ELSEVIER

Journal of Psychosomatic Research 58 (2005) 383–387

Journal of Psychosomatic Research

Short Communication

The effects of repeated thermal therapy for two patients with chronic fatigue syndrome

Akinori Masuda[a,*], Takashi Kihara[b], Tsuyoshi Fukudome[b], Takuro Shinsato[b], Shinichi Minagoe[b], Chuwa Tei[b]

[a]*Respiratory and Stress Care Center, Kagoshima University Hospital, 8-35-1 Sakuragaoka, Kagoshima 890-8520, Japan*
[b]*Cardiovascular, Respiratory and Metabolic Medicine, Kagoshima University Graduate School of Medicine, 8-35-1 Sakuragaoka, Kagoshima 890-8520, Japan*

Abstract

Objective: This paper describes the successful treatment of two patients with chronic fatigue syndrome (CFS) using repeated thermal therapy. **Methods:** Two patients with CFS underwent treatment with prednisolone (PSL), with no satisfactory effect. They were subjected to thermal therapy that consisted of a far-infrared ray dry sauna at 60 °C and postsauna warming. The therapy was performed once a day, for a total of 35 sessions. After discharge, these subjects continued the therapy once or twice a week on an outpatient basis for 1 year. **Results:** Symptoms such as fatigue, pain, sleep disturbance, and low-grade fever were dramatically improved after 15 to 25 sessions of thermal therapy. Although PSL administration was discontinued, the subjects showed no relapse or exacerbation of symptoms during the first year after discharge. The patients became socially rehabilitated 6 months after discharge. **Conclusions:** These results suggest that repeated thermal therapy might be a promising method for the treatment of CFS.

Keywords: Chronic fatigue syndrome; Far-infrared ray dry sauna; Fatigue; Pain; Body temperature

Introduction

Chronic fatigue syndrome (CFS) is an illness characterized by disabling fatigue lasting for at least 6 months. There are many controlled trials and case-control treatment studies that utilized immunological substances, pharmacological products, nutritional supplements, physical therapies, and cognitive behavioral therapy [1]. Because of the unclear etiology, diagnostic uncertainty, and the resultant heterogeneity of the CFS population, there are no firmly established treatment recommendations for CFS [2].

Recently Peckerman et al. [3] found that patients with severe CFS had significantly lower stroke volume and cardiac output than controls did. We reported that thermal therapy using far-infrared ray dry sauna increased stroke volume and cardiac output in patients with chronic heart failure (CHF). Furthermore, the therapy improved the quality of life, sleep quality, and general well-being of these subjects [4]. Sauna bathing also alleviated pain and improved joint mobility in patients with rheumatic disease [5]. We hypothesized that thermal therapy may improve the subjective symptoms in CFS patients and performed this therapy on two patients with CFS.

Cases and methods

Case 1

A female patient was admitted to our hospital, at age 26, with a 3-year history of general fatigue, femoral myalgia, low-grade fever, and sleep disturbance. The symptoms appeared after tonsillitis. The antinuclear antibody (ANA) level was 320-fold. The patient had attempted treatment with prednisolone (PSL) for 3 years, with no effect. She had stopped working for 3 years before admission. When she was admitted, she was periodically taking an oral dose of 5 mg of PSL daily and an analgesic, as needed. Examinations

* Corresponding author. Tel.: +81 99 275 5751; fax: +81 99 275 5749.
E-mail address: masudaak@m.kufm.kagoshima-u.ac.jp (A. Masuda).

0022-3999/04/$ – see front matter © 2005 Elsevier Inc. All rights reserved.
doi:10.1016/j.jpsychores.2004.11.005

after admission revealed that the patient was negative for anti-DNA antibody, LE cells, rheumatoid factors, and anti-Jo-1 antibody. Neither electromyography nor muscle biopsy showed any abnormal findings. Collagen diseases, such as systemic lupus erythematous (SLE), polymyositis, and dermatomyosis, were ruled out. The percentage of ANA-positive subjects is reportedly higher in CFS patients (25%) than in healthy subjects (6%) [6]. In addition, this patient met the 1994 Centers for Disease Control (CDC) Criteria for CFS [7], thus, she was diagnosed as having CFS.

