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Effective role of aromatherapy in reducing big little problem—postoperative nausea and vomiting: A systematic review

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Abstract:

Postoperative nausea and vomiting (PONV) are common and distressing side effects after surgery and anesthesia. Pharmacological treatment is not sufficient to manage these two symptoms. Although the use of certain anesthetic agents is considered the main basis for this phenomenon, the exact factors are unknown. Aromatherapy is effective in reducing PONV in adults. The aim of this review is to scan the studies evaluating the effect of aromatherapy on the management of nausea and vomiting in the postoperative. A literature search was performed by scanning Cochrane Reviews, PubMed, OVID, Sciences Direct, and Google Scholar. Keywords "aromatherapy," "use of aromatherapy," "aromatherapy oils," "nausea," "vomiting," "postoperative nausea and vomiting," and "PONV" combined with Boolean operators, including AND, OR, and NOT. Data gathered from studies published from 2013 to 2023 were reviewed for the effect of aromatherapy on PONV. As a result of the screening, 12 studies out of a total of 706 studies were examined based on the inclusion criteria. In the studies, aromatherapy was used either by inhalation or orally. The plants that were used the most in these studies were ginger and mint. When the literature was reviewed, it was found that aromatherapy reduced the rate of nausea and vomiting and the need for antiemetics, especially in the first minutes after surgery. Using aromatherapy in surgical patients may relieve common postoperative symptoms. The limitations of drug therapy have led to an increase in the use of alternative drugs for the management of nausea and vomiting. Aromatherapy was favored by most patients and is an effective treatment option for PONV.

Keywords:

Aromatherapy, postoperative care, postoperative nausea and vomiting, risk factor

Introduction

Postoperative nausea and vomiting (PONV) are common problems among adults undergoing surgery and can cause anxiety, unpleasantness, and decreased satisfaction.[1,2] The literature has shown that PONV depends on the surgical procedure, anesthesia technique, and patient characteristics. It is reported that the incidence of PONV varies between 35 and 80%. When PONV occurs, it can delay hospital discharge and is a leading cause of unexpected hospitalizations after elective ambulatory surgery. It is not surprising that PONV has attracted a significant amount of attention in surgical journals over the past decade.[3,4]

Today, the use of complementary and alternative medicine (CAM) is recommended in the literature to reduce patient anxiety and PONV and provide higher patient satisfaction in general. Used alone or in combination with pharmacological treatments, CAM plays an important role in the prevention and treatment of PONV.[5,6]

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Over the last 50 years, there have been more than 4000 peer-reviewed publications describing PONV treatments, and many new antiemetic drugs and devices have been introduced into clinical practice, but practitioners have not been able to eliminate this common postoperative problem.[7]

The use of CAM has increased worldwide, especially in the last few decades. In general, CAM, to maintain health, care, and treat various diseases, along with modern medicine, is more and more important all over the world and its use is increasing. The World Health Organization points out that for the promotion and correct use of complementary medicine by employees and people, training and familiarization of the specialists of health and treatment groups are needed. Parallel to the increase in CAM use, a growing interest in the introduction and integration of CAM instruction into curricula has also been witnessed all over the world.[3,4] PONV is not only a distressing complication for the patient and personal but may also result in pulmonary aspiration, pneumothorax, hypoxia, dehydration, electrolyte imbalance, acid–base imbalance, esophageal rupture, increased intracranial pressure, suture rupture, wound dehiscence, and bleeding. In addition, not able to continue oral intake, prolonged hospital stay, anxiety, and increased medical costs.[8,9] Management of PONV includes the use of a risk assessment, prophylactic treatment, and multimodal framework. In this review, we aimed to summarize the current recommendations regarding the effectiveness of CAM, which is increasingly used in modern surgical medicine, in relieving various symptoms with minimal side effects. Recently, the use of no pharmacology in the treatment of PONV has been evaluated.[10,11]

