



Research Article

Investigating the Effect of Acupressure on the Patients' Anxiety Before Open-Heart Surgery: A Randomized Clinical Trial

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ABSTRACT

Background: Anxiety is a common complaint of patients before diagnostic or therapeutic invasive procedures, especially before open-heart surgery. The most well-known method to reduce anxiety is the use of sedatives, which have pronounced side effects.

Objectives: The purpose of this study was to determine the effect of acupressure on anxiety in patients undergoing open-heart surgery.

Method: This is a randomized clinical trial study conducted on 90 patients who were candidates for open-heart surgery. The patients were randomly assigned into either intervention or control groups. Acupressure intervention was applied at three real acupoints over two consecutive days in the intervention group. The control group received acupressure on sham points. We used Spielberger State-Trait Anxiety Inventory to assess anxiety in our study.

Results: The results showed that before acupressure, there was no statistically significant difference between state anxiety scores and intergroup traits, and this difference was only significant in state anxiety after the second intervention. State and trait anxiety were significant before and after the intervention in the test group, respectively include ($p < 0.001$) ($p = 0.01$), but these changes in the control group did not show a statistically significant difference. After completing the second phase of the intervention at the actual sites, systolic blood pressure ($p = 0.007$) and heart rate ($p = 0.001$) decreased significantly. However, acupressure did not have a significant effect on diastolic blood pressure in any of the groups.

Conclusion: Based on the results of this study, the application of acupressure in patients who are candidates for open-heart surgery can reduce their state anxiety. Further larger-scale and rigorous studies are warranted.

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1. Introduction

Cardiovascular disease is one of the most common diseases which causes death and disability in many countries [1], especially in developing countries [2]. In Iran, cardiovascular disease is the leading cause of death in people aged older than 35 years [3]. Invasive interventions are the treatment of choice in many cardiovascular patients who do not respond to conventional therapies

[4]. Open-heart surgery is one of the invasive interventions that increase the level of anxiety in patients who are candidates [5].

Anxiety is an emotional state characterized by fear and panic caused by the prediction of a threatening event [6]. This health issue stimulates the sympathetic nervous system, causing tachycardia, high blood pressure, and arterial vasoconstriction [7]. Anxiety is the second leading cause of disability and one of the most common health problems all over the world [8]. Evidence shows that 11–80% of the adults who had undergone surgeries experienced varying degrees of anxiety [9]. Accordingly, interventions that reduce preoperative anxiety are of great interest. Secondary complications of surgical interventions including [6] postoperative pain prediction, separation from the family, loss of independence, and fear of surgery and death are among the most common causes

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of preoperative anxiety [10]. In this regard, anxiety in women is reported to be more likely than men [11].

Preoperative anxiety is an undesirable phenomenon and a source of stress for the patient. The progression of the disease depends largely on the ability to respond to stress. Severe anxiety negatively affects physiological parameters and interferes with postoperative recovery. Moreover, it increases the number of complications and prolonged hospitalization [12]. Recent studies have shown that patients who used preoperative anxiety reduction methods or adaptation skills are less anxious and experience less pain and discomfort after surgery. Moreover, they show a reduced length of hospitalization after surgery and less demand for painkillers [13].

Anxiety control methods include pharmacological and non-pharmacological approaches [14]. Generally, this method is accepted as a safe, low-cost, and noninvasive treatment method with little or no side effects [15]. Complementary medicine and alternative medicine are nonpharmacological treatments to control the anxiety. Acupressure is one of the oldest therapies of complementary medicine based on Chinese acupuncture [16]. Regarding the nonpharmacological and noninvasive nature of this method, as well as its effectiveness, the number of people interested in this method increases daily [17]. In this method, the pressure is applied to acupoints by fingers or by an object [18]. Acupressure theory states that there are 12 meridians in the body called energy channels. It is believed that diseases are caused by the unbalanced flow of vital energy within these meridians, which stimulates certain points in the meridian. Following the acupressure therapy, the vital energy flow in the body is balanced and the diseases are cured [19]. Acupressure can reduce anxiety by reducing the concentration of 5-hydroxytryptamine and adrenocorticotrophic hormone in the nerves and regulating the concentration of neurotransmitters [20].

To the best of our knowledge, limited number of studies have evaluated the immediate effects of acupressure in reducing anxiety in patients who have undergone open-heart surgery. Results showed that the patients experienced high anxiety before open-heart surgery [21]. Given the importance of reducing anxiety in these patients and its negative consequences and growing desire to use complementary medicine, the present study aimed to investigate the effect of acupressure on the EX-HN3, GB20, and HT7 on the anxiety of patients who were candidates for open-heart surgery. Overall, the use of acupressure by nurses can help improve the quality of nursing care and reduce the side effects of invasive procedures [22].

