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ORIGINAL PAPER

Spa therapy for elderly: a retrospective study of 239 older patients with osteoarthritis

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Abstract Very few studies tested the effectiveness of spa therapy in older patients with osteoarthritis. Therefore, we aimed to evaluate the short-term effects of spa therapy in patients aged 65 years and older with generalized, knee, hip, and cervical and lumbar spine osteoarthritis. In an observational retrospective study design at the Medical Ecology and Hydroclimatology Department of Istanbul Medical Faculty, we analyzed the records of 239 patients aged over 65 years with the diagnosis of all types of osteoarthritis who were prescribed a spa therapy course in some spa resorts in Turkey between 7 March 2002 and 31 December 2012. They travelled to a spa resort where they stayed at a thermal spa hotel and followed the usual therapy packages for 2 weeks. Patients were assessed by an experienced physician within a week before the spa journey and within a week after the completion of the spa therapy. Compared with baseline in whole sample, statistically significant improvements were observed in pain (visual analog scale, VAS), patient and physician global assessments (VAS), Health Assessment Questionnaire disability index (HAQ-DI), Lequesne algofunctional index (LAFI) for knee, Western Ontario and McMaster Universities index (WOMAC), Waddell disability index (WDI), and Neck Pain and Disability Scale (NPAD). According to Outcome Measures in Rheumatology—Osteoarthritis Research Society International (OMERACT-OARSI) Set of Responder Criteria, responder rate were 63.8 % (51/80) in generalized, 52 % (13/25) in knee, 50 % (2/4) in hip, 66.7 % (8/12) in lumbar, and 100 % (6/6) in cervical osteoarthritis subgroups. Spa therapy improved pain and physical functional status in older patients with osteoarthritis, especially generalized osteoarthritis and multiple joint osteoarthritis with involvement of knee. This improvement was clinically important in majority of the patients. To confirm the results of this preliminary study, there is a need of a randomized controlled clinical study comparing spa therapy with usual care in the elderly population with osteoarthritis.

Keywords Spa therapy · Balneotherapy · Osteoarthritis · Geriatrics · Elderly

Abbreviations

OA	Osteoarthritis
OARSI	Osteoarthritis Research Society International
VAS	Visual analog scale
HAQ-DI	Health Assessment Questionnaire disability index
LAFI	Lequesne algofunctional index
WOMAC	Western Ontario and McMaster Universities index
WDI	Waddell disability index
NPAD	Neck Pain and Disability Scale
PGA	Patient global assessments
MDGA	Physician global assessments
OMERACT	Outcome Measures in Rheumatology
SD	Standard deviation

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SPSS	Statistical Package for the Social Sciences
EULAR	European League Against Rheumatism
TLAR	Turkish League Against Rheumatism

Introduction

Osteoarthritis (OA) is a disorder involving synovial joints characterized by cartilage degradation, bone remodeling, osteophyte formation, joint inflammation, and loss of normal joint function (Kraus et al. 2015). OA may arise in any movable joints but the knee, hip, and hand are the most affected sites by the disease (Kraus et al. 2015; Bijlsma et al. 2011). Over the age of 65 years, 60 % of men and 70 % of women have OA of some joints and the prevalence of OA increases with age (Sarzi-Puttini et al. 2005). A 2010 study on the global burden of the disease estimated that hip and knee OA was the 11th highest causes of disability and 38th highest in disability-adjusted life years (Cross et al. 2014). According to the United Nations, by 2015, people aged 65 years or older constitute 8.3 % of the world population and that proportion is expected to almost double to 16.0 % in 2050 (UN 2015). The aging of population in the world will result in increased burden of OA on patients, society, and economy in the future. Therefore, treatment of OA has gained more importance and interest. There are three treatment modalities for management of OA: non-pharmacological, pharmacological, and surgical. Since no curative therapies exist for OA, both pharmacological and non-pharmacological treatment modalities focus on the reduction of pain and stiffness and on the maintenance and improvement of joint function (Bijlsma et al. 2011). Considering that the effective therapeutic options for OA is still limited, and taking into account the recent clinical trials on the effectiveness of spa therapy in OA, spa therapy seems to have a role in the management of this condition (Tenti et al. 2015; Fortunati et al. 2016).

