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Original Article

The effect of auricular acupressure on preoperative anxiety in patients undergoing gynecological surgery

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Abstract: Acupuncture and related techniques have been shown to be effective treatments for acute and chronic anxiety. We hypothesized that auricular acupressure (AA) may relieve preoperative anxiety without undesirable side effects and might also decrease bispectral index (BIS) values before surgery. Forty-three women undergoing elective American Society of Anesthesiologists (ASA) grade I and II gynecological surgery were randomly assigned to 1) sham acupressure (SA) or 2) AA groups. State-Trait Anxiety Inventory state scale (STAI-S) scores were determined before and after the intervention. BIS values, heart rate (HR), and blood pressure (BP) were recorded after the patients arrived at the preoperative preparation room, and at 5, 10, 15, 20, 25, and 30 min of intervention. After the intervention, the STAI-S scores demonstrated lower state anxiety levels in both groups. However, patients in the AA group showed significantly reduced anxiety levels compared to those in the SA group (80.86 ± 12.16 vs. 91.95 ± 10.21, respectively; $P = 0.002$). Two-way analysis of variance (ANOVA) with repeated measurement analysis revealed a remarkable decrease in BIS values after AA and SA intervention applied to the bilateral relaxation point at every time point, compared with the baseline values. However, patients in the AA group showed significantly lower BIS values than those in the SA group at every time point after the intervention. Therefore, intervention including AA or SA on the bilateral relaxation points could alleviate preoperative anxiety, but the anxiolytic efficacy of AA is better than that of SA.

Keywords: Auricular acupressure, preoperative anxiety, state-trait anxiety inventory, bispectral index

Introduction

Patients, particularly women, undergoing surgery frequently suffer undesirable and intense anxiety, fear, and depression before surgery [1-3]. Patients are commonly concerned about their disease, surgery, anesthesia, or unidentified factors. A survey of preoperative fear reported that the incidence of preoperative anxiety in adults may be as high as 60~70% [4]. Preoperative anxiety may lead to adverse events perioperatively, such as increased heart rate (HR) and blood pressure (BP), which may in turn increase the risks of anesthesia, requirement for sedatives and anesthetics, and incidence of postoperative pain, nausea, and vomiting [5, 6].

Sedatives such as benzodiazepines, most frequently midazolam, are often used to reduce preoperative anxiety. However, their use can result in psychomotor and cognitive function derangement after premedication [7], as well as side effects including somnolence, respiratory depression, ataxia, etc. Therefore, safer and more effective alternative preoperative interventions to sedation are needed.

Acupuncture and related techniques have a long history in China, and have also been more recently adopted by Western medicine, as they offer the advantages of few side effects and low cost. The theory of traditional Chinese medicine states that stimulation of acupoints could calm the heart for resuscitation. Acupuncture and related techniques have been proven to be useful for treatment of chronic or acute anxiety disorders [8-12]. Wang and Kain [13] reported that stimulation of auricular acupuncture (AA) "relaxation points" can decrease anxiety in

Table 1. Baseline characteristics of the patients

Characteristics	Sham Acupressure (n = 22)	Auricular Acupressure (n = 21)
Age (yr, Mean ± SD)	36 ± 7	35 ± 7
Education (yr, Mean ± SD)	9 ± 3	10 ± 3
Preoperative anxiety (%, yes)	82	81
Disease (%)		
Hysteromyoma	36	33
Ovarian cyst	36	48
Apogeny	32	14
Type of surgery		
Laparotomy	9	8
Celoscope	13	13
Baseline		
Trait anxiety (Mean ± SD)	41 ± 5	40 ± 7
State anxiety (Mean ± SD)	42 ± 9	43 ± 10

healthy volunteers and patients waiting for surgery. Based on previous data, we performed a randomized, double-blind, controlled study to test whether AA has the same alleviating effects on preoperative anxiety.

Materials and methods

Our study was approved by the ethics committee of the First Affiliated Hospital of Wenzhou Medical University, and all patients taking part in this trial provided informed consent. Forty-three women aged 18~60 years, undergoing elective ASA grade I-II gynecological surgery and without history of hypertension or mental disease, were enrolled in our study. Exclusion criteria included (a) pregnancy, (b) lack of fluency in Mandarin, (c) taking sedatives or analgesics within one week before the study, (d) allergy to adhesive plaster, (e) unable to or refusal to participate in the trial. All subjects were randomized into 1) sham acupressure (SA) (control group) and 2) AA groups. The group assignments were generated by a computer, and randomized numbers were stored in a sealed envelope available only to the acupuncturist. This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Wenzhou Medical University. Written informed consent was obtained from all participants.

