Cardiac Arrhythmias in Ischemic Heart Disease and Space Weather

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Abstract

• The aim of the research was an investigation of the solar activity and geophysical factors cyclic action’s influence on a prevalence of arrhythmias in ischemic heart disease (IHD).

• The results of investigation of the spectral analyses in the time structure of cardiac arrhythmias with special attention to components previously reported as characteristics in solar-terrestrial physics and found as signatures in cardiology are presented.
Investigations

- Investigation of the records of different types of arrhythmias, from April 1983 to 1992 by spectral analyses are investigated.
- We have obtained approximated periods of cardiac arrhythmias in patients with IHD and space weather periodicity. Close periods of dynamics of cardiac arrhythmias and fluctuations of space weather are revealed. We have drawn for the cycle of solar activity to be influencing cardiac patients with arrhythmias rhythms periodicity.
Different Types of Arrhythmias

- 1) Supraventricular extrasystoles (S),
- 2) Supraventricular paroxysmal tachycardia (Ps),
- 3) ventricular single extrasystoles (V1) and
- 4) ventricular multiple extrasystoles (Vm) are studied.
Holter-Monitoring

- Almost a half of the material studied includes results of the Holter-monitoring. Another half was a result of an electrocardiography records from different hospitals. Criteria for the Holter-monitoring were existence of arrhythmias in the patient's diagnosis. Our material includes data of patient’s observation during 24 hours a day 7 days a week.
Space Weather

- All the manifestations of solar activity, such as sunspots, solar flares, coronal mass ejections (CMEs), solar prominence eruptions (SPE), X-ray flares, solar Radio and UV radiation are changed with the 11-year period. Different active formations originated in the solar atmosphere in stage of its active phase carrying out the solar energy into the interplanetary space throw the interplanetary magnetic field (IMF), forming the space weather.
Power Spectrum of Cardiac Arrhythmias’ Daily Variations
Power Spectrum of 10-day Smoothed Data for all Cases of Arrhythmias
More Significant Periods for Variations of all Types of Arrhythmias
Space Weather Disturbances

The space weather disturbances interacting with the Terrestrial atmosphere, causes variations of climate, geomagnetic storms, disturbances of ionosphere and etc.
Conclusions

- There is obtained wider spectrum of periodicities from the several years up to quasi-biennial and quasi-annual periodicities.
- During the 11-years cycle of solar activity (1983-1992) 27-days very strong quasi-periodical peaks of different types of arrhythmias are revealed. All types of arrhythmias have 160 days (0.44y) periods (so called Rieger’s periods). Variations of solar and interplanetary magnetic fields and solar flares may be play a role of synchronizing factors for the similar periods of arrhythmias.
Results

• Hence we conclude that the most part of the periodicity, established by us, are modulated with space weather factors periodicities.