

Antihypertensive Effect of Far Infrared Board in Spontaneously Hypertensive Rat

Introduction

Hypertension refers to the continuous increase of arterial blood pressure over the normal range, and the adult's range of normal blood pressure is very wide. The World Health Organization's (WHO) definition of hypertension is: in the resting state, blood pressure is consistently higher than 140 (systolic) / 90 (diastolic) mmHg. According to the 7th version of hypertension definition published by the US National Institutes of Health in 2003, hypertension is systolic blood pressure higher than 140 mmHg or diastolic blood pressure higher than 90 mmHg. The systolic blood pressure between 140 ~ 159 mmHg and diastolic blood pressure between 90 ~ 99 mmHg is the first phase (mild) of hypertension. If the systolic pressure is over 160 mmHg or diastolic blood pressure over 100 mmHg, it is the second phase (moderate) of hypertension. The normal systolic blood pressure should be lower than 120 mmHg, and the diastolic blood pressure should be lower than 80 mmHg, if the systolic blood pressure is between 120 ~ 139 mmHg or diastolic blood pressure between 80 ~ 89 mmHg, it is pre-phase of hypertension. Hypertension is one of the top ten causes of death in Taiwan, and about five people die from hypertensive diseases per day on average. According to the statistics of the Ministry of Health and Welfare, five of ten leading causes of death are chronicle diseases related or closely related to hypertension including heart diseases, diabetes, cerebrovascular diseases, nephritis, kidney and renal syndrome diseases. According to the survey of the National Health Bureau of Taiwan, the prevalence rates of hypertension in the population aged 15 and over in Taiwan are 24.9% of the male and 18.2% of the female; the prevalence rate of the population aged 65 and over is up to 60%. However, the percentages of patients of blood pressure under the control of the target range are: 21% of the male and 29% of the female. The threat of hypertension to the health of the people can thus be seen. Known as the invisible killer, the symptom of hypertension is related to the level of damage to the terminal organs. The long-term and sustained rise in the blood pressure will harden and thicken the walls of small arteries, resulting in diseases of the cardiovascular system, brain and kidneys and other organs or the acceleration of the formation of atherosclerosis and stroke. Therefore, blood pressure regulation occupies a very important position in the prevention and treatment of cardiovascular diseases.

Far-infrared ray is generally defined as the electromagnetic wave in the wavelength range of 5.6-1000 μm . The band wavelength of 4-14 μm is closely related to biological growth, and thus it is known as the growth ray. It is the most widely applied band of wavelength in far-infrared treatment as it can promote capillaries and blood circulation, promote metabolism, increase the body's immune system, and balance body pH. Its clinical applications include: wound healing and pain killing, hypertension treatment, mental stress relief, improving sleeping quality, lowering blood sugar, alleviating fatigue sensation, tumor thermal therapy, maternal urinary retention treatment, and treatment of pediatric intestinal cramps. Far-infrared ray is commonly used in today's preventive medicine and widely applied in rehabilitation and disease treatment with a positive effect of treatment.

Hypertension is a common disease of adults, and its impact on the human body is systemic and destructive. Hypertension is often accompanied by lesions of the kidney, heart and vascular structures and can cause blood vessel end diseases such as kidney failure, heart failure and coronary artery diseases. In addition, high blood pressure often leads to some diseases of high death rate such as myocardial infarction, ischemic stroke and peripheral vascular obstruction and other diseases. Spontaneous hypertension rats (SHR) are the most widely used animal mode in the study of hypertension-related diseases. The genetic resistances, duration, cardiovascular complications of SHR are similar to human hypertension. The blood pressure of SHR varies with different gender and age. The blood pressure of male rate aged 10 weeks and above can exceed 200 mmHg. In this study, by using the wooden board with far infrared ray, we cultivated rats in the environment in contact with the wooden board to analyze the impact on the blood pressure of SHR. It is expected that the findings of this study can provide a reference for the prevention and treatment of hypertension.

Material and Method

Experimental materials:

1. Far infrared board: provided by Ua Wood Floors.
2. Spontaneous hypertensive rat (SHR) and the control group rat Wistar Kyoto (WKY): the rat aged 8 weeks were purchased from the National Laboratory Animal Center (NLAC), and raised and fed with granule feed in the Animal Center of National Chiayi University.

3. The non-invasive blood pressure measuring instrument for rats: Model UR-5000, UEDA, Tokyo, Japan, BioLASCO Taiwan Co.

Experimental method:

1. Experimental animal

The male SHR rats aged 8 weeks and WKY rats were purchased from NLAC as the experimental animals to be raised in the stainless steel cages in the Animal Center of National Chiayi University. Solid-type feeds were provided (MF-18, Oriental Yeast Co., LTD) for one week. The experiment was conducted when the rats were aged 9 weeks.

