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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

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თანამშრომლობითა და მისი პატრონაჟით

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

ТБИЛИСИ - НЬЮ-ЙОРК

GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board and The International Academy of Sciences, Education, Industry and Arts (U.S.A.) since 1994. **GMN** carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

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GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией и Международной академией наук, образования, искусств и естествознания (IASEIA) США с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения.

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GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

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При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

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2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

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ავტორთა საყურადღებოდ!

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1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

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5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

Содержание:

EFFECT OF ELECTRO- AND ULTRAPHONOPHORESIS OF THE PHYTOCOMPLEX ON MICROCIRCULATORY AND BIOCHEMICAL PARAMETERS IN PATIENTS WITH KNEE JOINT OSTEOARTHRITIS

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Osteoarthritis is one of the most common rheumatic diseases in the world [1-4]. Osteoarthritis affects all components of the joint: primarily cartilage, as well as the subchondral bone, synovial membrane, ligaments, capsules of the periarticular muscles [5]. The pathological process in the joint often leads to a chronic course of the disease, progression, disability, and a decrease in the quality of life of patients, which is a serious medical and social problem [6-8].

The main clinical symptoms of osteoarthritis are pain and limitation of joint function [9-12]. Microcirculatory disruptions in the affected joint and changes in biochemical parameters are often observed during this disease [13-17].

Treatment of osteoarthritis is mainly aimed at reducing pain, correcting functional failure of the joint, limiting the progression of the disease, reducing the risk of exacerbations and involvement of previously intact joints, improving the quality of life of patients, and preventing persistent joint deformities and disability [18-23]. Treatment of osteoarthritis includes medication and non-medication methods, including physiotherapeutic ones [24-30].

Low-frequency electrotherapy with sinusoidal modulated currents (SMC-electrophoresis), or amplipulse therapy, during osteoarthritis has analgesic, neurostimulating, vasodilating, and trophostimulating effects. Ultrasound therapy has anti-inflammatory, defibrosing, analgesic, reparative, and regenerative effects [31,32]. To enhance the therapeutic effect, physical factors are combined with the use of medicinal substances (SMC-electrophoresis, ultraphonophoresis). This is most relevant in the rehabilitation of patients of an older age group, many of whom take medications for underlying and concomitant diseases, which greatly complicates the choice of treatment method.

The phytocomplex for electrophoresis and ultraphonophoresis, which is proposed for use in this study, is a dry extract from grass and roots of the marsh cinquefoil, grass of alfalfa, and multiple fruits (or cones) of ordinary hops (Technical Specification 9375-021-00003938-11 “Extract of marsh cinquefoil, alfalfa and dry hops (phytocomplex)”) (33). It contains a set of biologically active substances, including flavonoids, cumestans, polysaccharides, steroids, essential oils, tannins, hydroxycinnamic and phenolcarboxylic acids, essential amino acids, vitamins. and mineral components. This composition makes it possible to use the phytocomplex in medicine for inflammatory and degenerative diseases of the musculoskeletal system, including osteoarthritis.

Previous studies have shown the strong effect of SMC-electrophoresis of the phytocomplex on clinical symptoms and quality of life in patients with osteoarthritis of the knee joint [34].

The research aimed to study the effect of the SMC-electrophoresis and ultraphonophoresis on disruptions in the microcirculation system in the affected joint area and on changes in connective tissue metabolism parameters, metabolic processes, and electrolyte metabolism in patients with knee joint osteoarthritis..

Material and methods. The study involved 72 patients. Clinical trials of SMC-electrophoresis and ultraphonophoresis of the phytocomplex in the treatment of patients with knee osteoarthritis were authorized by the Interuniversity Ethics Committee of the Association of Russian Pharmaceutical Universities.

Criteria for including patients in the test were the following: verified diagnosis of osteoarthritis of the knee joint in accordance with the standards of the American College of Rheumatology (ACR), presence of disruptions in the microcirculation system in the knee joint area and biochemical parameters, first to third radiological stage according to Kellgren-Lawrence grade, absence of synovitis or presence of its small manifestations, intensity of pain in the affected joint according to the visual analogue scale (VAS) not lower than 40 mm, intake of Symptomatic Slow Acting Drugs for Osteoarthritis (SYSADOA) according to generally accepted schemes in a stable dosage for a minimum of three months prior to the start of the study. Regular use of Non-Steroidal Anti-Inflammatory Drugs (NSAID) in stable standard daily average doses was also accepted. Patients signed a written consent to participate in the study. Exclusion criteria: secondary osteoarthritis of the knee joint, intra-articular administration of any drugs during six weeks before the start of the study, administration of glucocorticoids during the last month, history of surgeries of the joint under study, severe synovitis, pregnancy, breastfeeding, contraindications for the use of SMC and ultrasound therapy, individual intolerance to biologically active substances of the phytocomplex, presence of other rheumatic diseases, body mass index above 40 kg/m^2, presence of severe comorbid diseases.

