Evaluation of the influence of the force applied to the active electrode, on the results of measurements in the Nakatani method

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One of the main advantages of Nakatani electropunctural diagnostics is the speed and ease of data acquisition. Representative points (zones) for measurements on the human body are easily localized; the active electrode (probe) has an area tip that is not critical to accurate positioning. The design of the probe tip implies the presence of a damper in the form of a cotton insert, which reduces (but does not exclude) the effect of an incorrectly selected effort on the probe when measuring conductivity from the zone [1].

Against the background of these seemingly obvious advantages, a sufficient number of specialists have appeared comparing the methods of electropuncture diagnostics and preferring Nakatani's technology [2, 3]. However, unlike, for example, the method of R. Voll, for the Nakatani method there are practically no studies that answer the questions of the influence of the force applied to the active electrode during measurements. Basically, these questions in most works, one way or another affecting the Nakatani method, boil down to the statement that: "The pressure of the electrode according to Nakatani practically does not affect the results, since moistened cotton wool filled into an ebonite cup limits the mechanical effect on the testing area" [3]. In this case, of course, we are not talking about some, even the most approximate, instrumental assessments of force measurements when using a "cotton electrode", but only a subjective assessment of researchers. Considering this aspect, a study was carried out to assess the influence of the force applied to the active electrode on the measurement results in the Nakatani method.

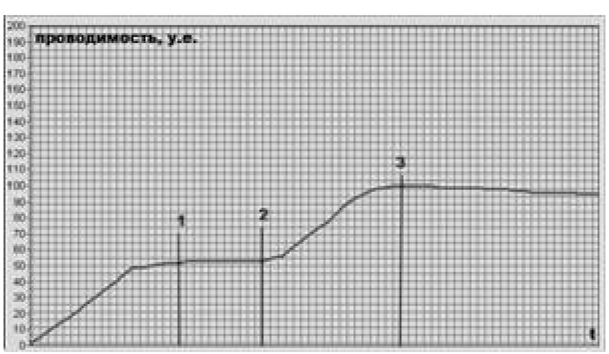
The work was performed on a hardware-software complex for traditional diagnostics and therapy for BAP with the ability to control the functions of other electro-, manito-, laser therapeutic devices ARM "PERESVET", registration certificate No. FSR2009 / 05421. To study the effect of force on conductivity, a force sensor based on quartz resonator, on the basis of which work was carried out to assess the effect of effort on the results of diagnostics by the method of R. Voll [4].

The study showed that the data obtained are influenced by a significant number of parameters. The resulting conductivity can vary significantly depending on the density of the cotton pad, the degree of moisture, the volume of the active electrode cup, etc. Estimates have shown that a wetted and dense cotton damper is elastically crumpled under forces on the active electrode of the order of several tens of grams. Up to the edge of the tip cup, creasing occurs when a force of the order of 150-200 grams is applied. In any case, even an insignificant (about 50 grams) increase in the force on the probe leads to a corresponding change in the resulting conductivity from the skin zone by 10–30 units. A further increase in effort also leads to an increase in conductivity, but this increase is becoming less pronounced. Almost all measurements have shown that there is a dependence of the change in conductivity on the force on the probe, and this dependence is in no way compensated by the presence of a cotton damper.

The effect of the applied force on the conductivity can be clearly demonstrated by fixing the probe tip on the zone using a rubber band or adhesive plaster (Fig. 1).

Rice. 1. Probe tip fixed on the zone

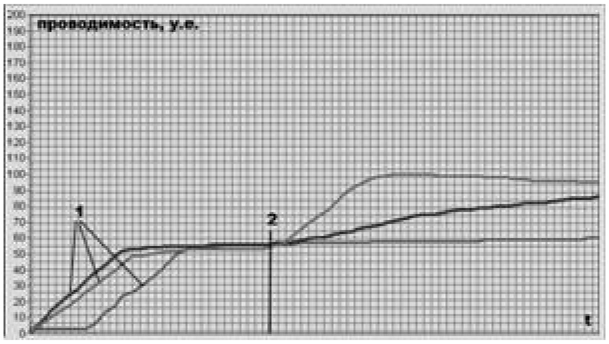
Fixation with a rubber band allows simulating a situation with several measurements taken at short time intervals with precise positioning on the zone and with the same initial slight force applied to the probe. In fig. 2 shows the resulting plot of conductivity versus time. When the test voltage is applied, the conductivity reaches an equilibrium value for a second, then with increasing force by pressing on the tip, another rise in conductivity is seen with a further plateau. All measurements presented in the graphs are carried out within 3 seconds.



