

Functional Status of the Cardiovascular System in Patients with Acute Myeloblastic Leukemia: Results of a Retrospective Study

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Abstract: A retrospective analysis of indicators of the functional state of the cardiovascular system in patients with acute myeloblastic leukemia was conducted in the hematology center of the multidisciplinary medical center of Samarkand city. The purpose of the study: to evaluate the functional changes in the cardiovascular system in Acute myeloblastic leukemia in order to identify characteristic diseases that require preventive therapy to reduce the risk of developing the disease.

Keywords: hemoblastosis, acute myeloblastic leukemia, chemotherapy, cardiovascular system, heart rate variability, functional research methods, heart rhythm disorders.

Materials and methods: 31 patients (10 controls, 23 patients with acute myeloblastic leukemia and 8 patients with chronic myeloid leukemia participated in the study. Screening criteria: patients aged 23 to 65 years diagnosed with Acute myeloblastic leukemia. Clinically unstable patients with comorbidities were excluded from the study. All patients were assessed for clinical condition, instrumental diagnostic methods (electrocardiography (ECG), Holter monitoring (HM), echocardiography (Echo-CG)), heart rate variability and autonomic tone.

Results of the study: General intoxication and weight loss were the main clinical signs of the patients at the time of admission. The most common complaints from the cardiovascular system were pain in the heart region of varying duration and intensity, shortness of breath during exercise, and increased heart rate. According to the ECG, sinus tachycardia, signs of left ventricular hypertrophy and heart block were noted. HM was more informative in detecting signs of CVS injury than ECG. Initial indicators of heart rate variability in patients with hemoblastosis are reduced in both groups. Echo-CG revealed signs of increased left ventricular size and volume, decreased contractility and dilatation.

Conclusion: Multicomponent chemotherapy of Acute myeloblastic leukemia causes a variety of side effects, including cardiotoxic effects, in most patients, so it is important to jointly manage patients by a hematologist, cardiologist, and general practitioner.

Introduction. Acute myeloblastic leukemia (AML) is described as a leukemia in the WHO report on the new classification of acute leukemias [1]. In Russia, as well as in European countries, the incidence of Acute myeloblastic leukemia in children under the age of 14 is about 0.6-0.8 cases per 100 thousand people per year, but after the age of 40-45 there is a sharp increase in the incidence. Men suffer from Acute myeloblastic leukemia 2 times more often than women, the role of heredity in the development of the disease has been determined [2, 3].

For information, it can be said that about 2,500 oncohematological diseases are diagnosed in Uzbekistan every year.

Acute myeloid leukemia (AML) is the third most common form of leukemia, accounting for approximately 20% of cases in North America and Europe. In countries such as India and Japan, the incidence of Acute myeloblastic leukemia ranks second among leukemias [2-4]. The prevalence of

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Acute myeloblastic leukemia is approximately 1-1.5 per 100,000 people in all countries. Men are sick more often than women, accounting for 55-60% of the total number of patients. The highest rate of the disease is observed at the age of 20-40 [4-7]. The genetic cause of Acute myeloblastic leukemia has not been identified, but there are isolated cases of several family members with Acute myeloblastic leukemia. [5].

Acute myeloblastic leukemia (AML) is a cardiovascular disease, which usually develops against the background of the development of the main disease and has a significant negative impact on the clinical picture. It is determined by the pathology of the vascular system. It is often fatal [6].

Early experimental methods: Researchers at the Fred Hutchinson Center for Tumor Research in Seattle have discovered a new way to increase the activity of immune cells against tumors. As a result, it was possible to achieve almost 100% efficiency in the treatment of patients who were previously considered hopeless. In 27 of 29 patients in the study, bone marrow analysis after using the new therapy showed a complete absence of bad-quality cells.

The purpose of the study: to assess functional changes in the cardiovascular system in acute myeloblastic leukemia (AML), to identify characteristic diseases that require preventive therapy to reduce the risk of developing the disease.

Materials and methods. To evaluate the functional status of the organs of the CKD, patients with acute leukemia were divided into 3 groups: group 1 (n=24) – patients with OLL, group 2 (n=32) – with Acute myeloblastic leukemia diseased patients, group 3 (n=20) - control (healthy individuals, gender and age comparable to patients in the study groups).

The study was conducted through a retrospective analysis of medical records of patients undergoing inpatient treatment at the hematology center of the multidisciplinary medical center of Samarkand. The history of the disease was selected according to the nosological principle according to the studied diseases and divided into 2 groups, which were compared by gender, age and duration of the disease.

