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## Microcirculation Evaluation Capabilities Using Capillaroscopy

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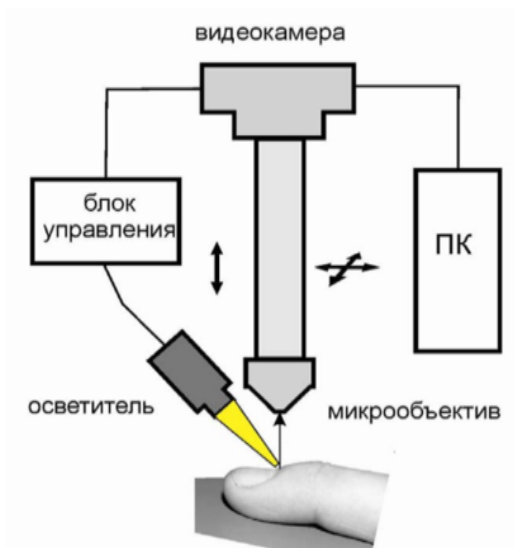
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An urgent issue of modern medicine is the search for new diagnostic methods to detect the smallest changes even at the preclinical stage [1, 2]. The study of the microcirculation system for surgery planning [3, 4] is very important for the diagnosis, assessment of the severity and nature of the course of pathological processes in the human body, predicting their dynamics, and monitoring the effectiveness of treatment [4, 5]. Biomicroscopic methods for studying capillary blood flow are traditionally used to study microcirculation and others parameters on microlevel [6, 7]. The main advantage of these methods is the ability to evaluate indicators such as the diameter of the microvessel [8], the passage of blood through them, the state of aggregation of the blood, the density of the capillaries, which is impossible with any other non-invasive technique. One of the most relevant and promising methods is capillaroscopy [9, 10].

The aim of the study is to study the possibilities of capillaroscopy in clinical practice as an informative and accessible method for assessing the state of peripheral blood circulation, as well as to study the mechanism of operation of an optical and computer capillaroscope.

**Figure. Scheme of the structure of a computer capillaroscope**



The essence of metabolic processes in the body is the constant redistribution of substances between the blood capillary, surrounding tissue and lymphatic capillaries. So, for an adequate description of metabolic processes, assessment of the functional reserves of the body,

identification of early forms of diseases and prediction of the reliability of examination, it is necessary to study the basic physiological functions of metabolism at the level of the microvasculature.

Since capillary circulation carries out the main function of the microcirculatory system - transcapillary metabolism, i.e., metabolism between blood and tissues, the state of microcirculation can serve as an arbiter of the well-being of systemic hemodynamics and the display of preserved arteriovenous equilibrium in regional vascular pools.

Given the fact that the change in the capillary link is closely correlated with shifts in central hemodynamics, it becomes possible to use microcirculation parameters as prognostic and diagnostic criteria for assessing the overall physical health of the subjects. Therefore, the work considered a qualitative and quantitative analysis of capillaries. This analysis is the main part of pathomorphological studies of microcirculation. A classification of microcirculatory disorders based on quantitative characteristics was also developed that was specially developed to form a medical report on the severity of microcirculation disorders, which indicates the state of the body as a whole, and normal indicators are considered.

**Figure. Normal capillary image**



In the process, we gradually came to the following classification with goal of a more complete clinical interpretation of changes capillaroscopic picture. Some of them: the shape of the capillary, the length of the capillary, the characteristic of the capillary in caliber, the specific gravity of the capillaries, the level of blood supply, the speed of capillary blood flow, the background of the capillary field, etc. All these indicators can help recreate the picture of the patient's health status and identify pathological disorders in his body.

The research helped to establish that the study of microcirculation using a method such as capillaroscopy can reveal the initial morphological and functional changes in the development of a number of diseases, as well as to monitor the effectiveness of treatment. The advantages of capillaroscopy are its uniqueness, painlessness, non-invasiveness, observation of microcirculation in the "natural environment", which increases the accuracy of diagnosis. The identification of the preclinical stages of various diseases opens up completely new opportunities for their prevention, and the monitoring of prescribed therapy makes it possible to conduct optimal treatment individually for each patient. The development of computer processing techniques for the obtained capillaroscopic images will allow the formation of an algorithm for the qualitative and quantitative analysis of the level of microcirculation, which will further improve the quality of objectification of the detected violations. Also, the fact of monitor visualization of a disturbed level of

microcirculation is often a factor for the patient to increase confidence in the doctor, the conscious need for treatment to eliminate the detected violations.

Regular capillaroscopy allows you to diagnose microcirculatory disorders, non-invasively monitor the effectiveness of therapy in almost all patients, and also monitor the status of patients associated with high-risk factors during professional examinations.

So, method of capillaroscopy is one of the most promising diagnostic methods at this stage in the development of medicine for complex diagnostic and treatment planning.

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