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ORIGINAL ARTICLE

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Immediate and delayed effects of treatment at the Dead Sea in patients with psoriatic arthritis

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Abstract The purpose of this study was to evaluate the immediate and delayed effects of balneotherapy at the Dead Sea on patients with psoriatic arthritis (PsA). A total of 42 patients with PsA were treated at the Dead Sea for 4 weeks. Patients were randomly allocated into two groups: group 1 (23 patients) and group 2 (19 patients). Both groups received daily exposure to sun ultraviolet rays and regular bathing at the Dead Sea. Group 1 was also treated with mud packs and sulfur baths. Patients were assessed by a dermatologist and a rheumatologist 3 days before arrival, at the end of treatment, and at weeks 8, 16, and 28 from the start of treatment. The clinical indices assessed were morning stiffness, right and left hand grip, number of tender joints, number of swollen joints, Schober test, distance from finger to floor when bending forward, patient's self-assessment of disease severity, inflammatory neck and back pain and psoriasis area and severity index (PASI) score. Comparison between groups disclosed a similar statistically significant improvement for variables such as PASI, morning stiffness, patient self-assessment, right and left grip, Schober test and distance from finger to floor when bending forward. For variables such as tender and swollen joints, and inflammatory neck and back pain, improvement over time was statistically significant in group 1. Addition of mud packs and sulfur baths to sun ultraviolet exposure and Dead Sea baths seems to prolong beneficial effects and improves inflammatory back pain.

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Introduction

The Dead Sea, with its unique optical, chemical and atmospheric properties, provides an effective alternative treatment for psoriasis. Indeed, thousands of patients suffering from psoriasis have been treated successfully in the Dead Sea by climatological methods without medication [1]. The effect of balneotherapy and climatherapy at the Dead Sea on psoriatic arthritis (PsA) is not clear. Sukenik et al. [2] have reported a beneficial short-term effect of climatherapy and balneotherapy on patients with PsA, balneotherapy providing an additional improvement. The objective of the present study was to evaluate the immediate and delayed effects of spa therapy at the Dead Sea on clinical variables of joints and skin of patients with PsA.

Patients and methods

A total of 42 patients with PsA were treated at the Dead Sea for 4 weeks. Patients with uncontrolled hypertension, ischemic heart disease or peripheral vascular disease were excluded. The patients were randomly divided into two groups – group 1 included 23 patients and group 2, 19 patients. The allocation into groups was done by a neutral local technician who did not have any information on the level of disease activity or seriousness except for the diagnosis. Patients were allocated to each group alternatively in alphabetical order, the first to group 1, the second to group 2 and so on. Because of a technical error, the last three patients were allocated to group 1.

Patients in both groups received the following treatment modalities: (1) daily exposure to sun, beginning with 10–20 min both in early morning and afternoon, with an increment of 10 min each day until a maximum of 3 h/day was reached; (2) daily bathing at the Dead Sea for a duration of 30 min. In addition, group 1 was treated daily with mud packs heated to 42 °C applied over the four extremities, neck and back for 20 min, and bathing in a sulfur pool heated to 37 °C for 20 min every second day.

The treatment protocol did not include any means other than those indicated above. Table 1 summarizes the demographic and

Table 1 Demographic and clinical characteristics of patients (*SE* standard error)

	Group 1	Group 2
Number of patients	23	19
Male (%)	14 (60)	12 (63)
Female (%)	9 (40)	7 (37)
Mean age ± SE (years)	51 ± 2.5	53 ± 3.3
Mean duration of psoriasis ± SE (years)	24 ± 2.9	20 ± 2.9
Mean duration of arthritis ± SE (years)	12 ± 2	15 ± 1.9
Number of patients using DMARD's (%)	6 (26)	5 (25)

clinical characteristics of the patients. All patients receiving disease-modifying drugs had been using them for at least 3 months before starting the study. Each patient was assessed in the clinic by the same rheumatologist and dermatologist, who were blinded to the treatment regimens, 3 days before arrival at the Dead Sea, at the end of treatment, and at weeks 8, 12, 16, and 28 from the start of treatment. The assessing physicians were not present at the Dead Sea resort during therapy.

The clinical indices assessed at each examination were:

1. Duration of morning stiffness of peripheral joints (min)
2. Right and left hand grip strength using a single standard recorder (mmHg)
3. Number of tender joints
4. Number of swollen joints
5. Schober test
6. Distance from finger to floor when bending forward
7. Patient self-assessment of disease severity on a 7-point scale from −3 to +3, in which −3 = severe deterioration, 0 = no change, +3 = marked improvement

In addition, patients were asked whether they had inflammatory back or neck pain (defined as pain and stiffness not relieved by rest): (a) neck pain (yes/no), (b) back pain (yes/no).

