

Correction of violations rheology of blood in ischemic heart disease

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Absrtact: The therapeutic effect of ozone-oxygenated crystalloids as a compensation factor for hemorheological disorders in patients with coronary heart disease has been studied. 53 patients with coronary heart disease: angina pectoris II>III FC aged 40 to 79 years were monitored. All patients received traditional antianginal therapy. Patients of the main groups were treated with ozone therapy against the background of traditional therapy. Before and after treatment, the apparent viscosity of blood, yield strength, shear stress were determined. A decrease in the studied parameters was revealed in all the studied groups and the absence of dynamics in patients, who received traditional therapy. It is concluded that parenteral administration of ozone-oxygenated crystalloids in therapeutic dosage contributes to the improvement of rheological properties of blood.

Keywords: coronary heart disease, hemorheological disorders, ozone therapy

INTRODUCTION

In the pathogenesis of many diseases, including ischemic heart disease (CHD), an important role belongs to violations of the rheological properties of blood. To date, a sufficient amount of data has accumulated indicating the development of increased blood viscosity syndrome in various pathological processes. Despite the extensive literature material concerning rheological disorders in coronary heart disease, the issues of treatment and prevention of these disorders have not yet been resolved. Generally accepted methods of normalization of hemorheological disorders (artificial hemodilution, heparin therapy, the use of disaggregants, fibrinolytics, cardiotonics, etc.) do not in all cases provide an effective effect on factors affecting the rheological behavior of blood. Such treatment is usually symptomatic and ineffective. It should also be taken into account that not all methods of correction of hemorheological disorders are applicable in cardiological practice.

Currently, the method of medical ozone treatment is widely used in (17.4%) all over the world. In recent years, there have also been works that convincingly prove the high efficiency of the use of medical ozone in the treatment of coronary heart

disease. Despite the fact that significant progress has been made in the use of ozone in cardiological practice, the mechanisms of its effects have not been fully disclosed. The aim of the study was to study the general patterns of the therapeutic effect of ozone-oxygenated crystalloids as a compensation factor for hemorheological disorders with the study of its leading mechanisms in patients with coronary heart disease.

MATERIAL AND METHODS

The work was based on clinical observations of 53 patients with coronary heart disease: angina pectoris II-II FC. All patients were divided into 2 groups: group 1 - CHD patients: group 2 - CHD patients in combination with arterial hypertension (AH).

The first group consisted of 22 patients aged 40 to 79 years (average age 59.5 years): 11 women aged 54 to 79 years (average age 66.5 years) and 11 men aged 40 to 76 years (average age 58 years). 5 patients (21.7%) had a history of myocardial infarction (MI) from 1 to 8 years old, 18 patients (76%) had clinical signs of chronic heart failure (CHF) II FC, 5 patients (24%) had CHF - III FC. All patients received traditional antianginal therapy: nitrate monotherapy in patients (76%), a combination of nitrates with a blocker- 35 calcium channels - 2 patients (4.3%), a combination of nitrates with B-blockers in 8 patients (17.4%); 38 patients (82.6%) as an antiagregant received aspirin.

The second group of patients consisted of 31 patients aged 45 to 76 years (average age - 60.5 years): 2, 19 women aged 55 to 76 years (average age 65.5 years) and 12 men aged 45 to 75 years (average age - 60 years). Essential arterial hypertension (AH) of stage II was diagnosed in 19 patients (62%), in 8 patients (27%) - stage III and in 3 patients (11%) symptomatic arterial hypertension (AH) of atherosclerotic genesis. In this group, 6 patients (19%) had a history of indications of a prescription from 1 to 8 years old, 21 patients (67%) had clinical signs of CHF P FC, 11 patients (33%) had CHF III FC.

All patients received traditional antianginal therapy: nitrates monotherapy - 14 patients (44%), a combination of nitrates with calcium channel blockers - 5 patients (16%), a combination of nitrates with B-blockers - 7 patients (24%), monotherapy with calcium channel blockers - 1 patient (3%), monotherapy in 2 patients (6%), a combination of nitrates with B-blockers and calcium channel blockers - 2 patients (6%). 21 patients (65%) received ACE inhibitors as antihypertensive drugs; 26 patients (80%) received aspirin as an antiplatelet

Patients of both groups underwent therapy in the form of intravenous drip administration of ozonated saline solution with an ozone concentration at the outlet of the device of 5 mg/l (therapeutic concentration of ozone in a solution of 0.05 micrograms /ml) of 200 ml daily for 10 days.

The comparison troupe consisted of 30 people comparable in age and gender, divided into 3 subgroups: 10 patients with coronary heart disease (group III), 10 patients with coronary heart disease in combination with hypertension (group IV) who received traditional antianginal therapy, ACE inhibitors and aspirin, and 10 conditionally healthy people (group V).

In accordance with the algorithm developed by us, before the appointment of treatment and after the completion of the course of treatment, patients of all groups were examined, including electrocardiography, ECHO cardioscopy, coagulogram, blood clotting according to Sukharev, determination of lipoproteins, total cholesterol, platelet aggregation, apparent blood viscosity, POL products and enzymes of the antioxidant system, general analysis blood.

