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Index

PS88

The Dynamics Of 0.1 Hz Oscillations Of The Heart Rate Variability In Patients With Coronary Artery Disease During Veloergometric Tests

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In accordance with the concepts of autonomic heart control system functioning listed above, it provoked an direct interest, in particular, to studying of a dynamic of 0,1 Hz oscillations of the HRV in subjects with different EF of the left ventricle. The aim of the present study was investigation of dynamic stability of 0,1 Hz component of the HRV spectrum in patients with coronary artery disease (CAD) and different EF during veloergometric tests under controlled breathing with 10 seconds period. **Methods.** 45 male patients with CAD aged of 50±3 years with left ventricle EF<50% and 35 male patients with CAD aged of 52±6 years with left ventricle EF>60% were involved in the study. Veloergometric test was performed. Registration of R-R intervals was performed in relaxed probationer's condition (sedentary posture) and in 90 seconds after the beginning of 25 Wt load stage of veloergometric test. The duration of R-R chain registration was 5 minutes. Frequency assessments of HRV obtained with the help of R-R chain spectrum construction on the basis of autoregressive model. **Results**. In process of studying of 0,1 Hz component of the HRV spectrum absence of any reliable differences in its spectral power in patients with normal and damaged EF was shown (table). Under the load rising till 25 Wt in subjects with EF<50% consequent depression of 0,1 Hz component spectral power in 2-3 times in comparison with the relaxed condition was observed (table). At the same time, there was no similar reliable expressed dynamic in the group with EF>60%. It possible to say that the activity level of the 0,1 Hz oscillations in the autonomic heart control system in subjects with EF>60% is characterized by relative tolerance to low-intensive loads, while in patients with EF<50% the activity of 0,1 Hz oscillations is very unstable to the same loads. **Conclusions.** The stability of 0,1 Hz component of the HRV spectrum to low intensity loads associates with the severity of myocardial contractility damage. The power dynamic of 0,1 Hz component of the HRV spectrum may be considered an independent index of dynamic stability of the heart autonomic control.

Groups	Power of 0,1 Hz component of the HRV spectrum, Me (25%; 75%)		p-level
	Rest	25 Wt	
EF > 60%	407 (150; 819)	334 (164; 639)	p = 0,19
EF < 50%	454 (96; 719)	130 (60; 265)	p < 0.001
p-level	p = 0,59	p < 0.001	

PS89

The Circadian Index as new simple method for assessment of the circadian heart rate

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Aim of this study was to assess of circadian profile of heart rate in pts with cardiac diseases. **Methods:** 24 hr Holter monitoring (HM), Oxford, UK, was performed in 201 pts 3-45 years. Indications for HM recording were arrhythmias detected on 12 leads ECG and diseases with high risk of life-threatening arrhythmias: extrasystoles (EX) 87 pts; atrial flutter (AF) 7 pts; sick sinus syndrome (SSS) 24 pts; complete AV block (AVB) 35 pts; long QT syndrome (LQTS) 11pts, catecholaminergic ventricular tachycardia (CVT) 10 pts; primary pulmonary hypertension (PPH) 15 pts, ishemic heart deseases (IHD) 12 pts. The control group (C) consisted of 115 healthy persons 3- 45 years. Circadian Index (CI) was calculated as ratio of mean HR (bpm) during awake period to mean HR (bpm) during night-sleep time. **Results:** CI in patients with arrhythmias is summarized in Table. * P <0,05 with control group Also the CI was calculated by the literature data (from the data of 20 published works) in various groups on healthy subjects and pts aged 2-79 years. In healthy subjects CI was stable irrespective of sex and age - 1,33 ± 0, 05. The reduction of CI < 1,2 was in cardiovascular pts with deterioration of the prognosis and autonomic denervation (diabetes mellitus with autonomic neuropathy). In neurological pts free of autonomic heuropathy CI was normal. CI > 1,46 was seen in patients with a basic high sensitivity to catecholamines. **Conclusion:** CI reflected a 'strong' component in architecture of circadian heart rate. Decreased of CI shows the reduced of autonomic influence on heart rate. Increased of CI reflected high heart rates sensibility to sympathetic influence.

C	EX	AVB	SSS	AF	LQTS	CVT	PPH	IHD
1,32 ± 0,06	**1,34 ± 0,12**	**1,23 ±0,04**	**1,25± 0,08**	**1,25 ± 0,15**	**1,12± 0,14***	**1,46± 0,05***	**1,52± 0,08***	**1,18 ± 0,04 ***

PS90

Clusterization of the Relationship between SNS and PSNS activity by Heart Rate Variability Analysis

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Question. The introduction of HRV analysis - especially, the identification of the power of low-frequency band of HRV spectral function with the activity of Sympathetic Nervous System (SNS) and the power of its high-frequency band with the activity of Parasympathetic Nervous System (PSNS) - opened up new theoretical opportunities for ANS assessment. But to make practical use of this important scientific discovery one had to solve the problem of deriving some form of quantitative relationship between SNS and PSNS from the spectral function. HRV analysis is based on measuring variability in heart rate; specifically, variability in intervals between R waves - "RR intervals". These RR intervals are then analyzed by spectral or some other form of mathematical analysis (e.g., chaos, wavelet theories). Such mathematical analysis generates multiple parameters; typically 15-30. The problem of SNS-PSNS quantification, which has remained for many years the principal dilemma of HRV analysis, is specifically in reducing all possible variations of these multiple parameters to a quantitative relationship between only two parameters: SNS and PSNS. **Method used.** We solve the problem of SNS-PSNS quantification by using proprietary algorithms and a new approach based on one of the leading theories of Artificial Intelligence - Marvin Minsky's Frame Theory. The analysis of the SNS – PSNS relationship uses the following parameters:

1. HF (0.15 - 0.5 Hz);
2. LF (0.04 - 0.15 Hz);
3. LF1 (0.07 - 0.15 Hz);
4. LF2 (0.04 – 0.07 Hz);
5. Smax(HF) – peak of amplitude in HF;
6. Smax(LF) – peak of amplitude in LF(0.04-0.15);
7. Smax(MF) - peak in mid-frequency range (0.15 ± 0.02) if the maximum falls within this range;
8. F max(HF) - Value of frequency at Smax(HF);