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Comparing acupressure with aromatherapy using Citrus aurantium in terms of their effectiveness in sleep quality in patients undergoing percutaneous coronary interventions: A randomized clinical trial

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ABSTRACT

Introduction: Poor sleep quality is prevalent in candidates for percutaneous coronary interventions (PCIs). The present study was conducted to compare aromatherapy with acupressure in terms of their effectiveness in sleep quality in patients undergoing PCIs.

Materials and methods: The present study was conducted on 85 patients undergoing PCIs and randomly assigned, using block randomization, to five groups, namely (1)aromatherapy, (2)placebo aromatherapy, (3)acupressure, (4)placebo acupressure (acupressure applied to a point not traditionally associated with improving sleep) and (5) control. The intervention groups received aromatherapy or acupressure or placebo from 10pm to 8am the following day. The control group received only routine care. Sleep quality was measured in the patients using a visual analog scale (VAS) that was completed by them before and after the intervention.

Results: The mean pretest score of sleep quality was 2.91 ± 0.53 in the aromatherapy group, 2.84 ± 0.47 in the placebo aromatherapy group, 2.98 ± 0.59 in the acupressure group, 2.75 ± 0.41 in the placebo acupressure group and 2.88 ± 0.41 in the controls. ANOVA suggested no significant differences among these groups in the pretest ($P = 0.746$). The mean posttest score of sleep quality was 3.72 ± 1.84 in the aromatherapy group, 3.70 ± 1.83 in the placebo aromatherapy group, 7.35 ± 0.99 in the acupressure group, 2.67 ± 0.41in the placebo acupressure group and 2.72 ± 0.34 in the controls, suggesting significant differences among the five groups based on the ANOVA results showed significant differences among the five groups ($P < 0.001$). The mean posttest score of sleep quality was higher than the pretest score by 4.37 in the acupressure group compared to in the other groups ($P < 0.001$).

Conclusion: The present findings provided scientific evidence for the benefits of using different methods, including acupressure, for sleep quality in patients undergoing PCIs.

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1. Introduction

1.1. Sleep problems in patients undergoing PCIs

Cardiovascular diseases (CADs) are a major cause of decreased sleep duration and increased nocturnal awakening, which contribute to physical fatigue, mental exhaustion, physical tensions, restlessness and aggression. These consequences can prolong length of stay and treatment in inpatients [1].

As a risk factor for CADs and acute myocardial infarction [2,3], poor sleep quality causes fatigue, restlessness, anxiety, major depression, daytime drowsiness, reduced mental activity, impaired functioning, exacerbated cardiovascular complications, reduced quality of life and increased mortality [4,5].

Advances in surgical and diagnostic techniques have decreased cardiovascular mortality rates during the past 40 years [6]. Patients undergoing PCIs as a popular though invasive surgical procedure for treating CADs [1] experience high levels of stress and anxiety and probably poor sleep quality [7,8].

Patients in a cardiac care unit (CCU) tend to be alert, and their exposure to environmental factors such as loud noise, constant lighting, unpleasant odors, frequent care procedures and critical situations and their fear of their disease are all a cause of anxiety that inhibits a sound sleep [9].

Farmahini et al. observed anxiety in 80% of hospitalized patients, of whom 71% received no medical or nursing interventions for their anxiety and stress [10]. Moreover, poor sleep quality as a stressor causes the secretion of catecholamine, which itself increases heart rate, respiratory rate, blood pressure and myocardial need for oxygen and causes cardiac dysrhythmia, ischemia and postoperative complications [11].

Several researchers who investigated sleep quality in cardiac patients include Schiza et al. that found poor sleep quality in patients during the first three days of their hospitalization for Acute Coronary Syndrome (ACS) [12]. Bagheri Nesami et al. also reported poor sleep quality in 93.3% of patients with ACS during their first night of hospitalization [13]. Moreover, Edell-Gustaffson introduced poor sleep quality as an independent risk factor for cardiac events in men [14]. Independent nursing interventions are therefore necessary for reducing anxiety and stress and improving sleep quality in these patients.

Poor sleep quality can be treated with different pharmacological and non-pharmacological methods. Diazepam and Oxazepam are the most commonly-used benzodiazepines for sleep disorders; nevertheless, despite their efficacy and relative safety, their many side effects mostly emerge at high doses or prolonged consumptions [15].