Spa therapy involves all medical activities in spa resort and is a widely used non-pharmacological tool for the management of musculoskeletal disorders (Gutenbrunner et al. 2010; Karagülle and Karagülle 2015) Balneotherapy as the central treatment modality in spa therapy regimens involves immersion in warm (thermal) mineral waters. In Turkey, balneotherapy is the sole intervention in most of the spas, but in some spas, massage, exercise, and Turkish bath (hamam) are frequently used and combined in spa therapy packages (Karagülle and Karagülle 2004). In addition, it is believed that health-promoting spa environment plays a role in the efficacy of spa therapy (Gutenbrunner et al. 2010). In the last decade, there has been increasing number of published studies in peer-reviewed journals that suggest the therapeutic effect of spa therapy and balneotherapy in OA. In the recent Cochrane systematic review, despite that most studies presented positive findings, a firm answer about the effectiveness of spa therapy and balneotherapy for treating OA cannot be provided because of the methodological flaws of the studies (Verhagen et al. 2007). On the other hand, in the 2014 OA Research Society International (OARSI) guidelines for the management of knee OA, balneotherapy was among the recommended treatment modalities that were considered appropriate for patients with multiple joint OA and comorbidities (McAlindon et al. 2014).

Even though the quantity and quality of recent studies testing the effectiveness of spa therapy in treatment of OA have been increased, very few of them specifically focused on elder patients with OA (Gaal et al. 2008; Karagülle and Karagülle 2000; Masiero 2008) This population, however, deserves much more attention for research due to their increasing proportion in the world population. Therefore, we aimed to evaluate the clinical effect of spa therapy as applied in daily practice according to the healthcare system in elderly patients (aged 65 years and older) with generalized, knee, hip, and cervical and lumbar spine OA.

Method

Study design and population

We conducted a retrospective observational study, among the out-patient population of the Department of Medical Ecology and Hydroclimatology at the Istanbul University, analyzing the records of the patients 65 years and older who had the diagnosis of OA and who were prescribed a spa therapy course for the management of OA between 7 March 2002 and 31 December 2012. Subjects were excluded if they had OA coexisting with other joint diseases, such as inflammatory arthritis. For patients who had received multiple courses of spa therapy, only the first course was included in the analysis.

The Locomotor Diseases Outpatient Clinic at the Department of Medical Ecology and Hydroclimatology of Istanbul Medical Faculty of Istanbul University annually cares for more than 6000 patients with a wide spectrum of musculoskeletal disorders and provides the pharmacological and non-pharmacological treatment options depending upon their clinical status and need. Non-pharmacological treatment options include patient education, home exercise, ambulatory balneological treatments comprising balneotherapy, hydrotherapy and peloidotherapy at the Balneological Treatment Unit of the department and spa therapy at a spa resort. After giving an informed consent, all patients who are prescribed a spa therapy are examined by an experienced physician and asked to fill out the outcome measure questionnaires within a week before the spa visit and within a week after the completion of spa therapy. Later, these obtained data, including descriptive characteristics, diagnoses, and responses from the

questionnaires, have been recorded into our database since 7 March 2002.

In the clinic, we diagnose knee, hand, and hip OA according to the criteria of the American College of Rheumatology for knee (Altman et al. 1986), hip (Altman et al. 1991), and hand OA (Altman et al. 1990) based on using clinical examination, laboratory tests, and radiographs criteria; clinical plus radiographic criteria; and clinical criteria, respectively. Cervical or lumbar spine OA is diagnosed if patient has at least one typical symptom and graphics showing osteophyte formation (Muraki et al. 2012). Generalized OA is diagnosed based on the Lawrence (1969) definition (three or more joint sites). In our practice, if a patient has at least one typical symptom of knee, hip, or spine OA including pain, morning stiffness, decreased joint function, and crepitus, we obtain X-rays to confirm the diagnosis and to determine the radiological grade.

Interventions

Traditionally, spa therapy has been applied as two balneotherapy sessions (10–30 min at 38–40 °C) everyday for 2 weeks, in most Turkish spas (Karagülle and Karagülle 2004). Other spa therapy modalities including massage, exercise, and Turkish bath (hamam) are undertaken according to usual therapy packages in each spa resort.

Outcome measures

Pain intensity and patient and physician global assessments were measured with visual analog scale (VAS). To measure the patients' physical functional status, the Health Assessment Questionnaire disability index (HAQ-DI) was used for all OA patients, Lequesne algofunctional index (LAFI) for knee and hip OA, Western Ontario and McMaster Universities index (WOMAC) for knee OA, Waddell disability index (WDI) for lumbar OA, and Neck Pain and Disability Scale (NPAD) for cervical OA.

