Effect of combined spa and physical therapy on pain in various chronic diseases

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ABSTRACT

Objective: The purpose of this study was to exhibit the effect of combined therapy (spa and physical therapy) on pain in various chronic diseases.

Methods: Retrospectively, 472 (58.1% female and 41.9% male) spa and physical therapy patients with a mean age of 53.4 ± 12.5 years were evaluated during 2001-2004 from the archives of Dumlupinar University TUTAV Thermal Cure Center. Before, after therapy and before discharging, visual analog scale (VAS) for pain, heart and respiratory rates, systolic and diastolic blood pressures were measured for hemodynamic evaluations.

Results: Arthrosis (230 patient, 48.7%) was found to be the main problem in our patients. Ankle arthrosis, fibromyalgia and cervical disc herniation were found with the highest VAS values compared to other pathologies before spa therapy ($p<0.05$). Immediately after spa therapy and before discharge, VAS values were lower than before treatment ($p<0.05$). Immediately after spa therapy, the highest decreases in VAS values were observed in coxarthrosis and gonarthrosis patients ($p<0.05$). Coxarthrosis and nonarticular patients had the lowest VAS values before discharge than other pathologies ($p<0.05$). No statistical differences were found between male and female VAS values in all stages of treatment ($p>0.05$). Heart and respiratory rate were statistically increased ($p<0.01$), diastolic blood pressure was decreased ($p<0.01$) but not changed in systolic blood pressure ($p>0.05$) immediately after spa therapy. Before discharging, all hemodynamic parameters were found statistically decreased before treatment and immediately after spa therapy ($p<0.01$).

Conclusion: A combination of spa and physical therapy decreases pain and improves functional capacity without any hemodynamic risk in rheumatological, neurological and cardiac patients.

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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 gynecological or rheumatological disorders. All spas; however, seem to be recommended for rheumatological diseases and sequelae of osteoarticular trauma, whether the water is sulfurous, bicarbonate, sodium chloride, bicarbonate-chloride, or other.[1,2] The goals of spa and physical therapy programs in patients with different pathologies are to relieve pain, to increase the level of functional independence, to increase the awareness and knowledge of patients about their

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disease, to help the patients in learning the strategies needed to cope with the problems related to this chronic disease, and as a result, to improve the quality of life of patients. As a rehabilitation and treatment method, spa therapy has the advantage to meet all those goals together when it is performed in a comprehensive manner. This comprehensive approach produces a combination of physical therapy like application 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 different kinds of rheumatic disorders. Besides thermal water applications, spa therapy can be combined with a broad spectrum of therapeutic modalities including electrotherapy, massage, manipulation, underwater traction, ultrasonic therapy, exercise, cold and hot applications, health education, stress reduction and relaxation.[1-6] In this study, this combination spa and physical treatment program short and long effects were evaluated retrospectively.

Methods. Four hundred seventy-two patients participated in the study and were evaluated retrospectively between 2001-2004. An informed consent form was completed for each patient. During the treatment period, all patients lived at the Kutahya TUTAV Thermal Resort in Turkey. Exacerbation of the inflammatory process and requiring an injection of cortisone led to exclusion from the study. Patients with central nervous system diseases such as epilepsy or with systemic inflammatory diseases such as collagen diseases and gout, patients with general contraindications to immersion in water and patients with advanced malignancies were also excluded. Patients with a chronic neurologic disease and who had hemodynamic stability before treatment were selected and included in the study. During their 3 weeks stay at the spa resort, patients received identical balneotherapeutic applications, such as massages, electrotherapies, and underwater-exercise. Characteristics of all subjects are illustrated in **Table 1**. Patient's data were collected from the 2001-2004 archive files of Dumlupinar University TUTAV Thermal Foundation Cure Center. Physical data, type of pathologies, habits, pain questionnaire scale results [0-10 cm visual analog scale (VAS)] including general, daily activities, night, and self care pain, nonsteroidal anti inflammatory drugs (NSAID) and analgesic consumption and hemodynamic results were calculated and selected for assessment.