2. Method

2.1. Ethical considerations

The present study was approved by the Research Ethics Committee of Shiraz University of Medical Sciences (No: OR.sums.-rec1398.209) and registered at the website of Iranian Registry of Clinical Trials (reference number: IRCT20190324043104N1). After receiving verbal explanations about the objective and methods, all participants signed a written informed consent form. In addition, the participants were assured that their information would remain confidential and if they were unwilling to participate, they could withdraw from the study at any time and their lack of participation or withdrawal had no effect on their care and treatment.

2.2. Study design and setting

It was a randomized clinical trial study conducted from March 2019 to August 2019 on 90 patients who were candidates for open-heart surgery at Kowsar Hospital in Shiraz, Iran. At 95% confidence

level and 80% power level and considering the standard deviation of 10 and the minimum difference of 6 units between the two groups, we needed to examine at least 45 samples in each group (90 samples in total). The participants were assigned into either intervention or control groups using a block randomization method (number of blocks = 4).

Of the total of 110 patients hospitalized in noted centers, 20 were not included in the study for failing to meet the eligibility criteria, and 90 patients were then randomly selected and allocated to the two groups. There were no cases of sample withdrawal over the course of the study.

2.3. Inclusion/exclusion criteria

Inclusion criteria were being a candidate for open-heart surgery, being at least 18 years old, and having hemodynamic stability. The exclusion criteria included a history of known mental illness or use of psychiatric medications, previous experience of acupressure, a history of attending training courses and yoga classes to control stress over the past six months, a history of exposure to severe mental crises (such as the death of first-degree relatives, divorce, or parental divorce in the past six months), use of sedatives and painkillers 5 hours before the intervention, drug addiction, and hyperthyroidism.

2.4. Intervention

The researcher and her assistant trained 25 patients who were to undergo open-heart surgery in seven 2-hour sessions working with acupressure specialist using Saehan Hydraulic Pinch Gauge sh 5005, Saehan Com, South Korea device, and the accuracy of the points and the right technique with a 100% precision was ensured.

Necessary permits were obtained from the relevant authorities, and the objectives and method of the study were explained to eligible patients. Demographic characteristics and state and trait anxiety were recorded in the checklist; also, hemodynamic indicators were measured and recorded before and after each intervention.

In the intervention group, patients received acupressure twice in two consecutive days after admission to the ward. They received acupressure each time for 15 minutes (5 minutes each point) in the Yintang (EX-HN3), Shenmen (HT7), and Fengchi (GB20). Some studies have previously demonstrated the effects of the stimulation of these points (individually and in combination) on anxiety [23,24].

The location of these points is listed as follows:

- 1 Shenmen (HT7) – On the ulnar end of the transverse crease of the wrist, in the small depression between the pisiform and ulna bones.
- 2 Fengchi (GB20) – In the depression created between the origins of the sternocleidomastoid and trapezius muscles, at the junction of the occipital and nuchal regions.
- 3 Yintang (EX-HN3) - Located between the eyebrows.

The first intervention was performed one day before the surgery and the second one 30 minutes before surgery. The acupressure was applied to each point for 5 minutes at a pressure of 4.5 kg/cm² by the thumb at the (EX-HN3), then at the (HT7) on both hands, and finally at the (GB20) on either side of the neck. Finally, immediately after the end of the second intervention, the hemodynamic indicators of blood pressure and pulse, recording, and questioning of Spielberger's anxiety were completed by the individual. If the patient was unable to read and write, the questionnaire was read and completed by the researcher.

Patients in the control group completed the demographic form and Spielberger's anxiety questionnaire and recorded the hemodynamic indicators of blood pressure and pulse in the relevant checklist. Next, they received acupressure medicine as the intervention group in two steps but in sham points to ensure that those points did not affect reducing anxiety. They received the sham points, (GB20) and (HT7), at a distance of 3 cun and the (EX-HN3), 2 cun were taken away from the real points. After the second intervention (30 minutes before the surgery), patients completed the Spielberger questionnaire for the second time and their blood pressure and pulse hemodynamic indicators were recorded. In this method, the patients were blinded about their allocation in the test or control group.

2.5. Outcome measures

2.5.1. Demographic information questionnaire

The demographic information questionnaire is a self-reported scale. The questionnaire includes parameters such as age, history of acupressure, education, gender, marital history, and history of hospitalization or surgery.

