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Тематика: Інші професійні науки

MICROCIRCULATION EVALUATION CAPABILITIES USING CAPILLAROSCOPY

Kovalova A.A.

Avrunin O.G.

Kharkov National University of Radioelectronics, student

The pressing question of modern medicine is a search of new methods of diagnostics, allowing to expose shallow changes on the preclinical stage [1, 2]. The study of the microcirculation system is very important for the diagnosis, assessment of the severity and nature of the course of pathological processes in the human body, predicting dynamics and monitoring the effectiveness of treatment [3, 4]. Biomicroscopic methods for studying capillary blood flow are traditionally used to study microcirculation [5, 6]. The main advantage of these methods is the possibility of evaluating such indicators as the diameter of the microvessel, 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 [7, 8].

The aim of the study is to study the possibilities of capillaroscopy in clinical practice as an informative and available method for assessing the state of peripheral blood circulation.

The essence of metabolic processes in the body is the constant redistribution of substances between the blood capillary surrounding tissue and lymphatic capillaries. Therefore, it is necessary to build complex models that take into account the interconnection of processes occurring in all parts of the microvasculature for an

adequate description of metabolic processes. Therefore, the work considered a qualitative and quantitative analysis of capillaries, which is the main part of pathomorphological studies of microcirculation [8-12]. Also a classification of microcirculation disorders based on quantitative characteristics, specially designed to form a medical report on the severity of microcirculation disorders was proposed. It indicates the condition of the patients in general, and the indicators are considered normal.

The video signal received from the capillaroscope [6] contains a number of different distortions and noise, therefore, it requires rather substantial processing. The results obtained demonstrate how to eliminate the distortion and interference of images of a video sequence, compensate for their drift, and ultimately increase the visual information content of the analyzed data. It is also shown how much visual information can be additionally extracted from the original video data as a result of their processing, which will reduce time and improve diagnostic accuracy.

Drift compensation and video sequence improvement allows further development and application of special methods and algorithms for automatic video analysis. They, in particular, include:

- the detection and localization of capillaries;
- the estimation of capillary frequency;
- the allocation of the contours of the capillary bed;
- the capillary size estimation;
- the analysis of capillary blood flow parameters: speed, volume of flowing blood.

Other directions of analysis and extraction of the necessary data required by the doctor-diagnostician are also possible.

Also, given the fact that a 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 condition and health of the subjects. In this regard, the study of the parameters of capillaries allows us to judge not only the functioning of central hemodynamics, but

also to determine diagnostic and prognostic criteria for the pathology of various organs.

The study helped to establish that the study of microcirculation using 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 various preclinical stages by capillaroscopy of various diseases opens up completely new possibilities for their prevention, and the monitoring of prescribed therapy makes it possible to carry out optimal treatment individually for each patient. The prospect of work is a realistic visualization [13, 14] of the visualization of capillary blood flow in the nasal cavity and its relationship with various chronic rhinological diseases

References:

[1] Oleg G. Avrunin, Natalia O. Shushlyapina, Yana V. Nosova, Wojciech Surtel, Aron Burlibay, Maral Zhassandykyzy. Method of expression of certain bacterial microflora mucosa olfactory area. Proc. SPIE 9816, Optical Fibers and Their Applications, 2015, 98161L (December 18, 2015), doi:10.1117/12.2229074.

[2] Avrunin O.G., Nosova Y.V., Shuhlyapina N.O., Zlepko S.M., Tymchyk S.V., Hotra O., Imanbek B., Kalizhanova A., Mussabekova A., Principles of computer planning in the functional nasal surgery. Przegląd Elektrotechniczny 93(3)/2017, 140-143.

