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VO2

Holter monitoring data in prediction a general health status in the elderly.

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Mortality risk in population is associated with conventional risk factors such as blood pressure, cholesterol, smoking, and body mass index. They have weaknesses in prediction and physiological explanation of differences in health at old ages. We apply the Holter monitoring for a study of determinants of health among the Russian elderly. Links between health outcomes and physiological toll scores based on Holter data and other biomarkers were studied. Data and methods. Randomly selected elderly Muscovites: 185 individuals aged 67 to 86 from the Moscow Lipid Research Clinics Cohort, set up in 1975-83. Data was collected as a part of the Moscow Pilot study in 2002-03. They included physical performance tests, blood pressure, cholesterol, BMI, HDL, urinary cortisol, epinephrine and norepinephrine excretion, ECG, and 24-hour Holter monitoring parameters. The principal health outcomes were: self-rated health, mobility limitations, number of reported diseases, grip strength, stress score, immediate recall. The health outcomes were predicted by regression models with control for age and sex. Results. The Conventional, the Framingham, and the Holter scores were constructed. The Conventional and the Framingham scores were built on established risk factors. The Holter score included characteristics of the circadian profile of heart rate, presence of arrhythmia, sleep duration, and sleep-awake heart rate pattern. The Framingham score was associated with the number of diseases. Among the risk scores the Holter score was the best predictor of self-rated health ($p<0.001$) and the number of diseases ($p<0.05$), and one of the best predictors of the grip strength ($p<0.001$). For the mobility limitations and stress score only the combination of Holter and Conventional scores was significant at $p<0.05$. For the cognitive function (immediate recall) Conventional, and Combined (Holter + Conventional) scores provided the highest significance ($p<0.0001$).

VO3

HyperQ - a novel technique for detecting stress-Induced ischemia using analysis of the ECG depolarization phase

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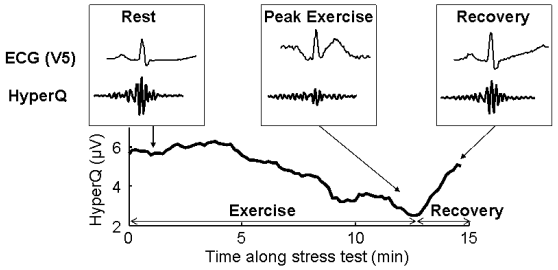
Electrophysiogical detection of stress-induced myocardial ischemia is typically based on identifying changes in the repolarization phase, yet with limited accuracy. A new technology, which quantifies ischemic changes in the depolarization phase of the cardiac cycle (mid-QRS potentials) using analysis of high frequency components, was reported to better identify stress-induced ischemia. Question. Our aim was to test the performance of this technique in patients undergoing exercise myocardial perfusion SPECT (MPS). Methods. MPS was performed in 95 consecutive patients (age: 62±11 yo, 72 males) and used as the gold standard for ischemia. Conventional exercise ECG recording was combined with high resolution ECG acquisition, which was digitized and analyzed using the HyperQ™ System (BSP, Israel). The relative intensity change in high frequency mid-QRS components (HyperQ) during exercise was used as an index of ischemia. Results. Analysis was possible in 85 patients of whom 33 exhibited MPS ischemia. Ischemia was characterized by reduction in HyperQ intensity (see figure). The HyperQ index of ischemia was found more sensitive than the conventional ST analysis (76% vs 59%, $p<0.01$) and with better specificity (85% vs 57%, $p<0.01$). Conclusions. HyperQ analysis presents a significant improvement to current stress ECG in detecting ischemia and may thus aid in enhancing the non-invasive diagnosis of ischemic heart disease.



VO4

The Dynamics Of Cardiovascular System Parts Synchronization In Patients With Coronary Artery Disease Under Impact Of Methoprolol Intake

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Phase locking of 0.1 Hz oscillations in heart rhythm and filling the vessels of microcirculation is a characteristic of autonomic control responsible for synchronization of cardiovascular system parts such as heart and vessels of microcirculation. **Purpose:** To study the impact of methoprolol tartrate (“Metocard”, Polpharma) intake on the dynamic of cardiovascular system parts synchronization in patients with coronary artery disease (CAD) who have had myocardial infarction (MI). **Methods:** 43 patients (24 men and 19 women) aged 63±8 who had MI 6 month ago were involved in the study. Synchronous 10 minutes record of electrocardiogram (ECG) and pulsogram during orthostatic test was performed. The first (initial) record was carried out in 6 month after MI, the second one – after 3 month of methoprolol intake (200 mg per day). The total duration of all lengths of 0,1 Hz rhythms phase locking in RR-chain and in pulsogram was estimated. This index expressed in percents from total record duration was called summary percent of synchronization (Sps, %). **Results:** All of probationers were divided into two groups according to orthostatic Sps dynamic. 21 probationers who have shown the positive Sps dynamic under methoprolol intake were related to the group A, 16 probationers who have shown the negative Sps dynamic under methoprolol intake were related to the group B (see table; Me (25%; 75%)). **Conclusion:** Methoprolol intake were associated with the

negative orthostatic Sps dynamic in 37,2% of probationers. We considered this phenomenon showing the worsening of adaptative reserve of cardiovascular system parts autonomic control. It is necessary to assess individual dynamic of adaptative reserve of autonomic control under methoprolol intake in CAD patients who have had MI. P.S. Methoprolol used in the study was purchased in disinterested pharmacies. Authors have no any concerns to clinical trials sponsored by "Polpharma" company.

