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THE EFFECTS OF BALNEOTHERAPY IN ELDERLY PATIENTS WITH CHRONIC LOW BACK PAIN TREATED WITH PHYSICAL THERAPY: A PILOT STUDY

FİZİK TEDAVİ UYGULANAN KRONİK BEL AĞRILI YAŞLILARDA BALNEOTERAPİNİN TEDAVİYE ETKİSİ: PİLOT ÇALIŞMA

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ABSTRACT

Objective: The aim of this study was to compare whether balneotherapy has a positive effect on the treatment of elderly individuals receiving physical therapy for chronic low back pain (CLBP).

Methods: 244 participants were randomly placed into two groups. The first group was treated with physical therapy (PT), the second group was treated with PT and balneotherapy (BT). Assessments were made using the PainVAS, Quebec Back Pain Disability Scale (Quebec), Health Assessment Questionnaire (HAQ) before treatment (T0) and after treatment (T1).

Results: In both groups, there was a statistically significantly decrease in terms of pain-VAS, Quebec and HAQ scores ($p<0.001$). When pain-VAS scores were compared between the two groups, pain-VAS T0 was significantly higher and pain-VAS T1 was significantly lower in the BT+PT group than the PT group ($p=0.001$). When the HAQ and Quebec values were compared between the groups, the T0 value was similar in the BT+PT and PT groups (HAQ $p=0.068$, Quebec $p=0.495$) while the BT+PT group HAQ and QuebecT1 scoreswere significantly lower than the PT group ($p<0.001$). The BT+PT group change values were significantly higher than the PT group ($p<0.001$).

Conclusion: These results recommend that combining therapies may be more effective in treating CLBP and balneotherapy may increase the effectiveness of the treatment.

Keywords: Low back pain, balneotherapy, physical therapy, chronic pain, elderly

ÖZET

Amaç: Bu çalışmanın amacı, balneoterapinin kronik bel ağrısı nedeniyle fizik tedavi alan yaşlı bireylerde tedavi etkinliğine katkısını araştırmaktır.

Gereç ve Yöntem: Toplam 244 hasta iki gruba randomize edildi. Grup I'e fizik tedavi ve Grup II'ye fizik tedavi ve balneoterapi uygulandı. Tedavinin başlangıcında (T0) ve tedavinin sonunda (T1) Ağrı (VAS), Quebec Bel Ağrısı Engellilik Ölçeği (Quebec) ve Sağlık Değerlendirme Anketi (HAQ) kullanılarak değerlendirmeler yapıldı.

Bulgular: Tüm gruplar VAS-ağrı, Quebec ve HAQ skorlarındaki düşüş istatistiksel olarak anlamlıydı ($p<0,001$). VAS-ağrı gruplar arası kıyaslandığında VAS-ağrı T0, BT + PT grubunda PT grubunda anlamlı düşüklük saptandı ($p=0,001$). HAQ ve Quebec değerleri gruplar arasında karşılaştırıldığında, T0 değeri BT + PT ve PT grubu arasında benzerken (HAQ $p= 0,068$, Quebec $p=0,495$), T1 değerleri BT + PT grubunda PT grubundan anlamlı şekilde düşüktü ($p<0,001$). Gruplar karşılaştırıldığında BT + PT grubunda tüm puanların ortalama değişiklikleri (T1-T0) istatistiksel olarak daha anlamlı değişiklik gösterdi ($p<0,001$).

Sonuç: Çalışmanın sonuçları, kronik bel ağrısı olan yaşlı hastalarda kombine tedavi uygulamalarının daha etkili olabileceğini göstermektedir. Uygun koşullarda, tüm vücuda uygulanan balneoterapi tedavinin etkinliğini artırabilir.

Anahtar Kelimeler: Bel ağrısı, balneoterapi, fizik tedavi, kronik ağrı, yaşlı

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INTRODUCTION

Today, life expectancy has increased as a consequence of developments in medicine, effective health services, and improvements in social conditions. In parallel with this increase, the elderly population is rapidly increasing. 10% of the total population in the world are aged 65 or over, and this figure is expected to be over 16% in 2050 (1).

