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HUMORAL IMMUNITY AND MARKERS OF INFLAMMATION IN THE PROGNOSIS OF COMPLICATIONS OF HYPERTENSION

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Abstract:

The author conducted a study of humoral immunity and markers of inflammation in patients with hypertension, studied the diagnostic value of immunological parameters for the development of methods of early prevention of patients with hypertension.

Keywords: Immunity, Arterial Hypertension, Prognosis, Metabolic Syndrome

The humoral link of immunity is assessed by the number of immunoglobulins that are synthesized in response to the stimulation of B cells. When pathogenic bacteria and helminths enter the body, a humoral immune reaction is manifested to their antigens, aimed at protecting extracellular forms and their toxins. An important aspect of humoral immunity is the secretion of antibodies that act on antigens, resulting in a protective function from extracellular parasites. This property is known in science as an adaptive immune response [2,4,5].

It is known that B-lymphocytes are responsible for the production of circulating antibodies that recognize the introduction of foreign antigens into the body and activate subsequent immune links aimed at their elimination [1,7].

IL-1 enhances sympathetic activation, leading to systemic vasoconstriction, which worsens sodium natriuresis. Similarly, the infusion of exogenous IL-1 in the systemic or pulmonary vascular system enhances hypertensive reactions. 186 IFN is produced by T cells and macrophages, regulating and labeling Th1 differentiation and activating myeloid cells and B lymphocytes, limits natriuresis. However, blockade targeting the IFN 1 receptor (IFNGR1) did not reduce Ang II-dependent hypertensive reactions, suggesting that the IFN 2 receptor (IFNAR2) plays an important role in the regulation of sodium retention. However, inhibition of IFN R1 does prevent the progression of tubulointerstitial inflammation in angiotensin-dependent hypertension [3,6].

OBJECTIVE: To study humoral immunity and markers of inflammation in patients with arterial hypertension.

MATERIALS AND METHODS: The study included 135 patients with a diagnosis of grade I and II hypertension in the age category from 30 to 70 years (average age 54.0 ± 1.0) hospitalized in the Bukhara Regional Cardiology Dispensary of Bukhara. AH verification was carried out according to the requirements of the World Health Organization (WHO), classified according to the International Classification of Diseases (ICD-10).

At the same time, they adhered to the ACC/AHA Hypertension Guidelines (2017) classification. All patients underwent clinical and immunological, biochemical, laboratory, functional and anthropometric (EchoCG, ECG, weight and height measurement) studies.

RESULTS AND THEIR DISCUSSION.

Metabolic syndrome (MS) among patients of the 1st group was found in 31 (48.4%), and in the 2nd group - in 68 (95.7%), which in general is 99 (73.3%) among all examined patients.

When studying the state of carbohydrate metabolism, all patients were measured in weight and height to calculate body mass index (BMI). Metabolic syndrome was established in 91 (67.5%) patients, of them with grade 1 hypertension-31 (34.1%) patients, with grade 2 hypertension - 60 (65.9%) patients. At the same time, there were 28 (20.7%) patients with hypertension and overweight with a BMI = 25-29, 33 (24.5%) patients with grade 1 obesity with a BMI = 30-34, and 30 (29.7%) patients with grade 2 obesity with a BMI = 35-40.

The absolute and relative values of CD20+ lymphocytes were studied from representatives of B-lymphocytes. The analysis showed a statistically significant increase in both absolute values and relative values of CD20+ lymphocytes in hypertension, regardless of the severity of its course. With grade 1 hypertension, the absolute number of CD20+ lymphocytes was significantly increased to - 0.67 ± 0.05 in 1 ml of blood ($p<0.05$), with grade 2 hypertension to -1.12 ± 0.07 in 1 ml of blood versus control - 0.42 ± 0.08 in 1 ml of blood ($p<0.05$), (Table 1.).

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The study of the concentration of the main classes of immunoglobulins showed a significant increase in IgM to 1.40 ± 0.09 g/l with grade 1 hypertension, and with grade 2 hypertension there was a tendency to increase to 1.05 ± 0.09 g/l with respect to control indicators - 0.92 ± 0.06 g/l. The obtained result indicates the importance of an acute inflammatory process in the development of hypertension and has a statistical significance of $p<0.05$.

Table 1.
Indicators of innate and adaptive humoral immunity in patients with arterial hypertension (M±m)

Indicators	Control group n=75	AH 1st degree n=64	AH 2nd degree n=71
CD20,%	18,6 ± 1,03	29,4 ± 1,2*	35,2 ± 1,3**
CD20, abs	0,42 ± 0,08	0,67 ± 0,05*	1,12 ± 0,07*
IgG, g/l	8,41 ± 0,30	7,50 ± 0,29*	7,71 ± 0,28
IgA, g/l	1,43 ±0,07	1,30 ±0,1	1,23 ±0,09
IgM, g/l	0,92 ±0,06	1,40 ±0,09*	1,05 ±0,09

Modern literature says that IgG are the main proteins of the immune system, account for up to 80% of all immunoglobulins and up to 20% of the total protein of the body.