Aromatherapy has been shown to be effective in the treatment of PONV in adults. Aromatherapy is the use of essential oils to relieve emotional or physical discomfort. The use of aromatherapy in PONV is attractive because its noninvasive application allows use by medical staff or patients and its low cost provides greater access to patients. Mint and ginger have been used in most of the studies, however, until now it was not known which aromatherapy or combinations of aromatherapy were truly effective in reducing PONV.[12,13]

Risk factors for PONV

Based on several literature reviews and the consensus of the international expert panel, the researchers published several evidence-based guidelines on the management of PONV. Pharmacological and nonpharmacological interventions are the recommended framework for PONV management. There are a number of factors that influence the occurrence of postoperative symptoms, including factors associated with the patient, anesthesia, and surgery [Table 1].[14,15]

Risk scores for predicting PONV

In 1997, Koivuranta *et al*.'s[16] PONV risk score features five risk factors: female gender, nonsmoking, history of PONV, history of motion sickness, and duration of surgery >60 min. If 0, 1, 2, 3, 4, or 5 risk factors are present, the incidence of PONV is 17, 18, 42, 54, 74, and 87%, respectively. In 1999, Apfel *et al*. determined simplified risk scoring for adults. According to this scoring, there are four independent predictors: female gender, history of PONV and/or motion sickness, nonsmoking status, and postoperative use of opioids. When 0, 1, 2, 3, or 4 factors are present, the risk of PONV is 10, 20, 40, 60, or 80%, respectively.[17,18] There is currently a simplified Apfel *et al*. 1999[18] PONV risk score for adults [Table 2].

Management and control of PONV

PONV is one of the most common discomforts associated with surgical operations, with an incidence of up to 43%. Although some believe that the main factor causing PONV is anesthetic drugs, many studies have shown the influence of a wide variety of factors, including age, gender, time between last meal and surgery, history of PONV, methods, and type of anesthesia. Surgical procedures are related to PONV [Figure 1].[19,20] Since long hospital stay, poor patient satisfaction from the medical team, and increased treatment costs are the most common morbidities associated with PONV, its prevention and treatment pose a significant challenge in modern medicine. Other complications of PONV include

Table 1: Risk factors for PONV in adults

Grouping	Risk factors in adults
Patient factors	Female
	History of PONV
	Motion sickness
	Nonsmoking
	Age <50 years
Surgery factors	long term surgery
	Surgical categories
Anesthesia factors	Type of anesthesia
	Prolonged anesthesia
	Nitrous oxide (>50%)
	Opioid analgesics during and after surgery

Table 2: Risk score for PONV in adults. Simplified risk score from Apfel *et al*. 1999 to predict the patient's risk for PONV. When 0, 1, 2, 3, and 4 of the risk factors are present, the corresponding risk for PONV is about 10, 20, 40, 60, and 80%, respectively

	PONV in adults	Points	Risk of PONV
A	Female gender	1	(A) Risk of PONV is approximately 10, 20, 40, 60, or 80%, respectively
	Nonsmoking	1	
	History of PONV	1	
	Postoperative opioids	1	
	Maximum score	4	