Musculoskeletal diseases are the most common causes of chronic pain and disability worldwide (2). Approximately 75-85% of people experience low back pain (LBP) at least once in their lifetime (3). Non-specific LBP is defined as LBP without any known pathology such as infections, tumors, fracture, structural deformity, inflammatory diseases, or disc herniation (4). While the vast majority of acute LBP sufferers recover within 4 to 6 weeks without treatment, 10-15% of cases escalate into chronic pain (4). Although there is no consensus in the diagnosis of chronic low back pain (CLBP), pain lasting longer than 3 months is generally accepted as chronic pain (2). Chronic pain is a frequent case that affects 20% of the people in the world and constitutes 15% to 20% of doctor visits (2). As a result, pain and pain related restriction in daily life activities, and psychological problems affect the quality of patients' lives (5).

There are many pharmacological and nonpharmacological treatment strategies in pain management. However, as a result of the increase in the number of chronic diseases that are associated with ageing, nonpharmacological treatment methods becomes more important in elderly individuals. In the treatment of LBP, there are treatment options such as pharmacological treatment, exercise, physical therapy (PT), spa therapy, and manual therapy. However, multidisciplinary approaches increase the efficacy of treatment. The aim of treatment is to decrease pain and disability and enhance physical activity. In PT, different PT modalities - for instance ultrasound (US) and transcutaneous electrical nerve stimulation (TENS) - are used together. The most commonly used treatment method in spa therapy is balneotherapy (BT). BT is a traditional method used in our country, which is rich in thermal springs, and is often used here for the treatment of chronic musculoskeletal diseases as well as in the countries of Japan, Israel, and throughout Europe (6).The aim of this study was to compare whether BT has positive effect on treatment of elderly individuals receiving PT due to CLBP.

METHODS

Study design

A prospective, controlled single-blind study was carried out in the Bolu Physical Medicine and Rehabilitation Hospital, following Usak University Ethics Committee approval (2018-005). In the study protocol, the principles of the Helsinki Declaration were followed. Participants signed consent forms before the study.

Participants

Between June 2018 and October 2018, 350 patients who had been suffering from LBP for more than 3 months and aged over 65 years took part in the PT program. All the participants underwent a detailed physical examination. Their diagnosis was confirmed by the laboratory and imaging methods required for those participants in need of further examination.

Participants who had suffered a radicular spread herniated disc, spondylolisthesis, spinal stenosis, psychiatric problems, inflammatory back pain, lumbar spine surgery,

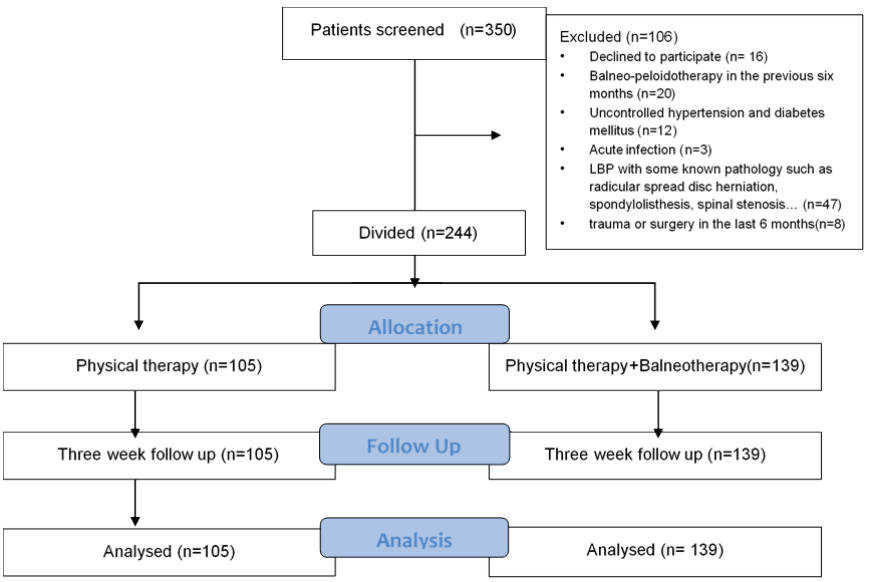

Figure 1: Flow diagram of the study population.

uncontrolled arterial hypertension and diabetes mellitus, malignancy treatment, infectious disease, severe trauma or surgery or received PT and BT within the last 6 months were excluded from the study. The study flow diagram is presented (Figure 1).

Allocation-Blinding

The 244 participants who met the study criteria were randomly divided into two groups. 105 individuals were included in the PT group. 139 individuals were included in the PT+BT group. Due to the nature of the treatment, since patient blinding was not possible, the outcome evaluation process was made blind. The evaluation of the patients and the statistical analysis of the results were carried out by the physician and biostatistics expert who were uninformed of the treatment of the participants and their treatment group.