Complementary and alternative medicine (CAM), including acupressure and aromatherapy, were recently used to improve the negative effects of poor sleep quality and reduce sleepiness and anxiety [16]. Gupta et al. Also found CAM to improve sleep quality without exerting adverse effects [17]; nevertheless, further studies are recommended that be conducted to demonstrate the effectiveness of these frequently-used complementary therapies.

As an increasingly-used approach in many countries, CAM is demanded by 80% of patients in Iran of physicians [18]. Acupressure and herbal medicine as inhalation aromatherapy, massage aromatherapy or essential oils, including Citrus aurantium, Lavender, Melissa officinalis L. and Valerian, have been reported by Iranian patients as the most commonly used CAM approaches [19].

1.2. Aromatherapy

Inhalation aromatherapy and massage aromatherapy are considered commonly-used aromatherapy techniques [20]. Inhalation aromatherapy can alleviate pains, stress, anxiety, fatigue and depression and improve sleep quality [21]; nevertheless, the effectiveness of different essential oils is a controversial issue, and the exact mechanism of effect of these extracts is yet to be explained [21,22].

The effects of the scents used in aromatherapy on senses resemble those of different medications on the brain and the nervous system [23]. Inhaling aromas relaxes the person by shifting the autonomic balance toward increased parasympathetic nervous activity [24]. Aromatherapy has been reported to improve sleep quality in patients in hospices, patients undergoing dialysis or colonoscopy and older adults [25–28]. Goel et al. found aromatherapy to enhance sleep quality in patients with insomnia [29].

A popular aromatic essential oil used in aromatherapy is extracted from Citrus aurantium as a medicinal plant indigenous to the north and south of Iran. In traditional medicine, Citrus aurantium flowers are used for treating neurological diseases such as hysteria, epilepsy and mental fatigue [30]. In Iranian traditional medicine, Citrus aurantium is identified as a tranquilizing and sleep-boosting plant [19].

1.3. Acupressure

Acupressure is a form of Chinese traditional medicine and a component of alternative therapy for increasing sleep quality in older adults and patients with chronic diseases [4]. According to ancient Chinese medical literature, sleep problems can be attributed to over 54 pressure points [5 and 31], including acupoint heart 7 (HT7) as the most popular one [5]. Acupressure is believed to help improve sleep quality by changing serum melatonin levels and serotonin secretion [32].

Acupressure stimulates meridians in the body to increase the flow of qi and thus decrease the energy imbalance in the body [33,34]. According to traditional medicine, the vital qi energy flows in the body's energy channels [35]. The Chinese believe that acupressure improves sleep quality by improving the flow of qi, i.e. the vital energy, through releasing neurological mediators and nervous hormones [36]. Acupressure increases endorphins in the brain and causes muscle relaxation, pain relief and increased comfort, as does acupuncture. It also regulates the physical mechanisms that induce body relaxation and improve sleep quality [37].

In addition, acupressure has been reported to improve sleep quality in residents of long-term care facilities, cancer patients, hemodialysis patients and those with end-stage renal disease [4 and 37-39].

To the best of the authors' knowledge, the health benefits of these alternative methods for sleep quality in patients undergoing PCIs have not been addressed in literature yet. The present study was therefore conducted to compare intervention strategies of aromatherapy and acupressure in terms of their effectiveness in sleep quality in patients undergoing PCI. The study hypothesis suggested the superiority of acupressure over Citrus aurantium in improving sleep quality in patients undergoing PCIs.

2. Materials and methods

2.1. Study design and participants

The present study was part of a randomized clinical trial conducted between 24 September 2017 and 10 March 2018. The researchers in charge of performing all the interventions were not blinded to the study. The study population comprised 85 patients undergoing PCI in the CCU and post-CCU of Fatemeh Alzahra Hospital in Sari in the north of Iran. Patients diagnosed with pectoris angina or myocardial infarction requiring PCIs were recruited in this study.

The eligible candidates consisted of male [40,41] literate individuals aged 40–75 years. The exclusion criteria comprised unwillingness to participate in the study, a history of neurological diseases leading to hospitalization or medication as reported by a specialist, using herbal medicines over the previous two weeks, a history of drug use, having a scar on the HT7 point, using hypnotics over the previous month, a history of acupressure, PCIs, respiratory disorders and allergy to plants, olfactory dysfunction, BMI$>$30 kg/m^2, having Carpal Tunnel Syndrome and loss of consciousness.

