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METHODS OF INFLUENCE ON BIOLOGICALLY ACTIVE POINTS ACCORDING TO PHYSICAL FEATURES OF ACUPUNCTURE

Abstract. The article presents the physical feature of acupuncture and the mechanisms of their stimulation. Technical devices and methods of influence on biologically active acupuncture points are considered.

Keywords: Biologically active points, acupuncture, electrical conductivity, potential.

The relevance

Man is considered to be a closed electrical system. Inside the body, electric currents of various frequencies are generated in 7 biological power plants: in a heart, in a brain and in five sensory organs. Firstly, biocurrents carry information through nerve cells to specific cells of the human body, to organs and tissues. The human body absorbs only 5 % of the total energy. At the final stage after transmitting information to the cells of the corresponding organs the fate of 95 % of biocurrents is to flow through the intercellular space to the skin, where they are annihilated by acupuncture points. All the electricity that is generated inside the human body (and animal body) is absorbed by its own tissues. Not a single electron produced inside a living organism leaves the human body and goes into the environment, but is absorbed by the skin. This is the reason for the closeness of the human electrical system. The body itself absorbs all the electricity that it previously produced, generated [1, 2].

According to the international classification of classical meridian points, there are 361 (asymmetric 52, symmetrical 309), extra-meridian – 171. These points are not so much skin points as skin projections of nerve and other elements embedded in the underlying tissues at a depth of several centimeters to several millimeters.

Acupuncture points (biologically active points – BAP) are considered as zones of maximum reception or as limited areas of receptors maximal concentration embedded in the skin and underlying tissues. The connecting link of points with internal organs is the autonomic nervous system.

The study of the physical properties of BAP is relevant for the creation of technical means for determining acupuncture points and various methods of influencing them.

The aim of the study. Analysis of the physical properties of acupuncture and methods of determining acupuncture points.

Main materials and methods

An insertion of a needle (or exposure to another physical factor) into the acupuncture point is accompanied by irritation of certain skin and underlying tissues receptor formations, the occurrence of differentiated afferent impulses. When the needle passes through the epidermal layer, tactile exteroceptors are stimulated, afferent from which is carried out along thick myelin fibers of the A-beta type (diameter 8...12 microns, speed of the nerve impulse 40...70 m/s). With a deeper insertion of a needle, the dermis is irritated, which, along with tactile pain and temperature exteroceptors, as well as the ends of the autonomic perivascular plexuses, is irritated. In addition to A-beta fibers, there are: thin myelin fibers A-delta (diameter 3...4 mm, impulse conduction speed 5...15 m/s), conducting pain and partially temperature afferentation; thin myelin fibers of type B (diameter 1...3.5 microns, impulse conduction velocity 3...18 m/s) – predominantly preganglionic fibers of the autonomic nervous system; non-myelinated thin C fibers (diameter 0.5...2 microns, impulse conduction speed 0.5...3 m/s), most of which are postganglionic sympathetic fibers and only a few conduct pain impulses.

When subcutaneous fat and muscular-fascial layers are influenced by an acupuncture needle, proprioceptors and the ends of the vegetative perivascular plexuses are irritated primarily, which are: thick myelin fibers of the A-alpha type (diameter 12...22 microns, impulse conduction velocity 70...120 m/s) – afferent from proprioceptors and efferent from skeletal muscles; A-gamma myelin fibers (diameter 4...8 microns, impulse conduction speed 15...40 m/s), which are efferents of muscle spindles and, to a lesser extent, conduct afferentation from touch and pressure receptors; fibers of type B and C. With a deeper influence (periosteal layer), a variety of receptors and endings of the autonomic perivascular plexuses are irritated.

Stimulation by an acupuncture needle or other physical factor of various peripheral nerve structures determines a certain modality of the evoked (considered) sensations. Thus, the sensation of acute localized pain is associated with irritation of the A-delta fibers; this is often followed by a diffuse dull pain sensation due to the involvement of C fibers slowly conducting nerve impulses, etc.

