

CHARACTERISTIC CHANGES IN ARTERIAL VESSELS IN TYPE 2 DIABETES MELLITUS

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Annotation: *In patients with diabetes mellitus (DM), long-term inadequate control of hyperglycemia leads to many complications, mainly associated with damage to small and / or large vessels (micro- and macroangiopathies). Arterial hypertension occurs in patients with diabetes mellitus approximately 2 times more often than in the general population. The frequency of arterial hypertension among patients with diabetes ranges from 20 to 60%, depending on the criteria used for high blood pressure (BP) and the type of diabetes. Arterial hypertension has a significant effect on the fate of patients with diabetes, significantly increasing the risk of developing cardiovascular and renal complications, which are the main causes of their premature death. So, according to the Framingham study, arterial hypertension 5 times increases mortality among patients with diabetes. In patients with diabetes mellitus with arterial hypertension, effective drug therapy significantly prevents the development of cardiovascular complications and renal failure.*

Keywords: *Diabetes mellitus, arterial hypertension, arterial stiffness, cardiovascular system, insulin, hyperglycemia.*

The purpose of the study: to study the associations between the duration of diabetes and the parameters of arterial rigidity in patients with type 2 diabetes mellitus (type 2 DM) and arterial hypertension (AH).

The combination of hypertension and diabetes mellitus increases the risk of coronary heart disease, stroke, and kidney failure by 2-3 times. Therefore, it is extremely important to recognize and diagnose both hypertension and diabetes mellitus early in order to prescribe appropriate treatment in time and stop the development of severe vascular complications.

The pathogenesis of many forms of arterial hypertension is based on insulin resistance - a violation of the body's response to endogenous or exogenous insulin. As a result, glucose consumption by peripheral tissues is reduced. This condition occurs more often in overweight people and may not manifest itself clearly before the onset of metabolic disorders. When BMI (ideal body weight) is exceeded by 35-40%, insulin sensitivity decreases by 40%. At the ionic level, insulin affects the intake of calcium and sodium into the cell, which affect the contractility of vascular smooth muscle fibers. As a result of a decrease in insulin sensitivity, the influx of calcium into the cell increases and the tension of smooth muscle cells increases. In such patients, the reaction of the coronary arteries to physiological stimuli decreases (the ability to dilate decreases), which leads to a violation of microcirculation.

In high concentrations, glucose has a direct toxic effect on the vascular endothelium, which in turn causes an increase in muscle spasm, hyperplasia of smooth muscle fibers and

leads to the development of atherosclerosis. There is also a feedback according to which hypertension leads to the appearance of insulin resistance. The main mechanism in this is the closure of small capillaries and a decrease in blood flow in skeletal muscles, which helps to reduce their utilization of glucose, that is, insulin resistance of muscle tissue.

Arterial hypertension is one of the risk factors for the development of type 2 diabetes mellitus and, in combination with overweight, impaired lipid metabolism, impaired carbohydrate tolerance, can lead to this disease in 40% of cases and subsequently significantly increase the number of cardiovascular and renal complications. It is possible to prevent the development of complications of these two formidable diseases if you influence risk factors and follow recommendations for a healthy lifestyle: normalization of body weight, limiting salt intake to 3 g /day, quitting smoking, paying attention to physical exercises (brisk walking - 30 minutes a day, swimming - up to 1 hour 3 times per week), regular performance of which has a beneficial effect on insulin sensitivity, blood pressure and lipid metabolism. However, it should be borne in mind that excessive physical activity can increase the risk of hypoglycemia (lowering blood sugar levels), especially in combination with alcohol intake.

Measuring blood pressure in a doctor's office often gives increased indicators – this is the so-called "white coat" hypertension, that is, a short-term increase in blood pressure in a patient due to worries about a visit to the doctor. Blood pressure monitoring at home helps to obtain more realistic blood pressure values. Do not forget about choosing a device for self-monitoring. Leading experts recommend using automatic blood pressure monitors with modern technologies, which guarantees reliable results. Portable glucose meters are ideal for monitoring blood glucose levels at home, allowing you to quickly get an accurate result.

MATERIAL AND METHODS:

90 patients with type 2 diabetes and hypertension were included (39% men, average age 63.8 ± 11.6 years, 44% smokers, 80% with dyslipidemia). The average blood pressure (BP) was $146 \pm 23 / 86 \pm 10$ mmHg. All patients received combined antihypertensive therapy, the target blood pressure $< 140 / 85$ mmHg was achieved in 29 (52.7%) patients. The median duration of diabetes was 8.5 years (IQR 2;13 years), the average plasma glucose level was 8.0 ± 2.4 mmol/l, the average HbA1c $9.2 \pm 2.0\%$, 58 (64.4%) patients received insulin therapy. Blood pressure was measured using a validated oscillometric device. The parameters of arterial rigidity were determined by the method of aplanation tonometry, the cardio-ankle vascular index (SLSI) and vascular age were determined using the VaSera 1500 device. The results were considered statistically reliable at $p < 0.05$.

RESULTS:

The average central blood pressure was $132 \pm 18 / 79 \pm 12$ mmHg, the average pulse wave propagation velocity (CPV) was 10.5 ± 2.4 m/s, the average SLSI on the right was 8.8 ± 1.9 , on the left – 8.9 ± 1.8 . Further analysis was carried out by groups depending on the duration of DM (Gr1 < 4 years ($n=31$), Gr2 – 4-10 years ($n=30$), Gr3 > 10 years ($n=29$)). Patients from Gr3 were older (69.5 ± 11.1 vs 62.1 ± 11.2 vs 60.0 ± 10.8 years), characterized by a higher vascular age (73.8 ± 9.0 vs 68.6 ± 11.8 vs 64.5 ± 13.4 years), right and left SLSI (9.3 ± 1.9 vs 9.0 ± 1.8 vs 8.1 ± 1.9 and 9.4 ± 2.0 vs 9.2 ± 1.6 vs 8.1 ± 1.8 , respectively); $p < 0.05$. Patients with longer duration of DM (Gr2 and Gr3) were more likely to receive insulin therapy (79% vs 70% vs 45.2%,

$p < 0.05$), and were characterized by higher CPV (11.0 ± 2.0 and 11.4 ± 2.4 vs 9.1 ± 2.4 m/s, $p = 0.0009$). Spearman's correlation analysis revealed significant correlations between the duration of diabetes and age ($r = 0.35$), vascular age ($r = 0.30$), creatinine level ($r = 0.23$), CPV ($r = 0.34$), SLSI on the right ($r = 0.3$) and on the left ($r = 0.3$), $p < 0.05$. Multivariate regression analysis showed that only age and duration of DM were significant predictors of an increase in CPV ($\beta = 0.3$, $p = 0.02$ and $\beta = 0.2$, $p = 0.04$, respectively).

Conclusion:

In patients with hypertension and type 2 diabetes mellitus, arterial rigidity is associated with the duration of diabetes, regardless of the level of hypertension. The most significant increase in the pulse wave propagation rate occurs during the first 4 years.:

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