Among the patients included in the study, 70.8% (51) were female and 29.2% (21) were male. The age of the examined patients ranged from 40 to 78 years. The median of the sample and the interquartile range (25th and 75th percentiles) of the patients’ age, duration of the disease, and body mass index at the time of the examination were 55.0 (47.5 and 62.5) years, 5.3 (2.7 and 7.8) years, and 30.4 (25.3 and 35.4) kg/m^2, respectively. The first radiological stage of osteoarthrosis was observed in 12.5% of patients, the second stage was observed in 65.3%, and the third stage was observed in 22.2%. In the majority of patients (81.9%), the pathological process was unilateral and only in 18.1%, it was bilateral. A rapidly progressing course of the disease was observed in 4.2% of patients. Several patients included in the study were diagnosed with concomitant diseases, including arterial hypertension (41), coronary heart disease (25), diabetes mellitus (10), metabolic syndrome (5), and gastroduodenal ulcer (15). In several patients, these diseases were combined.

All patients were randomly assigned (by the method of random numbers generated using a computer program) to five groups, comparable by clinical and functional characteristics. Also, the study involved ten practically healthy individuals of a similar age, the results of which were taken as normal parameters.

Patients of the first group (15) underwent a rehabilitation program including SMC-electrophoresis of the phytocomplex (SMC + PC) (Table 1). Patients of the second group (15) were prescribed ultraphonophoresis of the phytocomplex (US + PC). Patients of the third group (15) underwent treatment using amplipulse therapy (SMC). The fourth group (15) underwent ultrasound therapy (US) using methods similar to ones used in first and second groups, but without the phytocomplex. The study participants in the first four groups continued to receive drug therapy, which did not change during the course of the physiotherapeutic procedures. Patients of the fifth group (12) received

Table 1. Assignment of patients to groups

Healthy (normal)	Main groups		Comparison groups		Control group
	1 (SMC + PC)	2 (US + PC)	3 (SMC)	4 (US)	5 (MT)
Number of patients (*n*)					
10	15	15	15	15	12

only medication (MT): basic SYSADOA (12 patients – 100%), NSAID (2 patients – 16.7%), general tonic agents, and vitamin preparations. The drug therapy of patients of the fifth group was comparable to the drug treatment of the trial participants in the first four groups.

Electrotherapy was performed on the area of the knee joint using the transverse technique in the full-wave SMC mode with I and IV types of operation for five minutes each. The modulation frequency was 100 Hz, the modulation depth was 75%, the half-periods were two and three seconds, the current strength was five mA, and the exposure time was ten minutes. Ten daily procedures per course were performed. The procedures were performed using an "Amplipuls-6" apparatus ("Electroapparat", Russia).

A working solution of the phytocomplex for electrophoresis was prepared *ex tempore* by dissolving the dry extract (10 parts) in dimethyl sulfoxide (15 parts) and then adding warm (40°C) distilled water (up to 100 parts). 20 ml of the working solution was applied to disposable electrode pads for low-frequency electrotherapeutic procedures (INNISS-med, Russia), which were placed on the affected knee joint.

Ultrasound therapy was performed on the area of the knee joint using a contact method and the labile technique in continuous mode with an ultrasound intensity of 0.6 W/cm^2. The duration of the procedure was eight minutes per joint and ten daily procedures per course were performed. The procedures were performed using the UZT-1.07F apparatus (Maloyaroslavets Instrument Factory, Russia).

The working composition of the phytocomplex for ultraphonophoresis was prepared by adding dimethyl sulfoxide (10 parts) to the phytocomplex (10 parts). Then a special gel for ultrasound therapy "Repak-T" (Product License 29/06081001/3590-02, Geltek-Medica, Russia) was added (up to 100 parts). 1.5 g of the working composition was evenly distributed over the area of the affected knee joint.

The content of flavonoids in the working solution and working composition was 0.7% (in equivalent to quercetin) or 4% (in equivalent to the dry residue of flavonoids). The concentrations of the phytocomplex were experimentally selected as a result of studying the transdermal delivery of biologically active substances of the phytocomplex under the action of SMC and ultrasound in model experiments [35,36].

To assess the state of microcirculation in the area of the affected knee, the method of laser Doppler flowmetry was used (a two-channel laser microcirculation computerized analyzer LABC (LAKK)-02, Research and Production Enterprise LAZMA LLC, Russia). The following main microcirculatory parameters were determined: level of capillary blood flow, microcirculation intensity, and microvessel vasomotor activity.

