In the name of God

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Sulphur Thermal Water Improves Blood Lipids But Not Total Anti-oxidant Capacity in Knee Osteoarthritis Patients

Abstract

Objectives: Balneotherapy is known to alleviate pain in bone and joint diseases, and many blood parameters were shown to be modified upon thermal water therapy. In our study, we sought to investigate the effect of sulphur thermal water on blood lipids and total anti-oxidant capacity in patients suffering from knee osteoarthritis.

Interventions: Patients were selected according to the American College of Rheumatology criteria. Volunteers (13 women, aged 30 to 60 years old) underwent a thermal water cure session of 20 min daily during two weeks in a sulphur water pool of Moulay Yacoub spring.

Outcome measures: Patients have ha lipid laboratory tests and total anti-oxidant capacity measured before and after two weeks of thermal water treatment.

Results: In this study, we found that sulphur thermal water treatment reduced cholesterol, triglyceride and LDL in patients' blood; instead, no change was found in their plasma total anti-oxidant capacity.

Conclusions: Balneotherapy sessions lead to lowering of blood lipid of patients suffering from knee osteoarthritis. The latter effect could be part of the mechanism of action of thermal water in decreasing disease activity in knee osteoarthritis. On the other hand, blood total anti-oxidant capacity, as measured by our method, does not seem to be of relevance in the pathology of our patients.

Keywords

Knee Osteoarthritis **Anti-Oxidant** **Balneotherapy** **Blood Lipids**

Fulltext

1. Introduction

Knee osteoarthritis (OA) is one of the most common forms of arthritis. Knee OA affects more than 10 % of people over 55 years of age, mostly women.(1) Recommendations of EULARS (Europeans League again Rheumatism) pointed out to several forms of treatment for the relief of pain in knee OA.(2) Among non pharmacological treatment, balneotherapy is widely accepted as a good remedy for the relief of symptoms and pain in knee OA.(3-6) In a previous part of the present study, we also have confirmed the clinical improvement (pain score and walking distance) of knee OA patients who practice balneotherapy in a sulphur thermal pool.(7) Beside the clinical benefit of balneotherapy, researchers have focused on biochemical mechanisms and possible pain-related molecules, that could be modulated in patients upon thermal water treatment of OA.(8-10) It is believed that Oxidative stress resulting from either an over production of oxygen free radicals or from an imbalance in the capacity of defense mechanisms could play an important role in OA.(11) Because blood lipids represent a target of oxygen free radical, they were studied in many balneotherapy clinical trials, which have demonstrated indeed, that blood lipids can be modulated by balneotherapy interventions.(12-14) In the present study, we sought to investigate the effect of bathing in a sulphur water pool on blood lipids of patients suffering from knee OA, and also to assess their total anti-oxidant capacity. Our results confirm that blood lipids can be modified by balneotherapy in knee OA patients.

2. Material & Methods

Patients: 13 patients, all women, aged 30 to 60 years old (48,84 ± 7,11 years) were selected among a list of 34 patients, all, having signs of knee OA according to radiologic exam and examination by a team of rheumatologists. Patients enrolled in this study have had knee OA evolution for a mean period of time of 47, 23 ± 37, 73 months. Inclusion of patients in the study was carried out according to American College of Rheumatology (ACR)'s criteria. Inclusion criteria were: Fulfilling the ACR criteria for knee, Pain characteristic of knee joint OA for at least three months, no limitations of motion of the joint and outpatients with no severe disability. Exclusion criteria were: Patients with severe internal cardiovascular and peripheral vascular diseases, presence of any common contra indication for hot thermal water cure, any pharmacologic treatment change or intra-articular infiltration during the last three months. Patients were told not to take any special medication nor vitamins during the study, but they could keep taking their regular analgesic or non steroidal anti-inflammatory drugs. Volunteers were enrolled in the study after having signed a written consent and having received information about the purpose of the study during a meeting with the team of researchers. The study was approved by a local ethic committee. Balneotherapy: For daily treatment with thermal water, patients were taken every morning by bus from the city of Fez to the thermal balneotherapy resort of Moulay Yacoub (15 Kms far from Fez).

Thermal cure consisted on a hot spring pool session of 20 min daily, (not Monday) during two weeks. Temperature of water was 38-39.5 °C.

Lipids analyses: Among other blood analyses, blood lipid analyses were performed according to standard laboratory methods and were carried out at the university hospital Hassan II of Fez.

Total anti-oxidant capacity (TAC) of blood: TAC was evaluated in plasma samples of patients using a commercial kit according to its manufacturer (Merck-Boeringer). Blood plasma of each patient was obtained following centrifugation of heparinised blood samples. TAC assay was performed as indicated by the manufacturer, at the department of pharmacology of the faculty of medicine of Fez.