2. Animal grouping

The 9-week old female SHR rats were divided into four groups and each group consists of 10 rats, and the grouping is as shown below:

Group 1: the rats were raised in the far infrared environment for one week. Then, the blood pressure was measured every day by applying non-invasive tail blood pressure measurement to observe the blood pressure lowering effect of the far infrared board.

Group 2: given atenolol and far infrared environment, we observed the blood pressure lowering effect of the blood pressure lowering drugs.

Group 3: giving antihypertensive drugs only

Group 4: using SHR rats without any treatment as the control group.

In addition, the WKY rats were divided into four groups for experiment as the control groups.

3. Blood pressure measurement

Non-invasive blood pressure measuring instrument (UR-5000, UEDA, and Tokyo, Japan) was used for rats to measure the heart rate, the systolic, diastolic and mean blood pressure of rats by using the vibration method and light penetration measured volumetric calculation method. Before measurement, the rats were placed in the insulation tube of temperature at 38 ± 0.5 °C, and were wrapped up by using rat-pocket with the tail being disclosed. To prevent rats from being tense, we fixed the rat tail with the tail cuff for blood pressure measuring, so that the instrument can automatically detect the blood flow stability and apply the pressure to measure the mean blood pressure values.

4. Statistics Analysis

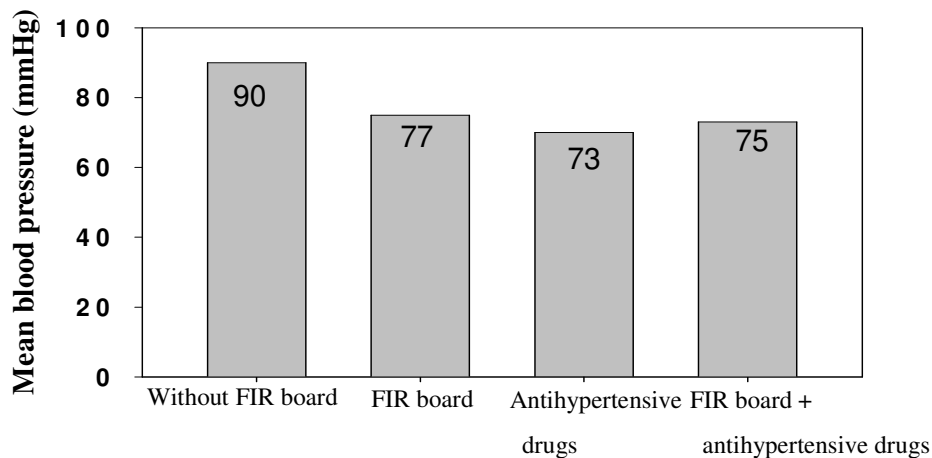
The experimental data were represented by mean±SD and analyzed by using SAS package software for statistical analysis. One-way ANOVA and Duncan's new multiple range test were conducted for post-event comparison, using $p < 0.05$ to represent the significant differences.

Results

1. Changes in mean blood pressure of rats raised in far infrared environment for one week

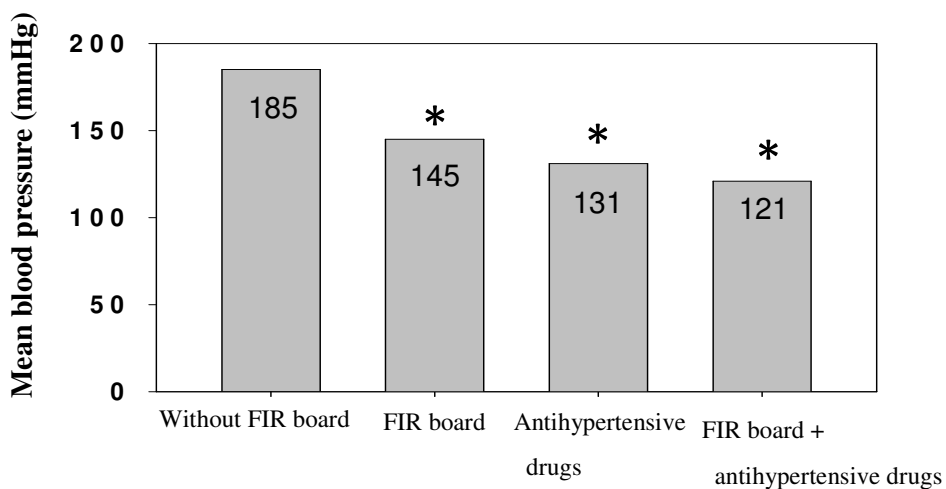
As shown in Figure 1, the mean pressure of the control group WKY rats is 90 mmHg, the mean blood pressure of the control group WKY rats raised in the far infrared board is 77 mmHg, the mean blood pressure of rats with antihypertensive drugs and the rats applied with antihypertensive drugs and far infrared board are 73 and 75 mmHg respectively, it thus can be concluded that the four groups have no significant differences.

