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PROLONGED EFFECTS OF 3 WEEK THERAPY IN A SPA RESORT ON LUMBAR SPINE, KNEE AND HIP OSTEOARTHRITIS: FOLLOW-UP AFTER 6 MONTHS. A RANDOMIZED CONTROLLED TRIAL

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SUMMARY

Spa therapy is frequently used in daily rheumatological practice, but its benefit remains to be evaluated. A prospective randomized controlled study was conducted in 1993 in patients with osteoarthritis of the hip, knee or lumbar spine. Treatment was either spa therapy at Vichy (France) of 3 weeks duration (spa group) or usual therapy (control group). Assessment criteria were pain (visual analogue scale), functional impairment (Lequesne's index for hip or knee disease, Main and Waddell's for lumbar spinal diseases), quality of life index [revised Arthritis Impact Measurement Scale ($AIMS_2$)], and analgesic and/or non-steroidal anti-inflammatory drug (NSAID) consumption. Patients were included by randomization into one of the two arms (spa or control) and assessment criteria were collected before spa therapy or the control period, and 3 and 24 weeks thereafter. A total of 188 patients (lumbar spine 95, knee 64, hip 29) were included in the study (spa group 91, control group 97). Changes in the assessment criteria after a 6 month follow-up period showed improvement in terms of pain, functional impairment and quality of life, with a reduced intake of symptomatic drugs (NSAID and analgesic drugs) in the spa group. This study suggests that spa therapy of 3 weeks duration has a prolonged, beneficial, symptomatic effect in osteoarthritis.

KEY WORDS: Spa therapy, Controlled trial, Osteoarthritis.

OSTEOARTHRITIS (OA) is a frequent, heterogeneous illness. Treatment has so far aimed at improving clinical status in the absence of known aetiology and in the absence of any demonstrated chondromodulating drug.

When surgery is not indicated, symptomatic drugs such as analgesic or non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used, sometimes for long-term treatment. Adverse events are not rare, however, and are potentially severe, explaining why some patients try other treatments such as spa therapy in the hope of long-term clinical improvement with a reduced intake of symptomatic drugs.

The use of spring water in therapy is as old as the history of medicine. Since Roman times, there has been a strong tradition of water cures. Traditionally, and especially empirically, the therapeutic value and the indications of thermal spring waters were linked to its composition and mineral concentration, as well as to the temperature of the water. Thus, different spas are recommended for disorders of the gastrointestinal tract, of the respiratory system or for ear–nose–throat, skin, gynaecological or rheumatological disorders. All spas, however, seem to be recommended for rheumatological diseases and sequelae of osteoarticular trauma, whether the water is sulphurous, bicarbonate, sodium chloride, bicarbonate-chloride, or other.

Experiments [1–4] aiming to demonstrate cutaneous passage of various minerals or their effect on a visceral function are thus not valid to demonstrate a therapeutic effect in rheumatic disorders. Only clinical evaluation can serve as a basis for such evaluation.

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Many studies [5–10] have tried to assess the therapeutic value of water cures in rheumatism. Their effect on habits of medical prescription is poor, however, for a number of reasons. Among these are the high variations in the tradition of water cures among countries (stronger in France, Germany, Italy and Eastern Europe than in the USA), the lack of or perfunctory teaching of balneotherapy in medical schools, confusion between experimental studies and the pragmatic demands of patients, as well as certain promotional and economic aspects. In fact, it appears that the poor scientific basis of most clinical evaluations is mainly at fault.

Most studies are retrospective and include much methodological bias that makes them uninterpretable. Only two randomized, controlled studies similar to clinical trials used in testing drugs are of note: one, a study on the therapeutic value of the water of the Dead Sea in rheumatoid polyarthritis and arthrosis, showed the short- and mid-term superiority of treatment with this seawater over tap water [11]; the second, evaluated at Bains les Bains on chronic low back pain, showed a greater effectiveness of spa treatment than of lack of treatment in a control group, with both a short-term effect and residual effects 9 months after treatment [12].