We used the following biochemical research methods:

– to evaluate the connective tissue metabolism, the content of serum fibrinogen, C-reactive protein, hexoses, seromucoid, ceruloplasmin, and mucoproteins was determined;

– to analyze the main metabolic parameters, the content of aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline and acid phosphatases was evaluated;

– to assess the state of electrolyte metabolism, the levels of calcium, potassium, sodium, magnesium, and phosphorus were determined.

All studies were performed before and after the course of treatment.

Statistical processing of the results was carried out using the SPSS. Statistics. v17. Multilingual-EQUiNOX (SPSS Inc.) software. The experimental, empirical distribution of variables did not differ much from the normal distribution (Kolmogorov-Smirnov test and the normal distribution graph). The data obtained are presented as mean values (M) with standard deviations (σ). To assess the significance of differences, the Student t-test was used. The critical level of significance in statistical hypotheses testing in the study was 0.05.

Results and discussion. According to modern concepts, disruptions in the microcirculation system play an important role in the development of dystrophic processes in the body, therefore, we studied the state of this pathogenetic link in patients with osteoarthritis of the knee joint (Table 2).

Table 2. The effect of the methods of SMC-electrophoresis and ultraphonophoresis of the phytocomplex on the microcirculation disruptions in the affected knee joint in patients with osteoarthritis (M±σ)

Parameter	Healthy (normal) (*n*=10)	Before treatment (*n*=72)	After treatment				
			Group				
			1 (*n*=15)	2 (*n*=15)	3 (*n*=15)	4 (*n*=15)	5 (*n*=12)
Level of capillary blood flow, cu	18.4±3.1	9.4±2.8 P_1**	17.3±2.3 P_2*	18.2±2.7 P_2**	13.0±2.1 P_1*, P_2*, P_3*	16.7±2.2 P_2*	9.2±2.5 P_1**, P_3**
Microcirculation intensity, cu	5.1±0.8	2.3±0.7 P_1**	3.8±0.9 P_1*, P_2*	4.7±1.2 P_2**	2.7±1.1 P_1*, P_3*	4.4±0.8 P_2*	2.4±0.5 P_1**, P_3**
Microvessel vasomotor activity,%	20.7±3.8	10.9±3.0 P_1**	16.7±1.9 P_2*	18.7±3.2 P_2*	11.8±2.1 P_1*, P_3*	13.2±2.6 P_1*, P_3*	11.0±2.4 P_1**, P_3*

Here, in Tables 3 and 4, and in Figure 1: P_1 – compared to normal parameters, P_2 – compared to parameters before treatment, P_3 – compared to parameters in the main group.
** - P<0.05, ** - P<0.01*

The examination of the trial participants before treatment revealed significant disruptions both in the arteriolar and venular parts of the microcirculatory system. They manifested themselves by a significant – almost twofold – decrease in the level of capillary blood flow. This, according to several researchers, leads to a decrease in the level of blood perfusion of the tissues in the area of the pathological process. Along with this, a 2.2-fold decrease in the total intensity of microcirculation and an almost twofold decrease in the total microvessel vasomotor activity was observed.

A comparative analysis of the studied treatment methods showed a significant corrective effect of SMC-electrophoresis and ultraphonophoresis of the phytocomplex (groups 1 and 2) on the microvessel vasomotor activity in the affected joint in patients with osteoarthritis compared to monotherapy methods (groups 3 and 4) and drug treatment (group 5). Among the pharmacophysiotherapeutic methods (groups 1 and 2), the use of ultraphonophoresis of the phytocomplex (group 2) led to a significantly better correction of microcirculatory disruptions. After treatment using this method was performed, all the studied parameters of laser Doppler flowmetry reached the level of healthy individuals. This may be fundamental in the formation of a therapeutic effect in patients with osteoarthritis of the knee joint. Methods of amplipulse therapy (group 3) and ultrasound therapy (group 4) also had a rather pronounced effect on the level of capillary blood flow. They were inferior to pharmacophysiotherapeutic methods (groups 1 and 2) in terms of the microvessel vasomotor activity improvement but were significantly more effective in terms of capillary blood flow improvement compared with drug treatment (group 5).

An objective diagnostic criterion in patients with osteoarthritis is the disruption in the connective tissue metabolism. According to several researchers, the severity of the disease can be assessed by the degree of the disruption. In this regard, the biochemical markers of connective tissue metabolism were investigated (Table 3).

