THE EFFECTS OF BALNEOTHERAPY ON DISEASE ACTIVITY, FUNCTIONAL STATUS, PULMONARY FUNCTION AND QUALITY OF LIFE IN PATIENTS WITH ANKYLOSING SPONDYLITIS

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Abstract

Objective: This study aimed to determine the effects of balneotherapy on disease activity, functional status, metrology index, pulmonary function and quality of life in patients with ankylosing spondylitis (AS).

Materials and Methods: The study included 28 patients (27 male and 1 female) diagnosed with AS according to modified New York criteria. The patients were treated with balneotherapy for 3 weeks (30 min/day, 5 days/week). The patients were evaluated using the global index, Bath ankylosing spondylitis disease activity index (BASDAI), disease functional index (BASFI), metrology index (BASMI), chest expansion measures, pulmonary function testing, and the medical outcomes study-short form-36 Health Survey (SF-36) (measure of quality of life) before balneotherapy and 1 month after treatment.

Results: Post balneotherapy BASDAI and global index decreased, BASMI parameters improved, chest expansion increased, and some SF-36 parameters improved; however, none of these changes were statistically significant ($P > 0.05$), except for the decrease in BASMI total score ($P < 0.05$). Before balneotherapy 6 patients had restrictive pulmonary disorder, according to pulmonary function test results. Pulmonary function test results in 3 (50%) patients were normalized following balneotherapy; however, as for the other index, balneotherapy did not significantly affect pulmonary function test results.

Conclusion: The AS patients' symptoms, clinical findings, pulmonary function test results, and quality of life showed a trend to improve following balneotherapy, although without reaching significant differences. Comprehensive randomized controlled spa intervention studies with longer follow--up periods may be helpful in further delineating the therapeutic efficacy of balneotherapy in AS patients.

Keywords: Balneotherapy; Disease Activity; Functional Status; Pulmonary Function; Quality of Life; Ankylosing Spondylitis.

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Introduction

Ankylosing spondylitis (AS) is a chronic rheumatic disease with a reported prevalence ranging from 0.15% to 1.1%[1-4]. It predominantly affects the spine and may lead to significant functional disability. The male/female ratio is approximately 1:3[5,6]. The first symptom to manifest is usually chronic back pain accompanied by stiffness; 75% of all AS patients present with back pain[7]. Its onset is slow and insidious; patients usually cannot report the exact time of the onset of symptoms nor where the pain is localized.

The characteristics of inflammatory back pain are prominent pain and stiffness in the morning, which increases during rest (gel phenomenon) and decreases with exercise. Pain decreases with warm water bathing, exercise, and physical activity[8-11]. Sometimes, restrictive ventilatory disorder may occur because of limited chest expansion associated with involvement of the costovertebral, costosternal, and sternocostal joints, as well as increased dorsal kyphosis and thoracic rigidity[12-14]. Costovertebral and costosternal joint involvement may cause chest pain, which could be confused with angina pectoris. Additionally, bone mineral densi-

ty can decrease[15].

Patient training and physical therapy are the primary non-pharmacological approaches in AS[11]. Non-steroid anti-inflammatory drugs (NSAIDs), disease modifying anti-rheumatic drugs (DMARDs), steroids, and biological agents are commonly used to treat AS. When indicated, intra-articular steroid injection and surgery may be used. Although symptoms may decrease in response to these treatments, there is no method known to prevent the disease. It was reported that physical therapy improves AS spine related symptoms and function[16-18].

Balneotherapy is a traditional physical therapy technique that has been used to treat rheumatic diseases since ancient times. Balneotherapy combines biological environmental effects, indigenous climate conditions of fountains and hot mineral water, gases, and mud from natural energy sources. While the physical characteristics of water are in the forefront of hydrotherapy, they constitute only one of the main components of balneotherapy, in which the chemical characteristics of water are also important[19].

We examined the effects of balneotherapy on disease activity, functional status, the global index, BASMI, pulmonary function test results, and quality of life in AS patients. We aimed to increase our knowledge of balneotherapy for the treatment of AS, which is a rarely subject of research.