It appeared necessary to evaluate further spa therapy, which is frequently used in daily rheumatological practice. The aim of this study was to assess the carry-over symptomatic effect of spa therapy in OA patients.

PATIENTS AND METHODS

Patients

Patients with knee or hip OA (American College of Rheumatology criteria) [13, 14], or lumbar spine OA (defined on X-ray by disc space narrowing and at least

one level of osteophyte or osteosclerosis) of both sexes were included in the study if they satisfied the following criteria: (1) pain for at least 1 month during the last 6 months; (2) no concurrent chronic disease including cardiovascular disease; (3) no spa therapy during the last 6 months; (4) written informed consent.

Study design

This study was a prospective, multicentre, randomized, controlled trial of 27 weeks duration. It was approved by the Ethical Review Board of Cochin Hospital.

Randomization and study treatments

After confirming that patients fulfilled the screening criteria defined above and after written informed consent, they were randomly allocated to the treatment or control group using a block randomization procedure and assigned to receive spa or control therapy. Spa therapy was defined as a 21 day period including journey, rest, balneotherapy, spring water and medical attention in the spa resort of Vichy (without distinguishing each potential effect). Control therapy was defined as a 21 day period during which patients maintained their routine life and out-patient care, including physical therapies if considered necessary by the physician. The investigating physician was aware of whether the patients had or had not attended Vichy.

Clinical assessments

NSAID and analgesic intake (main criteria) were noted during the whole 24-week period following each treatment (spa or control periods). Each patient noted his weekly intake of symptomatic drugs on a questionnaire, which was recorded each month by a co-ordinating centre assuring regular control, independent of investigators and spa staff, and blind to treatment. Analgesic consumption score was calculated by the sum of tablet and capsule intake in each group. NSAID consumption score was the sum of scores in each group using an equivalence score table [15] (example: 10 = 150 mg diclofenac = 20 mg piroxicam = 200 mg ketoprofen = 1100 mg sodiate naproxen). During the 6 months of the study, patients were asked to maintain their symptomatic drug intake at the lowest dose permitted by their clinical condition. These recommendations were made by all rheumatologists participating in the study at each visit but also, in the spa group, by the medical staff of the spa resort who might also propose to the patients that they stop their symptomatic treatment during the spa period.

Other clinical assessments were made by a single physician, independent of the spa medical staff, at entry and after 3 and 24 weeks. They included: (1) pain intensity on a visual analogue scale of 100 mm (VAS); (2) functional impairment using investigator-administered score indexes [Main and Waddell disability index [16] for lumbar spine OA (scores ranging from 0 to 9), Lequesne's knee functional index or Lequesne's hip functional index [17] (scores ranging from 0 to 24)]; (3) quality of life recorded on the revised Arthritis Impact Measurement Scale ($AIMS_2$) [18] which is a self-questionnaire assessing disease impact, including 55 questions. These questions can be grouped into 12 different scales, each of them ranged from 0 to 10. The total $AIMS_2$ score was the mean of the values obtained in the 12 different scales (range 0–10). Moreover, these 12 different scales can be further grouped into 5 different domains including physical activity (28 questions), pain (five questions), social and family occupations (nine questions), work (four questions) and psychological status (nine questions); (4) mobility by fingers-to-floor distance in lumbar spine OA, buttock-to-heel distance in knee OA and intermalleolar distance in hip OA.

Statistical analysis

One-way analysis of variance for continuous variables and χ^2 for categorical variables were used to compare baseline characteristics and the main criteria; changes from baseline of the clinical variables and the weekly NSAID and analgesic intakes between treatment groups were analysed by analysis of variance of repeated measurements, with a 0.05 α risk (two-tailed test). Moreover, the changes in all the variables during the study (final *vs* baseline visit values) have been completed in each group (within-group comparison) by using the paired Student's *t*-test. Analyses were performed using a Delta Soft P.C.S.M. statistic computer.

RESULTS

Patients and study course

Out of the 233 patients screened in the Paris area, 45 refused to take part in the study after randomization (29 in the spa group and 16 in the control group); reasons were withdrawal of consent (12 and five, respectively), refusal of the randomized treatment (eight and nine) and other (nine and two).

