16.5 Chronic (Congestive) Heart Failure (CHF)

1. Waon (Far Infrared) therapy improves quality of life as well as cardiac function and exercise capacity in patients with chronic heart failure.

Int Heart J. 2015;56(2):203-8. doi: 10.1536/ihj.14-266. Epub 2015 Feb 27.
Sobajima M[1], Nozawa T, Fukui Y, Ihori H, Ohori T, Fujii N, Inoue H.
Abstract
Waon therapy (WT), which in Japanese means soothing warmth, is a repeated sauna therapy that improves cardiac and vascular endothelial function in patients with chronic heart failure (CHF). We investigated whether WT could improve the quality of life (QOL) of CHF patients in addition to improving cardiac function and exercise capacity.A total of 49 CHF patients (69 ± 14 years old) were treated with a 60°C far infrared-ray dry sauna bath for 15 minutes and then kept in a bed covered with blankets for 30 minutes once a day for 3 weeks. At baseline and 3 weeks after starting WT, cardiac function, 6-minute walk distance (6MWD), flow mediated dilation (FMD) of the brachial artery, and SF36-QOL scores were determined.WT significantly improved left ventricular ejection fraction (LVEF), B-type natriuretic peptide (BNP), 6MWD, and FMD (3.6 ± 2.3 to 5.1 ± 2.8%, P < 0.01). Moreover, WT significantly improved not only the physical (PC) but also mental component (MC) of the QOL scores. WT-induced improvement of PC was negatively correlated with changes in BNP (r = -0.327, P < 0.05), but MC improvement was not related directly to changes in BNP, LVEF, or 6MWD. WT-induced changes in MC were not parallel to PC improvement.WT improved Quality of Life (QOL) as well as cardiac function and exercise capacity in patients with CHF. Mental QOL improved independently of WT-induced improvement of cardiac function and exercise capacity.

2. Leg heating using far infra-red radiation in patients with chronic heart failure acutely improves the hemodynamics, vascular endothelial function, and oxidative stress.

Intern Med. 2012;51(17):2263-70. Epub 2012 Sep 1.
Inoue S, Takemoto M, Chishaki A, Ide T, Nishizaka M, Miyazono M, Sawatari H, Sunagawa K.
Source: Department of Cardiovascular Medicine, Kyushu University Hospital, Japan.
Abstract
BACKGROUND: Systemic thermal therapy (STT) has been associated with beneficial effects in patients with chronic heart failure (CHF). The fact, however, that it requires a dedicated as well as spacious facility and trained personnel makes it difficult to practice in the daily care of patients with CHF.
OBJECTIVE: The aim of this study was to determine whether the leg thermal therapy (LTT) has a positive impact similar to that of STT in patients with CHF. Methods and Results Twenty patients with CHF (57 ± 17 years old, left ventricular ejection fraction=30 ± 10%) received LTT (45°C) for 20 minutes. Immediately after the treatment, the core temperature had increased (+0.3 ± 0.3°C) (p<0.01). While the LTT had no significant effects on the heart rate, systolic arterial pressure, and diastolic blood pressure, it increased the cardiac output (mixed venous oxygen saturation; +2 ± 3%) and decrease the pulmonary capillary wedge pressure (-2 ± 2 mmHg). The LTT significantly improved the flow-mediated vasodilatation (FMD) from 4.8 ± 2.6 to 7.1 ± 3.6%, the antioxidative markers, thiol from 4.0 ± 0.7 to 4.5 ± 0.9 μmoL/g, and the marker of oxidative deoxyribonucleic acid (DNA) damage, urine 8-hydroxy-2'deoxyguanosine (8OHdG) from 100 to 82 ± 3%, respectively (p<0.05). No patient had any adverse effects associated with LTT.
Conclusion: leg thermal therapy(LTT) acutely improved flow-mediated vasodilatation (FMD), and oxidative stress in patients with chronic heart failure (CHF). Although the long-term effect of leg thermal therapy (LTT) remains to be investigated, its practicality which is comparable to that of Systemic thermal therapy (STT) would make it an attractive therapeutic strategy for patients with chronic heart failure (CHF).

