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The Effect of Foot Massage Duration on Vital Signs of Patients with Cerebrovascular Accidents with Lowered Level of Consciousness in the Intensive Care Unit

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ABSTRACT

BACKGROUND AND OBJECTIVE: Stroke is caused by a disturbance in the blood flow to a part of the brain, and it is the most common disorder that requires long-term care. Maintaining the stability of vital signs in stroke patients with modern non-pharmacological methods is very important, so this study was conducted to investigate the effect of foot massage duration on vital signs of patients with cerebrovascular accidents in the intensive care unit.

METHODS: In this clinical trial, 64 patients were randomly assigned into two groups (32 people) of intervention 1 and 2. Samples were selected from patients with cerebrovascular accidents with lowered level of consciousness admitted to the intensive care unit. A four-step foot massage was performed similarly 5 minutes in group 1, and 10 minutes in group 2. In the groups, vital signs were measured and compared 2 minutes before the massage and in the first and fifth minutes after the massage.

FINDINGS: According to the findings, the mean heart rate (79±10.62 and 76.50±9.72) and respiration (16±3.20 and 15.03±3.02) decreased in the intervention groups (1 and 2) in the first minute and the fifth minute after massage ($p<0.001$). Mean arterial pressure in intervention group 2 (95.15±12.54 and 92.09±12.63) decreased in the first and fifth minutes after massage ($p<0.001$). Body temperature in group 1 in the fifth minute after massage (36.99±0.37 and 36.95±0.36) showed a decrease ($p=0.005$). There was no statistically significant difference between the two groups in changes of physiological indices.

CONCLUSION: According to the results of this study, foot massage duration has no effect on the stability of vital signs and short-term massage has the same effect as long-term massage.

KEY WORDS: *Massage, Vital Signs, Stroke, Intensive Care Unit.*

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Introduction

Cerebrovascular accident is the fifth leading cause of death in the United States and the most common debilitating neurological disorder. This illnesses in addition to the large number of deaths, leads to unemployment, disability, occupation of hospital beds and economic loss. Its incidence and prevalence is unknown in Iran and based on provincial and regional studies, its incidence is 113-149 people per 100,000 people of all ages and more than 500 cases per 100,000 people among the 45 years population (1, 2). A stroke is caused by a disturbance in the blood flow to a part of the brain, it lasts at least 24 hours and can lead to death (3). This disease is the most common disorder that requires long-term care (4). About 80% of it is ischemic, caused by the closure of a cerebral artery by a blood clot called a cerebral thrombosis. In the hemorrhagic type, which makes up about 20%, one of the arteries in the brain ruptures and blood enters the brain tissue (5, 6). High blood pressure is the most important factor in its occurrence. Studies have shown that controlling blood pressure reduces the incidence of stroke by 30 to 40 percent (7). These patients often need to be admitted to the intensive care unit. Intensive care unit is one of the most stressful areas for patients (8). Stress is the body's response to any physical or psychological change (9). Stress in a person causes changes in vital signs (10). Maintaining the hemodynamic status and vital signs of these patients is an important action in the intensive care unit through the use of pharmacological and non-pharmacological methods including complementary medicine such as massage therapy (11). One of the complementary treatments that has a long history is foot massage (12). The earliest scientific images of foot massage or reflexology were discovered in the tomb of Ankhmahor in Egypt and date back to 2500 BC (13). This method has been known as a scientific process in recent years, although so far many evaluations have not been done regarding the duration of massage and only this method has been important in complementary medicine (14). Foot massage is a natural treatment, in the sense that each organ of the body has a corresponding reflection zone in the feet, hands and ears (15). Massage specialists believe that the hands and feet are mirrors of the body and the body map is manifested in the hands and feet (16). Thus, their specific reflex stimulation affects the relevant organs and systems (17) (Figure 1).

