Medknow

Wolters Kluwer

BULLETIN OF FACULTY OF PHYSICAL THERAPY

BFPT

Cairo University

ISSN 1110-6611

Volume 23 Issue 2 July-December 2018

Effect of foot reflexology adjunct to paced respiration on vasomotor symptoms during menopause: randomized-controlled trail

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Received 7 May 2018
Accepted 29 October 2018

Bulletin of Faculty of Physical Therapy
2018, 23:77–84

Background
The most common vasomotor symptoms (VMS) are hot flashes and night sweats, which occur in as many as 68.5% of women as a result of menopause. Symptoms caused by fluctuating levels of estrogen may be alleviated by hormone therapy (HT), but a marked global decline in its use has resulted from concerns about the risks and benefits of HT. Consequently, many women in the postmenopausal period search for alternative natural treatment options to manage menopause. As large numbers of women are choosing not to take HT, it is increasingly important to identify evidence-based foot reflexology with paced respiration that has the potential to reduce vasomotor menopausal symptoms.
Aim
To examine the combined effect of foot reflexology with paced respiration versus paced respiration on VMS in symptomatic menopausal women.
Patients and methods
A total of 50 women of menopausal age, 45–55 years were studied; their BMI was less than 30 kg/m^2. They were allocated randomly to two groups with equal numbers of participants (A and B). The participants in group A received foot reflexology in addition to paced respiration, whereas the participants in group B received the paced respiration training only. The treatment program was conducted three times per week for 8 weeks. Assessment of all participants in both groups (A and B) was carried out before and after the treatment program throughout by determining blood cortisol level in addition to the use of the menopause rating scale (MRS).
Results
Both groups (A and B) showed a significant reduction in their blood cortisol and MRS values after the end of the 8 weeks of the training program. The mean values of blood cortisol after treatment were 15.40±1.47, 16.32±1.70 in both groups A and B, respectively. The mean values of total MRS were 8.12±2.19, 12.56±2.96 in both groups A and B, respectively.
However, the participants who received foot reflexology plus paced respiration, group A, showed a greater reduction in the blood cortisol value and total MRS ($P<0.001$ and <0.001), respectively.
Conclusion
It could be concluded that foot reflexology in addition to paced respiration are more effective than paced respiration only in decreasing blood cortisol level as well as VMS in symptomatic menopausal women.

Keywords:
cortisol, hot flashes, menopause, paced respiration, reflexology

Bulletin of Faculty of Physical Therapy 23:77–84

1110-6611

Introduction

The menopausal transition marks a time of great variability in reproductive hormones [1]. Natural menopause is defined after 12 consecutive months of amenorrhea without any self-evident, pathologic reason [2].

Vasomotor symptoms (VMS), or hot flashes and night sweats, are considered the common symptoms of menopause. VMS are episodes of generalized heat accompanied by sweating and flushing, experienced prevalently around the head, neck, chest, and upper back. VMS are experienced by most women (60–80%) during the menopausal transition [3].

Hot flushes that occur during the night are typically referred to as night sweats. Flashes and night sweats are

of concern in themselves, but they can also disrupt sleep patterns and alter daily activities, which can cause fatigue and depression [4].

Hot flushes are believed to result from the brain's reaction to reduced hormones. Also, hormonal changes that occur during the progression of menopause may lead to instability of thermoregulatory mechanisms that regulate temperature homeostasis in the hypothalamus [5].

The physiology of hot flashes is not completely clear, and likely represents interactions between multiple central and peripheral physiologic systems. Higher follicle-stimulating hormone and lower estradiol were associated with a greater likelihood of reporting VMS [6].

The hypothalamic–pituitary–adrenal axis plays an essential role in the body's acute reactions to stress by balancing hormone releases from the epinephrine-producing adrenal medulla and from the corticosteroid-producing adrenal cortex. Acute stress is associated with an abrupt physiologic increase in cortisol [7,8]. Late night cortisol might be increased with constant pressure, a sleeping disorder, and rest unsettling influences [9–11].

