia. Other associated risk factors have a synergistic effect in the pathogenesis of the disease.

Pathogenesis. The initial stage in the development of NEC is the lesion of the mucosal layer of the intestinal wall, which may be complicated by ulceration, perforation, peritonitis. The pathological process is localised in the small and/or large intestine in the form of "scattered" foci of necrosis.

Taking into account the leading factor of pathogenesis, three variants of NEC course were identified: haemodynamic, mixed, infectious-inflammatory.

Hemodynamic variant of the course is characterised by the presence of intestinal ischemia as a consequence of perinatal CNS lesion, centralisation of blood circulation. In blood analysis, inflammatory indices are slightly elevated.

Morphological picture shows circulatory disorders in the form of full blood vessels of submucosal layer, stasis of erythrocytes, extensive foci of hemorrhages, ischemic necrosis of the mucous membrane.

Mixed variant of the course of the disease combines intraorgan haemodynamic disorders with laboratory signs of inflammation, intoxication. In the study of histological sections of the intestinal wall taken intraoperatively, a pronounced vascular component combined with total inflammatory infiltration of the intestinal wall is noted.

In the infectious-inflammatory variant of NEC development the leading factors in the pathogenesis are infection and inflammation. In morphological picture inflammatory reactions in the form of intestinal wall edema, polymorphous cell infiltration, intestinal pneumatosis prevail over vascular disorders.

Dopplerometric studies revealed disorders of regional intestinal haemodynamics associated with the peculiarities of the proximal-distal gradient of blood supply. It was found that 40 min after a meal peripheral vascular resistance in the distal part of the small intestine decreases to 19.2% of the initial values. This condition is aggravated by enteral administration of high-calorie mixtures, which increase blood flow by 250% of the initial one at the 45th minute.

This fact explains the high frequency of lesions in the ileum and the initial colon.

Microbiology. The leading place in the microbiological status of newborns is occupied by S. epidermi-dis, P. aeruginosa, E. coli, E. faecalis, representatives of the genus Enterobacter. In most cases, S. epidermidis is isolated from the umbilical wound, and growth of the latter has also been observed in cultures from the intubation tube and oral cavity.

Representatives of the genus Enterobacter give abundant growth in cultures from the abdominal cavity, which is taken into account when sanitising the surgical area.

In cases of absence of microbial growth from peritoneal effusion in purulent peritonitis it is possible to assume the presence of anaerobes (C. perfringens, C. difficile). Thus, in case of C. perfringens the disease runs in a lightning-quick form with pronounced pneumatosis of the intestinal wall, perforation and often ends in death.

Studies of urine, umbilical wound and oral cavity demonstrate the presence of abundant growth of P. aeruginosa, E. coli, E. faecalis. In 40% of biological studies, the flora is not determined, since most patients (77%) are treated with antibacterial therapy in the maternity hospital. Monotherapy with cephalosporins is most commonly performed.

I (cefazolin) and III generation (cefotaxime, Cefobid, ceftriaxone) or aminoglycosides (amikacin).

Polymerase chain reaction is used to detect intrauterine infections in 40% of cases. Cyto-megalovirus (CMV) and ureoplasmosis are

found in 50% of patients, mycoplasmosis, chlamydia and toxoplasmosis are diagnosed in 30% of cases, herpes virus is present in 12% of studies. A combination of several pathogens (CMV and ureoplasma) is possible.

The study of the qualitative and quantitative composition of intestinal microorganisms shows oppression of normoflora, which is manifested by the absence of anaerobic bacteria of the genus Bifidobacterium and Lactobacillus. The presence of haemolytic properties in E. coli is revealed. High titre of opportunistic enterobacteria and yeast-like fungi of the genus Candida also confirms dysbiosis of the organism.

Differential diagnosis. NEC should be differentiated from birth spinal trauma, cerebro-visceral syndrome, in which: 1) intestinal paresis, regurgitation and vomiting develop earlier - on the 1-3rd day of life, in NEC the clinic unfolds in the 2nd week of life; 2) neurological symptoms prevail in the status; 3) on radiography

only single paretic levels and bloating of intestinal loops are noted; 4) neurological treatment significantly improves the condition.

Intrapartum infection manifests itself in the first days of the postnatal period, does not have a specific radiological picture, with antibacterial therapy positive dynamics is noted. Haemorrhagic disease of newborns proceeds without intoxication, intestinal bloating is visualised on radiography. Symptomatic therapy (administration of vitamin K) leads to clinical effect.

Clinical picture and diagnosis. NEC usually manifests itself in the 1st week of life. The peak of morbidity falls on the 5th day of life. The course of the disease is characterised by certain stages.

