Effects of Auricular Acupressure in Patients on Hemodialysis

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ABSTRACT

Background: Although studies on the effectiveness of self-management in limiting fluid intake in patients on hemodialysis have been conducted extensively, xerostomia, which is a powerful stimulus of fluid intake, has received scarce attention.

Purpose: The purpose of this study was to examine the effects of a 4-week auricular acupressure treatment on xerostomia, salivary flow rate, interdialytic weight gain, constipation, and diet-related quality of life in patients on hemodialysis in Korea.

Methods: This was a randomized controlled trial. Sixty patients on hemodialysis were randomly assigned to either the experimental group (n = 30) or the control group (n = 30). The experimental group received an auricular acupressure intervention, which included the application of skin tape with a *Senex vaccaria* seed on the five auricular acupoints, including the large intestine (CO7), San Jiao (CO17), middle triangular fossa (TF3), spleen (CO13), and upper tragus (TG1), for 4 weeks. The control group received only the application of skin tape without a seed on the same auricular acupoints for the same period. The outcome variables were as follows: xerostomia, measured using the visual analog scale; salivary flow rate, measured using the unstimulated whole saliva absorbed in oral cotton; interdialytic weight gain; the constipation assessment scale score; and the Quality of Life Related to Dietary Change Questionnaire results.

Results: The experimental group scored significantly better than the control group in terms of xerostomia (p = .004), salivary flow rate (p = .010), constipation (p = .009), and diet-related quality of life (p < .001).

Conclusions/Implications for Practice: Auricular acupressure may be an important tool for alleviating the negative symptoms of xerostomia and for improving quality of life in patients on hemodialysis. Nurses caring for patients on hemodialysis with both xerostomia and constipation may teach auricular acupressure to help patients self-manage their discomfort.

Key Words: auricular acupressure, xerostomia, interdialytic weight gain, constipation, quality of life.

Introduction

Studies on the efficacy of self-management in limiting the fluid intake of patients on hemodialysis have been conducted extensively. However, xerostomia (dry mouth), which is a powerful stimulus of fluid intake, has received little attention. Xerostomia is one of the most common complaints of patients on hemodialysis, with up to 78% experiencing this symptom (Bossola, Pepe, & Vulpio, 2018; Kara, 2016). Xerostomia is caused by a lower rate of salivary flow in these patients (Bossola & Tazza, 2012). Although xerostomia is a subjective feeling, it may negatively affect the social activities and personal lives of these patients; may engender difficulties in tasting, chewing, and swallowing; and may cause bad breath (G. Yang et al., 2017). In particular, xerostomia causes patients on hemodialysis to feel thirsty and to drink more water, which may lead to failure to comply with fluid restriction regimens. It has been estimated that only 25%–30% of patients on hemodialysis reduce their dietary fluid intake to 1 liter per day or less (Howren et al., 2015). Poor adherence to fluid restriction has been associated with interdialytic weight gain (IDWG), which may lead to serious complications such as hypertension, congestive heart failure, and death (Kalanter-Zadeh et al., 2009).

Prior strategies for alleviating xerostomia include salivary substitutes such as oral pilocarpine and mechanical stimulation of the salivary gland (e.g., chewing gum). However, salivary substitutes may cause hot flashes, chest tightness, or dyspnea, and chewing gum may not have a significant effect on xerostomia and may overwork the masticatory muscles and teeth (Bossola & Tazza, 2012). Thus, a valid and standardized therapy for controlling xerostomia in patients on hemodialysis remains to be introduced.

Constipation is a highly prevalent gastrointestinal problem (40%–73%) that adversely affects the physical and mental well-being of patients on hemodialysis (Tvistholm, Munch, & Danielsen, 2017). Fluid and food intake restrictions that are necessary to maintain the patient’s “dry weight” are the main causes of constipation and xerostomia. Common remedies for constipation are the intake of dietary fiber and water and increased physical activity. However, these methods are...
not always suitable for patients on hemodialysis, who must instead rely on laxatives (Y. M. Lee et al., 2006). The long-term use of laxatives may worsen constipation because it may alter the intestinal mucosa, weaken muscle tension, and reduce normal bowel reflexes. Moreover, previous studies have reported that laxatives are ineffective for 23%–45% of patients with constipation (Li, Lee, & Suen, 2014). Therefore, a more effective management strategy for constipation should be developed.