One hundred and eighty-eight patients satisfied the eligibility criteria and were included in the study, 91 in the spa group and 97 in the control group. Four patients refused to complete the 24 week follow-up period (2%) (one in the spa group, three in the control group). Patients suffered from lumbar spine OA ($n = 95$, spa group 46, control group 49), knee OA ($n = 64$, spa group 32, control group 32) or hip OA ($n = 29$, spa group 13, control group 16). Only 50 of the 188 patients had received spa therapy before their entry into the study (31% in the spa group, 23% in the control group). No statistically significant difference in demographic or clinical variables, including the weekly NSAID and analgesic intakes, was noted between groups at baseline (Table I).

Response to treatment

Response to treatment was analysed for all patients who entered the trial (intent to treat analysis).

The total intake of symptomatic drugs during the 24 week follow-up period was lower in the spa group than in the control group, in terms of NSAID consumption

TABLE I
Baseline characteristics of the 188 patients. Values given are either mean ± S.D., median (range) or number

Characteristics	Spa group ($n = 91$)	Control group ($n = 97$)	P†
Age (yr)	64 ± 7	63 ± 6	NS
Sex (F/M)	71/20	82/15	NS
Disease duration (yr)	11 ± 8	12 ± 10	NS
Obesity* (yes/no)	59/32	56/41	NS
Previous spa therapy (yes/no)	28/63	22/75	NS
Pain (100 mm VAS)	50 ± 20	47 ± 22	NS
Functional impairment‡	7 ± 3	7 ± 3	NS
Quality of life ($AIMS_2$)	3.0 ± 1.0	3.0 ± 1.0	NS
Mobility (cm)§	24 ± 24 15 (0–100)	29 ± 31 18 (0–150)	NS
NSAID weekly consumption (score)	15 ± 25 0 (0–140)	19 ± 30 0 (0–117)	NS
Analgesic weekly consumption (tablets)	7 ± 9 3.5 (0–42)	8 ± 11 2 (0–42)	NS

*Body mass index > 24.
†P statistical significance determined either by analysis of variance or χ^2.
‡Main and Waddell score index for lumbar spine osteoarthritis, Lequesne's hip index or Lequesne's knee index.
§Finger–floor distance for lumbar spine osteoarthritis, buttock-to-heel distance for knee osteoarthritis, intermalleolar distance for hip osteoarthritis.

[NSAID score, mean (S.D.), 264 (432); median (range), 62 (0–1752) *vs* 480 (576); 213 (0–2127), respectively, $P = 0.008$] and in terms of analgesic consumption [tablet count was, respectively, mean (S.D.), 144 (192); median (range), 41 (0–672) and 216 (240); 124 (0–974), $P = 0.010$].

Figure 1 shows the weekly consumption over time at entry and during the 6 month follow-up period, which was statistically lower after spa therapy during 5 months for NSAID and during the first 3 months for analgesics.

Table II shows the mean changes over time in the variables during the study.

The repeated measure analysis of the weekly symptomatic intake at baseline, week 4 and 24 weeks showed a statistically lower use in the spa group ($P = 0.024$ and $P = 0.004$ for NSAID and analgesics, respectively).

The same analysis also showed a statistically significant improvement in the spa therapy group for pain and quality of life after 4 weeks (i.e. just after spa therapy), and more interestingly also after the 24 week follow-up period, without any change in the control group (confirmed by the intra-group analysis which showed no difference between entry and after the 24 week follow-up period in the control group). Outcome measure analysis of each domain of the $AIMS_2$ after 24 weeks showed that improvement was observed only in the physical activity and pain domains (-0.5 ± 0.9 *vs* 0.0 ± 1.1, $P = 0.005$ and -0.9 ± 2.3 *vs* 0.0 ± 2.0, $P = -0.006$, respectively in the spa group and the control group). Possible interaction between treatment and osteoarthritis subgroups, evaluated by analysis of variance, did not indicate a statistically significant interaction. Thus, analyses were also performed separately for each osteoarthritis subgroup (Table III).

