Beneficial effect of climatic therapy on inflammatory arthritis at Tiberias Hot Springs

Philip J. Hashkes

Pediatric Rheumatology Service, Sieff and Poriya Hospitals, Technion Medical School, Haifa, Israel

Objective: To examine the beneficial effect of climatic therapy at the Tiberias Hot Springs on patients with inflammatory arthritis.

Methods: Patients from Sweden with inflammatory arthritis underwent climatic therapy for 4 weeks at the Tiberias Hot Springs in Israel. Patients were examined at the beginning and end of the therapy and were evaluated as responders according to internationally validated criteria.

Results: One hundred-thirty-six patients were evaluated, 83 with a clinical course of rheumatoid arthritis (RA) and 53 with ankylosing spondylitis (AS). Forty-seven (57%) of the RA patients and 32 (60%) of the AS patients were considered responders. Shorter disease duration and more active disease were associated with a greater response in RA, while in AS males responded more often than females.

Conclusion: Most patients benefited significantly from climatic therapy. Long-term follow-up is necessary to see whether improvement is sustained and if work ability and hospitalizations are also improved.

Keywords: climatic therapy, spa, rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, rehabilitation

Spa and climatic therapy are very popular, especially in Europe, in the treatment of musculoskeletal disorders and arthritis. Spa therapy is part of the European tradition since the 18th century and is funded in part by governments and health insurances in many countries.

Climatic and balneotherapy have several potential benefits in the treatment of arthritis (1–4). Improved local blood flow from heat decreases edema and increases the removal of inflammatory mediators. Increased buoyancy and hydrostatic pressure may also decrease edema. Hot water and mud baths decrease muscle tone and increase pain thresholds and tolerance. Heat also increases cortisol and β-endorphin secretion. These features of heat increase mobility and the range of joint motion, facilitating physical therapy. Furthermore, intensive physical therapy, exercise and the relaxing effect of rest and stress reduction also contribute to the beneficial effects of the therapy.

Patients with inflammatory arthritis including rheumatoid arthritis (RA), psoriatic arthritis (PsA) and ankylosing spondylitis (AS) are sent from Sweden to the Tiberias Hot Springs in Israel for 4 weeks of climatic therapy. Tiberias enjoys sunny and warm weather with low humidity during most of the year. Situated 212 meters below sea level, the barometric pressure and oxygen B concentration are increased. Less ultraviolet B (UVB) rays are let through the atmosphere. The increased UVA/UVB ratio decreases the risk of sunburn and improves psoriasis. An intensive therapeutic plan consisting of physical and occupational therapy, hydrotherapy, balneotherapy, massage and physical conditioning is developed for each patient. Therapy is funded in part by the Swedish health authorities.

Several studies have shown that balneotherapy has a beneficial effect on inflammatory arthritis for periods lasting up to 6 months (4–9). A recent study showed that spa-exercise therapy in patients with AS is effective in decreasing pain and stiffness while improving functional ability for up to 40 weeks after treatment (10). The spas were in “cold” countries such as Austria and The Netherlands. There are very few studies showing the effectiveness of climatic therapy (11). In 1996, 105 patients from Sweden with inflammatory arthritis treated with climatic therapy were followed for 6 months (12). There was a significant improvement in functional ability measured by the Stanford Health Assessment Questionnaire, work ability and a significant decrease in pain. There was a general improvement in the patients well being measured by the Nottingham Health Profile Questionnaire. The peak response was immediately after therapy but the improvement persisted after six months.

Many of the studies, however, used subjective measures of improvement (morning stiffness, pain, functional ability). No studies have used validated criteria to determine in a dichotomous manner whether patients have responded to therapy.

In this study, I assessed whether climatic therapy is effective in a large prospective series of patients with inflammatory arthritis. Patients were defined as responders or non-responders according to
internationally defined criteria including criteria of improvement defined by the American College of Rheumatology (ACR) for patients with RA.

Methods

Subjects

The study cohort included patients with inflammatory arthritis (RA, PsA, AS) who underwent climatic therapy at the Tiberias Hot Springs during 2000–1. Patients were selected for climatic therapy by their rheumatologist in Sweden and approved by the district rheumatologist. Therefore, patient selection was nonrandom. Only patients with active disease were analyzed. Active disease was defined as > 1 swollen or tender joint, ≥ 15 minutes of morning stiffness and a pretreatment physician overall assessment of disease activity > 10 (scale 0–100). Since there were few patients with PsA, these patients were analyzed according to their clinical course. Patients with predominant peripheral disease were assessed with RA patients, while those with predominant axial disease were assessed with AS patients.