Unless they receive a kidney transplant, it is essential for patients to receive dialysis two or three times per week. Patients experience physical and emotional stress from not only the dialysis but also the strict and complex therapeutic regimen, which may significantly decrease their quality of life (Morganstein, 2005). Eating is a basic human desire, a source of joy, and an important social activity that is closely linked to life quality (Delahanty, Hayden, Ammerman, & Nathan, 2002). It is desirable for patients on hemodialysis to gain satisfaction and pleasure from eating despite their dietary restrictions and limitations. However, their diet-related quality of life is often reduced by the burden of and dissatisfaction with their diet therapy (J. Lee, Kim, & Kim, 2013) as well as gastrointestinal symptoms such as xerostomia and constipation (E. K. Yang & Kim, 2016). Therefore, nursing interventions should aim not only to alleviate constipation and xerostomia but also to enhance quality of life.

Auricular acupressure (AA) is one of the most popular complementary therapies, as it stimulates specific auricular acupoints to manage physical and psychological health. Several different theories have been developed to provide a framework for understanding the mechanisms that underlie AA (Oleson, 2014). AA was first documented in a classical Chinese medical book, The Yellow Emperor’s Classic of Internal Medicine, in which the ear is posited to share a close relationship with the meridians and internal organs in the human body (Y. Wang, 2008). According to this book, the six yang meridians enter the ear directly or distribute to areas surrounding the ear (Y. Wang, 2008), whereas the six yin meridians connect to the ear indirectly through their corresponding yang meridians (Oleson, 2014). The compression of the auricular acupoints helps activate the meridians, balance yin and yang, and control the circulation of vital energy (Qi), with the aim of resolving health problems and restoring health (Yeh et al., 2014). Traditional Chinese medicine holds that the ear is closely connected with a number of internal organs, including the five Zang organs (liver, heart, spleen, lungs, and kidneys) and the six Fu organs (gall bladder, small intestine, stomach, large intestine, bladder, and triple energizer). Pathological changes in a person’s organs are reflected in the external ear. Therefore, acupuncture or acupressure on the ear treats ailments of these organs (Oleson, 2014; Y. Wang, 2008). The World Health Organization acknowledged AA as the most scientifically developed method of the microacupuncture systems (Working Group on Auricular Acupuncture Nomenclature & World Health Organization Traditional Medicine Unit, 1991).

Unlike acupuncture, AA is noninvasive, safe, and easy to implement. Therefore, it is well suited for application in clinical practice to alleviate discomfort and distress (Li et al., 2014). AA has been found to effectively alleviate physical and psychological symptoms in patients on hemodialysis, including fatigue, uremic pruritus, constipation, and depression (Li et al., 2014; S. Wang et al., 2014). AA may stimulate the vagus nerve, which triggers residual salivary secretory capacity (G. Yang et al., 2017). Application of pressure to auricular acupoints may also stimulate secretion of neuropeptides such as neuropeptide Y and neurokinin A, which increase salivary flow (Bossola et al., 2018). However, the effect of AA on xerostomia in patients on hemodialysis has not been adequately investigated. One study on 28 patients on hemodialysis found that acupressure significantly reduced thirst and increased salivary flow rates in comparison with placebo acupressure, which was applied before the actual acupressure (L. Y. Yang, Yates, Chin, & Kao, 2010). However, practice effects because of the within-group repeated measurements may have affected the internal validity of this investigation. Another study showed that a 4-week AA reduced xerostomia in maintenance patients on hemodialysis (G. Yang et al., 2017). However, the lack of a control group negatively affected the validity of that study’s findings.

The objective of this randomized, placebo-controlled trial was to examine the effects of AA on physical and mental health in patients on hemodialysis. Applying AA was expected to reduce xerostomia and constipation in patients on hemodialysis, leading to a decrease in IDWG, which would, in turn, enhance the diet-related quality of life of these patients. This study tested the following hypotheses: (a) The experimental group receiving the 4-week AA therapy intervention will have significantly less xerostomia and IDWG and a significantly higher salivary flow rate than the control group, (b) constipation will decrease significantly more in the experimental group than in the control group, and (c) diet-related quality of life will improve significantly more in the experimental group than in the control group.

