

# GEORGIAN MEDICAL NEWS

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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии  
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# GEORGIAN MEDICAL NEWS

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**ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ  
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## EFFICIENCY OF BIOFEEDBACK THERAPY IN COMPLEX TREATMENT OF RHEUMATOID ARTHRITIS PATIENTS

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Rheumatoid arthritis (RA) is a serious chronic inflammatory disease of the joints with symptoms of persistent pains, deformation, destruction and dysfunction of the involved joints.

Though the prevalence of RA is not as elevated as compared to osteoarthritis, it is considered as one of the most serious rheumatic diseases due to steadily progressing course which leads to dysfunction, ankylosis and early disability of the joints which goes permanent, and eventually premature death of the patients.

High socio-economic importance of RA is associated with the fact that it mainly affects people of working age and huge amounts of money is spent on the treatment of the patients which ultimately leads to exceeded budget of other chronic diseases.

In regard to this, it is urged to develop actual scientific and practical rationale to be used in RA. Thereupon, substantiation application of innovative, safe and effective treatment and rehabilitation technologies aimed at improving the functionality and adaptive capabilities of patients [1,6,8,9,11,17,19].

Very promising in this regard is the use of biofeedback techniques with biofeedback therapy mainly aimed at active participation of the patient in the treatment and training to manage own physiological functions [2,4,10,12,23]. The method of biofeedback therapy is based on the principle of effectiveness of self-regulation of involuntary functions of organs and systems using external feedback. Thus, biofeedback therapy to the patient opens the possibility to realize the mechanisms of self-control and self-regulation, to obtain sustainable positive changes in the activities of the various physiological systems of the body [7,13-16,21].

The purpose of our work was to increase the efficiency of complex RA treatment by means of biofeedback therapy.

**Material and methods.** We observed 90 patients with diagnosis of authentic RA: 65 women (72,2%) and 25 men (27,8%) aging from 18 to 66 years. The minimal (1<sup>st</sup> degree) of RA activity is found in 19 (21,1 %), moderate (2<sup>nd</sup> degree) - in 58 (64,4%) and high (3<sup>rd</sup> degree) - in 13 (14,5%) patients. 1<sup>st</sup> stage of RA according to The Steinbrocker criteria was established in 25 (27,8%) patients, 2<sup>nd</sup> - in 21 (23,3%), 3<sup>rd</sup> - in 44 (48,9%) after X-ray examination of joints. The 1<sup>st</sup> functional class was revealed in 32 (35,6%) patients, 2<sup>nd</sup> - in 52 (57,7%) and only 6 (6,7%) patients had no dysfunction of joints. Slowly progressive course of RA was observed in 63 people (70%), rapidly

progressive - in 27 (30%). Systemic manifestations of the disease were detected in 20 patients (22.2%), and are most often observed in patients with moderate to high degrees of activity of the process.

Criteria included in the research were: verbal consent of the patient; age over 18 years old; corresponding to the diagnostic criteria of the American College of Rheumatology 1991 (ACR); RA 1<sup>st</sup> – 3<sup>rd</sup> radiological stage of RA by Steinbrocker.

Criteria excluded were: age of patients' at least 18 years or more than 70 years; 4<sup>th</sup> stage of RA by Steinbrocker; cardiac arrhythmia, the presence of a pacemaker, coagulopathy, and concomitant serious medical pathology.

According to the objectives, RA patients were divided randomly into two groups, according to gender, age and duration of disease: main (n=60) and control (n=30). RA patients of the main and control groups received similar medicament and physiotherapeutic treatment. Besides, patients of main group received in addition 12-14 daily sessions of biofeedback therapy using Reacor - rehabilitation psycho-physiological complex by «Medicom MTD» (Taganrog), certificated medical products (Registration certificate Ministry of Health of Russian Federation #97/17-106; Patents of the Russian Federation ##2076625, 2102004, 2079284). Training based on the parameters of brain electrical activity (relaxation on electroencephalogram), aimed at increasing alpha activity of the brain was used. Procedure was carried out after single session «Topics of alpha activity» in order to determine the areas of greatest intensity of alpha rhythms.

