

Study of the resources of the adaptive function of the autonomic nervous system in patients with acute and chronic pain syndromes

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SUMMARY

The study of the adaptive function of the autonomic nervous system by the method of segmental bioelectronic functional diagnostics was carried out. An integral coefficient of instability of electrical conductivity of the skin of biologically active zones is proposed to assess the adaptive function of the autonomic nervous system. The correlation of the results of segmental bioelectronic functional diagnostics and the integral coefficient of instability with the nature and severity of the pain syndrome has been shown.

Keywords: adaptation function VNS, segmental bioelectronic functional diagnostics, acute and chronic pain syndromes.

Resume

The study of adaptive functions of the autonomous nervous system by the method of segmental bioelectronic functional diagnosis was performed. The integral coefficient of instability of electrical conductivity of the biologically active zones for evaluation of the VNS adaptation function is suggested. The correlation of the Sbfd results and integral coefficient with character and degree of the pain syndrome is shown.

Keywords: adaptation function VNS, segmental functional bioelectronic diagnosis, acute and chronic pain syndromes.

Introduction

Restoration of the impaired body functions as a result of the formation of various pathologies is carried out due to the inclusion of adaptive and compensatory reactions aimed at maintaining homeostasis. In these processes, the leading role is played by inter and intrasystem connections realized through the autonomic nervous system (ANS). Ensuring the adequacy of the functional systems of the body to the required level of regulation, the ANS adjusts the optimal somatovisceral synchronization by activating ergotropic and trophotropic mechanisms. It is generally accepted that the sympathetic division of the ANS regulates the ergotropic activity of the body, while its parasympathetic division regulates the trophotropic activity. In order to describe the state of the ANS, it was proposed to establish the following functional characteristics: initial autonomic tone, autonomic reactivity,

In order to study the initial vegetative tone (IWT),

testing of patients using tables of vegetative tone (according to A. Wayne), using integral indicators (vegetative Kerdo index, Hildebrandt coefficient), as well as hardware (cardiointervalography) and laboratory research techniques. The division of people into the categories of sympathotonics, vagotonics and normotonics is accepted, as well as a group of people with amphotonia (general increased tone of the ANS) [4, 5, 6, 11].

Autonomic reactivity (VR) reflects the ability of the autonomic nervous system to respond quickly to external and internal stimuli. In this regard, it mainly characterizes the functional state of the central regulation circuit. To assess VR, at the present time, hardware techniques are most often used that record the state of the ANS during short-term functional loads (ortho-clinostatic, cold tests). On the basis of VR, there is a division into categories depending on the consistency of reactivity: normal, decreased, increased [4, 11]. The presence of VR with sympathetic activation in most cases indicates the inclusion of adaptation mechanisms, hypersympathetic activation is observed with a decrease in the reserve capabilities of autonomic regulation.

The state of the autonomic nervous system during long-term maintenance of autonomic reactivity at a certain level is determined by autonomic support (VO). VO is studied by registering the state of the ANS with a prolonged orthostatic test or the proposed functional load with the study of heart rate and blood pressure. Inadequate VO is accompanied by clinical manifestations of autonomic dystonia. In some cases, vegetative dystonia may be accompanied by the development of a sympathicotonic crisis or orthostatic collapse [4, 11]. The named methods reflect the total state of adaptive-compensatory reactions aimed at maintaining homeostasis of autonomic regulation, and do not reflect the degree of tension of the internal adaptive mechanisms of ergo- and trophotropic functions.

We have proposed a method for studying the degree of activation of ergotropic and trophotropic mechanisms that implement autonomic homeostasis. As a research model, the state of parameters of electrical stability of tissues of reflex zones, reflecting the state of tension of adaptive functions in patients with pain syndromes in the back, was studied.

Back pain (dorsalgia) is caused by functional and dystrophic changes in the tissues of the musculoskeletal system (facet joints, intervertebral disc, fascia, tendons, ligaments) with possible involvement of adjacent structures (root, nerve) [1, 9]. The most common are the combined forms of pain syndromes: muscle-tonic, myofascial, facet, with dysfunction of the sacroiliac joint [1]. The purpose of our research was to study the degree of tension of the adaptive mechanisms that form autonomic homeostasis in patients with various pain syndromes in the back by the method of electropuncture diagnostics in biologically active zones.

Materials and research methods

In our studies, we studied the parameters of segmental bioelectronic functional diagnostics in 67 patients with pain syndromes and in 30 patients of the control group. Patients in the study group included 32 men and 35 women aged 24–72 years. The inclusion criteria were the presence of acute and chronic back pain at the time of examination. The exclusion criteria were the presence of oncological diseases, organic mental disorders. The control group included 30 people, including 19 women and 11 men, aged 22–67 years. The criteria for inclusion in the control group were the absence of pain at the time of the study and during the previous period of at least one year.