According to modern theoretical concepts and the results of anatomical and morphological studies, there are a significant number of special end zones (points) that have their own morphological substratum and their functional connections, which determines the expediency and possibility of their use for therapeutic, prophylactic and diagnostic purposes. Acupuncture points differ from surrounding tissues in a number of biophysical characteristics.

Electrical properties are the most studied among the biophysical ones. Many researchers point out that acupuncture points have lower electrical resistance compared to the surrounding tissue.

The electrical resistance for indifferent areas of the skin is 1...2 mOhm; resistance at acupuncture points with a negative sign on the active electrode is 20...40 kOhm. It also detected the presence of a higher electrical potential in biologically active points and a rapid increase of potential in organs affected by a disease. Patients have more pronounced change in electrical resistance at acupuncture points than healthy people, the difference in electrical resistance between active and neutral points in patients is also more clearly revealed. There are indications of the dependence of changes in the electrical properties of points on the functional state of the autonomic nervous system. The low electrical resistance and high electrical conductivity of the points served as the basis for using these biophysical parameters to indicate acupuncture points.

The dependence of the value of electrical skin resistance at acupuncture points on the polarity of the applied voltage was revealed, which indicates the semiconductor properties of BAP. The features of acupuncture points include: low threshold of sensitivity; high local temperature; increased skin respiration; low electrical resistance in the study of direct or alternating current (20...250 kOhm); large electrical capacitance (0.1...1.0 uF); high electric potential (up to 350 mV). A number of works mention the high thermal conductivity of acupuncture points, which provides a selective effect of heat-healing factors on them.

It is also known that heat transfer from the skin surface is carried out mainly from the acupuncture zones and is mainly explained by more intense metabolic processes compared to other areas of the skin. Though visually, as a rule, acupuncture points are indistinguishable from nearby skin areas, they are a source of stronger infrared radiation and differ in optical properties. Acupuncture points are more sensitive to pressure than the surrounding areas; if organism is affected by a disease, some points become painful when pressed, that has diagnostic and therapeutic value.

According to recent studies, the piezoelectric effect is inherent in biological tissues [3], i.e., the ability to generate a difference in electrical potentials of tissues during their deformation. An important feature of the piezoelectricity of living tissues is the conditionality of its life processes (metabolism). Skin areas corresponding to acupuncture points have a higher piezoelectric coefficient compared to other tissues. Therefore, even a slight deformation or exposure to low-intensity ultrasound causes the generation of a potential difference only at the acupuncture points.

The resistance of the skin in the acupuncture zone is lower than in the surrounding areas. Sometimes, for these purposes, a multielectrode technique is used to measure the electrical conductivity of the skin in the acupuncture zone [4]. The localization of acupuncture points (zones) is also determined by measuring skin potentials. There are also known methods for finding points along the temperature gradient [4]. To do this, various methods measure the temperature directly in the zone and compare it with the temperature of the surrounding tissues. Thermal imagers are used for these purposes [5].

Certain areas of the skin surface are experimentally shown to be capable of conducting incident light. The most plausible explanation for the reflective characteristics is an increased metabolism in the area of BAP projections, more active perspiration, and increased friability of the skin [6].

Traditional methods of influencing biologically active acupuncture points and their modern modifications are represented by the following types.

Acupuncture (reflexotherapy) is the main method of influencing biologically active points. The advantage of this method lies in the availability of application, simplicity of tools, the possibility of carrying out in any conditions and in a fairly rich practical experience of use. The classical method of acupuncture is understood as the impact on the body with a therapeutic or prophylactic purpose with special needles inserted into certain areas of the skin (points) and underlying tissues.

Acupressure is a type of reflexology based on stimulation of mechanoreceptors by applying pressure (pressuring) at acupuncture points. Acupressure involves the use of the basic techniques of classical massage

(stroking, rubbing, kneading, vibration), transformed into special techniques depending on the anatomical features of the acupuncture zone and the goals of exposure.

Vibromassage is carried out with the help of special massagers. To obtain the maximum effect, the oscillation frequency should be within 50...200 Hz, exposure time – 20...50 minutes, average pressure force – 1 kg (oscillation amplitude 200...400 microns). It is recommended to act directly on pain zones or points. The mechanism of vibration stimulation is based on the activation of the lamellar bodies of Paccini in the connective tissue and the primary endings in the muscle spindles.

