Balneotherapy at the Dead Sea Area for Knee Osteoarthritis

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Abstract

Background: Balneotherapy at the Dead Sea area has been applied in various inflammatory rheumatic diseases such as rheumatoid arthritis and psoriatic arthritis. The efficacy of balneotherapy at the Dead Sea area for the treatment of degenerative rheumatic diseases has not yet been formally evaluated.

Objective: To evaluate the efficacy of balneotherapy at the Dead Sea area in patients suffering from osteoarthritis of the knees.

Methods: Forty patients were randomly allocated into four groups of 10 patients. Group I was treated by bathing in a sulphur pool, group 2 by bathing in the Dead Sea, group 3 by a combination of sulphur pool and bathing in the Dead Sea, and group 4 served as the control group receiving no balneotherapy. The duration of balneotherapy was 2 weeks.

Results: Significant improvement as measured by the Lequesne index of severity of osteoarthritis was observed in all three treatment groups, but not in the control group. This improvement lasted up to 3 months of follow-up in patients in all three treatment groups.

Conclusion: Balneotherapy at the Dead Sea area has a beneficial effect on patients with osteoarthritis of the knees, an effect that lasts at least 3 months.

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At the Dead Sea area, balneotherapy for rheumatic diseases consists primarily of bathing in the salt water of the Dead Sea, bathing in immersion baths, bathing in pools of thermal spring water, and the application of mud packs to the joints. The Dead Sea is a unique body of water unlike any other on the face of the earth. It is the lowest and most salty of all deep natural bodies of water and has a singular chemical composition. In addition to the different balneotherapy regimes, the unique regional climatic conditions, particularly the high barometric pressure, the uniformly high temperatures, the low level of precipitation and the low relative humidity contribute to a beneficial effect on patients with joint pain.

In previous studies we have shown that patients suffering from inflammatory joint diseases, such as rheumatoid arthritis and psoriatic arthritis, feel an improvement for periods of up to 3 months after balneotherapy at the Dead Sea area [1–3]. The purpose of the present study was to assess the efficacy of balneotherapy in patients with osteoarthritis of the knees.

Material and Methods

Forty patients with primary osteoarthritis of the knees and fulfilling the diagnostic criteria of Altman et al. [4] were included in the study. All patients had been symptomatic for at least 12 months prior to inclusion in the study. Radiographic evidence of moderate or severe osteoarthritis was required. Patients with active ischemic heart disease, uncontrolled diabetes mellitus, severe hypertension, or central nervous system diseases (e.g., epilepsy) were excluded. All patients underwent treatment for a period of 2 weeks at the Ein Gedi spa resort hotel, which is located on the western shore of the Dead Sea.

The patients were randomly allocated into four groups of 10 patients each. Group 1 was treated by bathing for 20 minutes twice daily, once in the morning and once in the afternoon, in sulphur pools heated to 37°C. Group 2 was treated by bathing in the Dead Sea for 20 min twice daily — once in the morning and once in the afternoon. Group 3 was treated by bathing twice daily in sulphur pools (similar to group 1) and twice daily in the Dead Sea (similar to group 2). Group 4, the control group, received neither sulphur baths nor Dead Sea baths and was requested not to bathe in the Dead Sea or in sulphur baths. Patients in the control group were allowed to swim in a sweet-water outdoor pool (water temperature 24–25°C). Control group patients were aware of the other three groups and of the treatment modalities the other patients were receiving. Apart from the different modes of therapy, the four groups shared similar degrees of activity, rest and diet.

All patients in all four groups continued to receive their regular medications, including various painkillers and nonsteroidal anti-inflammatory drugs, without any change in the type or dose of their medication during the treatment and follow-up periods.

A single rheumatologist (S.S.), blinded to the mode of treatment, assessed all patients. Two to 3 days before the patients arrived at the Ein Gedi spa (phase 0), he had examined the patients at the outpatient clinic at the Soroka Medical Center in Beer Sheva (capital of Israel's southern region, located 75 kilometers from the Dead Sea). He examined them a second time after completion of 2 weeks of therapy at the spa. The third examination took place one

month after completion of therapy. The final assessment took place 3 months after completion of therapy. The last two examinations took place at the outpatient clinic at the Soroka Medical Center.

