

Effect of Auricular Acupressure on Nausea, Vomiting, and Retching in Patients with Colorectal Cancer Receiving Chemotherapy



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Purpose: The purpose of this study was to evaluate the effects of auricular acupressure on nausea, vomiting, and retching in patients with colorectal cancer receiving chemotherapy. **Methods:** A non-equivalent control group with a pretest-posttest design was used. The participants were assigned into either the control or the experimental group. The patients were recruited from November 2013 to March 2014 from a tertiary hospital in Seongnam city, South Korea. A total of 50 patients completed the study. The Korean version of the Index of Nausea, Vomiting, and Retching (INVR) was used. **Results:** The experimental group showed significantly lower nausea ($p=.011$) and retching ($p=.014$) than did the control group after receiving auricular acupressure. There were significant interaction effects between time and group on auricular acupressure on nausea ($F=3.11$, $p=.009$) and retching ($F=3.01$, $p=.010$). There were significant interaction effects between time and group on auricular acupressure on total score of INVR ($F=8.23$, $p<.001$). **Conclusion:** Auricular acupressure therapy is effective in relieving nausea and retching after chemotherapy. Auricular acupressure intervention could be used to improve the quality of life for patients with colorectal cancer.

Key Words: Acupressure, Colorectal neoplasm, Nausea, Vomiting

INTRODUCTION

Colorectal cancer is the third and second most common cancer worldwide in men and women, respectively [1]. Westernized diet and lifestyle are considered to be some of the principal reasons for the increase in the prevalence of colorectal cancer in Korea and other developed countries [2,3].

Surgery and radiation therapy are effective conventional treatments for patients with colorectal cancer [4]. However, chemotherapy is often crucial for those with early onset cancer, and recurrence of cancer after surgery [5]. Chemotherapy is the most common treatment; however, it can damage normal as well as cancerous cells, which could result in unexpected physical side effects [6]. Such unpleasant side effects of chemotherapy include nausea, vomit-

ing, stomatitis, constipation, diarrhea, leukopenia, and thrombocytopenia [7].

It has been reported that 70.0% to 80.0% of cancer patients experience nausea, vomiting, and retching [8]. These symptoms might have serious social consequences apart from physical and psychological ones [7]. In particular, pharmacological medicines such as oxaliplatin, irinotecan, and 5-fluorouracil often cause nausea and vomiting for a couple of days after administration [9]. These symptoms after and during chemotherapy might lead to dystrophias due to insufficient food intake, eventually exerting a negative influence on treatments [10].

Interventions to alleviate nausea and vomiting might include a combination of pharmacological and non-pharmacological treatments [11]. Pharmacological interventions can be exemplified by serotonin antagonists, central nervous

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system depressants, and antihistamines [9]. However, it was also reported that 56.5% of patients taking such antiemetics still suffer from nausea and vomiting [12]. Although the decrease in the incidence pharmacological prescriptions, studies have demonstrated that they are insufficient and suggested the use of non-pharmacological methods [10]. Acupressure is one such non-pharmacological method for minimizing nausea and vomiting [13]. It has several benefits, including non-invasiveness [14], not requiring any specific tools or instruments, availability, and ease of use to such an extent that it can be learned by nurses and patients alike, which may eventually promote its application by patients themselves, thereby eliminating the need to visit the doctor's clinics [7,15].

Auricular acupressure is an oriental medical intervention that applies acupressure or stimulates trigger points [16]. Stimulating trigger points on the ears would deliver stimuli to the contralateral side of the brain, with the information eventually crossing over to the side initially stimulated [17]. Auricular acupressure on the point zero, stomach, brainstem, Shen-men, and cardia was found to help reduce nausea and vomiting [18]. In this manner, the effect of the treatment has been determined [15]. In the field of nursing, auricular acupressure instead of acupuncture with needles has been used to alleviate pains and achieve the desired effect of treatments, placing non-invasive pressure on trigger points [16]. Some researchers have reported the effect of auricular acupressure on the reduction in nausea and vomiting [14-17]. However, little has been known about the effect of auricular acupressure on nausea, vomiting and retching in patients with colorectal cancer receiving chemotherapy in Korea. The suggestive effects of auricular acupressure, the non-invasiveness of the interventions [7,18], and its cost effectiveness [14] encourage researchers to investigate its efficacy in clinical settings.