Figure 1



As shown in Figure 2, the mean blood pressure of SHR rats is 185 mmHg; the mean blood pressure of SHR rats raised in the far infrared board environment is 145 mmHg, indicating the significant blood pressure lowering effects as compared to SHR rats without using far infrared board. The mean blood pressure using antihypertensive drugs and the rats of integrated use of anti-hypertensive drugs and far infrared board are 131 and 121 mmHg respectively, indicating the further blood pressure lowering effects.

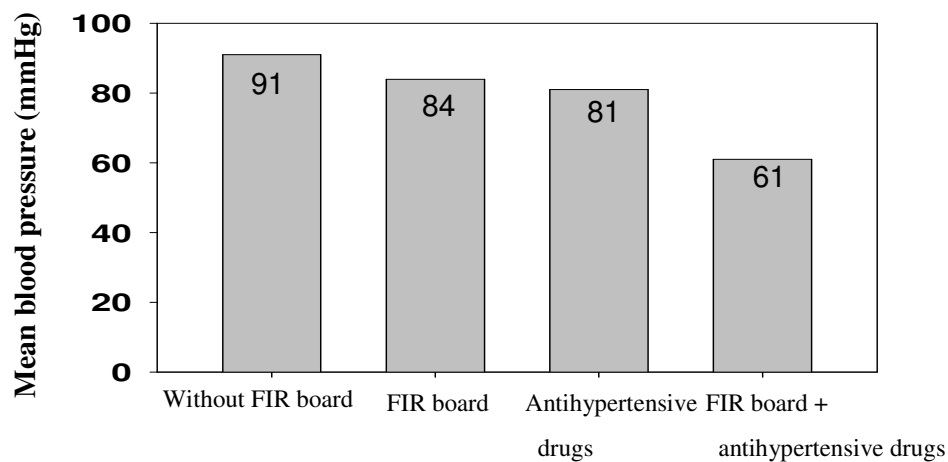
Figure 2



2. Changes in mean blood pressure of rats raised in far infrared environment for two weeks

As shown in Figure 3, the mean blood pressure of is 91 mmHg, and the mean blood pressure of the control group WKY rats raised in the environment of the far infrared board is 84 mmHg, the mean blood pressure of rats with far infrared board and antihypertensive drugs is 61 mmHg. The first three groups have no significant differences, and the mean blood pressure of the rats using far infrared board and antihypertensive drugs are significantly lower.

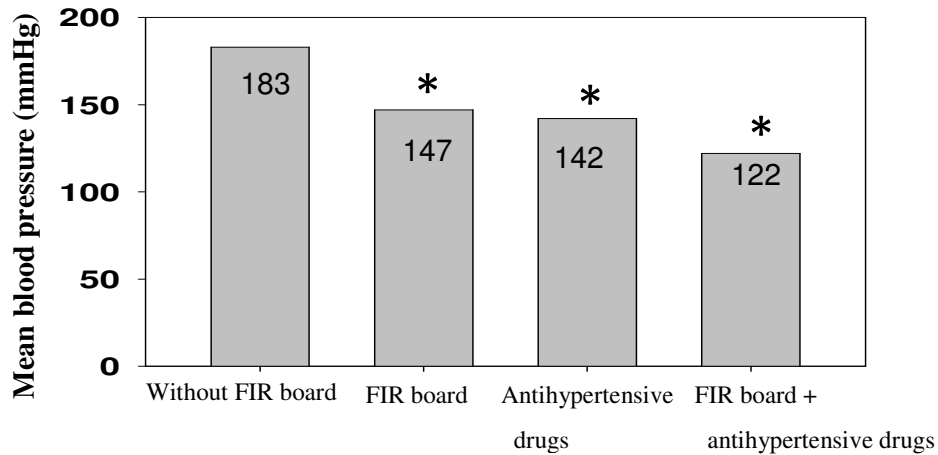
Figure 3



As shown in Figure 4, the mean average blood pressure of SHR rats is 183 mmHg; the SHR rats raised in the environment of the far infrared board is 147 mmHg,

indicating the significant blood pressure lowering effect as compared to the SHR rats without using the far infrared board. The mean blood pressure of the SHR rats using antihypertensive drugs and the SHR rats using both far infrared board and antihypertensive drugs are 142 and 122 mmHg respectively, indicating the significant blood pressure lowering effects.

Figure 4



Conclusion

This study confirmed that far infrared board has the long term blood pressure lowering effects and the functional mechanism, and other physiological impact need to be further explored. In recent years, many findings of the far infrared clinical and fundamental medical studies have made positive contribution to human health. Such non-invasive complementary healing methods have displayed effects in treating diseases and have been widely applied in alternative and complementary medicine. It is believed that such methods can create a new path for the majority medical sciences by instilling vitality into modern western medicine.