Case 2

A female patient was admitted to our hospital, at age 33, with an 8-year history of CFS-like symptoms. Following tonsillectomy at the age of 25, she persistently complained of low-grade fever and painful lymphadenopathy. At the age of 29, the patient was diagnosed as having necrotizing lymphadenitis based on the results of lymph node biopsy. Her clinical symptoms improved after the oral administration of PSL for 2 months. Thereafter, the dose of PSL was increased or decreased according to the severity of clinical symptoms. However, the severity of general fatigue, myalgia, headache, low-grade fever, sleep disturbance, swelling of cervical lymph nodes, impaired memory, or concentration worsened from the age of 32. She had been on leave of absence from work 1 year before admission. When she was admitted to our hospital, she had been periodically taking an oral dose of 2.5 mg of PSL daily. Infection and collagen disease were ruled out by the examinations on admission, and the patient was diagnosed as having CFS because she met the CDC criteria for CFS.

Treatment

In Case 1, PSL was reduced to 2.5 mg/day at the time of admission and was discontinued on the second week. Thermal therapy was started from the third week. In Case 2, PSL was discontinued after admission, and thermal therapy was started from the second week. Each patient underwent a total of 35 sessions of thermal therapy, once a day, from Monday through Friday. For 1 year after discharge, the patients continued thermal therapy once or twice a week on an outpatient basis. Written informed consent was obtained from the patients, and the protocol was approved by the Ethics Committee of Kagoshima University.

A far infrared-ray dry sauna system (Olympia, Miyazaki, Japan) was used for thermal therapy [4,8]. The patients were placed in a supine position on a bed in a 60 °C sauna for 15 min, then transferred into a room maintained at 28 °C; they were covered with a blanket from the neck downwards to keep warm for 30 min. The patients were weighed before and after the thermal therapy; oral hydration with water was used to compensate for lost weight.