Specifically, the purpose of this research was to investigate the effects of auricular acupressure on nausea, vomiting, and retching in patients with colorectal cancer patients receiving chemotherapy.

1. Conceptual Framework

For the auricular acupressure intervention, which strives to reduce nausea, vomiting, and retching among patients undergoing chemotherapy, the conceptual framework includes stimulating the reaction points, point zero, stomach, brainstem, Shen-men, and cardia, which are effective for controlling the aforementioned symptoms [18]. It rests on the notion that psychological responses occur when the elements of cortical stimulation and the vomiting center acting through the vagus nerve are combined, which brings signals from the gastrointestinal tract (Figure 1).

2. Research Hypotheses

Hypothesis 1. The patients receiving auricular acupressure (experimental group) will show less nausea, vomiting, and retching than those not receiving auricular acupressure, but a placebo intervention instead with non-acupressure stickers (control group).

Hypothesis 2. The patients receiving auricular acupressure (experimental group) will show interaction effects of groups and times in the level of nausea, vomiting, and retching.

METHODS

1. Study Design

This study had a quasi-experimental design using a pre-

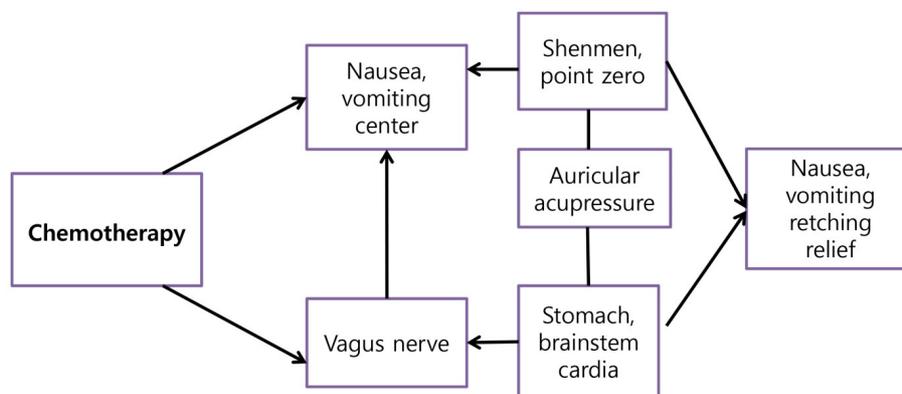


Figure 1. Conceptual framework.

test-posttest non-equivalent control group to examine the effects of auricular acupressure on patients with colorectal cancer.

2. Setting and Samples

The subjects of the present research consisted of a group of 50 patients who were diagnosed with colorectal cancer and visited Bundang CHA General Hospital Cancer Center located in Seongnam city between November 2013 and March 2014 for their chemotherapy. The criteria for being selected as research subjects included: 1) being older than 20 years and understanding the questions, 2) having no lesion of the ears or hearing aids, 3) having no brain injury symptom, 4) undergoing antiemetic drug therapy, 5) having no experience of undergoing auricular acupressure, and 6) having had at least two cycles of chemotherapy. The sample size was calculated with a t-test using G*Power [19] following Cohen's sampling method, with the level of significance set at 0.05, effect size at 0.5, and test power at 0.80 (sample size was calculated based on Yeh et al.'s [20] study, which needed 80% power at an effect size of 0.5). The combined results from six studies showed acupressure at the "correct" points to be more effective than control interventions, with an effect size of 0.55 ($Z_{0.553}=0.71$), a result which is confirmed to have a 21.0% greater effect than the control interventions [21].