2.2. Sample size

The sample size was determined based on the results of a pilot study conducted on five groups, namely the Citrus aurantium group with a mean sleep quality score of 0.80 ± 1.86, the pure sunflower oil group with a mean sleep quality score of 0.86 ± 1.97, the acupressure group with a mean score of 4.37 ± 1.12, the false point acupressure group with a mean score of 0.82 ± 0.50 and the controls with a mean score of 0.16 ± 0.58. The sample size was calculated as 17 in each group using $n=((z_{1-\alpha/2} + z_{1-\beta/2})^2 \times (\delta_1^2 + \delta_2^2))/(\mu_1 - \mu_2)^2)$ with a confidence interval of 95% and a test power of 80%. Convenience sampling was used to select 85 patients in the present study. The effect size f was estimated at 0.76 using G*power (ANOVA: fixed effect, omnibus, one-way).

2.3. Outcomes

The data collection tools comprised a demographic questionnaire, including age, gender, marital status, underlying diseases, level of education, history of using sleeping pills and herbal medications and drugs over the previous two weeks and history of undergoing acupressure, a VAS and the State-Trait Anxiety Inventory (STAI). The score of the VAS used to determine the quality of the previous night sleep in the patients was 0–10 cm, with 0–3 cm suggesting poor sleep quality, 3.1–6 cm moderate sleep quality and 6.1–10 cm good sleep quality. The scores obtained by the subjects using this tool show sleep quality. The validity and reliability of this tool have been confirmed in studies by Zisapel et al. and Myllymäkiet al. [42,43]. Abbasi et al. and Rezaei et al. have also used this instrument in Iran [44,45]. The score of the 40-item STAI ranges from 20, i.e. no anxiety, to 80, i.e. the highest level of anxiety, with scores of 20–39 suggesting mild anxiety, 40–59 moderate and 60–80 severe anxiety. The validity and reliability of this tool have been confirmed in study by Mahram [46]. Abolhassani confirmed the reliability of the STAI by calculating a Cronbach's alpha of 0.91 [47].

According to the hospital routine examined, the patients should be hospitalized the night before performing PCIs. In the meantime, the demographic questionnaire, the VAS and the STAI were completed by the patients at baseline. The patients were then randomly assigned to one of the five study groups using simple block randomization, and aromatherapy, acupressure or the placebo intervention began at10pm. The following morning (on the PCI day), the VAS was completed by the patients to assess the quality of their sleep at the hospital in the previous night. According to Fig. 1, the patients were kept in separate chambers to prevent them from communicating with one another.

2.4. Randomization

The eligible patients entered the study by convenience sampling using block randomization. They were then randomly assigned into five groups, including the aromatherapy group (A), placebo aromatherapy (pure sunflower oil) group (B), acupressure group (C), group with acupressure applied to a point not traditionally associated with improving sleep (D) and the control group (E). Due to the existence of five independent groups in the study, nine blocks of ten were formed. The patients who met the inclusion criteria were included in the study through convenience sampling and were randomly assigned into one of the four intervention groups and the one control group. One block from all the nine blocks of ten was randomly selected for each group and the patients were assigned to the five groups as specified by the block (A, B,