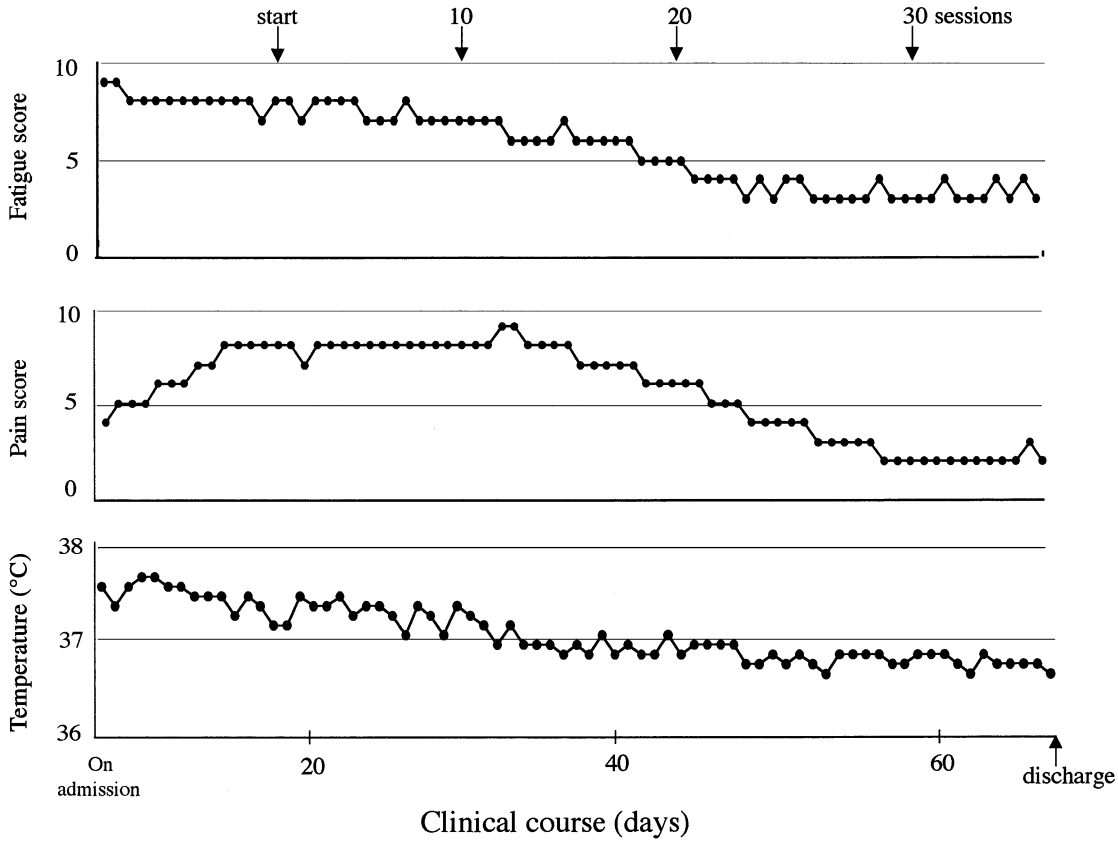

Fig. 1. Clinical course in Case 1. Body temperature was less than 37 °C after 15 sessions. General fatigue and myalgia improved after 20 sessions.

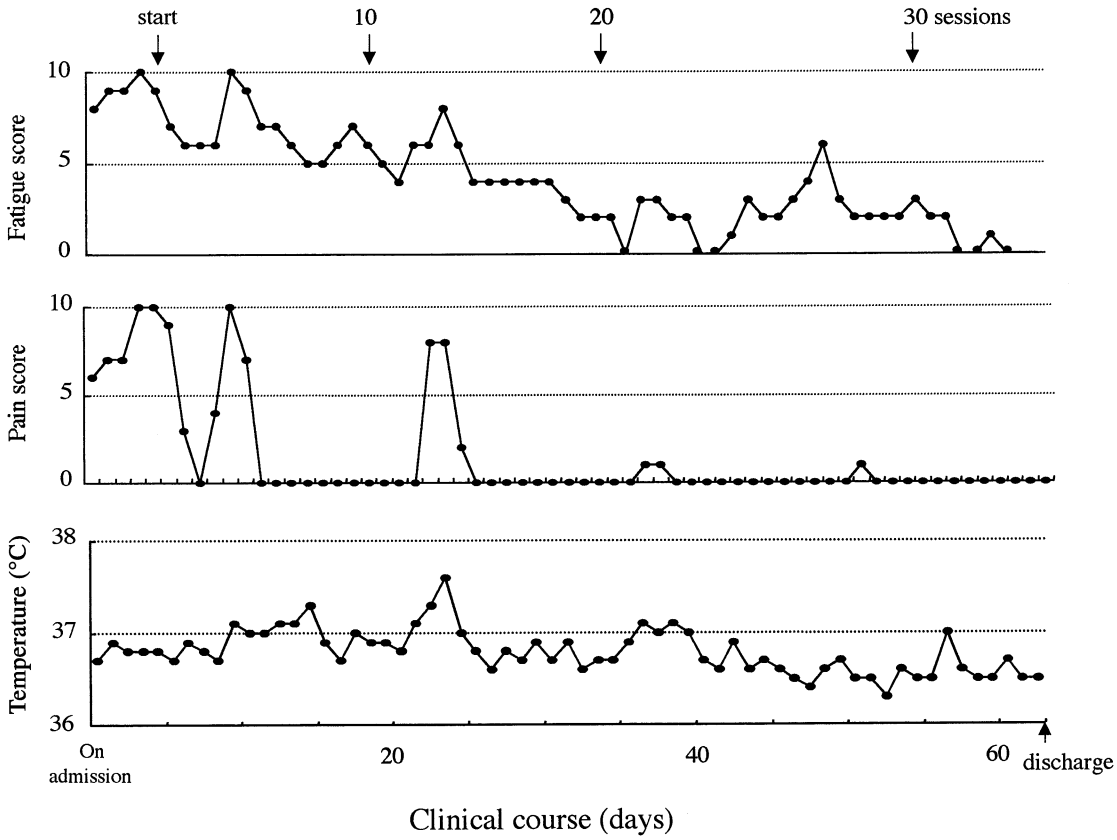

Fig. 2. Clinical course in Case 2. General fatigue, myalgia, and body temperature improved after 15 sessions.