The psychological status of patients was estimated by means of «Level of subjective control» questionnaire [3]. We studied the level of subjective control (LSC) as an integral characteristic, predetermining the personal characteristics of the patient and having a significant impact on the selection of certain individual strategies of behavior [5]. If a person takes most of the responsibility for the events taking place in his life for themselves, explaining them by their conduct, character, ability, it shows the presence of his inner (internalizing) control. If he is inclined to attribute the responsibility for all the surrounding factors, finding the causes of other people in the environment, or in the fate of the case, it indicates the presence of his external (externalities) control.

Efficiency of treatment was estimated by means of OMERACT III unified criteria (Outcome Measures in Arthritis Clinical Trials). The main list of criteria included the following indices: general assessment of patient's con-

Table 1. Evaluating the effectiveness of treatment of RA patients with ACR criteria

Estimated Parameter	Main Group (n=60)	Control Group (n=30)	Reliability ( $\chi^2$ , p)
ACR 20	39 (65%)	13 (43,3%)	$\chi^2 = 4,12$ , p = 0,04
ACR 50	12 (20%)	5 (16,6%)	$\chi^2 = 0,09$ , p = 0,76
ACR 70	–	–	–

Table 2. Evaluation of treatment efficacy using the ACR criteria, depending on the degree of disease activity

Estimated Parameter	I Degree of activity (n =12)	II Degree of activity (n =39)	III Degree of activity (n =9)
	(absolute value and percentage)		
ACR 20	6 (50%)	28 (71,8%)	6 (66,6%)
ACR 50	6 (50%)	6 (15,3%)	–
ACR 70	–	–	–

dition; physical function; radiological research; expressiveness of pain in joints by VAS (visual analog scale); index of activity of illness - DAS28 (joint count, number of the swollen joints, erythrocytes sedimentation rate (ESR)); the general assessment of health by VAS); criteria of efficiency of anti-rheumatic therapy carried-out - ACR; and laboratory indices also (C-reactive protein (CRP) and circulating immune complexes (CIC)). According to recommendations of the European league against rheumatism (EULAR), DAS > 1,2 corresponds to good response to treatment, 0,6<DAS<1,2 - moderate response to treatment; DAS<0,6 - absence of effect. ACR 20, ACR 50, ACR 70 indicates respectively 20%, 50% and 70% of improvement. Statistical processing of the received results was carried out with STATISTICA 6.0 for Windows package and Biostatistics 4.03 for Windows.

**Results and their discussion.** Analysis of the dynamics of compulsory clinical-laboratory parameters effectiveness and their comparison in patients of the main and control groups was carried out. Score of treatment efficacy was assessed by DAS 28 criteria (Fig. 1) and ACR (Table 1).

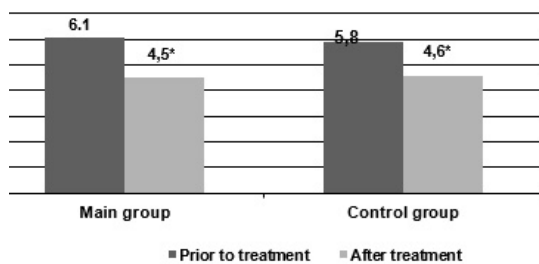


Fig. 1. Evaluating the effectiveness of the treatment of patients with rheumatoid arthritis using the criterion DAS 28

Evaluating the effectiveness of therapy by ACR 20 criteria in the main group was significantly higher than in control (p=0,04). At the same time, DAS 28 authentically changed in patients of both groups (at p<0,001), but these

changes corresponded to 1,6 points in the main group, and - 1,2 in the control that corresponds to moderate effect of anti-rheumatic therapy carried-out.

Efficiency of biofeedback therapy in complex treatment of RA patients in comparison with conventional treatment, depending on degree of activity and disease stage was analyzed. Efficiency of combined therapy by ACR criteria was higher in patients with 1<sup>st</sup> and 2<sup>nd</sup> degree of RA activity, however ACR 50 ( $\chi^2=4,09$  at p=0,043) meets at the 1<sup>st</sup> degree of RA (Table 2) significantly more often.

