

# An Integrated Approach to The Rehabilitation of Infants with Sepsis.

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**Annotation.** The results of a comparative study of two groups of children with sepsis who received combined rehabilitation therapy during the rehabilitation period, including correction of the intestinal biocenosis, neurometabolic therapy, and immunotherapy with Viferon, and children who received only the immunomodulator T-activin, showed that an integrated approach to rehabilitation was much more effective. In addition, a relatively rapid immunological effect, good tolerability of viferon, a non-invasive route of administration, and the absence of side effects with the described methods of immunorehabilitation allow us to recommend the use of this drug in infants suffering from sepsis.

**Keywords:** sepsis, infants, rehabilitation

**Introduction.** Violation of the functioning of vital organs against the background of a general disturbance of homeostasis in septic children usually carries the risk of a protracted or recurrent disease [1], and bacterial stress affects the further growth and development of the child [2]. There is good reason to believe that children infected at an early age may develop secondary immunodeficiency [3,4] and delayed immune maturation [5,6]. This requires the necessary rehabilitation measures for such children [7,8].

**The purpose of this study** was to evaluate the effectiveness of complex rehabilitation measures in infants with sepsis during the observation period.

## **Materials and methods.**

The study was a follow-up of 60 children aged from 1 month to 1 year who were treated for sepsis in 2 clinics of the Samarkand State. During the observation, physical and psychomotor development, as well as the functional state of organs and systems, were taken into account. The immune status was assessed by the following indicators:

- Cellular immunity was assessed by the number of circulating T-lymphocytes (CD3) and their subpopulations (T-helpers (CD4), cytotoxic T-suppressors (CD8) and immunomodulatory index (IRI), i.e. CD4/CD8 ratio;

- The activity of neutrophil-granulocytes was assessed in phagocytic reactions to determine their completeness: the percentage of phagocytic neutrophils, the number of absorbed microorganisms (average per cell), the phagocytization completeness index was calculated: assessment of the fluid immune system by B-lymphocytes (CD22) and the level of class A serum immunoglobulins, M and G.

Echocardiography (ECG) was used to assess the state of autonomic provision of the adaptive response in septic children. Examinations at the stage of rehabilitation were carried out every three months for 12 months, and more often if necessary. All children consulted a pediatric neurologist. The results were processed statistically. Significance was determined using a Fisher-Student t-table.

## **Results and discussion.**

It should be noted that children who underwent sepsis had various deviations in physical and psychomotor development and the functional state of organs. Almost all had deviations in the formation of motor functions.

75% of patients had moderate hepatomegaly, and 56.6% had changes in the cardiovascular system. All children (100%) had mild or moderate iron deficiency anemia.

In 88.3% of children, persistent disorders of the gastrointestinal tract associated with secondary fermentopathy and intestinal dysbiosis of 1-2 degrees were observed.

There were also violations of the immune system in the form of nonspecific immune changes - a decrease in the helper activity of T-lymphocytes, immunoglobulinemia, and a decrease in the phagocytic index, which is the basis for the immune rehabilitation of newborns with septicemia. In the autonomic tone of children, 26.6% had hypersympathoconia, 56.7% had sympathoconia, 10% had vagotonia, and 6.7% had eutonia. Their stress index was 1589 to 2000 conventional units. It characterized the remaining intensity of adaptation processes in children who have undergone sepsis as a criterion for the repeated failure of the adaptation mechanism and may contribute to the recurrence of sepsis in these children.

Such sympathetic-adrenal disorders can contribute to the recurrence of sepsis, as vegetative-visceral disorders of neuroendocrine regulation of adaptation processes are formed, indicate the expediency of including in the complexes of therapeutic and rehabilitation measures in infants who have undergone sepsis, nootropic drugs that physiologically regulate the mechanisms that affect the neurotransmitter systems of the brain, metabolic and bioenergetic

Taking into account the above changes, the following main areas were included in the complex of rehabilitation therapy for sepsis in infants:

- correction of intestinal biocenosis:
- the use of prebiotics, if necessary, antimycotic therapy;
- ensuring breastfeeding, and in the absence of mother's milk, the use of adapted mixtures enriched with bifidobacteria (Nutrilon, NAS fermented milk);
- Immunorehabilitation.
- Neurometabolic therapy

To eliminate violations of the intestinal micro biocenosis, a prebiotic was used Hilak forte 20 drops three times a day and Linex probiotic (each capsule contains at least  $1.2 \times 10^7$  viable bacteria). In addition to lactobacilli and bifidobacteria, it contains strains of *Bifidobacterium infantis* var. *liberatorum* and *Streptococcus faecium* SF68. One was taken one capsule twice a day.

Piracetam and glutamic acid have been used in age-appropriate doses for neurometabolic therapy.