The laboratory variable assessed was Westergren erythrocyte sedimentation rate (ESR) [3] at each visit. The extent and depth of skin involvement was assessed by the dermatologist using the psoriasis area and severity index (PASI) score [4].

Statistical analysis

Statistical analysis was done using SPSS software. For continuous variables, comparison between groups was done using the MANOVA test for repeated measured analysis. As a secondary analysis, we also performed MANOVA within each group. Pretreatment and posttreatment rates of pain of the cervical and lumbar spine were compared by means of the McNemar test. *P* values less than 0.05 were considered to be significant.

Results

Clinical assessment

At the beginning of the study, the groups were not statistically significantly different for variables of morning stiffness, number of tender and swollen joints, right and left grip, Schober test, distance from finger to floor when bending forward and presence of neck and back pain (Table 2).

Morning stiffness

A statistically significant improvement over time was observed in both groups (Hotelling = 0.67, $F = 5.53$, $P < 0.001$). Comparison between groups did not disclose any difference ($F = 0.43$, $P = 0.519$). Secondary analysis within each group revealed a statistically significant improvement in group 1, which was sustained until the end of follow-up (Fig. 1).

Table 2 Baseline values of morning stiffness, tender and swollen joints, right and left grip strength, Schober test, psoriasis area and severity index (*PASI*) and erythrocyte sedimentation rate (*ESR*) in group 1 and group 2 before therapy at the Dead Sea (mean ± standard error)

	Group 1	Group 2
Morning stiffness	48 ± 8	45 ± 13.6
Number of tender joints	9.2 ± 1.2	6.5 ± 0.8
Number of swollen joints	2.3 ± 0.6	1.6 ± 0.4
Right grip (mmHg)	166 ± 20	170 ± 21
Left grip (mmHg)	152 ± 18	209 ± 22
Schober test (cm)	14.7 ± 1.2	14.2 ± 1.3
PASI	83 ± 6.5	8.2 ± 7.6
ESR (mm/h)	24.5 ± 11	23.3 ± 13.7

Number of tender joints

Comparison between the two groups disclosed a similar improvement ($F = 0.10$, $P = 0.758$). For the variable of time and interaction between groups, a statistically significant improvement was achieved in group 1 in comparison with group 2 (Hotelling = 1.22, $F = 11.2$, $P < 0.001$ and $F = 2.91$, $P = 0.02$, respectively). Secondary analysis within each group revealed a statistically significant improvement in group 1, which was sustained until week 28 (end of the follow-up) (Fig. 2).

Number of swollen joints

No statistical difference between the two groups was found ($F = 0.81$, $P = 0.375$). For the variable of time

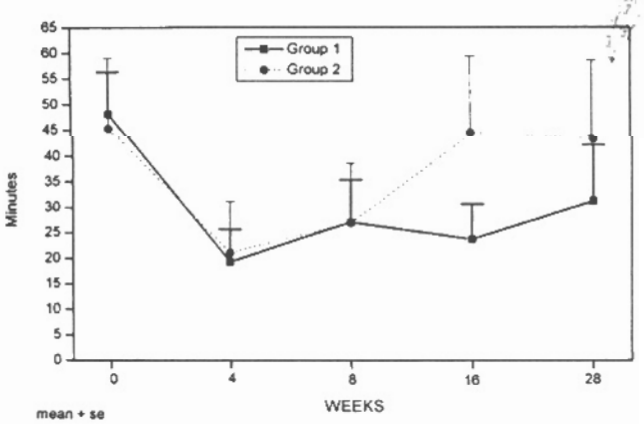

Fig. 1 Similar improvement of morning stiffness was achieved in both groups. Secondary analysis within each group revealed a statistically significant improvement in group 1

and interaction between groups, a statistically significant improvement over time was achieved in group 1 in comparison with group 2 (Hotelling = 0.25, $F = 3.77$, $P = 0.006$ and $F = 3.07$, $P = 0.019$, respectively). Secondary analysis within each group disclosed a statistically significant improvement in group 1 (Fig. 3).

Right and left grip

Both groups showed a similar statistically significant improvement over time in right and left grip strength (Hotelling = 0.795, $F = 5.4$, $P = 0.001$ and Hotelling = 0.69, $F = 23$, $P = 0.03$, respectively) without significant difference between groups ($F = 0.4$, $P = 0.533$) (Table 3).