2.5.2. Spielberger State-Trait Anxiety Inventory

Spielberger State-Trait Anxiety Inventory is a psychometric tool developed by Spielberger in 1970 [25] which was validated in Persian by Panahi in 1994 [26]. This questionnaire has two sections, each containing 20 questions. The first part measures the anxiety of the state (anxiety of the person at the same time) and the second part measures the anxiety of the attribute (anxiety of the person in most cases of life). The answers are based on a 4-point Likert scale (1 to 4), and the range of total score in each section is 20–80. Negative phrases are reversely scored. The validity and reliability of this questionnaire have been confirmed in Persian. Dehghan-nayeri and Adib-Hajbagheri [27] confirmed the content of the Spielberger State-Trait Anxiety Inventory and reported its reliability with a Cronbach α of 0.94. In the study of Rabiei et al. [28], the validity of the questionnaire was measured and confirmed by 10 nursing experts.

2.6. Statistical analysis

Data analysis was performed using SPSS software, version 21. To compare the two groups of test and control in terms of demographic characteristics and determine the mean anxiety scores and hemodynamic variables, we used Chi-square, Mann–Whitney, and independent *t* tests. Intermediate changes in intragroup hemodynamic variables were also calculated using the Wilcoxon and paired *t* test.

3. Results

3.1. Demographic characteristics

Demographic and clinical characteristics of all study units including age, sex, marital status, level of education, and hospital history, which may affect the anxiety score of open-heart surgery candidates, were examined in two groups of intervention and control.

The mean age of the participants was 57.08 ± 12.46 years; most of them were men (78.9%), married (94.4%), and had a diploma and subdiploma degree (67.8%). Half of the patients (50%) had a history of hospitalization and the other half had no history of hospitalization.

According to the *p*-value obtained from the independent *t* test and Chi-square test, both groups had no statistically significant

differences in demographic variables, except marital status. Therefore, more reliable changes in the anxiety levels and hemodynamic parameters of patients are due to the intervention in the study. Given that candidates for open-heart surgery are relatively old, it was expected that most of the participants in the study would be married (Table 1).

3.2. Anxiety levels

The results showed that there was no statistically significant difference between the mean anxiety of the two groups before the application of acupressure or the first intervention ($p > 0.05$); this difference in the state anxiety scores was significant after the second intervention ($p = 0.01$). However, this difference is not significant in trait anxiety scores ($p = 0.33$). After performing the intervention in the real points, the mean score of state anxiety decreased from 47.77 ± 10.13 to 38.75 ± 7.79 , which was statistically significant ($p < 0.001$). Meanwhile, in the control group, the state anxiety score rose slightly from 44.95 ± 10.14 to 45.06 ± 11.75 ; however, this increase was not small and statistically significant. The decrease in the level of trait anxiety in the test group was significant ($p = 0.01$), while in the control group it also changed with a slight increase from 40.40 ± 7.82 to 41.06 ± 7.76 ($p = 0.13$) (Table 2).

3.3. Hemodynamic status

The aforementioned tests showed that acupressure did not have a significant effect on any of the hemodynamic indicators in the first stage, but in the second stage, it significantly reduced the systolic blood pressure ($p = 0.007$) and heart rate ($p < 0.001$), as well as blood pressure. Diastolic pressure had no significant effect on neither of the groups ($p > 0.05$). None of the hemodynamic indicators in the control group before and after the intervention was statistically significant ($p > 0.05$) (Table 3).

4. Discussion

The results of this study revealed that applying acupressure during two stages on EX-HN3, HT7, and GB20 points reduced anxiety, systolic blood pressure, and heart rate in patients before open-heart surgery in comparison with the group receiving acupressure on sham points. The tools applied to measure the anxiety are not the same in the studies; so, precise comparisons might be difficult. We used the Spielberger questionnaire to assess anxiety in our study.

Table 1
Demographic data of the patients in both test and control groups.

Variable	Test group	Control group	<i>p</i>
Year (age), mean \pm SD	54.71 \pm 12.42	59.46 \pm 12.18	0.06*
Sex, n (%)			0.43†
Male	34 (75.6)	37 (82.2)	
Female	11 (24.4)	8 (18.8)	
Marital status, n (%)			0.02†
Unmarried	5 (12.1)	0 (0)	
Married	40 (88.9)	45 (100)	
Education, n (%)			0.26†
Under diploma	16 (35.5)	21 (46.6)	
Diploma	13 (28.9)	12 (26.7)	
College	16 (35.6)	12 (26.7)	
History of hospitalization, n (%)			0.67†
Yes	24 (53.3)	21 (46.7)	
No	21 (46.7)	24 (53.3)	

* Independent *t* test.

† Chi-square test.

Table 2
Changes of anxiety levels after acupressure.

