

Cardiorespiratory effect of Swedish back massage in hypertensive patients: a randomized clinical trial

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Abstract

Background: Chronic stress is one of the main risk factors for incident hypertension. Behavioral methodologies, such as unwinding and rub, have a dramatic effect on controlling the individuals' reaction to stress, diminishing hypertension and heart rate, as well as changing temperature and respiration rate.

Material and methods: 90 patients with primary hypertension were enrolled to this open-label study. The patients have been haphazardly classified into an affect and an intervention cluster. In the two groups, systolic and diastolic blood pressure, heart rate, body temperature and respiratory rate) were measured and recorded two times a week before and after a ten-min Swedish back massage and relaxation for six weeks. The records have been accrued using a questionnaire which includes demographic records, a checklist of vital signs (systolic and diastolic blood pressure, heart rate, temperature, and respiratory) record, a fixed manometer and thermometer.

Results: Within the experimental group, systolic and diastolic blood pressure, heart rate, and respiratory levels reduced to 6.44 and 4.77 mm Hg, 2.9 bpm, 0.94 breaths per minute, respectively ($p < 0.001$) and temperature increased to 0.08°C after the back massage ($p = 0.004$).

Conclusion: The obtained results show the effectiveness of back massage in reducing blood pressure, heart rate, and respiratory as well as increased temperature in the study participants.

Key words: cardiorespiratory; back massage; hypertension

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Introduction

High blood pressure is one of the leading risk factors for cardiovascular disease. In 2018, nearly half a million deaths in the United States were could be either directly or indirectly ascribed to hypertension (HTN) [1, 2]. The prevalence of HTN in the USA is estimated at 108 million (45% of adult population) which translates to financial burden of approximately

131 billion USD yearly [3]. In Iran, the prevalence of HTN strikingly contrasts with the prevalence seen in westernized societies, and it is estimated at 20.1% [4].

Body massage result among others in stress relief, mental and physical refreshment which may in turn advantageously affect cardiovascular regulation [5, 6]. Both, acute and chronic stress promote rise in systolic and diastolic BP, respectively. As suggested, repetitive tactile incitement decreases diastolic BP

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over time [7]. Osborn et al. reported that complementary medicine could effectively decrease BP, which may be extremely important in country areas where patients have limited access to medications [8]. However, analysis using the Systematic Review Quality Assessment Tool showed that the studies assessing impact of massage on cardiovascular system were of poor quality [9]. Other limitations of these studies include intervention short time periods and non-standardized tools and protocols which make it difficult to compare the effects.

Taking into account all the shortcomings of previous reports, in our study we aimed to examine the effect of back massage on selected cardiovascular parameters in patients with primary hypertension.

Material and methods

We enrolled consecutive patients with hypertension who were referred to Imam Reza Clinic, Shiraz University of Medical Sciences, for high blood pressure evaluation from August to September 2013. Study protocol was approved by local Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.REC. 1392.S6603). Eligible participants were informed about the study objective and about the voluntary nature of their participation. Written informed consent form obtained from all participants. All data were anonymized and pseudonymized to comply with respective data management local regulations. Inclusion criteria were as followed: primary hypertension, age of 30–70 years old, absence of psychological diseases, no participation in other relaxation programs. Exclusion criteria included: skin and vertebral column disorders, ongoing treatment with anti-anxiety and sedative drugs, hypertension diagnosis of less than 6 months prior to enrollment, non-adherence to medication regimen during the study, history of hypotension, systolic blood pressure exceeding 170 mm Hg and/or diastolic BP exceeding 120 mm Hg, diabetes, chronic kidney disease, suprarenal tumors, and congenital heart defects, back pain because of backbone injuries, hernia or disk degeneration, recent lumbar region surgery.

The study sample size was determined based on the study by Hassanvand et al. entitled “The effect of back massage on BP and radial heart rate of patients with primary hypertension” [10] and using the following formula ($d = 10$, $S = 8$, $\alpha = 0.05$, $\beta = 0.2$).

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 \times 2S^2}{d^2}$$

$$n = \frac{(1.96 + 0.84)22 \times 64}{100} \quad n = 40$$

At first, the patients eligible for the study filled out the demographic information questionnaire and signed written informed consent. A total of 80 patients participated in the study and were randomly divided into an intervention and a control group, each containing 40 patients. Moreover, 5 patients were added to each group because of the attrition; thus, each group consisted of 45 patients.

To measure BP, heart rate and temperature in this study, a digital manometer and thermometer were used (digital manometer: Onyx model, the measurement accuracy of BP ± 3 mm Hg, measurement accuracy of pulse $\pm 5\%$) which reliability and validity have been confirmed previously. Respiratory rate was assessed by medical inspection.

Operators were unaware of the fact whether the patient was allocated to intervention or control group.