In the studied patients with osteoarthritis of the knee joint, a significant increase in the studied parameters of connective tissue metabolism (compared to the values in the group of healthy individuals) was observed before treatment. The content of hexoses associated with protein (P>0.05) was the exception. The most pronounced disruptions were in the following parameters: seromucoid (1.5 times), mucoproteins (1.6 times), and ceruloplasmin (1.5 times). According to the literature, this often ac-

Table 3. The effect of SMC-electrophonophoresis and ultraphonophoresis of the phytocomplex on metabolic disruptions in connective tissue in patients with knee joint osteoarthritis

Parameter	Healthy (normal) (*n*=10)	Before treatment (*n*=72)	After treatment				
			Group				
			1 (n=15)	2 (n=15)	3 (n=15)	4 (n=15)	5 (n=12)
Hexoses (mmol/l)	6.20±1.30	7.40±2.10	6.90±1.30	6.60±1.40	7.00±1.80	6.90±1.00	7.40±1.20
Fibrinogen (g/l)	3.50±0.80	5.60±1.60 P_1*	4.10±1.20 P_2*	4.00±0.80 P_2*	4.60±1.30 P_1*	4.60±0.90 P_1*	5.60±1.40 P_1*, P_3*
C-reactive protein (mg/l)	1.60±0.50	3.00±0.80 P_1*	2.50±0.70 P_1*	2.10±0.40 P_1*, P_2*	2.70±0.50 P_1*	2.40±0.40 P_1*, P_2*	2.90±0.60 P_1*, P_3*
Seromucoid (mg/l)	240±31	356±44 P_1*	254±29 P_2*	242±28 P_2*	317±32 P_1*	284±30 P_2*	352±35 P_1*, P_3*
Ceruloplasmin (mg/l)	485±48	715±68 P_1*	580±54	511±51 P_2*	654±49 P_1*	616±55 P_1*	699±63 P_1*, P_3*
Mucoproteins (mmol/l)	0.45±0.06	0.74±0.19 P_1*	0.54±0.14 P_2*	0.49±0.12 P_2*	0.64±0.16 P_1*	0.60±0.08 P_1*	0.70±0.15 P_1*, P_3*

Table 4. Influence of the methods of SMC-electrophoresis and ultraphonophoresis of the phytocomplex on disruptions in electrolyte metabolism in patients with knee joint osteoarthritis

Parameter	Healthy (normal) (*n*=10)	Before treatment (*n*=72)	After treatment				
			Group				
			1 (n=15)	2 (n=15)	3 (n=15)	4 (n=15)	5 (n=12)
Calcium (mmol/l)	2.28±0.41	2.88±0.70 P_1*	2.64±0.42	2.53±0.31	2.78±0.12	2.67±0.26	2.85±0.55 P_1*
Potassium (mmol/l)	4.02±0.50	4.91±0.82	4.33±0.60	4.31±0.58	4.49±0.57	4.29±0.70	4.86±0.60
Sodium (mmol/l)	141±32	148±41	147±29	144±22	147±30	146±29	148±33
Magnesium (mmol/l)	0.91±0.16	0.56±0.11 P_1*	0.76±0.08 P_2*	0.88±0.19 P_2*	0.69±0.09 P_1*	0.70±0.08 P_1*, P_2*, P_3*	0.57±0.08 P_1*, P_3*
Phosphorus (mmol/l)	1.22±0.18	0.68±0.12 P_1*	0.95±0.17 P_1*, P_2*	1.18±0.09 P_2*	0.78±0.07 P_1*	0.92±0.11 P_1*, P_2*, P_3*	0.70±0.09 P_1*, P_3*