Pain, patient global assessments (PGA), and physician global assessments (MDGA) were evaluated with a 100-mm VAS where 0 indicates no pain or best and 100 indicates the most intense pain imaginable or worst (Huskisson 1974).

HAQ-DI is used to evaluate functional disability status in eight categories: dressing, rising, eating, walking, hygiene, reach, grip, and usual activities. This questionnaire includes 20 items and for each item, there is a four-level response set that is scored from 0 to 3, where 0 means without any difficulty and 3 is unable to do. The eight category scores are summed and averaged into an overall disability from 0 to 3, where 3 is very severe disability (Bruce and Fries 2005). HAQ-DI was found to show validity and internal consistency in patients with generalized OA (Cuperus et al. 2015).

LAFI is used to determine the pain and functional severity of either knee or hip OA with an 11-item questionnaire grouped into three parts: pain, maximum walking distance, and some activities of daily living. The total score ranges from 0 to 24, in which higher scores indicate severe involvement (Lequesne 1997).

WOMAC is used to assess patients with OA in clinical trials. This questionnaire consists of 24 items in three dimensions (pain 5 items; stiffness 2 items; and physical function 17 items) (Bellamy et al. 1988). We used the Likert-scale format and for each item, there is a five-level response set representing different degrees of intensity that is scored from 0 to 4, where 0 means none and 4 is extreme. For the interpretation, the scores for items in each subscale are summed to obtain subscale scores (score range for pain 0–20, stiffness 0–8, function 0–68) and higher scores indicate worse pain, more stiffness, and greater functional limitation (McAlindon et al. 2015).

WDI is used to evaluate basic physical activities of daily living commonly restricted by low back pain. It is a nine-item dichotomous (yes/no) questionnaire on lifting, sitting, travelling, standing, walking, sleeping, social activity, sexual activity, and putting on footwear. The Waddell score is calculated by adding up the yes answers and total score ranges from 0 to 9, in which higher values represent greater disability (Waddell and Main 1984).

NPAD, the 20-item questionnaire, is used to measure the intensity of neck pain, its interference with the vocational, recreational, social and functional aspects of living and the existence and extent of related emotional factors. Each item is responded by marking along a 100-mm VAS with six major divisions. Scoring of each item varies along a continuous scale from 0 to 5. The NPAD score is calculated by summing the score of all items and total score ranges from 0 to 100, wherein higher scores indicate more pain and disability (Wheeler et al. 1999).

Outcome Measures in Rheumatology (OMERACT)-OARSI set of responder criteria is used to present the results of changes after treatment in three symptomatic domains (pain, function, and patient global assessment) as a single variable for clinical trials on OA of the knee and hip (Pham et al. 2004). We used VAS to measure pain and patient global assessment in knee, hip, lumbar, cervical, and generalized OA. To measure the function, we used WOMAC function in knee and LAFI in hip, as recommended by the criteria. Although this criteria set was developed for clinical trials of knee and hip OA, we additionally used this set of responder criteria for lumbar, cervical, and generalized OA by adapting and using WDI, NPAD, and HAQ-DI, respectively, to measure function. Patient was considered as a responder if he/she has high improvement in pain or function ≥50 % and absolute change ≥20 (on a 0–100 scale). If the patient does not have such a high improvement but has an improvement in at least

two of the three domains (pain, function, patient global assessment) ≥20 % and absolute change ≥10, he/she is also considered as a responder (Pham et al. 2004).

Statistical methods

Descriptive characteristics of patients are presented as mean and standard deviation (SD) for continuous variables and as frequency and percentage for categorical variables. The outcome measures are expressed as mean and SD or median and range. Normality of distribution of these measures was evaluated with the one-sample Kolmogorov-Smirnov test. Then, the parametric paired *t* test for normally distributed data and the non-parametric Wilcoxon signed-rank test for skewed data and subgroups with small sample sizes were used to compare the differences between pretreatment and posttreatment measures. All statistical analyses were performed with Statistical Package for the Social Sciences (SPSS) for Windows version 21.0 (IBM SPSS Statistics, IBM Corporation, Armonk, NY). *p* Values less than 0.05 were considered statistically significant.

