Electropuncture diagnostics. Communication III. Comparative analysis of the main methods electropunctural diagnostics

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Electropuncture diagnostics Publication 3. Comparative analysis of basic methods of electropuncture diagnostics

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SUMMARY

The article presents a comparative metrological and bioelectrochemical analysis of the main and currently most widespread methods of electropunctural diagnostics (electro (acu) puncture diagnostics according to R. Voll, the "Ryodoraku" method according to J. Nakatani). Some new hardware methods of electropuncture diagnostics are also considered - devices for measuring the functions of meridians (AMI-Motoyama) and "Prognos".

Key words: electropunctural diagnostics, diagnostic methods, metrological and bioelectrochemical analysis.

RESUME

The comparative metrological and bioelectrochemical analysis of commonly used methods of electropuncture diagnostics (electropuncture diagnostics by R. Voll, “ryodoraku” method according to Y. Nakatani is presented. Certain modern device based methods of electropuncture diagnostics are considered apparatus for meridian identification (AMI- Motoyama) and “Prognos”.

Keywords: electropuncture diagnostics, diagnostic method, metrlogical and bioelectrochemical analysis.

Electropuncture diagnostics has recently become widely used in medical practice, which has contributed to the emergence of a large number of publications in this area of medicine and related fields. The effective use of methods of electropuncture diagnostics requires certain special knowledge and practical skills from the doctor. However, unfortunately, this is not always a guarantee of the correct use of the equipment and obtaining reliable diagnostic results. The problem is that in practice, methods are often used that have different methodological features and techniques, and, moreover, do not always have clear scientific and metrological support.

In the published studies, much attention is paid to the problem of increasing the efficiency of electropunctural diagnostics, which has been traced since the creation of the first devices. Attempts to solve this problem, as follows from the analysis of the current state of the methods of electropunctural diagnostics, in most cases are undertaken in the direction of improving the computer processing of diagnostic information. At the same time, in the literature little attention is paid to the methodology of electropuncture diagnostics and issues directly related to the metrology of the applied measurement methods. As a result, the absence of a standard, unified examination technology, reliable algorithms for data interpretation and conclusion limits the possibilities of clinical use of methods of electropuncture diagnostics.

It should be borne in mind that most of the methods of puncture diagnostics - R. Voll, J. Nakatani, auriculodiagnostics according to P. Nogier and partially SVT-CITO according to A.I. Nechushkin - refer to testing methods, i.e. all of them, to a greater or lesser extent, change the state of the object during the measurement. Strictly speaking, despite its non-invasiveness, almost all puncture diagnostic methods to one degree or another reflect the body's response to the test signal in the form of an electric current, a difference in electrical potential or heat, even if with a rather low intensity compared to the therapeutic one. This situation has led to the fact that in many of the author's modifications of the Y. Nakatani method, for example, in the SVT-CITO test, the intensity of the testing signals is reduced by an order of magnitude, which was the reason

In this regard, it is worth noting that such a change in the Y. Nakatani method was made as a result of the fact that the diagnosis itself was a therapeutic effect, since it caused a therapeutic effect. Hence, it follows that the use of the overwhelming majority of methods and means of puncture diagnostics and their various modern modifications require a certain caution and correctness in the clinical interpretation of the information received. The latter is due to the fact that with repeated measurements taken after a short time interval, the natural physiological reaction of the body will be superimposed on the diagnostic result in response to stimulation by the testing current or voltage.

Irritation, depending on the diagnostic measurements performed, can have a different form - from physicochemical changes in the skin and underlying tissues to functional changes in related organs and systems. All this not only significantly reduces the reliability of the measured parameters and, consequently, the quality and clinical significance of diagnostics [2]. In this context, the most promising from the point of view of minimizing the impact on the body in the process of diagnosis are mainly non-contact research methods, such as IR and radiothermometry, optical characteristics of skin points or measuring electrical potentials in them [3–7]. The only exceptions are those types of puncture diagnostics, in which the principle of recording the body's response to the dosed effect is initially laid down, considered in these methods as a functional test - bioelectronic functional diagnostics according to H. Pflaum and vegetative resonance test according to H. Schimmel. At present, in world practice, there are several of the most common methods of electropunctural diagnostics, a brief description of the hardware of which, together with some of their metrological characteristics and manufacturing firms, are given in Table. eighteen]. All presented in table. 1 methods of electropunctural diagnostics are based on measuring the electrical conductivity of the skin or the reciprocal value - electrical resistance - when a direct or impulse current passes through it. At present, in world practice, there are several of the most common methods of electropunctural diagnostics, a brief description of the hardware of which, together with some of their metrological characteristics and manufacturing firms, are given in Table. eighteen]. All presented in table. 1 methods of electropunctural diagnostics are based on measuring the electrical conductivity of the skin or the reciprocal value - electrical resistance - when a direct or impulse current passes through it. At present, in world practice, there are several of the most common methods of electropunctural diagnostics, a brief description of the hardware of which, together with some of their metrological characteristics and manufacturing firms, are given in Table. eighteen]. All presented in table. 1 methods of electropunctural diagnostics are based on measuring the electrical conductivity of the skin or the reciprocal value - electrical resistance - when a direct or impulse current passes through it.