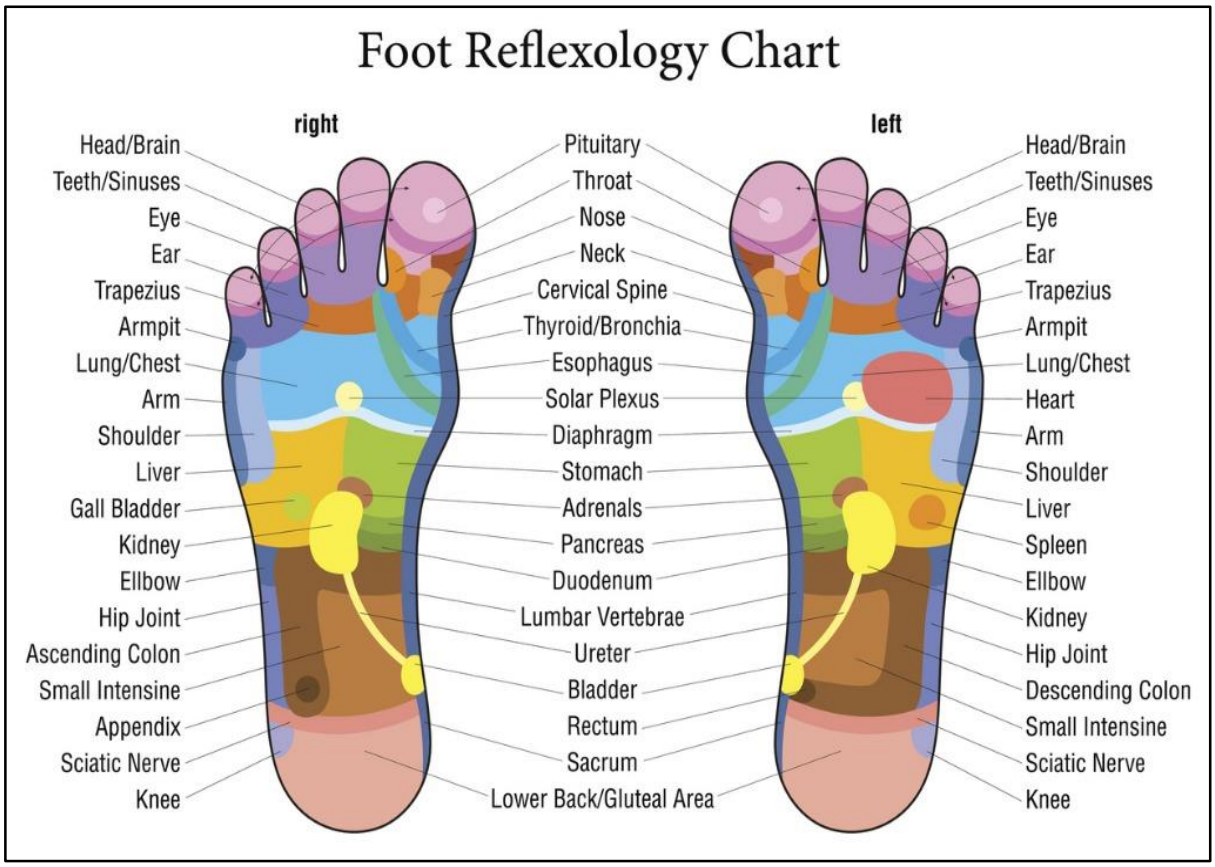

Figure 1. Scheme of pressure points on the foot

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In fact, foot massage is a deep massage in certain areas of the foot that can be used to relieve patients' discomfort (18). This method is often used as a symptomatic treatment in conjunction with pharmacological treatments (19). Various studies have reported many positive effects of foot massage in diseases, including the effects on lowering blood sugar (6), fatigue (17), reducing the complications of cancer (20, 21), premenstrual syndrome (22), reduction of asthma symptoms (23), multiple sclerosis (24) and pain relief (25). Due to the simple training of this massage for nurses and the fact that nurses can easily teach it to others and even the patients' companions and families (26), and since it is low cost, non-invasive and non-medicinal (27) and can be done while maintaining the privacy of patients (28) and does not require a lot of time and energy (29), this technique can be a way to increase the relationship between nurse and patient (26).

According to the results of various studies in this field and also lack of a specific standard time regarding the duration of foot massage, and the proposed duration in this regard has been reported from 5 to 20 minutes and it is not clear whether the duration of massage can have more effects (11, 30, 31), the present study was designed and performed to determine the effect of duration of foot massage on physiological parameters of patients with cerebrovascular accidents with lowered level of consciousness in the intensive care unit.