Interventions

All participants were included in the study for a duration of three weeks (1 session every day, 5 days a week, 15 sessions in total). PT and BT were performed under the control of the physician.

A 45°C localized hot pack was used in each session for 20 minutes followed by TENS at a frequency of 80 Hz, for 6 minutes of continuous therapy, US (frequency: 1 megahertz, intensity: 1.5 watts/square centimeter), and a range of motion and stretching exercises lasting 15 minutes (hamstring, pelvic and abdominal muscles) were performed on the patients with the PT protocol.

In addition to this treatment, the patients in the BT+PT group received a mineral water bath in a 38-40°C therapy pool for 20 minutes.

Thermo-mineral water with a source output temperature of 42°C, calcium bicarbonate and sulfate, carbon dioxide, and a total of fluoridated mineralization content of 1744 milligrams per liter (over 1000 mg/L) was used (Table 1).

Instruments

The assessment was made before (T0) and at the end of the treatment (T1). Pain - Visual Analog Scale (VAS) and Quebec Back Pain Disability Scale (Quebec) and Health Assessment Questionnaire (HAQ) were used in assessment.

VAS is used to determine the pain intensity. The pain being evaluated is generally assessed by placing a mark on a 10 cm line having opposite descriptors at either end (7).

The Quebec scale was developed in 1995 and is composed of 20 questions indicating daily activity (8). In this scale, the patient is asked to mark the appropriate option for himself/herself in varying proportions ranged from 0 to 5. The total score lies between 0 and 100 points and a high score indicates a high disability. The Turkish version, validity and reliability study was conducted by Melikoğlu et al. (9).

Table 1: Water analysis

SOURCE NAME		Bolu, Karacasu			
		PHYSICAL PROPERTIES			
Temperature		42°C			
		PHYSICOCHEMICAL PROPERTIES			
Carbon dioxide CO_2		563.2 mg/L			
	ANIONS (mg/L)			**CATIONS (mg/L)**	
Flouride	F^-	1.99	Sodium	Na^+	45.98
Chloride	Cl^-	7.374	Potassium	K^+	14.467
Bromide	Br^-	0.129	Magnesium	Mg^{2+}	27.349
İodide	I^-	0.0147	Calcium	Ca^{2+}	358.77
Nitrite	NO_2^-	0.3432	Manganese	Mn^{2+}	0.242
Nitrate	NO_3^-	5.72	Iron	Fe^{2+}	0.13
Sulfate	SO_4^{2-}	390	**Total**		**446.93**
Bicarbonate	HCO_3^-	835.7		**INSOLUBLE SUBSTANCES**	
Phosphate	HPO_4^{2-}	0.28	Meta silicate acid	H_2SiO_3	**55.883**
Total		**1,241.55**			
Total mineralization			**1,744.367 mg/ L**		

Milligram/liter (mg/L)

There are 20 questions in the HAQ survey covering of eight areas: dressing, eating, straightening up, walking, hygiene, reaching, comprehension and daily work. The scoring ranges between 0 and 3 points. (0: Doing the activity without difficulty, 1: Doing the activity with a little difficulty, 2: Doing the activity with difficulty, 3: Not able to do the activity at all) (10).

All questionnaires were filled in by patients.

The effectiveness was described as the change in the result measurement score between T1 and T0.

Hypotheses of the research
H0: In elderly individuals with CLBP, BT does not contribute positively to PT.

H1: In elderly individuals with CLBP, BT makes a positive contribution to PT.

Statistical analysis
Statistical analysis was performed using the IBM SPSS 22 software program. Descriptive statistical methods were used to analyze the demographic data. The Shapiro-Wilk test was used to evaluate whether the data was normally distributed. The paired sample t test was used for intra-group comparisons. The independent sample t test was used for inter-group comparisons. $p<0.05$ was accepted as statistically significant.

RESULTS

In the group receiving PT during treatment and follow-up, flu-like infections developed in 2 patients and mild hypertension developed in 3 patients. In the BT+PT group, flu-like infections in 3 patients, dizziness due to hypotension after the first treatment application and mild hypertension in 5 patients were observed.

The groups were similiar in terms of age ($p>0.05$). In the PT group, 71.4% of the patients were female and 28.6% were male while 64.7% of the patients were female and 35.3% were male in BT+PT group ($p>0.05$). Body mass index (BMI) was comparable in the two groups (28.75±3.48 kg/m² vs 28.65±3.51 kg/m², respectively) (Table 2).

