Proceedings

ALLERGY, ASTHMA, COPD, IMMUNOPHYSIOLOGY & IMMUNOREHABILITOLOGY: INNOVATIVE TECHNOLOGIES

Volume 10 - 2018

Editor
Professor REVAZ SEPIASHVILI

FILODIRITTO
International Proceedings

FiLOdiritto
dal 2008 editore

E-BOOK

ALLERGY, ASTHMA, COPD, IMMUNOPHYSIOLOGY & IMMUNOREHABILITOLOGY: INNOVATIVE TECHNOLOGIES

Volume 10 - 2018

Editor
Professor REVAZ SEPIASHVILI

FILODIRITTO
INTERNATIONAL PROCEEDINGS

FiLO diritto
dal 2008 editore

Log in to find out all the titles of our catalog
Follow Filodiritto Publisher on Facebook to learn about our new products

ISBN 978-88-85813-04-5

First Edition April 2018

filodirittoeditore.com
inFOROmatica srl, Via Castiglione, 81, 40124 Bologna (Italy)
inforomatica.it
tel. 051 9843125 - Fax 051 9843529 - commerciale@filodiritto.com

Printed by Rabbi S.r.l., Via del Chiù, 74, Bologna (Italy)

On the Antioxidant Status in Patients with Rheumatoid Arthritis

ALEKSANDROV Andrey V.[1,2], SHILOVA Ludmila N.[2], ALEKSANDROVA Nynel V.[1], CHERKACHINA Irina V.[3], MOZGOVAYA Elena E.[1], EMELIANOV Nikolay I.[2], ALEKSANDROV Vladislav A.[1,2], NIKITIN Mikhail V.[3]

[1] Federal State Budgetary Science Institution Research Institute for clinical and experimental rheumatology named after A.B. Zborovsky, Volgograd, (RUSSIA)
[2] Volgograd State Medical University Volgograd, (RUSSIA)
[3] Sanatorium-resort complexes "Vulan" – Scientific and clinical branch of the FSB Institution "National Medical Research Center for Rehabilitation and Balneology" of the Ministry of Health of the Russian Federation, Gelendzhik, (RUSSIA)
Email: imlab@mail.ru

Workcode C420C0030

Abstract

Methods of personalized physiotherapy take the main place in the non-pharmacological rehabilitation of patients with rheumatoid arthritis (RA).

The aim of the study was to study the effect of the rehabilitation program involving the method of personified physiotherapy on the immunological parameters of the antioxidant system (AOS) in RA patients. The study involved 63 patients with low RA activity (DAS28 <3.2): 45 patients – the main group and 18 people – the comparison group. A three-component complex based on kinesitherapy, hydrokinetic therapy, and low-frequency magnetotherapy was additionally included in the treatment regimen of RA patients of the main group. A significant number of RA patients (53.4%) prior to treatment started with significant inhibition of the overall antioxidant status, increased peroxides, increased levels of antibodies to xanthine oxidase, superoxide dismutase, catalase and glutathione peroxidase ($p<0.05$).

After the treatment in the main group, we observed positive changes in all the studied parameters ($p<0.05$), except antibodies to glutathione reductase ($p=0.084$) and ceruloplasmin ($p>0.1$). In the comparison group, only the decrease in the level of antibodies to ceruloplasmin ($p=0.035$) and the tendency to increase the total antioxidant status ($p=0.062$) were noted.

The inclusion of methods of personalized physiotherapy in rehabilitation

activities of RA patients can positively influence not only the degree of inflammation and the course of metabolic reactions, but also the majority of immunological indicators characterizing the state of AOS.

Keywords: Rehabilitation technology, rheumatoid arthritis, antioxidant status

Introduction

The problem of chronic diseases of the joints is becoming increasingly large due to the steady increase in the number of people suffering from them. In the last decade, issues of rehabilitation have assumed a mass character. Considering rehabilitation as a complex medical and social problem, the medical aspect should be placed on the foreground. Physiotherapy and balneotherapy belong to passive means of physical rehabilitation and occupy the main place in the non-pharmacological rehabilitation of patients with chronic joint diseases.

