

Heartfulness Meditation Practices As Complementary Therapy in Modulation of Cardiovascular Response to Stress in Hypertensive Patients

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ABSTRACT

BACKGROUND

The present study was aimed to study the effect of Heartfulness meditation in modulation of cardiovascular response in hypertensive patients which was done by measuring heart rate (HR), blood pressure (BP) and rate pressure product (RPP) under normal and isometric stress conditions.

METHODS

Measurements included Pulse pressure (PP), mean arterial blood pressure (MABP) and RPP. Isometric handgrip (IHG) test was used to induce stress conditions. BP and HR were measured under normal and stress conditions. All the patients were made to practice Heartfulness meditation 1 hour / day for 2 months.

RESULTS

There was a statistically significant decrease ($p < 0.01$) in systolic BP (SBP), diastolic BP (DBP), HR, PP and MABP at end of the study. Before Heartfulness meditation training IHG test produced an increase in all the parameters. However, the increase was significant in SBP, DBP and RPP (After 2 - months of meditation training, IHG test produced more pronounced and statistically significant increase in all the parameters. The resting values of SBP, DBP, HR, PP, MABP and RPP showed statistically significant decrease after 2 - months of meditation practice ($p < 0.01$). However, statistically significant decrease in response to IHG test at EOS was seen only in SBP, PP and RPP ($p < 0.0001$ for all the parameters).

CONCLUSIONS

Heartfulness meditation practice is an adjunct to pharmacological therapy in hypertension treatment which produces overall relaxation response, reduce BP and HR. It can reduce the myocardial oxygen consumption and decrease the work load on heart. It can also optimise the sympathetic response to stressful stimuli and restores the autonomic regulatory reflex mechanisms in hypertensive patients.

KEYWORDS

Heartfulness meditation, heart rate, hypertension, rate pressure product, stress.

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INTRODUCTION

Hypertension has got global importance as 40 % of world population is hypertensive. Hypertension is one of the most important causes of premature deaths worldwide.¹ In addition, being one of the key risk factors for cardiovascular diseases (CVDs) it is the fourth contributor to mortality in the world. In India, the overall prevalence of hypertension is 29.8 % with urban and rural areas having 33.8 % and 27.6 % prevalence respectively.² Hypertension is directly responsible for about 57 % of all stroke deaths and 24 % of all Coronary artery disease (CAD) deaths in India.³

Raised blood pressure is a serious warning sign and a silent killer that rarely causes symptoms. Yet, it can be prevented as it is a modifiable risk factor. Management of hypertension with non - pharmacological practices like yoga as a complementary adjunct to medical therapy has become popular in recent times owing to the increased awareness among people about the spiritual and health benefits.⁴

Heartfulness meditation is a form of Raja Yoga⁵ and is one of the simplest methods of non - pharmacological practices that has been proved to have positive role in - causing alteration in body metabolism, changes in brain chemistry, reduction in Heart rate, Respiratory rate, Blood pressure,⁶ stress reduction,⁷ treatment of bronchial asthma⁸ and Chronic Obstructive Pulmonary disease.⁹ It has also been proved to have effect on heart rate variability,¹⁰ burnout, emotional wellness and telomere length.¹¹ This is due to the fact that Heartfulness meditation practices cause reduction in sympathetic drive and improves parasympathetic activity and finally leads to body and mind relaxation.^{6,8-10}

In hypertension as the peripheral vascular resistance is increased, heart has to work more to pump blood against the raised pressure. Thus the cardiac work and myocardial oxygen consumption increases in hypertensive patients. Rate - pressure - product (RPP) (product of heart rate and systolic blood pressure) being a reliable index of myocardial oxygen consumption can be measured to study the vascular reactivity.¹² Since vascular reactivity response can be observed by isometric stress,¹³ isometric hand - grip (IHG) test is used to produce the isometric stress.¹⁴ As Heartfulness meditation is believed to have effect in regulation of autonomic nervous system,^{6,8-10} it is expected to have influence on RPP by affecting preload and / or afterload. Hence the present work was planned to study the effect of Heartfulness meditation in modulation of cardiovascular response in hypertensive patients which was done by measuring heart rate, blood pressure and rate pressure product under normal conditions and when subjected to isometric stress.

MATERIALS AND METHODS

This prospective, self - control study was conducted among known hypertensive patients attended to the out - patient unit of Cardiology department. This study was approved by the Institutional Ethical Committee of our institute [IEC No.: 909, dated 27-05-2019]. A written informed consent was obtained from all the study participants. Study was conducted from June to September 2019 under department of Physiology in collaboration with department of Cardiology, Sri Venkateswara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India.

One hundred hypertensive patients who were satisfying

the study criteria were taken as sample. Known hypertensive patients of either sex aged between 30 and 60 years or who are on anti - hypertensive medication for ≥ 1 year were enrolled into the study. Hypertensive patients aged less than 30 years and greater than 60 years, presenting with other comorbid conditions including diabetes, coronary artery disease, renal failure, epilepsy and asthma; pregnant women; patients practicing any form of meditation on a daily basis prior to the study were excluded.