The size of a group needed to examine the differences between the averages of two groups was calculated to be 23. A total target of 50 participants was set after considering a maximum 10% drop rate. The reason for limiting the use of chemotherapy to the second cycle or later is that nausea and vomiting become more severe after the second cycle of chemotherapy [22].

3. Intervention

This research started with a thorough literature review of past studies of auricular acupressure [14-17] and on nausea, vomiting, and retching. The auricular acupressure was conducted with a combination of ear massage and attaching acupressure stickers. The treatment utilized Benjamin and Tappan's ear massage protocol [23] and the method of applying stickers on five points on the ear used in Lee et al. [24]. Nausea, vomiting, and retching were measured six times in total (for two days). Auricular acupressure was applied to patients in the ward on the day after hospitalization (chemotherapy day) thrice per day for two days. On the other hand, the control group did not receive any massage, and non-acupressure stickers rather

than acupressure stickers were used for the study. Before massaging the ear, both ears were cleaned and disinfected with cotton with physiological saline solution. Adopting Benjamin and Tappan's acupressure protocol [23], a variety of massage techniques were employed to help blood circulation of the acupoints: pressing ears, stretching earlobes, crumpling ears, rubbing ears, pulling ears, and suppressing and pulling ears [24]. After massage treatments and checking patients' responses, acupressure stickers were attached to the acupoints. Acupressure stickers used for the present research were those with a 1 mm grain of red clay affixed to 3M's 0.8 cm × 0.8 cm plasters. Adopting Lee et al.'s model [24], the stickers were attached to the areas of the point zero, stomach, brainstem, Shen-men, and cardia. Using the thumb and the index finger, pressure was applied for three seconds, counting "one, two, three," to the stickers for a set of 10 sessions. Pressure was applied at such a level that the patients experienced pain. The patients were taught to apply such a treatment four times a day, or on the occurrence of nausea with a set of 10 sessions of pressing.

The process of applying auricular acupressure was as following. 1) The participant was instructed to assume comfortable position for applying auricular acupressure. 2) Auricular stickers with seeds were applied to the five acupoints: point zero, stomach, brainstem, Shen-men, and cardia. 3) Each area applied with sticker was pressed hard until the participant experienced mild pain. 4) Participants were then instructed to manually stimulate the areas applied with paste thrice a day.

4. Measurements

Nausea, vomiting, and retching

This research adopted the Korean version of Rhodes and McDaniel's Index of Nausea, Vomiting, and Retching (INVR) [25] and approved by the developers. The INVR was designed to measure the frequency, distress, and duration associated with nausea and the amount of vomiting [26]. The score for each item ranges from 0 to 4; higher scores indicate greater severity of the symptoms. It is an eight-item instrument that uses a five-point Likert scale and comprises three subscales: nausea (range, 0~12), vomiting (range, 0~12), and retching (range, 0~8). A total score between 0 and 32 can be obtained, with a greater score representing a greater level of these symptoms. It focuses on all three domains of the experience (nausea, vomiting, and retching) in terms of their occurrence, amount, and duration [26]. Cronbach's α of Rhodes and McDaniel's [26] INVR was .98, whereas that of the Korean version of the

INVR was .94 in this study.

5. Ethical Consideration and Data Collection

Ethical approval for the study was granted by the institutional review board of CHA general hospital (IRB no. 2013-12-127). The board confirmed that the study did not violate human rights, and all contents and processes conformed to the conduct of appropriate research ethics.

Researchers and one assistant completed training of the auricular acupressure and were taught by a professor of oriental medicine to be able to place acupressure at accurate points.

Data was collected at CHA general hospital located in Seongnam city. A total of 50 patients who were scheduled to receive folinic acid, fluorouracil, and oxaliplatin (Folfox) in chemotherapy were divided into two groups of 25 each: experimental and control. The research subjects were explained the purpose of the present research and informed consent for participation was sought.

