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Study of the Effect of Ear Acupressure on Stress and Serum Cortisol Level Before Rhinoplasty Surgery: A Randomized Clinical Trial

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Abstract

Objectives: An increase in the level of cortisol hormone caused by preoperative stress may have undesirable effects on the surgery. Thus, it is necessary to manage the level of this hormone. Therefore, this study aimed to investigate the effect of ear acupressure on stress and serum cortisol hormone levels before rhinoplasty surgery.

Materials and Methods: The present randomized clinical trial study was carried out in six months and finished on August 21, 2019. In general, 66 participants were selected based on quadratic-block randomization at Imam Reza hospital, Tabriz. Ear acupressure group received the intervention in each ear twice a day for 10 minutes (the duration of each intervention) three days before the surgery. The data were recorded in the demographic form of Spielberger's implicit and explicit stress just before and three hours after each intervention. The data were analyzed by SPSS 21 using Kolmogorov-Smirnov, independent samples *t* test, and chi-square statistical tests and $P<0.05$ was considered statistically significant.

Results: Before the intervention, both groups showed no significant differences ($P>0.05$) regarding the amount of implicit and explicit stress and serum cortisol levels ($P<0.05$). However, a significant difference was observed in the stress and cortisol levels of the participants of both groups after implementing the interventions. Regarding the inter-group differences, there were no statistically significant differences between the means of the control group both before and after the intervention ($P>0.05$). In contrast, the intervention group faced significant changes considering the level of stress and serum cortisol in the posttest.

Conclusions: Overall, performing ear acupressure before rhinoplasty can reduce stress (implicit and explicit) and serum cortisol levels.

Keywords: Ear acupressure, Stress, Rhinoplasty, Cortisol

Introduction

Preoperative stress is one of the most common and undeniable problems of the preoperative period that can have adverse effects on the disease process, postoperative care, and intraoperative management including anesthesia, surgical procedure, and recovery (1,2).

Studies suggest that preoperative stress is experienced among 11 to 80% of patients. This is especially salient when the patients undergo elective surgery rather than emergency surgery (3-5). Thus, physiological responses to stress increase the levels of hormones such as epinephrine, norepinephrine, and cortisol. Consequently, this increases the heart rate and blood flow in the muscles and affects the patient's vital signs. The impacts on a patient's vital signs can lead to increased cardiac muscle oxygen demand due to increased cardiac activity. On the other hand, stress can have various physical and psychological effects such as hypertension, heart rate, sweating, nausea and vomiting, anger, and insomnia (6,7).

One of the methods for managing preoperative stress is the use of complementary therapies such as ear acupressure. Some studies reported the positive effects of this intervention on reducing pre-operative stress which by itself has a positive effect on different surgical procedures (8,9).

Stress increases cortisol hormone and this may have adverse effects on preoperative hemodynamic status and make intraoperative management difficult. In addition, increased stress can increase bleeding during rhinoplasty, which is a delicate surgery, and affect the outcome of the surgery. Accordingly, the present study aimed to examine the effects of ear acupressure on stress and the serum cortisol level in elective rhinoplasty surgery.

Materials and Methods

This randomized clinical trial study was performed during 6 months and finished on August 21, 2019. A total number of 66 participants undergoing elective rhinoplasty in Imam Reza hospital of Tabriz University of Medical Sciences was selected for the study purpose. The inclusion

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criteria included candidates for elective rhinoplasty, who had 18 years old or more. On the other hand, the exclusion criteria were having hearing and speech problems, unhealthy and ear disorders, ear infections, and a history of sedation, being under the supervision of a psychiatrist for depression and stress, utilizing sleep medications, and having sleep disorders.

