

Acupressure on Anxiety and Sleep Quality After Cardiac Surgery: A Randomized Controlled Trial

Dilek Aygin, PhD, Sevim Şen, PhD, RN

Purpose: To determine the effect of acupressure on anxiety and sleep quality after cardiac surgery.

Design: A randomized pre-post test control group design.

Methods: Patients after cardiac surgery were divided into two groups: the intervention group ($n = 50$), who received acupressure on four different acupoints plus standard care, and the control group ($n = 50$), who received only standard care. Patients were admitted to the surgical clinic from the intensive care unit after 3 or 4 days of surgery. The levels of anxiety and sleep quality were evaluated during three postoperative days starting from their first day in the surgical clinic.

Findings: Among the patients in the intervention group, the usage of acupressure decreased the level of anxiety and increased the sleep quality significantly compared with the control group ($P < .05$).

Conclusions: Our findings showed that acupressure decreased the level of anxiety and improved the sleep quality in the surgical clinic after cardiac surgery.

Keywords: acupressure, anxiety, sleep, cardiac surgery, heart surgery, postoperative.

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ANXIETY AND SLEEP DISTURBANCE are problems (60% to 80%) after an open cardiac surgery,¹ and can affect the treatment and quality of the life after surgery. Sleep helps maintain a healthy balance of the endocrine and immune systems. In addition, it is an important factor in the healing of the body after an injury. Anxiety and sleep disturbance can be treated with medical or

nonmedical therapies. Because of the complications of medications, it is reasonable to use nonmedical therapies. One of the nonmedical therapies available is acupressure, which is an easy and safe procedure for symptom management, but requires experts to perform.¹⁻¹³

Acupressure is a noninvasive massage technique that has existed since ancient times and used for symptom management.¹⁴ In addition, it is also recognized by the World Health Organization as a complementary medicine method.¹⁴ Today, this method is used by applying pressure in certain points on the body with fingers, palm, elbow, and special bands.¹⁴ The traditional purpose of this method is to facilitate the healthy flow of the life energy Chi through the meridians (invisible energy pathways or channels that run through the body) that carry the energy throughout the body.^{14,15} There are 12 regular meridians, and each regular meridian is believed to correspond to an organ and run along the body to either

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the hand or the foot. Organs without an empty cavity (such as the heart, liver, spleen, lungs, and kidneys) are called yin organs and organs with an empty cavity (such as the gallbladder, stomach, bladder, and large and small intestines) are called yang organs.¹⁴ In a scientific perspective, the purpose of this method is to affect sympathetic and parasympathetic systems by applying pressure, therefore releasing neurotransmitters and mediators leading to improvements in postoperative discomforts. The predefined points for acupressure have limited blood and oxygen flow and the applied pressure in these points causes a mild painful muscle spasm. Therefore, applied pressure improves the blood-oxygen flow and maintains homeostasis.^{14,16}

Purpose and Hypotheses

The purpose of this study was to determine the effect of acupressure on anxiety and sleep quality after open cardiac surgery.

H₁: Acupressure application decreases the level of postoperative anxiety among cardiac surgery patients.

H₂: Acupressure application increases the level of postoperative sleep quality among cardiac surgery patients.

Methods

Design

A randomized pretest/post-test control group design was used. The study sample was randomized into two groups by using a simple random sampling method. A "Random Number Table" was used to create the study groups; intervention group was created according to the patients who were staying in a room with an even number, and a control group was created with the same method using the odd room numbers. Patients were informed about the acupressure technique but not about the aims of the study. In addition, the patients in each group could not observe each other.

