

## Pleiotropic Effect of Waon Therapy

JMAJ 52(3): 191–193, 2009

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### Introduction

In 1989, we developed a form of thermal therapy, which uses a dry sauna temperature maintained at 60°C and differs from the traditional sauna. In 2007, we changed the name from thermal therapy to Waon therapy in order to distinguish our soothing warm therapy from the thermal therapy for cancer.<sup>1</sup> “Waon” means soothing warmth that comfortably refreshes the mind and body. Patients remain in the 60°C dry sauna for 15 min, and are then placed in a supine position on a bed outside the sauna where they are covered with blankets for 30 min.

In this review, we summarize the beneficial effects of Waon therapy in relieving many diseases including chronic heart failure (CHF), peripheral arterial disease (PAD), lifestyle-related diseases, chronic obstructive pulmonary disease (COPD), fibromyalgia, chronic pain, mild depression, and chronic fatigue syndrome.

### Waon Therapy

Waon therapy uses a far infrared ray dry sauna, which is uniformly maintained at 60°C with an absence of hydration pressure. Patients are placed in a supine or sitting position in the 60°C sauna for 15 min, and once removed, allowed to rest on a bed in a supine position with a blanket to keep them warm for an additional 30 min. They are weighed before and after Waon therapy, and drink water to compensate for weight loss by perspiration.

### Chronic heart failure (CHF)

Regarding the acute effect of Waon therapy, we

have reported that 60°C sauna therapy for 15 min improved acute hemodynamics in patients with CHF, including cardiac index, mean pulmonary wedge pressure, systemic and pulmonary resistance, and cardiac function.<sup>2</sup> Subsequently, we reported that 4 weeks of Waon therapy significantly improved clinical symptoms, increased the ejection fraction, and decreased cardiac size on echocardiogram and chest x-ray.<sup>2–4</sup> Furthermore, we demonstrated that daily Waon therapy for 2 weeks decreased premature ventricular contractions and increased heart rate variability in patients with CHF, suggesting that Waon therapy decreases sympathetic nervous activity and improves ventricular arrhythmias.<sup>5</sup>

Furthermore, in a prospective multicenter study, we confirmed that Waon therapy is safe, improves clinical symptoms and cardiac function, and decreases cardiac size in CHF patients.<sup>6</sup> Recently, we assessed the impact of Waon therapy on the prognosis of 129 patients with CHF. Sixty-five and 64 patients without and with Waon therapy, respectively, were followed for 5 years. The patients in the Waon group continued this therapy at least twice weekly after discharge. Waon therapy significantly decreased the rate of death or hospitalization in patients with CHF in comparison to the non-Waon therapy group.<sup>7</sup>

We then investigated the vascular endothelial function to clarify the mechanisms of the effect of Waon therapy on CHF, since it has been reported that vascular endothelial function is impaired in CHF. We reported that 2 weeks of Waon therapy significantly reduced brain natriuretic peptide (BNP) concentrations and improved endothelial function in patients with CHF. There was a significant correlation between the change in flow-mediated dilatation (%FMD) and the percent

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improvement in BNP concentrations.<sup>8</sup>

In order to confirm the effect of Waon therapy on CHF and clarify its mechanism, we performed experimental studies using TO-2 cardiomyopathic hamsters with heart failure. We reported that repeated Waon therapy improved survival in TO-2 cardiomyopathic hamsters with heart failure.<sup>9</sup> We clarified that one of the molecular mechanisms by which repeated Waon therapy improved endothelial function was an increase in mRNA and protein of endothelial nitric oxide synthase (eNOS) in Syrian golden hamsters<sup>10</sup> and TO-2 cardiomyopathic hamsters.<sup>11</sup> We believe that eNOS up-regulation induced by repeated Waon therapy is caused by an increase in cardiac output and blood flow, which in turn results in increased shear stress, although thermal stimulation might up-regulate arterial eNOS directly.

