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Wpływ lecznictwa uzdrowiskowego na funkcję ręki u kobiet z reumatoidalnym zapaleniem stawów

The effects of health resort treatment on hand function in female rheumatoid arthritis patients

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Streszczenie

Wstęp. Reumatoidalne zapalenie stawów (RZS), to ogólnoustrojowa, przewlekła choroba tkanki łącznej o podłożu immunologicznym. Typowe dla schorzenia zapalenia stawów, głównie rąk prowadzą do osłabienia chwytu i ubytków funkcji manipulacyjnej, co w wielu przypadkach utrudnia codzienne funkcjonowanie i powoduje zależność od otoczenia. Celem pracy była ocena efektów terapii uzdrowiskowej w aspekcie poprawy funkcji ręki u kobiet z RZS na tle grupy porównawczej pacjentek usprawnianych w warunkach ambulatoryjnych.

Materiał i metody. Dwukrotnym badaniem objęto 120 kobiet z RZS w wieku 35-45 lat, w tym 60 pacjentek usprawnianych w Szpitalu Uzdrowiskowym „Ziemowit" w Rymanowie-Zdroju i 60 pacjentek poddanych terapii w warunkach ambulatoryjnych w Zakładzie Medycyny Pracy NZOZ w Sanoku. Przeprowadzono badanie chwytu szczypcowego i chwytu klucza oraz test Grinda. Do analiz wykorzystano test Wilcoxona i nieparametryczny test niezależności Chi-kwadrat Pearsona.

Wyniki. Po zakończeniu terapii w obu grupach uległa zwiększeniu liczba kobiet, które były w stanie poprawnie wykonać chwyt szczypcowy i chwyt klucza a w teście Grinda nie odczuwały bólu w okolicy stawu nadgarstkowo-śródręcznego kciuka. Stwierdzono również statystycznie istotny, wskazujący na poprawę wzrost wartości punktowych (zgodnie z przyjętym systemem „0-1") odnoszących się do poszczególnych testów.

Wnioski. Kompleksowe postępowanie w leczeniu uzdrowiskowym i terapia w warunkach ambulatoryjnych w podobnym stopniu wpływają na poprawę parametrów funkcjonalnych ręki u pacjentek z RZS.

Słowa kluczowe:
choroby reumatyczne, ograniczenia funkcjonalne, rehabilitacja

Abstract

Introduction. Rheumatoid arthritis (RA) is a systemic, chronic, immune-mediated disease of connective tissue. The disease mostly affects the hand joints, leading to weaker hand grip and functional limitations, which in many cases hinders everyday functioning and makes the patients dependent on the assistance of others. The aim of this study was to evaluate the effects of health resort treatment on improving hand function in female RA patients in comparison with a group of female patients receiving ambulatory treatment.

Materials and methods. The study included a group of 120 women between 35 and 45 years of age suffering from RA, 60 of which were rehabilitated in the "Ziemowit" Health Resort in Rymanów-Zdrój. The other 60 female patients received ambulatory care in the Occupational Health Center in Sanok. Both pinch grip and key grip tests were performed as well as the Grind test. The analyses were conducted with the aid of the Wilcoxon test and the Pearson non-parametric chi-square test of independence.

Results. After the treatment was completed, the number of women who were capable of correctly performing the pinch and key grips and did not feel pain in the carpometacarpal joint of thumb in the Grind test increased in both groups. A statistically significant increase in the scores (in accordance with the adopted binary system) of the respective tests, which indicates an improvement in the outcome measures, was also observed.

Conclusions. The comprehensive health resort treatment and ambulatory care have similar effects on the improvement of hand function parameters in female RA patients.

