

Review

Mechanism Development of Diabetic Microangiopathy and Opportunity of Diabetic Warning

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Abstract

Specific general defeat of arteriols, capillaries and veins at a diabet mellitus consists in the bulge of basale membrane of shallow vessels, laying of glycoproteins in a wall and proliferation of endothelium. A hyperglycaemia results in increasing of blood plasma, membranes and cages of level of free radicals on a background insufficiency of enzymes of the protective antioxidant system. Determination of the state insulin tolerance to the people with excessive body weight and obesity, by a hyperpiesis, problems with the lack of fats, by a gout and other endocrine diseases already on the stage of credible violation of carbohydrate exchange gives an opportunity in good time to conduct the correction of possible defeats of microvasculature toxic action of high concentration of glucose.

Keywords

hyperglycemia; tolerance of insulin; sugaring haemoglobin; microcirculation; diabetic angiopathy

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A diabetes mellitus DA in the whole world is one of the most widespread chronic diseases and the global medical and economic problem of contemporary or present world [26]. By the considerable increase of morbidity is the last decades established on a diabetes mellitus in entire countries and on all continents [11, 20]. This heavy chronic disease, associated with the increase of risk of development specific microvascular complicate pathologies of the cardiovascular system, which brings to early disability and death [1, 6, 13]. A microangiopathy presents by itself specific for a diabet mellitus general on the level of microvasculature such as arteriols, tiny veins and capillaries. In the early stage of illness a diabetic microangiopathy DMA has a characteristic morphological picture, that consists in the bulge of basale membrane of shallow vessels, laying of glycoproteins on a wall, proliferation of endothelium [2, 10].

A general sign of diabetic microangiopathy DMA is the bulge of basale membrane of capillaries in a skin, muscles, gastrointestinal tract, nerves, kidneys, fundus of eyes, heart, placenta, adipose tissue [12, 2]. Diabete mellitus DM and hyperpiesis HP basic damaging factors result in disfunction of endothelium, that in turn conduces increasing of enzyme activity (it converts angiotensin) on the surface of endothelial cages, hypertension of the tissue renin-angiotensin-aldosteron system. Activation of enzyme strengthens transformation of angiotensin-1 in strong vasoconstrictor angiotensin-2, which has negative influence on utilization of glucose by tissues [6, 17]. An important role is played by the inadequate secretion of

insulin in the damage of endothelial cages, their disfunction. Thus degree to the hyperglycaemia does not yet cause clinical symptoms and can exist during the protracted period of time to the moment of exposure of diabetes mellitus [4, 10]. Actually, an important role of endothelial disfunction is played by a hyperglycaemia, surplus of free radicals in circulation and cellular membranes, lack of fats. Disfunction of endothelium is assisted by the insufficient products of adyponektin, endogenous antioxidants, fats of high-density. A chronic hyperglycaemia causes switching of glucose exchange on the ways of "minor" components: sorbite, hecsosamin and finish products. They activate oxidant reactions, influence on the synthesis of oxide of nitrogen the cages of endothelium [14, 19].

Vascular pathology of DMA combines with violation of reologic properties of blood, change properties of blood cages - thrombocytes, leucocytes and red blood cells. The initial stages of DM is the violation in a microcirculation compensated by strengthening of capillary blood stream due to cardiovascular mechanisms. From data of electronic-microsopic researches the early displays of VIH appeared for 50% patients with the initial signs of DM. Progress of microangiopathy results in structural violations of microvasculature and insufficiency of organs of sight, kidneys, heart, central and peripheral nervous system, lower limbs. On results positron-emission of reography the patients of DM of the second type even in default of atherosclerotic defeats of basic coronal arteries have decline of coronal reserve on 37% comparatively with such

for the healthy people of the same age. The size of coronal reserve mainly depends on the state of arteriols, prearteriols and capillary degree of vascularization of myocardium [16, 25].

The basic factors of hyperglycaemia in the mechanisms of development of microangiopathy are:

- Activation of tiop way of exchange of glucose;
- Damages functions of mitochondrium that cause the blockade of hecsosamin way of metabolism of glucose and development of basic violation at DM (mitochondrian disfunctions);
- increasing of intacellular finish goods of surplus (Advanced Glycation End-products (AGEs));
- Activation of proteinkinase [6, 13].

A chronic hyperglycaemia is accompanied by increasing glycation of surrounding substrate. Glycated squirrel can accumulate in an endothelium in the basale membrane of shallow vessels, preventing to the free transport of substrate from tissues and vice versa.

For DM characteristic combination of insistence is lentin indicate, decline of oxidization of fats, increase in the cages of product of lipid exchange of dyacylglycerine. Dyacylglycerine activates proteincinase C, which participates in adjusting of providing of cages glucose [14, 19].

For patients with clinical displays a change is always marked as an increase of adgesium of thrombocytes, viscosity of plasma of blood, decline of deformity of red corpuscles [9, 24].

