ANALYSIS OF LABORATORY RESULTS IN PATIENTS WITH ACUTE LEUKEMIA

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Resume

Purpose. *To analyze laboratory changes in peripheral blood and myelogram in adult patients with acute leukemias.*

Methods. *The material for clinical and laboratory studies in the work were patients with AL (n=102) who sought diagnostic help and subsequent inpatient examination at the republican specialized Scientific and Practical Medical Center of Hematology (RSSPMCH, Tashkent) from 2019 to 2023.*

Patients with AL were aged from 18 to 74 years, while the median age was 37.0±1.5 years. The diagnosis was made taking into account clinical and laboratory data.

The research methods included laboratory examination (complete blood count (CBC) and myelogram) and statistical methods for data processing using the applied PC software package "OpenEpi 2009, Version 2.3".

Conclusions. *The severity of changes in peripheral blood and bone marrow, characterized by erythropenia, thrombocytopenia, blastosis, and reduced mature neutrophils common to all acute leukemia variants, differs in depth and severity in cases of T-ALL.*

Keywords: *CBC, myelogram, acute leukemia, blasts.*

Conclusion

Purpose. *To analyze laboratory changes in peripheral blood and myelogram in adult patients with acute leukemia.*

Methods. *The material for clinical and laboratory research consisted of patients with acute leukemia (n=102) who sought diagnostic assistance and subsequent inpatient examination at the Republican Specialized Hematology Scientific and Practical Medical Center (RSSPMCH, Tashkent) from 2019 to 2023. Patients with acute leukemia were aged from 18 to 74 years, with an average age of 37.0±1.5 years. The diagnosis was established based on clinical and laboratory data.*

The research methods included laboratory examination (clinical (complete) blood count (CBC) and myelogram) and statistical methods for processing results using the OpenEpi 2009, Version 2.3 software package.

Conclusion. *The severity of changes in peripheral blood and bone marrow characteristic of all variants of acute leukemia, including erythro- and thrombocytopenia, blastosis, and reduction of mature neutrophils, is distinguished by the depth and severity of disturbances in T-ALL.*

Keywords: *CBC, myelogram, acute leukemia, blasts.*

Summary

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Objective. *To analyze laboratory changes in peripheral blood and myelogram in adult patients with acute leukemia.*

Methods. *The material for clinical and laboratory studies in the work were patients with AL (n=102) who sought diagnostic help and subsequent inpatient examination at the Republican specialized scientific - practical medical center of Hematology (RSSPMCH, Tashkent) from 2019 to 2023. Patients with AL were aged from 18 to 74 years, while the median age was 37.0±1.5 years. The diagnosis was made taking into account clinical and laboratory data.*

The research methods included laboratory testing (clinical (general) blood test (GBT) and myelogram) and statistical methods for processing results using the "OpenEpi 2009, Version 2.3" computer software package.

Conclusions. *The degree of severity of changes in peripheral blood and in the bone marrow with erythro- and thrombocytopenia, blastosis and a decrease in the content of mature neutrophils characteristic of all variants of AL, disorders in T-ALL differ in their depth and severity.*

Key words: *GBT, myelogram, acute leukemia, blasts.*

Introduction. Acute leukemia is a heterogeneous group of blood-related cancers characterized by abnormal proliferation of blast cells in the bone marrow, leading to the replacement of normal cells and a decrease in the three hematopoietic lineages in peripheral blood [4,6,7,8]. They are the most common cause of cancer and death worldwide, respectively, with an estimated over 300,000 deaths in 2018. Timely and accurate diagnosis is crucial for effective disease treatment [5,9,10]. The World Health Organization (WHO) considers morphology, along with other additional tests such as immunophenotyping, cytogenetic, and molecular analysis, essential for the comprehensive diagnosis of acute leukemia [1,2,3].

Purpose. To analyze laboratory changes in peripheral blood and myelogram in adult patients with acute leukemias.

Methods. The material for clinical and laboratory studies in this work included patients with acute leukemia (n=102) who sought diagnostic assistance

and subsequent inpatient examination at the Republican Specialized Scientific and Practical Medical Center of Hematology (RSSPMC Hematology, Tashkent) from 2019 to 2023. The patients with acute leukemia were aged 18 to 74 years, with a median age of 37.0±1.5 years. The diagnosis was established based on clinical and laboratory data. Depending on the form of acute leukemia, the first combined group of patients was divided into two subgroups: 1a (n=70) — patients with acute lymphoblastic leukemia (ALL) and 1b (n=32) — patients with acute myeloblastic leukemia (AML).