Data Collection

Data collection was performed with use of a Patient Information Form, 0 to 10 vertical visual

analog scale for evaluating the level of anxiety and Richards-Campbell Sleep Questionnaire. The Patient Information Form was created by the researchers for obtaining sociodemographic and health-related data from the patients. Richards-Campbell Sleep Questionnaire is a brief 5-item questionnaire used to evaluate perceived sleep depth, sleep latency (time to fall asleep), a number of awakenings, efficiency (percentage of time awake), and sleep quality. The Cronbach's α value of the scale developed by Richards was found to be 0.82. The validity and reliability study of the scale was conducted by Özlü and Özer in 2015.⁵ The Cronbach's α internal consistency coefficient of the Turkish version of the scale is 0.91 and the item total correlation scores are between 0.48 and 0.96. Data collection and acupressure were performed by the same researcher. The levels of anxiety and sleep quality were reevaluated after each acupressure application.

Study Setting

The study was conducted in a university hospital in Istanbul, Turkey, between January and April 2016. Ethical committee approval was obtained from the university's Ethical Committee of Clinical Researches on October 6, 2015. The data collection process started after the ethical committee approval. Inclusion criteria were as follows: (1) no condition (eg, incision, catheter) on the wrist or the inner surface of the forearm that avoids massage application; (2) cardiac surgery for the first time; (3) age more than 18 years; (4) no neurologic diseases (eg, multiple sclerosis); (5) no problem, which may lead to misunderstandings (eg, hearing loss); and (6) ability to communicate in Turkish.

Sample

The sample included 100 patients who underwent cardiac surgery and were divided into the following two groups: intervention group ($n = 50$), who received acupressure and standard care; and control group ($n = 50$), who only received standard care. As there was not any study in the literature that is similar to our sample and methodology, 50 participants were selected for both study groups to allow comparisons under parametric conditions. Post hoc power analysis was performed after finishing the data collection, and it was found that the current data had 99.7%

power rate. Power analysis was calculated with PASS statistical software (PASS 13, NCSS, LLC, Kaysville, Utah). The study workflow is summarized in Figure 1.

Preintervention Phase

A pretest was conducted in both groups for the evaluation of the base sleep and anxiety scores. Besides, the homogeneity of the groups in terms of sociodemographic characteristics (age, sex, marital status, surgery type, body mass index, and smoking) and sleep and anxiety scores were evaluated, and it was found that the groups were distributed homogeneously.

Ethics Approval and Consent to Participate

The study complies with the Declaration of Helsinki and has been approved by the ethical committee of Bezmialem University Hospital in Istanbul on October 6, 2015. Written informed consent was

obtained from all participants. The objective of the study was explained to the participants and their voluntary participation was requested. The participants provided written consent after they were explained that their personal information would not be shared with third parties.

Acupressure Application Procedure

The patients in the intervention group were informed that they would receive pressure in specific points; however, the effect of acupressure on sleep and anxiety was not explained to avoid creating a possible placebo effect. Patients accepted acupressure application without any information of acupressure's effect on their symptoms.

- Acupressure Application and Technique: On the third postoperative day, the patients were transferred from the intensive care unit to the clinic. Among the patients in the intervention group, 16 minutes of