Methods

This clinical trial was performed in 2018 in the period of January 2018 to May 2018 in the intensive care unit of Imam Reza, Farabi and Taleghani hospitals in Kermanshah with the code IRCT20180110038292N1 and the ethics ID of IR.KUMS.REC.1396.652. All patients were those who experienced cerebrovascular accidents with lowered level of consciousness and admitted to the intensive care units of the mentioned hospitals and were selected through convenience sampling based on the results of a similar study (11).

With 95% confidence and 80% test power, the minimum required sample size was determined using pass 11 software; 32 patients in each group and a total of 64 people. Due to lowered level of consciousness in these patients informed consent was obtained from their legal guardian. Patients were randomly divided into two groups of intervention 1 and intervention 2 using the method of randomly permuted blocks (four blocks of letters A and B). The reason for omitting the control group was the existence of two intervention groups and the long-term stay of cerebrovascular patients in the hospital and the time limit of the study and as a result the small number of available samples. Patients admitted to the intensive care unit due to stroke (including all types of ischemic and thrombotic stroke), at least 48 hours after hospitalization, GCS scale less than 15 (criterion of complete unconsciousness; because in other articles the effect of massage in patients with full consciousness have been evaluated), heart rate greater than 60, systolic blood pressure greater than 90 and less than 160 mm Hg, oral temperature greater than 36.5 °C and at least 12 hours after the use of sedatives, were included in the study. Patients were excluded from the study if they received infusions of drugs that affect blood pressure and heart rate such as dopamine, dobutamine, norepinephrine and labetalol during the intervention.

Physiological parameters were measured using a Data Scope monitor (made in the United States), an analog blood pressure monitor (made in Japan) and a mercury thermometer (made in Iran). In addition, a researcher-made checklist for recording demographic and clinical information of patients, the content validity of which was approved by ten faculty members of Kermanshah University of Medical Sciences, was used. To assess the level of consciousness, the standard tool for assessing the level of consciousness based on the Glasgow GCS criterion was used and the researcher-made checklist was used to record physiological indicators. The patient's demographic and clinical information was completed by the researcher. In completing the checklist of physiological indicators, after observing the gender conformity in the massager and the patient, the female patients were massaged by the researcher and the male patients were massaged by the male nurse of the intensive care unit who were trained in the field of massage.

The four-step massage was scheduled in a way that in intervention group 1, each foot was massaged for 5 minutes. Each of the four steps was given 1 minute and 15 seconds of massage, which was 5 minutes in total, and the intervention group 2, which was supposed to receive massage for 10 minutes, the four steps were performed for 2 minutes and 30 seconds each, i.e. each foot was massaged for 10 minutes. The massage of the two groups was exactly the same and the only difference was the duration of the massage for the patients. In intervention group 1, the client's physiological parameters were recorded 2 minutes before the massage and then the massage was

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performed for 5 minutes. Physiological parameters were re-recorded in the first and fifth minutes after the end of 5 minutes of massage. In intervention group 2, the same was done as group 1, with the difference in the length of 10 minutes of massage. The patient was placed in a supine position at a 30-degree angle to the head while a pillow was placed under his/her feet, and after lubricating the researcher's hand with olive oil, the massage was performed as follows (32).

1- The sole of the foot was held with one hand and it was made sure that the toes are facing up. The thumb was then used to apply pressure to the back of the foot, slowly along each groove between the tendons that connect the ankle to the toes.

2- The foot was held with one hand and with the other thumb, the whole sole of the foot was gently massaged.

3- The fingers were pulled separately to one side in a balanced way and at the same time they were bent forward and backward.

4- The base of each finger was held between the thumb and toes and pulled along it and turned outwards. After the massage, these steps were performed for the other leg as well.

Data were entered into STATA 12 software and they were analyzed using Kolmogorov-Smirnov, Greenhouse-Geisser test, paired t-test and independent t-test and $p<0.05$ was considered significant. In order to compare the changes in physiological indices in the two intervention groups, repeated measures ANOVA was used. It should be noted that the power of the tests was estimated to be 0.88 with G * POWER software version 3.1.9.4 with Effect Size 0.7 and alpha 0.05.

Results

In this study, 32 patients were in intervention group 1 and 32 patients were in intervention group 2, which did not have a significant demographic difference (Table 1).

