

Spa Therapy for Ankylosing Spondylitis at the Dead Sea

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Abstract

Background: The efficacy of spa therapy in ankylosing spondylitis has not been investigated extensively.

Objective: To study the efficacy of balneotherapy and climatic therapy (climatotherapy) at the Dead Sea area in patients with ankylosing spondylitis.

Methods: In a single-blind randomized controlled study, 28 patients suffering from ankylosing spondylitis were allocated into two 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 the fresh water pool and experienced the same climatic conditions. The duration of treatment was 2 weeks and the follow-up period 3 months.

Results: For both patient groups a significant improvement was found in the outcome measures: Bath AS Disease Activity Index ($P = 0.002$), Visual Analog Scale for pain ($P = 0.002$) and VAS for spinal movement ($P = 0.011$). The variability was explained by the effect of time (within group effect) rather than the type of treatment (between group effect). 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.

Conclusions: Climatotherapy at the Dead Sea area can improve the condition of patients suffering from long-standing ankylosing spondylitis.

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Different modalities of spa therapy at the Dead Sea area of Israel are beneficial for patients with inflammatory arthritides such as rheumatoid arthritis [1–4] and psoriatic arthritis [5–7], as well as for patients with non-inflammatory arthritides such as osteoarthritis [8,9] and fibromyalgia [10,11].

Ankylosing spondylitis is a chronic inflammatory disease that predominantly affects the spine and may lead to significant functional disability. Physical therapy is one of the most important modalities of treatment to slow the progression of the spinal disease. Unfortunately, patients' long-time adherence to home exercises, as prescribed by physical therapists, is low.

Only a few clinical trials have been conducted in health resort areas to assess the efficacy of spa therapy, primarily balneotherapy, in AS. Surprisingly, no clinical trials have been

carried out at the Dead Sea area, the main health resort in Israel. We present the findings of a single-blind, randomized, controlled study to assess the efficacy of the unique climatic conditions at the Dead Sea area, with and without the addition of balneotherapy.

Patients and Methods

Twenty-eight patients were recruited for the study from two sources: the Rheumatology Clinic of the Soroka University Medical Center and through an advertisement in an Israeli newspaper published in Russian. Patients were eligible for inclusion in the study if they fulfilled the modified New York criteria for AS [12] and had suffered from back pain during the 3 months prior to enrollment. Exclusion criteria included concomitant psoriasis or any other seronegative spondyloarthropathy (except AS), malignancies, equilibrium disturbances, mental disorders, or any active non-inflammatory spinal disease. These exclusion criteria also reflect concern regarding the ability of the participants to commit to a 2 week stay at the Dead Sea area and to the 3 month follow-up period. The Helsinki committee of the Soroka University Medical Center approved the study.

All 28 participants spent 14 days at a Dead Sea health resort spa hotel. They were randomly allocated by a coordinator study nurse to two groups of 14 patients each. The first group received balneotherapy in addition to exposure to the climatic conditions of the Dead Sea area (combined treatment group). The second group was allowed access to the fresh water pool (26–28°C) for an unlimited amount of time, in addition to exposure to the same climatic conditions, but did not receive balneotherapy (climatotherapy group).

The combined treatment group received daily treatments consisting of each of the following: 20 minute applications of mud packs heated to 39–40°C to the entire body, 20 minute sessions in a sulfur (mineral) pool at 36–37°C, and bathing in Dead Sea water (in the sea itself or in an indoor pool). These treatments were administered daily except Saturday, i.e., for 12 of the 14 days. Participants in the climatotherapy group had similar exposure to climatic conditions as the combined treatment group, but were prohibited from receiving any form of balneotherapy.