Primary Outcome Measure

Patients were defined as responders or non-responders according to the definition of improvement for RA and AS. An intent-to-treat analysis was used. Therefore, patients who did not complete the treatment course were considered non-responders.

Response criteria for RA were based on the ACR definition (13). Briefly, these criteria consist of an improvement of at least 20% in both swollen and tender joint count and 20% improvement in 3 of 5 criteria including erythrocyte sedimentation rate (ESR), pain intensity, patient global assessment, physician global assessment and a functional ability questionnaire. Since blood samples were not obtained and functional questionnaires were not administered, a ≥ 20% improvement was necessary in all 3 domains of pain and global assessments (14).

Response criteria for AS were recently defined and validated, although not yet officially accepted by international organizations (15). Response criteria were defined as an improvement of at least 20% (and ≥ 10 units) in 3 of the following 4 criteria: morning stiffness, pain intensity, patient global assessment and functional assessment (Bath AS Functional Index). Since a formal functional assessment was not performed, improvement in all 3 criteria was necessary for a definition of responder.

Secondary outcome measures included each individual parameter of the response criteria as well as morning stiffness (min) and medication changes for patients with RA. For patients with AS: swollen and tender joint count, axial motion and medication changes. Adverse reactions to therapy were recorded.

Statistical Analysis

Descriptive statistics of demographic and disease related data were detailed. Patients were compared for improvement in disease parameters by paired Student’s t-tests. P < 0.05 was considered significant.
Demographic and pretreatment disease characteristics of responders and non-responders were compared by unpaired two-tailed logistic regression. Student’s t-test and chi-square to search for possible predictors of the response to therapy.

Results

Subjects

One hundred-fifty-four patients with inflammatory arthritis were treated during 2000–1. Eighteen patients, 10 with RA and 8 with AS, did not have active disease upon arrival, as previously defined. Therefore, 136 patients were analyzed for the primary outcome measure as responders or non-responders, 83 with a clinical course of RA and 53 with AS (Table I). Seven patients (4 with RA and 3 with AS) returned prematurely to Sweden for a variety of reasons and were not examined at the end of therapy. Therefore, only 129 patients were analyzed for secondary outcome measures, 79 with a clinical course of RA and 50 with AS.

Responders

Forty-seven (57%) of the RA patients were considered responders according to the modified ACR criteria. Eleven (13%) responded at the ACR 20% level, 17 (21%) at the ACR 30% level, 17 (21%) at the ACR 50% level and 2 (2%) patients did not have active disease at the end of therapy. There was no significant change in 25 (30%) of the patients while 7 (8%) patients worsened more than 10% after therapy. Several of those patients developed gastrointestinal and respiratory infections during the 4 weeks of therapy and did not complete their therapeutic plan. Four patients (5%) who returned early to Sweden were considered non-responders. There was a significant improvement in the number of swollen and tender joints, morning stiffness, pain perception, and the overall assessment of disease activity by patients and physician (Table II).

Among patients with AS, 32 (60%) were considered responders. Ten (19%) responded at the 20% level, 12 (23%) at the 30% level, 6 (11%) at the 50% level and 4 (7%) did not show disease activity at the end of therapy. There was no significant change among 15 (28%) of the patients, while 3 (6%) patients worsened more than 10% after therapy. Three patients (6%) who returned early to Sweden were considered non-responders. There was a significant improvement in the number of tender joints, morning stiffness, pain perception, axial motion (all 3 measures), and overall assessment of disease activity by patients and physician (Table III).

Among the RA patients, shorter disease duration (12 vs. 16 years, P = 0.04) and more active disease before therapy were associated with a significantly greater response to therapy (tender joints: 9 vs. 7 joints, P = 0.03; morning stiffness 73 vs. 44 min, P = 0.02). In the AS group, males responded to therapy more than females (23/32 males vs. 9/21 females; P = 0.04). No other demographic or disease-related characteristics were found to predict response in both groups of patients.

Medication changes

There were changes in the medications of 47 (59%) of the RA patients during therapy, including multiple changes in 9 patients. Thirty-seven (47%) patients took less NSAIDs or pain medications and 6 (8%) decreased their daily steroid dose. Six (8%) patients needed more pain medications or NSAIDs and in 3 (4%) patients there was an increase in the steroid dose.

Table I. Demographic and disease-related data of 136 patients with clinical characteristics of RA and AS (mean ±SD; range).