Human recombinant interferon- $\alpha$  "Viferon" was used to improve immunity in infants after sepsis. Viferon was prescribed at a dose of 150,000 IU twice a day, and suppositories were administered three times a week during a clinically favorable period of three months. The advantages of Viferon are a non-invasive method of administration and the possibility of long-term use without side effects in patients.

The children were divided into two groups: group 1 received complex rehabilitation therapy, and Group 2 received only immunoprotective therapy with 0.01% injection solution of taktivin, 25 mg/kg once a day subcutaneously for 10 days.

Three months later, the condition of patients in both groups was stable and relatively satisfactory. There was a positive trend towards weight gain: 51.4% of patients in group 1 and 36% of patients in group 2 had sufficient weight gain. Intestinal dysfunction was absent in 74.3% of children in group 1 and 25% in group 2. Psychomotor development was already age-appropriate in 17.1% of children in group 1, while in group 2 only 8% of the observed children showed a decrease.

Immunological parameters still differed from normal values, although in group 1 there was a trend towards an increase in CD4+, IgA, and phagocytic index. The tolerability of Viferon was satisfactory, and no side effects were observed.

6 months after the start of rehabilitation, the condition and well-being of children in group 1 were stable and satisfactory, without clinical signs of inflammation. 72.7% caught up with children of the same age in terms of weight, and 30.3% had the same psychomotor development as children of the same age. Intestinal dysfunction was not observed in 84.8% of children. Septic processes and recurrent acute respiratory infections were not observed in this group of examined children during this period; T-helpers, CD4+/CD8+ ratio, immunoglobulins A and G increased significantly compared to baseline values at the beginning of the recovery period and reached normal values by this period of rehabilitation.

In group 2, 43.4% of children during For 6 months, there were episodes of fever up to sub fibril numbers with symptoms of catarrh of the upper respiratory tract, which was regarded as a complication of acute respiratory infection. The duration of the respiratory disease was 10-12 days. Gastrointestinal tract dysfunction was present in 52.3% of children. Weight gain was observed in 39%. By this time, psychomotor development was normal in 17.4% of children in the 2nd group.

The same dynamics of clinical parameters were typical after 9 months of observation.

Improvement in psychomotor development was observed in 57.1% of children at 9 months and in 77.4% at 12 months. Episodes of bowel dysfunction occurred in 11.4% at 9 months and in 5.7% at 12 months of rehabilitation. In contrast, 17.6% of children in group 2 were readmitted within 12 months, and all children had acute respiratory viral infections, sometimes more than once. Bowel dysfunction was observed in 36% of children at 9-month follow-up and in 41.6% at 12-month follow-up. Normal psychomotor development was observed only in 24% and 29% of children at 9 and 12 months.

The immune status at 3, 6, 9, and 12 months of follow-up was as follows

Children from the first group recovered faster. The values of helper T-lymphocytes reached normal values, while in children of the second group, this parameter increased sufficiently for the first time after 9 months and reached normal values after 12 months; similar changes were observed for IgA, IgG, and phagocytic indices; T-suppressors were significantly higher at 6 months in both groups compared to the values and normalized after 9 months in the first group of children, while in the second group, they remained high until the 12-month follow-up. This was reflected in the CD4+/CD8+ index, which was significantly higher at 6 months in the first group but returned to normal after 9 months. In group 2, he was normal after 12 months of follow-up.

In addition, when assessing the distribution frequency of

of personal types of initial vegetative tone in the structure of providing the body of children who had sepsis, differences were revealed depending on the method of rehabilitation. So, in children of the 1st and 2nd groups, the beginning of the recovery period was characterized by high activity of the sympathetic link regulation vegetative nervous systems with an increase in the frequency of hypersympathicotonia compared with healthy children. In subsequent stages, there was a dynamic decrease in the frequency of hypersympathicotonia. and sympathicotonia in the 1st group. At the same time, the number of children in Estonia is.

In short, an integrated approach applied to the rehabilitation of children after sepsis, in terms of assessing the reactivity of the body, showed a decrease in the tension of adaptive mechanisms, which is a reliable indicator of maintaining a satisfactory adaptive state in children of the 1st group. The results showed the following.

The initial level of CIG values in children of the 1st group at the stage of recovery gradually approached the level of healthy children. In the relationship between the sympathetic and parasympathetic nerves, a restructuring took place in the direction of strengthening the latter. This manifested itself in an increase in the KIG indices Mo,  $\Delta x$ .

## Conclusion

Thus, a comparative study was conducted in two groups of children who received a complex rehabilitation therapy in the rehabilitation period with the implementation of measures to correct the intestinal biocenosis, neurometabolic therapy, and immunocorrection with Viferon, and children who received only the immunomodulator Taktivin, showed significant effectiveness of an integrated approach to rehabilitation. In addition, the comparatively fast reached positive immunological effect, good tolerability of Viferon, a non-invasive route of administration, and the absence of adverse reactions in the described method of immunorehabilitation allow us to recommend this drug for use in a complex of immunorehabilitation measures in infants who have undergone sepsis.

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