Daily cortisol patterns in post-menopausal women with hot flashes are understudied, but in theory, patterns may vary from those of normal healthy adults for three reasons. First, hot flashes are associated with stress and nervousness [12–14]. Second, estrogen may influence cortisol discharge [15]. Increased estrogen variability has been associated with hot flashes. Women with more hot flashes could have variant day-by-day cortisol level [16]. Third, a greater proportion of women with hot flashes report poor sleep [17]; insomnia [10] and sleep disturbances [11] are associated with abnormal cortisol patterns.

Reflexology is a particular type of foot massage in which the areas in the feet and hands are considered to correspond to the glands, organs, and other parts of the body [18]. Local finger pressure can influence the function of organs, inducing homeostasis and promoting relaxation [19]. Proposed theories of action include energetic effects, the dispersal of calcium, lactate, or uric acid crystals, improvement of blood flow, and a relaxant effect on the autonomic nervous system. It aids relaxation and easing the stresses during this transitional time [20].

Paced respiration has been recommended internationally as a first-line therapy for VMS [21]. Regular practice of slow-paced respiration has been shown to decrease sympathetic nervous system activity. Recommendations are to take slow deep abdominal breaths at the start of a hot flash, breathing in through the nose and out through the mouth [22–24].

The aim of our study was to examine the combined effect of foot reflexology with paced respiration versus paced respiration on VMS in symptomatic menopausal women.

It was hypothesized that foot reflexology and paced respiration have no effects on VMS in symptomatic menopausal women.

Patients and methods

Randomization

Participants were assigned randomly to group A (foot reflexology+paced respiration) (n=25) or group B (paced respiration only) (n=25) independent person who did the selection blindly from sealed envelopes containing numbers created by a random number generator. The randomization was restricted to permuted blocks to ensure that equal numbers were allocated to both groups A and B. The sequences assigned to the participants were placed in envelopes containing the allocation to both groups A and B.

Ethical considerations

The Ethical Committee of the Faculty of Physical Therapy at Cairo University approved this study (NO:P.T. Rec/012/001912). The study protocol was explained to all of the participating women, who then signed the informed consent form.

Sample size determination

The minimum sample size needed for 80% statistical power and at a 5% significance level was 23 for every group. Estimated power for 50 patients had been calculated to be 90.6%.

Participants

A total of 50 menopausal women, ranging in age from 45 to 55 years, were studied. They were selected from the outpatient clinic of Gynecology department at Kasr Al -Aini University Hospital, Cairo. BMI was less than 30 kg/m^2 for all participants. Inclusion criteria were as follows: natural cessation of menstrual periods for at least 12 months and no hormone replacement therapy for at least 3 months before the study. Women with a history of cancer, chronic pulmonary disease, and severe pathology of the feet, previous reflexology treatment, and current complementary therapy for VMS were excluded from the study. The purpose and nature of the study were explained to all participants.

A diagram of the participants' retention and randomization throughout the study is shown in Fig. 1. A total of 62 participants were initially screened. After the screening process, 50 participants were found to be eligible to participate in the study. In total, 50 (100%) participants completed the treatment program.

Methods

Evaluation

The assessment of all participants in both groups (A and B) was carried out before and after the treatment program by measuring the blood cortisol level in addition to the use of the menopause rating scale (MRS).

Blood cortisol level

A blood sample of about 5 cm was drawn in the morning (at 8 o'clock) for all participants in both groups (A and B). Blood samples were drawn before and after treatment for all women by a disposable sterile syringe using venipuncture.

