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The effect of combined therapy (spa and physical therapy) on pain in various chronic diseases

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Summary
Objective: Spa therapy is commonly used in the treatment of daily chronic diseases practice, but its benefits are still the subjects of discussion. This study investigates possible effects of a combined spa and physical therapy program on pain and hemodynamic responses in various chronic diseases.
Methods: The pain intensity and hemodynamic responses of 472 patients involved in a spa and physical therapy program were studied retrospectively. Assessment criteria were pain [Visual Analog Scale (VAS)] and hemodynamic responses (heart rate, blood pressure, respiratory rate). Assessments took place before, immediately after treatment, and after completion of the spa program (before discharge).
Results: The patients with ankle arthrosis, fibromyalgia and cervical disc herniation reported the highest VAS score before treatment program ($P < 0.05$). After the therapy program, VAS scores were seen to decrease compared to before treatment ($P < 0.05$). The patients with osteoarthritis of the hip (1.3 ± 1.2) and soft tissue rheumatism (1.3 ± 1.2) had the lowest VAS score before discharge compared to patients with other pathologies ($P < 0.05$). No statistically significant differences were detected between both sexes in terms of pain improvement ($P > 0.05$). On discharge, all hemodynamic responses decreased significantly compared to before and immediately after initiation of the therapy program ($P < 0.01$).
Conclusion: To decrease pain and high blood pressure without hemodynamic risk, a combined of spa and physical therapy program may help to decrease pain and improve hemodynamic response in patients with irreversible pathologies.

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Introduction

The use of spring water in therapy is as old as the history of medicine. Since Roman times, there has been a strong tradition of water cures. Traditionally, and especially empirically, the therapeutic value and the indications of thermal spring waters were linked to its composition and mineral concentration as well as to the temperature of the water. Thus, different spas are recommended for disorders of the gastrointestinal tract, of the respiratory system or for ear, nose, throat, skin, and gynecological or rheumatological disorders. All spas, however, seem to be recommended for rheumatological diseases and sequels of osteoarticular trauma, independent of whether the water is high sulfur, bicarbonate, sodium chloride, bicarbonate-chloride, or other mineral salt.[1,2]

The goals of a spa and physical therapy program in patients with different pathologies are to relieve pain, to improve functional capacity, to increase the awareness and knowledge of patients about their disease, to help the patients in learning the strategies needed to cope with the problems related to their chronic disease, and to improve health-related quality of life in general. As a rehabilitation and treatment method, spa therapy possibly meets all these goals when it is performed in a comprehensive manner based on a combination of physical therapy and a routine spa treatment program.[3,4]

Spa therapy is a very popular form of complementary therapy in many countries in Europe and the Middle East for various rheumatic disorders. Besides thermal water applications, spa therapy can be combined with a broad spectrum of physical therapeutic modalities including electrotherapy, massage, manipulation, underwater-exercise, ultrasonic therapy, special exercises, cold and hot applications, health education, stress reduction and relaxation.[1–8] The current work investigates the short and long-term effects of a combined program (spa and physical therapy) on pain and hemodynamic responses in patients with various chronic diseases.

Material and methods

Study sample

Data were collected retrospectively on the basis of patient records. Patients provided written informed consent for the use of their data for the purpose of this study. During the treatment period all patients stayed in TUTAV Thermal Resort in Kutahya province, Turkey. Patients with chronic rheumatological, neurological or cardiovascular diseases who had hemodynamic stability before treatment were eligible for inclusion. The following exclusion criteria were applied: exacerbation of the inflammatory process that required an injection of cortisone; central nervous system diseases, such as epilepsy; systemic inflammatory diseases, such as collagen diseases; advanced malignancies; general contraindications to immersion in water. Trained physiotherapists retrospectively assessed eligible patients. The spa and physical therapy program lasted in total 3 weeks and included journey, rest, balneotherapy (full body immersion bath), spring water, physical therapy (electrotherapeutic agents, massage, underwater-exercises) and medical attention in the spa resort.