Table 1. Comparison of demographic and general information of intervention groups one and two

Groups / Variable	Intervention 1 (Mean±SD)	Intervention 2 (Mean±SD)	Total (Mean±SD)	P-value
Age	73.2±5.14	75.1±3.12	74.15±4.13	0.454
Gender				
Man	62.5	71.9	67.2	0.424
Woman	37.5	28.1	32.8	
Place of residence				
City	84.4	87.5	85.9	0.99
Village	15.6	12.5	14.1	
Hospital				
Imam Reza	62.5	71.9	67.2	
Farabi	28.1	21.9	25	0.719
Taleghani	9.4	6.3	7.8	
Cerebrovascular injury				
Ischemic	59.3	56.3	57.8	
Hemorrhagic (EDH)	3.1	3.1	3.1	0.501
Hemorrhagic (SDH)	6.2	3.1	4.6	
Hemorrhagic (SAH)	6.2	12.5	9.3	
Hemorrhagic (ICH)	25	25	0.25	
Level of consciousness (GCS)	6.59±1.70	6.43±1.86	6.51±1.77	0.594

Based on the analysis of heart rate, in intervention groups 1 and 2, a significant difference was observed in the mean heart rate in the three measured periods (two minutes before the massage, one minute and five minutes after the massage) ($p<0.001$). While controlling the effect of mean heart rate before intervention ($p<0.001$), no significant difference was observed in changes in mean heart rate between the two intervention groups. This means that the duration of the massage had no effect on changes in heart rate between the two groups. In the analysis of respiratory rate, in intervention groups 1 and 2, a significant

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difference was observed in the mean respiratory rate in the three measured periods (p<0.001). The results of repeated measures analysis of variance showed no statistically significant difference between the two intervention groups. This means that the duration of the massage had no effect on changes in the number of breaths between the two groups. In the analysis of temperature, in intervention group 1, the mean temperature in the three periods of measurement showed a significant difference (p=0.005), which of course has no therapeutic value in the clinic, but if it continues, it can be a significant finding. In the intervention group 2, temperature was not significantly different in the three periods of measurement. Finally, it was shown that the duration of the massage had no effect on temperature changes between the two groups. Mean arterial pressure (Map) was not significantly different in intervention group 1 in the three periods of measurement. In intervention group 2, the mean arterial pressure in the three periods showed a significant difference (p<0.001). However, it was found that the duration of massage had no effect on changes in mean arterial pressure between the two groups (Table 2).

Table 2. Comparison of changes in physiological parameters at two minutes before foot massage, the first minute after massage and the fifth minute after that

Groups / Vital Signs	Intervention 1 (Mean±SD)	Intervention 2 (Mean±SD)	P-value
Heart rate			
Two minutes before the massage	79±10.62	79.21±9.88	
The first minute after the Massage	76.28±10.58	76.93±9.84	0.402
Fifth minute after massage	76.50±9.72	77.25±9.87	
	p<0.001	p<0.001	
Respiratory rate			
Two minutes before the massage	16±3.20	15.71±2.75	
The first minute after the massage	14.62±2.74	14.31±2.41	0.722
Fifth minute after massage	15.03±3.02	14.68±2.46	
	p<0.001	p<0.001	
Mean arterial pressure (Map)			
Two minutes before the massage	92.93±21.42	95.15±12.54	
The first minute after The massage	94.09±13.37	92.18±12.70	0.644
Fifth minute after massage	90.78±20.15	92.09±12.63	
	p=0.659	p<0.001	
Temperature			
Two minutes before the massage	36.99±0.37	36.83±0.23	
The first minute after the massage	36.97±0.35	37.25±0.59	0.242
Fifth minute after massage	36.95±0.36	36.82±0.23	
	p=0.005	p=0.374	

Discussion

In the present study, it was found that the duration of foot massage did not affect the physiological parameters of patients and in fact was the mechanism of action of foot massage, which even in the short term has its moderating effect by creating a feeling of relaxation by releasing endorphins and activating parasympathetic system (32 – 34). Regarding the short duration of foot massage, we can refer to the study of Cox et al., according to which, short-term foot massage in patients admitted to intensive care units showed modulatory effects on physiological parameters in their study (35). However, the distinguishing feature of this study was that it was performed in patients admitted to intensive care units in general, while in our study it was performed specifically in patients with cerebrovascular accidents. In the study of Azami et al., short-term foot massage was performed on patients undergoing neurosurgery hospitalized in intensive care units and it was found that the short-term massage process affects physiological parameters (36). The difference of the present study is that long-term foot massage was also evaluated, which was found to be ineffective. In the

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analysis of heart rate, it was found that massage was effective in the groups in the study periods. Consistent with the results of the present study, the study of Kordi et al. indicate that the heart rate after massage has decreased compared to before intervention (37). The difference between this study and our study was the application of hand massage on conscious patients, while our patients had complete unconsciousness. The studies of Imani et al. (11), Moyle et al. (38), Taghizadeh et al. (39) and Alimohammad et al. (40) were in the same line.