The subjects arrived at the preoperative preparation room 45 minutes before surgery on the scheduled day of operation. Each subject lay comfortably and quietly on a stretcher. The bispectral index (BIS), HR, BP, and State-Trait Anxiety Inventory state scale (STAI-S) scores were measured at baseline. After these measurements, the patients received AA or SA intervention according to their grouping. BIS, HR, and BP levels were recorded every 5 minutes until the end of the intervention. Every intervention was performed for 30 minutes.

AA

We chose a bilateral "relaxation point" marked with a magnetic ball 1 mm in diameter, which was fixed with an opaque ear patch, as the sedative point. This point is located at the superior lateral wall of the triangular fossa and documented in a French auricular acupuncture textbook. A previous trial reported the anxiolytic effect at this point was to be better than that of the traditional "shenmen" auricular point in healthy volunteers [11].

SA

We used an adhesive plaster similar in appearance to the ear paste, but without the magnetic ball, attached to the bilateral relaxation point.

Both AA and SA were implemented by a single acupuncturist who had a physician qualification certification. Data were recorded and analyzed by other two investigators respectively, who were blinded to group assignment. To minimize the risk of bias, the acupuncturist had less communication with patients, and covered patients' ears with operating caps in order to prevent the investigators from seeing the intervention. It was important that the acupuncturist was prevented from communicating with the investigators and did not participate in any aspect of data collection and analysis.

Statistical analysis

Data were analyzed using SPSS version 13.0. All normally distributed data were presented as means ± SD. $P < 0.05$ were considered statistically significant. Student's t test was used to test the significance between baseline characteristics and STAI-S scores in the AA and SA groups. Differences in BIS, HR, and BP between the AA and SA groups were analyzed by two-way analysis of variance (ANOVA) with repeated measurements. Multiple comparisons in BIS values were adjusted using the LSD method.

Table 2. BIS values during the intervention of AA or SA on the bilateral relaxation point (Mean ± SD)

Time points	Auricular Acupressure	Sham Acupressure
Baseline	96.8 ± 1.3	97.1 ± 0.9
5 min	89.4 ± 4.0*,#	94.8 ± 2.3$
10 min	84.7 ± 6.1*,#	94.3 ± 2.4$
15 min	84.1 ± 5.4*,#	93.6 ± 2.8$
20 min	83.8 ± 5.0*,#	94.1 ± 3.3$
25 min	83.3 ± 4.8*,#	93.3 ± 3.9$
30 min	83.1 ± 3.6*,#	94.1 ± 3.4$

*P = 0.000 for the BIS values during applying with AA for every 5 minute compared with the baseline. $$P$ = 0.001 for the BIS values during applying with SA for every 5 minutes compared with the baseline. #P = 0.000 for the BIS values during applying with AA for every 5 minutes compared with SA.

Results

Baseline patient characteristics

A total of 43 patients scheduled for elective gynecological surgical procedures were enrolled in the study. There were no statistically significant differences in age and years of education between the groups. There were also no significant differences in baseline anxiety levels, BIS values, HR, or BP between the groups (**Table 1**).

BIS values

Both AA and SA groups showed a significant decline in BIS values compared with baseline values after the intervention was applied to the bilateral relaxation point every five minutes. However, patients in the AA group showed significantly lower BIS values than those in the SA group at every time point after the intervention (**Table 2**).

STAI-S scores

The STAI-S scores showed lower state anxiety levels in both groups. However, patients in AA group had significantly lower anxiety compared to those in the SA group (80.86 ± 12.16 vs. 91.95 ± 10.21, respectively; P = 0.002) (**Figure 1**).

HR and BP

Patients in the AA group showed lower HR and BP during the intervention of acupressure on the bilateral relaxation point at five-minute intervals compared with those in the SA group; however, two-way ANOVA with repeated measurements revealed that this difference was not statistically significant (Data not shown).

Discussion

To assess the effectiveness of an alternative method to relieve preoperative anxiety without undesirable side effects, we applied AA to patients undergoing gynecological surgery 30 minutes before their operations. We observed decreased preoperative anxiety levels in both AA and SA groups, but the anxiety levels were significantly lower in the AA group than in the SA group. Several previous studies have suggested that acupuncture and related techniques might relieve anxiety in patients with depression or during many surgical conditions. auricular acupuncture and acupressure at the acupoints of shenmen, extra 1, GB-21 and SP-6, or relaxation points have been reported to relieve anxiety [14-22]. Our study showed that the AA intervention had the same anxiolytic effect before surgery, which showed a great advantage in relieving preoperative anxiety without undesirable side-effects and was easily applied in patients.