The design of the study included generally accepted measures: survey, neurological and orthopedic examination, clinical, laboratory, hardware diagnostic methods, the study of autonomic status, reactivity and provision [4] with generally accepted methods. Additionally, the state of adaptation was studied by the method of segmental bioelectronic functional diagnostics [7]. For this purpose, an apparatus was used for electropunctural diagnostics, drug testing, adaptive bioresonance therapy and electromagnet and light therapy.

on BAT and BAZ computerized
IMEDISEXPERT. (RU No. ФC 022a2005 / 2263-05 dated September 16, 2005)
manufactured by CIMS IMEDIS LLC (Moscow).

Studies by the method of segmental bioelectronic functional diagnostics (SBFD) were carried out according to the methodological recommendations [13]. The SBPD method belongs to the group of methods of electropuncture diagnostics for biologically active zones. The method uses the principle of segmental innervation of internal organs according to the Zakharyin-Ged zones. SBPD consists in the collection and processing of indicators of electrical conductivity of the skin from 6 paired biologically active zones: feet, palms, forehead on the right and forehead on the left [7]. Three series of measurements are carried out, after the first and second series, the current load, standard for this method, is carried out. The analysis of the obtained indicators allows us to evaluate the function of the ANS in the light of the concept of premorbid and the formation of morbid states, as a mobile process of maintaining or “breaking down” of adaptive self-regulation [10].

Consideration of adaptive self-regulation as a process of switching on the mechanisms of adaptation of the ANS makes it possible to assess the resources and mobility of the ergotropic and, to a lesser extent, trophotropic function of the ANS [4, 5, 6, 11].

In order to study the initial vegetative tone, the first series of SBPD indicators without current load was studied. The calculation of the average index of electrical conductivity of the skin was carried out, the integral coefficient of electrical instability was investigated for individual leads.

To determine the vegetative reactivity, the indicators after the current load were investigated: the change in the average indicator of the distribution of electrical conductivity, as well as the change in indicators on individual leads and the corresponding integral coefficients of electrical instability.

The variant of vegetative provision was studied on the basis of data obtained in the study of a series of SBPD after functional loading.

The calculation of the integral electric coefficient was carried out according to the results of the SBPD. instability

Measurements with SBPD consist of three cycles. In each of these cycles, 14 leads are examined. For each lead in each cycle, a coefficient is calculated from the results of the measurements, having a value from 0 (normal) to 100 (theoretically possible worst case). Further, for each lead, the instability coefficient (KN) is calculated as the average KN of this lead in all measurement cycles. Similarly, KN is calculated by cycles (as the average KN of this cycle by leads). The average value of KN for the leads, equal to the average value for the cycles, is the integral coefficient of instability (ICI) of the electrical conductivity of the skin according to the results of SBPD. TSC values from 0 to 10 are indicative of satisfactory electrical stability; from 10 to 20 - mild electrical instability; more than 20 - severe electrical instability; more than 30 - pronounced electrical instability. Patients with pain syndromes (n = 67) were divided into 2 study groups. The first study group (n = 46) consisted of patients in whom the nature of the pain syndrome reflected the state of inflammation, there were main complaints of acute pain, aggravated by movement, physical activity, decreasing at rest from analgesics, nonsteroidal anti-inflammatory drugs. An objective examination in the area of painful irritation revealed edema, painful tissue tension, and antalgic posture. When examining X-ray images, computed tomograms, magnetic resonance tomograms of the structures of the musculoskeletal system, there were no signs of degenerative changes [3]. A similar picture of the state reflects functional disorders in the musculoskeletal system with signs of muscle-tonic and myofascial syndromes [8, 9, 12]. The intensity of pain syndrome according to the VAS scale (visual analogue scale) was 7.67 ± 2.31 points.

Patients representing the second study group (n = 21) complained of aching, breaking, pulling, brain pains, mainly at rest and at night, sleep disturbances, decreased mood and appetite. Violation of the vascular supply of the brain and visceral organs was often noted. The effect of the use of analgesics, non-steroidal anti-inflammatory drugs is insignificant. In a number of cases, there were vegetative disorders such as angiotrophoplastic insufficiency. X-ray, computed tomography, and magnetic resonance imaging showed signs of degenerative-destructive disorders in the lumbar spine in the structures of the musculoskeletal system [3]. This picture of the state was accompanied by an organic process of damage to the structures of the musculoskeletal system.

Research results

The indicators of SBPD were obtained, the IQI was calculated and investigated in patients of the control group and in groups of patients with pain syndromes [2]. In the control group, IWT indices close to eutonia, VR close to normergy and sufficient VO, CI was 6.65 ± 2.45 . Testing IWT by conventional methods gave a picture close to normotensiveness; during the use of light stress tests, VR was in a corridor close to the indices of normality. VO was at a level close to sufficient.