A series of VAS was developed to assess several outcomes based on the participants' experiences over the past 3 weeks (general pain, night and self care pain, and pain during activities). Participants were asked to make a mark on the 10 cm line that best indicated their average experience over the past weeks. The line was then measured from the left end to provide a score from 0-10 cm, with a lower score representing less pain. The VAS are reliable and valid measures of pain, especially when self-comparing subjects over time. They have good test-retest reliability and have been shown to correlate with established methods of assessment of affective symptoms. The VAS scales are usually more effective in measuring change over brief periods such as one week or one month than they are over 6 months or a year.[3-6]

Thermal bathing increases hydrostatic pressure and body metabolism, including stimulating the secretions of the intestinal tract and the liver, aiding digestion on the body, thus increasing blood circulation and cell oxygenation. The increase in blood flow also helps dissolve and eliminates toxins from the body. Repeated hot springs bathing (especially over a 3-4 week period) can help normalize the functions of the endocrine glands as well as the functioning of the body's autonomic nervous system. Trace amounts of minerals such as carbon dioxide, sulfur, calcium, magnesium, and lithium are absorbed by the body and provide healing effects to various body organs and circulation system. Magnesium has analgesic, sedative and antihypertensive properties. These healing effects can include stimulation of the immune system, leading to enhanced immunity; physical and mental relaxation; the production of endorphins; and normalized gland function. The spa therapy that is used for treatment in the TUTAV Thermal Resort is rich in bicarbonate ion, and it contains sodium, calcium, magnesium, ferrum and sulphate. The temperature at which the water springs from the soil is 42°C. The average temperature of the treatment pools is 30-35°C, and safe for use by neurology patients. The spa water mineralization is shown in **Table 2**. Patients received spa therapy 2 times a day (with underwater-exercise in spa pool), of 20 minutes duration in the first week and 30 minutes following that. Treatment duration was selected according to the type of diseases. Thus, they had a total of 13.5 ± 5.8 days (10-21) and 12.4 ± 4.2 hours (7.6-18.6) of spa therapy. The physical therapy program was dependent on the type of diseases and included massage, electrotherapy, manual therapy, magnetotherapy and specific exercises.

The SPSS 10.0 statistical program for Windows was used for data analysis. Before and after spa therapy evaluation data were calculated by paired t-test. Gender and pathology differences were analyzed by independent t-test. A $p<0.05$ was deemed significant. Data were presented as SD ± mean.[7]

Results. There was a total of 472 patients, comprising 58.1% female and 41.9% male. Most of

Table 1 - Demographic and clinical features of patients (472).

Features	Value
Age, yr	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)
Exercises habit, (n, %)	71 (15)

Data is shown as mean ± SD
NSAID - non-steroidal anti-inflammatory drugs

Table 2 - Spa water minerals

Minerals	Mg/lt	Milival/lt
Cations		
Sodium	655.215	28.5
Potassium	54.749	1.4
Calcium	204	10.2
Magnesium	106.92	8.8
Iron	0.3	0.011
Anions		
Chloride	1,262.02	35.6
Ivhoride	0.03	0.001
Bromide	0.55	0.006
Fluoride	0.25	-
Sulfate	275	5.729
Nitrate	5.28	0.085
Hydrophosphate	0.12	0.002
Bicarbonate	439.2	7.2
Total mineralization	2976 mg/L	-

Table 3 - Pain results after therapy (472).

Disorder	n (%)	VAS		
		Before spa	Immediately after spa*	Before discharge*
Osteoarthritis				
Cervical	34 (7.2)	5.9±3.6	4.2±3.4	2.3±1.5
Lumbar	33 (7)	6.5±1.9	4.5±3	2.8±1.2
Coxarthrosis	29 (6.1)	6±2.5	3.4±2.3**	1.3±1.2**
Gonarthrosis	117 (24.7)	6.3±3	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
Chondromalacia patella	8 (1.6)	5.4±4.2	4.3±3.4	2.3±1.5
Polioarthrosis				
Coxa, knee, ankle	49 (10.3)	6.6±2.8**	4.2±3.4	2.3±1.5
Nonarticular arthritis				
Bursitis, fibrositis				
Tendinitis, impingement	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				
Peripheral neural lesions, stroke and cerebral palsy	23 (4.8)	4.9±3.2	3.2±2.4**	2.3±1.5
Other disorders				
Fracture complications	14 (2.9)	5.1±3	3.5±2.2**	1.9±1.5

