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Effect of Peppermint Oil Inhalation on Postoperative Nausea and Vomiting

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BACKGROUND/AIMS
Nausea and vomiting cause a feeling of illness that is frequently observed after surgical interventions, and they often lead to increased dissatisfaction and prolonged hospitalization period of the patient. The aim of this study was to determine the effect of peppermint oil inhalation on postoperative nausea and vomiting.

MATERIAL and METHODS
This study is a randomized clinical trial. Fifty-six patients who had undergone surgery at the department of orthopedics and traumatology of a university hospital between November 2015 and April 2016 and who met criteria of the study were separately investigated under experimental (n=27) and control (n=29) groups. Personal information form, Apfel Scoring System, and Visual Analog Scale were used to collect data. Peppermint oil inhalation was performed by patients in the experimental group, and all the patients were followed up to 48 h postoperatively.

RESULTS
There was a significant difference between the experimental and control groups with respect to nausea existence at 6-12, 12-24, and 24-48 h postoperatively. In the peppermint oil inhalation group (experimental), nausea existence was lower than that in the control group. Nausea was also not observed at 24-48 h postoperatively in the experimental group. According to personal Visual Analog Scale score results, there was a significant difference between the experimental and control groups at postoperative 2-6, 6-12, 12-24, and 24-48 h.

CONCLUSION
Peppermint oil inhalation was effective in decreasing postoperative nausea severity. In this study, it was proved that in patients susceptible to postoperative nausea and vomiting, peppermint oil inhalation is preferable to pharmacologic treatments because of its effectiveness and easy administration methods.

Keywords: Postoperative nausea and vomiting, complementary therapies, peppermint oil, nursing care

INTRODUCTION

Postoperative nausea and vomiting (PONV) related to anesthetic methods and drugs are among the most common and frequent postoperative problems. They lead to patient dissatisfaction and prolonged hospitalization (1, 2).

Postoperative nausea and vomiting is multifactorial; it is related to patient characteristics and surgery, and there are multiple underlying physiologic factors. PONV may cause aspiration of enteral contents in patients with insufficient laryngeal reflexes when awakening from general anesthesia and it increase the risk of mortality and morbidity (3).

Postoperative nausea and vomiting is defined as nausea and/or vomiting during postoperative 24 h. It is classified as early (2-6 h), late (6-24 h), and delayed (after 24 h). Age, gender, weight, personal factors, anxiety, preoperative medications, operation area and surgical method, anesthetic method and drugs, and postoperative factors have an effect on PONV (4-6).

Guidelines have been prepared for pharmacologic treatment of PONV, and with the help of these guidelines (in a 6-month period after guideline implementation), PONV incidence has decreased from 8.36% to 3%. However, pharma-

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cologic treatment is not effective in all cases, and drug-related adverse effects are possible (7).

Aromatherapy is a treatment method that uses herbal essences, such as lavender and peppermint oil. Peppermint oil has been used for medical treatment since ancient times. It finds use in treatment of nausea and vomiting because of its antiemetic and spasmolytic effects on the gastrointestinal system. Another effect of peppermint oil on the gastrointestinal system is its inhibitor effect on Substance P and serotonin-initiated muscle contractions (8-10).

The purpose of the study was to evaluate the effect of peppermint oil inhalation on PONV.

Hypotheses of the Study
Hypothesis 0 (H_0): Peppermint oil inhalation is ineffective on PONV.

Hypothesis I (H_I): Peppermint oil inhalation is effective on PONV.

MATERIAL and METHODS

Study Design
A randomized clinical trial

Setting
The study was conducted in the postoperative care unit of a university hospital in Nicosia city of Northern Cyprus.

Participants
Fifty-six patients aged between 18 and 86 years with American Society of Anesthesiology (ASA) classification risk group 1-2 were evaluated for observing effects of peppermint oil inhalation on PONV.