Microneedling is one of the varieties of classical (corporal and auricular) acupuncture, designed for long-term exposure to acupuncture points.

Tsubotherapy (micropressoreflexotherapy) is a method of prolonged action on mechanoreceptors and consists in applying and fixing stainless steel, gold, silver balls with a diameter of 1...3 mm in the acupuncture zone.

Multi-needle acupuncture is used more often in pediatric practice. Irritation with a bundle of needles is carried out by quickly applying a series of injections with a conventional acupuncture needle. More effective is the use of special multi-needle hammers, the head of which contains needles symmetrically fixed at a certain distance from each other or bundled into a bundle (5...13 needles). A method of multi-needle stimulation is also described – needle application, in which the impact on certain areas of the skin is carried out by applying flexible plates of various sizes with needles attached to them (1...16 needles per 1 cm²).

Cryopuncture – cold exposure to acupuncture points – is used in several ways. An acupuncture needle is inserted in the usual way, after which a device for cryoextraction of the lens is attached to it and the required temperature is set. Small-sized semiconductor thermoelectric devices are also used, which make it possible to regulate the temperature effect. Sometimes chloroethyl spray is used to cool the acupuncture points.

Laser puncture – exposure of an acupuncture point with a laser beam through intact skin. Laser acupuncture is a deep stimulation of acupuncture points through a hollow needle into which a light guide is inserted that conducts laser light. Laser radiation is transmitted through single-mode monofilaments made of optical quartz, introduced into the channels of special hollow acupuncture needles. The source of laser radiation are optical quantum generators. For laser puncture, low-power lasers that generate radiation in the red part of the spectrum are most often used.

Magnetopuncture – exposure of acupuncture points with an alternating or constant magnetic field.

Microwave resonant therapy – exposure to non-thermal electromagnetic radiation of the millimeter range on acupuncture points. At the same time, electromagnetic radiation of a certain resonant frequency imitates the signals produced by living organisms, and, when exposed to them, contributes to the restoration of the functional systems of the body.

Thermopuncture – thermal effect of a distant or contact type on acupuncture points using wormwood-cigarette heating. There are three types of exposure with distant thermopuncture: stable, intermittent, ironing.

Phonopuncture (ultrasonic puncture) – the effect of ultrasound on acupuncture points. Ultrasonic devices are used with a radiator diameter of up to 10 mm, a frequency of 0.8...2,7 MHz, and a power of 0.05...0.5 W/cm². The time of exposure to one point is from 30 s to 2 min. They also carry out a combined effect – phonophoresis puncture (phonophoresis of medicinal substances at certain acupuncture points).

Sonopuncture is the impact on acupuncture points with sound waves of various tones. The effect of sound is considered not as a mechanical massage, but as the effect of various sound frequencies on the corresponding organs and psyche. Low sounds affect the lower part of the body, high sounds affect the upper part, in particular the head. The interval and loudness of the sound also matter.

Ultraviolet irradiation of acupuncture points is methodically close to laser puncture. Initially determine the biological dose. After searching for points, 5...6 points are irradiated in one session, 2 biodoses for each. In order to avoid irradiation of neighboring skin areas, dense pads with holes with a diameter of about 5 mm are used.

Electropuncture (superficial transcutaneous electrical stimulation) and electroacupuncture (deep electrical stimulation through inserted needles) are reflexotherapy methods in which acupuncture points are affected by electric current.

Pharmacopuncture – the introduction of drugs into acupuncture points. The American version of acupuncture is prolotherapy – the introduction of drugs into painful (trigger) zones. One of the options for pharmacopuncture is the introduction of homeopathic remedies into acupuncture points.

Osteoperiosteal acupuncture consists in the impact of various physical factors (mechanical and electrical, mechanical and laser) directly on the periosteal areas and osteoreceptors of the bone tissue.

Conclusion

Acupuncture is the main method of influencing BAP. For the greatest effect from the use of reflexology in physiotherapy, it is advisable to create new technical means and a combination of various methods of influence based on the study of the physical properties of BAP.

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