International Journal of Academic Health and Medical Research (IJAHMR)
ISSN: 2643-9824
Vol. 5 Issue 1, January - 2021, Pages: 31-33

Correlation between the State of Sumpatik – Adrenal System and Lipids Peroxidum Oxidation Processes in Fertile Age Women with Metabolic Syndrome

Tashtemirova I. M., Kodirova G.I., Uzbekova N.R., Vahobov B.M., Sotvoldiev G.I., Bektashov I.

Andijan State Medical Institute, Uzbekistan

Abstract: *In the study of patients with hypertension and MS, we noted a statistically significant increase in the excretion of A, NA and DOPA in the daily urine. The excretion of all DA fractions was statistically below the control level. The MAO study showed a statistically significant decrease in its level in groups II and III (P<0.001). The maximum level of total cholesterol, triglycerides, low-density lipoproteins and malondialdehyde is observed in group III, compared with the control and II groups. An increase in the activity of CAC at the stages of formation in MS can be regarded as compensatory, ensuring the mobilization of the body's defenses, increasing the energy supply of the myocardium.*

Keywords— metabolic syndrome, atherosclerosis, dyslipidemia, insulin resistance, arterial hypertension, sympathetic-adrenal system, lipid peroxidation processes.

1. INTRODUCTION

In the 90s, a new term appeared in medicine-metabolic syndrome (MS), which combines several major risk factors that contribute to the development of atherosclerosis. The hypothesis created by the American scientist G. Reaven allowed to explain the reason for the frequent combination of arterial hypertension (AH), obesity, dyslipidemia and carbohydrate metabolism disorders (impaired glucose tolerance, insulin resistance, hyperinsulinemia). According to epidemiological studies, about 300,000,000 people in the world have MS and, according to scientists, the number of patients is expected to increase by 50% in 10 years [1, 2]. Hypertension is often one of the first clinical manifestations of MS. Currently, it is reliably known that the activation of peroxide free radical processes underlies the pathogenesis of many diseases of internal organs. The processes of lipid peroxidation (LPO) cause the accumulation of oxidized LDL, which leads to a violation of microcirculation. From this point of view, the study of LPO processes in MS has become particularly interesting, since the main biochemical indicator of blood is an increase in LDL [3, 4, 5]. Recent studies suggest that to understand atherosclerosis, hypertension and CHD, it is necessary to study biogenic amines (epinephrine, norepinephrine, serotonin, etc.) and their precursors, metabolic products and enzymes involved in their metabolism. It was found that in patients with IHD, the activity of monoamine oxidases (MAO) was reduced by 2 times, and in acute myocardial infarction by 2.5 times [6]. The combination of hyperinsulinemia with hypertension is most common in patients with type 2 diabetes mellitus (DM) and in obese individuals. Chronic hyperinsulinemia affects blood pressure through the following mechanisms: stimulates the activity of the sympathetic-adrenal system(SAS); stimulates the activity of the renin-angiotensin-aldosterone system; blocks transmembrane ion-exchange mechanisms (Na+, K+ and Ca2+ - dependent ATPase); increases the reabsorption of Na+ in the proximal and distal tubules of the nephron; stimulates the proliferation of vascular smooth muscle cells [7, 8, 9].

2. OBJECTIVE

To study the functional activity of the sympathetic-adrenal system and the processes of lipid peroxidation in women of fertile age with metabolic syndrome.

3. MATERIALS AND METHODS

In a hospital setting, 41 examined women aged 25-49 years were randomized into the following 3 groups: I (control) - healthy individuals aged 25-40 years – 15 people; II - patients with arterial hypertension-10 people aged 30-49 years; III group-MS patients-16 women aged 30-49 years. The diagnosis in all examined patients is based on the data of clinical observation, laboratory analysis and functional diagnostics. MS is exposed on the basis of recommendations of experts of the All-Russian Society of Cardiology.

Table 1.

Diagnostic criteria for metabolic syndrome (Recommendations of experts of the All-Russian Society of Cardiology).

