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Diagnostic Methods of Premature phenomena of Diabetic Microangiopathy in Patients with Diabetes Mellitus Type 2

Alijonov D.A. student
6 Course of the Faculty of General Medicine
Bektasheva G.M. student
5 Course of the Faculty of General Medicine
Kholmatova G.A. PhD
Head of the Department of Endocrinology and Hospital Therapy
Andijan State Medical Institute
Andijan Uzbekistan

Abstract: Type 2 diabetes mellitus belongs to the risk factors for the development of cardiovascular diseases, which are currently the main cause of early disability and mortality in the working-age population. According to Panzram G., diabetes mellitus increases mortality 2-3 times, the risk of coronary heart disease and myocardial infarction - 2 times, kidney pathology - 17 times, gangrene of the lower extremities - 20 times, arterial hypertension - more than three times.

Key words: diabetes mellitus, microangiopathy, myocardial infarction, cardiovascular disease.

Introduction. The relevance of the topic is determined by the prevalence of diabetes mellitus (DM) in the population and the recurrenseof secondary vascular lesions that cause early disability and mortality of patients. According to M.B. Antsiferov et al. [1,4] Currently, about 200 million people in the world suffer from diabetes. The number of patients increases annually by 5-7% and doubles every 15 years. According to WHO experts, their number in 2025 will reach 325 million. People, while 410 million. Will be a violation of tolerance, glucose. M.I. Balabolkin et al. [2,6] published information according to which out of 2 million registered in Russia patients with diabetes, 300 t thousand are among patients with type 1 diabetes, 1 million 700 thousand - on patients with type 2 diabetes ... At the same time, the true prevalence of diabetes is much higher, and according to experts' calculations it is 6-8 million people [3,7].

The development of circulatory disorders leading to ischemic organ damage is based on diabetic angiopathy, the formation of which is caused by metabolic disorders accompanying the course of diabetes, primarily hyperglycemia and hyperinsulinemia [3,4,6]. Structural disorders of the vascular wall that occur in patients with diabetes are irreversible. However, early (preclinical) diagnosis of emerging diabetic angiopathy followed by adequate treatment of the underlying disease and prevention of vascular complications can significantly improve the prognosis in this category of patients.

Diabetic angiopathies include damage to large and medium-sized vessels (macroangiopathy) and pathological changes in capillaries, arterioles and venules (microangiopathy) [4,8]. Diabetic macroangiopathy is mainly formed with type 2 diabetes. The defeat of large vessels occurs in the form of atherosclerosis, Minkeberg's calcific sclerosis (diffuse media calcinosis), diffuse intimal fibrosis [1,3]. The morphological equivalents of diabetic macroangiopathy are structural changes in the vascular wall: fibrosis, sclerosis, calcification, which, in the absence of secondary thrombotic complications, do not lead to impaired patency of the vessel lumen and, therefore, are not accompanied by the formation of objective clinical symptoms [6, 8]. At the same time, due to the increased rigidity of the vascular wall, there is a violation of the adaptive capabilities of the arterial system.

To diagnose various stages of diabetic angiopathy, a complex of non-invasive instrumental methods is used, the most common of which is ultrasonic - duplex scanning (DS). The results of numerous studies have demonstrated the presence of characteristic changes in blood flow parameters in the renal arteries with the syndrome; diabetic nephropathy, in the arteries of the eyeball - in diabetic retinopathy syndrome [3,4,5]. Pathological changes in blood flow parameters in the cerebral vascular system were revealed in patients with clinical signs of diabetic angiopathy; [2.8]. An increase in the

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frequency of atherosclerotic plaques in the carotid arteries has been shown in patients with type 2 diabetes [4,7]. The detailed characterization of y ltrazvukovoy 'picture with occlusive lesions; arteries of the lower extremities in patients with type 2 diabetes [6].

A number of studies have been published on the assessment of stiffness; vascular wall in patients with type 2 diabetes and other risk factors for the development of similar disorders [5,8]. The information given in the aforesaid works, does not allow to identify sonographic phenomena, the presence of which is characteristic of the early stadiy1 diabetic angiopathy on macro-o- and micro levels. There was no definite opinion about the visual and hemodynamic manifestations of the early (not accompanied by the development of objective clinical symptoms of vascular disorders) stages of diabetic angiopathy. There was no analysis of the presence; nature, localization and severity of structural changes; vascular? walls in target pools, as well as the degree of functional activity of the mechanisms; regulation of vascular tone in clinically; asymptomatic (in relation to vascular disorders) patients with type 2 diabetes. The present study is devoted to solving these problems.

