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The effect of foot reflexology on physiologic parameters and mechanical ventilation weaning time in patients undergoing open-heart surgery: A clinical trial study

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ABSTRACT

The aim of this study was to investigate the efficacy of foot reflexology on physiological parameters and mechanical ventilation weaning time in patients undergoing open-heart surgery. This was a double blind three-group randomized controlled trial. Totally, 96 patients were recruited and randomly allocated to the experimental, placebo, and the control groups. Study groups respectively received foot reflexology, simple surface touching, and the routine care of the study setting. Physiological parameters (pulse rate, respiratory rate, systolic and diastolic blood pressures, mean arterial pressure, percutaneous oxygen saturation) and weaning time were measured. The study groups did not differ significantly in terms of physiological parameters (P value > 0.05). However, the length of weaning time in the experimental group was significantly shorter than the placebo and the control groups (P value < 0.05). The study findings demonstrated the efficiency of foot reflexology in shortening the length of weaning time.

1. Introduction

The prevalence of cardiovascular diseases (CVD) has increased during recent centuries [1]. Currently, CVD is the first leading cause of death, bringing sixteen million deaths yearly [2]. There are numerous treatment options for CVD. One of the most common options—particularly for treating ischemic problems and valvular disorders—is open-heart surgery (OHS) [3]. However, patients usually experience many physical and psychological problems in achieving recovery from OHS [4]. After OHS, patients are usually transferred to OHS intensive care unit (OHS-ICU) to allow weaning from mechanical ventilation (MV) and also for receiving advanced nursing and medical care [5].

Studies have shown that prolonged mechanical ventilation increases healthcare costs and also negatively affects patients' cardiovascular, respiratory, digestive, and musculoskeletal systems, fluid and electrolyte balance, and psychological state [6,7]. MV-associated physical and psychological problems cause considerable stress to patients [8–10] This stress, in turn, stimulates sympathetic and neuroendocrine responses, disturbs patients' sleep, increases cardiac muscle oxygen demand, and causes tachypnea, tachycardia, and hypertension [11]. Accordingly, patients who receive MV usually are treated with sedatives, hypnotic, and tranquilizers to alleviate their pain, stress, and anxiety and also to prevent from patient-ventilatory asynchrony [12]. However, these agents can slow the process of weaning from MV [13]. An alternative method for managing patients' pain, stress, and anxiety is non-pharmacologic interventions. Non-pharmacologic management of anxiety has received great importance during recent years. Compared with pharmacologic agents, non-pharmacologic interventions are simpler, less expensive, and non-invasive and produce fewer side effects [14]. These interventions include a wide range of techniques including music therapy, praying, aromatherapy, guided imagery, muscle relaxation, meditation, reflexology, cognitive therapy, and physical exercise [15].

The therapeutic application of reflexology is to produce “stimulations” on the referred reflexology areas. These can be done through alternate pressing and releasing the areas in extremities of the body, specially feet, hands and ears [16]. Evidence shows that reflexology massage—as a simple, cost-effective, and non-invasive method—regulates the activity of the autonomic nervous system, coordinates physiological responses, alleviates anxiety, and induces relaxation [17,18]. Accordingly, it can be used for alleviating anxiety,

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preventing anxiety-related complications, and stabilizing hemodynamic condition of patients who receive MV.

The effects of foot reflexology on pain, anxiety, tension, physiological parameters, fatigue, and sleep quality have been examined in different studies [19–24]. However, to the best of our knowledge, few studies have been conducted so far on the efficiency of foot reflexology in reducing the length of MV weaning time in patients undergoing OHS. Accordingly, this study was conducted to reduce this gap. The aim of the study was to investigate the efficacy of foot reflexology on physiological parameters and the length of MV weaning time in patients undergoing OHS.

2. Methods

2.1. Design

This was a double blind three-group randomized controlled trial.

2.2. Setting

This study was conducted between February and April 2014 in two OHS-ICUs of two teaching hospitals affiliated to Baqiyatallah University of Medical Sciences, Tehran, Iran.