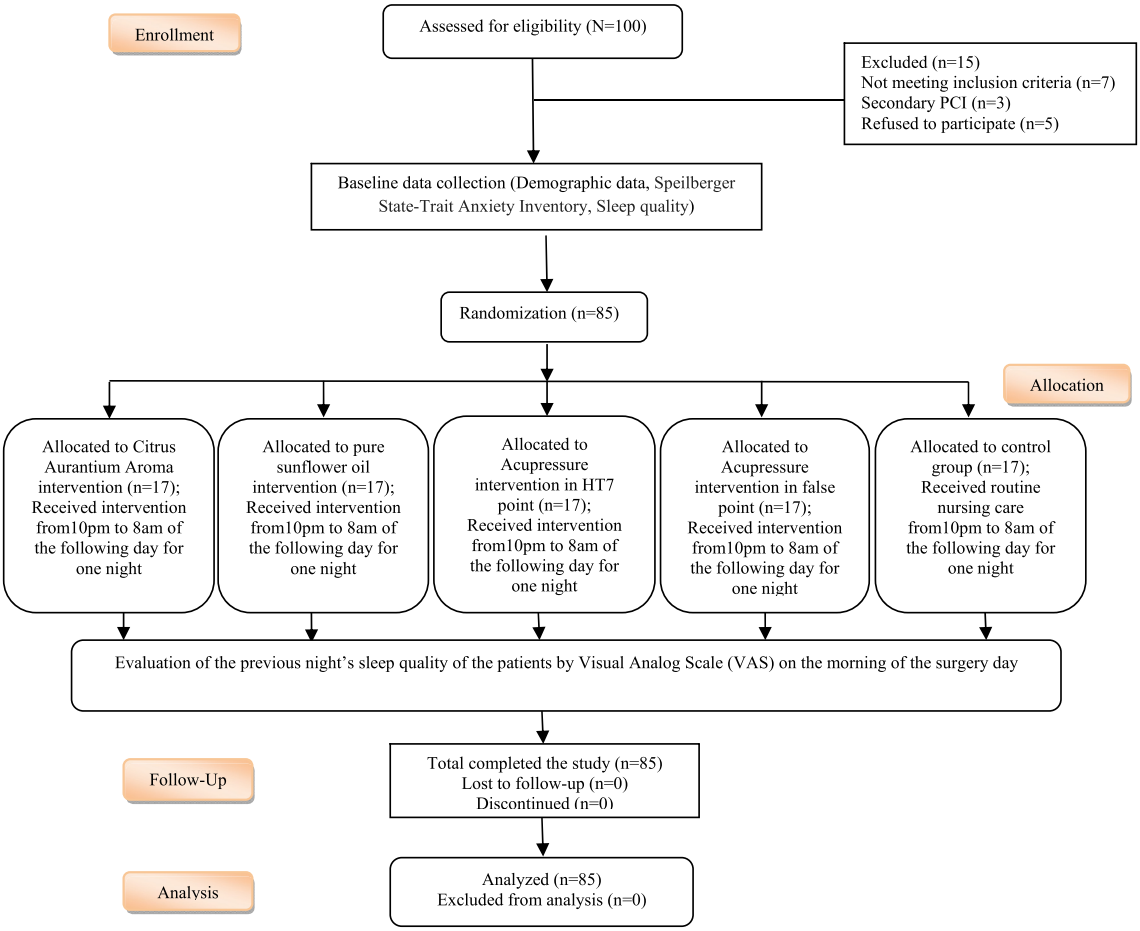

Fig. 1. Recruitment and retention of participants in the study.

C, D and E). A total of ten patients (two per group) were studied each time. In the next round, another block was randomly chosen and the patients were allocated to one of the five groups as per the selected block. Some of the blocks of ten formed were AA BB CC DD EE, AB AB CC DE ED and AC BE CA DE DB.

2.5. Intervention

In the aromatherapy group, the intervention began at 10pm the night before the PCI. A cotton ball impregnated with two drops of Citrus aurantium 10% (Barij Essence Co., Kashan, Iran) was held under the patient's nose and the patient was asked to take two to three deep breaths. The cotton ball was then pinned to the patient's collar, kept at this position until 8am the next morning, and ultimately taken off and discarded. The concentration of Citrus aurantium administered was selected in this study based on the literature review [19,30]. The same procedure was carried out for the placebo aromatherapy group with two drops of sunflower oil instead of Citrus aurantium.

In the acupressure group, the HT7 point was first precisely located using an accurate acupuncture point locator device (Point Excel Model, Spain). Wristbands (Sea-bands) with a plastic button (0.7 cm in diameter) were then wrapped around the patient's right and left wrists with the plastic button located exactly on the HT7 point. The wristbands were kept from 10pm to 8am. The precision of acupressure was confirmed if the subjects felt sore, numb, heavy, distended and/or warm [39]. In group D, where acupressure was applied to a point not traditionally associated with improving sleep, the same procedure was followed but the plastic buttons on the wristbands were fixed opposite the HT7 point (false point). The researcher and a collaborating nurse provided training on how to use the wristband. The patients were allowed to remove the wristbands when washing their hands, but had to wear them afterwards (in a way that the plastic button was placed on a marked point). The control group received only routine care with no additional interventions.