Rice. 2. Change in the conditional conductivity at a fixed electrode atchange in effort in time: 1 - reaching the conductivity plateau when the test signal is applied; 2 - the moment of application of additional effort on

tip; 3 - final conductivity stabilization.

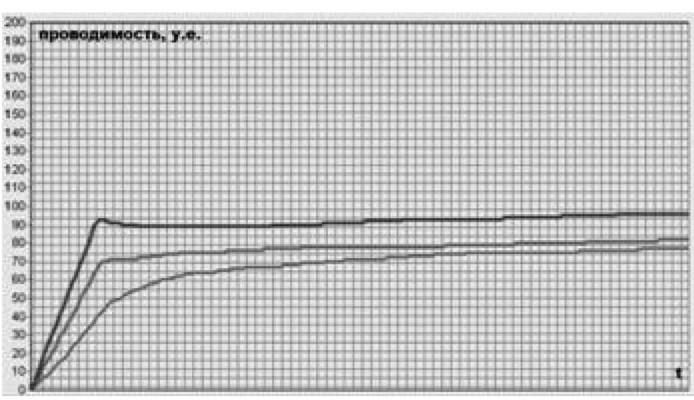
Different changes in force lead to different rises in conductivity. In fig. 3 shows several successive measurements carried out on an electrode fixed on the zone with a change in force.



Rice. 3. A series of measurements on a fixed electrode followed bychange in effort. Dependence of conductivity on time: 1 - initial section; 2 - the moment of applying additional force to the tip.

In fig. 3, one can clearly see almost 100% coincidence of the initial portion of the conductivity curves. This fact demonstrates the close to ideal repeatability of measurements, which can be obtained under standard conditions in the case of a correct (equal effort, precise positioning, etc.) technique for taking data, and measurements carried out several times in a row do not change the obtained values from the zone.

Consecutive measurements on one zone, performed without fixing the tip with a gradual increase or decrease in the force applied to the probe, do not change the essence of the dependence of the conductivity on the force. In fig. 4 shows measurements taken sequentially on one zone with a gradual weakening of the force on the probe without fixing the electrode.



Rice. 4. Graphs of conductivity versus time in one zone withgradual weakening of the applied force on the probe.

In this case, the differences in the initial portion of the curves are noticeable. The less the applied force, the more gentle curve growth is observed.

The results obtained in this work seem to be expected and obvious. As in the method of R. Voll, the more force is applied to the probe, the more conductivity is obtained. And the wadded damper, somewhat weakening this dependence (or rather, complicating it), fundamentally does not change it in any way.

However, the technique of taking conductivity readings in the Nakatani method has, in contrast to the R. Voll method, some peculiarities. In particular, the Nakatani method provides for fixing the result at 3 seconds. On the one hand, this simplifies and speeds up the process of retrieving diagnostic data. And in the absence of computer technology at the time of the creation of this technique, this seems to be the only way out for obtaining an acceptable result in manual mode. But, on the other hand, a significant amount of diagnostic data remains outside the field of view of the diagnostician.

Another feature of the method is the way the received data is presented - the so-called Nakatani map. This brilliant solution made it possible to obtain a very visual way of presenting the results obtained and, in addition, made it possible to partially neutralize the errors that arise when taking the primary data. In particular, if the diagnostician stably holds approximately the same force at all 24 measured points, then due to averaging, small errors will not introduce significant deviations in the final result.

Thus, the study shows that for the Nakatani method, as well as for other methods of traditional electropuncture diagnostics (R. Voll's method, VRT, etc.), the correct and stable choice of force on the probe is important to obtain repeatable and correct results.

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