Aromatherapy as Treatment for Postoperative Nausea: A Randomized Trial

Ronald Hunt, MD,* Jacqueline Dienemann, PhD, RN,† H. James Norton, PhD,‡ Wendy Hartley, MSN, RN,§ Amanda Hudgens, BSN, RN,‖ Thomas Stern, MD,¶ and George Divine, PhD#

BACKGROUND: Postoperative nausea (PON) is a common complication of anesthesia and surgery. Antiemetic medication for higher-risk patients may reduce but does not reliably prevent PON. We examined aromatherapy as a treatment for patients experiencing PON after ambulatory surgery. Our primary hypothesis was that in comparison with inhaling a placebo, PON will be reduced significantly by aromatherapy with (1) essential oil of ginger, (2) a blend of essential oils of ginger, spearmint, peppermint, and cardamom, or (3) isopropyl alcohol. Our secondary hypothesis was that the effectiveness of aromatherapy will depend upon the agent used.

METHODS: A randomized trial of aromatherapy with patients who reported nausea in the postanesthesia care unit was conducted at one ambulatory surgical center. Eligibility criteria were adult, able to give consent, and no history of coagulation problems or allergy to the aromatherapy agents. Before surgery, demographic and risk factors were collected. Patients with a nausea level of 1 to 3 on a verbal descriptive scale (0–3) received a gauze pad saturated with a randomly chosen aromatherapy agent and were told to inhale deeply 3 times; nausea (0–3) was then measured again in 5 minutes. Prophylactic and postnausea antiemetics were given as ordered by physicians or as requested by the patient.

RESULTS: A total of 1151 subjects were screened for inclusion; 303 subjects reporting nausea were enrolled (26.3%), and 301 meeting protocol were analyzed (26.2%). The change in nausea level was significant for the blend ($P < 0.001$) and ginger ($P = 0.002$) versus saline but not for alcohol ($P < 0.76$). The number of antiemetic medications requested after aromatherapy was also significantly reduced with ginger or blend aromatherapy versus saline ($P = 0.002$ and $P < 0.001$, respectively).

CONCLUSION: The hypothesis that aromatherapy would be effective as a treatment for PON was supported. On the basis of our results, future research further evaluating aromatherapy is warranted. Aromatherapy is promising as an inexpensive, noninvasive treatment for PON that can be administered and controlled by patients as needed. (Anesth Analg 2012;117:597–604)

Recently, nonpharmaceutical therapies have been evaluated for use in the treatment of postoperative nausea (PON).[1] Aromatherapy is appealing for use in PON because its noninvasive administration allows use by either medical staff or patients, and its low cost offers greater accessibility to patients. However, to this point, it has been unknown which, if any, aromas or combinations of aromas are actually effective in reducing PON; thus, for purposes of this study, we hypothesized simply that aromatherapy will reduce PON.

The aromas chosen for inclusion in this study were selected on the basis of traditional applications advocated by aromatherapists for the treatment of nausea.

From the *Department of Anesthesia, Carolinas Medical Center University, Charlotte, NC; †School of Nursing, University of North Carolina Charlotte, Charlotte, NC; ‡Department of Biostatistics, Carolinas Medical Center, Charlotte, NC; §Clinical Care Management, Carolinas Medical Center, Charlotte, NC; ‖Outpatient Surgery, Carolinas Medical Center University, Charlotte, NC; ¶Department of Medicine, Carolinas Medical Center University, Charlotte, NC; #Public Health Sciences, Henry Ford Hospital, Detroit, MI.

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Address correspondence to Ronald Hunt, MD, Carolinas Medical Center University, 8801 No Tryon, Charlotte NC 28262. Address e-mail to rdhsac@aol.com.

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A randomized trial design was used to examine the use of aromatherapy in comparison with the action of a placebo for treating PON. The primary endpoint for assessment was change in PON nausea score 5 minutes after aromatherapy administration.