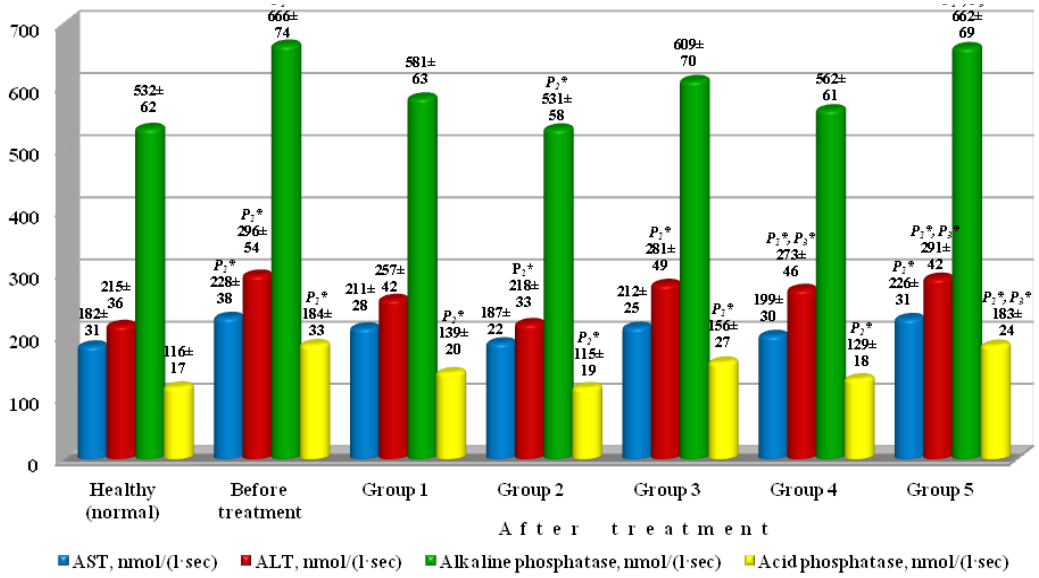

Fig. The effect of SMC-electrophoresis and ultraphonophoresis of the phytocomplex on metabolic disruptions in patients with knee joint osteoarthritis

companies damage to connective tissue. The content of C-reactive protein was within the reference interval.

A comparative analysis of the studied treatment methods showed that the ultraphonophoresis of the phytocomplex (group 2) had the greatest effect on the analyzed parameters. Its course application contributed to the restoration of such parameters as fibrinogen, seromucoid, mucoproteins, and ceruloplasmin content to the physiological norm. Among the traditional methods of physiotherapy (groups 3 and 4), a significant corrective effect of ultrasound therapy (group 4) on the seromucoid parameter of connective tissue metabolism was established.

Additionally, the state of electrolyte metabolism in patients with knee joint osteoarthritis was studied. Most of its parameters reflect the state of cell membranes of various organs and tissues (Table 4).

During a biochemical study of the level of mineral components in the blood serum of patients with knee joint osteoarthritis before treatment, it was found that calcium content was 1.3 times higher than normal while magnesium and inorganic phosphorus content was 1.6 times and 1.8 times lower than normal, respectively. The potassium and sodium levels were within the reference values; their variations were negligible and insignificant (P>0.05).

The use of ultraphonophoresis of the phytocomplex (group 2) had the greatest effect on electrolyte imbalance: the levels of magnesium and phosphorus after treatment were close to the level of healthy individuals (group 1).

One of the important indicators for osteoarthritis, indicating the severity of the dystrophic process, is metabolic disruptions. In this regard, several metabolic parameters in the observed patients were studied (Fig. 1).

Examination of the studied patients revealed a significant metabolic imbalance: an increase in the content of acid phosphatase (by 1.6 times) and ALT (by 1.5 times) with significantly smaller increase in the content of alkaline phosphatase and AST (by 1.3 times).

Of all pharmacophysiotherapeutic methods of treatment (groups 1 and 2), only the use of ultraphonophoresis of the phytocomplex (group 2) had an effect on the metabolic disruptions and restored the content of ALT and alkaline and acid phosphatases to physiologically normal values. The effect of the monotherapy method (group 4) and especially drug therapy (group 5) on the content of ALT was significantly greater compared to the ultraphonophoresis of the phytocomplex (group 2). A significant corrective effect of the SMC-electrophoresis of the phytocomplex (group 1) on the imbalance of acid phosphatase was also observed.

The pronounced anti-dystrophic effect of SMC-electrophoresis and ultraphonophoresis of the phytocomplex in patients with knee joint osteoarthritis was based on the correction of microcirculatory disruptions. The laser Doppler flowmetry showed an increase in capillary blood flow, an increase in blood perfusion in tissues, and a decrease in congestion effects in the venular microcirculation. Possibly, improvement of blood circulation occurred mainly due to the effect of physical factors. It is known that SMC improve blood circulation mainly due to the direct effect on the sensitive and autonomic nerve fibers, as well as due to reflectory improvement of blood supply to the periarticular muscles [32,37]. As a result of this, venous outflow and arterial influx increase and lymph circulation is activated. Ultrasound causes local vasodilation in the microvasculature and increases the volumetric blood flow in weakly vascularized tissues, their oxygenation and metabolic rate [32,37].

SMT-electrophoresis and ultraphonophoresis of the phytocomplex (the latter being the most effective method) improved the metabolism in connective tissue in patients with knee joint osteoarthritis, which was confirmed by the restoration of the main studied parameters (seromucoid, fibrinogen, and mucoproteins levels) to normal values.

