Korean Hand Acupressure for Motion Sickness in Prehospital Trauma Care: A Prospective, Randomized, Double-Blinded Trial in a Geriatric Population

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Patients with trauma or medical illnesses transported to the hospital by ambulance have a frequent incidence of motion sickness. Because the administration of drugs in the ambulance is prohibited by law in Austria, the noninvasive Korean hand acupressure point at K-K9 may be an alternative against nausea and vomiting. We enrolled 100 geriatric patients with minor trauma, randomizing them into a K-K9 group and a sham acupressure group. We recorded visual analog scores (VAS) for nausea and for the patient's overall satisfaction with the treatment, hemodynamic variables, and peripheral vasoconstriction. In the K-K9 group, a significant ($P < 0.01$) increase in nausea was recorded in all cases: from VAS of 0 mm to 25 ± 6 mm. A similarly significant ($P < 0.01$) increase was registered in the sham group: from VAS of 0 mm to 83 ± 8 mm. However, at the time of arrival in the hospital, nausea scores were significantly different between the K-K9 group and the sham group ($P < 0.01$). Although all patients had been vasoconstricted at the emergency site before treatment, there was a significant difference ($P < 0.01$) between groups with regard to the number of vasoconstricted patients at the hospital (4 and 46 constricted and dilated, respectively, in the K-K9 group versus 48 and 2 constricted and dilated, respectively, in the sham group). On arrival in the hospital, a significant difference ($P < 0.01$) in heart rate was noted between the K-K9 group and the sham group (65 ± 6 bpm versus 98 ± 8 bpm). The patients' overall satisfaction with the provided care was significantly higher ($P < 0.01$) in the K-K9 group (19 ± 9 mm VAS) than in the sham group (48 ± 12 mm VAS). Neither group experienced a significant change in blood pressure. K-K9 stimulation was an effective and simple treatment for nausea during emergency care and significantly improved patient satisfaction.

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Older people often experience motion sickness during public road transport (1) and ambulance rides (2). Motion sickness aggravates the discomfort of patients being transported by ambulance. Typical symptoms include epigastric discomfort, nausea, headache, and cold sweat (3). The most severe form of motion sickness is accompanied by vomiting (4). Sick patients experience increased heart rate, hypertension, and arteriolar vasoconstriction. Because paramedics in Europe are not allowed to give antiemetic drugs, the possibility of using non–drug-based therapies to reduce motion sickness during ambulance transport and thus providing better care for these patients is worthy of investigation.

In contrast to Chinese acupuncture, Korean hand acupuncture is a relatively new method; it was first developed and described by the Korean physician T-W Yoo. Two publications (5,6) have focused on the antiemetic effect of the method. Both studies revealed that stimulation of Korean acupuncture points, also with acupressure, had a strong effect on postoperative nausea in high-risk populations. We therefore hypothesized that the K-K9 point, which is located in the middle phalanx of the fourth finger on both hands, produces a similar antiemetic effect on patients with motion sickness during transport in acute trauma care. On the basis of these data, we conducted a prospective, randomized, double-blinded study to test the

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hypothesis that Korean hand acupressure at the K-K9 point reduces motion sickness during the ride to the hospital in trauma care.

Methods

After the approval of the IRB, 100 patients who had experienced minor trauma and fulfilled inclusion/exclusion criteria were enrolled in the study. Inclusion criteria were older age (60–100 yr), a history of motion sickness or postoperative nausea and vomiting (PONV), medical need for being transported, and an estimated transport duration of >20 min. Exclusion criteria were not being fluent in German, being unable to give informed consent, having neurological or psychiatric disorders, taking any sedatives, having gastrointestinal disorders or any malignancies, and having a pain visual analog scale (VAS) of >50 because of their trauma.

At the site of accident, two paramedics—A (treatment) and D (data collection)—were assigned. 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, the hemodynamic variables (blood pressure and heart rate), and nausea (on a 100-mm VAS) and asked about four symptoms that were not directly linked to nausea (perspiration in the hands, subjective sensation of strong heartbeats, vertigo, and visual problems). Then, skin sensors (Mallinckrodt, St. Louis, MO) were placed on the forearm and the finger to register indirect signs of vasodilation (finger warmer than forearm) or vasoconstriction (forearm warmer than finger). In a previous study, we showed this technique to be an effective means of measuring stress in emergency care (7). After paramedic D obtained the baseline assessments, paramedic A opened a sealed envelope with a predetermined group assignment inside and performed the intervention accordingly.