Water composition of Moulay Yacoub's spring is as follows (in mg/ml): Ca2+; 1200, Mg2+; 277, Na+; 9600, K+; 660, Fe2+; 1.2. Anions: Cl-; 17200, SO42-; 34.8, PO42-; 1.6, SiO3-; 36, HCO3-; 238 and sulphurs; 32. pH: 6.5.

Statistical analysis: Data are expressed as mean ± S.D (Standard Deviation). Quantitative variables were compared using paired Student t-test.

3. Results

Following two weeks of balneotherapy at Moulay yacoub's spring, and among several biochemical blood parameters analyzed in our patients, blood lipids were the most affected parameters in this study. Interestingly, although blood lipids were in the normal range for all patients, data analyses (Table 1) showed that upon balneotherapy sessions, there have been a significant decrease (more than 25%) in plasma triglycerides concentration, as well as a slight but significant decrease of LDL and total cholesterol concentrations. Instead, a slight, but not significant increase of HDL concentrations was found in patients at the end of balneotherapy cure. Plasma TAC analysis in patients did not show any significant change upon balneotherapy sessions (Table 2).

Table 1. **Table 1.** Plasma Lipid Levels (G/L) of Patients before and After Balneotherapy

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	Before treatment	**After treatment**	**P.Value**
Triglycerides	1.28 ± 0.49	0.95 ± 0.41	P < 0.001
LDL Cholesterol	1.14 ± 0.32	1.04 ± 0.26	P < 0.049
HDL Cholesterol	0.44 ± 0.09	0.50 ± 0.15	P < 0.072

Total Cholesterol	1.86 ± 0.28	1.74 ± 0.32	P < 0.015

Table 2. **Table 2.** Plasma Total Anti-Oxidant Capacity (Mm) Of Patients before and After Balneotherapy Balneotherapy

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	Before treatment	**After treatment**	**P.Value**
Total Anti-oxidant Capacity	2.54 ± 0.52	2.38 ± 0.42	P < 0.363

4. Discussion

SPA therapy is mentioned in the EULARS 2003 report (6) as a possible choice of treatment of pain in knee osteoarthritis patients. In order to unravel the mechanism of action of thermal water and how it acts in the body, many clinical studies have focused on biochemical regulations that take place in the blood. Blood lipids were shown to be improved by be balneotherapy. A study on degenerative musculoskeletal disease has shown that balneotherapy decreased cholesterol and triglyceride levels in patients.(13) Another study has shown that SPA therapy was associated with a decrease of cholesterol, HDL and LDL levels, with no effect on triglycerides nor on cholesterol/HDL ratio.(14) Although our study have some limits in term of number of patients enrolled in the study, or the absence of a control group of patients that did not undergo balneotherapy, the statistical comparisons of blood lipids of our patients clearly indicate that their lipid profile has improved upon two weeks balneotherapy. At present, the relevance of balneotherapy in lowering blood lipids in musculoskeletal diseases is not clear yet, but lipids could represent a target of thermal water cure, where lowering certain lipids could have a beneficial role in these diseases. Our current results on blood lipids and those of other studies (12, 14) demonstrate that balneotherapy is able to modulate lipid metabolism of OA patients. In recent years, many studies have focused on molecules that could be modulated upon balneotherapy, such as those belonging to free radical-generating pathways and anti-oxidant systems, cytokines and some lipid mediators.(8-11, 13) All of these molecules could be linked to pain generation in musculoskeletal diseases. An attractive idea was whether balneotherapy could have some protection against molecular oxidation that usually occurs in chronic diseases such as OA (11), thus, by enhancing the anti-oxidant potential of the body. Indeed, total blood anti-oxidant capacity is considered as a parameter of immune defense, whose low level may be associated with certain chronic pathologies. In our study, plasma TAC of patients was not modified upon balneotherapy sessions. We believe

that the assay of TAC may not be specific enough to draw any conclusion about the real anti-oxidant capacity of the blood, because many molecules could have a non specific anti-oxidant property, such as uric acid, so as the interpretation of the result could be misleading. Instead, measurement of each anti-oxidant molecule separately could give a real anti-oxidant status of blood, which could be correlated to the clinical outcome. In a similar clinical study (12), and based on superoxide dismutase activity and peroxides concentrations in patients's blood, the authors have concluded that oxidative stress could be reduced by sulphur bath therapy. Another study concluded instead, that TAC was reduced upon balneotherapy.(13) In conclusion, our study confirms the data of other similar studies (13, 14) on lowering blood lipids upon balneotherapy sessions, and this effect could be of relevance for patients suffering from knee OA. Instead, blood TAC should be investigated further, by analyzing separately the level of blood anti-oxidant molecules as well as the products of oxidative stress in patients. Our results on lowering blood lipids upon balneotherapy should encourage to investigating such an effect in hyperlipidemic patients as well.

5. Conclusion

Our study showed that knee osteoarthritis patients have had an improvement of blood lipids upon balneotherapy in sulphur water.

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