Patients operated in the university hospital between November 2015 and April 2016 for orthopedic diseases were evaluated in this study. Patients aged over 18 years with no known allergy to peppermint; having no cognitive, sensorial, or verbal problem in communication; undergoing no routine antiemetic medical treatment; operated with general anesthesia; and having no history of tracheostomy or intubation were included in the study.

Patients operated for high-risk PONV surgeries (head, neck, eye, ear, and intra-abdominal area), those with prolonged intubation where oil inhalation is not possible, and those necessarily requiring postoperative antiemetic treatment were excluded from this study. Informed consent was obtained from the patients.

Intervention
All included patients were followed up in the postoperative care unit, and treatment was not interfered with in both groups. Only oil inhalation was provided to the experimental group. Antiemetic treatment was allowed in case of nausea and vomiting.

Control Group
Operated patients were postoperatively followed up for nausea and vomiting severity. PONV at 0-2, 2-6, 6-12, 12-24, and 24-48 h were reported. Researcher did not interfere with routine treatment of patients.

Experimental Group
In the experimental group, peppermint oil was applied over the lip and spread over the mustache area 5 min following extubation. Peppermint oil (Tabia 2015-Turkey) was diluted to 1/10 with wheat oil to prevent skin irritation. Peppermint oil was applied five times in every 30 min to balance the decreased efficiency caused by evaporation. Natural inhalation was used. Patients were followed for PONV severity and vital signs at 0-2, 2-6, 6-12, 12-24, and 24-48 h.

Randomization
Patients were randomized into the two groups (experimental and control) using the sealed envelope method (Figure 1). The demographic and operative characteristics of the two groups were similar.

Measure
Data were reported and evaluated using the Personal Information Form (formed by literature research), Apfel Score, and Visual Analog Scale (VAS) (2, 4, 6, 9-12).

Personal Informatıon Form
It comprises five parts: descriptive information, patient information, surgical intervention information, the peppermint oil application form, and postoperative VAS score for nausea and vomiting.

Apfel Score
It is a scoring system that includes four variables, and each variant is scored for a point. The variants include female gen-

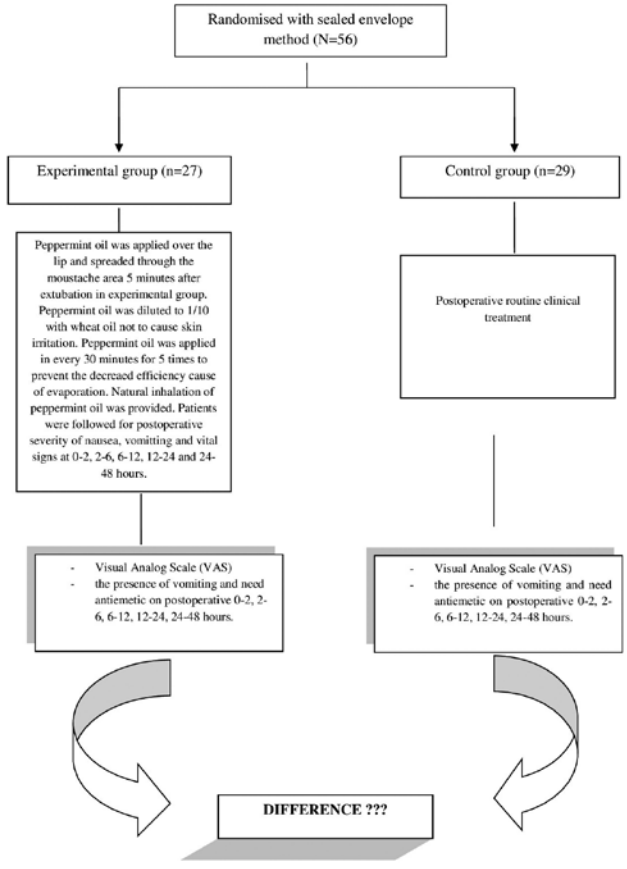

FIGURE I. Data collection

der, vehicle sickness and/or nausea and vomiting history during previous surgeries, non-smokers and postoperative necessity for opioids. Every variant is scored with 1 point. The score ranges from 0 to 4. An increased score indicates increased risk of PONV (11).

