Bionic foundations of the therapeutic effect of bioresonance therapy

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Bionic principle of therapeutic action of bioresonance therapy

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RESUME

Mechanisms of therapeutic action of bioresonance therapy and role of balance between chaos and order in control of homeostasis are considered from position of nonlinear dynamics. The participation of processes of suppression of the ordered rhythmic processes and increase of their chaotic behavior in bionic principles of treatment is analyzed. The main arguments in favor of application of the principles of nonlinear dynamics to the analysis of factors determining the processes of regulation in the body are presented.

keywords:bionic, deterministic systems, dynamical chaos, dynamical diseases, bioresonance therapy, mechanisms of therapeutic action.

SUMMARY

In the article, from the standpoint of nonlinear dynamics, the mechanisms of the therapeutic effect of bioresonance therapy and the role of the ratio of chaos and order in the management of homeostasis are considered. The participation of the processes of suppression of ordered rhythmic processes and the increase in their randomness in the bionic principles of treatment is analyzed. The main arguments in favor of applying the principles of nonlinear dynamics to the analysis of the factors that determine the processes of regulation in the body are given.

Keywords: bionics, deterministic systems, dynamic chaos, dynamic diseases, bioresonance therapy, mechanisms of therapeutic action.

“... nature does not tolerate emptiness,
but loves rhythm and periodicity very much ...”
R. G. Goldacre
The control of rhythm and homeostasis in
biology and medicine // Cybernetica.
1960. - N.2. – P.115.

Introduction

Among the existing physical methods of treatment, the most promising are those that are closest to natural factors both in their

nature, and by the mechanism of therapeutic action. Due to a number of advantages, such as physiology, systemic nature of action, lack of toxicity, etc., the use of such methods of treatment expands the indications and, on the contrary, narrows the contraindications to their use. Bioresonance therapy (BRT) is one of such factors, and now it is difficult to name a disease in which this promising method of treatment could not be used in one form or another [1]. At present, BRT can be considered as a bioregulated physiotherapy, which "...is based on the use of corrective, synchronizing or control signals from functioning organs and body systems during physiotherapeutic influences" [2, p.13].

In the development of this provision, it is possible to emphasize the common features of such an approach to the therapeutic use of natural physical factors with bionics - a science based on the principle of using in technology knowledge about the structure and processes in a living organism, aimed at solving various problems. Thus, the connection that exists between bionics and BRT lies in the bionic principles underlying the bioresonance treatment method.

Bionics and bioresonance therapy

Bionics, according to A.I. Berg, lies in the application of biological laws in technology to improve the quality and expand the capabilities of technical systems, machines and devices [3]. It is formally believed that the term bionics (from the Greek word bios - life) began to be used after the First National Symposium on Bionics, which took place in September 1960 in Daytona (USA). The English-language literature also uses the term "biomimesis" or, as W. McCulloch defined it, imitation of some forms of life to other forms [4]. The bionic approach is to create technical devices in which the principle and main elements are borrowed from biological representatives of wildlife. The most developed field of bionics at present is bionic modeling, which includes the development of systems, imitating this or that function of organisms of higher animals and humans, devices for bioelectric control, detection, navigation, etc. [5]. However, the application of bionic principles in medical diagnostic and medical equipment, despite the advances in electronics and computer technology, is practically not considered and not used.

The BRT method is based on the assumptions that were made in 1978 by the German doctor F. Morell about the presence of electrical oscillations (currents) in the human body, which, in his opinion, were of two types - “physiological”, or “harmonious”, and "pathological", or "disharmonious" [6]. Subsequently, F. Morell, together with the engineer E. Rasche, developed a device for MORA-therapy (derived from Morell-Rasche), which immediately showed its high therapeutic effectiveness. The principle of the device for MORA-therapy consisted in inverting the “pathological” oscillations registered in a person and returning them back to the patient, but already in the form of “physiological” ones with a simultaneous increase in “harmonious” (physiological) ones, also sent back to the body. However, in addition to this empirical hypothesis, F. Morell

Subsequently, in none of his publications did he characterize what he meant by “physiological” and “pathological” fluctuations present in the human body [7, 8].