The clinical indices assessed at each examination included: a) Lequesne index of severity of knee osteoarthritis [5]; b) patient assessment of knee pain severity on a scale of 0-10, where 0 signifies no pain and 10 signifies severe pain; and c) assessment of the range of movement for each knee, existence or absence of soft tissue swelling, effusions and crepitus.

The results of these three clinical indices were analyzed using paired *t* tests, and comparing the results within each group as well as between the four study groups for similar period examinations.

Results

Table 1 summarizes the demographic and clinical characteristics of all patients. Four patients, one in the control group and three in group 3, who had to leave the spa due to unexpected personal or work-related problems, withdrew from the study. Because of the very late announcement of their cancellation we were unable to substitute other patients.

Most of the patients in all groups had been using painkillers and various NSAIDs. None were using narcotic painkillers. There was no significant difference in patients' ages or disease duration in the four groups.

According to the index of severity, there was a significant improvement at the end of the treatment period in all three treatment groups, but not in the control group [Table 2]. This improvement continued for up to 3 months. The effect of treatment appears to wane over time, although the effect remained statistically significant during the 3-month follow-up. With regard to the patients' assessment of disease severity, a significant improvement at the end of the treatment period was reported only by patients in the group treated with combined sulphur and Dead Sea baths [Table 3]. This improvement lasted for one month.

No significant improvement was found in any of the other parameters assessed, which included range of movement, soft tissue swelling, knee effusions, and crepitus.

Table 1. Demographics and clinical characteristics of patients by treatment group

	Group 1	Group 2	Group 3	Group 4
	Sulphur pools	Dead Sea baths	Sulphur pools and Dead Sea	Control
No. of patients	10	10	7	9
Age (yr ±SD)	63.2 ± 7.8	65.4 ± 8.1	57.6 ± 5.8	65.9 ± 6.5
Sex (male/female)	2/8	1/9	0/7	1/8
Disease duration (yr ±SD)	11.6 ± 7.9	9.2 ± 5.4	9.3 ± 6.2	8.4 ± 6
Medication				
Painkillers	9	10	7	8
NSAID	8	9	6	8
Narcotics	0	0	0	0

Table 2. Index of severity of knee osteoarthritis by treatment group (mean ± standard deviation)

Group 1 — Sulphur pool	15.5 ± 2.37	12.0 ± 2.0 **	11.9 ± 2.72 *	12.9 ± 2.28 *
Group 2 — Dead Sea	13.0 ± 2.0	12.0 ± 4.76 *	12.2 ± 2.86 *	12.3 ± 2.71 *
Group 3 — Sulphur pool and Dead Sea	13.0 ± 2.16	6.7 ± 2.75 **	11.7 ± 4.64 *	11.4 ± 3.87 *
Group 4 — Control	14.9 ± 1.9	12.4 ± 4.89	14.0 ± 3.84	14.0 ± 3.62

* $P < 0.05$ compared with phase 0
** $P < 0.01$ compared with phase 0

Table 3. Patient assessment of disease severity by treatment group (scale of 0–10) × (mean±SD)

	Phase 0	2 weeks	1 month	3 months
Group 1 — Sulphur pool	6.1 ± 1.59	5.9 ± 1.19	5.5 ± 0.85	6.2 ± 1.48
Group 2 — Dead Sea	6.5 ± 0.97	5.4 ± 1.58	5.5 ± 1.35	6.1 ± 0.99
Group 3 — Sulphur pool and Dead Sea	6.6 ± 0.97	3.7 ± 1.49 *	4.3 ± 1.25 *	5.7 ± 1.70
Group 4 — Control	6.1 ± 1.45	6.2 ± 1.20	6.1 ± 1.17	6.6 ± 1.51

⁺ Scale (0–10): 0 = no pain, 10 = most severe pain
* $P < 0.01$ compared with phase 0

Discussion

There are few controlled clinical studies on the effect of balneotherapy on osteoarthritis of the knees. In 1982, Machtey [6] showed that daily immersion in Dead Sea water over a period of one week, or in a bath of 2% or 7.5% Dead Sea salt solution over a 2-week period, led to a significant improvement in patients with osteoarthritis of the spine, hips and knees. The major limitations of that study were the lack of a control group treated with regular tap water baths, and the lack of post-treatment follow-up. In another uncontrolled study, Elkayam et al. [7] demonstrated that patients with osteoarthritis of the knees who were treated for 2 weeks at a spa in Tiberius, Israel, showed an improvement that lasted up to 6 months after the end of the treatment period. The authors of that study demonstrated a reduction of nocturnal pain, reduction of pain on passive motion, reduction of tenderness on palpation, and an improvement on the Lequesne index of severity of osteoarthritis.