2.6. Statistical methods

The collected data were described using descriptive statistics, including tables of frequency and mean and standard deviation. The one-way analysis of variance (ANOVA) was applied to compare the patients' mean age and BMI between the five groups. The Chi-square test was administered to compare the patients' marital status, smoking and opium use. The Kruskal-Wallis test was used to assess their literacy level. The one-way ANOVA was performed to compare the patients' mean trait and state anxiety and sleep quality. Pairwise comparisons of the groups were carried out using Tukey's post-hoc test. The normal distribution of the data was assessed using the Shapiro-Wilk test. All the analyses were conducted in SPSS-23 (SPSS Inc., Chicago, IL, USA). The level of statistical significance was set at $P < 0.05$.

2.7. Ethical considerations

This study was approved by the National Committee for Ethics in Biomedical Research (approval code: IR.SEMUMS.REC.1396.64) and registered at the Iranian Registry of Clinical Trials (registration code: IRCT201707248665N6). Sampling began after obtaining permissions from the hospital authorities and the cardiac and post-CCU ward managers. After introductions, the researcher explained the study objectives and methods to the participants and ensured them and their families of the voluntary nature of participation in the study and the confidentiality of their data and then obtained their written consent for participation in the study. Participants' rights were protected according to the Helsinki declaration.

3. Results

Of the 85 participating patients, 100% were male, 89.4% were married and 44.7% had high school education. The mean age and BMI of the patients were 58.48 years and 27.8 kg/m^2 (with a range of 26.2–29 kg/m^2). None of the patients had a history of antiepileptic and herbal medication use or acupressure. The ANOVA and Chi-square and Kruskal-Wallis tests showed no significant differences between the five groups in terms of age, BMI, marital status, education, smoking, opium use and the state and trait anxiety scores ($P > 0.05$, Table 1).

The mean scores of sleep quality were 2.91 ± 0.53 in group A, 2.84 ± 0.47 in group B, 2.98 ± 0.59 in group C, 2.75 ± 0.41 in group D and 2.88 ± 0.41 in group E in the pretest. The ANOVA results showed no significant differences between these groups in the pretest ($P = 0.746$). In the posttest, however, the mean sleep quality scores were 3.72 ± 1.84,3.70 ± 1.83,7.35 ± 0.99,2.67 ± 0.41 and 2.72 ± 0.34 in the five groups, and the ANOVA results showed significant differences between the five groups ($P < 0.001$). Compared to the other groups, the acupressure group attained 4.37 more points in the pretest-posttest difference testing for sleep quality ($t = -16.05$, $P < 0.001$). Moreover, Tukey's test results in the posttest showed that the mean sleep quality scores were significantly higher in the acupressure group compared to the other groups ($P < 0.001$ in all the cases, Table 2). The results regarding sleep quality showed that 82.35% of the patients in the placebo acupressure group, 76.47% in the placebo aromatherapy group, 64.7% in the aromatherapy group, 64.7% in the control group and 58.8% in the acupressure group experienced poor sleep quality before the intervention, while most patients in the acupressure group (88.2%) experienced good sleep quality after the intervention (Table 3). During the course of the study, the participants reported no side-effects caused by Citrus aurantium or acupressure.

4. Discussion

The results showed that the acupressure group (receiving acupressure at the HT7 point) had a significantly higher mean score of sleep quality compared to the other groups, but no significant differences were observed between the other groups. Moreover, more than 50% of the patients in all five groups experienced poor sleep quality before the intervention, while most patients in the acupressure group (88.2%) experienced good sleep quality after the intervention.

In line with the present findings, a systematic review and meta-analysis study by Waits et al. reported acupressure on the HT7 point to improve sleep quality in various patients [48]. Wiyarno et al. also confirmed the positive effect of acupressure on the HT7 point on sleep quality in patients with acute myocardial infarction. In fact, 72% of the intervention group experienced a good sleep quality and only 28% had poor sleep after the intervention [49]. Similarly, Arab et al. and Tsay and Chen concluded that acupressure on the HT7 point improves sleep quality in hemodialysis patients [4,18]. Ahmadinezhad et al. found acupressure on the HT7 point to enhance sleep quality in post-menopausal patients [50]. According to Bagheri Nesami et al., pressure applied to the HT7 point in the wrists improves sleep quality in patients with ACS in the CCU [13,51].