Menopause rating scale

The MRS is a questionnaire that is used to evaluate the severity of 11 symptom categories related to menopause on a five-point rating scale from 0 (no symptoms) to 4 (extremely severe). These include symptoms such as hot flashes, heart discomfort, trouble sleeping, depressive mode, irritability, anxiety, sexual problems, bladder problems, vaginal dryness, mental and physical exhaustion as well as joint and muscular pain. Three subscales of symptoms are identified and scored: psychological, somatic, and urogenital.

Women were assigned a number next to each of the 11 symptoms identified on the questionnaire. The composite scores for each of the dimensions (subscales) are based on the total scores of the items of the respective dimensions. The composite score (total sore) is the sum of the dimension scores. Each item ranged from 0 (not present) to 4 (1=mild; 2=moderate; 3=severe; 4=very severe). Values equal to or above 9 (somatic), 7 (psychological), 4 (urogenital), and 17 (total) were used to define severe menopause [25].

Treatment

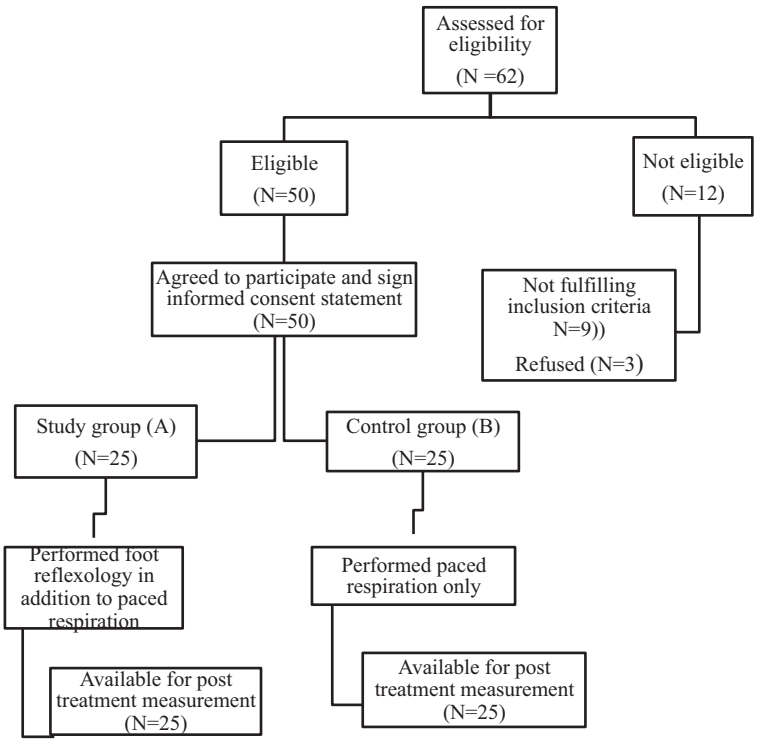
Foot reflexology technique for group A

All participants in group A received foot reflexology from the same physiotherapist with expertise in the reflexology technique. Each participant was instructed to wear comfortable and light clothes and assume a relaxed supine lying position with her feet resting on a plinth in a quiet room. The patient was asked to remove both socks and shoes to receive the treatment program.

Foot reflexology procedures

The treatment session started with warm-up by washing of the entire sole with warm water. This

Figure 1



Flow chart of the study.

helps to enhance over all relaxation, relax the feet, and prepares the feet for reflexology session. Then, the foot was massaged and included 5 min of light pressure and light stroking using the whole hand on the dorsal and plantar surfaces of each foot relax the patient.

The reflexology intervention was conducted using a mixture of thumb walking and finger pivot techniques to the base of the toes and the foot, which correspond to the reflex zones.

The pressure was applied gently applied on the following points [26,27] (Fig. 2):

(1) Solar plexus point: it is located just below the ball of both feet, at the midline.
(2) Pituitary reflex point: it represents the pituitary gland; it is located exactly at the planter aspect of the center of the hallux (big toe) of both feet.
(3) Heart reflex point: it is located at the bottom of the big toe of the planter aspect of both feet.
(4) Adrenal reflex point: it is located at the base of the second and third metatarsal bones of both feet.
(5) Kidney reflex point: it is located in the middle of the arch of both feet close to the base of the second metatarsals.