At the same time, a positive effect from carried-out therapy was observed in patients with the 1<sup>st</sup> degree of activity of RA, according to criterion of DAS 28 (Fig. 2) of which the changes corresponded to 1,6 points, these changes corresponded to 0,9 points (moderate effect), in group of patients with 2<sup>nd</sup> degree of RA activity, and - 0,2 points that corresponds to absence of effect in patients with the 3<sup>rd</sup> degree.

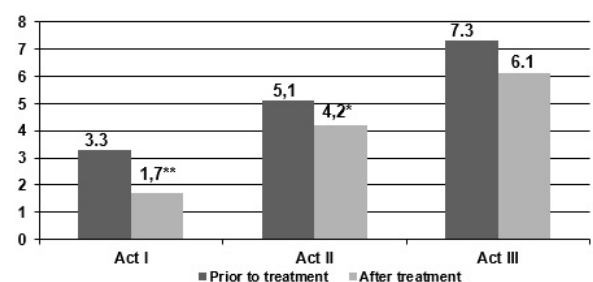


Fig. 2. Evaluating the effectiveness of the treatment of patients with rheumatoid arthritis using the criterion DAS 28 depending on the degree of disease activity

Note: \* - p < 0,01, \*\* - p < 0,001

The obtained data on set of estimated indicators testify that results of treatment were essentially better in the group of patients with RA I and the II degree of activity. In evaluating the effectiveness of biofeedback therapy depending on radiological stages of the disease following results were obtained (Table 3 and Fig. 3).

Table 3. Evaluating the effectiveness of treatment of RA patients with ACR criteria, depending on the stage of the disease

Estimated Parameter	I Stage (n=16)	II Stage (n=14)	III Stage (n =30)
	(absolute value and percentage)		
ACR 20	9 (56,25%)	9 (64,28%)	19 (63,3%)
ACR 50	7 (43,75%)	5 (35,72%)	–
ACR 70	–	–	–

On the basis of the data received it is possible to draw a conclusion that efficiency of the combined therapy by criteria of ACR is higher in patients with I and the II stage of RA. Patients with stage I RA, a change according to criterion DAS 28, scores corresponded to 1.5 at  $p < 0,001$ , the group of patients with stage II RA, these changes conform 1,1 scores ( $p < 0,05$ ), and with III - 0.5 ( $p < 0,05$ ). On sets of estimated indicators, results of treatment were essentially better in group of RA patients with I radiographic stage. While the use of biofeedback therapy in the treatment of patients with stage III RA has been relatively not been a success.

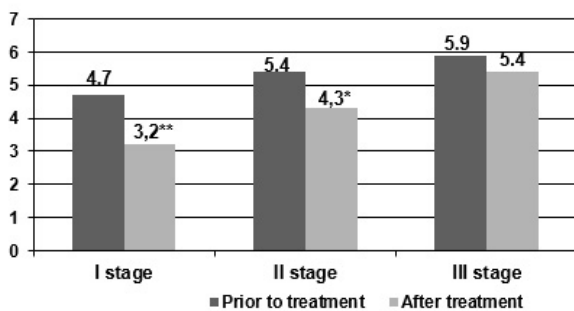


Fig. 3. Evaluating the effectiveness of treatment in patients with rheumatoid arthritis using the criterion DAS 28, depending on the stage of the disease  
Note: \* -  $p < 0,05$ , \*\* -  $p < 0,001$

Dynamics of indicators of level of subjective control in the main and control groups (Figs. 4,5) were besides studied.

In the main group of patients, after using method of biofeedback therapy, a significantly strong trend towards internality (performance improvement) on the scale of developments in the field and relationship to the disease was seen. In the group of patients treated only with conventional therapy, the results of the dynamics of the USK were not statistically significant.