Results

During the 10-year period from 7 March 2002 to 31 December 2012, we identified a total of 1364 spa therapy courses prescribed to 832 patients. Of these patients, 582 were excluded because they were lower than 65 years of age. Patients were then excluded if they had no recorded diagnosis of OA or if diagnosis of coexisting inflammatory arthritis was present. Thus, a total of 239 patients were analyzed as illustrated in the flow diagram (Fig. 1). The descriptive characteristics of these patients are summarized in Table 1. The majority of patients were women (63.6 %), and the mean age was

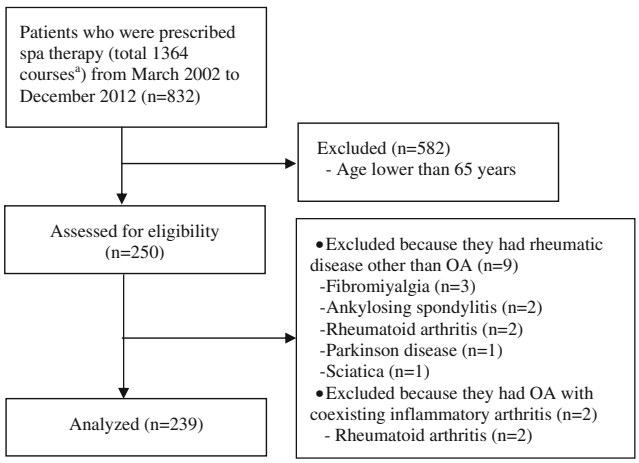

Fig. 1 Flow diagram of study population. *OA* osteoarthritis. [a]Patients who had received multiple courses of spa therapy, only the first course was included in the analysis

Table 1 Characteristics of the patients

Age (years)	72.3 ± 5.6
Sex, *n* (%)	
Female	152 (63.6 %)
Male	87 (36.4 %)
Weight (kg)	73.8 ± 10.9
Height (cm)	162.9 ± 8.3
Body mass index (kg/m^2)	27.8 ± 3.9

The data are expressed as mean ± standard deviation, unless otherwise indicated

72.3 years. The distribution of diagnoses, as shown in Table 2, was 124 generalized, 42 two-joint site, 39 knee, 18 lumbar, 11 cervical and 5 hip OA. The spa resorts, where the patients had undertaken spa therapy, and main chemical compositions of thermal mineral waters, which are used in balneotherapy at those spa resorts, are listed in Table 3. Majority (67.8 %) were submitted to Gönen Spa Resort mostly then to Karahayıt (17.6 %) and Balçova (4.2 %) and the rest (10.4 %) to other seven different resorts. The changes in outcome measures are detailed in Table 4.

Pain The VAS pain scores were decreased significantly as compared with baseline in whole sample ($p < 0.001$), generalized ($p < 0.001$), knee ($p = 0.001$), multiple joint with involvement of knee ($p < 0.001$), and lumbar ($p = 0.016$) OA subgroups (Table 4). Although the VAS pain scores decreased in cervical OA, the difference was not statistically significant ($p = 0.058$) (Table 4).

Table 2 Recorded diagnoses of patients

Diagnosis	Number of patients (%)
One joint site osteoarthritis	
Knee osteoarthritis	39 (16.3 %)
Lumbar osteoarthritis	18 (7.5 %)
Cervical osteoarthritis	11 (4.6 %)
Hip osteoarthritis	5 (2.1 %)
Subtotal	73 (30.5 %)
Multiple joint sites osteoarthritis	
Generalized osteoarthritis	124 (51.9 %)
Knee and lumbar osteoarthritis	22 (9.2 %)
Knee and cervical osteoarthritis	8 (3.3 %)
Lumbar and cervical osteoarthritis	6 (2.5 %)
Hip and lumbar osteoarthritis	3 (1.3 %)
Knee and hip osteoarthritis	2 (0.8 %)
Hip and cervical osteoarthritis	1 (0.4 %)
Subtotal	166 (69.5 %)
Total	239 (100 %)

Table 3 Spa resorts and main chemical compositions of thermal mineral waters used in balneotherapy