Schober test

No significant changes from baseline ($F = 1.98$, $P = 0.226$) and no difference between groups ($F = 1.93$, $P = 0.75$) was found.

Distance from finger to floor when bending forward

No significant changes from baseline ($F = 1.14$, $P = 0.308$) and no difference between groups ($F = 0$, $P = 0.935$) was found.

Presence of neck and back pain

A statistically significant reduction in the number of patients who reported neck and back pain was observed in group 1; it was maximal at the end of treatment and persisted until week 28. No change in the percentage of patients with neck and back pain was noted in group 2 (Figs. 4, 5).

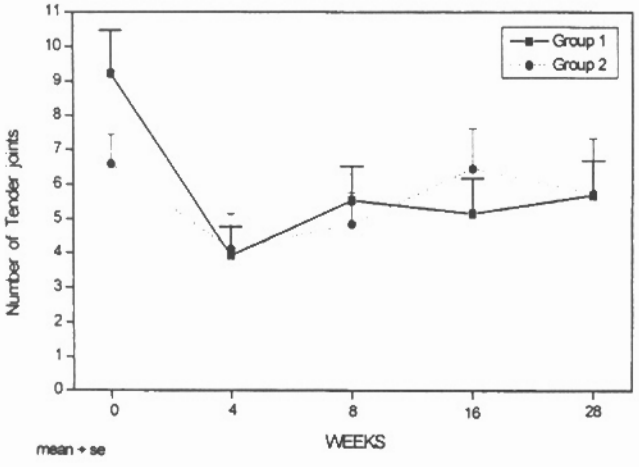

Fig. 2 Comparison of number of tender joints between group 1 and 2 disclosed significant improvement over time in group 1. Secondary analysis within each group revealed significant improvement in group 1

Table 3 Right and left grip strength (mean ± standard error)

	Group 1		Group 2	
	Right grip (mmHg)	Left grip (mmHg)	Right grip (mmHg)	Left grip (mmHg)
Week 0	166 ± 20	152 ± 18	177 ± 21	219 ± 22
Week 4	201 ± 20	199 ± 21	209 ± 20	249 ± 10
Week 8	183 ± 21	181 ± 22	195 ± 19	226 ± 18
Week 16	185 ± 22	186 ± 22	202 ± 24	208 ± 21
Week 28	186 ± 25	198 ± 26	222 ± 23	214 ± 22

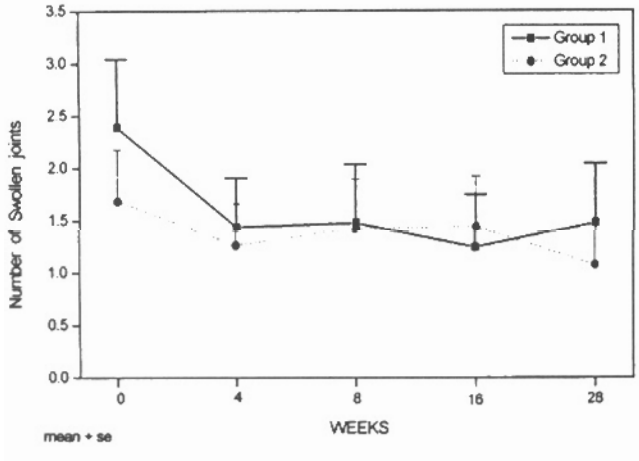

Fig. 3 Comparison of number of swollen joints between groups did not disclose a significant difference. A statistically significant improvement over time was achieved in group 1 in comparison with group 2

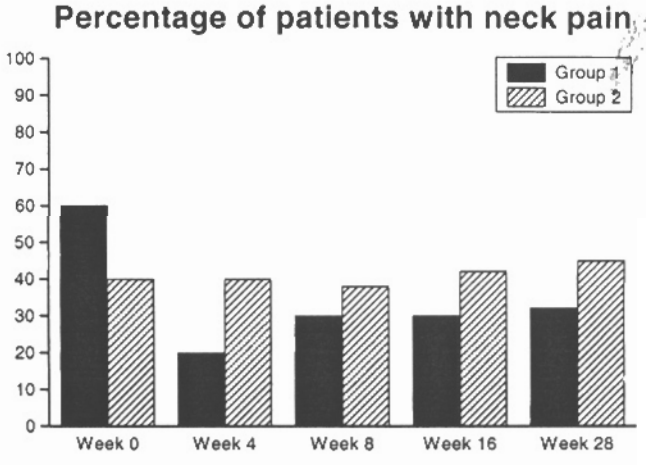

Fig. 4 A statistically significant reduction in the number of patients who reported neck pain was observed in group 1. No change in the percentage of patients with neck pain was observed in group 2

Patient self-assessment

A statistically significant improvement was found in both groups (Hotelling = 1.32, $F = 7.13$, $P < 0.001$) without significant difference between groups ($F = 1.49$, $P = 0.23$). Secondary analysis within each group revealed a statistically significant improvement in group 1 (Fig. 6).