3. Effect of repeated (Far Infrared) sauna treatment on exercise tolerance and endothelial function in patients with chronic heart failure.

Am J Cardiol. 2012 Jan 1;109(1):100-4. doi: 10.1016/j.amjcard.2011.08.014. Epub 2011 Sep 23.
Ohori T, Nozawa T, Ihori H, Shida T, Sobajima M, Matsuki A, Yasumura S, Inoue H.

Source: Second Department of Internal Medicine, Graduate School of Medicine, University of Toyama, Japan.

Abstract

Repeated sauna treatment, known as Waon (Far Infrared) therapy, has been shown to improve cardiac function as well as exercise tolerance in patients with chronic heart failure. However, the underlying mechanisms of this therapy regarding these improvements remain to be elucidated. Forty-one patients with chronic heart failure (mean age 68.3 ± 13.5 years old) underwent Waon (Far Infrared) therapy 5 times a week for 3 weeks. Before and after treatment, a number of assessments were performed in all subjects: 6-minute walk test, echocardiography, determination of neurohumoral factors and number of circulating CD34(+) cells, and a flow-mediated dilation (FMD) test of endothelial function. Cardiopulmonary exercise testing was also performed in 20 patients. Waon (Far Infrared) therapy increased the left ventricular ejection fraction (from 30.4 ± 12.6% to 32.5% ± 12.8%, p = 0.023) and reduced plasma levels of norepinephrine (from 400 ± 258 to 300 ± 187 pg/ml, p = 0.015) and brain natriuretic peptide (from 550 ± 510 to 416 ± 431 pg/ml, p = 0.035). Waon (Far Infrared) therapy increased the 6-minute walk distance (from 337 ± 120 to 379 ± 126 m, p <0.001) in association with an improvement in FMD (from 3.5 ± 2.3% to 5.5% ± 2.7%, p <0.001) and an increase in the number of circulating CD34(+) cells (p = 0.025). Changes in 6-minute walk distance were correlated positively with those in the left ventricular ejection fraction and FMD and negatively with those in plasma levels of norepinephrine and brain natriuretic peptide levels. A multivariate analysis revealed that an increase in FMD was the only independent determinant of 6-minute walk distance improvement. Finally, Waon (Far Infrared) therapy significantly increased peak Vo(2), and this increase was also correlated with changes in FMD.

In conclusion, repeated (Far Infrared) sauna therapy in patients with chronic heart failure improves exercise tolerance in association with improvement in endothelial function.

4. Does thermal therapy benefit patients with chronic heart failure?

Mayo Clin Proc. 2010 Jul;85(7):693; author reply 693. doi: 10.4065/mcp.2010.0185.

J. Timothy Hanlon, MD

Comment on

- Chronic heart failure: contemporary diagnosis and management.[Mayo Clin Proc. 2010]

The recent symposium by Ramani et al1 is a concisely written overview of the current management of chronic heart failure, surely to be of value to both the specialist and generalist. Absent from this review, however, is any mention of “Waon” (Far Infrared) or thermal therapy, likely in part because Waon (Far Infrared) therapy is not well known or appropriately used by most clinicians in the United States.

First described by Tei et al in 1995, the methodology of thermal therapy and its benefits for patients with chronic heart failure (CHF) have been detailed extensively in the literature.

These studies demonstrate improved New York Heart Association classification, decreased heart size, improved cardiac function, lowered incidence of arrhythmias, reduced brain natriuretic peptide and norepinephrine levels, and improvement in endothelial function. Furthermore, although not germane to this article, additional benefits have been described for thermal therapy in several other diseases, including Sjögren syndrome, peripheral vascular disease, pulmonary hypertension, and fibromyalgia. It is interesting to speculate about reasons for the failure to use this therapeutic modality in this country, including absence of any financial incentives, but clearly a deficiency in knowledge of Waon (Far Infrared) therapy plays an important role.

A brief discussion of thermal therapy in CHF would have been appropriate in this symposium inMayo clinic Proceedings, especially because Tei’s original research into this modality was done while he was an international fellow at Mayo Clinic.