#### Peripheral arterial disease (PAD)

Recently, we have shown that repeated Waon therapy is safe for patients with severe peripheral arterial disease (PAD) and is potentially effective as evidenced by a substantial decrease in the pain score, by increases in the ankle brachial pressure index and blood flow assessed by laser Doppler perfusion imaging, and by the formation of new collateral vessels on angiography. In addition, ischemic ulcers heal or improve markedly.<sup>12,13</sup>

Nitric oxide (NO), constitutively produced by eNOS, plays a role in angiogenesis. In a mouse model of hindlimb ischemia, we demonstrated that repeated Waon therapy increased eNOS protein expression, blood flow, and capillary density. Moreover, Waon therapy did not increase blood flow and capillary density in eNOS-deficient mice, and we concluded that eNOS is a critical regulator of angiogenesis by Waon therapy.<sup>14</sup>

#### Lifestyle-related diseases

For patients with CHF, 2 weeks of Waon therapy improves the impaired vascular endothelial function in the setting of coronary risk factors, such as hypertension, hypercholesterolemia, diabetes mellitus, obesity, and smoking.<sup>15</sup> In addition, we investigated the effect of Waon therapy on oxidative stress evaluated by urinary 8-epi-PGF2 $\alpha$  levels in patients with at least one coronary risk factor. We reported that 2 weeks of Waon therapy significantly decreased urinary 8-epi-PGF2 $\alpha$  levels compared to the non-Waon therapy group.<sup>16</sup>

#### Chronic obstructive pulmonary disease (COPD)

Many patients with COPD suffer from breathing-related problems in spite of receiving conventional therapies such as medication, physical therapy, and oxygen inhalation. Therefore, there is a great demand for the development of new therapies for COPD. We reported that 4 weeks of Waon therapy improved the impaired right ventricular positive dp/dt, pulmonary hypertension during exercise, exercise tolerance, and the quality of life in patients with severe COPD.<sup>17</sup>

#### Fibromyalgia syndrome

Fibromyalgia syndrome is a chronic syndrome characterized by widespread pain with tenderness in specific areas. Thirteen female patients with fibromyalgia syndrome received Waon therapy. All patients experienced a significant reduction in pain by half after the first session of Waon therapy, and the effects of Waon therapy became stable after 10 treatments. The pain visual analog scale and symptom scores of the fibromyalgia impact questionnaire were significantly improved after Waon therapy and remained low throughout the observation period of a mean 14 months.<sup>18</sup>

#### Chronic pain

Patients with chronic pain have pain-related anger, and it is difficult to change their pain-related cognition and behavior. We examined the effect of combining Waon therapy and multidisciplinary treatment including cognitive behavioral therapy, rehabilitation, and exercise therapy, on patients with chronic pain. The combination of Waon therapy and multidisciplinary treatment decreased the pain visual analog scale, number of pain behaviors, depressive mood, and anger score.<sup>19</sup>

#### Mild depression

We examined the effect of Waon therapy on mildly depressed patients with general fatigue, appetite loss, and somatic and mental complaints. Somatic and mental complaints decreased, and a relaxation effect was obtained after 4 weeks of Waon therapy.<sup>20</sup> Furthermore, we found that appetite increased and that plasma ghrelin concentrations and daily caloric intake increased after 4 weeks of Waon therapy. Ghrelin is a novel growth hormone-releasing peptide isolated from human and rat stomachs and stimulates food

intake, body weight gain, and growth hormone secretion.

### Chronic fatigue syndrome (CFS)

CFS is an illness characterized by disabling fatigue lasting for at least 6 months. Because of its unclear etiology, diagnostic uncertainty, and the resultant heterogeneity of the patients with CFS, there is no established treatment for CFS. Many patients with CFS were successfully treated by Waon therapy including 2 patients reported previously.<sup>21</sup>

### Conclusion

An ideal therapy should be safe, free of side effects, and have high medical value, that is, a high effect/cost ratio. It should be non-invasive, and patients should feel better. Waon therapy fulfills all of these criteria. Waon therapy is an innovative and promising therapy for treating patients with intractable diseases such as CHF, PAD, COPD, fibromyalgia, chronic pain, mild depression, and CFS.