Thus, complex treatment, including using the method of biofeedback therapy was more effective than the traditional treatment of RA patients. When using biofeedback therapy there was a decrease of intensity of pain eventually bringing to relief and a decrease in exudative phenomena in the joints, increased joint mobility, and improved overall well-being of patients. Apparently, the mechanism of therapeutic effect of biofeedback therapy should be found not only in changes related physiological systems. One of the possible mechanisms of therapeutic action is the effect of cognitive experiences biofeedback training in self-control, the re-orientation of external level of subjective control on internalising (which is confirmed by the results of the present study). With the help of biofeedback therapy, patients gained a sense of controllability of their illness, which before they were not able to do and hence adhere to stricter treatment regime, taking responsibility for their health.

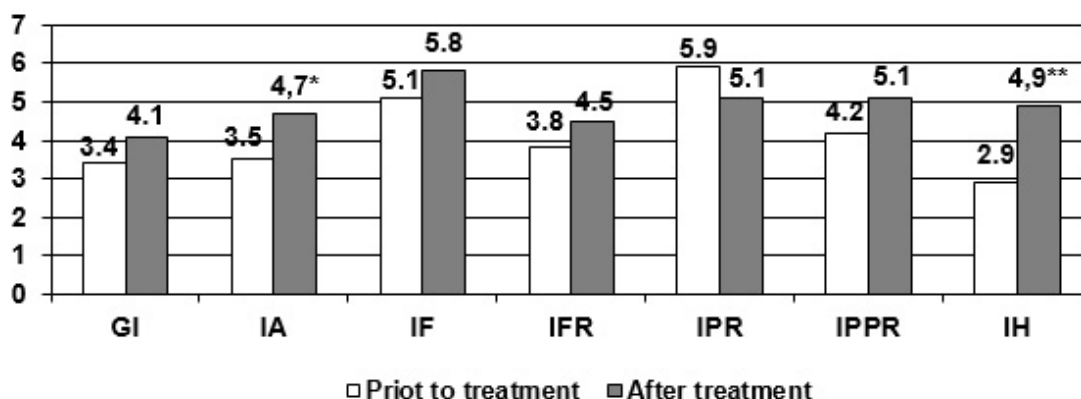


Fig. 4. Indicators of subjective control in patients with Rheumatoid arthritis, the main group before and after treatment  
Note: \* -  $p < 0,05$ , \*\* -  $p < 0,01$ . GI - the general internality; IA - internality in the field of achievements; IF - internality in the field of failures; IFR - internality in the family relations; IPR - internality in relations of production; IPPR - internality in the field of the interpersonal relations; IH - internality concerning health and an illness



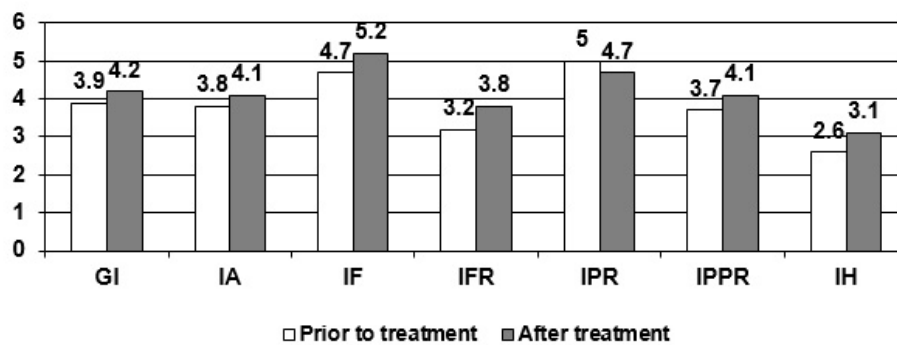


Fig. 5. Indicators of subjective control in patients with Rheumatoid arthritis of the control group before and after treatment

Note: GI - the general internality; IA - internality in the field of achievements; IF - internality in the field of failures; IFR - internality in the family relations; IPR - internality in relations of production; IPPR - internality in the field of the interpersonal relations; IH - internality concerning health and an illness

Perhaps these aspects of biofeedback therapy lead to improved results of the therapeutic process. We can say that in this case that not the degree of physiological change serves as a critical value, but the degree of belief in the patient to take control over the disease symptoms. Biofeedback training gives the patient the opportunity to receive positive reinforcement through feedback, informing them about the development of skills of self-regulation, the patient brings a sense of satisfaction associated with the completion of self-voluntary efforts, and the awareness of the possibility of improvement. Sense of hopelessness and helplessness is replaced by feeling of the prospect, a new possibility that promotes the reduction of pain syndrome and a decrease in depression and frustration [18,20,22].