Table 1

The main devices for electropunctural diagnostics produced abroad and their specifications. According to [8]

Аппарат (фирма-производитель)	Диагностические напряжение, ток	Измеряемая точка	Активный электрод	Пассивный электрод	Лит-ра
«Dermatron» (Pitterling Electronic GmbH, Munich, Германия)	< 2 В, постоянный ток	Корпоральные точки по R. Voll	Латунный, диаметром 3мм	Латунный, ручной, диаметром 30 мм	[9, 10]
«Neurometer», (Ryodoraku Research Insitute, Ltd., Tokyo, Япония)	12 В или 24 В, постоянный ток	24 точки на руках и ногах	Чашечка, с ватой смоченной физиологическим раствором	Металлический цилиндр, ручной	[11]
Apparatus for meridian identification (AMI-Motoyama Institute of Life Physics, Tokyo, Япония)	3 В, постоянный ток, прямоугольные импульсы длительностью 256 мкс	Дистальные точки на пальцах рук (*Ting* points)	Серебряная 7 мм пластина с токопроводящим гелем	ЭКГ электрод диаметром 30 мм	[12]
«Prognos» (MedPrevent, Walderschorf, Германия)	1,1 мкА, постоянный ток, 223 мс	Дистальные точки на пальцах рук (*Ting* points)	4,57 мм диаметром, гибкий, снабженный пружиной	6×3,5 см, закрепляемый на ладонной поверхности предплечья	[13]

A very small number of publications are devoted to the analysis and comparison of hardware for electro-puncture diagnostics from the standpoint of metrology and the generality of biophysical principles [8, 12-16]. The latter circumstance is due to the fact that in publications, as a rule, there is no description of the hardware of the technical means of electropuncture diagnostics or is given without detail. However, we must not forget that almost all of these methods are based on an empirical approach based on a large accumulated professional experience. Some metrological foundations for obtaining diagnostic information by measuring the electrical properties of skin points were recently formulated only for the two most common methods of electropuncture diagnostics according to R. Voll and Y. Nakatani, while similar questions concerning other methods,

The electrical characteristics of human skin have always attracted attention from the point of view of their use as a diagnostic indicator of a disease. Electrical phenomena in human skin in the form of a galvanic skin reaction (reflex) have been known since 1888, when the Russian physiologist I.R. Tarkhanov and Frenchman Ch. Féré discovered this phenomenon almost simultaneously and independently of each other, although I.R. Tarkhanov measured the biopotentials of the skin, and Ch. Féré -

electrical conductivity, they were based on the same physiological process [17]. All these electrical phenomena were not tied to any specific areas or points of the skin and are currently used as a routine method for assessing the psychophysiological state of a person.

Currently, numerous studies have been published in several thousand journal articles, reviews, monographs, which show the results of measurements of the electrical characteristics of human skin at acupuncture points using various methods, measurement topology, electrodes, treatment methods, etc. [eighteen]. However, all these results in absolute terms were practically incomparable, and the relative values were not of clinical value.

This was explained by the fact that each method demonstrated its own rather stable change in the properties of the object of measurement (skin), which allowed each author to obtain his own, more or less reproducible results, but incomparable with other data. These failures are explained by the main functions of the skin (barrier-protective, thermoregulatory, gas transport, excretory, etc.), as a complex integumentary organ that takes an active part in the process of adaptation of the body to continuously changing environmental conditions. All these briefly listed factors make almost all skin parameters extremely variable, since it is this instability that is one of the indispensable components of homeostasis, aimed at maintaining the constancy of the internal environment of the body. As a result of all this, an idea was formed that

Only thanks to many years of research, R. Voll and Y. Nakatani managed to develop and, on the basis of a large accumulated professional experience, introduce into clinical practice such methods of electropuncture diagnostics, which have received well-deserved recognition and are widely used in many medical institutions around the world. These two most common methods of electropuncture diagnostics are R. Voll and Y. Nakatani, which represent two main, independent directions. All other methods of electropunctural diagnostics widely used in the Russian Federation and the CIS countries are, in principle, derived from them and differ exclusively in the author's modifications.