In a later study, Wigler et al. [8] compared the effectiveness of spa therapy for patients with gonarthrosis who were treated at a Tiberius spa. Three modalities of therapy were assessed. One group of patients was treated with mineral water baths and hot local mud packs; the second group was treated with hot mineral baths and rinsed, mineral-free, mud packs; and the third group was treated with tap water baths and mineral-free mud packs. The main conclusion of their study was that patients with gonarthrosis seemed to benefit from spa therapy under all three modalities. However, reduction of night pain and significant improvement on the Lequesne index of severity of osteoarthritis was observed mainly in the first group.

In 1989, a group of researchers from Hungary [9] showed that patients suffering from knee osteoarthritis improve after 3 weeks of treatment with thermal water. This was a double-blind study; neither patients nor the

examiner knew if the patients were treated with tap water or thermal water. The main disadvantage of this study was the lack of a follow-up.

Another team from France reported in 1997 [10] that 21 days of spa therapy that included balneotherapy, bathing in spring water and medical attention in the spa resort of Vichy, France, had a beneficial effect on 64 patients with knee osteoarthritis. This was a prospective, randomized controlled study. Like us, the researchers used the Lequesne index of severity of osteoarthritis and the patients received analgesics or NSAIDs; they also used a quality of life index. Their study showed that spa therapy has a prolonged beneficial effect on symptoms of knee osteoarthritis, lasting up to 24 weeks.

The results of the present study demonstrate an improvement in all three treatment groups. It is unclear why significant improvement as reported by patients' assessment of disease severity was observed only in group 3, an improvement that lasted for one month of follow-up, in contrast to the assessment of disease severity, which showed a continued beneficial effect for 3 months.

Our current results are more conclusive than those observed by us in a previous study in which we compared the efficacy of baths using dissolved Dead Sea salt to baths with regular table salt (NaCl) in patients suffering from knee osteoarthritis [11]. In the previous study patients remained in their houses, rather than at the Dead Sea, and did not enjoy the climatic advantages and the resort hotel facilities that might have contributed to the difference between these two studies.

The mechanisms responsible for the improvement observed after balneotherapy are not clearly understood and probably consist of a combination of mechanical, thermal and chemical effects. Mechanically, balneotherapy may favorably affect muscle tone, joint mobility and pain intensity. Increased buoyancy and hydrostatic pressure during immersion in spa water is especially beneficial at the Dead Sea, due to the very high salinity of the water. Short-term thermal stress is also known to alleviate pain. Heat increases the secretion of β-endorphin, a substance that has an analgesic effect. Heat may also have an anti-inflammatory effect. In experimental animals both hyperthermia and the local application of heat have been shown to prevent the development of chronic and proliferative inflammation. This anti-inflammatory effect of heat may result from the increased secretion of cortisol and catecholamines induced by thermal stress [12]. Bellometti et al. [13] showed that mud-pack treatment enhances the antioxidant defenses of serum, with a resulting decrease of radical mediated peroxidation in patients with osteoarthritis. Absorption of trace elements through the skin after bathing in mineral water, Dead Sea water or mud-pack application may occur and affect the inflammatory process [14].

The chemical composition of thermal water and mud varies among spas. Moreover, several issues remain unsettled, including which elements are essential, and the ideal concentration of each element required to attain an optimal response to treatment. Finally, the relaxant effects of rest in a health resort area may also contribute to the beneficial effects of balneotherapy.

In summary, the various forms of balneotherapy can lead to temporary relief of suffering in patients with osteoarthritis of the knees. Balneotherapy cannot replace the standard modes of therapy for osteoarthritis, yet it can safely be added to standard regimens. The high cost of balneotherapy, not covered by most health insurance programs, renders it inaccessible to the majority of patients.

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