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5. Waon (Far Infrared) therapy improves the prognosis of patients with chronic heart failure.

J Cardiol. 2009 Apr;53(2):214-8. doi: 10.1016/j.jjcc.2008.11.005. Epub 2009 Jan 18.

Kihara T, Miyata M, Fukudome T, Ikeda Y, Shinsato T, Kubozono T, Fujita S, Kuwahata S, Hamasaki S, Torii H, Lee S, Toda H, Tei C.

Abstract

BACKGROUND: We developed a Waon (Far Infrared) therapy (soothing warm therapy) and have previously reported that repeated Waon (Far Infrared) therapy improves hemodynamics, peripheral vascular function, arrhythmias, and clinical symptoms in patients with chronic heart failure (CHF). The aim of this study was to investigate the effect of Waon (Far Infrared) therapy on the prognosis of CHF patients.
PATIENTS AND METHODS: We studied 129 patients with CHF in NYHA functional class III or IV who were admitted to our hospital between January 1999 and March 2001. In the Waon (Far Infrared) therapy group, 64 patients were treated with a far infrared-ray dry sauna at 60 degrees C for 15 min and then kept on bed rest with a blanket for 30 min. The patients were treated daily for 5 days during admission, and then at least twice a week after discharge. In the control group, 65 patients, matched for age, gender, and NYHA functional class, were treated with traditional CHF therapy. The follow-up time was scheduled for 5 years.
RESULTS: Recent, complete follow-up data on each patient were obtained. The overall survival rate was 84.5% (Kaplan-Meier estimate). Twelve patients died in the control group and 8 patients died in the Waon (Far Infrared) therapy group at 60 months of follow-up. Cardiac events due to heart failure or cardiac death occurred in 68.7% of the control group but only 31.3% of the Waon (Far Infrared) therapy group ($P<0.01$) at 60 months of follow-up.
CONCLUSION: Waon (Far Infrared) therapy reduced cardiac events in patients with chronic heart failure (CHF). This therapy is a promising non-pharmacological treatment for CHF.

6. Beneficial effects of Waon (Far Infrared) therapy on patients with chronic heart failure: results of a prospective multicenter study.

J Cardiol. 2008 Oct;52(2):79-85. doi: 10.1016/j.jjcc.2008.07.009. Epub 2008 Aug 27.
Miyata M, Kihara T, Kubozono T, Ikeda Y, Shinsato T, Izumi T, Matsuzaki M, Yamaguchi T, Kasanuki H, Daida H, Nagayama M, Nishigami K, Hirata K, Kihara K, Tei C.
Abstract
BACKGROUND: We conducted a prospective multicenter case-control study to confirm the clinical efficacy and safety of Waon (Far Infrared) therapy on chronic heart failure (CHF).
METHODS: Patients (n=188) with CHF were treated with standard therapy for at least 1 week, and then were randomized to Waon (Far Infrared) therapy (n=112) or a control group (n=76). All patients continued conventional treatment for an additional 2 weeks. The Waon (Far Infrared) therapy group was treated daily with a far infrared-ray dry sauna at 60 degrees C for 15 min and then kept on bed rest with a blanket for 30 min for 2 weeks. Chest radiography, echocardiography, and plasma levels of brain natriuretic peptide (BNP) were measured before and 2 weeks after treatment.
RESULTS: NYHA functional class significantly decreased after 2 weeks of treatment in both groups. Chest radiography also showed a significant decrease of the cardiothoracic ratio in both groups (Waon (Far Infrared) therapy: 57.2+/-8.0% to 55.2+/-8.0%, $p<0.0001$; control: 57.0+/-7.7% to 56.0+/-7.1%, $p<0.05$). Echocardiography demonstrated that left ventricular diastolic dimension (LVDd), left atrial dimension (LAD), and ejection fraction (EF) significantly improved in the Waon (Far Infrared) therapy group (LVDd: 60.6+/-7.6 to 59.1+/-8.4 mm, $p<0.0001$; LAD: 45.4+/-9.3 mm to 44.1+/-9.4 mm, $p<0.05$; EF: 31.6+/-10.4% to 34.6+/-10.6%, $p<0.0001$), but not in the control group (LVDd: 58.4+/-10.3 mm to 57.9+/-10.4 mm; LAD: 46.3+/-9.7 mm to 46.2+/-10.1 mm; EF: 36.6+/-14.1% to 37.3+/-14.0%). The plasma concentration of BNP significantly decreased with Waon (Far Infrared) therapy, but not in the control group (Waon: 542+/-508 pg/ml to 394+/-410 pg/ml, $p<0.001$; control: 440+/-377 pg/ml to 358+/-382 pg/ml).
CONCLUSION: Waon (Far Infrared) therapy is safe, improves clinical symptoms and cardiac function, and decreases cardiac size in chronic heart failure (CHF) patients. Waon (Far Infrared) therapy is an innovative and promising therapy for patients with chronic heart failure (CHF).