Purpose of the study - The purpose of this study was a comprehensive ultrasound assessment of the state of the wall of the common carotid artery
(OSA) in patients with type 2 diabetes mellitus without clinical signs of cerebrovascular pathology.

Material and research methods. In the period from March 2017 to July 2019, 72 patients were examined with a clinically verified diagnosis of type 2 diabetes mellitus (group 1) aged 29 to 71 years (average age 56 ± 10 years), of which 40 (55.6%) men aged 29 to 71 years (average age 54 ± 11 years), 32 (44.4%) women aged 40 to 70 years (average age 58 ± 9 years). The control group (group 2) consisted of 17 apparently healthy individuals without laboratory signs of impaired glucose metabolism at the age of 23 to 62 years (mean age 51 ± 8 years).

Research results and their discussion. The duration of type 2 diabetes mellitus was from 1 to 20 years. In accordance with generally accepted classification approaches [13], 16 (22.2%) patients had a mild course of the disease, 54 (75.0%) had moderate severity, and 2 (2.8%) had severe ones.

The maximum blood glucose level for the entire duration of the disease, on average in 1 group, was 14.7 ± 4.6 mmol / l (8.0-26.0 mmol / l). The average "working" blood glucose level in the group was $\pm$ 1.4 mmol / L (6.0-12.0 mmol / L). The "working" glucose level was taken as the indicator most often recorded on an empty stomach against the background of a habitual diet and drug therapy.

For all patients of groups 1 and 2, the value of systemic arterial pressure (BP) was measured with calculation of pulse BP. The mean value of systolic blood pressure in patients of group 1 was 130.4 ± 15.0 mm Hg . Art. (100.0-170.0 mm Hg), diastolic blood pressure - 82.0 ± 8.9 mm Hg . Art. (60.0-100.0 mm Hg), pulse blood pressure - 48.5 ± 13.3 mm Hg . Art. (30.0-80.0 mm Hg). In persons of group 2, the corresponding indicators were 118.7 ± 10.0 mm Hg . Art. (100,0-130,0 mm Hg . V.), $\pm$ 8,2 mm Hg . Art. (60.0-90.0 mm Hg), 32.5 ± 10.2 mm Hg . Art. (30.0-50.0 mm Hg).

Examination of the brachiocephalic arteries at the extracranial level was carried out using Sonoline G60 and Acuson Sequoia-512 ultrasound scanners (Siemens , Germany) with linear format transducers in the frequency range from 5 to 10 MHz. During the study, the patency of the carotid and vertebral arteries and the presence of intra-luminal formations were assessed. The state of the CCA wall (qualitative and quantitative parameters) was assessed according to the B-mode data. Structural characterization included analysis of echogenicity and degree of differentiation into layers of the intima-media complex (IMC). For conventional standard when assessing the echogenicity of the intima took oh o- gennost surrounding vascular tissue, ME - di- - echogenicity of the vessel lumen.

The results were statistically processed using standard methods. Quantitative data are presented as M $\pm$ a or median (depending on the nature of the distribution), as well as the minimum and maximum values of the indicators. Differences were considered significant at p <0.05.

In all persons of the control group, the carotid and vertebral arteries were patent, signs of intraluminal formations were not determined.

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When analyzing IMC of CCA revealed the following embodiments disorders: increased echogenicity in combination with partial or complete loss of the differentiationinto layers (Type 1), increased echogenicity with the appearance in the structure of the IMC additional layers and increased in Reductions echogenicity ("Layering") (type 2). The characteristics of structural changes in IMC of CCA in the comparison groups are presented in table. 2. More than half of the patients with type 2 diabetes mellitus had various structural changes in the CCA IMC. An increase in the echogenicity of IMC in combination with impaired differentiation into layers is often considered as the ultrasonic equivalent of atherosclerosis [14].

Conclusions. 1 . In patients with type 2 diabetes mellitus, a statistically significant increase in the rigidity of the vascular wall of the CCA is revealed.

2 . Among the calculated indicators characterizing the rigidity of the vascular wall, statistically significant changes were obtained for the coefficients of elasticity, extensibility and the flow deformation index.

3. The changes in echogenicity, the degree of differentiation into layers and the IMC thickness of the CCA detected in B-mode in patients with type 2 diabetes mellitus are nonspecific in relation to diabetes mellitus and may be the result of a complex of pathological factors.

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