PASI score

Comparison between groups revealed similar results ($F = 1.03$, $P = 0.3$) with a statistically significant improvement over time in both groups (Hotelling = 1.62, $F = 3$, $P = 0.02$). Secondary analysis within each group revealed a statistically significant improvement in group 1 (Fig. 7).

ESR

No significant change over time ($F = 0.99$, $P = 0.415$) or difference between groups ($F = 0.99$, $P = 0.415$) was found (Table 4).

Discussion

Treatment at the Dead Sea has been shown to be effective, clearing 80–100% of the involved skin area in 88% of patients, with skin clearing completely in nearly 58% of patients [5]. Sukenik et al. [2] have demonstrated an immediate (at the end of Dead Sea therapy) statistically significant improvement in most clinical variables of arthritis in PsA patients who received a 3-week treatment comprising daily exposure to sun and bathing at the Dead Sea, with the treatment group receiving additional mud packs and sulfur baths. The above mentioned studies have convincingly established the immediate benefit from treatment at the Dead Sea on the skin and arthritis of PsA patients.

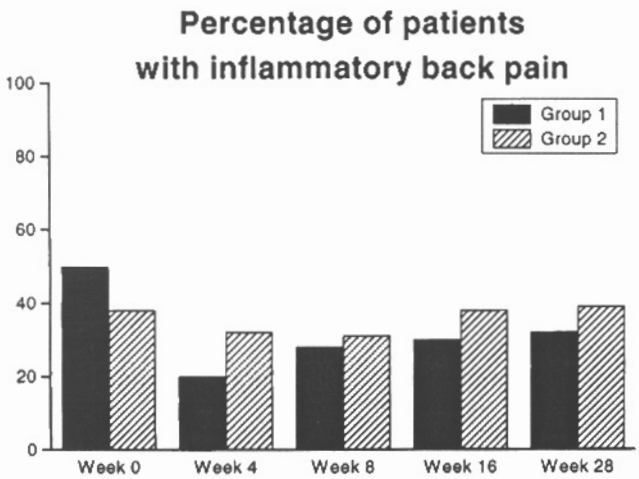

Fig. 5 A statistically significant reduction in the number of patients who reported back pain was observed in group 1. No significant change was observed in group 2

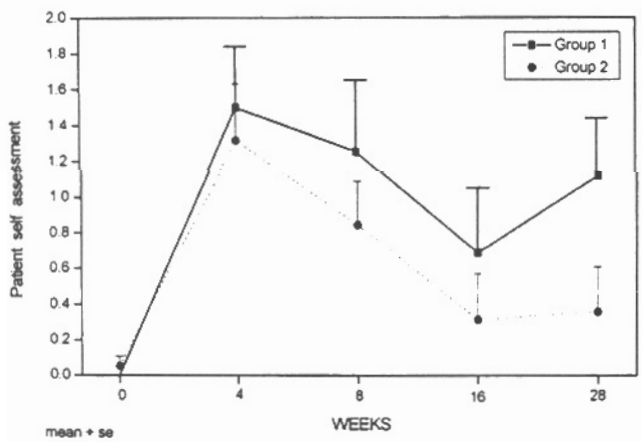

Fig. 6 A similar improvement of patient self-assessment was observed in both groups. Secondary analysis within each group revealed a statistically significant improvement in group 1

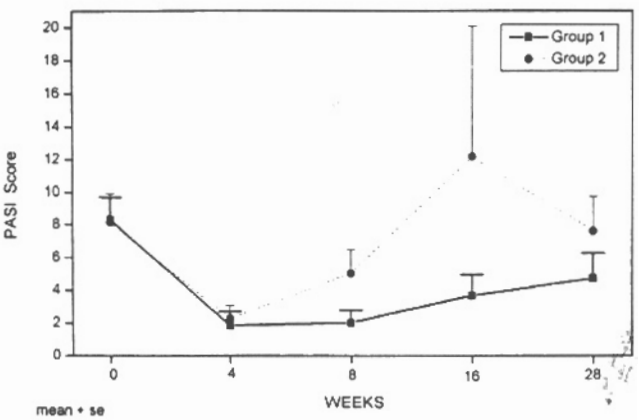

Fig. 7 A similar improvement of psoriasis area and severity index (PASI) was observed in both groups. Secondary analysis within each group revealed a significant reduction in group 1