Spa resort	Total mineralization, and main constituents of thermal mineral waters	Number of patients (%)
Gönen	1796 mg/L rich in sodium, sulfate, bicarbonate, chloride, fluoride	162 (67.8)
Karahayıt	3257 mg/L rich in CO_2, calcium, sulfate, bicarbonate, fluoride	42 (17.6)
Balçova	1571 mg/L rich in sodium, bicarbonate, metasilicate	10 (4.2)
Bursa	567 mg/L rich in sodium, calcium, magnesium, bicarbonate, metasilicate	7 (2.9)
Yoncalı	806 mg/L rich in calcium, magnesium, sulfate, bicarbonate, fluoride	6 (2.5)
Bolu	1744 mg/L rich in calcium, sulfate, bicarbonate, CO_2, fluoride, metasilicate	4 (1.7)
Afyon	1713 mg/L rich in sodium, sulfate, bicarbonate, fluoride, metasilicate	3 (1.3)
Oylat	566 mg/L rich in calcium, magnesium, bicarbonate	3 (1.3)
Edremit	2774 mg/L rich in sodium, calcium, sulfate, fluoride	1 (0.4)
Armutlu	968 mg/L rich in sodium, calcium, sulfate, bicarbonate, metasilicate	1 (0.4)
Total		239 (100)

CO_2 carbon dioxide

Patient and physician global assessments Whole sample ($p < 0.001$), generalized ($p < 0.001$), knee ($p = 0.022$), multiple joint with involvement of knee ($p < 0.001$), lumbar ($p = 0.009$), and cervical ($p = 0.046$) OA subgroups showed significant improvements in VAS patient global assessment scores after spa therapy (Table 4). Similarly, whole sample and all subgroups except hip OA subgroup (p = N/A) showed significant improvements in VAS *physician* global assessment scores (Table 4).

Health assessment questionnaire disability index Whole sample and generalized OA subgroup showed significant improvements in HAQ-DI scores compared with baseline ($p < 0.001$) (Table 4).

Western Ontario and McMaster universities index The WOMAC pain, stiffness, function, and total scores decreased significantly compared with baseline in whole sample and multiple joint with involvement of knee OA subgroup ($p < 0.001$) (Table 4). There were no significant differences in knee OA subgroup ($p = 0.876$, 0.204, 1.000, and 0.652, respectively) (Table 4).

Lequesne algofunctional index (knee) The LAFI for knee scores decreased significantly after spa therapy in whole sample and multiple joint with involvement of knee OA subgroup (<0.001), whereas LAFI scores also decreased in knee OA subgroup without statistical significance ($p = 0.080$) (Table 4).

Lequesne algofunctional index (hip) Although LAFI for hip scores decreased in whole sample and hip OA subgroup, the differences were not statistically significant ($p = 0.066$ and 0.180, respectively) (Table 4).

Waddell disability index WDI scores decreased in whole sample and lumbar OA subgroup, although this decrease was significant only in the whole sample ($p = 0.002$ and 0.057, respectively) (Table 4).

Neck Pain And Disability Scale Whole sample and cervical OA subgroup showed significant improvements in NPAD scores compared with baseline ($p < 0.001$ and $p = 0.046$, respectively) (Table 4).

OMERACT-OARSI responder criteria The responder rate was 63.8 % (51/80) in generalized, 52 % (13/25) in knee, 50 % (2/4) in hip, 66.7 % (8/12) in lumbar, and 100 % (6/6) in cervical OA subgroups, and 62.9 % (80/127) in all groups (Table 5).

Discussion

To our knowledge, this study is the first of its kind aimed to evaluate the clinical effect of spa therapy in elderly patients (aged 65 years and older) with OA including generalized, multiple joint with involvement of knee, knee, hip, and cervical and lumbar spine OA subgroups. We found significant improvements in all assessed parameters except LAFI for hip after spa therapy in whole sample. Detailed analysis of each subgroup separately showed significant reduction in pain scores in generalized, knee, multiple joint with involvement of knee, and lumbar spine OA patients and significant improvement in function in generalized, multiple joint with involvement of knee, and cervical OA subgroups. Similar improvements were seen in patient and physician global assessments in all subgroups. Additionally, majority of patients met the OMERACT-OARSI's set of responder criteria indicating clinically relevant improvement.

