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Restoration Of Microcirculatory Processes In Persons Of The Second Mature Age With Osteochondrosis Of Lumbar Spine In The Course Of Daily Wearing Of Medicinal Prophylactic Clothes For Half A Year.

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ABSTRACT

Manifestations of lumbar osteochondrosis are inevitably accompanied by disturbances of hemocirculation processes in vessels of the least diameter aggravating its clinical signs. In our work we tested daily wearing of the author's variant of medicinal prophylactic clothes for half a year and estimated the dynamics of microcirculatory indices in 43 patients of the second mature age with lumbar osteochondrosis. The control group was composed of 37 clinically healthy persons of the second mature age. In our work we applied instrumental, laboratory and statistical methods of investigation. In the result of medicinal prophylactic clothes' wearing for half a year the observed persons were noted to have preservation of normal microcirculation in the upper extremities and its normalization in the lower ones. It became possible in the result of the increase of linear systolic speed of bloodstream in lower extremities by more than 22.0%, linear average speed of bloodstream - by more than 73.0%, average volumetric speed of bloodstream - by more than 78.0% and the level decrease of systolic speed of bloodstream – by more than 41.0%. The plasma of persons with osteochondrosis who had worn medicinal prophylactic clothes for 6 months, was noted to have leveling of the existed imbalance of arachidonic acid metabolites on behalf of the level lowering of thromboxane B_2 by 30.2% and the rise of 6-keto-prostaglandin $F_{1\alpha}$ by 15.6%. By the end of observation it was accompanied by the increase of nitric oxide summary metabolites in plasma of the observed persons by 23.3% till the level which was near to the control one. Daily wearing of medicinal prophylactic clothes was accompanied by the content rise of erythrocytes-discocytes in patients' blood till 85.4±0.16% at the fall of erythrocytes' reversibly and irreversibly modified forms till 11.1±0.07% and 3.5±0.07% respectively. At the same time, in 6 months the patients from the group of observation reached normalization of erythrocyte aggregation on behalf of the fall of erythrocytes' sum in aggregates by 32.5% and the quantity of these aggregates – by 31.1% at the increase of freely lying erythrocytes by 21.6%. So, the patients of the second mature age with osteochondrosis of the 2nd degree wearing medicinal prophylactic clothes are noted to have the normalization of microcirculation indices and erythrocytes' rheological properties. Given changes can optimize the processes of microhemodynamics and activate the trophism of intervertebral disks decelerating osteochondrosis progression and eliminating its clinical manifestations.

Keywords: the second mature age, osteochondrosis, erythrocytes, microcirculatory course, aggregation, surface properties of the membrane.

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INTRODUCTION

Spinal osteochondrosis is one of the most often met pathological processes in mature age [1]. The great role in its development is acknowledged to belong to genetic predisposition [2] which leads to high frequency of osteochondrosis occurrence in people in all the regions of the planet [3] and in various species of animals [4,5]. The start of osteochondrosis clinical manifestations and their active progression in a man is often observed in mature age. Given pathology often causes episodes of temporary disability leading sometimes to stable invalidism [6]. High prevalence of osteochondrosis, its tendency to chronic course, frequent resistance to the applied medical impacts dictate the necessity of detailed studying of some changes in the body against its background [7].

It's noted that osteochondrosis development nearly always leads to worsening of the body's common functional state [8]. It is connected with the fact that osteochondrosis development negatively influences the processes of most internals' functioning [9]. The development of pathological processes in spinal column is accompanied by microrheological dysfunctions of regular blood elements what forms the signs of hypoxia in tissues [10]. It disturbs anabolic processes in them and weakens their vitality [11,12]. It forms the basis for pathology development in the internals [13,14] and promotes the appearance of stable vessels' spasm [15,16]. It's established that conditions for the stable systemic vessels' spasm with the rise of arterial pressure can be often formed against the background of degenerative changes in spinal column. The rise of pressure leads to gradual development of poorly controlled arterial hypertension [17]. Besides, the presence of osteochondrosis aggravates the course of already existing cardio-vascular pathology and promotes the formation of resistance to the applied hypotensive therapy [18,19].