In our profound conviction, the methods of personalized physiotherapy should be an obligatory part of the rehabilitation process for all patients with a threat of a prolonged loss of functional capabilities. In this regard, the development of new multicomponent schemes using physiotherapy methods for the correction of immunological and biochemical changes should be given a specific attention and provided a worthy application at the stage of medical rehabilitation of RA patients.

With rheumatoid arthritis (RA), the inflammatory process is directly related to oxidative stress. Excessive production of oxygen radicals (ROS) and insufficient antioxidant protection lead to a dangerous imbalance in the body.

In the RA, there are significant violations in the control of ROS products and in various defense mechanisms against their harmful effects. Assessment of oxidative status/oxidative stress is very important in the laboratory diagnosis of RA, as well as in determining the effectiveness of the proposed treatment methods.

Object

Studying the influence of the rehabilitation program using the method of personified physiotherapy on the immunological parameters of the antioxidant system (AOS) in patients with rheumatoid arthritis.

Materials and methods

The study involved 63 patients with low RA activity (DAS28 <3.2): 56

women and 7 men aged 28 to 72 years; the median duration of the disease is 9.3 [3.6: 14.7] years; in 69,8% the erosive process in the joints was noted; 20.6% have signs of osteoporosis.

After randomization (the block randomization method was used) RA patients were divided into two groups: the main (n=45) and the comparison group (n=18). Formed groups of patients were comparable in age, sex, duration of anamnesis and severity of the disease and the factor of background pharmacological treatment. The duration of sanatorium-resort treatment was determined by regulatory enactments and was not more than 21 days. Cases of complete cancellation or premature termination of treatment (due to the development of side effects or for other reasons) were not recorded.

All patients with RA at this stage of medical rehabilitation climatotherapy and a standard set of physiotherapy procedures (lower limb massage, iodide-bromine baths and swimming in the pool) were prescribed. Along with this, patients from the main group additionally performed a three-component rehabilitation complex (kinesitherapy, hydrokinetic therapy and low-frequency magnetotherapy).

The methods included in the three-component rehabilitation program:

1. Kinesitherapy: morning hygienic gymnastics (daily exercises of general training nature for relaxation and coordination), dosed walking (daily, duration 30-60 minutes);
2. Hydrokinesitherapy: therapeutic swimming in the sea water pool (within 20-40 minutes, water temperature 26 ^{0}C, 16-18 procedures);
3. Method of low-frequency magnetotherapy (LFMT): the Multimag complex («Kasimov Instrument Plant», Ryazan, Russian Federation) was used with a constant, variable, pulsed magnetic field (from 0.3 to 100 Hz, up to 5 mT), the duration of the procedure was 10-20 minutes, 10 procedures.

Evaluation of the effectiveness of treatment was carried out twice: on primary admission and on the 30th day of observation. We have considered the dynamics of special laboratory studies characterizing the functioning of AOS; the quantitative determination of the total antioxidant status by the method of enzyme immunoassay (Immundiagnostik, Germany, Cat. No. KC5200); quantitative determination of peroxides by the method of enzyme immunoassay (Biomedica, Austria, Cat. No. 442-5007); quantitative determination of uric acid (UA) (Callegari, Italy, Cat. No. AD-12007); the level of antibodies to AOS enzymes: xanthine oxidase (anti-XO), superoxide dismutase (anti-SOD), glutathione peroxidase (anti-GP), glutathione reductase (anti-GR), catalase (anti-CAT) and ceruloplasmin (anti-CP) (ELISA-test).

The statistical analysis was carried out using "STATISTICA 6.0" software for Windows and recommendations of the guidelines on biostatistics [1].

The sample characteristics were displayed as mean (M) and standard deviation (SD) for normally distributed values, and also as a median and interquartile interval (Me [P25: P75]) for values with a distribution law different from normal. The statistical value of error threshold of the various tests was determined at 5%.