Visual Analog Scale (VAS)

It is used to convert subjective results to objective findings. A 100 mm scale is used in which the worst and the best parameter conditions are written on each side, and the patient is asked to mark his/her condition on this scale. VAS is a safe, easy, and a well-accepted test in literature (12).

In this study, VAS was used for measuring nausea severity (0-1: no nausea, 2-4: mild, 5-7: moderate, and 8-10: severe nausea) and vomiting existence (1: no vomiting; 2: vomiting exist) at postoperative 0-2, 2-6, 6-12, 12-24, 24-48 h. Thus, the experimental and control groups were compared for nausea severity and vomiting existence. This study was approved by Near East University Ethics Committee (2015/33-237).

Limitation of the Study

The limitation of this study was the small sample size. These research results can be generalized to patients included in sampling.

Statistical Analysis

Statistical Package for Social Sciences (SPSS), version 20.0 (IBM Corp.; Armonk, NY, USA) was used for evaluating and comparing data with frequency, percentage, chi-square test, Kolmogorov-Smirnov test, Mann-Whitney U test, independent sample test, and Pearson Chi-square test. Power analysis (power test) in the selected sample calculated at the end of study was 96%.

RESULTS

In this study, 44.4% of patients in the experimental group and 51.7% of patients in the control group were female. Age, height, weight, and body mass index (BMI) were found to be similar between the groups (Table 1).

When the general health condition and operative characteristics of patients were compared between experimental and control groups, ASA scores, chronic disease existence, and previous operation conditions were found to be similar (Table 2). There was no statistical difference between the two groups for antibiotic administration intraoperatively and postoperatively; antiemetic administration preoperatively and intraoperatively was also statistically similar between the two groups. Postoperative necessity for opioids was also similar between the experimental and control groups (p>0.05; Table 2).

In the experimental group, the Apfel score of 44.4% patients was 1 point, of 18.5% patients was 2 points, of 18.5% patients was 3 points, and of 18.5% patients was 4 points. In the control group, the Apfel score of 34.5% patients was 1 point, of 34.5% patients was 2 points, of 24.1% patients was 3 points, and of 6.9% patients was 4 points. Apfel scores were found to be statistically similar between the two groups (p>0.05; Figure 2).

TABLE 1. Patient-related descriptive statistics (n=56)

Measure	Group	$\bar{x}$	s	p
Age	Experimental	50.56	20.81	0.68
	Control	48.14	23.10	
Height (cm)	Experimental	167.81	7.29	0.35
	Control	169.86	8.91	
Body weight (kg)	Experimental	69.89	13.43	
	Control	78.14	13.72	0.30
BMI* (kg/m^2)	Experimental	24.90	5.20	0.10
	Control	27.20	5.09	

*BMI: body mass index

TABLE 2. General health condition and operative characteristics of patients (n=56)

	Experimental (n=27) %	Control (n=29) %	p
ASA			
ASA I*	62.96	65.52	0.32
ASA II**	37.04	34.48	
Chronic disease			
Exist	48.15	27.59	0.16
Not exist	51.85	72.41	
Surgery experience			
Yes	70.37	8.62	0.36
No	29.63	41.38	
Operation time			
<120 min	59.26	48.28	0.61
>120 min	40.74	51.72	
Intraoperative antibiotic administration			
Administered	85.19	86.21	0.91
Not administered	14.81	13.79	
Postoperative antibiotic administration			
Administered	77.78	89.66	0.72
Not administered	22.22	10.34	
Preoperative antiemetic administration			
Not administered	100.00	100.00	-
Intraoperative antiemetic administration			
Administered	77.78	82.76	0.86
Not administered	22.22	13.79	
Opioid analgesia administration			
Administered	18.5	6.9	0.83
Not Administered	81.5	93.1	

*ASA: American Society of Anesthesiology

Nausea existence at postoperative 0-2 and 2-6 h was statistically similar between the patients in the experimental and control group (p>0.05). Its ratio was higher in the control group at postoperative 6-12 h, 12-24 h, and 24-48 h (p<0.05; Table 3).