**Methods**

**Design and Participants**

This single-blinded, randomized, and placebo-controlled study was conducted between October and November 2017. The study sites were two hemodialysis centers in a metropolitan city in South Korea that were similar in size, staff composition, number of patients, and operational status. In each center, patients on hemodialysis were randomly divided into an experimental group and a control group. The selection process and the study procedure are shown in Figure 1. An advertisement regarding the research program was posted on the message board of two hemodialysis centers. Seventy-five patients expressed interest in the study. Of these, 60 met the selection criteria and were randomly assigned to one of the two groups (Center A: experimental group, n = 12;
control group, \( n = 16 \), Center B: experimental group, \( n = 18 \); control group, \( n = 14 \) by tossing a coin (heads: experimental group; tails: control group). Patients aged \( \geq 20 \) years who were on regular hemodialysis three times a week, had experienced xerostomia in the last month, had IDWG \( \geq 1 \) kg at the beginning of the study, and had fulfilled the Rome III diagnostic criteria for constipation were included in the study. A patient was considered to have fulfilled the Rome III diagnostic criteria if two or more of the following six criteria were met for more than 25% of defecations in at least 3 of the previous 6 months: straining, lumpy or hard stools, sensation of incomplete evacuation, sensation of anorectal obstruction/blockage, application of manual maneuvers, and fewer than three defecations per week (Longstreth et al., 2006).

The exclusion criteria were as follows: patients with a skin condition (e.g., ulcer or rash) on the AA site; patients taking medication such as tricyclic antidepressants, anticholinergics, antihistamines, or beta-blockers that could cause xerostomia (patients were asked to stop taking this type of medication at least 1 week before participation); and patients currently participating in a bowel-training program. The sample size was calculated using G*Power 3.1 (Heinrich Heine University, Dusseldorf, Germany). The study of G. Yang et al. (2017) was referenced to determine sample size. A sample size of 52 (26 in each group) was identified as necessary to detect a large effect size \((d = 0.80)\) between two independent sample means at \( \alpha = .05 \) with a power = 0.80.

**Intervention and procedures**

This study was preceded by a 4-week pilot investigation to test the feasibility of AA. In the pilot test, AA was applied to two patients on hemodialysis who met the inclusion criteria. The results of the pilot test indicated the feasibility of applying AA to a larger group.

The experimental group received AA, which included the application skin tape with a *Semen vaccariae* seed for 4 weeks, and the control group received only the skin tape (without a *Semen vaccariae* seed) on the same auricular acupoints for the same period. The *Semen vaccariae* seeds used in this study have been shown in previous studies on patients on hemodialysis to be safe and effective for xerostomia treatment (G. Yang et al., 2017). An AA protocol was developed based on a review of the literature (Li et al., 2014; National Department of Meridian Acupoints, 2000; G. Yang et al., 2017; L. Y. Yang et al., 2010) and in consultation with an AA specialist. The intervention lasted 4 weeks and was conducted by a master’s-prepared registered nurse who had been trained for this study by the researcher. All of the participants in the experimental group received AA on five auricular acupoints, including the large intestine (CO7), San Jiao
According to the meridian and Zang–Fu theories, the large intestine, San Jiao, middle triangular fossa, and spleen points help alleviate constipation, whereas stimulation of the upper tragus point is effective in increasing saliva secretion and reducing thirst (Li et al., 2014; G. Yang et al., 2017). For AA to be effective, auricular acupoints should be pressed until the subject feels dullness, pressure, or distention (L. Y. Yang et al., 2010). We defined the force of finger pressure as 0.3–0.5 kg during the pilot test, and the same pressure range was used in the main study. AA was applied while the participants were receiving hemodialysis. The area to which AA was applied was sterilized using 70% alcohol. A section of tape to which one *Semen vaccariae* seed was attached was applied to each acupoint and maintained for 4 weeks. The participants were asked to press each seed four times per day or whenever they experienced thirst. To avoid skin irritation, the ears were treated alternately for 1 week each. Stickers were replaced at each dialysis session, and participant AA performance was evaluated. Outcomes were measured at baseline and after the 4-week intervention period in both groups.