The VAS, Quebec and HAQ scores were evaluated before the treatment (T0) and after the treatment (T1) for both the PT and PT+BT groups. In the PT group, the VAS-pain T0 was 7.29±1.04 cm and the VAS-pain T1 was 4.10±1.11 cm ($p<0.001$). The VAS-pain scores had a statistically significantly decrease. In the BT+PT group, the VAS-pain T0 was 7.78±1.21 cm while the VAS-pain T1 was 2.24±1.19

Table 2: Characteristics of the study population

	PT (n=105)	BT+PT (n=139)	p
Age*	72.96±4.61	70.59±5.71	0.001
Gender			
Female	75 (%71.4)	90 (%64.7)	0.270
Male	30 (%28.6)	49 (%35.3)	
BMI (kg/m²)*	28.75±3.48	28.65±3.51	0.816

*Mean±SD, Physical therapy (PT), Balneotherapy (BT), Independent samples t test

Table 3: Comparison of the VAS-pain, Quebec Back Pain Disability Scale (Quebec) and Health Assessment Questionnaire (HAQ) values within the groups and between groups

		T0	T1	p**(T1-T0)
VAS-pain	**PT (n=105)**	7.29±1.04	4.10±1.11	<0.001
	BT+PT (n=139)	7.78±1.21	2.24±1.19	<0.001
	p*	0.001	<0.001	
Quebec	**PT (n=105)**	68.50±14.33	42.86±13.20	<0.001
	BT+PT (n=139)	69.83±15.55	21.84±10.17	<0.001
	p*	0.495	<0.001	
HAQ	**PT (n=105)**	1.73±0.51	1.07±0.44	<0.001
	BT+PT (n=139)	1.86±0.46	0.67±0.39	<0.001
	p*	0.068	<0.001	

*Mean±SD, T0: before treatment, T1: after treatment, Physical therapy (PT), Balneotherapy (BT)
Independent samples t test (between the groups), **Paired sample test (within the groups)

cm. There was a statistically significant improvement in VAS-pain after treatment in BT+PT group (p<0.001). When VAS-pain was compared between the two groups, VAS-pain T0 was significantly higher (p=0.001) and VAS-pain T1 (p<0.001) was significantly lower in the BT+PT group than the PT group (Table 3).

When the Quebec LBP scale was evaluated before and after the treatment; in the PT group, Quebec T0 was found to be 68.50±14.33, and Quebec T1 was found to be 42.86±13.20. The Quebec scores saw a statistically significant improvement after the treatment (p<0.001). In the BT+PT group, Quebec T0 was 69.83±15.55 and Quebec T1 was 21.84±10.17. In the BT+PT group, there was a statistically significant decrease in terms of Quebec after the treatment (p<0.001). When the Quebec values were compared between the groups, the Quebec T0 value was similar between the BT+PT and the PT group while Quebec T1 was significantly lower in the BT+PT group than the PT group (p=0.495 vs p<0.001, respectively) (Table 3).

When the groups were evaluated in terms of HAQ survey scores; there was a significant decrease in HAQ score after PT treatment (1.73±0.51 vs 1.07±0.44, p<0.001). In the BT+PT group, HAQ T0 decreased significantly from 1.86±0.46 to 0.67±0.39 (p<0.001). The HAQ score was not different when comparing the BT+PT and PT group before the treatment at baseline although HAQ score T1 was statistically significantly lower in the BT+PT group than the PT group (p=0.068 vs p=<0.001, respectively) (Table 3).

The mean alterations (T1-T0) of VAS-pain, Quebec and HAQ scores before and after treatment were also compared between the PT and BT PT groups. The mean alterations of all scores were significantly greater in the BT+PT group than the PT group (T1-T0 VAS-pain 3.19±1.25 in PT and -5.54±1.27 in BT+PT group, p<0.001), T1-T0 Quebec 25.65±9.70 in PT and -47.99±14.67 in BT+PT, p<0.001), T1-T0 HAQ -0.66±0.31 in PT and -1.18±0.36 in BT+PT, p=0.000) (Table 4).