Key words:
rheumatic diseases, functional limitations, rehabilitation

Introduction

Rheumatoid arthritis (RA) is a systemic, chronic, immune-mediated disease of connective tissue, which is characterized by non-specific, usually symmetrical joint inflammation, non-joint lesions and complications in other systems [1]. It is estimated that approximately 0.3-1.5% of the adult population, predominantly women, is afflicted by this disease, and it most often develops in people between 25 and 50 years of age. A significant role in the onset of the disease process is attributed to genetic inclinations and viral infections. The genetic predisposition of the Caucasian race towards RA was determined in relation to the occurrence of pentapeptide in the location of the HLA-DR beta-1 class II gene of histocompatibility genes. The so-called family aggregation of the disease is frequently observed as well [2, 3]. In the course of the disease, patients experience gradual affection of respective joints or rapid inflammation of multiple joints [4]. The early radiological examination reveals erosion in metacarpophalangeal joints and proximal interphalangeal joints in 15-30% of patients [5]. As the disease progresses, flexion contractures, often accompanied by hand subluxations, form in particular joints, including carpal joints and metacarpophalangeal joints. Other typical effects produced by RA include deformities such as swan neck, boutonniere finger, boutonniere thumb (also known as shoemaker's thumb) and duck-bill thumb [1, 6]. The inflammation of proximal and distal interphalangeal joints as well as the ankylosis of radiocarpal joints, also known as the ulnar deviation, frequently occur in RA patients. These lesions lead to decreased grip strength and functional limitations, which significantly hinder everyday functioning and, in many cases, make the patients dependent on the assistance of others. The disease also spreads to other parts of locomotor system. It produces flexion contractures in elbow and knee joints, flexion-adduction contractures in hip joints as well as knee and foot deformities. The cervical spine is affected by the erosion of the dens of the axis and the subluxation of C_1-C_2 vertebrae [6]. In most cases of RA, pain remains the dominant symptom, which may result from the on-going inflammatory process and the disturbed joint biomechanics [7]. In RA patients, a vicious circle can be observed: joint pain increases the muscle tone, which in turn draws the damaged joint surfaces closer, thus intensifying the pain. The basic objective of proper rehabilitation is to break the cycle in three separate points at the same time through pain alleviation, muscle relaxation and load reduction [1]. Early diagnosis and mapping of the course of the disease remain of great importance for establishing the proper treatment strategy, which should include pharmacotherapy, kinesiotherapy, physiotherapy and psychotherapy [8]. Health resort treatment remains highly significant for the comprehensive RA therapy, mostly due to the stimulation provided by the natural medicinal materials.

Aim

The aim of this study was to evaluate the effects of health resort treatment on improving hand function in female rheumatoid arthritis patients in comparison with a group of female patients receiving ambulatory treatment.

Materials and methods

The study included a group of 120 women between 35 and 45 years of age suffering from RA, 60 of which were rehabilitated in the "Ziemowit" Health Resort in Rymanów-Zdrój. The other 60 female patients received ambulatory care in the Occupational Health Center in Sanok. Patients were qualified for the study according to the following inclusion criteria: female, 35-45 years of age, stage II or stage III on Gofton's scale [9], suffering from RA for at least 2 years, no contraindications for undergoing any of the therapies included in the treatment program, informed consent for participation in the study.

Both in case of the patients from the health resort and the women from the ambulatory group, the rehabilitation program was planned for 14 days of treatment.

The rehabilitation program for the health resort group included the following therapies:

1. Balneotherapy: peat pulp partial baths, i.e. extremity baths (patients immersed their hands in suspended peat heated to the temperature of 40-45°C; the peat had been sourced from the natural deposits in Rymanów-Zdrój; bath duration: 20-30 minutes; frequency: every second day), peat iontophoresis for elbow joints (2-3 cm of peat paste heated to approx. 38°C and diluted in distilled water to medium density was applied on clean skin, followed by the base and the cathode; the anode closed the electrical circuit; therapy duration: 15 minutes; the procedures were performed alternating with extremity baths), carbonic acid baths (CO_2 content in the water amounted to 250-1000 mg/dm^3 of water; therapy duration: 20 minutes, frequency: every second day).
2. Kinesiotherapy: general rehabilitation exercises, active exercises for hand joints (each session lasted 15-30 minutes), slow-paced active-passive exercises, up to the threshold of pain (each sequence comprised of 10-15 repetitions and the exercised muscles were relaxed through massage during 2-minute breaks). The patients also exercised in a swimming pool, including: 15 minutes of group gymnastics (non-weight bearing active exercises of appropriately regulated intensity) and 15 minutes of "free time" spent on walking in water with slow movements resembling swimming strokes as well as air and water massage by the nozzles installed in the pool side walls.
3. Physiotherapy: magnetotherapy (applied to the peripheral joints of uppers limbs; frequency of the magnetic field amounted to 4-6 Hz and its intensity peaked at 7 mT; a single procedure lasted 10-20 minutes; the procedures were performed every second day, alternating with carbonic acid baths).