In a previous study, Gaal et al. (2008) investigated the effect of balneotherapy on degenerative knee and spine conditions in the elderly. They involved 81 patients (41 knee OA

Table 4 The outcomes of the study population

Outcome	Whole sample	Generalized OA	Knee OA	Multi-joint with knee	Hip OA	Lumbar OA	Cervical OA
Pain VAS							
n	151	81	24	99	*3*	*11*	*6*
Before	64.70 ± 19.65	67.54 ± 19.87	59.13 ± 19.71	66.53 ± 20.02	*70.00 (67–75)*	*61.00 (37–90)*	*64.00 (20–85)*
After	39.76 ± 22.46	40.25 ± 24.20	36.67 ± 21.36	40.06 ± 23.05	*72.00 (48–88)*	*38.00 (6–70)*	*28.00 (14–58)*
Difference	24.91(20.37 to 29.45)	27.30(20.93 to 33.66)	22.46 (9.71 to 35.21)	26.47(20.75 to 32.18)	*−5.00 (−13.00–22.00)*	*23.00 (−8.00–58.00)*	*26.00 (−10.00–51.00)*
p Value	<0.001	<0.001	0.001	<0.001	*N/A*	*0.016*[a]	*0.058*[a]
PGA VAS							
n	151	81	24	99	*3*	*11*	*6*
Before	61.83 ± 19.67	64.37 ± 20.53	53.08 ± 19.85	63.76 ± 20.14	*84.00 (63–93)*	*61.00 (37–89)*	*54.50 (44–82)*
After	38.00 ± 21.00	37.26 ± 22.68	40.08 ± 19.34	37.24 ± 21.91	*68.00 (47–82)*	*41.00 (7–67)*	*26.00 (11–55)*
Difference	23.83(19.47 to 28.19)	27.11(20.68 to 33.54)	13.00 (2.03 to 23.98)	26.52(20.96 to 32.07)	*2.00 (−5.00–46.00)*	*25.00 (−6.00–55.00)*	*25.50 (−2.00–64.00)*
p Value	<0.001	<0.001	0.022	<0.001	*N/A*	*0.009*[a]	*0.046*[a]
MDGA VAS							
n	145	79	23	97	*2*	*10*	*5*
Before	59.92 ± 17.44	62.06 ± 18.38	54.87 ± 17.06	61.22 ± 18.50	*69.00 (61–77)*	*65.00 (34–77)*	*52.00 (45–74)*
After	35.02 ± 19.41	34.91 ± 20.08	34.35 ± 18.05	35.16 ± 20.01	*57.50 (50–65)*	*34.00 (8–68)*	*27.00 (9–48)*
Difference	24.90(20.71 to 29.10)	27.15(21.28 to 33.02)	20.52 (9.13 to 31.92)	26.05(20.80 to 31.31)	*11.50 (−4.00–27.00)*	*33.50 (−8.00–63.00)*	*26.00 (5.00–56.00)*
p Value	<0.001	<0.001	0.001	<0.001	*N/A*	*0.032*[a]	*0.043*[a]
HAQ-DI							
n	152	83					
Before	0.94 ± 0.52	1.03 ± 0.54					
After	0.74 ± 0.47	0.84 ± 0.52					
Difference	0.20 (0.13 to 0.27)	0.19 (0.09 to 0.28)					
p Value	<0.001	<0.001					
WOMAC pain							
n	*134*		22	93			
Before	*10.00 (0–20)*		8.86 ± 4.34	10.63 ± 4.72			
After	*8.50 (0–18)*		9.00 ± 3.12	8.38 ± 4.22			
Difference	*1.00 (−13.00–15.00)*		−0.14 (−1.93 to 1.66)	2.26 (1.24 to 3.27)			
p Value	*<0.001*[a]		0.876	<0.001			
WOMAC stiff.							
n	*134*		21	*94*			
Before	*4.00 (0–9)*		3.38 ± 1.63	*4.00 (1–8)*			
After	*3.50 (0–7)*		3.86 ± 1.53	*3.50 (0–7)*			
Difference	*0.50 (−4.00–7.00)*		−0.48 (−1.23 to 0.28)	*1.00 (−4.00–5.00)*			

Table 4 (continued)