6. Data Analysis

The collected data were analyzed using SPSS 21.0. Their general characteristics were analyzed using features such as frequency, percentage, average, and standard deviation. The homogeneity of the general characteristics of the two groups was tested using χ^2 test, independent t-test, and Mann-Whitney non-parametric test, while testing for normality was conducted using the Kolmogorov-Smirnov method. The proposed hypotheses were tested by comparing the level of nausea, vomiting, and retching through an independent t-test. An analysis of variance (ANOVA) was conducted for additional verification by controlling exogenous variables. We investigated the time effect of auricular acupressure as well as group effect. Therefore, a repeated measures ANOVA was performed to examine the differences between the two groups under discussion and at three different times. To verify the sphericity assumption, the variance of the outcome variables was verified as being homogeneous (Mauchly's $W=.90, p=.136$).

RESULTS

1. General Characteristics of the Subjects

Table 1 shows the result of the chi-squared test and independent t-test for the general characteristics of the two groups. The subjects had an average age 51.5 years and included 24 men and 26 women. Overall, it was found that

there was no statistically significant difference between the two groups, suggesting homogeneity of the two groups.

Disease-related characteristics of the subjects

The homogeneity of the disease-related characteristics of the two groups were examined using the chi-squared test and independent t-test (Table 1). Among the brands of antiemetic agent used, Zofran (44.0%) was the most common. Most patients (70.0%) took antiemetics 0 to 3 times per day. Of the subjects, 12 patients (24.0%) were also undergoing radiation therapy. A significant difference between the two groups in terms of disease-related characteristics was found for antiemetics and experience of radiation therapy ($\chi^2=4.71, p=.008, \chi^2=5.12, p=.020$).

2. Homogeneity of Dependent Variables between Two Groups

An independent t-test was conducted to examine the homogeneity of the dependent variables. As shown in Table 2, the two groups could be considered homogeneous in terms of nausea, vomiting, and retching before auricular acupressure treatments.

3. Test of Hypotheses

Hypothesis 1. The patients undergoing auricular acupressure (experimental group) will experience less nausea, vomiting, and retching than those (control group). In order to test Hypothesis 1, types of antiemetics and experiences of radiation therapy were set as covariates. The experimental group had a significantly lower level of nausea, vomiting, and retching after auricular acupressure, with a score of 10.61 at posttest 2 (1 week after anticancer treatment) in contrast to 13.61 at pretest. Conversely, the control group showed increased nausea, vomiting, and retching 1 week after the anticancer treatment at posttest 2 ($F=3.31, p=.018$). Therefore, Hypothesis 1 was supported.

Hypothesis 2. There will be interaction between groups and times in the level of nausea, vomiting, and retching in the experimental and control group before and after intervention. Hypothesis 2 was tested using repeated measures ANOVA for nausea, vomiting, and retching measured at three different times: before chemotherapy, after chemotherapy, and 7 days after auricular acupressure. It was found that there were significant differences between the two groups and the three different times in the level of these symptoms. Changes in nausea, vomiting, and retching in both groups are presented in Table 3. There was a significant difference in nausea ($F=2.64, p=.011$) and ret-

ching ($F=2.23, p=.014$) in the interaction between groups. However, there was no statistically significant difference in nausea ($F=1.71, p=.307$), vomiting ($F=1.97, p=.057$), and retching ($F=1.24, p=.255$) in the interaction between time. Table 3 summarizes the results of the nausea, vomiting, and retching between and within the groups. There were significant interaction effects between time and group on auricular acupressure on nausea ($F=3.11, p=.009$) and retching ($F=3.01, p=.010$). There were significant interaction effects between time and group on auricular acupressure on total score of INVR ($F=8.23, p<.001$)(Table 3).