In findings inconsistent with the results of the present study, studies by Haji Hosseini et al. (9), Cox et al. (35) and Cankaya et al. (41) showed that the heart rate did not change after massage. The modulating effects of foot massage on heart rate can be attributed to the release of endorphins in the brain and has little to do with patients' level of consciousness. It is worth noting that stimulation of various chakras (energy fields) on the body surface, especially in the soles of the feet may cause these effects (34, 42, 43).

In our study, although the reduction of heart rate was not physiologically significant, if this adjustment of heart rate occurs every day, repetition of massage process may have beneficial effects. The contradictory results obtained in this field may be due to factors such as the way of performing the massage, patients' mood and stressors such as ambient noise, which may lower the relaxing effect of massage.

Considering the effectiveness of massage on the respiratory rate, consistent with the results of the present study, the findings of the study by Kordi et al. showed that hand and foot massage reduces the respiratory rate after massage (37). The results of the study of Imani et al. were in line with our findings (11). Furthermore, in a study conducted by Haji Hosseini et al. based on foot massage for 3 consecutive days, the respiratory rate decreased on the second day after the massage (9). Alimohammad et al. also found that percussion massage of the sole of the foot after 60 to 90 minutes reduced the respiratory rate in patients with acute coronary syndrome, which could also indicate the effect of the duration of the massage (40).

Contrary to the results of the present study, Ejindu et al., who compared two types of foot and face massage, and also in the study of Cox et al., it was shown that foot massage has no effect on the respiratory rate (30, 35). Cankaya et al., who studied the effect of classical foot massage on the vital signs of patients after laparoscopic cholecystectomy, did not observe a decrease or modulation in respiratory rate (41). Contradictory results can be due to the physiological condition of patients or the presence of any other psychological factor. The difference between our research and other researches is that it was done in an environment with many intervening variables, i.e. the intensive care unit. Therefore, this relaxation may be manifested more.

Consistent with our findings, Imani et al. (11), Alimohammad et al. (40) and Cankaya et al. (41) found that foot massage is effective in reducing temperature. Our findings show that foot massage has little effect on reducing body temperature, which could be due to the long-term process of adjusting body temperature, which required much more time to measure real changes. Contradicting these results, the study of Taghizadeh et al. showed that back stroke massage increases patients' temperature (39). The research findings can be due to the nature of stroke or percussion massage.

Research by Hattan et al. showed that massage had no effect on patients' temperature (44). Fakori and Jones evaluated the effect of back stroke massage on 18 patients and found that body temperature decline is one of the outcomes of massage. On the contrary, Smith et al. reported an increase in skin temperature at the massage spot (45, 46). Activation of the parasympathetic system and reduction of the body's metabolism seem to reduce body temperature.

Regarding mean arterial pressure, in intervention group 2 in three periods of measurement time, a significant difference was observed in favor of its reduction in contrast to intervention group 1. In a study conducted by Eguchi et al. on a community of Japanese men and women in the form of massage with aromatherapy, they obtained similar results to our study, but their statistical population was completely different from our patients and was performed outside the treatment environment. (47). In the study of Imani et al. (11), Alimohammad et al. (40) and Cankaya et al. (41), it was found that the mean arterial pressure decreased after massage, which was confirmed by the results of the present study in intervention group 2. Cox in his study showed that massage is not effective on the mean arterial pressure, which was in line with the results of the present study in the intervention group 1 (35). The results of the present study showed that foot massage can be effective in modulating the vital signs of patients with cerebrovascular accidents admitted to intensive care unit, but it is important to note that the duration of foot massage had no effect on accelerating or sustaining

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these symptoms and short - term massage has the same effect as long-term massage and this can be very important in saving time.

Conflict of interest: The authors of this study state that this work is the result of an independent study and has no conflict of interest with other organizations and individuals.

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