Outcome	Whole sample	Generalized OA	Knee OA	Multi-joint with knee	Hip OA	Lumbar OA	Cervical OA
p Value	*<0.001*[a]		0.204	*<0.001*[a]			
WOMAC func.							
n	132		22	91			
Before	34.09 ± 15.27		31.91 ± 14.39	35.58 ± 15.69			
After	28.60 ± 13.94		31.91 ± 12.77	29.40 ± 14.18			
Difference	5.49 (2.84 to 8.14)		0.00 (−7.46 to 7.46)	6.19 (3.07 to 9.31)			
p Value	<0.001		1.000	<0.001			
WOMAC total							
n	132		21	91			
Before	47.79 ± 21.05		44.00 ± 19.94	50.29 ± 21.47			
After	39.99 ± 18.81		46.05 ± 15.28	40.93 ± 19.09			
Difference	7.80 (4.28 to 11.31)		−2.05 (−11.37 to 7.28)	9.35 (5.13 to 13.57)			
p Value	<0.001		0.652	<0.001			
LAFI for knee							
n	106		23	82			
Before	11.97 ± 4.59		11.57 ± 4.76	12.18 ± 45.09			
After	9.96 ± 4.48		9.91 ± 4.25	10.03 ± 4.57			
Difference	20.05 (12.59 to 27.50)		1.65 (−0.22 to 3.52)	21.46 (13.20 to 29.73)			
p Value	<0.001		0.080	<0.001			
LAFI for hip							
n	32				*4*		
Before	11.53 ± 5.14				*11.00 (10–15)*		
After	9.41 ± 4.17				*10.50 (4–15)*		
Difference	21.25 (−0.15 to 44.03)				*0.50 (0.00–6.00)*		
p Value	0.066				*0.180*[a]		
WDI							
n	*98*					*11*	
Before	*7.00 (0–14)*					*7.00 (3–9)*	
After	*7.00 (0–9)*					*7.00 (0–9)*	
Difference	*1.00 (−5.00–9.00)*					*1.00 (−2.00–7.00)*	
p Value	*0.002*[a]					*0.057*[a]	
NPAD							
n	57						*6*
Before	46.81 ± 19.86						*52.00 (20–63)*
After	38.14 ± 19.26						*25.00 (16–40)*

Table 4 (continued)

Outcome	Whole sample	Generalized OA	Knee OA	Multi-joint with knee	Hip OA	Lumbar OA	Cervical OA
Difference	8.67 (3.83 to 13.50)						*21.00 (−3.00–37.00)*
p Value	<0.001						*0.046*[a]

Normal font: before-after variables are expressed as mean ± standard deviation; difference variables as mean (95 % confidence interval). Paired-*t*-test is used. Italic font: WOMAC pain and WDI in whole sample; WOMAC stiffness in whole sample and multi-joint OA with knee; all parameters of hip and lumbar and cervical OA. Before-after and difference variables are expressed as median (minimum–maximum)

OA Osteoarthritis, *VAS* visual analog scale, *PGA* patient global assessment, *MDGA* physician global assessment, *HAQ-DI* Health Assessment Questionnaire disability index, *WOMAC* Western Ontario and McMaster Universities Index, Stiff Stiffness, *Func* function, *LAFI* Lequesne algofunctional index, *WDI* Waddell disability index, *NPAD* Neck Pain and Disability Scale, *N/A* not applicable

[a] Wilcoxon signed-rank test is used

Table 5 The responder rate according to OMERACT-OARSI criteria

Osteoarthritis subgroup	Responders, n (%)
Generalized osteoarthritis	51 (63.8 %)
Knee osteoarthritis	13 (52 %)
Hip osteoarthritis	2 (50 %)
Lumbar osteoarthritis	8 (66.7 %)
Cervical osteoarthritis	6 (100 %)
Total	80 (62.9 %)

OMERACT Outcome Measures in Rheumatology, *OARSI* Osteoarthritis Research Society International

and 40 chronic degenerative low back pain) and tested the efficacy of balneotherapy in a daily living environment; in other words, patients continued their daily routine during therapy period. Distinct from this trial, we included a study population representing a wider spectrum of OA subgroups, and in our study, balneological treatment modalities was undertaken at a spa resort by journeying and staying at that resort and this led to changes in environmental and social milieu. Although the balneological treatment modalities differed in these two trials as balneotherapy and spa therapy, they both displayed beneficial effects on OA in the elderly.

Besides evaluation of the spa therapy with measuring pain intensity, physical functional status, and patient global assessment, we also assessed spa therapy with an OMERACT-OARSI's set of responder criteria for a clinically important improvement evaluation. Interestingly, majority of the patients in all groups (62.9 %) met the criteria. Similarly, Erol et al. (2015) also used this criteria set in a trial assessing the benefit of spa therapy for generalized OA and found 41 % of the patients met the OMERACT-OARSI's set of responder criteria at the end of therapy.