The rehabilitation program for the ambulatory group included the following therapies:

1. Kinesiotherapy: general rehabilitation exercises, active exercises for hand joints combined with massage (methodology and frequency of exercises were the same as in the health resort group) and non-weight bearing active exercises for upper limbs with the aid of a suspension set (each session lasted 30 minutes).
2. Physiotherapy: magnetotherapy (the procedures were performed every day; methodology was the same as in the health resort group).

The assessment of the grip ability and degenerative changes in the carpal-phalangeal joint of the thumb of the dominant hand

was performed twice: before (first assessment) and after rehabilitation (second assessment). The following tests were carried out:

• pinch grip test: the patient was asked to pick up a small object held between the fingertip of a thumb and an index finger;
• key grip test: the patient was asked to pick up a key with a thumb and the side of an index finger;
• Grind test: the examiner held the aching thumb and made slow movements, which were transferred along its long axis. Complaints about pain in the carpal-phalangeal joint of the thumb proved the presence of degenerative changes [10].

The results of the above-mentioned tests were analyzed using a binary rating system. In case of the pinch grip test and the key grip test, 0 marks the inability to perform the grip, whereas 1 denotes the patient's ability to do so. In the Grind test, 0 is synonymous with the occurrence of pain, while 1 means the patient did not experience any pain during the test.

Conformity of the results with normal distribution was verified using the Shapiro-Wilk test. The Wilcoxon test was used to evaluate the significance of the differences between the analyzed variables before and after treatment within the group. The analysis of the qualitative data was performed on the basis of the Pearson non-parametric chi-square test of independence ($\chi 2$). The differences were regarded as statistically significant if the test probability level was lower than the assumed level of significance $\alpha = 0.05$. Calculations were done with the aid of the Statistica 10.0 software by Stat Soft.

Results

Table 1 presents the results of the functional tests carried out before and after treatment. Before treatment, 29 health resort patients had been able to perform the pinch grip, while afterwards the number of women capable of successfully completing the test increased to 48. The average scores (in accordance with the adopted binary system) were 0.48 ± 0.50 prior to treatment and it increased to 0.80 ± 0.40 afterwards. The Wilcoxon test revealed statistically significant differences between the results obtained before and after treatment ($p < 0.001$). Within the group of ambulatory patients, a statistically significant improvement following the completion of treatment was also observed ($p = 0.002$).

Before treatment, only 30 patients from the health resort group had been able to pass the key grip test, while afterwards their number increased to 53. The average scores were 0.50 ± 0.50 prior to treatment and 0.88 ± 0.32 after treatment. The differences between the results obtained before and after treatment were statistically significant ($p < 0.001$). The statistically significant improvement was noted in the group of ambulatory patients as well ($p = 0.002$).

Before treatment, 28 health resort patients had reported no pain during the Grind test, while afterwards as many as 47 patients did not experience pain in the carpal-phalangeal joint of the thumb when making slow movements transferred along its long axis. The average of point values amounted to 0.47 ± 0.50 prior to treatment and 0.78 ± 0.42 after its completion. Statistically significant differences between the results obtained before and after treatment were revealed ($p < 0.001$). In the group of ambulatory patients, the improvement was also found as statistically significant ($p = 0.001$).

Table 1. Comparison of functional test results obtained before and after treatment within the examined groups of women

