

Aromatherapy With Peppermint, Isopropyl Alcohol, or Placebo Is Equally Effective in Relieving Postoperative Nausea

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To determine whether aromatherapy can reduce postoperative nausea, the investigators studied 33 ambulatory surgery patients who complained of nausea in the PACU. After indicating the severity of nausea on a 100-mm visual analogue scale (VAS), subjects received randomized aromatherapy with isopropyl alcohol, oil of peppermint, or saline (placebo). The vapors were inhaled deeply through the nose from scented gauze pads held directly beneath the patients' nostrils and exhaled slowly through the mouth. Two and 5 minutes later, the subjects rated their nausea on the VAS. Overall nausea scores decreased from 60.6 ± 4.3 mm (mean \pm SE) before aromatherapy to 43.1 ± 4.9 mm 2 minutes after aromatherapy ($P < .005$), and to 28.0 ± 4.6 mm 5 minutes after aromatherapy ($P < 10^{-6}$). Nausea scores did not differ between the treatments at any time. Only 52% of the patients required conventional intravenous (IV) antiemetic therapy during their PACU stay. Overall satisfaction with postoperative nausea management was 86.9 ± 4.1 mm and was independent of the treatment group. Aromatherapy effectively reduced the perceived severity of postoperative nausea. The fact that a saline "placebo" was as effective as alcohol or peppermint suggests that the beneficial effect may be related more to controlled breathing patterns than to the actual aroma inhaled.

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POSTOPERATIVE NAUSEA is a frequent cause of patient dissatisfaction and prolonged PACU stays following outpatient surgery. Conventional therapies for postoperative nausea tend to be either expensive (5HT₃ antagonists), cause patients to be drowsy (antihistamines), or may be associated with cardiac dysrhythmias (droperidol). Aromatherapy with alcohol or peppermint has been suggested as effective, complementary therapy for nausea, both postoperatively and in other settings.^{1,2} Potential advantages include rapid onset, ease of administration, low cost, and absence of known side effects. As complementary medicine gains popularity in Western cultures, patients are likely to welcome the inclusion of such treatment modalities in their care. This randomized, double-blind, placebo-controlled study was designed to

determine if aromatherapy with isopropyl alcohol or oil of peppermint is effective in treating patients who develop nausea after outpatient surgery.

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Literature Review

Despite the introduction of new pharmacotherapies, postoperative nausea and vomiting (PONV) continues to be a major cause of patient dissatisfaction and delayed discharge of patients from the PACU. The reported incidence of PONV ranges from less than 10% to greater than 60%, depending on individual patient risk factors such as age, gender, previous history of PONV or motion sickness, type and duration of surgery, and anesthetic technique.³⁻⁵ There are numerous pharmacotherapeutic approaches to the management of PONV. Unfortunately, none of these is particularly effective. In a meta-analysis, Domino et al⁶ found that when administered prophylactically, neither droperidol, metoclopramide, nor ondansetron reduced the incidence of PONV to less than 40%. Numerous less traditional approaches to the problem have been advocated. Increased inspired oxygen concentrations,⁷ acupressure,⁸ transcutaneous electrical stimulation,⁹ supplemental IV fluids,¹⁰ and even hypnosis¹¹ have been suggested as potential modalities for preventing or treating PONV, with varying degrees of success.

Aromatherapy with peppermint oil has been promoted as a remedy for "morning sickness," dyspepsia, and other gastrointestinal complaints.¹² Tate¹³ demonstrated that inhalation of peppermint oil vapors significantly reduced postoperative nausea and the requirement for pharmacologic antiemetics following gynecologic surgery. Inhalation of isopropyl alcohol vapors is a South American folk remedy for nausea. More recently, its use has been advocated for transport-related nausea¹ as well as for PONV in children and adults.^{2,14} Winston et al¹⁴ found that isopropyl alcohol inhalation relieved PONV more rapidly than ondansetron 4 mg IV, but a placebo group was not studied.

In an unblinded study, Merritt et al¹⁵ found that isopropyl alcohol was less effective than standard IV antiemetic therapy in treating PONV, although the difference between study groups

was not statistically significant. The present study was designed to overcome some of these shortcomings: group assignments were made in a randomized, double-blind fashion, and a "placebo" aromatherapy group was included.

