

Auricular Acupressure as a Treatment for Anxiety in Prehospital Transport Settings

Alexander Kober, M.D.,*† Thomas Scheck, M.D.,*† Barbara Schubert, B.S.,‡ Helmut Strasser, B.S.,‡ Burkhard Gustorff, M.D.,§ Petra Bertalanffy, M.D.,* Shu-Ming Wang, M.D.,|| Zeev N. Kain, M.D.,# Klaus Hoerauf, M.D.**

Background: Auricular acupuncture at the relaxation point has been previously shown to be an effective treatment for anxiety in the preoperative setting. The purpose of this prospective, randomized, blinded study was to determine whether auricular acupressure can reduce stress and anxiety during ambulance transport.

Methods: Patients who required ambulance transport secondary to medical conditions were randomized to receive auricular acupressure at the relaxation point ($n = 17$) or at a sham point ($n = 19$). A visual analog scale was used to assess state anxiety as well as patient anticipation of hospital medical treatment (estimated waiting period for treatment, anticipated pain during treatment, attitude toward the physicians, and treatment outcomes). These variables were assessed at baseline and on arrival to the hospital.

Results: Patients in the relaxation group reported significantly less anxiety than patients in the sham group on arrival to the hospital (visual analog scale mean \pm SD: 37.6 ± 20.6 to 12.4 ± 7.8 mm vs. 42.5 ± 29.9 to 46.7 ± 25.9 mm, respectively; $P = 0.002$). Similarly, patient perception of pain during treatment (mean visual analog scale \pm SD: 32.7 ± 27.7 to 14.5 ± 8.1 mm vs. 17.2 ± 26.1 to 28.8 ± 21.9 mm, respectively; $P = 0.006$) and treatment outcomes of their illnesses (mean visual analog scale \pm SD: 46.7 ± 29.4 to 19.1 ± 10.4 mm vs. 35.0 ± 25.7 to 31.5 ± 20.5 mm, respectively; $P = 0.014$) were significantly more positive in the relaxation group than in the sham group. No differences were found in the other variables assessed.

Conclusion: It was concluded that auricular acupressure is an effective treatment for anxiety in prehospital emergency settings.

IN most European countries, paramedics accompanying patients during ambulance transport to the hospital are not allowed to administer any medication or to perform procedures such as acupuncture.¹ Thus, patients frequently have anxiety and pain during the ambulance ride.²

Recently, Wang *et al.*³ demonstrated that auricular acupuncture is effective in reducing state anxiety in both healthy volunteers and adult patients awaiting their surgery. Other previous reports suggested that acupuncture can be used as the treatment of chronic anxiety disor-

ders.⁴ Eich *et al.*⁵ demonstrated that body acupuncture can lead to a significant reduction in anxiety symptoms in patients with minor depression and in patients with generalized anxiety disorders. Similarly, Roccia and Rogora⁶ showed that the combination of body acupuncture and auricular acupuncture could produce relaxation in patients with chronic anxiety disorders. In contrast to body acupuncture, the auricular approach has the advantage of easy access, avoiding undressing patients to reach any body stimulation point. Beside the location, there are several techniques used in acupuncture practice such as inserting hair-thin needles (acupuncture) or applying direct pressure onto the acupuncture points (acupressure). Although direct comparisons between acupressure and the different techniques of acupuncture are lacking, stimulation of acupuncture points with pressure is noninvasive *per se* and therefore applicable by paramedics.

Based on the above data, we conducted a prospective, randomized, double-blinded study to test the hypothesis that auricular acupressure can decrease anxiety in the prehospital setting.