In this study, the sample size for comparing the stress level of the two groups was estimated based on the square level of 80%, a confidence level of 95%, as well as the mean and standard deviation of a similar study (10). Besides, considering the median effect of $\delta = 0.5$ for the ear acupressure, 66 patients were selected as the subjects of this study. Patients were randomly divided into ear acupressure and control groups based on the availability criteria. Furthermore, they were randomly classified into 14 blocks of 4 based on randomize blocks. The numbers 0 to 5 were assigned to BAAB, ABBA, AABB, ABAB, BABA, and BBAA blocks, respectively. Then, a randomized initiation was selected from a table of random numbers. The block would be selected and the numbers 6 to 9 would be removed if the numbers were zero to 5. None of the subjects were blind to the study.

The researcher introduced himself to research units and explained the aims of the research simply and comprehensively. Then, the unit members were asked to sign the written consent forms. The patients were assured of the complete safety of this method and the lack of adverse effects on the surgical procedure.

The applied materials consisted of two main sections. The first part encompassed demographic information about age, gender, educational status, and occupation. The second part of the tool was related to Spielberger's Implicit and Explicit Anxiety Inventory, which contained items regarding implicit (n=20) and explicit (n=20) anxiety. The questions were scored by a 4-point Likert-type scale that ranged from very low to very high. Each question received a score of 1-4 and 4-1 in direct and reverse expressions, respectively. The final numeric score ranged from 20 to 80. A study in Iran (11) used this tool and confirmed its reliability and validity (Cronbach's alpha= 0.84).

Ear acupressure was performed twice a day every 12 hours, three days before surgery (two days at home and one day in the hospital). Prior to the intervention, the researcher explained the procedure to each individual as clearly as possible, and the intervention was conducted by a specialist in this field (a Chinese acupuncture specialist who was not part of the research group) by using a hand probe massaging specific points in the outer area of the ear. More precisely, the person with the hand pointer in his right hand carried out acupressure on the right ear of the patient for 30 seconds. The acupressure was performed spirally at areas including Shen men, Subcortex, and the brain stem (totally, 4 turns or two minutes per point). Then, the same movements were performed on the left ear. Overall, each ear received 10 minutes of intervention.

Two to three hours after each intervention, the records were completed using a pen and paper. The data were completed at home and in the hospital and were eventually handed over to the head researcher. It should be noted that there was no intervention for the second group and the questionnaire was completed at the intervals of twelve hours. Moreover, the patients of both groups were blood tested and 5 cc blood was collected using a 5 cc syringe by a skilled nurse, who was not part of the research group, 30 minutes before entering the operating theater. The samples were then delivered to the gamma in plastic ice caps and inside the ice bag to the hospital. The blood was transferred and examined in a laboratory by a pathologist who was not part of the research group (12).

Ethical considerations in this study included observing the ethics in research (13-15), obtaining a code of ethics (IR.RBZMED.REC.1397.1059), registering the code in a clinical trial system (identifier: IRCT20190325043107N10), and obtaining informed consent.

The data were confirmed and analyzed using SPSS, version 21 by Kolmogorov-Smirnov in order to check the normal distribution of the data. Finally, independent samples *t* test and chi-square test were used to compare variables such as stress and cortisol levels and $P<0.05$ was considered significant in all cases.

Results

Considering the total number of patients (72 patients) who referred to Imam Reza hospital, 6 patients were not enrolled based on inclusion and exclusion criteria. Thus, the study started with 66 patients who were present until the end of the study (Figure 1). The investigation of variables using the Kolmogorov-Smirnov test indicated that there was a normal distribution, thus further investigations were carried out by parametric tests. The mean (SD) of the participants was 29.15 (6.53) years and 56 (84.84%) patients were women. All 63 (95.45%) cases had a college education and 60 (90.90%) of them were employers. The demographic characteristics of the participants in the two groups are presented in Table 1.

Pre-intervention studies demonstrated that the 2 groups were similar in terms of the levels of anxiety (latent and explicit) and cortisol hormone. In other words, based on the results (Table 2), there was no statistically significant difference between the two groups ($P>0.05$). On the other hand, there was a statistically significant difference between the two groups in terms of the mentioned variables after the intervention so that the intervention group had lower anxiety (latent and explicit) and cortisol levels after receiving the ear massage (Table 3).