Measurements

Visual analog scales (VAS), using a marked 10-cm line extending from *no symptoms* to *worst ever symptoms*, were used to score fatigue and pain. Patients rated the intensity of fatigue and pain two times a day (at 12:00 and 18:00), and the average score was recorded. The Cornell Medical Index (CMI; [9]) and the Profile of Mood States (POMS; [10]) were used to evaluate psychobehavioral responses. A subjective "energy" score was derived by subtracting the POMS fatigue score from the POMS vigor score. The hour of nonsedentary activity per day was investigated by asking the patients and patients' families to evaluate functional activity [11]. To evaluate sleep quality, we constructed five questions [12]. The patients answered "yes", "sometimes", or "no" to each question, and these were scored as 2, 1, and 0 points, respectively. Tympanic temperature was measured three times a day before meals (at 06:00, 12:00, and 18:00), and the mean value was recorded. Although tympanic temperature has not yet been established as an accurate method of measuring body temperature [13], we measured tympanic temperature because it was easy to use and has been shown to accurately reflect rectal temperature [14].

Tympanic temperature and VAS for fatigue and pain were recorded daily during hospitalization. Physical and mental complaints in CMI and POMS subscales, POMS energy score, hour of nonsedentary activity per day, and sleep score were assessed on five occasions: at baseline (1 month before thermal therapy), before and after repeated thermal therapy, and at follow-up, 6 and 12 months after discharge.

Results

In Case1, because the patient had increased myalgia and difficulty in walking from 1 week after the discontinuation of PSL, she was prescribed an analgesic that was taken three times daily. After 20 sessions of thermal therapy, her myalgia improved, thus, her analgesic medication was discontinued after 25 sessions. Body temperature was less than 37 °C after 15 sessions, and general fatigue improved after 20 sessions (Fig. 1). In Case 2, general fatigue and myalgia temporarily worsened after the discontinuation of PSL, but the symptoms and low-grade fever improved after 15 sessions (Fig. 2).

Physical and mental complaints, fatigue, depression, confusion, and sleep score decreased. On the other hand, POMS energy score and hour of nonsedentary activity increased after repeated thermal therapy (Table 1). The patients followed a favorable clinical course at 6 and 12 months after discharge. In both cases, PSL has not been

Table 1
The changes of subjective symptoms and outcomes after repeated thermal therapy

	Case 1					Case 2				
		Thermal therapy		Outcomes[b]			Thermal therapy		Outcomes	
	Baseline[a]	Before	After	6	12	Baseline	Before	After	6	12
CMI										
Physical complaints[c]	51	48	12	15	11	47	44	13	20	12
Mental complaints[d]	16	12	3	2	1	4	1	1	2	1
POMS										
Fatigue[e]	18	17	3	5	3	24	28	5	8	6
Depression[f]	24	16	0	3	2	35	38	0	2	2
Confusion[g]	10	7	1	3	1	23	22	4	5	4
Energy score[h]	−16	−13	17	13	18	−23	−27	8	7	15
Sleep score[i]	8	8	0	1	1	10	9	1	2	2
Nonsedentary activity[j]	2.5	–	–	6.0	7.0	2.5	–	–	7.0	9.0

The changes of subjective complaints and outcomes after repeated thermal therapy.
[a] One month before thermal therapy.
[b] Months.
[c] Range: 0–162.
[d] Range: 0–51.
[e] Range: 0–28.
[f] Range: 0–58.
[g] Range: 0–26.
[h] Energy score was derived by subtracting the POMS fatigue score from the POMS vigor score.
[i] Range: 0–10.
[j] Hour of nonsedentary activity per day (h/day).

taken since it was discontinued before the start of thermal therapy. They started to work 6 months after discharge.