Table 4 Erythrocyte sedimentation rate (ESR) (mm/h) in group 1 and 2 (mean ± standard error)

	Group 1	Group 2
Week 0	24 ± 3	23 ± 3.7
Week 4	23 ± 3.7	21 ± 3
Week 8	23 ± 3	21 ± 3
Week 16	26 ± 3.6	26 ± 5.2
Week 28	25 ± 3.9	21 ± 3.8

The purpose of our study was to further evaluate the effect of different treatment regimens at the Dead Sea, emphasizing the medium-term outcome, with a follow-up of 6 months after finishing therapy. We could confirm the results of Sukenik et al. regarding good outcome at the end of treatment. In both groups, clinical variables of morning stiffness, tender joints, and PASI improved in a similar fashion at the end of the 4-week treatment. However, analysis over time comparing the two groups, showed a significant improvement in group 1, which received the basic treatment regimen (daily exposure to Dead Sea water and sun rays) in addition to mud packs and sulfur baths for variables such as swollen and tender joints, and inflammatory neck and back pain. In spite of the clinical improvement, we could not find any changes in ESR. The observation that there is no decrease in laboratory monitoring of the acute phase response in patients treated with balneotherapy is consistent with various studies published on the effects of balneotherapy on rheumatic diseases [6, 7].

Our results suggest that balneotherapy (i.e., mud packs and sulfur baths) contributes an additional beneficial effect to patients with PsA. Balneotherapy in patients with rheumatic disease has been a subject of much debate. While historically it has been considered effective in palliating rheumatic disease, its role in modern medicine is controversial. Part of this controversy is due to the scarcity of controlled studies and the difficulties encountered in their applications. We and others have previously shown an improvement in clinical indices such as Ritchie and grip strength in rheumatoid arthritis patients treated with spa therapy [6, 7] and a long-term benefit from mineral baths and mud packs on patients with gonarthrosis [8]. Interestingly, one of the statistically significant results of the present study was the improvement in inflammatory back pain which was noticed only in the group that received additional treatment with mud packs and sulfur baths. This was also the only statistically significant difference observed by Sukenik et al.; Tishler et al. [9] have reported a dramatic improvement in inflammatory back pain in patients with ankylosing spondylitis who received spa therapy. These observations suggest that beyond its effect on peripheral arthritis, balneotherapy may be even more effective in inflammatory back pain.

Spa therapy at the Dead Sea in patients with PsA has a more complex significance due to its effect on the skin and possible interaction between skin and arthritic components in PsA. The possible therapeutic influences of the Dead Sea have fascinated many researchers and include factors such as sun rays, Dead Sea water, and mental relaxation. Ultraviolet radiation at the Dead Sea is attenuated by traversing an extra 400 m of atmosphere, affecting mainly erythrogenic UBV and allowing a longer and less harmful exposure to the sun [10]. Dead Sea water contains 30% dissolved solids and, compared to the Mediterranean Sea, has three times more sodium chloride and potassium chloride, 30 times more magnesium bromine and magnesium chloride, and 100 times more calcium chloride [11]. Sham et al. [12] have shown that elements such as bromine, rubidium and zinc are absorbed through the skin of patients with psoriasis after bathing at the Dead Sea, the increase in serum bromine levels being correlated with clinical improvement [14].

Psychological factors may also contribute to the beneficial effect of the Dead Sea – removal from the stresses of home and work, and social encounters with other PsA patients [11].

We are aware of the inevitable limitations of our study. The relatively small number of patients included in this study may have affected the results. Rest is known to have a positive effect on inflammatory arthritis [14] and an additional control group of patients whose only treatment would have been rest may have helped to clarify the factors contributing to the effects of balneotherapy.

There are no published data on follow-up of patients with PsA after departure from the Dead Sea area. Our results have shown that treatment at the Dead Sea is safe for PsA patients. The improvement achieved was maximal for most variables at the end of therapy and was maintained for several months. Addition of mud packs and sulfur baths improved the immediate results regarding tender and swollen joints and inflammatory back pain, and contributed to the further maintenance of improvement. However, additional controlled studies, with larger groups of patients, are needed to confirm our results.

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