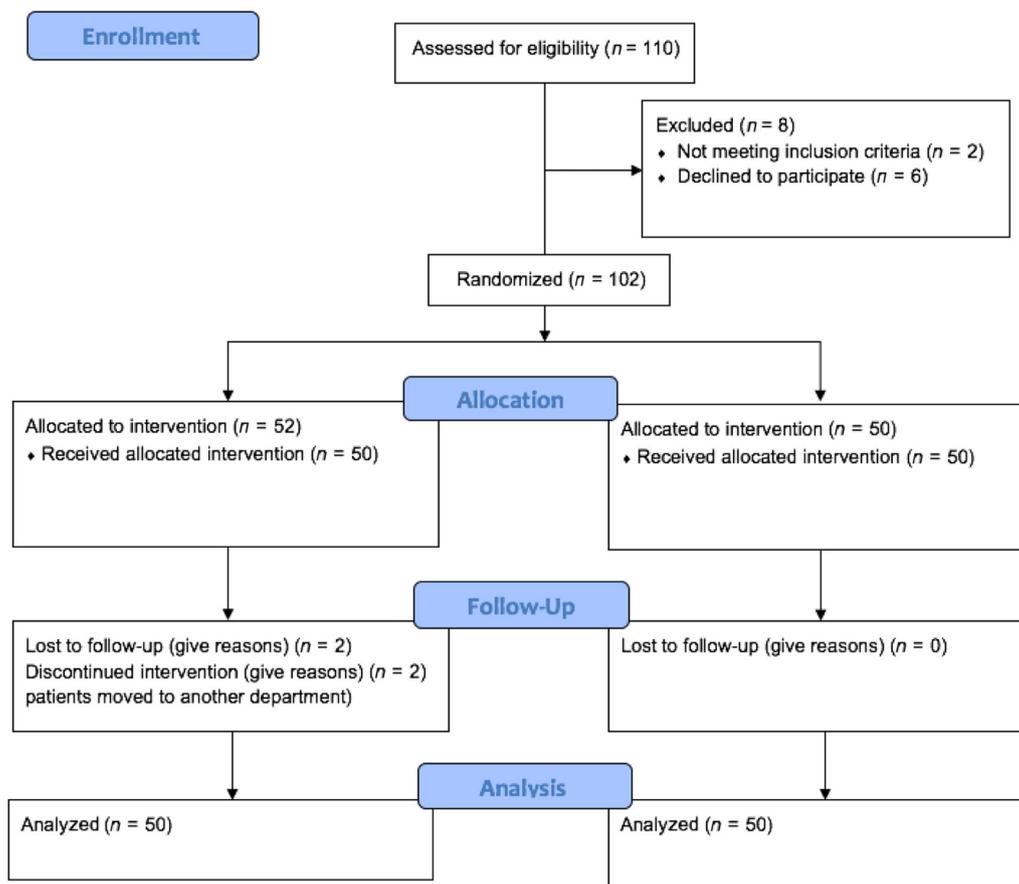


Figure 1. Study flow chart. This figure is available in color online at www.jopan.org.

acupressure session was applied once a day for 3 days, and the patients continued receiving the standard care in the clinic. The control group only received standard care. The level of anxiety was measured after each acupressure session. The mean anxiety score of the three application days was considered as the final anxiety score. The pressure was done manually with fingertips of thumb, index, or middle finger depending on the position of the patient or the practitioner. Each acupressure point received 2 minutes of constant but gentle pressure without giving any disturbance and pain. The position of the acupressure point was confirmed with the declaration of the patient about feeling a slight pain and burning sensation. The level of pressure kept at a constant level for not causing discomfort. For preventing the risk of cross infections, essential hand hygiene and disinfection rules were applied before and after the application. To avoid the risk of inconsistency between practitioners, acupressure application was done by the first author, who is a certified acupressure applicator.

- Application Points: Heart 7 (H7), Pericardia 6 (MC6 = PC6), Gallbladder 20 (GB20), and Stomach 6 (ST6) (Figure 2)¹⁷ were selected according to the standard acupressure application report of the World Health Organization,¹⁸ and limited with the points far away from the incision area.
- Application Number and Frequency: Immediately after the patients came from the intensive care unit to the clinic, acupressure sessions were applied every day for 3 days. During the application, the order of the acupressure points was: HT7, P6, GB20, and ST6; and application time was 16 minutes for each patient. According to acupressure guideline, an application should be taken 2 minutes on each acupoints. We prefer to use HT7, P6, GB20, and ST6 acupoints on the right side of the body and also HT7, P6, GB20, and ST6 acupoints on the left side of the body. The application period took 16 minutes for each patient.
- Application Position: Acupressure sessions were done while the patients were comfortably lying down or sitting in their bed.

Analysis

Data analysis was performed by using SPSS Statistics for Windows, version 21.0 (IBM Corp, Armonk, New York). Depending on the homogeneity of data, parametric and nonparametric tests were used, which were chi-square test, independent sample *t* test, multiple variance analysis, and linear regression analysis.