Discussion

Repeated thermal therapy was performed on two patients with CFS, and, after a dramatic improvement in their subjective symptoms, they became socially rehabilitated 6 months after discharge. After undergoing PSL therapy for 3 (Case 1) or 5 years (Case 2), both patients recovered remarkably, even after PSL medication was discontinued. Low-dose hydrocortisone may be efficacious in significant reduction in fatigue and disability in patients with CFS [15]. However, the side and long-term effects of corticosteroid treatment are well known. Although we temporarily used an analgesic in Case 1, the therapeutic effect of thermal therapy and the posttherapeutic course of the two patients in the 1-year period suggest that thermal therapy can be an effective treatment for CFS.

Mild warming of the whole body exhibits sedative effects via the sensory nerve ending [16]. Thermal therapy also promotes capillary dilation and relieves muscular spasm related to tonic muscle contraction and pain [17]. In this study, physical and mental complaints decreased, and pain and depressed mood improved, suggesting that repeated thermal therapy exhibits sedative and analgesic effects.

A single far-infrared ray dry sauna at 60 °C elevated core body temperature by 1.2 °C and induced a 1.5-fold increase in cardiac output in our previous report [4]. In patients with CFS, lower cardiac output was associated with greater severity rating for postexertional fatigue and fever chills and with lower rating for a problem with memory and concentration [3]. Although we did not measure the cardiac output in the two cases, the improvement of clinical symptoms might have been associated with repeated thermal therapy. That is, the high rate of metabolism and perspiration due to increased body temperature and increased blood flow, in addition to the relaxation effects of thermal therapy, decreased subjective symptoms, resulting in increased energy scores. Moreover, regular and prolonged (five times a week for 7 weeks) thermal therapy might have prevented the exacerbation of clinical symptoms, even after the discontinuation of PSL administration.

CFS patients frequently report symptoms of subnormal body temperature and low-grade fever [18]. Sweat rate during our single thermal therapy was estimated to be about 100 to 500 ml, based on decreased body weight. The improvement of low-grade fever in the two cases shows that thermal therapy may have a regulating action of body temperature through sweating.

Far-infrared rays have a sleep-enhancing effect [19], thus, sleep scores improved after both subjects underwent far-infrared ray thermal therapy. Increased brain temperature is associated with a type of neuronal activation typical of sleep in the hypothalamus and basal forebrain [20]. Central nervous system arousal was reduced by increased blood temperature in the hypothalamus; consequently, thermal therapy may have a soporific effect. We think that the improvement of mental symptoms may be produced by the reduction of persistent fatigue or pain and improvement of sleep disturbance in repeated thermal therapy.

One year after the completion of the therapy, both patients became socially rehabilitated, and neither showed any relapse or exacerbation of symptoms during this period. Older age, longer illness duration, fatigue severity, comorbid psychiatric illness, and a physical attribution for CFS have been associated with poorer prognosis [21]. Among these prognostic factors, longer illness duration and fatigue severity were prominent in these two patients; however, their posttherapeutic course has been favorable. This is due to the continuation of thermal therapy after discharge, because recurring symptoms are relieved by repeated thermal therapy. In conclusion, the symptoms of CFS patients dramatically improved after repeated thermal therapy. Although further studies must be made in a larger number of CFS patients, repeated thermal therapy may be a promising method for the treatment of CFS.

References

[1] Whiting P, Bagnall AM, Sowden AJ, Cornell JE, Mulrow CD, Ramirez G. Interventions for the treatment and management of chronic fatigue syndrome: a systematic review. JAMA 2001;286: 1360–8.

[2] Afari N, Buchwald D. Chronic fatigue syndrome: review. Am J Psychiatry 2003;160:221–36.

[3] Peckerman A, LaManca JJ, Dahl KA, Chemitiganti R, Qureishi B, Natelson BH. Abnormal impedance cardiography predicts symptom severity in chronic fatigue syndrome. Am J Med Sci 2003;326:55–60.