DISCUSSION

This study used a non-equivalent control group with a pretest-posttest design to examine the effects of auricular acupressure on nausea, vomiting, and retching in patients with colorectal cancer who received chemotherapy. Auricular acupressure has been practiced as a complementary treatment for nausea, vomiting, and retching [20,21,27]. This study's results indicated that auricular acupressure significantly reduced nausea and retching scores. This finding is consistent with those of previous studies conducted

Table 1. Homogeneity Test of General and Disease-related Characteristics between Two Groups (N=50)

Characteristics	Categories	Exp. (n=25)	Cont. (n=25)	Total (n=50)	χ^2 or t (p)
		n (%) or M±SD	n (%) or M±SD	n (%) or M±SD	
Gender	Men	11 (22.0)	15 (30.0)	26 (52.0)	2.00 (.340)
	Women	14 (28.0)	10 (20.0)	24 (48.0)	
Age (year)		53.42±4.15	49.10±3.78	51.51±2.15	1.52 (.200)
Education (year)		11.45±2.02	11.37±4.23	11.40±3.79	0.69 (.480)
Diagnosis period (month)	>6	10 (22.0)	9 (18.0)	19 (38.0)	2.77 (.090)
	6~11	8 (16.0)	12 (24.0)	20 (40.0)	
	≥12	6 (12.0)	5 (10.0)	11 (22.0)	
Stage	II	5 (10.0)	6 (11.0)	11 (27.0)	3.57 (.070)
	III	13 (25.0)	11 (21.0)	24 (49.0)	
	IV	7 (15.0)	8 (18.0)	15 (34.0)	
Experience of operation	Yes	15 (30.0)	20 (41.0)	35 (72.0)	0.53 (.400)
	No	10 (20.0)	5 (10.0)	15 (28.0)	
Antiemetics	Zofran	13 (26.0)	9 (18.0)	22 (44.0)	4.71 (.008)
	Macperan	8 (16.0)	11 (22.0)	19 (38.0)	
	Aloxi	2 (4.0)	1 (2.0)	3 (6.0)	
	Emend	2 (4.0)	4 (8.0)	6 (12.0)	
Frequency of taking antiemesis medicine (per day)	0~3	16 (32.0)	19 (38.0)	35 (70.0)	0.91 (.770)
	4~5	7 (14.0)	4 (8.0)	11 (22.0)	
	≥6	2 (4.0)	2 (4.0)	4 (8.0)	
Experience of radiation therapy	Yes	8 (16.0)	4 (8.0)	12 (24.0)	5.12 (.020)
	No	17 (34.0)	21 (42.0)	38 (76.0)	

Exp.=experimental group; Cont.=control group.

Table 2. Homogeneity Test of Dependent Variables between Two Groups (N=50)

Variables	Exp. (n=25)	Cont. (n=25)	t	p
	M±SD	M±SD		
INVR-Nausea	7.87±3.95	8.21±2.59	0.74	.460
INVR-Vomitting	5.20±1.30	4.97±2.32	0.50	.670
INVR-Retching	2.67±1.12	2.88±1.91	0.87	.390
Total	13.61±6.88	14.89±8.01	1.21	.090

Exp.=experimental group; Cont.=control group; INVR=Index of Nausea, Vomiting and Retching.

Table 3. Distribution Analysis of Repeated Measures of Nausea, Vomiting and Retching between Two Groups (N=50)

Categories	Group (n)	Pretest	Posttest 1 [†]	Posttest 2 [†]	Source	F	p
		M±SD	M±SD	M±SD			
INVR-Nausea	Exp. (n=25)	7.87±3.95	9.91±4.95	9.12±3.17	Group effect	2.64	.011
	Cont. (n=25)	8.21±2.59	8.80±5.87	11.27±5.19	Time effect	1.71	.307
					G×T effect	3.11	.009
INVR-Vomiting	Exp. (n=25)	5.20±1.30	10.33±4.51	10.20±3.99	Group effect	1.64	.068
	Cont. (n=25)	4.97±2.32	10.41±4.95	11.19±4.88	Time effect	1.97	.057
					G×T effect	1.05	.071
INVR-Retching	Exp. (n=25)	2.67±1.12	3.75±2.62	2.11±2.01	Group effect	2.23	.014
	Cont. (n=25)	2.88±1.91	3.28±2.87	2.94±1.62	Time effect	1.24	.255
					G×T effect	3.01	.010
Total	Exp. (n=25)	13.61±6.88	11.74±4.88	10.61±1.88	Group effect	3.98	.016
	Cont. (n=25)	14.89±8.01	12.11±5.62	13.89±2.01	Time effect	3.31	.018
					G×T effect	8.23	<.001