Description of the procedure

Massage therapists were trained by a physical medicine expert. The expert supervised the performance of the therapists to assure about the uniformity of the procedure. Furthermore, two nurses assisted the patients with all the questionnaires to be filled after each procedure or both in experimental and control group. The massage that was applied in the present study is a part of Swedish massage which starts from neck to the back (from shoulders to lumbar area) via compression or kneading and continues with pushing, tapotement, and ringing. The massage was performed twice a week between 8 A.M. and 13 P.M. for six weeks. A demographic questionnaire and BP, heart rate, temperature and respiratory rate records were filled for all the participants. In both groups, participants were asked to have a five-minute rest prior to BP, heart rate, temperature and respiratory rate were recorded. In the experimental arm, sesame oil was used for 10-minute massage. Immediately after the 10-min massage, BP, heart rate, temperature and respiratory were recorded again. In the control group, the patients rested for 10 min and BP, heart rate, temperature and respiratory were recorded.

Statistical calculations

Statistical analyses were performed using SPSS (Ver. 15). T test and chi square test were applied to analyze demographic data. Variables are presented as mean \pm SD. Repeated measures ANOVA was used as appropriate. The significance level was set at p-value of < 0.05 .

Results

Both the experimental and the control arms consisted of 45 patients (25, and 27 females respectively). Because four females did not continue their participation, 41 patients were considered in the control group. The mean age of the participants and other demographic variables for both groups are presented in Table 1.

The change in mean BP and pulse are presented in Table 2. In the experimental group, the mean systolic BP decreased by 6.4 mm Hg; the mean diastolic BP decreased by 4.8 mm Hg mean heart rate decreased by 2.9 bpm; the mean respiratory rate decreased by 0.9 breaths per minute; the mean

temperature increased by 0.08°C. In the control group, the mean systolic BP decreased by 2.3 mm Hg, ($p = \text{NS}$); the mean diastolic BP decreased by 1.5 mm Hg, $p = \text{NS}$; the mean heart rate decreased by 1.0 bpm in the control group ($p = \text{NS}$); the mean respiratory rate decreased by 0.1 breaths per minute ($p = \text{NS}$); the mean temperature decreased by 0.03°C, $p = \text{NS}$.

The changes in systolic and diastolic BP, heart rate, temperature and respiratory rate were compared between the experimental and the control arm from sessions 1–12, and the results of repeated measures ANOVA indicated that the differences were statistically significant ($p < 0.001$, $p < 0.001$, $p = 0.008$, $p = 0.04$, $p = 0.04$). Furthermore, the

Table 1. The patients' demographic data

Variable	Experimental	Control	Total	Used test and p-value (intervention group vs. control group)	
Age (mean \pm SD)	56.8 \pm 8.2	59.2 \pm 8.5	58.0	t-test $p = 0.18$	
Sex	Male	20	18	χ^2 $p = 0.67$	
	Female	25	27		52
Education level	Higher	7	3	χ^2 $p = 0.48$	
	Secondary	13	11		24
	Primary	20	24		44
	Illiterate	5	7		12
Occupation	Employee	3	1	χ^2 $p = 0.76$	
	Self-employed	5	5		10
	Retired	11	13		24
	Housewife	26	26		52
Marital status	Widowed	2	4	χ^2 $p = 0.43$	
	Single	1	0		1
	Married	42	41		83

Table 2. The results on mean changes in variables. ANOVA with repeated measures

Variables	Group	F	p-value
Systolic BP	Experimental	11.39	< 0.001
	Control	2.29	0.05
Diastolic BP	Experimental	7.36	< 0.001
	Control	1.2	0.23
Heart rate	Experimental	5.35	< 0.001
	Control	5.69	< 0.001
Respiratory rate	Experimental	4.73	< 0.001
	Control	0.69	0.86
Temperature	Experimental	1.95	0.004
	Control	0.76	0.79

effects of time, group, and time*group on systolic BP, diastolic BP and heart rate in both groups were assessed using repeated-measures ANOVA (data not shown).

Discussion

Our study demonstrated potential utility of back massage in promoting BP and heart rate decreases. The size effect was modest, yet unanimous in almost all participants in the intervention group.

A study in Hong Kong showed that a 10-minute massage for 7 consecutive days by superficial stroke (alternative technique to the one studied here) was effective in decreasing high BP in elder patients with a history of stroke [11]. In a small comparative study which explored the impact of Swedish massage on BP, heart rate, and vital signs in females with hypertension authors reported similar results only after the four sessions [12]. Similarly, another study showed a decrease in BP and the heart rate after a 10-session back knead [10]. Contrasting with these findings, another study which evaluated body massage on cardiovascular control showed no significant changes in systolic and diastolic BP [13]. Nonetheless, the outcomes of several studies revealed that massage therapy reduced diastolic and systolic BP considerably [14–19].

Jahdi, Mehrabadi et al, showed that mother's vital signs during postpartum period decreased significantly after the massage compared to the control group [20]. The results of the studies show that massage therapy reduces systolic blood pressure, respiratory rate, and heart rate across different patients groups [21–26].

One of the limitations of the present study was that back massage was performed for 10 minutes only. Therefore, further studies are warranted to see whether longer duration or massage of alternative body areas with different techniques may exert comparable effects.

Conclusion

The results of the present study showed that a 12-session back massage decreased systolic and diastolic blood pressure, heart rate, and respiratory rate in hypertensive patients. Our findings warrants further studies on specific protocols of back massages as a non-pharmacological mean to improve BP control in hypertensive patients.

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