Materials and Methods

Following approval by the institutional review board and informed consent from the patients, we enrolled a total of 36 patients (age range, 23-89 yr) who had gastrointestinal illnesses. The patients were transported by ambulance with accompanying paramedics to the local hospitals for anticipated painful gastrointestinal procedures. It is important to note that it is a standard practice in Austria to dispatch an ambulance with an emergency physician for advanced medical care for all patients who had a visual analog scale (VAS) score for pain of greater than 80 of 100 after an initial evaluation by a paramedic. In this study, none of the patients were in pain at all. We excluded all patients who were not fluent in German, patients who unable to give informed consent, patients with neurologic or psychiatric disorders, patients who were taking any sedatives for chronic psychological disorders, or patients who had a VAS score for pain of more than 80.

Outcome Measures

VAS-Anxiety. A self-assessment instrument was used to rate the level of state anxiety experienced by the individual. This scale consists of a 100-mm line that represents the extremes of symptoms at either end of

* Resident, § Attending Physician, ** Associate Professor, Department of Anesthesiology and General Intensive Care, University Hospital of Vienna. † Resident, ‡ Research Fellow, Vienna Red Cross, Van Swieten and the Research Institute of the Vienna Red Cross, Vienna, Austria. || Assistant Professor, # Professor, Departments of Anesthesiology, Pediatrics, and Child Psychiatry, Yale University School of Medicine New Haven, Connecticut.

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Address reprint requests to Dr. Hoerauf: Department of Anesthesiology and General Intensive Care, University Hospital of Vienna, Waehringer Guertel 18-20, A-1090 Vienna, Austria. Address electronic mail to: klaus.hoerauf@univie.ac.at. Additional article reprints may be purchased through the Journal Web site, www.anesthesiology.org.

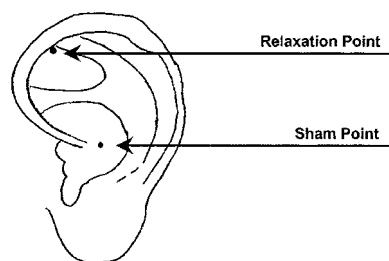


Fig. 1. Acupressure points used in the study.

the continuum, ranging from 0 (“not anxious”) to 100 (“extremely anxious”).

Anticipation Questionnaire. The anticipation questionnaire consisted of four questions about estimation of the waiting period for treatment, anticipated pain during treatment, attitude toward the physicians, and treatment outcomes to assess patient anticipation of hospital medical treatment. A VAS of a 100-mm line was used to assess the responses for each question. The VAS ranged from 0 (“maximal satisfaction”) to 100 (“absolute dissatisfaction”).

Study Protocol

At the site of the accident, two paramedics—paramedic A (treatment) and paramedic D (data collection)—were assigned to care for the patient. Patients were treated according to the Austrian Red Cross Ambulance Service’s Guidelines. These guidelines are accepted as the basis of paramedical education in Austria, which guarantees a standard of prehospital trauma care. After the medical intervention, the patient was asked to participate in the study. After obtaining written informed consent, paramedic A left the site. Paramedic D obtained the baseline demographic characteristics and the hemodynamic parameters (blood pressure and heart rate). The patient also completed the anxiety assessment and the anticipation questionnaire before acupressure intervention. The ends of the VAS were randomized to avoid confounding of handedness. During evaluation, patients were sitting and drew VAS values. After paramedic D performed the baseline assessments, paramedic A opened a sealed envelope with a predetermined group assignment inside and performed the intervention accordingly.

Relaxation Group. Subjects in this group received bilateral auricular acupressure at a “relaxation” point that was documented by Wang *et al.*³ in a recent report. This acupuncture point is located at the superior lateral wall of the triangular fossa (fig. 1). Acupressure was performed with a small plastic ball (1-mm diameter) that was pressed on the mentioned relaxation point and fixed with an opaque ear patch, which remained there until the end of transport.

Sham Group. Subjects in this group received bilateral auricular acupressure at a “sham” point, defined as an acupuncture point that is not documented to have any

relaxation or anxiolytic effect.³ The sham acupuncture point used in this study is located at the tip of the concha and is reported to achieve homeostasis of the stomach (fig. 1). Acupressure was performed with a small plastic ball (1-mm diameter) that was pressed on the mentioned relaxation point and fixed with an opaque ear patch, which remained there until the end of transport.