METHODS

This study was a prospective 4-arm placebo-controlled clinical trial to examine reduction in severity of nausea using aromatherapy with essential oil of ginger, an essential oil blend of ginger, spearmint, peppermint, and cardamom, or 70% isopropyl alcohol in comparison with the change in nausea severity with the use of the placebo, normal saline. The measure of nausea was a verbal, descriptive 4-point scale (VDS) from 0 to 3 with zero being *none*, 1 being *some*, 2 being *a lot*, and 3 being *severe*.[2] This scale was chosen from other global scales of severity for ease of administration and because patients were recovering from anesthesia. Minor changes were made in the formatting of the scale for its use in the study. In the original scale, the anchor points were labeled 0 = *no nausea*, 1 = *mild*, 2 = *moderate*, 3 = *severe*; and these labels were changed for use in this study to 0 = *none*, 1 = *some*, 2 = *a lot*, and 3 = *severe*. IRB approval was obtained from Carolinas Health System and the University of North Carolina at Charlotte. The trial was not registered with clinicaltrials.gov.

All participants were from 1 ambulatory surgical site in the Charlotte metropolitan area and were contacted on the

day of their surgery. Trained research nurses recruited subjects who met eligibility criteria of being age 18 years or older, being cognitively able to give informed consent, having surgery that day, not receiving warfarin (Coumadin), heparin, full dose 325 mg aspirin, or clopidogrel (Plavix), and not having a history or diagnosis of bleeding diatheses or any known allergies to ginger, spearmint, peppermint, or cardamom. The exclusion of patients with clotting disorders was based on studies finding antiplatelet and cyclooxygenase-1 enzymes inhibitors from constitutions of ginger.[3]

Written informed consent was obtained from all patients. After consent, participants were asked to provide demographic information about their gender, age, and race/ethnic heritage, and were screened for PON risk factors including history of smoking, motion sickness (car, sea), and PON.

Any determination to premedicate participants was at the sole discretion of their physicians, as this study was conducted in a natural setting. The study tools completed by the research nurses included information of any preoperative antiemetic medications. Each tool and a study participant tag were placed in the medical record to follow the participant from surgery to the postanesthesia care unit (PACU).

Treatment Instruments

Aromatherapies used were normal saline, 70% isopropyl alcohol, essential oil of ginger, and a blend of the essential oils of ginger, spearmint, peppermint, and cardamom. One cubic centimeter of the randomly selected, designated aromatherapy was placed on a 2-inch by 2-inch impermeable, backed gauze pad. Each aromatherapy was stored in a plain white bottle labeled *1* to *4* and kept in a locked cart labeled "For Research Purposes Only." Despite the lack of any identifying label, the study treatment arms could not be blinded because of the specificity of odors. This research used the method of assessment and administration reported by Anderson and Gross.[4]

Procedure

After surgery, research nurses collected the following data: time surgery began and ended, nitrous oxide or volatile gas anesthesia, type of surgery, and administration of any intraoperative antiemetic medications. Participants were asked to rate their level of nausea using the VDS on a 0 to 3 Likert-type scale of 0 = *no nausea*, 1 = *some*, 2 = *a lot*, and 3 = *severe*. Those who reported zero or no nausea were not assigned to a treatment group. Participants who responded with a score of 1 to 3 were randomly assigned to 1 of the 4 treatment groups using a computerized listing for random assignments generated by Assumption College.[a] The research nurse checked off the study number of the participant and aromatherapy on the list and then prepared the gauze pad.

Each participant was instructed to inhale the scent through the nose and exhale through the mouth 3 times. At the end of 5 minutes, each subject was asked to rate the level of nausea again using the VDS, and the aromatherapy was discontinued. If nausea was rated 1 to 3 at the end of 5 minutes, participants were offered antiemetics as prescribed by their physicians. If vomiting occurred, the number of times was documented and antiemetic medication given.

A protocol deviation occurred in 2 of the 303 participants who reported PON. These 2 subjects were excluded from the protocol analysis because of what was believed to be a degradation of the blend of the aromatherapy oils. These subjects, both of whom had been randomized to the blend, complained that the aroma was not "pleasant" so the research team investigated and found that the aroma of the blend had changed. It is hypothesized that degradation occurred because of either an oxidation reaction during repeated usage of the blend and the lid not being secured tightly or failure to shake the bottle before each use, which may have allowed for layering of the oils with the lightest oil on top being used completely and the heaviest oils remaining behind. The study was suspended until an appropriate solution to this problem could be found.