Exp.=experimental group; Cont.=control group; INVR=Index of Nausea, Vomiting and Retching; G×T=Group & Time;

[†] After chemotherapy; [†] 7 days after chemotherapy.

on patients with breast cancer [20] and gynecological cancer [27]. Although previous studies have been conducted in settings and with patient populations different from those of this study, the same positive results suggest that acupressure is a complementary therapy effective for reducing nausea and retching. Similarly, auricular acupressure was also found to prevent Chemotherapy-Induced Nausea and Vomiting (CINV) in children undergoing chemotherapy [20]. However, a previous study conducted a week after each of three rounds of chemotherapy showed unclear findings that acupuncture and sham acupressure equally reduced nausea and vomiting. Selection of the acupressure point and the frequency and duration of acupressure might vary the treatment effect. In this study, acupressure applied consistently thrice a day might have a therapeutic dose of acupressure that was adequate for reducing nausea and retching.

The results of this study are expected to provide convincing evidence regarding effectiveness of auricular acupressure for patients with colorectal cancer receiving chemotherapy. The participants who received auricular acupressure had reduced INVR scores on nausea and retching; auricular acupressure was thus demonstrated to be an effective intervention to relieve nausea and retching. Significantly lower INVR-nausea scores in the experimental group were similar to the results from a study that reported lower occurrence and severity of nausea among patients through application of an ear seed at five auricular acupoints in the experimental group [20].

It was found that the experimental group showed a lower level of nausea and retching in posttests. Additionally, vomiting level in the experimental groups improved over

the course of the study, and it was at a higher level than that of control group. However, the difference was not statistically significant. Although different instrument was used in the past study, it reported that the use of auricular acupressure led to the decrease in the number and intensity of nausea and vomiting in experimental group, which were significantly lower than those of the control group after the acupressure [18]. The sample in Eghbali et al.'s [18] study was different from that in this study in terms of diagnosis and chemotherapeutic agents. However, another study used an intervention for CINV in children [20] reported no significant differences in nausea and vomiting between auricular acupressure intervention group and sham auricular points group. Further studies that added a sham group is required to clarify the effects of auricular acupressure.

There are several limitations to consider in our study. First, nausea intensity was not evaluated during the adjuvant therapy, in particular, during chemotherapy, which is a period of intense nausea. More data about frequency would have given comprehensive information about the intervention effects on nausea, vomiting, and retching intensity. Second, this study had a small sample size, which was heterogeneous in terms of the antiemetic regimens prescribed and the patient characteristics (including age and sex).

These results indicate that the participants in the experimental group felt more comfortable than those in the control group at posttest. These positive findings regarding relief from nausea and retching suggest the efficacy of the intervention. Auricular acupressure is a therapy that is easy to learn. By simply stimulating acupoints on the ears,

we can expect a curative effect similar to stimulating the meridian system of the whole body. A more comprehensive assessment of the effect of auricular acupressure on nausea, vomiting, and retching is needed in the future.

CONCLUSION

The present research identified the effect of auricular acupressure on nausea, vomiting, and retching in colorectal cancer patients receiving chemotherapy. The results lead us to propose that auricular acupressure should be utilized as a nursing intervention for such patients.

Based on the present results, we provide the following suggestions. First, further research is necessary to support the identified effect of auricular acupressure on nausea, vomiting, and retching. The same line of research may be conducted in patients with kinds of cancer other than colorectal. Second, further research should secure homogeneity in terms of medication pretest and posttest, since there was no pretest homogeneity in this study.

CONFLICTS OF INTEREST

The authors declared no conflict of interest.

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