Test result	Score 0-1	Test I		Test II		Z	p
		n	$\bar{x} \pm s$	n	$\bar{x} \pm s$		
Health resort patients							
Pinch grip test							
Made the grip	1	29		48			
			0.48 ± 0.50		0.80 ± 0.40	3.47	< 0.001*
Did not do the grip	0	31		12			
Key grip test							
Made the grip	1	30		53			
			0.50 ± 0.50		0.88 ± 0.32	4.02	< 0.001*
Did not do the grip	0	30		7			
Grind test							
No pain	1	28		47			
			0.47 ± 0.50		0.78 ± 0.42	3.82	< 0.001*
Pain during test	0	32		13			
Ambulatory patients							
Pinch grip test							
Made the grip	1	38		50			
			0.63 ± 0.49		0.83 ± 0.38	3.06	0.002*
Did not do the grip	0	22		10			
Key grip test							
Made the grip	1	34		51			
			0.57 ± 0.50		0.85 ± 0.36	3.10	0.002*
Did not do the grip	0	26		9			
Grind test							
No pain	1	33		47			
			0.55 ± 0.50		0.78 ± 0.42	3.30	0.001*
Pain during test	0	27		13			

$\alpha = 0.05$

The data presented in Table 2 indicates that a number of women who had demonstrated the improvement in the capability to complete motor function tests of the hand and the alleviation of pain in the carpal-phalangeal joint of the thumb following the conclusion of treatment was not dependent on the employed program of rehabilitation.

Table 2. Functional state of the examined women after treatment depending on the rehabilitation program

Functional state	Health resort patients		Ambulatory patients		Chi-square test
	n	%	n	%	
Pinch grip test					
Improvement	21	35	12	20	
No change	37	62	48	80	$\chi^2(2) = 5.88$; $p = 0.053$
Deterioration	2	3	0	0	
Key grip test					
Improvement	24	40	20	33	
No change	35	58	37	62	$\chi^2(2) = 1.42$; $p = 0.492$
Deterioration	1	2	3	5	
Grind test					
Improvement	19	32	14	23	
No change	41	68	46	77	$\chi^2(2) = 1.04$; $p = 0.307$
Deterioration	0	0	0	0	

Discussion

Papers of authors who studied the functional limitations resulting from the constantly progressing degradation of the locomotor system and the gradual impairment of the function of joints affected by the disease process, both typical of rheumatoid arthritis, can be found in the literature. According to the study by Stawińska et al. [11], 44% of women suffering from RA claimed their everyday activity was limited and that they required assistance. One third of the examined patients were able to function on their own; however, their performance of certain activities resulted in increased pain.

Only 4% of the examined women declared they remained completely self-reliant and did not consider their everyday activity as limited in any way. Rojczyk-Chmarek et al. [12] employed the the Manipulandum device to evaluate the functional state of the elbow joint in RA patients during cyclical isokinetic exercises involving flexion and extension movements. The characteristics of movements made by the examined patients were abnormal. The differences were most notable in terms of the lower speed and amplitude of motion but they also related to their frequency and period. A significant asymmetry of flexion and extension phases was observed. In the opinion of the authors, the main reason for the disorders of mobility was the ankylosis of the elbow joint caused by the pain reaction and the increased resistance resulting from the pathological lesions accompanying the disease. Smith and Wallston [13] emphasized the fact that in RA patients who had been afflicted by the disease for more than 10 years, the degree of impairment was proportional to their initial degree of disability. One of the causes, which make the RA patients depend on the assistance of others, are the dysfunctions of the hand, which is the working end of the upper limb. According to Żuk and Księżopolska-Orłowska [14], the hand function includes the following elements: quality of grip, that is the ability to adjust the hand to the object being held; value of grip, that is the ability to transmit the external loads, conditioned by the efficiency of the muscle and ligament apparatus; and the manipulative ability. Nordenskiöld and Grimby [15] noticed strong correlation between the values of hand muscle strength, the intensification of joint pain and the capability of performing everyday activities. Tests carried out on a group of 20 female RA patients revealed that 65% of them had difficulties with performing everyday activities which require the deployment of great hand strength (opening jars) and manual dexterity (fastening buttons, tying shoelaces). The examined women also found it difficult to clean their apartments using a vacuum cleaner as this activity requires coordinated activity of multiple joints (hip, knee, elbow and arm joints). The authors suggest undertaking efforts to change the type of grip in RA patients in order to protect the joints and prevent their premature destruction.

A large number of publications suggest that treatment alleviate the pain experienced by the rheumatoid arthritis patients as well as the improvement of their joint function.