Foot reflexology sessions were conducted for 30 min (each foot 15 min) twice a week for 8 weeks.

Paced respiration for both groups (A and B)

Each participant in both groups (A and B) was taught how to maintain a target breath rate of 6–8 breaths per minute, practiced twice per day, 15 min, for 8 weeks, and to apply the breathing technique at the onset of each hot flash. Women were instructed to do slow, deep, abdominal breathing in through the nose and out through the mouth as per international recommendations [22].

Results

Statistical analysis was carried out using SPSS for Windows, version 22 (SPSS Inc., Chicago, Illinois, USA). The *P* value is the degree of significant. A *P* value less than or equal to 0.05 was considered to be significance. Comparison between the mean values of different parameters in the two groups was performed using an unpaired *t* test. Comparison between pretreatment and post-treatment data in the same group was performed using a paired *t* test.

Demographic characteristics of the participants in both groups A and B

Table 1 shows the general characteristics for women in both groups A and B when enrolled in the study.

Blood cortisol level (mg/dl) for both groups (A and B)

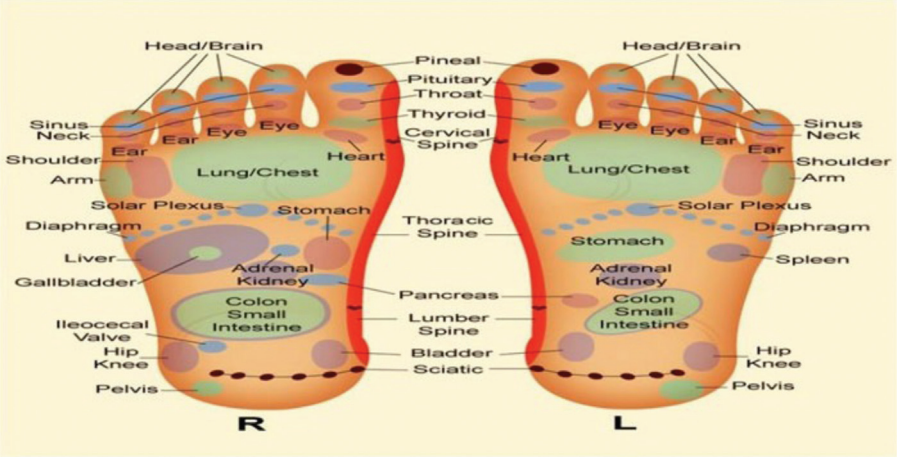
Blood cortisol level (mg/dl) before and after treatment for both groups (A and B) showed statistically significant decreases in both groups (A and B) after treatment (15.40±1.47, 16.32±1.70 mg/dl) compared with the corresponding value before treatment (17.68 ±1.55, 17.60±1.61 mg/dl). Comparison between both

Table 1 Participants' demographic characteristics

Variables	Groups	Mean	Comparison	
			t value	*P* value
Age (years)	Group A	49.92±4.465	0.153	0.879 (NS)
	Group B	49.80±3.055		
BMI (kg/m^2)	Group A	27.96±1.019	0.362	0.719 (NS)
	Group B	28.066±0.971		

Data are expressed as mean±SD. NS, *P* value more than 0.05, not significant. S.

Figure 2



Foot reflexology chart [27].

groups A and B showed a statistically nonsignificant difference in the blood cortisol level (mg/dl) before the treatment (t=0.179, P=0.858) and a statistically significant difference after the treatment in favor of group A (t=–2.050, P=0.046) as shown in Table 2.