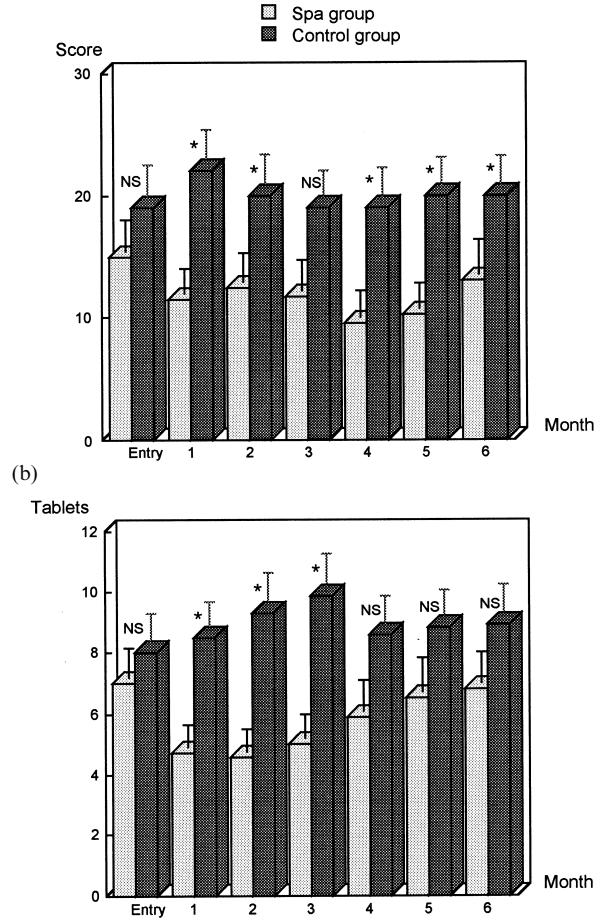

FIG. 1.—(a) NSAID weekly consumption over time at entry and after the 3 weeks duration of spa or control period. (b) Analgesic weekly consumption over time at entry and after the 3 weeks duration of spa or control period. Values given are mean ± S.E.M. *Statistically significant difference $P < 0.05$. NS, no statistically significant difference.

These analyses showed an improvement after spa therapy in each subgroup, which reached statistical significance only in the lumbar spine ($n = 95$) and knee ($n = 64$) OA subgroups.

DISCUSSION

This controlled study suggests that a 3 week therapy programme in a spa resort has a beneficial carry-over symptomatic effect on OA. These results are in accordance with those of studies previously reported in the literature and, in particular, with one evaluating patients suffering from low back pain [12].

In our study, the difference in clinical variables between groups is explained by an improvement in the spa group, while no change or deterioration was noted in the control group after 24 weeks. The fact that analysis performed for each OA subgroup separately reached statistical significance only in the lumbar spine and knee OA subgroups suggests that beneficial effects of spa therapy are moderate and necessitate a large sample size to be demonstrated.

TABLE II
Clinical variables at entry and mean changes during the 24 week follow-up period in each group. Values given are mean ± S.D.

Variable	Spa group ($n = 91$)			Control group ($n = 97$)			P*
	Entry	4 weeks	24 weeks	Entry	4 weeks	24 weeks	
NSAID weekly consumption (score)†	15 ± 23	−8 ± 24	−3 ± 24	19 ± 30	2 ± 28	1 ± 24	0.024
Analgesic weekly consumption (tablets)	7 ± 9	−4 ± 8	−1 ± 7	8 ± 11	0 ± 8	1 ± 9	0.004
Pain (100 mm VAS)	50 ± 20	−15 ± 29	−9 ± 28	47 ± 22	1 ± 22	3 ± 24	<0.0001
Quality of life ($AIMS_2$)	3.0 ± 1.0	−0.4 ± 0.8	−0.5 ± 0.8	3.0 ± 1.0	−0.1 ± 0.7	−0.1 ± 1.0	<0.0001

*P values are the statistical significance of the difference in effect between treatment groups over time, determined by repeated analysis of variance of repeated measurements.
†See the text.