	Orthostatic Sps dynamic, %		
	Initial	**3 months**	**p-level**
Groups A	-20 (-29; -8)	+5 (-3; +18)	p<0.001
Groups B	+17 (+7; +26)	-16 (-23; -4)	p<0.001
p-level	p<0.001	p<0.001	

Dynamical Changes of the ECG

Contribution of Heart Rate, Blood Pressure Variability and Blood Pressure Morphology to Risk Stratification in Patients with Heart Failure

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More than 50 % of patients with heart failure suffer from cardiac death within 5 years. The aim of this study was to develop an optimal multivariate parameter set for enhanced risk stratification in patients with heart failure (HF) using heart rate variability (HRV), blood pressure variability (BPV) and blood pressure morphology (BPM) analysis methods. ECG and continuously non-invasive blood pressure were recorded from 43 HF characterised by a NYHA value greater or equal 3, EF lower 45% and in 20 age and gender matched healthy subjects (REF). For the analysis of beat-to-beat variability in HRV and BPV time and frequency domain measures (according to the Task Force recommendations) were calculated. After a 6-month follow-up the HF group was divided into two subgroups: HF with no progression (HFlow, n=21, low risk group) and with significant progression of the disease including 7 patients suffered from cardiac death (HFhigh, n=22, high risk group). Mann-Whitney U-test (p<0.05) was assessed for statistical evaluation. A multivariate parameter set was developed for the risk stratification using Cox regression analysis and receiver operator curve (roc). Measures from BPV and BPM but not from HRV revealed high significances (p<0.0001) discriminating the groups REF and HF. For risk stratification in differentiating the groups HFhigh and HFlow an optimal set of three parameters was determined and achieved a sensitivity of 82.4%, specificity of 83,3% and accuracy (area under roc) of 85%. The parameter set consists of two linear parameters from BPM (maximum diastolic slope, blood pressure wave amplitude) and one non-linear parameter from BPV (non-linear interactions between blood pressure and interbeat intervals). In conclusion, the applied methods appear to be suitable for an enhanced diagnosis of HF including improved risk stratification. To validate these results further prospective studies with an increased number of patients have to be performed

Friday, June 30

Markers of impaired repolarization

Submitted as:
Spatial Heterogeneity of T-wave Alternans in Subjects with Coronary Artery Disease during Exercise Stress Test

New title:
Dynamic analysis of repolarization instability: methods and emerging applications

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T-wave alternans (TWA), an index of proarrhythmic repolarization instability, has recently become a clinical tool for arrhythmia risk stratification. However, the spatial distribution of TWA and the optimal lead set for analysis of this repolarization instability are still uncertain. We hypothesized that because of the spatial heterogeneity, TWA is frequently localized in a single (anterior, lateral, or inferior) lead set and tested this hypothesis in subjects undergoing exercise stress-testing. In addition, we examined the ability of TWA determined on the root-mean-square (RMS)-curve (a robust representation of the average cardiac repolarization properties) to capture repolarization instability independent of the spatial differences (TWA-RMS). **Methods:** Continuous, 1uV-resolution, 12-lead ECG was recorded in 25 patients undergoing clinically scheduled stress testing with nuclear imaging. TWA was analyzed using previously validated software. For analysis of TWA, 6 subjects with documented coronary artery disease (CAD), Group 1, were matched to CAD-free controls (Group 2) based on age, gender, EF, and maximum heart rate achieved during the test. **Results:** TWA increased in a single (anterior, lateral, or inferior) lead set in 33% of the subjects, in 2 sets in 33% of the subjects, and in all 3 lead sets in 22% of the subjects. TWA-RMS increased in Group 1 (p=0.046) but not in Group 2. In Group 1, the increase in TWA-RMS occurred both in the early portion of the T-wave (between T-onset and T-peak) and in the late portion (between T-peak and T-end). **Conclusions:** TWA is spatially heterogeneous and localized in <3 lead sets in 66% of the studied patients. Analysis of the spatial distribution of TWA might provide new insights into the regional irregularities of repolarization in patients with CAD. TWA measurement on the RMS-curve does not require specialized equipment, and this simple and practical screening test can be easily incorporated into a clinical practice.

Safety pharmacology and QT prolongation

Drug Induced Changes Of The QT Interval In Guinea Pigs Measured By Contactless Noninvasive Magnetocardiography

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Question. The reliable assessment of drug induced changes of the QT interval in animals is an important task in safety pharmacology. Contactless noninvasive magnetocardiography (MCG) might provide an alternative method to the use of telemetric ECG devices. MCG and ECG were performed simultaneously to clarify the relation between QT intervals as assessed by ECG or MCG. **Method used**. Multichannel MCG was measured in 11 conscious guinea pigs and simultaneous ECG and MCG