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EFFECTS OF TREATMENT WITH MATURE THERMAL MUD ON POSTMENOPAUSAL OSTEOPOROSIS—A PRELIMINARY EVALUATION

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ABSTRACT

Use of mud therapy to improve or resolve various osteoarticular disorders has been well known since ancient times in certain European and Eastern countries. This study evaluated some biological effects of mud therapy on postmenopausal osteoporosis by comparing the administration of carbocalcitonin ([aminosuberic acid[1,7]]-eel calcitonin), mature-mud therapy alone, calcium alone, and carbocalcitonin in combination with mature-mud therapy. Of these four regimens, the combination of carbocalcitonin and mature-mud therapy had the greater biologic effect as documented by biochemical assay and bone mineral density measurement.

INTRODUCTION

In recent years, physicochemical analysis of thermal mud and of the effects of mud therapy (or pelotherapy) has allowed some standardization of the features of mature and non-mature mud.[1] Maturation is the end point of a slow and complex process involving both fluid and solid components of the mud and resulting in a progressive enrichment of organic substances in the mud. Different types of microorganisms growing in the mud and colonizing it are responsible for the changes in its features.[2,3]

The therapeutic effects of pelotherapy are measurable in terms of biochemical changes in the serum of treated patients. These effects are significant, particularly after pelotherapy with mature mud.[4] Previous studies[4,5] indicate that mud therapy may be effective in the treatment of postmenopausal and senile osteoporosis, because it stimulates bone-remodeling cells by modulating enzymatic and hormonal activities, as shown by common metabolic bone markers. This study reports on the state of bone mineral density (BMD) in four groups of osteoporotic postmenopausal women after pelotherapy with mature mud alone, calcium therapy alone, carbocalcitonin therapy alone, or a combination of carbocalcitonin and pelotherapy.

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PATIENTS AND METHODS

One hundred patients, aged 48 to 58 years, with postmenopausal osteoporosis were entered into the study. Patients with renal or hepatic disease were excluded. In accordance with the second Declaration of Helsinki, all participants provided informed consent. BMD was determined by a computerized densitometer (Osteoscan, NIM, Verona, Italy). The BMD levels of study patients were below the standard deviation of the age-matched average of healthy women. The anatomic areas examined were the ultradistal and the mid-distal parts of both the radius and ulna; the precision of this measurement is >0.4%, with accuracy >0.5%.

After 3 days on a controlled diet (a hospital diet of 1400 kcal), baseline blood samples for osteocalcin (BGP) assay and 24-hour urine samples for evaluation of hydroxyproline were collected. Serum BGP levels were determined by radioimmunoassay (International CIS, Gif-sur-Yvette France); and hydroxyproline by a photometrical method (Hypronosticon, Organon Teknika, Boxtel, The Netherlands).

Patients were randomly divided into four treatment groups. Group A: 25 women were treated for 1 year with alternating cycles of oral calcium 500 mg/day (2 months) followed by 1 month without drug therapy. This group was considered the control group against which the biochemical variations induced by pelotherapy and/or carbocalcitonin were evaluated. Group B: 25 women received mature-mud therapy for 12 days, as described elsewhere[4]; the treatment was repeated after 11 months (pelotherapy occurred twice/year). Group C: 25 women were treated for 1 year with alternating cycles of 40 IU/day of carbocalcitonin ([aminosuberic acid^{1,7}]-eel calcitonin) administered by endonasal route (2 months) followed by 1 month without drug therapy. Group D: 25 women received mud therapy with mature mud for 12 days. After 6 months, the women were treated for 6 months with alternating cycles of carbocalcitonin 40 IU/day administered by endonasal route (2 months) followed by 1 month without drug therapy.

At the end of the 1-year treatment period, blood and urine samples were collected to measure BGP and hydroxyproline levels. BMD was also evaluated.

The significance of the differences between means was evaluated by Student's t test.

RESULTS

The results are summarized in Tables I and II. After 1 year, average serum BGP and urinary hydroxyproline/creatinine levels increased 5% and 18% respectively, in group A, treated with calcium, while BMD decreased 2%. In group B, treated with mature mud, average BGP and BMD increased 7% and 1.2%, respectively, while hydroxyproline/creatinine levels de-

Table I. Baseline levels of biochemical markers and bone mineral density (BMD) in the different treatment groups. (Values are expressed as mean ± SD.)