During the study, all patients were asked to take their symptomatic drug at the lowest dose permitted by their clinical condition. However, there was an imbalance between the two groups since, in the spa group, the medical staff of the spa resort could strongly suggest to the patients that they decrease or even stop their symptomatic drug intake. This difference could introduce a bias in the study results. However, this decrease in symptomatic drug intake occurred concurrently with an improvement in the clinical condition of the patients. Therefore, one can also argue that the decrease in symptomatic drug intake was related to improvement in the clinical status of the patients rather than to the recommendations of physicians.

The inevitably more frequent contact of the spa patients with spa staff could also introduce a bias since such contact could well result in additional explanations and education. Therefore, such attention by spa medical staff could be considered as an individual component of the spa therapy which could contribute to improvement.

Since this therapeutic objective seems less linked to the chemical composition of the water than to various procedures of hydrotherapy and kinebalneotherapy using spa water (full immersion or local bathing, various types of showers, underwater massage, application of hot mud, etc.), it appeared useless and even illusory to base the evaluation on the composition of the spa water. Several factors are, in fact, likely to play a role in the therapeutic benefit: kinebalneotherapy, the sedative effect of heat, the role of rest in a clinical environment, the role of medical care, etc. It therefore appeared more pertinent to evaluate the factor 'spa treatment' rather than the factor 'spa water', as well as to assess not only its immediate effect, but also its carry-over effect after 24 weeks when the patients had returned to routine life. It is, in fact, likely that 3 weeks of rest in a medical environment would lead to clinical improvement in chronic disorders, where the effect of rest is often favourable in the short term.

Another question concerns the relevance of these results in the absence of a double-blind design. The use of a randomized controlled design and an assessment performed independently of the spa staff contributes objectivity to the assessment of a potential benefit of the study therapy.

Using this methodology, a statistically significant difference in favour of spa therapy was observed not only in the consumption of symptomatic drugs, but also in the clinical parameters evaluating both pain and

TABLE III
Changes in clinical variables from baseline to 24 weeks (mean ± S.D.). Total intake during the 24 week follow-up period [mean ± S.D. and median (range) in patients according to group]

Variable	Osteoarthritis subgroup					
	Lumbar spine		Knee		Hip	
	Spa group ($n = 46$)	Control group ($n = 49$)	Spa group ($n = 32$)	Control group ($n = 32$)	Spa group ($n = 13$)	Control group ($n = 16$)
Pain (100 mm VAS)	−12 ± 28	*2 ± 22	−9 ± 29	*4 ± 26	−4 ± 30	0 ± 27
Functional impairment†	−1 ± 2	−1 ± 2	−2 ± 3	*0 ± 3	−1 ± 2	0 ± 3
Quality of life ($AIMS_2$)	−0.6 ± 0.9	*−0.2 ± 1.0	−0.4 ± 0.5	0.1 ± 1.1	−0.8 ± 1.0	−0.2 ± 0.7
Mobility (cm)‡	−1 ± 11	−4 ± 8	−2 ± 4	−1 ± 9	−4 ± 18	−4 ± 13
NSAID total consumption (score§)	264 ± 432	*360 ± 432	288 ± 432	552 ± 720	288 ± 360	672 ± 672
	50 (0–1522)	167 (0–1763)	77 (0–1763)	225 (0–2127)	92 (0–962)	486 (0–1786)
Analgesic total consumption (tablets)	144 ± 192	168 ± 226	96 ± 144	*240 ± 192	144 ± 168	288 ± 336
	46 (0–672)	89 (0–784)	7 (0–429)	202 (0–622)	91 (0–472)	180 (0–974)

*P value determined by variance analysis <0.05.
†Main and Waddell score index for lumbar spine osteoarthritis, Lequesne's hip index, Lequesne's knee index.
‡Finger–floor distance for lumbar spine osteoarthritis, buttock-to-heel distance for knee osteoarthritis, intermalleolar distance for hip osteoarthritis.
§Score: see the text.

quality of life. These results were observed immediately after spa therapy, but a carry-over effect was also observed since differences in clinical parameters between the two study groups remained statistically significant during the 6 months of the study. However, a detailed analysis of the weekly consumption of symptomatic drugs suggests that the treatment effect begins to taper off as of the third month.