Materials

The scented gauze pads used in this study were prepared by an individual not otherwise involved in the study and placed in sealed, polyethylene bags that were stored at each recovery bay. A random number generator determined the contents of each serially numbered bag. The isopropyl alcohol pads were prepared by placing 1 mL of 70% isopropyl alcohol on two stacked 2" × 2" gauze pads; placebo pads were prepared similarly, except that 2 mL of isotonic saline were used. Peppermint scented pads were prepared with 2 mL of isotonic saline and 0.2 mL of essential oil of peppermint. Equal potency of the alcohol and peppermint aromas was verified by subjective evaluation of the prepared samples by individuals not otherwise involved in the study. Before administering aromatherapy, the PACU nurse donned a surgical mask lightly scented with peppermint, the strongest aroma, to prevent them from identifying the aroma being tested.

Patients indicated the severity of their nausea on a VAS. The patients were shown a 100-mm-long line on a piece of paper. One end was marked "no nausea," and the other was marked "worst possible nausea." The PACU nurse instructed the patient to make a mark on the line corresponding to their degree of nausea. (Nurses received in-service training on how to administer both the VAS and the aromatherapy in a consistent manner before the study began. Patients were not instructed in the technique until they experienced nausea.) During data analysis, an investigator who was unaware of treatment group assignments measured the distance from the "no nausea" end of the line to the patient's mark. This corresponded to the VAS score for nausea; a VAS of 0 mm corresponded to no nausea, whereas a VAS of 100

mm indicated the worst possible nausea. VAS scores are commonly used to quantitate subjective phenomena such as pain and nausea.¹⁶

Methods

With Institutional Review Board approval, all patients over 18 years of age were invited to participate in the study when they arrived at the hospital for their scheduled surgery. Patients who refused or were unable to give informed consent, as well as those who did not require anesthesia services, were excluded. Those who provided informed consent were considered to be potential study participants; however, only 33 patients developed nausea in the PACU and thus entered the study. The patients' anesthetic management was at the discretion of the attending anesthesiologist, without regard to their possible subsequent inclusion in the study.

Patients entered the study when they spontaneously reported nausea to their PACU nurse. The PACU nurse then coached the patient to inhale vapors from a scented 2" × 2" gauze pad held directly under their nostrils. Patients were instructed to take three slow, deep breaths, inhaling through the nose and exhaling through the mouth. If patients were receiving supplemental oxygen, the oxygen delivery device was temporarily removed for aromatherapy and promptly replaced. Two minutes later, subjects again rated their nausea on the VAS and were given the choice of continuing aromatherapy or receiving "rescue" therapy with standard IV antiemetics (droperidol, ondansetron, or metoclopramide at the discretion of the attending anesthesiologist).

After an additional 3 minutes, patients rated their nausea again on the VAS. Because of the time required to obtain, prepare, and administer IV antiemetics, this 5-minute VAS score was obtained before these medications were administered to patients who had requested them. After conclusion of the 5-minute study period, patients were permitted to continue with aromatherapy if they chose to do so; in fact, several

patients requested aromatherapy "supplies" to take home.

Just before discharge to home, patients rated their overall satisfaction with the management of nausea in the recovery room on a VAS (0 mm = extremely dissatisfied; 100 mm = fully satisfied). They also indicated whether they would want to try aromatherapy if they developed nausea following a subsequent operation. The PACU nurse recorded whether IV antiemetics were administered at any time prior to discharge.

Statistical Analysis

Categorical data were analyzed by χ^2 contingency tables. VAS data (shown as means \pm standard error) were analyzed by repeated measures analysis of variance. Within-groups changes in VAS nausea scores were analyzed by Bonferroni-corrected paired t-tests. Relationships between continuous variables were analyzed by linear regression. Analysis was performed by using Minitab (version 12.22, State College, PA). $P < .05$ indicated significance throughout.

Results

A total of 33 patients participated in the study. Overall, 85% of the patients received general anesthesia, with the remainder receiving moderate or deep IV sedation with or without a peripheral nerve block. Intraoperatively, all of the patients received fentanyl, and except for one patient in the alcohol group, all also received propofol. Treatment groups did not differ significantly in age, gender distribution, the fraction receiving general anesthesia, or the type of surgery they received (Table 1).