Group	No. of Patients	Osteocalcin (ng/ml)	Hydroxyproline/ Creatinine (mmol/mol)	BMD (mg/cm^2)
A	25	9.0 ± 2.0	16 ± 3.0	413 ± 80
B	25	9.2 ± 1.9	17 ± 4.0	415 ± 80
C	25	9.0 ± 1.5	15 ± 3.0	415 ± 84
D	25	9.4 ± 2.0	16 ± 3.5	414 ± 75

Group A = calcium 500 mg/day orally for 2 months followed by 1 month without drug therapy (1-year treatment period).
Group B = mature-mud therapy for 12 days, repeated after 11 months.
Group C = 40 IU/day carbocalcitonin administered endonasally for 2 months followed by 1 month without drug therapy (1-year treatment period).
Group D = mature-mud therapy for 12 days; after 6 months, carbocalcitonin 40 IU/day administered endonasally for 2 months followed by 1 month without drug therapy.

creased 11%. In group C, treated with carbocalcitonin only, average serum BGP and urinary hydroxyproline/creatinine levels decreased 38% and 26%, respectively, while BMD increased 4.3%. In group D, treated with mature mud and carbocalcitonin, average serum BGP and urinary hydroxyproline/creatinine levels decreased 9.5% and 31.8%, respectively, while BMD increased 5.3%.

DISCUSSION AND CONCLUSIONS

Mud therapy is a traditional treatment in many European countries (especially Germany, France, Italy, Austria, and Hungary), but this therapy is virtually unknown in the United Kingdom and the United States. Since ancient times, mud therapy has been used to improve or resolve pain caused by various diseases.[5] The evaluation of results was based on the

Table II. Biochemical marker levels and bone mineral density (BMD) after therapy. (Values are expressed as mean ± SD.)

Group	No. of Patients	Osteocalcin (ng/ml)	Hydroxyproline/ Creatinine (mmol/mol)	BMD (mg/cm^2)
A	25	9.5 ± 2.3	19 ± 2.0	404 ± 84
B	25	9.9 ± 2.0	15 ± 32.0	470 ± 70
C	25	5.5 ± 0.5	11.7 ± 3.1	433 ± 71
D	25	8.5 ± 1.7	10.9 ± 3.0	436 ± 71

Group A = calcium 500 mg/day orally for 2 months followed by 1 month without drug therapy (1-year treatment period).
Group B = mature-mud therapy for 12 days, repeated after 11 months.
Group C = 40 IU/day carbocalcitonin administered endonasally for 2 months followed by 1 month without drug therapy (1-year treatment period).
Group D = mature-mud therapy for 12 days; after 6 months, carbocalcitonin 40 IU/day administered endonasally for 2 months followed by 1 month without drug therapy.

subjective response of the patient at the end of treatment, while the underlying biologic mechanisms were not identified. The differences between the therapeutic responses to mature and non-mature mud suggest that the effects of mud therapy cannot be due simply to heat.[5]

The current study considered the effects of mature-mud therapy alone or in combination with drug therapy in postmenopausal patients with osteoporosis. Results were evaluated on the basis of changes in biochemical parameters and BMD.

Previous studies[4,5] demonstrated that mature mud was able to increase some calciotropic hormones and to normalize and even increase osteoblastic activity. These modifications were verified by the increase in BGP.

The present study demonstrates, for the first time, that mature-mud therapy is able to increase bone mass in osteoporotics. On the basis of these results, we believe that oral calcium administration alone is not efficacious in bone mass preservation, as shown by the increase in biochemical markers and decrease in BMD after 1 year.

Mature-mud therapy produced an increase in serum BGP levels (a greater stimulation of osteoblastic activity) and BMD (+15%), with a decrease in urinary hydroxyproline. After 1 year of treatment, BMD and biochemical markers show that the effects of mature-mud therapy on bone cells are constant, continuous, and not limited to the end of treatment. The biologic effects following carbocalcitonin administration are shown by the decrease in osteocalcin and hydroxyproline/creatinine levels and the increase in BMD (+4.3%), confirming data obtained by other authors.[6–8] The therapeutic association of mature-mud therapy with two carbocalcitonin treatments was even more effective as shown by the increase in BMD (+5.3%) and the modification of serum BGP and hydroxyproline/creatinine, emphasizing the simultaneous increase in osteoblastic activity and the osteoclastic reduction.

The effectiveness of mature-mud therapy alone and its potentiation of carbocalcitonin activity provide new treatment possibilities for women with postmenopausal osteoporosis.

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