Materials and Methods

The study included 28 patients (27 male and 1 female) diagnosed with AS according to modified New York criteria[20]. Inclusion criteria were also therapy with sulfalasalazine 2000 mg/d and indomethacin 75 mg/d for at least 6 months. Exclusion criteria were use of DMARDs (except sulfasalazine), biological agents, spa treatment during the previous 6 months, history of orthopedic surgery, chronic obstructive pulmonary disease, coronary artery disease, congestive heart failure, and hypertension.

The AS patients underwent spa treatment (37-°C therapeutic pool) for 3 weeks (30 min/d, 5 days/week), including underwater exercises. Patients performed 20 minutes ventilation and 20 minutes posture exercise after therapeutic pool.

The following measures were assessed before balneotherapy and 1 month after the treatment: the bath ankylosing spondylitis disease activity index (BASDAI)[21], the bath ankylosing spondylitis functional index (BASFI)[22], tragus wall distance, Schober's test, cervical rotation, lateral flexion, intermalleolar distance, chest expansion, pulmonary function testing (PFT), and the medical outcomes study-short form-36 health survey (SF-36). The SF-36 was used to measure the effects of the treatment on quality of life. SF-36 includes 8 subscales: general health perceptions, physical functioning, role limitations due to physical problems, bodily pain, social functioning, mental health, role limitations due to emotional role problems, and vitality. Scores range from 0 (the worst health condition) to 100 (the best health condition). The bath ankylosing spondylitis metrology index (BASMI)[23] was calculated based on tragus wall distance, Schober's test results, cervical rotation, spinal lateral flexion, and intermalleolar distance.

Vital capacity (VC), forced vital capacity (FVC %), forced expiratory volume during the first second (FEV_1 %), peak expiratory flow (PEF), and the FEV_1/FVC ratio were calculated based on the pulmonary function test (PFT). PFT was evaluated as follows, according to American Thorax Society criteria (ATS 1995):

- obstructive pattern: FEV_1/FVC < 75%
- restrictive pattern: FVC (%) < 80% and FEV_1/FVC in the normal range
- normal pattern: FVC (%) > 80% and FEV_1/FVC > 80%

SPSS v.13.0 was used for statistical analysis. The Wilcoxon test was used to compare pre- and post treatment data.

All the patients signed an informed consent and the study was approved by the local Institutional Review Board.

Results

Mean age of the patients was 24.39 ± 2.97 years (range: 20-33 years). Mean duration of disease was of 4.71 ± 1.86 years (range: 2-9 years). The BASDAI, BASFI, and global index scores before and after treatment are shown in the Figure 1. Mean BASDAI and global index scores decreased after treatment, but not significantly (P > 0.05).

Changes in tragus wall distance, Schober's test results, cervical rotation, spinal lateral flexion, intermalleolar distance, BASMI score, and chest expansion are shown in Table I. After treatment, tragus wall distance and intermalleolar distance de-

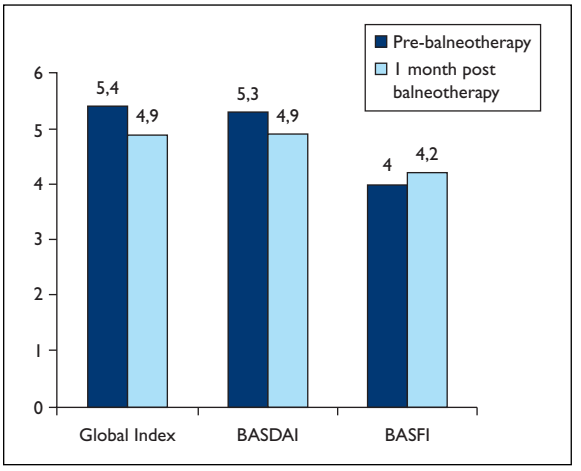

Figure 1. Pre- and post balneotherapy global index, BASDAI and BASFI scores.