In the group of patients with acute pain syndromes during FBDS, IWT indices corresponding to insignificant parasympathicotonia and insignificant sympathicotonia were obtained, VR by the type of mild hypo- or hyperergia, VO close to sufficient, CNI was 15.98 ± 3.48 . At the same time, light and prolonged exercise tests in a number of cases improved adaptation indicators. In the study of autonomic indicators by conventional methods, IWT was defined as para or sympathicotonia, VR is weak or moderate, VO is sufficient. The pattern of SBPD in patients of the second study group with chronic pain syndromes was distinguished by a pronounced dissociation of indicators in separate series of measurements. The IWT in some patients significantly differed from normotensiveness in the direction of severe parasympathicotonia (6 patients) or sympathicotonia (12 patients), some of them had amphotonia (4 patients), 3 patients had amphitonia. Parameters of VR in all patients of this group differed in rigidity, the study after functional load revealed pronounced hypoergy, unresponsiveness and deterioration of VO, CNI averaged 33.25 ± 5.05 .

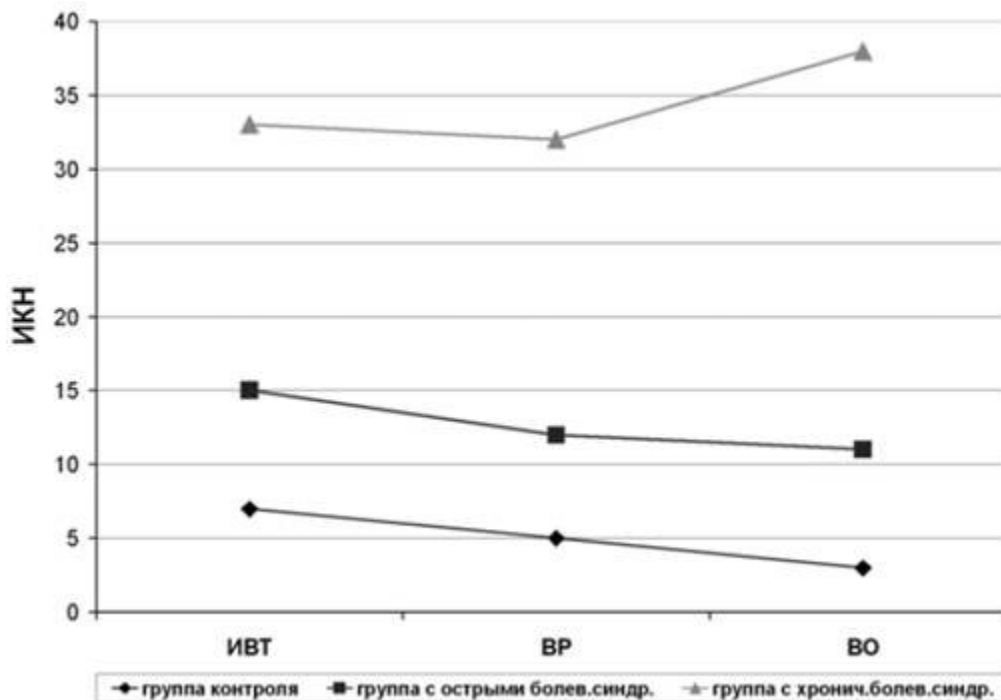
In the study of the adaptive function of the ANS by conventional methods, the patients of the second study group revealed the following signs: IWT testing revealed a dissociative picture. Parasympathetic tone was tested in 6 patients, 12 patients showed a pronounced initial sympathicotonia, and amphitonia was detected in 3 patients. Also, in patients of this group, in the study of VR and VO, rigidity was revealed in 7 cases or deterioration of test indicators in 14 cases. The study of VO in some cases was accompanied by a significant deterioration in well-being and the threat of orthostatic collapse or hypertensive crisis, and therefore the proposed functional load (orthostatic test) was canceled.

The discussion of the results

The research results in the control group significantly differed from the research results in the groups of patients with pain syndromes ($p < 0.05$) both when comparing absolute indicators and when studying the integral coefficients of electrical conductivity (Fig. 1).

The indices of instability of the electrical conductivity of the skin of the reflex zones in the patients of the control group are the lowest ICI = 0-10 conventional units, the dynamics of the VR and VO indices reflects a satisfactory state of adaptation. Autonomic adaptation is weaker in patients with acute pain syndromes when tested by the SBPD method, and the CNI = 10-20 conventional units. Adaptation is least pronounced in patients with chronic pain syndromes,

the coefficient of instability differs significantly from that in the control group and in the group of patients with acute pain syndromes and is more than 20 conventional units. An attempt to study VO using conventional methods in patients with high indices of CNI in some cases leads to a threat of adaptation failure with clinical manifestations of severe autonomic insufficiency.



Rice. 1. Dynamics of TSC in different groups.

conclusions

As a result of the study of the degree of tension of the adaptive mechanisms that form autonomic homeostasis in patients with various pain syndromes in the back, the possibility of assessing the nature and severity of pain syndrome with the help of SBPD was revealed.

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