TABLE 3. Comparison of nausea in the patients at postoperative 0-48 h (n=56)

Measurement time	Nausea condition	Experimental %	Control %	X^2	p
Postoperative	No	74.07	48.28	3.90	0.06
0-2 h	Exist	25.93	51.72		
Postoperative	No	66.67	41.38	3.59	0.07
2-6 h	Exist	33.33	58.62		
Postoperative	No	88.89	48.28	10.57	0.00*
6-12 h	Exist	11.11	51.72		
Postoperative	No	96.30	58.62	11.13	0.00*
12-24 h	Exist	3.70	41.38		
Postoperative	No	100.00	72.41	8.69	0.00*
24-48 h	Exist	0.00	27.59		

*p<0.05

TABLE 4. Comparison of nausea-related VAS scores of the patients at postoperative 0-48 h (n=56)

Measurement time	Group	$\bar{x}$	s	U	p
VAS score at postoperative	Experimental	0.67	1.24	296.50	0.07
0-2 h	Control	1.59	2.53		
VAS score at postoperative	Experimental	0.78	1.50	269.00	0.03*
2-6 h	Control	1.45	1.38		
VAS score at postoperative	Experimental	0.15	0.46	212.50	0.00*
6-12 h	Control	2.24	2.59		
VAS score at postoperative	Experimental	0.07	0.38	240.00	0.00*
12-24 h	Control	2.55	3.78		
VAS score at postoperative	Experimental	0.00	0.00	283.50	0.00*
24-48 h	Control	0.62	1.08		

*p<0.05

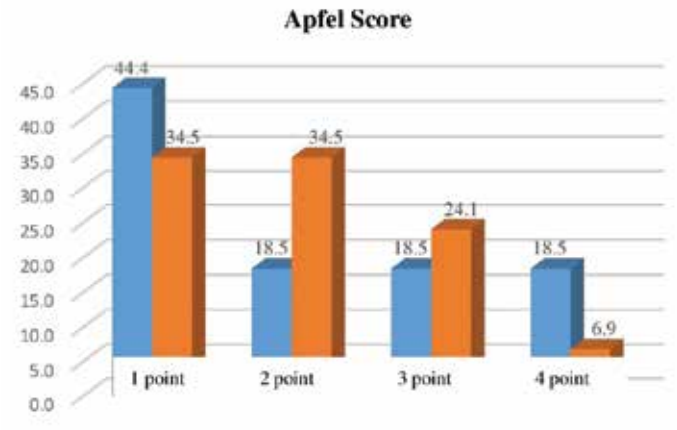

FIGURE 2. Distribution of patients according to their Apfel scores

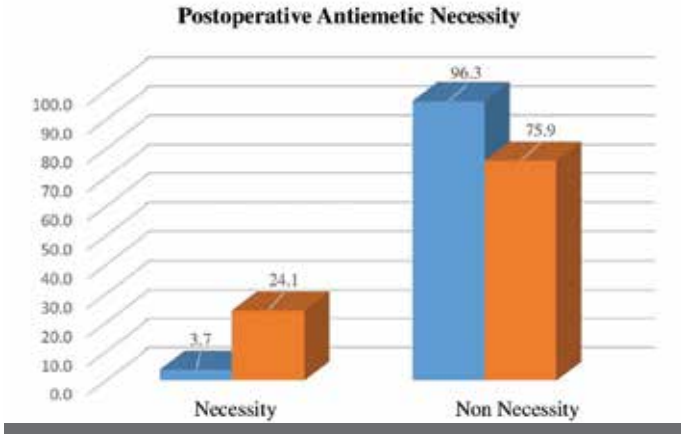

FIGURE 3. Distribution of patients according to postoperative antiemetic necessity