Data Measurements

Patient data including age, gender, body mass index, systolic and diastolic blood pressures, pulse pressure, mean arterial blood pressure (MABP), heart rate, rate pressure product (RPP) were collected.

Blood Pressure Recording

Systolic blood pressure (SBP) and diastolic blood pressures (DBP) were recorded with calibrated sphygmomanometer in sitting position after five minutes of relaxation. Three readings were collected by giving 3 minutes of time interval and average of the 3 readings was calculated and noted. Different parameters related to heart rate were calculated using below formulas:¹⁴⁻¹⁶

$$\text{Pulse pressure} = \text{SBP} - \text{DBP}$$

$$\text{Mean Arterial Blood Pressure} = \text{DBP} + 1 / 3 \text{PP}$$

$$\text{Rate Pressure Product (RPP)} = \text{HR} \times \text{SBP}$$

Isometric Handgrip (IHG) Test

Isometric stress was produced by performing isometric handgrip test using handgrip dynamometer. The patients were asked to sustain the handgrip for 1 - 2 min after which BP and heart rate was measured.

All these parameters were recorded before, during and after the two months Heartfulness meditation practice. The response to IHG test was measured before and after two months of study period.

Heartfulness Meditation Intervention

All the patients were made to practice the key elements of Heartfulness meditation that include relaxation & meditation, cleaning and prayer for the first three consecutive days for a duration of 1 hour under the guidance of Heartfulness meditation trainer. Patients were asked to follow the Heartfulness meditation practice guidelines provided to them daily for 2 months. All the patients were followed - up on weekly basis and one to one meditation session was conducted to check the compliance of the meditation practice.

Statistical Analysis

All statistical analysis was performed using statistical package for social sciences (SPSS) version 25.0 (IBM Corp, Armonk, NY, USA). All the continuous variables were presented using mean and standard deviation. Comparison of pre and post meditation values of all the parameters was done by using Paired Student's t - test. A p - value ≤ 0.05 was taken as significant.

RESULTS

The mean age of the study participants was 52.3 ± 7.2 years (Range: 31 - 60 years) and most of the patients were between the age group of 51 - 60 years (57 %). Females (57 %) were more than males (43 %). Among the study patients, 50 % were compliant to regular physical activity.

The median duration of hypertension treatment in this group was 7 years.

Comparison of parameters related to blood pressure were recorded at baseline, during weekly follow ups and at the end of the study (EOS) is shown in Table - 1. There was an insignificant increase in SBP at the end of 1st week, after which it decreased progressively. The decrease was significant at EOS (p < 0.0001). DBP also showed marginal increase in the 1st week, which was decreased to a statistically significant value at EOS (p = 0.003). An insignificant increase in HR was found in 1st week, which was followed by significant decrease at EOS (p = 0.002). PP and MABP also showed a similar pattern of insignificant raise in 1st week followed by significant decrease at EOS (p < 0.0001 in both the parameters).

	SBP	DBP	HR	PP	MABP
Baseline	121±18	73±12	77±11	48±12	88.5±13.5
Week-1	122.3±15.3	74.96±13.4	78.6±11.9	47.5±12.9	90.8±12.8
Week-2	116.0±14.5	71±11.2	78.8±11.7	45.3±8.2	86.1±11.8
Week-3	112.4±12.2	70.8±11.9	76.5±11.3	41.6±7.3	84.6±11.6
Week-4	110.9±13.0	68.6±10.9	76.6±9.7	42.3±9.7	82.7±10.7
Week-5	110.7±11.1	69.1±8.6	74.3±7.6	41.5±5.6	81.9±10.2
Week-6	107.9±15.8	72.3±11.0	72.9±6.7	35.6±7.7	84.1±12.3
Week-7	107.3±5.2	72.2±8.7	71.9±6.8	35.1±4.1	83.9±7.5
EOS	103.6±8.7	67.1± 7.9	71.5± 7.4	36.5± 5.9	79.3 ± 7.7
p-value	<0.0001*	0.003*	0.002*	<0.0001*	<0.0001*

Table-1: Comparison of Blood Pressure parameters

The comparison of parameters at rest and in response to IHG test at baseline and at EOS was shown in Table - 2. Before Heartfulness meditation training IHG test produced an increase in all the parameters. However, the increase was significant in SBP, DBP and RPP (p = 0.02; p = 0.03 and p = 0.03 respectively). After 2 months of meditation training, IHG test produced more pronounced and statistically significant increase in all the parameters.

