

International Conference on

# METABOLOMICS AND DIABETOLOGY

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### **Heart rate variability at the stages of carbohydrate metabolism disturbance and the phenomenon of early aging of regulatory system in diabetes type 2**

**Statement of the Problem:** Study of heart rate variability indices allows not only to identify already existing disorders with the system of regulation and adaptation, but also to predict the risk of developing diseases by measuring the overall stress of regulatory mechanisms, neurohumoral regulation of the heart and the relationship between sympathetic and parasympathetic parts of the autonomic nervous system.

**The purpose of this study:** Is to assess the impact of diabetes mellitus on mechanisms of autonomic regulatory at the different stages of carbohydrate metabolism disturbance.

**Methodology & Theoretical Orientation:** At the first stage of this study, patients were divided into several groups. The group of patients without metabolic disorders as the primary cause of the disease - group 1 (n=27); patients with abdominal obesity, hypertension, dyslipidemia - metabolic syndrome - group 2 (n=33); group with symptomatic of DT 2 - group 3b (n=62) at the stage of clinically expressed disorders. Group 3a (n=39) - patients with DT 2 and HTN with normal body weight (endogenous insulin at the lower limit of the norm or below). At the second stage patients with DT 2 (101 people) were divided in four age group: 20-30 years, 31-40 years, 41-50 years, 51-60 years of age. All patients were evaluated autonomic regulation by the method of spectral analysis of daily variability of the heart rhythm power spectrum of oscillation in three frequency bands: 0,004-0,08 Hz (very low frequency - VLF), 0,09-0,16 Hz (low frequency - LF), 0,17-0,5 Hz (high frequency - HF). The selection of three frequency ranges is due to differences in their formation. The low frequency range reflects the activity of the sympathetic system on the segmental level, the high-frequency range, the activity of parasympathetic nervous system at the segmental level.

**Findings:** Simultaneous progressive increase in the power spectra of low-frequency and high-frequency waves at the stages of the progression of metabolic disturbances indicates the transition of the mechanisms of vegetative regulation to a higher energy-consuming level, and the decrease in VLF is about the centralization of regulation and depletion of body resources. Evaluation of spectral analysis revealed a significant increase in the power of ULF% waves in patients with type 2 diabetes, which indicates disruption in adaptation and violation of autonomic regulation of heart rhythm. The revealed significant difference in the analysis of the centralization index in groups with metabolic syndrome and type 2 diabetes with obesity and hypertension emphasizes the importance of the stages of carbohydrate metabolism disorders. Changing the IC towards the increase at the stages of the progression of the violations of the carbohydrate metabolism testifies to the activation of the central contour of regulation and the gradual transition of systemic vegetative regulation from the control level to the management level. Patients with diabetes at the age of 30-40 years we have seen a decrease in parasympathetic activity, which is more typical for patients the next decade of life. Since the age of 41, there was considerable centralization on mechanism of regulation (increase VLF), which usually starts 10-15 years later. The decrease in the total power spectrum on the background of inadequate compensator of diabetes showed decrease of reserve opportunities of the organism.

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**Conclusion & Significance:** In patients with metabolic syndrome, vegetative dysfunction was manifested by hypersympathicotonia and in patients with type 2 diabetes mellitus - simultaneous activation of two systems of multidirectional action, rapid depletion of the system of regulation of the heart rhythm and a decrease in the rehabilitation capabilities of the organism. In patients with diabetes mellitus, complicated by cardiac autonomic neuropathy, the phenomenon of "early aging of regulatory systems" is observed, which is manifested by the level of vegetative regulation adequate to the older (for the decade) age group. An important cause of early atherosclerosis in patients with diabetes is, in addition to endothelial dysfunction, syndrome of "early aging of regulatory system" (the reason - autonomic neuropathy). The status autonomic regulation in the current decade corresponds next age decade of the patient, which leads to increased comorbidities and increased cardiovascular risk.

## Biography

Irina Kurnikova - MD, PhD, Professor of Medicine, RUDN University, Moscow, Russia She has become Doctor of Medical Sciences (PhD) in 2010, the first academic degree (MD) received at the age of 28 years. Dealing with Problems of Endocrinology for over 20 years. She had led a course of Endocrinology at the Medical Academy (Izhevsk, Russia), was the Head of Endocrinology department at the Russian Scientific Center of Medical Rehabilitation and Health Resort (Moscow, Russia). Currently she teaches at Peoples' Friendship University of Russia, curator of the Scientific Direction Endocrinology. She has published more than 30 articles in well-known journals, the author of 25 books and tutorials in Russian language. Author of 10 patents for inventions.

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