BASDAI: Bath ankylosing spondylitis disease activity index; BASFI: Bath ankylosing spondylitis functional index.

creased, and Schober's test results, cervical rotation, chest expansion, and spinal lateral flexion increased, but not significantly (P > 0.05), except for the decrease in the BASMI score.

Restrictive ventilatory disorder was observed before treatment in 6 patients based on PFT. While 3 of the patients' PFT results were in the normal range after treatment, the other 3 patients' PFT results were unchanged after treatment. PFT scores are shown in Table II. The difference in PFT scores before and after treatment was not statistically significant as neither the difference in SF-36 scores before and after treatment. Changes in the SF-36 parameters are shown in Table III.

Discussion

It is known that physical therapy is the best option for maintaining the functional status of AS patients. Physical therapy increases mobility, strength, and exercise performance, protects and improves the physical posture, and prevents deformity[24,25]. Balneotherapy is a traditional physical therapy technique that has been used to treat rheumatic diseases since ancient times. Increased

Table I. Pre- and post balneotherapy evaluation results. Change is the BASMI total score was statistically significant, p<0.05 (*)

	Pre-balneotherapy (mean)	1 month post balneotherapy (mean)	P
Tragus wall distance (cm)	15.96	14.26	.242
Schober's test (cm)	2.66	2.92	.607
Cervical rotation (degree)	70.44	72.25	.449
Spinal lateral flexion (cm)	10.04	10.59	.807
Intermalleolar distance (cm)	105.44	106.78	.407
BASMI Total Score	3.23	2.29	.048*
Chest expansion (cm)	4.01	4.14	.556

Table II. Pre- and post balneotherapy evaluation results. Change is the BASMI total score was statistically significant, p<0.05 (*)

	Pre-balneotherapy (mean)	1 month post balneotherapy (mean)	P
Vital capacity (%)	92.56	91.31	.977
FVC (%)	91.78	90.31	.531
PEF (%)	94.86	94.63	.587
FEV1 (%)	94.73	92.05	.815
FEV1/FVC	103.47	100.88	.167

FVC: forced vital capacity; PEF: peak expiratory flow; FEV1: forced expiratory volume during the first second.

Table III. Pre- and post balneotherapy SF-36 parameters

Study Short-Form-36 Health Survey (SF-36) parameters	Pre-balneotherapy (mean)	1 month post balneotherapy (mean)	P
Physical functioning	48.33	46.48	.412
Role limitations due to physical problems	32.77	37.03	.358
Bodily pain	43.48	42.59	.575
General health perception	33.33	36.00	.434
Vitality	43.70	43.33	.796
Role limitations due to emotional problems	53.00	48.81	.614
Social functioning	57.85	57.55	.986
Mental health	49.59	51.92	.579

blood circulation in tissues is a physiological effect of exposure to heat during spa treatment. Exposing inflamed tissues to heat supports fresh blood due to increased blood circulation, and increases evacuation of nociceptive elements from tissues. Elimination of free oxygen radicals, which are primarily nociceptive elements and support of fresh blood, increase healing of tissues[26]. Nonetheless, it was reported that thermal stimulus decreases pain, in accordance with Melzak and Wall's gate-control theory[26]; however Davis et al. reported that thermal stimulus temporarily blocks cutaneous sensory nerve endings[27]. Thus, balneotherapy prevents anoxia and decreases muscle spasms via vasodilatation, and also relieves pain and increases tissue flexibility.

Data in the literature on the efficiency of balneotherapy in AS patients varies. Ek?io?lu et al. grouped patients according to exercise habits, and a history of balneotherapy and physical therapy, and reported there were no significant differences in BASFI, BASDAI, and ankylosing spondylitis quality of life questionnaire (ASQoL) scores between patients that exercised regularly, did not exercise regularly, and didn't exercise at all, between patients that regularly received balneotherapy, irregularly received balneotherapy, and never received balneotherapy, or between patients that regularly received physical therapy, irregularly received physical therapy, and never received physical therapy[28].