The use of SMC-electrophoresis and ultraphonophoresis of the phytocomplex led to an improvement of the magnesium and phosphorus electrolyte metabolism in patients with knee joint osteoarthritis, which was confirmed by the restoration of the magnesium mineral balance to the physiologically normal levels. This was due to the complex integrated effect of the physical factor and biologically active substances of the phytocomplex on electrolyte metabolism. It is known that ultrasound, in addition to its main therapeutic effect, enhances the transdermal penetration of active substances by increasing the permeability of cell membranes, the diffusion rate and penetration depth, and reducing the "delay time"[38-41].

SMC-electrophoresis and ultraphonophoresis of the phytocomplex contributed to the elimination of the metabolic imbalance of acid phosphatase. Additionally, ultraphonophoresis of the phytocomplex contributed to the normalization of the content of ALT and alkaline phosphatase, which had a positive effect on the improvement of the function of the knee joint in patients with osteoarthritis.

Conclusions. As a result of the study, the effect of SMC-electrophoresis and ultraphonophoresis of the phytocomplex on disruptions in the microcirculation system in the affected joint, as well as changes in the connective tissue metabolism, metabolic process, and electrolyte metabolism in patients with knee joint osteoarthritis was established.

The obtained results provide the basis for further studies to assess the overall effectiveness of the use of SMC-electrophoretis and ultraphonophoresis of the phytocomplex in patients with knee joint osteoarthritis.

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SUMMARY

EFFECT OF ELECTR- AND ULTRAPHONOPHORESIS OF THE PHYTOCOMPLEX ON MICROCIRCULATORY AND BIOCHEMICAL PARAMETERS IN PATIENTS WITH KNEE JOINT OSTEOARTHRITIS

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The goal was to study the effect of modulated sinusoidal currents electrophoresis and ultraphonophoresis of the phytocomplex on disruptions in the microcirculation system in the affected joint area and on changes in connective tissue metabolism parameters, metabolic processes, and electrolyte metabolism in patients with knee joint osteoarthritis.

Seventy-two patients were randomly assigned to five

groups. Patients of the first group were prescribed modulated sinusoidal currents electrophoresis of the phytocomplex. The second group was prescribed ultraphonophoresis of the phytocomplex, the third group was prescribed amplipulse therapy (modulated sinusoidal currents), the fourth group was prescribed ultrasound therapy, and the fifth group was prescribed basic drug therapy. Drug therapy of patients of the fifth group was comparable to the drug treatment of patients of the first four groups. The concentration of the phytocomplex in the working composition was 10%. Electrotherapy was carried out in the full-wave modulated sinusoidal currents mode with I and IV types of operation while ultrasound therapy was carried out in continuous mode with an ultrasound intensity of 0.6 W/cm^2. To assess the state of microcirculation, the laser Doppler flowmetry method was used.

The pronounced anti-dystrophic effect after the use of modulated sinusoidal currents electrophoresis and ultraphonophoresis of the phytocomplex in patients with knee joint osteoarthritis was based on the correction of microcirculatory disruptions: an increase in the capillary blood flow, an increase in the blood perfusion in tissues, and a decrease in congestion effects in the venular microcirculation. The use of modulated sinusoidal currents electrophoresis of the phytocomplex (ultraphonophoresis of the phytocomplex had an even greater effect) improved the connective tissue metabolism and the content of seromucoid, fibrinogen, and mucoproteins. The use of the studied treatment methods improved magnesium and phosphorus parameters of the electrolyte metabolism. Modulated sinusoidal currents electrophoresis and ultraphonophoresis of the phytocomplex contributed to the elimination of the metabolic imbalance of acid phosphatase. Ultraphonophoresis of the phytocomplex also contributed to balancing of the alanine aminotransferase and alkaline phosphatase content. As a result of the study, the effect of modulated sinusoidal currents electrophoresis and ultraphonophoresis of the phytocomplex on disruptions in the microcirculation system in the affected joint area and on changes in connective tissue metabolism parameters, metabolic processes, and electrolyte metabolism in patients with knee joint osteoarthritis was established.

The obtained results provide the basis for further studies to assess the overall effectiveness of the use of modulated sinusoidal currents electrophoresis and ultraphonophoresis of the phytocomplex in patients with knee joint osteoarthritis.

Keywords: knee joint osteoarthritis, medicine electrophoresis, phonophoresis, plant extract, electrotherapy, ultrasound therapy.