To address the oxidation/evaporation concerns, we changed the bottle size from 10 cc to 5 cc to limit the amount of degradation due to air. In addition, the research nurses were instructed to secure the lid after each use and were educated as to the need to thoroughly shake the bottle before each use to prevent the layering of the oils. The protocol was then restarted. On the basis of the above, the total number of participants in the blended oil group differs by 2 subjects between the per-protocol (PP) and intent-to-treat (ITT) analyses.

If a patient in the treatment group received antiemetic medication while in the PACU, that fact was recorded. The administration of an opioid in the PACU was also documented. No additional data were collected.

Sample Size

The target sample size for the study was computed on the basis of a Wilcoxon ranked-sum test comparing 1 of the 3 active treatment arms to the normal saline control group. For a Wilcoxon ranked-sum test, the effect being tested may be expressed as $p'' = \text{Prob}(X < Y)$, where X and Y are representative subjects from the control and active arms, respectively. Under the null hypothesis, $p'' = 0.5$. It was assumed that $p'' = 0.63$ would present a clinically important effect, and using a formula given by Noether,[5] a sample size of 77 per group was computed. The impact of ties is not incorporated in Noether's formula, but their presence will increase power, so the final target sample size was fixed at 75 subjects per group (or 300 total). There were reports in the literature suggesting that each of the 3 active treatments might be of benefit; therefore a multiple-comparison adjustment was not incorporated in the original sample size calculation. However, as a result of suggestions received during the manuscript review process, a Bonferroni adjustment for the 3 primary comparisons is now included in the main analyses. The impact of this change is described in an updated and more detailed sample size presentation given in a companion paper appearing in this issue of *Anesthesia & Analgesia*.[6]

Data Analysis

To describe the treatment groups at baseline, we calculated descriptive statistics including means, standard deviations,

[a]Assumption College random assignment to groups. Retrieved from www1.assumption.edu/users/anndem/applets/RandAssign/GroupGen.html.

counts, and percentages. Demographic and baseline variables were compared among the 4 groups. Age was the only variable on an interval scale, so analysis of variance (ANOVA) was used for age. A Kruskal–Wallis test was used to test for an association between group and the mean number of emesis episodes before/during surgery. The significance of associations between potential nominal scale risk factors and nausea was assessed using a χ^2 or Fisher exact test.

For the principal outcome variable, change in level of nausea using the VDS, Wilcoxon rank sum exact (permutation) test *P* values were used to compare the groups 2 at a time. For each Wilcoxon test, the observed probability of a patient in one arm having a greater decrease in nausea VDS than a patient in another arm [$p'' = \text{Prob}(X < Y)$] was computed along with a 95% confidence interval (or 98.3%, if Bonferroni adjusted). To assist in interpretation, each p'' value, and its corresponding confidence limits, was converted to the odds of seeing a bigger improvement [i.e., odds = $p''/(1 - p'')$]. Finally, the proportions of patients with any improvement in VDS and requesting antinausea medication were computed and compared between arms.

For each outcome, a Bonferroni adjustment was made for the 3 primary comparisons to the saline control group. The other 3 pairwise comparisons (among alcohol, ginger, and blend) were considered secondary and were made without any multiple-comparisons adjustment, because a significant difference for one or more of these comparisons would not be definitive without there also being least 1 significant difference versus saline (control).

RESULTS

A total of 1190 patients were screened for inclusion to participate in the study. Four consented but vomited on entry to the PACU and were excluded; 1 subject was dropped at physician request due to high blood pressure in the PACU; and 3 subjects withdrew requesting antiemetic medications before aromatherapy. The data from 31 subjects were excluded as incomplete, resulting in a sample of 1151 subjects. After a total sample size of >300 had been accrued, enrollment in the study was ended. Seven risk factors were significant predictors of nausea for this sample: history of motion sickness or PON, surgery over 60 minutes, volatile gas anesthesia, opiods after surgery, female gender, gynecological surgery, and gastrointestinal surgery.

Of the 1151 participants, 301 (26.2%) reporting PON and receiving the intended aromatherapy agent were included in the PP analysis. Eighty-nine of the 301 reporting nausea received antiemetic medication before (n = 49) or during (n = 40) surgery. The PP sample included 73 patients receiving normal saline, 78 receiving 70% isopropyl alcohol, 76 receiving essential oil of ginger, and 74 receiving the blend of essential oils of ginger, spearmint, peppermint, and cardamom. There were no significant differences in the demographic characteristics, significant risk factors, or in receiving pre- or intraoperative antiemetic medication among the groups (Table 1). There was no significant difference in the initially reported nausea severity level among the 4 different aromatherapy groups (P = 0.951) (Table 2). One hundred eighty-seven participants requested antiemetic medication after aromatherapy, with 115 (61.5%) coming from the placebo and alcohol groups.