Group	Anxiety type	Mean ± SD of anxiety before first intervention	Mean ± SD of anxiety after the second intervention	p
Test	State anxiety	47.77 ± 10.13	38.75 ± 7.79	< 0.001†
Control		44.95 ± 10.14	45.06 ± 11.75	0.72*
p		0.16‡	0.01‡	
Test	Trait anxiety	41.26 ± 6.35	39.64 ± 6.03	0.01*
Control		40.40 ± 7.82	41.06 ± 7.76	0.13‡
p		0.77‡	0.33§	

Between-group and within-group comparison of the state and trait anxiety before the first intervention and following the second acupressure intervention.

* Wilcoxon test.

† Paired t test.

‡ Mann–Whitney test.

§ Independent t test.

Table 3
Comparison of hemodynamic status of patients.

	Group	Mean ± SD before the first intervention	Mean ± SD after the first intervention	p	Mean ± SD before the second intervention	Mean ± SD after the second intervention	p
Systolic blood pressure	Test	129.57 ± 18.57	128.20 ± 17.43	0.08*	134.06 ± 16.88	131.28 ± 16.76	0.007‡
	Control	132.28 ± 18.86	131.11 ± 17.27	0.39†	135.97 ± 16.10	134.60 ± 15.46	0.12*
	p	0.49§	0.43‡		0.65‡	0.30‡	
Diastolic blood pressure	Test	78.31 ± 13.46	78.80 ± 12.62	0.82*	81.28 ± 10.69	81.60 ± 10.05	0.67*
	Control	79.02 ± 13.48	78.51 ± 12.74	0.68*	80.57 ± 10.22	79.42 ± 9.32	0.09*
	p	0.82‡	0.87‡		0.52‡	0.36‡	
Heart rate	Test	73.93 ± 11.18	73.42 ± 10.64	0.07*	74.66 ± 10.61	72.84 ± 9/90	0.001**
	Control	73.33 ± 10.94	73.28 ± 10.96	0.93‡	73.97 ± 10.99	73.68 ± 11.00	0.44‡
	p	0.79§	0.89‡		0.76§	0.60‡	

Between-group and within-group comparison of systolic blood pressure diastolic blood pressure, and heart rate values before the intervention and following the second acupressure intervention.

* Wilcoxon test.

† Paired t test.

‡ Mann–Whitney test.

§ Independent t test.

Lijwan et al. [24] evaluated the effectiveness of acupressure on HT7, GB20, and EX-HN5 in patients with preoperative anxiety. They concluded that acupressure on these points had reduced the anxiety. It was confirmed by our results; however, they did not find significant changes in physiological parameters such as blood pressure and heart rate. The results of the study by Nantes et al.[29] on patients with hemodialysis, in which acupressure was applied on three points (EX-HN3), (HT7), and (KI3), were consistent with those of the present study; these results indicate a reduction in anxiety of the patients in the test group.

Jenk and Tan [30] examined the effect of acupressure on PC6 point on reducing anxiety in patients with breast cancer who underwent chemotherapy. In line with our study, anxiety had decreased in this group of patients.

Our results showed that acupressure on the aforementioned points had reduced systolic blood pressure and heart rate without a significant effect on diastolic pressure. Nevertheless, this intervention in the second stage can lead to a decrease in the heart rate and systolic blood pressure.

The results of changes in the heart rate in the study of Rajai et al.[31], despite the unequal acupoints, and the study of Batvani et al.[32], although only one point (HT7) of the acupoints was the same, were inconsistent with those of the present study. In the study of Chen et al. [33] and Barker et al.[34], the heart rate of the patients after acupressure decreased significantly, which is in the same line with the present study.

Given that the significant changes in systolic blood pressure and heart rate in this study, the results of Rahmani Vasokolaie et al. [35] do not support those of us, probably due to differences in the samples and the taken points. Our results were in contrary to those of Rahmani Vasokolaie et al [35] probably due to differences in the

samples and the taken points. Because only one point (HT7) was the same from the two points adopted in Rizi et al. [36]’s study, except for the changes in the heart rate that increased significantly, other hemodynamics indicators did not change significantly.

The results of the studies can show diversity due to factors such as different sample sizes, disease type, geographical and cultural characteristics, number and location of acupoints, duration of pressure, and duration of postanxiety assessment after the intervention.

One of the strengths of this study was the application of acupressure in two stages.

The present study had some limitations. The first of which was related to the experience and skill of the heart surgeons. Patients’ anxiety levels appear to vary from surgeon to surgeon. It is suggested that, in future studies, the research samples should be the same for the surgeon. The second limitation was the short duration of preoperative preparation as the second stage of acupressure was performed half an hour before the operation.

5. Conclusion

The results of the present study showed that acupressure after 2 sessions on (EX-HN3), (HT7), and (GB20) reduced the level of state anxiety, heart rate, and systolic blood pressure of patients before open-heart surgery.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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