In the absence of paramedic D, paramedic A performed the auricular acupressure with ear patches. The patient was then moved to the ambulance. Paramedic D had to sit in front of the car, and paramedic A stayed with the patient in the back of the car (sections of the ambulance were separated by a rigid wall). On arrival at the hospital, paramedic D reassessed all the parameters without the presence of paramedic A. Finally, the completed data sheets were put into opaque envelopes and sealed by paramedic D to ensure complete blinding.

To minimize bias, paramedic A was not told that he was using a true as well as a sham technique. Instead, he was instructed that the aim of the study was to compare acupressure intervention using two different points. None of the paramedics involved in the study had knowledge about or were experienced with acupressure or similar treatments. To ensure the accuracy of treatment performance, paramedic A was intensively trained by a physician with experience in acupressure and acupuncture at the University Hospital of Vienna (Vienna, Austria). Great care was taken to ensure that either treatment or data collection was performed in the absence of the other investigator. The design of the ambulance provided no possibility for paramedic D to be aware of the auricular acupressure intervention during transport. To ensure that the blinding system was obeyed and that the treatment was performed accurately, a physician, otherwise not involved in data collection or treatment, performed 10 on-site audits of the methodology and data collection.

Sample Size and Statistical Analysis

The *a priori* study planning needed a total sample size of 34 patients to detect a difference of 1 SD (effect size = 1.0) with ANOVA at an α level of 0.05 with a power of 80%. After testing on normal distribution, a two-way repeated-measures ANOVA was used to analyze the changes in behavioral and physiologic anxiety levels of patients at two time points (before acupressure intervention and on arrival at the hospital). Results are presented as mean \pm SD; $P < 0.05$ was considered statistically significant.

Results

A total of 36 patients were enrolled in the study. The relaxation group consisted of 17 patients, and the sham group consisted of 19 patients. All enrolled patients

Table 1. Baseline Characteristics of the Patients

Characteristic	Acupressure (n = 17)	Sham (n = 19)
Age (y)	74.9 ± 15	70.0 ± 14
Height (cm)	165 ± 12	168 ± 10
Weight (kg)	69 ± 19	74 ± 21
ASA classification II or III	13/4	15/4
Gender (male/female)	5/12	8/11
Attitude (believer/nonbeliever)	0/17	0/19
Reason for transport		
Gastritis	11	12
Cholecystitis	2	1
Pancreatitis	1	1
Diverticulitis	3	5
Procedure		
Endoscopy	11	11
ERCP	1	0
Colonoscopy	3	5
Combined procedures	2	3
Baseline values		
Anxiety	37.6 ± 20.6	42.5 ± 29.9
Heart rate	79.1 ± 10.2	81.6 ± 11.5
Pain during treatment	32.7 ± 27.7	17.2 ± 26.1
Treatment outcome	46.7 ± 29.4	35.0 ± 25.7
Waiting period	35.0 ± 29.3	47.3 ± 30.4
Attitude toward physician(s)	32.7 ± 27.7	17.6 ± 27.9

Values are expressed as mean ± SD or as numbers, as indicated.

ASA = American Society of Anesthesiologists; ERCP = endoscopic retrograde cholangiopancreatography.

completed the study, and no patient had to be handled as a dropout for technical or medical reasons. Baseline patient characteristics were comparable regarding age, sex, blood pressure, heart rate, belief in acupuncture, and all other outcome parameters (table 1).

