

Sudden Death

Evgeniy Chazov - 1985 NOBEL PEACE PRIZE WINNER

The problem of sudden death (SD), which is being discussed in this Symposium, is very significant for health care systems all over the world. Since the 70s, Russian and American cardiologists together, would discuss SD mechanisms and the methods to prevent it. Among the scientists from both countries, over the last 30 years several symposia devoted to this topic have been organized periodically. From United States, the following participated in these events: Dr. B. Lown, Dr. T. Kuper, Dr. T. James, and the Honorary President of this Symposium, Dr. Zipes. From the Soviet Union: Dr. L. Rozenshtraug, Dr. A. Vigert, Dr. N. Mazur, Dr. S. Golitsin, and other scientists.

Since these symposia, population studies arose in which Holter monitoring was used to determine the relationship between SD and cardiac rhythm disorders; also the possibilities of antiarrhythmic treatment were evaluated, to prevent SD. A great work was performed that correlated the severity of coronary disease with risk of SD. However, it was proven that SD occurs also in some young people, without coronary artery disease. Besides, alcoholic cardiomyopathy would be one of the risk factors of SD.

In 60% of SD cases, histological test showed signs of myocardial ischemia, which may have caused ventricular fibrillation; in 20%, the cause of SD was acute coronary syndrome, with typical signs: rupture of atherosclerotic plaque, local thrombosis, hematoma within the plaque. For the first time, in patients with SD, sympathetic innervation disorders of the myocardium were verified, as well as adrenergic nerve plexus degeneration, and also an increase of catecholamines in the hypothalamus. These data confirmed the relationship between SD mechanisms and autonomous nervous system disorders.

Besides the theoretical aspects of SD, practical aspects were also developed. The latter included the following steps addressed to prevent SD: use of antiarrhythmic drugs, population education about some maneuvers of cardiopulmonary resuscitation, implementation of cardioverter defibrillators. One of the examples of the usefulness of resuscitation maneuvers was the Conference of Nobel Peace Prize Winners in Oslo, where Dr. Lown, some other colleagues and I, could revive a Russian journalist, Mr. Novikov, who has suffered cardiac arrest.

Nowadays, in Russia, cardiovascular mortality has grown enormously, mostly between young people, working and in their reproductive age; for this reason, the problem of SD has a very important place. In year 2005, in Russia 625.5 thousand people died because of this coronary disease, among which 18.3% was in their active age. We should emphasize that 23.4% of the victims of AMI were young people, working actively. These data remind us all what has been done, and what is yet to be done. Anatole France once said, "The future is based in the present, but also in the past."

Returning to the past, is worth remembering that even in favorable years, from the point of view of mortality and alcohol consumption, in 30% of the cases, the cause of SD was alcoholic cardiomyopathy, mostly in young people. The myocardial damage produced by alcohol are well studied and express in the following traits: located perivascular sclerosis, appearance of fat tissue in left ventricular myocardium and interventricular septum, microcirculatory disorders, atrophy of a significant number of cardiomyocytes, destruction of intercalated disks, dilatation of sarcoplasmic reticulum channels with formation of giant vacuoles, decrease of activity of most metabolic enzymes. Nevertheless, electrophysiological mechanisms of arrhythmias and conduction disorders in alcoholic cardiomyopathy have not been enough studied yet. It is necessary to determine the role of metabolic disorders, the autonomous nervous system in this type of cardiomyopathies, and also assess the state of myocardial receptors in this pathology.

We consider that it is very important to continue studying SD mechanisms, both in the clinical setting and at the experimental level. According to our studies conducted in the 80s, 80% of the patients that presented arrhythmic complications during the first post-AMI year (and did not receive antiarrhythmic treatment), died after having suffered their first episode of ventricular tachycardia. Therefore, in this type of patients, it would be very important to stratify risk for malignant arrhythmias (with Holter monitoring, electrophysiological study) and thus, start the proper antiarrhythmic treatment, which could be effective in 60% of the cases.

Due to a great number of patients refractory to medical antiarrhythmic treatment, the need arises to use nonmedical methods to prevent SD. There is a wide implementation in daily practice for implantable cardioverter defibrillators. Nevertheless, there are still several obstacles for the clinical use of these devices, such as their high cost and the lack of well defined criteria for a proper selection of patients.

Experimental electrophysiological studies helped to enlighten some triggering mechanisms for SD. It is worth mentioning the works that studied the influence of the parasympathetic tone on the appearance of ventricular fibrillation (VF) within the setting of occlusion of the anterior descending artery. As a result, it was proven that interrupting parasympathetic stimuli in the setting of experimentally caused ischemia, openly decreases the probability of VF appearance.

Over the last few years and to this date, in the laboratory of Dr. Rozenshtraug, the properties of the cardiac muscle of a type of lakutia rodents (north of Russia) are being studied. These animals remain for 8 months a year in caves with temperatures averaging from -2°C to 0°C . It is known that in mammals there is threshold of temperature, below which VF may appear. For this reason, the study of the myocardial properties of these rodents during their hibernation period, may clarify some of the causes of myocardial resistance to fatal arrhythmias. Of course, the total volume of current electrophysiological investigations addressed to the search of arrhythmogenic mechanisms and prevention methods of malignant arrhythmias is much greater. And undoubtedly, all these studies will contribute new data for the development of methods to prevent SD.