[3] Oleg G Avrunin, Yana V Nosova, Victor G Paliy, Natalia O Shushlyapina, Maksat Kalimoldayev, Paweł Komada, Azhan Sagymbekova. Study of the air flow mode in the nasal cavity during a forced breath. Proceedings Volume 10445, Photonics Applications in Astronomy, Communications, Industry, and High Energy Physics Experiments 2017; 104453H (2017); doi: 10.1117/12.2280941

[4] Skidanov, A., Avrunin, A., Tymkovych, M., Zmiyenko, Y., Levitskaya, L., Mischenko, L., & Radchenko, V. (2015). Assessment of paravertebral soft tissues

using computed tomography. Orthopaedics, traumatology and prosthetics, 3, 61-64.
doi:10.15674/0030- 59872015361-64

[5] Nosova, Ya. V. Biotechnical system for integrated olfactometry diagnostics / Ya. V. Nosova, O. G. Avrunin, V. V. Semenets // Innovative technologies and scientific solutions for industries. – 2017. – No. 1 (1). – P.64 – 68. – doi:10.30837/2522-9818.2017.1.064

[6] Носова, Я. В. Разработка метода экспресс диагностики бактериальной микрофлоры полости носа / Я. В. Носова, Х. Фарук, О. Г. Аврунин // Проблеми інформаційних технологій. – Херсон, 2013. – № 13. – С. 99-104.

[7] Носова, Я. В. Определение микрохарактеристик воздушного потока в носовой полости при дыхании / Я. В. Носова, О. Г. Аврунин, Х. И. Фарук // Вестник НТУ «ХПИ», Серия: Новые решения в современных технологиях. – Харьков: НТУ «ХПИ». – 2018. – № 16 (1292). – С. 122-127. – doi:10.20998/2413-4295.2018.16.19.

[8] Гурфинкель Ю.И., Кузнецов М.И., Певгов В.Г. Устройство и способ неинвазивного исследования характеристик капилляров и капиллярного кровотока. 18.06.2008. Режим доступа <http://bd.patent.su/2389000-2389999/pat/servlet/servlet34cf.html>.

[9] Shchabrykina N. S. The use of a mathematical model of microcirculatory processes for the diagnosis of functional disorders of microcirculation. – 2007. – P. 9–14.

[10] Lutchik U. B. Modern opportunities of capillaroscopy. – 2004. – P. 36-38

[11] Hardware-software complex for studying the effect of air composition on the aerodynamic parameters of nasal breathing / O. Avrunin, Ya. Nosova, N. Shushliapina, S. Khudaieva, Ibrahim Younouss Abdelhamid. // Proceedings of the XV International Scientific and Practical Conference "International Trends in Science and Technology", Warsaw, Poland. – Vol.1, 2019. – P. 17-20.

[12] Аврунін О.Г., Безшапочний С.Б., Бодянський Є.В., Семенець В.В., Філатов В.О. Інтелектуальні технології моделювання хірургічних втручань. – Харків : ХНУРЕ, 2018. – 224 с.

[13] Аврунин О.Г. Визуализация вентролатерального ядра таламуса головного мозга человека / О. Г. Аврунин, В. В. Семенец, С. Ю. Масловский// Радиоэлектроника и информатика.– 1998.– № 1/(2). – С. 132– 134

[14] Книгавко, Ю.В. Алгоритмы программного рендеринга трехмерной графики для задач медицинской визуализации [Текст] / Ю.В. Книгавко, О.Г. Аврунин // Журн. Технічна електродинаміка.- 2010. – С. 258-261.

Тематика: Географічні науки

ФОРМУВАННЯ ПРОФЕСІЙНОЇ КОМПЕТЕНТНОСТІ У МАЙБУТНІХ УЧИТЕЛІВ ГЕОГРАФІЇ

Ковальська К.В.

ДВНЗ «Переяслав-Хмельницький державний
педагогічний університет імені Григорія Сковороди»

кандидат історичних наук,

доцент кафедри географії,

екології та методики навчання

Основою сучасного розвитку українського суспільства постає його людиноцентристська спрямованість, характерними особливостями якої є розвиток особистості: її здібностей, мислення, задоволення запитів, потреб тощо.

Базою для розвитку кожної особистості, утвердження України на світовій арені як вільної, демократичної, конкурентноздатної держави була і залишається освіта. Саме освіта має відповідати інтересам і запитам суспільства, тому одним із головних завдань освіти є професійна компетентність фахівців, що задовольняє сучасні потреби.