All patients in both groups were assessed four times by the same physician. The first assessment was performed immediately prior to their arrival at the Dead Sea, the second on the last day of stay at the Dead Sea, and the third and fourth 1 and

AS = ankylosing spondylitis
VAS = Visual Analog Scale

3 months after the end of the treatment period, respectively. A physical examination was performed at each assessment. The following parameters were assessed each time: disease-related well-being, disease activity by means of the Bath AS Disease Activity Index (BASDAI) [13], and subjective quantification of disease severity by visual analog scales (from 0 to 100 mm), one for pain and the other for limitation of movement. Quality of life was assessed by the SF-36 questionnaire [14] at the first and last assessment. This questionnaire is designed to evaluate changes over a long period and was therefore not administered at the interim assessments.

The SF-36 measures physical and mental health, with four scores for each of these components. Physical health has scores for limitation in physical activities due to health problems, limitations in everyday activities due to physical problems, bodily pain and general health perception. Mental health is scored for mental health, social functioning, emotional state, and vitality.

All data were analyzed with the SPSS statistical package. Continuous variables were compared with the unpaired two-tailed Student *t*-test. Categorical variables were compared using the chi-square test. Two-way repeated measurement analysis of variance (ANOVA) was used to compare repeated measurements in the two groups and within each group, and the Bonferroni procedure was applied in post-hoc analyses. Results were considered significant at $P < 0.05$.

Results

The baseline characteristics of the study participants are presented, by group, in Table 1. There were no statistically significant differences between the two groups, although there was a trend toward lower BASDAI scores in the combined treatment group. Table 2 presents the BASDAI scores, by study group, for each of the four assessments. Post-treatment BASDAI scores were lower than baseline values. BASDAI scores were significantly changed during the four assessment periods ($P = 0.002$), but this change was not affected by treatment group ($P = 0.5$). Post-hoc analyses revealed that this significant improvement in BASDAI scores stemmed from a significant improvement between the first two assessments (immediately preceding and immediately following the Dead Sea stay).

Table 3 shows the VAS scores for pain and limitation in movement. Both types of VAS evaluation show improvement. The results of the ANOVA analyses, taking into account the effect of time and the treatment group, mirror those found for the BASDAI scores. There was a significant effect of time within the four assessment periods (pain VAS, $P = 0.002$; limitation of movement VAS, $P = 0.011$), but no significant effect of the treatment group on either of the VAS scores ($P = 0.77$).

BASDAI = Bath AS Disease Activity Index

Table 1. Baseline characteristics of study participants

	Combined (n=14)	Climatotherapy (n=14)	P
Gender			
Male	12	14	0.48
Female	2	0	
Age (yrs, mean \pm SD)	49.7 \pm 12.0	46.1 \pm 13.4	0.46
Disease duration (yrs, mean \pm SD)	17.1 \pm 13.3	18.6 \pm 12.2	0.77
Medication use			
Pain killers	7 (50%)	4 (28.6%)	0.22
Narcotics	0	1 (7.1%)	0.50
Non-steroidal anti-inflammatory drugs	9 (64.3%)	8 (57.1%)	0.50
Routine physical therapy	1 (7.1%)	0	0.50
Baseline characteristics (mean \pm SD)			
BASDAI	4.9 \pm 2.0	6.1 \pm 1.5	0.07
Pain VAS	6.7 \pm 2.2	6.4 \pm 2.4	0.75
Limitation of movement VAS	6.3 \pm 2.4	7.1 \pm 1.6	0.28
Morning stiffness (minutes)	46.3 \pm 32.9	74.3 \pm 48.6	0.10

Table 2. BASDAI scores at the four assessment points, by treatment group (mean \pm SD)

	Combined (n=14)	Climatotherapy (n=14)
Baseline	4.86 \pm 1.98	6.10 \pm 1.47
End of treatment at Dead Sea	3.96 \pm 1.58	4.16 \pm 2.18
1 month follow-up	4.83 \pm 1.59	4.67 \pm 1.56
3 month follow-up	4.77 \pm 1.67	4.86 \pm 1.96

$P = 0.002$ for the difference between the various assessment periods (within groups effect), and $P = 0.5$ for differences between the two treatment groups (between groups effect) in two-way repeated measurement ANOVA.