Findings

There was a homogeneous distribution between groups regarding sociodemographic characteristics such as age, sex, surgery type, body mass index, and baseline score of anxiety scale and sleep questionnaire scale. Most participants were middle-aged or older, overweight, married, and regular smokers and had a low educational level. Main surgical interventions were coronary artery bypass graft surgery and cardiac valve surgery ($P > .05$, Table 1). When compared with the

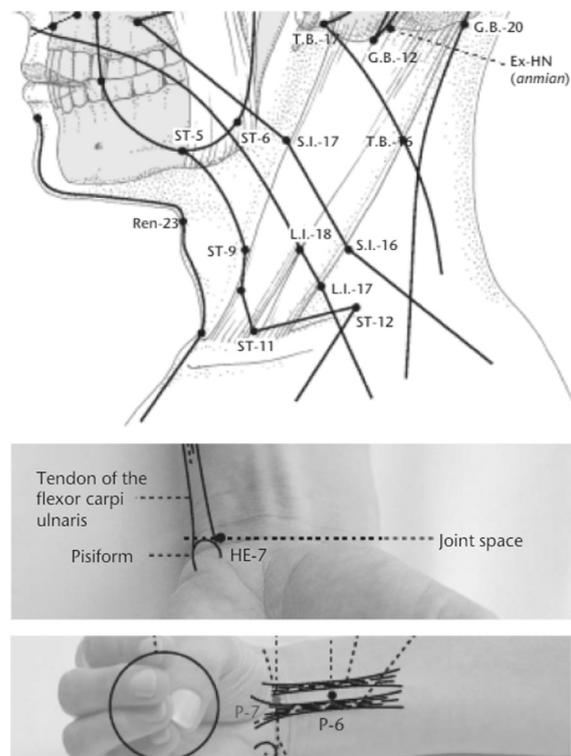


Figure 2. St6, GB20, H7, and P6 acupoints.¹⁷ (p117,210,641) © Elsevier Limited, reprinted with permission.

Table 1. Patient Characteristics

Patient Characteristics	Intervention Group (<i>n</i> = 50)	Control Group (<i>n</i> = 50)	Total (<i>N</i> = 100)	Homogeneity of Variances
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	
Gender				
Female	26 (52)	18 (36)	44 (44)	$\chi^2 = 2.59$ $P = .580$
Male	24 (48)	32 (64)	56 (56)	
Total	50 (100)	50 (100)	100 (100)	
Age (Mean \pm SD), y	60.62 \pm 8.29	58.24 \pm 9.27	59.43 \pm 8.83	$t = 1.35$
	Min: 39	Min: 31	Min: 31	$P = .158$
	Max: 82	Max: 78	Max: 87	
Marital Status				
Single	4 (8)	5 (10)	9 (9)	$\chi^2 = 0.122$ $P = 1.000$
Married	46 (92)	45 (90)	91 (91)	
Total	50 (100)	50 (100)	100 (100)	
Educational Level				
Elementary school & lower	35 (70)	42 (84)	77 (77)	$\chi^2 = 2.767$ $P = .153$
High school & higher	15 (30)	8 (16)	23 (23)	
Total	50 (100)	50 (100)	100 (100)	
Surgery Type				
CABG	16 (32)	14 (28)	30 (30)	$\chi^2 = 1.224$ $P = .747$
Valve surgery	16 (32)	13 (26)	29 (29)	
CABG & valve surgery	9 (18)	13 (26)	22 (22)	
Aorta surgery	9 (18)	10 (20)	19 (19)	
Total	50 (100)	50 (100)	100 (100)	
BMI	28.59 \pm 4.29	27.74 \pm 3.42	28.16 \pm 3.88	$t = 1.088$
	Min: 17.63	Min: 16.42	Min: 16.42	$P = .279$
	Max: 42.61	Max: 34.38	Max: 42.61	
Regularly Smoking				
Yes	34 (68)	39 (78)	73 (73)	$\chi^2 = 1.268$ $P = .368$
No	16 (32)	11 (22)	27 (27)	
Total	50 (100)	50 (100)	100 (100)	

CABG, coronary artery bypass graft; BMI, body mass index.

χ^2 = chi-square test; t = independent sample t test.