7. Beneficial effects of sauna bathing for heart failure patients.

Exp Clin Cardiol. 2007 Spring;12(1):29-32.
Blum N, Blum A.

Abstract
Generally, the sauna bathing has been contraindicated for patients with chronic heart failure. However, it has been well tolerated and improved hemodynamics has been shown in patients with chronic heart failure after a single exposure and after a four-week period of sauna bathing (five days per week). Left ventricular ejection fraction increased from 24+/-7% to 31+/-9% and left ventricular end-diastolic dimension decreased from 66+/-6 mm to 62+/-5 mm after four weeks. In the present review, the mechanisms of action, the

clinical data available to date and the possible beneficial effects of sauna bathing for patients with heart failure are discussed, as well as the precautions and the contraindications in this specific group of patients with chronic heart failure.

Conclusion:
It seems that sauna treatment may help improve clinical symptoms and hemodynamic parameters secondary to an improvement in the endothelial function of patients with CHF whose endothelial function is impaired. Confirms safety

8. Safety and efficacy of repeated sauna bathing in patients with chronic systolic heart failure: a preliminary report.

J Card Fail. 2005 Aug;11(6):432-6.

Miyamoto H, Kai H, Nakaura H, Osada K, Mizuta Y, Matsumoto A, Imaizumi T.

Abstract
BACKGROUND: We sought to determine the safety and efficacy of repeated 60 degrees C sauna bathing in patients with chronic systolic congestive heart failure (CHF).
METHODS AND RESULTS: This study included 15 hospitalized CHF patients (New York Heart Association class = 2.8 +/- 0.4) in stable clinical condition on conventional treatments. Sauna bathing was performed once per day for 4 weeks. Repeated sauna bathing was safely completed without any adverse effects in all patients. Symptoms improved in 13 of 15 patients after 4 weeks. Sauna bathing decreased systolic blood pressure without affecting heart rate, resulting in significant decrease in the rate-pressure product (6811 +/- 1323 to 6292 +/- 1093). Echocardiographic left ventricular ejection fraction was significantly increased from 30 +/- 11 to 34 +/- 11%. Sauna bathing significantly improved exercise tolerance manifested by prolonged 6-minute walking distance (388 +/- 110 to 448 +/- 118 m), increased peak respiratory oxygen uptake (13.3 +/- 1.8 to 16.3 +/- 2.1 mL/kg/min), and enhanced anaerobic threshold (9.4 +/- 1.2 to 11.5 +/- 1.9 mL/kg/min). Four-week bathing significantly reduced plasma epinephrine (40 +/- 42 to 21 +/- 23 pg/mL) and norepinephrine (633 +/- 285 to 443 +/- 292 pg/mL). Sauna bathing reduced the number of hospital admission for CHF (2.5 +/- 1.3 to 0.6 +/- 0.8 per year).
CONCLUSION: Repeated 60 degrees C sauna bathing was safe and improved symptoms and exercise tolerance in chronic congestive heart failure (CHF) patients. Sauna bathing may be an effective adjunctive therapy for chronic systolic congestive heart failure (CHF). Confirms safety

9. Effects of repeated (Far Infrared) sauna treatment on ventricular arrhythmias in patients with chronic heart failure.

Circ J. 2004 Dec;68(12):1146-51.
Kihara T1, Biro S, Ikeda Y, Fukudome T, Shinsato T, Masuda A, Miyata M, Hamasaki S, Otsuji Y, Minagoe S, Akiba S, Tei C.