A two-way repeated-measures ANOVA that examined changes in state anxiety demonstrated that individuals who received acupressure at the relaxation point had significantly lower anxiety scores on arrival to the hospital (37.6 ± 20.6 to 12.4 ± 7.8 mm) than did individuals who received the sham intervention (42.5 ± 29.9 to 46.7 ± 25.9 mm; *P* = 0.002) (fig. 2). Similarly, a two-way repeated-measures ANOVA that examined the anticipation of pain during treatment in the hospital found a group-by-time interaction (*F* = 8.68; *P* = 0.006). Thus, individuals who received acupressure at the relaxation

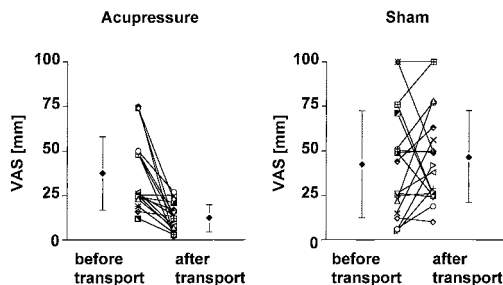


Fig. 2. Changes in anxiety (visual analog scale [VAS]) before and after transportation and in acupressure and sham groups. *P* is significant only in the sham group.

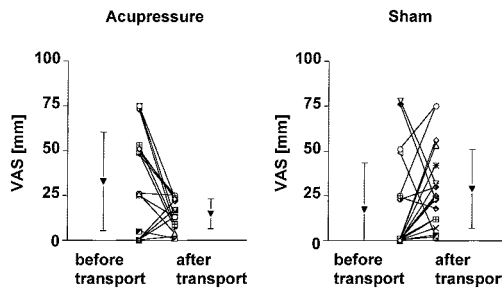


Fig. 3. Changes in anticipation of pain scores (visual analog scale [VAS]) before and after transportation and in acupressure and sham groups. *P* is only significant for the sham group.

point had significantly lower anticipation pain scores (32.7 ± 27.7 to 14.5 ± 8.1 mm) than did individuals who received the sham intervention (17.2 ± 26.1 to 28.8 ± 21.9 mm; *P* = 0.006) (fig. 3). Finally, we demonstrated that patients were also significantly more optimistic about treatment outcomes for their illnesses after the acupressure intervention (46.7 ± 29.4 to 19.1 ± 10.4 mm) than after the sham intervention (35.0 ± 25.7 to 31.5 ± 20.5 mm; *P* = 0.014) (fig. 4).

In contrast, we found that the estimation of waiting times for treatment did not differ significantly between the two groups (repeated-measures ANOVA: *F* = 0.04; *P* = 0.83)—*i.e.*, the two groups did not differ significantly at baseline or after the intervention (17.4 ± 11.4 vs. 32.0 ± 20.6). Similarly, no difference was observed with regard to the perception of attitude toward the physicians (repeated-measures ANOVA: *F* = 0.4; *P* = 0.53). There were also no significant changes in blood pressure and heart rate either between the groups or within the groups before and after intervention (figs. 5 and 6).

Discussion

Under the conditions of this study, we found that ambulance patients who receive auricular acupressure at relaxation points are less anxious, anticipate less pain, and more optimistic about the outcome of their illness. To minimize the potential bias of patient contact *per se*, the paramedics were not aware of the hypothesized differences of the acupressure points used in this study.

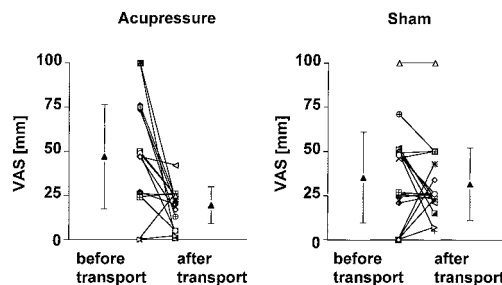


Fig. 4. Changes in estimation of outcome scores (visual analog scale [VAS]) before and after transportation and in acupressure and sham groups. *P* is only significant for the sham group.