Table 1. Demographics of Participants Reporting Nausea for Sample by Aromatherapy (N = 301)

Demographics	Normal saline (n = 73)	Alcohol (n = 78)	Ginger (n = 76)	Blend (n = 74)	P value
Age (mean)	41.3	40.3	42.5	40.6	0.70*
Female	69	70	71	66	0.56
Race					
Caucasian	47	50	50	44	
African American	22	28	22	27	0.57
Other	4	0	4	3	

*P value from analysis of variance.

Table 2. Significant Predictors of Nausea, Receiving of Antiemetic Medication Before/During Surgery and Emesis for Sample by Aromatherapy (N = 301)

Significant risk factors, outcomes	Normal saline (n = 73)	Alcohol (n = 78)	Ginger (n = 76)	Blend (n = 74)	P value
Female	69	70	71	66	0.56
History motion sickness	38	39	39	33	0.84
History PON	40	39	27	30	0.08
Volatile gas/nitrous oxide	70	70	73	67	0.54
Length surgery over 60 minutes	40	37	34	36	0.84
GI surgery	16	12	12	15	0.67
Gynecological surgery	32	37	42	37	0.56
Postoperative opiods	46	52	47	48	0.88
Prophylactic medication	11	12	14	12	0.94
Times emesis (mean)	0.27	0.22	0.21	0.16	0.39*

PON = postoperative nausea; GI = gastrointestinal.
*P value from Kruskal–Wallis test.

The results of the trial are summarized in Figures 1, 2, and 3, and in Tables 3, 4, and 5. As can be seen from Figure 1, all 4 groups had shifts toward reduced nausea, with the ginger and blend groups having the biggest shifts. The primary hypothesis test results are found in the first column of Table 3, in which the Bonferroni-adjusted Wilcoxon ranked-sum test *P* values for ginger versus saline and for blend versus saline are $P = 0.002$ and $P < 0.001$, respectively. In secondary comparisons among the 3 active arms, ginger and blend were also superior to alcohol ($P = 0.017$ and $P < 0.001$). The strengths of the differences among treatment arms are reflected in the odds found in Table 3. For instance, the odds of having a greater reduction in PON score with ginger versus saline are almost 2 to 1 (1.86), and for blend versus saline, the odds approach 3 to 1 (2.70). The odds of greater reduction with ginger and blend versus alcohol are also fairly large, 1.50 and 2.13, respectively. There was little evidence that alcohol was helpful. The odds of a greater reduction with alcohol versus saline were only 1.22, and the Bonferroni-adjusted *P* value for this comparison was 0.76.