Menopause rating scale for both groups (A and B)

In group A, there was a statistically significant decrease in the value of total menopausal, somatic, psychological, and urogenital symptoms measured after treatment compared with the corresponding value measured before treatment, whereas in group B, there was a significant decrease in total menopausal, somatic, and psychological symptoms, with a nonsignificant difference before and after treatment in urogenital symptoms. Between groups, there were no significant differences in pretreatment values between both groups (A and B), but there was a significant difference in the post-treatment values as shown in Tables 3–6.

Discussion

The hot flush is recognized as the most characteristic and troublesome symptom of menopausal transition. Hot flushes and night sweats are referred to as VMS because of the vascular reactivity with initial prominent vasodilatation and subsequent vasoconstriction [28,29]. VMS can be treated effectively with hormone replacement therapy. Psychological symptoms may be improved but hormonal treatment may have adverse effects [30,31].

The aim of this study was to examine the combined effect of foot reflexology with paced respiration versus paced respiration on VMS in symptomatic menopausal women.

Reflexology is a systematic practice of applying some pressure to specific points on the feet and hands give impacts on the health of related parts of the body. Each point of the pressure acts as sensors on the feet and hands and links with other parts of body specifically. These sensors will be stimulated by the reflexology technique to improve the blood and energy circulation, induce relaxation, and maintain homeostasis [32].

The results of the present study showed that combining foot reflexology with paced respiration (group A) produced a significant reduction in blood cortisol levels compared with paced respiration alone (group B) after 8 weeks of treatment, which indicated that combining foot reflexology with paced respiration is more effective than paced respiration alone.

A similar association was found in a study of menopausal women (n=120). A low VMS score was found to be correlated with reflexology [33]. Three common symptoms that women can experience in peri-menopause and menopause are hot flushes, poor sleep,

Table 2 Blood cortisol level (mg/dl) for both groups

	Group A (n=25)	Group B (n=25)	t value	P value
Before treatment	17.68±1.55	17.60±1.61	0.179	0.858 (NS)
After treatment	15.40±1.47	16.32±1.70	–2.050	0.046 (S)
Mean difference	2.28	1.28		
% change	12.90% ↓↓	7.27% ↓↓		
t and P values	9.658 and 0.001 (S)	9.270 and 0.001 (S)		

Data are expressed as mean±SD. NS, P value more than 0.05, not significant. S, P value less than 0.05, significant. ↓↓, decrease.

Table 3 Mean values for somatic symptoms of menopause rating scale before and after treatment for both groups (A and B)

	Group A (n=25)	Group B (n=25)	t value	P value
Before treatment	7.20±1.61	6.40±1.87	1.622	0.111 (NS)
After treatment	3.48±1.64	5.92±1.85	–4.945	0.001 (S)
Mean difference	3.72	0.48		
t and P values	20.883 and 0.001 (S)	1.091 and 0.286 (NS)		

Data are expressed as mean±SD. NS, P value more than 0.05, not significant. S, P value less than 0.05, significant.

Table 4 Mean values for psychological symptoms of menopause rating scale before and after treatment for both groups (A, B)

	Group A (n=25)	Group B (n=25)	t value	P value
Before treatment	6.20±1.15	6.56±1.12	–1.118	0.269 (NS)
After treatment	3.00±0.96	4.24±1.27	–3.903	0.001 (S)
Mean difference	3.20	2.32		
t and P values	22.627 and 0.001 (S)	15.501 and 0.001 (S)		

Data are expressed as mean±SD. NS, P value more than 0.05, not significant. S, P value less than 0.05, significant.

Table 5 Mean values for urogenital symptoms of menopause rating scale before and after treatment for both groups (A and B)

	Group A (*n*=25)	Group B (*n*=25)	*t* value	*P* value
Before treatment	2.68±0.75	2.56±0.87	0.523	0.603 (NS)
After treatment	1.64±0.99	2.40±0.96	–2.752	0.008 (S)
Mean difference	1.04	0.16		
t and *P* values	7.076 and 0.001 (S)	1.445 and 0.161 (NS)		

Data are expressed as mean±SD. NS, *P* value more than 0.05, not significant. S, *P* value less than 0.05, significant.