$P > .05$ indicates no significant difference.

control group, in the intervention group, the anxiety score before the first acupressure application decreased significantly after the repetitive acupressure applications ($P < .001$; Table 2).

Regression analysis showed that acupressure application was 92.7% effective on the decrease of postoperative anxiety ($P < .001$; Table 3). Regarding the quality of sleep, it was seen that

Table 2. Changes in the Average VAS-A Scores During Repetitive Acupressure Sessions

VAS-A	Baseline Mean \pm SD	Day 1 Mean \pm SD	Day 2 Mean \pm SD	Day 3 Mean \pm SD	Level of Significance
Acupressure Group (<i>n</i> = 50)	5.62 \pm 0.63	3.04 \pm 1.26	1.76 \pm 0.98	1.36 \pm 0.85	$F: 204.15$
Control Group (<i>n</i> = 50)	5.04 \pm 0.94	5.04 \pm 0.94	4.92 \pm 1.02	4.78 \pm 0.97	$P = .000^*$

VAS-A, visual analog scale for anxiety; ANOVA, analysis of variance.

F : ANOVA.

* $P < .001$ indicates a significant difference.

Table 3. The Effect Rate of Acupressure on the Changes in Anxiety and Sleep Quality

	<i>B</i>	<i>R</i> ²	Adjusted <i>R</i> ²	<i>F</i>	<i>P</i> Value
Change in the level of anxiety	2.031	0.964	0.927	256.773	.000
Change in the level of sleep quality	2.201	0.810	0.641	45.272	.000

Linear regression analysis, $P < .001$ indicates a significant difference.

sleep quality of the patients in the intervention group was increased significantly after the repetitive acupressure applications ($P < .001$; Table 4), and according to the regression analysis, the effect of acupressure on better sleep quality was found to be 64.1% ($P < .001$; Table 3). In addition, acupressure was found more beneficial among patients who smoke regularly and also women had more benefits than men in terms of achieving better sleep quality ($P < .05$; Table 5).

Discussion

Experiencing moderate-to-severe anxiety and sleep disturbance are common symptoms after cardiac surgery, which is very challenging to treat completely with medical treatment. Medical treatments used for relieving these symptoms have various side effects. Complementary medicine can be easier than medical treatment for the application. Also, complementary medicine is not the expensive method for symptom management. Therefore, in addition to medical treatment, the importance of complementary methods should be considered as well.¹⁻¹³

Acupressure and Anxiety

Among the intervention group, the level of anxiety (5.62 ± 0.63) was decreased significantly after repetitive acupressure applications (1.36 ± 0.85); meanwhile, this change in the control group was from 5.04 ± 0.94 to 4.78 ± 0.97 , which was not statistically significant. In addition, the effect of

acupressure on anxiety relief was found to be 92.7% ($P = .000$; Table 3). It is a known fact that acupressure creates sedative and anxiolytic effects because of its action on neurotransmitters,¹⁹⁻²¹ which is also confirmed by the first hypothesis of the study: "Acupressure application decreases the level of postoperative anxiety among cardiac surgery patients."

In the study of Park et al,²² which was conducted with rats by applying acupuncture on H7 point, a significant decrease was found in adrenocorticotrophic hormone (ACTH) and plasma cortisol levels. Bagheri-Nesami et al²³ investigated the effect of foot massage on anxiety among cardiac surgery patients and reported that anxiety level of the intervention group was decreased from 2.25 ± 2.95 to 1.45 ± 2.90 ($P < .001$), whereas in the control group the decrease was only from 2.10 ± 2.48 to 2.00 ± 2.44 ($P > .05$). Besides these parallel findings, we have found that the effect of acupressure on anxiety was not related to the demographic characteristics of the sample ($P > .05$). However, among the patients who were smoking regularly, acupressure application was found significantly more effective ($P < .05$; Table 5). In the study of Chae et al,²⁴ acupuncture application to HT7 and ST36 points was found effective on decreasing anxiety behaviors related to nicotine withdrawal among a sample of rats. This result also shows that among the cardiac surgery patients who smoke regularly, the level of preoperative anxiety may be related to nicotine withdrawal and acupressure may prove a beneficial effect on the management of these symptoms.

