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Repeated thermal therapy improves outcomes in patients with chronic pain

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Abstract. The purpose of this study is to clarify the effects of repeated thermal therapy in patients with chronic pain. Forty-six chronic pain patients were assigned to group A (multidisciplinary treatment, $n=24$) or group B (combination of multidisciplinary treatment and repeated thermal therapy, $n=22$). Thermal therapy was performed with 60 °C far-infrared ray dry sauna for 15 min and was then kept at bed rest with a blanket for 30 min once a day, 5 days a week for a total of 20 sessions. The number of pain behavior and anger score significantly decreased after treatment in both groups. After treatment, the number of pain behavior was slightly smaller ($p=0.07$) and anger score was significantly lower in group B than those in Group A ($p=0.05$). Two years after treatment, 17 patients (77%) in group B returned to work compared with 12 patients (50%) in group A ($p<0.05$). These results suggest that a combination of multidisciplinary treatment and repeated thermal therapy may be a promising method for treatment of chronic pain.

Keywords: Chronic pain; Repeated thermal therapy; Far-infrared ray dry sauna; Pain behavior; Pain-related anger

1. Introduction

Behavioral therapy (BT), cognitive behavioral therapy (CBT), and pain rehabilitation are effective in reducing pain [1]. In some patients, prolonged refractory pain affects their daily life and social function despite BT–CBT and rehabilitation. Etiologically, they have psychosocial backgrounds such as chronic stresses, problems in the family and between married couples, childhood abuse, or insufficient family affection [2]. They

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have pain-related anger and it is difficult to change their pain-related cognition and behavior. These social, emotional and environmental situations and incorrect pain-related cognition easily cause trouble for the therapist. In these cases, it is difficult to achieve therapeutic success with treatments such as BT–CBT and pain rehabilitation. Therefore, alternative effective treatments are needed. Local thermal therapy with a hot pack or paraffin has been used to treat pain [3]. We found that thermal therapy improved quality of life by improving sleep quality and general wellbeing in patients with chronic heart failure [4]. The purpose of this study is to clarify the effects of thermal therapy for patients with chronic pain [5].

2. Methods

2.1. Subjects

Forty-six patients were assigned to a multidisciplinary treatment group including CBT, rehabilitation and exercise therapy ($n=24$, group A) or a combination of multidisciplinary treatment and thermal therapy group ($n=22$, group B). There were no significant differences in age, gender, history of marriage or divorce, duration of illness, or the number of previous admissions due to chronic pain between the two groups (Table 1). The Ethics Committee of the Faculty of Medicine at Kagoshima University approved the experimental protocol.

2.2. Treatment program

All patients were admitted to our hospital for 5 weeks. One week after admission, behavioral counseling was given by a clinical psychologist to motivate the patients to participate in our treatment program. In group A, CBT and rehabilitation were started 2 weeks after admission, and exercise therapy was started 4 weeks after admission. In group B, thermal therapy was started 2 weeks after admission in addition to CBT and rehabilitation, and exercise therapy was started 4 weeks after admission (Fig. 1).

Table 1
Patient profile

	Group A ($n=24$)		Group B ($n=22$)		p
	n	%	n	%	
Gender					ns
Male	12	50	11	50	
Female	12	50	11	50	
Marital status					ns
Married	17	71	16	73	
Single	7	29	6	27	
Divorced	5	21	4	18	
Age (years)[a]	47.5 ± 8.5		43.5 ± 10.6		ns
Duration of illness (months)[a]	44.0 ± 14.2		46.0 ± 12.8		ns
The number of hospitalization[a]	2.4 ± 0.6		2.5 ± 0.2		ns

[a] Mean ± S.D., ns; not significant. No statistically significant differences were found between the two groups in the variables.

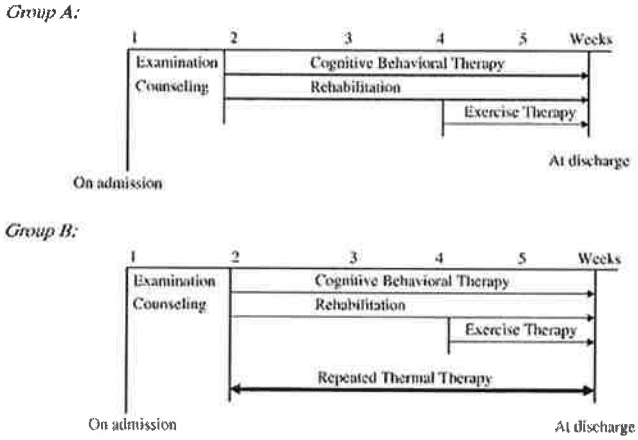

Fig. 1. Treatment program. Group A ($n=24$) patients were treated by multidisciplinary treatment including cognitive behavioral therapy, rehabilitation, and exercise therapy. Group B patients ($n=22$) were treated by a combination of multidisciplinary treatment and repeated thermal therapy.

2.3. Thermal therapy

A far infrared-ray dry sauna system (Olympia Co., Miyazaki, Japan) was used for thermal therapy [4]. The patients were placed in a supine position on a bed in a 60 °C sauna room for 15 min, and, after being transferred to a room kept at 28 °C, they were made to rest on a bed and covered with a blanket to keep them warm for an additional 30 min. The therapy was performed once a day and 5 days a week from Monday through Friday for 4 weeks.