Table 6 Mean values of total menopause rating scale before and after treatment for both groups (A and B)

	Group A (*n*=25)	Group B (*n*=25)	*t* value	*P* value
Before treatment	16.08±2.18	15.52±2.73	0.803	0.426 (NS)
After treatment	8.12±2.19	12.56±2.96	–6.035	0.001 (S)
Mean difference	7.96	2.96		
t and *P* values	33.962 and 0.001	6.107 and 0.001		

Data are expressed as mean±SD. NS, *P* value more than 0.05, not significant. S, *P* value less than 0.05, significant.

and anxiety. A study has been completed in Iran that studied the effect of reflexology on menopausal women and showed a reduction in anxiety and hot flushes, and an improvement in sleep [33].

Self-foot reflexology is an effective intervention in reducing perceived stress, depression, and stress response and to strengthen the immune system in middle-aged women. Reflexology during pregnancy may reduce stress by increasing Beta-endorphin levels [34].

At menopause, reflexology works by regulating the hormones and glandular functions of the body. It can help to adjust both the physical and emotional systems. reflexology works by regulating the hormones and glandular functions of the body. This in turn can alleviate menopausal symptoms such as hot flushes as well as depression and anxiety. By calming the central nervous system, sleep disturbances and anxiety can also be alleviated. Reflexology also helps the ovaries to regulate their estrogen secretions and the uterus to maintain its natural health and flexibility [35].

Song and Kim [36] observed that foot reflexology improved quality of sleep, reduced depression, and increased the level of serotonin in elderly patients. A significant difference was also observed in climacteric symptoms in fatigue, in total cholesterol, and in the level of cortisol [37].

There are five theories that support how reflexology improves body health [38]. The first and second basic theories are related to energy. Energy theory advocates. If there is a block of the body's energy, it will have an effect on any organ or part of the body within that particular zone [39]. The third and fourth theories indicate that energy flow can be restored and the fourth is about the blocked pathway of energy may be restored [40]. The last theory proposes that reflexology can break up the lactic acid crystals that usually become deposited in the feet and allow energy to flow efficiently [38].

The results of the present study showed that paced respiration induced a significant reduction in blood cortisol level and MRS after 8 weeks of treatment. Huang *et al.* [41], reported that paced respiration training may be an alternative treatment for the reduction of hot flushes in women who cannot tolerate hormone replacement therapy. Paced respiration has been recommended as a potentially effective treatment for hot flushes.

Sood *et al.* [42], designed a 9 weeks, randomized, three-arm, parallel-group study. Participants in the active arms practiced paced breathing at 6 breaths/minute for 15 min, either once or twice a day, whereas the control arm practiced usual breathing at 14 breaths/minute for 10 min/day. Feasibility was assessed through self-report questionnaires. The paced-breathing intervention is feasible, although paced breathing twice a day seems to be the most helpful dose.

One of the nonpharmacologic treatments that has been recommended widely for hot flushes is slow-paced respiration, a behavioral relaxation technique that leads to slowing of the resting respiratory rate and prolonged expiration [43]. Regular practice of slow-paced respiration has been proven to decrease sympathetic nervous system activity [23,24] as well as improve chronic conditions such as hypertension associated with excess sympathetic tone. The beneficial effects of paced respiration may be mediated by other

mechanisms, however, including an increased sense of relaxation, which may decrease the perceived burden of hot flushes [44–46]. As abnormal adrenergic neurotransmission is also implicated in the etiology of hot flushes [47,48], paced respiration has been recommended as a potentially effective treatment for hot flushes [43].

Conclusion

Foot reflexology combined with paced respiration are more effective than paced respiration only in decreasing blood cortisol levels as well as VMS in symptomatic menopausal women.

Acknowledgments

The authors thank all the participants in this study for their cooperation.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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