Results

A major number of RA patients (53.4%) had a significant inhibition of the overall antioxidant status, elevated levels of peroxides, anti-XO, anti-SOD, anti-CAT and anti-GP (<0.05), as well as a tendency to increase the UA content (p=0.063), anti-GR levels (p=0.08) and anti-CP (p=0.071) before the treatment (compared to healthy individuals) (Tab. 1).

Table 1. Baseline values immunological parameters in RA patients (before treatment), M ± SD

	N	AOS, umol/l	Peroxides, umol/l	UA, umol/l	anti-XO, U	anti-SOD, U	anti-GP, U	anti-GR, U	anti-CAT, U	anti-CP, U
Healthy individuals	30	267.4 ± 115.3	365.5 ± 214.8	0.24 ± 0.13	0.032 ± 0.013	0.060 ± 0.022	0.078 ± 0.053	0.097 ± 0.054	0.067 ± 0.039	0.094 ± 0.053
RA patients	63	204.9 ± 83.8	509.7 ± 297.2	0.30 ± 0.15	0.182 ± 0.069	0.169 ± 0.056	0.157 ± 0.062	0.125 ± 0.078	0.144 ± 0.057	0.121 ± 0.072

After the treatment, positive changes were observed in the main group in all the studied parameters (p<0.05), except for anti-GR (p=0.084) and anti-CP (p>0.1). In the comparison group there was only a decrease in the level of anti-CP (p=0.035) and a tendency to increase the total antioxidant status (p=0.062) (Fig. 1).

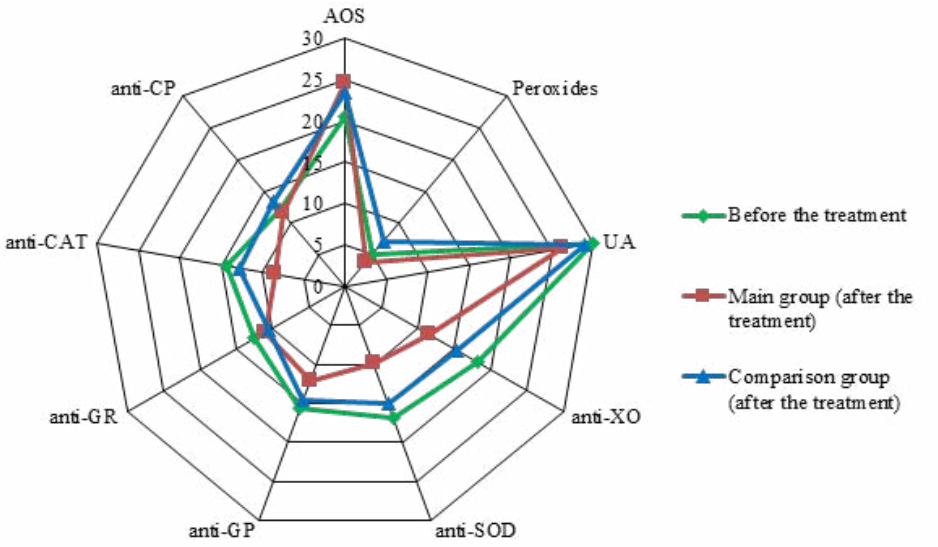

Fig. 1. Dynamics of AOS indices in RA patients in the main group and in the comparison group (after the treatment)

Discussion

Immune mechanisms occupy a leading place in the development of the RA.

Various physical factors should be regarded as effective immunomodulators if by immunomodulation we mean a directed action on individual links of the immune system with the aim of stimulating or suppressing their activity. First of all, we should consider magnetotherapy, which refers to the most sparing and easily tolerated methods, but at the same time, it gives notable anti-inflammatory and desensitizing effects [2, 3].

It is advisable to use a wide range of laboratory indicators [4] for timely diagnosis and control of the effectiveness of RA treatment, so we tried to use the maximum possible number of tests that can fully characterize the state of AOS in patients with RA. The problem of chronic diseases of the joints is becoming increasingly large due to the.