Data collection

The patients' data were collected from archive files (between 2001 and 2004) of Dumlupinar University TUTAV Thermal Foundation Cure Center. Demographic and physical data, type of pathologies, habits, Pain Questionnaires Scale results [0—10 cm Visual Analog Scale (VAS)] including general, daily activities, night, and self care pain, NSAID and analgesic consumption and hemodynamic responses were recorded and selected as assessment criteria.

Visual Analog Scale

The VAS is commonly used to subjectively assess the intensity of pain. In the study, the VAS was used to define pain intensity of the patients' experiences over the past 3-week period (general pain, night and self care pain, pain during the activities). The participants were asked to make a mark on the 10-cm line so that the highest indicated their average experience over the past 3-week period.

The line was measured from the left to the right to provide a score from 0 to 10 cm, with a lower score representing less pain.[3–6]

Combination of the spa and physical therapy

When a cure is not possible, a combined treatment program (spa and physical therapy) is frequently used, sometimes for a long-term treatment. The majority of the patients with chronic diseases preferred the combined treatment. In addition, the program regulates the body systems and improves well-being. In that regime, trace amounts of minerals such as carbon dioxide, sulfur, calcium, magnesium, and lithium are absorbed by the body and provide healing effects on various body organs and

Table 1 Spa water mineral content.

		mg/l	Milival/l
Cations			
Sodium	Na	655.215	28.500
Potassium	K	54.749	1.400
Calcium	Ca	204.000	10.200
Magnesium	Mg	106.920	8.800
Iron	Fe	0.300	0.011
Anions			
Chloride	Cl	1.262.020	35.600
Ivhoride	I	0.030	0.001
Bromide	Br	0.550	0.006
Fluoride	F	0.250	
Sulfate	SO_4	275.000	5.729
Nitrate	NO_3	5.280	0.085
Hydrophosphate HPO_4		0.120	0.002
Bicarbonate	HCO_3	439.200	7.200
Total mineralization is 2976 mg/l			

circulation system. One of them, magnesium, has analgesic, sedative and antihypertensive benefits. These healing effects can stimulate the immune system, induce physical and mental relaxation, the production of endorphins, and normalise gland function.[1–6] Underground spring thermal water is used for treatment in TUTAV Thermal Resort has rich resources in terms of bicarbonate ion and contains sodium, calcium, magnesium, ferrum and sulfate. The temperature of the thermal water from the soil is 42 °C. The average temperature of the treatment pools is 30–35 °C and safe for use in neurological patients. The thermal water mineral content is given in Table 1.

The patients received spa therapy two times a day (with underwater-exercise in the spa pool), 20 min total duration for each day in the first week and 30 min for the following weeks. The treatment duration was determined individually according to type of disease. The physical therapy program was organized by a physical therapist according to the type of disease, and consisted of daily massage, electrotherapeutic agents, manual therapy, magnetotherapy and special therapeutic exercises.

Statistical analysis

SPSS for Windows (version 10.0) was used to analyze the data obtained from the patients' files. The scores after treatment (both immediately after treatment and shortly before discharge) were calculated and compared statistically by the paired *t*-test. Gender and pathology differences were analyzed using the independent group *t*-test. One-way ANOVA test was also used to look into the differences among patient groups. A $P < 0.05$ was deemed significant. Data were presented as S.D. ± mean values.[9]

Results

Four hundred and seventy-two patients were eligible. The study population had on average 13.5 ± 5.8 days (range 10–21) and 12.4 ± 4.2 h (range 7.6–18.6) of spa therapy. Demographic and other baseline data of subjects are given in Table 2. Arthritis was the most common problem. NSAID and analgesic consumption was quite high at baseline. The pain and other scores after treatment compared to baseline for various types of pathologies

Table 2 Demographic and clinical features.