VAS - visual analog scale (0-10 cm)
*$p<0.05$ before and after therapy (Paired t test) data is shown as ± SD
**$p<0.05$, comparing the pathologies in patients (independent sample t test)

the patients participating in this study had hypertension (37.9%) and diabetes mellitus (22.6%). The NSAID and analgesic consumption (15 and 7 tablets per week per patient) were observed to be higher before treatment. Arthrosis (230 patients, 48.7%) was found to be the main problem in our patients. Ankle arthrosis in osteoarthritis, fibromyalgia in nonarticular arthritis and cervical herniation in disk herniation had a higher VAS value than other pathologies before spa therapy ($p<0.05$). Immediately after spa therapy (the first session of treatment), and before discharge VAS values were lower than before treatment ($p<0.05$). Immediately after spa therapy the highest decreases in VAS values were observed in the coxarthrosis and gonarthrosis patients ($p<0.05$). In addition nonarticular arthritis, neurological and fracture complication patient's VAS values were found lower than other pathologies immediately after spa therapy ($p<0.05$). Coxarthrosis and nonarticular patients had the lowest VAS values before discharge than other pathologies ($p<0.05$). Before and after spa therapy VAS results are shown in **Table 3**. Although there was a decrease in VAS values in all pathologies immediately after spa therapy, the VAS values were increased almost to the before treatment values ($p>0.05$) in both male and females before the 2nd treatment session. No statistical differences were found between male and female VAS values in all stages of treatment ($p>0.05$). The VAS values before discharging in both the male and females groups were found lower than before treatment ($p<0.01$). Male and female pain VAS results are shown in **Table 4**. Heart and

Table 4 - Pain results in male and female groups after therapy (472).*

Gender	Before spa	2nd session of treatment**	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
*No statistical differences between male and female groups ($p>0.05$)
†$p<0.01$ data is shown as ± SD
**VAS tested before treatment. No statistical differences between 2nd treatment than before treatment in both groups ($p>0.05$)

Table 5 - Hemodynamic results of the patients after spa therapy (472).

Hemodynamics	Baseline**	Immediately after ST	Before discharge**
HR, per/min	81.0±12.7 (68-106)	102.8±15.8* (80-132)	74.6±13.6* (66-102)
SBP, mm Hg	136.6±14.2 (105-160)	135.7±14.3 (100-165)	125.3±13.1 (100-140)
DBP, mm Hg	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 (18-22)	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,
*$p<0.01$, data shown as SD ± mean
**Sedentary level not treatments

respiratory rate were statistically increased ($p<0.01$), diastolic blood pressure was decreased ($p<0.01$) but not changed in systolic blood pressure ($p>0.05$) immediately after spa therapy. Before discharging, all hemodynamic parameters except respiratory rate were found to be statistically lower than before treatment and immediately after spa therapy ($p<0.01$). Hemodynamic results were shown in **Table 5**.

Discussion. The goals of spa and physical therapy programs in patients with various diseases are to relieve pain, and to increase the level of functional independence.[8,9] Osteoarthritis is a frequent, heterogeneous illness. Treatment has so far aimed at improving clinical status in the absence of known etiology and without any demonstrated chondro-modulating drug. When surgery is not indicated, symptomatic drugs such as analgesic NSAIDs are commonly used, sometimes for long-term treatment. Adverse events are not rare; however, and are potentially severe, explaining why some patients try other treatments such as spa therapy in the hope of long-term clinical improvement with a reduced intake of symptomatic drugs.[10,11] Studies on the therapeutic value of spa therapy in rheumatoid polyarthritis, arthrosis and in chronic low back pain showed a great effectiveness of spa treatment compared with lack of treatment in a control group with both a short-term effect and residual effects 9 months after treatments.[12,13]

Fioravanti et al[14] treated 48 gonarthrosis patients for a period of 2 weeks with mineral water baths and 24 gonarthrosis patients treated with short-wave therapy for the same period. They reported that a significant improvement in the Lequesne's index (functional impairment) in the VAS and a significant decrease in analgesic consumption was achieved in both groups up to 15 days. The improvement remained to the end of the follow-up 3 month period only in the group treated with spa therapy. In addition, Wigler et al[6] studied patients with gonarthrosis, and for night pain the combination of mineral water baths and mud packs appeared to be superior treatments than mineral water baths and rinsed mineral-free mud packs and tap water baths and mineral-free mud packs. On a short-term basis, mud packs and exercise was found to be associated with a greater improvement in mood, whereas a greater frequency of massage therapy and carbon dioxide baths was associated with a smaller improvement in health satisfaction. On a long-term basis, exercise therapy and spinal traction was associated with a greater reduction in back pain. Hill et al[11] and Yilmaz et al[8] conducted their studies on a group of patients with osteoarthritis of weight bearing joints and reported that there was no significant improvement in SF-36. However, in other studies a comprehensive spa therapy program may increase the quality of life of patients with knee osteoarthritis.

