World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-29, December 2023
ISSN: 2749-3644

CHARACTERISTIC FEATURES OF VOLATILE METABOLITES OF BIOGENIC AMINES IN THE AIR OF THE BREATH IN MYOCARDIAL INFARCTION

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Article history:

Received: October 4th 2023
Accepted: November 4th 2023
Published: December 6th 2023

Abstract:

The volatile metabolits of biogenical amins of exhaled air were studied for the first time, the functional activity of sympatic-adrenal system on the excretion of combined and free fractions of catecholamins and DOFA in daily urine was studied simultaneously. It is shown the results of the investigation on the new methods of noninvasing diagnosing of Ischemic Heart disease in this paper. This method is based on analyzes of expirating air. The results of investigation showed the possibility of the surface ionizating detector in diagnosis of Ischemic Heart disease. It was revealed the statisticly importance of difference in containing the amines in expirating air of patients ill with Ischemic Heart disease and healthy people. The advantage of this method concludes whole harmless, expressive ness and canceling the operative intervention and possibilities of mass testing, and cheap price of observation. The difference in eliminating the amines with expirating air can be stable marker for early diagnosing of the preinfarctive state.

Keywords:

INTRODUCTION. The great damage caused to human health by cardiovascular diseases (CVD) poses serious problems for both clinicians and public health workers [1]. As a result of epidemiological and clinical observations conducted in our country and abroad, it has been shown that among CVD in recent years, coronary heart disease (CHD) is one of the main causes of early disability, disability and mortality [2].

As is known, in most cases, CVD develops covertly, their clinical signs appear at a late stage. Often patients are unaware of the presence of the disease and die suddenly; very rarely, a Clinician has the opportunity to examine the patient before his cardiovascular system is seriously affected [1, 3]. It follows that only therapeutic measures can not solve the problem of death from CVD [4].

The development of coronary insufficiency is facilitated by nervous and (or) physical stress, which causes an increase in the activity of the sympathetic-adrenal system (SAS). Due to the increased production of catecholamines (CA) by the adrenal glands and postganglionic endings of sympathetic nerves, an excess of these biologically active substances accumulates in the myocardium [5, 6, 7]. there is a need to make significant changes to research methods, despite the fact that they are based on clinical methods [5, 8, 9].

As you know, there is a constant gas exchange between the body and the environment, the supply of oxygen and the removal of carbon dioxide and many organic compounds. Carbon dioxide is easy to detect, since its content in the exhaled air (BB) reaches 5%. Unfortunately, other volatile components of EXPLOSIVES have much lower concentrations – about 10-6 or even lower [12, 13].

Breath analysis has become a promising branch of medical technology in recent years [6, 14].

In modern medicine, the analysis of EXPLOSIVES is also used in the diagnosis of diseases of the stomach, liver, and intestines.

In available literature we found a single work devoted to the analysis of EXPLOSIVES [7, 10] and the total lack of work on the study of volatile metabolites of biogenic amines in BB CHD patients, as well as parallel and simultaneous study and qualitative evaluation of the functional state of the SAS.

OBJECTIVE: to study the content of volatile metabolites of biogenic amines in EXPLOSIVES in patients with MI and the relationship of their violation with the functional activity of the SAS and to develop a new gas-analytical method for diagnosis of this pathology.

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MATERIALS AND METHODS OF RESEARCH. Under our observation there were 45 male patients aged from 31 to 68 years suffering from coronary heart disease. The duration of the disease is from 3 to 20 years. The patients were hospitalized in the cardiology Department of the Andijan branch of the center for emergency care. 45 patients were randomly assigned to 2 groups based on the diagnosis. 25 patients were diagnosed with IHD QMI (aged 31 to 68 years); 20 men were diagnosed with IHD NQMI (35 to 60 years). The diagnosis in all examined patients is based on data from clinical observation, laboratory analysis, and functional diagnostics. For many years – from 3 to 20, patients received inpatient and outpatient treatment for CHD. Our patients with acute myocardial infarction received traditional treatment.

The control group consisted of 20 patients aged 30 to 55 years. IV samples for analysis in patients with myocardial infarction were taken on the first day of admission to the hospital, on the 7th-8th day, and on the 12th-14th day of the disease. When selecting patients for the analysis of BB, respiratory pathology was excluded.

The results of clinical studies were processed using the application programs for statistical processing of Excel, as well as by the method of variation statistics according to Fischer using t-criteria of student tables. Differences between the arithmetic mean values were considered statistically significant at $p<0.05$. To determine the strength of the relationship between the indicators, we used correlation analysis using Excel statistical processing programs.

THE RESULTS OF THE RESEARCH When examining QMI patients in the first days of admission to the hospital, there was an increased content of volatile amines in the BB. And if patients with NQMI on day 1 increased the level of biogenic amine metabolites by 412.1%, then patients with QMI increased by 11.8 times compared to healthy ones. On day 7-8, the content of amines in BB in QMI patients decreased to 582· 27.29 10-9 g/l, which is 7.8 times higher than in healthy patients. On days 12-14, there was a significant decrease in the content of amines in IV in QMI patients to 301· 17.91 10-9 g/l, which is 4 times higher than the control group.