As shown in Table 2, the percentage of subjects who continued with aromatherapy after 2 minutes, as well as the fraction who required systemic antiemetics at some time during their PACU stay, did not differ among the groups. Furthermore, the percentage who would try aromatherapy following a subsequent operation

Table 1. Patient Demographics

	Alcohol (n = 11)	Peppermint (n = 10)	Saline (n = 12)
Age	49 ± 3	42 ± 6	44 ± 5
Gender (M/F)	1/10	4/6	4/8
Type of surgery			
General	3	1	3
Ortho	4	8	8
Gyn	4	1	1
Anesthetic technique			
General	8	8	12
Regional	2	1	0
IV sedation	1	1	0

was also similar among the treatments, suggesting that all three “aromas” were associated with the same degree of satisfaction. Baseline nausea scores were similar among the three groups; neither the intraoperative use of nitrous oxide nor the intraoperative fentanyl dose affected initial nausea scores. Two patients vomited during their PACU stay; both had received aromatherapy with peppermint.

The time course of VAS nausea scores for the three treatment groups is shown in Figure 1. Two minutes after aromatherapy, overall nausea scores decreased from 60.6 ± 4.3 to 43.1 ± 4.9 mm ($P < .005$; Fig. 1); the decrease in nausea did not differ among the treatment groups. Only 15% of subjects requested IV antiemetics 2 minutes after the initial aromatherapy; however, because of the time required to obtain the medications from the medication-dispensing system, these patients did not actually receive antiemetics until after the 5-minute nausea VAS determination. Five minutes after

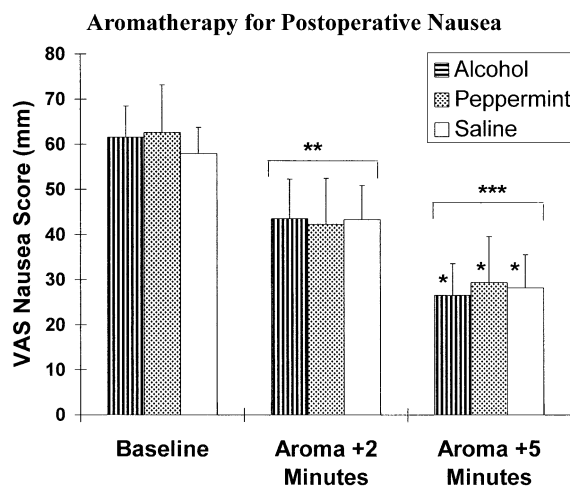


Fig 1. Visual analogue scale (VAS) nausea scores when patients first complained of nausea (baseline) and 2 and 5 minutes after aromatherapy. * $P < .05$ versus baseline value for same group; ** $P < .005$ versus baseline for pooled patient groups; *** $P < 10^{-6}$ versus baseline for pooled patient groups.

the initial aromatherapy, nausea scores were 28.0 ± 4.6 mm ($P < 10^{-6}$ versus baseline). This VAS score includes patients who had requested but not yet received IV antiemetics; the corresponding VAS score excluding such patients was 26.2 ± 5.1 mm ($P < 10^{-6}$ versus baseline). Overall, 52% of the subjects required IV antiemetics at some time during their recovery room stay; the overall VAS satisfaction score was 86.9 ± 4.1 mm, and 93% of patients indicated that they would like to try aromatherapy following a subsequent operation. None of these figures differed among the treatment groups. Regression analysis revealed a modest but significant correlation between the decrease in the nausea score 5 minutes after initial aromatherapy and patients' overall satisfaction ($r^2 = .17$; $P = .028$).

Table 2. Outcomes Patient Satisfaction Scores Following Aromatherapy of Postoperative Nausea

	Alcohol (n = 11)	Peppermint (n = 10)	Saline (n = 12)	Overall (n = 33)
Rescue antiemetics requested at 2 minutes (%)	18	20	8	15
IV antiemetics at any time (%)	45	60	50	52
Would repeat aromatherapy following future surgery (%)	100	78	100	93
Overall satisfaction VAS (mm ± SE)	90.3 ± 4.5	86.3 ± 10.2	83.7 ± 7.4	86.9 ± 4.1

Discussion

These results complement previous reports regarding the perioperative use of aromatherapy for postoperative nausea. Smiler and Srock¹ found that aromatherapy with isopropyl alcohol effectively treated the nausea caused by the motion patients experience while being transported on a stretcher. Wang et al² found that isopropyl alcohol was more effective than placebo for the initial treatment of postoperative nausea in children; however, a majority of their patients had recurrent nausea and/or vomiting within 20 to 60 minutes. More recently, Winston et al¹⁴ found that isopropyl alcohol inhalation relieved PONV more quickly than ondansetron; however, because their study did not include a control group, it is impossible to tell if the effect they observed was related to the alcohol odor per se or to the associated controlled breathing pattern. Merritt et al¹⁵ were unable to demonstrate a beneficial effect of isopropyl alcohol inhalation in patients with PONV; their study had no control group, did not properly define the “control” treatment, and had a small sample size, leading to the potential for Type II statistical error.