Positive dynamics of immunological parameters in the main group of RA patients is primarily due to the use of LFMT. It is known that LFMT has an expressed anti-inflammatory and trophicoregenerative action [5]. Activation of the entire body's adaptation system, restoration of functional reserves, normalization of metabolic processes, improvement of central and peripheral hemodynamics occur under the influence of electromagnetic low-frequency currents [6].

A positive aspect of the use of LFMT can also be associated with the purification of polarized membranes from fixed on their surface immune complexes that can deactivate membrane receptors and impede cellular metabolism. Elimination of these effects by available methods of physiotherapy can positively influence the course of metabolic reactions and the degree of expression of local inflammatory processes. Preformed physical factors, such as magnetotherapy, also allow to avoid the negative effects of pharmacological therapy, improve the clinical state of patients and in some cases to stabilize the course of the process and improve the function of the affected joints.

The therapeutic physical factors are inferior to the typical immunostimulants and immunosuppressors in their immunomodulating effect, but at the same time they have almost no side effects and complications and give the possibility of potentiating the action of other immunocorrectors or alleviating their side effects.

The tendency to normalization of initially pathologically altered indicators is clearly traced in the main group, and the multidirectional nature of the changes does not allow to make significant conclusions in the comparison group. So, summarizing the obtained results, we confidently mention the significant effect of our three-component rehabilitation complex on the immunological parameters characterizing the functioning of the organism's AOS.

Conclusion

The inclusion of methods of personalized physiotherapy in rehabilitation measures can positively influence not only the degree of inflammation and the course of metabolic reactions, but also has a positive effect on individual immunological indicators characterizing the state of AOS in RA patients. The study of the mechanisms of action of LFMT at cellular and subcellular levels is necessary to optimize and expand the practical possibilities of physical immunomodulation and personalized physiotherapy. The possibilities of influencing the immunological aspects of the pathological process and the clinical perfomance of RA increase in connection with the development of new methods of rehabilitation.

REFERENCES

1. Rebrova O.Ju. Statisticheskij analiz medicinskih dannyh. Primenenie prikladnyh programm STATISTICA / O.Ju. Rebrova // M.: Media Sfera, 2002. – 312 s.
2. Degtjarev V.K., Aleksandrov A.V., Nenasheva N.V., Cherkashina I.V., Nikitin M.V. Vlijanie obshhej magnitoterapii na psihologicheskij status bol'nyh osteoartrozom //

Voprosy kurortologii, fizioterapii i lechebnoj fizicheskoj kul‘tury. – 2013. – №3. – S. 27-30.

3. Cherkashina I.V., Nenasheva N.V., Volchok A.V., Aleksandrov A.V., Degtjarev V.K., Nikitin M.V., Zborovskaja I.A. Vlijanie hronomagnitoterapii na pokazateli kachestva zhizni pacientov s zabolevanijami oporno-dvigatel’nogo apparata // Voprosy kurortologii, fizioterapii i lechebnoj fizkul‘tury. – 2016. – №2. – S. 13-16. DOI: 10.17116/kurort2016213-16.
4. Wiik A.S., Gordon T.P., Kavanaugh A.F., Lahita R.G., Reeves W., vanVenrooij W.J., Wilson M.R., Fritzler M., and the IUIS/WHO/AF/CDC Committee for the Standardization of Autoantibodies in Rheumatic and Related diseases. Cutting edge diagnostics in rheumatology: the role of patients, clinicians, and laboratory scientists in optimizing the use of autoimmune serology // Arthritis Rheum. (Arthritis Care & Research) 2004; 51: 291-8.
5. Ulashhik V.S. Fizioterapija. Universal’naja medicinskaja jenciklopedija. – Minsk: Knizhnyj dom, 2008. – S. 359-362.
6. Kompleksnaja hronomagnitoterapija / S.G. Gurzhin [i dr.] // Biomedicinskaja radiojelektronika. 2009. № 7. S. 4-9.