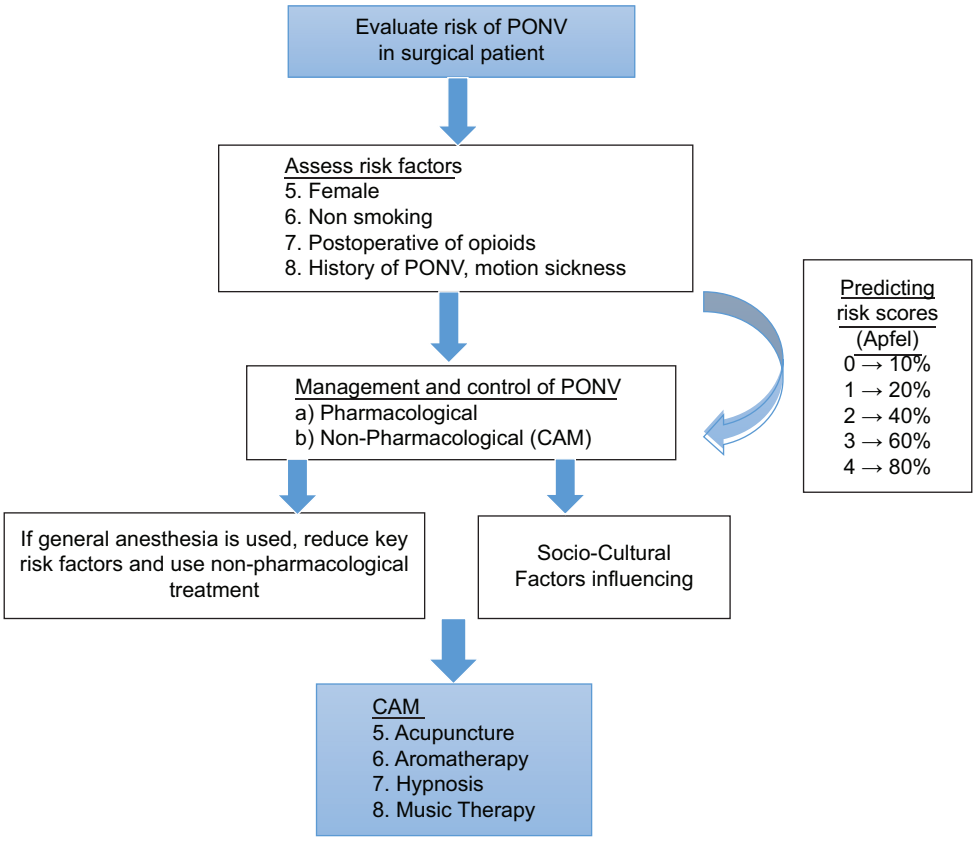

Figure 1: Algorithm for management of PONV

electrolyte disorders, increased pain, hypertension, and probably elevated risk of pulmonary aspiration.[21]

Surgical procedures related to PONV, prolonged hospital stay, and increased treatment costs are the most common complications associated with PONV. Every time, prevention and treatment are important points in modern medicine. Bleeding at the surgical incision site, hematoma, electrolyte disturbances, increased pain, and increased risk of pulmonary aspiration are other complications of PONV. The effectiveness of CAM in relieving various symptoms with minimal complications and its use in modern surgical medicine is on the rise. Several studies have shown that CAM can improve perioperative patient care.[22] Literature has suggested that applying various CAM methods during the perioperative period can improve outcomes, reduce patient anxiety and PONV, and lead to overall patient satisfaction.[21,23]

PONV prophylaxis

Prophylaxis should be given according to the risk level. Monotherapy or combination therapy interventions that reduce baseline risk begin with no pharmacological approach and antiemetics. Prophylaxis is not recommended in low-risk patients. PONV except when they are at risk of medical consequences.[12] In intermediate- and high-risk patients, it should be preferred to develop a management strategy for each individual based on patient preference, cost-effectiveness, and the risk of PONV level with the patient's pre-existing condition.[21]

Objective

The objective of this review is to identify, analyze, and synthesize research evidence of the effectiveness of aromatherapy on treatment-related nausea and vomiting.

Materials and Methods

The present study was a systematic review of the effective role of aromatherapy in reducing PONV. This study was conducted based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

Inclusion and exclusion criteria

Inclusion criteria: (1) Randomized controlled clinical trials (RCTs); (2) Anesthesia Society of America Physical Status I or II (ASA I or II); (3) Aromatherapy was applied by inhalation or orally; (4) Data from 2013 to 2023 were screened for the effect of aromatherapy on PONV; (5) Having no history of asthma, allergy, respiratory problems, motion sickness, and olfactory problems.

Exclusion criteria: (1) Nonclinical trials; (2) Studies conducted with patients under 18 years of age; (3) Allergy or sensitivity to aromatherapy components, inability to smell; (4) Patients with nausea and vomiting before operation; (5) Duplicate articles.