Comparison of these two main methods of electropuncture diagnostics shows that R. Voll and Y. Nakatani, each in its own way, solved the problem of instability of electrical parameters of the skin at the measured points. The electrical properties of the skin when measured with direct current are primarily determined by the degree of moisture content of the keratinizing epithelium (epidermis) or layerstratum corneum,depending on the intensity of perspiration, the presence of sweat glands and other difficult and not always taken into account factors [20]. In the context of the above, the leading role in the measurement process belongs to the method of contact of the electrodes with the skin at the test point. In his method, R. Voll used a contact method in the form of an electrochemical electrode of the first kind, while Y. Nakatani used an electrode of the second kind.

In the R. Voll method, due to the dosed pressure on the skin surface, the epidermal cells are mechanically flattened, which allows to obtain comparable diagnostic results. In addition to this, the measurement time in the R.Voll method is limited, which also reduces the likelihood of erroneous readings. It should be noted that in some publications, which are extremely far from the scientific understanding of the R. Voll method, the following “discoveries” are given: “In addition, electrical conductivity, as it turned out, is not an informative characteristic of AT(acupuncture point, authors). By pressing on the skin with an electrode, we squeeze the electrolyte out ofcapillaries and intercellular spaces. Measuring addictionI (P) (current from pressure, authors),we simultaneously take into account the conductivity of the tissue and its elastic properties, which is closely related to the elasticity of the connective tissue fibers of the underlying layers, the permeability of cell membranes, the tone of muscle fibers, the capillary network ”[21, p. eleven]. There are also more curious expressions from other authors, as, for example, it is explained that the first rise in the curve depending on the current strength on the pressure of the active electrode when measured by the R. Voll method is due to "... squeezing out of the intercellular fluid, and the second - of the intracellular fluid." In accordance with the cited diagnostic mechanisms, in the first case, the patient would have had a serious injury, in the second case, the patient would have received injuries incompatible with life. For the sake of fairness, it should be noted that the second cited "mechanism" of the R. Voll method may exist

only in theory, since its practical provision in the form of squeezing out "intercellular" and "intracellular fluid", as it seems, would be a rather complicated and practically difficult engineering task.

In the Y. Nakatani method, skin contact with the active electrode is carried out through a liquid - an electrolyte solution. For this, a cotton swab soaked in an isotonic (0.9%) solution of sodium chloride is placed in the plastic (metal) cup of the measuring electrode before the start of measurements [22]. From the standpoint of metrology and electrochemistry, the contact method used in Y. Nakatani's method is more correct, however, one must remember about the hydration of the epidermis through the liquid contact of the electrode and natural distortion as a result of this true measurement results. On the other hand, the measurement time (the period of stay of the active electrode on the skin), as well as in the R. Voll method, is strictly dosed, which makes it possible to minimize the errors of this contact method in the “electrode-skin” system.

Comparing these most common methods of electropuncture diagnostics, it should be noted that both the R. Voll method and the Y. Nakatani method have their own advantages and disadvantages. However, the most important thing is that they both allow for functional diagnostics and nosological diagnosis, and in diagnostic quality they are compatible with each other. Applied metrological evaluation of these methods shows that "one amazing numerical relationship should be noted between the nonlinear scale of the R-map in the Nakatani method and the linear scale of the device in the Voll method" [15, p. 58].

Less well known is the method of electropuncture diagnostics, developed and used in research and clinical practice by the Japanese H. Motoyama [12]. Implementing this method and the device developed by him "Apparatus for Measuring the Internal Organs and their Corresponding Meridians" or AMI is a computer-controlled measuring system that evaluates differences in the state of 12 main meridians. The assessment was carried out on the basis of measuring the electrical resistance of the skin at 28 end (seiketsu) points on the fingers and toes of the right and left meridians. The differences in the electrical properties of the end points (imbalance of the meridians) revealed by the AMI are, according to H. Motoyama, evidence of an existing or just emerging pathology of organs, associated with the corresponding meridians. The AMI method takes into account some factors that arise during the measurement - the contact of the active electrode with the skin is through a conductive gel, and a standard electrode used in electrocardiography is used as a passive one. The AMI method differs in that “before polarization” measurements are made, then testing current pulses of a rectangular shape with a fixed duration of 256 μs are applied to each measured point, and upon completion, “after polarization” measurements. Thus, AMI is a characteristic testing method of electropunctural diagnostics and in some features reveals similarities with bioelectronic functional diagnostics according to H. Pflaum. The recently developed apparatus for electropunctural diagnostics "Prognos" is also focused on measuring the electrical resistance of the skin at the end points of the meridians at direct current [13]. The design of the active electrode provides for limiting the pressure on the skin during the measurement, the duration of which is fixed at 223 ms. A 6 × 3.5 cm passive electrode is attached during the measurement to the palmar surface of the forearm. The diagnostic characteristics of the method incorporated in the "Prognos" apparatus, judging by the latest publications, are still being refined [23]. In conclusion, it should be noted that the methods of electropuncture diagnostics are currently in constant improvement and development.

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