<table>
<thead>
<tr>
<th></th>
<th>RA (N=83)</th>
<th>AS (N=53)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td>F = 67 (81%), M = 16 (19%)</td>
<td>M = 32 (60%), F = 21 (40%)</td>
</tr>
<tr>
<td>Age (yrs):</td>
<td>49.0 ±10.1, 22–66</td>
<td>49.0 ±10.1, 21–66</td>
</tr>
<tr>
<td>Disease duration (yrs):</td>
<td>13.9 ±9.1, 1–42</td>
<td>21.8 ±11.5, 1–44</td>
</tr>
<tr>
<td>Diagnosis:</td>
<td>RA – 61 (73%), PsA – 13 (16%)</td>
<td>AS – 44 (83%), PsA – 8 (15%)</td>
</tr>
<tr>
<td>Initially JCA – 9 (11%)</td>
<td>Reiter’s – 1 (2%)</td>
<td></td>
</tr>
<tr>
<td>Current Drugs:</td>
<td>NSAID: 60 (72%), Prednisolone: 19 (23%)</td>
<td>NSAID: 42 (79%), Prednisolone: 10 (19%)</td>
</tr>
<tr>
<td>Methotrexate:</td>
<td>44 (53%)</td>
<td>Sulfasalazine: 11 (21%)</td>
</tr>
<tr>
<td>Other DMARD:</td>
<td>34 (41%)</td>
<td>Other DMARDs: 3 (6%)</td>
</tr>
<tr>
<td>Anti TNF:</td>
<td>8 (10%)</td>
<td></td>
</tr>
<tr>
<td>DMARD combination:</td>
<td>15 (18%)</td>
<td></td>
</tr>
</tbody>
</table>

RA: rheumatoid arthritis; AS: ankylosing spondylitis; PsA: psoriatic arthritis; JCA: juvenile chronic arthritis; NSAID: non-steroidal antiinflammatory drugs; DMARD: disease modifying antirheumatic drug; TNF: tumor necrosis factor.
Table II. Treatment effects among 79 patients with clinical characteristics of RA: mean ± SD (range).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before Treatment</th>
<th>After Treatment</th>
<th>Difference (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swollen joints</td>
<td>8.5 ± 6.7 (0-34)</td>
<td>5.1 ± 4.4 (0-17)</td>
<td>-25.1 ± 78.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Tender joints</td>
<td>9.3 ± 9.6 (0-56)</td>
<td>4.2 ± 4.5 (0-24)</td>
<td>-24.4 ± 137.4</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>AM stiffness (min)</td>
<td>61.1 ± 59.1 (0-270)</td>
<td>19.8 ± 25.3 (0-105)</td>
<td>-66.6 ± 32.7</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Pain (scale 0–100)</td>
<td>41.9 ± 25.4 (0-90)</td>
<td>21.5 ± 22.1 (0-100)</td>
<td>-20.4 ± 126.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>MD assessment</td>
<td>39.7 ± 17.3 (15-80)</td>
<td>27.7 ± 16.9 (5-80)</td>
<td>-29.2 ± 30.4</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Patient assessment</td>
<td>50.4 ± 20.5 (0-98)</td>
<td>22.6 ± 18.7 (0-78)</td>
<td>-53.2 ± 27.2</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Table III. Treatment effects among 50 patients with clinical characteristics of AS: mean ± SD (range).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before Treatment</th>
<th>After Treatment</th>
<th>Difference (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swollen joints</td>
<td>0.9 ± 1.5 (0-6)</td>
<td>0.8 ± 1.5 (0-8)</td>
<td>-10.5 ± 137.4</td>
<td>NS</td>
</tr>
<tr>
<td>Tender joints</td>
<td>5.8 ± 4.6 (0-25)</td>
<td>3.5 ± 4.0 (0-19)</td>
<td>-39.6 ± 54.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>AM stiffness (min)</td>
<td>72.6 ± 79.6 (0-360)</td>
<td>25.6 ± 408 (0-210)</td>
<td>-58.7 ± 42.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Pain (scale 0–100)</td>
<td>52.6 ± 26.4 (0-100)</td>
<td>29.6 ± 25.1 (0-100)</td>
<td>-14.4 ± 176.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>MD assessment</td>
<td>39.2 ± 20.5 (15-80)</td>
<td>24.0 ± 16.7 (0-65)</td>
<td>-38.2 ± 28.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Patient assessment</td>
<td>51.7 ± 19.4 (20-80)</td>
<td>30.4 ± 25.0 (0-100)</td>
<td>-49.5 ± 34.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Schober’s test (cm)</td>
<td>3 ± 1.4 (1-6)</td>
<td>3.5 ± 1.5 (1-6)</td>
<td>33.1 ± 73.8</td>
<td>0.003</td>
</tr>
<tr>
<td>Occipital-wall (cm)</td>
<td>4.4 ± 4.2 (0-16.5)</td>
<td>2.8 ± 3.6 (0-11.5)</td>
<td>-45.7 ± 42.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Finger-floor (cm)</td>
<td>28.4 ± 15.2 (4-61)</td>
<td>18.6 ±11.2 (4-34)</td>
<td>-45.7 ± 31.7</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Dose. Five joint injections were performed in 3 (4%) patients and 1 patient discontinued cyclosporin.