РЕЗЮМЕ

ВЛИЯНИЕ МЕТОДОВ ЭЛЕКТРО- И УЛЬТРАФОНОФОРЕЗА ФИТОКОМПЛЕКСА НА МИКРОЦИРКУЛЯТОРНЫЕ И БИОХИМИЧЕСКИЕ ПОКАЗАТЕЛИ У ПАЦИЕНТОВ С ОСТЕОАРТРОЗОМ КОЛЕННОГО СУСТАВА

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Цель исследования – определить влияние методов электрофореза синусоидальными модулированными токами и ультрафонофореза фитокомплекса на нарушения в системе микроциркуляции в области пораженного сустава, на изменения показателей обмена соединительной ткани, метаболического процесса и электролитного обмена у пациентов с остеоартрозом коленного сустава.

72 пациента рандомизированно распределены на 5 групп: пациентам I группы назначен СМТ-электрофорез фитокомплекса, II группы – ультрафонофорез фитокомплекса, III группы – амплипульстерапия (СМТ), IV группы – ультразвуковая терапия, пациентам V группы – «базисная» медикаментозная терапия. Лекарственная терапия пациентов V группы сопоставима с медикаментозным лечением пациентов первых четырех групп. Концентрация фитокомплекса в рабочем составе – 10%. Электротерапию проводили в выпрямленном режиме СМТ при I и IV роде работ, ультразвуковую терапию – в непрерывном режиме при интенсивности ультразвука 0.,6 Вт/см^2. Для оценки состояния микроциркуляции использовали метод лазерной допплеровской флоуметрии. Выраженный противодистрофический эффект при применении СМТ-электрофореза и ультрафонофореза фитокомплекса у пациентов с остеоартрозом коленного сустава базировался на коррекции микроциркуляторных нарушений и проявлялся в виде усиления капиллярного кровотока, увеличения перфузии крови в тканях и уменьшения застойных явлений в венулярном звене микроциркуляции. Под влиянием СМТ-электрофореза фитокомплекса, в большей степени при ультрафонофорезе фитокомплекса, улучшался обмен соединительной ткани по содержанию серомукоида, фибриногена и мукопротеинов. При использовании исследуемых методов лечения отмечалось улучшение состояния электролитного обмена по показателям магния и фосфора. СМТ-электрофорез и ультрафонофорез фитокомплекса способствовали устранению метаболического дисбаланса по показателю кислой фосфатазы, а ультрафонофорез фитокомплекса - также по содержанию аланинаминотрансферазы и щелочной фосфатазы.

В результате проведенного исследования установлено, что СМТ-электрофорез и ультрафонофорез фитокомплекса способствуют устранению метаболического дисбаланса кислой фосфатазы. Кроме того, ультрафонофорез фитокомплекса способствует нормализации содержания аланинаминотрансферазы и щелочной фосфатазы, что положительно влияет на функции коленного сустава у больных остеоартрозом.

რეზიუმე

ფიტოკომპლექსის ელექტრო- და ულტრაფონოფორეზის მეთოდების გავლენა მიკროცირკულაციურ და ბიოქიმიურ მაჩვენებლებზე პაციენტებში მუხლის სახსრის ოსტეოართროზით

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მოსკოვის ი.სეჩენოვის სახელობის პირველი სახელმწიფო სამედიცინო უნივერსიტეტი,რუსეთის ფედერაცია

კვლევის მიზანს წარმოადგენდა ფიტოკომპლექსის სინუსოიდური მოდულირებული დენებით ელექტროფორეზის მეთოდის და ფიტოკომპლექსის ულტრაფონოფორეზის მეთოდის გავლენის განსაზღვრა მიკროცირკულაციურ დარღვევებზე დაზიანებული

სახსრის მიდამოში, შემაერთებელი ქსოვილის ცვლის მაჩვენებლებზე, მეტაბოლურ პროცესზე და ელექტროლიტურ ცვლაზე პაციენტებში მუხლის სახსრის ოსტეოართროზით.

72 პაციენტი რანდომულად განაწილდა 5 ჯგუფად: I ჯგუფს დაენიშნა ფიტოკომპლექსის ელექტროფორეზი სინუსოიდური მოდულირებული დენებით, II ჯგუფს - ფიტოკომპლექსის ულტრაფონოფორეზი, III ჯგუფს - ამპლიპულსთერაპია, IV ჯგუფს – ულტრაბგერითი თერაპია, V ჯგუფს – "ბაზისური" მედიკამენტური თერაპია. ფიტოკომპლექსის კონცენტრაცია სამუშაო შემადგენლობაში იყო 10%. ელექტროთერაპია სინუსოიდური მოდულირებული დენებით ჩატარდა I და IV ჯგუფებში, ულტრაბგერითი თერაპია – უწყვეტ რეჟიმში 0,6ვტ/სმ² ინტენსივობის ულტრაბგერის გამოყენებით. მიკროცირკულაციის მდგომარეობის შეფასებისათვის გამოიყენებოდა ლაზერული დოპლერული ფლოუმეტრიის მეთოდი. გამოხატული ანტიდისტროფიული ეფექტი ფიტოკომპლექსის სინუსოიდური მოდულირებული დენებით ელექტრო- და ფონოფორეზის გამოყენებისას პაციენტებში მუხლის სახსრის ოსტეოართროზით ეფუძნებოდა მიკროცირკულაციური დარღვევების კორექციას და გამოიხატებოდა კაპილარული სისხლის ნაკადის გაძლიერებაში, სისხლის პერფუზიის მომატებასა და შეგუბებითი მოვლენების შემცირებაში მიკროცირკულაციის ვენურ რგოლში.

