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Leukemia in Children: Causes, Stages, Symptoms, Diagnosis, and Treatment

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Abstract

Leukemia in children is a malignant disease of the hematopoietic system characterized by uncontrolled proliferation бластныхof bone marrow blast cells and a violation of normal hematopoiesis. The most common are acute lymphoblastic and acute myeloblastic leukemias. Current treatments include chemotherapy, immunotherapy, and bone marrow transplantation, which can significantly improve survival and remission rates. Early diagnosis, individual approach to therapy, and long-term follow-up are key factors for successful treatment and improving the quality of life of children with this disease.

Key words: Leukemia, Pediatric oncohematology, Acute lymphoblastic leukemia, Hematopoiesis, Hematopoiesis disorders, Cytogenetics, Diagnosis, Prognosis, Blood diseases, Hematological syndrome.

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Introduction: According to statistics, the prevalence of leukemia is up to 4-5 cases for every 100 thousand children under the age of 18 years. Approximately 30% of all cases are diagnosed with acute leukemia, which most often affects babies aged 2-5 years. At the same time, high mortality from this disease and increased frequency of occurrence are the main issues of pediatrics and the scientific community.

To date, there are no exact causes of leukemia in children. In addition, it is not clear why the disease is diagnosed in some children, but in the presence of the same conditions it does not happen in others.

However, there are a number of provoking factors that can indirectly or directly affect the development of the disease in childhood. This list includes:

- ✓ irradiation of the child's body – one-time, but large-scale, long-term, but small doses;

- ✓ living in ecologically unfavorable areas;
- ✓ hereditary predisposition;
- ✓ genetic pathologies and mutations.
- ✓ excessive exposure to the sun;
- ✓ acute infectious and viral diseases;
- ✓ prolonged and frequent exposure to carcinogens and toxic substances.

It is believed that secondhand smoke of parents or other family members can provoke blood leukemia in children, and in adolescence it can be active smoking. An unfavorable factor is considered alcoholism of the mother during pregnancy and feeding the baby with breast milk.

In some children, leukemia is associated with existing immune defense disorders, as well as primary or secondary immunodeficiency. Leukemia in a child is classified according to strict rules. Depending on the duration of the course of the disease, acute and chronic forms are divided. In the first case, the disease lasts up to 2 years, ends in recovery (remission)or death. In the second case, the duration of the disease exceeds 2 years. Most often, acute leukemias are diagnosed, which are considered the most dangerous. A congenital form of pathology is considered very rare.



Picture 1. Common Symptoms, which Children with blood cancer.

Depending on the type of cells involved in the pathological process, the acute form of pathology can be lymphoblastic, myeloid, or non-lymphoblastic. Chronic forms are lymphoblastic and non-lymphoblastic.

In modern oncohematology, it is customary to distinguish three stages of leukemia in children:

1. The first is acute. It begins with the appearance of the first signs and diagnosis, and ends with an improvement in all indicators during treatment.
2. The second phase is remission, complete or incomplete.
3. The third phase is a relapse that has begun, in which the symptoms of the disease return, often in an even more severe form.

Analysis and results: The symptoms of leukemia in children often appear gradually and at first they are attributed to a cold or fatigue. Among these manifestations, you can note rapid fatigue, lack of appetite, constant pain in muscles and bones, weight loss, sleep disorders, fever up to 38 degrees.

Some children have a pronounced hemorrhagic syndrome, in which heavy bleeding begins due to a violation of blood clotting. Additional signs include pallor of the skin, enlarged lymph nodes, liver and spleen, frequent episodes of acute tonsillitis, an earthy skin tone with further yellowing, and lesions of the oral mucosa.

There are no specific signs of leukemia in children, and the described symptoms can be observed in a variety of diseases.Lymphoblastic leukemia in children develops rapidly. Every 7 days, the number of blast cells increases by about 2 times. There are several syndromes inherent in this condition – intoxication, hyperplastic, hemoglobin reduction syndrome, sudden bleeding syndrome and infectious. In the initial period, which lasts up to 3 months, there are non-specific manifestations, during this height of all the symptoms of the syndromes described above are revealed. In remission after treatment, the symptoms of the disease completely disappear. The terminal period is characterized by the return of the disease and a fatal outcome.