### References

1. Tei C. Waon therapy: soothing warmth therapy. *J Cardiol.* 2007; 49:301–304.
2. Tei C, Horikiri Y, Park JC, et al. Acute hemodynamic improvement by thermal vasodilation in congestive heart failure. *Circulation.* 1995;91:2582–2590.
3. Tei C, Tanaka N. Thermal vasodilation as a treatment of congestive heart failure: A novel approach. *J Cardiol.* 1996;27:29–30.
4. Basford JR, Oh JK, Allison TG, et al. Safety, acceptance, and physiologic effects of sauna bathing in people with chronic heart failure: a pilot report. *Archives of Physical Medicine and Rehabilitation.* 2009;90:173–177.
5. Kihara T, Biro S, Ikeda Y, et al. Effects of repeated sauna treatment on ventricular arrhythmias in patients with chronic heart failure. *Circ J.* 2004;68:1146–1151.
6. Miyata M, Kihara T, Kubozono T, et al. Beneficial effects of Waon therapy on patients with chronic heart failure: Results of a prospective multicenter study. *J Cardiol.* 2008;52:79–85.
7. Kihara T, Miyata M, Fukudome T, et al. Waon therapy improves the prognosis of patients with chronic heart failure. *J Cardiol.* 2009;53:214–218.
8. Kihara T, Biro S, Imamura M, et al. Repeated thermal therapy treatment improves vascular endothelial and cardiac function in patients with chronic heart failure. *J Am Coll Cardiol.* 2002;39:754–759.
9. Ikeda Y, Biro S, Kamogawa Y, et al. Effect of repeated sauna therapy on survival in TO-2 cardiomyopathic hamsters with heart failure. *Am J Cardiol.* 2002;90:343–345.
10. Ikeda Y, Biro S, Kamogawa Y, et al. Repeated thermal therapy upregulates arterial endothelial nitric oxide synthase expression in Syrian golden hamsters. *Jpn Circ J.* 2001;65:434–438.
11. Ikeda Y, Biro S, Kamogawa Y, et al. Repeated sauna therapy increases arterial endothelial nitric oxide synthase expression and nitric oxide production in cardiomyopathic hamsters. *Circ J.* 2005;69:722–729.
12. Tei C, Shinsato T, Miyata M, Kihara T, Hamasaki S. Waon therapy improves peripheral arterial disease. *J Am Coll Cardiol.* 2007;50:2169–2171.
13. Tei C, Shinsato T, Kihara T, Miyata M. Successful thermal therapy for end-stage peripheral artery disease. *J Cardiol.* 2006; 47:163–164.
14. Akasaki Y, Miyata M, Eto H, et al. Repeated thermal therapy up-regulates endothelial nitric oxide synthase and augments angiogenesis in a mouse model of hindlimb ischemia. *Circ J.* 2006;70:463–470.
15. Imamura M, Biro S, Kihara T, et al. Repeated thermal therapy improves impaired vascular endothelial function in patients with coronary risk factors. *J Am Coll Cardiol.* 2001;38:1083–1088.
16. Masuda A, Miyata M, Kihara T, Minagoe S, Tei C. Repeated sauna therapy reduces urinary 8-epi-prostaglandin F(2alpha). *Jpn Heart J.* 2004;45:297–303.
17. Umehara M, Yamaguchi A, Itakura S, et al. Repeated waon therapy improves pulmonary hypertension during exercise in patients with severe chronic obstructive pulmonary disease. *J Cardiol.* 2008;51:106–113.
18. Matsushita K, Masuda A, Tei C. Efficacy of Waon therapy for fibromyalgia. *Intern Med.* 2008;47:1473–1476.
19. Masuda A, Koga Y, Hattanmaru M, Minagoe S, Tei C. The effects of repeated thermal therapy for patients with chronic pain. *Psychother Psychosom.* 2005;74:288–294.
20. Masuda A, Nakazato M, Kihara T, Minagoe S, Tei C. Repeated thermal therapy diminishes appetite loss and subjective complaints in mildly depressed patients. *Psychosom Med.* 2005; 67:643–647.
21. Masuda A, Kihara T, Fukudome T, Shinsato T, Minagoe S, Tei C. The effects of repeated thermal therapy for two patients with chronic fatigue syndrome. *J Psychosom Res.* 2005;58:383–387.