**Ethical Considerations**

This study was approved by the institutional review board at the host institution (K-1709-001-009). The researchers explained the study purpose and procedures to the participants and obtained written informed consent. Participants in the control group received AA treatment after the study had ended.

**Measures**

**General characteristics**

Demographic and clinical data collected on the participants included age, gender, socioeconomic status, drinking status, smoking status, regular exercise status, years on hemodialysis, comorbidities, diabetes mellitus history, and use of laxatives. To measure exercise status, a criterion introduced by the investigator was used. A participant was classified as a “regular exerciser” if they exercised for 20 minutes at least 3 days per week for more than 6 months and a “nonexerciser” if they did not exercise on a regular basis.

**Xerostomia**

Participants rated their xerostomia using a visual analog scale ranging from 0 = *no thirst* to 10 = *extreme thirst*.

**Salivary flow rate**

Salivary flow rate was measured using the amount of unstimulated saliva absorbed in oral cotton. Participants refrained from eating, drinking, and oral care at least 1 hour before this measurement, and saliva was collected for 5 minutes without stimulation. The collected saliva was measured to a sensitivity of 0.0001 g using a CAS electric scale 120 (Seoul, Korea). The weight of the collected saliva was converted to a secretion-per-minute value (ml/min).

**Interdialytic weight gain**

IDWG, defined as the difference in predialysis and postdialysis body weights, is calculated as the weight difference (kilograms) between the body weight immediately before and the body weight immediately after a consecutive hemodialysis treatment. In this study, body weight was measured using a CAS electronic scale 200B (Seoul, Korea). Pre- and post-IDWG were measured before (baseline) and after the 4-week intervention. IDWG was calculated by averaging the weekly IDWG values.

**Constipation**

The constipation assessment scale (CAS) was used to assess constipation. The CAS was originally developed by McMillan and Williams (1989) and translated into Korean by S. Yang (1992). The CAS comprises eight items, respectively scored on a 3-point Likert scale (0 = *no problem*, 1 = *slight problem*, 2 = *serious problem*), and is used to determine constipation-related discomfort and ease of bowel movement. A higher CAS score indicates greater constipation severity. The reliability of the scale at the time of development was Cronbach’s $\alpha = .70$, and the reliability in this study was Cronbach’s $\alpha = .73$.

**Diet-related quality of life**

Diet-related quality of life was assessed using the Quality of Life Related to Dietary Change Questionnaire, which was developed by Delahanty et al. (2002) and modified by J. Lee et al. (2013). The questionnaire comprises three subcategories (“quality of life-related to dietary change,” “satisfaction,” and “dietary impact”), each of which includes 13, seven, and four items, respectively. Each item is measured using a 5-point scale, with higher scores indicating higher diet-related quality of life. The Cronbach’s $\alpha$ coefficient was .79 in the study by J. Lee et al. and .87 in this study.
Statistical Analysis
Data were analyzed using IBM SPSS Statistics Version 23.0 (IBM, Inc., Armonk, NY, USA). The homogeneity in general characteristics and in the variables of interest between the two groups was analyzed using the chi-square test, Fisher’s exact test, and t test. All data were normally distributed, as tested using the Kolmogorov–Smirnov test. A two-way, repeated-measures analysis of variance was used to investigate the main effect of AA over time according to group. Within-group analyses were conducted using paired t tests. The significance level was set at \( p < .05 \) for all analyses.

Results

Demographic and Baseline Characteristics
Four participants in the experimental group withdrew because of hospitalization (three participants) and moving to another area (one participant), and three participants in the control group withdrew because of hospitalization (two participants) and death (one participant), resulting in a dropout rate of 11.7%. Thus, data from 53 participants (experimental group, \( n = 26 \); control group, \( n = 27 \)) were used in data analysis.