Myeloblastic leukemia in children is manifested by signs of anemia, cutaneous hemorrhagic syndrome, in which the skin suddenly appears bruised, intoxication with fever, as well as an increase in the liver, spleen and lymph nodes. There are also frequent diseases of infectious origin, which can end in pneumonia, sepsis.

Acute leukemia in children can also manifest as a disorder of the cardiovascular system. The patient has tachycardia, arrhythmia, changes in the structure of the myocardium, and expansion of the boundaries of the heart muscle, a decrease in the ejection fraction

Leukemia in children quickly progresses with the development of various complications that can affect all organs and even systems. Most often, septic complications come to the fore due to the inability of the body's immune system to suppress numerous infectious and viral diseases.

Ulcerative-necrotic skin lesions are also noted in the late stages of the disease, and hemorrhagic manifestations occur already in the first weeks of leukemia development. Often, a fatal outcome occurs not because of the development of leukemia, but because of massive internal bleeding, hemorrhage, or kidney and liver failure.

To diagnose leukemia in children, the usual general blood test is used. At the first suspicion of the disease, if there are deviations in the obtained analysis, a sternal puncture and a myelogram are prescribed.

Additional diagnostic methods are ultrasound of the lymph nodes, liver, spleen, X-ray of the thoracic region, as well as CT or MRI of internal organs. Sometimes you may need to consult other doctors –an infectious disease specialist, an allergist,a cardiologist, or a gastroenterologist.

Treatment of blood leukemia in children is carried out by an oncologist or hematologist. All therapy is performed in a hospital for a long time. To prevent the development of infectious complications, the patient must be placed in a single sterile box. Great attention is paid to nutrition – it must necessarily be full-fledged, high-quality, balanced.

According to clinical recommendations, leukemia in children is treated by choosing a special protocol of

polychemotherapy. Treatment is divided into several stages, and the main task of this is to achieve the fastest and longest hematological remission.

In addition to chemotherapy, immunotherapy is performed, which can be active or passive. Other methods can also be used, including bone marrow, cord blood, and stem cell transplants.

All other treatment is symptomatic, including blood transfusion, administration of antibacterial drugs, detoxification, and hemostasis.

No doctor can give accurate results of the prognosis of leukemia in children, since the cause of this disease remains unknown. The disease is worst in children under 2 years of age and in those who are more than 10 years old. Favorable factors can be considered acute lymphoblastic form, rapid diagnosis and early initiation of therapy, age 2-10 years, female gender, and the absence of serious complications.

Against the background of treatment, the survival rate for leukemia in children in the first 5 years is noted in 80% of all cases. Full recovery is recorded if no relapse has occurred within 7-10 years. Without specific treatment, the fatal outcome of patients with this diagnosis will always be 100%.

Specific prevention of leukemia in children has not been developed, as the cause of the disease remains unclear. If it is available, it is not recommended to conduct physical therapy, change the climate, and move to other regions, and all vaccine prevention is built according to an individually developed plan.

Conclusion

Modern protocols of chemotherapy and maintenance therapy allow achieving stable remission in most children with acute leukemia, which significantly improves the prognosis of the disease.

Bone marrow transplantation remains one of the most effective methods of treating recurrent or refractory leukemia in children, ensuring long-term survival.

The introduction of targeted immunotherapy opens up new perspectives in the treatment of childhood leukemia, increasing the effectiveness and reducing the toxicity of traditional schemes.

Successful treatment of leukemia in children is possible only with a comprehensive approach that includes early diagnosis, individualized therapy, and long-term follow-up.

Despite the progress made, the treatment of leukemia in children remains a complex task that requires further research and improvement of therapeutic strategies.

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