Age (year)	53.4 ± 12.5 (21–81)
Weight (kg)	71.3 ± 9.9 (57–110)
Height (cm)	1661 ± 8.8 (148–188)
Sex, F/M (*N*, %)	274 (58.1)/198 (41.9)
NSAID consumption (tablet/week)	15 ± 2.5 (0–21)
Analgesic consumptions (tablet/week)	7 ± 2.5 (0–15)
Cardiac problems (*N*, %)	76 (16.1)
Lung problems (*N*, %)	42 (8.8)
Diabetes mellitus, (*N*, %)	107 (22.6)
Hypertension (*N*, %)	179 (37.9)
Drug using (*N*, %)	391 (82.8)
Alcohol habit (*N*, %)	44 (9.3)
Smoking habit (*N*, %)	89 (18.8)
Exercise habit (*N*, %)	71 (15.0)

Data are shown as mean ± S.D.

Table 3 Pain scores after therapy compared to baseline by type of pathology.

	VAS[a]		
	Before spa	Immediately after spa[*]	Before discharge[*]
Osteoarthritis, *N* (%)			
Cervical, 34 (7.2)	5.9 ± 3.6	4.2 ± 3.4	2.3 ± 1.5
Lumbar, 33 (7.0)	6.5±1.9	4.5 ± 3.0	2.8 ± 1.2
Coxarthrosis, 29 (6.1)	6.0 ± 2.5	3.4 ± 2.3[**]	1.3 ± 1.2[**]
Gonarthrosis, 117 (24.7)	6.3 ± 3.0	3.2 ± 2.4[**]	1.5 ± 1.4[**]
Ankle arthrosis, 9(1.9)	6.8 ± 3.8[**]	4.5 ± 2.4	1.8 ± 1.5
Condramalasia patella, 8 (1.6)	5.4 ± 4.2	4.3 ± 3.4	2.3 ± 1.5
Poliarthrosis, *N* (%)			
Coxa, knee, ankle, 49 (10.3)	6.6 ± 2.8[**]	4.2 ± 3.4	2.3 ± 1.5
Soft tissue rheumatism, *N* (%)			
Bursitis, fibrositis, tendinitis, impengement, 22 (4.6)	5.8 ± 3.4	3.2 ± 1.4[**]	1.3 ± 1.2[**]
Fibromyalgia, 7 (1.4)	6.9 ± 2.5[**]	4.6 ± 3.4	1.3 ± 1.8[**]
Disc herniation (%)			
Cervical, 29 (6.1)	6.6 ± 3.7[**]	4.2 ± 3.4	2.4 ± 1.5
Lumbar, 113 (23.9)	6.1± 2.3	4.5 ± 3.4	2.5 ± 1.8
Neurological disorders, *N* (%)			
Peripheral neural lesions, stroke and cerebral palsy, 23 (4.8)	4.9 ± 3.2	3.2 ± 2.4[**]	2.3 ± 1.5
Other disorders, *N* (%)			
Fracture complications, 14 (2.9)	5.1 ± 3.0	3.5 ± 2.2[**]	1.9 ± 1.5

[a] VAS: Visual Analog Scale (0—10 cm).
[*] $P < 0.05$, before and after therapy (paired *t*-test), data are shown as mean ± S.D.
[**] $P < 0.05$, comparing the pathologies in patients (independent sample *t*-test).

are given in Table 3. Pain scores immediately after and before discharge were significantly decreased in all patients. The highest pain decreases were observed in patients with hip and knee osteoarthritis, non-articular arthritis, neurological disorders and fracture complications ($P < 0.05$). No statistically significant gender differences were found between male and female patients in terms of the VAS scores during all stages of the treatment program ($P > 0.05$). Before discharge, VAS scores were found to be lower than that before treatment ($P < 0.01$). The various types of VAS scores after treatment compared to baseline, stratified by gender are given in Table 4.

Table 4 Pain scores after therapy compared to baseline[a] by gender.

