



To Assess Clinical and Laboratory Parameters in Children with Verified Purulent Meningitis

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Abstract: This article provides information about the study of 42 case histories of patients treated for purulent meningitis of hemophilic etiology. The objective of our work was to evaluate clinical and laboratory parameters in children with verified purulent meningitis of hemophilic etiology of various age groups.

Key words: verified purulent meningitis, hemophilic etiology, and diagnostics.

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Relevance. Bacterial purulent meningitis (BGM) is the most common childhood neuroinfection, especially in the first 5 years of life (90% of cases). The risk group consists of children of the 1st-2nd year of life, which make up half of the cases [1,2]. Analysis of 410 cases of BGM in children from 2 months. up to 14 years (over the last 5 years) showed that 3 pathogens still have the main (90%) etiological significance: meningococci (68%), pneumococci (12%), Haemophilus influenzae type b - 18% (in 1997 amounted to 44%). Among meningococci, the causative agent of type B prevails (up to 70%), less often - C (20%) or A (10%), pneumococci of 1,2,3,6,19,27 serotypes, rarely - staphylococci, streptococci, escherichia, salmonella, fungi of the genus Candida. The highest mortality is observed in pneumococcal meningitis (27.4%) and Hib-meningitis (11%), the lowest - in meningococcal (2.7%); with BGM of another etiology - reaches 25-40.9%. The following risk factors in the development of BGM are noted: early age, male sex, urban lifestyle, impoverishment of the population and overcrowding, as well as genetic predisposition (lack of HLA-BW-40 or presence of HLA-B-12), while breastfeeding is protective factor. Studies on BGM have made it possible to explain the processes of invasion of pathogens, starting with adhesion, colonization and penetration of bacteria through the nasopharyngeal mucosa into the bloodstream, followed by bacteremia; accumulation of endo- and exotoxins, inducing a cascade of inflammatory reactions of the macroorganism mediated by cytokines. This process goes in parallel with the destruction of the blood-brain barrier (BBB) and the penetration of toxins and microbes into the cerebrospinal fluid (CSF). Bacterial replication or lysis in the CSF induces cytotoxic acute purulent meningitis with the death of neuronal structures and brain death. Clinical studies have shown that, despite the use of new generation chemotherapy drugs, over the past 20 years there have been no significant changes in the incidence of neurological complications and mortality from BGM. What factors determine the outcome of BGM? Early diagnosis and the fastest possible initiation of therapy are associated with the peculiarities of manifestations of BGM in

infants: the predominance of nonspecific (temperature, drowsiness, irritability) and cerebral symptoms in the absence or late appearance of typical meningeal signs. In older children, BGM manifests more typically with cerebral and meningeal manifestations. However, with late diagnosis, the disease is characterized by a rapid increase in disorders of consciousness, the appearance of epileptic seizures, strabismus, hemi- and tetraparesis.

Purpose: to evaluate clinical and laboratory parameters in children with verified purulent meningitis of hemophilic etiology in different age groups.

Material and methods. Forty-two case histories of patients treated for purulent meningitis of hemophilic etiology were retrospectively analyzed.