It should be noted that the few cases of ineffectiveness of biofeedback therapy were observed only in patients with maximum activity and stage III of radiographic RA as the stage of progression of the rheumatoid process was accompanied by the development of irreversible organic lesions of joints and high impaired immunological activity requiring use of powerful immunosuppressive agents, hormonal and, methods of extracorporeal therapy.

**Conclusions.** Application of biofeedback therapy enhances the effectiveness of integrated treatment of RA patients by reducing pain and joint syndrome, promotes active and conscious participation of the subject in the course of therapy on the basis of self-regulation and self-control, and therefore mobilized will potential and increased self-esteem of patients. The method of biofeedback therapy is an affordable and safe treatment that can be recommended for widespread use in rheumatology practice.

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## SUMMARY

### EFFICIENCY OF BIOFEEDBACK THERAPY IN COMPLEX TREATMENT OF RHEUMATOID ARTHRITIS PATIENTS

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Biofeedback is the process of gaining greater awareness of many physiological functions primarily using instruments that provide information on the activity of those same systems, with a goal of being able to manipulate them at will. In this work, the analysis of efficiency of biofeedback therapy in treatment of patients suffering from rheumatoid arthritis (RA) is carried out. This analysis was fulfilled by studying the dynamics of clinical, laboratory and psychological (level of subjective control) indices and their comparison in patients of main and control groups before and after

the treatment. During the course of combined therapy alongside biofeedback therapy, an analgesic and anti-inflammatory effects, and improved functional capabilities were noticed in the patients. Thus, the additional use of biofeedback mechanism in complex treatment of RA patients promote increased efficiency of medical and rehabilitation process and improvement of level of self-control in the patients.

**Keywords:** biofeedback therapy, rheumatoid arthritis, level of subjective control.

## РЕЗЮМЕ

### ЭФФЕКТИВНОСТЬ БИОЛОГИЧЕСКОЙ ОБРАТНОЙ СВЯЗИ В КОМПЛЕКСНОМ ЛЕЧЕНИИ БОЛЬНЫХ РЕВМАТОИДНЫМ АРТРИТОМ

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Биологическая обратная связь заключается в процессе достижения пациентом большей осведомленности о многих физиологических функциях, прежде всего, с использованием инструментов, которые предоставляют ему информацию о деятельности этих систем, с целью получения возможности управлять ими по своему усмотрению. В исследовании проведен анализ эффективности терапии с использованием биологической обратной связи при лечении пациентов, страдающих ревматоидным артритом (РА). Анализ проведен путем изучения динамики клинических, лабораторных и психологических (уровень субъек-

тивного контроля) показателей и их сравнения у пациентов основной и контрольной групп до и после лечения. В ходе комплексной терапии с использованием метода биологической обратной связи у пациентов отмечались анальгетические и противовоспалительные эффекты и улучшение функциональных возможностей. Таким образом, дополнительное использование механизмов биологической обратной связи в комплексном лечении пациентов с ревматоидным артритом содействует повышению эффективности лечебного и реабилитационного процессов и повышению уровня самоконтроля у больных.

## რეზიუმე

ბიოლოგიური უკუკავშირის ეფექტურობა რევმატოიდული ართრიტით  
ავადმყოფების კომპლექსური მკურნალობის დროს

<sup>1</sup>რ. გრეხოვი, <sup>1,3</sup>გ. სულეიმანოვა, <sup>1</sup>მ. რამხელაშვილი

<sup>1</sup>ფედერალური სახელმწიფო საბიუჯეტო სამეცნიერო დაწესებულება “ა. ზობოროვსკის სახ.