Altan et al. treated 30 patients with balneotherapy and exercise for 3 weeks, and treated another 30 patients with exercise only for 3 weeks. They recorded the BASDAI, BASFI, and Nottingham health profile (NHP) scores at 3 and 24 weeks. While significant decreases were observed at 3 weeks, there were significant changes at 24 weeks[18]. Yurtkuran et al. divided 61 AS patients into 3 groups. The first group was treated with balneotherapy and NSAIDs, the second group received only balneotherapy, and the third group received only NSAIDs. The first and second groups were treated with balneotherapy for 3 weeks. It was reported that there were both clinical and symptomatic developments in all 3 groups 6 months after therapy; the first and second groups had more developments than the third group[29].

In another study 120 AS patients were randomly allocated to 3 treatment groups, each containing 40 patients. One group received 3 weeks of balneotherapy at a spa in Austria, the second group received 3 weeks of balneotherapy at a spa in the Netherlands, and the third group, which served as a control group, remained at home and continued standard treatment during the same 3-week period the other 2 groups received balneotherapy. Following this 3-week intervention period all the patients continued with weekly group physical therapy for another 37 weeks. The main findings reported in this study were that significant improvement was observed in the 2 groups that underwent spa treatment, as compared to the control group, and that the improvement was maintained for at least 40 weeks. The same investigators, in another publication based on the same study population, concluded that combined spa and exercise therapy is more efficacious and cost-effective, and has a better cost-utility ratio than standard treatment alone[16]. A single-blind, randomized controlled study allocated 28 AS patients into 2 groups of 14 patients each. The first group (the combined treatment group) received balneotherapy (mud packs and sulfur pool) and exposure to the unique climatic conditions of the Dead Sea. The second group (the climatotherapy group) used a fresh water pool and ex-

perienced the same climatic conditions. The duration of treatment was 2 weeks and the follow-up period was 3 months. Significant improvement was observed in both groups based on the following outcome measures: BASDAI, visual analog scale (VAS) for pain, and VAS for spinal movement. Quality of life, assessed by the SF-36 questionnaire, was very low prior to the study, but improved in terms of pain amelioration in the combined treatment group. The researchers concluded that the variability in the results was due to the effect of time (within group effect) rather than the type of treatment (between group effect)[17].

We observed decreases in BASDAI and BASMI scores, the global index, tragus wall distance, and intermalleolar distance, and increases in Schober's test results, cervical rotation, and spinal lateral flexion; however, there were increases and decreases in some SF-36 parameters. However only the changes in BASMI scores were statistically significant.

Pulmonary effects of rheumatic diseases are variable. Restrictive ventilatory disorder may occur because of limited chest expansion due to involvement of the costovertebral, costosternal, and sternocostal joints, and increased dorsal kyphosis and thoracic rigidity. Different incidence rates were reported for restrictive ventilatory disorder in AS patients. Dinçer et al.[30] reported that 12 of 36 (33.3%), Turetschek et al.[31] reported that 12 of 21 (57%), and Tüzün et al.[32] reported that 9 of 35 (25.9%) AS patients had restrictive ventilatory disorder. In the present study 6 of the 28 AS patients (21.42%) had restrictive ventilatory disorder. Tüzün et al. reported that disease duration is directly proportional with the risk ofrestrictive ventilatory disorder. Mean age of the patients in the present study was 24.39 years, which is lower than that in previous studies. This could explain why the prevalence of restrictive type ventilatory disordere in the present study was lower than that in previous studies. Additionally, the observed improvement in pulmonary function test results after balneotherapy in 3 (50%) of our patients that had restrictive type ventilatory disorder before treatment suggests that the therapy positively affected ventilatory function.

The present study's limitations include the lack of a control group, small study population, and follow-up at only 1 month post therapy, and as such, the long-term effects of balneotherapy were not determined. Nevertheless, we think the results obtained in the present study could add some knowledge in the field.

In conclusion, AS patients' symptoms, clinical findings, pulmonary function test results, and quality of life improved following balneotherapy. Additional randomized controlled spa intervention studies with longer follow-up periods may be helpful in further delineating the therapeutic efficacy of balneotherapy in AS patients.

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