Based on the in-group comparisons of data before and after the intervention, no statistically significant difference was observed in the control group before and after the intervention ($P>0.05$) whereas there were statistically significant differences before and after the intervention in

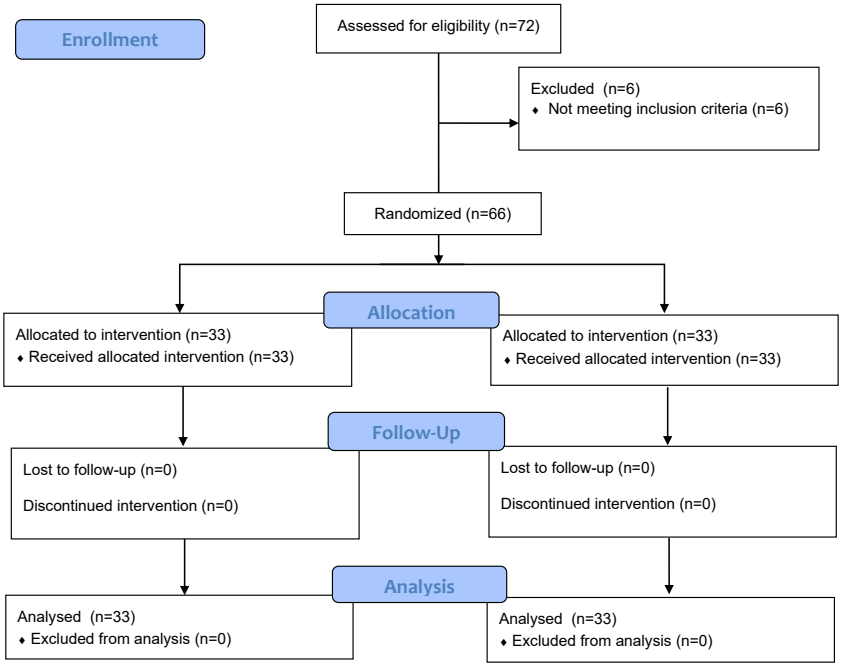

Figure 1. The Flow Chart of the Recruitment and Retention of Participants.

the intervention group (P<0.05), the details of which are provided in Table 4.

Discussion

The aim of this study was to investigate the effect of ear acupressure on stress and serum cortisol levels before rhinoplasty. In traditional Chinese medicine, pressure is applied to the ears with the help of needles, manual pressure, lasers, heat, and the like which relieve pain and stress. This is a part of complementary medicine that is abundant in medical sciences (12,16). The results indicated that pre-rhinoplasty acupressure reduces the implicit and explicit stress and subsequently the cortisol hormone which is known as the stress hormone. Some studies showed that preoperative stress before elective surgery causes adverse and undesirable effects (17,18). This has led many researchers to implement different interventions in order to reduce and alleviate stress prior to various surgeries. Unfortunately, the present study failed to find this intervention type in rhinoplasty surgery when examining ear acupressure studies. Thus, the results of this study were compared with those of other elective surgeries.

Based on the results of our study, acupressure decreased

Table 1. Comparison of Demographic Characteristics of Study Participants

Study Variables	Groups (N=33)		Results
	Control (n=33)	Intervention (n=33)	
Age (y) (Mean ± SD)	28.80±6.40	29.90±6.88	t= -0.82* *df*=50 *P*=0.309
Gender			χ^2=0.000** *df*=1 *P*=0.203
Male	27 (81.81%)	29 (87.87%)	
Female	6 (18.19%)	4 (12.13%)	
Education			χ^2=0.000** *df*=1 *P*=0.363
Academic	32 (96.96%)	31 (93.93%)	
Non-academic	1 (03.04%)	2 (06.07%)	
Marital status			χ 2=0.000** *df* =1 *P*=0.511
Single	29 (87.87%)	32 (96.96%)	
Married	4 (12.13%)	1 (03.04%)	

Note. SD: Standard deviation; **t* test; ** Chi-square.