Evaluation criteria: age of patients from 23 to 65 years, diagnosis, presence of accompanying chronic diseases in the decompensation phase, severe infectious processes (HIV infection, tuberculosis, syphilis, progressive course of viral hepatitis B and C), history of epilepsy, so Major surgery within the last 3 months. or scheduled/suspected major surgery or cardiac intervention was identified during the study period.

The clinical condition of all patients was evaluated, instrumental diagnostic methods were used: ECG, Holter monitoring (HM), Exo-KG and heart rate variability were evaluated.

To evaluate the vegetative process, the vegetative Kerdo index (VIC) was calculated using the following formula: $VIC=100 \times (1 - DBP/HR)$. The obtained VIC parameters made it possible to determine the dominant part of the autonomic nervous system in subjects: $VIC > 0$ - sympathicotonia, $VIC < 0$ - parasympathicotonia, $VIC = 0$ - eutonia (balance of sympathetic-parasympathetic regulation of vegetative functions).

Statistical processing of the obtained data was carried out according to the generally recognized method, arithmetic mean (M) and arithmetic mean error (m) were calculated. Student's t test was used in groups with normal data distribution; non-parametric Wilcoxon and Mann-Whitney tests were used in non-normally distributed samples. Differences were considered significant at a significance level of $p < 0.05$. Correlation analysis was used to assess the correlation of characteristics by calculating Spearman's correlation.

Results. Clinical characteristics of patients. General intoxication was the main clinical symptom in 31 patients with Acute myeloblastic leukemia when hospitalized. Weight loss was noted as the main symptom in the rest of the patients. Complaints in patients: weight loss (19 patients in group 1 and 12 patients in group 2); for enlarged lymph nodes (16 patients in group 1), bone pain, and hemorrhagic syndrome (14 and 9 patients in groups 1 and 2, respectively).



At the time of hospitalization, 14 patients with Acute myeloblastic leukemia were in satisfactory condition and 17 patients were in moderate condition;

Thus, patients with hemoblastosis often have complaints and clinical manifestations of the cardiovascular system, which is caused by a number of reasons. The main causes include leukemic infiltration of the myocardium as a manifestation of hematologic spread of the tumor during disease progression in patients with acute leukemia; non-specific changes in the myocardium associated with bleeding (often with Acute myeloblastic leukemia); anemia syndrome; pericarditis; infectious complications.

Frequent and diverse ECG changes noted in acute myeloblastic leukemia are explained by the duration of the disease and the age of this cohort of patients. At the same time, specific ECG changes characteristic of hemoblastoses could not be determined.

Daily HM revealed more signs of CVS damage than standard classical ECG: 109 (165.2%) vs. 51 (77.3%). Therefore, in hematological tumors, HM is a diagnostically more informative method than regular ECG. In acute myeloblastic leukemia, the dysfunction of automaticity in the form of supraventricular and ventricular extrasystoles is very often detected.

An increase in the size of the left ventricle, a decrease in contractility and its expansion were found in patients with Acute myeloblastic leukemia. Ejection fraction and reduction in left ventricular anteroposterior volume in systole were significantly less than in the control group. Vascular volume (SV) did not change significantly, but significant increases in minute volume and systolic index were noted as a result of increased heart rate. This condition can be evaluated as a hyperkinetic type of blood circulation. At the same time, the preservation of the rate of contraction of the myocardial fibers and the blood circulation of the VR indicates the preserved reserves of the contractile function of the left ventricle.

Changes in group 2 are the same as changes in group 1, but less pronounced. There were no significant differences between the data of patients with OLL and Acute myeloblastic leukemia.

In patients with hemoblastosis, the main indicators of heart rate variability are reduced in both groups, but not significantly compared to the control group.

Conclusion. Acute myeloblastic leukemia is a very common severe progressive disease, which leads to consequences that require life-long complex basic treatment with drugs that inhibit the activation of the pathological process. Initially, the disease itself has a systemic and not only hematological character, affecting the functional state of many organs and systems of the patient, in particular, the cardiovascular system. However, long-term multicomponent therapy for leukemia causes side effects in a large proportion of patients, including cardiotoxic ones. All these together have a direct negative impact on both the length of life of patients and its quality.

Thus, in the initial detection of this or that variant of hemoblastosis, clinical examination of the patient and taking therapeutic measures should be carried out by several specialists: a hematologist who treats the main disease, a therapist who monitors patients for early detection of negative consequences, events in the pharmacotherapy of the main disease, it will be necessary to monitor the functional state of life-supporting organs and systems, as well as to plan preventive complex medical and recreational activities.

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