Table 3. VAS scores for pain and movement limitation at the four assessment points, by treatment group (mean \pm SD)

	Combined (n=14)		Climatotherapy (n=14)	
	Pain	Movement	Pain	Movement
Baseline	6.7 \pm 2.2	6.3 \pm 2.4	6.4 \pm 2.4	7.1 \pm 1.6
End of treatment at Dead Sea	4.4 \pm 2.2	5.9 \pm 2.2	4.4 \pm 2.5	5.1 \pm 2.3
1 month follow-up	5.2 \pm 2.5	5.9 \pm 1.8	5.1 \pm 2.1	5.4 \pm 2.1
3 month follow-up	5.1 \pm 2.7	6.1 \pm 2.0	4.9 \pm 2.5	5.6 \pm 2.2

For pain VAS: $P = 0.002$ for the difference between the various assessment periods (within groups effect) and $P = 0.77$ for the difference between the two treatment groups (between groups effect).

For limitation of movement VAS: $P = 0.011$ for the difference between the various assessment periods (within groups effect) and $P = 0.7$ for the difference between the two treatment groups (between groups effect). Both were assessed by two-way repeated-measurement ANOVA

At each of the four assessment periods a pertinent physical examination was conducted that included the following measures commonly checked in AS patients: wall to occiput distance, chest expansion, distance between the tip of the third finger and the floor when bending as far as possible with the knees locked, and Schober's test. There were no significant changes in any of these values between patient assessment

Table 4. Selected physical examination tests for all 28 participants together

Test	Assessment period				P
	1	2	3	4	
Wall-occiput distance	10.5 ± 8.7	10.2 ± 8.7	10.5 ± 8.8	11.1 ± 9.0	0.67
Chest expansion	3.5 ± 4.7	3.3 ± 1.5	3.3 ± 1.2	3.6 ± 2.4	0.86
Finger 3 to floor distance	35.2 ± 11.4	31.5 ± 11.5	34.0 ± 13.5	33.8 ± 12.3	0.20
Schober's test	2.0 ± 1.3	3.1 ± 2.4	2.6 ± 1.2	2.4 ± 1.3	0.048

All values are in centimeters (mean ± SD)

Assessment period 1: immediately prior to departure for the Dead Sea area.

Assessment period 2: immediately before departure from the Dead Sea area.

Assessment period 3: one month follow-up.

Assessment period 4: three months follow-up.

P values reflect one-way repeated measures ANOVA results.

periods or between the treatment groups (results not shown). Physical examination changes were then assessed for the entire study population (n=28). The results are shown in Table 4.

Both groups reported values compatible with an overall low quality of life. None of the measures had improved significantly 3 months after completion of the treatment except for the measure of bodily pain, which was significantly improved only in the combined treatment group (results not shown).

Discussion

Physical therapy plays an important role in the treatment of AS. Its aim is to improve mobility, fitness and strength, and to slow down the development of deformities [15,16]. Spa treatment has served as a treatment modality for AS since ancient times [17]. Nowadays, spa therapy consists of a broad range of different treatments including balneotherapy (bathing in mineral water), hydrotherapy (immersion of the entire body, or part of it, in heated fresh water), massages, mud packs, relaxation, and physical therapy. The exact mechanisms of action of spa therapy are only partially understood. Putative non-specific factors that may contribute to the success of spa therapy include change of environment, a non-competitive atmosphere with fellow patients, and distance from work and other stressful circumstances [18].