Databases and search strategy

This study was conducted in January 2013 to review English and Persian language-published papers in the field of aromatherapy in reducing PONV. For this purpose, we studied databases including ISI Web of Science, Cochrane Reviews, PubMed, OVID, Sciences Direct, and Google Scholar from January 1, 2013, to January 12, 2023. The search keywords included "aromatherapy," "aromatherapy use," "aromatherapy oils," "nausea," "vomiting," "postoperative nausea and vomiting," and "PONV" combined with Boolean operators, including AND, OR, and NOT. Keywords were combined and typed into the databases' search box. All synonyms of the keywords were searched using MESH strategies.

Data collection process and quality assessment

All studies examined in this study were transferred to EndNote software version 8 and duplicate references were removed. Initial screening of studies was performed by two independent researchers based on information contained in titles and abstracts. Independent reviewers screened the abstracts and qualifying titles when the judges felt liking its abstract or potentially useful title. A full copy of the article was considered for eligibility by both arbitrators if there was a dispute between examiners, the reasons were identified, and a final decision was made based on the third review agreement. After the agreement, the final studies were evaluated based on quality assessment tools. The quality of all selected papers was assessed using critical appraisal tools including the Critical Appraisal Skills Program (CASP). Critical appraisal involves interpreting information, in particular information within research papers, in a systematic and objective manner. These skills help understand research methodologies, ensure reliability, and draw correct conclusions in a given situation. Study designs are subject to a number of variables that introduce bias, and the use of a set of standardized checklists to judge the quality of the study is strongly recommended. The CASP checklist has three sections and a total of 10 questions with answers yes, no, and unsure.[24]

Finding

The result of the database search in the first stage led to the collection of 706 articles in total. In the next step, repeated articles were removed and their number was reduced to 620 articles. Using a systematic screening, we examined the topics related to PONV and aromatherapy and selected 596 articles. Then the abstracts of the articles were reviewed and 24 articles were selected for full study. After that, all the selected articles were fully analyzed, and based on the inclusion criteria, only 12 articles were selected. Figure 2 shows the search strategy and selection of articles according to PRISMA guidelines.

Results

The effect of aromatherapy on nausea and vomiting has been evaluated by using different visual analog scales. In most of the studies, the score on the scale was evaluated between 0 and 10 points. The frequency of assessment of nausea and vomiting after the use of aromatherapy varies between studies.[9] The study findings of Beiranvand *et al*.,[26] in which aromatherapy was used orally to prevent nausea and vomiting after surgery, and was analyzed, showed that the rate of nausea and vomiting in the ginger group was lower than in the placebo group. In another study, it was determined that the rate of nausea was lower in the group using ginger capsules compared to the placebo group.

In contrast to these studies, one study found oral ginger capsules there was no difference in the incidence of PONV between the receiving group and the placebo group. In another study, it was determined that the rate of nausea and vomiting during surgery was lower in the peppermint group compared to the control group, and that there was no statistically significant difference between the groups in PONV at the second and fourth hours.[12]

In a study with patients who underwent nephrectomy surgery, it was found that ginger was effective in reducing PONV compared to the placebo group.[10] Another study showed that when peppermint oil at a concentration of 10% was applied to patients undergoing open heart surgery, it reduced PONV compared to a control group.[23] In a study where the same aroma therapeutic was applied, PONV was higher in the experimental group than in the control group.[27] In randomized controlled clinical studies aromatherapy was applied via inhalation and more than two intervention groups were examined. Hunt *et al*.,[28] in their study of patients who underwent outpatient surgery, reported that the rate of postoperative nausea was 26.3%. In the study, it was determined that the rate of nausea was less in patients who received aromatherapy in the form of a mixture (ginger, two types of mint, cardamom) or only ginger, and the antiemetic drug requirements of the patients were significantly reduced compared to the placebo group. In another study, it was stated that ginger, lavender, peppermint, and lemon essential oils were more effective in preventing PONV. It has been stated that peppermint essential oils applied at 10% and