Acupressure and Sleep Quality

Sleep quality of the patients in the intervention group increased significantly after the acupressure sessions in comparison with the control group, which proves the second hypothesis of the study: "Acupressure application increases the level of postoperative sleep quality among cardiac surgery patients." According to the Richards-Campbell Sleep Questionnaire subscales, sleep depth ($P < .001$) and quality of falling asleep ($P < .001$) were increased, whereas the frequency of waking up at night ($P < .001$) and duration of staying awake at night were decreased among the intervention group. The effect of acupressure on sleep quality was found to be 64.1% ($P < .001$; Table 3). Among

Table 4. Changes in the Average RCSQ Scores During Repetitive Acupressure Sessions

Group	Baseline	Day 1	Day 2	Day 3	Level of Significance
<i>My sleep last night was ... (Light → Deep)</i>					
Acupressure	35.40 ± 14.42	46.20 ± 11.89	51.40 ± 11.38	54.60 ± 12.07	$F = 34.513$ $P = .000^*$
Control	38.30 ± 15.76	38.50 ± 15.02	39.40 ± 14.76	38.88 ± 15.00	
<i>Last night the first time I got to sleep ... (Could never fall asleep → Fall asleep immediately)</i>					
Acupressure	34.60 ± 12.77	46.30 ± 12.64	51.70 ± 12.02	54.70 ± 12.75	$F = 42.038$ $P = .000^*$
Control	37.20 ± 14.46	37.40 ± 14.11	38.50 ± 13.71	38.30 ± 12.99	
<i>Last night, I was ... (Awake all night → Awake very little)</i>					
Acupressure	35.50 ± 13.25	46.70 ± 12.92	52.10 ± 12.45	54.90 ± 12.91	$F = 40.436$ $P = .000^*$
Control	38.20 ± 16.43	38.90 ± 15.22	39.80 ± 15.08	40.00 ± 12.92	
<i>Last night, when I woke up or was awakened ... (I couldn't get back to sleep → Got back to sleep immediately)</i>					
Acupressure	35.60 ± 14.23	48.20 ± 11.05	53.60 ± 10.10	56.00 ± 10.87	$F = 54.238$ $P = .000^*$
Control	38.80 ± 15.76	38.60 ± 15.81	39.70 ± 15.36	39.70 ± 14.96	
<i>I would describe my sleep last night as ... (A bad night's sleep → A good night's sleep)</i>					
Acupressure	36.00 ± 13.70	49.10 ± 11.50	54.70 ± 10.12	57.50 ± 10.36	$F = 53.756$ $P = .000^*$
Control	38.80 ± 15.60	38.80 ± 15.60	40.20 ± 14.60	40.00 ± 14.53	
<i>I would describe the noise level last night as ... (Very noisy → Very quiet)</i>					
Acupressure	91.70 ± 19.49	90.80 ± 19.44	90.80 ± 19.44	91.00 ± 19.48	$F = 0.628$ $P = .599$
Control	91.00 ± 20.12	89.20 ± 22.02	90.20 ± 21.04	90.80 ± 20.58	
<i>RCSQ Total Score</i>					
Acupressure	268.80 ± 69.54	327.30 ± 61.51	354.30 ± 61.73	368.70 ± 66.49	$F = 54.247$ $P = .000^*$
Control	282.30 ± 79.98	281.50 ± 78.31	287.80 ± 75.91	287.68 ± 72.39	
<i>Total Score</i>					
Acupressure	275.550 ± 74.87	304.40 ± 73.74	321.05 ± 76.51	328.19 ± 80.24	$F = 54.247$ $P = .000^*$

RCSQ, Richards-Campbell Sleep Questionnaire; ANOVA, analysis of variance.

F: ANOVA.

* $P < .001$ indicates a significant difference.