Criteria	Value
Abdominal obesity Waist Circumference	Female >80 sm
Triglycerides	>1,7 mmol/l
HDL-C	<1,29 mmol/l
Arterial hypertension	>130/85 mmHg
Fasting plasma glucose or previously diagnosed diabetes	>5,6 mmol/l

Determination of epinephrine (A), norepinephrine (NA), dopamine (DA) and DOPA in daily urine was performed by trioxyindole fluorimetric method in the modification of E. Sh.Matlina, Z. M. Kiseleva, I. E. Sofieva (1965). Determination of the content of catecholamine (CA) conjugates in urine was performed according to the method described by T. I. Lukicheva, V. V. Menshikov, and T. D. Bolshakova (1971). POL products in blood serum were determined by the method of B. V. Gavrilov et al. (1987),

MAO in the blood – according to the method of A. I. Balakleevsky (1976).

The results of clinical studies were processed using the application programs of statistical processing of the Excel program, as well as by the method of variation statistics according to Fisher using t-criteria of Student tables. The arithmetic mean values (M) and the average errors of the arithmetic mean (m) are indicated. The differences between the arithmetic mean values were considered statistically significant at p<0.05 (G. G. Avtandilov, 1990).

4. Result and Discussion

The second table shows the average values and confidence interval of the content of lipids, glucose and POL products in the blood serum for all examined groups at t>2 according to the Student's criterion (P<0.05; P<0.01; P<0.001). As can be seen from the table, the maximum level of total cholesterol, triglycerides, low – density lipoproteins (LDL) and malondialdehyde (MDA-a product of POL) is observed in group III, compared with the control and II groups. Compared with the control, the total cholesterol value in patients with hypertension was increased by 42.2%, and in women with MS-by 51.1%. The content of triglycerides in group III exceeded the control value by 46.6%, in group II by 20%. The level of LDL in group II exceeded the indicator of the control group by 60.7%, the content of LDL in group III increased by 85.7% compared to the healthy group. High-density lipoproteins (HDL) in group II and III were reduced compared to the control group. When comparing the first and second groups, the difference in blood glucose level was 7.1%, and in groups I and III – 47.6%. When analyzing the MDA data, we noted a statistically significant increase in the content in group III compared to group I by 47.6%, and the difference between groups I and II was 7.1%.

Table 2.

The content of lipids, glucose and POL products in the blood serum of practically healthy and patients with arterial hypertension and metabolic syndrome

Indicator	Group I	Group II	Group III
Total cholesterol, mmol/l	4,5±0,3	6,4±0,3***	6,8±0,4***
Triglycerides, mmol / l	1,5±0,1	1,8±0,1*	2,2±0,1***
LDL cholesterol, mmol/l	2,8±0,2	4,5±0,2***	5,2±0,3***
HDL cholesterol, mmol/l	1,3±0,1	1,2±0,1***	1,0±0,1*
MDA, nmol / ml	3,6±0,2	5,6±0,3***	6,9±0,4***
Fasting plasma glucose, mmol / l	4,2±0,4	4,5±0,2^	6,2±0,4**

Note. Cholesterol, LDL-low-density lipoproteins, HDL-high-density lipoproteins, MDA-malondialdehyde. * - P<0.05; * * - P<0.01; * * * - P<0.001; ^ - unreliable.

The third table shows the average values of daily urinary excretion of KA in all the examined groups.

In the study, we noted a statistically significant increase in the excretion of A and NA in the daily urine of patients with hypertension and MS. Thus, the daily excretion of total A in patients with hypertension with healthy individuals was increased by 38.2% (P<0.001), total na – 31.8%. Excretion in the daily urine of all fractions of DA and DOPA in patients with hypertension is statistically significantly lower than the control level. The excretion of free, conjugated and total A and NA in MS patients was statistically significantly higher than in healthy patients (Table 3). The difference in DOPA excretion in MS was 39.1% (P<0.001) (Table 3). The MAO study showed a statistically significant decrease in its level in groups II and III (P<0.001).

Table 3.