This study demonstrated that aromatherapy is an effective initial treatment for postoperative nausea in adults. Furthermore, on the basis of previous observations, all of the patients included in this study would have received IV antiemetics when they first complained of nausea. The fact that only 52% of these patients ultimately required IV antiemetics during their PACU stay implies a significant reduction in IV antiemetic use with its inherent expense and potential for side effects.

A surprising finding was that the antiemetic effect of aromatherapy was independent of the actual aroma; a saline placebo reduced nausea scores just as effectively as isopropyl alcohol or peppermint. This finding suggests that it is not the “aroma” per se, but the act of consciously controlling one’s breathing pattern that may be responsible for the antiemetic effect. Such a

relationship would not be surprising, given the proximity of the vomiting and breathing centers to the fourth cerebral ventricle. In fact, Miller et al¹⁷ demonstrated that chemically induced medullary lesions that abolished vomiting also significantly reduced or eliminated spontaneous respiratory activity. One alternative explanation is a placebo effect, which is most likely to be observed in studies like this one, which track subjective outcomes on a continuous scale.¹⁸ Another possibility is the Hawthorne effect in which experimental subjects tend to behave differently when they know they are being observed.¹⁹ However, the fact that this study cannot definitively explain the underlying mechanism in no way detracts from the utility of aromatherapy in treating postoperative nausea.

Overall, aromatherapy was very popular with study patients. This result was reflected by the very high overall patient satisfaction scores (more than 86 mm on a 100-mm VAS) and the fact that 93% of patients indicated that they would like to try aromatherapy again if they suffered nausea following a subsequent operation. This is especially encouraging given that a prerequisite for entering the study was that they were suffering from postoperative nausea. Many of the patients were pleased that this complementary therapy had been integrated with their conventional medical treatment. Some patients reported that they intended to try aromatherapy in other situations where they were likely to experience nausea.

One possible limitation of the study is related to the fact that the IRB required that patients give informed consent to participate in the study before surgery. This may have biased the results by 1) suggesting to patients that they would experience postoperative nausea; 2) suggesting to patients that aromatherapy would effectively treat nausea if it occurred; and (3) selecting a subset of patients who were open-minded about the possible beneficial effects of complementary therapies. Another concern is that nausea might have abated on its own, even if we

had not administered aromatherapy. This seems unlikely because postoperative nausea, when severe enough to cause patients to request treatment, seldom resolves spontaneously. Finally, the small sample size might have been insufficient to detect subtle differences between the treatment groups, leading to a Type II error. However, because the response to the three treatments was so similar, power analysis revealed that sample sizes of at least 397 per aroma group would be required to demonstrate significant differences between the effects of the three aromas on the nausea VAS ($\alpha = 0.05$, $(1 - \beta) = 0.8$). Thus, any between-group differences that we failed to detect because of the small sample size are unlikely to be clinically important.

Perianesthesia Implications

The results of this study suggest that aromatherapy with isopropyl alcohol should be considered as a first step in the management of PONV in the PACU. The data indicate that using aromatherapy as the initial modality for treating patients with PONV may reduce the need for IV antiemetics at any time during their PACU stay by almost 50%. Although placebo (saline) and peppermint are as effective as alcohol, the latter offers the advantage of being readily available at every patient's bedside. Therefore, it can be administered with minimal delay either as sole

therapy or to provide immediate treatment while medications are being prepared. Because isopropyl alcohol has a readily detectable odor, patients are more likely to think that their PONV is being actively treated when they inhale alcohol vapors rather than just engaging in breathing exercises. The present popularity of complementary therapies was evident from patients' reaction to the study; many of them commented that they would prefer to try a non-pharmacological approach to treating their PONV before receiving standard IV therapy.

Conclusion

The results of this study indicate that initial treatment of postoperative nausea with aromatherapy reduces patients' subjective perception of nausea and IV antiemetic use in the PACU by nearly 50%. Despite the small sample size, this effect had a high degree of statistical significance. Future research in this area might be designed to include a control group (no aromatherapy or antiemetics for the first 5 minutes) in addition to those receiving aromatherapy; this design would help to determine whether the hypothesis regarding breathing patterns is correct. Because it is effective, inexpensive, readily available, popular among patients, and has no known side effects, aromatherapy should be considered for the initial treatment of nausea in the PACU.

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