Division of NEC by stages of development is the basis of its classification (3 stages of the process). For the first time such classification was proposed by M.J. Bell et al. Bell et al. [1]. The three-stage clinical and radiological classification of M. Walsh, R. Kleig is widely used in practical healthcare. Walsh, R. Kleigman [2]. In domestic practice, 4 stages of the disease are distinguished on the basis of clinical signs. The principal difference from the classification of M.J. Bell is the allocation of the prodromal stage. Bell is the allocation of the prodroma stage, when there are no reliable signs of the disease [3].

Stage I (prodrome of the disease) is characterised by the child's severe condition due to neurological disorders, respiratory and cardiovascular disorders, signs of prematurity and immaturity. There is no clinic of enterocolitis, but there is lethargic sucking and regurgitation. In all cases there is an aggravated anamnesis (signs of prematurity, immaturity, chronic hypoxia, intrauterine infection). Ultrasound reveals brain oedema with predominant manifestation in the periventricular areas, possible peri- and intraventricular haemorrhages, signs of immaturity of brain structures.

For stage II of the disease (uncomplicated enterocolitis), in addition to typical anamnestic signs, the following system-wide clinical manifestations are characteristic: CNS depression syndrome or hyperexcitability, respiratory and cardiac rhythm disturbances, unstable body temperature, mixed acidosis, moderate thrombocytopenia, exicosis, manifestations of immaturity, infection. On the part of the GI symptoms of dystonia and dyskinesia are noted: sluggish sucking, regurgitation with bile, weight loss, abdominal pain and bloating. Stools - frequent, scanty, liquid, with mucus and green, sometimes with blood. Peristalsis - sluggish, sometimes there is a delay in stool.

Radiological findings include gastric paresis, irregular gas filling of the GI tract, increased thickness of the intestinal wall due to edema and inflammation, the phenomenon of a "static" loop. In X-ray examination, a picture of dynamic intestinal obstruction is observed.

Ultrasound diagnoses irregular, moderate dilatation of intestinal loops, sluggish peristalsis or its absence, thickening of the intestinal wall, possibly a minimal amount of fluid component between the intestinal loops on the type of reactive effusion. Pathology of the biliary tract is often combined with enlargement of the pancreas and hepatosplenomegaly.

Stage III NEC (preperforation, delimited peritonitis) is characterised by increasing

severity of general clinical manifestations: progressive depression of the CNS, ecstasy, infectious toxicosis, signs of intrauterine infection and sepsis. Laboratory diagnosis reveals metabolic acidosis, leukopenia, less often leukocytosis, pronounced thrombocytopenia is determined. When collecting urine, oliguria is noted.

Gastrointestinal tract is observed regurgitation, vomiting stagnant contents, "coffee grounds", bloating and abdominal pain, localised pastosity of the anterior abdominal wall, venous network on the anterior abdominal wall, stool and gas retention, sometimes blood from the rectum. On palpation in some cases, it is possible to determine the infiltrate in the abdominal cavity.

On radiography, clearly differentiate sub-serous pneumatosis of the intestinal wall with its thickening, the presence of multiple different levels, between the intestinal loops is determined fluid component.

Echography reveals pronounced local thickening of the intestinal wall; between the intestinal loops, in the pelvic cavity and in the lateral canals, a fluid component is visualised, which has the character of a finely dispersed suspension, which corresponds to purulent-fecal or haemorrhagic effusion. Fragmentary dilatation of intestinal loops and "pendulum" symptom are noted.

Stage IV NEC (spilled peritonitis) is characterised by extreme severity, peritoneal shock, oligoanuria, manifestations of DIC. In blood analysis leuko- and thrombocytopenia, marked acidosis, signs of sepsis are determined. The abdomen is sharply distended, painful, there is oedema and hyperaemia of the anterior abdominal wall and external genitalia, vomiting of stagnant contents, stool retention, often observed blood discharge from the rectum. At perforation of the hollow organ are determined by bulging in the epigastrium, disappearance of hepatic bluntness at percussion and absence of peristalsis at auscultation.

Radiological signs of intestinal obstruction, widespread pneumatosis of the intestinal wall, a large amount of free fluid in the pelvic cavity and in the lateral canals, signs of pneumoperitoneum (the "sickle" symptom) in intestinal perforation are expressed.

Echographically, a significant amount of heterogeneous fluid component in the abdominal cavity is visualised, which is characteristic of purulent-fecal effusion. Peristaltic waves are not noted. Indirect signs of pneumoperitoneum are determined, as it is difficult to objectively differentiate gas in the abdominal cavity from gas in aperistaltic intestinal loops.