Daily catecholamine excretion and MAO activity in healthy individuals and patients with metabolic syndrome

Groups	Catecholamines				MAO, ed / ex.
	A, mcg/day	NA, mcg/day	DA, mcg/day	DOPA, mcg/day	
I	Free 4,2±0,1 Con. 3,9±0,1 Sum. 8,1±0,2	Free 3±0,3 Con. 7±0,3 Sum.18,5 ±0,5	Free 290,5±9,2 Con. 175,4±5,2 Sum.465, 9±6,1	47,0±0 ,7	0,07±0,00 1
II	Free 5,8±0,3*** Con. 5,4±0,4** Sum.11,2±0 3***	Free 12,3±0,2*** Con. 12,1±0,3** Sum.24,4± 0,4***	Free 164,2±6,6*** Con. 162,3±7,6^ Sum.326,5± 15,1***	54,4±0 ,9***	0,054±0,0 038**
III	Free 9,2±0,3*** Con. 8,0±0,2*** Sum.17,2± 0,4***	Free 13,5±0,2*** Con. 12,4±0,3*** Sum.25, 9±0,2***	Free 165,4±1,3*** Con. 158,7±1,2* Sum.324,1 ±23,5***	65,4±0 ,7***	0,041±0,004 ***

Note. A-epinephrine, NA-norepinephrine, DA-dopamine, MAO-monoamine oxidase, Con. - conjugated, Sum. - total. * - P<0.05; * * - P<0.01; * * * - P<0.001; ^ - unreliable.

Thus, the results of the conducted studies showed that in MS there is an activation of CAC, expressed by an increase in the excretion of CA (A, NA, DA, DOPA). An increase in the activity of SAS at the stages of formation in MS can be regarded as compensatory [2]. A further increase in the tension of the activity of the CAC is aimed at mobilizing the internal reserves of the body. However, at one of the stages of this process, the catabolic orientation of the effects of SAS begins to manifest itself, and the further increase in the activity of which becomes one of the main elements of the formation of pathology and its complications [10].

We studied the activity of MAO in healthy and MS patients, during the observation it was revealed that the lowest functional activity of MAO in MS patients.

Our results indicate an increased intensification of LPO processes in MS.

5. CONCLUSION

A comprehensive study of patients with metabolic syndrome showed significant violations of the sympathetic-adrenal system and the metabolism of biogenic amines, which is expressed by increased urinary excretion of free and conjugated forms of epinephrine and norepinephrine, and therefore early correction is necessary to prevent the development of complications.

In metabolic syndrome, there is a marked decrease in the activity of the key enzyme deamination of catecholamines (MAO). This leads to a long-term toxic effect of catecholamines on the myocardium.

In metabolic syndrome, there is a significant activation of lipid peroxidation products, which is of great interest in identifying the mechanism of development of the metabolic syndrome.

REFERENCES

1. Mammadov M. N. Metabolic syndrome: practical aspects of diagnosis and treatment in outpatient settings. Manual for doctors. Moscow 2018.
2. Giordano M., Matsuda M., Sanders L. et al. Effects of angiotensinconverting enzyme inhibitors. Ca channel antagonists and adrenergic blockers on glucose and lipid metabolism in NIDDM patients with hypertension. Diabetes 2018: 44: 665-671.
3. Meerson F. Z. Pathogenesis and prevention of stress and ischemic heart damage. 2014. 267 p.
4. Olofinskaya I. E., Adamova I. Yu., Susekov A. V. et al. Correlation of serum lipoprotein levels with the degree of coronary atherosclerosis. Ter archiv 2018; 7: 100-103.
5. Kosmatova O. V., Perova N. V., Mamedov M. N. Effectiveness of combined correction of arterial hypertension and hyperlipidemia in metabolic syndrome. Ros Cardiologist Journal 2014; 6: 38-43.
6. Kodirova G. I., Khuzhamberdiev M. A., Askarov B. A new gas-analytical method for diagnosing coronary heart disease. Medical Journal of Uzbekistan 2015; 4: 111-114.
7. Stryuk R. I., Tsyganok N. Yu. Neurohumoral mechanisms of pathogenesis of metabolic syndrome. Cardiology 2019; 4: 54-58.
8. Sokolov E. I., Simonenko V. B., Zykova A. A., Srednyakov A.V. Clinical significance of insulin resistance detection in women with metabolic syndrome. Cardiology 2018; 4: 24-29.
9. Bagdade J. D., Buchanan W. F.,Pollare T., Lithell H. Abnormal lipoprotein phospholidip composition in patients with essential hypertension. Atherosclerosis 2016:117:209-215.
10. Vasiliev V. N., Chugunov V. S. Sympathetic-adrenal activity in various functional states of a person. Moscow: Meditsina, 2015. -272 p.