Mean participant age was 64.4 ± 1.31 years, and 56.6% of the participants were men. Furthermore, 47.2% of the participants reported their economic status as “low,” mean duration of dialysis was 66.7 ± 56.21 months, nearly all of the participants (98.1%) had concomitant diseases, 52.8% had diabetes, 30.2% were smokers, and 77.4% drank alcohol. Half of the participants were regular exercisers (52.8%), 56.6% experienced bowel movements fewer than three times per week, and 22.6% regularly took laxatives. In the pretest, no significant difference was identified between the experimental group and the control group in terms of xerostomia, salivary flow rates, IDWG, constipation, or diet-related quality of life (all \( p s > .05 \); Table 1).

Intervention Effects
The xerostomia scores of the experimental group decreased at posttest (\( t = 6.08, p < .001 \)). A significant interaction effect between time and group on xerostomia scores was evident (\( F = 8.91, p = .004 \)). Salivary flow rates increased from baseline to posttest (4 weeks later) in the experimental group

### TABLE 1.

**Comparison of Participants’ General Characteristics**

| Characteristic                          | All (\( N = 53 \)) | Experimental Group (\( n = 26 \)) | Control Group (\( n = 27 \)) | \( \chi^2 \) | \( t \) | \( p \) |
|----------------------------------------|--------------------|-----------------------------------|------------------------------|------------|------|-------|
| Age (years; \( M \) and \( SD \))      | 64.40 1.31         | 67.30 10.60                       | 61.50 1.31                   | 1.64       | .108 |
| Gender (male)                          | 30 56.6            | 12 46.2                           | 18 66.7                      | 2.27       | .132 |
| Economic status                        |                    |                                   |                              |            |      |       |
| 1. High                                | 12 22.6            | 7 26.9                            | 5 18.5                       | 1.36       | .508 |
| 2. Middle                              | 16 30.2            | 6 23.1                            | 10 37.0                      |            |      |       |
| 3. Low                                 | 25 47.2            | 13 50.0                           | 12 44.4                      |            |      |       |
| Alcohol (yes)                          | 41 77.4            | 20 76.9                           | 21 77.8                      | 1.90       | .247 |
| Smoking (yes)                          | 16 30.2            | 7 26.9                            | 9 33.3                       | 0.26       | .611 |
| Comorbidities (yes)                    | 52 98.1            | 25 96.2                           | 27 100.0                     | 1.06       | .304 |
| Diabetes mellitus (yes)                | 28 52.8            | 10 38.5                           | 18 66.7                      | 4.23       | .056 |
| Duration of hemodialysis (months; \( M \) and \( SD \)) | 66.70 56.21       | 61.04 63.36                       | 72.15 48.94                  | 0.71       | .480 |
| Regular exercise (yes)                 | 28 52.8            | 11 42.3                           | 17 63.0                      | 2.27       | .132 |
| Frequency of bowel movements (per week) |                    |                                   |                              |            |      |       |
| < 3                                    | 30 56.6            | 18 69.2                           | 12 44.4                      | 33.17      | .069 |
| Regular prescribed laxative usage (yes) | 12 22.6            | 4 15.4                            | 8 29.6                       | 1.54       | .327 |
| Xerostomia                             | 5.77 2.37          | 5.65 2.08                         | 5.89 2.65                    | −0.36      | .720 |
| Salivary flow rates (ml/minute)        | 0.48 0.49          | 0.53 0.49                         | 0.44 0.50                    | 0.64       | .523 |
| Interdialytic weight gain (kg)         | 3.00 1.19          | 3.10 1.30                         | 2.89 1.09                    | 0.64       | .525 |
| Constipation                           | 4.96 3.30          | 4.31 2.92                         | 5.59 3.57                    | −1.44      | .157 |
| Diet-related quality of life           | 68.57 12.08        | 67.46 13.76                       | 69.63 10.35                  | −0.65      | .521 |
(t = −7.07, p < .001). In addition, there was a significant Time × Group interaction effect on salivary flow rates (F = 7.19, p = .010). The mean IDWG score improved in the experimental group (t = 3.02, p = .006), whereas the control group remained largely unchanged (t = 0.28, p = .785). However, there was no significant interaction effect between time and group on IDWG scores (F = 3.18, p = .081).

The experimental group had significantly lower constipation scores (t = 3.02, p = .006) at posttest than at baseline. In addition, a significant interaction was identified between time and group for the constipation score (F = 7.35, p = .009).