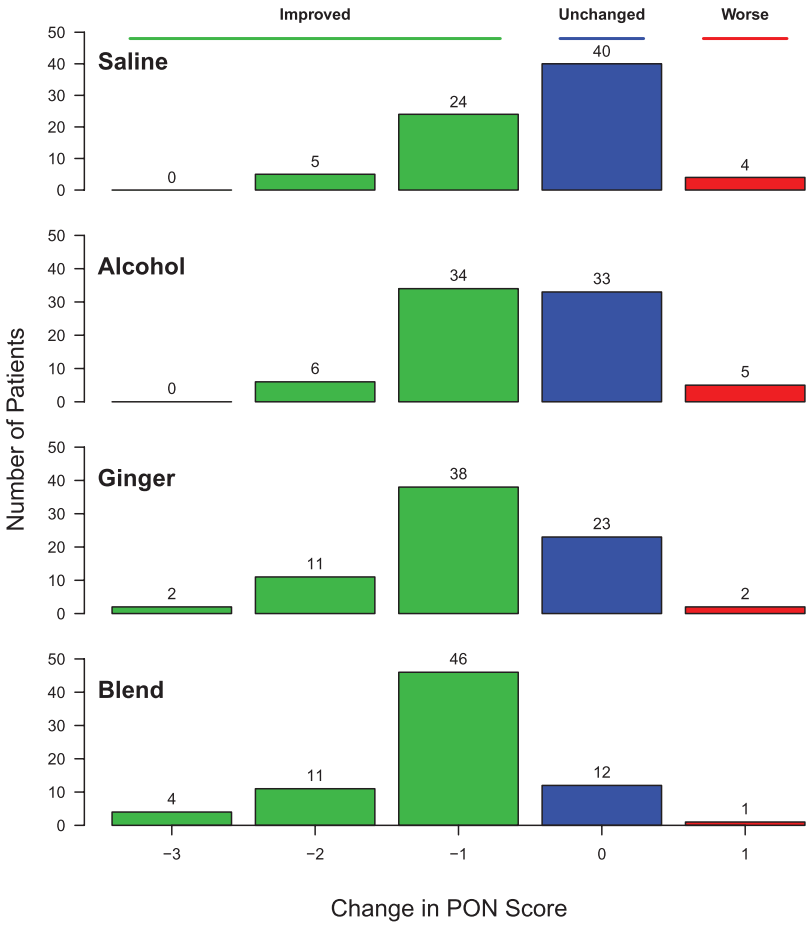

Figure 1. Change in postoperative nausea (PON) score by aromatherapy group.

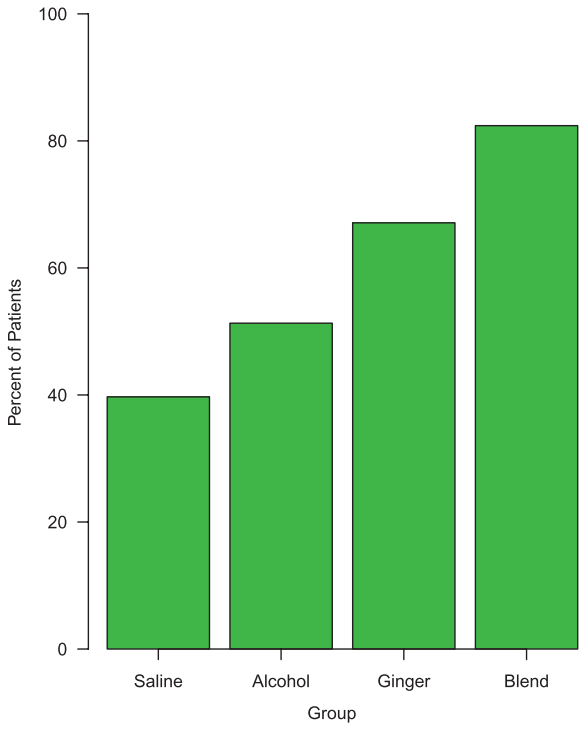

Figure 2. Percentage of patients reporting any improvement by aromatherapy group.

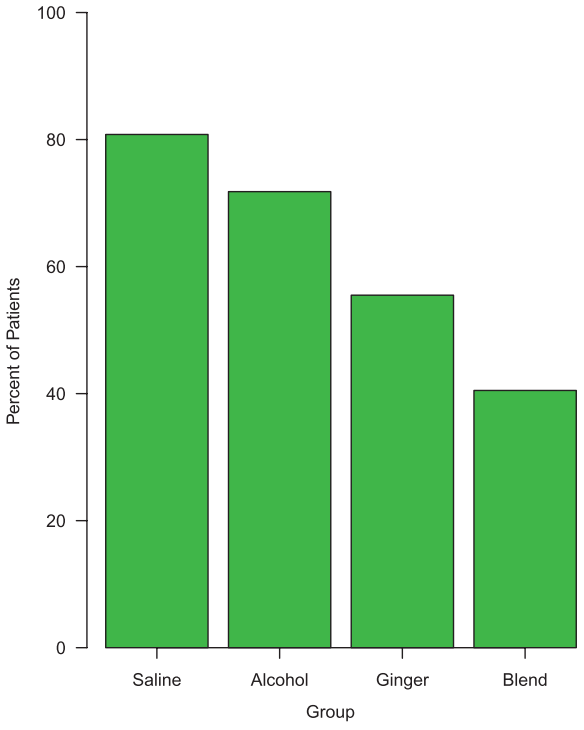

Figure 3. Percentage of patients requesting antinausea medication by aromatherapy group.