The coordination of theories developed on the basis of physical processes, on the one hand, and on the basis of biological processes, on the other, brings with it many difficulties and contradictions, since here we are dealing with different classes of phenomena. It is known that one of the most characteristic features of any living organization is the ability to fluctuate, which at the level of the whole organism or its structures can be regarded as a fundamental characteristic of the functioning of the biological system itself and its multilevel control systems [9]. An experimental study of the activity of the main physiological systems of the body as a function of time made it possible to obtain convincing evidence that the indicators do not remain constant over time, and their changes are not the same. It is accepted that such basic concepts are used to characterize their behavior in time,

The stationary state of physiological systems implies the ability to maintain the relative constancy of the internal environment with the help of homeostasis under changing conditions of the external or internal environment. The stationary state is characterized by a set of parameters, the values of which, during fluctuations, do not go beyond certain boundaries and do not change over time. In reality, biological systems do not approach stationary states, and all fluctuations in them exist around some average value, the accuracy of maintaining which is not high. So, for example, in the human body, only the pH value of the blood is maintained by acid-base balance with a relatively high accuracy with an average value of 7.4 and with minor deviations ranging from 7.37 to 7.43. It should be recognized, that the term "chaos" is often used as a synonym for "noise", but this is a completely different phenomenon, since chaos is observed even in the complete absence of noise in the environment. Within the framework of the direction, only those systems are considered that respond to external disturbances in a nonlinear manner, which allows them to be considered as nonlinear deterministic systems, i.e. consisting of several simple elements [10]. In some cases, the behavior of such deterministic nonlinear systems can be unpredictable, random, which is chaos. which allows them to be considered as non-linear deterministic systems, i.e. consisting of several simple elements [10]. In some cases, the behavior of such deterministic nonlinear systems can be unpredictable, random, which is chaos. which allows them to be considered as non-linear deterministic systems, i.e. consisting of several simple elements [10]. In some cases, the behavior of such deterministic nonlinear systems can be unpredictable, random, which is chaos.

For many years, the study of the statistical properties of physiological fluctuations, such as the dynamics of the behavior of heart rate, respiration, bioelectrical activity of the brain, human locomotor activity, etc., revealed their significant complexity, which could not be formally described. In academic medical practice, for a long time there was an opinion that, for example, the heart rate in a person is quite stable within certain physiological limits, and therefore, the heart rate was usually represented as a sinusoidal curve. As a result of the first attempts to apply chaos theory to the processes occurring in the human body, an assumption arose about the presence of chaotic

processes only in the body of sick or aging people. And only the development of new mathematical approaches and computer technologies made it possible to approach the search for patterns from a point of view that is not traditional for physiology and medicine - based on the study of their chaotic dynamics. Among the first researchers in this direction, we should mention AL Goldberger, who, studying the dynamics of the heart rate, suggested that the rhythms of the heart and other systems of a healthy body can be disordered or chaotic, while more regular (pathological) functioning is sometimes associated with diseases and aging [11]. Subsequently, the representations of AL Goldberger by his co-authors were widely disseminated, and the concept of dynamic (deterministic) chaos as a norm in the behavior of the functional systems of the body has become fundamental for the study of many physiological phenomena, as well as for the clinic [12–14]. The chaotic nature of the heart rhythm allows it to adapt to changes in physical and emotional stress on the body, thereby responding to these changes more flexibly. At the same time, the appearance of regularity in the activity of the heart, according to AL Goldberger, characterized by the ordering of the rhythm, is an indicator of a decrease in chaos, not only in the heart itself, but also in other related functional systems of the body [15]. All this indicates a decrease in the body's ability to withstand the effects of external and internal environmental factors on it and to adequately respond to them. In the end, the development of such regularity in the activity of the heart can, after a while, lead to death. In the development of this well-established concept, there is every reason to consider "physiological" or "harmonious" oscillations according to F. Morell as a chaotic type of oscillatory processes, and "pathological" or "disharmonious" as regular. Thus, it is obvious that pathological oscillations have a sinusoidal or close to it character, while physiological ones differ significantly in their form from pathological ones and, as a result, are more complex in their spectral composition. Morell as a chaotic type of oscillatory processes, and "pathological" or "disharmonious" as regular. Thus, it is obvious that pathological oscillations have a sinusoidal or close to it character, while physiological ones differ significantly in their form from pathological ones and, as a result, are more complex in their spectral composition. Morell as a chaotic type of oscillatory processes, and "pathological" or "disharmonious" as regular. Thus, it is obvious that pathological oscillations have a sinusoidal or close to it character, while physiological ones differ significantly in their form from pathological ones and, as a result, are more complex in their spectral composition.

One of the fundamental properties of chaotic systems is their high sensitivity to small changes in the parameters of the regulatory system, due to which external influence has an effective effect on endogenous rhythmic processes. At the same time, the provision of stable relationships between a multitude of oscillatory processes differing in frequency in the body, which are not accompanied by frequency capture, should consist of constant phase shifts between various physiological processes.