Subjects of the K-K9 group (Group 1) received bilateral K-K9 stimulation. This acupuncture point is located on both hands in the middle phalanx of the fourth finger (Fig. 1). Subjects of the sham group (Group 2) received bilateral acupressure at a sham point, defined as an acupuncture point known to have no effect. It is located in the middle phalanx of the second finger (Fig. 1).

In the absence of paramedic D, paramedic A performed the acupressure stimulation with hand patches consisting of a hard plastic ball (Fig. 2) fixed with a small bandage. The patient was then shifted to the ambulance. Paramedic D sat next to the driver while paramedic A stayed with the patient in the rear. On arrival at the hospital, paramedic A removed the hand patch, and paramedic D reassessed all the variables in the absence of paramedic A. Additionally, the patient's overall satisfaction with care was assessed with a VAS.

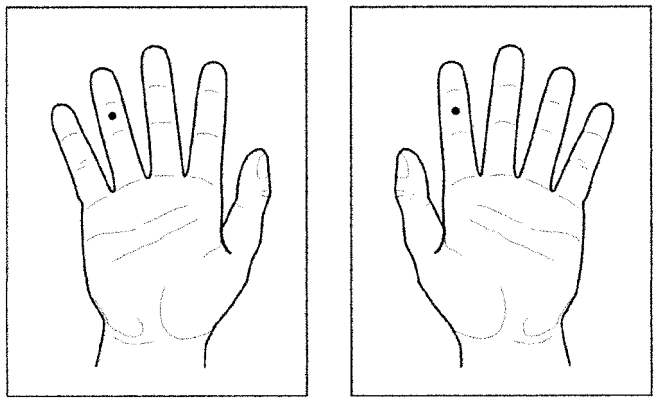

Figure 1. The K-K9 point (left) and the sham point (right).

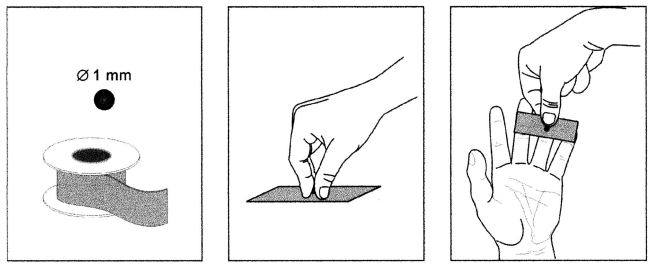

Figure 2. The hand patch and its preparation and use in this trial.

The *a priori* study planning was based on 20 preliminary cases showing that a total sample size of 98 patients was needed to detect a difference of 10 mm on the VAS with a common SD of 15 mm with an analysis of variance at the α level of 0.05 and a power of 90%. Results are presented as mean ± SD; $P \leq 0.05$ was considered statistically significant.

Results

A total of 100 patients were enrolled in the study; both groups consisted of 50 patients each. All enrolled patients completed the study; no patient had to be treated as a dropout for technical or medical reasons. The patients were comparable with regard to the baseline characteristics (Table 1).

In Group 1 and Group 2, a significant ($P < 0.01$) increase in nausea was recorded from 0 mm to 25 ± 6 mm and from 0 mm to 83 ± 8 mm on the VAS, respectively. At the time of the patients' arrival in the hospital, nausea scores were significantly different between Group 1 and Group 2 ($P < 0.01$).

In Group 1 and Group 2, a significant increase ($P < 0.01$) of perspiration in the hands was recorded from 0 mm to 56 ± 12 mm and from 0 mm to 93 ± 18 mm on the VAS, respectively. At the time of the patients'

Table 1. Demographic and Morphometric Characteristics, Potential Confounding Factors, and Baseline Variables