Table 3. Pr(X < Y) and Associated Odds of Better Improvement in Nausea Relief Between-Arms Comparisons (Confidence Intervals) and Significance Levels (*P* Values)

Arm	Pr(Arm < Saline) Odds (95% CI)	Pr(Arm < Alcohol) Odds (95% CI)	Pr(Arm < Alcohol) Odds (95% CI)
Alcohol	0.55 1.22 (0.82, 1.86) (*P*=0.76)		
Ginger	0.65 1.86 (1.22, 3.00) (*P*=0.002)	0.60 1.50 (1.08, 2.13) (*P*=0.017)	
Blend	0.73 2.70 (1.78, 4.56) (*P*<0.001)	0.68 2.13 (1.50, 3.17) (*P*<0.001)	0.58 1.38 (0.96, 1.94) (*P*=0.07)

The "arm vs saline" column has 98.3% confidence intervals (CI) (corresponding to Bonferroni adjustment for these primary comparisons). The secondary comparison columns (arm vs alcohol and arm vs ginger) have 95% confidence intervals. Confidence intervals computed starting with SAS PROC LOGISTIC (via equivalence to the C-index), *P* values computed with SAS PROC NPAR1WAY.

Table 4. Comparisons of Arm Estimates of Any Improvement (Yes/No) in Nausea Relief by Aroma Between-Arms Comparisons (Confidence Intervals) and *P* Values

Arm	Arm-specific estimate (and CI)	Arm vs saline	Arm vs alcohol	Arm vs ginger
Saline	39.7% (28.5, 51.9)			
Alcohol	51.3% (39.7, 62.8)	11.6 (−7.7, 30.8) (*P*=0.31)		
Ginger	67.1% (55.4, 77.5)	27.4 (8.6, 46.2) (*P*=0.002)	15.8 (0.5, 31.1) (*P*=0.05)	
Blend	82.4% (71.8, 90.3)	42.7 (25.4, 60.0) (*P*<0.001)	31.2 (17.1, 45.2) (*P*<0.001)	15.3 (1.7, 29.0) (*P*=0.03)

The "arm vs saline" column has 98.3% confidence intervals (CI) (corresponding to Bonferroni adjustment for these primary comparisons). The secondary comparison columns (arm vs alcohol and arm vs ginger) have 95% confidence intervals.

Table 5. Comparison of Arm Estimates and Percentage Patients Requested Antinausea Medication (Yes/No) by Aroma, Between-Arms Comparisons, Confidence Intervals, and *P* Values

Arm	Arm-specific Estimate (CI)	Arm vs saline	Arm vs alcohol	Arm vs ginger
Saline	80.8% (69.9, 89.1)			
Alcohol	71.8% (60.5, 81.4)	−9.0 (25.5, 7.4) (*P*=0.58)		
Ginger	55.3% (43.4, 66.7)	−25.6 (−43.1, −8.0) (*P*=.002)	−16.5 (−31.5, −1.5) (*P*=0.03)	
Blend	40.5% (29.3, 52.6)	−40.3 (−57.8, −22.7) (*P*≤0.001)	−31.3 (−46.3, −16.3) (*P*=0.001)	−14.7 (−30.6, 1.1) (*P*=0.07)

The "arm vs saline" column has 98.3% confidence intervals (CI) (corresponding to Bonferroni adjustment for these primary comparisons). The secondary comparison columns (arm vs alcohol and arm vs ginger) have 95% confidence intervals.

The treatment effects reflected by the proportions of patients reporting any improvement (Table 4 and Fig. 2) or requesting antinausea medication (Table 5 and Fig. 3) are also large and consistent with Table 3 and Figure 1. For all 3 outcomes, ginger and blend were both superior to either saline or alcohol. There is also a suggestion in the data that blend may be better than ginger alone. The odds of having a greater reduction in PON score with blend versus ginger are 1.38. The *P* value for this and for the comparison of the proportions requesting antinausea medication was $P = 0.07$, but the *P* value for the proportion with any improvement as a dichotomous outcome was 0.03.

The ITT analysis population differed only for the blend group, and the ITT blend comparisons were virtually identical to those for the PP analysis for saline and alcohol ($P < 0.001$ for all 3 outcomes). For blend versus ginger, the ITT results were slightly less favorable to blend, with estimates of the odds of a lower PON score with blend decreasing to 1.30 from 1.38 ($P = 0.13$). The any improvement outcome was no longer significant ($P = 0.07$), and the *P* value for antinausea medication requested increased slightly to 0.11.