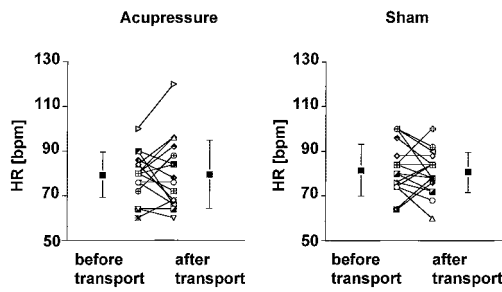


Fig. 5. Changes in heart rate (HR) before and after transportation and in acupressure and sham groups.

Beside this potential limitation, the study is of importance in countries such as Austria, where only physicians are allowed to administer medications by law and thus the administration of anxiety-reduction medication is restricted in such paramedic-based rescue systems. This restriction results in significant untreated anxiety during the ride to the hospital in thousands of patients in a paramedic-based transport system. Thus, there is a need for nonpharmacologic anxiolysis that can be administered to stabilize patients on their way to the hospital. In our study, we demonstrated that auricular acupressure is an effective treatment for stress and anxiety in such patients. The technique is easy to learn and can be performed by paramedics.

Despite the significant reduction in anxiety and improved attitudes revealed by the patient psychologic parameters, we were unable to demonstrate any difference in the physiologic measurements in this study. The dichotomy between psychologic and physiologic measures of anxiety is consistent with data from existing medical literature.³ This lack of correlation between psychologic and physiologic indicators of anxiety may be explained by trait-related individual responsiveness of the sympathetic system,⁷ which was not evaluated in this study.

The potential mechanism for the effectiveness of auricular acupressure may be similar to that documented in the acupuncture literature. Stimulating a particular point

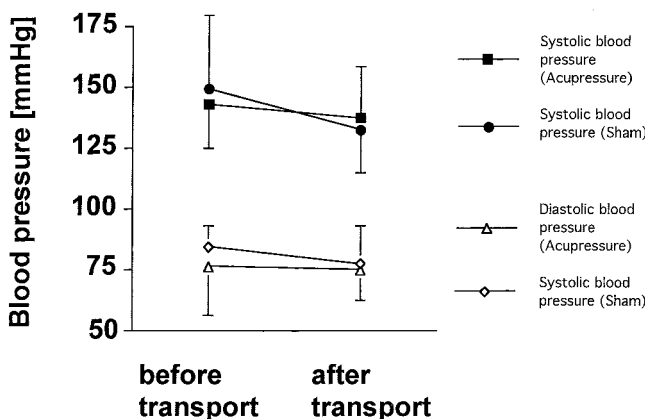


Fig. 6. Changes in blood pressure values before and after transportation and in acupressure and sham groups.

with either a needle or pressure can activate small myelinated nerve fibers that send impulses into the spinal cord, midbrain, pituitary, and hypothalamus,⁸ causing a measurable release of endorphins into the blood.⁹ Beside this, various neurotransmitters such as serotonin, norepinephrine, and possibly γ -aminobutyric acid are known to interrupt incoming stress signals in the central nervous system.

There are several reasons why auricular acupressure is an ideal intervention for reduction of anxiety in first aid settings. First, only minimal equipment is needed; thus, any physician, nurse, paramedic, or emergency medical technician can perform this treatment at once at the site of an accident without having to wait for any help, assistance, or complex device. Second, only short training is needed to learn one simple point. Physicians as well as other health care providers who have rare or no experience in traditional Chinese medicine can learn this technique within a few hours and use it whenever indicated. Last, but not least, it is almost a “no-cost” intervention. Considering that anxiety can potentially provoke major adverse physiologic responses, “instant on-site” reduction of anxiety, probably followed by a decrease in the release of neurotransmitters, is clearly beneficial in elderly or coronary-impaired patients before hospital admission. Auricular acupressure as a treatment for anxiety not only is effective but also may decrease the overall cost of health care by decreasing the potential complications associated with traumatic stress.¹⁰ Obviously, the role of this technique is limited to stable patients who do not have major trauma or illness.