The positive effect of SA on preoperative anxiety may be partially due to a placebo effect from lying in a silent room for 30 minutes. The STAI-S is a widely used self-report anxiety instrument considered the gold standard for measurement of anxiety [23].

The BIS, a measure of the hypnotic effect of sedatives and anesthetics, has been used in daily anesthesia practice. BIS values decrease progressively during the natural physiologic stages of sleep. BIS values fluctuate from 75 to 90 for individuals in the stage of light sleep, [24, 25]. Fassoulaki and colleagues [26] documented that pressure applied to the extra 1 point reduced BIS values and stress response in volunteers. Agarwal and colleagues [27] also showed that acupressure at the extra 1 point was effective in decreasing both preoperative anxiety and BIS values. Both AA and SA resulted in reduced BIS values in the current study; however, the efficacy of AA was better than that of SA. Patients with conditions that did not coincide with a clinically determined sedative-hypnotic state, such as hypoglycemia, cardiac

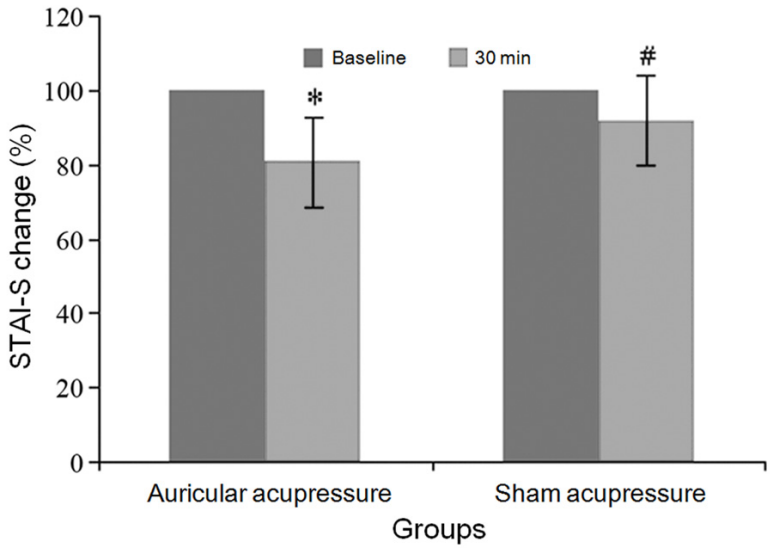

Figure 1. Changes in the anxiety levels by self-assessment of STAI-S. *P = 0.000 for the STAI-S scores before and after auricular acupressure on relaxation point. #P = 0.002 for the STAI-S change (%) after application with AA and SA.

arrest, cerebral ischemia, etc. [28], were excluded from our study.

The results of the present study showed that AA on the relaxation point significantly decreased STAI-S scores and BIS values, and tended (although the difference was not statistically significant) to reduce the HR and BP in patients undergoing surgical procedures, indicating that AA might relieve preoperative anxiety. However, the mechanisms of this effect are not well understood. It may correlate with effects on the autonomic nervous system (ANS) [29]. The sympathetic nervous system is involved in regulating the anxiety, insomnia, and arousal responses. Research has suggested that AA may exert a physiological effect by modulating the ANS. This effect would result in increased parasympathetic and reduced sympathetic activities by affecting the stimulation projection from the auricular branch of the vagus nerve to the nucleus of the solitary tract [30, 31]. Thus, AA may also inhibit sympathetic nerve activity to relieve preoperative anxiety in our study. Additionally, BIS values are reportedly significantly associated with plasma norepinephrine and epinephrine levels. Intravenous injection of epinephrine can increase mean BIS levels [32, 33]. Therefore, the believe that the decline of BIS values in the AA group in our study may be correlated with decreased plasma catecholamine levels due to stimulation of the ear acupoint.

AA is a non-invasive technique. Compared with acupuncture, it avoids skin lesions and pain from needle insertion. Thus, AA might be more accepted by more people, especially children. Moreover, AA is easy to manipulate and apply before surgical procedures.

Our study had several limitations. We assessed anxiety and recorded BIS values for only the 30 minutes during the intervention. It is not known whether the efficacy of sedation and BIS values are comparable after 30 min. The requirement for sedatives and anesthetics when patients arrived at the operating room was not determined in our study. It remains unknown whether AA offers the same effects as conventional medical treatment.

In conclusion, both AA and SA alleviated preoperative anxiety in this study. However, the anxiolytic efficacy of the AA was better than that of SA. Therefore, AA might be a better complementary and alternative treatment for relief of preoperative anxiety.

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Disclosure of conflict of interest

None.

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