DISCUSSION

This study found aromatherapy using oil of ginger or a blend of ginger, spearmint, peppermint, and cardamom to be an effective treatment in reducing nausea severity occurring after surgery in an acute care setting. Aromatherapy also reduced the number of requests for antiemetic medication due to PON.

PON is a common complication after surgery,[7-9] and its root cause is unknown.[10] If a patient is at high risk for PON due to uncontrollable factors, the guidelines recommend using antiemetic medicines as prophylaxis for PON. There is no consensus as to the optimal antiemetic therapy.[11-14] Nonpharmaceutical therapies offer important alternatives to antiemetic therapies with their benefits including but not limited to their low cost and the noninvasive nature of their administration. Among the nonpharmaceutical therapies available for the treatment PON are aromatherapy treatments.

We hypothesized that aromatherapy might be beneficial in reducing PON and designed this study to evaluate 3 different aromatherapies in comparison with a placebo to test this hypothesis. However, because there was no consensus in the scientific literature at the time of this study as to what aromas or combinations of aromas actually might be effective in reducing PON, this study may be viewed as an objective, data-based first look at this important adjunct to current antinausea therapies. The results of the study strongly suggest that while more research is needed to better understand its efficacy over time, aromatherapy as a fast-acting agent either alone or combined with antiemetic medications merits additional research in the treatment of nausea.

Aromatherapy using alcohol as a treatment has been shown to be significantly more effective than, or to have the same effectiveness as, antiemetic medication in 4 randomized controlled trials (RCT) with small samples.[4,15-17] It was also found to reduce nausea significantly faster in 2 RCTs,[18,19] but concerns were raised about the duration of effect[16,17]; because of modest sample sizes and differences in design, there was insufficient evidence for a recommendation.[4,18] Results of 2 RCTs[4,20] of aromatherapy using

peppermint oil as a treatment were significant, but again the samples were very small.

One study used antiemetic medications with and without aromatherapy with oil of ginger[21] and found a 50% reduction in nausea with the ginger aromatherapy, but the import of the finding is unclear because no sample size or description of the nausea measure was given. Seven RCTs studying the ingestion of ginger powder as a preventive measure for PON show mixed results.[22-28] Ginger is not mentioned in the 2010 PON rescue recommendations.[10] However, the Western Australia Centre for Evidence Informed Healthcare Practice review of prevention and treatment of PON for abdominal laparoscopic–gynecological procedures found "some limited evidence to support providing ginger in doses between 1 to 5g to prevent or reduce PON and to reduce the need for rescue medication" (p. 20). Unfortunately, the calculation of 3 meta-analyses[29-32] yielded conflicting conclusions, with 2 finding ginger ineffective and 1 finding it effective as a preventive measure for PON.

Only 2 studies of aromatherapy with a blend of oils for treatment related to PON were found, with neither using a control group. One used the essential oils of ginger, peppermint, spearmint, and lavender sold in an inhaler and 39 of 46 participants (85%) reported nausea relief over 24 hours.[33] Another study used an aromatherapy blend of ginger, cardamom, and tarragon in equal parts applied to the anterolateral aspect of the neck with 56 of 76 participants (74%)[34] reporting relief of nausea.

In a study of physician practice using vignettes, 6% reported that they would use alcohol aromatherapy for PON.[35] Memorial Sloan Kettering Cancer Center reports reviewing the evidence and offering aromatherapy with alcohol, ginger, and peppermint as treatments for PON.[36]

This study has several limitations including the following: (1) limiting the aromatherapy to a 5-minute interval and not testing its efficacy over a longer period; (2) not controlling for the type of antiemetic given pre- or intraoperatively; (3) not having a large enough sample to explore the differential effects with patients who did or did not receive premedication to prevent nausea or different risk factor combinations; (4) uncertainty about the causes of the aromatherapy blend degradation and protocol deviation; (5) not having a large enough sample size to detect differences in rates of emesis for different aromatherapies versus placebo; and (6) use of a rating scale for assessing levels of nausea in the subjects that is a variation of a previously validated instrument.