ფიტოკომპლექსის სინუსოიდური მოდულირებული დენებით ელექტროფორეზის გავლენით მეტად, ვიდრე ფიტოკომპლექსის ფონოფორეზისას, უმჯობესდებოდა ცვლითი პროცესები შემაერთებელ ქსოვილში სერომუკოიდის, ფიბრინოგენის და მუკოპროტეინების შემცველობის მხრივ.

მკურნალობის აღნიშნული მეთოდების გამოყენებისას აღინიშნებოდა ელექტროლიტური ცვლის მდგომარეობის გაუმჯობესება მაგნიუმის და ფოსფორის მაჩვენებლების მიხედვით. ფიტოკომპლექსის სინუსოიდური მოდულირებული დენებით ელექტრო- და ფონოფორეზმა ხელი შეუწყო მეტაბოლური დისბალანსის ალაგებას მჟავე ფოსფატაზას მაჩვენებლის მიხედვით, ხოლო ფიტოკომპლესის ულტრაფონოფორეზმა, ასევე, ალანინამინოტრანსფერაზას და ტუტე ფოსფატაზას შემცველობის მიხედვით.

ჩატარებული კვლევის საფუძველზე დადგენილია, რომ ფიტოკომპლექსის სინუსოიდური მოდულირებული დენებით ელექტრო- და ფონოფორეზი ხელს უწყობს მჟავე ფოსფატაზას მეტაბოლური დისბალანსის ალაგებას. გარდა ამისა, ფიტოკომპლექსის სინუსოიდური მოდულირებული დენებით ფონოფორეზი ხელს უწყობს ალანინამინოტრანსფერაზას და ტუტე ფოსფატაზას შემცველობის ნორმალიზებას, რაც დადებითად აისახება მუხლის სახსრის ფუნქციის გაუმჯობესებაზე პაციენტებში ოსტეოართროზით.

APPLICATION OF ANTIBIOTIC-CONTAINING EAR DROPS IN TREATMENT OF ACUTE OTITIS MEDIA

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Otitis is a very serious and noteworthy disease. In time and adequate treatment guarantees to prevent complications and to cure it. The antibiotic therapy plays a leading role in the treatment of this disease. Sometimes however the symptomatic treatment is sufficient: painkillers, fever controllers, utilization of local nose and ear drops [5,13].

According to the results of various studies, the prevalence of otitis media in one year and two-three year varies under 19% and 32%, respectively. Streptococcus pneumoniae, Haemophilusinfluenzae and Moraxella catarrhalis are the most common bacterial pathogens of [4,8].

Otalgia appears the most common otitis symptom. It has primary and secondary forms. Theprimery forms include the ear diseases, the main cause of which is the the eustachian tube dysfunction. Thesecondary forms cover the otalgias that include the sacral nerve, facial nerve, miscarriage, jaw inflammation, odontogenicpain.The acute inflammation of the middle ear is the most frequent cause of the ear pain in children. Primary otalgia can be the bacterial or viral infectious as well as the mechanical trauma or cochlear neuritis [11].

The classification and treatment of otitis media are discussed in the present paper. The course of the disease is atypical in some cases that often combine with the properly diagnostic acute otitis media [15]. The special attention demands theneonates andadults with systemic chronic diseases [5,15].

In some otitis media instances the ear drops can play an important cure role. A number of studies have suggested that the drops are appropriate for plaque ear lesions only [10].

The use of topical antibiotics in the form of ear drops is recommended during or after the plaque miringotomy. After the miringotomymany patients develop otorrhea. In such cases the utilization of topical antibiotics with a combination of corticosteroids is effective.

According toa double-blind randomized study in one of the clinics in Germany: The use of ciprofloxacin and fluocimolacetonid in the ear drops reduces otorrhea from 7 days to 4 days. It can be prescribed twice a day for 1 week [4].

In General and Family Medicine of the German Society provided guideline of chronic otitis media, we read that the patients suffering from this disease should undergo ear toilet, cleaning