Abstract
BACKGROUND: The aim of the present study was to determine whether repeated 60 degrees C sauna treatment improves cardiac arrhythmias in chronic heart failure (CHF) patients, because ventricular arrhythmias are an important therapeutic target in CHF.
METHODS AND RESULTS: Thirty patients (59+/-3 years) with New York Heart Association functional class II or III CHF and at least 200 premature ventricular contractions (PVCs)/24 h assessed by 24-h Holter recordings were studied. They were randomized into sauna-treated (n=20) or non-treated (n=10) groups. The sauna-treated group underwent a 2-week program of a daily 60 degrees C far infrared-ray dry sauna for 15 min, followed by 30 min bed rest with blankets, for 5 days per week. Patients in the non-treated group had bed rest in a temperature-controlled room (24 degrees C) for 45 min. The total numbers of PVCs/24 h in the sauna-treated group decreased compared with the non-treated group [848+/-415 vs 3,097+/-1,033/24 h, $p<0.01$]. Heart rate variability (SDNN, standard deviation of normal-to-normal beat interval) increased [142+/-10 (n=16) vs 112+/-11 ms (n=8), $p<0.05$] and plasma brain natriuretic peptide concentrations decreased [229+/-54 vs 419+/-110 pg/ml, $p<0.05$] in the sauna-treated group compared with the non-treated group.

CONCLUSION: Repeated FIR sauna treatment improves ventricular arrhythmias in patients with chronic heart failure (CHF).

10. Acute hemodynamic improvement by thermal vasodilation in congestive heart failure.
Circulation. 1995 May 15;91(10):2582-90.
Tei C, Horikiri Y, Park JC, Jeong JW, Chang KS, Toyama Y, Tanaka N.

Abstract
BACKGROUND: A warm-water bath (WWB) or sauna bath (SB) has generally been considered inappropriate for patients with severe congestive heart failure (CHF). However, a comprehensive investigation of the hemodynamic effects of thermal vasodilation in CHF has not been previously undertaken.
METHODS AND RESULTS: To investigate the acute hemodynamic effects of thermal vasodilation in CHF, we studied 34 patients with chronic CHF (mean age, 58 +/- 14 years). Clinical stages were New York Heart Association functional class II in 2, III in 19, and IV in 13 patients. Mean ejection fraction was 25 +/- 9%. After a Swan-Ganz catheter was inserted via the right jugular vein, the patient had a WWB for 10 minutes at 41 degrees C or an SB for 15 minutes at 60 degrees C. Blood pressure, ECG, echo-Doppler, expiration gas, and intracardiac pressures were recorded before, during, and 30 minutes after each bath. Oxygen consumption increased mildly, pulmonary arterial blood temperature increased by 1.2 degrees C, and heart rate increased by 20 to 25 beats per minute on average at the end of WWB or SB. Systolic blood pressure showed no significant change. Diastolic blood pressure decreased significantly during SB ($P < .01$). Cardiac and stroke indexes increased and systemic vascular resistances decreased significantly during and after WWB and SB ($P < .01$). Mean pulmonary artery, mean pulmonary capillary wedge, and mean right atrial pressures increased significantly during WWB ($P < .05$) but decreased significantly during SB ($P < .05$). These pressures decreased significantly from the control level after each bath ($P < .01$). Mitral regurgitation associated with CHF decreased during and 30 minutes after each bath. Cardiac dimensions decreased and left ventricular ejection fraction increased significantly after WWB and SB. In an additional study, plasma norepinephrine increased significantly during SB in healthy control subjects and in patients with CHF and returned to control levels by 30 minutes after SB.
CONCLUSIONS: Hemodynamics improve after A warm-water bath (WWB) or sauna bath (SB) in patients with chronic congestive heart failure. This is attributable to the reduction in cardiac preload and afterload. Thus, thermal vasodilation can be applied with little risk if appropriately performed and may provide a new nonpharmacological therapy for congestive heart failure (CHF). Confirms safety