The diet-related quality of life scores increased between baseline and posttest in the experimental group only (t = −9.25, p < .001). There was a significant interaction between time and group in diet-related quality of life (F = 52.89, p < .001; Table 2).

**Discussion**

The AA intervention executed in this study successfully improved xerostomia, salivary flow rate, constipation, and diet-related quality of life in patients on hemodialysis. The results of this study are meaningful because AA was shown to effectively alleviate common discomfort and improve mental well-being in patients on hemodialysis. This is important, as the number of patients on hemodialysis has been increasing at a rate of 5%–8% per year in South Korea (Korean Society of Nephrology, 2019). AA was shown to be effective in terms of significantly lowering xerostomia scores and increasing saliva secretion. These results are consistent with the results of a pilot observational study that conducted a 4-week AA intervention on patients on hemodialysis, in which xerostomia and saliva secretion significantly improved from baseline values (G. Yang et al., 2017). Xerostomia was likely improved because of the increase in saliva secretion, which was induced by the activation of the parasympathetic nervous system caused by the selective stimulus on the thirst auricular acupoint (Bossola & Tazza, 2012). Previous studies have shown the beneficial effects of acupuncture on the ears as a complementary treatment to alleviate xerostomia in patients who had received head and neck radiation therapy (Homb, Wu, Tarima, & Wang, 2014; Morganstein, 2005). Although these previous reports employed invasive acupuncture in different settings and patient populations, similar effects were found because both acupuncture and AA apply pressure to auricular acupoints to stimulate the circulation of Qi and restore normal bodily functions (National Department of Meridian Acupoints, 2000). Recent studies have recommended acupuncture for alleviating xerostomia using four acupoints (three on each ear and one on each index finger; Morganstein, 2005; G. Yang et al., 2017; L. Y. Yang et al., 2010). However, significantly increased salivary secretion from 0.53 to 1.17 ml/m was found in this study when pressure was applied to only one acupoint on the ear (TG1). Therefore, this simplified protocol may be sufficient to alleviate xerostomia, with the advantage of reducing skin discomfort by targeting fewer acupoints. Further studies are necessary to provide more concrete evidence for the efficacy of this protocol.

The mean IDWG of the participants before the experiment was 2.99 kg, which was higher than the 1.3 kg reported for Italian patients on hemodialysis (Bellomo, Coccetta, Pasticci, Rossi, & Selvi, 2015) and the 2.45 kg previously observed in Taiwanese patients (L. Y. Yang et al., 2010). This IDWG value is alarming because previous studies have consistently reported IDWG values greater than 1.5 kg to be

**TABLE 2.**

| Variable                        | n   | Pretest | Posttest | Time Effect × Group | Group × Time Effect |
|---------------------------------|-----|---------|----------|--------------------|--------------------|
| Xerostomia                      |     | Mean    | SD       | Mean              |        |
| Experimental group              | 26  | 5.65    | 2.08     | 2.96               | 6.08   |
| Control group                   | 27  | 5.89    | 2.65     | 5.15               | 1.55   |
| Salivary flow rates (ml/minute) |     | Mean    | SD       | Mean              |        |
| Experimental group              | 26  | 0.53    | 0.49     | 1.17               | −7.07  |
| Control group                   | 27  | 0.44    | 0.50     | 0.58               | −0.91  |
| Interdialytic weight gain (kg)  |     | Mean    | SD       | Mean              |        |
| Experimental group              | 26  | 3.10    | 1.30     | 2.60               | 3.02   |
| Control group                   | 27  | 2.89    | 1.09     | 2.84               | 0.28   |
| Constipation                    |     | Mean    | SD       | Mean              |        |
| Experimental group              | 26  | 4.31    | 2.92     | 1.69               | 5.08   |
| Control group                   | 27  | 5.59    | 3.57     | 4.89               | 1.46   |
| Diet-related quality of life    |     | Mean    | SD       | Mean              |        |
| Experimental group              | 26  | 67.46   | 13.76    | 84.73              | −9.25  |
| Control group                   | 27  | 69.63   | 10.35    | 70.33              | −0.53  |