Modern researchers [20,21] are inclined to consider the disturbance of the regional microcirculatory blood circulation as one of the leading pathogenesis components of local and referred vertebrogenic painfulness against the background of compressive-ischemic disturbances in the epidural cavity of the intervertebral voramen and the involvement of the nearest roots of spinal nerves into the pathological process [22]. Given opinion is supported by the absence of correlation between radiographic manifestations of degenerative changes in spinal column and evidence of pain syndrome. In this respect great significance in pain genesis at osteochondrosis is given to vascular and microcirculatory mechanisms [23,24]. Besides, there was noted the impact of the pain syndrome on the aggravation of pathological changes in microvessels and the fall of bloodstream speed in them. It is considered that restoration of local microcirculation indices is an important factor of radicular and reflex pain reduction at osteochondrosis [25,26]. In this respect the search of correction approaches to the given state which can optimize microcirculatory processes, acquires special urgency.

Earlier in the clinic [27,28] and in the experiment [29,30], the possibilities of various therapeutic effects on the organism with respect to improving the microcirculation process were evaluated [31]. In previous studies, the possibilities of various medicinal and non-medicinal effects on the components of microcirculation are shown [32]. At the same time, for the bulk of the working population, a low commitment to regular exercise is characteristic [33]. In addition, a large number of people of the second adulthood have various contraindications regarding the drug therapy of clinical manifestations of osteochondrosis. That's why, the further search of variants of non-pharmacological correction is necessary. It will be more popular among most patients [34,35] and will be able to not only steadily eliminate clinical manifestations of the disease but also positively influence platelets' aggregation which is rather significant for microcirculation. The authors considered daily wearing of medicinal-prophylactic clothes (MPC) as an alternative to medicinal physical training at osteochondrosis. From one side, the attachment to MPC among patients is incommensurably higher than to medicinal physical training [36]. From the other side, in previous researches there was established the possibility of correction of clinical and hematological disturbances caused by pathology of spinal column [37,38], with the help of MPC. So, we put the following aim in our research: to estimate the dynamics of indicators of microcirculation in persons of the second mature age with osteochondrosis of the 2nd degree who daily wore the author's MPC for half a year.

MATERIALS AND METHODS

The research was conducted on people living in Central Russia (Moscow City and Moscow region). Into our research we took 37 healthy people of both sexes (18 men and 19 women) of the second mature age

(mean age 43.5±2.5 years) who composed the control group. We also examined 43 people of both sexes (21men and 22 women) of the same age (mean age 44.7±1.9 years) with osteochondrosis of the 2nd degree who composed the group of observation. The diagnosis of osteochondrosis was confirmed clinically and rontgenologically. Existing in some persons from the group of observation concomitant chronic diseases (chronic bronchitis, chronic tonsillitis, chronic cholecystitis) were in the state of lasting persistent remission. In 93.0% of patients, the duration of exacerbation of the disease exceeded 2 weeks, with 88.4% of patients receiving treatment (medication, physiotherapy, massage, reflexology) for osteochondrosis, which in all cases was not effective enough. This research is approved by the local Ethics Committee of the Russian State Social University on May, 14th, 2015 (Record №5). All the examined persons gave written informed consent on participation in conducted research.

For the estimation of microhemodynamics in the extremities we used the noninvasive transcutanned ultrasonic doppler-graphy which was equipped by the diagnostic system "Minimax-Doppler-K" produced by "Minimax" (Russia). The state of microcirculation was determined on the nail folds of the first toes and fingers applying ultrasonic detector 25 MH. In our research we took into account the following indices: linear systolic speed of bloodstream (Vas), linear average speed of bloodstream (Vam), volume systolic speed of bloodstream (Qas), average volume speed of bloodstream (Qam).

In our research we determined the activity of the processes of lipids' peroxidation (LPO) in blood plasma which was registered according to the content of thiobarbituric acid (TBA)-active products in it with the help of a set produced by the firm "Agat-Med" (Russia) and to the level of acylhydroperoxides (AHP) [39]. We also registered antioxidant activity (AOA) of blood [40].

In blood plasma of examined children we determined the content of thromboxane A_2 metabolite – thromboxane B_2 and prostacyclin metabolite – 6-keto-prostaglandin $F_{1\alpha}$ by enzymoimmunoassay with the help of sets produced by the firm "Enzo Life science" (USA). We also determined the summary content of nitric oxide metabolites [41] in children's plasma.