Based on Chinese traditional medicine and its corresponding literature, there are many points such as the HT7, including Yungchuan and Saninjiao, whose stimulation increases serotonin and melatonin and leads to relaxation and improved sleep quality [39,52]. This study assessed acupressure on the HT7 point and the results obtained suggested an improved sleep quality in the subjects after the intervention. To investigate the mechanisms of effect of massaging the hands at the HT7 point, Nordio et al. measured melatonin metabolite levels in 24-h urine in their acupressure group following 20 days of treatment and reported a significant normalization of melatonin metabolite in the acupressure group compared to the control group. They considered acupressure on the HT7 point as a natural, reliable and effective

Table 1
Baseline characteristics of participants included in the study.

Variables	Group					P Value
	Citrus aurantium (n = 17)	Pure sunflower oil (n = 17)	Acupressure (n = 17)	False point acupressure (n = 17)	Control (n = 17)	
Age (Mean ± SD)	59.6 ± 11.1	59.6 ± 11.5	56.4 ± 11.6	59.2 ± 9.3	57.6 ± 7.8	0.866[c]
BMI[a] (Mean ± SD)	27.9 ± 5.2	28.3 ± 8.3	26.2 ± 4.2	27.6 ± 3.8	29.0 ± 3.7	0.622[c]
Anxiety Scores (STAI)[b]						
State (Mean ± SD)	40.3 ± 13.1	36.5 ± 8.2	36.9 ± 5.3	39.7 ± 11.3	40.2 ± 9.5	0.655[c]
Trait (Mean ± SD)	40.9 ± 9.6	38.4 ± 7.2	38.0 ± 9.0	35.7 ± 9.0	38.5 ± 7.0	0.510[c]
Marital Status N (%)						
Single	2 (11.8)	1 (5.9)	3 (47.6)	1 (5.9)	2 (11.8)	0.783[d]
Married	15 (88.2)	16 (94.1)	14 (82.4)	16 (94.1)	15 (88.2)	
Educational status N (%)						
High school	8 (47.1)	7 (41.2)	7 (41.2)	9 (53.0)	7 (41.2)	0.660[e]
Diploma	4 (23.5)	0 (0)	5 (29.4)	4 (23.5)	6 (35.3)	
Higher education	5 (29.4)	10 (58.8)	5 (29.4)	4 (23.5)	4 (23.5)	
Smoking N (%)						
Yes	4 (23.5)	6 (35.3)	2 (11.8)	7 (41.2)	3 (17.6)	0.260[d]
No	13 (76.5)	11 (64.7)	15 (88.2)	10 (58.8)	14 (82.4)	
Opium consumption N (%)						
Yes	1 (5.9)	2 (11.8)	1 (5.9)	1 (5.9)	1 (5.9)	–
No	16 (94.1)	15 (88.2)	16 (94.1)	16 (94.1)	16 (94.1)	

[a] BMI: Body Mass Index.
[b] The State and Trait Anxiety Inventory (STAI).
[c] One-way ANOVA test.
[d] Chi-square test.
[e] Kruskal-Wallis.

Table 2
The comparisons of mean scores of the sleep quality according to experimental and control groups.

Variables	Group					P Value
	Citrus aurantium (n = 17)	Pure sunflower oil (n = 17)	Acupressure (n = 17)	False point acupressure (n = 17)	Control (n = 17)	
Sleep quality scores[b]						
Pre-test (Mean ± SD)	2.91 ± 0.53	2.84 ± 0.47	2.98 ± 0.59	2.75 ± 0.41	2.88 ± 0.41	0.746[a]
Post-test (Mean ± SD)	3.72 ± 1.84	3.70 ± 1.83	7.35 ± 0.99	2.67 ± 0.41	2.72 ± 0.32	>0.001[a]
Difference (Pretest-Posttest)	0.80 ± 1.86	0.86 ± 1.97	4.37 ± 1.12	−0.82 ± 0.50	−0.16 ± 0.58	>0.001[a]
t[c]	t = −1.77	t = −1.79	t = −16.05	t = 0.67	t = 1.14	
P-value	P = 0.095	P = 0.091	P < 0.001	P = 0.508	P = 0.271	

[a] One-way ANOVA test.
[b] Measured by Visual Analog Scale (VAS).
[c] Paired *t*-test.