The research methods included laboratory examination (complete blood count (CBC) and myelogram) and statistical methods for data processing using the applied PC software package “OpenEpi 2009, Version 2.3”.

Results. In patients with acute leukemia, the clinical blood analysis compared to healthy individuals revealed a decrease in hemoglobin, red blood cells, and platelets, along with a simultaneous increase in the median leukocyte count and ESR (erythrocyte sedimentation rate).

The average hemoglobin concentration in the main group of patients with acute leukemia was statistically significantly reduced 2.1 times compared to the control (62.8±1.0 g/L; P<0.01), accompanied by a reduction in the median red blood cell count in the patient group by 2.3 times (1.9±0.04 x 10^12/L; P<0.01). Moreover, erythrocytopenia was associated with thrombocytopenia, with the mean platelet count statistically significantly reduced compared to the control by 5.2 times (56.0±4.3 x 10^9/L; P<0.001). At the same time, the leukocyte count and ESR levels were significantly increased in patients with acute leukemia, rising 10 times on average (54.0±4.9 x 10^9/L; P<0.001 and 51.0±1.5 mm/h; P<0.001).

Thus, based on the values of the main indicators in the clinical blood analysis, the presence of key hematological changes characteristic of acute leukemia is evident. Meanwhile, it is known that the morphological substrate of acute leukemia is the appearance of blast forms of leukocytes in peripheral blood, the proportion of which in the main group of patients reached 40.6±2.2%, with a complete absence of these cells in the control healthy group.

In addition to the blast burden in peripheral blood, a characteristic feature of acute leukemia was the decrease in the number of neutrophils among patients in the main group, the count of which, compared to the control, was significantly reduced by 2.4 times (25.1±0.8%; P<0.001).

At the same time, in acute leukemia, the median lymphocyte count (28.7±1.7%; P>0.05), monocyte count (4.9±0.6%; P>0.05), and eosinophil count (0.6±0.08; P<0.01), although reduced compared to the healthy control, still remained within the normal range.

Thus, based on the average values of the clinical blood analysis indicators, the main hematological changes in acute leukemia are a decrease in hemoglobin, red blood cells, platelets, and neutrophils, accompanied by an increase in leukocyte levels due to blastosis and ESR.

After identifying changes in the clinical blood analysis, the next task was to study the status of the indicators in the myelogram for the final accurate diagnosis of acute leukemia.

Blast cells, characterized by the presence of nucleoli and a fine chromatin structure, reached 67.5±1.6% in the main group of acute leukemia patients, while their number in normal conditions should not exceed 5%.

Along with this, neutrophilic elements, represented by neutrophils, basophils, and eosinophils, decreased to 19.7±1.1%, which was statistically significantly reduced by 2.1 times (P<0.01) compared to the lower normal limit.

In the analysis of the myelogram, the determination of the number of lymphocytes was of particular significance, with their median being slightly higher than the upper reference value, reaching 14.2±0.6% in the main group of patients with acute leukemia.

As a result of the decrease in the total number of erythroid cells to 11.2±0.2% in acute leukemia and the increase in the content of cells from the white germ (myeloid lineage) to 101.4±5.4%, the leukocyte-erythroblast ratio increased to 9:1.

Moreover, another characteristic finding in the myelogram was the decrease in the number of megakaryocytic cells to 3.0±0.2 per field of view.

Thus, evaluating the morphology of the bone marrow, a characteristic picture for acute leukemia was found, differing from the normal hematopoiesis pattern by an increase in the number of blast cells, along with a decrease in mature granulocytic elements, narrowing of the erythroid lineage, and a consistent reduction in the number of erythroid cells and megakaryocytes. However, it is important to note that blast cells reached their highest number in the T-ALL variant, which also exhibited the greatest reduction in neutrophil cells and a higher frequency of lymphocytes.

Conclusion. The degree of severity of changes in peripheral blood and in the bone marrow with erythro- and thrombocytopenia, blastosis and a decrease in the content of mature neutrophils characteristic of all variants of OL, disorders in T-ALL differ in their depth and severity.

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