In the studies conducted by us, an ozone synthesizer "Ozone 3" was used, capable of producing an ozone concentration at the output of 0.5 micrograms/ml. Ozonation of the saline solution was carried out according to the method proposed by G.A. Boyarinov [1] in standard 200 ml vials under normal conditions by bubbling through an air needle with an oxygen-ozone mixture obtained on an ozone synthesizer. The saturation time of the solution with ozone was 5 minutes.

RESULTS AND DISCUSSION

Prior to treatment, the apparent viscosity of blood (KVK) at a shear rate of 25 seconds had no significant differences in all the studied groups ($p > 0.05$) and significantly differed from the indicators in the group of conditionally healthy ($p < 0.001$). KVK at a shear rate of 25 seconds in the group was 32.74 ± 0.39 sDr and was 36.1% higher compared to the group of conditionally healthy ($p < 0.001$). In group II, the same indicator was 33.12 ± 0.23 sDr and was increased, compared with the group of conditionally healthy, by 37.6% ($p < 0.001$). In group III, an increase in KVK was detected at a shear rate of 25 sec 1 by 38.7%, in group IV by 33.7%, compared with the group of conditionally healthy ($p < 0.001$). The study of HOW at a shear rate of 100 sec 31 revealed the same patterns. In group I, the studied parameter was 22% ($p < 0.001$) higher than that in the group - conditionally healthy. AS with a shear rate of 100 sec 31 in group II exceeded by 19.8% ($p < 0.001$) the results obtained in the group of conditionally healthy, in Group III pe by 19.5% ($p < 0.001$), in group IV pe - by 19.3% ($p < 0.001$). The study, as at a shear rate of 250 seconds, showed the following. AS in group I before treatment, it exceeded this indicator in the group of conditionally healthy patients by 14.8% ($p < 0.001$), in group II - by 11.3% ($p < 0.001$), in group III - by 15.4% ($p < 0.001$), in group IV - by 16.2% ($p < 0.001$). The yield strength in group I was increased by 1.7 times ($p < 0.001$), in group II and III - by 1.9 times ($p < 0.001$), in group IV - by 1.8 times ($p < 0.001$), compared with the group of conditionally healthy. After treatment with ozone, there was a decrease in KVK by 25% ($p < 0.001$) and 27.3% ($p < 0.001$) in groups I and II, depending on the type of

veins, which correlated with the values in the group of conditionally healthy ($p > 0.05$). In groups that did not receive ozone therapy, significant changes KVK at a shear rate of 25 sec 31 not passed ($p > 0.05$). Similar results were obtained by us when studying the KVK at a shear rate of 100 sec 31. CPK decreased by 14.7% ($p < 0.001$) and 15.1% ($p < 0.001$) in the groups of patients receiving ozone therapy, and it did not change in the groups of patients receiving only traditional treatment ($p > 0.05$). After treatment with ozone, we also observed a decrease in KVK at a shear rate of 250 sec 31 by 10.2% ($p < 0.001$) and 12.2% ($p < 0.001$) in the study groups. In the groups of patients who did not receive ozone therapy, there were no significant changes in CVC ($p > 0.05$). The study of the blood flow limit revealed its decrease in the groups of patients who underwent ozone therapy by 44% ($p < 0.001$) and 42.6% ($p < 0.001$). In patients who did not receive ozone therapy, the values of the blood flow limit did not change significantly ($p > 0.05$).

The course of coronary heart disease in a certain way affected the rheological behavior of blood. There was an increase in blood viscosity at the studied shear rates from 25 to 250 reverse seconds, and the yield strength reached values of $0.6 = 0.02$ and $0.605 = 0.01 \text{ din/cm}^2 \times 1031$ in groups I and II, respectively. This condition can be regarded as a syndrome of increased blood viscosity.

It can be seen from the table that the indicators of blood fluidity and plasticity in patients of groups III and IV had no significant differences compared with similar indicators before the start of therapy, which indicates that traditional treatment did not lead to changes in the values of apparent blood viscosity, as well as the yield strength.

Rheological parameters of blood after infusion of solutions of ozonated crystalloids significantly decreased and were within the physiological norm, as it was established for the group of conditionally healthy. The values of the apparent viscosity of the blood at all the studied shear rates did not have significant differences from those in the conditionally healthy.

CONCLUSIONS

1. The course of coronary heart disease is accompanied by a characteristic violation in the hemorheology system, manifested in an increase in the apparent viscosity of blood, the limits of fluidity and shear stress.

2. Parenteral administration of ozone-oxygenated crystalloids in therapeutic dosage it improves the rheological properties of blood, which is expressed in a decrease in the apparent viscosity of blood, yield strength, shear stress.

3. The lack of effect on the studied parameters when using traditional antianginal and antiplatelet therapy and the presence of such afterinfusions of solutions saturated with ozone indicate that it was ozone that influenced the pathogenetic components of coronary heart disease studied by us.

4. The use of ozone-oxygenated crystalloids is a promising method of treating patients with coronary heart disease.

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