Erythrocytes were washed and resuspended. Then we estimated quantitatively the levels of cholesterol (CS) in them by enzymatic colorimetric method with the help of a set produced by the firm "Vital Diagnostikum" (Russia), and common phospholipids (CPL) – according to the quantity of phosphorus in them [42].

The evidence of the processes of intra-erythrocyte LPO was found in washed and resuspended erythrocytes according to the concentration of malondialdehyde (MDA) in the reduction reaction of thiobarbituric acid and to the quantity of AHP [39].

We judged the state of erythrocytes' microrheological features of children by their cytoarchitecture and aggregation. We determined the quantity of erythrocytes' normal and changed forms in blood with the help of light phase-contrast microscopy [43].

The ability of erythrocytes to spontaneous aggregation was determined with the help of light microscopy by calculating the quantity of erythrocytes' aggregates, the number of aggregated and non-aggregated erythrocytes [43] in Goryaev's box.

All the persons from the group of observation were recommended to wear designed by the authors medicinal-prophylactic clothes [44] every day to correct osteochondrosis manifestations. The applied MPC consisted of belt-cast with warming effect which was composed of two details – backplate and breast-plate. There were elements of their mutual connection. The belt-cast was also provided with vertical pockets of different width. Stiffening ribs of elastic material were inserted into one of them, warming elements – into the others. Both plates were made of two layers of fabric. Vertical stitches forming pockets, were made along whole their surface. Both layers of fabric were sewed between each other along the lower cut and sides. The upper cut was left open and was provided with a zipper. A set of salt heaters was used as warming element.

The patients from the group of observation were examined at the beginning and in 3 months, 6 months of constant MPC wearing. The control group was examined once.

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Received in our research results were processes by Student's (t)criterion.

RESULTS OF INVESTIGATION AND DISCUSSION

Estimation of initial microcirculation speeds in persons with lumbar osteochondrosis showed its deviation of control values. The patients from the group of observation were noted to have the fall of bloodstream speed indices in the lower extremities: linear speed into systole from the right side – by 21.7%, from the left side – by 26.4%; average linear speed from the right side – by 85.7%, from the left side – by 73.3%; average volume speed from the right side – by 84.6%, from the left side – by 78.6%, at the increase of average volume speed into systole from the right side – by 45.1%, from the left side – by 38.4%. There were found no statistically significant differences in the indices of microcirculation in tissues of the upper extremities between the group of observation and the control group.

The examined persons with osteochondrosis were noted to have strengthening of LPO processes (Table 1). The quantity of AHP and TBA-products in their plasma surpassed the control values on 38.4% and 37.4%, respectively (control values – 1.77±0.23 D_{233}/1ml and 3.26±0.29 mkmol/l, respectively). It took place against the background of weakening of plasma antioxidant activity in them on 36.9% (in the control group – 32.6±0.49%).

Table 1. The dynamics of accountable characteristics of the examined persons with osteochondrosis against the background of medicinal prophylactic clothes' wearing by them

Parameters	Persons with osteochondrosis on the background of wearing medical preventive clothing, n=43, M±m			Control, n=34, M±m
	initial state	3 months	6 months	
Vas right leg, cm/s	1.29±0.032	1.39±0,025 p_1<0.05	1.58±0.019 p_1<0.01	1.57±0.027 p<0.01
Vam right leg, cm/s	0.14±0.017	0.18±0,019 p_1<0,05	0.25±0.012 p_1<0,01	0.26±0.010 p<0.01
Qas right leg, ml/min	0.74±0.028	0,65±0,026 p_1<0.05	0.52±0,020 p_1<0.01	0.51±0.022 p<0.01
Qam right leg, ml/min	0.13±0.002	0.18±0.005 p_1<0.01	0.25±0,007 p_1<0.01	0.24±0.008 p<0.01
Vas left leg, cm/s	1.25±0.010	1.37±0.019 p_1<0.05	1.57±0.25 p_1<0.01	1.58±0.030 p<0.01
Vam left leg, cm/s	0.15±0.007	0.18±0.006 p_1<0.01	0.26±0.010 p_1<0.01	0.26±0.009 p<0.01
Qas left leg, ml/min	0.72±0.027	0.60±0.028 p_1<0.05	0.51±0.024 p_1<0.01	0.52±0.021 p<0.01
Qam left leg, ml/min	0.14±0.012	0.18±0.014 p_1<0.01	0.25±0.011 p_1<0.01	0.25±0.010 p<0.01
Vas right hand, cm/s	1.10±0.030	1.10±0.028	1.10±0.032	1.10±0.033
Vam right hand, cm/s	0.09±0.010	0.09±0.007	0.09±0.008	0.09±0.005
Qas right hand, ml/min	0.76±0.039	0.77±0.045	0.76±0.036	0.77±0.042
Qam right hand, ml/min	0.08±0.004	0.08±0.007	0.08±0.005	0.08±0.006
Vas left hand, cm/s	1.04±0.030	1.05±0.033	1.04±0.035	1.05±0.028
Vam left hand, cm/s	0.11±0.007	0.11±0.006	0.11±0.005	0.10±0.003
Qas left hand, ml/min	0.67±0.026	0.68±0.029	0.67±0.025	0.68±0.031