Table 4: Comparison of VAS-pain, Quebec Back Pain Disability Scale (Quebec) and Health Assessment Questionnaire (HAQ) change values between groups

		T1-T0
VAS-pain	**PT (n=105)**	-3.19±1.25
	BT+PT (n=139)	-5.54±1.27
	p*	<0.001
Quebec	**PT (n=105)**	-25.65±9.70
	BT+PT (n=139)	-47.99±14.67
	p*	<0.001
HAQ	**PT (n=105)**	-0.66±0.31
	BT+PT (n=139)	-1.18±0.36
	p*	<0.001

*Mean±SD, T0: before treatment, T1: after treatment, Physical therapy (PT), Balneotherapy (BT)
Independent samples t test (between the groups)

DISCUSSION

In the present study, we observed positive effects on pain (VAS-pain), quality of life (HAQ) and disability (Quebec) in geriatric patients undergoing PT and BT+PT. However, we would like to point out that the most interesting result of the study is an impressive improvement of all scores in the PT group combined with the BT compared to PT alone.

Aging is an inevitable process. In geriatric patients, musculoskeletal diseases are important causes of morbidity. As age increases, the incidence of many musculoskeletal diseases also increases. Elderly people with chronic pain define their health as worse and use healthcare services more compared to those without pain (11). It is important to improve the quality of life and develop strategies related to healthy aging during the aging period. In the management of chronic diseases supported by Active And Healthy Ageing, complementary and nonpharmacological treatments are gaining importance (12).

PT is a commonly used treatment modality in the world yet the effectiveness of these methods still remains controversial. TENS is a PT modality which is used in pain situations to reduce pain by increasing the release of endogenous opiates and by stimulating the sensory nerves by administering a low frequency electrical current (13). Although its effectiveness is controversial, it is used to reduce the pain related to the musculoskeletal system and many painful conditions (chronic neck-low back pain, osteoarthritis, fibromyalgia, etc.) (14). Ultrasound (US) is also a commonly used method for PT. Its effect in the musculo skeletal diseases singly or in combination with other PT agents has been investigated in the literature. While there is conflicting data regarding its effectiveness and reliability, several studies have shown that it is effective in different musculoskeletal diseases (15-17). Exercise is another very important tool that has been used for a long time in chronic pain. Exercise reduces pain, strengthens weak muscles, reduces mechanical load in vertebral structures, improves form level, stabilizes hypermobile segments, corrects posture and improves movement (17). In the present study, the effects of the modalities; exercise, tens and ultrasound were not evaluated separately so that the significant improvement of all pain scores in PT group were considered related with a combination of these modalities in CLBP.

Spa treatments have been used in musculoskeletal diseases for centuries. It has been shown that BT is effective on many problems such as pain, physical dysfunction, and

suppression of daily life activity (18,19). In recent studies, it has been reported that BT is effective in the treatment of CLBP (20-26). In the elderly, research activities into the efficacy and reliability of BT have increased recently. The positive effects of BT on pain, physical function, general well-being, sleep quality, anxiety and depression in the elderly as well as their positive impact on cardiac protective efficacy have been reported (27-32). In this study, the efficacy of BT alone was not evaluated. The effectiveness of BT and PT combined has been examined and the positive effects of combined use on pain, physical function and quality of life have been shown. Also in this study, similar results were obtained from Onat et al. comparing physical therapy and balneotherapy with physical therapy (23). While the mechanism of action of BT is not exactly known, one explanation may be its application to the whole body including the lumbar region which is the body's center of gravity and is affected by almost all body movements. Furthermore, a reduction of nociception and muscle spasm in the whole body with thermal, mechanical and chemical methods, increases the flexibility of tisues and other adoptive mechanisms to which hot applications were applied to the whole body may explain the additional positive changes in the patients with CLBP.

Limitations

The lack of a control group and long-term follow-up results of patients are considered among the main limitations of our study.

CONCLUSION

Today, combined treatment practices can be more effective in elderly people with CLBP. In appropriate conditions, BT applied to the entire body may increase the effectiveness of the treatment.

Ethics Committee Approval: Ethics committee approval was received for this study from the Usak University Ethics Committee.

Informed Consent: Written consent was obtained from the participants.

Peer Review: Externally peer-reviewed.

Author Contributions: Conception/Design of Study K.Ö, E.D.; Data Acquisition- E.D.; Data Analysis/Interpretation- K.Ö.; Drafting Manuscript- K.Ö.; Critical Revision of Manuscript- E.D.; Final Approval and Accountability- K.Ö, E.D.; Technical or Material Support- K.Ö, E.D.; Supervision- K.Ö.

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