Table 3
Distribution of the VAS score of the sleep quality according to experimental and control groups.

Sleep quality level N (%)	Group				
	Citrus aurantium (n = 17)	Pure sunflower oil (n = 17)	Acupressure (n = 17)	False point acupressure (n = 17)	Control (n = 17)
Before intervention					
Poor (0–3)	11 (64.7)	13 (76.47)	10 (58.8)	14 (82.35)	11 (64.7)
Fair (3.1–6)	6 (35.3)	4 (23.53)	7 (41.2)	3 (17.65)	6 (35.3)
Good (6.1–10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
After intervention					
Poor (0–3)	7 (41.2)	8 (47.05)	0 (0)	15 (88.2)	15 (88.2)
Fair (3.1–6)	7 (41.2)	6 (35.3)	2 (11.8)	2 (11.8)	2 (11.8)
Good (6.1–10)	3 (17.6)	3 (17.65)	15 (88.2)	0 (0)	0 (0)

technique for improving sleep quality with no side-effects [53].

The present findings showed that Citrus aurantium essential oil has no positive effects on sleep quality in patients scheduled for PCI. In line with these results, Tazakori et al. investigated the effects of damask rose extract on sleep quality in angiography candidates in the CCU [54]. They found no significant differences between the intervention and control groups in the quality of sleep. The present findings are also in line with the results obtained by Fismer and Pilkington regarding the effect of aromatherapy with lavender essential oil on the sleep quality of patients in the CCU [55]. Nevertheless, they are in contrast with the results of studies conducted by Zeighami et al., MohaddesArdabili et al., Cho et al., Kamalifard et al. and Aalami et al. [14,19,56–58]. According to previous studies, Citrus aurantium neroli essential oil contains 35% hydrocarbons, 47% terpene alcohols such as linalool, terpineol, geraniol, nerol and flavonoids and 6% nerolidol and 7–11% indole. Flavonoids act as the agonist of benzodiazepine receptors and thus have relaxation effects [56]. The ineffectiveness of Citrus aurantium essential oil in the present study can probably be attributed to the low duration of the intervention (one night), the amount and dose of essential oil used (two drops of 10% essential oil), the unpleasant scent of the essential oil for some of the

patients, the type of study population and the different sleep quality measurement tools used compared to other studies. Some studies have used a combination of essential oils such as lavender and Citrus aurantium or lavender, chamomile and Citrus aurantium at higher amounts and dosages (eight drops of 20% essential oil) for at least three consecutive nights [14,19,56–58]. These differences can explain the effectiveness of the essential oil applied in the other studies.

This study had some limitations. First, the effect of acupressure on sleep should be interpreted with caution, as no blinding was performed in this study. Second, the HT7 point is one of the recommended acupoints for sleep interventions and additional acupoints might be adopted according to individual characteristics. Another limitation was the lack of control over participants' activities before sleep time, which could have affected the onset and continuation of sleep in them. Nevertheless, the patients were asked to refrain from eating and drinking coffee and tea. Another major limitation of this study was the use of a subjective sleep scale to assess the quality of sleep in the patients. Moreover, the patients were hospitalized in the ward the night before PCI, and this tool therefore measured the patients' sleep quality the night before their hospitalization. The low duration of the intervention was another limitation of the study. The present study was conducted in one center and the results may therefore not be generalizable to all centers. Multi-center studies with standardized measurement instruments, such as the Pittsburgh sleep quality index and polysomnography, are recommended in order to produce definitive evidence of the higher efficacy of acupressure compared to Citrus aurantium in improving patients' sleep quality. Pre-sleep arousal, which is known to be associated with anxiety and poor sleep quality, is also recommended to be measured.

5. Conclusion

According to the present findings, acupressure is more effective in improving the sleep quality of patients undergoing PCI. Given the interactions between cardiovascular disease and poor sleep quality in patients, acupressure could be considered as a non-invasive, safe, fairly inexpensive and side-effect-free method for improving sleep quality in patients undergoing PCI.

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Declaration of competing interest

The authors have no conflicts of interest to declare.

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