	Baseline		P-val	EOS		p-val
	Rest	IHG		Rest	IHG	
SBP	121±18	129±18	0.02*	103.6±8.7	115.1±11.5	<0.0001*
DBP	73±12	78±13	0.03*	67.1±7.9	74±8.5	<0.0001*
HR	77±11	79.7±11.8	0.21	71.5±7.4	76.7±11.1	0.004*
PP	48±12	51±12	0.18	36.5±5.9	41.1±5.9	0.0001*
MA BP	88.5±13.5	92.9±18.5	0.15	79.3±7.7	92.1±11.7	<0.0001*
RPP	9367.6±21	10270.0±20	0.03*	7411.0±9	8578.8±16	<0.0001*

Table-2: Cardiovascular Response To IHG Test Before And After Heartfulness Meditation Training For 2 Months

Table - 3 shows that there was a decrease in all the parameters by the end of study when compared to the baseline values in both situations i.e., at rest and in response to IHG test. At rest, all the parameters showed statistically significant decrease after the meditation training period. However, statistically significant decrease in response to IHG test at EOS when compared to baseline was seen only in SBP, PP and RPP.

	Rest		p-val	IHG		p-val
	Baseline	EOS		Baseline	EOS	
SBP	121±18	103.6±8.7	<0.0001*	129±18	115.1±11.5	<0.0001*
DBP	73±12	67.1±7.9	0.003*	78±13	74±8.5	0.06
HR	77±11	71.5±7.4	0.002*	79.7±11.8	76.7±11.1	0.165
PP	48±12	36.5±5.9	<0.0001*	51±12	41.1±5.9	<0.0001*
MA BP	88.5±13.5	79.3±7.7	0.01*	92.9±18.5	92.1±11.7	0.78
RPP	9367.6±21	7411.0±9	<0.0001*	10270.0±20	8578.8±16	<0.0001*

Table-3: Comparison Of Heart Rate Variables At Rest And After IHG

Expressed as Mean ± SD. SBP: systolic blood pressure; DBP: diastolic blood pressure; HR: heart rate; PP: pulse pressure; MABP: mean arterial blood pressure; RPP: rate pressure product; IHG: isometric hand grip test.

Paired student's t - test. *indicates significant p - value (p ≤ 0.05).

At the end of the study, out of 100 patients, 10 (10 %) patients were advised to stop the antihypertensive, 20 (20 %) were shifted from dual antihypertensive medication to single antihypertensive medication. These results indicative of beneficial role of heartfulness meditation in controlling the BP in hypertensive patients.

DISCUSSION

In the present study, the effect of heartfulness meditation on BP and HR in hypertensive patients was recorded. The marginal and insignificant increase in BP and HR at the end of the 1st week was most likely to be due to adjustment of the subjects to the study environment. There was statistically significant decrease in all the parameters by EOS period. Similar changes were found in the study of Vijayalakshmi et al¹⁴ who have reported that 4 - weeks of yoga training produces a significant reduction in BP and HR in hypertensive patients. Raja Amarnath et al⁶ also demonstrated that Heartfulness meditation practice results in statistically significant decrease in vital parameters by moderating autonomic nervous system.

The early reduction in BP and HR in our subjects might be due to the relaxing response induced by Heartfulness meditation, as the very process of meditation results in regulation of thoughts and emotions. The significant decrease seen in all the parameters by the end of study period can be explained by the increase in parasympathetic activity caused by Heartfulness meditation. Significant reduction in RPP indicates reduction in myocardial oxygen consumption and work load on heart.¹² This can be explained by the reduction in sympathetic activity on the heart. Similar outcome was observed in the study of Vijayalakshmi et al.¹⁴

The isometric stress produced by IHG test acts as a pressor stimuli to cardiovascular system through the sympathetic pathways resulting in increased BP and HR.¹⁷ In our study B.P and HR were increased in response to IHG test which are similar to the results of the study done by Vijayalakshmi et al¹⁴ who had reported a rise in BP and HR with IHG in essential hypertensive patients. Initially before meditation training only SBP and DBP showed statistically significant increase with IHG test. After Heartfulness meditation training, all the parameters increased significantly in response to IHG test (table - 2).

Therefore, our study indicates that under stressful conditions Heartfulness meditation also shows a positive effect on the sympathetic reactivity, contrary to its general effect i.e., increasing the parasympathetic drive at rest. This is an interesting finding that Heartfulness meditation practice can modulate the cardiovascular responses by influencing and improving the autonomic regulatory mechanisms whenever needed. Though, similar results were seen with yogasanas¹⁴ practicing Heartfulness meditation is simpler, easy but equally effective when compared to yoga. This is a single centre study. Sample size is relatively small and randomization was not performed. Patients were given meditation intervention and followed - up for only two months.

CONCLUSIONS

Heartfulness meditation practices as complementary adjuncts to medicine in hypertension therapy produces overall relaxation response and reduce blood pressure & heart rate. It can reduce the myocardial oxygen consumption and decrease the work load on heart. It can also optimise the sympathetic response to stressful stimuli like isometric handgrip test and restores the autonomic regulatory reflex mechanisms in hypertensive patients. As, this is a novel observation with Heartfulness meditation, further multi - centric studies with larger sample size are required to confirm and to generalize these findings.

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