CLINICAL-LABORATORY AND PROGNOSTIC CHARACTERISTICS OF ACUTE LYMPHOBLASTIC LEUKEMIA IN CHILDREN

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Abstract
Leukemia in children is a malignant disease of the blood characterized by the disruption of hematopoiesis in the bone marrow, leading to the replacement of normal blood cells with immature blast cells of the leukocyte lineage. The incidence of this disease is approximately 4–5 cases per 100,000 children. This article analyzes the clinical course of Acute Lymphoblastic Leukemia (ALL) in children and the primary prognostic factors influencing treatment outcomes. Research indicates that the accurate stratification of patients into risk groups based on age, sex, initial white blood cell (WBC) count, and cytogenetic characteristics is the key to enhancing therapeutic efficacy.

Keywords: Acute lymphoblastic leukemia, pediatric oncology, prognostic factors, blast cells, chemotherapy.

Introduction

Acute Lymphoblastic Leukemia (ALL) accounts for approximately 30% of all childhood malignancies. The peak incidence is primarily observed between the ages of 2 and 5 years. In 2019, approximately 6,000 new cases and 1,500 deaths from ALL were estimated in the United States, with an age-adjusted incidence rate of 1.38 per 100,000 individuals; the highest incidence occurred among children aged one to four years. In recent decades, the implementation of modern polychemotherapy protocols (e.g., BFM) has increased the complete remission and cure rates in children to 80–90%. However, treatment outcomes remain heavily dependent on clinical and laboratory indicators present at the time of diagnosis.

The clinical presentation of ALL in children is primarily characterized by anemic syndrome (pallor, fatigue), hemorrhagic syndrome (petechiae, ecchymosis, and mucosal bleeding such as epistaxis), proliferative syndrome (lymphadenopathy, hepatosplenomegaly), and bone pain. Key diagnostic laboratory findings include the presence of blast cells in the peripheral blood, anemia, thrombocytopenia, and a significantly elevated Erythrocyte Sedimentation Rate (ESR). Morphologically, ALL is classified into three subtypes (L1, L2, L3) according to the FAB classification. Studies show that approximately 60% of children present with the L1 variant, which generally responds more favorably to chemotherapy compared to other subtypes.

Prognostic Factors

Factor	Favorable Prognosis	Unfavorable Prognosis
Age	1 to 10 years	<1 year and >10 years
WBC Count	<50 \times 10^9/L	>50 \times 10^9/L
CNS Status	Not involved	Leukemic infiltration present
Cytogenetics	Hyperdiploidy	Philadelphia chromosome

In international clinical practice, male sex is traditionally associated with a higher risk due to potential extramedullary relapses.

Currently, the most powerful prognostic indicator is the patient's initial response to therapy:

Prednisolone Test: A blast count of less than 1,000/\mu L in the peripheral blood on day 8 of treatment is considered a positive (favorable) response.

Induction Outcome: Achieving remission by day 33 (defined as <5% blasts in the bone marrow) significantly determines the long-term survival probability. ###

In the treatment of children with ALL in our country, the following aspects require particular attention:

1. Early Diagnosis: Primary care physicians must maintain high clinical suspicion when encountering symptoms of anemia and hemorrhagic syndrome.
2. Sanitation and Hygiene: Due to immunosuppression during chemotherapy, strict adherence to sanitary norms in educational institutions is vital to prevent infectious complications.
3. Molecular Genetic Analysis: Expanding access to modern diagnostic methods to allow for more precise risk-group stratification.

Conclusion

Acute Lymphoblastic Leukemia in children is a highly treatable and potentially curable disease. Thoroughly studying prognostic factors and accounting for them at every stage of treatment allows for the development of individualized and effective therapeutic strategies for every patient.

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