Qam left hand, ml/min	0.08±0.004	0.07±0.005	0.08±0.003	0.07±0.005
acylhydroperoxides of plasma, D_{233}/l ml	2.45±0.048	2.05±0.052 p_1<0.05	1.80±0.029 p_1<0.01	1.77±0.023 p<0.01
thiobarbituric acid-products of plasma, mkmol/l	4.48±0.052	3.91±0.042 p_1<0.05	3.30±0.034 p_1<0.01	3.26±0.029 p<0.01
antioxidant activity of plasma, %	23.8±0.41	27.5±0.38 p_1<0.05	32.2±0.32 p_1<0.01	32.6±0.49 p<0.01
thromboxan B_2, pg / ml	220.3±0.67	187.3±0.54 p_1<0.05	169.2±0.45 p_1<0.01	168.7±0.75 p<0.01
6-keto-prostaglandin $F_{1\alpha}$, pg / ml	82.8±0.32	89.4±0.30	95.7±0.29 p_1<0.05	96.0±0.42 p<0.05
nitric oxide's metabolites, umol/l	29.2±0.24	32.5±0.35	36.0±0.28 p_1<0.05	36.1±0.29 p<0.05
cholesterol of erythrocytes, mkmol/10^{12} erythrocytes	1.06±0.008	1.01±0.009	0.95±0.010 p_1<0.05	0.95±0.012 p<0.05
common phospholipids of erythrocytes, mkmol/10^{12} erythrocytes	0.63±0.007	0.65±0.010	0.70±0.012 p_1<0.05	0.70±0.009 p<0.05
acylhydroperoxides of erythrocytes, D_{233}/10^{12} erythrocytes	4.16±0.009	3.72±0.016 p_1<0.05	3.18±0.012 p_1<0.01	3.20±0.015 p<0.01
malonic dialdehyde of erythrocytes, nmol/10^{12} erythrocytes	1.94±0.008	1.76±0.010 p_1<0.05	1.41±0.008 p_1<0.01	1.42±0.012 p<0.01
erythrocytes-discocytes, %	75.6±0.24	80.3±0.20 p_1<0.05	85.4±0.16 p_1<0.01	85.2±0.17 p<0.01
reversibly modified erythrocytes,%	15.2±0.12	13.4±0.11 p_1<0.05	11.1±0.07 p_1<0.01	11.2±0.09 p<0.01
irreversibly modified erythrocytes,%	9.2±0.08	6.3±0.10 p_1<0.01	3.5±0.07 p_1<0.01	3.6±0.06 p<0.01
sum of all the erythrocytes in an aggregate	43.6±0.11	38.0±0.14 p_1<0.05	32.9±0.10 p_1<0.01	32.8±0.12 p<0.01
quantity of aggregates	8.4±0.07	7.2±0.11 p_1<0.05	6.4±0.17 p_1<0.01	6.3±0.11 p<0.01
quantity of free erythrocytes	238.6±0.32	254.1±0.25	290.1±0.29	288.5±0.34 p<0.01

Conventional signs: p – signification of parameters' differences of persons with osteochondrosis and the control group; p_1 – signification of accountable indices' dynamics in persons with osteochondrosis in the course of correction in comparison with the initial state.