	Before treatment	Second day of treatment program[b]	Before discharge[*]
Male (*N* = 198)			
VAS	6.5 ± 1.1 (4—10)	5.9 ± 1.3 (4—10)	2.4 ± 1.6 (0—5)
NP-VAS	5.3 ± 3.6 (3—8)	4.8 ± 2.8 (4—8)	2.2 ± 1.4 (0—5)
ADL-VAS	5.5 ± 2.7 (3—9)	4.9 ± 2.3 (4—9)	2.4 ± 2.3 (0—5)
SC-VAS	4.1 ± 2.5 (3—8)	4.0 ± 2.0 (2—8)	2.2 ± 1.5 (0—6)
Female (*N* = 274)			
VAS	6.4 ± 2.1 (4—8)	5.7 ± 1.4 (4—9)	2.6 ± 1.6 (0-5)
NP-VAS	5.4 ± 2.9 (3—8)	5.0 ± 2.8 (4—8)	2.7 ± 1.8 (0—5)
ADL-VAS	5.6 ± 2.8 (3—10)	5.1 ± 1.3 (4—9)	2.4 ± 1.9 (0—5)
SC-VAS	4.7 ± 2.3 (3—8)	3.7 ± 2.5 (2—8)	2.2 ± 2.0 (0—6)

VAS: Visual Analog Scale; NP: night pain; ADL: activities of daily living; SC: self care.
[a] No statistical significant differences between male and female groups ($P > 0.05$).
[b] VAS were tested before treatment. No statistical significant differences before second day of the treatment than before treatment in both groups ($P > 0.05$).
[*] $P < 0.01$, data are shown as mean ± S.D.

Table 5 Hemodynamic responses after therapy compared to baseline.

	Baseline[a]	Immediately after ST	Before discharge[a]
HR (per/min)	81.0 ± 12.7 (68–106)	102.8 ± 15.8* (80–132)	74.6 ± 13.6* (60–102)
SBP (mmHg)	136.6 ± 14.2 (105–160)	135.7 ± 14.3 (100–165)	125.3 ± 13.1* (100–140)
DBP (mmHg)	84.1 ± 12.9 (60–110)	78.4 ± 10.2* (55–90)	77.1 ± 11.2* (60–90)
RR (per/min)	23.1 ± 2.4 (18–28)	26.3 ± 2.7* (22–31)	22.2 ± 1.9 (16–24)

ST: Spa therapy; HR: heart rate; SBP: systolic blood pressure; DBP: diastolic blood pressure; RR: respiration rate.
[a] At rest time, no treatment.
* $P < 0.01$, data are shown mean ± S.D.

The hemodynamic parameters after treatment compared to baseline are given in Table 5. Heart and respiratory rates increased significantly ($P < 0.01$), while the both systolic and diastolic blood pressures decreased significantly by the time of discharge ($P < 0.01$). At discharge, all hemodynamic parameters except respiratory rates were seen in the process of decreasing compared to both the immediately after therapy and the baseline values ($P < 0.01$).

Discussion

The combined spa and physical therapy program was conducted with the aim to determine its effects on patient with chronic diseases. The program decreased pain and blood pressure without any complication in geriatric and neurological patients. Hearth rate, systolic and diastolic blood pressures were seen to be decreased before discharge compared to baseline values in all groups.

The pain scores and hemodynamic responses were assessed in 472 subjects, which is a considerable number of subjects. This study also showed that underwater-exercise program at warm temperature in a therapeutic pool plus physical therapy did not lead to a worsening of functional status of the neurological patients. In addition, the patients did not report any complaint related to heat sensitivity or fatigue.

The absence of a control group and the inability to compare the spa and physical therapy programs are two weak points of the study. The effectiveness of the program could have been demonstrated more clearly if we would have evaluated some blood laboratory results and neurological assessments such as muscle tone, balance ability so on.

