INFLUENCE OF TILT-TEST ON A FUNCTIONAL STATE OF WOMEN CARDIOVASCULAR SYSTEM IN THE DIFFERENT PHASES OF MENSTRUAL CYCLE

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PURPOSE: The state of the women organism from menarche to menopause depends on the consecutive changes of the hormonal status. In spite of the fact that the effect of influence of the hormonal secretion cyclical changes on the reproductive system is well-studied, its influence on the other systems of organs, namely on the cardiovascular system isn’t investigated enough. At the same time the diagnostics of the state of women cardiovascular system under the different physiological conditions is the important part of the identification, prediction and correction of their health state [9]. The present data about the peculiarities of hemodynamics and cardiac rhythm variability of the healthy women depending on the age and phase of the ovarian-menstrual cycle (OMC) are to a certain extent insufficient and unmatched [1].

METHODS: The measurements were realized for the group of the 32 women of 17-19 years old. For each woman the three tests were done – for the folliculin (I), ovulatory (II) and lutein (III) phases of OMC. The investigation of cycle phases was realized by using the anamnesis, measurement of the basal temperature and set of the stream ovulation tests “Solo” (IND Diagnostic, Inc., Canada). Systolic (SAP) and diastolic (DAP) arterial pressure had been measured. Also systolic volume of blood (SVB) by the signals of differentiated impedance rheogram, average arterial pressure (APa), cardiac index (CI) power of oscillation spectrum –R in standard frequency ranges 0-0,04 Hz (VLF), 0,04-0,15 Hz (LF), 0,15-0,4 Hz (HF), 0-0,4 Hz (TP) and normalized power in the range 0,15-0,4 Гн (HFnorm) had been estimated. Also the spectral density (aLF) and frequency (tLF) of the maximum amplitude peak in range 0,04-0,15 Hz were estimated. In order to the investigation of the wave structure peculiarities the median spectrogram in this range were drawn (with the step 0,01 Hz) [4].

RESULTS: It was established that in the rest there is no significant difference between the parameters of the central hemodynamics depending on the OMC phase. On the other hand for the levels of SAP, and APa, GPR the distinctions were observed. The higher values of its parameters were obtained for phase III (p<0,05) in comparison with phases I and II. In the transition to a vertical position under all conditions the decreasing of the (p<0,001) T-R-R, CI, SVB and increasing of GPR are observed. The responsiveness of the arterial pressure factors depended on OMC phase. So, in the phases I and II the increasing of the SAP, DAP, APa was observed, but in the phase III the changes was statistically insignificant. According to this fact the differences between the levels of SAP and APa for different OMC phases in the lying position can be neglected; at the same time the differences of T-R-R between phase III and phases I and II were observed (676±17 ms, 641±16 ms τа 534±11 ms, p<0,05, respectively). Therefore the most significant changes of the central hemodynamics in rest in the lying position had been obtained in lutein phase of OMC. Such changes vanished in the vertical position. During the analysis of the wave structure parameters of the cardiac rhythm in rest in the lying position it was obtained that there is no significant difference between its levels in the different phases of OMC. The higher values of HFnorm in the phase II of OMC in comparison with phase I (62.4 [54.8; 75.0] % and 55.4 [42.9; 68.9]% respectively) and lower aLF (11533 [5449; 23958] ms²·Hz⁻¹ and 17224 [9769; 26508] ms²·Hz⁻¹, respectively) were exceptions. It can be explained by f
higher level activation of the parasympathetic branch of vegetative nervous system (VNS) in the folliculin and lutein phases.

According to the Parati G. et al [8], La Rovere M.T. et al [6], Milic M. et al [7], the methods of the investigation of the baroreflex sensitivity can be related to the methods of the estimation of the heart activity neurogenic control. Among the great number of techniques the estimation of the spontaneous baroreflex function is the most acceptable. It doesn't need an external nonspecific stimulus, doesn't change a natural human state and can be used in the no clinical conditions. There are a few techniques of the spontaneous baroreflex function which are very important to the search of the connection between the oscillations of heart rate and AT [10]. It can be noted that the maximum deviation of the responsiveness is the typical for the parameters which characterize the range of the R-R oscillations from 0,04 to 0,15 Hz. According to such data the detail analysis of the distribution of the cardiac rhythm waves by using the normalized median spectrogram had been realized (Fig).

![Normalized median spectrogram of the power of the R-R intervals length oscillations in the range of low frequencies of women cardiac rhythm in the different phases of biological cycle.](Image)

It was shown that the character of the spectral power distribution in the different phases of OMC has significant distinctions. In the rest in phase I the unique peak for the frequency 0,1 Hz was observed. At the same time in phases II and III two peaks which can have different origins [4] had been observed. Besides in the phase III the maximum corresponds to the frequency 0,08 Hz. Such frequency in full measure defines the functioning of the baroreflex [5].

**CONCLUSION:** The presence of two peaks can be evidence of two types of influence on the cardiac rhythm spectrogram. There are two theories of the wave formation in the range of low frequency. The first theory bases on the influence of functioning of the baroreflex mechanism of the arterial pressure regulation [9]. Other one takes into account the influence of the endogenous rhythm generator [5]. Corbe et al. [2] estimated the oscillation spectrum of the arterial pressure and R-R-intervals in patients with an implanted artificial left ventricle. After implantations (1 and 15 months) in the spectra of arterial pressure slow waves were absent and slow oscillation in the spectra of own heart RR-intervals "became apparent and dominant". Probably endogenous oscillator can capture the rhythm of the waves caused by the activity of baroreflex mechanism. Such behaviour is a manifestation of the fundamental natural phenomenon of synchronization and in this case, the frequencies of baroreflex and oscillator are same or slightly different. Such adaptive changes have compensatory character and quite probably contribute to less pressure increasing during tilt-test.

**REFERENCES:**