NQMI patients were examined at admission, then on 7-8 days of stay and on 12-14 days. On the first day, there was a significant increase to 379· 41 10-9 g/l of volatile metabolites of biogenic amines in the BB, which is 5.1 times higher than the control indicator ($P<0.001$). On day 7-8 of the disease, there was a slight decrease in biogenic amine metabolites to 301· 49 10-9 g/l, which is 4 times higher than in the healthy group ($P<0.001$). And on 12-14 days, the level of diethylamine descends to 207· 47 10-9 g/l, which is 2.7 times higher than the control level ($P<0.001$).

A study of QMI patients (25 people) on the first day of admission to the hospital revealed a significant increase in daily urinary excretion of catecholamines (CA) and DOPA (table 2).

There was a statistically significant increase in the excretion of free epinephrine (A) in comparison with healthy people by 1.7 times ($P<0.001$). Compared with the control, the excretion of conjugated A was 3.1 times higher ($P<0.001$). Accordingly, the coefficient of increase in the content of total A in daily urine in relation to the control value was 2.6 ($P<0.001$) ($P<0.001$). The excretion of all norepinephrine (NA) fractions was also statistically significantly higher than the control level. There was an increase in free NA in comparison with the control almost 2 times ($P<0.001$). The increase in conjugated NA in daily urine exceeded the control level by 2.4 times ($P<0.001$). Accordingly, the indicator of increased excretion of total NA was 2.2 in relation to the control ($P<0.001$). The excretion of free, conjugated and total dopamine (DA) in patients remained relatively lower than in healthy patients and was statistically unreliable. The excretion of free, conjugated, and total dopamine in healthy subjects was 141.4 7.6 mcg/day, 141.4 7.6 mcg/day, and 282.8 10 mcg/day, respectively (see table 3.9). The level of excretion of DOPA in patients with QMI on the 1-2 day of the disease was significantly lower ($P<0.001$) the rate of healthy and 23.9 to 1.9 mg/day, and healthy excretion of DOPA amounted to 47.9 per 2 mg/day (table. 2).

The correlation coefficient between the total and volatile amines And at QMI made -0,13 that says the opposite of weak ties. When determining the correlation between diethylamine and total NA, a direct relationship was found (coefficient =+0.03), with DA – feedback (-0.44), and with DOPA – also feedback (coefficient = -0.05).

In the study of patients with NQMI, we noted a statistically significant increase in the excretion of A, NA, DA and DOPA in the daily urine.

Daily excretion of free A in patients with NQMI compared with healthy individuals increased by 22.6% ($P<0.05$), conjugated by 84.1% ($P<0.001$) and total by 52.3% ($P<0.001$). Daily urine excretion IN NQMI patients is statistically significantly higher than the control level. The excretion of free NA increased by 55.1% ($P<0.01$), conjugated by 68.5% ($P<0.01$) and total by 62.2% ($P<0.001$). The decrease in daily excretion of all DA fractions compared to healthy ones, free by 17.9% ($P<0.05$), conjugated by 3.3% was statistically unreliable. The level of DOPA excretion was statistically significantly reduced by 2.2 times ($P<0.01$).

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Thus, the values obtained by us indicate a statistically significant increase in the excretion of KA, in particular NA and A, and a decrease in DOPA in the daily urine of NQMI patients.

DISCUSSION OF RESULTS. In the course of our work, we obtained interesting and important data that open up certain prospects for further research. Gas-analytical methods were used to detect volatile metabolites of biogenic amines in EXPLOSIVES and simultaneously study the daily excretion of KA in the urine of patients with MI and clinically healthy people. The results of our research led to the development of a new survey method. Our proposed method is based on the use of modern methods of physical electronics and gas analysis.

The analysis of EXPLOSIVES also provides an interesting clue to the biochemical basis of many diseases, the causes of which are still unknown. The value of information that can be obtained in the analysis of EXPLOSIVES is due to the fact that the contents of the alveoli of the lungs are separated from the blood in the capillaries only by a thin barrier – the alveolocapillary membrane. Volatile organic compounds can diffuse through the alveolocapillary membrane from one compartment to another, in the direction of lower vapor pressure – from the air to the blood, or Vice versa (M. Phillips).

The results obtained by us, taking into account the data from literature sources, indicate the need to monitor the state of SAS in patients with MI. This is not only theoretical, but also of great practical importance for the diagnosis, prediction, as well as determining the tactics of rational treatment of MI and prevention of complications.

CONCLUSIONS:

1. An additional method for the diagnosis of coronary heart disease is developed by the amine gas analyzer. Due to its high sensitivity, the amine gas analyzer can solve the problem of diagnosing myocardial infarction. The obtained data on the volatile metabolites of biogenic amines in the exhaled air can be used as additional diagnostic criteria.
2. A significant increase in the yield of volatile metabolites of biogenic amines with exhaled air was found in patients with myocardial infarction, especially in Q-wave myocardial infarction, which is of great interest in identifying the mechanism of development of myocardial infarction.
3. A comprehensive study of the sympathetic-adrenal system and the metabolism of biogenic amines in patients with coronary heart disease showed that acute myocardial infarction has a pronounced violation of catecholamine biosynthesis, which is manifested by an increase in urinary excretion of free and conjugated forms of epinephrine and norepinephrine.
4. A comparative analysis of the content of volatile metabolites of biogenic amines in the exhaled air with daily excretion of catecholamines in the urine revealed that in acute myocardial infarction, there is a significant increase in the output of volatile amines through the exhaled air and increased urinary excretion of catecholamines

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Available Online at: https://www.scholarexpress.net
Volume-29, December 2023
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