Results and its discussion. When analyzing the clinical course of purulent meningitis of hemophilic etiology, it was found that males were more often ill ($55.0 \pm 7.7\%$). Morbidity at the age of up to 3 years was observed in $59.5 \pm 7.7\%$ of patients, less often at the age of 3 to 14 years ($40.5 \pm 7.4\%$). Seasonality of the disease was not observed. The largest number of patients was admitted to the hospital on the 2nd day of illness ($52.0 \pm 7.7\%$). The referral diagnosis of ARVI was made in $42.8 \pm 7.7\%$ of patients, meningitis was suspected in $40.5 \pm 6.4\%$. Upon admission, the diagnosis of neuroinfection was made in $88.0 \pm 5.0\%$ of patients. The final diagnosis of neuroinfection of hemophilic etiology was confirmed bacteriologically in 100% of patients. The main clinical symptoms were febrile temperature (in 100% of patients), vomiting ($80.1 \pm 6.3\%$), lethargy ($45.2 \pm 7.7\%$), headache ($37.9 \pm 6.8\%$), hemorrhagic rash ($11.9 \pm 5.0\%$), convulsions ($11.9 \pm 4.6\%$). Meningeal symptoms were pronounced in $30.1 \pm 7.0\%$ of patients. The average length of stay of patients in the hospital was 24 days (including 8 days in the ICU). For the etiological interpretation of meningitis, general clinical methods (general and biochemical analysis of blood and urine) and a set of microbiological examination methods were used: inoculation of cerebrospinal fluid and blood on nutrient media to isolate the causative agent of meningitis; bacterioscopy of cerebrospinal fluid and blood, and in some patients (10%) - PCR of cerebrospinal fluid. The general blood test was determined based on the norm of age indicators. On the first day of illness, 13 patients ($30.9 \pm 7.1\%$) had a decrease in the number of erythrocytes, and 29 ($69.1 \pm 7.1\%$) had normal values of erythrocytes. A decrease in hemoglobin was noted only in 3 patients ($7.1 \pm 3.9\%$). Leukocytosis was noted in 21 ($50 \pm 7.7\%$) patients, normal values of leukocytes - in 14 ($33.3 \pm 7.3\%$) patients, leukopenia - in 7 ($16.7 \pm 5.8\%$) patients. An increase in ESR was observed in 37 children ($88.1 \pm 4.9\%$). The number of platelets corresponded to the norm in 33 ($82.5 \pm 5.9\%$) patients, in 6 ($15 \pm 5.5\%$) patients - thrombocytopenia, and only in 1 ($2.5 \pm 2.4\%$) - thrombocytosis. The study of cerebrospinal fluid showed that cytolysis up to $1000 \times 10^6/l$ was observed in 2 people ($4.9 \pm 3.4\%$), $1000-5000 \times 10^6/l$ - in 20 ($48.8 \pm 7.8\%$), more than $5000 \times 10^6/l$ in 19 ($46.3 \pm 7.8\%$). On the first day of the disease, exclusively neutrophilic cytolysis was observed in 35 patients ($85.4 \pm 5.5\%$) and the predominance of neutrophils in 6 ($14.6 \pm 5.5\%$) patients.

The content of chloride ions was determined in 33 patients. In 5 ($15.2 \pm 6.2\%$) of them, the amount of ions corresponded to the norm (120-128 mmol/l), in 28 ($84.8 \pm 6.2\%$) - below the norm. Glucose levels were determined in 40 patients. In 13 people ($32.5 \pm 7.4\%$) it corresponded to the norm (2.5-3.5 mmol/l), in 20 ($50 \pm 7.9\%$) it was reduced, in 7 ($17.5 \pm 6.0\%$) - above 3.5 mmol / l. In 39 patients ($95.1 \pm 3.4\%$), the level of protein in the cerebrospinal fluid was above normal values, and only in 2 ($4.9 \pm 3.4\%$) patients it corresponded to the norm (0.2-0.4 g/l). In bacterioscopic examination of CSF, bacterial flora was found in $87.5 \pm 5.4\%$ of patients in the form of gram-negative rods of irregular shape, and in the study of a "thick drop" of blood, only in $40.0 \pm 7.4\%$. As a result of bacteriological examination of cerebrospinal fluid, hemophilus bacillus was detected in 100% of patients, with blood cultures - in $67.6 \pm 7.3\%$. In 10 ($23.8 \pm 6.6\%$) isolated Haemophilus influenzae, sensitivity to antibiotics was determined. It was found that 69% were sensitive to 3rd generation cephalosporins, and 20% were resistant to antibiotics of this group. As reserve antibiotics for the treatment of patients with

hemophilic meningitis, meropenem can be used (susceptibility was determined in 7 cultures, all sensitive), as well as levomecithin-succinate (5 out of 5 sensitive cultures). The treatment was carried out with the following antibiotics: ceftriaxone (in 50% of patients), cefotaxime (36%). Initial treatment with 3rd generation cephalosporins was effective in 29 (69.0±7.1%) patients. Due to the lack of effect from the initial treatment in 13 (31%) patients, the etiotropic treatment was changed to meropenem in 7 (53%) patients, amikacin - in 3 (23%), levomycetin - in 2 (16%), linezolid – in 1 (8%). The treatment was effective in 41 patients, which was 98%. Mortality was 2% (1 child died, because the *Haemophilus influenzae* isolated from him was resistant to ceftriaxone, which was treated).

Conclusions: The incidence of purulent meningitis/meningoencephalitis of hemophilic etiology is more often observed at the age of up to 3 years. The leading clinical symptoms are febrile temperature, vomiting, lethargy, headache, convulsions, focal symptoms. Identifying meningeal symptoms is often difficult. A bacterioscopic examination of cerebrospinal fluid and blood suggests a hemophilic infection on the first day of the disease, because pathogens found are gram-negative rods. Determination of the sensitivity of *Haemophilus influenzae* to antibiotics confirms the feasibility of using 3rd generation cephalosporins, with meropenem as a reserve antibiotic.

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