Very few clinical trials have been reported on the effect of spa therapy on AS. The results of the largest randomized controlled trial were recently published [19]. In that study 120 AS patients were randomly allocated to three treatment groups of 40 patients each. One group received 3 weeks of spa therapy at a spa in Austria, the second group received 3 weeks of spa therapy at a spa in the Netherlands, and the third group, which served as a control group, remained at home and continued standard treatment for the same 3 week period as the spa therapy in the other two groups. After the intervention period all patients continued weekly group physical therapy for another 37 weeks. The main conclusion of this study was that significant improvement was seen in the two groups treated at spa resort areas compared to the control group, and 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-exercise therapy is more effective and

has favorable cost-effectiveness and cost-utility ratios compared with standard treatment alone [20].

The first study on the effectiveness of spa therapy in AS in Israel was published in 1995. Tishler et al. [21] conducted an uncontrolled study at a spa in Tiberias, and found that the combination of hot mineral water baths and mud packs significantly improved the range of movement and overall well-being of 16 AS patients, as assessed by both the patient and the physician. In another study, Hashkes [22] reported on 53 AS patients who underwent 4 weeks of climatotherapy at a spa in Tiberias. This was also an uncontrolled study and no details are provided as to the exact modalities of treatment administered during the 4 week treatment period. Thirty-two patients (60%) were considered responders, with males responding better and more often than females. Hafstrom and Hallengren [23] conducted a prospective study in which they compared the effectiveness of physical therapy in a subtropical climate at Tenerife, Spain with that at a spa in Tiberias, Israel. This study was based only on data obtained from two questionnaires — the Swedish version of the Stanford Health Assessment Questionnaire (HAQ) and a quality of life questionnaire (Nottingham Health Profile). The investigators' conclusion was that physical therapy and spa therapy at both sites led to improved functional capacity and health-related quality of life, as well as reduced pain.

The present study is the first to be conducted at the Dead Sea area, which is the main health resort area in Israel. We had originally planned to recruit a larger number of AS patients and to conduct the study over a longer treatment period. However, due to the prevailing state of the Israeli economy and a very high unemployment rate, many patients refused to participate in the study out of fear of losing their jobs. The fact that spa therapy is not yet recognized as acceptable therapy for AS and is not covered by the health management organizations also hindered the recruitment process.

The population in our study had relatively high baseline BASDAI scores, advanced disease and lower quality of life than previously reported for AS patients [24]. The poor baseline characteristics combined with the higher BASDAI scores in the combined treatment group and the low overall number of participants might account for the lack of statistical difference between the two groups. Despite the advanced disease and low quality of life characterizing participants in this study, we observed significant improvement in both treatment groups throughout the study duration. It seems, therefore, that the unique climate conditions at the Dead Sea area, primarily the high barometric pressure, low relative humidity, high constant temperatures, and sunny days associated with the non-specific factors previously mentioned are as important as balneotherapy itself. Future studies with larger study populations and for longer duration are necessary to assess the relative efficacy of climatotherapy versus balneotherapy at the Dead Sea.