Variable	K-K9 ($n = 50$)	Sham ($n = 50$)	P value
Age (yr)	87.6 ± 16.9	85.4 ± 17.1	0.62
Sex (M/F)	6/44	10/40	
Height (cm)	153.9 ± 9.2	155 ± 9.9	0.84
Weight (kg)	66.4 ± 9.9	67.6 ± 13.8	0.50
Pain (VAS)	22.7 ± 9.5	21.9 ± 13.2	0.88
Systolic arterial blood pressure start (mm Hg)	144.6 ± 24.9	154.3 ± 32.5	0.48
Diastolic arterial blood pressure start (mm Hg)	93.7 ± 6.8	89.1 ± 9.9	0.73
Heart rate start (bpm)	98.0 ± 9.2	95.6 ± 15.1	0.94
Core temperature start (°C)	35.6 ± 0.9	35.3 ± 1.6	0.93
Ambient temperature in the car (°C)	22.5 ± 2.5	23.3 ± 1.9	0.77
Transport duration (min)	31.1 ± 8.9	28.4 ± 15.3	0.73

Data are shown as means ± SD. None of these factors differed significantly.
VAS = visual analog scores.

arrival in the hospital, the hand-perspiration scores were significantly different between groups ($P < 0.01$).

Group 1 showed a significant ($P < 0.01$) increase in the subjective sensation of strong heart beats: from 0 mm to 33 ± 23 mm on the VAS. A similar increase ($P < 0.01$) was noted in Group 2 as well: from 0 mm to 44 ± 26 mm on the VAS. The score did not significantly differ between the groups at the end of the ambulance ride.

Regarding the vertigo VAS, patients in both groups experienced a significant ($P < 0.01$) increase in their subjective sensation of vertigo, from 0 mm to 43 ± 33 mm and from 0 mm to 53 ± 29 mm for Groups 1 and 2, respectively, on the VAS. This score was comparable between groups at the time of arrival at the hospital.

With regard to the vision scale, no patient had any value other than 0. Although all patients had been vasoconstricted at the emergency site before treatment, there was a significant difference ($P < 0.01$) in the number of vasoconstricted patients in the hospital between groups (4 and 46 constricted and dilated, respectively, in Group 1 versus 48 and 2 constricted and dilated, respectively, in Group 2).

On arrival in the hospital, a significant difference ($P < 0.01$) in heart rate was noted between groups (65 ± 6 bpm versus 98 ± 8 bpm for Groups 1 and 2, respectively). The patients' overall degree of satisfaction with the provided care was significantly higher ($P < 0.01$) in Group 1 (19 ± 9 mm on the VAS) than in Group 2 (48 ± 12 mm on the VAS). Neither group experienced a significant change in blood pressure.

Discussion

Within the framework and conditions of this study, patients being transported by ambulance and receiving Korean hand acupressure at the K-K9 point had less motion sickness than patients treated with sham acupressure. Furthermore, our patients had reduced sympathetic activity (decrease in heart rate and vasodilation) and were more satisfied with the provided care.

Patients frequently experience nausea during their ambulance ride to the hospital. Although statutory regulations in Austria and many other countries allow only physicians to administer medication, a nonpharmacological mode of treatment for motion sickness, such as acupressure, could be beneficial. This study showed that Korean hand acupressure is an effective treatment for motion sickness and stress in this setting. Although alternative techniques such as acupressure are currently not very common, the described method is easy to learn and could be performed by paramedics to improve the quality of care.

All patients developed symptoms of motion sickness. A positive history of motion sickness and PONV combined with acute trauma stress are risk factors for an episode of motion sickness when a patient is being transported to a trauma care center (2). Our treatment was able to reduce nausea but could not entirely eliminate the symptom. Other symptoms, such as vertigo, a subjective sensation of strong heart beats, and visual problems, are reported as frequent symptoms of motion sickness (8). However, we established sweating of the hands and nausea as the dominant symptoms in our population. Visual problems were not encountered at all. Moreover, our results show that K-K9 stimulation is not effective in reducing vertigo.

Further, we could show that correct K-K9 acupressure reduces sympathetic activity and causes a decrease in heart rate and peripheral vasodilation. The mechanism underlying this may be similar to that reported for acupuncture. Stimulating a specific point with either needle or pressure may activate small myelinated nerve fibers that send impulses to the spinal cord, midbrain, pituitary, and hypothalamus and cause a measurable release of endorphins into the blood. Various neurotransmitters such as serotonin,

epinephrine, and, possibly, gamma-aminobutyric acid are known to interrupt incoming stress signals in the central nervous system (9–11).

The described technique is easy to use and inexpensive. We conclude that Korean hand acupressure is an effective treatment for anxiety and improves the patient's overall perception of medical care. Therefore, the technique might improve the quality of care in patients being transported to the hospital by ambulance.

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