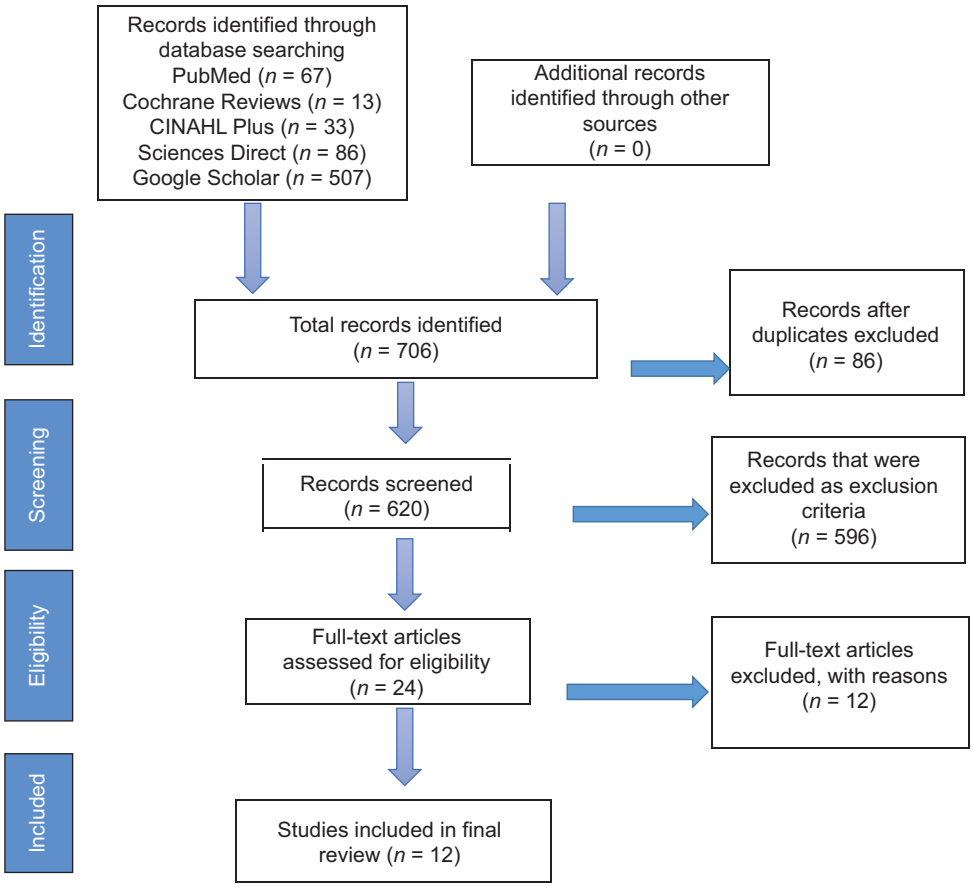

Figure 2: Strategy searching and selecting the articles in accordance with the PRISMA Guidelines. From: Moher D, Liberati A, Tetzlaff J, Altman DG, and the PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and MetaAnalyses[25]

30% concentrations after abdominal surgery are equally effective in reducing the severity of nausea.[29]

Discussion

CAM used alone or in combination with pharmacologic therapies plays an important role in the prevention and management of PONV. PONV management is an important consideration as pain affects, patient comfort, surgical experience, outcomes, wound healing, and family perception. Contemporary studies suggest a role for CAM in the postoperative management of all surgeries.[30]

PONV is one of the common complications that negatively affect the recovery process of surgical patients.[31,32] Various pharmacological and nonpharmacological treatment methods are used in the management of PONV. One of the nonpharmacological methods known to be effective in preventing nausea and vomiting is aromatherapy.[33]

The CONSORT flowchart is widely used in the reporting process of randomized controlled trials, which is considered the "gold standard" in evidence-based practices.[34] In the articles reviewed, it was determined that aromatherapy was applied by nurses and physicians [Table 1]. A study showed that of nurses working in surgical units, 60.4% of these personnel stated that they do not know the method of aromatherapy; the reason for this problem is the lack of sufficient information about CAM and aromatherapy and the lack of experts in the field of aromatherapy.[35]

In another study, it was determined that aromatherapy was applied orally or inhaled to surgical patients [Table 3]. It is stated that aromatherapy can be applied topically, internally, orally, and through inhalation.[30,36] In the reviewed articles, it is thought that the oral and inhalation route is preferred in surgical patients because it is easier to implement in the postoperative period. In the articles examined, ginger, mint, lavender, and rose were used alone or as a mixture in aromatherapy methods. In the literature, it is stated that, unlike these plants, essential oils obtained from plants such as chamomile, eucalyptus, lemon, orange, and rosemary are also used in aromatherapy.[12,37]