Table 2. Comparison of the Levels of Implicit and Explicit Anxiety and Cortisol in the Two Groups Before the Intervention

Study Variables	Groups (N=66)		*P* Value
	Control (n=33) (Mean ± SD)	Intervention (n=33) (Mean ± SD)	
Implicit anxiety	45.15±7.19	44.19±8.03	0.309
Explicit anxiety	46.80±7.39	45.60±7.15	0.211
Serum cortisol level, µg/L	159.55±39.42	157.30±40.14	0.219

Note. SD: Standard deviation; Statistical test: *t* test.

Table 3. Comparison of Implicit and Explicit Anxiety and Cortisol Hormone Levels in the Two Groups After the Intervention

Study Variables	Groups (N=66)		*P* Value
	Control (n=33) (Mean ± SD)	Intervention (n=33) (Mean ± SD)	
Implicit anxiety	44.85±7.30	34.30±7.12	0.009
Explicit anxiety	47.20±7.80	33.45±6.90	0.007
Serum cortisol level, µg/L	161.40±40.14	126.30±42.15	0.003

Note. SD: Standard deviation; Statistical test: *t* test.

Table 4. In-group Comparisons of Implicit and Explicit Anxiety and Cortisol Level Before and After the Intervention Between the Study Groups

Groups		Implicit Anxiety	Explicit Anxiety	Serum Cortisol Level ug/L
Control group (n=33) (Mean ± SD)	Before intervention	45.15±7.19	46.80±7.39	159.55±39.42
	After intervention	44.85±7.30	47.20±7.80	161.40±40.14
	P value	0.409	0.399	0.293
Intervention group (n=33) (Mean ± SD)	Before intervention	44.19±8.03	45.60±7.15	157.30±40.14
	After intervention	34.30±7.12	33.45±6.90	126.30±42.15
	P value	0.003	0.001	0.001

Note. SD: Standard deviation; Statistical test: Independent samples *t* test.

the levels of implicit and explicit stress among those who received this intervention. Further, the comparison of intervention and control groups revealed that there was a significant difference in implicit stress levels. In their meta-analysis, Doreen et al suggested that ear acupressure reduces preoperative anxiety in adults (19). In another study, Luo et al investigated the effects of acupressure on patients undergoing a gynecological surgery and reported the effects of this intervention on reducing preoperative stress levels (20), which is consistent with the results of the current study. Other studies such as de Lorent et al (8) and Abadi et al (21) reported similar results as the findings of the present study.

Another part of the present study evaluated the effects of acupressure on reducing cortisol hormone. The results indicated the effectiveness of this intervention on stress reduction in the acupressure recipient group. The findings of this study is also in line with the findings of Ventura et al (22) and Kuo et al (23).

It seems that ear acupressure with its special mechanism can reduce stress levels in patients before the surgery and consequently cortisol hormone levels. The reduction of the cortisol hormone is an unwanted side effect of surgery which is observed during preoperative, inoperative, and postoperative stages. Thus, ear acupressure is very effective in helping the patients to undergo a successful surgery.

Limitations of the Study

The researchers were unaware of the family stress, which could influence one's stress level accordingly. Besides, the lack of considering patients' possible medications that may affect their cortisol levels was another limitation of the present study.

Suggestions for Future Studies

Further studies are recommended to examine the effects of stress control and management on a family-centered approach. In addition, considering the effectiveness of this method in reducing stress, this intervention can be performed in the hospital. Finally, to reduce the level of stress, patients must be trained on ear acupressure.

Conclusions

In general, ear acupressure prior to rhinoplasty surgery reduces stress (implicit and explicit) and cortisol hormone levels.

Conflict of Interests

Authors have no conflict of interests.

Ethical Issues

The research project was approved by the Ethics Committee of Tabriz University of Medical Sciences (ethics no. IR.TBZMED.REC.1397.1059; identifier: IRCT20190325043107N10).

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