2.4. Measurements

Pain behavior was assessed based on 11 items [5]. The number of pain behavior per day was counted by doctor, nurse, clinical psychologist, and other hospital staff. Anger score (0–9) was evaluated using the mental complaints in the Cornell Medical Index (CMI) [6]. The number of pain behavior was checked during 1 week after admission and 1 week before discharge, and the mean values were recorded. The anger score was checked on admission and at discharge.

2.5. Degree of satisfaction with treatment

The degree of satisfaction with the treatment was evaluated at discharge using a 5-grade scale of "very satisfactory", "satisfactory", "not sure", "disappointing", and "very disappointing".

Table 2
Changes in parameters before and after treatment

	Group A ($n=24$)		Group B ($n=22$)		p[a]
	Before	After	Before	After	
Number of pain behavior	12.0 ± 3.1	3.3 ± 2.2**	11.9 ± 2.7	2.1 ± 1.5**	0.07
Anger score (0–9)	4.3 ± 1.2	3.2 ± 1.9*	4.5 ± 1.1	2.2 ± 1.6**	0.05

Mean ± S.D., *$p<0.05$, **$p<0.001$ compared with before treatment.
[a] Comparisons of values after treatment between the two groups.

Table 3
Outcomes 2 years after treatment

Outcomes	Group A ($n=24$)		Group B ($n=22$)	
	n	%	n	%
Good	12	50	17	77
Poor	12	50	5	23

Twelve patients (50%) in group A and 17 patients (77%) in group B showed good outcomes 2 years after discharge ($\chi^2=3.7$, $p<0.05$).

2.6. Outcomes 2 years after discharge

The outcomes 2 years after discharge were evaluated as "good" in patients who were able to return to work, and "poor" in patients who had not returned to work and/or remaining hindrance in daily life.

2.7. Statistical analysis

All data were expressed as mean ± S.D. The comparisons between before and after treatment within the group were made with the Wilcoxon matched pairs signed ranks test. The comparisons between the two groups were compared using the Mann–Whitney U-test. The outcomes in group A and group B were compared using the Chi square test. $p<0.05$ was regarded as significant.

3. Results

3.1. The number of pain behavior and anger score before and after treatment

On admission, there were no significant differences in the number of pain behavior and anger score between the two groups. In both groups, the number of pain behavior, and anger score significantly decreased after treatment (Table 2). After treatment, the number of pain behavior was slightly smaller ($p=0.07$), and anger score was significantly lower in group B than those in group A ($p=0.05$).

3.2. Outcomes 2 years after discharge

Twelve patients (50%) in group A and 17 patients (77%) in group B showed good outcomes 2 years after discharge (Table 3). On the other hand, 12 patients (50%) in group A and 5 patients (23%) in group B showed poor outcomes ($\chi^2=3.7$, $p<0.05$).

Table 4
Evaluation of treatment

Evaluation of treatment	Group A ($n=24$)		Group B ($n=22$)	
	n	%	n	%
Very satisfactory	4	17	14	64
Satisfactory	9	38	4	18
Not sure	5	21	4	18
Disappointing	5	24	0	0
Very disappointing	0	0	0	0

The treatment was rated as "satisfactory" or "very satisfactory" by 13 patients (55%) in group A and 18 (82%) in group B ($\chi^2=14.0$, $p<0.01$).

3.3. Degree of satisfaction with treatment

The treatment was rated as "satisfactory" or "very satisfactory" by 13 patients (55%) in group A and 18 (82%) in group B (Table 4). It was rated as "disappointing" by 6 patients (24%) in group A but none in group B ($\chi^2=14.9$, $p<0.01$).

4. Discussion

The number of pain behavior and anger score significantly decreased after treatment in both groups. After treatment, the number of pain behavior was slightly smaller and anger score was significantly lower in group B than those in group A. Although all patients were not working at the beginning of treatment, 50% of patients in the multidisciplinary treatment group and 77% of those in the combined therapy group returned to work 2 years after discharge. The following 2 issues may be considered as reasons for the favorable outcomes in the combined therapy group. First, the number of pain behavior and anger score after treatment decreased in the combined therapy group in comparison to the multidisciplinary treatment group. Secondly, the rate of satisfaction for treatment was higher in the combined therapy group than in the multidisciplinary treatment group.

Thermal therapy is useful for relieving pain in patients with rheumatic disease [7], and mild warming exhibits sedative effects via the sensory nerve endings [8]. Furthermore, thermal therapy using far-infrared rays have a sleep-enhancing effect and relaxation effect of mind and body [9]. In the combined therapy group, these effects of thermal therapy may be related to the improvement of pain and sleep quality, and these may have resulted in the higher degree of satisfaction with the treatment. When satisfaction was obtained, the patients could smoothly accept the therapist's behavioral counseling and neutral management to decrease pain behavior. In addition, a cognitive shift from negative emotional responses against pain to acceptance of pain was acquired. They also noted that it is important to live with pain rather than avoid it [10]. As a result, it is considered that the number of pain behavior and pain-related anger decreased after repeated thermal therapy.

In conclusion, a combination of multidisciplinary treatment and repeated thermal therapy decreased the number of pain behavior and anger score, and led to a better clinical course and outcomes in patients with chronic pain. Therefore, this combination therapy may be a promising method for treatment of chronic pain.

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