In blood of the examined persons with osteochondrosis we noted imbalance of arachidonic acid metabolites: the level of thromboxane B_2 in their plasma turned out to be higher in comparison with the control level on 30.6%, whereas the level of its functional antagonist's derivative – 6-keto-prostaglandin $F_{1\alpha}$ – lowered on 15.9% (Table 1). It was accompanied by content lowering of summary quantity of nitric oxide metabolites on 23.6% in comparison with the control values.

In erythrocytes' membranes of persons with osteochondrosis of the 2nd degree we noted level rise of CS till 1.06±0.008 mkmol/10^{12} erythrocytes and CPL lowering till 0.63±0.007 mkmol/10^{12} erythrocytes (in the control group CS – 0.95±0.012 mkmol/10^{12} erythrocytes and CPL – 0.70±0.009 mkmol/10^{12} erythrocytes). It was accompanied in them by LPO strengthening in erythrocytes (AHP till 4.16±0.09 D_{233}/10^{12} erythrocytes,

MDA till 1.94±0.08 nmol/10^{12} erythrocytes) in comparison with the level in the control group (AHP – 3.20±0.15 D_{233}/10^{12} erythrocytes, MDA – 1.42±0.12 nmol/10^{12} erythrocytes).

The examined persons with osteochondrosis were noted to have lowering of erythrocytes-discocytes' percentage in blood on 12.7% in comparison with the control level (Table 1). The quantity of reversibly and irreversibly changed erythrocytes' forms in blood of persons from the group of observation increased on 35.7% and in 2.5 times, respectively. At the same time, the examined persons with osteochondrosis were found to have strengthening of erythrocytes' aggregative properties. It was pointed by index increase of erythrocytes' summary involvement into aggregates on 32.9% and quantity rise of these aggregates on 33.3% at the decrease of freely lying erythrocytes on 20.9% in comparison with the control level.

Daily wearing of the author's MPC provided fast elimination of osteochondrosis clinical manifestations and smooth improvement of microcirculation indices in the lower extremities. By the end of observation the persons with lumbar osteochondrosis signs were registered to have Vas increase in the lower extremities from the right side – by 22.5%, from the left side – by 25.6%, Vam from the right side – by 78.6%, from the left side – by 73.3%, and Qam value from the right side – by 92.3%, from the left side – by 78.6%, at the fall of Qas value from the right side – by 42.3%, from the left side – by 41.1%. Reached dynamics of microcirculation parameters in the lower extremities was accompanied in the group of observation by preservation of its optimal indices in the upper extremities.

In the result of daily MPC wearing the observed persons with lumbar osteochondrosis were noted to have weakening of LPO processes in plasma. In 3 months of observation the quantity of AHP and TBA-products in their plasma decreased from 2.45±0.048 D_{233}/1ml and 4.48±0.052 mkmol/l (in the control group – 1.77±0.023 D_{233}/1 ml and 3.26±0.029 mkmol/l respectively) till 2.05±0.052 D_{233}/1 ml and 3.91±0.042 mkmol/l respectively. By 6 months of MPC application the content of AHP in blood of persons from the group of observation summarily fell by 36.1% at the decrease of TBA-active compounds in it by 35.7% and reached the control values. It turned out to be possible in the result of strengthening of plasma AOA by 35.3% till the level corresponding to the control one.

The plasma of persons with osteochondrosis who daily wore MPC, was noted to have gradual leveling of the existed imbalance of arachidonic acid metabolites. By 6 months of observation the level of thromboxane B_2 in their plasma lowered in comparison with the initial one by 30.2% and the derivative level of its functional antagonist – 6-keto-prostaglandin $F_{1\alpha}$ rose by 15.6% and reached the control values in both cases (Table 1). In 6 months of observation it was accompanied in the observed persons by content rise of nitric oxide summary metabolites in their plasma by 23.3%.

In the result of 3 months' MPC wearing the erythrocytes' membranes of persons with lumbar osteochondrosis were noted to have lowering of CS level till 1.01±0.009 mkmol/10^{12} erythrocytes and the increase of CPL till 0.65±0.010 mkmol/10^{12} erythrocytes. The continuation of MPC application led to additional positive dynamics in erythrocytes' lipid composition and provided summary CS fall for the whole period of observation by 11.6% and CPL rise by 11.1%.