In our study most patients had arthritis, especially degenerative arthritis. The most decrease in pain (78.3%) was found in the coxarthrosis patients. Combination spa and physical therapy programs are effective and decreased arthritis pain by 56.9-78.3% in osteoarthritis patients. Also, no more studies were found that evaluated the effect of spa therapy in different arthritic pathologies. Altan et al[15] studied the effects of pool-based exercise and balneotherapy in fibromyalgia syndrome (FMS) patients. Evaluation parameters included pain, morning stiffness, sleep, tender points, global evaluation by the patient and the physician, fibromyalgia impact questionnaire, chair test, and Beck depression inventory. They showed significant improvements in pain and fatigue according to VAS, 5-point scale, number of tender points, algometric and myalgic scores, and patient and physician global evaluation in FMS treatment. In our fibromyalgia patients, pain was decreased 81.1% with combination therapy. Physical therapy (electrotherapy, massage and exercises) was effective in reducing pain and ischemic phenomenon. It improves sustained muscle contraction by increasing the permeability of the cell membrane and improves intracellular energy consumption, increases angiogenesis in ischemic tissues, and promotes tissue repair. Almeida et al[16] studied fibromyalgia patients and noted a decreased pain of 62.9% (VAS from 7.0 to 2.6) with a physical therapy program. Thus, combination therapy programs are more effective in these patients.

In addition to the long practical experience, recent studies have tried to analyze the mechanisms of the effects of spa therapy scientifically. Karagülle et al[17] demonstrated that sulfurous bath therapy has anti-inflammatory effects on chronic experimental arthritis in rats. Ekmekcioglu et al[10] demonstrated that sulfur baths can reduce the antioxidative defense system (Glutathione-Peroxidase and Superoxide-Dismutase) in the blood and moderately improve the lipid status. They discussed that the decline of these enzyme-activities in their sulfur group may be caused by 2 reasons: either as a consequence of reduced oxidative stress during sulfur therapy leading to a lower expression of the enzymes or as an enhanced generation of superoxide radicals exhausting the superoxide scavenging enzyme. Strauss-Blasche[3] et al studied 153 patients with chronic back pain and applied the following treatments: mud packs, carbon dioxide baths, massages, exercise therapies, spinal traction, and electrotherapy. They concluded that, aside from the individual therapies, other factors relating to spa therapy as a whole must contribute to overall treatment outcome. In our study after 2 days of the treatment, night pain, general, self care and activity

was increased and after finishing the cure program was decreased. The highest decrease was found in night pain. Arthritic pain (especially osteoarthritis) did not stop at all. The medical staff of the spa resort strongly suggested to the patients that they decrease or even stop their symptomatic drug intake. Because of this decrease, the intake of the drugs pain could be increased in the 2 days after therapy. Symptomatic drug intake was not evaluated correctly before discharge, however, the patients declared a decreasing intake of these drugs. Before discharge pain had decreased, therefore, we can also argue that the decrease in symptomatic drug intake was related to improvement in the clinical status of the patients. However, chemical effects of the spa therapy and physical therapy increases cellular metabolism and stimulates the soft tissue. Thus, pain can be increased by these chemical effects at the beginning of therapy. Combination spa and physical therapy programs increase the range of motion and soft tissue elasticity. In addition, this program regulates body systems and the patient has a feeling of well-being. Because of all the positive factors, pain decreased after the cure program. Jezova et al[18] studied the dynamics of plasma adrenocorticotrophic hormone (ACTH) and cortisol levels studied during a 30 minute sauna exposure (90°C). This dynamic study showed a biphasic response of plasma cortisol which decreased during the initial phase of sauna bath (15 minute) and increased thereafter, reaching its maximum 15 minutes after the end of bathing. In the first sauna exposed group, the increase in body temperature was the same (approximately 2°C) in both sexes. The elevation in plasma ACTH concentration was more pronounced in women than in men. In the plasma collected at the end of sauna bath inside the sauna room, a significant rise in both adrenaline and noradrenalin levels was found. Sauna-induced prolactin release was also more pronounced in women compared with men. Thus hyperthermia induced by sauna exposure resulted in a more pronounced neuroendocrine activation in women compared with men. In this study we did not find any gender differences in pain before treatment, after treatment and before discharging. In addition, no more studies were found on spa therapy and gender differences. As our study included different type of pathologies, treatment results can be hidden and gender differences could not be seen.