Table 5. Comparison of the Efficiency of Acupressure on Anxiety and Sleepy Quality Scores In Terms of Some Demographic Characteristics

Demographic Characteristics	<i>n</i>	Mean ± SD	Level of Significance
The Effect of Acupressure on Anxiety (VAS Anxiety)			
Smoking			
Yes	34	4.47 ± 0.78	$t = 2.150$
No	16	3.81 ± 1.37	$P = .030^*$
The Effect of Acupressure on Sleep Quality (RCSQ)			
Gender			
Female	26	114.23 ± 46.81	$t = 2.129$
Male	24	85.83 ± 47.44	$P = .038^*$

VAS, visual analog scale; RCSQ, Richards-Campbell Sleep Questionnaire.

* $P < .05$ indicates a significant difference.

the control group, the quality of life increased gradually during the hospital stay; however, this difference was not statistically significant ($P > .05$; Table 4). Chen and Chao et al²⁵ investigated the effect of acupressure on Neiguan (P6), Yongquan and Shenmen discussed patients who were in an intensive care unit and reported a decrease in the frequency of waking up at night and in the frequency of staying awake on the second day of their hospitalization. In addition, there was an increase in the duration of sleep when compared with the control group. Bagheri-Nesami et al²⁶ studied the effect of acupressure on HT7, K11, GB 20, and ear points among the patients in the cardiac intensive care unit and compared the efficiency of acupressure with and without heliotrope oil in a controlled experimental design; both interventions had a significantly positive effect on sleep quality, whereas acupressure with heliotrope oil was found more effective than only acupressure. In the literature, there are many studies that studied the effect of stimulating the meridian points on sleep quality by using different points. Yao et al²⁷ used GB20 and PC6 points, whereas Lee et al²⁸ and Ruan²⁹ only used PC6 point. Many studies such as Tu et al,³⁰ Ruan et al,²⁹ Xiao et al,³¹ Yao et al,²⁷ Luo et al,³² Yan et al,³³ Lee et al,²⁸ Ruan,²⁹ Xuan et al,³⁴ and Gao et al^{35,36} preferred HT7 point and demonstrated a positive effect on sleep quality. Conversely, Li et al,³⁷ Wang et al,³⁸ and Zhou et al³⁹ demonstrated an increase in dopamine and serotonin levels after electroacupuncture application. Zhou et al⁴⁰ applied pressure to HT7 and PC6 points and obtained increased γ -aminobutyric acid neurotransmitter activity and decreased sleeplessness. Melatonin is another neurotransmitter that affects sleep quality. It was found by Nordio and Romanelli⁴¹ that acupuncture applied on HT7 point increases the level of melatonin. Waits et al⁴² systematically analyzed 13 studies (968 patients) and reported that acupressure application on HT7 and other points increases sleep quality, which investigated the effect of acupressure on sleep quality. In this study, there was not a significant relationship between the effect of acupressure on sleep quality and the age and/or educational

level of the patients ($P > .05$). However, the effectiveness of acupressure was higher among women (114.23 ± 46.81) than men (85.83 ± 47.44), which was a statistically significant difference ($P < .05$). In the study of Yeo et al,⁴³ it was shown that acupuncture application on GB34 point affects different brain zones in both women and men (ie, only amygdala and insula zones are affected in women), which causes different neurologic responses. The authors purpose acupressure points that were used in this study (GB20, St6, PC6, and HT7) also caused a different neural activity among female participants, which was detected as obtaining better sleep quality than men.

Conclusion

In conclusion, acupressure application to the St6, GB20, PC6, and HT7 points decreased the level of anxiety and increased the quality of life among cardiac surgery patients. Acupressure is easy and effective in nature, and it can be suggested that health professionals use this method in addition to routine medical care. It is believed to be a positive contribution to the literature as there was a lack of findings in both English and Turkish about the effect of acupressure on anxiety and sleep quality after cardiac surgery. Therefore, the authors believe that there should be more studies in this clinical area with well-planned acupressure applications among wider study samples. The studies should be planned to determine the effect of acupressure on certain symptoms so that it can be understood which acupressure point has an effect on which symptom.

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The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

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