Taking only the publications into consideration that have tested the effects of spa therapy in patients with OA (Nguyen et al. 1997; Karagülle et al. 2007; Forestier et al. 2010; Fioravanti et al. 2010), they, in general, reported beneficial therapeutic results in short and long term. Nguyen et al. (1997) reported that spa therapy of 3-week duration has a prolonged (6 months), beneficial, symptomatic effect in patients with lumbar spine, knee, and hip OA in general and lumbar and knee OA subgroups. We have earlier demonstrated that a 10-day spa therapy course would provide short and long-term (up to 6 months) improvements in pain and functional status of a younger age (mean 57.3 years) population of patients with severe knee OA (Karagülle et al. 2007). In a large randomized multicenter trial in patients with knee OA, Forestier et al. (2010) demonstrated that a 3-week course of spa therapy, together with home exercises and usual pharmacological treatments, offers benefit after 6 months compared with exercises and usual treatment alone. Fioravanti et al. (2012) showed that the beneficial effects of

2-week cycle of spa therapy in patients with knee OA lasts over time (3 months) with positive effects on the painful symptomatology and a significant improvement in functional capacities and quality of life. Even though direct comparison of our study is limited by differences in study design, in type-intensity-period of spa therapy intervention and especially in age of study population, our results are in accordance with these earlier studies, in particular, with Nguyen et al.'s trial (1997) in which subgroup analysis reached statistical significance in lumbar and knee but not hip OA subgroup, which is also the case in our study. Since their study and ours included a low number of hip OA patients, as they suggested with a larger sample size, the beneficial effects of spa therapy could possibly be demonstrated.

In a most recent network meta-analysis of all non-pharmacological treatments for knee OA, Corbett et al. (2013) found that balneotherapy along with acupuncture were the two interventions with the highest rank, a probability statistic calculated from the treatment effect distributions. A meta-analysis (Falagas et al. 2009) and several systematic reviews (Brosseau et al. 2002; Verhagen et al. 2007; Forestier and Françon 2008; Harzy et al. 2009) evaluating the effectiveness of balneotherapy/spa therapies in OA patients have also been published last decade. The authors of these publications in general conclude that nearly all studies provide promising evidence to suggest a therapeutic effect and safety of spa therapy and balneotherapy in patients with OA, but the heterogeneity in design and methodological flaws of included studies preclude drawing definitive conclusion.

Balneotherapy and spa therapy have been recommended in recent evidence-based clinical practice guidelines for the management of knee OA (McAlindon et al. 2014; Jordan et al. 2003; Tuncer et al. 2012). In the recent OARSI guidelines for the non-surgical management of knee OA, balneotherapy/spa therapy was among the recommended treatment modalities that were considered appropriate for patients with multiple joint OA and comorbidities (McAlindon et al. 2014). With evidence-based approach to the management of knee OA earlier, European League Against Rheumatism (EULAR) recommendations in 2003 has included spa therapy for evaluation among the non-pharmacological treatment modalities of knee OA but not included in recommendations (Jordan et al. 2003). Recently, in a consensus report published by the Turkish League Against Rheumatism (TLAR) for evidence-based recommendations for the management of knee OA, at least 2 weeks of balneotherapy is strongly recommended (Tuncer et al. 2012). Our study results are in accordance with latest OARSI and TLAR recommendations, confirming that patients with multiple joint OA including knee in older age have shown relevant clinical improvement in pain and function after spa therapy. Additionally, our study patients who benefited from spa therapy might have comorbidities, but we cannot clarify this possibility since we did not have sufficient information about the comorbidities of the patients in the data records we used in our study.

Several limitations of our study need to be discussed. The main limitation of our study is its retrospective design, in which its reliability is lower compared with a prospective study. Additionally, since no control group was available, we compared the differences between pretreatment and posttreatment measures. The assessing physicians were aware of the patients' treatment status; however, the outcome measures (except physician global assessments) are unlikely to be influenced by a lack of physician blinding. We could not provide any information about the adverse effects of spa therapy since they were either not reported to the physician or not recorded. Therefore, the safety of spa therapy is not evaluated. Furthermore, some characteristics of patients were missing. For example, we cannot comment on the possibility of presence of coexisting comorbidities since these data had not been recorded systematically. Lastly, although the study sample was relatively large, hip OA subgroup was too small to demonstrate any effect of therapy.

Conclusion

Spa therapy improved pain and physical function and general well-being in patients over 65 years with OA, especially generalized OA and multiple joint OA with involvement of knee. When assessed using an OMERACT-OARSI set of responder criteria, this improvement was clinically important in majority of the patients of nearly all OA subgroups. To confirm the results of this preliminary study, there is a need for a randomized controlled clinical study comparing spa therapy with usual care in the elderly population with OA.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

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