*By paired t tests. **By two-way repeated-measures analysis of variance.*
significantly related to mortality (Kalantar-Zadeh et al., 2009) and increases or decreases of 1% in body weight as strongly related to mortality in patients on hemodialysis (Cabezas-Rodriguez et al., 2013). However, the results of this study failed to support the hypothesis that AA therapy reduces IDWG. This may be because of the 4-week duration of the study, which may have been too short to alter the water intake habits of the participants. However, IDWG decreased significantly after the intervention in the experimental group, which suggests that AA has beneficial effects on dietary fluid restriction by alleviating the symptoms of xerostomia. This finding should be verified using a longer duration of treatment. It has been emphasized in previous studies that symptom management should be prioritized to improve the effectiveness of a therapeutic regimen in patients on hemodialysis (G. Yang et al., 2017). Undoubtedly, AA is a safe method for these patients to self-manage xerostomia simply by pressing a specific point on the ear. Thus, AA may be a strategy with the potential to help patients on dialysis adhere to dietary fluid restrictions.

Furthermore, AA significantly reduced constipation in the experimental group. This result is similar to those of previous studies with regard to constipation (Li et al., 2014) and fecal impaction (Mojalli, Abbasi, Kianmehr, & Zamani, 2016) in patients on hemodialysis. Four of the acupoints used in this study (CO7, CO17, TF3, and CO13) promote bowel movement by regulating the circulation of blood, increasing intestinal peristalsis, and reducing the desiccation and hardening of stools (National Department of Meridian Acupoints, 2000). The participants in the experimental group reported easier passing and softening of their stools. A study conducted in South Korea revealed that patients on hemodialysis had a significantly longer transit time in the right and rectosigmoid colon than patients with chronic constipation (Y. M. Lee et al., 2006). Therefore, AA may be a suitable intervention for patients on hemodialysis who need to restrict fluid and dietary fiber intake and to shorten the duration of passage through the colon.

The diet-related quality of life score of the experimental group improved significantly, whereas that of the control group did not. These results concur with previous findings that AA improved the life quality in patients with diabetes and chronic kidney disease (S. Wang et al., 2014). Furthermore, this result supports findings that acupressure is helpful for managing symptoms such as sleep disturbances in patients on hemodialysis, resulting in enhanced health-related quality of life (Arab et al., 2016). Alleviation of constipation and increased chewing and swallowing ease because of the mitigation of xerostomia may improve diet-related quality of life. J. Lee et al. (2013) showed that diet-related quality-of-life scores in patients on hemodialysis were lower than those in patients with diabetes or hypercholesterolemia. In particular, patients with gastrointestinal symptoms, including constipation, had significantly lower scores for dietary-related quality of life than those without symptoms in that study. According to a phenomenological study of Korean patients on hemodialysis (E. K. Yang & Kim, 2016), participants perceived eating as a “painful” activity because they had been required to give up their favorite foods, could not eat as much as they would have liked, and found it difficult to taste or swallow foods. Therefore, it is strongly advised to include AA in nursing care to increase saliva secretion and decrease the discomfort associated with eating, with the goal of significantly improving quality of life in patients on hemodialysis (Kim & Kim, 2004; J. Lee et al., 2013).

This study is affected by several limitations. First, the small sample size may have resulted in Type II errors. Second, as data were collected 4 weeks after treatment only, no information regarding the long-term effects of AA is available. Finally, the recruitment of participants was restricted to South Korea, and thus the findings may not be generalizable to other populations.

Conclusions
AA decreases xerostomia and constipation and improves salivary flow rate and diet-related quality of life. AA acts through the stimulation of the acupuncture points of the ear to prevent disease, improve health, and enhance quality of life. Therefore, AA may be an important tool to alleviate negative symptoms and improve overall quality of life in patients on hemodialysis. In addition, because of its noninvasive nature, AA is recommended for use as an effective, independent nursing intervention.

Implications for Clinical Practice
On the basis of the findings of this study, nurses in hemodialysis centers should consider AA as a strategy to enhance the physical and mental well-being of patients on hemodialysis. Nurses may teach AA as an intervention to help patients with xerostomia and constipation to manage their discomfort. Therefore, AA may help patients on hemodialysis better control fluid ingestion and blood pressure and reduce their risk of developing cardiovascular disease.

Author Contributions
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