SIMULTANEOUS ASSESSMENT OF BLOOD FLOW IN CENTRAL AND CEREBRAL CIRCULATORY SYSTEM DURING VARIABLE GRAVITATIONAL TEST CONDITIONS

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Abstract. The measurement system described earlier, based on impedance method, was also applied as a noninvasive tool in evaluation of high level gravitational stimulus influence on pilot organism. The major physiologic response to the increasing acceleration stimulus directed from head to foot axis (+Gz) is the redistribution of blood. An advantage of the presented system is the possibility of assessing blood flow changes in central and cerebral circulatory system.

Basing on chosen research results, we have performed an initial evaluation of method's usefulness to acceleration tolerance appraisal.

INTRODUCTION

The presented paper is a trial of hemodynamic phenomenon quantitative assessment in the circulatory system evolved by the effect of +Gz forces on pilot's organism. Up to now the impedance cardiography method [1] has been one of the few noninvasive methods, which can be applied to continuous determination of stroke volume SV, cardiac output CO and other parameters in functional tests. The objects of this paper are physiological phenomena observed, such as: mechanism of cerebral blood flow modulated by the respiratory activity, delayed cardiovascular reaction to rapid gravitational stimulus, and others.

METHOD

New electrode system have been designed (as shown on fig.1) for simultaneous registration of two rheographic leads in T(horacic) and N(eck) segments. This way, the Kubicek's electrode standard has been maintained. Both segments are described by the same physical model presented in Kubicek's method and the same formula can be used for determination of N.SV (analogous to T.SV in thorax). The analysis concerns ΔZ and Zo signals of both segments. This is usually done in the presence of the respiratory component difficult to separate from the useful signal. For this purpose we have used spline functions properties.

As a result of a sampled, rheographic signal analysis in Offline mode at the frequency of 50Hz, plus ECG signal analysis at 250Hz - characteristic point co-ordinates and consequently hemodynamical parameters were determined. These included: heart rate - HR, stroke volume - SV, cardiac output - CO, preejection period - PEP, left ventricular ejection time - LVET and others.

Each examination resulted in a series of parameter changes called trends, with regard to stimulus, time or number of ECG cycles.
REFERENCES