It is well-proven on this time, that a hyperglycaemia results in an increase in plasma of blood, membranes and cages of level of free radicals onabackground insufficiency of enzymes of protective antioxidant system- antioxidant stress. There fore in this difficult multivariable system of violations of exchange that causes changes in a microvasculature it follows a starting mechanism to count oxidental stress [8, 18].

Formation of DNA passes for the clinician elusivcly. It is practically important that the complex rigid control of glycemia and hypertension definitely reduces the risk of development of micro- and macrovascular complications, and stroke development by 44% [21, 25].

In older people, diabetes is often not diagnosed and remains untreated, and inevitable vascular complications combined with other age-related pathologies significantly impair the general condition. In 24 cities in the UK, 3642 women and 3734 men aged 60-79 years were examined. It was found that 5.7% of men and 5.2% of women were not previously diagnosed with diabetes (glucose levels 7.0 mmol/l or more, and 17.3% of British hyperglycemia were onset) [23].

To prevent development of progression of microangiopathy is possible only through full compensation of carbohydrate metabolism, restoration of physiological sensitivity of tissues to insulin. A huge clinical study convincingly demonstrated

how much control of glycemia reduces the frequency and delayed the development of all the complications of diabetes. Decreasing the level of glycosylated hemoglobin (HbA1c) by 0.9% (from 7, 9 to 7, 0%) leads to a reduction in overall mortality by 21%, cardiovascular mortality by 14%, and a violation of the microcirculation the channel is 37%. When the HbA1c level decreases by 2%, the mortality risk for patients with second-degree diabetes is reduced by 42%. Target indicators of the vaginal exchange that characterize the compensation are close to the physiological. They are in line with the European guidelines for the second type of diabetes [22].

Glycosylated hemoglobin (HbA1c) <6.5%.

The level of glucose in plasma:

- onset <6.0 mmol/l;
- 2 hours later <7.5 mmol/l.

The blood test for HbA1c has advantages over the blood sugar analysis that it can be delivered at any time, not necessarily on the nose. It is precise, to hold it faster and easier; to clearly answer the question: there are people with prediabetes, diabetes mellitus. The result of the analysis of HbA1c does not depend on the time, eating, taking medication, exercise, emotional state of man, colds or other infections. This analysis describes the state of carbohydrate metabolism over the past 2-3 months [3, 10].

The result of the analysis on HbA1c allows you to diagnose diabetes at an early stage, when the analysis of glycemia onset still shows that everything in the body is normal. The main threat of micro- and macrovascular complications in diabetes of 2-gothipus is considered to be the state of chronic hyperglycemia. It is known that over 80% of patients with type 2 diabetes are characterized by excessive massothelium and obesity.

According to the NHANES (USA) 1999-2000 study, the prevalence of second-line diabetes in overweight people was 2.9 times higher than that of normal human body mass. With a body mass index of over 30kg/m², the risk of developing type 2 diabetes is 27.6 times higher than with a body mass index of 22kg/m² [8].

In 2009-2013, a project to study 20 risk factors in the urban population of Dnipropetrovsk was implemented. According to this population survey, only 29.9% of the population had normal body mass, and 70.1% had a totally superfluous mass and obesity of 1 -3 degrees [17].

The total prevalence of all violations of carbohydrate metabolism amounted to 77.2% among the urban population of Ukraine. Among them, IR was detected in 41.2% of respondents, glucose intolerance-28%, and the prevalence of DM 2-nd type was 8% of the total population [17].

With the progression of body weight, the percentage of detection of IR increased from. 16.8 at normal body weight to 77.2%, with obesity, the percentage detection of CD - from 3.4 to 16.3, respectively [4].

In many prospective studies, it has been demonstrated that early carbohydrate disturbances, in particular glucose tolerance, are independent of the risk factors for cardiovascular

disease. The use of antihyperglycemic agents in people with prediabetes reduces the occurrence of not only type 2 diabetes, but also the total cardiovascular event.

It is important not to miss the time, to prevent formation of morphological changes in blood vessels, clinical laboratory criteria of diabetes in the implementation of preventive measures to prevent and treat DMA. The risk of development of type 2 diabetes can be reduced (by almost 30%) in compliance with the regime of non-pharmacological therapy, lifestyle changes, nutrition, regular physical activity with the normalization of the mass of visceral adipose tissue [4, 7, 10].

Detection of persons with early violations of carbohydrate metabolism and preventive interventions is of great medical and social significance. With the proper organization of screening in groups of patients with high probability of detecting carbohydrate metabolism disorders, successful primary prophylaxis of type 2 diabetes at the prediabetes stage can contribute to a significant decrease in DMA.

The period of determination of the condition of people with intentional body weight and obesity, hypertension, dipyridemia, gout and other endocrine diseases already at the stage of pre-diabetes gives the opportunity to timely correct the possible damage of the microcirculatory channel toxic effects of high concentrations of glucose and to appoint complex means of pathogenetic therapy.

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Received: 19 Dec 2017

Revised: 9 Jan 2018

Accepted: 26 Mar 2018