[4] Tei C, Horikiri Y, Park JC, Jeong JW, Chang KS, Toyama Y, Tanaka N. Acute hemodynamic improvement by thermal vasodilation in congestive heart failure. Circulation 1995;91:2582–90.

[5] Nurmikko T, Hietaharju A. Effect of exposure to sauna heat on neuropathic and rheumatoid pain. Pain 1992;49:43–51.

[6] Nishikai M, Kosaka S. Incidence of antinuclear antibodies in Japanese patients with chronic fatigue syndrome. Arthritis Rheum 1997;40: 2095–6.

[7] Fukuda K, Straus SE, Hickie I, Sharpe MC, Dobbins JG, Komaroff A. The chronic fatigue syndrome: a comprehensive approach to its definition and study International Chronic Fatigue Syndrome Study Group. Ann Intern Med 1994;121:953–9.

[8] Kihara T, Biro S, Imamura M, Yoshifuku S, Takasaki K, Ikeda Y, Otsuji Y, Minagoe S, Toyama Y, Tei C. Repeated sauna treatment improves vascular endothelial and cardiac function in patients with chronic heart failure. J Am Coll Cardiol 2002;39:754–9.

[9] Brodman K, Erdmann AJ, Lorge I, Gershenson CP, Wolf HG, Caples B. The Cornell Medical Index-Health questionnaire: 3. The evaluation of emotional disturbances. J Clin Psychol 1952;8:119–24.

[10] McNair DM, Lorr M, Droppleman LF. Profile of Mood States: manual. San Diego (CA): Educational and industrial testing service, 1981.

[11] Vollmer-Conna U, Hickie I, Hadzi-Pavlovic D, Tymms K, Wakefield D, Dwyer J, Lloyd A. Intravenous immunoglobulin is ineffective in the treatment of patients with chronic fatigue syndrome. Am J Med 1997;103:38–43.

[12] Masuda A, Nozoe S, Matsuyama T, Tanaka H. Psychobehavioral and immunological characteristics of adult people with chronic fatigue and patients with chronic fatigue syndrome. Psychosom Med 1994;56: 512–8.

[13] Craig JV, Lancaster GA, Taylor S, Williamson PR, Smyth RL. Infrared ear thermometry compared with rectal thermometry in children: a systematic review. Lancet 2002;360:603–9.

[14] van Staaij BK, Rovers MM, Schilder AG, Hoes AW. Accuracy and feasibility of daily infrared tympanic membrane temperature measurements in the identification of fever in children. Int J Pediatr Otorhinolaryngol 2003;67:1091–7.

[15] Cleare A, Heap E, Malhi GS, Wessely S, O' Keane V, Miell J. Low-dose hydrocortisone in chronic fatigue syndrome: a randomized crossover trial. Lancet 1999;353:455–8.

[16] Fischer E, Solomon S. Physiological responses to heat and cold. In: Licht S, editor. Therapeutic heat and cold. 2nd ed. Baltimore: Waverly Press; 1965. pp. 126–69 [chap. 4].

[17] Glaser EM, Shepherd RJ. Simultaneous experimental acclimatization to heat and cold in man. J Physiol 1963;169:592–602.

[18] Hamilos DL, Nutter D, Gershtenson J, Redmond DP, Clementi KB, Schmaling KB, Make BJ, Jones JF. Core body temperature is normal in chronic fatigue syndrome. Biol Psychiatry 1998;43: 293–302.

[19] Honda K, Inoue S. Sleep-enhancing effects of far-infrared radiation in rats. Int J Biometeorol 1988;32:92–4.

[20] Van Someren EJ. More than a marker: interaction between the circadian regulation of temperature and sleep, age-related changes, and treatment possibilities. Chronobiol Int 2000;17:313–54.

[21] Joyce J, Hotopf M, Wessely S. The prognosis of chronic fatigue and chronic fatigue syndrome: a systemic review. Q J Med 1997;90: 223–33.