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References

1. Sukenik S, Buskila D, Neumann L, Kleiner-Baumgarten A, Zimlichman RS, Horowitz J. Sulphur bath and mud pack treatment for rheumatoid arthritis at the Dead Sea area. *Ann Rheum Dis* 1990;49:99–102.
2. Sukenik S, Neumann L, Flusser D, Kleiner-Baumgarten A, Buskila D. Balneotherapy for rheumatoid arthritis at the Dead Sea. *Isr J Med Sci* 1995;31:210–14.
3. Sukenik S, Neumann L, Buskila D, Kleiner-Baumgarten A, Zimlichman S, Horowitz J. Dead Sea bath salts for the treatment of rheumatoid arthritis. *Clin Exp Rheumatol* 1990;8:353–7.
4. Sukenik S, Buskila D, Neumann L, Kleiner-Baumgarten A. Mud pack therapy in rheumatoid arthritis. *Clin Rheumatol* 1992;11:243–7.
5. Sukenik S, Giryas H, Halevy S, Neumann L, Flusser D, Buskila D. Treatment of psoriatic arthritis at the Dead Sea. *J Rheumatol* 1994;21:1305–9.
6. Sukenik S, Baradin R, Codish S, et al. Balneotherapy at the Dead Sea area for patients with psoriatic arthritis and concomitant fibromyalgia. *IMAJ* 2001;3:147–50.
7. Elkayam O, Ophir J, Brener S, et al. Immediate and delayed effects of treatment at the Dead Sea in patients with psoriatic arthritis. *Rheumatol Int* 2000;19:77–82.
8. Sukenik S, Flusser D, Codish S, Abu-Shakra M. Balneotherapy at the Dead Sea area for knee osteoarthritis. *IMAJ* 1999;1:83–5.
9. Sukenik S, Mayo A, Neumann L, Flusser D, Kleiner-Baumgarten A, Buskila D. Dead Sea bath salts for osteoarthritis of the knees. *Harefuah* 1995;129:100–3 (Hebrew).
10. Buskila D, Abu-Shakra M, Neumann L, et al. Balneotherapy for fibromyalgia at the Dead Sea. *Rheumatol Int* 2001;20:105–8.
11. Neumann L, Sukenik S, Bolotin A, et al. The effect of balneotherapy at the Dead Sea on the quality of life of patients with fibromyalgia syndrome. *Clin Rheumatol* 2001;20:15–19.
12. van der Linden S, Valkenburg HA, Cats A. Evaluation of diagnostic criteria for ankylosing spondylitis. A proposal for modification of the New York criteria. *Arthritis Rheum* 1984;27:361–8.
13. Garrett S, Jenkinson T, Kennedy LG, Whitelock H, Gaisford P, Calin A. A new approach to defining disease status in ankylosing spondylitis: the Bath Ankylosing Spondylitis Disease Activity Index. *J Rheumatol* 1994;21:2286–91.
14. Ware JE, Snow KK, Kosinski M, Gandek B. SF-36 Health Survey Manual and Interpretation Guide. Boston: The Health Institute, 1993.
15. Helliwell PS, Abbott CA, Chamberlain MA. A randomised trial of three different physiotherapy regimens in ankylosing spondylitis. *Physiotherapy* 1996;82:85–90.
16. Kraag G, Stokes B, Groh J, Helewa A, Goldsmith C. The effects of comprehensive home physiotherapy and supervision of patients with ankylosing spondylitis – a randomized controlled trial. *J Rheumatol* 1990;17:228–33.
17. van Tubergen A, van der Linden S. A brief history of spa therapy. *Ann Rheum Dis* 2002;61:273–5.
18. Fam AG. Spa treatment in arthritis: a rheumatologist's view. *J Rheumatol* 1991;18:1775–7.
19. van Tubergen A, Landewe R, van der Heijde D, et al. Combined spa-exercise therapy is effective in patients with ankylosing spondylitis: a randomized controlled trial. *Arthritis Rheum* 2001;45:430–8.
20. Van Tubergen A, Boonen A, Landewe R, et al. Cost effectiveness of combined spa-exercise therapy in ankylosing spondylitis: a randomized controlled trial. *Arthritis Rheum* 2002;47:459–67.
21. Tishler M, Brostovski Y, Yaron M. Effect of spa therapy in Tiberias on patients with ankylosing spondylitis. *Clin Rheumatol* 1995;14:21–4.
22. Hashkes PJ. Beneficial effect of climatic therapy on inflammatory arthritis at Tiberias Hot Springs. *Scand J Rheumatol* 2002;31:172–7.
23. Hafstrom I, Hallengren M. Physiotherapy in subtropic climate improves functional capacity and health-related quality of life in Swedish patients with rheumatoid arthritis and spondylarthropathies still after 6 months. *Scand J Rheumatol* 2003;32:108–13.
24. Chorus AM, Miedema HS, Boonen A, Van Der Linden S. Quality of life and work in patients with rheumatoid arthritis and ankylosing spondylitis of working age. *Ann Rheum Dis* 2003;62:1178–84.

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