Przedborska et al. [16] considered the deep electromagnetic stimulation as an efficient therapy for RA patients. The application of a series comprised of 10 procedures helped alleviate pain, reduce the amount of administered analgesics and shorten the duration of the morning stiffness. Ostrowska and Szczuka [17] observed the improvement of mobility and the reduction of swelling in elbow and carpal joints in RA patients between 25 and 65 years of age who were rehabilitated in the Świeradów-Zdrój health resort. The authors also noticed a slight improvement in muscle strength, the reduction of subjective pain sensation and the improvement in general coordination, precision and strength of the hand grip. On this ground, they concluded that a 3-week stay in the health resort had enabled the improvement of the hand function, thus retarding the disease process. Codish et al. [18] analyzed the effects of applying Dead Sea mud compresses on the painful carpal, metacarpophalangeal and interphalangeal joints in patients suffering from RA. The patients who had been treated with the compresses that contained

more minerals showed a reduction in the number of sensitive joints as well as the decrease in pain intensity as evaluated using the VAS scale. In turn, Staalesen Strumse et al. [19] compared the effects of health resort treatment on the functional parameters of RA patients rehabilitated in the resorts located in different climates – in Norway and in the Mediterranean. Greater improvement of the range of joint motion and better results of the 6-minute walk and the Timed Up and Go test were observed within the group of patients who had been treated in the warm Mediterranean climate. Horváth et al. [20] examined patients of the specialist rheumatology clinic in Gunaras Health Spa in Hungary. Patients were divided into 3 groups. For 3 weeks, two groups were treated five times a week in thermal baths of different temperatures (36°C and 38°C). Additionally, their hands were subjected to 20-minute magnetotherapy sessions. Patients from the third group were subjected only to magnetotherapy. At the end of the study, the authors concluded that the combination treatment, comprised of thermal baths and magnetotherapy, had a considerably better effect on the improvement of the hand joint function than magnetotherapy alone. Kovács et al. [21], after examining the patients treated in the Musculoskeletal Rehabilitation Center in Mezőkövesd in Hungary, noticed considerably better results, including the improved hand function, the shorter duration of the morning stiffness and the alleviation of pain, in patients who had been subjected to hydrogen sulfide baths (sulfide ion-content amounting to 13,2 mg/l), whereas hot baths in tap water did not produce expected results. Santos et al. [22] analyzed the effects of treatment administered to the RA patients rehabilitated in Caldas de São Jorge Thermal Spa – Sta Maria da Feira and concluded that despite having been subjected to physiotherapy, the patients still suffered from acute pain, functional impairment, fatigue and, in some cases, even depression. Ponikowska [23] stressed that the differences in the response to the rehabilitation employed in the health resort treatment depend on the course of the disease, the period of the disease process, the current progress of pathological lesions in the organ of locomotion, the psychological integrity and commitment of the patient as well as the selection of therapeutic means. The therapeutic methods used in health resorts cause the development of adaptive and compensatory reactions in the organism. The gradual retuning of the organism for recuperation is possible when a systematic treatment, comprised of a series of therapies, is administered. Through the balneological stimuli, it is possible to achieve the improvement of a number of bodily functions at the same time.

In the author's own research, the effects of the rehabilitation program, which included therapies with the use of natural medicinal materials, the exercises of regulated intensity, massages and swimming pool gymnastics, were evaluated and compared with the results obtained in the group of patients who had received ambulatory treatment. It is worth emphasizing that striving to prevent further progression of the disease, thus preventing the impairment, bears a significant role in the course of treating RA patients. If appropriately planned, the treatment allows the development of functions that enable the adaptation of the hand grip to everyday activities and the overcoming of obstacles that had been created as the result of limited functional abilities. The author's own research proved that both the health resort rehabilitation and the ambulatory care allowed the improvement of hand function in female RA patients. To summarize, it must be emphasized that the rehabilitation of RA patients presents

a difficult challenge for the medical professionals, mainly due to the progressing disease process and the multifocal nature of the lesions. Considering the specificity of the health resort treatment, all in all, it seems to provide better conditions for developing in those patients the ability to consciously control the relaxation of their muscles, which is conducive to becoming self-dependent and facilitates the functioning within the society. This problem requires a separate line of study.

Conclusions

The comprehensive health resort treatment and ambulatory care have similar effects on the improvement of hand function in female RA patients.

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