2.3. Participants

The target population of the study consisted of all patients who were hospitalized in cardiac surgery units of the study setting and were subjected to OHS. The inclusion criteria were having an age of 18–75 years, having a non-emergency OHS, having no foot problem (such as callus, corn, fungal skin infection, previous scars, or known neuropathy), having no intra-aortic balloon pump or pace-maker in place, having a heart rate of greater than 60 beat per minute and a systolic blood pressure of higher than 90 mmHg, receiving no sedative or tranquilizer before the study intervention, and having a partial thromboplastin time of more than 60. Patients who were subjected to a second OHS, received more than one inotropic medication after surgery, needed prolonged MV based on physician's order, or had hemodynamic instability and decreased level of consciousness were excluded from the study.

2.4. Randomization and sample size

The sample size was calculated by using the Altman's nomogram [25] and the findings of a similar study conducted by Sadeghi-Shermeh et al. (2009). Accordingly, with a power of 90% and a confidence interval of 95%, the sample size was determined to be 30 patients in each group. Totally, 96 patients were recruited and randomly allocated to the study groups. Allocation was performed the day before the surgery by randomly selecting one of the three cards labeled groups A, B, or C. Accordingly, 34, 30 and 32 patients were randomly allocated to the experimental, placebo, and the control groups, respectively. Three patients from the experimental group and one patient from the control group were excluded from the study because of either being in need of prolonged MV based on physician's order or having decreased consciousness. Finally, the number of patients in the experimental, placebo, and the control groups was 31, 30, and 31, respectively (Fig. 1).

2.5. The intervention

Patients in the experimental group received foot reflexology one hour after admission to OHS-ICU. The reflexology protocol was developed by a complementary therapist and a reflexology specialist based on the foot reflexology textbooks [26,27]. All patients received the reflexology intervention in supine position in four consecutive steps. The intervention was implemented by two same-gender nurses. Both nurses had received similar reflexology trainings. Primarily, we (i.e. both male and female nurses who provided reflexology) rubbed our hands with non-therapeutic baby oil to warm, lubricate, and prepare them for the intervention. In the first step, we held the left foot in hand for one minute. In the second step, we performed the foot spread technique on the foot for one minute. This technique includes massaging and spreading the plantar surface of the foot with the thumbs of both hands from heel towards toes. In the third step, we put the four fingers of both hands on the dorsal surface of patient's foot and used our thumbs for massaging the heart and lung area of the sole (i.e. the anterior third of the sole) in a rotating manner for 7–10 min. In the last step, the top sliding technique was applied for one minute. In this technique, we put the thumbs of both hands on the sole and the other four fingers on the dorsal surface of the foot and slid them with a gentle pressure from the toes towards the heel and the ankle. After massaging the left foot, we massaged the right foot in the same way. The reflexology massage of each foot lasted for ten minutes—twenty minutes in total. In the placebo group, we only touched patients' heels for twenty minutes without exerting any pressure. Accordingly, the heart and lung area of their sole was not touched at all. Reflexology theory suggests that massaging irrelevant areas produces no therapeutic effect [28]. Patients in the control group received the routine care of the study setting which included no foot massaging or touching.

2.6. Data collection and outcome measures

Patients' demographic data were collected by using a demographic questionnaire containing questions on patients' age, gender, body mass index, cardiac ejection fraction, the amount of time that patient had been on cardiopulmonary pump during surgery, and previous history of diabetes mellitus, hypertension, pulmonary diseases, and smoking. We collected the demographic data by both interviewing patients and referring to their medical records. Patients' physiological parameters—including pulse rate (PR), respiratory rate (RR), systolic and diastolic blood pressures (SBP and DBP), mean arterial pressure (MAP), and percutaneous oxygen saturation (SpO2)—were monitored six times by using a Dtex electronic monitor (General Electric Co, USA). The six measurement time-points included immediately after being admitted to OHS-ICU (T1), one hour after admission (i.e. immediately before the intervention; T2), immediately after the intervention (i.e. twenty minutes after T2; T3), ten minutes after the intervention (T4), immediately after extubation (T5), and one hour after it (T6). The time interval between admission to OHS-ICU and extubation was considered as the MV weaning time and was measured by using a chronometer.

2.7. Blinding

Both the participating patients and the healthcare providers of the study setting were blind to the study intervention and allocation.

2.8. Ethical considerations

The Ethics Committee of Baqiyatallah University of Medical Sciences approved the study. We obtained written informed consent from the study participants at the day before the surgery. Patients were informed about the aim of the study and also about being free to withdraw from the study. Moreover, we ensured them