



## Solar activity and cardiovascular pathology

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Influence of solar activity on acute cardiovascular pathology at the first time was demonstrated by M.Faure and G.Sardou in France (1927). Alexander Tchijevsky in Russia (1930) compared sudden cardiac death with solar activity and showed similar correlations with Conrad Wolf's number of sunspots. The analyzing data collected by the Moscow ambulance services covering more than one million observations over three years, cleaned up by seasonal effects of meteorological and social causes, show that the number of cases of myocardial infarction increased during geomagnetic storms (Breus et al., 1995). Ionova et al., (2004), analyzed 1255 cases of brain strokes in Moscow district Tushino in dependence on helio- geomagnetic conditions in 1974-1975 and found increasing quantity of cases more than in two times during high level of helio- geomagnetic conditions. In addition, they found in the similar periods deterioration of rheological properties of blood in patients with cerebrovascular pathology and in healthy volunteers.

Goal of the study: to learn statistical evidence of geomagnetic influence on the rate of acute myocardial infarction and brain stroke collected at seven different medical centers.

Patients and method. The data of myocardial infarction and brain stroke at seven medical centers was analyzed. The longest period of observation was 14 years in the Central Clinical Hospital, JSC "Russian Railways". In addition, in the study participated City hospital "Pokrovskaya bolnitsa" St.-Petersburg, Benxi city hospital (China), Batumi City urgent hospital (Georgia) and some others hospitals (a total - 7th sources). Myocardial infarction and brain stroke cases totaled 10390 and 15660, respectively. Only cases with established date of acute attack of diseases were included in the study. Undated cases were excluded from the analysis. Biotropic coefficient (bt) as a quantitative measure of frequency of cardiovascular diseases as a function of geomagnetic activity was calculated for myocardial infarction and brain stroke. The diurnal average number (daily average frequency) of patients, related to one active day (c1) compared with diurnal average number in one magnetically quiet day (c2). The  $bt = c1/c2$ . Geomagnetic activity local indices provided by the Institute of Terrestrial Magnetism, Ionosphere and Radio wave Propagation of Russian Academy of Sciences (IZMIRAN), and processed using the method of "superposition epoch".

Results and discussion. The biotrophic coefficient bt for myocardial infarction was made  $1.89 \pm 0.16$ , for brain stroke –  $2.05 \pm 0.12$ . In the data delivered from China the quantity of patients with brain stroke exceeded the quantity of myocardial infarction cases more, than three times.

What is a pathway responsible for deterioration patients suffering with cardiovascular pathology at the solar activity increasing? It was revealed (Gurfinkel et al., 1996) that during geomagnetic disturbances the microcirculation parameters deteriorated in 94,8% myocardial infarction patients. Most probable that geomagnetic fluctuations (frequency) acting on blood, brain, adrenals involves the adaptation system. This leads to the appearance in blood of the hormones of adrenals responsible for activation of the clotting system, rise in aggregation and spasm in the afferent vessels of the microcirculatory network. For persons suffering from cardiovascular pathology, the main problem is the reversibility of these pathological processes.

Key words: solar activity, myocardial infarction, brain stroke.