The research design for this study was limited to investigating whether certain aroma treatments reduce the severity of postsurgery nausea. Boogaerts et al.[2] showed 86% agreement between a 10-point visual analog scale and a 4-point VDS with the points defined as 0 = *no nausea*, 1 = *mild*, 2 = *moderate*, and 3 = *severe*. The 4-point scale used in this study followed that order very closely by using 1 = *none*, 2 = *some*, 3 = *a lot*, 4 = *severe*. Both scales are ordinal and use 4-point values from *none* to *severe*. In the current study, the same scale was used for all patients across all treatments. Thus, for purposes of this study, it is suggested that the measurement instrument used has sufficient validity to provide consistently stable results. Future studies should address the issue of cross-study instrument validity. Given the observed potential for aromatherapy blend degradation, further studies should address more rigorously the differential effectiveness of ginger alone in comparison with the aromatherapy blend in the treatment of PON. Finally, the protocol deviation affected only 2 subjects, and the PP and ITT analyses both supported the study conclusions. None of these limitations detracts appreciably from the strength of the study results, which clearly suggest the potential and value of additional examination of aromatherapies for treatment of PON.

Further research should examine (1) aromatherapy and vomiting, (2) the length of time aromatherapy is effective in treating PON with continued use, (3) a follow-up trial of different aromatherapies as treatment for PON (ginger versus the blend), (4) a larger study with standardized antiemetic medication treatment before and after surgery with stratified risk factor groups, and (5) a prevention trial in which aromatherapy is used prophylactically before surgery. Aromatherapy is promising as an inexpensive, noninvasive treatment for PON that can be administered and controlled by patients as needed. ■

DISCLOSURES

Name: Ronald Hunt, MD.

Contribution: Ronald Hunt has seen the original study data, reviewed the analysis of the data, and approved the final manuscript.

Conflicts of Interest: In the planning and design of this research, the goal has been, and is, to examine more carefully whether specific aromas as therapeutic agents have differential results with patients in actual hospital PON situations. At the time that the study was designed, data were collected and analyzed, and the results discussed and written up, none of the authors had any conflict of interest. No conflict of interest exists at this time. The procedure and results are reported so that medical personnel in other settings can replicate the study and obtain independent findings that will add evidence for the therapeutic uses of aromas. None of the authors at any time attempted to influence or predetermine the findings reported in this article. There are no monetary or other benefits to any of the authors from the research reported in this article. Analysis of the results of the statistical test procedures revealed the need for additional research on treatment variations, and anecdotal evidence collected from research nurses and subjects suggested that there were no treatment delivery mechanisms that are empirically research proven, inexpensive, simple to use, and easily available. As a result, some experimental treatment delivery options that will require additional research have been developed subsequent to the data collection and analysis written up in this article. It is too early to know with any certainty whether these experimental procedures will produce monetary or other gain to any of the authors. The authors are committed to rigorous scientific research on treatment options and outcomes that can be independently verified and are uncontaminated by the possibility of secondary gains or benefits.

[b] Hewitt H, Watts R. The effectiveness of non-invasive complementary therapies in reducing postoperative nausea and vomiting following abdominal laparoscopic surgery for women: a systematic review. Western Australian Centre for Evidence Informed Healthcare Practice Within the Curtin Health Innovation Research Institute, Curtin University of Technology, Perth, Australia. Available from www.wacebnm.curtin.edu.au/reviews/SR_81_revised_WA.pdf.

Name: Jacqueline Dienemann, PhD, RN.
Contribution: Jacqueline Dienemann has seen the original study data, reviewed the analysis of the data, approved the final manuscript, and is the author responsible for archiving the study files.
Conflicts of Interest: The author has no conflict of interest to declare.
Name: H. James Norton, PhD.
Contribution: H. James Norton reviewed the analysis of the data and approved the final manuscript.
Conflicts of Interest: The author has no conflict of interest to declare.
Name: Wendy Hartley, MSN, RN.
Contribution: Wendy Hartley approved the final manuscript.
Conflicts of Interest: The author has no conflict of interest to declare.
Name: Amanda Hudgens, BSN, RN.
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Conflicts of Interest: The author has no conflict of interest to declare.
Name: Thomas Stern, MD.
Contribution: Thomas Stern reviewed and edited the article and approved the final manuscript.
Conflicts of Interest: The author has no conflict of interest to declare.
Name: George Divine, PhD.
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