The most commonly used aromatherapy plants in the reviewed studies are ginger and mint [Table 1]. Similar to

Table 3: Summary of selected studies examining the effects of aromatherapy on PONV

Study	Study design	Patients (*n*)	Surgery type	Intervention	Findings
Sites *et al*., 2014[41]	Randomized single-blind clinical trial	330	General surgery	Peppermint	Data also support the use of peppermint AR in conjunction with CB for PONV relief
Mandal *et al*., 2014[42]	Randomized controlled	100	Ambulatory surgery	Ginger	Prophylactic administration of ginger and ondansetron significantly reduced the incidence of PONV
M Adib-Hajbaghery *et al*., 2015[10]	Randomized clinical trial	120	Nephrectomy	Ginger	Ginger essence inhalation has a positive effect on PONV
Briggs *et al*., 2016[43]	Randomized, double-blinded clinical trial	123	Cardiac surgery	Peppermint	Peppermint oil inhalation is a viable first-line treatment for PONV
Soltani *et al*., 2018[44]	Randomized, double-blinded clinical trial	100	Laparoscopic cholecystectomy	Ginger	Oral ginger 1 h before the operation to control the severity of PONV
Tóth *et al*., 2018[38]	Meta-analysis	918	General surgery	Ginger	Ginger is safe and well tolerated and decreases the severity of PONV
Maghami *et al*., 2020[23]	Randomized, clinical trial	60	Cardiac surgery	Peppermint	It has beneficial effects on reducing PONV
Karsten *et al*., 2020[12]	Clinical trial	50	General surgery	Peppermint	Use of peppermint in conjunction effectively on the severity of PONV
Wulandari *et al*., 2021[22]	Randomized, double-blinded clinical trial	36	Laparotomy	Peppermint and ondansetron	Peppermint aromatherapy was better at reducing, especially in the early minutes after surgery
Marsh *et al*., 2022[3]	Randomized, double-blinded clinical trial	384	Orthopedic surgery	Lavender, peppermint, ginger and lemon	Supports the use of aromatherapy to reduce PONV
Beiranvand *et al*., 2022[26]	Randomized, clinical trial	60	Upper and lower limb surgery	Ginger	Ginger was effective at decreasing PONV
Ahmadi *et al*., 2022[29]	Randomized single-blind clinical trial	120	Abdominal surgery	10 and 30% Peppermint	10 and 30% Peppermint essential oils are equally effective on the severity of nausea

this result it is stated in the literature that frequently used aromatherapy plants are ginger, mint, lavender, rose, or a mixture (AORN, 2020). A meta-analysis study stated that ginger is safe and effective in preventing PONV, reduces the incidence of PONV, and can be used as a cost-effective and effective alternative method instead of antiemetic drugs.[38]

One study with female patients undergoing laparoscopic abdominal surgery showed that the application of peppermint oil inhalation in the postoperative recovery unit was effective in preventing PONV.[7,39,40] Karsten *et al*. (2020)[12] study also reported that peppermint oil inhalation is effective in preventing PONV.

Conclusion

In conclusion, this review provides evidence of significant progress over the past 20 years but also provides opportunities for further development. We must be careful that the gaps in human resources are eliminated and that professional education and awareness are the focus of the next steps. Despite the clinical perception that the severity of PONV is decreasing, it still remains a big little problem. Patients with a history of vomiting now experience only nausea. But for many patients, persistent nausea can be more bothersome than vomiting. As a first step, studies should be directed to patients at low risk for PONV. This should be followed by an investigation of the effectiveness of various antiemetic regimens in susceptible individuals; there is currently no magic cure that completely controls or treats PONV. Our review of the alternative medicine literature concluded that nonmedical treatments for PONV should be used in addition to, rather than replacing, medical treatments.

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Conflicts of interest

There are no conflicts of interest.

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