კლინიკური და ექსპერიმენტული რევმატოლოგიის სამეცნიერო-კვლევითი ინსტიტუტი”;

<sup>2</sup>ფედერალური სახელმწიფო უმაღლესი განათლების საგანმანათლებლო დაწესებულება  
რუსეთის ჯანდაცვის სამინისტროს “ვოლგოგრადის სახელმწიფო სამედიცინო უნივერსიტეტი”;

<sup>3</sup>უმაღლესი განათლების ფედერალური სახელმწიფო ავტონომიური საგანმანათლებლო  
დაწესებულება “ვოლგოგრადის სახელმწიფო უნივერსიტეტი”, რუსეთი

ბიოლოგიური უკუკავშირის მდგომარეობს პაციენტის მიერ სხვადასხვა ფიზიოლოგიური ფუნქციების გაცნობიერებაში ხერხების გამოყენებით, რომლებიც იძლევიან ინფორმაციას ამ ფუნქციების მკურნალობის პროცესში სათანადო გამოყენების შესახებ ყველა ნიუანსის გათვალისწინებით.

კვლევის პროცესში ჩატარდა რევმატოიდული ართრიტით დაავადებული პაციენტების ბიოლოგიური უკუკავშირის გამოყენებით მკურნალობის ეფექტურობის ანალიზი. ანალიზი ჩატარდა კლინიკური, ლაბორატორიული და ფსიქოლოგიური (სუბიექტური კონტროლის დონე) მანევრებულების დინამიკის შესწავლის და მათი ორ ჯგუფს შორის (ძირითადი და სა-

კონტროლო) შედარების გზით მკურნალობამდე და მკურნალობის შემდეგ. კომპლექსური თერაპიის მსვლელობაში აღინიშნა ანალგეტიკური და ანთების საწინააღმდეგო ეფექტები ავადმყოფების ფუნქციური შესაძლებლობების გაუმჯობესებით.

ჩატარებული მკურნალობის შედეგებზე დაყრდნობით, სტატისტიკური ანგარიშების მიერ გამოტანილია დასკვნა, რომ რევმატოიდული ართრიტით დაავადებული პაციენტების კომპლექსური მკურნალობის დროს ბიოლოგიური უკუკავშირის მანევრების დამატებით გამოყენება უზრუნველყოფს სამკურნალო და სარეაბილიტაციო პროცესების გაუმჯობესებას და ავადმყოფების თვითკონტროლის დონის ამაღლებას.

## NEPHROPATHY IN EARLY RHEUMATOID ARTHRITIS PATIENTS: DOES A SIGNIFICANT RISK EXIST?

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Rheumatoid arthritis (RA) is autoimmune disease which is characterized by chronic inflammation and formation of irreversible organic changes in the joints.

The systemic inflammatory process in the body is maintained primarily by synovial tissue macrophages, which produce the tumor necrosis factor alpha (TNF- $\alpha$ ) with higher the detection of this marker as inflammatory activity grows. TNF- $\alpha$  mediates the production of the osteoprotegerin ligand (osteoclast differentiation factor), adhesion molecules, metalloproteinases, collagenases, chemokines and prostaglandins increase. Osteoprotegerin mediates the resorption of bone tissue in the affected joints [2,4,5,7,9,11].

RA is characterized by the defeat not only of the joints, but also of other organs and systems, particularly, skin, lungs, heart, blood vessels, kidneys, eyes, hematopoietic organs. Nephropathy is currently the leading symptomatic complex of RA, having a 36 to 73% occurrence frequency, being the third world widespread reason for kidney damage. Renal pathology is a prognostic criterion of disease severity, determining further prognosis and outcome of the disease. The development of renal insufficiency, as a rule, is the main cause of the fatal outcome of RA without possibility of regular hemodialysis to such patients. Complications of this situation are the low level of diagnosis of nephropathy in the patients with RA - only in every