Evaluating spa therapy is certainly more difficult than for a drug, but this study has shown it to be possible. Thus, it is necessary to evaluate spa therapy further, in particular in the field of rheumatology and osteoarticular sequelae, which constititute the majority of prescriptions. Further studies are required to confirm these results and to assess the biological effect of hot mineral water, in combination or not with physical therapy, on clinical status.

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References

1. Epstein M, Bricker N, Bourgonie J. The presence of natriuretic factor in urine of normal men undergoing water immersion. Kidney Int 1978;13:152–8.
2. Grahame R, Huntz J, Kitchen S. The diuretic and natriuretic effect of water immersion, possible rationale for balneotherapy. Ann Rheum Dis 1978;37:567 (Abstract).
3. Epstein M, Lifschitz M, Hoffman D, Stein J. The relationship between renal prostaglandin E and renal sodium handling during water immersion in normal man. Circ Res 1979;45:71–80.
4. O'Hare JP, Roland J, Scott G, Walters G, Corrall RJM. Haemodilution during water immersion in man. Clin Sci 1984;66:47.
5. Machtey I. Dead Sea balneotherapy in osteoarthritis. In: Machtey I, ed. Progress in rheumatology. Boston: Wright, 1982:161–2.
6. O'Hare JP, Heywood A, Dodds P, Corral RJM, Dieppe P. Water immersion in rheumatoid arthritis. Br J Rheumatol 1984;23:117–8.
7. O'Hare JP, Heywood A, Summerhayes C *et al*. Observations on the effects of immersion in Bath spa water. Br Med J 1985;291:1747–51.
8. Sukenik S, Buskila D, Neumann L, Kleiner-Baumgarten A, Zimlichman S, Horowitz J. Sulphur bath and mud pack treatment for rheumatoid arthritis at the Dead Sea area. Ann Rheum Dis 1990;49:99–102.
9. Konrad K, Tatrai T, Hunka A, Vereckei E, Korondi I. Controlled trial of balneotherapy in treatment of low back pain. Ann Rheum Dis 1992;51:820–2.
10. Kranjc I, Siftar M, Turk Z, Barovic J, Nikolic T. The effect of balneotherapy on the low-back pain disease at the Moravci spa and the Department of Physiotherapy and Rheumatology—Maribor Teaching hospital. Scand J Rheumatol 1992;(suppl. 94):55.
11. Elkayam O, Wigler I, Tishler M *et al*. Effect of spa therapy in Tiberias on patients with rheumatoid arthritis and osteoarthritis. J. Rheumatol 1991;18:1799–803.
12. Guillemin F, Constant F, Collin JF, Boulanger M. Short and long-term effect of spa therapy in chronic low back pain. Br J Rheumatol 1994;33:148–52.
13. Altman R, Asch E, Bloch O *et al*. Development of criteria for the classification and reporting of osteoarthritis of the knee. Arthritis Rheum 1986;29:1039–49.
14. Altman R, Alarçon G, Appelrouth D *et al*. The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hip. Arthritis Rheum 1991;34:505–14.
15. Dougados M, Nguyen M, Listrat V, Amor B. Score d'équivalence des AINS. Rev Rhum Mal Osteoartic 1989;56:251 (Abstract 1134).
16. Waddell G, Main CJ. Assessment of severity in low back disorders. Spine 1984;9:204–8.
17. Lequesne M. Clinical features, diagnostic criteria, functional assessments and radiological classifications of osteoarthritis. In: Huskisson EC, Katoma G, eds. New trends in osteoarthritis. Basel: Kayer, 1982:1–10.
18. Poiraudeau S, Dougados M, Ait Hadad H. Evaluation of the French version of a quality of life scale ($AIMS_2$) in rheumatology patients. Rev Rhum *(*Engl Edn) 1993;60:466–72.