In neurologic patients, heat sensitivity has been found to result in an increase of neurological symptoms.[19] Norm and Hanson[20] recommended that the water temperature of a therapeutic pool should be between 92°F (33°C) and 94°F (34.4°C) to promote muscular relaxation, decrease muscle spasm and pain sensitivity, and increase ease of joint movement and peripheral circulation, but there is no research to indicate whether the use of this temperature really is beneficial. Whitlatch and Adema[21] concluded that a 12-week exercise program conducted in a 94°F therapeutic pool produced improvements in range of motion, muscle force, and walking speed and a decrease in pain in a group of 56 community-dwelling individuals aged 42-94 years. Gattenby et al[22] measured peak knee flexor and extensor torques of 4 individuals with multiple sclerosis who participated in hydrotherapy with the water temperature at 94°F and concluded that a hydrotherapy program has the potential to increase torque of the knee extensors and flexors. In our study, aquatic therapy at a warm temperature in a pool with warm water did not result in a decrease in the neurologic patient's functional limitations or make impairments worse, and they did not experience heat sensitivity or fatigue. On the contrary, functional mobility, hemodynamics and patient satisfaction improved following aquatic exercises in warm water, in conjunction with a land-based program. In addition muscular relaxation, decrease muscle spasm and pain sensitivity, and increase ease of joint movement and peripheral circulation were shown in our neurological patients.

Spa therapy is referred to increase the vagal activity. Complex cardiac rehabilitation among these patients increases the tolerance of physical load and of parasympathetic activity.[23-25] Obligatory lowering of corresponding peak blood pressure showed an economization of cardiac hemodynamics. Thus, spa treatment among patients after myocardial infarction leads to significant improvement of hemodynamic reaction to load.[23-27] Ekmekcioglu et al[23] found that the carbon dioxide and mud baths as well as massages and physical therapy after 3 weeks, that the 24-hour blood pressure and day- and night-time blood pressure of patients with medium and high initial values decreased significantly. In addition, recent studies have shown that nonpharmacological peripheral vasodilatation with thermal therapy by means of warm-water baths and sauna has beneficial effects in chronic heart failure. With hydrotherapy, a significant improvement in 3 of 6 dimensions of quality of life (mood, physical capacity, enjoyment) and a significant reduction in heart-failure-related symptoms were found. Heart rates at rest and at 50-Watt workload were significantly reduced by hydrotherapy; blood pressure decreased non significantly at rest and during exercise.[9] Similarly, Zunnunov[24] examined clinical efficiency and safety of moderate hydrogen sulfide (HS) baths in the treatment of hypertensive patients living in arid zones. They showed that systolic and diastolic blood pressure after HS balneotherapy fell significantly both in daytime and at night. The 24-hour profile of blood pressure improved, and heart rate decreased by 4.3%.

According to the literature, and our study, combined spa and physical therapy programs in patients with different pathologies improves cardiac function and decreases blood pressure. In addition, with spa therapy heart and respiratory rate were increased in physiological limits as a normal acute response. On the other hand, diastolic blood pressure decreased and systolic blood pressure did not change. It is shown that spa therapy produces effective peripheral vasodilatation and improves circulation. Before discharging we can shown the chronic effects of the spa therapy on hemodynamics. Sedentary heart rate (9.2%), systolic (10.9%) and diastolic (9.1%) blood pressures were found to be decreased compared to before treatment values. With these results, spa therapy is an effective and safe non-pharmacological agent for decreasing high blood pressure in patients with different pathologies.

In our opinion, comprehensive therapies, such as combination of spa and physical therapy are appropriate and effective for patients with irreversible pathologies for decreasing the pain and improving functional capacity without hemodynamic risk. The spa therapy can also be applied to the neurologic patients in addition to the rehabilitation programs.

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