Already in 3 months of daily MPC wearing, LPO (which was initially activated in erythrocytes of persons with osteochondrosis) significantly weakened (AHP fell by 11.8%, MDA – by 10.2%). In 6 months of constant MPC application the content of LPO products in their erythrocytes additionally fell (AHP till 3.18±0.012 D_{233}/10^{12} erythrocytes and MDA till 1.41±0.008 nmol/10^{12} erythrocytes respectively) reaching the control level.

Daily MPC wearing by persons from the group of observation was accompanied by the rise of discocytes' percentage in their blood (Table 1). So, in 3 months of their application the level of discoid erythrocytes in their blood was equal to 80.3±0.20% additionally rising by the 6^{th} month till 85.4±0.16%. The quantity of erythrocytes' reversibly and irreversibly modified forms in the group of observation gradually lowered in the result of MPC wearing and became equal in half a year of observation to 11.1±0.07% and 3.5±0.07% respectively.

In the result of daily 6 months' MPC application to persons with lumbar osteochondrosis there was reached the fall of erythrocytes' sum in aggregates by 32.5% and the quantity of these aggregates by 31.1% at

the rise of freely lying erythrocytes by 21.6% what allowed taking out the accountable indices to the control level.

DISCUSSION

Notwithstanding the serious successes of medical and biological sciences many aspects of pathology development and progression remain unclear. It is the cause of preserving low efficiency of the applied approaches to correction and prophylaxis of various disturbances in a human body [45].Working out of new effective variants of physiological optimum's lasting maintenance in a body and its rehabilitation is possible only in the course of continuation of active studying of human biology's different aspects with planned collection and systematization of information about human being's physiology [46,47]. It is equally right as respects to developing involutory changes in intervertebral disks of a man while aging. These changes form the basis of osteochondrosis. It was noted long ago that gradually progressing they gave more and more evident clinical manifestations, sometimes sharply worsening life quality [48]. Notwithstanding the efforts of medicine this state remains one of rather wide-spread among population of mature age in the whole world during the last decades. At the same time, osteochondrosis continues to cripple greatly to economics because of high frequency of working capacity slowdown against its background [6]. It's noted that osteochondrosis formation is accompanied by worsening of not only musculoskeletal system's state but also metabolism and processes of blood circulation. It worsens additionally the functions of spinal column. Given situation influences negatively the functioning of a man's internals [49] what points at the necessity of continuation of profound studying of its progression's mechanisms.

The conducted research of microcirculation indices allowed considering that at clinical exacerbation of lumbar osteochondrosis, its evident disturbances develop in lower extremities. The dysfunction of microcirculation in the given category of patients manifests itself by the fall of the following indices – Vas, Vam and Qam - against the background of Qas compensatory rise what points at the development of bloodstream bypassing type in persons with lumbar osteochondrosis. The leveling of indices' disturbances of bloodstream speed in the given category of patients in the course of the author's MPC applicationdemonstrates evident positive reaction of the microcirculatory course on the given variant of medicinal impact. Registered changes show the evident MPC impact on the vascular course what is confirmed by the fall of the peripheric resistance and the elasticity increase of microvessels' walls, the perfusion rise of soft tissues at the moment of systolic emission and the rise of blood inflow into tissues of patients worn MPC. The rise of speed indices on MPC application allows supposing that reached positive dynamics of microcirculatory course indices is realized in the group of observation according to the mechanisms of reflex activation [50]. Detected unidirectional dynamics of bloodstream speed in the right and the left lower extremities is, undoubtedly, the result of evident extra-vertebral reflex changes and, simultaneously, an important cause of lumboischalgia reduction.

In the result of the conducted research it became clear that daily MPC wearing could lead to the optimization of microcirculatory processes in persons with lumbar osteochondrosis on behalf of rheological properties' improvement of the most multiple population of regular blood elements – erythrocytes [51]. Special signification belongs to strengthening of the body's antioxidant protection leading to the lowering of LPO intensity in plasma and erythrocytes themselves. Quantity decrease of lipids' peroxidation products in plasma and erythrocytes provides state optimization of these cells' membranes from the outside and inside what improves their structure and functions. Great positive effect at MPC wearing belongs to gradual elimination of lipid imbalance in erythrocytes' membranes which is characteristic for osteochondrosis. It additionally promotes improving of structural and functional characteristics of these regular blood elements [52]. Optimum restoration of quantity and ratio of phospholipids and cholesterol in their membranes is very important for normalization development of selective permeability and viscosity of the membrane. Given phenomena positively influence the membrane-bound proteins preserving their normal secondary and tertiary structure. Given situation also promotes preservation of the membranes' optimal state of circulating erythrocytes' basic mass minimizing the content of erythrocytes' reversibly and irreversibly modified forms in blood and raising the quantity of their discoid forms to the control level.