All processes in the human body are accompanied by the generation of electromagnetic fields, the bioelectric nature of which is associated with the processes of occurrence and conduction of excitation. Endogenous electromagnetic fields and radiations are participants in remote intercellular interactions that occur in biological objects of various levels of organization without the mediation of molecular (chemical), mechanical contacts or other direct contacts, which is a reliably established fact [16, 17]. The BRT method in this context is considered as a way of external influence (control) on the functioning of any biological system,

which consists of electromagnetic signals carrying certain information, which contributes to the gradual restoration of a normal physiological state [18]. In principle, the process of treatment using BRT can be considered as a control process in the presence of deviations in the functioning of one or another body system from the value that is defined as the norm. The result of such treatment is the achievement of the physiological norm that is characteristic of a given organism (individual), which ultimately leads to the maintenance (stabilization) of the main parameters of the organism's vital activity within certain limits - homeostasis.

Bioresonance therapy and dynamic (periodic) diseases

In 1985, AL Goldberger et al. expressed the first ideas about the dynamic nature of some diseases that are not caused by any pathogenic agents, but are the result of a violation of regulatory processes in biological subsystems or an abnormal temporal organization [16]. However, much earlier, S. Siegal (1945) and H. Reimann (1948) almost simultaneously introduced the term “periodic illness” into scientific medical circulation and described individual cases of this disease [17, 18]. Subsequently, analyzing periodic diseases in more detail, H. Reimann considered them as diseases that recur with different periods or are irregular in nature and manifest themselves in otherwise healthy people [19]. All this pathology, in his opinion, are the result of the imposition of one or more rhythms of manifestations of other diseases that are somehow associated with circadian rhythms. L. Glass and MC Mackey (1988) expanded these ideas, and they proposed another term - "dynamic disease" and formulated the basic concepts of its etiology. One of the qualitative signs of a dynamic disease is changes in the nature of the dynamics of any periodic process in the body, which include [17]:

- the occurrence of regular fluctuations affecting those processes in organism, which, in a normal physiological state, do not change or change in an insignificant way;
- the appearance in an already existing periodic process of new oscillations, having a periodic character;
- the disappearance of previously existing rhythmic processes and their replacement constant or aperiodic dynamics.

Thus, the basis of dynamic diseases is a violation of the normal organization of the dynamics of oscillatory processes, which is closely related to deviations in the parameters of physiological regulation in the body. The processes occurring at each level of the biological organization of the body are characterized by their own periodicity, which is determined by both endo- and exogenous factors that form a specific control algorithm. The control algorithm itself can be considered as a kind of cyclical process in which certain operations have specific time characteristics. In turn, the existence of temporary links between individual algorithms leads to the fact that the delay in the execution time of at least one operation

leads to disruption of the entire cycle (algorithm) and other closely related processes. This situation leads to the accumulation of errors, the correction of which is carried out by restructuring the control system under the influence of control actions, which can be both external and internal. Within the framework of dynamic behavior, since chaos is a normal state in the functioning of biological systems, there is every reason to assume that there is an algorithm in the homeostasis control system aimed at suppressing ordered rhythmic processes and increasing chaos. This kind of internal control action in the terminology of F. Morell maintains the existence of “physiological” or “harmonious” fluctuations in the body and prevents the occurrence of “pathological” or “disharmonious” ones. Apparently violation of the normal operation of this algorithm, which corrects rhythmic processes, leads to the onset of a disease, and its “breakdown” leads to the development of a more serious pathology, and therefore there is a need for an external control action. In the biomedical interpretation, the term "external control actions" refers to corrective or normalizing actions that have a therapeutic focus. It is obvious that these therapeutic effects should be of an oscillatory nature and, acting on the necessary algorithm of the control system, bring it to a normal state, thereby removing the body from the state of abnormal rhythm dynamics. It can be assumed that BRT, based on its main mechanisms of therapeutic action, has the necessary effect on the state of rhythmic processes in the body, acting through the correction of the homeostasis control system algorithm. Of course, it should be recognized that many difficulties still lie in the way of the final establishment of such mechanisms, if only because many pathologies can still be considered as dynamic diseases and cannot be easily identified. However, one cannot but keep in mind the undoubted advantage of building a model of dynamic diseases and their connection with the possibilities of modern methods of treatment, which will undoubtedly increase their therapeutic effect.

conclusions

Complex dynamic phenomena that are observed in the body of a healthy and sick person are considered from the standpoint of nonlinear dynamics and in its application to BRT. It is shown that against the background of many sometimes difficult to interpret factors of both endogenous and exogenous origin, which determine the processes of regulation in the body, the ratio of chaos and order has a great influence. The concept of diseases is discussed, which are based on violations of the normal organization of the dynamics of oscillatory processes, due to deviations in the parameters of physiological regulation in the body. It can be assumed that a revision of views on the role of homeostasis-managing algorithms, the purpose of which is to suppress ordered rhythmic processes and increase chaos, will be useful in introducing bionic principles into modern methods of treatment.

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