Measurement of IgG concentration in the study in patients with hypertension showed a decrease to 7.50 ± 0.29 g/l with grade 1 hypertension $p < 0.05$, against the control-8.41 ± 0.30 g/l. And with hypertension of the 2nd degree, there was a slight tendency to decrease to 7.71 ± 0.28 g/l.

From the previously provided facts and based on the data on measuring the concentration of IgG in the blood in hypertension, it can be concluded that in age groups starting from adolescence, it is necessary to study IgG subclasses and compile correct algorithms for the treatment and diagnosis of immune status.

In a study of the IgA content in the blood of patients with hypertension, a transient decrease was found to - 1.30 ± 0.1 g/l with 1st degree hypertension, and to-1.23 ± 0.09 g/l with 2nd degree hypertension, with respect to control -1.43 ± 0.07 g/l.

The data obtained showed a tendency to decrease the concentration of IgA in the blood in hypertension, regardless of the severity, and such a trend in the study had no statistical significance. This condition is explained as a transient decrease in IgA in the blood, which may be associated with concomitant diseases and MS in hypertension.

Consequently, the established IgG deficiency and a transient decrease in IgA indicates the formation of secondary immunodeficiency in hypertension against the background of MS. An increase in IgM shows an acute phase of inflammation, which means that acute and chronic infectious concomitant diseases contribute to the exacerbation and aggravation of the course of hypertension.

In a study in patients with hypertension, an increase in the level of C3 was found to be 1.53 times (53.6 ± 0.9 ng/ml, $P<0.01$) with grade 1 hypertension and 1.67 times (58.8 ± 1.19 ng/ml, $P<0.01$) with grade 2 hypertension, against control - 35.2 ± 1.02 ng/ml, which indicates a favorable course of the inflammatory process in the body (Table 2).

Table 2.
Indicators of markers of inflammation in arterial hypertension (M±m)

Indicators	Control group n=75	AH 1st degree n=64	AH 2nd degree n=71
CRP, mg/l	1,69±0,09	5,5 ± 0,06***	8,90 ± 0,19***
C3, ng/ml	35,2 ± 1,02	53,6 ± 0,9**	58,8 ± 1,19**
CIC, IU	54,9 ±1,79	65,2 ± 2,02*	55,6 ±1,19

*Note: * - differences relative to the control group data are significant*
(- P<0.05, ** - P<0.01, *** - P<0.001)*

A sensitive marker of the acute phase of tissue damage in inflammation, necrosis and injury is C-reactive protein (CRP). CRP is an indicator in acute phases of inflammatory processes. In a healthy person, there is no blood serum. The liver is a protein synthesizer. IL-6, IL-8 and TNF-α are synthesis regulators. The concentration of CRP is very variable and depends on the stage and degree of activity of the disease.

The presence of CRP in the blood serum without obvious pathologies indicates chronic and subclinical inflammation of the vascular wall. This can

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be a harbinger of pathologies such as atherosclerosis, heart attack, stroke and thromboembolism. The diagnostic value of CRP in comparison with LDL indicators is higher. The risk of cardiovascular complications with an increase in CRP increases in the presence of other risk factors: cholesterol, fibrinogen, homocysteine, etc.

In patients with hypertension, a statistically significant increase in its level was found to 5.5 ± 0.06 mg/l with grade 1 hypertension (P<0.001) and to 8.90 ± 0.19 mg/l with grade 2 hypertension (P<0.001) versus control - 1.69±0.09 mg/l.

The established significant increase in the level of CRP in hypertension indicates chronic subclinical inflammation of the vascular wall. At the same time, an increase in CRP was noted depending on the degree of hypertension: the more severe the course of hypertension, the progressive increase in its level from 3.3 times with 1st degree hypertension to 5.3 times with 2nd degree hypertension.

To clarify the nature of the inflammatory process, the concentration of circulating immune complexes (CIC) in the blood of patients in the examination group was studied.

Usually, normally formed CIC are phagocytized and destroyed by blood phagocytes and liver. With an excess of antigen or binding of IgM and the C1 component of the complement to them, the size of the CIC increases. As a result, CIC is deposited in the perivascular spaces and in the cortical layer of the kidneys, causing complement activation and inflammatory processes.

In patients with hypertension, the study found an increase in the content of CIC in grade 1 hypertension to 65.2 ± 2.02 us units versus control - 54.9 ± 1.79 us units (P <0.05). And with grade 2 hypertension, the CIC content was within the control values - 55.6 ± 1.19 us units.

The result showed active vascular inflammation in patients with grade 1 hypertension. Consequently, infectious and immuno-metabolic factors contribute to the formation of hypertension.

CONCLUSION.

Thus, in patients with hypertension, activation of B-lymphocytes with the formation of antibodies of the acute phase of inflammation was established. The established IgG deficiency and a transient decrease in IgA indicate the formation of secondary immunodeficiency in hypertension against the background of metabolic syndrome. Taking into account the above, the results obtained by measuring the concentration of IgG in the blood of patients with hypertension show the need to develop a therapeutic algorithm for patients with hypertension and to monitor the immune status with the study of IgG subclasses in various age groups, starting from adolescence, and starting from the age of 30, both in women and men of mature age dynamic measurement of immunoglobulins is necessary to draw up a prevention plan and a treatment plan for hypertension.

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