Nausea-related VAS scores at postoperative 0-2 h were higher in the control group; however, this difference between the experimental and control groups was not statistically significant (p>0.05) (Table 4). There was a significant statistical difference between the groups for nausea-related VAS scores at postoperative 2-6, 6-12, 12-24 and 24-48 h as the control group patients suffered from more nausea incidence (p<0.05). It was observed that in the experimental group, the VAS score was "0" at postoperative 24-48 h.

Postoperative antiemetic necessity was 24.1% in the control group and 3.7% in the experimental group. (Figure 3)

DISCUSSION

Postoperative nausea and vomiting frequently complicates recovery from anesthesia (13-16). In this study, we aimed to evaluate the effect of peppermint oil inhalation on PONV. Although this method was found to be ineffective at postoperative 0-2 h, it was observed that peppermint oil inhalation decreased nausea and vomiting severity at postoperative 6-12 h, decreased the incidence and severity at postoperative 12-24 h and completely prevented nausea and vomiting at postoperative 24-48 h.

Postoperative nausea and vomiting is evaluated in three phases. The first phase describes PONV at 2-6 h (4). In the clinical explanation of PONV, there is no description for nausea and vomiting before 2 h. We did not find any study or information in the literature reporting PONV incidence at postoperative 0-2 h. To the best of our knowledge, this data is unique to our study.

We did not find any research on peppermint plant complimentary treatment method in the Turkish Republic of Northern Cyprus; however, in Turkey, which has a similar culture, peppermint and volatile peppermint oil is a frequently used spice for treating several diseases (17). There are many foreign studies on PONV treatment with peppermint and its oil (2, 18-20). Peppermint and its oil is a frequently preferred treatment for different diseases and also for children (9, 21, 22).

In their study, Apfel et al. (11) defined risk factors for PONV. These factors are female gender, non-smoking, history of vehicle sickness and/or PONV, and postoperative opioid usage condition. The results of their study showed 10%, 21%, 39%, 61%, and 79% PONV risk for zero, one, two, three, and four factors, respectively. They observed that an increased Apfel score is related to increased PONV risk. In some studies, female gender is also reported as a risk factor (2, 4-6, 11, 13, 14). Age is mentioned as a risk factor, and PONV incidence is higher in children and young adults (5, 6, 13-15). It is also reported that PONV risk increases with higher BMI (5, 6, 13, 14). The ASA score is not defined to be related with PONV; however, it could be an effective factor. In our study, similar Apfel scores were expected in both groups for proper comparison. All patients in this research used opioids postoperatively; therefore, there was no patient with an Apfel score of 0. The Apfel score difference between the experimental and control groups was not statistically significant ($p>0.05$) (Figure 2). In this study, sex, age, BMI, and ASA score distribution difference between the two groups was also not statistically significant ($p>0.05$). It was assumed that patient's characteristics had no effect on research results.

In literature, it has been reported that chronic diseases increase PONV incidence (15, 16). In our study, patients with an ASA score of I and 2 were included. It means that existing chronic diseases are "mild systemic diseases." The difference between the two groups for chronic diseases was not statistically significant ($p>0.05$) and it did not affect the result of the research.

Anesthesia type, surgical approach, and operation time are other reported risk factors for PONV (4, 5, 14, 23-25). In our study, all patients were operated on using an open surgical approach under general anesthesia, and the operation time was not statistically different between the groups.

Yavaşçaoğlu et al. (26) conducted a study on 1458 patients and reported that PONV is one of the most frequent postoperative complications. They also mentioned that this complication most frequently occurs at postoperative 12 h. In our study, in the control group, it was observed that nausea existence and severity was more frequently and intensively observed at postoperative 6-12 h. In the experimental group, nausea existence and severity at postoperative 6-12 h was significantly less frequent, proving the positive effects of peppermint oil inhalation on postoperative nausea existence and severity at 6-12 h.