Detected in the course of MPC application weakening of initially strengthened erythrocytes' aggregation at osteochondrosis can be estimated as the result of the combined MPC impact on the elements of its pathogenesis which negatively influence microrheological processes [53,54]. Reliable number decrease of reversibly modified erythrocytes and their irreversibly modified forms provides quantity decrease of

erythrocyte aggregates and the degree fall of new erythrocytes' involvement into them in blood of persons with lumbar osteochondrosis worn MPC. Detected evidence decrease of erythrocytes' aggregation in persons with lumbar osteochondrosis worn MPC, can be also mostly explained by weakening of catecholamines' impact on them. Their level in blood falls in case of successful pathology correction [55]. Given process is always accompanied by quantity decrease of α_2-receptors on erythrocytes. It leads to adenylatecyclase activation and, consequently, to level rise of cyclic adenosine monophosphate in them. Besides, reached decrease of erythrocytes' aggregation in persons with lumbar osteochondrosis against the background of MPC wearing can be also connected with gradual content decrease of Ca^{2+} in them [16].

The synthesis of biologically active substances which can influence erythrocytes' aggregation, in vascular wall of persons with osteochondrosis gets balanced in the result of constant MPC wearing. It was detected in the research that proaggregants' levels were optimized in blood of patients against the background of daily MPC wearing. It was connected with the decrease of thromboxane A_2 formation what was judged by the level fall of its inactive form – thromboxane B_2 – in blood. In the result of MPC wearing the persons with osteochondrosis were also noted to have the level rise of its physiological antagonist – prostacyclin what restored the balance of arachidonic acid metabolites in blood. Given changes were strengthened in those persons who wore MPC, by the rise of NO production in vascular walls. Probably, it took place in the result of synthesis activation of endothelial NO-synthase in conditions of LPO suppression in plasma [47]. Erythrocytes' microrheological disturbances which were minimized in these conditions, also could improve microcirculation processes and strengthen trophism including vascular walls. It additionally stimulated disaggregants' production in them.

So, it can be stated that in the course of 6 months' MPC application to persons with osteochondrosis some constructive peculiarities [56,57,58] can fully eliminate clinical manifestations of this pathology and reach the control level of microcirculatory indices. In this respect it can be considered that in the field of efficiency given medicinal approach is not inferior to the traditionally applied [59] and innovative [60] medicinal impacts which are applied at osteochondrosis. At the same time, taking into account availability, simplicity of application and absence of pharmacological or physiotherapeutic load on a body, MPC can be widely recommended to patients with osteochondrosis having various contraindications to traditional variants of treatment.

CONCLUSION

The development of lumbar osteochondrosis is rather often accompanied by worsening of microcirculation processes and erythrocytes' rheological properties what additionally aggravates trophic processes in it. In this respect special attention in the course of the search of new approaches to lumbar osteochondrosis correction should be devoted to the dynamics of these indices. In our research we conducted the estimation of the impact of daily 6 months' wearing of the author's variant of medicinal prophylactic clothes at lumbar osteochondrosis. Its application efficiently reduced symptomatology of osteochondrosis weakening the processes of lipids' peroxidation in plasma and erythrocytes. In the given category of patients it was accompanied by evident positive reaction of microcirculatory course what manifested itself by the decrease of peripheric resistance and elasticity increase of microvessels' walls leading to perfusion rise of soft tissues at the moment of systolic emission. The persons with osteochondrosis daily wearing medicinal prophylactic clothes, were noted to have some indices' improvement of cytoarchitecture and their erythrocytes' aggregation which were approaching the control level in 6 months of observation. Received results allow considering medicinal prophylactic clothes as a full-fledged component of mass prophylaxis of osteochondrosis progression and one of the means of the internals' health preservation in persons with the given disease. MPC application positively influencing the vascular wall and erythrocytes' rheological properties, activates microcirculation processes in the paravertebral zone and lower extremities, provides metabolism activation in them what promotes stable improvement of general state.

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