Depending on the speed of development of pathological processes, lightning, acute and sub-acute course of NEC is distinguished.

Lightning course is characteristic for premature "large" children. From the first vague symptoms of discomfort, which appear on the 3-5th day of life, to the occurrence of perforation takes no more than 1.5 - 2 days.

2 days. Timely diagnosis is difficult due to the very severe general condition of the child.

Acute course of NEC is noted in premature infants with weight more than 1500 g. The disease begins acutely on the 10th-28th day of life with a pronounced clinic of NEC. In case of inadequate conservative therapy, an irreversible stage of the process development occurs in 3-4 days.

Subacute course is manifested in profoundly premature infants with weight up to 1500 g. The disease develops slowly (more than 5 days). The first symptoms appear on the 12-45th day of life, the child stops digesting nutrition with subsequent gradual accession of GI pathology.

Treatment. The choice of therapeutic tactics in NEC depends on the severity of the child's condition and the stage of the process. At I and II stages of the disease conservative therapy is carried out, at III stage both conservative and surgical treatment is possible, at IV stage emergency surgery is indicated.

Complex pre- and postoperative treatment, which includes:

-complete parenteral nutrition 3-5 days or more depending on the severity of the child's condition and restoration of intestinal passage; gastric decompression with a nasogastric tube; infusion and post-syndromic therapy to stabilise the haemostasis system and haemodynamic parameters;

use of broad-spectrum antibiotics (III generation cephalosporins) in combination with ami-noglycosides (amikacin) and metronidazole;
-immune replacement therapy (Pentaglobin, immunoglobulin, Viferon);
selective intestinal decontamination, pre- and probiotics (bacteriophages, Inulin, Florin forte, Bi-Fiform);
-taking vitamins and enzymes to restore intestinal motility;
use of biogenic drugs to improve metabolic processes and accelerate tissue regeneration (Solcoseryl intravenously, jet).

On average, 3540% of children with NEC, in whom conservative therapy was unsuccessful, need surgical treatment.

If conservative measures are ineffective and in the absence of obvious indications for laparotomy, laparoscopy is used. The use of this technique makes it possible to directly assess the condition of the intestine, purposefully drain the abdominal cavity and in most cases (60%) avoid wasted laparotomy.

Preoperative preparation lasts no more than 2.5-3 hours. During it, the functions of vital organs are corrected. In the presence of peritonitis to alleviate the child's condition and reduce intra-abdominal pressure, palliative intervention is performed - laparocentesis with drainage of the abdominal cavity. The inflammatory nature of the exudate obtained during laparocentesis is an indication for extending the surgical intervention.

In NEC, operations are performed from the midline access. After revision of the abdominal cavity organs in case of multisegmental intestinal lesions, the most appropriate intervention is considered to be economical (local) resection of the altered part of the intestine with the creation of a double entero- or colostomy (or several stomas), since preservation of the length of the intestine, sufficient for growth and development, is extremely important. Subsequently, staged closure of intestinal stomas is performed 1-5 months after the first operation.

In localised form of intestinal lesions complicated by single perforations (1-2 ulcers), ulcer defects are sutured with double-row sutures.

Situations requiring resection of necrotised bowel sections are completed by primary end-to-end anastomosis.

In cases of subtotal and total lesions of various sections with multiple mosaically located subserosal necroses, combined surgical tactics in the form of a lapa-rostoma combined with intestinal stomas are used.

Taking into account the prevalence of abdominal exudate, drainage of the abdominal cavity is performed using a PVC microirrigator with a diameter of 0.2 to 0.4 cm, installed through a separate puncture of the skin to the site of the greatest localization of the purulent-inflammatory process for the administration of antibacterial drugs, 0.5% metronidazole solution. This method of passive rehabilitation is used for 3-4 days after surgery.

In the postoperative period, the initiated therapy is continued.

Complications. Intestinal stricture appears as a complication of the NEC healing period. It occurs with a frequency of 20-25% in both conservative and surgical treatment, in some cases it may require resection.

Short bowel syndrome develops after extensive intestinal resection. This complication can be avoided by using economical (local) intestinal resection. In the presence of areas with questionable viability, the use of laparostomy is indicated.

Malabsorption syndrome occurs after massive damage to mucosal cells in NEC. This complication is completely cured with the regeneration of cellular elements and the restoration of intestinal function.

The interest in studying the problems of necrotic enterocolitis does not weaken.

Conclusions: therefore, the most relevant areas are the study of pathogenesis, the search for new diagnostic criteria for this disease and the development of preventive measures for patients with the threat of necrotic enterocolitis.

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