The Cochrane Review studies[10,11] on the effects of spa therapy, screened 6 and 10 trials from 1966 to June 1999 and from 1966 to June 2002, respectively. Although most trials reported positive findings (the absolute improvement in measured outcomes ranged from 0 to 44%), the majority of the studies were assessed as methodologically flawed. Therefore, the reported ''positive findings'' should be interpreted with caution. Due to these methodological flaws, an answer about the efficacy of balneotherapy cannot be provided at this point.

In accordance with our study, there are many studies in the literature[6,8,12,13] that report positive effects of spa and physical therapy programs in patients with osteoarthritis. Whilst these studies only focused on specific joints, such as osteoarthritis of the knee and spine, we also dealt with osteoarthritis of the hip, cervical and lumbar spinal column. Our study demonstrates that the combined program decreased pain intensity in patients with osteoarthritis of the hip.

Some investigations[14,15] on patients with fibromyalgia syndrome (FMS) reported significant improvements in pain and fatigue. Almeida et al.[15] reported a 62.9% improvement in pain when using only physical therapy. In our study, we were able to achieve a better pain reduction (81.1%) using the combination of spa and physical therapy.

Experimental studies demonstrate significant gender differences concerning pain perception and responses. In one study, women reported lower pain threshold, pain tolerance, and analgesic response after experimental exposure to pain when compared with men.[16] On the other hand, women with acute pain reported greater pain and analgesic usage than men[17] as well as greater pain severity, frequency, duration and interference.[18] Jezova et al.[19] reported that changes in plasma ACTH concentration and cortisol levels were more pronounced in women compared with men during sauna exposure. Despite these four studies, we did not find any gender difference regarding pain intensity at every stage of the program. However, our results are in accordance with the results of many other studies. It can therefore be concluded that gender is not an important factor affecting the treatment results.

In neurological patients, heat sensitivity results in an increase of neurological symptoms.[20] In order to decrease muscle spasm and pain sensitivity and to increase joint movement and peripheral circulation, Norm and Hanson[21] recommended

that the water temperature should be between 92 and 94 °F. Despite this, there is no firm evidence on the effects of the water temperature. Some researchers[22] produced improvements in a range of motions, muscle force, walking speed and a decrease in pain after a 12-week exercise program in a 94 °F therapeutic in a group of 56 community-dwelling individuals aged 42—94 years. Gattenby[23] measured peak knee flexor and extensor torques of four individuals with multiple sclerosis who participated in hydrotherapy with the water temperature at 94 °F. He concluded that a hydrotherapy program has a potential to increase torque of the knee extensors and flexors, and an underwater-exercise program at warm temperature did not worsen the functional status of neurological patients. Also, the patients did not report any complaints related to heat sensitivity or fatigue.

Spa therapy for cardiac patients can increase the tolerance of physical load and of parasympathetic activity.[24—26] Obligatory lowering of corresponding systolic blood pressure can have a synergistic effect on cardiac hemodynamic responses. Some literature reports that the spa therapy program is beneficial for patients with cardiac problems.[24—28] Thermal mineral water with carbon dioxide decreases blood pressure and improves cardiac function.[8,24—28] In our study, we saw an improvement of cardiac function and a decrease in blood pressure even though the thermal water does not contain carbon dioxide. With the treatment program, heart and respiratory rates showed some increases in physiological limits, and there were decreases in diastolic blood pressure whilst the systolic blood pressure was unchanged. Thus, suggests that the combined therapy produces peripheral vasodilatation and improves blood circulation. On discharge, we observed prolonged effects on hemodynamic responses. This suggests that the combined treatment program may decrease high blood pressure in geriatric patients with a variety of pathologies. Many clinicians do not recommend spa therapy for cardiac and neurological patients; however, we observed that the combined spa and physical therapy program is safe and effective. Therefore, spa therapy could be considered for inclusion in rehabilitation program for cardiac and neurological patients. Future work should concentrate on the relative effectiveness of the spa therapy compared to physical therapy.

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