Finally, the method that was used to assess anxiety in this study must be addressed. Currently, the Spielberger state trait anxiety inventory (STAI) is considered the gold standard for assessment of anxiety in acute settings. To date, the STAI has been used in more than 1,000 peer-reviewed medical publications.¹¹ It should be noted, however, that the STAI consists of 20 items, and it may take up to 10 min to complete. Thus, the utility of the STAI for research in clinical care settings such as described in this article is limited. Instead, we chose to use the VAS to assess patient anxiety. Although the VAS may be inferior to the STAI, it is much easier to use; thus, it can be used in difficult clinical settings. Furthermore, previous investigations reported a correlation coefficient (r) of 0.55–0.84 between VAS and STAI.^{12–14} Thus, we believe that use of the VAS to assess anxiety in the present investigation was justified and that our results are valid.

In conclusion, we demonstrated that auricular acupressure is an effective treatment for anxiety and improves the patients overall perception toward medical care. This technique not only is easy to learn, but it also has great potential to improve the quality of care for patients who are being transported to the hospital.

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References

1. Brismar B, Dahlgren BE, Larsson J: Ambulance utilization in Sweden: Analysis of emergency ambulance missions in urban and rural areas. *Ann Emerg Med* 1984; 13:1037-9
2. Kober A, Scheck T, Greher M, Lieba F, Fleischackl R, Fleischackl S, Randunsky F, Hoerauf K: Prehospital analgesia with acupressure in victims of minor trauma: A prospective, randomized, double-blinded trial. *Anesth Analg* 2002; 95:723-7
3. Wang SM, Peloquin C, Kain ZN: The use of auricular acupuncture to reduce preoperative anxiety. *Anesth Analg* 2001; 93:1178-80
4. Wang SM, Kain ZN: Auricular acupuncture: A potential treatment for anxiety. *Anesth Analg* 2001; 92:548-53
5. Eich H, Agelink MW, Lehmann E, Lemmer W, Klieser E: Acupuncture in patients with minor depressive episodes and generalized anxiety: Results of an experimental study. *Fortschr Neurol Psychiatr* 2000; 68:137-44
6. Roccia L, Rogora G: Acupuncture and relaxation. *Minerva Med* 1976; 67:1918-20
7. Hanser SB, Thompson LW: Effects of a music therapy strategy on depressed older adults. *J Gerontol* 1994; 49:265-9
8. Hui KK, Liu J, Makris N, Gollub RL, Chen AJ, Moore CI, Kennedy DN, Rosen BR, Kwong KK: Acupuncture modulates the limbic system and subcortical gray structures of the human brain: Evidence from fMRI studies in normal subjects. *Hum Brain Mapp* 2000; 9:13-25
9. Levine JD, Gormley J, Fields HL: Observations on the analgesic effects of needle puncture (acupuncture). *Pain* 1976; 2:149-59
10. Akca O, Melischek M, Scheck T, Hellwagner K, Arkilic CF, Kurz A, Kapral S, Heinz T, Lackner FX, Sessler DI: Postoperative pain and subcutaneous oxygen tension. *Lancet* 1999; 354:41-2
11. Tenenbaum G, Furst D, Weingarten G: A statistical reevaluation of the STAI anxiety questionnaire. *J Clin Psychol* 1985; 41:239-44
12. Arellano R, Cruise C, Chung F: Timing of the anesthetist's preoperative outpatient interview. *Anesth Analg* 1989; 68:645-8
13. Millar K, Jelcic M, Bonke B, Asbury AJ: Assessment of preoperative anxiety: Comparison of measures in patients awaiting surgery for breast cancer. *Br J Anaesth* 1995; 74:180-3
14. Kindler CH, Harms C, Amsler F, Ihde-Scholl T, Scheidegger D: The visual analog scale allows effective measurement of preoperative anxiety and detection of patients' anesthetic concerns. *Anesth Analg* 2000; 90:706-12