In the experimental group, nausea was not observed at postoperative 24-48 h, whereas in the control group, it was observed in 27.59% patients. Therefore, it was demonstrated that peppermint oil inhalation is effective in preventing postoperative nausea.

Tate (27) showed that peppermint oil inhalation is effective on nausea, but the difference between patients who inhaled peppermint oil and those who did not inhale it was not statistically significant for nausea severity. In a study by Anderson and Gross (18), peppermint oil (n=10), isopropyl alcohol (n=11), and saline (n=12) were administered to 33 patients. Although there was no statistical difference between the groups, they advised aromatherapy as the initial treatment for PONV as it decreases the perception of nausea severity. But it is unknown if the reason of decreased nausea severity was aroma or controlled breathing. In our study, peppermint oil inhalation showed positive effects on postoperative nausea severity. Patients were not asked for controlled breathing. Therefore, it proved that positive effects of peppermint oil on postoperative nausea severity are caused by aroma and not controlled breathing.

Ferruggiari et al. (19) showed positive effects of peppermint oil on postoperative nausea in women who inhaled peppermint oil (n=23) and those who did not (no=22), similar to the results of our study. But the difference in their study between peppermint oil inhalation and saline inhalation was not statisticallly significant, and study with a larger population was advised. In our study on 56 patients (27 in the experimental group and 29 in the control group), the difference was statistically significant.

Hodge et al. (20) conducted a study on 121 patients that underwent aromatherapy and placebo inhalation. They used peppermint, lavender, and ginger oil combination for aromatherapy. They observed significant positive effects of aromatherapy on nausea, as observed in our study, and they stated that aromatherapy is an effective treatment method for postoperative nausea.

Sites et al. (2) compared groups that underwent peppermint oil inhalation and controlled breathing. They observed that controlled breathing had better effects on postoperative nausea. But patients in the peppermint oil inhalation group expressed that they felt good and wanted to use peppermint oil.

Different results of studies may be caused by low number of cases, evaluation of different patient groups, lack of multi-center studies, and comparison of different application methods.

Nursing care and nursing support for relieving frequent symptoms of patients and understanding of this effort by the patient increase their satisfaction and healing responses. Nursing care

specific to the individual and intended to the patient necessity always positively affects the patient's satisfaction level (28). In a study conducted by Sevilir Pamukcu (28) evaluating postoperative complications and nurse care-related satisfaction level, it was observed that postoperative patients with complications were more satisfied with nurse care instead of pharmacologic treatment, and it was stated that nurse care increases the patients' satisfaction level (28).

Nurses should be informed about complementary therapies, and the prevalence of complementary treatment usage should be increased. Nurses are important and necessary for communication between patients, their family, and health workers for these applications (29). It is also important to include complementary treatment lectures in nursing education and raise awareness on this subject.

In conclusion, in this study, peppermint oil inhalation treatment for PONV prevention was found to be effective. In conclusion, in patients with high PONV risk, we suggest peppermint oil inhalation before pharmacologic treatments because of the former's positive effects and easy administration. It may be advised to work on a larger population for increasing the validity of this result.

Ethics Committee Approval: Ethics committee approval was received for this study from Near East University ethics committee. (Approval Date: 2015, Approval Number: 33-237).

Informed Consent: Informed consent was obtained from patients.

Peer-review: Externally peer-reviewed.

Author contributions: Concept - N.A., Ü.D.Y; Design - N.A., Ü.D.Y.; Supervision - Ü.D.Y.; Resource - N.A., Ü.D.Y.; Data Collection and/or Processing - N.A.; Analysis and/or Interpretation - N.A.; Literature Search - N.A., Ü.D.Y.; Writing - N.A., Ü.D.Y.; Critical Reviews - Ü.D.Y.

Conflict of Interest: The authors have no conflicts of interest to declare.

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