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DIAGNOSTIC SIGNIFICANCE OF HEMATOMORPHOLOGICAL AND IMMUNOPHENOTYPIC CHARACTERISTICS OF ACUTE MYELOID LEUKEMIA IN CHILDREN

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Introduction

One of the most pressing challenges in pediatric oncohematology is the group of neoplastic disorders of the hematopoietic system, among which acute myeloid leukemia (AML) plays a central role. AML is characterized by clonal proliferation of myeloid precursor cells in the bone marrow, accompanied by a blockade of normal differentiation. This disease accounts for 15–20% of all childhood leukemias. Its rapid clinical progression necessitates a thorough understanding of both morphological and immunophenotypic properties of leukemic blasts, which are essential for accurate diagnosis and prognosis determination.

In recent years, the combined use of morphological and immunohistochemical approaches has greatly expanded the diagnostic possibilities in AML. These methods enable precise determination of the cellular lineage, differentiation level, and biological activity of blast cells. Such integrative analysis contributes significantly to early diagnosis, monitoring of remission, and tailoring of individualized therapeutic strategies.

Relevance of the problem

The morphological spectrum of AML is highly variable across its clinical subtypes. A marked increase in the number of blasts in the bone marrow and peripheral blood, together with cytoplasmic granules and Auer rods, serves as a major indicator of myeloid origin. However, in certain cases, morphological criteria alone are insufficiently defined, which can lead to diagnostic uncertainty. Therefore, combining morphological assessment with immunophenotypic profiling has become a key direction in modern hematopathology.

Immunophenotyping helps to determine the differentiation stage of blast cells by identifying cluster of differentiation (CD) markers on the cell surface. For instance, CD13, CD33, CD117, and MPO are indicative of myeloid lineage, while CD34 and HLA-DR reflect stem cell characteristics. Such immunoprofiles are of high diagnostic value, particularly for differentiating AML from acute lymphoblastic leukemia (ALL) [8,9].

Aim of the study

To analyze the morphological and immunophenotypic characteristics of childhood acute myeloid leukemia, to determine their interrelationship, and to evaluate their significance in clinical diagnosis.

Materials and Methods

This study included 32 pediatric patients aged 5–15 years diagnosed with AML and treated between 2020 and 2024 at the hematology departments of Andijan regional clinical hospitals. Bone marrow aspirates and peripheral blood samples were examined.

Morphological assessment was performed using Romanowsky–Giemsa staining under light microscopy. Immunophenotyping was conducted through flow cytometry using monoclonal antibodies against CD13, CD33, CD34, CD117, HLA-DR, and myeloperoxidase (MPO). The morphological findings were correlated with the immunophenotypic profiles in each case.

Results

Morphological evaluation revealed Auer rods in 65% of patients and well-defined nucleoli in enlarged blast nuclei in 78% of cases. The presence of cytoplasmic granules confirmed the myeloid nature of the leukemic process.

Immunophenotyping showed high expression of CD33 and CD13 in 81%, CD117 in 54%, CD34 and HLA-DR in 43% and 49%, respectively. MPO enzyme activity was positive in 67% of samples. The correlation between morphological and immunophenotypic data was observed in 84% of the analyzed cases.

These findings indicate a predominance of myeloid-specific CD markers in pediatric AML and suggest a close link between morphological features and cellular proliferative activity.

Conclusion

In children with acute myeloid leukemia, morphological evaluation reveals high blast proliferation, frequent Auer rods, and cytoplasmic granularity, all of which are characteristic of the myeloid lineage.

Immunophenotypic profiling confirms the myeloid differentiation through strong expression of CD13, CD33, CD117, and MPO, while CD34 and HLA-DR indicate the presence of immature stem-like blasts. The combined assessment of morphological and immunophenotypic parameters provides a more accurate diagnostic basis and guides therapeutic decision-making.

Future research should focus on integrating these data with molecular and genetic markers, thereby improving both diagnostic precision and prognostic evaluation in pediatric AML.

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