Among patients with AS, 27 (54%) patients had medications changes, including 5 patients with multiple changes. Twenty-one (42%) patients needed less NSAIDs or pain medications and 3 (6%) patients decreased their daily steroid dose. Six (12%) patients needed more NSAIDs or pain medications. Three joint injections were performed in 2 (4%) patients.

Problems with therapy

Nineteen (15%) patients, 12 with RA and 7 with AS, had mild and transient problems with therapy. Most were related to over-exercise. Eight (6%) patients had mild reactions to balneotherapy and mud baths, including palpitations, rash, a feeling of swelling and claustrophobia.

Discussion

In this first study of climatic therapy using internationally accepted criteria, 57% of the patients with a clinical course of RA and 60% with a clinical course of AS were considered responders at the end of one month of therapy. A profound improvement, of at least 50%, was seen in 23% of RA and 18% of AS patients. However, 40% of the patients did not improve or worsened during therapy. No significant differences were seen between the RA and AS patients in the proportion of responders or in the degree of response.

The proportion of responders is similar to that seen in recent short-term drug studies (16,17), and is significantly greater that the proportion of patients that improve spontaneously, or while receiving a placebo, over the course of one month (16–18). It was interesting that RA responders had a shorter disease duration and more active disease than nonresponders. Drug studies in RA have often found a greater response in early disease than in patients with a prolonged course (19). There were no disease features that differentiated responders from nonresponders among AS patients, but male patients responded more than female. Most AS studies did not find differences in outcome between males and females (20), but a recent study of psoriatic spondyloarthropathy found a poorer functional performance and more aggressive disease in females (21). In a study of the therapeutic effect of exercise in AS, response was not related to disease duration (22).

The patients with PsA were not analyzed as a separate group, since their number was relatively small (N = 21). These patients had 2 clear clinical patterns and were analyzed with RA or AS patients according to their clinical course.

These studies concur with previous studies of balneotherapy, spa and climatic therapy (4–12). However,
none of those studies offered a dichotomous result as responders or non-responder based on well-defined validated criteria. Most of the published studies were of balneotherapy only (4–9). Climatic therapy includes in addition to balneotherapy an intensive multidimensional individualized treatment plan in sunny and dry environments. However, the response to climatic therapy cannot be explained only by the warm environment. Several recent studies have shown that the effect of warm weather on the disease course or even symptoms of inflammatory arthritis is controversial (23,24). Therefore, the benefit of climatic therapy includes many facets of treatment of which warm weather and sun is only one aspect.

An ESR was not obtained and functional questionnaires were not administered (25,26; validated in Swedish for RA and AS, respectively). Therefore the criteria for response was more stringent; a ≥ 20% improvement was needed in all 3 remaining criteria, pain, physician and patient global assessments in RA patients and morning stiffness, pain and patient global assessment in AS patients. The number of responders therefore may have been somewhat underestimated. A recent study in RA has found that not using ESR and functional questionnaires as response criteria subtracts the proportion of responders by only 1–5% (14). In that study, the ESR was considered to be a redundant response criteria. The non-responders in this study would have not been defined as responders even had an ESR and functional questionnaire been obtained since they did not improve in more than one of the minor criteria. Therefore, it is probable that not many responders were overlooked.

The study measured responsiveness immediately at the end of therapy. Formal functional assessment at that time may have not been appropriate since the comparison would have been between function before therapy in Sweden and function at the spa, which may not represent the true functional ability at home. Unfortunately, the scope of this study did not enable long-term follow up since I was unable to follow the patients after they were dispersed in Sweden. Follow-up is important for long-term aspects of disease in addition to activity and damage, for example work ability, medication use and hospitalizations. In a spa-exercise study of patients with AS improvement in functional ability, pain and stiffness persisted for 40 weeks (11). Similar findings were seen in a study of 105 Swedish patients that underwent climatic therapy. Improvement continued for 6 months, although the peak was immediately after therapy and then gradually decreased (12).

It is important for physicians to show that climatic therapy is effective by accepted criteria since therapy is costly and is funded to a large extent by governments and medical insurances. Also, climatic therapy takes patients away from their natural environment (including family and work) for nearly one month.

In summary, the results of this study show an impressive short-term effect of climatic therapy, not less than for most new medications. Future studies should include a randomly selected usual therapy control group with long-term follow-up to see whether improvement is sustained and if parameters such as work ability and hospitalizations are also improved.

References

13. Lipsky PE, van der Heijde DM, St Clair EW, Furst DE,


